PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE 90.1-2007-SI Edition, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.
.1 ASTM C 335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
.2 ASTM C 449/C 449M-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
.3 ASTM C 533-07, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
.4 ASTM C 547-07, Standard Specification for Mineral Fiber Pipe Insulation.
.5 ASTM C 553-02, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
.6 ASTM C 612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
.7 ASTM C 795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
.8 ASTM C 921-03a, 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 Canada Green Building Council (CaGBC)
.1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

1.1 REFERENCES (Cont'd)

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.6 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.7 Thermal Insulation Association of Canada (TIAC)
.1 National Insulation Standards 2005.

.8 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, include product characteristics, performance criteria, physical size, finish and limitations.
.2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.

.3 Sustainable Design Submittals:
.1 LEED Submittals: in accordance with Section 01 35 21 - LEED Requirements.

.4 Samples:
.1 Provide for review: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
.1 Mount sample on 12 mm plywood board.
.2 Affix typewritten label beneath sample indicating service.

1.2 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.5 Manufacturer's Instructions:
.1 Include procedures to be used and installation standards to be achieved.

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Store at temperatures and conditions recommended by manufacturer.

.4 Packaging Waste Management: remove for reuse or return of pallets, crates, padding, banding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 COMPONENTS

.1 Sustainable Requirements:
.1 Materials and products in accordance with Section 01 35 21 - LEED Requirements.

2.2 FIRE AND SMOKE RATING

.1 Fire and smoke ratings to CAN/ULC-S102:
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.3 INSULATION

.1 Mineral fibre: includes glass fibre, rock wool, slag wool.
.1 Recycled content: 20% (Post-Consumer + ½ Post-Industrial) in accordance with Section 01 35 21 - LEED Requirements.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
.1 Mineral fibre: ASTM C 547.
.2 Maximum "k" factor: ASTM C 547.

.4 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
.1 Insulation: ASTM C 533.
.2 Maximum "k" factor: to 0.075 w/m°C @ 500°C.
.3 Design to permit periodic removal and re-installation.

.5 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
.1 Mineral fibre: ASTM C 547.
.2 Jacket: to CGSB 51-GP-52MA.
.3 Maximum "k" factor: ASTM C 547.

.6 TIAC Code C-1: rigid mineral fibre board, unfaced.
.1 Mineral fibre: ASTM C 612.
.2 Maximum "k" factor: ASTM C 612.

.7 TIAC Code C-4: rigid mineral fibre board faced with factory applied vapour retarder jacket.
.1 Mineral fibre: ASTM C 612.
.2 Jacket: to CGSB 51-GP-52MA.
.3 Maximum "k" factor: ASTM C 612.

.8 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 C 553.
.2 Jacket: to CGSB 51-GP-52MA.

2.3 INSULATION (Cont'd)

.8 TIAC Code C-2:(Cont'd)
.3 Maximum "k" factor: ASTM C 553.

.9 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 corrodents.

2.4 CEMENT

.1 Thermal insulating and finish
.1 To: ASTM C 449/C 449M.
.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449.

2.5 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: to match adjacent finish paint selected by Departmental Representative.
.3 Minimum service temperatures: -20 degrees C.
.4 Maximum service temperature: 65 degrees 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 Indoor:0.5 mm thick.
.2 Outdoor: UV rated material at least 0.5 mm thick.
.9 Covering adhesive: compatible with insulation.
.1 Maximum VOC limit to SCAQMD Rule 1168 and in accordance with Section 01 35 21 - LEED Requirements.

2.5 JACKETS (Cont'd)

.2 Canvas:
.1 220 and 120 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
.2 Lagging adhesive: compatible with insulation.
.1 Maximum VOC limit to SCAQMD Rule 1168 and in accordance with Section 01 35 21 - LEED Requirements.

2.6 INSULATION SECUREMENTS

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.
.1 Maximum VOC limit to SCAQMD Rule 1168 and in accordance with Section 01 35 21 - LEED Requirements.

.3 Canvas adhesive: washable.
.1 Maximum VOC limit to SCAQMD Rule 1168 and in accordance with Section 01 35 21 - LEED Requirements.

.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 on one face of insulation with expanded metal lath on other face.

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

2.7 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.
.1 Maximum VOC limit to SCAQMD Rule 1168 and in accordance with Section 01 35 21 - LEED Requirements.

2.8 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.9 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 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE-INSTALLATION REQUIREMENTS

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

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

3.3 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.

3.3 INSTALLATION (Cont'd)

.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.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

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

3.5 FIRE SUPPRESSION EQUIPMENT INSULATION SCHEDULES

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

.2 Hot Equipment:
.1 TIAC code A-1 or C-1 with mechanical fastenings or wire or bands and 13 mm cement reinforced with one layer of reinforcing mesh.
.2 TIAC code C-2 unfaced with wire or bands and 13 mm cement precede by one layer of reinforcing mesh.
.3 Thicknesses:

Domestic hot water storage tanks 63mm

.3 Engine exhausts and mufflers:
.1 TIAC code A-2 with 25 mm air gap, mechanical fastenings or wire or bands and 13 mm cement reinforced with one layer of reinforcing mesh.

3.5 FIRE SUPPRESSION EQUIPMENT INSULATION SCHEDULES (Cont'd)

.4 Cold equipment:
.1 TIAC A-3 or C-4 with mechanical fastenings orwire or bands and 13 mm cement reinforced with one layer of reinforcing mesh.
.2 TIAC C-2 faced with vapour retardant jacket and with wire or bands and 13 mm cement preceded by one layer of reinforcing mesh.
.3 TIAC A-6 or C-4 with mechanical fastenings orwire or bands.

.5 Finishes:
.1 Engine exhaust piping and muffler: To TIAC code CRF-4.
.2 Equipment in mechanical rooms: TIAC code CEF/1 with jacket.
.3 Equipment elsewhere: TIAC code CEF/2 with 13 mm cement jacket.

3.6 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

END