.3 Coverage: 14 L at 9.0 m^2.

.4 Drying time to touch: 4 h maximum.

.5 Drying time firm: 48 h maximum.

.6 Service temperature: minus 29 to plus 93 °C.

.7 Application temperature: 4.4 °C minimum.

.8 Moisture permeability: 3.2 mm wet film at 37.3 °C.

.9 90% relative humidity: to ASTME96, 02 perms.

.10 Shelf life: 12 months.

.4 Silicone caulking for joining faces of rigid urethane insulation.

.1 Colour: black.

.2 Specific gravity: 1.07.

.3 Tensile strength: 25 kg/cm^2.

.4 Tear strength: 8 kg/cm^2.

.5 Service temperature: 205°C maximum.

2.7 Pipe Bedding and Surround Materials

.1 Granular material to following requirements:

.1 Crushed or screened stone or sand consisting of hard, durable, particles, free from clay lumps, cementation, organic material and other deleterious materials to Section 02315.

.2 ASTMC136 and ASTMC117. Sieve sizes to CAN/CGSB-8.1.

2.8 Backfill Materials

.1 Backfill material in accordance with Section 02315 Excavating, Trenching and Backfilling.

PART 3

PART 3 EXECUTION

3.1 Unloading and Handling of Pre-insulated Polyethylene Pipe

.1 Unload from trucks or containers by hand or by lifting apparatus with fabric slings. Do not use cables or chains.

.2 Once removed, store on smooth surface. Lay pipes flat. Where sleepers are desired use several lengths of wide planks to provide broad bearing surface.

.3 Lift, do not drag, insulated pipes from storage area to job site.

.4 Follow manufacturer's recommendations.

3.2 Repairing Damaged Pre-insulated Pipe

.1 Repair any damage to outer jacket by applying heat shrink sleeve to approval of Engineer or cover using heated HDPE UV resistant adhesive backed tape.

3.3 Trenching

.1 Do trenching work in accordance with Section 02315 - Excavating, Trenching and Backfilling.

.2 Trench depth to provide cover over pipe of not less than 1 m from finished grade.

.3 Trench alignment and depth require Engineer's approval prior to placing bedding material or pipe.

3.4 Granular Bedding and Surround

.1 Place bedding and surround material in unfrozen condition.

.2 Place materials in uniform layers not exceeding 150 mm compacted thickness up to 300 mm above top of pipe. Compact each layer before placing succeeding layer. Avoid compaction directly over pipe with less than 300 mm of cover.

.3 Shape bed true to grade to provide continuous uniform bearing surface for pipe exterior. Do not use blocks when bedding pipe.

.4 Shape transverse depressions in bedding as required to make joints.

.5 Compact each layer full width of bed to at least 90 % maximum density to ASTMD698.

.6 Fill authorized excavation or unauthorized over excavation below design elevation of bottom of specified bedding with compacted bedding material

3.5 Pipe Installation

.1 On dry ground, assemble shipping lengths of pipe into suitable installation lengths by heat butt-fusion.

.2 Provide trained personnel and jointing machine approved by pipe manufacturer for butt-fusion jointing of polyethylene pipe. Obtain services of trained technician from pipe manufacturer to certify and/or train Contractor's personnel on jointing procedures and inspect jointing machine. Obtain letter from manufacturer certifying that Contractor's representative(s) who will perform jointing, is/are qualified and that jointing equipment has been inspected and is suitable for pipe supplied.

.3 Follow manufacturer's instructions in butt-fusion of joints.

.4 Join pipes at flanged ends in accordance with manufacturer's recommendations.

.5 Recheck pipe joints assembled above ground after placing in trench to ensure no movement of joints has taken place.

.6 Complete installation of rigid polyurethane halves on joints after laying pipe in trench and after successful pressure testing of pipe.

.1 Trim half shells to required length with handsaw to provide tight-fit in insulation gap between ends of factory insulation.

.2 No seam to exceed 3 mm in width at any joint. Match outer surface of shell with outer surface of installation on pipe within tolerance of plus or minus 6 mm. Shave off any sharp edge with rasp.

.3 Hold half shells in place with masking tape while installing heat shrink sleeve.

.7 Install heat shrink sleeves using large broad flame propane torch to produce 600 mm flame.

.1 Peel back release liner 12 cm from end, centre sleeve over joint and press firmly down. Wrap sleeve around pipe, removing release liner as it is wrapped. If corner on underlap is not precut, then cut off about 25 mm from each corner.

.2 Before completing overlap wrapping, warm underlap area approximately 12 cm until adhesive starts to appear at edge. Smooth out any wrinkles with gloved hand.

.3 Remove remaining release liner and complete wrapping.

.4 Remove release paper from closure seal, prewarm adhesive slightly, centre seal over overlap and press down until well bonded. Heat closure seal, and press down with gloved hand to remove any bubbles and wrinkles.

.5 With torch, start at centre of sleeve and shrink it all around joint. Keep torch moving using broad circumferential strokes to avoid burning. Continue shrinking sleeve toward one end until about 50mm is left. Then aim torch inward towards centre and shrink edges. Repeat this operation on other end of sleeve. Finish off by applying long horizontal strokes of torch all around sleeve.

.6 Pay special attention to sleeve overlap area, ensuring no void remains along underlap edge. Use roller, or gloved hand to firmly and thoroughly press down along underlap edge. Start in centre and work outwards.

.7 Allow joint and sleeve to cool for at least 30 min before lowering pipe into trench.

.8 Lay pipes on prepared bed, true to line and grade as indicated. No deviations to be made without written approval of Engineer. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take out and replace defective pipe. Correct pipe that is not in true alignment or grade, or pipe that shows undue settlement after installation. Change method or equipment for setting alignment or grade if requested by Engineer.

.9 Do not lay pipe on frozen bedding.

.10 Do not let rocks or other foreign material, which might damage insulation jacket, fall on pipe.

.11 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Install removable watertight bulkhead at open end of pipe to prevent entry of foreign materials.

3.6 **Insulation of Fittings**

.1 Cut pipes as required to accommodate fittings and fitting insulation kits without damaging pipe insulation or its jacket. Leave smooth end at right angles to pipe axis.

.2 Cracks larger than 6.4 mm to be filled with insulation foamed-in-place in following manner:

.1 Use strip of thin galvanized sheet metal wide enough to overlap both insulation kit and pipe by at least 8 cm and long enough to wrap around pipe leaving 2.5 cm opening on top.

.2 Hold metal in place with two tension metal or nylon straps, one at either end.

.3 Spray foam through opening on top into cavity.

.4 Spray until cavity is almost half-filled on both sides of pipe. Foam will rise to complete filling.

.5 Allow to cure for 10 to 15 min.

.6 Trim top and apply waterproofing sealant asphalt mastic, HDPE tape or heat shrink tape.

3.7 **Pipe Backfilling**

.1 Do backfilling work in accordance with Section 02315 - Excavating Trenching and Backfilling.

.2 Lay continuous runs of warning tape on top of surround material 300 mm directly above water mains.

.3 Upon completion of pipe laying and after Engineer has inspected work in place, surround and cover pipes between joints.

.4 Protect pipe from freezing if temperatures lower than minus 5°C.

.5 When Engineer accepts testing results, surround and cover joints and fittings with surround material placed and compacted as specified.

.6 Place backfill material above pipe surround, in uniform layers not exceeding 150 mm compacted thickness.

.7 Mechanically compact each layer to at least 90 % maximum density to ASTMD698.

3.9 Testing

1. Give five (5) days written notice of date for tests.

2. Insulted or conceal work only after testing and approval by Engineer.

3. Engineer reserves the right to be present during testing.

4. Bear costs including retesting and making good.

5. Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

6. Hydrostatically test the high density polyethelene piping systems prior to installation in accordance with the following procedures, as recommended by the pipe manufacturer:

.1 Over a period of three (3) hours, slowly raise the pressure in the pipe to 1.5 times the rated pressure of the pipe.

.2 During the next 1 hour, maintain the required test pressure.

.3 Start the test after the above described initial "pipe stretch" period.

.4 Observe and record the hydrostatic pressure in the pipe over the next 3 hour period at ½ hour intervals.

.5 At the end of the 3 hour test period, measure the amount of makeup water required to be added to the system to return the pipe to the test pressure.

.6 An acceptable test is one for which the amount of makeup water does not exceed the following:

Nominal Pipe Size	Maximum Allowable Makeup Water @ 23°C.
100	5.0
250	7.8
300	12.6

Correction (Mulitplication) factor to be applied to make up water.

Pipe Testing Temperature	Allowance in Table Above
23°C	1.0

22°C	0.875
20°C	0.75
18°C	0.66
16°C	0.60
14°C	0.53
12°C	0.47
10°C	0.42
8°C	0.36
6°C	0.325

For pipe testing temperatures between those listed above, interpolate correction factor.

For pipe testing temperatures above or below limits tabulated, contact Engineer.

.7 Allow a minimum of 8 hours between successive polyethelene pipe tests to allow pipe to "relax".

.8 Hydrostatically test steel piping system by pressurizing with water to 860kPa, and maintaining this pressure for a period of 4 hours without leakage.

.9 Flush out all new piping with fresh, clean water for a period of one (1) hour following final pressure test.

.10 Provide written documentation of all test results, for acknowledgement by Engineer.

3.10 Flushing and Disinfecting Water Lines

.1 Flushing and disinfection operations shall be carried out by the Contractor and must be witnessed by the Public Works Representative, or Engineer. Notify the Engineer at least five (5) days in advance of the proposed date when disinfecting operation will commence.

.2 Complete all leakage procedures, standards and tests before flushing and disinfection.

.3 Before being placed into service, all new process piping shall be flushed and disinfected.

.4 Flush all piping through available outlets with a sufficient flow to produce a velocity of 1.5 m/s, within the pipe for thirty (30) minutes, or until all foreign materials have been removed and the flushed water is clear. This includes the intake casings and is to be completed prior to final installation.

.5 Supply materials and test kits to carry out dis infection tests for total and fecal coliforms; and total and residual chlorine at no additional cost to the Owner.

.6 Disinfect immediately after flushing. Disinfect all potable water pipes. Use either Method A or B as indicated:

Method A

.1 Fill piping system with chlorine/water solution with a strength of at least 50mg/L. Ensure pipe is full and no air pockets remain.

.2 Leave solution in piping system for 24 hours, while maintaining a pressure of 175 kPa.

.3 After 24 hours sample and test the chlorine solution for total and fecal coliform (FC) levels. If the chlorine residual is at least 25 mg/L and the FC levels are within acceptable limits, the disinfection will be considered successful. Flush chlorine solution from the piping system. Protect against contamination of the disinfected system.

.4 If the chlorine residual is less than 25 mg/L or the total and FC levels are unacceptable, flush the piping system, clean any deleterious material, reflush and disinfect again. Repeat until satisfactory.

Method B

.1 Introduce chlorine solution into the intake casing to achieve a chlorine residual of 50 mg/L in the discharge pipe, which is to be recirculated back to the pump.

.2 Operate the pump and allow the chlorine solution in the intake casing. Operate continuously for 2 hours.

.3 After 2 hours sample and test the chlorine solution and the total and fecal coliform (FC) levels. If the chlorine residual is at least 25mg/L and the total and FC levels are within acceptable limits, the disinfection will be considered successful. Flush chlorine

solution from the piping system. Protect against contamination of the disinfected system.

.4 If the chlorine residual is less than 25mg/L or the total and FC levels are unacceptable, flush the piping system, clean any deleterious material, reflush and disinfect again. Repeat until satisfactory.

.7 The Contractor shall collect two (2) samples of disinfectant solution for bacteriological testing. The Contractor is responsible for submitting the samples to an accredited laboratory for total and fecal coliform testing for verification of field tests. The results are to be sent to the Engineer for confirmation.

.8 If, in the opinion of the Engineer, any component of the potable water system becomes contaminated after disinfection, it shall be flushed and disinfected again at no additional cost to the Owner.

.9 Do not discharge flush water or disinfection solution to the Mackenzie River. Flush water is to be disposed of at the community sewage lagoon.SPEC NOTE: Re 3.11. Delete where not applicable.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1- [1989], Power Piping, (SI Edition).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A 125- 81(1988), Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307- 94, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563- 94, Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58- 1993, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP-69-1991, Pipe Hangers and Supports - Erection and Application.

.3 MSS SP-89-1991, Pipe Hangers and Supports - Fabrication and Installation.

1.2 Design Requirements

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Submit shop drawings and product data in accordance with Section 15010.

.3 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

1.4 Closeout Submittals

.1 Provide maintenance data for incorporation into manual specified in Section 01730 - Operations and Maintenance Manual.

PART 2 PRODUCTS

2.1 General

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP-58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 Pipe Hangers

.1 Finishes:

.1 Pipe hangers and supports: galvanized painted with zinc-rich paint after manufacture.

.2 Use electro-plating galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: Suspension from lower flange of I-Beam.

.1 Cold piping NPS 2 maximum: Malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed 13 mm FM approved.

.2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed FM approved to MSS-SP-58 and MSS-SP-69.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved to MSS-SP-69.

.2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed FM approved.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed FM approved to MSS-SP-69.

.5 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.4 Cadmium plated continuous thread.

.6 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel black galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.7 Adjustable clevis: material to MSS SP-69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-69.

.9 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A 563.

.1 Finishes for steel pipework: black galvanized.

.2 Finishes for copper, glass, brass or aluminum pipework: black galvanized, with formed portion plastic coated.

.10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.

2.3 Riser Clamps

.1 Steel or cast iron pipe: galvanized black carbon steel to MSS-SP-58, type 42, UL listed FM approved.

.2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.4 Insulation Protection Shields

.1 Insulated cold piping:

.1 64 kg/m3 density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-69.

2.5 Constant Support Spring Hangers

.1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/- 5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

.2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 Variable Support Spring Hangers

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger to be complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 Equipment Supports

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements. Submit calculations with shop drawings.

2.8 Equipment Anchor Bolts and Templates

.1 Provide templates to ensure accurate location of anchor bolts.

2.9 House-keeping Pads

.1 For base-mounted equipment: Concrete, at least 100 mm high, 50 mm larger all around than equipment, and with chamfered edges.

.2 Concrete: to Section 03300 - Cast-in-place Concrete.

2.10 Other Equipment Supports

.1 Submit structural calculations with shop drawings.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with:

.1 manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 vertical movement of pipework is 13 mm or more,

.2 transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 transfer of load to adjacent piping or to connected equipment is not critical.

.2 variation in supporting effect does not exceed 25 % of total load.

3.2 Hanger Spacing

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.6 Within 300 mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	
10	6.6 m	
12	6.9 m	

.7 Pipework greater than NPS 12: to MSS SP-69.

3.3 Hanger Installation

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 Horizontal Movement

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4° from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 Final Adjustment

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

PART 1 GENERAL

1.1 References

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1- 1989.

.2 American Society for Testing and Materials (ASTM).

.1 ASTM B 209M- 92a, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.2 ASTM C 335- 95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C 411- 82(1992) , Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449M- 88 , Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 795- 92 , Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.6 ASTM C 921- 89 , Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.2- 95, Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers.

.2 CAN/CGSB-51.9- 92, Mineral Fibre Thermal Insulation for Piping and Round Ducting.

.3 CAN/CGSB-51.10- 92], Mineral Fibre Board Thermal Insulation.

.4 CAN/CGSB-51.11- 92, Mineral Fibre Thermal Insulation Blanket.

.5 CAN/CGSB-51.12- 95, Cement, Thermal Insulating and Finishing.

.6 CAN/CGSB-51.40- 95, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.

.7 CGSB 51-GP-52Ma- 89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Manufacturer's Trade Associations.

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

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102- M88, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 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" - will mean "not concealed" as defined herein.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

:2 CRF: Code Rectangular Finish.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.4 Samples

.1 Submit samples in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.5 Manufacturer's Instructions

.1 Submit manufacturer's installation instructions in accordance with Section 01340 - Shop Drawings, Samples and Mock-Ups.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.6 Qualifications

.1 Installer to be specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards member of TIAC.

1.7 Delivery, Storage and Handling

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

1.8 Description of System

.1 Provide insulation on the following systems.

.1 fresh air duct work.

.2 exhaust and relief air duct work.

PART 2 PRODUCTS

2.1 Fire and Smoke Rating

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 Insulation

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code C-1: Rigid mineral fibre board to CAN/CGSB51.10, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to CAN/CGSB-51.11 faced withfactory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/CGSB-51.11.

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

.3 Maximum "k" factor: to CAN/CGSB-51.11.

2.3 Jackets

.1 Canvas:

.1 220 gm/m 2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:

.1 To ASTM B 209 with 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: 12 or 19 mm wide, 0.5 mm thick stainless steel.

.4 Stainless steel:

.1 Type: 304 or 316.

.2 Thickness: 0.25 0.50 mm sheet.

.3 Finish: Smooth.

.4 Jacket banding and mechanical seals: 12 or 19 mm wide, 0.5 mm thick stainless steel.

2.4 Accessories

.1 Vapour retarder lap adhesive:

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

.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.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m 2 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 2.

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

.7 Contact adhesive: quick-setting

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

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

.12 Fasteners: 4 mm diameter pins with 35 mm square] clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 Pre-installation Requirements

.1 Pressure testing of ductwork systems to be complete, witnessed and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 Installation

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

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

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 15061 Bases, Hangers and Supports

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

3.3 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
Round cold and dual temperatire 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 to mixing plenum	C-1	yes	25
Mixing plenums	C-1	yes	25
Exhaust duct between dampers and louvres	C-1	no	25
Rectangular ducts outside	C-1	special	50
Round ducts outside	C-1	special	50
Acoustically lined ducts	none		

.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	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3

	TIAC Code	
	Rectangular	Round
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

END OF SECTION