

Part 1 General**1.1 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-13, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-10, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-07(R2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-2013, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-08(R2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-01, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2005).
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings

- .4 CAN/ULC-S702.2-10, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 00 10 – General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 10 – General Instructions. Include product characteristics, performance criteria, and limitations.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this Section, and have successful experience in this size and type of project, member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 00 10 – General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 00 10 – General Instructions.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.

- .3 Divert unused metal materials from landfill to metal recycling facility.
- .4 Dispose of unused adhesive material at official hazardous material collections.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at mean temperature when tested in accordance with ASTM C335.
- .3 Type A: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547, type I.
 - .2 Jacket: to CGSB 51-GP-52Ma,
 - .3 Maximum "k" factor: to CAN/ULC-S702, 0.035 W/m.°C at 24°C.
- .4 Type B: flexible unicellular tubular elastomer.
 - .1 Insulation: with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: 0.039 W/m.°C at 32°C.
 - .4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
- .5 Type C: Glass fiber blankets bounded together with factory applied aluminium reinforced vapor retarder, 12 kg/m³ density.
 - .1 Maximum "k" factor: 0.042 W/m.°C at 24°C.
- .6 Type F: high temperature, abuse-resistant pipe insulation with structural strength, composed of hydrous calcium silicate for use on systems operating up to 650°C.
 - .1 Maximum "k" factor: 0.065 W/m.°C at 150°C

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19mm wide, 0.5 mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement to be used on connections, flanges, valves and accessories:
 - .1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Minimum service temperatures: -20 degrees C.
 - .3 Maximum service temperature: 65 degrees C.
 - .4 Moisture vapour transmission: 0.02 perm.
 - .5 Thickness: 20 mm.
 - .6 Fastenings:
 - .1 In accordance with manufacturer's instructions
- .2 Aluminum:
 - .1 To ASTM B209, for exterior installations.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: corrugated.
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

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 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified prior to commencement of insulation work.

- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided. All piping support on cold piping shall be installed outside of the insulation. For this application, use foam glass rigid material at each support.
- .6 Cold Application (40 to 60°F)
 - .1 Piping:
 - .1 Apply pipe insulation with integral vapour retarder jacket to piping and hold in place by securing the jacket flap. Seal all flaps and butt strips with vapor retarder adhesive or alternately secure with staples on 3" centres and cover with a heavy brush coat of retarder coating. Pipe insulation with integral self-sealing vapour retarder jacket will not require additional fastening.
 - .2 Fittings:
 - .1 Insulate fittings with section of the pipe insulation mitred to fit tightly, or with tightly placed flexible insulation, then apply reinforcing membrane embedded in vapour retarder coating. Alternately insulate fittings with tightly placed flexible insulation then apply reinforcing membrane embedded in vapour retarder coating and apply PVC fitting covers.
 - .3 Valves, Strainers:
 - .1 Insulate valve bodies, bonnets and strainers with insulating cement; or fitted pipe insulation; or mitred blocks all to thickness of adjacent pipe insulation, then apply reinforcing membrane embedded in retarder coating. Alternately, insulate with tightly placed flexible insulation covered with reinforcing membrane covered with a retarder coating. Drains, blow-off plugs and caps shall be left uncovered. Alternately insulate with tightly placed flexible insulation, then apply reinforcing membrane embedded in vapour retarder coating and apply PVC fitting covers.
 - .4 Flanges:
 - .1 Insulated flanges with oversized pipe insulation or mitred blocks to the thickness of the adjacent pipe insulation, then apply reinforcing membrane embedded in vapour retarder coating. Alternately insulate with tightly placed flexible insulation, then apply reinforcing membrane embedded in vapour retarder coating and apply PVC fitting cover.

.5 Alternative Application:

- .1 For certain areas where insulation application as described above is impractical, flexible foamed elastomeric or closed cell insulation may be used in accordance with the manufacturer's directions.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.
- .2 Design: to permit movement of expansion joint, periodic removal and replacement without damage to adjacent insulation.
- .3 Insulation:
- .1 Insulation, fastenings and finishes: same as system.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.
- .2 Provide vapor retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings on cold systems (domestic water, chilled water and glycol).
- .2 Where type A or B is specified, thicknesses are given for type A. If type B is used, thickness shall be reduced by 13 mm from the specified thickness.
- .3 Pipe dimensions are "Nominal Pipe Sizes" (NPS).
- .4 Thickness of insulation as listed in following table.
- .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
- .2 On domestic water booster pumps: Type B, 10mm thick.
- .3 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Applications	Insulation type	Pipe Sizes NPS and insulation thickness mm.				
		Run Out	Up to 1	1 1/4 to 2	2 1/2 to 4	6 and over
A/C Condensate Drain	B	10	10	10	10	10
Chilled Glycol Cooling	A	25	25	25	38	38
Condenser Glycol	A	25	25	25	38	38

.5 Finishes:

- .1 Exposed indoors: PVC jacket.
- .2 Exposed in mechanical rooms: PVC jacket.
- .3 Concealed, indoors: canvas on valves, fittings. No further finish.

- .4 Outdoors: water-proof aluminum jacket.
- .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

END OF SECTION