1. GENERAL

1.1 RELATED REQUIREMENTS

.1 Mechanical General Requirements: Section 15010

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Comply with requirements of Section 15010.

.2 Submit an insulation schedule, for each application include the following information:

.1 Material;

.2 “K” value;

.3 Thickness;

.4 Density;

.5 Finish;

.6 Jacketing.

.3 Submit product data and test reports when requested to substantiate that insulation and recovery assemblies meet flame/smoke development ratings and performance requirements for the assembly and thickness used.

1.3 DEFINITIONS

.1 For the purposes of this section, the following definitions apply:

.1 Concealed: Piping systems and equipment in trenches, shafts, furring, and suspended ceilings.

.2 Exposed: Piping systems and equipment in mechanical rooms, or otherwise not “concealed”.

.3 “K” Value: Thermal conductivity of insulating material per unit of thickness (W/m°C).

1.4 FLAME/SMOKE DEVELOPMENT RATINGS

.1 Pipe insulations, recovery materials, tapes, vapour barrier facings, and adhesives shall have maximum flame spread rating of 25, and maximum smoke developed rating of 100 except in plenum spaces and air handling systems, where maximum smoke development rating shall be 50, when tested in accordance with CAN/ULC-S102-1988, NFPA 255-1996, or ASTM E84-96a.

*[**SPEC NOTE:** Specify smoke development of 50 when a building is classified as a "high rise".]*

.2 Insulating materials and accessories shall withstand service temperatures without smouldering, glowing, smoking, or flaming when tested in accordance with ASTM C441-82.

2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS

.1 Fibreglass, Manson, Owens Corning or Krauf.

2.2 HOT PIPE INSULATION

.1 Hot Pipe Insulation - Mineral Fibre:

.1 Material: Formed rigid mineral fibre insulation sleeving to CAN/CGSB-51.9-92.

.2 "K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: Up to 150°C.

.4 Jacket: Factory applied general purpose jacket.

.2 Hot Pipe Insulation - Black Rubber:

.1 Material: Flexible elastomeric, unicellular preformed pipe covering to CAN/CGSB-51.40-95.

.2 "K" Value: 0.04 W/m°C at 24°C mean temperature.

.3 Service Temperature: Up to 100°C.

.4 Maximum Allowable Thickness: 25 mm.

2.3 HOT EQUIPMENT INSULATION

.1 Hot Equipment Insulation - Flat Surfaces:

.1 Material: Rigid mineral fibre to CAN/CGSB-51.10-92.

.2 "K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: 20°C to 120°C.

.2 Hot Equipment Insulation - Curved Surfaces:

.1 Material: Mineral fibre blanket to CAN/CGSB-51.11-92.

.2 "K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: 20°C to 120°C.

2.4 ENGINE EXHAUST INSULATION

.1 Rigid Piping:

.1 Material: Formed rigid hydrous calcium silicate for piping to CAN/CGSB-51.2-95.

.2 "K" Value: Maximum 0.059 W/m°C at 93°C mean temperature.

.3 Service Temperature: Up to 750°C.

.2 Flexible Piping:

.1 Provide flexible insulation with recoverable covers on flex-to-engine connection.

.2 Construct from an insulating blanket mesh with 0.008" diameter wire, high temperature fibre insulating blanket (Burglass 1200, Grade 1), Alpha Maritex Style #3259-2-SS fibreglass fabric, and stainless steel/kevlar 110/3 K.S. natural thread. Assembly to be purposely made for the flexible connection, and provide personal protection from the hot gas discharge.

2.5 COLD PIPE INSULATION

.1 Cold Pipe Insulation: Mineral Fibre:

.1 Material: Formed mineral fibre rigid insulation sleeving to CAN/CGSB-51.9-92.

.2 "K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: -14°C to 100°C.

.4 Jacket: Factory applied vapour barrier jacket to CGSB 51-GP-52Ma, Type 1, with longitudinal lap seal.

.2 Cold Pipe Insulation - Black Rubber:

.1 Material: Flexible elastomeric, unicellular preformed pipe covering to CAN/CGSB-51.40-95.

.2 "K" Value: 0.04 W/m°C at 24°C mean temperature.

.3 Service Temperature: -4°C to 100°C.

.4 Maximum Allowable Thickness: 25 mm.

2.6 COLD EQUIPMENT INSULATION

.1 Cold Equipment Insulation - Flat Surfaces:

.1 Materials: Rigid mineral fibre to CAN/CGSB-51.10-92.

.2 "K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: -14°C to 100°C.

.4 Jacket: Factory applied vapour barrier jacket to CGSB 51-GP-52Ma, Type 1.

.2 Cold Equipment Insulation - Curved Surfaces:

.1 Material: Mineral fibre blanket to CAN/CGSB-51.11-92.

.2 :K" Value: Maximum 0.035 W/m°C at 24°C mean temperature.

.3 Service Temperature: -14°C to 100°C.

.4 Jacket: Factory applied vapour barrier jacket to CGSB 51-GP-52Ma, Type 1.

2.7 ACCESSORIES

.1 For mineral fibre insulation materials:

.1 FSK Tape: Vapour barrier tape consisting of laminated aluminum foil, glass fibre scrim and paper, with pressure sensitive self-adhesive.

.2 ASJ Tape: Vapour resistant tape consisting of all service jacket material with pressure sensitive self-adhesive.

.3 Adhesive: Quick setting adhesive for joints and lap sealing.

.2 Black Rubber Insulation Adhesive: Manufacturer's recommended contact cement.

.3 Finishing Cement: To CAN/CGSB-51.12-95 Type 1 - mineral fibre hydraulic setting, thermal insulating and finishing cement for use up to 650°C.

.4 Insulating Cement: To CAN/CGSB-51.12-95, Type 2 - mineral fibre thermal insulating cement for use up to 870°C.

*[**SPEC NOTE:** CAN/CGSB-51.12-95 allows for three types of insulating and finishing cements as follows:*

Type 1: Mineral fibre hydraulic setting thermal insulating and finishing cement for use up to 650°C.
Type 2: Mineral fibre thermal insulating cement for use up to 870°C.
Type 3: Expanded or exfoliated vermiculite thermal insulating cement for use up to 980°C.]

2.8 RECOVERY MATERIALS

.1 Canvas: ULC listed, 220 g/m^2 plain weave cotton fabric.

.2 Aluminum: To 0.5 mm thick with longitudinal slip joints and 50 mm end laps, 0.4 mm thick die shaped fitting covers with factory attached protective liner on interior surface.

.3 PVC: To CAN/CGSB-51.53-95, [____] mm thick for interior use and [____] mm thick for exterior use, off-white in colour with one piece pre-moulded fitting covers.

.4 Black Rubber Finish: Insulation manufacturer's recommended vinyl lacquer type coating.

3. EXECUTION

3.1 INSTALLATION, GENERAL

.1 Apply insulation after required piping system tests have been completed and inspected by the Consultant.

.2 Ensure insulation is continuous through walls and floor penetrations.

.3 Ensure piping surface is clean and dry before insulating.

.4 Locate cover seams in least visible locations.

.5 Stagger butt joints where multi-layered insulation is used.

.6 On vertical piping with diameters 25 mm and larger, use insulation supports welded or bolted to pipe directly above lowest pipefitting. Repeat supports on 4.5 m centres, and at each valve and flange.

.7 Tightly fit insulation sections to pipe to make smooth and even surfaces. Cut insulation for proper fit where weld beads protrude. Bevel away from studs and nuts to allow their removal without damage to insulation. Trim closely and neatly around extending parts of pipe saddles, supports, hangers and clamp guides, and seal with insulating/finishing cement.

3.2 HOT PIPE INSULATION APPLICATION

.1 Apply mineral fibre insulation when pipe surface temperatures are 50°C to 60°C.

.2 Apply mineral fibre insulation and recovery over full length of pipe without penetration of hangers, or interruption at sleeves and fittings. Seal butt joints with 100 mm wide ASJ tape.

.3 Terminate mineral fibre insulation at each end of unions and flanges. Trowel finishing cement into bevel.

.4 Cover fittings and valves with equivalent thickness of finishing cement. Apply finishing cement over exposed fittings and valves before applying canvas recovering.

.5 Cut mineral fibre insulation layers straight on 10 m centres, with 25 mm gap to allow for expansion between terminations. Pack void tightly with insulation, and protect joints with aluminum sleeves.

.6 Seal black rubber insulation butt joints and seams with black rubber insulation adhesive.

.7 Re-cover exposed mineral fibre insulated piping with [canvas][PVC][aluminum].

.8 Re-cover mineral fibre insulated piping exposed to outdoors with aluminum.

.9 Coat exposed black rubber insulation with two coats of black rubber finish material.

.10 Do not insulate the following piping system components:

.1 Hot water heating piping in radiation cabinets.

.2 Unions, flanges, strainers, expansion joints, flexible piping connectors.

.3 Condensate trap assemblies and drip legs.

.4 Chrome plated or stainless steel piping.

.5 Valve bonnets on domestic water systems.

3.3 HOT EQUIPMENT INSULATION APPLICATION

.1 Use rigid fibreboard for flat surfaces, and blanket for curved surfaces.

.2 Tightly butt edges and stagger joints. Weld mechanical fastener pins to equipment where necessary.

.3 Cover insulation with 25 mm galvanized hexagonal mesh, and 12 mm coat of insulating cement. Finish with a final 12 mm coat of finishing cement, and re-cover with canvas.

3.4 ENGINE EXHAUST INSULATION APPLICATION

.1 Ensure insulation is continuous through the wall or roof to point of termination.

.2 Cover elbows and fittings with equivalent thickness of insulating cement.

.3 Re-cover all piping, including muffler, with aluminum.

.4 Provide flexible insulation with removable jackets on engine flexible exhaust.

3.5 COLD PIPE INSULATION APPLICATION

.1 Insulate 2 m portion of plumbing vents measured from roof outlet back. Do not insulate remaining vent piping.

.2 Insulate storm sewer piping throughout. Insulate final 2 m portion from outlet drain back with 25 mm insulation.

.3 Apply mineral fibre insulation and recovery over full length of pipe without penetration of hangers, or interruption at sleeves and fittings. Apply adhesive to ends of butt joints, and seal joint seams with 100 mm wide strips of joint tape.

.4 Insulate complete system including valves, unions, flanges, strainers. Cover fittings and valves with equivalent thickness of finishing cement. Cover finishing cement with open mesh glass cloth and adhesive. Seal lap joints with 100% coverage of joint tape, and seal the assembly with adhesive.

.5 Seal black rubber insulation butt joints and seams with black rubber insulation adhesive.

.6 Re-cover exposed mineral fibre insulated piping with [canvas][PVC][aluminum].

.7 Recover mineral fibre insulated piping exposed to outdoors with [aluminum][PVC].

.8 Coat exposed black rubber insulation with two coats of black rubber finish material.

3.6 COLD EQUIPMENT INSULATION APPLICATION

.1 Tightly butt edges and stagger joints. Seal joints with 100 mm wide FSK tape.

.2 Cover insulation with 25 mm galvanized hexagonal mesh, and 12 mm coat of finishing cement. Finish with a final 12 mm coat of finishing cement, and re-cover with canvas.

3.7 INSULATION TYPE AND THICKNESS SCHEDULE

*[**SPEC NOTE:** Specify insulation for "condenser water piping indoors" only when free cooling chillers or exchangers are specified.]*

Service Type and Nominal Pipe Diameter (mm)	Insulation Type	Insulation Thickness (mm)
Hot water heating		
50 mm and smaller	Hot pipe	25
65 mm and larger	Hot pipe	40
Glycol heating		
50 and smaller	Hot pipe	25
65 and larger	Hot pipe	40
Low pressure steam		
50 and smaller	Hot pipe	40
65 and larger	Hot pipe	50
Condensate		
25 and smaller	Hot pipe	25
30 to 50	Hot pipe	40
65 and larger	Hot pipe	50
Domestic hot water and re-circulation		
40 and smaller	Hot pipe	12
50 and larger	Hot pipe	25
Chilled water		
25 and less	Cold pipe	12
30 to 50	Cold pipe	20
Plumbing vents		
All sizes	Cold pipe	25
Storm sewer piping		
All sizes	Cold pipe	12
Final 2 m section	Cold pipe	25
Emergency generator exhaust system		
All sizes	Engine exhaust	50
All sizes	Flexible exhaust	25
Heat exchangers	Hot equipment	50
Hot water storage tanks	Hot equipment	50
Condensate tanks	Hot equipment	50
De-aerators	Hot equipment	50
Heat exchangers	Cold equipment	50
Chillers	Cold equipment	25

Service Type and Nominal Pipe Diameter (mm)	Insulation Type	Insulation Thickness (mm)
Chilled water pumps	Cold equipment	25
Chilled water storage tanks	Cold equipment	25
Water softeners	Cold equipment	25
Condenser water storage tanks	Cold equipment	25

END OF SECTION