DIVISION 23

SECTION 23 09 24

STEAM FLOW METERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Section specifies the requirements for provision of annubar type steam flow meters and associated microprocessor-based signal converters.

B. Under this Section, the Contractor shall furnish and install the annubar type steam flow measurement equipment and accessories as indicated on the plans, in accordance with the manufacturer's published instruction manuals and as herein specified.

1.02 RELATED SECTIONS

A. Related Sections:

1. Section 01 51 23 - Temporary Heating
2. Section 23 05 00 – Common Work Results For HVAC
3. Section 23 05 13 - Common Motor Requirements For HVAC Equipment
4. Section 23 05 23 - General Duty Valves For HVAC Piping
5. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
6. Section 23 05 53 - Identification for HVAC Piping and Equipment
7. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
8. Section 23 07 00 - HVAC Insulation
9. Section 23 09 13 - Instrumentation and Control for HVAC
10. Section 23 09 14 - Natural Gas and CO Gas Leak Detection Equipment
11. Section 23 09 23 - Control Dampers
12. Section 23 09 24 - Steam Flow Meters
13. Section 23 22 13 - Steam and Condensate Heating Piping
14. Section 23 25 19 - Water Treatment for Steam System Feedwater
15. Section 23 31 13 - Metal Ducts
16. Section 23 33 00 - Air Duct Accessories
17. Section 23 34 16 - Boiler Room Combustion Air Makeup And Ventilation System
18. Section 23 51 00 - Chimney Liner
19. Section 23 51 16 - Prefabricated Breechings and Accessories
20. Section 23 51 23 - Gas Vents
21. Section 23 52 39 - Firetube Boilers
22. Section 23 53 12 - Vacuum Condensate Pumps
23. Section 23 53 13 - Boiler Feedwater Pumps

1.03 SUBMITTALS

A. The following information shall be included in the submittal for this Section:

1. Data sheets and catalog literature for the Annubar insertion type steam flow meters.

2. Connection diagrams for equipment wiring, including wiring to additional remote auxiliary electronic flow transmitters with digital readout, that shall be wall mounted within the Boiler Room as shown on the Contract Drawings, and interfaces to the future BMS that is to be provided by others under a separate contract.

3. List of spare parts and auxiliary equipment.

B. Maintenance Data: Operation and Maintenance Manuals.

1.04 WARRANTY

A. The manufacturer of the annubar insertion type steam flow meters shall guarantee for eighteen months from time of manufacture, or one year of operation after installation (whichever comes first) that the equipment shall be free from defects in design, workmanship, or materials.

PART 2 - PRODUCTS

2.01 ANNUBAR TYPE STEAM FLOW METERS

A. Provide steam flow meters with flow sensing elements of the multi-port self-averaging differential pressure sensor type, “Wedgebar” Self Averaging Pitot-Tube (SAPT) type, Model WBF-200, flanged, as manufactured by Experflow Measurements Inc., or approved equal, in locations and of capacities, characteristics and sizes, as shown and as scheduled on the Contract Drawings and as specified herein. Steam flow meters shall be constructed in conformance with ASME/ANSI-MFC-12M and ASME/ANSI B31.1/B31.3 Standards. The flow measuring station shall be rated to at least 150 psig at 250 degrees F, minimum. Flow meters shall be located where indicated on the Contract Drawings, and installed in strict accordance with the manufacturer's published instructions.

B. Each steam flow meters shall each be provided with an integral microprocessor-based signal converter and an electronic flow transmitter, and with a remote digital flow computing and display readout panel, that shall be wall mounted within the Boiler Room as shown on the Contract Drawings, and that shall also be capable of future monitoring interface with the future BMS that is to be provided by others under a separate contract.

C. Configuration: The flow element shall be of a maximum two (2) piece construction of a wedge shape with two (2) 100% independent pressure sensing chambers to prevent signal degradation and mixing.

D. The impact velocity sensing holes (ports) shall be strategically located along the leading edge and the true static sensing holes (ports) shall be on the exterior probe sides. The quantity and position of the holes (ports) shall be as determined by the manufacturer. The probe must not generate any vortices or vacuum effects that impinge on the static pressure measurement sensing area and shall have a low drag coefficient-Cd (less than <0.35).

E. Each flow sensor shall be complete with instrument shut-off valves, including an integral 3-valve manifold head.

F. A stainless steel identification tag shall be provided, rigidly affixed to each flow meter, with specific flow measurement information, as applicable, including design flow rate, meter reading for design flow rate, metered fluid, line size, and station number or location.

G. All sensors shall be of 316/316L stainless steel. The mounting weld fitting and flange shall be of the same material as the process pipe material. The flow element shall be rated according to ANSI B16.5 flange standards and be selected to meet actual design conditions.

H. The accuracy of the flow element shall be within +/-1% of rates with a repeatability of +/-0.2% of rates. The effective turn-down ratio shall be 6:1 and or 10:1 by using two (2) DP-transmitters for (low flow / high flow rates) in the corresponding and appropriate range of Reynolds Numbers (Re No's).

I. Each steam flow meter shall be provided with mounting flange and accessories, including, but not limited to bolts, nuts and gaskets.

J. Each steam flow meter shall be provided with a Model SITRANS P320/P420 mass flow transmitter, as manufactured by Siemens Corp., or approved equal.

1. Signal Converter:
    a. Sealed Aluminum Enclosure: FM Class I, II, III Div 1 & 2, Groups A, B, C, D IP66/67.
    b. Display: Background illumination with alphanumeric 2-line, multi-character display to indicate flow rate, totalized values, settings, and faults.
    c. Power supply: Loop-powered, two wire 14-36VDC, Ex version: 14-30VDC.
    d. Operating temperature: -40° F to +465.degrees F.
    e. Outputs: 4-20 mA (max. 20.8mA). Passive pulse for external display of flow rate, and HART Digital protocol.
2. Sensor and signal converter performance:
    a. Flow Accuracy:
        1. Liquids: 0.75 to 2.0% of rate depending on Reynolds number and flow rate.
        2. Gases and steam: 1.0 to 2.0 % of rate depending on Reynolds number and flow rate.
        3. Refer to the manufacturer's latest published operations and maintenance manual for detailed data.
3. Totalizer: Multi-digit counter for forward flow.

K. For each steam flow meter, provide a Model REI-SFC digital microelectronic steam mass flow computation readout panel, as manufactured by Ritec Corp., or approved equal. The digital flow meter computation readout panel shall be complete, provided with density compensation to provide direct mass flow of steam output. The digital flow meter computation readout panels shall be wall mounted within the Boiler Room at an elevation of 5-feet above finished floor, as shown on the Contract Drawings.

L. The flow computation readout display panel shall calculate mass flow corrected for density with real time calculations, based on temperature and/or pressure measured at the flow measurement point. The flow readout meter shall be capable of configuration

with default values for temperature and pressure. The flow readout meter shall display steam mass flow rate and mass flow total with an integral 4.3 inch LCD display and shall support field programming of all parameters.

M. The flow computation readout display panel shall be single or dual channel as required and capable of field upgrade with auto recognition, if/when channels are added.

N. The flow computation readout display panel shall be wall mounted in a NEMA 4X enclosure, with a 4.3 inch TFT color LCD panel, with 180 degree viewing angle. The unit shall include capability to support single or dual simultaneous display.

O. Inputs shall be 4-20 mA DC, or pulse, for flow, and 4-20 mA DC for pressure and temperature. 4-20 mA DC inputs shall be sinking. Pulse inputs shall be 0.4 Hz to 10K Hz, optically isolated and auto current limiting.

P. Outputs shall be solid state Form A relay, 5 to 50 VDC, 100 mA. Building Management System connectivity capability shall include integral provision of:

1. Modbus TCP/IP
2. Modbus RTU Slave [RS485]
3. BacNet MSTP (optional)
4. BacNet IP (optional)
5. USB DFU port for firmware upgrades
6. Micro-SD card socket and card for long term storage of logged files.

Q. Provide associated interconnecting control monitoring signal wiring and low-voltage 120Volt/1-Phase/60Hz control power wiring to each flow meter's transmitter and to the associated remote digital computation readout panel, in accordance with the manufacturer's published specification requirements and installation instructions. Coordinate with Div. 26, Electrical, for location of the nearest local available power panels 120Volt/1-Ph/60Hz electrical circuit breakers, for provision of 120Volt/1-Ph/60Hz. power source wiring to steam flow meter transmitters and remote wall-mounted digital readout display panels, located as shown in the Boiler Plant.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow the manufacturer’s recommendations for the minimum upstream and downstream straight lengths of steam piping installation requirements for each flow meter.

B. Wiring between flow sensor transmitter and remote mounted flow meter microelectronic computation and readout monitoring panels shall include the provision of conduit or cable type and procedures in strict accordance with the manufacturer’s published instructions and specifications. Coordinate with Div. 26, Electrical, for location of the nearest local available power panels 120Volt/1-Ph/60Hz electrical circuit breakers, for provision of 120Volt/1-Ph/60Hz. power source wiring to steam flow meter transmitters and remote wall-mounted digital readout display panels, located as shown in the Boiler Plant.

END OF SECTION