## Part 1 General

### 1.1 SECTION INCLUDES

.1 Duct work insulation.

.2 Insulation jackets.

### 1.2 RELATED SECTIONS

.1 Section: Finishing outdoor insulation jacket.

.2 Section 23 05 53 - Mechanical Identification.

.3 Section 23 31 00 - Duct Work: Glass fibre duct work.

### 1.3 REFERENCES

.1 Section 01 43 00: Requirements for references and standards.

.2 ASTM

- .1 ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- .2 ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .3 ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Metre Apparatus.
- .4 ASTM C553 - Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .5 ASTM C612 - Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
- .6 ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation
- .7 ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- .8 ASTM C1071 - Fibrous Glass Duct Lining Insulation(Thermal Sound Absorbing Material).
- .9 ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
- .10 ASTM E96 - Water Vapour Transmission of Materials.
- .11 ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
- .12 ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.3 NAIMA: North American Insulation Manufacturers Association

- .1 National Insulation Standards.

.4 NFPA: National Fire Protection Association

- .1 NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems
- .2 NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems

.5 South Coast Air Quality Management District

.1 SCAQMD Rule 1113 – Architectural Coatings

.2 SCAQMD Rule 1168 - Adhesive and Sealant Applications

.6 SMACNA: Sheet Metal & Air Conditioning Contractors' National Association

.1 HVAC Duct Construction Standards - Metal and Flexible.

.7 Standards Council of Canada

.1 CAN/ULC S102 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 CAN/ULC-S701 - Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.8 Thermal Insulation Association of Canada (TIAC):

.1 National Insulation Standards.

.9 Underwriters Laboratories

.1 UL 2818 - Greenguard Standard for Building Materials, Finishes And Furnishings

## 1.4 SUBMITTALS FOR REVIEW

.1 Section 21 05 00: Procedures for submittals.

.2 Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

## 1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

.2 Applicator Qualifications: Company specializing in performing the work of this section minimum three years documented experience.

## 1.6 REGULATORY REQUIREMENTS

.1 Materials:

.1 Flame spread/smoke developed rating of 25/50 to CAN/ULC S102.

.2 Where in contact with or exposed to temperatures greater than 120°C, combustible materials must comply with ASTM C411.

## 1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Section 21 05 00: Transport, handle, store, and protect products.

.2 Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

.3 Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

## 1.8 ENVIRONMENTAL REQUIREMENTS

.1 Section 21 05 00: Environmental conditions affecting products on site.

.2 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

.3 Maintain temperature during and after installation for minimum period of 24 hours.

## Part 2 Products

### 2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

### 2.2 VAPOUR BARRIER EXTERNAL DUCT WRAP, GLASS FIBRE, FLEXIBLE

.1 Manufacturers:

.1 Johns Manville Microlite FSK

.2 Owens Corning SoftR Duct Wrap.

.3 Other acceptable manufacturers offering equivalent products.

.1 Knauf.

.2 Insulation: ASTM C553; flexible, noncombustible blanket.

.1 'ksi' ('K') value: ASTM C518, 0.045 W/m-K at 24°C (0.31 Btu-in/(hr ft²-°F) at 75 degrees F).

.2 Maximum service temperature: 121 °C (250°F).

.3 Maximum moisture absorption: 0.20 percent by volume.

.4 Density 12 kg/cu. meter (0.75 lb/cu. Foot).

.3 Vapour Barrier Jacket:

.1 Kraft paper with glass fibre yarn and bonded to aluminized film (FRK).

.2 Moisture vapour transmission: ASTM E96; ASTM C1136: 0.02 perm.

.3 Secure with pressure sensitive tape.

.4 Vapour Barrier Tape:

.1 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

.5 Outdoor Vapour Barrier Mastic:

.1 Vinyl emulsion type acrylic or mastic, compatible with insulation, black colour.

.6 Tie Wire: Annealed steel, 1.5 mm (16 gauge).

### 2.3 VAPOUR BARRIER EXTERNAL GLASS FIBRE RIGID INSULATION BOARD

.1 Manufacturers:

.1 Johns Manville 800 Series

.2 Owens Corning Series 700

.3 Other acceptable manufacturers offering equivalent products.

.1 Knauf.

.2 Insulation: ASTM C612; rigid, noncombustible blanket.

.1 'ksi' ('K') value : ASTM C518, 0.045 at 24 degrees C (0.31 at 75 degrees F).
.2 Maximum service temperature: 121 degrees C (250 degrees F).
.3 Maximum moisture absorption: 0.20 percent by volume.
.4 Density: 48 kg/cu m (3.0 lb/cu ft).

.3 Vapour Barrier Jacket:

.1 Kraft paper with glass fibre yarn and bonded to aluminized film.
.2 Moisture vapour transmission: ASTM E96; ASTM C1136: 0.04 perm.
.3 Secure with pressure sensitive tape.

.4 Vapour Barrier Tape:

.1 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

.5 Indoor Vapour Barrier Finish:

.1 Cloth: Untreated; 305 g/sq m (9 oz/sq yd) weight, glass fabric.
.2 Vinyl emulsion type acrylic, compatible with insulation, black colour.

## 2.4 JACKETS

.1 Canvas Jacket: UL listed.

.1 Fabric: ASTM C921, 220 g/sq m (6 oz/sq yd), plain weave cotton treated with dilute fire retardant lagging adhesive.
.2 Lagging Adhesive:
.1 Compatible with insulation.

.2 Aluminum Flexible Self Adhesive Insulation Jacket: UL listed

.1 Manufacturers:
.1 VentureClad 1577CW
.2 Bakor Foilskin
.3 Polyguard Alumaguard
.2 Tensile Strength: 316.5 N/25 mm (70 lb/in)
.3 Puncture: 111 N (25 lbs)
.4 Service Temperature: -50 to 70°C (-58°C to 160°F)
.5 Finish: Embossed
.6 Aluminum foil exterior surface over multilayer laminate, vapour barriered jacket with pressure sensitive adhesive integral to jacket application surface with peel off release liner.
.7 Permeation (ASTM E96): 0.05 perm (maximum)
.8 UV resistant.
.9 Flame based application not acceptable.

.3 Sheet Aluminum Jacket: ASTM B209M.

.1 Thickness: 0.40 mm (0.016 inch) sheet.
.2 Finish: Smooth.
.3 Joining: Longitudinal slip joints and 50 mm (2 inch) laps.
.4 Fittings: 0.4mm (0.016 inch) thick die shaped fitting covers with factory attached protective liner.

.5 Metal Jacket Bands: 10 mm (3/8 inch) wide; 0.015 mm thick aluminum.

## Part 3 Execution

### 3.1 EXAMINATION

.1 Section 01 70 00 - Examination and Preparation: Verification of existing conditions before starting work.

.2 Verify that duct work has been tested before applying insulation materials.

.3 Verify that surfaces are clean, foreign material removed, and dry.

### 3.2 INSTALLATION

.1 Section 01 43 00 - Quality Assurance: Manufacturer's written instructions.

.2 Install to NAIMA National Insulation Standards.

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

.4 All duct sizes on the drawings refer to inside duct dimensions. On all acoustically lined ductwork, the external duct dimensions shall be increased by the thickness of the lining.

.5 Insulated duct work conveying air below ambient temperature:

.1 Provide insulation with vapour barrier jackets.

.2 Finish with tape and vapour barrier jacket.

.3 Continue insulation through walls, sleeves, hangers, and other duct penetrations.

.4 Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

.6 Insulated duct work conveying air above ambient temperature:

.1 Provide with or without standard vapour barrier jacket.

.2 Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

.7 External insulation on duct work exposed in Mechanical Equipment Rooms or Finished Spaces below 3 metres (10 feet) above finished floor: Provide canvas jacket ready for finish painting.

.8 Exterior Applications: Provide insulation with vapour barrier jacket. Cover the insulation with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

.9 Where ducts are acoustically lined to the equivalent R-value, no exterior duct insulation is required, except where exposed to outside temperature and weather.

.10 External Duct Insulation Application:

.1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.

.2 Secure insulation without vapour barrier with staples, tape, or wires.

.3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.

.4 Seal vapour barrier penetrations by mechanical fasteners with vapour barrier adhesive.

.5 Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

## 3.3 SCHEDULES

.1 Duct insulation shall follow the Schedules below as a minimum requirement. These requirements shall apply regardless of whether or not duct insulation is shown on the drawings.

.2 Where duct insulation is shown on the drawings (either with the hatching convention or by means of a key note) and exceeds the requirements of the schedules below, the additional insulation requirements shall be met.

## 3.4 EXTERNAL DUCT WRAP, GLASS FIBRE, FLEXIBLE

| DUCT SERVICE | DUCT SIZE <Inch><mm> | THICKNESS <mm><Inch> |
|---|---|---|
| | | |
| All conditioned air supply ductwork in return plenums or un-conditioned interior space or mechanical rooms or electrical rooms | =< 400 mm (16”) per side, or round duct | 29mm (1 1/8") Installed<br>38mm (1 ½”) Nominal |
| Round exhaust ducts, relief ducts from external wall or roof back for length of 3000mm (10 feet) or to insulated damper, whichever is greater | All | 57mm (2 1/4") Installed<br>75mm (3") Nominal |
| Round duct from insulated damper for length of up the 3000mm (10 feet) | All | 38mm (1 1/2") Installed<br>50mm (2") Nominal |
| Round outdoor air ducts located in conditioned space to the air handler or mixed air plenum. | All | 95mm (3 3/4") Installed<br>125mm (5") Nominal |
| Round ducts located outdoors or where exposed to outdoor temperatures (eg. Attics). | Not Permitted | Not Permitted |
| Round ducting to centrifugal exhaust fans on roofs. | All | 38mm (1 1/2") Installed<br>50mm (2") Nominal |

## 3.5 EXTERNAL GLASS FIBRE RIGID INSULATION BOARD

| DUCT SERVICE | DUCT SIZE <Inch><mm> | THICKNESS <mm><Inch> |
|---|---|---|
| | | |
| Air conditioning supply plenums, before, including, and after cooling coils | all | 50mm (2") |
| All conditioned air supply ductwork in return plenums or un-conditioned interior space or mechanical rooms or electrical rooms | > 400 mm (16”) per side | 25mm (1") |
| Rectangular exhaust ducts, relief | All | 75mm (3") |

| DUCT SERVICE | DUCT SIZE <Inch><mm> | THICKNESS <mm><Inch> |
|---|---|---|
| ducts from external wall or roof back for length of 3000mm (10 feet) or to insulated damper, whichever is greater | | |
| Rectangular duct from insulated damper for length of up the 3000mm (10 feet) | All | 50mm (2") |
| Outdoor air ducts located in conditioned space from the intake louver at outside wall or roof to the air handler or mixed air plenum | All | 75mm (3") |
| Rectangular conditioned air ducts located outdoors or where exposed to outdoor temperatures (eg. Attics, roofs). | All | 125mm (5") |
| Rectangular ducting to centrifugal exhaust fans on roofs. | All | 50mm (2") |

**END OF SECTION**