Project Specification

1 General

1.1 The sub–contractor shall include for the supply, delivery and installation of materials necessary for the thermal insulation of systems described in this specification.

1.2 The insulation work shall be carried out by a Member of the Thermal Insulation Contractors Association. The thermal insulation specialist shall make himself fully acquainted with all the site conditions and programme of works and shall execute his works within such confines and programme.

1.3 The thermal insulation shall not be applied until the ductwork installation has been tested.

1.4 Insulation materials and finishes shall be inherently proof against rotting, mould and fungal growth and attack by vermin, be non–hygroscopic and in all respects be suitable for continuous use throughout the range of operating temperatures and within the environment indicated.

1.5 Any work not of acceptable standard shall be removed and replaced at no cost to the contract.

1.6 All insulation materials and finishes shall be installed in accordance with the manufacturers recommendations.

1.7 No insulation material containing CFC or HCFC components shall be accepted.

2 Standard References

2.1 British Standards

BS 476–6: 1989
Fire tests on building materials and structures. Method of test for fire propagation for products

BS 476–7: 1997
Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products

BS 4370–1: 1988 (1996)
Methods of test for rigid cellular materials. Methods 1 to 5

BS 4370–2: 1993
Methods of test for rigid cellular materials. Methods 7 to 9

BS EN ISO 4590: 2003
Rigid cellular plastics. Determination of the volume percentage of open cells and of closed cells

BS 5422: 2001
Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range –40°C to +700°C

BS EN ISO 9001: 2000
Quality management systems. Requirements

2.2 Other References

TIMSA Guide
TIMSA Domestic and Non-Domestic Heating, Cooling and Ventilation Guide

NES Specification Expert
Y50 Thermal Insulation

NHS C02
National Health Service. Model engineering specifications. C02. Thermal insulation

Defence Estate Organisation Ministry of Defence Specification 037: 1997
Air conditioning, air cooling and mechanical ventilation for buildings

2.3 Building Regulations / Standards

England & Wales
The Building Regulations 2000. Approved Document B 2002 Edition. Appendix A 12

Scotland
The Building Standards (Scotland) Regulations. Section 2 (Non Domestic) 2006. 2 E Table

Northern Ireland
The Building Regulations (Northern Ireland) 2005. Technical Booklet E. Paragraph 2.4

Irish Republic
The Building Regulations 2006. Technical Guidance Document B. Appendix A. Paragraphs A11 and A12

Project Specification

3 Fire Rating of Insulation Materials

3.1 All insulation materials and facings installed within buildings shall achieve the following standards when tested to:–

BS 476–6: 1989 – Of Low Contribution to Fire Growth with Fire Propagation Index of performance (I) not exceeding 12 and sub index (i_1) not exceeding 6.

BS 476–7: 1997 – Of Very Low Surface Spread of Flame (Class 1).

3.2 Insulation systems which meet the required combined standards as detailed above are rated Class O / Low Risk to the Building Regulations / Standards.

3.3 Insulation materials, adhesives, sealants and facings installed on ductwork and equipment external to buildings shall be rated as Class 1 when tested to BS 476–7: 1997.

4 Scope of Works

4.1 Unless otherwise indicated, the following services shall be thermally insulated and also vapour sealed where noted:

a. warm air ventilation distribution ductwork insulated to suit temperatures;

b. air conditioning distribution ductwork insulated and vapour sealed;

c. fresh air intake ducts to plant insulated and vapour sealed;

d. return air to plantroom insulated to suit temperature; and

e. ductwork exposed on roof or other external locations as above, but with additional weatherproof finish.

5 Materials

5.1 Rectangular Ductwork

5.1.1 Insulation shall comprise 40 kg/m³ nominal density CFC/HCFC–free rigid phenolic insulation boards with zero Ozone Depletion Potential (ODP), reinforced with an aluminium foil vapour barrier jacket autohesively bonded to the exposed face and glass fibre autohesively bonded to the inner face.

5.1.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.1.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.1.4 The insulation shall be *Kingspan* **Kool**therm® Duct Insulation, rigid phenolic insulation as manufactured by Kingspan Insulation Limited. App. A1
App. D: Figure D1

5.1.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable), from the tables in App. B / C (delete as applicable) of this specification.

5.1.6 Ductwork supports for insulated ductwork shall be rigid phenolic insulated duct support inserts between the support and the ductwork to the thickness of adjacent duct insulation. The support inserts shall be minimum one and a half times as wide as the support itself, e.g. Fensell Flat Duct Supports, or equivalent. App. A2
App. D: Figure D1

5.2 Circular Ductwork (up to and Including 350 mm Diameter)

5.2.1 Insulation shall comprise foil faced 35 kg/m³ nominal density CFC/HCFC–free rigid phenolic pipe insulation sections or radius & bevelled lags with zero Ozone Depletion Potential (ODP).

5.2.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.2.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.2.4 The insulation shall be e.g. **Kool**therm® Pipe Insulation, as manufactured by Kingspan Tarec Industrial Insulation Limited, or equivalent. App. A3
App. D: Figure D2

5.2.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable).

5.2.6 Ductwork supports for insulated ductwork shall be rigid phenolic insulated pipe support inserts between the support and the ductwork to the thickness of adjacent duct insulation. The support inserts shall be minimum one and a half times as wide as the support itself, e.g. **Kool**therm® Insulated Pipe Support Inserts as manufactured by Kingspan Tarec Industrial Insulation Limited, or equivalent. App. A4
App. D: Figure D2

5.3 Circular Ductwork (with Diameter Greater than 350 mm)

5.3.1 Insulation shall comprise 40 kg/m³ nominal density CFC/HCFC–free rigid phenolic insulation boards with zero Ozone Depletion Potential (ODP), reinforced with an aluminium foil vapour barrier jacket autohesively bonded to the exposed face and glass fibre autohesively bonded to the inner face during manufacture, and slotted so as to accommodate surface curvature.

5.3.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.3.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.3.4 The insulation shall be *Kingspan* **Kool**therm® Duct Insulation, rigid phenolic insulation as manufactured by Kingspan Insulation Limited. App. A1
App. D: Figure D2

5.3.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable), from the tables in App. B / C (delete as applicable) of this specification.

5.3.6 Ductwork supports for insulated ductwork shall be crocodile strips (rigid phenolic insulated circular duct support inserts) between the support and the ductwork to the thickness of adjacent duct insulation. The support inserts shall be minimum one and a half times as wide as the support itself e.g. Fensell Flexible Duct Supports, or equivalent. App. A5
App. D: Figure D2

5.4 Flat Oval Ductwork (Rounded Ends up to and Including 350 mm Diameter)

5.4.1 Insulation shall comprise foil faced 35 kg/m³ nominal density CFC/HCFC–free rigid phenolic pipe insulation sections or radius & bevelled lags with zero Ozone Depletion Potential (ODP).

5.4.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.4.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.4.4 The insulation shall be e.g. **Kool**therm® Pipe Insulation, as manufactured by Kingspan Tarec Industrial Insulation Limited, or equivalent. App. A3
App. D: Figure D3

5.4.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable).

5.5 Flat Oval Ductwork (Rounded Ends with Diameter Greater than 350 mm)

5.5.1 Insulation shall comprise 40 kg/m³ nominal density CFC/HCFC–free rigid phenolic insulation boards with zero Ozone Depletion Potential (ODP), reinforced with an aluminium foil vapour barrier jacket autohesively bonded to the exposed face and glass fibre autohesively bonded to the inner face during manufacture, and slotted so as to accommodate surface curvature.

5.5.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.5.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.5.4 The insulation shall be *Kingspan* **Kool**therm® Duct Insulation, rigid phenolic insulation as manufactured by Kingspan Insulation Limited. App. A1
App. D: Figure D3

5.5.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable), from the tables in App. B / C (delete as applicable) of this specification.

5.6 Flat Oval Ductwork (Flat Surfaces)

5.6.1 Insulation shall comprise 40 kg/m³ nominal density CFC/HCFC–free rigid phenolic insulation boards with zero Ozone Depletion Potential (ODP), reinforced with an aluminium foil vapour barrier jacket autohesively bonded to the exposed face and glass fibre autohesively bonded to the inner face.

5.6.2 The aged thermal conductivity of the insulant shall not exceed 0.021 W/m·K at 10°C mean.

5.6.3 The rigid phenolic core of the insulation shall be Class O / Low Risk rated to the Building Regulations / Standards.

5.6.4 The insulation shall be *Kingspan* **Kool**therm® Duct Insulation, rigid phenolic insulation as manufactured by Kingspan Insulation Limited. App. A1
App. D: Figure D3

5.6.5 Insulation thickness is to be determined in accordance with the TIMSA Guide / BS 5422: 2001 (delete as applicable), from the tables in App. B / C (delete as applicable) of this specification.

5.6.6 Ductwork supports for insulated ductwork shall be rigid phenolic insulated duct support inserts between the support and the ductwork to the thickness of adjacent duct insulation. The support inserts shall be minimum one and a half times as wide as the support itself, e.g. Fensell Flat Duct Supports, or equivalent. App. A2
App. D: Figure D3

6 Insulation Finishes

6.1 Service Ducts, Ceiling Voids and Floor Voids

6.1.2 Duct insulation and insulated duct support inserts shall be supplied with a factory applied reinforced aluminium foil finish, rated as Class O / Low Risk to the Building Regulations / Standards. All joints in the foil jacket, penetrations through the jacket or exposed edges to the insulation shall be sealed with 100 mm wide self–adhesive aluminium foil tape, or moisture resistant sealant, e.g. Fosters 95–44 or equivalent (App. A6).

6.2 Internal and Exposed to View

6.2.1 Specification for duct insulation will be as detailed in section 6.1, plus the following finish:

The duct insulation shall be wrapped with a 170 g/m² canvas membrane with a water based coating, e.g. Idenden ET–10 or equivalent (App. A7). When fully dried the outer surface of the canvas shall be treated with a second coat in accordance with the manufacturers instructions. It is essential that the finish is applied to a high standard. An additional acrylic emulsion paint finish shall be provided to an approved BS colour if necessary.

6.3 Internal in Plant Rooms or Boiler Houses

6.3.1 Specification for duct insulation will be as detailed in section 6.1, plus the following mechanical protection:

- insulation to be overcoated with two full applications of Idenden ET–150 coating (App. A8) with open weave No. 10 Glass Cloth between coats (App. A9); or alternatively
- insulation to be finished with fabricated sheet aluminium casings 0.8 mm thick. Cladding to ductwork operating at temperatures below ambient, to be secured with aluminium bands and matching seals at 450 mm centres and at circumferential joints which shall be overlapped by a minimum of 40 mm.

6.4 External (Weather Protection)

6.4.1 Specification for duct insulation will be as detailed in section 6.1 plus the following weather protection:

- insulation to be overcoated with two full applications of Idenden 30–150 coating (App. A10), with No. 10 Glass Cloth between coats (App. A9). A solvent based weatherproof mastic e.g. Foster 60–75 (App. A11) or equivalent shall be used in damp and low temperature conditions; or alternatively
- insulation shall have a weatherproof coating of minimum 0.8 mm thickness polyisobutylene sheeting bonded to the insulation with, minimum 30 mm wide circumferential and longitudinal lap joints, which shall be fully solvent welded in accordance with the manufacturers instructions.

7 Standards and Workmanship

7.2.1 All thermal insulation shall be bonded to the duct with a general purpose contact adhesive, e.g. Howstik 230 NF or equivalent. App. A12

7.2.2 On rectangular ductwork, the insulation shall be cut on site so that the top and bottom slabs overlap the sides at all four corners of the duct. Insulation to inverted surfaces, or on sides of ducts exceeding 600 mm in depth, shall be additionally secured with pre–bonded insulation pins and washers spaced at 300 mm centres.

7.2.3 On circular and flat oval ducting the insulation shall be additionally supported with 15 mm wide aluminium strapping with matching seals applied circumferential bands at minimum 350 mm centres.

7.2.4 All foil joints and any protrusions through the facing shall be sealed with 100 mm wide self–adhesive aluminium foil tape.

7.2.5 The vapour seal shall be maintained by taping over the joint between insulated duct support inserts and the adjacent duct insulation.

7.2.6 The insulation shall be carefully formed around access openings, damper arms and test holes to give adequate access, whilst maintaining the vapour seal and providing protection from mechanical damage.

7.2.7 Where the insulated ductwork is external at roof level, insulation to the ductwork topside shall be fitted to falls to avoid 'ponding' of rain water in way of the weatherproofing membrane.

8 Identification of services

8.1 The contractor shall include for the identification of those services both insulated and uninsulated.

8.2 Directional arrows or other labels denoting flow and return (F & R) where specified, shall be either PVC adhesive tape or painted symbols as agreed with the engineer.

8.3 Directional arrows and labels, shall be made at changes of direction, inlets & exits to ducts and buildings and at either side of walls and floors.

8.4 All arrows used to indicate direction of flow shall be either black or white to contrast with the colour of the insulation finish.

Appendix A – Materials, Technical Data and Information

A1 *Kingspan* **Kool**therm® Duct Insulation
(CFC/HCFC–free rigid phenolic insulation with zero Ozone Depletion Potential (ODP) for ductwork)

A2 Fensell Flat Duct Supports
(Rigid phenolic insulated rectangular duct support inserts)

A3 **Kool**therm® Pipe Insulation
(Rigid phenolic insulation for small circular ductwork and rounded ends of flat oval ductwork with a diameter of up to and including 350 mm)

A4 **Kool**therm® Insulated Pipe Support Inserts
(Rigid phenolic insulated circular support inserts for small circular ductwork and the rounded ends of flat oval ductwork with a diameter of up to and including 350 mm)

A5 Fensell Flexible Duct Supports
(Crocodile strips – rigid phenolic insulated circular duct support inserts for large circular ductwork with a diameter of greater than 350 mm)

A6 Fosters 95–44
(Moisture resistant sealant)

A7 Idenden ET–10
(Protective coating)

A8 Idenden ET–150
(Coating)

A9 No.10 Glass cloth
(Open weave glass fibre reinforcing membrane)

A10 Idenden 30–150
(Vapour barrier coating)

A11 Fosters 60–75
(Solvent based weatherproof mastic)

A12 Howstik 230 NF
(General purpose contact adhesive)