

## **SECTION 40 91 23.33 – IN-LINE LIQUID FLOW MEASURING SYSTEMS**

### **PART 1 - GENERAL**

#### **1.1 THE REQUIREMENT**

- A. General: The CONTRACTOR shall provide in-line liquid flow measuring systems, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 40 90 00 – Process Control and Instrumentation Systems apply to this Section.
- C. All parts and components shall be of a single manufactured and designed as a single system.
- D. All instruments shall be FM-approved, or equal.

#### **1.2 SUBMITTALS**

- A. General: Shop Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems, and MASS Section 10.05 Article 5.6.
- B. General:
  - 1. Submittals shall be furnished for the purpose of evaluating bids.
  - 2. Shop Drawings, Owner's Manual, and Record Drawings shall be submitted in conformance with the requirements of Section 40 90 00 – Process Control and Instrumentation Systems, and MASS Section 10.05 Article 5.6.
- C. Shop Drawings: Provide detail drawings of the metering body (i.e.: flow tube or propeller meter) for the purpose of verifying sizes, fit and application.
- D. Technical Data: Provide data sheets along with operations and maintenance manuals for bid evaluation purposes.
- E. Startup Services: The system manufacturer shall be locally represented having a factory-certified factory-trained service technician. The representative's technician shall provide startup services once the owner has installed the equipment. Technician credentials are to be submitted with this bid.
  - 1. These instruments will be installed at separate locations in the Anchorage area resulting in a service trip for each installation.
  - 2. Startup services are to include installation verification, commissioning, calibration and 1 hour of informal training.

## PART 2 - PRODUCTS

### 2.1 INSERT-TYPE MAGNETIC FLOW SENSORS

- A. Magnetic flow meter systems shall be of the low frequency electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flow meter system. Each magnetic flow metering system shall include a metering tube, transmitter and flow meter grounding rings.
- B. Magnetic flow meters and electronics shall be manufactured at facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.
- C. The system shall be capable of measuring flow bi-directional in a range no less than -39 ft./sec to +39 ft./sec. Flow rates of 0.04 ft/sec in either direction shall be sensible.
- D. Metering Tube: The metering tube shall have the following:
  - 1. Carbon steel, rated for water at a working pressure of 150 psi and have flanged connections in accordance with ANSI 16.5 Class 150.
  - 2. Utilize a minimum of 2, self-cleaning electrodes
  - 3. Liner in conformance with the Manufacturer's recommendation for the meter's intended service
  - 4. Electrodes constructed of 316L stainless steel
  - 5. Metering tubes shall be 10 inch line size
  - 6. Meter coating consisting of epoxy painted finish
  - 7. System to include 2 grounding rings which are in conformance with the Manufacturer's bore and material recommendation for the meter's intended service. Grounding rings shall be designed to protect and shield from process abrasion the liner's edge interface at the meter's end.
- E. Transmitter: The microprocessor-based signal converter/transmitter shall be integrally mounted on the flow tube and shall have the following:
  - 1. Utilize DC pulse technique to drive flux-producing coils.
  - 2. Convert DC pulse signal from the tube to a standard 4-20 mA signal into a minimum of 600 ohms.
  - 3. HART communications.
  - 4. An operator interface with a 2 line display each having 16 characters minimum for flow rate, percent of span, and totalizer.
  - 5. An operator interface consisting of keypads which respond to English text entry
  - 6. Programmable zero return to provide a consistent zero output signal in response to an external dry contact closure.
  - 7. Bi-directional flow
  - 8. Automatic range change
  - 9. Programmable parameters including meter size, full scale Q, magnetic field frequency, primarily constant, time constant
  - 10. Data retention for a minimum of 5 years without auxiliary main or battery power

11. Self-diagnostics and automatic data checking
12. Protected terminals and fuses in a separate compartment which isolates field connection from electronics.
13. The housing shall be constructed of low copper aluminum be of type 4X, IEC 60529, IP66 with polyurethane paint and rubber gaskets.
14. The housing shall accommodate two ½-14 NPT raceway entries.
15. Can tolerate ambient temperature operating limits of -20 to 140 degrees F (-29 to 60 degrees C).
16. Power Consumption not to exceed 10 watts
17. Power Supply shall be 24 VDC +/-10 percent

F. Performance Requirements

1. Turn-on time shall be no greater than 5 minutes to rated accuracy. Startup time shall be no greater than 50 ms from no flow.
2. Low flow cutoff shall be adjustable down to 0.01 ft./s. The transmitter shall output a linear signal to 110% of upper range.
3. Standard system accuracy shall be +/-0.25% of rate +/-1.0 mm/sec from 0.04 to 6 ft./sec (0.01 to 2 m/sec); above 6 ft./sec (2 m/sec), the system has an accuracy of +/-0.25% of rate +/-1.5 mm/sec.
4. Repeatability shall be 0.1 percent of full scale and stable to 0.1% of rate over six months with an ambient temperature effect no greater than +/- 0.25% over the temperature rating range.
5. Isolation: either galvanic or optic

G. Manufacturer, or equal

1. **Rosemount 8705** flow tube with **Rosemount 8732E** integral transmitter
  - a. Flow tube: 8705 (*Insert relevant parameter/feature code here*)
  - b. Transmitter: 8732E S T 2 A 1 N0 M5

H. Provide insert-type magnetic flow meters as shown on the

I. The following insert-type magnetic flow sensors shall be provided:

Flow Tube	Tag No.	Location

## 2.2 PROPELLER METER FLOW TRANSMITTERS

- A. Replacement or added propeller meter flow transmitters shall attach to the existing meter heads and shall be provided by the same Manufacturer as the meter head.
- B. The unit shall provide local indication of instantaneous flow and total flow, and a 4-20 mA current signal output proportional to the rate of flow. The unit shall operate on 24 VDC power supply.
- C. The totalizer-transmitter shall have an O-ring sealed housing with a NEMA 4X rating.
- D. Accuracy shall be plus or minus 5 percent of full scale minimum.
- E. Manufacturer: **Water Specialties Model TR-16**, or equal.
- F. Provide the following propeller meter flow transmitters:

Tag No.	Facility

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Flow measuring systems shall be handled, installed in accordance with the Manufacturers installation instructions and calibrated, loop-tested, precommissioned, and performance tested by authorized manufacturer's representatives according to Section 40 90 00 – Process Control and Instrumentation Systems.
- B. The Manufacturer shall provide 4 hours of on-site training for each type of instrument.
- C. The CONTRACTOR shall cut, patch, fit, and weld fittings to existing pipes as necessary. Pipes shall be cleaned and painted to match existing pipe finish. All fittings and fixtures shall be disinfected following the standard procedure before being put into service.

**END OF SECTION 40 91 23.33**