

Part 1 General**1.1 Related Sections**

- .1 N/A

1.2 References

- .1 ASTM A53 Standard Specification for Pipe, Steel, Black and hot dipped, zinc-coated, welded and Seamless
- .2 ASME B31.1 Power Piping Code.

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Manufacturer, model number, line contents, pressure and temperature rating.
 - .2 Movement handled, axial, lateral, angular and the amounts of each.
 - .3 Nominal size and dimensions including details of construction and assembly.
 - .2 Expansion joints to be installed in a registered piping system: listed with Canadian Registration Number (CRN).

1.2 PRODUCTS

- .1 The existing steam and condensate expansion joints being replaced are:
 - .1 Steam – Adscos RJ Ram Pak slip type packed expansion joint with dual piston and integral anchor base – 200 mm x 200 mm travel c/w Class 300 flange connections.
 - .2 Condensate – Adscos RJ Ram Pak slip type packed expansion joint with single piston – 100 mm travel c/w Class 300 flange connections.
 - .3 The new replacement expansion joints to have the same flange-to-flange dimensions.

1.3 Slip type expansion joints:

- .1 Application:
 - .1 for axial pipe movement,
 - .2 travel: 100 mm to 300 mm single unit, 200 mm to 600 mm for double units.
 - .3 size: NPS 14 for steam and NPS 6 for condensate.

- .4 Working pressure: 2070 kPa saturated steam.
- .5 factory tested to 1½ times maximum working pressure; furnish test certificate.
- .2 Construction:
 - .1 body and packing housings: Class 300 carbon steel pipe to ASTM A 53, Grade B,
 - .2 wall thickness to match service pipe with flanges or weld ends to match service pipe jointing specification.,
 - .3 adjustable packing gland or fixed packing gland arrangement with a packing injection assembly, arranged for repacking under full line pressure.,
 - .4 slip pipe of carbon steel pipe to ASTM A 53, Grade B, hard chrome plated,
 - .5 anchor base constructed of steel welded to body on double units,
 - .6 internal and external guides in packing housing with concentric alignment of slip pipe,
 - .7 extension limit stop of stainless steel, with accessible and removable pins,
 - .8 not less than six packing rings of teflon or graphite impregnated material,
 - .9 lubricating fittings with grease nipple, pet cocks, and lubricant gun with hose assembly or plunger body of heavy wall carbon steel and plunger of carbon steel with hex head for use with socket wrench.
 - .10 lubricant: to manufacturer's recommendations. .
 - .11 drip connection coupling with drain plug.
 - .12 threaded adjusting rods for field pre-setting.

1.4 CLOSEOUT SUBMITTALS

- .1 In accordance with section [01 78 00 – Close-out Submittal].

1.5 DELIVERY,

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Execution

2.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

2.2 INSTALLATION OF EXPANSION JOINTS

- .1 Expansion joints will be ordered with factory cold setting. Threaded adjustable rods will be used for field pre-setting depending at what interval of the shutdown the joint will be installed.
- .2 Contractor to calculate temperature of pipe after shutdown date and length is determined to field preset.
- .3 Existing steam and condensate expansion joints are being replaced. Existing joints are flanged connections.

**2.3 INSPECTION OF EXPANSION JOINT AND ANCHOR
INSTALLATION/REPAIR**

- .1 Engineer to inspect expansion joint and anchor installation/repairs prior to energizing system.

2.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 23 22 13 – Steam and Condensate Piping

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1, Power Piping.
- .2 ASTM International
 - .1 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A563-[07a], Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .4 Underwriter's Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario of Canada.
 - .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.
- .4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions
- .2 Delivery and Acceptance Requirements:

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
 - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
- .2 Performance Requirements:
 - .1 Design supports & hangers to withstand seismic events

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58.

2.3 Upper attachments

- .1 Surface mount on concrete:
 - .1 carbon steel plate with clevis and malleable iron socket and expansion case and bolt with minimum of two expansion cases and bolts for each hanger.
 - .2 Do not use explosive drive pins in any section of Work without obtaining prior approval.
- .2 Piping or equipment supported from existing concrete construction:
 - .1 drill and install threaded inserts.

2.4 Hanger rod

- .1 Carbon steel threaded rod;
 - .1 electro-galvanized finish in mechanical rooms and outdoors.

2.5 Horizontal pipe support - suspended

- .1 Hot or cold suspended piping, including conduits, where horizontal movement is 25 mm or less and hanger rod is longer than 300 mm.
 - .1 steel or cast iron piping:

- .1 adjustable clevis to MSS SP-58, type 1, ULC listed, sized for outside dimension of pipe and insulation.
 - .2 opening clevis, ULC listed, sized for outside dimension of pipe and insulation.
- .2 Suspended hot steel or copper piping having horizontal movement in excess of 25 mm or hot steel piping with hanger rod 300 mm or less:
 - .1 trapeze or yoke style pipe roller to MSS SP-58, type 43.

2.6 INSULATION PROTECTION SHIELDS

- .1 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.

3.3 HANGER SPACING**Table 1 : Hanger Spacing for Steel Piping**

Pipe Size mm	Rod Diameter	Maximum Spacing
13	10 mm	1.8 m
19 to 32	10 mm	2.1 m
38	10 mm	2.7 m
50	10 mm	3.0 m
63	13 mm	3.3 m
75	13 mm	3.3 m
100	16 mm	4.2 m
150	16 mm	5.1 m
200	22 mm	5.7 m
250	22 mm	6.7 m
300	22 mm	7.0 m
350	25 mm	7.5 m
400	25 mm	8.0 m
450	25 mm	8.4 m
500	30 mm	9.0 m
600	30 mm	9.6 m

3.4**3.4 HANGER INSTALLATION**

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 Related Sections

- .1 N/A

1.2 References

- .1 Material and method of application to comply with or be tested in accordance with following Standards;
 - .1 Thermal Insulation Association of Canada (TIAC) National Insulation Standard, excluding section 12
 - .2 NFPA 90-A Installation of Air-Conditioning and Ventilating Systems
 - .3 ASHRAE/IES 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
 - .4 NFPA 255 Test of Surface Burning Characteristics of Building Materials
 - .5 CAN/ULC-S102 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies
 - .6 ASTM C411 Standard Test Method for Hot Surface Performance of High Temperature Thermal Insulation
 - .7 ASTM C518 Standard Test Method for Steady State Thermal Transmission Properties by Means of Heat Flo Meter Apparatus
 - .8 ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
 - .9 ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
 - .10 ASTM C547 Standard Specification for Mineral Fiber Pipe Insulation
 - .11 ASTM C552 Standard Specification for Cellular Glass Thermal Insulation
 - .12 ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - .13 ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation
 - .14 ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
 - .15 ASTM C1126 (Gr.1) Standard Specification for Faced and Unfaced Rigid Cellular Phenolic Thermal Insulation
 - .16 CGSB 51-GP-52MA Vapour Barrier, Jacket and Facing Material for Pipe, Duct, and Equipment Thermal Insulation.
 - .17 CGSB 51.53-95 Poly(Vinyl Chloride) Jacket Sheeting, for Insulated Pipes Vessels and Round Ducts.

1.3 Scope

- .1 Insulate and finish piping, valves, fittings, and pipeline accessories.
 - .1 provide insulation, coatings, finishes, and mechanical protection.

1.4 Quality

- .1 Manufacturers and products are listed in this Section to establish quality and manufacturing standards. Products from other manufacturers with explicitly similar characteristics may be acceptable but must be submitted as an alternative product submission.

1.5 Material test criteria

- .1 Insulation, adhesives, coatings, finishes, sealers, and tapes:
 - .1 maximum flame spread rating of 25 to CAN/ULC-S102,
 - .2 maximum smoke developed rating of 50 to CAN/ULC-S102..
- .2 Exception: vapor barrier mastics installed outside of building.

1.6 Definitions

- .1 In this Section;
 - .1 **"Ambient"**: as applied to temperatures means outdoor design temperature.
 - .2 **"Concealed"**: as applied to mechanical services and equipment located in space above opaque suspended ceilings, and within trenches not in boiler rooms, pipe and/or duct shafts, and non-accessible chases and furred spaces.
 - .3 **"Exposed"**: as applied to remainder of mechanical services and equipment which are not "concealed" as defined above. For greater certainty, the following locations are Exposed:
 - (a) Services in tunnels,
 - (b) Services in space beneath raised floors.
 - (c) Trenches located in boiler rooms.
 - .4 **"Conditioned air"**: air supplied from air handling units which heats, cools, dehumidifies, or humidifies the air.
 - .5 **"Unconditioned space"**: rooms or spaces that are not supplied with conditioned air, including ceiling spaces which are not part of a ceiling return plenum system
 - .6 **"Outdoor"**: mechanical services and equipment located outside of the building envelope including services located beneath overhangs and soffits, and exposed to any outdoor condition including temperature, sun exposure, or precipitation.
 - .7 **"Mastic"**: heavy-consistency waterproof compound for outdoor applications used in conjunction with reinforcing fabric that remains adhesive and generally pliable with age, to provide either a breathable or vapour barrier finish to insulation.
 - .8 **"Coating"**: light-consistency compound for indoor applications used in conjunction with reinforcing fabric, to provide either a breathable or vapour barrier finish to insulation.
 - .9 **"Finish Jacket"**: final finish protective layer for insulation, including lagging fabric, PVC, metal, and adhesive films; that provides weather-protective finish depending on application.
 - .10 **"Service temperature"**: for purpose of piping temperature, is equal to the gas or vapour design operating temperature, or the liquid supply operating temperature.

2 PRODUCTS

2.1 Adhesives, Fasteners, and Tape

- .1 Contact bond cement:
 - .1 for quick setting for metal surfaces.
 - .2 Volatile Organic Content: maximum 80 g/L.

- .2 Adhesive for flexible closed cell foam insulation:
 - .1 Volatile Organic Content: maximum 80 g/L.
- .3 Lap seal adhesive:
 - .1 for joints and lap sealing of vapour barriers.
 - .2 Volatile Organic Content: maximum 250 g/L.
- .4 Fibrous insulation adhesive:
 - .1 Volatile Organic Content: maximum 250 g/L
- .5 Weld Pins, Studs and Clips:
- .6 Staples:
 - .1 Monel, flare type, minimum size 12 mm.
- .7 Tie Wire:
 - .1 1.6 mm (16 ga) stainless steel with twisted ends.
- .8 Caulking for sheetmetal jackets (outdoor use only)
 - .1 fast-drying, aluminum colour finish, flexible butyl elastomer based vapour barrier sealant.

2.2 Coatings and Membranes

- .1 Reinforcing Membrane:
 - .1 synthetic fibre:
 - (a) Leno weave,
 - (b) indoor and outdoor use.
- .2 Breather Coating - Indoors:
 - .1 for breather coatings and lagging adhesive,
 - .2 Volatile Organic Content: maximum 50 g/L
 - .3 white in colour,

2.3 Insulation Cement

- .1 Hydraulic-setting finishing type.

2.4 Field Applied Finishes

- .1 Fabric finish jacket:
 - .1 ULC listed plain weave cotton fabric at 220 g/m² (6 oz/sq yd), treated with fire retardant lagging adhesive, or
 - .2 re-wettable fiberglass lagging fabric with water activated self-adhesive.
 - .3 suitable for field painting.
- .2 Metal finish jacket:
 - .1 straight pipe, duct or plenum:
 - (a) stucco embossed aluminum not less than 0.45 mm thick sheet or,

- (b) corrugated stainless steel not less than 0.25 mm thick sheet.
- .2 fittings:
 - (a) Custom made swaged ring or lobster back covers on bends and die shaped fitting covers over fitting, valves, strainers, flanges, and grooved couplings.
- .3 bands:
 - (a) 12 mm wide stainless steel with mechanical fasteners.

2.5 Pipe Insulation

- .1 Type P-6 calcium silicate:
 - .1 to ASTM C533,
 - .2 pipe size application: up to and including NPS 16
 - .3 service temperature: to 649°C.
 - .4 density 232 kg/m³,
 - .5 molded or block type,
 - .6 asbestos-free,
 - .7 thermal performance: 0.058 W/m/C @ 149°C,
- .2 Type P-7 molded mineral wool fibre:
 - .1 to ASTM C547,
 - .2 pipe size application: up to and including NPS 30,
 - .3 service temperature: up to 650°C,
 - .4 rigid molded type,
 - .5 thermal performance: 0.04 W/m/C @ 50°C,
- .3 Type P-9 removable/reuseable high temperature insulated jackets:
 - .1 custom fabricated, removable insulation covers for hot surfaces,
 - .2 suitable for outdoor use,
 - .3 maximum touch-safe temperature protection : 95°C to UL2200.
 - .4 insulation: high density, fire resistant mineral or fibreglass insulation suitable for system operating temperature.
 - .5 cover: silicone impregnated fibreglass cover, for temperatures up to 260°C.
 - .6 internal liner: silicone impregnated fibreglass fabric, or stainless steel knitted wire mesh.
 - .7 single piece construction
 - .8 metal identification tag, referenced equipment served.
 - .9 tie-straps with D-rings, or Velcro™ closures.

3 EXECUTION

3.1 General Requirements

- .1 Apply insulation after pressure and leakage testing is completed and accepted.

- .2 Surfaces to be clean and dry before application of insulation.
- .3 Store and use adhesives, mastics, and insulation cements at ambient temperatures and conditions recommended by product manufacturers.
- .4 Do not apply insulation on chrome plated surfaces of piping, valves, fittings, and equipment.
- .5 Cut and bevel insulation around nameplates and pressure vessel stamps.
- .6 Neatly finish insulation at supports, protrusions, and interruptions.
- .7 Seal exposed insulation with reinforced vapor barrier or breather coating or mastic.
- .8 Finish piping with field installed finish jackets as specified herein.

3.2 Hot Piping Systems Insulation

- .1 Insulate hot piping systems including pipe, valves, fittings, and pipeline accessories.

3.3 Piping

- .1 Insulate straight pipe sections by staggering adjacent longitudinal seams 1/4 turn each butt joint.
- .2 Secure insulation at centre of each section, at each end, and at not more than 600 mm intervals with:
 - .1 mechanical fastened (stapled) or jackets with self adhering lap joints on type P1 and P2 insulation on Hot piping,
 - .2 bands or wire for type P4 to P8 insulation,

3.4 Fittings, Flanges and Strainers

- .1 Insulate flanges:
 - .1 Insulate with preformed inserts or build-up insulation with same material as on adjacent pipe:
 - (a) butt pipe insulation to each side of flange, coupling, valve, or strainer,
 - (b) build up rigid insulation blocking on each side of fitting, coupling, valve or strainer, with a width dimension same as pipe insulation thickness, and
 - (c) apply insulation layer over outside of flange, coupling, valve or strainer to a thickness equal to pipe insulation thickness.
 - (d) provide removable insulation section on strainer head.
 - .2 Where phenolic insulation is used;
 - (a) same as above except use factory made insulation inserts, or fabricate inserts to suit fixture.
 - .3 Where elastomeric insulation is used;
 - (a) same as above except adhere insulation to flange, coupling, or strainer with full coverage of °C adhesive,
 - (b) do not adhere insulation across bolted connections - insulate on each side of connection and add additional insulation layer across connection and fix in place with bands.

3.5 Pipeline Accessories

- .1 Insulate pipeline accessories:
 - .1 Expansion Joints
- .2 Insulate accessories for Hot Piping systems:
 - .1 with type P-9 removable fitted insulation covers,

3.6 Sealing Insulation

- .1 Apply coatings and mastic in accordance with manufacturer requirements.
 - .1 Hot piping: breather coating/mastic
- .2 Only use mastics on outdoor installations.
- .3 Apply mastics and coatings when ambient temperature is above 4°C, unless manufacturer's instructions permit colder ambient installation conditions.
- .4 Hot Piping;
 - .1 seal lap joints with self-adhesive lap joint, reinforced breather coat, or vapour barrier tape,
 - .2 seal butt joints with matching vapour barrier tape.

3.7 Insulation Finish Coverings

- .1 Install protective finish coverings on insulation to match existing.

END OF SECTION

Part 1 General

1.1 Related Sections

- .1 Section 23 22 13 – Steam and Condensate Piping

1.2 References

- .1 CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code
- .2 ASME Boiler and Pressure Vessel Code
- .3 ASME B18.2.1 Square and Hex Bolts and Screws, Inch Series
- .4 ASME B18.2.2 Square and Hex Nuts
- .5 ASTM A126 Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings
- .6 ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .7 ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
- .8 ASTM A276 Standard Specification for Stainless Steel Bars and Shapes
- .9 ASTM A278 Standard Specification for Gray Iron Castings for Pressure Containing Parts for Temperatures up to 350°C
- .10 ASTM A285 Standard Specification for Pressure Vessel Plates, Carbon Steel, Low- and Intermediate Tensile Strength.
- .11 ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .12 ASTM A351 Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure- Containing Parts
- .13 ASTM A516 Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.
- .14 ASTM A564 Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
- .15 ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings.

Part 2 PRODUCTS

2.1 General

- .1 Listings:
 - .1 fittings installed in a registered piping system: listed with Canadian Registration Number (CRN).
- .2 Materials:
 - .1 To CSA B51 with;
 - .1 cast iron to ASTM A278, Class 30 or ASTM A126 Class B.
 - .2 bronze to ASTM B62
 - .3 stainless steel: to ASTM A351, ASTM A167, ASTM A276 or ASTM A564.
- .3 Bolting requirements:
 - .1 to ASTM A307
 - .2 studs, bolts and nuts to ASME B18.2.1, ASME B18.2.2 and ASTM A194, "high strength" type.

2.2 Thermodynamic disc steam traps

- .1 Construction:
 - .1 design pressure: 1700 kPa and steam inlet pressure of 100 -1700 kPa,
 - .2 stainless steel body,
 - .3 hardened stainless steel disc,
 - .4 Integral strainer.

2.3 Strainers

- .1 Construction:
 - .1 "Y" pattern with bronze, cast iron or steel bodies,
 - .2 threaded or flanged to match pressure class and size limitations specified for valves in section of piping system where strainer is to be installed,
 - .3 stainless steel baskets with 0.8 mm diameter perforations.

Part 3 EXECUTION

3.1 Steam service

- .1 High pressure steam service will be supplied from plant, to building at pressure between 900 kPa and 1400 kPa.

3.2 High pressure drip assemblies:

- .1 Located in high pressure steam piping; at base of risers, before automatic control valves, before pressure reducing valves, at low points and at intervals of not more than 90 m in horizontal runs.
- .2 Sized for condensate rates as shown in table below.
- .3 Made up with;
 - .1 socket weld fittings and connections for trap line, dirt pocket, and blow down,
 - .2 thermodynamic traps for steam inlet pressure of 100 kPa - 1725 kPa,
- .4 Line size dirt pockets on lines up to NPS 4 and on larger main sizes, at least half of main diameter, but not less than NPS 4.
- .5 Dirt pockets 1½ main diameters long, but not less than 250 mm.
- .6 Blow-down connection, NPS 1 size with NPS 1 gate valve, nipple, and cap located at bottom of each drip assembly dirt pocket.
- .7 Trap line made up with gate valve, strainer, union, steam trap, union and gate valve.
- .8 Lift check valve in condensate discharge line at locations where drip assembly return is lifted above top of gravity return main.

3.3 Condensing rate for sizing steam main drip trap assemblies.

Steam main size (mm)	Condensate rate lb/hr/ft	Condensate rate kg/hr/min
300	1.03	1.53
400	1.19	1.71

3.4 Strainers

- .1 Installed in horizontal or downflow lines with clearance for removal of basket.
- .2 Threaded blind caps on strainers up to NPS 2 size.
- .3 Install so that screen is in horizontal position.
- .4 Valved blowout connection consisting of globe valve with nipple and cap on steam systems NPS 2½ and over

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 23 22 11 – Steam Specialities

1.2 REFERENCES

- .1 Materials:
 - .1 ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - .2 ASTM B43 Standard Specification for Seamless Red Brass Pipe, Standard Sizes
 - .3 ASTM A106 Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service
 - .4 ASTM A312 Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
 - .5 ANSI/ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings
 - .6 ANSI/ASME B16.3 Malleable Iron Threaded Fittings
 - .7 ANSI/ASME B16.5 Pipe Flanges and Flanged Fittings: NPS ½ through 24
 - .8 ANSI/ASME B16.9 Factory Made Wrought Buttwelding Fittings
 - .9 ANSI/ASME B16.11 Forged Fittings Socket Welding and Threaded
 - .10 ANSI/ASME B16.20 Metallic Gaskets for Pipe Flanges: Ring Joint Spiral Wound and Jacketed.
 - .11 ANSI/ASME B16.21 Nonmetallic Flat Gaskets for Pipe Flanges.
 - .12 ANSI/ASME B31.1 Power Piping
 - .13 ANSI/ASME B18.2.1 Square and Hex Bolts and Screws,
 - .14 ANSI/ASME B18.2.2 Square and Hex Nuts
- .2 Piping code:
 - .1 ANSI/ASME B31.1 Power Piping
- .3 Make application and pay costs for registration and inspection of pressure piping systems with the Technical Standards and Safety Authority in accordance with:
 - .1 CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code SPEC NOTE: Edit the following paragraphs for this specific project.

1.3 Pipe for steam and condensate service

- .1 Design pressures (all saturated steam)
 - .1 Operating Pressure: 1276 kPa
 - .2 Design pressure: 2068 kPa

- .2 Carbon steel:
 - .1 NPS ½ to 2:
 - .1 ASTM A106 Gr B, schedule 80 seamless

1.4 Pipe jointing

- .1 NPS 2 and smaller:
 - .1 black steel for high pressure drip lines;
 - .1 threaded malleable iron fittings, Class 300 to ANSI B16.3.
 - .2 Socket weld - steel socket welding type to ANSI B16.11, 2070 kPa forged, wall thickness to match pipe],
 - .3 2070 kPa black malleable iron, bronze face, ground joint unions.
- .2 Welding fittings:
 - .1 wall thickness and material specification to match pipe,
 - .2 butt weld type to ANSI B16.9 or socket weld type to ANSI B16.11.

Part 2 Execution

2.1 Piping installation

- .1 Install pipes close to building structure to as possible.
- .2 Run piping parallel to walls and conserve headroom and space.
- .3 Provide drain valves and air vents in pumped condensate lines.
- .4 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .5 Condensate piping:
 - .1 slope return mains down in the direction of flow 1:160 (19 mm in 3 m),
 - .2 install return branches with greater slope,
 - .3 concentric reducers at pipe size changes in vertical runs,
 - .4 eccentric reducers at pipe size changes in horizontal runs, arranged flat on top,
 - .5 eccentric reducers arranged flat on bottom at valve inlet and flat on top at valve outlet, in horizontal runs at valves where pipe connection size is greater than valve size.
- .6 Ream pipe after cutting to length and clean off scale and dirt both inside and outside before assembly.

- .7 Cap ends during construction to prevent entry of foreign matter.
- .8 Threaded pipe to be made up with;
 - .1 couplings,
 - .2 caps and plugs,
 - .3 90° and 45° elbows, and
 - .4 tee fittings
- .9 Welded pipe to be made up with;
 - .1 long radius elbows,
 - .2 tee fittings where branch connections are same size as main,
 - .3 tee fittings or welded outlet fittings where branch connections are smaller than main and where main is NPS 2 to NPS 5 size, and
 - .4 saddles where mains and branches are NPS 6 or over but of different sizes,
 - .5 branches may be welded directly into main provided main is more than NPS 4 and branch is at least 2 pipe sizes smaller than main.
 - .6 Where branch fitting is welded into main;
 - .1 cut opening in main true and beveled,
 - .2 hole saw or drill and ream main to maintain full inside diameter of branch line,
 - .3 opening to be sized to prevent branch pipe from projecting inside main, and
 - .4 to inhibit entry of welding metal and slag into pipes.

2.2 PERFORMANCE VERIFICATION (PV)

- .1 PV Procedures:
 - .1 Monitor operation of provisions for controlled pipe movement including expansion joints, guides and anchors.

END OF SECTION