

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Common Work Results for HVAC Section 23 05 00

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- .2 American Society for Testing and Materials International (ASTM).
- .3 Canadian General Standards Board (CGSB).
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).
- .5 Underwriters Laboratories of Canada (ULC).
- .6 Model National Energy Code for Buildings, MNECB-1997.
- .7 ASHRAE 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

- .1 Refer to Division 01 for requirements pertaining to product options and substitutions.

1.4 SHOP DRAWINGS

- .1 Comply with requirements of Section 01 33 10.
- .2 Submit a insulation schedule, for each application and include the following information:
 - .1 Materials
 - .2 "k" value
 - .3 Thickness
 - .4 Finish
 - .5 Jacketing
- .3 Provide product data or other documentation for adhesives and sealants used in that clearly shows VOC content (in g/L).

1.5 DEFINITIONS

- .1 For the purposes of this Section, the following definitions apply:
 - .1 Concealed: piping systems and equipment in trenches, shafts, furring, crawl spaces. Suspended ceilings are considered "concealed".
 - .2 Exposed: piping systems and equipment in mechanical rooms or otherwise not concealed are considered "exposed".
 - .3 "k" Value: thermal conductivity of insulating material per unit of thickness (W/m. °C).
 - .4 Mineral Fibre Insulation: Glass fibre, rock fibre and slag fibre insulation.

1.6 FLAME/SMOKE DEVELOPMENT RATINGS

- .1 Pipe insulations, jackets, 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 S102.2, NFPA 255 or ASTM E84.
- .2 Insulating materials and accessories must withstand service temperatures without smoldering, glowing, smoking or flaming when tested in accordance with ASTM C411-82.

Part 2 Products

2.1 INSULATION MATERIALS

- .1 Hot Pipe Insulation:
 - .1 Material: formed rigid mineral fibre insulation sleeving to CGSB 51-GP-9M.
 - .2 "k" Value: maximum 0.035 W/m. °C at 24°C.
 - .3 Service Temperature: up to 150°C.
 - .4 Jacket: factory applied all purpose jacket of a white kraft bonded to a metalized polyester, reinforced with glass scrim.
- .2 Hot Equipment Insulation - Flat Surfaces:
 - .1 Material: rigid mineral fibreboard to CGSB 51-GP- 10M.
 - .2 "k" Value: maximum 0.035 W/m.°C at 24°C.
 - .3 Service Temperature: 20°C to 150°C.

- .3 Hot Equipment Insulation - Curved Surface:
 - .1 Material: mineral fibre blanket to CGSB 51-GP- 11M.
 - .2 "k" Value: maximum 0.035 W/m.°C at 24°C.
 - .3 Service Temperature: -14°C to 200°C.
 - .4 Jacket: factory applied vapour barrier jacket to CGSB 51-GP-52M.
- .4 Cold Piping Insulation - Rigid Phenolic:
 - .1 Material: formed, rigid phenolic sleeving with closed cells.
 - .2 "k" Value: maximum 0.019 W/m°C at 24°C.
 - .3 Service Temperature: -73°C to 121°C.
 - .4 Jacket: factory applied vapour barrier.
- .5 Cold Piping Insulation – Fibreglass:
 - .1 Material: formed mineral fibre rigid insulation sleeving to CGSB 51-GP-9M.
 - .2 "k" Value: maximum 0.035 W/m°C at 24°C.
 - .3 Service Temperature: -14°C to 100°C.
 - .4 Jacket: factory applied vapour barrier jacket of a white kraft bonded to a metalized polyester, reinforced with glass fibre scrim, to CGSB 1-GP-52M.
- .6 Cold Pipe Insulation - Black Rubber
 - .1 Material: flexible elastomeric unicellular preformed pipe covering to CAN2 51.40-M80.
 - .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: 13 mm.
- .7 Cold Equipment Insulation - Flat Surfaces:
 - .1 Materials: rigid mineral fibreboard to CGSB 51-GP- 10M; black rubber (flexible elastomeric unicellular sheet material).
 - .2 "k" Value: maximum 0.035 W/m°C at 24°C.
 - .3 Service Temperature: -14°C to 100°C.

- .4 Jacket: factory applied vapour barrier to CGSB 51-GP-52M.
- .8 Cold Equipment Insulation - Curved Surfaces:
 - .1 Materials: mineral fibre blanket to CGSB 51-GP- 11M; black rubber (flexible elastomeric unicellular sheet material).
 - .2 "k" Value: maximum 0.035 W/m°C at 24°C.
 - .3 Service Temperature: -14°C to 100°C.
 - .4 Jacket: factory applied vapour barrier to CGSB 51-GP-52M.

2.2 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 Tap: 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: manufacturers 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.
- .5 Type 1: Mineral fibre hydraulic setting thermal insulating and finishing cement for use up to 650°C.
- .6 Type 2: Mineral fibre thermal insulating cement for use up to 870°C.
- .7 Type 3: Expanded or exfoliated vermiculite thermal insulating cement for use up to 980°C.

2.3 RECOVERY MATERIALS

- .1 Canvas: 220 g/m² plain weave cotton fabric with dilute fire retardant lagging adhesive, ULC listed.
- .2 Aluminum: to CSA-HA-Series M-1980, 0.5 mm thick with longitudinal slip joints and 50 mm end laps, 0.4 mm thick die shaped fittings with factory attached protective liner on interior surface.

- .3 PVC: to CGSB-51-GP-53M, 0.50 mm thick (minimum) jacketing, off- white in colour with matching one-piece premoulded fitting covers.
- .4 Black Rubber Finish: insulation manufacturers recommended vinyl lacquer type coating.

Part 3 Execution

3.1 INSTALLATION

- .1 Apply insulation after required piping system tests have been completed and approved by the Consultant.
- .2 Ensure insulation is continuous through sleeves in walls and floors.
- .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 pipe fitting. Repeat supports on 4.5 m centers and at each valve and flange.
- .7 Tightly fit insulation sections to pipe to make smooth and even surfaces. Gouge out 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, clamp guides and seal with insulating cement.

3.2 HOT PIPE

- .1 Insulate the following with Hot Pipe Insulation:

<i>Service</i>	<i>Nominal Pipe Diameter (mm)</i>	<i>Insulation Thickness (mm) for Fibreglass</i>	<i>Insulation Thickness (mm) for Phenolic</i>
Hot Water Heating to 96°C	Runouts (<50)	25	20
	20 to 50	25	20
	65 and larger	40	25
Domestic Hot Water and Recirculation to 70°C	Runouts (<50)	25	20
	20 to 50	25	20
	65 and larger	40	25

- .2 Apply insulation when pipe surface temperatures are 50°C to 60°C.
- .3 Terminate insulation at each end of unions and flanges. Trowel insulation cement into bevel.

- .4 Insulate fittings with preformed 2-piece insulation covers wherever possible. Otherwise field mitre the covers. Valve and flanges to be insulated with oversize pipe insulation.
- .5 Cut mineral fibre insulation layers straight on 10 m centers with 25 mm gap to allow for expansion between terminations. Pack void tightly with mineral fibre insulation and protect joints with aluminum sleeves.
- .6 Recover exposed piping indoors with PVC. Secure PVC by applying bonding cement to all seams.
- .7 Recover exterior insulated piping exposed to outdoors with aluminum. Secure aluminum with metal banding 250 mm centers and at the circumference overlaps.
- .8 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 Chrome plated or stainless steel piping components.
 - .4 Valve bonnets on domestic water systems.
- .9 Run out insulation length to not exceed 3.7 m.

3.3 COLD PIPE

- .1 Insulate the following with Cold Pipe Insulation:

<i>Service</i>	<i>Nominal Pipe Diameter (mm)</i>	<i>Insulation Thickness (mm) for Fibreglass</i>	<i>Insulation Thickness (mm) for Phenolic</i>
Domestic Cold Water	25 and smaller	25	20
	30 and larger	40	25
Plumbing Vents	50 and smaller	12	12
	65 and larger	25	20

- .2 Insulate plumbing vents up to 2 m from point of exit at roof. Do not insulate remaining vent piping.
- .3 Apply insulation and jacket over full length of pipe or surface without penetration of hangers, interruption at sleeves and fittings. Apply non-setting sealer to ends of butt joints and seal joint seams with 100 mm wide strips of joint tape. Overwrap joint tape by 50 percent.

- .4 Insulate complete system including valves, unions, flanges, strainers. Cover fittings with mitred pipe insulation and valves with equivalent thickness of oversized pipe insulation. Cover insulation with a bedding coat of vapour barrier mastic and open mesh glass cloth and a final coat of vapour barrier mastic.
- .5 Recover insulated exposed piping indoors with PVC. Secure PVC by applying bonding cement to all the seams.
- .6 Recover exterior insulated piping exposed to outdoors with aluminum. Secure aluminum with metal banding 250 mm centers and at the circumferential overlaps.

END OF SECTION