

**PLUMBING SYSTEMS**

**PART 1 GENERAL**

**SUMMARY OF WORK**

Provide and install the following:

- o Cold water, domestic hot water, systems, fixtures, and modifications.
- o Drain, waste, and vent systems with fixtures.
- o Waste connections to utility services.
- o Gas piping systems.

**CODES AND STANDARDS**

Furnish and install all materials and equipment in conformance with the latest adopted rules and regulations of the following:

California Building Code (CBC)

California Plumbing Code (CPC)

**TESTING**

Perform pressure tests on all plumbing systems in conformance with the CPC. Repair any nonconforming sections and re-test until the test criteria are satisfied. Conduct tests conducted before piping is concealed in walls, floor, ceiling, or buried. Construction inspector to witness all tests. After pressure testing, provide an operational test on all systems.

**WARRANTY**

Provide one-year unconditional warranty on all plumbing equipment and systems, as described in the General Conditions.

**SUBMITTALS REQUIRED FOR THIS SECTION**

- o All equipment shown in schedules in plans.
- o Clean outs, hose bibbs, and valves.
- o Piping and equipment insulation.

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- o Shop drawings for all contractor-proposed piping layouts varying significantly from plans.
- o Proposed pipe hanger, seismic restraint, and roof pipe support systems.
- o Operation and maintenance manual.

## **PART 2 PRODUCTS**

### **PIPE AND PIPE FITTINGS**

#### Domestic Water Piping:

Inside building above floor: Type "L" hard copper tubing, conforming to ASTM B-88, with wrought copper fittings and 95/5 solder joints. Rigid/Viega Pro-Press fittings may be substituted for solder joint fittings. Grooved copper fittings and mechanical couplings may be used provided fittings are not flared. Type "M" may be used for unpressurized drain piping. Beneath floor slab and below grade: Type "K" soft or hard temper copper tubing conforming to ASTM B-88, with wrought copper fittings and 95/5 solder joints above grade only. Minimize joints below slabs, using wrought copper fittings and brazed joints below slab only where unavoidable. Outside building: Schedule 40 PVC pipe conforming to ASTM D1785, PVC socket fittings and solvent joints.

#### Gas Piping:

Low pressure piping below grade and exterior above grade: Schedule 40 black steel pipe conforming to ASTM A-120, with extruded plastic coating, with threaded malleable iron fittings, wrapped with UPC-approved 20 mil PVC pipe wrap (buried fittings only). Piping inside building: Schedule 40 black steel pipe conforming to ASTM A-120, with malleable iron fittings. Polyethylene PE2406 yellow gas piping with fuse-sealed connections and IAPMO listed anodless steel risers may be substituted for buried steel pipe if installed by contractors with qualification certificates. Plexco Yellowpipe or equal.

#### Sanitary Soil, Waste and Vent Piping:

Soil and waste piping and vent piping above and below grade inside of building: cast iron with no-hub joints, using stainless steel clamps. Use heavy-duty clamps for all below grade waste lines. Confirm with engineer before substituting plastic. Outside of building: Unless otherwise noted, shall be SDR-35 PVC Pipe, ASTM D3034. Vent piping 1-1/2" diameter above grade may be threaded Schedule 40 galvanized steel pipe with drainage fittings.

#### Pipe Installation -

Make screwed joints with full cut standard taper pipe threads with teflon tape or teflon-based pipe dope applied to male threads only.

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Steel to PVC connections may be made with service saddles, or screwed fittings.

Use unions at all equipment connections.

Use di-electric unions at all copper to steel connections.

Bury outside water and drainage pipe minimum 2 feet.

Extend vents six inches above roof, ten feet minimum from outside air openings.

Backfill drain lines under slab with sand, compacted to 95% in 6" lifts maximum. Provide copper tracer wire over all exterior non-metallic piping.

See structural plans for penetrations through or under foundations and details under slabs.

Use left/right nipples and couplings in lieu of unions for gas piping, except at equipment connections.

Install buried copper tubing in red (hot water) or blue (cold water) plastic sleeves.

Provide pipe sleeves around pipe penetrations through floor slabs as required in the structural plans.

#### Pipe Route and Grades -

Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping whenever practical at common elevations. Install concealed pipes close to building structure to keep furring to minimum.

Slope water piping 1 inch in 40 feet and install drain valves and hose nipples at low points.

Grade horizontal sanitary sewer drainage and vent piping 1/4 inch per foot minimum. For ultra-low flush water closets, slope waste 1/2" per foot to the building main.

Offset waste lines as required to avoid encroaching the restricted areas adjacent to foundation footings parallel to the waste lines. See structural plans for restricted areas.

Grade horizontal rain water drainage piping 1/4 inch per foot minimum.

Install piping to allow for expansion and contraction without stressing pipe or equipment connected.

Provide clearance for installing pipe insulation and for access to valves, air vents, drains and unions. Install 12" x 12" access doors for all concealed valves.

Install same type piping material specified for inside building to 8 feet outside of building.

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Install gas piping in open or ventilated spaces. Pitch lines and provide drip legs for condensation collection points. Mark gas lines with yellow "gas" labels every 25 feet. Propane gas piping may not be installed in basements or other places with low pockets.

**SUPPORTS, ANCHORS AND SLEEVES**

Pipe Hangers and Supports:

Use B-Line, Superstrut, or equal hanger or trapeze system, including the factory pre-approved seismic restraint system. Provide copper plated or plasticized hangers for copper piping, or wrap pipe with 20 mil PVC wrap. Use insulation shields and rigid calcium silicate insulation inserts at least 6" long for insulated piping to prevent insulation crushing. Use steel threaded hanger rods. For single pipes, use adjustable wrought steel clevis hangers.

Use "U"-shaped pipe clamps and channel struts where piping is routed tight to walls, ceilings, or exposed structure. Use lag screws to attach strut to structure.

Where copper piping passes through wood or steel studs, use plastic pipe guide bushings. Provide metal support plates at pipe terminations at fixtures.

Use PVC pipe supports with integral pitch pockets on pipe runs over flat roofs.

Support horizontal steel and copper piping as follows:

Nominal Pipe Size (in.)	Distance Between Rod Support (ft.)	Hanger Diameter (in.)
1/2	3/8	5
3/4 to 1	3/8	6
1-1/4 to 2	8	3/8
2-1/2 to 3	10	1/2
4 and 5	5/8	12
6	3/4	14

Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

work.

Place a hanger within one foot of each horizontal elbow.

Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.

Support horizontal soil pipe near each hub, with 5 feet maximum spacing between hangers.

Support vertical piping at every floor. Support vertical soil pipe at each floor at hub.

Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

Where practical, support riser piping independently of connected horizontal piping.

Flashing :

26 gauge galvanized steel, installation to architectural roofing specifications.

Sleeves:

Install 18 gauge galvanized steel sleeves through all pipe penetrations through footings, foundation walls, and other concrete work. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves. Extend sleeves through potentially wet floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

Where piping passes through floor, ceiling or wall close off space between pipe or duct and construction with a UL-listed sealant rated at the penetration's fire rating. Provide tight fitting metal caps on both sides and caulk.

Install chrome plated escutcheons where piping passes through finished surfaces.

## **VALVES, COCKS, AND FAUCETS**

Backflow Preventer:

Standard backflow preventer - Reduced pressure principle backflow preventer with two gate valves, check valves, and pressure relief valve. Wilkins or equal. Size as per plans.

Valve Connections:

Use pipe size valves. Use threaded valves and fittings for pipe sizes 2 inches and smaller, flanged for larger sizes. Use solder joint valves or screw to solder adapters for copper tubing.

Gate Valves:

Threaded or solder joint - bronze, non-rising stem, inside screw, double wedge or disc. Flanged -

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Iron body, bronze trim, rising stem, O.S.& Y., solid wedge.

Butterfly Valves:

Grooved joint- bronze body, EPDM encapsulated disc.

Check Valves:

Threaded or solder joint - bronze, swing disc. Flanged - Iron body, bronze trim, swing disc, renewable disc and seat.

Wall Hydrants:

Exterior - Bronze or red brass freezeproof wall hydrant, replaceable hexagonal disc, hose thread spout, vacuum breaker, wall flange, loose key, Woodford model 65. Interior - Chrome plated bronze, hose thread spout, vacuum breaker, wall flange, and loose key, Woodford model 24P.

Ball Valves:

All sizes - Bronze body, bronze trim, solder or screwed ends.

Gas Valves:

Exterior - Iron lubricated gas plug valves with square head, full pipe size, AGA approved. Interior - Brass lubricated gas plug valves with L-handles, full pipe size, AGA approved.

Flexible gas connectors:

Only use where specifically shown on plans. AGA approved and UL listed, size and length per UPC requirements.

Pressure Ratings:

Unless otherwise indicated, rate at 200 psig WSP and 250° F. Fire protection valves rated at 175 psig WOG.

Valve Installation:

Install valves with stems upright or horizontal, not inverted. Install gate or ball valves for shut-off and isolating service, to isolate equipment, part of systems or vertical risers. Use unions at or near valves to facilitate servicing. Install backflow prevention valves at the service fill connection of each piping system or component requiring a water service connection.

Valve Boxes:

One piece pre-cast concrete with cast iron cover labeled "Water", "Sewer", "Gas", or other label as appropriate. Install valve box and cover with H20 traffic loading in traffic areas.

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Recessed refrigerator ice maker water connection box:

Specialty Products model OB-801 plastic recessed box with cold water connection.

## **CLEANOUTS**

Finished floor:

Adjustable round heavy duty floor cleanout with cast iron body and frame, lead seal and bronze plug. Provide nickel-bronze top. J.R. Smith model 4021.

Unfinished floor:

Adjustable round double extra heavy duty floor cleanout with cast iron body and frame, lead seal and bronze plug. Provide non-skid bronze top. J.R. Smith model 4221.

Outside or grade:

Adjustable round double extra heavy duty flanged cleanout with cast iron body and frame, lead seal and bronze plug. Provide non-skid bronze top. J.R. Smith model 4251. Install with 12" square by 6" deep concrete case.

Tiled finished wall:

Extra heavy duty wall cleanout tee with cast iron body, lead seal and bronze plug. Provide square chrome-plated face-of-wall access cover. J.R. Smith model 4551.

Other walls:

Extra heavy duty wall cleanout tee with cast iron body, lead seal and bronze plug. Provide round stainless steel shall face-of-wall access cover. J.R. Smith model 4521.

Installation:

Lubricate cleanout plugs with mixture of graphite and linseed oil. Prior to building turnover, remove cleanout plugs, re-lubricate and reinstall using only enough force to ensure permanent leakproof joint.

## **PLUMBING FIXTURES AND TRIM MATERIALS**

Water Closets:

Standard flush valve WC's - white vitreous china floor mounted flush valve type. Siphon jet action and elongated bowl designed for 1.6 gallon flushes. Height 15" to rim. Open extra heavy-duty plastic seat. Top spud mounted flush valve with all stainless internal components, vacuum breaker, designed for 1.6 gallon flush. Handicapped flush valve WC - similar to standard

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and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

flush valve WC except 17" height to rim. Install flush valve handle on accessible side of WC enclosure.

Lavatories and Sinks:

Kitchen sink - double bowl 18 gauge 304 stainless steel with self-rimming lip. Sound deadening coated and three-hole edge for washerless hot and cold water faucet. Washerless chromed brass single-lever type kitchen faucet. Heavy duty, holes 8" O.C. to match sink. Swing spout, aerator, stainless steel ball type valve control with replaceable non-metallic seats. Include crumb cup strainer.

Wall mounted lavatories - white vitreous china wall mounted with faucet holes on 8" centers, drilled for concealed arm carriers. Concealed arm carriers to be heavy duty floor mounted. Faucet to be chromed brass washerless dual lever type meeting California handicap requirements, with flow restrictor.

Exam sinks - single bowl 18 gauge 304 stainless steel with self-rimming lip. Hole on back for faucet. Sound deadening coated. Include crumb cup strainer. Faucet to be chromed brass single deck mounted with quarter-turn washerless lever valve and gooseneck spout. Faucet levers to meet handicap requirements. Include volume control adjustment.

Lab sinks - single bowl 18 gauge 304 stainless steel with self-rimming lip. Sound deadening coated. Include crumb cup strainer. Faucet to be chromed brass single deck mounted with quarter-turn washerless lever valve and gooseneck spout. Faucet levers to meet handicap requirements. Include volume control adjustment.

Janitor's floor sink - Terrazzo, for corner floor installation, with chromed brass strainer and stainless rim guards. Faucet to be chrome brass with quarter-turn washerless valves, spout with pail hook and threaded for hose connection, vacuum breaker, spout wall brace, loose key stops.

Drinking fountain:

Handicapped non-refrigerated type: 18 gauge stainless steel, chrome-plated bubbler and bubbler guard, front push bar, flow regulator, self closing valve, 1/2" IPS stop, 1-1/4" IPS trap. Provide special heavy-duty wall support system, attach to studs.

Floor drain:

Cast iron floor drain with integral P-trap and trap primer connection. Nickel plated brass strainer. Include NSF and UPC approved PPP Prime-rite trap primer, installed at the nearest plumbing fixture with a cold water connection.

Floor sink:

Enameled cast iron floor sink with dome strainer and enameled half-grate.

Gas water heater:

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Gas water heater with glass-lined steel tank, anode, dip tube, aluminumized steel burners, refractory lined combustion chamber, flue damper, electronic ignition, inspection port, 2" urethane foam insulation, sheet metal jacket, pressure relief valve, drain valve, and dielectric flexible connections. Include three-year warranty for commercial use. Must be California Energy Commission certified. Make, model, and size as shown on plans.

Flues:

Type "B" UL listed double wall steel gas flue with thimbles, flashings, draft hoods and roof caps.

### **PLUMBING FIXTURES AND TRIM INSTALLATION**

Install each fixture with a trap, easily removable for servicing and cleaning. At completion thoroughly clean plumbing fixtures and equipment.

Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.

Install wall mounted lavatories, urinals and water closets, with approved wall carriers, model to suit installation.

Install stainless steel bellows type or piston type water hammer arrestors on water lines connected to dishwashers, clothes washers, other devices with solenoid valves, flush valves, and to fixture or group of fixtures complete with accessible isolation valve. Size to match connected fixture units. Piston-type to have brass piston and EDPM seals and O-rings. Provide access door to allow future service. Watts series 15 or equal.

Anchor floor-mounted water closets with manufacturer's recommended lag screws or bolts.

### **PIPE INSULATION**

Hot water:

Use 1 inch thick fiberglass insulation with Kraft reinforced vapor barrier up to 2" pipe diameter, 1-1/2" thick for larger pipe. All service jacket with self-sealing lap (ASJ-SSL). R-value of 4.0/inch, smoke/flame rating of 50/25 or less. Knauf, O-CF, Certainteed, or equal. Follow manufacturer's recommendations. Use the proper sealing tool. Insulate elbows, tees, and other fittings with unfaced insulation and pre-molded PVC fitting covers. Insulate the first five feet of cold water supply piping connections to water heaters. Stuff insulation in wall, floor, or ceiling penetrations, except where noted to apply fire-rated sealants or gasketing. Apply weatherproof aluminum jacketing and banding over all exterior insulated piping.

Cold water:

Insulate all cold water piping in uninsulated attics, exterior walls, and other areas of potential freezing. Use insulation meeting hot water supply requirements.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

Handicapped Lavatories and Sinks:

Enclose exposed traps and water connectors with pre-fabricated closed cell vinyl insulated safety covers. Truebro Handi Lav-Guard, Plumberex Pro-2000, or equal. Field-applied pipe wrap is not acceptable.

Electric heat trace cable:

Self-regulating UL listed heat trace cable for domestic hot water temperature maintenance. Include pipe labels, tees, terminal end seals, power connection kits, and special glass tape for attaching to pipe. Start and terminate where shown on the plans.

**PART 3 EXECUTION**

**PAINTING**

Prime coat and finish paint to match building all exposed pipe, steel hangers, and supports. Hangers and supports, located in crawl spaces, pipes shafts and suspended ceiling spaces are not considered exposed.

**PIPE CLEANING AND STERILIZATION**

Flush lines to remove all chips, burrs, and debris from pipe interior after system rough-in, but before final fixture connection. Use compressed air for gas lines and water for water lines. Clean all strainers after flushing. Sterilize all potable water lines to AWWA standards, then flush out lines to remove all residual hyper-chlorinated water.

**\*\*END OF SECTION\*\***