

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Balancing valves.
 - 4. Temperature-actuated, water mixing valves.
 - 5. Strainers for domestic water piping.
 - 6. Outlet boxes.
 - 7. Hose bibbs.
 - 8. Wall hydrants.
 - 9. Drain valves.
 - 10. Water-hammer arresters.
 - 11. Trap-seal primer device.
 - 12. Flexible connectors.
 - 13. Water meters.

1.3 DEFINITIONS

- A. AMI: Advanced Metering Infrastructure.
- B. AMR: Automatic Meter Reading.
- C. FKM: A family of fluoroelastomer materials defined by ASTM D1418.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Test and inspection reports.

- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - b. WATTS.
 - c. Zurn Industries, LLC.
 - d. Or equal as approved by the Professional.
 - 2. Standard: ASSE 1001.
 - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: Threaded.
 - 6. Finish: Rough bronze or Chrome plated based upon location and application.
- B. Hose-Connection Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - b. WATTS.
 - c. Zurn Industries, LLC.

- d. Or equal as approved by the Professional.
- 2. Standard: ASSE 1011.
- 3. Body: Bronze, non-removable, with manual drain.
- 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
- 5. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - b. WATTS.
 - c. Zurn Industries, LLC.
 - d. Or equal as approved by the Professional.
- 2. Standard: ASSE 1013.
- 3. Operation: Continuous-pressure applications.
- 4. Pressure Loss: 12 psig maximum, through middle third of flow range.
- 5. Size: 2 NPS.
- 6. Pressure Loss at Design Flow Rate: 12 psig for sizes NPS 2 and smaller.
- 7. Body: Bronze or stainless steel for NPS 2 and smaller.
- 8. End Connections: Threaded for NPS 2 and smaller.
- 9. Configuration: Designed for horizontal, straight-through flow.
- 10. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Dual-Check-Valve Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - b. WATTS.
 - c. Zurn Industries, LLC.
 - d. Or equal as approved by the Professional.
- 2. Standard: ASSE 1024.
- 3. Operation: Continuous-pressure applications.
- 4. Size: As noted.
- 5. Body: Bronze with union inlet.

C. Hose-Connection Backflow Preventers:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - b. WATTS.
 - c. Woodford Manufacturing Company.
 - d. Zurn Industries, LLC.
 - e. Or equal as approved by the Professional.
- 2. Standard: ASSE 1052.
 - 3. Operation: Up to 10-foot head of water back pressure.
 - 4. Inlet Size: NPS 3/4.
 - 5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
 - 6. Capacity: At least 3-gpm flow.

2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Bell & Gossett; a Xylem brand.
 - b. NIBCO INC.
 - c. WATTS.
 - d. Or equal as approved by the Professional.
- 2. Type: Ball valve with two readout ports and memory-setting indicator.
- 3. Body: bronze.
- 4. Size: Same as connected piping, but not larger than NPS 2.
- 5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Automatic Flow Control Balancing Valves:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Acorn Engineering Company
 - b. Caleffi North America.
 - c. ThermOmegaTech.
 - d. Or equal as approved by the Professional.
- 2. Basis of Design: Acorn - TemFlow Thermostatic Zone Valve - Model# TZV-2 or ThermOmegaTech - Circuit Solver - Model #CSUA
- 3. Flow Regulation: Plus or minus 5 percent over 95 percent of the working range.
- 4. Pressure Rating: 200 psig.
- 5. Size: NPS 2 or smaller.
- 6. Design Temperature Differential: 5°F to 10°F from set outlet temperature of Water Heater or as otherwise designated.
- 7. Body: Stainless steel or brass.
- 8. Temperature Gauges: Provide integral or separate temperature gauge at each valve assembly.
- 9. Flow Cartridge: Stainless steel or anti-scale polymer.
- 10. End Connections: Threaded or solder joint.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Acorn Engineering Company; a Division of Morris Group International.
 - b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
 - c. Leonard Valve Company.
 - d. Zurn Industries, LLC.
 - e. Or equal as approved by the Professional.
2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded or union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 100 - 105 deg F.
9. Tempered-Water Design Flow Rate: .50 - 2 gpm.
10. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves (TMV-#):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Lawler Manufacturing Company, Inc.
 - b. Leonard Valve Company.
 - c. POWERS; A WATTS Brand.
 - d. Or equal as approved by the Professional.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded or union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 120 - 125 deg F.
9. Valve Finish: Polished, chrome plated.
10. Piping Finish: Copper.
11. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless steel door.

C. Master Shower, Thermostatic, Water Mixing Valve Assembly (TMV-#):

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

- a. Lawler.
 - b. Leonard Valve Company.
 - c. POWERS; A WATTS Brand.
 - d. Or equal as approved by the Professional.
 - 2. Description: Factory-fabricated, cabinet-type, thermostatically controlled, water mixing valve assembly with temperature gauge on outlet.
 - 3. Basis of Design: Lawler Model# 410 - Leonard - Eco-Mix Model# XL-186-32A-CP
 - 4. Thermostatic Mixing Valve: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
 - 5. Pressure Rating: 125 psig minimum unless otherwise indicated.
 - 6. Cabinet: Factory fabricated, stainless steel, for recessed mounting and with hinged, stainless steel vandal resistant locking door.
 - 7. Tempered-Water Setting: 100 - 105 deg F.
 - 8. Unit Tempered-Water Design Flow Rate: 2 - 10 gpm.
 - 9. Unit Minimum Tempered-Water Design Flow Rate: 2 gpm.
 - 10. Unit Pressure Drop at Design Flow Rate: 5 - 10 psig.
 - 11. Unit Tempered-Water Outlet Size: 1 NPS end connection.
 - 12. Unit Hot- and Cold-Water Inlet Size: 1 NPS end connections.
 - 13. Thermostatic Mixing Valve and Water Regulator Finish: Polished, chrome plated.
 - 14. Piping Finish: Chrome plated or Copper.
- D. Individual-Fixture, Water Tempering Valves:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Lawler Manufacturing Company, Inc.
 - b. Leonard Valve Company.
 - c. POWERS; A WATTS Brand.
 - d. Or equal as approved by the Professional.
 - 2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
 - 3. Pressure Rating: 125 psig minimum unless otherwise indicated.
 - 4. Material: Bronze body with corrosion-resistant interior components.
 - 5. Temperature Control: Adjustable.
 - 6. Connections: Threaded inlets and outlet.
 - 7. Finish: Chrome plated.
 - 8. Tempered-Water Setting: 100- 105 deg F.
 - 9. Tempered-Water Design Flow Rate: .35 - 2 gpm.
 - 10. Valve Finish: Rough bronze.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Titan Flow Control, Inc.
 - b. WATTS.
 - c. Zurn Industries, LLC.

- d. Or equal as approved by the Professional.
- 2. Pressure Rating: 125 psig minimum unless otherwise indicated.
- 3. Body: Bronze for NPS 2 and smaller; End Connections: Threaded for NPS 2 and smaller.
- 4. Screen: Stainless steel with round perforations unless otherwise indicated.
- 5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
- 6. Drain: Factory-installed, hose-end drain valve.

2.8 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Acorn Engineering Company; a Division of Morris Group International.
 - b. Guy Gray, IPS Corporation.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Water-Tite, IPS Corporation.
 - e. Or equal as approved by the Professional.
- 2. Mounting: Recessed.
- 3. Material and Finish: Enameled-steel or epoxy-painted-steel or Stainless steel box and faceplate.
- 4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
- 5. Drain Outlet Connection: NPS 2.
- 6. Accessory: Water hammer arresters.
- 7. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
- 8. Drain: NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
- 9. Inlet Hoses: Two 60-inch-long, rubber, household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
- 10. Drain Hose: One 48-inch-long, rubber, household clothes washer drain hose with hooked end.

2.9 HOSE BIBBS

A. Hose Bibbs (HB-#): Refer to Hose Bibb Schedule on Plumbing Drawing P-701 for designated hose bibb descriptions, details, associated accessories, components and basis of design information. Refer to the Plumbing Floor Plans for the designated locations.

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. WATTS.

- c. Woodford Manufacturing Company.
 - d. Zurn Industries, LLC.
 - e. Or equal as approved by the Professional.
2. Standard: ASME A112.18.1 for sediment faucets.
 3. Body Material: Bronze.
 4. Seat: Bronze, replaceable.
 5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
 6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 7. Pressure Rating: 125 psig.
 8. Vacuum Breaker: Integral or field-installation, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
 10. Finish for Service Areas: Chrome or nickel plated.
 11. Finish for Finished Rooms: Chrome or nickel plated.
 12. Operation for Equipment Rooms: Wheel handle or operating key.
 13. Operation for Service Areas: Operating key.
 14. Operation for Finished Rooms: Operating key.
 15. Include operating key with each operating-key hose bibb.
 16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

- A. Non-freeze Wall Hydrants (WH-#): Refer to Wall Hydrant Schedule on Plumbing the Drawing P-701 for designated wall hydrants descriptions, details, associated accessories, components and basis of design information. Refer to the Floor Plans for the designated locations.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. WATTS.
 - c. Woodford Manufacturing Company.
 - d. Zurn Industries, LLC.
 - e. Or equal as approved by the Professional.
 2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
 3. Pressure Rating: 125 psig.
 4. Operation: Loose key.
 5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 6. Inlet: NPS 3/4 or NPS 1.
 7. Outlet, Concealed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 8. Box: Deep, flush mounted with cover.
 9. Box and Cover Finish: Polished nickel bronze.
 10. Outlet, Exposed: With integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
 12. Operating Keys(s): One with each wall hydrant.
- B. Moderate-Climate Interior Wall Hydrants (WH-#): Refer to Wall Hydrant Schedule on Plumbing Drawing P-701 for designated wall hydrants descriptions, details, associated accessories,

components and basis of design information. Refer to the Plumbing Floor Plans for the designated locations.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. WATTS.
 - c. Woodford Manufacturing Company.
 - d. Zurn Industries, LLC.
 - e. Or equal as approved by the Professional.
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet, Concealed:
 - a. With integral vacuum breaker or non-removable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet, Exposed:
 - a. With integral vacuum breaker or non-removable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Key(s): One with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters (WHA- #):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. Precision Plumbing Products.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. WATTS.
 - e. Or equal as approved by the Professional.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device (TP):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. Precision Plumbing Products.
 - c. WATTS.
 - d. Or equal as approved by the Professional.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.14 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Flex-Hose Co., Inc.
2. Mason Industries, Inc.
3. Metraflex Company (The).
4. Or equal as approved by the Professional.

B. Stainless Steel-Hose Flexible Connectors: Corrugated-stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.

2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.15 WATER METERS

- A. Water Service Entrance Meter: Furnished and installed a domestic water meter on the domestic building water service entrance located in the Mechanical Room with compatible digital output connection for remote read out monitoring capabilities. The Contractor shall coordinate the exact size, dimensions and digital compatibility prior to purchasing and installing the water service meter.
- B. Displacement-Type Water Meters: Client Agency / remote monitoring system connections to water supply meter for monitoring water usage.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Badger Meter, Inc.
 - b. Neptune Technology Group Inc.
 - c. Or equal as approved by the Professional.
 2. Standard: AWWA C700.
 3. Pressure Rating: 150-psig working pressure.
 4. Body Design: Nutating disc; totalization meter.
 5. Basis of Design: Badger - Recordall Model# RCDL.
 6. Registration: BMS system contact for monitoring usage in gallons or cubic feet as required by Client Agency.
 - a. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required.
 - 1) System shall be capable of transmitting data using AMR/AMI technology.
 7. Case: Bronze Stainless steel.
 8. End Connections: Threaded or flanged.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.

- B. Water Regulators: Install with inlet and outlet shutoff valves and bypass with valve. Install pressure gauges on inlet and outlet.
- C. Water Control Valves: Install with inlet and outlet shutoff valves and bypass with valve. Install pressure gauges on inlet and outlet.
- D. Automatic Water Shutoff Valves: Test for signal strength before valve installation. Install automatic shutoff valve downstream from main domestic water shutoff valve. Install valve controller in an accessible location with sensors in areas where water is likely to accumulate.
- E. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
- F. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- G. Y-Pattern Strainers: For water, install on supply side of each control valve and pump.
- H. Outlet Boxes: Install boxes recessed in wall or surface mounted on wall. Install 1-1/2-by-3-1/2-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- I. Wall Hydrants: Install non-freeze, self-draining exterior wall hydrants in recessed locking box with cover at finish wall. Determine the exact thickness of wall for casing and valve stem length to the water supply line located within the insulated envelope of the wall. Set wall hydrants a minimum 24" above finish grade unless otherwise specified.
- J. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201. Locate and install as following:
 - 1. All hot and cold water down feed and up feed risers shall be fitted with engineered, manufactured water hammer arresters (shock absorbers). The same shall apply for hot and cold water lines at fixtures and other equipment, and where specifically indicated on the drawings. Vertical or horizontal capped pipe columns, prefabricated or constructed by the Contractor, will not be permitted.
 - 2. Water hammer arresters shall be installed on each hot water supply to dishwashing equipment at all locations.
 - 3. Install water hammer arresters on each water supply to domestic type automatic washers at all locations.
- K. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Balancing valves.
 - 4. Temperature-actuated, water mixing valves.
 - 5. Outlet boxes.
 - 6. Wall hydrants.
 - 7. Trap-seal primer device.
 - 8. Water meters.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.
- D. Adjust each reduced-pressure-principle backflow preventer in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections.
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION