

USask Master Specification Directions: The master specifications are intended to be incorporated into the Consultant's final, project specific specification package. The project specific specifications are expected to include any and all sections or portions of sections (Part 1, Part 2, Part 3) that are required to create a fully executable project specification. USask Master Specs only provide information that USask **requires** be a part of the final specification package. Components or sections not included in the Master USask Specifications may still be required for a complete, well-designed project. **It is the consultant's responsibility to ensure all specifications match USask requirements. Any deviations or revisions to any section included in the master specifications requires written consent from the USask Engineering department. The consultant is liable for any omissions, errors, or incorrect equipment or components supplied to site.**

The Master Specifications shall be used in conjunction with USask's Design Guidelines. Any conflicts shall be brought to the attention of USask Engineering staff for clarification.

Part 1 General

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 specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed $34.56(\text{Wmm})/(\text{m}^2\text{C})$ at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket, complete with All Service Jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Maximum "k" factor: to CAN/ULC-S702.
 - .3 Acceptable product: Manson Alley-K, Fibrex, Knauf
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket and All Service Jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702.
 - .4 Acceptable product: Manson Alley-K, Fibrex, Knauf
- .5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to CAN/ULC-S702.
 - .2 Jacket: to CGSB 51-GP-52Ma.

- .3 Maximum "k" factor: to CAN/ULC-S702.
- .6 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Insulation: with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
- .7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
 - .1 Insulation: to ASTM C533.
 - .2 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

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

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.1 JACKETS

- .1 Canvas:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.
- .2 Aluminum:
 - .1 To ASTM B209, with moisture barrier as scheduled in PART 3 of this section.
 - .2 Thickness: 0.50 mm sheet.

- .3 Finish: stucco embossed.
- .4 Joining: longitudinal and circumferential lap joints with 50 mm laps.
- .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
- .6 Metal jacket banding and mechanical seals: minimum 12 mm wide, 0.5 mm thick stainless steel at 300 mm spacing.
- .3 Stainless steel:
 - .1 To ASTM A-240.
 - .2 Type: 304.
 - .1 Use 316 where directed, for additional corrosion protection.
 - .3 Thickness: 0.25 mm.
 - .4 Finish: smooth.
 - .5 Joining: longitudinal and circumferential lap joints with 50 mm laps.
 - .6 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .7 Metal jacket banding and mechanical seals: minimum 12 mm wide, 0.5 mm thick stainless steel at 300 mm spacing.
- .4 Polyvinyl Chloride (PVC):
 - .1 One piece molded type fittings, rolls, and sheet to CAN/CGSB-51.53.
 - .2 Colours: white.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness, minimum:
 - .1 up to 375mm \varnothing : 0.5mm (.02")
 - .2 375mm \varnothing and larger: 0.8mm (.03")
 - .7 Securement: Combination of vapour retarder lap adhesive, solvent weld adhesive, mechanical tacks and PVC tape, as recommended by manufacturer and service conditions.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION – HOT WATER, GLYCOL, STEAM, CONDENSATE, CHILLED WATER (TEMPERED)

- .1 Cover with Fiberglass Sectional Pipe Insulation with All Service Jacket with side and end joints butted tightly. Seal lap of jacket and Butt Joint strips with Lagging Adhesive. Pressure sensitive tape shall also be used to seal longitudinal and butt joints as well as the adhesive. Tape shall be Mactac Aluminum Foil Tape, well burnished in place. Where piping is exposed, the insulation shall be recovered with canvas pasted down and finished with sufficient coats of Foster Lagfas to seal.
- .2 Expansion and ball joints shall be insulated. Allow for movement due to expansion.
- .3 All flanges, valves, and fittings 64mm and over shall be insulated with fabricated mitred segments of pipe insulation equal in thickness to the insulation on the adjoining pipe.
- .4 Fittings on piping 50mm and smaller shall be insulated as above.
- .5 If Victaulic piping systems are used, all couplings shall be insulated and finished as noted above.
- .6 Approved PVC elbow covers meeting requirements may be used. Screws, tacks, or other mechanical fasteners shall not be used. PVC elbows to be recovered with approved canvas to match appearance of adjacent canvas covered insulation.
- .7 Do not insulate over unions. Ends of insulation at unions and other non-insulated components shall be neatly tapered, sealed and finished.
- .8 Apply materials in accordance with manufacturers instructions and this specification.

3.4 INSTALLATION - CHILLED WATER PIPING, GLYCOL PIPING ON HEAT RECLAIM SYSTEMS

- .1 Piping, fitting, valves: Insulate with Fiberglass or Manson Alley-K sectional pipe insulation with All Service Jacket and vapour barrier.
- .2 All insulation and vapour barriers to be continuous without penetration or breaks except for hanger rods. See below for treatment at hanger rods.
 - .1 Piping at hangers as follows: insulate up to the ring hanger with a first layer of insulation (25 mm), apply over the ring hanger a second layer of insulation (25 mm or as required), approximately 300 mm long, then insulate up the rod and past the turnbuckle. Vapour seal all. Hanger rods shall have 13 mm insulation applied around the rod for a distance of 100 mm up the rod beyond the pipe insulation.
- .3 All pumps, valves, fittings, etc. shall be insulated with molded or fabricated insulation of a thickness equal to that of the insulation of the adjoining pipe, securely fastened in place.
- .4 All exposed piping, fittings, valves, etc. shall be covered with canvas nearly adhered in place. Lagging adhesive shall be applied to canvas.
- .5 Paint all steel piping to prevent rusting prior to installation of insulation. Paint shall be Bakor 110-14. Painted coating to be inspected and approved by Owner's representative before insulation is installed. Paint shall be applied at a thickness of 1.5 mm for all piping to be insulated. Coating thickness to be increased to 3 mm on equipment that requires vapour barrier but will not be insulated.

- .6 Chilled water piping serving Dry Coolers and located outside the building shall not be insulated.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
 - .1 Securements: 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3.
 - .1 Securements: 300 mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .4 Thickness of insulation as listed in following table.
 - .1 For tanks and heat exchangers, use semi-rigid fiberglass board in roll form faced with factory applied jacket to suit application. Equal to Knauf Pipe and Tank Insulation.
 - .2 Based on latest NECB requirements.

Application	Temp (° C)	TIAC code	Pipe sizes (mm) and Minimum Insulation Thickness (mm)				
			Runouts up to 50	Up to 25	32 - 50	65 - 100	150 and Larger
Steam, high pressure	> 177	A-1	38	115	125	125	125
Steam, medium pressure	122-177	A-1	38	75	100	115	115
Steam, low pressure	Up to 121	A-1	38	63	63	75	75
Condensate, Low Pressure	61 - 94	A-1	25	38	50	50	50
Pumped Condensate return	up to 94	A-1	25	38	50	50	50
Hot Water Heating	up to 94	A-1	25	38	50	50	50
Glycol Heating	up to 94	A-1	25	38	50	50	50
Chilled Water	4 - 13	A-3	25	25	38	50	50

Chilled Water or Glycol	below 4	A-3		25	38	50	50
Heat Exchangers, Flash Tanks	All	See note 1		50	50	50	50
Refrigerant	All	A-6	25	25	25	25	25
Diesel Generator Exhaust	All	A-2	38	65	65	75	90

.5 Finishes:

- .1 Concealed indoors: canvas on valves, fittings. No further finish.
- .2 Exposed indoors: none.
- .3 Exposed in mechanical rooms/service spaces: canvas, aluminum, or PVC jacket.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Outdoors: waterproof 304SS, except where 316SS is called for in these specifications or on the drawings.
- .6 Installation: to appropriate TIAC code CRF/1 through CPF/5.

END OF SECTION