

SECTION 23 22 00
STEAM AND STEAM CONDENSATE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Steam Piping System.
- D. Steam Condensate Piping System.

1.2 REFERENCES

- A. ANSI/ASME SEC 9 - Welding and Brazing Qualifications.
- B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.
- C. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- D. ANSI/ASME B16.9 - Factory Made Wrought Steel Butt Welding Fittings.
- E. ANSI/ASME B31.1 - Code for Power Piping.
- F. ANSI/ASME B31.9 - Building Services Piping.
- G. ANSI/AWS D1.1 - Structural Welding Code.
- H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- I. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

1.3 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9 for systems operated at less than 125 psig, and ANSI/ASME B31.1 for systems operated at 125 psig and above.

1.4 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body. Remanufactured valves are not acceptable.
- B. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 23 05 00. Include data on pipe fittings, valves and accessories.
- B. Include certification of compliance with ANSI/AWS D1.1 for all welders.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect piping to prevent corrosion and entrance of foreign matter.

- B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 STEAM PIPING (0 TO 125 PSIG)

- A. Design Pressure: 125 psig.
Maximum Design Temperature: 350°F.
- B. Piping - 2" and Under:
 - 1. Pipe: Standard weight black steel, threaded and coupled, ASTM A53.
 - 2. Joints: Screwed.
 - 3. Fittings: 125 psi S - 175 psi. WOG, cast iron, ASTM A126, ANSI B16.4.
 - 4. Unions: 250 psi S - 500 psi. WOG, black malleable iron, ground joint with brass seat.
- C. Piping - 2-1/2" and Over:
 - 1. Pipe: Standard weight black steel, beveled ends, ASTM A53.
 - 2. Joints: Butt welded or flanged.
 - 3. Fittings: Standard weight seamless steel, butt welded type, ASTM A234, Grade WPB, ANSI B16.9.
 - 4. Flanges: 150 lb. forged steel, welding neck or slip-on, ASTM A181, Grade I, ANSI B16.5.
- D. Shut-Off Valves:
 - 1. Gate Valves:
 - a. GA-1: 2" and under, 150 psi S @ 406°F, 300 psi WOG @ 150°F, screwed, bronze, rising stem, screwed bonnet. Crane #431, Hammond #IB641, Stockham #B122, Walworth #56, Milwaukee #1150, Watts #B-3210.
 - b. GA-2: 2-1/2" thru 12", 125 psi S @ 353°F, 200 psi WOG @ 150°F, flanged, iron body, bronze mounted, OS&Y. Crane #465-1/2, Hammond, Stockham #G623, Walworth, Milwaukee #F2885, Watts #F-503.
 - 2. Ball Valves:
 - a. BA-1: 3" and under, 150 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of 95-5 solder), bronze or brass body, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

- 1) Provide extended shaft for all valves in insulated piping.
 - 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lockout trim.
- b. BA-1A: 2-1/2" and 3", 150 psi saturated steam, 275 psi WOG ANSI Class, 150 psi standard port, carbon steel body stainless steel ball and trim, Teflon seats and seals. Apollo #88A-100, Nibco #F510-CS/66, Milwaukee #F90.

NOTES:

- 1) Provide extended shaft for all valves in insulated piping.
- 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

E. Check Valves:

1. CK-1: 2" and under, 125 psi S @ 406°F, 200 psi WOG @ 150°F, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319, Walworth #3406, Milwaukee #509, Watts #B-5000.
2. CK-6:2-1/2" thru 12", 125 psi S @ 450°F, 200 psi WOG @ 150°F, flanged, all iron, horizontal swing. Crane #373-1/2, Hammond #IR1126, Stockham #G933, Walworth #8928-1/2F, Milwaukee #F2971, Watts #F-511-R.

F. Strainers:

1. ST-1: Bronze body, screwed ends, screwed cover, 150 psi S @ 350°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777.
2. ST-3: Cast iron body, 250 lb. flanged ends, bolted cover, 250# steam @ 406°F, 400# WOG @ 150°F. Armstrong #A1FL, Metraflex #TF2, Mueller Steam Specialty Co. #752, Sarco #CI-250.

2.2 CONDENSATE PIPING (0 TO 125 PSIG)

A. Design Pressure: 125 psig.
Maximum Design Temperature: 350°F.

B. Piping - 2" and Under:

1. Pipe: Extra strong black steel, threaded and coupled, ASTM A53.

2. Joints: Screwed.
 3. Fittings: 125 psi S - 175 psi WOG, black cast iron, ASTM A126, ANSI B16.4.
 4. Unions: 250 psi S - 500 psi WOG, black malleable iron, ground joint with brass seat.
- C. Piping - 2-1/2" and Over:
1. Pipe: Extra strong black steel, beveled ends, ASTM A53.
 2. Joints: Butt welded and flanged.
 3. Fitting: Extra strong seamless steel, butt weld type, ASTM A234, Grade WPB, ANSI B16.9.
 4. Flanges: 150 psi forged steel, welding neck or slip-on, ASTM A181, Grade I, ANSI B16.5. Welding neck type shall have bore to match pipe.
- D. Shut-Off Valves:
1. Ball Valves:
 - a. BA-1: 3" and under, 150 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of 95-5 solder), bronze or brass body, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham #S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.
- NOTES:
- 1) Provide extended shaft for all valves in insulated piping.
 - 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lockout trim.
- E. Throttling Valves:
1. Globe Valves:
 - a. GL-1: 2" and under, 150 psi saturated steam, 300 psi WOG, screwed, bronze. Crane #7TF, Stockham #B22T, Walworth #3095, Milwaukee #590, Hammond #IB413, Watts #B-4010-T.
 - b. GL-2: 2-1/2" thru 10", 125 psi S @ 450°F, 200 psi WOG @ 150°F, flanged, iron body, bronze mounted. Crane #351, Hammond #IR116, Stockham #G-512, Walworth #8906F, Milwaukee #F2981, Watts #F-501.

F. Check Valves:

1. CK-1: 2" and under, 125 psi S @ 406°F, 200 psi WOG @ 150°F, screwed, bronze, horizontal swing. Crane #37, Hammond #IB904, Stockham #B319, Walworth #3406, Milwaukee #509, Watts #B-5000.
2. CK-6: 2-1/2" thru 12", 125 psi S @ 450°F, 200 psi WOG @ 150°F, flanged, all iron, horizontal swing. Crane #373-1/2, Hammond #IR1126, Stockham #G933, Walworth #8928-1/2F, Milwaukee #F2971, Watts #F-511-R.

G. Strainers:

1. ST-1: Bronze body, screwed ends, screwed cover, 150 psi S @ 350°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777.
2. ST-2: Cast iron body, 125 lb. flanged ends, bolted cover, 125 psi S @ 350°F, 175 psi WOG @ 150°F. Armstrong #A1FL, Metraflex #TF, Mueller Steam Specialty Co. #751, Sarco #CI-125, Watts #77F-D.

2.3 CONDENSATE RETURN - PUMPED (0 TO 100 PSIG)

A. Design Pressure: 125 psig.
Maximum Design Temperature: 350°F.

B. Piping - 2" and Under:

1. Pipe: Extra strong black steel, threaded and coupled, ASTM A53.
2. Joints: Screwed.
3. Fittings: 125 psi S - 175 psi WOG, cast iron, ASTM A126, ANSI B16.4.
4. Unions: 250 psi S - 500 psi WOG, black malleable iron, ground joint with brass seat.

C. Piping - 2-1/2" and Over:

1. Pipe: Extra strong black steel, beveled ends, ASTM A53.
2. Joints: Butt welded and flanged.
3. Fittings: Extra strong seamless steel, butt weld type, ASTM A234, Grade WPB, ANSI B16.9.
4. Flanges: 150 lb. forged steel, welding neck or slip-on, ASTM A181, Grade I, ANSI B16.5. Welding neck type shall have bore to match pipe.

D. Shut-Off Valves:

1. Ball Valves:

- a. BA-1: 3" and under, 150 psi saturated steam, 600 psi WOG, full port, screwed or solder ends (acceptable only if rated for soldering in line with 470°F melting point of 95-5 solder), bronze or brass body, stainless steel ball and trim, Teflon seats and seals. Apollo #77C-140, Stockham

#S-206 BR1-R, Milwaukee #BA-400, Watts, Nibco #585-70-66, National Utilities Co., RUB.

NOTES:

- 1) Provide extended shaft for all valves in insulated piping.
 - 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lockout trim.
- b. BA-1A: 2-1/2" and 3", 150 psi saturated steam, 275 psi WOG ANSI Class, 150 psi standard port, carbon steel body stainless steel ball and trim, Teflon seats and seals. Apollo #88A-100, Nibco #F510-CS/66, Milwaukee #F90.

NOTES:

- 1) Provide extended shaft for all valves in insulated piping.
- 2) Provide lock out trim for all valves opening to atmosphere installed in domestic water piping over 120°F, heating water piping over 120°F, steam, condensate, boiler feed water piping, compressed air piping and gasoline/kerosene piping, and as indicated on the drawings. Solid extended shaft is not required on valves with lock out trim.

E. Throttling/Shut-Off Valves:

1. Globe Valves:

- a. GL-1: 2" and under, 150 psi saturated steam, 300 psi WOG, screwed, bronze. Crane #7TF, Stockham #B22T, Walworth #3095, Milwaukee #590, Hammond #IB413, Watts #B-4010-T.
- b. GL-2: 2-1/2" thru 10", 125 psi S @ 450°F, 200 psi WOG @ 150°F, flanged, iron body, bronze mounted. Crane #351, Hammond #IR116, Stockham #G-512, Walworth #8906F, Milwaukee #F2981, Watts #F-501.

F. Check Valves:

1. CK-12: 2" and under, 150 psi saturated steam, 250 psi WOG, screwed, bronze or iron body, bronze mounted, center guided silent type, metal-to-metal seat. Lunkenheimer #233, Mueller Steam Specialty Co. #203-BP.
2. CK-14: 2-1/2" thru 12", 200 psi WOG, double disc wafer type, bronze or iron body, bronze trim, metal-to-metal or Viton seat, 316 SS shaft, Inconel 600 spring. Mission Duo Chek #12HPP (with Inconel springs), Muessco #71-AHB-K-W, Stockham #WG-976.

G. Strainers:

1. ST-1: Bronze body, screwed ends, screwed cover, 150 psi S @ 350°F, 200 psi WOG @ 150°F. Armstrong #F4SC, Metraflex #TS, Mueller Steam Specialty Co. #351, Sarco #BT, Watts #777.
2. ST-2: Cast iron body, 125 lb. flanged ends, bolted cover, 125 psi S @ 350°F, 175 psi WOG @ 150°F. Armstrong #A1FL, Metraflex #TF, Mueller Steam Specialty Co.#751, Sarco #CI-125, Watts #77F-D.

2.4 UNDERGROUND STEAM PIPING - OUTSIDE BUILDING - PREINSULATED - CLASS A

A. Design Pressure: 125 psig.
Maximum Design Temperature: 350°F.

B. Steam Piping - 2" and Under:

1. Pipe: Standard weight black steel, plain ends, ASTM A53.
2. Joints: Socket welded.
3. Fittings: 2000 lb. WOG, forged steel, socket weld type, ASTM A105, Grade II, ANSI B16.11.
4. Unions: None allowed.

C. Steam Piping - 2-1/2" and Over:

1. Pipe: Standard weight black steel, beveled ends, ASTM A53.
2. Joints: Butt welded.
3. Fittings: Standard weight seamless steel, butt welded type, ASTM A234, Grade WPB, ANSI B16.9.
4. Flanges: None allowed.

D. Steam Pipe Insulation:

1. Mineral wool having a "K" factor not over 0.31(Btu/hr sq ft/°F/in) at 75°F.
2. Capable of continuous operation at 1200°F.
3. Minimum insulation thickness of 2".

E. Steam Pipe Outer Jacket:

1. 10 gauge minimum black steel with 6 mil interior and 20 mil exterior coating of fusion bonded epoxy.
2. Class A conduit system (airtight, pressure testable, drainable and dryable).
3. Service pipe supported at intervals not over 10 feet.

F. Accessories:

1. Fitting insulation and covers shall match the pipe insulation.
2. Install gland seal terminations at all building and manhole entrances. Gland seals shall allow the inside pipe to move freely to allow for pipe expansion.
3. Provide integral pipe anchor plates where required. Plates shall be secured to the inner carrier pipe and be at least 3/8" thick. Plate shall extend beyond the outer jacket to allow anchoring in concrete. Completely seal plate to prevent entrance of any moisture.
4. Provide insulation, sleeves, fitting covers and all other items needed to field insulate pipe joints.
5. Seal all field joints watertight.

2.5 UNDERGROUND CONDENSATE PIPING - OUTSIDE BUILDING - PREINSULATED - CLASS A

A. Design Pressure: 125 psig @ 200°F.
Maximum Design Temperature: 225°F.

B. Condensate Piping:

1. Pipe: Filament wound epoxy pipe with chemical resistant epoxy resin liner at least 0.015 inches thick. ASTM D2996, MIL-P-28584.
2. Fittings: All fittings shall be of the same material and construction as the pipe.
3. Joints: Join pipe and fittings with a bell and spigot joint secured with thermosetting epoxy adhesive. Furnish sufficient adhesive kits for all field joints.
4. Acceptable Manufacturers: Bondstrand - Series 2000, A. O. Smith Inland - Green Thread, or Fibercast - RB-2530.

C. Condensate Pipe Insulation:

1. Mineral wool having a "K" factor not over 0.31 (Btu/hr sq ft/°F/in) at 75°F.
2. Capable of continuous operation at 1200°F.
3. Minimum insulation thickness of 1".

D. Condensate Pipe Outer Jacket:

1. 10 gauge minimum black steel with 6 mil interior and 20 mil exterior coating of fusion bonded epoxy.
2. Class A conduit system (airtight, pressure testable, drainable and dryable).
3. Service pipe supported at intervals not over 10 feet.

E. Accessories:

1. Fitting insulation and covers shall match the pipe insulation.

2. Install gland seal terminations at all building and manhole entrances. Gland seals shall allow the inside pipe to move freely to allow for pipe expansion.
3. Provide integral pipe anchor plates where required. Plates shall be secured to the inner carrier pipe and be at least 3/8" thick. Extend plate beyond the outer jacket to allow anchoring in concrete. Completely seal plate to prevent entrance of any moisture.
4. Provide insulation, sleeves, fitting covers and all other items needed to field insulate the pipe joints.
5. Seal all field joints watertight.

2.6 STRAINERS

- A. Unless otherwise indicated, strainers shall have stainless steel screens with perforations as follows:

Description	Steam All Sizes	Condensate All Sizes
Strainer	1/32'	3/64'

- B. Furnish pipe nipple with gate valve and threaded cap to blow down all strainer screens.
- C. Use bronze body strainers in copper piping and iron body strainers in ferrous piping.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends, remove burrs, bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Make connections to equipment with flanges or unions.
- D. After completion, fill, clean, and treat systems.

3.2 TESTING PIPING

- A. Steam Piping:
Condensate Piping:
Pumped Condensate Return Piping:
1. Complete all testing of pipes underground, or in chases and walls, before piping is concealed.
 2. Complete all testing before insulation is applied, or if insulation is applied before the pipe is tested and a leak develops which ruins the insulation, the pipe installing contractor shall arrange and pay for replacing the damaged insulation.
 3. Test piping with water at 150% of the maximum operating pressure.
 4. Hold pressure for at least two hours.

5. Test to be witnessed by the Architect/Engineer or their representative, if requested by the Architect/Engineer.

3.3 CLEANING PIPING

A. Assembly:

1. Prior to assembly of pipe and piping components, all loose dirt, scale, oil and other foreign matter on internal or external surfaces shall be removed by means consistent with good piping practice subject to the approval of the Architect/Engineer's representative. Chips and burrs from machinery or thread cutting operation shall be blown out of pipe before assembly. Cutting oil shall be wiped from internal and external surfaces.
2. During fabrication and assembly, remove slag and weld spatter from both internal and external pipe joints by peening, chipping and wire brushing.
3. Notify the Architect/Engineer's representative prior to starting any post erection cleaning operation in sufficient time to allow witnessing the operation. Consult with and obtain approval from the Architect/Engineer's representative regarding specific procedures and scheduling. Arrange for proper disposal of cleaning and flushing fluids.
4. Prior to blowing or flushing erected piping systems, disconnect all instrumentation and equipment, open wide all valves, and install all strainer screens.

B. Water Flush:

1. Flush pipe and components with clean water until all discharge from system is clean. Maintain minimum velocities at all points of 5 ft/sec. Flow shall be in same direction as when system is in normal operation. Discharge shall be from low points of pipes, ends of headers and as otherwise needed to flush entire system. After flushing, drain and/or blow out any residual water.
2. Water flush applies to the following systems:
 - a. Boiler Feedwater Piping
 - b. Pumped Condensate Return Piping
 - c. Steam Piping
3. Steam and condensate pipes may be cleaned using compressed air at 80 to 90 psig. Maintain adequate airflow to obtain velocities of 5 feet per second.
4. Clean and replace all strainers after pipe cleaning.

3.4 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space, other work, or equipment.

- C. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Provide clearance for installation of insulation and access to valves and fittings.
- F. Provide access doors where valves and fittings are not exposed.
- G. Slope steam piping 0.25" in 10 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe level.
- H. Slope steam condensate piping 0.5" in 10 feet.
- I. Provide drip trap assembly at low points and before control valves and pressure reducing valves.
- J. Provide loop vents over trapped sections.
- K. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply zinc rich primer to welds.
- L. Prepare pipe, fittings, supports, and accessories for finish painting.
- M. Provide drip legs as shown on the drawings, at low points, traps, and the base of all risers in steam, and condensate pipes. Unless otherwise shown, drip legs shall be full pipe size on pipes through 4" and at least 4", but not less than half line size over 4". Drip legs shall be 12" minimum length, with a reducer and a 3/4" shut-off valve.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Provide shut-off valves in supply and return to all equipment.

3.5 PIPE ERECTION AND LAYING

- A. Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be rejected and removed from the job immediately.
- B. All pipe, fittings, valves, equipment and accessories shall have factory applied identification sufficient to determine conformance with specified requirements.
- C. Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.
- D. During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item of system. Use plugs, caps, blind flanges or other items designed for this purpose.
- E. Run pipe straight and true, parallel to building lines with minimum use of offsets and couplings. Provide only offsets required for needed headroom or clearance and to provide needed flexibility in piping.

- F. Change direction of pipes only with fittings or pipe bends. Change size only with fittings. Do not use miter fittings, face or flush bushings, or street elbows. All fittings shall be long radius type, unless otherwise noted.
- G. Provide flanges or unions at all connections to equipment traps and valves to facilitate dismantling.
- H. Arrange piping and connections so equipment served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- I. Use full and double lengths of pipe wherever possible.
- J. Unless otherwise indicated, install all inlet and outlet piping, including shut-off valves and strainers, to coils, pumps and other equipment at line size with reduction in size made only at control valve, pump, or trap.
- K. Cut all pipe to exact measurement and install without springing or forcing.
- L. Avoid creating, even temporarily, undue loads, forces or strains on valves, equipment or building elements with piping connections or supports.
- M. Unless otherwise indicated, branch take-offs shall be from top of mains or headers at either a 45° or 90° angle from the horizontal plane for steam pipes, and from top, bottom or side for liquids.

3.6 BRANCH CONNECTIONS

- A. Make branch connections with standard tee or cross fittings of the type required for the service unless otherwise indicated.
- B. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
- C. Branch connections from mains may be cut into black steel pipe using forged weld-on fittings:
 - 1. Steam.
 - 2. Condensate.
- D. Use of forged weld-on fittings is further limited as follows:
 - 1. Must have at least same pressure rating as the main.
 - 2. Header or main must be 2-1/2" or over.
 - 3. Branch pipe is at least two sizes under main size.

3.7 JOINING OF PIPE

- A. Threaded Joints:
 - 1. Screw threads shall conform to ANSI B2.1 "Pipe Threads".
 - 2. Ream pipe ends and remove all burrs and chips formed in cutting and threading.
 - 3. Protect plated pipe and valve bodies from wrench marks.
 - 4. Apply high temperature, anti-seize thread lubricant to male threads.

B. Flanged Joints:

1. Steel flanges shall conform to ANSI B16.5 "Steel Pipe Flanges and Flanged Fittings". Cast iron flanges shall conform to ANSI B16.1 "Cast Iron Flanged and Flanged Fittings". Steel flanges shall be raised face except when bolted to flat face cast iron flange.
2. Bolting for services up to 399°F shall be ASTM A307, Grade B bolts and heavy hexagonal nuts. Bolting for services from 400°F to 790°F shall be ASTM A193, Grade B-7 with Grade 24 hexagonal nuts. Bolts and nuts shall conform to ANSI B18.2.1 "Square and Hex Bolts" or B18.2.2 "Square and Hex Nuts".
3. Set flange bolts beyond finger tightness with an indicating torque wrench to insure equal tension in all bolts. Tighten bolts so those directly opposite are torqued in sequence.
4. Gaskets for flat face flanges shall be full face type. Gaskets for raised faced flanges shall conform to requirements for "Group I Gaskets" in ANSI B16.5. Unless otherwise specified gaskets shall be 3/32" thick asbestos free type (Asbestofre or approved equal).
5. For services from 400°F to 790°F, gaskets shall be Flexitallic "Flexite Super Style CG".

C. Welded Joints:

1. Welding of all pipe joints, both as to procedures and qualification of welders, shall be in accordance with Section IX, ASME "Boiler & Pressure Vessel Code" unless local codes take precedence.
2. Furnish to the Owner's Representative prior to start of work certificates qualifying each welder.
3. The Owner's Representative reserves the right to require qualifying demonstration, at the Contractor's expense, of any welders assigned to the job.
4. Ends of pipe and fittings to be joined by butt welding shall be beveled, cleaned to bare metal and internal diameters aligned before tack welding.
5. Backing rings shall be used for all butt weld joints 3" size and over and for all sizes where operating pressure is over 200 psig and/or temperature is over 400°F. Backing rings shall be of the material being welded.

END OF SECTION