

PART I – GENERAL

WORK SPECIFIED HEREIN

- Pipe, fittings, valves, piping specialties, and mechanical supporting devices.

SUBMITTALS

- Unless otherwise noted, the contractor shall prepare all shop drawings, product literature, etc. only as required to properly coordinate and construct the project.
- Review of submittals by the Professional of Record is limited to specific shop drawings as called for in the Project Manual.

SUBSTITUTIONS

- In accordance with Section 01600.

ALTERNATE EQUIPMENT

- Below is a list of alternate equipment. Refer to Section 15000 for all instructions.
 Valves: Nibco/Scott, Milwaukee, Red & White
 Shock Absorbers: Zurn, Smith, Wade.
 Pipe Hangers & Supports: Grinnell, Kin-Line, B-line, Michigan, Toyo.

PART II – PRODUCTS

MATERIALS

Pipe and Fittings:

- Pipe furnished under this Contract shall be new; practically circular in cross sections with inner and outer surfaces concentric, free from cracks, blisters, and defects. All piping shall be subjected to standard mill tests before being shipped and each length of pipe shall give maker's name or trademark legibly rolled on outside or shall be marked in an approved manner.
- All pipe shall conform to Federal Government and/or A.S.T.M., A.S.M.E. Specifications for all types specified.
- Fittings furnished under this Contract shall be new and free from cracks, sponginess, shrinkage, sand and gas holes, and all other defects. All fittings shall be 125 lb. steam working pressure.

Schedule of Piping and Fittings:

SERVICE	PIPE	FITTINGS
Soil, waste, & vent piping inside building to 5' outside building walls – 2" and larger	Preferred – ABS Schedule 40 ASTM D2661-87a Alternate – DWV Rated PVC	Solvent Weld Joints & Fitting

Storm piping in building above and below grade	Schedule 40 DWV Rated PVC with DMV filling	Joints – Solvent Cemented Fittings – Drainage Pattern Schedule 40 PVC
Soil, waste, piping inside building to 5' outside building walls – 1.5" and smaller	Preferred – ABS Schedule 40 ASTM D2661-87a Alternate – DWV Rated PVC	Solvent Weld Joints & Fitting
Vent piping inside building to 5' outside building walls – 1.5" and smaller	ABS Schedule 40 ASTM D2661-87a or PVC	Solvent Weld Joints & Fitting
Water piping underground	Type "K" – Soft Copper (wrapped as per specification)	Wrought Copper Solder Type
All cold & hot water piping above ground	PEX; Non-Barrier Tubing cross linked polyethylene tubing If PEX is not acceptable by code, alternate - Type "L" – Hard Copper	PEX only Wrought Copper Solder Type
Compressed Air	Type "L" – Hard Copper	Wrought Copper Solder Type
Fire Line	See Section 15300 herein for all requirement.	
Condensate Piping from A/C Coils	Type "M" – Hard Copper	Wrought Copper Solder Type
Gas Piping up to 2-1/2"	Schedule 40 Black Steel	Screwed Malleable Iron
Gas Piping 3" and larger	Schedule 40 Black Steel	Welded Forged Steel

PIPING MATERIALS

- General: Provide pipe and tube of the type, joint type, grade, size and weight (wall thickness or class) indicated for each service and as required by local code requirements. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements and comply with governing regulations and industry standards. See schedule above. Where allowed by local code the use of ABS piping is allowed at underslab locations.

STEEL PIPE

- ASTM A53, A106 or A120 except as called for (I.E. natural gas piping shall be A53) with ASTM A53 or A106 where close coiling or bending is required.

COPPER PIPING

- ASTM B88; type (wall thickness) as indicated for each service: hard-drawn temper, except as otherwise indicated.

PEX NON-BARRIER TUBING

- ASTM F-876/F-877, CSA B137.5 and ANSI/NSF 61 as suitable for potable water.

PIPE AND TUBE FITTINGS

- *General:* Provide factory-fabricated fittings of the type, materials, grade class and pressure rating as indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve, or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

FITTINGS FOR STEEL PIPE

- Malleable iron threaded unions shall be Class 150 MSS SP-76; selected by installer or as indicated herein, for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats, (iron, bronze or brass); plain or galvanized as indicated.
- Threaded pipe plugs shall conform to ANSI B16, 14.
- Steel flanges and fittings shall conform to ANSI 16.5, including bolting and gasketing of the following group, end connection and facing, except as otherwise indicated; material group; Group 1.1.
- End connections shall be butt-welded.
- Facings shall be raised faced.
- Wrought-steel butt-welding fittings shall conform to ANSI B16.9 except use ANSI B16.28 for short-radius elbows and returns with ratings to match pipe.
- Pipe nipples shall be fabricated from same pipe as used for connected pipe, except do not use less than Schedule 80 pipe when length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/4", and do not thread nipples full length (no close-nipples).
- Fittings for copper piping shall be cast/bronze solder type conforming to ANSI B16.18 or wrought Copper/bronze solder type conforming to ANSI B16.22.
- Fitting for PEX tubing shall be PEX only.

Copper Unions:

- Provide standard products recommended by the manufacturer for use in the service indicated.

Valves:

- Ball valves, 2 Wilkins Model 850 Full Port Ball Valve.
- Swing check valves, screwed ends, 2 inches and smaller, bronze, 125 psi WSP, 200 psi WOG, Hammond #IB-940, Milwaukee #509.
- Swing check valves, solder ends, 2 inches and smaller bronze 125 psi WSP, 200 psi WOG, Hammond #IB-912, Milwaukee #1509.
- Provide valves in underground piping with square operating nut and extension wrench.
- PEX Valves, see Section 15106 Cross-Lined Polyethylene Tubing and Fittings.

Piping Specialties:

- Unions - Malleable iron ground joint type crane #1280 brass to iron seat for ferrous pipe. For copper pipe Nibco #633.
- Escutcheons - Chrome plated brass (with set screws) for all pipes passing through walls, floors, or ceiling.
- Roof flashing assemblies – To match single-ply roof by roofing contractor.
- Dielectric Insulating Fittings - Dielectric fittings, unions, or couplings, for all connections between ferrous and copper piping.
- Water hammer arrestors: J.R. Smith Hydrotrol, sized and submitted as per manufacturer's requirements.

Cleanouts:

Plastic cleanouts will not be accepted. Cleanouts shall be installed at location as shown on the drawings. Any deviation from the Contract Documents without the written approval of the Professional of Record will not be allowed. Submitted as-built drawings shall indicate such. Cleanouts shall be as follows:

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|---|----------------------|
| • Grade (outside building): | Zurn Z-1400-HD-BP-VP |
| • Finish Floors: | Zurn ZN-1400-T-VP |
| • Concrete Slabs and Unfinished Floors: | Zurn Z-1400-HD |
| • Dry Walls: | Zurn Z-1447 |
| • Tile Walls: | Zurn Z-1443 |

NOTE: Cleanouts shall be installed flush with the finish floor. The Contractor has the responsibility to referring to the Architectural Room Schedule and determine the exact height the top of the cleanout must be to be installed perfectly flush with the FINAL finish floor. Cleanouts installed higher or lower than the FINAL finish floor will be rejected and removed and installed flush at no additional expense to the Owner. ALL floor and surface cleanouts shall have nickel bronze tops, with bronze

plugs; ALL wall cleanouts shall have Stainless steel cover plates; NO EXCEPTIONS!

PART III – EXECUTION

PIPE HANGERS AND SUPPORTS

Hangers shall adequately support the piping system. They shall be located near or at changes in piping direction and concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow expansion and contraction of the piping. Hangers shall be fastened to building structural members wherever practicable. Provide "Stoneman" "Trisolators" at each pipe hanger, support bracket or strap, on all uninsulated water piping.

Plastic pipe shall be supported with clevis type hangers per pipe section located close to the hub, changes in direction and branch connection. Rod and spacing sizes as follows:

DWV PIPING	SPACING	ROD SIZE
Up to 6"	10'-0"	3/8" dia.

HORIZONTAL STEEL PIPING	SPACING	ROD SIZE
Up to 1-1/4"	8'-0" (maximum)	3/8" dia.
1-1/2 to 2"	10'-0" (maximum)	3/8" dia.
2-1/2" to 3"	10'-0" (maximum)	1/2" dia.
4"	10'-0" (maximum)	5/8" dia.

HORIZONTAL COPPER TUBING	SPACING	ROD SIZE
1/2"	3'-6" (maximum)	3/8" dia.
3/4"	4'-3" (maximum)	3/8" dia.
1"	5'-0" (maximum)	3/8" dia.
1-1/4" to 1-1/2"	6'-0" (maximum)	3/8" dia.

HORIZONTAL PEX TUBING	SPACING	ROD SIZE
Up to 2"	2'-8" (maximum)	3/8" dia.

INSTALLATION: VERTICAL PIPING

When support locations are not indicated on the drawings, support steel and copper pipe at every floor and roof penetration.

Structural Attachments:

- To concrete: Use Grinnell Fig. 281 wedge type concrete inset for loads up to 1200 lbs. or Grinnell Fig. 282, Universal concrete insert for loads up to 1430 lbs.
- To steel: Use Grinnell Fig. 87 C-clamp with retaining clip for pipe 2" and smaller.
- Intermediate attachments: Continuous threaded rod may be used wherever possible. No chain, wire, or perforated strap shall be used.
- Pipe Attachments: Grinnell, Elcen, or Kin-Line.
- All pipe attachments shall be clevis type with vertical turnbuckle adjustment, or Grinnell, Fig. 260 clevis hanger.
- When thermal expansion on excess of 1/2" axially is anticipated, use Grinnell Fig. 174 adjustable swivel pipe roll or Grinnell Fig. 271 pipe roll stand, or equal. Where pipe is insulated, use a pipe covering protection saddle in conjunction with the roll device.
- For copper tubing, use Grinnell Fig. CT-65 clevis hanger, copper hanger or plastic-coated hanger.
- For vertical pipe, use Grinnell Fig. 261.

HANGER SIZING:

- Hangers shall be pipe size installed inside insulation for all lines regularly operating at 70°F and above.
- Hangers shall be insulation O.D. size for all covered lines operating at 69°F and below. Install protection saddles between insulation and hanger.
- Trapeze hangers may be used to support three or more parallel pipes. Trapeze design and application shall be subject to approval by the Professional of Record and shall incorporate adjustment features specified for ring or clevis hangers.
- Piping near the floor shall be supported from side wall or floor by approved upright iron pipe brackets, stanchions or hangers, in such manner as to maintain its alignment while making suitable provisions for necessary expansion. In stud walls and pipe chases mechanically attach water piping to structure with "Trisolators".
- Where pipes or conduits of different contractors may possibly be racked on the same supporting structure, each Contractor shall cooperate with the others involved to properly locate the supporting members and shall furnish a proportionate share of the labor and materials involved in the installation.

WORKMANSHIP

- Pipe fitting and installation.
- Cleaning: All piping materials shall be installed free of dirt, scale, rust, excess oil, grease or other compounds. Steel and copper piping sections before installation shall be stood on end and rapped sharply

to loosen cutting and other foreign materials from the interior. After installation, open ends of piping systems shall be temporarily plugged. Foreign matter accumulating in or on the piping as a result of fabrication and erection work shall be removed as the work progresses.

- Openings in pipes, drains, fittings and equipment shall be kept covered or plugged to prevent accumulation or debris in systems.
- Piping shall be free of traps, sags and bends. Piping shall be drainable at low points in the systems. Where obstacles are encountered the piping shall drop below to allow drainage. Minimum slope on water lines shall be 1/8" per foot toward drain.
- Install piping to maintain head room and keep passageways clear. Offset to maintain the required clearances and conform to architectural and structural features of the building. Run parallel and straight with adjacent walls or ceilings to present a uniform appearance. Maintain spacing to accommodate insulation.
- All rough-in shall be set to dimensions furnished by manufacturers.
- Street elbows, bushings and long screw fittings shall not be used.
- Mains and risers: All piping shall be continuous between fittings wherever possible, as short lengths and couplings will not be permitted.
- Unions and Flanges: Provide unions or flanges at all connections to equipment for dismantling of piping. Provide unions at connections to all screwed body and solder end valves.
- Copper, brass pipe and chromed, polished, or painted connections from fixtures shall not show tool marks.

JOINTS AND CONNECTIONS

- Screwed piping shall be fabricated using sharp cutting, threading and reaming tools which maintain proper thread dimensions and produce standard thread engagement. Pipe shall be properly reamed after cutting. Joints shall be made with graphite and oil lubricant, or teflon tape. Sealing or adhesive type compounds will be rejected. Exposed threads at joints shall be coated with red lead not later than the end of the day's work.
- Solder joint piping shall be cut square using roller type tube cutter; ends shall be de-burred, resized and polished to "bright" metal; fitting sockets shall be cleaned; heat indicating flux shall be applied to tube end; joint shall be assembled and uniformly heated to proper temperature; solder or brazing alloy shall be melted by contact with tube and fitting, not by exposure to flame; solder application shall stop as soon as joint flows full.
- Solder joints on all copper piping shall be made with approved non-lead 95-5 solder, for all piping above grade and silver solder for all piping below grade.

- Joints in mechanical joint piping shall be installed in strict compliance with manufacturer's instructions. Provide thrust blocking for all cast iron pipe below grade as directed by manufacturer, at all changes of directions and all branch takeoffs. Thrust blocks shall have a minimum of one yard of concrete.
- All underground copper piping shall be wrapped spirally with three layers of 20 mil. polyethylene tape with 50% overlap.
- PEX shall be installed using PEX crimping system and in strict compliance with manufacturer's instructions. Do not use polyethylene crimp fitting and rings.

VALVES

All shut-off and drain valves in water piping shall be ball valves.

TESTING

Furnish all test pumps, gauges, equipment and personnel required and test as necessary to demonstrate the integrity of the finished plumbing installation to the approval of pertinent authorities, as called for herein. Test all valve bonnets for tightness. Test operate all valves at least once from closed-to-open-to-closed position while valve is under test pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three times.

Piping Specialties: Test all piping specialties for proper operation.

END OF SECTION