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**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE Standard 90.1 (Latest Edition), 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 B 209M (Latest Edition), Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
  - .2 ASTM C 335 (Latest Edition), Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .3 ASTM C 411 (Latest Edition), Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C 449/C 449M (Latest Edition), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C 533 (Latest Edition), Calcium Silicate Block and Pipe Thermal Insulation.
  - .6 ASTM C 547 (Latest Edition), Mineral Fiber Pipe Insulation.
  - .7 ASTM C 795 (Latest Edition), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
  - .8 ASTM C 921 (Latest Edition), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .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).
- .6 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102 (Latest Edition), Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701 (Latest Edition), Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .3 CAN/ULC-S702 (Latest Edition), Thermal Insulation, Mineral Fibre, for Buildings

- .4 CAN/ULC-S702.2 (Latest Edition), 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 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available one (1) copy of systems supplier's installation instructions.

## 1.4 QUALITY ASSURANCE

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section and have at least three (3) years successful experience in this size and type of project, qualified to standards of TIAC.
- .3 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## 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 61 00 - Common Product Requirements.
  - .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.

## **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 24°C mean temperature when tested in accordance with ASTM C 335.
- .3 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
  - .1 Mineral fibre: to CAN/ULC-S702 or ASTM C 547.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to CAN/ULC-S702 or ASTM C 547.
- .4 TIAC Code A-6: Flexible unicellular tubular elastomer.
  - .1 Insulation: with vapour retarder jacket to ASTM C534.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: 0.039 W/m – degree C.
  - .4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodents.
  - .5 Flame spread index less than 25, and smoke developed index less than 50.

### **2.3 INSULATION SECUREMENT**

- .1 Tape: self-adhesive, aluminum, plain reinforced, 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, 19 mm wide, 0.5 mm thick.

## 2.4 CEMENT

- .1 Thermal insulating and finishing cement:
  - .1 Air drying on mineral wool, to ASTM C 449/C 449M.

## 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 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m<sup>2</sup>.

## 2.8 JACKETS

- .1 Polyvinyl Chloride (PVC):
  - .1 One-piece moulded type with pre-formed shapes as required.
  - .2 Colours: by Departmental Representative.
  - .3 Minimum service temperatures: -20°C.
  - .4 Maximum service temperature: 65°C.
  - .5 Moisture vapour transmission: 0.02 perm.
  - .6 Thickness: 0.5 mm.
  - .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.
- .2 Stainless steel:
  - .1 Type: 304 or type 316
  - .2 Thickness: 0.25 mm
  - .3 Finish: Smooth
  - .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.

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**2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS**

- .1 Caulking to: Section 07 92 00 – Joint Sealing.

**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**

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

**3.4 PIPING INSULATION SCHEDULES**

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-3.
  - .1 Securements: Tape at 300 mm on centre.
  - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
  - .3 Installation: TIAC Code: 1501-C.
- .3 TIAC Code: A-6
  - .1 Insulation securements: as per manufacturer's recommendation
  - .2 Seals: lap seal adhesive, lagging adhesive
  - .3 Installation: TIAC Code: 1501-C

- .4 Thickness of insulation as listed in following table.
- .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
  - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp (°C)	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)				
			up to 1	1¼ to 2	2½ to 4	5 to 6	8 & up
Hot Water Heating	60 - 94	A-3	25	38	38	38	38
Domestic HWS		A-3	25	25	25	38	38
Domestic CWS		A-3	25	25	25	25	25
Refrigerant hot gas, liquid, suction	4-13	A-6	25	25	25	25	25

- .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 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
  - .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.
  - .6 Outdoors: Waterproof 35 jacket

### 3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**