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GENERAL TECHNICAL SPECIFICATION

THERMAL INSULATION

2.5.1 GENERAL

The whole of the thermal insulation works shall be carried out in strict accordance with B.S. 5970 1981 and BS 5422, 1990 for Thermal Insulation or whichever British Standard is relevant at the time the works are being carried out. The installation shall be carried out by a Specialist Insulation Contractor approved by TICA. The Contractor shall allow in his price for this work to be carried out by the specialist including all necessary supervision and attendance by him.

a) Storage

No insulation materials shall be brought on site in a loose condition. They are to be boxed, or bundled together with a polythene shrunk wrapped finish.

All materials are to be delivered dry and stored on site in a dry atmosphere and in accordance with the manufacturer's recommendations.

Materials must not be stored in a manner which will constitute a fire hazard.

Materials must be in a suitable condition at time of use, otherwise they will be rejected and replaced at no additional cost to the Contract.

b) Application

Insulation shall only be applied after required pressure tests have been completed, the required finishes applied by the Contractor, e.g.. red oxide paint to steel pipework etc., and the installation has been inspected and passed by the Consulting Engineer.

All surfaces are to be cleaned prior to the application of the insulation.

c) Clearing Waste Materials

Waste shall be cleared away from site on a daily basis.

d) Site Safety

All tins of adhesive and paint shall be sealed at the end of the day's work and returned to the central store. Where cellular plastic insulating materials are in use, the Insulation Contractor shall take the necessary

precautions as detailed in H.S.E. Guidance Note GS3.

The Insulation Contractor shall inform the Contractor any special precautions necessary with regards to certain materials and adhesives.

Allowance is to be made for sealing or screening areas of the site as required.

e) Health Hazards

The Insulation Contractor must comply with Clause 6.11 BS 5970 1981 which concerns the detrimental effect on health of materials.

f) Fire and Explosive Hazards

The Insulation Contractor must ensure that the insulation and finish shall comply with the necessary fire rating, degree of flame spread and level of fume production as required by the Fire officer of Building Regulations Department and as detailed in BS 476.
These criteria especially apply in escape staircases and corridors.

g) Material Characteristics

All materials used on the Contract for insulation purposes shall be resistant to vermin, insect and fungal growth, odourless and non-hygroscopic.

The materials must be suitable for application to the surface being covered.

h) Correct Thickness and Finish

The Insulation Contractor shall, as required by the Consulting Engineer, cut out sections from the finished covering, to ensure the correct thickness has been applied.

Material of the incorrect thickness shall be removed and the correct material fitted at the Insulation Contractors expense.

All thermal insulation work shall be carried out with no form of 'heat bridge' being present, which would affect the finish of the insulation. All insulation damaged or subject to failure due to 'heat bridge' shall be replaced at no cost to the Employer.

2.5.2 HOT WATER SYSTEMS

a) General

This part of the thermal insulation section of the Specification applies to pipework and associated equipment carrying water in the temperature

range 3 to 250 degrees Centigrade and includes heating, domestic hot water services, chilled and cold water systems.

b) Materials

The materials used for insulation of heating and domestic hot water in the range of
15 to 250 degrees centigrade pipework shall be pre-formed rigid section of glass fibre, bonded with a heat resistant binder all in accordance with BS 3958 Part 4 1970:72.

The materials used for insulation of chilled and cold water pipework in the range of 3 to 15 degrees centigrade shall be performed pipe sections manufactured from Low K CFC free Phenolic Foam, nominal density 35kg supplied complete with a reinforced aluminum foil jacket and passivating bore coating in accordance with BS3927 Table 1/Type A and Class 0 Fire Rated Thermal conductivity not to exceed 0.020 W/MK. All longitudinal and butt joints to be tightly butted and sealed with 50mm wide self adhesive Aluminium Foil Tape to provide a permanent vapour seal. For extra securement two additional bands of foil tape should be applied to each 1 metre length of insulation at 300mm from each joint.

Bends, fittings, etc. are to be formed by using carefully mitred sections of same material and neatly taped joints. All to be fully sealed using type T21 7FR (Class "0") tape.

At the termination of all insulation the vapour barrier must be maintained, by the use of
Class 0 Aluminium Foil, carefully sealed to exposed insulation and pipe. Metal end caps then to be fitted.

The thickness of material to pipework is to be in accordance with the attached table.

(Note: THE VAPOUR BARRIER MUST BE CONTINUOUS AND UNPUNCTURED IN ALL CASES, WITH GREAT CARE TAKEN WHEN APPLYING FINISHES).

c) Finish

The following finishes shall be applied to all insulation unless otherwise stated elsewhere in the particular Specification.

1. Plantrooms

Depending upon the project concerned one of the following finishes shall be applied:-

EITHER

22 swg hammered or polished aluminum cladding of pre-formed sheets and fittings to be applied over the basic insulation. This insulation is to be firmly secured using metal bands prior to the application of the cladding. The cladding is to be neatly fixed by means of pop rivets at 150mm centres.

Seam edges shall be cut straight with a 50mm overlap. Seams must be kept from open view where practical and the number of sheets used in intricate areas kept to a minimum. Openings in the cladding for test points, gauges, etc., are to be pre-cut, concentric and have clean edges. No patching will be allowed.

OR

Isogenopak shall be applied employing similar criteria to the above.

Sections complete with a pre-finished facing which shall attain class "O" rating. The facing shall be aluminum foil laminate having a 50mm overlap for fixing the sections. All sections shall be close butted and longitudinal overlaps and butt joints shall be secured without distortion by 20mm wide polished metal band fixed at 300mm centres. Bends, fittings, etc., are to be formed by using same material and neatly taped joints.

2. Occupied Spaces

Where insulated pipework passes through areas which are occupied and the insulation is exposed to view, the finish applied, unless otherwise stated in this specification, shall be of the pre-finished white foil fenced type as described under the plantroom section.

3. Unoccupied Spaces

This section concerns service ducts, ceiling spaces, roof voids, etc.

Rigid pre-formed sections shall be utilised, pre-finished with bright Class 'O' Aluminium Foil.

The overlap and butt joints shall be sealed with matching tape.

Bends and fittings shall be metered using the pre-finished material and sealed in a similar manner.

The whole being secured, without distortion, by 20mm bands fixed at 300mm centers.

d) External Pipework

Whether exposed to the elements or running through external service trenches, passing into cooling tower chambers, or through areas

having high humidity levels, shall be insulated with glass fibre rigid pre-formed sections secured by metal bands and wrapped with 0.8m thick polyisobutylene sheeting in order to form a weather and vapour seal.

e) End Caps

Termination's of insulation shall be fitted with metal end caps. The caps are to be constructed from polished aluminum, pre-formed and, arranged to secure the insulation without causing distortion. This is in plantrooms and internal, exposed positions only. In ceiling voids and risers, the ends can be foil tape sealed.

f) Insulation of Adjacent and Parallel Pipes

All pipework must be insulated separately. They are not to be "married " together with insulation material under any circumstances.

g) Valve Bodies, Flanges and Unions

For heating and hot water services all valve bodies, flanges, strainers and unions are to be thermally insulated.

In areas where the insulation is finished with aluminum cladding the valve and flange boxed shall e purpose made from the same material and lined with the required thickness of insulation. The enclosures are to be easily removable and fitted with metal clasps.

In other areas the valves and flanges shall be insulated and finished by means of enclosures are to be both removable and replaceable and be secured by means of metal bands.

(Refer to figures 15, 16, 17, 28 and 29 BS 5970, 1981).

On chilled and cold water services all pump bodies, valves, flanges, strainers and unions shall be thermally insulated and vapour sealed. After cleaning they are to be painted with a dedicated anti-condensate paint, or, hand coated with Denso Paste prior to the application of any insulation.

In areas where the insulation is finished with aluminum cladding, the insulation applied to the fitting is to be secured with metal bands and the joints sealed with type T21 7FR tape to give a vapour seal. The cladding is then to be fixed over this insulation without puncturing the vapour seal.

Where aluminum cladding is not applied, enclosures made from the same material as that insulating the pipework are to insulate the various types of fitting. The enclosures are to be both removable and replaceable and be secured by means of metal bands. This finish of all enclosures shall be as that for the remainder of the pipework

installation.

(Refer to figures 11, 28 and 29 BS 5970, 1981).

h) Flexible Connections

Flexible connections shall be insulated using two layers of 25mm diameter mineral fibre rope around the flexible coupling, the rope windings being secured by adhesive and then wrapped with glass silk cloth. The cloth is to be overlapped 50mm and sealed by Kooltherm CP50. Where metal cladding is used on pipework the glass cloth shall be Aluminized to match the general finish. (Refer to figure 25, BS5970, 1981).

i) Expansion Bellows

Expansion Bellows shall be thermally insulated using mineral fibre mat of the same thermal conductivity as that for the pipework.

A pre-formed 0.5mm metal shield is to be constructed around the bellows to allow free movement. The mineral fibre mat shall pass over the shield and be fixed to the pipework insulation by means of securing bands.

The whole should be finished in accordance with the general pipework finish. (Refer to Figure26, BS 5970, 1982).

The mineral fibre is to be impregnated with Foster Sealfas 30-36, in order to maintain a vapour seal, on chilled and cold water services.

j) Miscellaneous Pipework

In addition to the general distribution pipework the Insulation Contractor must allow for insulting all cold feed and open vent pipework which is likely to be filled with water; all air bottles and associated bleeds pipes; and equipment drains up to two metres from the equipment carrying the heated water.

k) Painting

The Contractor shall allow for painting of uninsulated iron and steel work, all valve handles, gas lines, open vents, air bottle bleed pipes and equipment drains etc. in all plant rooms. The surfaces concerned are to be wire brushed, painted with one coat red oxide, one undercoat/primer and finished with a top coat in a colour to be agreed with the Engineer.

l) Identification

The Insulation Contractor shall supply and fix pipework identification in

accordance with BS 1710. Non-ferrous colour bands shall be used to indicate the type of service, pipe size and direction of flow. The bands are to be installed at spacings of 6 metres or in accordance with the relevant standard. They are also to be fitted on either side of equipment, pumps, three port valves and at the point of entry and exit from areas e.g. plantrooms, boiler rooms etc.

m) Cleaning

Prior to the handover of the installation the Insulation Contractor must clean the whole of the thermal insulation within his Contract.

The Main Contractor shall be responsible for the removal of paint drips, dust, oil, etc., from floors, walls and all other such surfaces.

n) Wall Sleeves

Where chilled water services are sleeved and pass through walls or sections of structure the insulation and vapour seal must be installed continuously through the sleeve.

o) Supports

All pipework and equipment which is to be insulated in accordance with this section of the specification shall be supported in such a manner that a complete thermal breakdown between pipework/equipment and supports is provided and maintained at all times.

The material used can be either Load Bearing Kooltherm K Pipe support inserts or hard rubber, however, it must not deteriorate nor be water absorbent. The hanger blocks to be installed by the Contractor whilst fitting pipework.

The vapour barrier formed by the insulation is to be taken over such supports in order to retain continuity.

(Refer to figure 9, BS 5970, 1981).

p) Gauge and Test Points

Where openings have been formed in the insulation for removable gauges or test points, a purpose made plug is to be provided, attached to the adjacent insulation, which, on removal of the piece of equipment, can be inserted in the opening, thereby maintaining the vapour seal.

q) Electrical Bonding

Where the IEE Regulations require the pipework to be electrically bonded it will be necessary for sections of cable to pass through the insulation and, hence, through the vapour barrier. In these instances

the cable will be plastic sheathed and the insulation and vapour barrier bonded to the sheathing with a suitable adhesive.

2.5.3 WARM AIR DUCTWORK INSULATION

a) General

This section of the specification concerns air movements systems, both supply and extraction, which are carrying air having a temperature generally in the range –2 to 15 and 15 to 30 degrees centigrade.

Insulation shall be applied to all supply ductwork irrespective of location and extract ductwork being used for heat reclamation purposes, which passes through plantrooms, above false ceilings, down service shafts and through non-conditioned spaces. Where equipment is installed in distribution ductwork, e.g. heater batteries, balancing dampers, etc. these shall be insulated in the same material as the remainder of the ductwork.

It shall also be applied to fresh air intake ductwork between the point of entry and heater batteries. Where systems are installed which operate utilizing "free cooling", with temperatures dropping into the range mentioned above the whole of the system shall be insulated in accordance with this section of the specification.

All fresh air ductwork installed internally is to be insulated.

b) Material

For ductwork in the range 15 to 30 degrees centigrade all rectangular ductwork and associated equipment shall be insulated by means of slabs of rigid fibre glass insulation trimmed to size. The insulation is to be bonded as for rectangular ducts.

Smaller ductwork insulation shall have lacing wire as supplementary support. Ductwork over 450mm wide shall have banding or 50mm galvanised mesh wire netting for supporting the insulation.

The thickness of material to be used shall be in accordance with the attached table.

For chilled and cold water services the insulation shall be as above. A vapour barrier must however always be provided.

Where the vapour seal is punctured by fixing pins the area is to be coated with Foster Ductfas 81-22 and then covered with T217Fr (Class 'O') tape.

All joints shall be sealed with adhesive and then tape applied over the joints. The tape is to be 100mm wide and be of the T217Fr (Class 'O')

type, as manufactured by Idenden Adhesives Ltd.

At the termination of insulation a 50 mm lap shall be formed by cutting the insulation but restraining the cover. This lap is to be sealed to the exposed edge of the insulation as previously described with solvent welded finish taped over with T217Tr (Class 'O') tape. The joint must continue to form a vapour barrier.

Where fittings occur in the ductwork installation, e.g. supply grille plenum boxes, volume control dampers, zonal batteries, etc., these are to be installed to the same standard as the remainder of the installation and sealed and jointed in a similar manner in order to maintain the vapour seal.

The Insulation Contractor must ensure that Air Cooler Batteries under positive fan pressure have been tested by the Contractor for no air leakage prior to installation.

The thickness of material to be used shall be in accordance with the attached table.

c) Finishes

The following finishes are to be supplied to all insulation.

1. Plantrooms

Depending on the project one of the following finishes shall be applied:-

EITHER

22swg hammered or polished aluminium cladding of pre-formed sheets and fittings to be applied over the basic insulation. This insulation is to be firmly secured using metal bands prior to the application of the cladding. The cladding is to be neatly fixed by means of pop rivets at 150mm centres.

Longitudinal joints shall be formed by creasing the sheets to form a sharp edge, fixings then being applied from the top or bottom of the ductwork, where practical.

All the cladding shall be self supporting and made rigid by means of wooden battens which are to allow the paneling to be fixed and strengthened. All seam edges are to be cut straight and all duct edges parallel.

Where openings occur for access doors, damper drives, test holes etc., they are to be properly formed in the cladding and trimmed with purpose made edging pieces. No patching will be allowed.

2. General Distribution

Where ductwork and associated equipment are installed in both occupied and unoccupied areas fibre glass insulation shall be applied, all as described in the preceding paragraph above (section 2.5.4 (c) of this specification).

3. External Ductwork

All ductwork which is exposed to the elements, run through external service shafts, passes through cooling tower chambers, or through areas having high humidity levels which are likely to cause the formation of condensation on the ductwork, shall be either insulated as per next paragraph, or treated.

Where the ductwork is transferring warm air which is to be used for heating or reclamation purposes, the ductwork shall be insulated with suitable CFC Free Phenolic Laminates (Foilphen K, Ductphen K) and then overwrapped with 0.8mm thick polyisobutylene sheeting in order to form a weather and vapour seal.

All joints in the sheeting shall be overlapped by 50mm and sealed with a solvent welded finish.

Where the ductwork is carrying air which is not useful heat, the Insulation Contractor is to allow for painting this with two coats of bituminous paint. This paint finish shall also be applied to all flanges, damper boxes, access doors etc.

When painted, all dampers and access doors should remain operable, and must not show any signs of non-operation due to the application of paint.

d) End Capping

For heating and hot water where thermal insulation terminates at walls items of plant, etc., the exposed end of the insulation shall be capped by means of a 50mm white plastic angle.

The angle is to be joined to the insulation separately. They are not to be "married" together with insulation material, under any circumstances.

Where thermal insulation terminated an end cap shall be formed which shall also be a vapour barrier.

The cap is to be formed by cutting back the insulation to leave an overlap which is then to be sealed to the exposed edge of the insulation. The joint is then to be taped with type T217FR (Class 'O') tape and plastic angle strip fixed around the termination by means of a

suitable adhesive.

e) Insulation of Adjacent and Parallel Ducts

All duct work runs must be insulated separately. They are not to be married together with insulation material, under any circumstances.

f) Removable Equipment

All ductwork may require to be removed from the ductwork for servicing, the insulation and cladding shall be installed in such a manner that it can be detached and replaced without disturbing the remainder of the installation.

g) Identification

All as described in Section 2.5.2.(l) of this specification.

Identification symbols shall be fixed on either side of items of plant, at the entry and exit of all plantrooms and at the recommended intervals throughout the ductwork distribution.

h) Cleaning

All as described in Section 2.5.2.(m) of this specification.

This section of the Specification concerns air movement systems both supply and extraction, which are carrying air having a temperature generally in the range -2 to 15 degrees centigrade.

i) Wall Sleeves

Where chilled air ductwork having a vapour seal passes through walls and sections of the structure a sleeve is to be introduced into the structure to allow the duct or fire damper and associated insulation to pass through without a break in the insulation or vapour barrier occurring.

The insulation must provide the same period of protection as the fire damper to which it is applied.

j) Flanges

Where flanges occur in the ductwork, they are to be treated with the full thickness of insulation and the vapour seal maintained over them. Where access to equipment is necessary (see above) the flanges should be accessible.

k) Supports

Generally in a similar manner to that described in Section 2.5.3. (l) of this Specification.

l) Access Doors

Access doors installed in ductwork carrying chilled air should generally be pre-insulated. However, where this is not possible a removable panel is to be formed in the insulation which is to cover the door, the joint between the panel and remainder of the insulation being sealed with 100mm wide tape to maintain a vapour seal. The removable panel is to fitted with handles and an identification label applied.

m) Electrical Bonding

All as described in Section 2.5.3.

2.5.4 HOT WATER TANKS AND VESSELS

a) General

This section of the Specification applies to tanks and vessels which are to contain heating water, cold water, chilled water, domestic hot water and condensate in the temperature range of 3 to 15 and 15 to 250 degrees centigrade.

For temperatures below this level see Section 2.5.7 of this Specification relating to Chilled and Cold Water Tank and Vessels.

b) Materials

For temperatures in the range of 15 to 250 degrees centigrade the materials to be used for the insulation of all tanks and vessels shall be slabs of fibre glass. For rectangular vessels these are to be rigid slabs, whilst for circular or oval vessels they are to be semi-rigid. The sheets shall be bonded with a heat resistant binder, unless otherwise stated later.

The thickness of the insulation applied shall be in accordance with the attached table.

For circular and oval tanks and vessels the slabs are to trimmed as necessary to follow the contours of the vessel and sealed to the surface of the vessel with a suitable adhesive. The insulation shall then be further secured by means of 25mm wide metal bands applied circumferentially at 300mm centres. The application of the bands must not distort the insulation .

For rectangular tanks and vessels the bands shall be applied

horizontally with the insulation on the underside also secured by purpose made pins at 300mm centres.

All the edges of the tank or vessel shall be protected from damage by means of a 50mm plastic angle applied to the surface of the insulation by means of suitable Aluminium Banding.

The materials to be used for the insulation of all tanks and vessels shall be a suitable CFC Free Phenolic Laminatex (Foilphen K, Ductphen K). For rectangular vessels these are to be rigid slabs, whilst for circular or oval vessels they are to be suitably slotted (e.g. Foilphen, Flatwrap). The sheets shall be bonded with a suitable fire resistant adhesive, unless otherwise stated later.

The thickness of the insulation applied shall be in accordance with the attached table.

For circular or oval tanks and vessels the slabs are to be trimmed as necessary to follow the contours of the vessel and sealed to the surface of the vessel by means of s suitable fire resistant adhesive. All slabs are to be butted together and sealed with bright class 'O' foil finish, the insulation then being overwrapped with good quality canvas and the whole vapour sealed by applying two coats of Foster Sealfas 30-36, or Chaders CP50.

For rectangular tanks and vessels the slabs shall be pre-finished with a bright aluminium foil laminate coating providing class 'O' fire rating. The insulation shall be bonded to the sides and top of the vessel by means of Foster Safetee Ductfas 81-99 adhesive with the insulation on the underside also secured by purpose made pins fixed at 300mm centres.

All the edges of the tank shall be protected from damage by means of a 50mm plastic angle applied to the surface of the insulation by means of a suitable adhesive.

Where the vapour seal is punctured by fixing pins the area shall be coated with Foster Ductfas 81-22 and then covered with T217FR (Class'O') tape.

All joints shall be sealed with adhesive and then tape applied over the joints. The tape is to be 100mm wide and be of the TR217TR (Class 'O") type, as manufactured by Idenden Adhesives Ltd.

At the termination of insulation a 50mm lap shall be formed by cutting the insulation but retaining the cover. Laps are to be sealed to the exposed edge of the insulation with Foster Dustfas 81-22 adhesive and taped over with T217TR (Class'O') tape. Joints must continue to form a vapour barrier.

c) Finishes

22swg hammered or polished aluminium or Isogenopak cladding shall then be applied. The cladding shall be fitted in sheets with the minimum of joints and seams utilised. All dished or oval ends are to be pre-formed.

Where necessary wooden blocks or battens shall be provided within the insulation to enable the cladding to be self-supporting and prevent distortion. Suitable access to the top of the tank shall be catered for.

All seams edges are to be cut straight and overlapped by 50mm, the seam being joined by either screws or rivets at 150mm centres. All seams wherever possible shall be kept from open view . Where openings occur in the cladding for test points, gauges etc. they are to be pre-cut and have clean edges.

When rectangular vessels are being clad all edges shall be formed by creasing the sheeting and then forming on the top or bottom of the vessel.

Where vessels are sited externally or are subject to low temperatures and excessive condensation or dampness, they shall be insulated with the basic fibre glass panels and bands etc. However, this shall be then be overwrapped in 0.8mm thick polyisobutylene sheeting in order to provide a weather and vapour proof seal. All joints are to be overlapped by 50mm and sealed with a solvent welded finish.

1. External

Where tanks or vessels are sited externally, or are subject to low temperatures and excessive condensation or dampness, the tank shall be insulated as previously described. However, this shall then be overwrapped in 0.8mm thick polyisobutyene sheeting in order to provide a weather and vapour proof seal. All joints are to be overlapped by 50mm and sealed with a solvent welded finish.

d) Manholes and Access Doors

Where manholes and access door is flush with the surface of the vessel a panel is to be formed in the insulation This panel is to consist of thermal insulation fixed to a section of cladding by a suitable adhesive and purpose made pins. The cladding shall be larger than the opening concerned to enable the panel to be secured into the main body of the insulation by means of self tapping screws. The shape of the panel is to be perfectly concentric and the edges filed smoothly. (Refer to figure 30, BS 5970, 1982).

Where the manhole or access door is raised from the surface of the vessel, the insulation and cladding is to be formed in such a manner

that it runs up the neck of the manhole.

The lid of the manhole is to be insulated by means of a pre-formed cap formed from the cladding and incorporating the necessary thickness of insulation for the manhole cover. The manhole cap is to fit over the cover and neck and be secured to the main body of the insulation by means of a minimum of four metal quick release catches.

However, a continuous compressible foam rubber strip shall be secured to the cladding around the manhole thus ensuring that, when the manhole is secured with quick release toggles, the flange is compressed on to the foam strip and the vapour seal maintained.

e) Heater Coil Chests

Where removable chests occur for heating coils in calorifiers and vessels, these are to be completely insulated.

A metal enclosure, similar to a valve box, is to be constructed in two halves with metal fastenings

The box shall be lined with the appropriate thickness of insulation and be of sufficient size and detail to enclose the whole of the chest whilst allowing provision for pipework connections. The enclosure shall be complete with a flanged face which is to secure the enclosures to the main body by means of self-tapping screws at 150mm centres.

f) Removable Sections of Equipment

Where tanks and vessels contain other removable sections, the Insulation Contractor is to allow for making the relevant section of the insulation and cladding removable, in a similar manner to paragraphs d or e above whichever is more appropriate.

To maintain the vapour seal between sections a continuous compressible foam rubber seal strip shall be provided throughout out the length of the joint.

The two sections of the joint shall then be secured by means of quick release toggles, which, when applied, cause the rubber to compress and the vapour seal to be maintained.

g) Supports

All hot water storage vessels shall be insulated from supporting frameworks, cradles and brackets by means of wooden supports. The contractor is to make all due allowances for providing these supports which are to be either hard rubber or hard wood and be shaped to the contours of the vessel. The supports shall be non-distorting and non-water absorbing and have two layers of a damp proofing material

placed between the vessel and support.

This work shall be undertaken by the Contractor.

h) Cleaning

All as described in section 2.5.2. (m) of this specification.

i) Flanged Tanks

Where tanks are constructed from plates bolted together by means of external flanges, the insulation shall be applied in such a manner that the complete thickness of insulation covers the end of all flanges.

2.5.5 BOILER SMOKE PIPES

a) General

This part of the Specification concerns all single skin mild steel and stainless steel, smoke and exhaust pipework which occurs in boiler rooms, plantrooms, service risers, etc. It does not apply to multiple skin systems unless specifically required elsewhere in this Specification

b) Materials

The materials to be used for all insulation of smoke pipes and exhaust pipes shall be rigid slabs of 50mm fibre glass, bonded with a heat resistant binder and suitable for use with the relevant temperature of the flue or exhaust pipework concerned.

The Contractor must at time of Tender ascertain the surface temperature of the flue or exhaust pipe if not stated in the documentation. No extra cost will be permitted for want of knowledge under any circumstances.

This information must be passed by the Contractor to the Insulation Contractor at Tender stage.

Metal spacing pieces shall be provided around the pipe at 300mm centres to provide an air gap between flue and insulation of 25mm metal bands at 300mm centres to coincide with the location of the spacer pieces. The bands must secure but must not cause any form of distortion.

All bends shall be insulated by forming a "lobster back" arrangement of trimmed slabs. The insulation is to have a 25mm air gap between flue pipe and insulation and be secured by means of wire netting, cut to size.

c) Finish

In plantrooms the insulation shall be clad with 22swg hammered or polished aluminium sheeting applied over the insulation, generally as described in Section 2.5.2.(c) 1 of this specification.

In service risers the flue shall be wrapped with good quality mattress with a class 'O' finish and supported with wire netting.

THERMAL INSULATION THICKNESS
TABLE 1 CIRCULATING WATER AND STEAM

CHILLED/ M.C.W.S/.D.H.W.S/.L.T.H.W

PIPE SIZE	3	10	60	80	116
	(Degrees Centigrade)				
15	15mm	15mm	25mm	25mm	25mm
20	15mm	15mm	25mm	25mm	25mm
25	15mm	15mm	25mm	25mm	25mm
32	15mm	15mm	25mm	25mm	38mm
40	20mm	15mm	38mm	38mm	38mm
50	20mm	15mm	38mm	38mm	38mm
65	20mm	15mm	38mm	38mm	38mm
80	20mm	15mm	38mm	38mm	38mm
100	20mm	15mm	38mm	38mm	50mm
150	25mm	15mm	50mm	50mm	50mm
200	25mm	20mm	50mm	50mm	50mm

Insulation thickness applies also to the above ground plastic pipework.

THERMAL INSULATION
TABLE 2 NON-CIRCULATING WATER

Mains and Tank Cold Water and Hose Reels

Pipe Size	Internal Pipework	External Pipework
15	30mm	40mm
20	25mm	40mm
25	15mm	30mm
32	15mm	25mm
40	15mm	20mm
50	15mm	20mm
65	15mm	20mm
80	15mm	15mm
100	15mm	15mm
150	15mm	15mm
200	15mm	15mm

Insulation thickness apply also to above ground plastic pipework

THERMAL INSULATION THICKNESS

TABLE 3 Storage Tanks and Vessels

Services C.W.S, M.C.W.S., D.H.W.S., L.T.H.W.

Water Temperature (Degrees Centigrade)	3	10	60	80	116
Insulation Thickness	30mm	30mm	50mm	63mm	63mm

THERMAL INSULATION THICKNESSES

TABLE 4 Ductwork

Temperature Difference between ducted air and ambient air

(Degrees Centigrade)	10	25	50
Rigid Duct Insulation	40mm	50mm	65mm
Flexible Duct Insulation	50mm	50mm	75mm
Phenolic	20mm	25mm	30mm

In all cases, unless specified, it is the Contractors obligation to obtain from the consulting Engineer at Tender stage the exact temperatures applicable to the specific project.

No extra cost will be permitted for want of knowledge under any circumstance.

Where CFC Free Phenolic Foam product is used e.g. Kool-Therm, the specialist must observe the manufacturer's recommended thickness, type and installation procedures.