

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 21 07 19.

1.2 SUMMARY

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories in commercial type applications.

1.3 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineer (ASHRAE):
 - .1 ASHRAE Standard 90.1-01, 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-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-2004, Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-2003, Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB):
 - .1 CGSB 51-GP-52Ma-89, 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 2004).

- .6 Underwriters' Laboratories of Canada (ULC):
 - .1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.4 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.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Division 01 – General Requirements.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Division 01 – General Requirements. 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 Division 01 – General Requirements.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Division 01 – General Requirements.
- .4 Quality assurance submittals: submit following in accordance with Division 01 – General Requirements:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

- .1 Subcontractor responsible for installation shall be a specialist in performing work of this Section, have at least 3 years successful experience in this size and type of project, and be a member of TIAC.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Division 01 – General 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.
- .3 Waste management and disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.
 - .3 Divert unused metal materials from landfill to approved metal recycling facility.
 - .4 Dispose of unused adhesive material at official approved hazardous material collections site.

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 C335.
- .3 TIAC Code A 1: Rigid moulded mineral fibre with factory applied vapour retarder jacket:
 - .1 Mineral fibre: to CAN/CGSB 51.9.
 - .2 Maximum "k" factor: to CAN/CGSB 51.9.
 - .3 Acceptable materials: Fiberglass 850 with all service jacket and double sure closure system, Knauf, Mansville, Manson.
- .4 TIAC Code A 3: Rigid moulded mineral fibre with factory applied vapour barrier jacket and facing material:

- .1 Mineral fibre: to CAN/CGSB 51.9.
- .2 Jacket: to CGSB 51 GP 52 Ma.
- .3 Maximum "k" factor: to CAN/CGSB 51.9.
- .4 Acceptable materials: Fiberglass 850 with all service double sure closure system, vapour barrier jacket and facing material, Knauf, Mansville, Manson.
- .5 TIAC Code A-6: Flexible unicellular tubular elastomer:
 - .1 Insulation: To CAN/CGSB-51.40 with vapour retarder jacket.
 - .2 Jacket: To CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: To CAN/CGSB 51.40.
 - .4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.
 - .5 Thermal conductivity: 0.039 W/m·°K at 24°C mean temperature per ASTM C 177 or C 518
 - .6 Water vapour permeability: 1.16x10⁻¹⁵ kg/(s·m·Pa) as per ASTM E96.
 - .7 Water absorption: 0.2% per volume per ASTM C209.
 - .8 Flame spread and smoke development: 25/50 per ASTM E84.
 - .9 Temperature range: -57 to 105°C.
 - .10 Acceptable materials: AP Armaflex Pipe Insulation or approved equal.
- .6 TIAC Code C 2: Mineral fibre blanket faced with factory applied vapour retarder jacket:
 - .1 Mineral fibre: to CAN/CGSB 51.11.
 - .2 Jacket: to CGSB 51 GP 52 Ma.
 - .3 Maximum "k" factor: to CAN/CGSB 51.11.
 - .4 Acceptable materials: Fiberglass faced flexible piping insulation Type II with reinforced foil and flame retardant craft facing, Knauf, Mansville, Manson.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, 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 Hydraulic setting 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 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.8 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: -20°C.
 - .4 Maximum service temperature: 65° C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .7 Special requirements:
 - .1 Outdoor: UV rated material at least 0.15 mm thick.
 - .8 Jacket must meet or exceed a flame spread rating of 25 and a smoke development rating of 50.
 - .9 Acceptable materials: ITW, Zeston, Proto.
- .2 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 0.50mm sheet.
 - .3 Finish: Smooth.
 - .4 Joining: Longitudinal and circumferential slip joints with 50mm laps.
 - .5 Fittings: 0.5mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19mm wide, 0.5mm thick at 300mm 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.
- .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 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 system.
 - .2 Jacket: To match adjacent pipe jacketing.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1:
 - .1 Securements: SS bands 19mm at 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3:
 - .1 Securements: SS wire at 300 mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.

- .4 TIAC Code: C-2 with vapour retarder jacket:
 - .1 Insulation securements: ss. wire, 300 mm on centre
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .5 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 run outs to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp ° C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Hot Water Heating (Supply and Return)		A-1	25	38	38	38	38	38
Domestic Cold Water CWS		A-3	25	25	25	25	25	25
Trap Primer		A-3	25	25	25	25	25	25

- .6 Finishes:
 - .1 Exposed outdoors: Aluminum jacket.
 - .2 Exposed indoors: PVC jacket.
 - .3 Exposed in mechanical rooms: PVC jacket.
 - .4 Concealed, indoors: canvas on valves, fittings. No further finish.
 - .5 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
 - .6 Finish attachments: SS bands at 150 mm on centre.
 - .7 Installation: to appropriate TIAC code CRF/1 through CPF/5.
 - .8 Damaged insulation shall be replaced or repaired to TIAC Code recommendations.

3.6 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Division 01 – General Requirements shall include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.

- .7 Certified wood.
- .8 Low-emitting materials.

3.7 CLEANING

- .1 Proceed in accordance with Division 01 – General Requirements.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION