SECTION 22 10 16
PLUMBING PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Description of systems:

1. Systems:

a. Cold, hot, and circulating domestic water piping systems within building.

b. Exposed piping in finished areas.

B. Definitions:

1. Caulked: Tamped lead and oakum joint.

2. Brazing: High-temperature soldering.

1.2 QUALITY ASSURANCE

A. Outside Utilities, Division 40.

B. Meters and Gages: See Section 20 05 19.

C. American Water Works Association Standard AWWA-C601: Sterilization Standard.

D. Comply with NSF 61 for potable domestic water piping and components that come in contact with potable water.

E. Valve Standards: See Section 20 05 23 (for values labeled “v_”).

1.3 SUBMITTALS

A. Shop Drawings:

1. Piping layout drawings at 1/4 IN/FT scale.

B. Product Data:

1. Include sufficient information to verify compliance with specifications:

a. Valves.

b. Water meters.

C. Contract Closeout Information:

1. Pressure test reports.

2. Disinfection test report.

3. Operating and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL

A. Acceptable manufacturers:

1. Valves (Constant flow control balancing valves):
   a. Base:
      1) Griswold Controls COMBO.
   b. Optional:
      1) Flow Design Inc. - Autoflow.
      2) Preso.
2. Valves (Pressure reducing):
   a. Base:
      1) Cla-Val.
   b. Optional:
      1) Watts Regulator.
      2) Fisher.
      3) Wilkins Regulator.
3. Water meters:
   a. Base:
      1) Hersey Measurement.
   b. Optional:
      1) Badger Meter.
      2) Sensus Technologies.
4. Other manufacturers desiring approval comply with General Requirements.

2.2 PIPE AND FITTINGS

A. Domestic water piping:

1. 2 IN and smaller after service entrance:
   a. Above grade:
      1) Copper, type L, with solder joints, and wrought copper or cast brass fittings.
      2) Optional fitting:
         a) Viega “ProPress” fitting system: With approval of local authority having jurisdiction.
2. 2-1/2 IN and larger after service entrance:
   a. Softened cold water:
      1) Copper, type L, with soldered joints and wrought copper or cast brass fittings.

b. Hot water and soft water:

1) Copper, type L, with solder joints and wrought copper or cast brass fittings.

B. Exposed piping in finished areas:

1. Chrome or nickel plated brass to wall or floor.
2. Piping 2 IN and larger may be provided with chrome or nickel plated brass sleeves to cover pipe and fittings.
   a. See Section 20 05 00.

2.3 VALVES

A. Balancing valves, constant flow control:

1. Factory calibrated, direct acting, automatic pressure compensating.
2. Control flow rates within 5 percent of flow rating over operating pressure differential range.
   a. Set flow rating according to pipe sizes indicated on plans:
      1) 1/2 IN: 1.0 GPM.
      2) 3/4 IN: 2.5 GPM.
      3) 1 IN: 6 GPM.
      4) 1-1/4 IN: 9 GPM.
3. Pressure differential range:
   a. 4-57 PSID.
4. Threaded-brass or copper-sweat body with stainless-steel internal parts.
5. Provide a metal identification tag with chain for each installed valve.
   a. Identify zone or location, valve model number, flow rate, direction of flow, and differential pressure range.
6. Provide with integral unions to allow field exchange of internal components without removing valve body from pipeline.

B. Check valves:

1. 2 IN and smaller: V-24 or V-25.
2. 2-1/2 IN and larger: V-28 or V-29.

C. Manual valves, potable-water:

1. 2 IN and less: V-13 or V-14.

2. 2-1/2 to 4 IN:
3. 6 IN and larger:
   a. V-34
4. Balancing cocks:
   a. Constant flow control balancing valves, V-11.

2.4 WATER MONITORING SYSTEM

A. Fixed system:
1. Basis of Design: Global Data Specialist - 1815 W. 1st Ave, Mesa AZ – 480.461.3401
2. Sensors: PH, Conductivity, Chlorine, Pressure, Temperature, and Chlorine Dioxide
3. The system will monitor the water quality and communicates the data via the existing Ethernet network. The data is received by the master station that reports the data directly to the BMS. In the event of network failure between the master units and the BMS, or in the event that the BMS itself is offline, the master units will log data locally to an internal SD card. This insures that data is not lost.
4. Master Unit:
   a. Inputs and Outputs
      1) Analog Inputs: 4 channels
      2) Configurable DI/Os: 12 channels
      3) Isolation: 3k VDC or 2k Vrms
   b. Analog Input
      1) Type: Differential input
      2) Resolution: 16 bits
      3) I/O Mode: Voltage / Current (software selectable)
      4) Input Range: ±10 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA (with burn-out detection)
      5) Accuracy: • ±0.1% FSR @ 25°C • ±0.3% FSR @ -10 and 60°C • ±0.5% FSR @ -40 and 75°C
      6) Sampling Rate: • All channels: 400 samples/sec • Per channel: 100 samples/sec
      7) Input Impedance: > 1M ohms (min.)
      8) Built-in Resistor for Current Input: 120 ohms
   c. LAN

1) Ethernet: • 4 switched 10/100 Mbps RJ45 ports • 1 optimized port for faster downstream communications with daisy-chained
2) ioLogik E1200 units
3) Note: The optimized daisy-chain port is not supported on wind industry devices (ioLogik E1261W-T, E1261H-T, or E1263H-T).
4) Protection: 1.5 kV magnetic isolation
5) Protocols: Modbus/TCP, TCP/IP, UDP, DHCP, BOOTP, SNMP, HTTP, CGI, SNTP, SMTP

d. Power Requirements
1) Power Input: 24 VDC nominal, 9 to 48 VDC

e. Storage
1) Expansion Slot: Up to 32 GB microSD™ memory card (SDHC compatible)
2) Note: For units operating in extreme temperatures, industrial grade, wide-temperature SD cards are required.

f. Environmental Limits
1) Operating Temperature: Standard Models: -10 to 60°C (14 to 140°F) Wide Temp. Models: -40 to 75°C (-40 to 167°F)
2) Storage Temperature: -40 to 85°C (-40 to 185°F)
3) Ambient Relative Humidity: 5 to 95% (non-condensing)
4) Altitude: Up to 2000 m

g. Standards and Certifications
1) Safety: UL 508, EN 60950-1, NCC
2) EMI: EN 55022; EN 61000-3-2; EN 61000-3-3; FCC Part 15, Subpart B, Class A
3) EMS: EN 55024, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11, EN
4) 61000-6-2
5) Radio: FCC Part 22H, FCC Part 24E, EN 301 489-1, EN 301 489-7, EN 301 511
6) Shock: IEC 60068-2-27
7) Freefall: IEC 60068-2-32
8) Vibration: IEC 60068-2-6

9) Green Product: RoHS, CRoHS, WEEE

5. Wireless Access Point Specifications

a. WLAN Interface

1) Standards: IEEE 802.11a/b/g for Wireless LAN IEEE 802.11i for Wireless Security IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseTX IEEE 802.3af for Power-over-Ethernet IEEE 802.1D for Spanning Tree Protocol IEEE 802.1w for Rapid STP

2) Spread Spectrum and Modulation (typical): • DSSS with DBPSK, DQPSK, CCK • OFDM with BPSK, QPSK, 16QAM, 64QAM 802.11b: CCK @ 11/5.5 Mbps, DQPSK @ 2 Mbps, DBPSK @ 11 Mbps • 802.11a/g: 64QAM @ 54/48 Mbps, 16QAM @ 36/24

3) Mbps, QPSK @ 18/12 Mbps, BPSK @ 9/6 Mbps

4) Operating Channels (central frequency): US: 2.412 to 2.462 GHz (11 channels) 5.18 to 5.24 GHz (4 channels) EU: 2.412 to 2.472 GHz (13 channels) 5.18 to 5.24 GHz (4 channels) JP: 2.412 to 2.472 GHz (13 channels, OFDM) 2.412 to 2.484 GHz (14 channels, DSSS) 5.18 to 5.24 GHz (4 channels for W52)

5) Security: • SSID broadcast enable/disable • Firewall for MAC/IP/Protocol/Port-based filtering • 64-bit and 128-bit WEP encryption,

6) WPA /WPA2

b. Protocol Support

1) General Protocols: Proxy ARP, DNS, HTTP, HTTPS, IP, ICMP, SNTP, TCP, UDP, RADIUS, SNMP, PPPoE, DHCP

c. Interface

1) Default Antennas: 2 dual-band omni-directional antennas, 2 dBi, RP-SMA (male)

2) Connector for External Antennas: RP-SMA (female)

3) RJ45 Ports: 1, 10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection

4) Console Port: RS-232 (RJ45-type)

5) Reset: Present

6) LED Indicators: PWR1, PWR2, PoE, FAULT, STATE, signal strength, CLIENT MODE, BRIDGE MODE, WLAN, 10M, 100M

7) Alarm Contact: 1 relay output with current carrying capacity of 1 A @ 24 VDC
8) Digital Inputs: 2 electrically isolated inputs • +13 to +30 V for state “1” • +3 to -30 V for state “0” • Max. input current: 8 mA

d. Environmental Limits
1) Operating Temperature: Standard Models: -25 to 60°C (-13 to 140°F) Wide Temp. Models: -40 to 75°C (-40 to 167°F)
2) Storage Temperature: -40 to 85°C (-40 to 185°F)
3) Ambient Relative Humidity: 5% to 95% (non-condensing)

e. Power Requirements
1) Input Voltage: 12 to 48 VDC, redundant dual DC power inputs or 48 VDC Power-over-Ethernet (IEEE 802.3af compliant)
2) Connector: 10-pin removable terminal block
3) Power Consumption: 12 to 48 VDC, 0.121 to 0.494 A
4) Reverse Polarity Protection: Present

f. Standards and Certifications
1) Safety: UL 60950-1, EN 60950-1
2) Hazardous Location: UL/cUL Class I Division 2, ATEX Zone 2
3) EMC: EN 301 489-1/17; FCC Part 15, Subpart B; EN 55022/55024
4) Radio: EN 300 328, EN 301 893, TELEC, FCC ID SLE-WAPA003

6. PH Sensor:
a. Measuring Range: 0 to 14 pH
b. Accuracy: Less than 0.1 pH under reference conditions
c. Temperature Range: 0 to 105ºC (32 to 221ºF)
d. Flow Rate: 0 to 2 m/s (0 to 6.6 ft./s); non-abrasive
e. Pressure Range: 0 to 6.9 bar at 100ºC (0 to 100 psig at 212ºF)
f. Sensor Cable Integral coaxial cable (plus two conductors for temperature compensator option); 4.5 m (15 ft.) long

7. Conductivity Sensor Specifications
a. Accuracy: ± 2 % of reading above 200 µS/cm

b. Cable Length: 20 fixed cable (6 wire, 4 conductors and two isolated shield wires)
c. Cell Constant k: 5
d. Diameter: 0.5 in (12.7 mm)
e. Electrode Material: Titanium
f. Flow: 0 to 3 m/s maximum, fully immersed
g. Length: 7.6 in (193.5 mm)
h. Material: Compression Fitting: KYNAR (PVDF)
i. Measurement Range 2: 0.002 to 20 MΩ resistivity
j. Operating Temperature Range: -20 to 200 °C
k. Pressure Range: 1.7 bar at 150 °C
l. Range: 0 to 100 µS/cm conductivity
m. Repeatability: ± 0.5 % of reading
n. Response Time T90: 30 s
o. Sensitivity:
   1) ± 0.5 of reading
p. Sensor Immersion Depth: 155 mm
q. Sensor Thread: NPT

8. Free Chlorine Sensor Specifications
   a. Measuring Range: 0 to 5 ppm free chlorine
   b. pH Range: Range: 6.0 to 9.5
   c. Mounting Size: Flow Cell ¼″
   d. Body Material: PVC
   e. Temperature Range: 0 to 50°C (32 to 122°F)
   f. Temperature Compensation: Integrated
   g. Maximum Pressure: 14.7 PSI (1 bar)
   h. Cable Length: 25′ 2 conductors
   i. Output: 4 to 20 mA
   j. Flow Range:
      1) Minimum: 1 GPM
      2) Maximum: 5 GPM
   k. Supply Voltage: 12 to 24 Vdc, 250 mA min
9. Temperature Sensor
   a. Body: Stainless steel AISI 316L
   b. Probe Length: 13 mm (0.51") and 24 mm (0.94")
   c. Diameter: Ø 3 mm (0.1")
   d. Probe Type: Thermowell AISI 316L SS

e. Probe Minimum Bending Radius: Three-times the outer diameter [except the sensing tip which length is 30 mm (1.2")]
f. Connection: 1/8 NPT male thread
g. Sensor: RTD PT100 class A up to 300°C in accordance to IEC751
h. Range: -50 to 120°C (-58 to 248°F)
i. Tmax. Electronic: 80°C (176°F)
j. Sensor Break Monitoring:
   1) Selectable: Upscale (>21.0 mA) or downscale (<3.6 mA) action
   2) Sensor Short-Circuit: Fixed to downscale (<3.6 mA) action
k. Output:
   1) Signal: 4 to 20 mA
   2) Permissible Load: 700 @ 24 Vdc [RLo= (Vsupply-8,5)/0,020]
l. Default Factory Setting for 4 to 20mA output: 0 to 100°C
m. Response Time (90%): <50 ms
n. Isolation In-Out: Non-isolated
o. Power Supply: 8.5 to 32 Vdc (polarity protected)
p. Environment Conditions:
   1) Temperature: -40 to 80°C (-40 to 176°F) for plastic body
   2) Relative Humidity: 0 to 100%
   3) EMC: In accordance to EN 61326
   4) Degree of Protection: IP65 and IP67 in accordance to IEC60529
q. Accuracy:
   1) Transmitter: Maximum of ±0.2°C or ±0.2% of span
   2) Sensor: Class A in accordance to IEC751
r. Temperature Influence [Deviation from 20°C (68°F)]: Maximum of ±0.3°C/25°C (77°F) or ±0.3% of span/25°C (77°F)
s. Supply Voltage Influence: Negligible

t. Range Configurations: It is possible set the input temperature range (span) by the M12TX-CONFIG configuration kit (PC with OS Windows required)

u. Zero Adjustments: Any value between -50 to 50°C

v. Minimum Span: 50°C (122°F) [if the zero value is set between one of these values: -40°C (-40°F), -20°C (-4°F), 0°C (32°F), 20°C (68°F), 40°C (104°F), the minimum span is 20°C (68°F) rather than 50°C (122°F)] Sensor Error Compensation: Over 2 points (maximum 1% of span)

w. Factory Setting: 0 to 100°C/sensor break >21 mA (upscale)

x. Response Time: Diameter 3 mm <3.5 seconds, diameter 6 mm <13 seconds (test in water to IEC751- time for reaching 63.2% of instantaneous temperature change)

10. Pressure Sensor

a. Range: 0 to 150 psi

b. Temperature Range: 0 to 200 F

c. Mounting: ¼″ NPT

d. Thermal Error: +/-0.02% Full Scale

e. Output: 4-20ma

B. Portable Sampling System (Optional):

1. Two Portable Sampling kits shall be provided. A water sampling kit will be provided for the portable unit allowing the lab technician to easily connect to a sampling port and immediately begin taking readings. The sampling kit will simply plug into a sampling location plumbing port via quick connect couplers. The sampling kit and portable unit are designed to either take a quick data sample, or leave in place for an extended period. The sampling kit includes two sensor kits (hot and cold) plus one spare. Each kit is in its own case to prevent cross contamination.

2. A construction jig will be built and provided so that the contractors can easily configure the sampling locations to match the sampling kit. This jig will be an exact replica of the real kit minus the sensors and valves insuring a proper fit.

3. The portable sampling kit features the same data reporting options as the fixed system. This equipment will be mounted in a protective equipment case for ease of use and protection of the equipment. The portable unit will report data in real time via a wireless network to the BMS in the same manner as the fixed system. The portable unit will possess local data logging capability for areas without wireless access. To help with wireless coverage each master panel will contain a wireless access point. Locally, the lab technician taking the sample can read data from the operator interface terminal mounted in the case. This terminal will be capable of displaying the current data readings.

PART 3 - PART 3 - EXECUTION

3.1 GENERAL

A. General:

1. Install piping as indicated and to provide fixtures and items of equipment with proper water connections as required by governing codes.
2. Hold piping as close to structure as possible to maintain maximum head room.
3. Run piping concealed wherever possible.
4. Under no circumstances reduce pipe size indicated without written consent of Architect.
5. Size branches to individual fixtures as scheduled.
6. Consult the following before roughing in piping:
   a. Manufacturer's data.
   b. Large-scale Architectural, and Mechanical Drawings of rooms containing equipment and plumbing fixtures.
7. Stub piping through wall directly behind item being served (e.g., equipment, plumbing fixtures, vending machines).
   a. Cap and protect until such time as installation is performed.
8. Plug or cap piping immediately after installation.
9. Install chromed escutcheons on finished-area sides of pipe penetrations.

a. Secure escutcheons so they make contact with floor, wall, or ceiling.

10. Install equipment in accordance with manufacturer's instructions.

3.2 DOMESTIC WATER PIPING SYSTEMS

A. General:

1. Install plumbing without cross- or inter-connections between potable and non-potable lines.
2. Provide thermometers and pressure gauges where indicated on drawings: See Section 20 05 19.

B. Balance hot water circulation system.

C. Provide manual isolation valves at following locations.

1. To isolate groups of fixtures and equipment on branch runouts from piping mains.
2. On each branch serving a rest room.
3. On inlet and outlet of each equipment.
4. On each branch to hose bibb or wall hydrant.
5. At main feed points to domestic water pipe risers.
6. As indicated and as required to adequately service parts of systems and equipment.

D. Testing of domestic water system:

1. Upon completion of system or a section of system, test piping hydrostatically to pressure not less than 50 percent in excess of pipe's working pressure, but in no case less than 150 PSI.
   a. System shall hold pressure for 24 hours.
2. Repair leaks or replace defective pipe disclosed by tests.
3. Repeat tests until piping indicates tight.

E. Sterilization of domestic water system:

1. Sterilize system as indicated or in accordance with AWWA-C652 or CS186.
2. Thoroughly flush potable water systems.
3. After flushing, introduce chlorine or chlorine compound into system with dosage sufficient to give an initial residual chlorine content of 50 PPM.

4. Collect samples from various taps and fixtures throughout buildings during introduction of chlorine to assure uniform distribution.
5. Open and close valves several times.
6. After a 24 hour contact period, flush traces of heavily chlorinated water from systems.
7. After flushing is complete, indicate effectiveness of disinfection by submitting laboratory reports of bacteriological tests on samples taken from system.
8. If unsatisfactory results are obtained, repeat disinfection process until satisfactory.
9. Do not put system into service until tests are approved by Plumbing Inspector.

END OF SECTION