Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 21 05 01 – Common Work Results for Mechanical.

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

1.2 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 90.1-2013 (SI); Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.

.1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-07(R2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-12, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-11, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-08(R2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.9 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-01, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Green Seal Environmental Standards (GSES)

.1 Standard GS-36-00, Adhesives for Commercial Use.

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

.6 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.7 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 00 10 – General Instructions.

.2 Product Data:

.1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

.3 Manufacturers' Instructions:

.1 Provide manufacture's written duct insulation jointing recommendations and special handling criteria, installation sequence, cleaning procedures.

.4 Samples submit for approval:

.1 Complete assembly of each insulation proposed type, including insulation material, coating and adhesive with indications on VOC value.

.2 Mount sample on a 12 mm thick plywood board.

.3 Affix typewritten label beneath sample indicating service.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist in performing work of this section, and have successful experience in this size and type of project, member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 00 10 – General Instructions.

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

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 INSULATION

.1 Mineral fibre: as 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 Type C: Glass fiber blankets bounded together with factory applied aluminium reinforced vapor retarder, 12 kg/m³ density.

.1 Maximum "k" factor: 0.042 W/m.ºC at 24ºC.

.4 Type D: Rigid mineral fibre board to ASTM C553 faced with factory applied FSK vapour retarder jacket, 36 kg/m³ density.

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

.2 Maximum "k" factor: 0.035 W/m.ºC at 24ºC.

2.3 JACKETS

.1 Polymer self- adhesive jacket:

.1 Four-ply white laminate made with 2 layers of aluminum foil, a layer of polyester film and an outer layer of tedlar film. It shall be coated with a special cold weather acrylic pressure sensitive adhesive system which combines rapid adhesion at normal temperatures with superior low temperature performance below freezing.

.2 Minimum service temperatures: -20 degrees C.

.3 Maximum service temperature: 65 degrees C.

.4 Moisture vapour transmission: 0.02 perm.

.5 Thickness: 18 mm.

.6 Fastenings:

.1 Pressure sensitive vinyl tape of matching colour.

.7 Special requirements:

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

.8 Covering adhesive: compatible with insulation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

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

.1 Maximum VOC limit to SCAQMD Rule 1168 and GSES GS-36.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

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

.6 Contact adhesive: quick-setting

.1 Maximum VOC limit to SCAQMD Rule 1168 and GSES GS-36.

.7 Canvas adhesive: washable.

.1 Maximum VOC limit to SCAQMD Rule 1168 and GSES GS-36.

.8 Tie wire: 1.5 mm stainless steel.

.9 Banding: 12 mm wide, 0.5 mm thick stainless steel.

.10 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation.

.11 Fasteners: 2 mm diameter pins with 35 mm diameter 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.

.2 Cold or Dual Temp Duct and Plenum - (Ambient to 65°C)

.1 Rigid Insulation

.1 Preparation:

.1 Fix mechanical fasteners to both horizontal and vertical surfaces at approximately 300 mm on centres, each direction.

.2 Application:

.1 Cut insulation with integral vapour retarder to required size and apply to exterior of duct and/or plenum with vapour retarder to the warm side with horizontal surfaces overlapping vertical surfaces. Butt edges together tightly.

.2 Secure insulation by impaling on mechanical fasteners. Where mechanical fasteners penetrate vapour retarder, and at all corners and joints, apply vapour retarder tape or vapour retarder strips adhered with vapour retarder adhesive. Where raised seams are encountered, secure to the seams an overlapping strip of flexible insulating material with integral vapour retarder to provide a continuous vapour retarder.

.2 Flexible insulation

.1 Preparation:

.1 On round ducts and on rectangular ducts 740 mm or less in width, no preparation is necessary. On rectangular ducts 762 mm or more in width, apply to bottom surface, either mechanical fasteners at approximately 450 mm centres or insulation adhesive in strips 100 mm wide on approximately 300 mm centres.

.2 Application:

.1 Cut insulation with integral vapour retarder to required size and apply to exterior or duct with vapour retarder to the outside. Where mechanical fasteners or staples penetrate the vapour retarder and at all joints apply vapour retarder tape or vapour retarder strips adhered with vapour retarder adhesive. All joints shall be overlapped a minimum of 50 mm and stapled on approximately 100 mm centres.

.2 Secure insulation with either twine or wire fastening on approximately 300 mm centres.

.3 Outside Air Duct and Plenum - (-40°C to Ambient)

.1 As Rigid insulation above but firstly apply a layer of rigid insulation without vapour retarder before applying layer of rigid insulation with vapour retarder. All joints shall be staggered.

.4 Exceptions:

.1 For external applications of rigid insulation where the use of mechanical fasteners is unsuitable due to space limitations, twine or wire fastenings, insulation adhesive or other suitable method of attachment may be substituted.

.2 Except where specifically called for in the Insulation section of the project specifications, where an interior duct liner is used, external insulation shall not be applied.

3.2 FINISHES

.1 Indoors, mechanical rooms:

.1 Polymer self- adhesive jacket:

.1 Four-ply white laminate made with 2 layers of aluminum foil, a layer of polyester film and an outer layer of tedlar film. It shall be coated with a special cold weather acrylic pressure sensitive adhesive system which combines rapid adhesion at normal temperatures with superior low temperature performance below freezing.

.2 Minimum service temperatures: -20 degrees C.

.3 Maximum service temperature: 65 degrees C.

.4 Moisture vapour transmission: 0.02 perm.

.5 Thickness: 18 mm.

.6 Fastenings:

.7 Pressure sensitive vinyl tape of matching colour.

.8 Special requirements:

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

.2 Outdoors:

.1 Polymer self- adhesive jacket:

.1 Four-ply white laminate made with 2 layers of aluminum foil, a layer of polyester film and an outer layer of tedlar film. It shall be coated with a special cold weather acrylic pressure sensitive adhesive system which combines rapid adhesion at normal temperatures with superior low temperature performance below freezing.

.2 Minimum service temperatures: -20 degrees C.

.3 Maximum service temperature: 65 degrees C.

.4 Moisture vapour transmission: 0.02 perm.

.5 Thickness: 18 mm.

.6 Fastenings:

.7 Pressure sensitive vinyl tape of matching colour.

.8 Special requirements:

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

3.3 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.4 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions. Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.3 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.

.4 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.5 DUCTWORK INSULATION SCHEDULE

.1 Thermal insulation is not required on: ductwork with acoustical liner used as thermal insulation, unless otherwise indicated.

.2 Insulation types and thicknesses: conform to following table:

Description	Type	Thickness
In mechanical rooms	D	50 mm
Above acoustic tile	C	25
Outdoor ductwork	D (C if concealed)	100 mm

3.6 SPECIAL CONSIDERATIONS

.1 Exhaust air systems:

.1 From fan outlet up to air exhaust louvers including motorized dampers:

.1 Insulation type D

.2 Thickness : 50 mm

.2 Fresh air intakes and exhaust outlets:

.1 Over drainage pans, on all parts not acoustically treated, that is bottom and sides on pan height. Thermal insulation must overlap acoustical lining (installed inside) by at least 50 mm.

.1 Insulation type C

.2 Thickness : 50 mm

.3 Return air duct:

.1 No insulation.

.4 Non treated air (transfer air duct, etc.):

.1 Acoustic liner on transfer ducts.

END OF SECTION