

PART 1 - GENERAL

1.1 REFERENCES

- .1 Definitions:
    - .1 For purposes of this section:
      - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
      - .2 "EXPOSED" - means "not concealed" as previously defined.
      - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
    - .2 TIAC Codes:
      - .1 CRD: Code Round Ductwork,
      - .2 CRF: Code Rectangular Finish.
  - .2 Reference Standards:
    - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
      - .1 ANSI/ASHRAE/IESNA 90.1-2007, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
    - .2 ASTM International Inc.
      - .1 ASTM B 209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
      - .2 ASTM C 335-05a1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
      - .3 ASTM C 411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
      - .4 ASTM C 449/C 449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
      - .5 ASTM C 547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
      - .6 ASTM C 553-02e1, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
      - .7 ASTM C 612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
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- 1.1 REFERENCES (Cont'd)
- .2 Reference Standards: (Cont'd)
- .2 (Cont'd)
- .8 ASTM C 795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .9 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.
- .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.
- .5 Green Seal Environmental Standards (GSES)
- .1 Standard GS-36-00, Commercial Adhesives.
- .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): National Insulation Standards (2005).
- .8 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- 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 duct insulation, and include product characteristics,
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- 1.4 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 and ULC markings.
  - .3 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 SUSTAINABLE  
REQUIREMENTS
- .1 Materials and products in accordance with Section 01 35 21 LEED Requirements.
- 2.2 FIRE AND SMOKE  
RATING
- .1 To CAN/ULC-S102:
    - .1 Maximum flame spread rating: 25.
    - .2 Maximum smoke developed rating: 50.
- 2.3 INSULATION
- .1 Mineral fibre: as specified 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 C-1: Rigid mineral fibre board to ASTM C 612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
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2.3 INSULATION  
(Cont'd)

- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
  - .1 Mineral fibre: to ASTM C 553.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to ASTM C 553.

2.4 JACKETS

- .1 Canvas:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .2 Lagging adhesive: compatible with insulation.
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .3 Aluminum:
  - .1 To ASTM B 209 with and without moisture barrier as scheduled in PART 3 of this section.
  - .2 Thickness: 0.50 mm sheet.
  - .3 Finish: Smooth.
  - .4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.
    - .1 Stainless steel:
  - .5 Type: 304.
  - .6 Thickness: 0.50 mm sheet.
  - .7 Finish: Smooth.
  - .8 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

2.5 ACCESSORIES

- .1 Vapour retarder lap adhesive:
  - .1 Water based, fire retardant type, compatible with insulation.
    - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .2 Indoor Vapour Retarder Finish:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.

2.5 ACCESSORIES  
(Cont'd)

- .4 ULC Listed Canvas Jacket:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .5 Outdoor Vapour Retarder Mastic:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
  - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m<sup>2</sup>.
- .6 Tape: self-adhesive, aluminum, plain reinforced, 50 75 mm wide minimum.
- .7 Contact adhesive: quick-setting
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .8 Canvas adhesive: washable.
  - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .11 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on both faces of insulation.
- .12 Fasteners: 2 4 mm diameter pins with 35 mm diameter square clips, length to suit thickness of insulation.

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.
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- 3.2 PRE-INSTALLATION REQUIREMENTS
- .1 Pressure test ductwork systems complete, witness and certify.
  - .2 Ensure surfaces are clean, dry, free from foreign material.
- 3.3 INSTALLATION
- .1 Install in accordance with TIAC National Standards.
  - .2 Apply materials in accordance with manufacturers instructions and as indicated.
  - .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
  - .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
    - .1 Ensure hangers, and supports are outside vapour retarder jacket.
  - .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
    - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
  - .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.
- 3.4 DUCTWORK INSULATION SCHEDULE
- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50

3.4 DUCTWORK .1 (Cont'd)  
 INSULATION SCHEDULE  
 (Cont'd)

	TIAC Code	Vapour Retarder	Thickness (mm)
Round cold and dual temperature supply air ducts	C-2	yes	50
Rectangular warm air ducts	C-1	no	25
Round warm air ducts	C-1	no	25
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts	C-1	yes	25
Exhaust duct between dampers and louvres	C-1	no	25
Acoustically lined ducts	See Section 23 33 53-Duct Liners		

- .2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:  
 .1 Use TIAC code C-1 insulation, scored to suit diameter of duct.  
 .1 Finishes: conform to following table:

	TIAC Code	
Indoor, concealed	Rectangular none	Round none
Indoor, exposed within mechanical room	CRF/1	CRD/2

- 3.4 DUCTWORK .2 (Cont'd)  
INSULATION SCHEDULE .1 (Cont'd)  
(Cont'd) .1 Finishes:(Cont'd)

	TIAC Code	
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

- 3.5 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.