SECTION 13301
FIELD INSTRUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Section includes:

1. In-line Flow Meters.

1.02 REFERENCES

A. I.S.A. – Instrument Society of America

B. Hydraulic Institute

C. ANSI – American National Standards Institute

D. NEMA – National Electrical Manufacturers Association

E. UL – Underwriters Laboratories

F. NEC – National Electric Code

1.03 PERFORMANCE – GENERAL REQUIREMENTS

A. The instrumentation equipment shall be furnished by a manufacturer regularly engaged in the manufacture of process instrumentation equipment and systems for water and wastewater treatment facilities. The instrument manufacturer shall produce detailed drawings for the complete coordination and installation of the various system components; shall provide the services of a qualified engineer to supervise the installation; and shall test and make any adjustments required, at no additional cost to the WSD, to the extent that the system initially functions as intended by this specification to the satisfaction of the WSD.

B. WSD's Representative will check after the Contractor certifies that all the instruments are installed and are operating as per intended specification. The Contractor shall be required to correct, at no extra cost to the WSD, all deviations and/or deficiency from the intended use of the instruments individually as well as the system in its entirety, which the WSD's Representative may find during the detail checkup of the system(s).

C. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Contractor shall examine the architectural, structural, mechanical, electrical and shop drawings for the various pieces of

equipment in order to determine the exact routing and final terminations for conduits and signal lines. Instrumentation work shall be carefully coordinated between the various trades in order to secure the best arrangement of the work as a whole. No changes in the work shall be made without written acceptance of the WSD.

D. The Instrument Contractor shall submit evidences of his prior experience, technical skill, capacity to handle a project of the volume and reference of other clients for whom he has performed similar installations.

E. Services by Manufacturer and Guarantee:

1. Certification sheets shall be prepared by the Instrumentation Manufacturer to guarantee that each component has been calibrated and commissioned prior to start-up. Certification sheets shall be signed and dated by the Instrumentation Manufacturer. All instruments shall be calibrated by an instrument traceable to a primary standard. All instruments shall be calibrated to within the accuracy stated by the manufacturer. Each instrument shall be checked for zero and full span and in addition, a check shall be made of minimum of 5 points between 10 and 90 percent of the actual span for each analog instrument. The certification sheets shall show "as found" and "as left" readings.

2. After all tests and adjustments have been made, the manufacturer shall fully instruct the WSD's Representative in all details of operation and maintenance of equipment installed under his work.

3. The Contractor and his surety shall guarantee in writing for a period of one year from the date of final acceptance that all materials, equipment and labor furnished by him are free from defects. The Contractor shall further guarantee that if any piece is found to be defective within the guarantee period because of faulty manufacturing, faulty installation or workmanship, in the opinion of the WSD's Representative, the Contractor will replace and install such material or equipment without any additional expense to the WSD.

F. Installation, Calibration, Commissioning and Start-Up Assistance

1. Work Included
   a) Install, calibrate, commission and assist in the start-up of instrumentation and controls including those furnished with purchased equipment in accordance with this specification section, the applicable design drawings and other Contract Documents.
   b) Furnish and install all necessary instrumentation materials and piping required to perform the work.

1.04 GENERAL INSTRUMENT CONSTRUCTION

A. Attachments and Supports

1. All instrumentation and electrical equipment shall be securely supported. It shall be the responsibility of the Contractor to provide adequate support for all equipment he installs. Methods of support shall be subject to the approval of the WSD.
2. All fastenings, supports, hangers, clamps, and anchors shall be of the type made for the specific purpose for which they are to be used. Toggle bolts or machine bolt fastenings shall be used for hollow tile, terra-cotta, or lath construction. Machine screws shall be used for structural steel fastening. Lead expansion shield and machine screws shall be used for solid masonry fastening. Lag screws or bolts shall be used for wood fastening. All conduit and tubing shall be rigidly and firmly installed to prevent swaying, vibration or sagging by malleable or wrought steel hangers of standard design, pipe clamps, or fabricated steel supports of approved design. Hangers for horizontal conduit runs shall be adjustable clevis type. Perforated strap iron hangers are not permitted.
3. All exterior fastening devices shall be Series 304 stainless steel.
4. Panels and other equipment that are located on subgrade walls in unfinished areas or in damp locations, shall be mounted on square aluminum channel.

B. Identification Nameplates

1. All sensors, transmitters, terminal and junction boxes, and similar or related items shall be identified by name, function, and/or control. Nameplates shall be at least 1” x 3” with characters not less than ¼ inch. They shall be made up of 2 laminated white plastic sheets bonded with a middle sheet of black plastic and characters engraved in one white sheet to the depth of the black plastic. Nameplates shall be attached with sheet metal screws or bolts and nuts.
2. Plastic tape embossed nameplates will not be acceptable.

C. Instructions

1. After all tests and adjustments have been made, this Contractor shall fully instruct the representatives of the WSD in all details of operation and maintenance of equipment installed under his work.

D. Materials

1. All material shall be new, free from defects, and of the quality specified or shown. Each type of material shall be of the same manufacture throughout the work. All material shall be the product of established, reputable manufacturers normally engaged in the production of the particular item being furnished.
2. Care shall be exercised in the installation of all equipment to avoid damage or disfiguration of any kind. All equipment shall be protected from dust and

moisture prior to and after installation. The panels and consoles shall be covered with a heavy polyethylene plastic sheet or laminated kraft paper having a moisture barrier during all stages of construction.

3. Equipment which is stored in unheated or open areas on the job shall be provided with thermostatically controlled heating units of sufficient size to keep the temperature of the equipment above the dew point.
4. Failure of the Contractor to protect the equipment as outlined herein shall be grounds for rejection of the equipment.

E. Indicating Scales

1. All instrument components furnished under this Contract requiring indicating scales or meters shall be furnished with the appropriate ranges and engineering units. Indicating scale reading 0-100 percent will not be acceptable.

1.05 TESTING, CALIBRATION AND COMMISSIONING

A. As preparation for the calibration and commissioning of the instrumentation, the Contractor shall:

1. Visually inspect electrical devices and connections for compliance with specifications, drawings and manufacturer's recommended installation practice.
2. Remove all shipping stops and install components such as charts, etc., which have been supplied separately but are integral parts of the instruments.
3. Operationally check all instruments, including those provided with equipment and marked on the "piping and Instrument Diagrams". After, or during checking, each instrument shall be calibrated and commissioned.
4. Furnish and report forms recording the calibration of all devices and settings of all final adjustments.
5. Check calibration of all instruments with respect to zero, span and linearity. Calibrate instruments individually. Attach a calibration sticker to each item after calibration. Furnish a signed calibration report for each instrument.
    a) If, during calibration procedures, any reason is discovered to question the conformance of any device or installation with applicable codes and regulations, the WSD shall be notified so that corrective measures may be taken.
    b) When doubt exists as the correct method of calibrating an instrument, the manufacturer's printed recommendations shall be used.

1.06 INSTRUCTION MANUALS

A. The Contractor shall provide the WSD with 3 complete sets of manufacturer's operating and maintenance instructions and recommended spare parts lists for all instrumentation equipment furnished.

PART 2 – PRODUCTS

2.01 IN-LINE MAGNETIC FLOW METERS

A. Size as shown on Drawings.

B. Flow Meter Characteristics:

1. Accuracy: ± 0.5% of reading ≥ 2.0 fps; ± 0.01 fps for < 2.0 fps.
2. Flow range: 0 – 2 fps minimum to 0 – 50 fps maximum.
3. Coil excitation: Pulsed DC excitation.
4. Environmental Protection: NEMA 6 and IP68 indefinitely submersible to 30 feet water column.
5. Internal grounding electrode on each sensor or stainless steel grounding ring.
6. Carbon steel body with polyamide or 2 component coating.
7. Stainless steel flow tube.
8. Liner: Hard-rubber or ebonite.
9. Electrodes: Hastelloy C22 or C276.
10. AISI/ASME 150 lb. flanged connections.
11. Cable length from flow meter to transmitter: Contactor to field verify to meet field conditions.
12. Medium to be measured: Domestic raw sewage.
13. Ambient temperature operating range: -40^0 F to 149^0F.
14. Medium temperature range: 32^0F to 158^0F.
15. Junction box: aluminum.
16. Rating: FM ordinary; CSA Class 1, Division 2.
17. Meter Manufacturer: Foxboro 9100A Series or Krohne OptiFlux 2000 Series.

C. Transmitter:

1. Wall-mount, epoxy coated, cast aluminum or polyester coated aluminum enclosure, NEMA 4 rating.
2. Cable entry: 4 non-threaded holes for ½" conduit.
3. Communication interface: HART protocol
4. Analog outputs: 4-20 mA outputs.
5. Transmitter Power Supply: 120V
6. Low flow cut-off.
7. Self-diagnostic with empty pipe detection.
8. Display: LCD display with integral push-button operation.
9. Operating language: English
10. Diagnostics: All necessary diagnostics, readings and system status to be available via front panel keypad.
11. Capable of measuring instantaneous flow and bi-directional flow in units of gallons/minute.
12. Capable of totalizing flow by day and by month.
13. Transmitter Manufacturer: Foxboro IMT25 Series or Krohne IFC 100 Series.

PART 3 – EXECUTION

3.01 MANUFACTURER'S SERVICES

A. All manufacturer's visits to construction site prior to final performance test shall be the responsibility of the Contractor. The Contractor shall furnish the WSD with services of equipment manufacturer's representatives for a period of 1 man-day. The pumping station shall be fully operable and capable of pumping medium at its designed flow rate so start-up and calibration can occur. If station is not operable, then start-up services flow the flow meter will not be considered complete until such time pump station is fully operable.

B. Applicable contract prices shall include the furnishing of all said services. Furthermore, said services shall be additional to those furnished in connection with equipment erection, installation, testing and the correction of deficiencies. Services provided shall consist of furnishing detailed instructions to personnel of the WSD regarding equipment operation and maintenance.

3.02 INSTRUCTION MANUALS

A. Contractor shall furnish, prior to initial testing, three (3) copies of an indexed maintenance manual composed of suppliers' maintenance manuals on all equipment and suppliers' brochures on all specialty equipment, including performance curves with size, model, figure number, etc., indicated to identify unit furnished. Maintenance manuals are to be a hardback, loose-leaf type and of a durable quality. Manuals are to be for the specific equipment provided. Manuals describing general equipment lines will not be accepted.

B. Each set is to include the following:
   1. Manufacturer's parts list identified with the make, model and serial number of the equipment furnished.
   2. Control and wiring diagrams.
   3. Installation, operation, and maintenance instructions.

3.03 INSTALLATION

A. Install per manufacturer's recommendations. Device shall be calibrated per manufacturer's recommendations. If inadequate sewage flow into pumping station is not available for testing and calibration of the flow meter, Contractor shall provide adequate water into the station in order to perform testing and calibration of the flow meter.

B. Flow meter transmitter/signal converter shall be mounted on the backboard containing the pump station control panel.

C. Maintain manufacturer's recommended distance upstream and downstream of flow meter with no other pipe interferences such as bends or tees.

D. Install power wiring and communication signal wiring between the meter and the transmitter/signal converter in two (2) separate conduits. Placement of power wiring and signal wiring in the same conduit is not permitted.

E. Where required by the manufacturer for correct operation, grounding rings shall be employed on the meter flanges.

3.04 WARRANTY

A. Warranty shall be for one (1) year from date of acceptance of the entire pumping station by the WSD. Operational start-up of the meter alone without the entire pumping station being placed into service will not be considered as beginning of warranty date for flow meter devices.

END OF SECTION