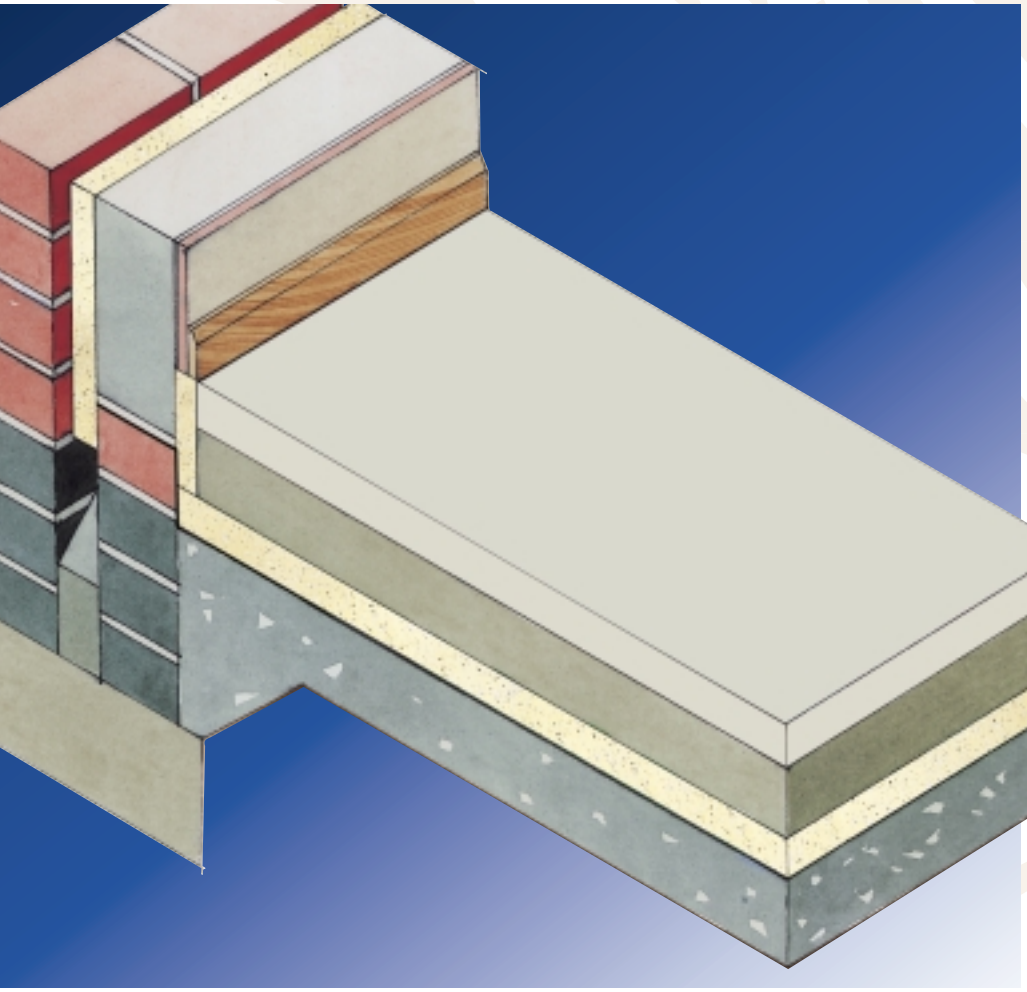
CI/Sfb Rn7 M2
First Issue January 2002

Thermafloor TF70 zero ODP

INSULATION FOR SOLID CONCRETE AND SUSPENDED GROUND FLOORS



- High performance rigid urethane insulation – thermal conductivity 0.022 W/m.K
- No requirement for a vapour control layer
- Quick response floor heating – prevents heat loss through 'heat sump'
- Minimises the cost of related items – soil removal, DPM's, service connections
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for newbuild and refurbishment
- CFC / HCFC-free with zero Ozone Depletion Potential (ODP)

BS EN ISO 9002: 1994
Certificate No. FM 10697

zero O.D.P

TYPICAL DESIGN DETAILS

Figure 1 BELOW THE FLOOR SLAB

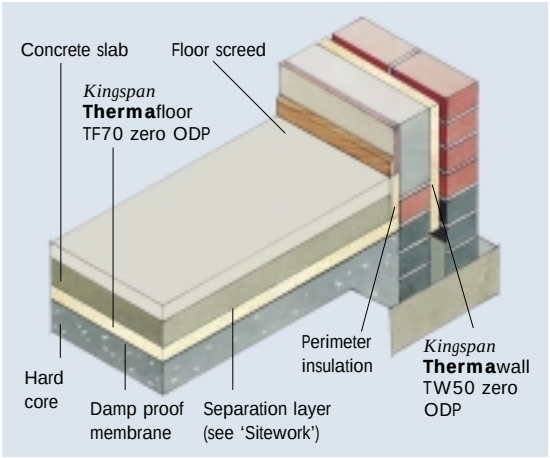


Figure 2 UNDERFLOOR HEATING - 24 HOUR HEATING CYCLE APPLICATIONS

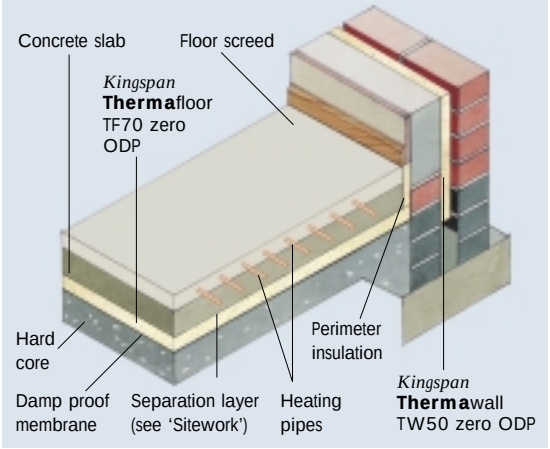


Figure 3 BELOW THE FLOOR SCREED

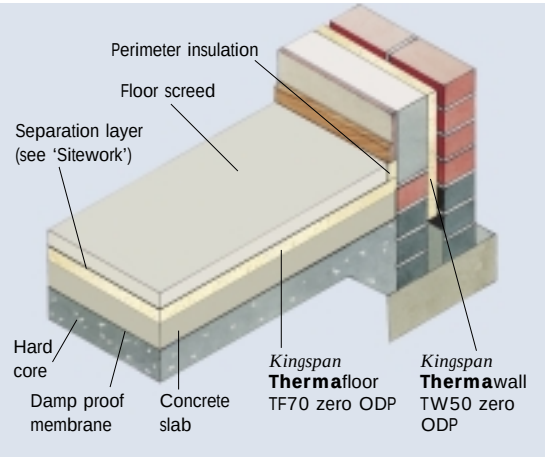


Figure 4 UNDERFLOOR HEATING - INTERMITTENT HEATING CYCLE APPLICATIONS

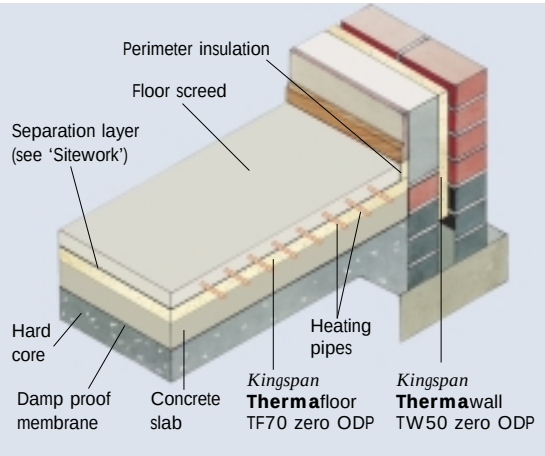


Figure 5 BEAM AND BLOCK FLOOR

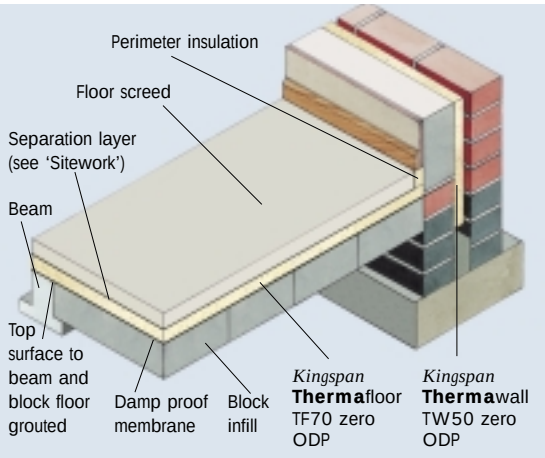


Figure 6 UNDERFLOOR HEATING - INTERMITTENT HEATING CYCLE APPLICATIONS - BEAM AND BLOCK FLOOR

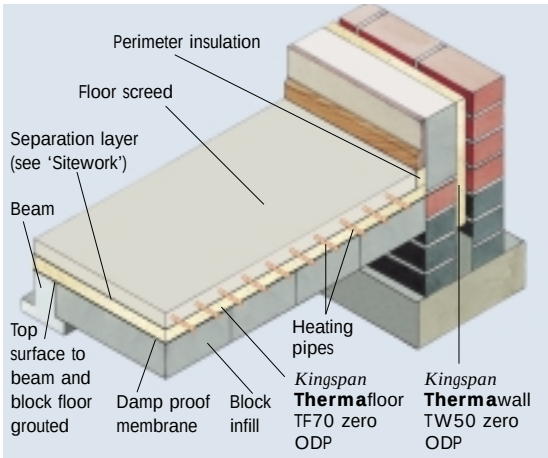


Figure 7 SUSPENDED TIMBER FLOOR

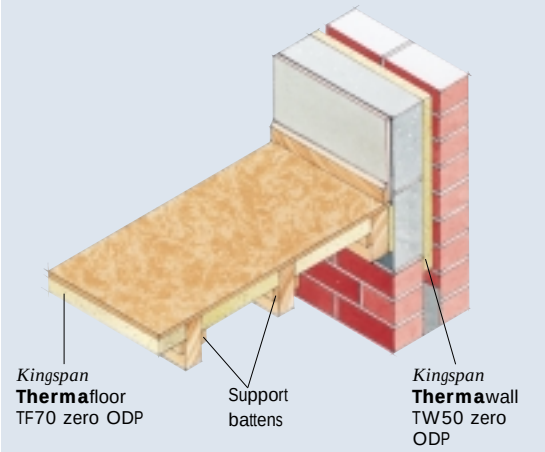


Figure 8 UNDERFLOOR HEATING - SUSPENDED TIMBER FLOOR

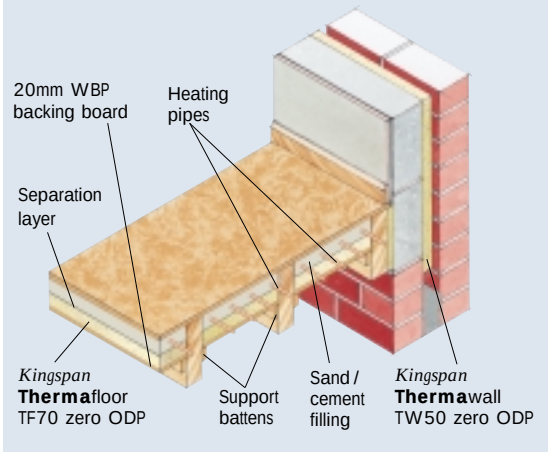


Figure 9 TIMBER FLOOR ON BATTENS

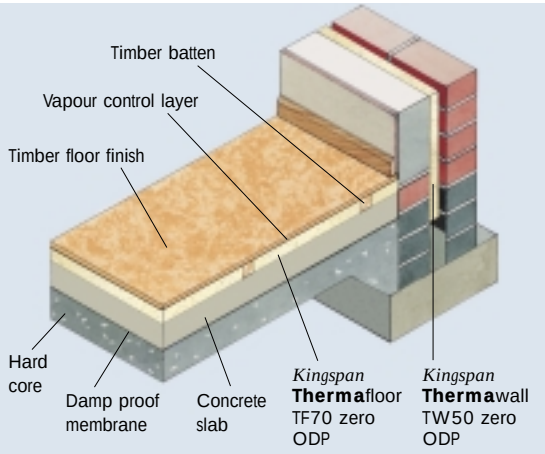
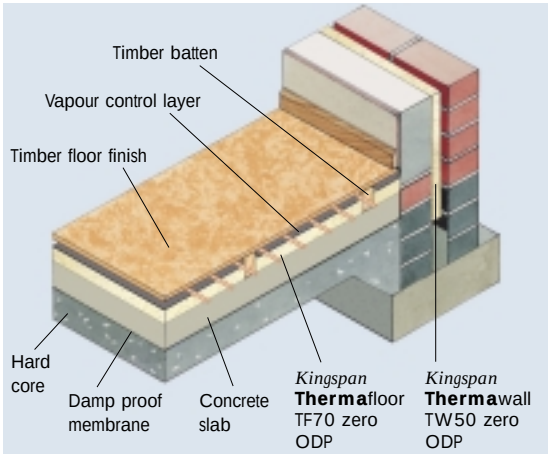


Figure 10 UNDERFLOOR HEATING - TIMBER FLOOR ON BATTENS



SPECIFICATION CLAUSE

Kingspan **Therma**floor TF70 zero ODP should be described in specifications as:-

The floor insulation shall be *Kingspan* **Therma**floor TF70 zero ODP ____mm thick comprising a CFC / HCFC-free rigid urethane insulation core with low emissivity composite foil facings on both sides manufactured to BS EN ISO 9002: 1994 by Kingspan Insulation Limited and shall be applied in accordance with the instructions issued by them.

Details also available in NBS PLUS. NBS users should refer to clause(s):
E20 200 (Standard and Intermediate)
E20 30 (Minor Works)

DESIGN CONSIDERATIONS

GENERAL

Consideration should be given to the recommendations of BS CP 102 (1973) (Code of practice for protection of structures against water from the ground) and the information given in Building Research Establishment Digests numbers, 104 (Floor Screeds), and 145 (Heat Losses Through Ground Floors).

Un-reinforced floor screeds can be used in conjunction with *Kingspan* **Therma**floor TF70 zero ODP in most applications. The compressive strength of *Kingspan* **Therma**floor TF70 zero ODP offers considerable advantages over some historically more popular floor insulants. Providing a minimum compressive strength of 140 kPa at 10% compression allows greater floor loads to be considered and therefore additional scope in the use of *Kingspan* **Therma**floor TF70 zero ODP. However, where floor loads are to be excessive, consideration should be given to the use of **Styro**zone™ extruded polystyrene insulation which offers far greater compressive strength characteristics. For further information please contact our Technical Services Department (see rear cover).

Where *Kingspan* **Therma**floor TF70 zero ODP is to be laid over a site fabricated concrete slab, the floor slab should be is allowed to dry out fully prior to the application of *Kingspan* **Therma**floor TF70 zero ODP. For those applications where the insulation and DPM is below the slab, construction water should be allowed to dry out, e.g. by delaying the installation of the floor finish.

Surface condensation is unlikely to occur on the floor surface if the *Kingspan* **Therma**floor TF70 zero ODP is laid over the slab due to the fast thermal response of the construction.

Kingspan **Therma**floor TF70 zero ODP is not recommended for use in direct contact with subsoil and must be used over the DPM. The surface of slabs should be smooth and free of projections. Beam and block floors should level and grouted. Rough cast slabs should be levelled using a thin sand blinding to ensure boards are continuously supported.

UNDERFLOOR HEATING SYSTEMS

The constructions shown in Figures 1,3 & 8 can be readily converted to accommodate underfloor heating systems.

For a solid concrete floor, the position of the insulation is important in either exposing the thermal mass of the concrete floor to the heat provided by the system or isolating the thermal mass from it.

For a 24 hour heating cycle, allowing the heat from the underfloor heating system to penetrate the concrete slab will provide a more even heating regime over a 24 hour period (see figure 2).

For intermittent heating cycles where a fast response time is required it is beneficial to have less thermal mass available to take up heat from the system and so placing the insulation layer below the screed or timber floor but above the concrete slab or beam and block floor is the best solution (see figures 4, 6 and 10).

Underfloor heating systems can also be accommodated in suspended timber floors. This arrangement has low thermal mass and so is more suited to intermittent heating cycle applications (see figure 8).

HEAT LOSS

It has been well documented that heat loss through a ground floor consists of two components:

(a) heat loss through the floor perimeter, which is proportional to the length of perimeter and the temperature difference between inside and outside;

(b) heat loss through the ground which depends on the temperature difference between inside and outside and the overall floor area.

Figure 11 HEAT FLOW THROUGH SLAB

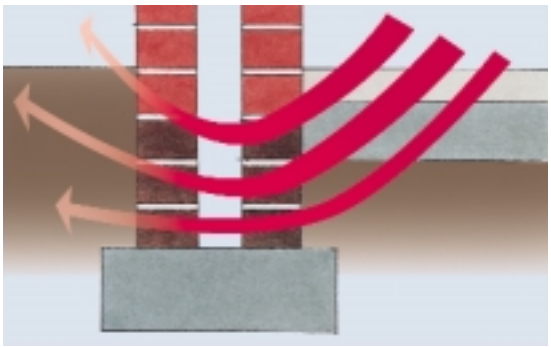
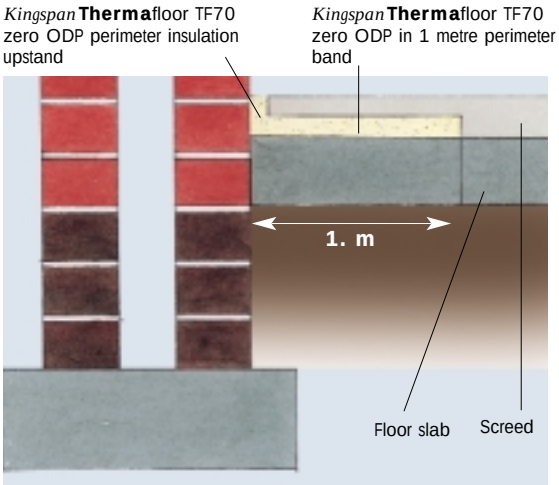


Figure 12 PERIMETER INSULATION



The greatest heat loss through an uninsulated floor is from the edges (Figure 11). Insulating the floor perimeter in a 1 metre band (Figure 12), will not only provide good insulating results but will also prevent the risk of cold bridging at the junction of the floor and external wall.

The thermal performance of an uninsulated domestic floor slab, however is relatively poor. To enhance the thermal performance, complete rather than perimeter insulation may need to be adopted in domestic floor constructions.

Complete floor insulation offers significant advantages over perimeter insulation when considering the floor dimensions of typical dwellings, e.g. it provides quick response to heating.

THERMAL PROPERTIES

The R-values and λ-values quoted in this document rigid urethane insulation are based on the procedures for the determination of the aged values of thermal resistance and thermal conductivity, laid down in the harmonised European standard BS EN 13165, using so called 90:90 principles. Comparison with alternative products may not be appropriate unless the same procedures have been followed.

THERMAL CONDUCTIVITY

The boards achieve a thermal conductivity (λ-value) of 0.022 W / mK.

THERMAL RESISTANCES

Thermal resistance (R-value) varies with thickness and is calculated by dividing the thickness of the board (expressed in metres) by its thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m^2.K / W)
20	0.909
25	1.136
30	1.364
35	1.591
40	1.818
45	2.045
50	2.273
55	2.500
60	2.727
65	2.955
70	3.182
75	3.409
80	3.636
85	3.864
90	4.091
95	4.318
100	4.545
105	4.773
110	5.000
115	5.227
120	5.455
125	5.682
130	5.909

TYPICAL U-VALUES

U-VALUE CALCULATIONS

Unlike roofs, walls and intermediate floors, U-value calculations for ground floors cannot be calculated in the normal manner with reference to the construction detail alone. Heat loss from ground floors depends upon the ratio of exposed floor perimeter to total floor area.

The U-value of an uninsulated ground / floor is calculated using the following equation:

$$U_0 = 0.05 + 1.65\left(\frac{P}{A}\right) - 0.6\left(\frac{P}{A}\right)^2$$

Where U_0 = U-value of uninsulated ground floor (W / m^2K)
P = Exposed perimeter of floor (m)
A = Area of floor (m^2)

Dimensions for floors should be measured between finished internal faces of external elements of the building, including projections. With semi-detached, terraced buildings etc. the floor dimensions can be taken either as the premises themselves, or the whole building. Where extensions to existing buildings are necessary, the floor dimensions can be taken as those of the entire building, including extension, or the extension alone.

Unheated spaces outside the insulated fabric, such as attached garages or porches, should be excluded when determining the area but the length of the wall between the heated building and the unheated space should be included when determining the perimeter.

The table below has been derived from the (U_0) uninsulated ground floor U-value equation.
It applies to all types of uninsulated floors constructed next to the ground including slab-on-ground, concrete raft, suspended timber and beam-and-block.

U-values of Uninsulated Floors

Perimeter / Area Ratio $\frac{P\ (m)}{A\ (m^2)}$	U-value (W / m^2K)
0.1	0.21
0.2	0.36
0.3	0.49
0.4	0.61
0.5	0.73
0.6	0.82
0.7	0.91
0.8	0.99
0.9	1.05
1.0	1.10

To establish the U-value for intermediate P / A ratios linear interpolation can be used as an alternative to calculation.

Should the U-value of the uninsulated floor be worse than that required, an additional layer of insulation may be required.

EASY GUIDE TO U-VALUES USING KINGSPAN THERMAFLOOR TF70 ZERO ODP

All of the U-values shown below were calculated using two methods, that detailed in BS / IS EN ISO 13370: 1998 (Thermal performance of buildings – Heat transfer via the ground- Calculation methods) and that detailed in BRE information paper 3/90. The method given in BS / IS EN ISO 13370: 1998 (Thermal performance of buildings – Heat transfer via the ground- Calculation methods) is required for compliance with Building Regulations / Standards revised after the year 2000.

BS / IS EN ISO 13370: 1998 Method - U-values were calculated using the method which has been / will be adopted to bring National standards in line with the European Standard calculation method. BS / IS EN ISO 13370: 1998 details methods for the calculation of U-values for solid and suspended ground floors, solid ground floors with edge insulation and basements.

BRE Information paper 3/90 / Proportional Area Method – BRE information paper 3/90 gives a calculation procedure for dense concrete ground floors where the insulation layer is unbridged. Where the insulation layer is bridged and/or the ground floor is not of dense concrete construction a combination calculation must be performed using either the proportional area method as detailed in The Chartered Institute of Building Services Engineers (CIBSE) Guide A3 (Thermal Properties of Building Structures).

NB for the purposes of these calculations using the method as detailed in BS / IS EN ISO 13370: 1998, the soil has been assumed to be clay or silt, the wall insulation is assumed to overlap the floor insulation by 200 mm minimum and the standard of workmanship has been assumed good and therefore the correction factor for air gaps has been ignored.

The figures below are for guidance only. A detailed U-value calculation together with a condensation risk analysis should be completed for each individual project. Please call our Technical Services Department for assistance (see rear cover).

SOLID CONCRETE GROUND FLOOR / BEAM & DENSE BLOCK FLOOR

These examples are valid for all dense concrete ground floor types with continuous *Kingspan* **Therma**floor TF70 zero ODP and no thermal bridging. If your construction is any different, please consult our Technical Services Department (see rear cover). There is no difference between the thicknesses of *Kingspan* **Therma**floor TF70 zero ODP required when calculated using either method detailed above.

	Thickness of *Kingspan* **Therma**floor TF70 zero ODP Required (mm)									
U-Value (W/m².K)	Perimeter / Area Ratio (m⁻¹)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.7					20	20	20	20	20	20
0.6					20	20	20	20	20	20
0.45			20	20	20	25	25	30	30	30
0.37			20	20	30	30	35	35	35	40
0.27		20	40	45	50	55	60	60	65	65
0.25		25	45	55	60	60	65	65	70	70
0.22		30	50	60	65	70	70	75	75	80

SUSPENDED TIMBER GROUND FLOOR

These examples are based on the use of *Kingspan* **Therma**floor TF70 zero ODP between 50 mm wide joists at 400 mm centres overlain with 18 mm chipboard. If your construction is any different, please consult our Technical Services Department (see rear cover). There is no difference between the thicknesses of *Kingspan* **Therma**floor TF70 zero ODP required when calculated using either method detailed above.

	Thickness of *Kingspan* **Therma**floor TF70 zero ODP Required (mm)									
U-Value (W/m².K)	Perimeter / Area Ratio (m⁻¹)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.7					20	20	20	20	20	20
0.6					20	20	20	20	25	25
0.45			20	25	35	40	45	45	50	50
0.37			20	35	45	50	55	60	60	65
0.27		35	60	75	85	90	95	100	100	105
0.25		45	70	85	95	100	105	110	110	115
0.22		55	80	95	105	115	120	125	125	130

TIMBER FLOOR ON BATTENS

These examples are based on the use of *Kingspan* **Therma**floor TF70 zero ODP between 50 mm wide battens at 600 mm centres overlain with 18 mm chipboard. If your construction is any different, please consult our Technical Services Department (see rear cover). There is no difference between the thicknesses of *Kingspan* **Therma**floor TF70 zero ODP required when calculated using either method detailed above.

	Thickness of *Kingspan* **Therma**floor TF70 zero ODP Required (mm)									
U-Value (W/m².K)	Perimeter / Area Ratio (m⁻¹)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.7					20	20	20	20	20	20
0.6					20	20	20	20	20	25
0.45			20	20	30	35	40	40	40	45
0.37			20	30	40	45	45	50	55	55
0.27		30	55	65	75	80	85	85	90	90
0.25		40	65	75	85	90	95	95	95	100
0.22		45	70	85	90	100	105	105	110	110

SITEWORK

LAYING BELOW THE FLOOR SLAB

After the site has been prepared and foundations where appropriate built to damp proof course level the damp proof membrane (minimum 300 micron / 1200 gauge polythene) should be laid over the well compacted hard-core, sand blinded, with joints well lapped and folded to prevent the passage of ground water. The membrane should be brought up the surrounding foundation walls until it is sufficiently above the height of the wall damp proof course so that it will connect with or form the DPC. The *Kingspan* **Therma**floor TF70 zero ODP insulation should be laid break-bonded with the joints lightly butted. A strip of the boarding should be placed vertically around the perimeter of the floor slab in order to prevent cold bridging of the slab. Boards are overlaid with a separating layer of building paper to BS 1521: 1972 (Specification for waterproof building papers), Grade B1F or polythene sheet (not less than 125 micron / 500 gauge). The subsequent application of the concrete slab and screed or other flooring material is similar to those laid over an un-insulated floor (see Figure 1).

LAYING BELOW THE FLOOR SCREED

Kingspan **Therma**floor TF70 zero ODP is simply laid loose over the concrete floor slab or beam and block floor with the necessary water and vapour proof protection. Board joints should be tightly butted, staggered, and laid to a break-bonded pattern. The floor slab should be uniformly flat without steps or gaps to provide continuous bearing support to the *Kingspan* **Therma**floor TF70 zero ODP. Beam and block floors should be level and grouted. A thin section of board should be used around the perimeter of the floor area being insulated. This should be placed vertically against the abutting wall so that it connects with the insulation laid over the slab and protects the edge of the screed, so preventing cold bridging of the floor screed. Boards are overlaid with a separating layer of building paper to BS 1521: 1972 (Specification for waterproof building papers), Grade B1F or polythene sheet (not less than 125 micron / 500 gauge) between the screed and the Kingspan Thermafloor TF70 to prevent the wet screed penetrating joints between the boards. Use a sand and cement screed laid to a minimum thickness of 65 mm for domestic construction and 75 mm elsewhere (see Figure 3).

LAYING IN SUSPENDED TIMBER FLOORS

The application of *Kingspan* **Therma**floor TF70 zero ODP in suspended floor constructions should be carried out before commencement of floor boarding. *Kingspan* **Therma**floor TF70 zero ODP should be cut to fit snugly between joists. It should be supported on softwood timber battens, proprietary galvanised steel saddle clips or galvanised nails partially driven into the side of the joists. Battens / nails should be placed at an appropriate height to suit the thickness of board being employed and nails should remain 40 mm proud of the joist. The boards should then be laid between the joists so that they are supported by the battens / nails. Any narrow gaps between a joist and perimeter wall should be insulated by specially cut pieces of board. They should be supported on blocks nailed to the underside of the joists. Where water services, including central heating pipes, run below the floor boards the location of the *Kingspan* **Therma**floor TF70 zero ODP insulation can be lowered to create an insulated duct for the services. Access from beneath the floor may later be obtained by removal of the nail supports, from the underside (see Figure 7). *Kingspan* **Therma**floor TF70 zero ODP is not suitable for battens placing over timber joists.

LAYING BETWEEN BATTENS UNDER A TIMBER FLOOR

The subfloor should be level and flat. *Kingspan* **Therma**floor TF70 zero ODP should be cut to fit snugly between battens. Any narrow gaps between battens and perimeter wall should be insulated by specially cut pieces of board. Board joints should be tightly butted.

UNDERFLOOR HEATING SYSTEMS

Please refer to the instructions of the specific underfloor heating system manufacturer.

CUTTING

Cutting should be carried out using a fine toothed saw, or sharp knife and snapping the board over a straight edge and cutting the foil facing on the other side. Ensure accurate trimming to achieve close butting joints and continuity of insulation.

AVAILABILITY

Kingspan **Therma**floor TF70 zero ODP is available through specialist insulation distributors and selected builders merchants throughout the UK, Ireland and Europe.

PACKAGING

The boards are supplied in labelled packs shrinkwrapped in polythene.

STORAGE

The packaging of *Kingspan* **Therma**floor TF70 zero ODP should not be considered adequate for long term outside protection. Boards should be stored inside a building. If, however, outside storage cannot be avoided, the boards should be stacked clear of the ground, and covered with a polythene sheet or weatherproof tarpaulin. Boards that have been allowed to get wet should not be used.

HEALTH AND SAFETY

Kingspan Insulation products are chemically inert and safe to use. A leaflet on this topic which satisfies the requirements set out in the Control of Substances Hazardous to Health Regulations, 1988 (COSHH) is available from our Technical Services Department (see rear cover).

Please note that the reflective surface on this product is designed to enhance its thermal performance. As such, it will reflect light as well as heat, including ultraviolet light. Therefore, if this board is being installed during very bright or sunny weather, it is advisable to wear UV protective sunglasses or goggles, and if the skin is exposed for a significant period of time, to protect the bare skin with a UV block sun cream.

Warning – do not stand on or otherwise support your weight on this board unless it is fully supported by a load-bearing surface.

PRODUCT DESCRIPTION

THE FACINGS

Kingspan **Therma**floor TF70 zero ODP is faced on both sides with a low emissivity composite foil autohesively bonded to the insulation core during manufacture.

THE CORE

The core of *Kingspan* **Therma**floor TF70 zero ODP is a high performance CFC / HCFC-free rigid urethane insulant of typical density 32 kg / m³.

CFC / HCFC-FREE

Kingspan **Therma**floor TF70 zero ODP is manufactured without the use of CFCs / HCFCs and has zero Ozone Depletion Potential (ODP).

zero O.D.P

PRODUCT DATA

STANDARDS AND APPROVALS

Kingspan **Therma**floor TF70zero ODP is manufactured to the highest standards under a quality control system approved to BS EN ISO 9002: 1994 (Quality systems. Model for quality assurance in production, installation and servicing).

BS EN ISO 9002 : 1994
Certificate No. FM 10697

STANDARD DIMENSIONS

Kingspan **Therma**floor TF70 zero ODP is available in the following standard sizes and thicknesses:

Nominal Dimension		Availability
Length	(m)	2.4
Width	(m)	1.2
Insulant Thickness*	(mm)	20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130

* Other thicknesses are available subject to quantity.

INSULATION COMPRESSIVE STRENGTH

Typically exceeds 140 kPa at 10% compression when tested to BS 4370: Part 1: 1988 (1996) (Methods of test for rigid cellular materials).

WATER VAPOUR RESISTANCE

Modified to include board facings, the boards achieve a resistance greater than 100 MN.s / g when tested in accordance with BS 4370: Part 2: 1993. *Kingspan* **Therma**floor TF70 zero ODP should always be installed over a separate damp proof membrane (minimum 1200 gauge).

DURABILITY

If correctly applied, *Kingspan* **Therma**floor TF70 zero ODP has an indefinite life. Its durability depends on the supporting structure and floor finish structure and the conditions of its use.

RESISTANCE TO SOLVENTS, FUNGI & RODENTS

The insulation core is resistant to dilute acids, alkalis, mineral oil and petrol. It is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone.

Adhesives containing such solvents should not be used in association with *Kingspan* **Therma**floor TF70 zero ODP. Boards which have been in contact with harsh solvents, petrol, mineral oil or acids, or boards that have been damaged in any other way should not be used.

The insulation core and facings used in the manufacture of *Kingspan* **Therma**floor TF70 zero ODP resist attack by mould and microbial growth and do not provide any food value to vermin.

FIRE PERFORMANCE

The fire rating of *Kingspan* **Therma**floor TF70 zero ODP boards when subjected to British Standard fire tests, will vary, depending on the particular application. Further details on the fire performance of Kingspan Insulation products may be obtained from our Technical Services Department (see rear cover).

Test	Result
BS 476: Part 7: 1997 (Surface Spread of Flame Test)	Class 1 rating

CUSTOMER SERVICE

For quotations, order placement and details of despatches please contact our Building Fabric Insulation Customer Services Department on the numbers below:

UK – Telephone: +44 (0) 1544 388 601
– Fax: +44 (0) 1544 388 888
– email: commercial.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95000
– Fax: +353 (0) 42 97 46129
– email: commercial.ie@insulation.kingspan.com

TECHNICAL ADVICE

Kingspan Insulation Ltd support all of their products with a comprehensive Technical Advisory Service for specifiers, stockists and contractors.

This includes a free computer-aided service designed to give fast, accurate technical advice. Simply phone our *TECHLINE* with your project specification and we can run calculations to provide U-values, condensation / dew point risk, required insulation thicknesses etc.... Thereafter we can run any number of permutations to help you achieve your desired targets.

We can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

Please contact our Building Fabric Insulation Technical Services Department on the *TECHLINE* numbers below:

TECHLINE

UK: – Freephone: 0800 610 061
– Telephone: +44 (0) 1544 387 260
(if dialling from outside the UK)
– Fax: +44 (0) 1544 388 888
– email: techline.uk@insulation.kingspan.com

Ireland: – Telephone: +353 (0) 42 97 95032
– Fax: +353 (0) 42 97 46129
– email: techline.ie@insulation.kingspan.com

LITERATURE AND SAMPLES

Kingspan Insulation produces a comprehensive range of technical literature for specifiers, contractors, stockists and end users. The literature contains clear 'user friendly' advice on typical design; design considerations; thermal properties; sitework and product data.

Available as a complete Design Manual, on CD-ROM or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact our Marketing Department on the numbers below:

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