

1. PART 1 – GENERAL

1.1 References

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-1989.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-95, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - .2 ASTM C335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-82 (1992), Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C 449M-88, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C795-92, Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .6 ASTM C921-89, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.2-95, Calcium silicate thermal insulation for piping, machinery and boilers.
 - .2 CAN/CGSB-51.9-92, Mineral Fibre Thermal Insulation for Piping and Round Ducting.
 - .3 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket.
 - .4 CAN/CGSB-51.12-95, Thermal Insulating and Finishing Cement.
 - .5 CAN/CGSB-51.40-95, Flexible elastomeric, unicellular thermal insulation, sheet and pipe covering.
 - .6 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .7 CGSB 51-GP-53M-95, Jacketing, Polyvinyl Chloride Sheet, for Insulating Pipes, Vessels and Round Ducts.
- .4 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.

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 Codes:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.3 Shop Drawings

- .1 Submit shop drawings in accordance with Section 230500E – Common Work Results for Mechanical.
- .2 Submit for approval all manufacturers' documentation regarding installation, forming and jointing of pipes, fittings, and valves.

1.4 Qualifications

- .1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of this project, qualified to standards of TIAC.

1.5 Delivery, storage and handling

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather, and from personnel, material, and vehicular traffic.
- .3 Protect against damage.
- .4 Store at temperatures and conditions required by manufacturer.

1.6 Waste Management and Disposal

- .1 Sort and recycle waste according to provincial and municipal requirements and standards.
- .2 Place all packaging in designated containers.
- .3 Place excess or unused insulation and insulation accessory materials in designated containers.

2. **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 75°F mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/CGSB-51.9.
 - .2 Maximum "k" factor: to CAN/CGSB-51.9.
 - .3 Acceptable product: Fiberglas SSL-II or equivalent.
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/CGSB-51.9.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/CGSB-51.9.
 - .4 Acceptable product: Fiberglas SSL-II or equivalent
- .5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in Part 3 of this section).
 - .1 Mineral fibre: to CAN/CGSB-51.11.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/CGSB-51.11.

- .6 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Insulation: to CAN/CGSB-51.40.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/CGSB-51.40.
 - .4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
 - .5 Acceptable product: Armaflex AP or equivalent.
- .7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
 - .1 Insulation: to CAN/CGSB-51.2.
 - .2 Maximum "k" factor: to CAN/CGSB-51.2.
 - .3 Design to permit periodic removal and re-installation.

2.3 Insulation securement

- .1 Tape: self-adhesive, aluminum, reinforced, 2" wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 0.06" diameter stainless steel.
- .5 Bands: stainless steel, 0.02" wide, 3/4" thick.

2.4 Cement

- .1 Thermal insulating and finishing cement:
 - .1 To CAN/CGSB-51.12.
 - .2 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 and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: white.
 - .3 Minimum service temperatures: -5°F.
 - .4 Maximum service temperature: 150°F.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness: 0.04".
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .8 Special requirements:
 - .1 Install on all exposed piping, as indicated on drawings.
 - .2 Outdoor: UV rated material at least 0.5 mm thick.

- .2 Canvas:
 - .1 0.05 lb/ft cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.
- .3 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 0.50 mm (0.05") sheet.
 - .3 Finish: smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 2" laps.
 - .5 Fittings: 0.02" thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 3/4" wide, 0.02" thick at 12" spacing.
- .4 Stainless steel:
 - .1 Type: 304.
 - .2 Thickness: 0.01".
 - .3 Finish: smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 2" laps.
 - .5 Fittings: 0.02" thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 3/4" wide, 0.02" thick at 12" spacing.

3. PART 3 – EXECUTION

3.1 Pre-installation requirement

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.2 Installation

- .1 Install in accordance with appropriate TIAC National Standards.
- .2 Apply materials in accordance with manufacturers' instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 3".
- .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.

3.3 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 and to permit periodic removal and replacement without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as adjacent insulation system.
 - .2 Jacket: aluminum in mechanical rooms, canvas or PVC, above hanging ceilings.

3.4 Installation of elastomeric insulation

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 Piping insulation schedules

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
 - .1 Securements: wire at 12" on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3.
 - .1 Securements: aluminum bands.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .4 TIAC Code: A-6.
 - .1 Seals: lap seal adhesive for elastomer.
 - .2 Installation: to applicable TIAC Code.
- .5 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Insulation securements: aluminum bands.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .6 TIAC Code: A-2.
 - .1 Seals: lap seal adhesive, lagging adhesive.
 - .2 Installation: TIAC Code: 1501-H.
- .7 Piping insulation
 - .1 Scope of work
 - .1 Domestic CWS and cooling coil drainage piping full length: insulation to TIAC-A3, 13 mm thick for NPS-1 ¼" and less; 25 mm for NPS-1 ½" and more.
 - .2 Chilled water piping full length : insulation TIAC-A6, 13mm thick.
 - .2 Finishes
 - .1 Finish all exposed insulation with certified finishing coating and according to section 3.3 for this usage. Joints on cold piping must be completely sealed.
 - .2 Acceptable product: Proto PVC by Proto Corp. or equivalent with canvas lining coated with two (2) fire retardant coatings, gauge 26 aluminium.