## 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 16.

### 1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

### 1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

.1 ANSI/ASHRAE/IESNA 90.1-01-SI, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials (ASTM International):

.1 ASTM B209M-01, 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 C411-97, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533-95 (2001), Specification for Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547-00, Specification for Mineral Fiber Pipe Insulation.

.7 ASTM C553-00, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.8 ASTM C612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.

.9 ASTM C795-92 (1998) e1, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.10 ASTM C921-89 (R1996), 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 CGSB 51-GP-53M-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.

.4 Thermal Insulation Association of Canada (TIAC):

.1 National Insulation Standards 1992 (R1999).

.5 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S102-M88 (R2000), Surface Burning Characteristics of Building Materials and Assemblies.

**1.4 PRODUCT DATA**

.1 Submit product data in accordance with Division 01 – General Requirements.

**1.5 SAMPLES**

.1 Submit samples in accordance with Division 01 – General Requirements.

.2 Submit for approval by Engineer: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

**1.6 MANUFACTURER'S INSTRUCTIONS**

.1 Submit manufacturer's installation instructions in accordance with Division 01 – General Requirements.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

**1.7 QUALIFICATIONS**

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

**1.8 DELIVERY, STORAGE AND HANDLING**

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

**1.9 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate and recycle waste materials in accordance with Division 01 – General Requirements.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to approved metal recycling facility.

.5 Divert unused adhesive materials from landfill to official approved hazardous material collections site approved.

.6 Do not dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

## 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: 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 without factory applied vapour retarder jacket:

.1 Mineral fibre: ASTM C547.

.2 Maximum "k" factor: ASTM C547.

.4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket:

.1 Mineral fibre: ASTM C547.

.2 Jacket: to CGSB 1-GP-52Ma.

.3 Maximum "k" factor: ASTM C547.

.5 TIAC Code C-1: Rigid mineral fibre board, un-faced:

.1 Mineral fibre: ASTM C612.

.2 Maximum "k" factor: ASTM C612.

.6 TIAC Code C-4: Rigid mineral fibre board faced with factory applied vapour retarder jacket:

.1 Mineral fibre: ASTM C612.

.2 Jacket: to CGSB51-GP-52Ma.

.3 Maximum "k" factor: ASTM C612.

.7 TIAC Code C-2: Mineral fibre blanket unfaced or faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section):

.1 Mineral fibre: ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: ASTM C553.

.8 TIAC Code A.6: Flexible unicellular tubular elastomer:

.1 Insulation: with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor.

.4 Certified by manufacturer free of potential stress corrosion cracking corrodants.

.9 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements:

.1 Insulation: ASTM C533.

.2 Maximum "k" factor: ASTM C533.

.3 Design to permit periodic removal and re-installation.

**2.3 CEMENT**

.1 Thermal insulating and finish:

.1 To: ASTM C449/C449M.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C449.

**2.4 JACKETS**

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CGSB 51-GP-53M with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint selected by Architect.

.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.

.8 Special requirements:

.1 Outdoor: UV rated material at least 0.5 mm thick.

.9 Covering adhesive: Compatible with insulation.

.2 ABS Plastic:

.1 One-piece moulded type and sheet with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint selected by Architect.

.3 Minimum service temperatures: -40°C.

.4 Maximum service temperature: 82°C.

.5 Moisture vapour transmission: 0.012 perm.

.6 Thickness: 0.75 mm.

.7 Fastenings:

.1 Solvent weld adhesive compatible with insulation to seal laps and joints

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.8 Locations:

.1 For outdoor use ONLY.

.3 Aluminum:

.1 In accordance with ASTM B209.

.2 Thickness: 0.50 mm sheet.

.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.

## 2.5 INSULATION SECUREMENTS

.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.

.6 Facing: 25 mm galvanized steel hexagonal wire mesh on both faces of insulation.

.7 Fasteners: 4 mm diameter pins with 35 mm square clips. Length of pin to suit thickness of insulation.

## 2.6 VAPOUR RETARDER LAP ADHESIVE

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

## 2.7 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

## 2.8 OUTDOOR VAPOUR RETARDER MASTIC

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/$m^2$.

**Part 3 Execution**

**3.1 PRE- INSTALLATION REQUIREMENTS**

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

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

**3.2 INSTALLATION**

.1 Install in accordance with TIAC National Standards:

.1 Hot equipment: To TIAC code 1503-H.

.2 Cold equipment: to TIAC code 1503-C.

.2 Elastomeric insulation: to remain dry. Overlaps to manufacturer's instructions. Joints tight and sealed properly.

.3 Provide vapour retarder as recommended by manufacturer.

.4 Apply materials in accordance with insulation and equipment manufacturer's instructions and this specification.

.5 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.6 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes:

.1 Hangers, supports outside vapour retarder jacket.

.7 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, chilled water pumps, and unions at equipment.

.2 Installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

**3.4 EQUIPMENT INSULATION SCHEDULES**

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 Hot equipment:

.1 TIAC code A-1 with mechanical fastenings or wire and 13 mm cement reinforced with one layer of reinforcing mesh.

.2 Thicknesses:

.1 Expansion Tanks: 25 mm Type A-1, PVC jacket.

.2 Combination air, dirt, hydraulic and magnetic separator: 25 mm Type A-1, PVC jacket.

.3 Finishes:

.1 Equipment in mechanical rooms: TIAC code CEF/1 with aluminum jacket unless specified otherwise.

END OF SECTION