PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Divisions 00 and 01, apply to this Section.

1.2 SUMMARY

A. This Section includes the following meters and gages for mechanical systems:

1. Thermometers.
2. Gages.
3. Trumpet valves and gages.
4. Portable instrument connections.
5. Flowmeters.
6. Thermal-energy meters.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. Domestic Water Piping: Piping inside building that conveys potable cold and hot water to fixtures and equipment throughout the building.

D. Non-Potable Water Piping: Piping inside building that conveys non-potable water to fixtures and equipment throughout the building.

1.4 SUBMITTALS

1.5 Product Data: For each type of product indicated; include performance curves.

1.6 Shop Drawings: Schedule for [thermometers][gages][flowmeters][and][thermal-energy meters] indicating manufacturer's number, scale range, and location for each.

1.7 Product Certificates: For each type of [thermometer][gage][flowmeter][and][thermal-energy meter], signed by product manufacturer.

1.8 Operation and Maintenance Data: For [flowmeters][and][thermal-energy meters] to include in emergency, operation, and maintenance manuals.

1.9 CODES AND STANDARDS

A. Codes and Standards shall be the current version adopted by the Authority Having Jurisdiction.

1.10 QUALITY ASSURANCE

A. Comply with the Reduction of Lead in Drinking Water Act of 2011 for domestic water systems. This act redefines “lead free” as “not containing more than 0.2 percent lead when used

with respect to solder and flux and not more than a weighted average of 0.25 percent lead when used with respect to wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures". Products required to be "lead free" shall have NSF 61-G or NSF 372 certification.

B. Soldered Lead Free End Connections: Copper alloys with silicone content greater than 0.005% are not allowed.

1.11 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of instrumentation on floor plans and diagrams.

PART 2 – PRODUCTS

2.1 BASIC, COMMON FEATURES

A. Lead free products and materials shall be used for meters and gages in Domestic Water Piping Systems.

B. Soldered Lead Free End Connections: Copper alloys with silicone content greater than 0.005% are not allowed.

2.2 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal-Case, Liquid-In-Glass Thermometers:

a. Trerice, H. O. Co.
b. Weiss Instruments, Inc.
c. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
d. Or Approved Equal

B. Case: Die-cast aluminum with enamel finish, 7 inches long.

C. Tube: Red reading with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings or white face with black markings.

E. Window: Glass or polycarbonate.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of material and length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 PLASTIC-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plastic-Case, Liquid-In-Glass Thermometers:

a. Ernst Gage Co.
b. Eugene Ernst Products Co.
c. Marsh Bellofram.
d. Miljoco Corp.
e. Trerice, H. O. Co.
f. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
g. Winters Instruments.
h. Or Approved Equal

B. Case: Plastic, [7 inches][9 inches]<Insert other> long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings or white face with black markings.

E. Window: Glass or plastic.

F. Connector: [Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device][Rigid, straight type][Rigid, angle type].

G. Stem: Metal, for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.4 DIRECT-MOUNTING, VAPOR-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Direct-Mounting, Vapor-Actuated Dial Thermometers:

a. Marsh Bellofram.
b. Trerice, H. O. Co.
c. Weiss Instruments, Inc.
d. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
e. Or Approved Equal

B. Case: Dry or liquid-filled type to suit application, stainless steel or cast aluminum, 4-1/2-inch diameter.

C. Element: Bourdon tube or other type of pressure element.

D. Movement: Mechanical, connecting element and pointer.

E. Dial: White face with black markings.

F. Pointer: Black metal.

G. Window: Glass.

H. Ring: Stainless steel.

I. Connector: Rigid, bottom or back type to suit application.

J. Thermal System: Liquid- filled bulb in brass stem for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.5 REMOTE-MOUNTING, VAPOR-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Remote-Mounting, Vapor-Actuated Dial Thermometers:

a. Marsh Bellofram.
b. Trerice, H. O. Co.
c. Weiss Instruments, Inc.
d. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
e. Or Approved Equal

B. Case: Dry type, stainless steel or cast aluminum, 4-1/2-inch diameter with holes for panel mounting.

C. Element: Bourdon tube or other type of pressure element.

D. Movement: Mechanical, connecting element and pointer.

E. Dial: White face with black markings.

F. Pointer: Black metal.

G. Window: Glass.

H. Ring: Stainless steel.

I. Connector: Bottom or back union type to suit application.

J. Thermal System: Liquid- filled bulb in copper-plated steel, aluminum, or brass stem for thermowell installation with capillary tube of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.6 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.7 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pressure Gages:

a. Marsh Bellofram.
b. Trerice, H. O. Co.
c. Weiss Instruments, Inc.
d. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
e. Or Approved Equal

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry or liquid-filled type to suit application, stainless steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Black metal.
7. Window: Glass.
8. Ring: Stainless steel.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Remote-Mounting, Dial-Type Pressure Gages: ASME B40.100, indicating-dial type.

1. Case: Dry type, stainless steel or cast aluminum, 4-1/2-inch diameter with holes for panel mounting.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: White face with black markings.
6. Pointer: Black metal.
7. Window: Glass.
8. Ring: Stainless steel.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

D. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.8 TRUMPET VALVE AND GAGE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trumpet Valve and Gage

a. Flow Conditioning Corp.
b. Or Approved Equal

B. Description: Brass manifold with hydronic indicator gage, spring return pushbutton valves, ports to connect to system, test port, and universal mounting bracket for horizontal or vertical pipe.

C. Hydronic Indicator Gage: Shall meet ASA Grade A specifications for pressure gages, accurate to 1%. Case shall be 4-1/2" diameter, stem mounted, heavy steel with screwed ring and unbreakable crystal. Indicator shall have recalibrator, compound scale calibrated in both psig and feet W.C. from full vacuum to selected pressure, and quick-set dial for pressure comparison. Maximum indicator pressure shall at least equal pump shut-off head and shall exceed this minimum by no more than 50 psig.

2.9 PORTABLE INSTRUMENT CONNECTIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Portable Instrument Connections:

a. Flow Design, Inc.
b. MG Piping Products Co.
c. National Meter, Inc.
d. Peterson Equipment Co., Inc.
e. Sisco Manufacturing Co.
f. Trerice, H. O. Co.
g. Watts Industries, Inc.; Water Products Div.
h. Or Approved Equal

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed, and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

E. Test Kit: Furnish one test kit containing one pressure gage and adaptor, two thermometers, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit portable instrument connections and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be 0 to 200 psig.
2. Low-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 25 to 125 deg F.
3. High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
4. Carrying case shall have formed instrument padding.

2.10 TURBINE FLOWMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Turbine Flowmeters:

a. Badger Meter, Inc.; Industrial Div.
b. Engineering Measurements Company.
c. ONICON Incorporated.
d. Sponsler Company, Inc.
e. Venture Measurement.
f. Or Approved Equal

B. Description: Insertion type for inserting turbine into piping and measuring flow directly in gallons per minute.

C. Construction: Bronze or stainless-steel body; with plastic turbine or impeller and integral direct-reading scale.

D. Pressure Rating: 150 psig minimum.

E. Temperature Rating: 250 deg F minimum.

F. Display: Visual instantaneous rate of flow.

G. Accuracy: Plus or minus 2-1/2 percent.

PART 3 – EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install thermometers in the following locations and where shown on drawings:

1. Inlet and outlet of each heat exchanger.
2. Inlet and outlet of each thermal storage tank.

B. Provide the following temperature ranges for thermometers:

1. 30 to 240 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve and where shown on drawings.

B. Install liquid-filled-case-type pressure gages at suction and discharge of each pump.

3.3 TRUMPET VALVE AND GAGE APPLICATIONS

A. Install trumpet valve and hydronic indicator gage at large circulating pumps as detailed on the drawings. Make connections across pump inlet and discharge, and across suction diffuser or strainer.

3.4 INSTALLATIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and portable instrument connections.

B. Install direct-mounting thermometers and adjust vertical and tilted positions.

C. Install remote-mounting dial thermometers on panel, with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.

D. Install thermowells with socket extending one-third of diameter of pipe and in vertical position in piping tees where thermometers are indicated.

E. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

F. Install remote-mounting pressure gages on panel.

G. Install needle-valve and snubber fitting in piping for each pressure gage for fluids.

H. Install portable instrument connections in tees in piping.

I. Install flow indicators, in accessible positions for easy viewing, in piping systems.

J. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters as prescribed by manufacturer's written instructions.

K. Install flowmeter elements in accessible positions in piping systems.

L. Install differential-pressure-type flowmeter elements with at least minimum straight lengths of pipe upstream and downstream from element as prescribed by manufacturer's written instructions.

M. Install permanent indicators on walls or brackets in accessible and readable positions.

N. Install connection fittings for attachment to portable indicators in accessible locations.

O. Mount meters on wall if accessible; if not, provide brackets to support meters.

3.5 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Ground equipment according to Division 26.

E. Connect wiring according to Division 26.

3.6 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION