

Plumbing and Fire Protection General Information	
A. General	1. Conform to all general and special conditions of contract as specified by architect, tenant and owner. 2. Specifications are applicable to all contractors and subcontractors for plumbing and electrical systems 3. Contractor shall comply with owner's standards, facility specifications, rules and regulations. All owner's criteria shall be complied with and included in this bid. Check other plans and specifications and fully coordinate with other trades and architect's requirements. 4. Visit site, check facilities and conditions, and verify all utility company requirements and connection points in field prior to starting work. Take all items into consideration in bid. 5. Systems are to be complete and workable in all respects, placed in operation and properly adjusted. 6. Each contractor shall provide for his own clean-up, removal and legal disposal of all rubbish daily. 7. The contractor shall be solely responsible for construction means, methods, and sequences of construction and the safety of workmen, comply with all OSHA regulations. 8. No piping, controls, etc., shall be installed or routed above electrical panels and equipment or through elevator rooms or shafts. 9. The plumbing and electrical contractors shall coordinate the electrical characteristics of all plumbing equipment prior to ordering of equipment. No additional payment will be made for lack of contractor coordination of electrical characteristics. 10. All plumbing and electrical system components shall be routed tight to underside of structure and through joists or trusses where possible. Coordinate installation to preserve headroom, equipment access, and architectural clearances for finishes, including ceiling heights. Coordinate with all other trades and do not conflict with the architectural requirements for the finished construction. Provide offsets where required to coordinate with other trades. 11. Operation and maintenance manuals: three (3) bound sets of the operation and maintenance manuals shall be provided to the construction representative at turnover, and are required for final acceptance. 12. As-built drawings: the plumbing subcontractor shall progressively record all plumbing drawing changes which shall be available at all times for review by the construction representative. An AutoCAD copy of the final as-built drawings shall be provided to the construction representative at turnover. This AutoCAD as-built is required for final acceptance of the project.
B. Codes, standards and regulations	1. Conform to all applicable codes, government regulations, utility company requirements, and national electrical code. 2. Obtain permits and pay all fees. Arrange for all required inspections and approvals.
C. Related work specified elsewhere	1. Openings and chases, when shown on architectural drawings.
D. Drawings	1. The systems as shown on the contract drawings are diagrammatic. 2. The intent is for complete and workable systems. The drawings and these notes are to be used together as a basis of showing and/or describing the system requirements for the facility. 3. Verify all dimensions and clearances by field measurements and check for interferences prior to starting work.
E. Base equipment and materials and substitutions	1. All equipment and materials shall be new, free of defects and U.L. labeled. 2. Submit shop drawings for all equipment, fixtures, etc., including all accessories to be furnished. Base bid manufacturers and models are included in specifications or listed in schedule on drawing. Any other manufacturer or model is a substitution. 3. Substitutions are subject to the approval of the owner and shall be listed on the form of proposal for the owner's consideration prior to contract award. If substitution is submitted, it is the contractor's responsibility to evaluate it and certify that the substitution is equivalent in all respects to the base specifications. 4. If substitutions are approved, notify all other contractors, subcontractors or trades affected by substitution and fully coordinate. Any costs resulting from substitution, whether by contractor or others, shall be responsibility of and paid for by substituting contractor. 5. All equipment shall be installed in full accordance with the manufacturer's installation instructions. It is this contractor's responsibility to check and conform to these requirements prior to starting work.
F. Check, test, start, adjust, balance and instructions	1. After installation, check all equipment, and perform start up in accordance with the manufacturer's instructions. 2. All piping shall be tested and free of leaks. 3. Balance all systems, calibrate controls, check for proper operating sequence under all conditions, and make all necessary adjustments. 4. All wiring shall be fully tested and made free of grounds and short circuits. 5. Instruct owner in operation of systems and submit operating and maintenance manual on all equipment and systems. 6. Provide engraved labels and identification tags for all piping systems, valves and equipment. 7. Provide typed panel directions and engraved labels for all panels and equipment.
G. Cutting, patching and drilling	1. All cutting and chasing of the building construction required for this work shall be by the contractor unless shown on architectural drawings and confirmed as to size and location prior to new construction. Cutting shall be in a neat and workmanlike manner. 2. Neatly saw cut all rectangular openings, set sleeves through opening, and finish patch or provide trim flange around opening. 3. Neatly saw out floors for sewer installation and patch floor to match existing, including floor covering. 4. Core drill and sleeve at round openings. 5. Do not cut any structural components without architect's approval. 6. Patch and finish to match adjacent areas that have been cut, damaged or modified to install equipment for this project. 7. Cutting of roof, installation of curbs, and patching of roof shall be by a certified roofing contractor, approved by building owner, and paid for by this contractor. 8. Fire stop all penetrations of fire rated construction in a code approved manner, using UL listed fire rated materials. 9. All contractors shall confirm with owner, prior to bid, times available for noise producing work such as cutting and core drilling of floors, walls, etc., as well as times for work which require access into adjoining areas. Include any premium time required in bid.
H. Warranty	1. Fully warrant all materials, equipment and workmanship for one (1) year from date of acceptance. 2. Extend all manufacturer's warranties to owner. 3. Repair or replace without charge to the owner all items found defective during the warranty period.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION	
PART 1 GENERAL	
1.01 SECTION INCLUDES	
A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.	
1.02 SUBMITTALS	
A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.	
B. Shop Drawings: Indicate pipe materials used, joining methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.	
C. Operation and Maintenance Data: Include installation instructions and spare parts lists.	
PART 2 PRODUCTS	
2.01 FIRE PROTECTION SYSTEMS	
A. Sprinkler Systems: Comply with NFPA 13.	
B. Welding Materials and Procedures: Comply with ASME BPVC-IX.	
2.02 BURIED PIPING	
A. Steel Pipe: ASTM A334S3M Schedule 40, ASTM A135A135M Schedule 10, ASTM A750A759M Standard Weight, or ASME B36.10M Schedule 40, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape. B. Ductile Iron Pipe: AWWA C151/A21.51.	
2.03 ABOVE GROUND PIPING	
A. Steel Pipe: ASTM A33 Schedule 40, black. 1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4 threaded fittings. 2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M. 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.	
2.04 PIPE SLEEVES	
A. Vertical Piping 1. Sleeve Length: 1 inch (25 mm) above finished floor. 2. Provide sealant for watertight joint.	
B. Pipe Passing Through Below Grade Exterior Walls: 1. Zinc-coated or cast-iron pipe. 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.	
C. Clearances: 1. Provide allowance for insulated piping. 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter. 3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 to prevent the spread of fire, smoke, and gases.	
2.05 ESCUTCHEONS	
A. Material: 1. Metals and Finish: Comply with ASME A112.18.1.	
B. Construction: 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split pattern type elsewhere. 2. Internal spring tension devices or set screws to maintain a fixed position against a surface.	
PART 3 EXECUTION	
3.01 INSTALLATION	
A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.	
END OF SECTION	
SECTION 21 1300 FIRE-SUPPRESSION SPRINKLER SYSTEMS	
PART 1 GENERAL	
1.01 SECTION INCLUDES	
A. Wet-pipe sprinkler system. B. Dry-pipe sprinkler system. C. Fire department connections.	
1.02 SUBMITTALS	
A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections. B. Shop Drawings: 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation. 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls. 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.	

1.03 DELIVERY, STORAGE, AND HANDLING	
A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.	
PART 2 PRODUCTS	
2.01 SPRINKLER SYSTEM	
A. Sprinkler System: Provide coverage for building areas noted. B. Water Supply: Determine volume and pressure from water flow test data. C. Interface system with building control system. D. Provide fire department connections where indicated. E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve. F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows: 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC108. 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01. 3. Concrete Screw Type Anchors: Complying with ICC-ES AC103. 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106. 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308. 6. Other Types: As required.	
2.02 SPRINKLERS	
A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate. 1. Response Type: Quick. 2. Coverage Type: Standard. 3. Finish: Brass. 4. Escutcheon-Plate Finish: Antique Brass. 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard. 6. Exposed Area Type: Pendant type with guard. 1. Response Type: Quick. 2. Coverage Type: Standard. 3. Finish: Brass. 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard. 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard. 6. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate. 1. Response Type: Quick. 2. Coverage Type: Standard. 3. Finish: Brass. 4. Cover Plate Finish: Brass. 5. Fusible Link: Fusible solder link type temperature rated for specific area hazard. 6. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap. 1. Finish: Brass. H. Flexible Drop System: Stainless steel, multiple use, open gate type. 1. Application: Use to properly locate sprinkler heads. 2. Include all supports and bracing. 3. Provide braided type tube as required for the application.	
PART 3 EXECUTION	
3.01 INSTALLATION	
A. Install in accordance with referenced NFPA design and installation standard. B. Place pipe runs to minimize obstruction to other work. C. Hydrostatically test entire system. D. Require test be witnessed by Authority Having Jurisdiction.	
END OF SECTION	
SECTION 22 0533 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT	
PART 1 GENERAL	
1.01 SECTION INCLUDES	
A. Pipe markers.	
PART 2 PRODUCTS	
2.01 IDENTIFICATION APPLICATIONS	
A. Piping: Pipe markers.	
2.02 PIPE MARKERS	
A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed. B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. C. Color code as follows: 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters. 2. Fire Quenching Fluids: Red with white letters. 3. Toxic and Corrosive Fluids: Orange with black letters. 4. Flammable Fluids: Yellow with black letters. 5. Combustible Fluids: Brown with white letters. 6. Compressed Air: Blue with white letters.	
PART 3 EXECUTION	
3.01 PREPARATION	
A. Degrease and clean surfaces to receive adhesive for identification materials.	
3.02 INSTALLATION	
A. Install plastic pipe markers in accordance with manufacturer's instructions. B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.	
END OF SECTION	
SECTION 22 0719 PLUMBING PIPING INSULATION	
PART 1 GENERAL	
1.01 SECTION INCLUDES	
A. Piping insulation. B. Jackets and accessories.	
1.02 SUBMITTALS	
A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.	
1.03 DELIVERY, STORAGE, AND HANDLING	
A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.	
PART 2 PRODUCTS	
2.01 REGULATORY REQUIREMENTS	
A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.	
2.02 GLASS FIBER	
A. Insulation: ASTM C547 and ASTM C795, rigid molded, noncombustible. 1. K (Ks) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C). 2. Maximum Service Temperature: 850 degrees F (454 degrees C). 3. Maximum Moisture Absorption: 0.2 percent by volume. B. Insulation: ASTM C547 and ASTM C795, rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere. 1. K (Ks) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C). 2. Maximum Service Temperature: 220 degrees F (104 degrees C). 3. Maximum Moisture Absorption: 0.2 percent by volume. C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminumized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m). D. Vapor Barrier Lap Adhesive: Compatible with insulation.	
2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION	
A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C354/C354M Grade 1; use molded tubular material wherever possible. 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C). 2. Maximum Service Temperature: 220 degrees F (104 degrees C). 3. Connection: Waterproof vapor barrier adhesive.	
2.04 JACKETS	
A. PVC Plastic: 1. Jacket: One piece molded type fitting covers and sheet material, off-white color. a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C). b. Maximum Service Temperature: 150 degrees F (66 degrees C). c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M. d. Thickness: 10 mil (0.25 mm). e. Connections: Brush on welding adhesive. 2. Covering Adhesive Mastic: Compatible with insulation.	
PART 3 EXECUTION	
3.01 EXAMINATION	
A. Verify that piping has been tested before applying insulation materials. B. Verify that surfaces are clean and dry, with foreign material removed.	
3.02 INSTALLATION	
A. Install in accordance with manufacturer's instructions. B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards. C. Exposed Piping: Locate insulation and cover seams in least visible locations.	

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.	
E. Glass fiber insulated pipes conveying fluids below ambient temperature: 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic. 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers. F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but level and seal ends of insulation. G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment. H. Glass fiber insulated pipes conveying fluids above ambient temperature: 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples. 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers. I. Inserts and Shields: 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger. 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts. 3. Insert Location: Between support shield and piping and under the finish jacket. 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated. J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers. L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. M. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.	
3.03 SCHEDULES	
A. Plumbing Systems: 1. Domestic Hot Water Supply: a. Glass Fiber Insulation: 1) Pipe Size Range: 1 1/2 inch and larger. 2) Thickness: 1 1/2 inch. b. Glass Fiber Insulation: 1) Pipe Size Range: 1 1/4 inch and smaller. 2) Thickness: 1 inch. c. Cellular Foam Insulation: 1) Pipe Size Range: 1 1/4 inch and smaller. 2) Thickness: 1 inch. 2. Domestic Hot Water Recirculation: a. Glass Fiber Insulation: 1) Pipe Size Range: All sizes. 2) Thickness: 1 inch (25 mm). 3. Domestic Cold Water: Glass Fiber 1 inch 4. Rod Drain Boilers: Glass Fiber 1 inch 5. Rod Drainage Above Grate: Glass Fiber 1 inch 6. Rod Drainage Within 10 Feet (3 Meters) of the Exterior: Glass Fiber 1 inch 7. Rod Drainage Run Horizontal at Rod Level: Glass Fiber 1 inch 8. Plumbing Vents Within 10 Feet (3 Meters) of the Exterior: Glass Fiber 1 inch B. Other Systems: 1. Piping Exposed to Freezing with Heat Tracing: Glass Fiber 1 inch	
END OF SECTION	
SECTION 22 1005 PLUMBING PIPING	
PART 1 GENERAL	
1.01 SECTION INCLUDES	
A. Pipe, pipe fittings, specialties, and connections for piping systems. 1. Sanitary sewer and Vent piping. 2. Domestic water. 3. Storm water. 4. Gas piping. 5. Flanges, unions, and couplings. 6. Pipe hangers and supports. 7. Valves. 8. Flow controls. 9. Check. 10. Water pressure reducing valves.	
1.02 SUBMITTALS	
A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.	
1.03 FIELD CONDITIONS	
A. Do not install underground piping when bedding is wet or frozen.	
PART 2 PRODUCTS	
2.01 GENERAL REQUIREMENTS	
A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings. 2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING A. Cast Iron Pipe: CISPI 301, hubless. 1. Fittings: Cast iron. 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies. B. PVC Pipe: ASTM D2665 or ASTM D3034. 1. Fittings: PVC. 2. Joints: Solvent welded, with ASTM D2564 solvent cement.	
2.03 SANITARY SEWER PIPING AND VENT PIPING, ABOVE GRADE A. Cast Iron Pipe: CISPI 301, hubless, service weight. Required in plenum ceiling space. 1. Fittings: Cast iron. 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.	
2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING A. Copper Pipe: ASTM B62, hard draw. 3. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze. 4. Joints: ASTM B32, alloy Sn65 solder. 2.05 DOMESTIC WATER PIPING, ABOVE GRADE A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H). 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze. 2. Joints: ASTM B32, alloy Sn65 solder. 3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.	
2.06 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING A. Cast Iron Pipe: CISPI 301, hubless, service weight. 4. Fittings: Cast iron. 5. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. B. PVC Pipe: ASTM D2665 or ASTM D3034. Solid core pipe. 1. Fittings: PVC SOLID CORE. 2. Joints: Solvent welded, with ASTM D2564 solvent cement.	
2.07 STORM WATER PIPING, ABOVE GRADE A. Cast Iron Pipe: CISPI 301, hubless, service weight. Required in plenum ceiling space. 1. Fittings: Cast iron. 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies. B. PVC Pipe: ASTM D2665 or ASTM D3034. Solid core pipe. 1. Fittings: PVC SOLID CORE. 2. Joints: Solvent welded, with ASTM D2564 solvent cement.	
2.10 FLANGES, UNIONS, AND COUPLINGS A. Unions for Pipe Sizes 3 inches (80 mm) and Under: 1. Ferrous Pipe: Class 150 malleable iron threaded unions. 2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints. B. Flanges for Pipe Size Over 1 inch (25 mm): 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges, preformed neoprene gaskets. 2. Copper Tube and Pipe: Class 150 slip-on or bronze flanges, preformed neoprene gaskets. C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe grooves, circular C-profile gasket, and bolts to secure and compress gasket. 1. Dimensions and Testing: In accordance with AWWA C606. 2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized. 3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C). 4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel. 5. When pipe is field grooved, provide coupling manufacturer's grooving tools. D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.	
2.11 PIPE HANGERS AND SUPPORTS A. Provide hangers and supports that comply with MSS SP-58. 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations. 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers. a. Cold and Hot Pipe Sizes 6 inches (150 mm) and Over: Double hangers. 3. Trapeze Hangers: Welded steel channel frames attached to structure. 4. Vertical Pipe Support: Steel riser clamp.	

2.12 BALL VALVES A. Construction, 4 inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.	
2.13 PIPING SPECIALTIES A. Flow Controls: 1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain. 2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).	
2.14 WATER PRESSURE REDUCING VALVES A. Up to 2 inches (50 mm): 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends. B. Over 2 inches (50 mm): 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.	
PART 3 EXECUTION	
3.01 EXAMINATION A. Verify that excavations are to required grade, dry, and not over-excavated.	
3.02 PREPARATION A. Remove pipe and tube ends. Remove burrs. Bevel plain end and ferrous pipe. B. Remove scale and dirt, on inside and outside, before assembly. C. Prepare piping connections to equipment with flanges or unions.	
3.03 INSTALLATION A. Install in accordance with manufacturer's instructions. B. Provide non-conducting dielectric connections wherever joining dissimilar metals. C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls. D. Install piping to maintain headroom, conserve space, and not interfere with use of space. E. Group piping whenever practical at common elevations. F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. H. Provide access where valves and fittings are not exposed. I. Establish elevations of buried piping outside the building to ensure not less than local requirements for cover depth. J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly. K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding. L. Provide support for utility meters in accordance with requirements of utility companies. M. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting. N. Install bell and adapt pipe with bell and gasket. O. Install valves with stems upright or horizontal, not inverted. P. Install water piping to ASME B31.9. Q. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372. R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2655. S. Sleeve pipes passing through partitions, walls, and floors.	
1. Provide inserts for placement in concrete formwork. 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm). 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface. 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.	
U. Pipe Hangers and Supports: 1. Install in accordance with ASME B31.9. 2. Support horizontal piping as indicated. 3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work. 4. Place hangers within 12 inches (300 mm) of each horizontal elbow. 5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe. 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping. 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. 8. Provide copper plated hangers and supports for copper piping. 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. 10. Provide hangers adjacent to motor-driven equipment with vibration isolation. 11. Support cast iron drainage piping at every joint.	
V. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.	
3.04 APPLICATION A. Use grooved mechanical couplings and fasteners only in accessible locations. B. Install unions downstream of valves and at equipment or apparatus connections. C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe. D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers. E. Install ball valves for throttling, bypass, or manual flow control services. F. Provide spring-loaded check valves on discharge of water pumps. G. Provide flow controls in water recirculating systems where indicated.	
3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM A. Disinfect water distribution system. B. Prior to starting work, verify system is complete, flushed, and clean. C. Bleed water from outlets to ensure disinfection and test for disinfectant residual at minimum 15 percent of outlets. D. Maintain disinfectant in system for 24 hours. E. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.	
3.06 SERVICE CONNECTIONS A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing. B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve. 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall. 2. Provide 18 gage, 0.0478-inch (1.21 mm) galvanized steel metal sleeve around service main to 6 inch (150 mm) above floor and 6 inch (160 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose ball insulation stuffing.	
3.07 SCHEDULES A. Pipe Hanger Spacing: 1. Metal Piping: a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm): 1) Maximum Hanger Spacing: 6.5 ft (2 m). 2) Hanger Rod Diameter: 3/8 inches (9 mm). b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm): 1) Maximum Hanger Spacing: 10 ft (3 m). 2) Hanger Rod Diameter: 3/8 inch (9 mm). c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm): 1) Maximum Hanger Spacing: 10 ft (3 m). 2) Hanger Rod Diameter: 1/2 inch (13 mm). d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm): 1) Maximum Hanger Spacing: 10 ft (3 m). 2) Hanger Rod Diameter: 5/8 inch (15 mm). 2. Plastic Piping: a. All Sizes: 1) Maximum Hanger Spacing: 6 ft (1.8 m). 2) Hanger Rod Diameter: 3/8 inch (9 mm).	
END OF SECTION	
SECTION 22 4000 PLUMBING FIXTURES	
PART 1 GENERAL 1. Section Includes: PART 2 PRODUCTS Refer to plumbing fixture schedule.	
PART 3 EXECUTION	
3.01 PREPARATION A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.	
3.02 INSTALLATION A. Install each fixture with trap, easily removable for servicing and cleaning. B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons. C. Install components level and plumb.	
3.03 INTERFACE WITH WORK OF OTHER SECTIONS A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.	
3.04 ADJUSTING A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.	
END OF SECTION	

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