

SPECIFICATION

Resolution Phenolic foam insulation AS/NZ 4859

Building Equipment

THERMAL INSULATION SPECIFICATION

GENERAL SPECIFICATION FOR Resolution THERMAL INSULATION FOR HEATING, VENTILATING AND AIR CONDITIONING SERVICES.

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THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

1.0 GENERAL

1.1 SCOPE

1.1.1 This SPECIFICATION covers the specific requirements and design features of supply and application of internal and external thermal insulation for pipe work, vessels and auxiliary equipment in heating, ventilating and air conditioning services.

1.1.2 Insulation in hot service shall generally be defined as vessels, equipment and piping at normal operating temperature above ambient temperature where reduction of heat transport is desired.

Domestic hot water	up to 65°C
Low pressure hot water	up to 95°C
Medium pressure hot water	up to 120°C

1.1.3 Insulation in cold service shall generally be defined as vessels, equipment and piping at normal operating temperature of +15°C and lower where reduction of heat gain and the prevention of surface condensation is desired.

Chilled water	0°C to 6°C
Cold water	6°C to 12°C

1.1.5 This specification shall be followed in all respects, unless deviations, for example with regard to national and/or local regulations, are specifically noted on the requisition.

1.2 STANDARDS

1.2.1 **European standard NEN-EN 13166 and AS/NZ 4859**

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

1.3 EXTENT OF INSULATION

- 1.3.1 All piping, equipment and ductwork within the scope of this specification shall be completely insulated, after completion and acceptance of all tests for leaks. Instruments shall be insulated when specified.
- 1.3.2 All supply and water mains, headers, branches, risers, drips, runouts, pump suction and discharge, pipe fittings, and valves on all services operating below ambient temperature shall be insulated to the extent specified. Flanges and unions for all piping as above shall be insulated except where making final connections to equipment.
- 1.3.3 All metal parts which protrude through the insulation, shall be insulated to the same thickness as the piping/equipment over a length of at least three times this thickness.
- 1.3.4 Surfaces required to be bare for operating reasons shall be left exposed when specified.
- 1.3.5 Each line shall be insulated as a single unit. A minimum clearance of at least 50 mm between the outside surface of any insulation and adjacent equipment or structural member shall be maintained.
This clearance shall take account the thickness of any fire proofing, coating or insulation, applied to such adjacent equipment or structural members.
- 1.3.6 When pumps and compressors are to be insulated, thermal dams shall be provided to insulate the pump support from supporting steel or concrete.
- 1.3.7 On surfaces operating below ambient temperature a complete vapour barrier seal shall be provided over the insulation by a continuous unpunctured vapour barrier foil.
- 1.3.8 Gauge glasses of insulated equipment operating below ambient temperature shall be fully insulated except for the face of the glass.
- 1.3.9 Name plates, coding tags, etc. on pipes or equipment operating below ambient temperature shall be insulated. A duplicate name plate shall be installed over the outside surface of the insulation system. The method of attachment used shall not puncture the vapour barrier.
- 1.3.10 The supply and installation of duplicate name plates shall be done by others.
- 1.3.11 All air conditioning supply air ducts shall be insulated, including covering of seams and ducts stiffeners. Return air ducts shall be insulated where they are not in air conditioned areas, exposed to ambient conditions and where shown on the drawings. Ducts exhausting air directly to the outside and ducts acoustically lined shall not be insulated thermally unless noted on the drawings.
- 1.3.12 All insulation, exposed to weather conditions, shall be weatherproofed with a heavy duty mastic, applied in accordance with the instructions on the manufacturer's technical data sheet or with metal jacketing.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

1.3 EXTENT OF INSULATION (Contd)

- 1.3.13 Where insulated pipes or ducts pass through hangers, sleeves or openings, the full specified thickness of the insulation shall pass through the hanger, sleeve or opening, unless otherwise noted on the line tables and/or drawings.

Note: Vapour barriers, if specified, shall be continuous through sleeves, openings, etc.

1.4 INSULATION THICKNESS

- 1.4.1 The thickness of insulation shall be as the relevant services in tables 1 to 4.
The following thermal conductivity values have been used in determining the thicknesses of **Resolution** insulation:

Mean Temperature in °C	Thermal Conductivity in W/Mk
10	0.022
40	0.027
55	0.029

- 1.4.2 To select the thickness of insulation in hot service, the highest operating temperature of the medium in the equipment or pipeline shall be taken.
- 1.4.3 To select the thickness of insulation in cold service, the lowest operating temperature of the medium in the equipment or pipeline shall be taken.
- 1.4.4 The thickness of the basic insulation on pipe fittings and valves shall be the same as the thickness on the adjoining pipe.
- 1.4.5 The thickness of the basic insulation on equipment heads shall be the same as the thickness on the cylindrical section of the vessel.
- 1.4.6 Insulation thicknesses for other ambient air temperatures, relative humidities and wind velocities than indicated in the tables on the appendices shall be calculated separately.

1.5 INSULATION SUPPORTS

- 1.5.1 In general all support rings shall be clamped on the pipe. In principle all welding of rings and studs on equipment and piping shall be done by the installation contractor.
- 1.5.2 Welding of studs, rings and the use of welding pins is not permitted on all equipment or piping, unless permitted in writing by the consulting engineer.
- 1.5.3 Material of studs to be identical to the material to which it will be welded.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

1.6 MATERIALS

- 1.6.1 All materials shall be in strict accordance with this specification and fulfil the EN 13166 / AS/NZ 4859
- 1.6.2 Dissimilar metals and materials subject to galvanic corrosion shall not be installed in contact with each other.
- 1.6.3 The use of galvanised or zinc coated insulation steel jacketing and accessories on or near austenitic stainless steel and austenitic nickel steel/alloy equipment and piping, is prohibited.

1.7 STORAGE AND HANDLING OF MATERIALS

- 1.7.1. Insulation materials, mastics, sealants, adhesives, etc. shall be supplied in original unopened packing and stored in a locked, weatherproof enclosure till application.
- 1.7.2. Packing shall be clearly marked with manufacturer's name, brand name, type, quality and dimensions.
- 1.7.3. Materials shall be kept dry and free of dust and other foreign matter.
- 1.7.4. Phenolic foam insulation shall be stored in dry and clean condition and not exposed to sunlight.
- 1.7.5. Manufacturer's instructions shall be adhered to.
- 1.7.6. Shelf life, where applicable, shall never be exceeded.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

2.0 PIPING AND EQUIPMENT INSULATION

2.1 INSULATION FOR PIPING AND FITTINGS

- 2.1.1 Preformed half pipe sections/segments of **Resolution** , foil faced with alu foil in either 500 mm and/or 1000 mm length built up to the thickness specified shall be used.
- 2.1.2 Prefabricated and prelaminated models for bends, flanges, valves, etc. shall be used wherever practical.

2.2 PIPE SUPPORTS FOR COLD PIPE WORK

- 2.2.1 Special high-density **Resolution 60, 80 or 120** pipe support units, foil faced with alu foil shall be used.
- 2.2.2 Pipe supports shall be fitted by the pipe work installation contractor.

2.3 INSULATION FOR HEADS

- 2.3.1 Up to 1000 mm Outside Insulation Diameter the rigid foam shall be supplied in 3-dimensional milled domes in 1 or 2 piece(s).
- 2.3.2 For O.I.D. between 1000 mm and 1800 mm the rigid foam shall be supplied in either 3-dimensional milled domes in 1 or 2 piece(s) or factory-made radiused, bevelled and mitred segments.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

3.0 AIR CONDITIONING DUCTWORK INSULATION

3.1 INSULATION FOR CIRCULAR DUCTING

- 3.1.1 Preformed half pipe sections/segments of **Resolution**, foil faced with alu foil in either 500 mm and/or 1000 mm length built up to the thickness specified shall be used.
- 3.1.2 Prefabricated and prelaminated models for bends, flanges, valves, etc. shall be used wherever practical.

3.2 INSULATION FOR RECTANGULAR DUCTING

- 3.2.1 Standard slabs of **Resolution**, aluminium foil faced, in 1000 mm length built up to the thickness specified shall be used.

3.3 INSULATION FOR OVAL DUCTING

- 3.3.1 A combination of standard slabs in 1000 mm length and preformed half pipe sections/segments of **Resolution**, foil faced with Alu foil in either 500 mm and/or 1000 mm length built up to the thickness specified shall be used.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

4.0 APPLICATION**4.1 GENERAL**

- 4.1.1 Piping, equipment and ductwork shall not be insulated until welding and testing has been completed and released for insulation work.
- 4.1.2 Piping, equipment and ductwork which is subject to leak testing or other shall not be insulated until such tests have been successfully completed and released for insulation work.
- 4.1.3 All surfaces to be insulated shall be made free of foreign matter and shall be clean, and free of all oil, grease and loose scale.
- 4.1.4 All surfaces to be insulated shall be dry and free from frost.
- 4.1.5 All lines and equipment constructed of copper, ferritic and austenitic materials to be insulated shall have been prime-coated.
- 4.1.6 Components of dissimilar metals shall not be brought into contact with each other, unless otherwise noted in the specification.

4.2 INSULATION IN HOT SERVICE

Domestic hot water	up to 65°C
Low pressure hot water	up to 95°C
Medium pressure hot water	up to 120°C

4.2.1 PIPEWORK

The **Resolution** insulation sections/segments shall be preformed to fit the diameter of the pipe or underneath layer of insulation.

- 4.2.2 All insulation joints shall be installed close butted together.
- 4.2.3 All insulation joints shall be carefully fitted. Filling voids with adhesive, joint sealer or mastic shall not be acceptable. Any damaged corners shall be trued before application.
- 4.2.4 All circumferential and longitudinal seams in the aluminium foil shall be sealed with a self-adhesive aluminium joint tape.

4.2.5 BENDS

Prefabricated and prelaminated **Resolution** insulation bends shall be used wherever practical.

If site mitred bends are specified the segments shall be faced with a self-adhesive aluminium tape.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

4.3 INSULATION IN COLD SERVICE

Chilled water	0°C to 6°C
Cold water	6°C to 12°C

4.3.1 PIPEWORK

All insulation sections/segments shall be preformed to fit the diameter of the pipe or underneath layer of insulation.

4.3.2 All joints shall be carefully fitted. Filling voids with adhesive, joint sealer or mastic shall not be acceptable. Any damaged corners shall be trued before application.

4.3.3 The circumferential and longitudinal seams in the aluminium foil shall be sealed with a self-adhesive aluminium joint tape.

4.3.4 BENDS

Prefabricated and prelaminated **Resolution** insulation bends shall be used wherever practical.

If site mitred bends are specified, the segments shall be faced with a self-adhesive aluminium tape.

4.3.5 PIPE SUPPORTS

Special high-density **Resolution 60, 80 or 120** pipe supports shall be installed in conjunction with the pipe support clamp. Insulation for supports shall be equal in thickness to that applied to equivalent sized piping.

The pipe insulation shall be installed close and tightly butted against the pipe support.

The vapour barrier shall be made continuous.

4.3.6 FITTINGS, VALVES AND FLANGES

Insulation for fittings, valves, flanges and supports shall be equal in thickness and type to that applied to adjacent or equivalent sized piping.

4.3.7 Flange covers shall be pre-formed or fabricated in single layer matched halves to the extent possible. Where multilayer is necessary, longitudinal joints shall be staggered and of tongue and groove construction.

4.3.8 Individual layers of insulation for fittings shall to the maximum extent be fitted in two-piece fabricated covers with individual segments cemented together with a two part solvent free fabrication adhesive.
Application for the joints between the two halves and the adjacent piping insulation shall be in the same manner as specified for the respective insulation layers on straight piping.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

4.3 **INSULATION IN COLD SERVICE** (Contd.)

4.3.9 Insulation shall fit the surface of the valve, support or fitting with as few voids as possible, with all joints tightly fitted together.

4.3.10 **EQUIPMENT**

Insulation segments shall be pre-formed to fit the diameter of the equipment or underneath layer of insulation and shall be laid with staggered joints and the full joint faces (of the outer layer) shall be completely sealed, using a butylic based sealant.

4.3.11 The joints around the protrusions shall be completely filled and sealed using jointing compound.

4.3.12 Wire is not to be used to secure this method.

4.3.13 All insulation segments up to 3500 mm outside insulation diameter shall be secured with filament tape 38 mm (1.5") wide at approx. 300 mm centres. Over 3500 mm diameter stainless steel banding shall be used.

4.3.14 **CIRCULAR AIR CONDITIONING DUCTWORK**

All insulation sections/segments shall be pre-formed to fit the diameter of the duct.

4.3.15 All insulation joints shall be installed close butted together and the full joint faces (of the outer layer) shall be completely sealed, using a butylic based sealant.

4.3.16 All **Resolution** insulation sections/segments shall be secured with three self-adhesive tape bands per linear metre of ductwork.

4.3.17 All joints shall be carefully fitted. Filling voids with adhesive, joint sealer or mastic shall not be acceptable. Any damaged corners shall be trued before application.

4.3.18 The circumferential and longitudinal seams in the aluminium foil shall be sealed with a self-adhesive aluminium joint tape.

4.3.19 **BENDS**

Prefabricated and prelaminated **Resolution** insulation bends shall be used wherever practical.

If site mitred bends are specified, the segments shall be faced with a self-adhesive aluminium tape.

THERMAL INSULATION MATERIALS INSTALLATION PROCEDURES:

specification for insulation of piping, equipment and ductwork of heating, ventilating and air conditioning services.

4.3 INSULATION IN COLD SERVICE (Contd)

4.3.20 RECTANGULAR AIR CONDITIONING DUCTWORK

All insulation slabs shall be cut to fit on site. The top and bottom slabs shall overlap the sides at all corners of the ductwork. The insulation slabs shall be adhered to the duct surface using a quick-setting, non-flammable, fire-resistive, synthetic elastomeric adhesive. On the underside of the duct the insulation shall be additionally secured by means of insulation "stick" pins and washers, fixed at maximum 300 mm centres.

4.3.21 VAPOUR BARRIER MATERIALS

The circumferential and longitudinal seams in the vapour barrier foil shall be sealed with a self-adhesive vapour barrier tape.

4.3.22 There shall be absolutely no cracks, holes, thin spots, open joints or seams in the vapour barrier foil.

4.3.23 Any evidence of discontinuity of the vapour barrier foil shall be sufficient cause for rejection or repair.

4.3.24 Vapour barriers shall be continuous through sleeves, openings, etc.

4.3.25 Repairs to the vapour barrier foil shall be carried out using self-adhesive vapour barrier tape.

4.3.26 If metal jacketing is specified self-tapping screws are not allowed.
Care shall be taken not to damage the vapour barrier with other fastenings.

APPENDIX A**TABLE 1** THICKNESS OF THERMAL INSULATION ON HOT PIPES AND VESSELS. (based on K value's declared according **AS/NZ 4859**)MATERIAL: **Resolution****INSULATION THICKNESSES IN MM**

Pipe size N.B.	Pipe size O.D.in mm	DHW up to 65°C	LTHW up To 95°C	MTHW up to 120°C
15	21.3	20	20	20
20	26.9	20	20	20
25	33.7	20	20	20
32	42.4	20	20	20
40	48.3	20	20	20
50	60.3	20	20	20
65	76.1	20	20	25
80	88.9	20	20	25
100	114.3	20	25	25
125	139.7	20	25	25
150	168.3	20	25	30
200	219.1	25	25	30
250	273.0	25	30	30
300	323.9	25	30	30
Flat Surfaces	Vessels	30	35	40

D.H.W. = Domestic Hot Water Services
 L.T.H.W. = Low pressure Hot Water
 Heating and Conventional Domestic Central Heating
 M.T.H.W = Medium Pressure Hot Water
 Heating and Unvented Domestic Central Heating Systems

Notes:

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX B

TABLE 2 MINIMUM THICKNESS OF THERMAL INSULATION TO PREVENT CONDENSATION ON INSULATION OF COLD PIPES, EQUIPMENT AND VESSELS (based on K value's declared according **AS/NZ 4859**)

MATERIAL: **Resolution**

INSULATION THICKNESSES IN MM

Pipe size N.B.	Pipe size O.D.in mm	Cold Water 6°C – 12°C High e	Chilled Water 0°C – 6°C High e	Cold Water 6°C – 12°C Low e	Chilled Water 0°C – 6°C Low e
15	21.3	20	20	20	20
20	26.9	20	20	20	20
25	33.7	20	20	20	20
32	42.4	20	20	20	20
40	48.3	20	20	20	20
50	60.3	20	20	20	20
65	76.1	20	20	20	20
80	88.9	20	20	20	20
100	114.3	20	20	20	20
125	139.7	20	20	20	20
150	168.3	20	20	20	25
200	219.1	25	25	25	25
250	273.0	25	25	25	25
300	323.9	25	25	25	30
Flat Surfaces	Vessels	25	25	25	30

Low e = Low emissivity

High e = High emissivity.

Notes:

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX C

TABLE 3 MINIMUM THICKNESS OF THERMAL INSULATION TO PREVENT CONDENSATION ON INSULATION OF COLD PIPES, EQUIPMENT AND VESSELS ((based on K value's declared according **AS/NZ 4859**)

MATERIAL: **Resolution**

INSULATION THICKNESSES IN MM

Pipe size N.B.	Pipe size O.D.in mm	0°C High e NC	-10°C High e NC	-18°C High e NC	0°C High e SC	-10°C High e SC	-18°C High e SC
15	21.3	20	20	20	20	20	20
20	26.9	20	20	20	20	20	20
25	33.7	20	20	20	20	20	20
32	42.4	20	20	20	20	20	20
40	48.3	20	20	20	20	20	20
50	60.3	20	20	20	20	20	20
65	76.1	20	20	20	20	20	20
80	88.9	20	20	20	20	20	20
100	114.3	20	20	20	20	20	20
125	139.7	20	20	20	20	20	25
150	168.3	20	20	20	20	20	25
200	219.1	25	25	25	25	25	25
250	273.0	25	25	25	25	25	25
300	323.9	25	25	25	25	25	25
Flat Surfaces	Vessels	25	25	25	25	25	25

Notes:

NC: Normal (Environmental) Conditions = 20°C Ambient Temperature, 70% Relative Humidity.

SC: Severe (Environmental) Conditions = 25°C Ambient Temperature, 80% Relative Humidity.

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX D

TABLE 4 MINIMUM THICKNESS OF THERMAL INSULATION TO PREVENT CONDENSATION ON INSULATION OF COLD PIPES, EQUIPMENT AND VESSELS (based on K value's declared according **AS/NZ 4859**)

MATERIAL: **Resolution**

INSULATION THICKNESSES IN MM

Pipe size N.B.	Pipe size O.D.in mm	0°C Low e NC	-10°C Low e NC	-18°C Low e NC	0°C Low e SC	-10°C Low e SC	-18°C Low e SC
15	21.3	20	20	20	20	25	30
20	26.9	20	20	20	20	25	30
25	33.7	20	20	20	20	30	35
32	42.4	20	20	20	25	30	35
40	48.3	20	20	20	25	30	35
50	60.3	20	20	20	25	30	40
65	76.1	20	20	25	25	35	40
80	88.9	20	20	25	25	35	50
100	114.3	20	20	25	25	40	50
125	139.7	20	20	25	30	40	50
150	168.3	20	20	25	30	50	55
200	219.1	25	25	30	30	50	55
250	273.0	25	25	30	35	50	55
300	323.9	25	25	30	35	50	55
Flat Surfaces	Vessels	25	25	35	40	55	65

Notes:

NC: Normal (Environmental) Conditions = 20°C Ambient Temperature, 70% Relative Humidity.

SC: Severe (Environmental) Conditions = 25°C Ambient Temperature, 80% Relative Humidity.

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX E

TABLE 5 MINIMUM THICKNESS OF THERMAL INSULATION TO PREVENT CONDENSATION ON INSULATION OF COLD PIPES, EQUIPMENT AND VESSELS VESSELS
(based on K value's declared according **AS/NZ 4859**)

MATERIAL: **Resolution**

INSULATION THICKNESSES IN MM

Pipe size N.B.	Pipe size O.D.in mm	-20°C High e NC	-30°C High e NC	-40°C High e NC	-20°C High e SC	-30°C High e SC	-40°C High e SC
15	21.3	20	20	20	20	20	25
20	26.9	20	20	20	20	20	25
25	33.7	20	20	20	20	20	25
32	42.4	20	20	20	20	25	25
40	48.3	20	20	20	20	25	25
50	60.3	20	20	20	20	25	25
65	76.1	20	20	20	25	25	30
80	88.9	20	20	20	25	25	30
100	114.3	20	20	20	25	25	30
125	139.7	20	20	20	25	30	30
150	168.3	20	20	20	25	30	35
200	219.1	25	25	25	25	30	35
250	273.0	25	25	25	25	30	35
300	323.9	25	25	25	25	30	35
Flat Surfaces	Vessels	25	25	25	30	35	40

Notes:

NC: Normal (Environmental) Conditions = 20°C Ambient Temperature, 70% Relative Humidity.

SC: Severe (Environmental) Conditions = 25°C Ambient Temperature, 80% Relative Humidity.

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX F

TABLE 6 MINIMUM THICKNESS OF THERMAL INSULATION TO PREVENT CONDENSATION ON INSULATION OF COLD PIPES, EQUIPMENT AND VESSELS (based on K value's declared according **AS/NZ 4859**)

MATERIAL Resolution**INSULATION THICKNESSES IN MM**

Pipe size N.B.	Pipe size O.D.in mm	-20°C Low e NC	-30°C Low e NC	-40°C Low e NC	-20°C Low e SC	-30°C Low e SC	-40°C Low e SC
15	21.3	20	20	25	30	35	45
20	26.9	20	25	25	35	40	45
25	33.7	20	25	30	35	40	50
32	42.4	20	25	30	40	50	50
40	48.3	20	25	30	40	50	55
50	60.3	20	25	30	40	50	55
65	76.1	25	30	35	50	50	60
80	88.9	25	30	35	50	55	65
100	114.3	25	30	40	50	65	75
125	139.7	30	35	40	55	65	75
150	168.3	30	40	50	55	70	80
200	219.1	30	40	50	60	70	80
250	273.0	30	40	50	60	75	85
300	323.9	30	40	50	65	75	85
Flat Surfaces	Vessels	35	50	50	70	85	100

Notes:

NC: Normal (Environmental) Conditions = 20°C Ambient Temperature, 70% Relative Humidity.

SC: Severe (Environmental) Conditions = 25°C Ambient Temperature, 80% Relative Humidity.

On pipe work with screwed joints it is recommended that a minimum thickness of 20 mm is used to allow for the larger diameter of the screwed fittings.

APPENDIX G**TABLE 7** THICKNESS OF THERMAL INSULATION ON AIR CONDITIONING DUCTS.MATERIAL: **Resolution****INSULATION THICKNESSES IN MM**

Thickness of Insulation	Difference in temperature between the air inside the duct and the ambient (still) air.
20	10°C
25	25°C
30	50°C

APPENDIX H

TABLE 8 THICKNESS OF THERMAL INSULATION TO PROTECT WATER AGAINST FREEZING ON PIPE WORK (VESSELS (based on K value's declared according **AS/NZ 4859**))

Freezing of still water is a matter of time.

Insulation alone will not give complete protection against freezing of water in pipes under all ambient conditions.

If the ambient temperature remains low enough and the water is slow-moving or still, freezing will take place.

Small pipes and valves are, because of their small content, vulnerable. In some cases insulation in combination with heat tracing should be used.

MATERIAL: **Resolution**

INSULATION THICKNESSES IN MM

Recommended thickness of Resolution insulation which will give reasonable protection against freezing during normal occupation of buildings.			
Pipe Size		Indoor Pipes	Outdoor Pipes
N.B.	O.D.in mm	thickness in mm	thickness in mm
15	21.3	20	30
20	26.9	20	30
25	33.7	20	25
32	42.4	20	25
40	48.3	20	25
50	60.3	20	25
65	76.1	20	25
80	88.9 and above	20	25