

1. **General Information**

1.1 **Section Contents**

- .1 Insulation of piping and related accessories associated with commercial installations.

1.2 **References**

- .1 Unless otherwise indicated, complete all work in accordance with the current edition of the "*Code de Construction du Québec*"
- .2 In addition, perform the work in accordance with any other code or other standard having jurisdiction, according to the edition in force, including but not limited to:
 - .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Standard 90.1, 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 A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - .2 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - .3 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .4 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .5 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .6 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.
 - .7 ASTM C547, Mineral Fiber Pipe Insulation.
 - .8 ASTM C552, Standard Specification for Cellular Glass Thermal Insulation.
 - .9 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

- .10 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Manufacturers associations.
 - .1 Thermal Insulation Association of Canada (TIAC), National insulation standards
- .4 National Research Council Canada.
 - .1 National Energy Code of Canada for Buildings
- .5 *Gouvernement du Québec*.
 - .1 Regulation respecting energy conservation in new buildings
- .6 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies
 - .2 CAN/ULC-S102.2, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies
 - .3 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards & Pipe Covering
 - .4 CAN/ULC-S702, Standard for Mineral Fiber Insulation for Buildings.
 - .5 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre for Buildings, Part 2: Applications Guidelines/Standard for Mineral Fibre Thermal Insulation for Buildings
- .7 Canadian General Standards Board (CGSB).
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation
 - .2 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing
 - .3 CAN/CGSB 51.9, Mineral Fibre Thermal Insulation for Piping and Round Ducting
 - .4 CAN/CGSB 51.11, Mineral Fibre Blanket Thermal Insulation.

- .5 CAN/CGSB-51.12, Thermal Insulating and Finishing Cement.
- .6 CAN/CGSB-51.40, Flexible, Elastomeric, Unicellular Thermal Insulation, Sheet and Pipe Covering.
- .7 CAN/CGSB-51.53, Poly(Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Data Sheets (DS).

1.3 Definitions

- .1 For the purposes of this section, the following definitions apply:
 - .1 "Concealed" elements: Insulated piping, ducts and mechanical appliances, located above suspended ceilings or in inaccessible building spaces.
 - .2 "Apparent" elements: Elements which are not concealed (as specified).
 - .3 "Network": Piping, including accessories, trim, etc., such as valves, elbows, pumps, etc. which are incorporated.
- .2 The insulation thickness is that which must cover all the components of the element to be insulated, such as reinforcements, angle irons, supports, joints, etc.

1.4 Documents/samples to be submitted

- .1 Samples:

Submit a complete set of each type of suggested insulation complex including the insulation material itself, the coating and the glue. Mount the sample on a 12 mm (½ in) plywood panel. Place a label under the sample indicating the network / fluid conveyed.

1.5 Qualification of the workforce

- .1 The installer must be an expert in the field, have at least three years of proven experience in performing work of the same type and scope corresponding to those described in this section, and possess the qualifications required by the TIAC or is a member.
 - .1 Have the work done by insulation specialists.

1.6 Quality assurance

- .1 The Mechanical Insulation Quality Standards Manual from the Thermal Insulation Association of Canada (TIAC), in addition to the authorized additions and amendments, must be used as a standard reference and part of the specification of this project.
- .2 The Contractor responsible for installing the mechanical insulation must keep a copy of this quality standards manual as a reference.

2. Products

2.1 Fire resistance characteristics

- .1 According to the CAN/ULC-S102 standard.
 - .1 Flame spread value: not greater than 25.
 - .2 Smoke Developed Value: not greater than 50.
- .2 The materials must be tested according to the ASTM C411 standard.

2.2 Sealing compounds

- .1 Caulking products that emit strong odours, contain toxic chemicals or are not certified to be of a mold-resistant type should not be used in air handling units.
- .2 If toxic products must be used, restrict their use to areas where fumes can be vented outside or where they will be confined behind an airtightness system, or apply them several months before the location is occupied as to allow the fumes to evacuate over the longest possible period.

2.3 Insulating materials

- .1 The thermal conductivity coefficient "K" shall not exceed the prescribed values at an average temperature of 24 ° C according to the tests performed in accordance with the ASTM C335 standard.
- .2 Insulation type **P-1**: Molded rigid sheath made of mineral fibers, with factory-installed vapour barrier.
 - .1 Mineral fibre insulation: In accordance with the CAN/ULC-S702 and ASTM C547 standards.
 - .2 Vapour Barrier: In accordance with the CGSB 51-GP-52Ma standard.
 - .3 Thermal Conductivity Coefficient "K" not to exceed 0.033 W/m•°C (0.231 Btu-

in/h•ft²•°F) at an average temperature of 24 °C.

- .4 Temperature limit: -29 °C to 454 °C.
- .3 Insulation type **P-2**: Mineral fibre blanket, with factory-installed vapour barrier installed at the factory.
 - .1 Mineral fibre blanket: In accordance with the CAN/ULC-S702 and ASTM C547 standards.
 - .2 Vapour Barrier: In accordance with the CGSB 51-GP-52Ma standard.
 - .3 Thermal Conductivity Coefficient "K" not to exceed 0.035 W/m•°C (0.24 Btu-in/h•ft²•°F) at an average temperature of 24 °C.
 - .4 Temperature limit: 120 °C.
 - .5 Density: 24 kg/m³.
- .4 Insulation type **P-3**: flexible tubular element, in unicellular elastomeric.
 - .1 Insulating element: In accordance with the CAN/CGSB-51.40 standard.
 - .2 Thermal Conductivity Coefficient "K" not to exceed 0.039 W/m•°C (0.27 Btu-in/h•ft²•°F) at an average temperature of 24 °C (75 °F).
 - .3 Temperature limit: -57 °C à 105 °C.
 - .4 Insulation certified by the manufacturer to be free from agents that may cause stress corrosion cracking.
- .5 Insulation type **P-4**: For underground piping.
 - .1 Rigid glass foam insulation, totally waterproof, recommended for underground installation, the thermal conductivity coefficient "K" is 0.043 W/m•°C (0.25 Btu/h•ft²•°F) at 0 °C, compliant with ASTM C552.
 - .2 Cover the insulation with a Pittwrap brand jacketing, entirely waterproof.
- .6 Insulation type **P-5** high density.
 - .1 Use: For cold potable water piping and cold coolants, for installation with protective shell.
 - .2 Insulation thickness: Equal to the thickness of the specified thermal insulation.
 - .3 Material: High density insulation

2.4 Glues, tapes and fasteners

- .1 Accessory products:
 - .1 Tape: Aluminum, self-adhesive, reinforced, at least 50 mm wide.
 - .2 Contact adhesive: Quick setting.
 - .3 Adhesive for jackets in canvas: Washable
 - .4 Tie Wire: 1.5 mm diameter stainless steel.
 - .5 Retention strips: 0.5 mm thick stainless steel, 19 mm wide.
- .2 For P-1 and P-2 type insulation:
 - .1 Tape: Aluminum, ULC-approved self-adhesive for the following characteristics:
Flame spread value less than 25 and Smoke Developed Value less than 50:
 - .2 Adhesive to seal overlaps: Quick-setting adhesive for sealing joints and overlaps of vapour barriers:
 - .1 Accepted products: Foster 87-75 without asbestos fibre, with covering capacity of 6 m²/L (17.1 ft²US /gal).
 - .3 Heat-insulating coating adhesive, flame retardant coating:
 - .1 Accepted products: Foster 30-36 without asbestos fibre, with covering capacity of 1.25 m²/L (3.6 ft²/US gal).
- .3 For P-3 type insulation:
 - .1 Contact adhesive: Quick-setting, open-drying adhesive for sealing the insulation transverse and longitudinal joints.
 - .2 Tape: PVC, self-adhesive:
 - .3 Coating material for P-3 type insulation: Coating to be installed over all exposed piping, water-based, flexible semi-gloss finish for indoor and outdoor application and white in colour and can be applied by brush or spray.

2.5 Jackets

- .1 Polyvinyl chloride (PVC) jackets.
 - .1 One-piece molded pipes and jacketing sheets, in accordance with the CAN/CGSB-51.53 standard, preformed as needed.

- .2 Colour: The one chosen by the [Engineer].
- .3 Minimum operating temperature: -20 °C.
- .4 Maximum operating temperature: 65 °C.
- .5 Water vapour permeability: 0.02 perm.
- .6 Thickness: 0.5 mm.
- .7 Fastener.
 - .1 Solvent adhesive compatible with insulating material, to seal joints and overlaps.
 - .2 Tacks.
 - .3 Self-adhesive vinyl tape - assorted colours.

2.6 Insulating cement

- .1 Thermal insulating and finishing cement.
 - .1 Mineral fiber hydraulic-setting or air-setting in accordance with the ASTM C449/C449M standard.

3. Execution

3.1 Installation

- .1 Do not lay insulation until the mandatory tests have been completed and the results have been approved by the Engineer.
- .2 Ensure that insulation elements and insulating surfaces are clean and dry while laying insulation and applying a finishing coat.
- .3 Lay insulation, accessories and jacketing and apply finishing coats according to manufacturers' recommendations and these instructions; apply at least two coats of finishing.
- .4 The insulation on the body of the roof drains must be held in place by means of glue applied over the entire surface (100%).
- .5 Plan for mounting plates and protective sheets according to the terms in section 23 05 05:
 - .1 Cut the insulation under the piping to a length at least equal to the length of the

mounting plate or shell, and a width equal to one third of the perimeter of the piping.

- .2 Replace the insulation with high-density insulation.
- .3 Cover with a vapour barrier to ensure continuity for cold pipes.
- .4 Install the protective plate.
- .6 The vapour barrier must not have any openings or be interrupted at the sleeves, fittings and supports.

3.2 Insulation

- .1 Install the insulation according to the ANSI/NFPA 90A and ANSI/NFPA 90B standards.
- .2 Use insulating shells for pipe diameters of DN 12 or less and insulation in shells or curved segments for pipe diameters greater than DN 12.
- .3 Multiple thickness insulation: offset the abutment joints of each thickness of insulation.
- .4 Vertical piping diameter greater than DN 3: Use insulation brackets that will be welded or bolted to the pipes, directly above the lowest fitting and then 4.5 m (15 ft) apart.
- .5 Expansion joints for insulation: Cut the ends of each insulation thickness straight, according to the manufacturer's instructions, leave a gap of 25 mm (1 in) between the successive sections and fill with flexible thermal insulation type P2 mineral fiber without compacting it.
- .6 Seal and finish the ends of the insulation, visible or not, with insulating cement.
- .7 Pipe expansion joints: Provide joints to allow free expansion and contraction of the piping without risk of damage to the insulation or its coating.
- .8 Flanges for mounting orifice plates, flanges and unions at the inlet and outlet of equipment, expansion joints, faucets, valves and other elements requiring periodic maintenance: Install the insulation and its coating in such a way that these elements can be disassembled and reassembled without damaging the adjacent insulation and its coating.
- .9 Fittings, Cold Application (5 ° C to 15 ° C): Insulate fittings with tight-fitting miter cut pipe insulation sections or tightly fitting, or a flexible insulation tightly fitted and covered with a reinforcing membrane embedded in a vapour barrier coating. Alternatively, insulate the fittings with a flexible insulation that is tight and covered

with a reinforcement membrane embedded in a vapour barrier coating and covered with PVC.

.10 Do not install insulation on the following chrome elements:

.1 Pipes, valves and fittings.

3.3 Fastening the insulation

.1 Secure each insulation section with tape at not more than 900 mm spacing at least one tape at each end and another in the center of each section of insulation.

3.4 Chart - Piping insulation

- .1 Unless otherwise specified, pipe insulation also includes the insulation of valve devices, valve caps, filters and strainers, flanges and fittings.
- .2 Chrome plated pipelines and valves and chrome fittings serving plumbing fixtures must not be insulated.
- .3 Insulate piping systems and equipment according to the following table:

NETWORKS AND EQUIPMENT		TEMPERATURE OF °C	FLUID	TYPE OF INSULATION
1.	Cold water drinking networks	4		P-1
2.	Hot water drinking networks	60		P-1
3.	Recirculated hot water drinking networks	60		P-1
6.	Exposed ventilation piping, 5 m from the roof, on main pipe and branch lines	--		P-1
7.	Concealed ventilation piping, over a distance of 5 m from the roof, on main pipe and branch lines, insulation thickness 25 mm	--		P-2
9.	Drainage piping for aeraulic device units and air plenums, insulation thickness 25 mm (1 in)	--		P-1
12.	Hot water heating networks	83		P-1
15.	Glycol heat recovery networks	4		P-1
31.	Any other piping system or equipment that must be insulated according to the requirements of the Act respecting the conservation of energy (Quebec)	--		--

.1 Type P-1 insulation thickness

TEMPERATURE OF °C	NOMINAL DIAMETER OF DRAINS (DN)			
	FLUID	1 or less	1 ¼ to 2	2½ to 4
				5 and more:
Thickness in mm				
151-240	64		76	89
121-150	51	64		76
96-120	38		51	
50-95	25		38	
14-49	25		38	
5-13	25	38		
Less than 5	25	38		
Ventilation	25			
Geothermal fluid	38	51	51	51

3.5 Finishing

- .1 Visible pipes located inside the building: Canvas jacketing
- .2 Exposed pipes located in mechanical installation rooms: Canvas jacketing.
- .3 Concealed pipes located inside the building: Canvas jacketing on valves and fittings; no other finishing coating.
- .4 Pipes located outside the building: Jackets that are completely airtight and waterproof.
- .5 Fasteners: Stainless steel screws and straps, 150 mm (6 in) center-to-center; wing or sleeve seals.
- .6 Install: According to TIAC's recommendations.

3.6 Prefabricated and removable barriers and insulators

- .1 Purpose: pumps, inspection doors, expansion joints, valves, flow measuring devices, mechanical seals, flanges, unions and other accessories.
- .2 Design: Designed to be removed and replaced periodically without risk of damage to adjacent insulation.
- .3 Insulation.
 - .1 Insulation of the type required for the appliance or pipe network involved, shaped to match the shape of the elements to be insulated.
 - .2 Thickness: twice the thickness required for the device or piping system involved.
 - .3 Vapour barrier added in the case of water cooling systems or other cold surfaces.
- .4 Barrier: Aluminum 1.3 mm thick or stainless steel 0.6 mm thick, with external coating and quick disconnect straps.

3.7 Sealing compounds

- .1 Follow the manufacturer's recommendations for temperatures, relative humidity and moisture content of the substrate specific to the application and drying of sealants, as well as special instructions for their use.

END OF SECTION