Pipe Diameter mm	Thickness mm
10 to 25	1.6
32 and 38	2.0
50 to 75	2.8
100	3.2

.4 Copper (insulated); as per 2.4.6.3 with insulation shield.

.7 Type 7 - U-Bolt: Provide carbon steel U-bolts with configuration as follows:

.1 Steel pipe (uninsulated) - Grinnell Figure B-Line B3188 or Superstrut H-115.

.2 Steel pipe (insulated) - Grinnell Figure 137, B-Line B3188 or Superstrut H-115 with insulation shield.

.3 Cast and ductile iron pipe - Grinnell Figure 137, B-Line B3188 or Superstrut H-115.

.4 Copper pipe (uninsulated) - B-Line B3501 CT, Grinnell Figure 137C, Superstrut H-115 (with plastic coating) or Unistrut No. 13 (with plastic coating).

.5 Copper pipe (insulated) - Grinnell Figure 137 or B-Line B3188, Superstrut H-115 with insulation shield.

.6 Plastic pipe - Grinnell Figure 137C, B-Line B3188 or Superstrut H-115 (with plastic coating).

.8 Type 8 - Adjustable Pipe Roll Support: Provide cast iron rollers and sockets, and carbon steel cross rod and support rods with configuration and components as follows:

.1 Steel pipe (insulated) - B-Line B3122 or Grinnell Figure 177 with insulation shield.

.2 Steel pipe (uninsulated) - B-Line B3122 or Grinnell Figure 177.

.3 Copper pipe (insulated only) - B-Line B3122 or Grinnell Figure 177 with insulation shield.

.4 Plastic pipe - B-Line B3122 or Grinnell Figure 177.

.9 Type 9 - Welded Pipe Stanchion: Provide a carbon steel, standard schedule pipe stanchion, cut pipe to match contour of pipe elbow. Use only for ambient commodity systems.

.10 Type 10 - Pipe Stanchion saddle: Provide carbon steel saddles and yokes as follows:

.1 Steel pipe (insulated) - B-Line B3900 or Grinnell Figure 259 with insulation shield.

.2 Steel pipe (uninsulated) - B-Line 3090 or Grinnell Figure 259.

.3 Cast and ductile iron pipe - B-Line 3090 NS or Grinnell Figure 259.

.4 Copper pipe (uninsulated) - B-Line B3090 or Grinnell Figure 259 with insulation shield or lined with dielectric material.

.5 Copper pipe (insulated) - B-Line B3090 or Grinnell Figure 259 with insulation shield.

.6 Plastic pipe - B-Line B3090 or Grinnell Figure 259.

.11 Type 11 - Offset Pipe Clamp: Provide carbon steel pipe clamps with con-figuration and components as specified and to the most standard design manufactured by a pipe hanger component manufacturer:

.1 Steel pipe (insulated) - B-Line B3148 or Grinnell Figure 103 or with insulation shield.

.2 Steel pipe (uninsulated) - B-Line B3148 or Grinnell Figure 103

.3 Cast and ductile iron pipe - B-Line B3148 NS or Grinnell Figure 103.

.4 Copper pipe (insulated) - B-Line B3148 or Grinnell Figure 103 or with insulation shield.

.5 Copper pipe (uninsulated) - B-Line B3148 or Grinnell Figure 103 lined with dielectric material.

.6 Plastic pipe - B-Line B3148 or Grinnell Figure 103.

.12 Type 12 - Riser Clamp: Provide carbon steel riser clamps with configuration and components as follows:

.1 Steel pipe (insulated) - B-Line B3373 or Grinnell Figure 261, Superstrut C-720 or Unistrut No. 82.

.2 Steel pipe (uninsulated) - B-Line B3373 or Grinnell Figure 261, Superstrut C-720 or Unistrut No. 82.

.3 Cast and ductile iron pipe - B-Line B3373 or Grinnell Figure 261, Superstrut C-720 or Unistrut No. 82

.4 Copper pipe (insulated) - B-Line B3373 CT, Grinnell Figure 261, Superstrut C-720 or Unistrut No. 82.

.5 Copper pipe (uninsulated) - B-Line B3373 CT, Grinnell Figure CT-261, Superstrut C-720 or Unistrut No. 84.

.6 Plastic pipe - B-Line B3373, Grinnell Figure 261C, or Superstrut C-720 or Unistrut No. 82.

.13 Type 13 - Framing Channel Pipe Strap: Provide carbon steel pipe strap with configuration as follows:

.1 Steel pipe (uninsulated) - B-Line B2400 Series, Powerstrut PS3126, Superstrut C-708-U or Unistrut P2008 Series.

.2 Steel pipe (insulated) - B-Line B2400 Series, Powerstrut PS3126, Superstrut C-708-U or Unistrut P2008 Series with insulation shield.

.3 Copper pipe (uninsulated) - B-Line B2400 Series, Powerstrut PS3126, Superstrut C-708-U or Unistrut P2008 Series with insulation shield.

.4 Copper pipe (insulated) - B-Line B2400 Series, Powerstrut PS3126, Superstrut C-708-U or Unistrut P2008 Series with insulation shield.

.5 Plastic pipe - B-Line B2400 Series, Powerstrut PS3126, Superstrut C-708-U or Unistrut P2008 Series.

.14 Rack and Trapeze Supports:

.1 Unless otherwise specified, provide steel trapeze and pipe rack components having a minimum thickness of 2.8 mm with a maximum deflection 1/240 of the span. Framing channel as specified in 2.4.16.5.

.2 Type 20 - Trapeze Pipe Support: Trapeze pipe support cross members as specified in 2.4.16.5. Provide 41mm square carbon steel flat plate fittings of stranded design manufactured by framing channel manufacturer, B-Line B202-2, Powerstrut PS619 or Unistrut P1062 Series.

.3 Type 21 - Pipe Rack Support: Post and cross member framing channels, as specified in 2.4.16.5. Provide carbon steel pipe rack fittings of standard design manufactured by framing channel manufacturer. Provide gusset type, 90-degree fittings, B-Line B844, Grinnell PS3373 or Unistrut P2484. Post base fittings as specified in 2.4.15.14.

.15 Structural Attachments:

.1 Type A - Malleable Iron Concrete Insert: Provide malleable iron concrete inserts; B-Line B3014, Grinnell Figure 282 or Unistrut M2808.

.2 Type B - Side Beam Bracket: Provide malleable iron bracket; Grinnell Figure 202 or B-Line B3062.

.3 Type C - Malleable Beam Clamp With Extension Piece: Provide malleable iron clamp and extension pieces with steel tie rods; Grinnell Figure 218 with Figure 157 extension piece or B-Line B3054.

.4 Type D - Steel Beam Clamp With Eye Nut: Provide forged steel beam clamps and eye nuts; Grinnell Figure 292, B-Line B3291 series.

.5 Type E - Steel channel clamp: Provide malleable iron clamp and heel plates, and steel bolts and nuts; Grinnell Figure 226.

.6 Type F - Welded Beam Attachment: Provide carbon steel beam attachments; B-Line B3083 or Grinnell Figure 66.

.7 Type G - Adjustable Beam Attachment: Provide carbon steel beam attachments, B-Line B3082, Unistrut P1737 or Powerstrut PS2648.

.8 Type H - Double Channel Bracket: Provide single channel attachment as specified in 2.4.16.5. Provide a carbon steel double framing channel cantilever bracket assembly; B-Line B297-12 through B297-36, Powerstrut PS809 or Unistrut P2542 series.

.9 Type J - Single Channel Bracket: Provide single channel attachment as specified in 2.4.16.5. Provide a carbon steel single framing channel cantilever bracket assembly; B-Line B198-6 through B198-24, Powerstrut PS661 or Unistrut P2231 through P2234.

.10 Type K - Wall Mounted Channel: Provide 41 mm x 62 mm carbon steel framing channel; B-Line B12 or Unistrut P5500.

.11 Type L - Pipe Stanchion Attachment: Provide minimum 12 mm thick carbon steel baseplate. Anchor bolt holes: 1.6mm larger than bolt diameter. Provide non-shrink grout between the baseplate and upstand.

.12 Type M - Welded Steel Bracket: Provide carbon steel brackets which comply with MSS Type 32 and FEDSPEC Type 33 for medium welded bracket: Grinnell Figure 195. Heavy welded bracket to comply with MSS Type 33 and FEDSPEC Type 34; Grinnell Figure 199.

.13 Type N - Cast Iron Bracket: Provide cast iron brackets; Grinnell Figure 213.

.14 Type P - Framing Channel Post Base: Provide carbon steel post bases of stranded design manufactured by framing channel manufacture. Single channel: Unistrut P2072A, B-Line B280 Powerstrut PS3025. Double channel: Unistrut P2073A, B-Line B281 or Powerstrut PS3064.

.15 Type Q - Continuous Concrete Inserts: Provide 300 mm long carbon steel concrete inserts; Unistrut P3253.

.16 Accessories:

.1 Weldless Eye Nut: Provide forged steel eye nuts and comply with MSS and FEDSPEC Type 17; Grinnell Figure 290 or B-Line B3200.

.2 Welded Eye Rod: Provide carbon steel eye rods with eye welded closed. Inside diameter of eye to accommodate a bolt diameter 3.2 mm larger than the rod diameter; Grinnell Figure 278 or B-Line B3211.

.3 Turnbuckle: Provide forged steel turnbuckles; Grinnell Figure 230 or B-Line B3202.

.4 Framing Channels: Provide 41 mm x 62 mm roll formed carbon steel framed channel, having a thickness of 2.7 mm. Channel to have a continuous slot along one side with in-turned clamping ridges. Single Channel: Unistrut P5500. Double Channel: Unistrut P5501.

.5 Anchor bolts to Section 05500.

2.5 Hanger Rods

.1 Rod material shall conform to ASTM A307 as a minimum, and shall be cadmium plated in non-corrosive interior spaces, stainless steel in exterior, submerged or corrosive applications, threaded on both ends or continuous threaded and sized as specified.

.2 Hanger rod sizing, as a minimum shall be as follows:

Pipe Size Nominal (mm)	Hanger Rod Diameter (mm)
50	10
75	12
100	16
150	20
200	22
250	25
300	25
400	29
500	38
600	44

2.6 Base Elbows

.1 Where elbows change the run of a horizontal pipe to a vertical direction, supports shall be secured to the elbow.

.2 Dimensions for the supports shall be as follows:

Pipe Size Nominal (mm)	Support Pipe Diameter (mm)	Base Plate (mm x mm)
100	50 Schedule 40	100 x 6
150	75 Schedule 40	125 x 6
200	100 Schedule 40	150 x 6
250	100 Schedule 40	150 x 6
300	150 Schedule 40	200 x 10
350	200 Schedule 40	250 x 10
400	200 Schedule 40	250 x 10
500	250 Standard Weight	300 x 10
600	300 Standard Weight	350 x 10
750	350 Standard Weight	400 x 10
1050	350 Standard Weight	400 x 10

.3 Gauge piping: In general, support elbow stanchions for gauge stainless steel piping shall be of the same diameter as the pipe.

2.7 Thermal Pipe Hanger Shield

.1 Provide thermal shields at hanger, support and guide locations on pipe requiring insulation. The shield consists of an insulation layer encircling the entire circumference of the pipe and a steel jacket encircling the insulation layer. The thermal shield is the same thickness as the piping system insulation. Use standard shield for hot systems and vapour barrier shield for cold systems. Use stainless steel band clamps to ensure against slippage between the pipe wall and the thermal shield.

.2 Standard Shield:

.1 Insulation:

- Hydrous calcium silicate, high density, waterproof.
- Compressive strength: 700 kPa average.
- Flexural strength: 500 kPa average.
- R unit: 2.16 at 37.8°C mean.
- Temperature range: -7°C to 260°C.
- Steel Jacket: Galvanized steel, thickness as per manufacturer's standards, supplied for the given pipe size.

- Connection: Provide butt connection shield to pipe insulation. Steel jacket and insulation to be flush with end.

.2 Vapour Barrier Shield:

- Insulation:

  Hydrous calcium silicate, high density, waterproof.

  Compressive strength: 700 kPa average.

  Flexural strength: 500 kPa average.

  R. unit: 2.16 at 37.8°C mean.

  Temperature range: -7°C to 260°C.

- Steel Jacket: Galvanized steel, thickness as per manufacturer's standards, supplied for the given pipe size.

- Connection: Provide butt connection shield to pipe insulation. Insulation to extend 25 mm each side of steel jacket for vapourtight connection to pipe insulation vapour barrier.

3. EXECUTION

3.1 Hanger and Support Location

.1 Locate hangers and supports as near as possible to concentrated loads such as valve, flanges, etc. Locate hangers, supports and accessories within the maximum span lengths specified on drawings to support continuous pipeline runs unaffected by concentrated loads.

.2 Provide hangers and/or base supports within one metre of each change in direction on each leg, on one side of each valve, and on the first spool piece or fitting extending from a piece of equipment.

.3 Locate hangers and supports to ensure that connections to equipment, tanks, etc. are substantially free from loads transmitted by the piping.

.4 Ensure that where piping is connected to equipment, a valve, piping assembly etc. that will require removal for maintenance, the piping will be supported in such a manner that temporary supports will not be necessary for this procedure.

.5 Support piping so that no pockets will be formed in the span due to sagging of the pipe between supports caused by the weight of the pipe, medium in the pipe, insulation, valves and fittings.

.6 Install spring hangers where required to offset expansion in horizontal runs which follow long vertical risers.

3.2 Installation

.1 Welded and bolted attachments to the building structural steel to be in accordance with the requirements of Division 05. Unless otherwise specified, do not drill or burn holes in the building structural steel.

.2 Do not use hanger components for purposes other than for which they were designed. Do not use hanger components for rigging and erection purposes.

.3 Install items to be embedded before concrete is poured. Fasten embedded items securely to prevent movement when concrete is poured.

.4 Aluminum or galvanized steel clips shall be used to support piping from aluminum or steel structural members. Where metals of different type are to be connected, provide isolation to prevent galvanic corrosion.

.5 Use embedded anchor bolts instead of concrete inserts for support installation in areas below water surface or normally subjected to submerging.

.6 Install thermal pipe hanger shields on insulated piping at required locations during hanger and support installation. Butt joint connections to pipe insulation shall be made at the tie of insulation installation in accordance with the manufacturer's recommendation.

.7 All minor modifications to accommodate installed equipment and structural components are subject to review. Do not commence work on related piping until written acceptance has been received.

.8 Include any piping support modifications on the shop drawings submitted prior to fabrication or installation.

.9 Prior to installation, inspect and field measure to ensure that previous work is not prejudicial to the proper installation of piping.

.10 Hanger and support components in contact with plastic pipe shall be free of burrs and sharp edges.

.11 Rollers shall roll freely without binding.

.12 Finished floor beneath Type L structural attachments and framing channel post bases shall be roughed prior to grouting. Grout between base plate and floor shall be free of void of foreign material.

.13 Cut and drill baseplates to specified dimensions prior to welding stanchions or other attachments and prior to setting anchor bolts.

.14 Provide plastic or rubber end caps at the exposed ends of all framing channels that are located up to 2100 mm above the floor.

.15 Review the drawings prior to installation of ping, conduit, and fixtures by this or any other division. Identify any conflicts and confirm the routing of each section of pipe work prior to commencement of installation. Advise of any conflicts with existing services. Where necessary, amend the routing of pipework to avoid conflict and provide shop drawings showing proposed routing.

3.3 Adjustment

.1 Adjust hangers and supports to obtain required pipe slope and elevation. Use shims made of material that is compatible with the piping material. Adjust stanchions prior to grouting of baseplates.

END OF SECTION

PROCESS PIPING AND EQUIPMENT INSULATION

1. GENERAL

1.1 Scope

.1 Process piping and equipment insulation.

.2 Adhesives, tie wires, tapes.

.3 Recovering.

.4 Refer to Division 02 "Thermal Insulation for Underground Pipe", if buried insulated pipe is required.

1.2 Quality Assurance

.1 Install insulation employing skilled workmen regularly engaged in this type of work.

.2 Materials shall meet or exceed fire and smoke hazard ratings as stated in this section and defined in applicable building codes.

1.3 Submittals

.1 Submit shop drawings which indicate complete material data, "K" value temperature rating, density, finish, recovery jacket of materials proposed for this project and indicate thickness of material for individual services.

1.4 Job Conditions

.1 Deliver material to job site in original non-broken factory packaging, labelled with manufacturer's density and thickness.

.2 Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

2. PRODUCTS

2.1 General

.1 Insulation Materials, Recovery Jackets, Vapour Barrier Facings, Tapes and Adhesives: Composite fire and smoke hazard ratings shall not exceed 25 for flame spread and 50 for smoke developed rating when tested in accordance with CAN4-S102, NFPA 255 or ASTM E84.

.2 Provide insulating materials and accessories that withstand service temperatures without smoldering, glowing, smoking or flaming when tested in accordance with ASTM C441.

.3 All insulation materials shall meet current Building Code Standards, and packages or containers of such materials shall be appropriately labelled.

.4 Insulate fittings and valve bodies with preformed removable insulated fittings.

2.2 Materials

.1 Cold Piping Interior: Semi-rigid, pre-formed fibreglass or formed rigid mineral fibre pipe insulation, with factory applied paintable canvas vapour barrier jacket, factory moulded to conform with piping, "K" value: maximum 0.035 W/m°C at 24°C. Service temperature: -40°C to 150°C.

.2 Hot Piping Interior: Semi-rigid, pre-formed fibreglass or rigid mineral fibre pipe insulation, with factory applied paintable canvas general purpose jacket, factory moulded to conform to piping, "K" value: maximum 0.035 W/m°C at 24°C. Service temperature: up to 200°C.

.3 Cold Piping Exterior: Foamglass insulation with factory applied aluminum vapour barrier jacket, factory moulded to conform with piping. "K" value: maximum 0.035 W/m°C at 24°C. Service temperature: -40°C to 150°C.

.4 Hot Piping Exterior: Foamglass insulation with factory applied aluminum vapour barrier jacket, factory moulded to conform with piping. "K" value: maximum 0.035 W/m°C at 24°C. Service temperature: -40°C to 150°C.

.5 Buried Piping: Refer to Section 02513, if applicable.

.6 Recovery Jackets: 0.9 mm smooth aluminum sheet or paintable canvas for all new insulated piping.

.7 Cold and hot water piping up to 115°C: As an alternate to formed fibreglass pipe insulation, rigid phenolic closed cell foam insulation equal to Kingspan Koolphen K CFC-free rigid phenolic insulation may be used. Product shall meet ASTM-E-84 and ASTM-C-585-90 and ULC burn and smoke spread rating for non-combustible installations (ULC-S102, S127).

2.3 Above Ground Piping

.1 Provide insulation for all pipe and equipment with an operating surface temperature in excess of 50°C. Use a minimum thickness of 25 mm. Use greater thicknesses as required to lower the outer skin temperature to below 40°C.

.2 Provide insulation for all piping where heat retention is required, at the locations indicated on the drawings and for other piping systems where insulation is indicated on the process mechanical drawings.

.3 Provide insulation at pipe hangers and supports with factory applied vapour jacket and a self sealing lap, manufactured specifically for use at support locations. It shall be a minimum of 200 mm long and of the same thickness as adjacent pipe insulation.

.4 Provide a suitable bonding agent to joint the preformed sections.

.5 On exterior piping, provide aluminum jacketing with a minimum thickness of 0.9 mm, unless indicated otherwise.

.6 Provide aluminum banding, 12 mm wide by a minimum of 0.5 mm thick with matching seals.

.7 Provide polypropylene jacketing at elbows, tees or other changes of direction and where indicated. Use the heat-shrink type jacketing, with a minimal thickness of 0.1 mm.

.8 On interior piping, provide paintable canvas jacketing, ULC listed, 0.27 kg/m^2 minimum.

3. EXECUTION

3.1 Preparation

.1 Do not install insulation and recovering before piping and equipment has been tested and approved.

.2 Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application. Finish with systems at operating conditions.

3.2 Installation

.1 Ensure insulation is continuous through inside walls and floor penetrations. Pack around pipes with fire proof self-supporting insulation material, properly sealed.

.2 Insulate piping and fittings as noted in the schedule below. Insulate valves unless otherwise noted. Do not insulate unions, flanges (except on flanged valves if valve must be insulated), "victaulic" couplings, strainers, (except on chilled water lines), flexible connections and expansion joints. Terminate insulation neatly with plastic material trowelled on a bevel.

.3 Provide insulation on all process air pipes located in the building and tunnel areas. Use 50 mm thick fibreglass insulation over the entire length of the pipe run except over couplings, valves and meters. Provide stainless steel bands over the insulation at a maximum of 300 mm centres.

.4 Unless indicated otherwise, do not insulate water body valves.

.5 Terminate insulation 100 mm on each side of all flanges and grooved joint couplings.

.6 Finish insulation neatly on hangers, supports and other protrusions.

.7 Locate insulation or cover seams in least visible locations. Locate seams on piping in ceiling spaces on the underside of the pipe.

.8 Cover all insulated piping throughout with aluminum or paintable canvas recovery jacket secured with aluminum bands on 200 mm centres or screws on 150 mm centres, unless otherwise noted. Lap joints 75 mm minimum. Align longitudinal seams in aluminum recovering to shed water. All bands and screws are to be accessible for service and removal.

.9 Cold Piping: Seal lap joints with 100% coverage of vapour barrier adhesive. Seal butt joints with 50 mm wide strips of vapour barrier sealed with vapour barrier adhesive. For fittings and valves, apply hydraulic insulating cement; or apply factory fabricated insulation half shells, seal all laps and joints.

.10 Flare out staples may be used to secure jacket laps on hot systems. Staples are to be applied on 100 mm centres.

.11 Hot Piping: For fittings and valves, apply hydraulic insulating cement; or apply factory fabricated insulation half shells.

3.3 Process Pipe Insulation Installation Thickness Schedule

	Piping or Equipment	Pipe Sizes mm	Insulation Thickness (fibreglass) mm	Insulation Thickness (closed cell phenolic) mm	Recovery Jacket
1.	Insulated Process Piping, as shown on drawings	15 to 50 Over 50	25 50	25 25	As noted in 2.2

END OF SECTION

MECHANICAL IDENTIFICATION

1. GENERAL

1.1 References

.1 CAN/CGSB-24.3, Identification of Piping Systems.

.2 ANSI A13.1.

.3 GNWT Design Standards and Guidelines Standard Colour and Identification Chart #15190.101.

1.2 Samples

.1 Submit samples in accordance with Section 01300 – Submittals.

.2 Submit samples and lists of proposed wording for approval before engraving.

2. PRODUCTS

2.1 Manufacturers' Nameplates

.1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters.

.2 Indicate size, capacity rating, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 System Nameplates

.1 Colour:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where noted in these Specifications and as required otherwise by applicable codes).

.2 Use self-sticking vinyl tape pipe markers.

.3 Use self-sticking vinyl tape direction arrow markers for indicating flow direction.

2.3 Piping

.1 General:

.1 To CAN/CGSB-24.3.

.2 Do not paint PVC piping, use bands to identify pipe commodities and show flow direction.

.3 Identify medium by lettered legend, classification by primary colours only, direction of flow by arrows.

.2 Sizes:

.1 Legend: block capitals to following table:

Outside Diameter of Pipe (mm)	Size of Letters (mm)	Length of Colour Field (mm)
12	6	150
20	12	200
30	12	200
50	20	200
150	30	300
250	60	600
Over 250	75	800

.3 Arrows:

.1 Outside diameter of pipe 75 mm and greater: 150 mm long x 50 mm high.

.2 Outside diameter of pipe 32 mm to 75 mm: 100 mm long x 50 mm high.

.3 Outside diameter of pipe 25 mm and smaller: 50 mm long x 12 mm high.

.4 Use double headed arrows where flow is reversible.

.4 Material:

.1 Legend markers, arrows and colour bands: pressure sensitive self-sticking vinyl tape with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150 C and intermittent temperature of 200 C. Apply to dry, clean prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping 1 pipe diameter.

.2 Valve tags, harsh environment equipment tags (H.E.E.T.), 50 mm x 50 mm size, format H6.

.3 Acceptable material supplier: W.H. Brady Inc.

2.4 Valves and Controllers

.1 Plastic tags with 12 mm stamped code lettering and numbers filled with black paint.

.2 Furnish Engineer with two (2) typical identification flow markers and tags of specified size for each system complete with lettering for approval before ordering all tags and markers. Include valve tag schedule, designating station site acronym, valve number, service and function of each tagged item and normal operating position of valves.

.3 Add identification plates behind fill valves in kiosks as shown on Drawings. Size: 200 mm x 150 mm, letter size 10 mm.

2.5 Controls Identification

.1 Identify all systems, equipment, components, controls and sensors.

.2 Inscription to identify station site number, function and (where applicable) fail-safe position.

3. EXECUTION

3.1 General

.1 Do identification work in accordance with CAN/CGSB-24.3, except where specified otherwise.

.2 Provide ULC and CSA registration plates, as required by respective agency.

3.2 Location of Nameplates

.1 In conspicuous location to facilitate easy reading from operating floor and to properly identify equipment and system.

.2 Provide stand-offs for nameplates on hot surfaces.

3.3 Piping

.1 Locations:

.1 On straight runs in open areas in equipment rooms, so that at least one is clearly visible from any one viewpoint in operating areas or walking aisles and not at more than 3 m intervals.

.2 Adjacent to all changes in direction.

.3 At least once in each room through which piping passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of any separation such as walls, floors and partitions.

.6 Where piping is concealed in pipe chase, ceiling space, gallery or other confined space, at entry and leaving points and adjacent to each access opening.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves. Where this is not possible, place identification as close to valve as possible, preferably on upstream side.

.9 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.

.10 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of colour or legends caused by dust and dirt and risk of physical damage.

3.4 Valves and Controllers

.1 Secure tags with plastic or nylon straps for valves and operating controllers.

.2 Number valves in system in accordance with P&ID's.

END OF SECTION

SUPPORTS, ANCHORS AND SEALS

1. GENERAL

1.1 Scope

.1 Pipe hangers and supports.

.2 Duct hangers and supports.

.3 Flashing for mechanical equipment.

.4 Sleeving for mechanical equipment.

.5 Pipe anchors.

1.2 Reference Standards

.1 Pipe supports shall meet the requirements of current edition of ANSI B31.1, Power piping.

.2 Duct hangers shall follow the recommendations of the current edition of the SMACNA Duct Manuals.

1.3 Submittals

.1 Submit shop drawings of each factory-manufactured component.

1.4 General Requirements

.1 Provide hangers and supports to secure equipment in place, prevent vibration, maintain grade; provide for expansion and contraction and to accommodate insulation; provide insulation protection saddles.

.2 Install supports of strength and rigidity to suit loading without unduly stressing building. Locate adjacent to equipment to prevent undue stresses in piping and equipment.

.3 Select hangers and supports for the service and in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.

.4 Fasten hangers and supports to building steel or "Z" roof purlin in pre-fabrication building or inserts in concrete construction.

.5 Provide and set sleeves required for equipment, including openings required for placing equipment. Provide sleeves for all pipe and duct penetrations through walls, ceilings, floors and footings.

.6 Dielectrically isolate dissimilar metals.

.7 Obtain approval from the Engineer prior to drilling for inserts and supports for piping systems.

.8 Obtain approval from the Engineer prior to using percussion type fastenings.

.9 Use of piping or equipment for hanger supports is not permitted.

.10 Use of perforated band iron, wire or chain as hangers is not permitted.

.11 Do not weld piping, ductwork or equipment supports to building metal decking or building structural steel supports unless prior written approval has been obtained from the Engineer and Structural Engineer.

2. PRODUCTS

2.1 Inserts

.1 Inserts shall be malleable iron case or galvanised steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.

.2 Size inserts to suit threaded hanger rods.

2.2 Pipe Hangers and Supports

.1 Hangers: Pipe sizes 15 mm to 40 mm: Adjustable wrought steel ring.

.2 Hangers: Pipe sizes 50 mm to 100 mm and Cold Pipe Sizes 150 mm and Over: Adjustable wrought steel clevis.

.3 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

.4 Vertical Support: Steel riser clamp.

.5 Floor Support: Pipe Sizes to 100 mm and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.

.6 Install hangers so they cannot become disengaged by movements of supported pipe.

.7 Provide copper plated hangers and supports for copper piping or provide sheet lead packing between hanger or support and piping.

2.3 Hanger Rods

.1 Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

2.4 Duct Hangers and Supports

.1 Conform to current edition of SMACNA handbooks.

2.5 Flashing

.1 Steel Flashing: 0.55 mm galvanised steel.

.2 Lead Flashing: 25 kg/m² sheet lead for waterproofing, 5 kg/m² sheet lead for soundproofing.

.3 Safes: 25 kg/m² sheet lead or 0.5 mm neoprene.

.4 Caps: Steel, 0.7 mm thickness minimum, 1.6 mm thickness at fire resistance structures.

2.6 Sleeves

.1 Pipes through Floors: Form with 1.2 mm galvanised steel.

.2 Pipes through Beams, Walls, Fire Proofing, Footings, Potentially Wet Floor: Form with steel pipe or 1.2 mm thickness galvanised steel.

.3 Ducts: Form sleeves with galvanised steel.

.4 Size large enough to allow for expansion with continuous insulation.

2.7 Pipe Seals

.1 Provide "Link-seal" pipe sealing system where passing through room foundation walls.

2.8 Finishes on Hanger Rods, Hangers and Supports

.1 All steel hanger rods, hangers and supports shall be galvanised or factory primed with alkyd red oxide primer to CGSB 1-GP-40m.

3. EXECUTION

3.1 Inserts

.1 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying piping over 100 mm or ducts over 1500 mm wide.

.3 Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

.4 Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

3.2 Pipe Hangers and Supports

.1 Support horizontal steel and copper piping as follows:

Nominal Pipe Size	Distance Between Supports		Hanger Rod Diameter
	Steel	Copper	
15 mm	1.8 m	1.5 m	10 mm
20 mm to 40 mm	2.1 m	1.8 m	10 mm
50 mm & 65 mm	3.0 m	2.4 m	10 mm
80 mm & 100 mm	3.6 m	3.0 m	16 mm

.2 Install hangers to provide minimum 12 mm clear space between finished covering and adjacent work.

.3 Place a hanger within 300 mm of each horizontal elbow.

.4 Use hangers which are vertically adjustable 40 mm minimum after piping is erected.

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

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

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

.8 Use oversized hangers to accommodate pipe insulation thickness. For pipes up to 50 mm use high-density rigid pipe insulation at hanger location, with an insulation protection shield. For pipes 65 mm and over, use insulation protection saddle.

3.3 Duct Hangers and Supports

.1 Hanger Minimum Sizes:

.1 Up to 750 mm wide: 25 x 1.6 mm at 3 m spacing.

.2 Vertical Duct on Wall Supports Minimum Sizes at 3.65 m spacing:

.1 Up to 610 mm wide: 40 x 1.6 mm.

.2 640 to 900 mm wide: 25 x 25 x 3 mm.

.3 Vertical Duct Floor Supports Minimum Sizes, riveted or screwed to ducts:

.1 Up to 1520 mm wide: 40 x 40 x 3 mm

3.4 Equipment Supports

.1 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

.2 Rigidly anchor ducts and pipes immediately after vibration connections to equipment.

3.5 Flashing

.1 Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

.2 For pipes through outside walls turn flange back into wall and caulk.

3.6 Sleeves

.1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeve.

.2 Extend sleeves through potentially wet floors 25 mm above finished floor level. Caulk sleeves full depth and provide floor plate.

.3 Piping and duct work passing through floor, ceiling or wall, close off space between duct and sleeve and non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

.4 Piping passing through mechanical room floor, roof or wall, close off space between pipe and sleeve with synthetic rubber compound mechanical type seals.

.5 Sleeves provided through walls or floors where liquids could potentially pass from one side to the other, provide sleeves with a 25 mm "flange" welded to the external face of the sleeve at the mid point of the thickness of the structure to provide a water stop.

.6 Install chrome-plated escutcheons where piping passes through finished surfaces.

END OF SECTION