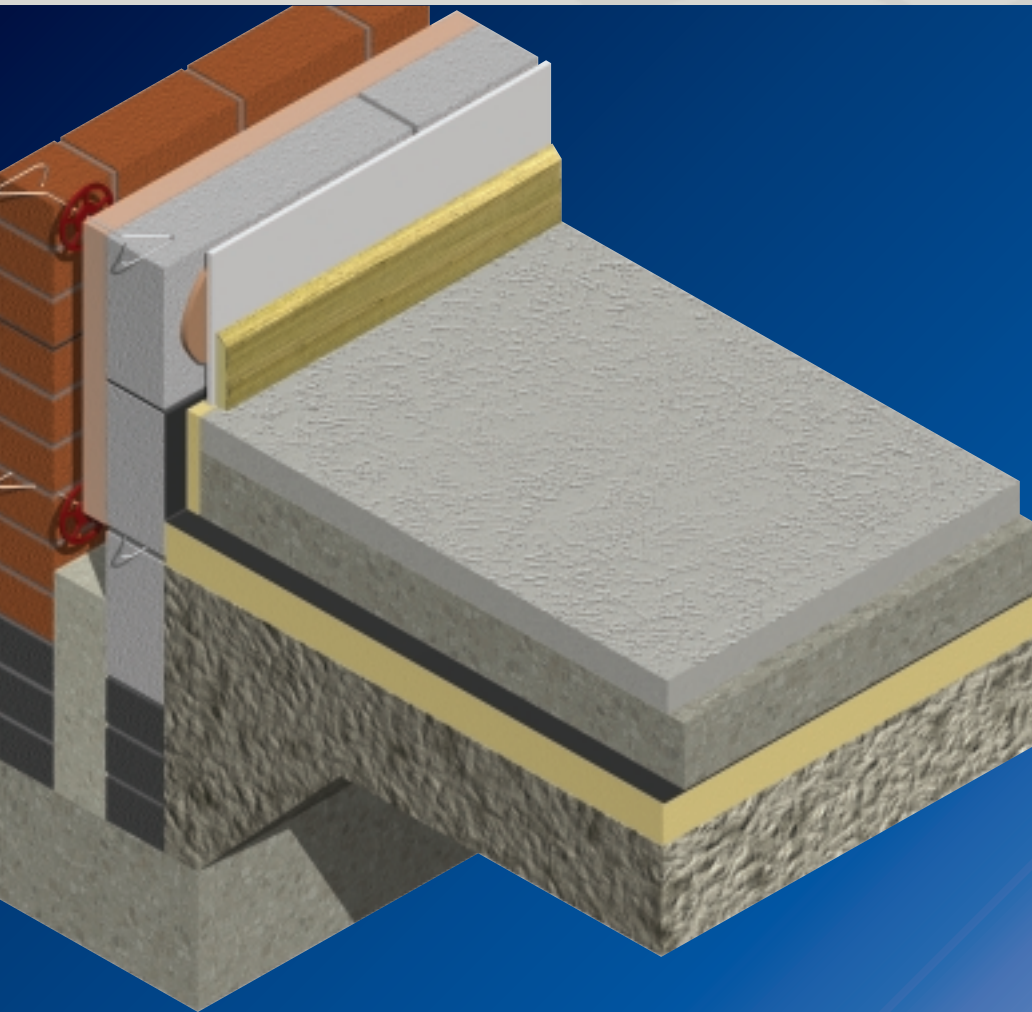


# Styrozone®

INSULATION FOR HEAVY DUTY COMMERCIAL,  
INDUSTRIAL AND COLD STORE FLOORING



- High performance rigid extruded polystyrene insulation – thermal conductivity 0.029–0.038 W/m-K
- High compressive strength – available in a number of grades to suit application
- Closed cell structure – will not absorb ground moisture
- No requirement for a separate vapour control layer
- When used beneath floor slab, provides a smooth stable platform for the DPM
- Easy to handle and install
- Ideal for newbuild and refurbishment
- Non-deleterious material
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP)



## Typical Design Details

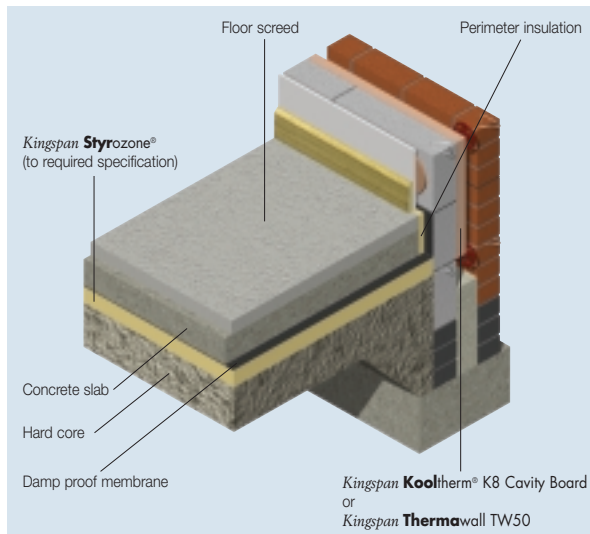


Figure 1 Below the Floor Slab

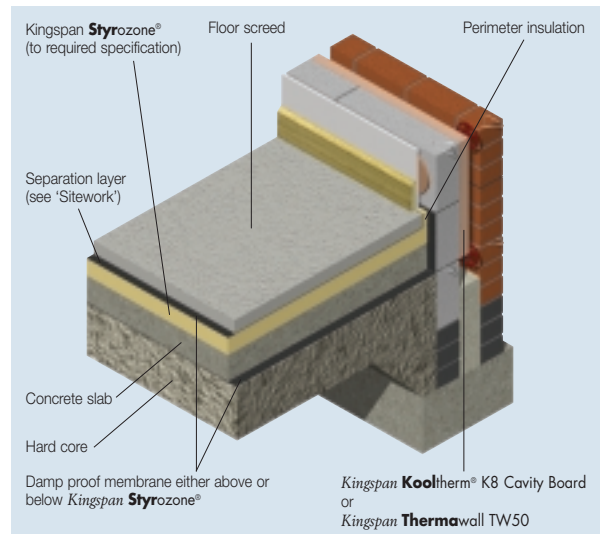


Figure 2 Below the Floor Screed

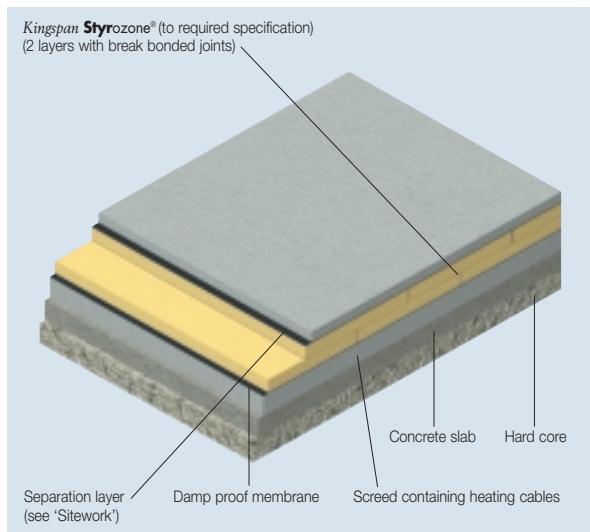


Figure 3 Cold Store Floor

## Specification Clause

*Kingspan Styrozone®* should be described in specification as:-

The floor insulation shall be *Kingspan Styrozone®* (insert grade) \_\_\_\_ mm thick comprising CFC/HCFC-free rigid extruded polystyrene insulation manufactured to BS EN ISO 9001: 2000 and shall be applied in accordance with the instructions issued by Kingspan Insulation Limited.

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 CP 102: 1973 (Code of practice for protection of buildings 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).

Where *Kingspan Styrozone®* is to be laid over a site fabricated concrete slab, the floor slab should be allowed to dry out fully prior to the application of *Kingspan Styrozone®*. 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 Styrozone®* is laid over the slab due to the fast thermal response of the construction.

### Loading

Un-reinforced floor screeds can be used in conjunction with *Kingspan Styrozone®* in most applications. The high compressive strength of *Kingspan Styrozone®* makes it particularly suitable for use where floor loads are to be excessive. *Kingspan Styrozone®* is available in 4 grades, each with a different compressive strength. The grade selected will be dependent on the anticipated floor loads.

*Kingspan Styrozone®* N 300 typically provides a minimum compressive strength of 300 kPa at 10% compression and is particularly suited to floors in commercial construction with relatively high compressive loading.

*Kingspan Styrozone*<sup>®</sup> H 350 typically provides a minimum compressive strength of 350 kPa at 10% compression and is particularly suited to cold store floor applications.

*Kingspan Styrozone*<sup>®</sup> N 500 typically provides a minimum compressive strength of 500 kPa at 10% compression and is particularly suited to floors in industrial construction with relatively high compressive loading.

*Kingspan Styrozone*<sup>®</sup> N 700 typically provides a minimum compressive strength of 700 kPa at 10% compression and is particularly suited to floors subjected to considerable compressive loading, such as aircraft hangers.

For further product information, please refer to pages 6 and 7.

### Domestic Flooring

Grades of *Kingspan Styrozone*<sup>®</sup> are also available for domestic flooring applications. Please contact the Kingspan Insulation Technical Services Department for further information (see rear cover).

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

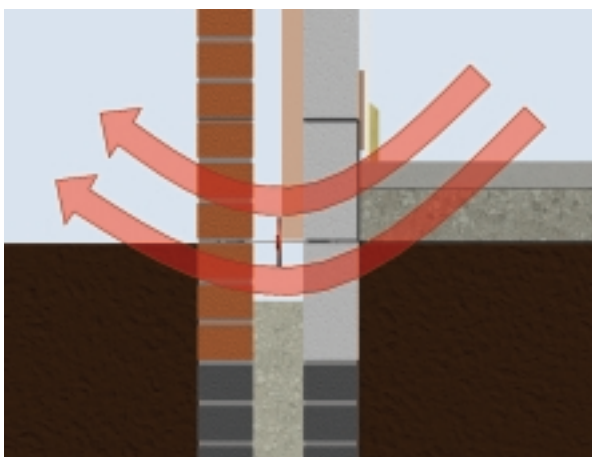


Figure 4 Heat Flow Through Slab

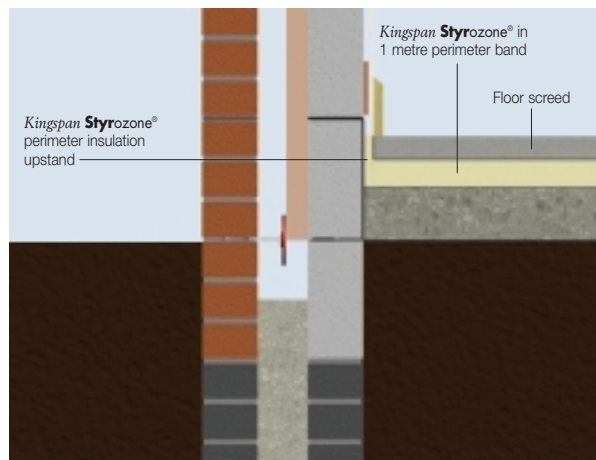


Figure 5 Perimeter Insulation

The greatest heat loss through an uninsulated floor is from the edges (Figure 4). Insulating the floor perimeter in a 1 metre band (Figure 5), 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.

## 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.

Dimensions for floors should be measured between finished internal faces of external elements of the building, including projections. Non-usable space such as ducts and stair wells are to be included. 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.

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. The table below applies to uninsulated floors constructed next to the ground including slab-on-ground, concrete raft and solid floor.

### U-values of Uninsulated Slab-on-ground, Concrete Raft and Solid Floors

Perimeter/Area Ratio $\frac{P (m)}{A (m^2)}$	U-value (W/m <sup>2</sup> ·K)
0.1	0.22
0.2	0.37
0.3	0.49
0.4	0.60
0.5	0.70
0.6	0.78
0.7	0.86
0.8	0.93
0.9	0.99
1.0	1.05

The table below applies to uninsulated suspended beam and block/timber/concrete floors.

### U-values of Uninsulated Suspended Beam and Block/Timber/Concrete Floors

Perimeter/Area Ratio $\frac{P (m)}{A (m^2)}$	U-value (W/m <sup>2</sup> ·K)
0.1	0.26
0.2	0.41
0.3	0.52
0.4	0.61
0.5	0.69
0.6	0.75
0.7	0.80
0.8	0.85
0.9	0.89
1.0	0.92

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, the inclusion of insulation will be necessary.

## Sitework

### Laying Below the Floor Slab

After the site has been prepared and the foundations where appropriate built to damp proof course level the *Kingspan Styrozone*® boards should be laid loose with the joints staggered and tightly butted onto well compacted hard-core, blinded with sand or cement. A strip of the boarding should be placed vertically around the perimeter floor slab in order to prevent cold bridging of the slab. The damp proof membrane (minimum 300 micron/1200 gauge polythene) should be laid over the *Kingspan Styrozone*® insulation boards 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 subsequent application of the concrete slab and screed or other flooring material is similar to those laid over an uninsulated floor (see Figure 1).

### Laying Below the Floor Screed

*Kingspan Styrozone*® is simply laid loose over the concrete floor slab 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 Styrozone*®. A thin section of the 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 (1994) (Specification for waterproof building papers), Grade B1F or polythene sheet (not less than 125 micron/500 gauge) between the screed and the *Kingspan Styrozone*® to prevent the wet screed penetrating joints between the boards. Use a sand and cement screed laid to a minimum thickness of 75 mm or greater as required for the intended purpose of use (see Figure 2).

### Cutting

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

### Availability

*Kingspan Styrozone*® 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.

## Easy Guide to U-values Using Kingspan **Styrozone**<sup>®</sup>

All of the U-values shown below were calculated using the method that is detailed in BS/I.S. EN ISO 13370: 1998 (Thermal performance of buildings. Heat transfer via the ground. Calculation methods) which is required for compliance with Building Regulations/Standards revised after the year 2002.

**BS/I.S. EN ISO 13370: 1998 Method** – U-values were calculated using the method which has been adopted to bring National standards in line with the European Standard calculation method. BS/I.S. 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.

*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 the Kingspan Insulation Technical Services Department for assistance (see rear cover).*

*NB for the purposes of these calculations using the method as detailed in BS/I.S. 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.*

### Solid Concrete Ground Floor

These examples are valid for all dense concrete ground floor types with continuous **Kingspan Styrozone**<sup>®</sup> and no thermal bridging. If your construction is any different, please contact the Kingspan Insulation Technical Services Department (see rear cover).

U-Value (W/m <sup>2</sup> -K)	Thickness of <b>Kingspan Styrozone</b> <sup>®</sup> H 350 Required (mm)									
	Perimeter / Area Ratio (m <sup>-1</sup> )									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.70						25	25	25	25	25
0.60					25	25	25	25	25	25
0.45			25	25	25	25	30	35	35	35
0.37			25	30	35	40	45	45	50	50
0.27		25	45	55	60	65	70	75	75	80
0.25		30	50	65	70	75	80	80	85	90
0.22		40	65	75	85	90	95	100	100	100

U-Value (W/m <sup>2</sup> -K)	Thickness of <b>Kingspan Styrozone</b> <sup>®</sup> N 300, N 500 Required (mm)									
	Perimeter / Area Ratio (m <sup>-1</sup> )									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.70						30	30	30	30	30
0.60					30	30	30	30	30	30
0.45			30	30	30	30	40	40	40	50
0.37			30	30	40	50	50	60	60	60
0.27		30	50	70	80	100	100	100	100	100
0.25		30	60	80	100	100	100	100	120	120
0.22		50	100	100	120	120	120	140	140	140

U-Value (W/m <sup>2</sup> -K)	Thickness of <b>Kingspan Styrozone</b> <sup>®</sup> N 700 Required (mm)									
	Perimeter / Area Ratio (m <sup>-1</sup> )									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.70						50	50	50	50	50
0.60					50	50	50	50	50	50
0.45			50	50	50	50	50	50	50	50
0.37			50	50	50	50	55	55	60	60
0.27		50	55	70	80	85	90	95	95	100
0.25		50	60	80	85	95	100	50+55*	50+55*	50+55*
0.22		50	85	95	50+60*	50+60*	55+60*	60+60*	60+65*	60+65*

\*NB The first thickness indicated refers to the insulation layer closest to the finished floor

## Storage

The packaging of *Kingspan Styrozone*® wrapped in polythene should not be considered adequate for long term outside protection.

*Kingspan Styrozone*® should be stored flat in a ventilated area and protected generally from accidental damage, contact with volatile solvents, flames and extended exposure to UV and sunlight. If it is stored outside for more than a few weeks, it must be covered with a pale pigmented plastic sheet.

*Kingspan Styrozone*® should not left in the sun covered by either a transparent or a dark plastic sheet, since in both cases, board temperatures can build up to a level hot enough to appreciably alter their dimensions or warp them.

## 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 the Kingspan Insulation Marketing Department (see rear cover).

*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

### Composition

*Kingspan Styrozone*® N 300, H 350, N 500 and N 700 are high performance rigid extruded polystyrene insulants of typical density 35, 35, 40 and 45 kg/m<sup>3</sup> respectively, with a smooth, dense skin on both faces.

### CFC/HCFC-free

*Kingspan Styrozone*® is manufactured without the use of CFC/HCFCs and has zero Ozone Depletion Potential (ODP).



## Product Data

### Standards and Approvals

*Kingspan Styrozone*® is manufactured to the highest quality standards under a quality control system approved to BS EN ISO 9001: 2000 (Quality management systems. Requirements).



Manufactured to BS EN ISO 9001: 2000

## Standard Dimensions

*Kingspan Styrozone*® H 350 R and H 350 S are available in the following standard sizes and thicknesses:

Nominal Dimension		Availability
Length	(m)	1.25
Width	(m)	0.6
Insulant Thickness	(mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.
Edge Profile		Rebated to all four edges (R Grade) Straight edge to all four edges (S Grade)

*Kingspan Styrozone*® H 350 T is available in the following standard sizes and thicknesses:

Nominal Dimension		Availability
Length	(m)	2.5
Width	(m)	0.6
Insulant Thickness	(mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.
Edge Profile		Tongue and groove to all four edges

*Kingspan Styrozone*® N 300 T is available in the following standard sizes and thicknesses:

Nominal Dimension		Availability
Length	(m)	2.5
Width	(m)	0.6
Insulant Thickness	(mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.
Edge Profile		Tongue and groove to all four edges

*Kingspan Styrozone*® N 300 R, N 300 S, N 500 R and N 700 R are available in the following standard sizes and thicknesses:

Nominal Dimension		Availability
Length	(m)	1.25
Width	(m)	0.6
Insulant Thickness	(mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.
Edge Profile		Rebated to all four edges (R Grade) Straight edge to all four edges (S Grade)

## Insulation Compressive Strength

The compressive strengths of *Kingspan Styrozone*® N 300 , H 350, N 500 and N 700 typically exceed 300, 350, 500 and 700 kPa respectively at 10% compression when tested to BS EN 826: 1996 (Thermal insulating products for building applications. Determination of compression behaviour).

### Thermal Expansion

The linear thermal expansion coefficient of *Kingspan Styrozone*<sup>®</sup> is 0.07 mm/m.K when tested to BS 4370-3: 1988 (2002) (Methods of test for rigid cellular materials. Methods 12 and 13).

### Water Vapour Resistivity

Modified to include board facings, the boards achieve a resistivity greater than 350 MNs/gm when tested in accordance with BS EN 12086: 1997 (Thermal insulating products for building applications. Determination of water vapour transmission properties).

### Absorption of Moisture

*Kingspan Styrozone*<sup>®</sup> is not sensitive to moisture of any kind. Its surface is water-repellent and there is no capillary suction. The material is also not hygroscopic. Over a 28 day cycle with temperature fluctuating 20/40°C its water absorption is < 0.5% when tested to BS EN 12087: 1997 (Thermal insulating products for building applications. Determination of long term water absorption by immersion).

### Durability

If correctly applied, *Kingspan Styrozone*<sup>®</sup> 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

*Kingspan Styrozone*<sup>®</sup> is resistant to most dilute acids and alkalis. It may not be resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone. Adhesives containing such solvents should not be allowed to come into contact with the product. Edible oils, white oil, petroleum jelly and fuel oil should also be avoided. Organic solvents, petrol, petroleum solvents, and solvent based cold bitumen and or mastic will have a detrimental effect if allowed to come into contact with the boards. In the event of the boards coming into contact with harsh solvents, petrol, mineral oil or acids or being damaged in any other way, they should not be used. If already fixed, they should be replaced.

*Kingspan Styrozone*<sup>®</sup> resists attack by mould and microbial growth.

*Kingspan Styrozone*<sup>®</sup> does not provide any food value to vermin and they are not normally attractive to them.

### Fire Performance

When tested in accordance with the requirements of DIN 4102: 1981 – B1 is obtained – not readily ignitable.

### Maximum Service Temperature

*Kingspan Styrozone*<sup>®</sup> should not be brought into direct contact with high temperature heat sources. The maximum service temperature of *Kingspan Styrozone*<sup>®</sup> is 75°C.

NB *Kingspan Styrozone*<sup>®</sup> will be delivered in packaging bearing the Uralita Batifoam or Poliglas Glascofoam names.

## Thermal Properties

The  $\lambda$ -values and R-values quoted are in accordance with the Harmonised European Standard BS EN 13164: 2001 (Thermal insulation products for buildings – Factory made products of extruded polystyrene (XPS) – Specification) using so called 90/90 principles. Comparison with alternative products may not be appropriate unless the same procedures have been followed.

### Thermal Conductivity

The thermal conductivity ( $\lambda$ -value) of *Kingspan Styrozone*<sup>®</sup> H 350 is 0.029 W/m.K (insulant thickness 0–130 mm), 0.031 W/m.K (insulant thickness > 130 mm).

The thermal conductivity ( $\lambda$ -value) of *Kingspan Styrozone*<sup>®</sup> N 300 and N 500, is 0.034 W/m.K (insulant thickness 0–60 mm), 0.036 W/m.K (insulant thickness 61–120 mm) and 0.038 W/m.K (insulant thickness > 120 mm).

The thermal conductivity ( $\lambda$ -value) of *Kingspan Styrozone*<sup>®</sup> N 700 is 0.036 W/m.K (insulant thickness 50–60 mm), 0.037 W/m.K (insulant thickness 70–100 mm).

### 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 <sup>2</sup> ·K/W)		
	H 350	N 300/N 500	N 700
25	0.85	0.70	
30	1.00	0.85	
35	1.20	1.00	
40	1.35	1.15	
45	1.55	1.30	
55	1.85	1.60	1.50
60	2.05	1.75	1.65
65	2.20	1.80	
70	2.40	1.90	1.85
75	2.55	2.05	2.00
80	2.75	2.20	2.15
85	2.90	2.35	2.25
90	3.10	2.50	2.40
95	3.25	2.60	2.55
100	3.45	2.75	2.70
105	3.60	2.90	
110	3.75	3.05	
115	3.95	3.15	
120	4.10	3.20	
125	4.30	3.25	
130	4.45	3.40	
140	4.50	3.65	
145	4.65	3.80	
150	4.80	3.90	
160	5.15	4.20	

Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.

# Contact Details

## Customer Service

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

UK – Telephone: +44 (0) 870 850 8555  
– Fax: +44 (0) 870 850 8666  
– 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

## Literature & Samples

Kingspan Insulation produce 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department on the numbers below:

UK – Telephone: +44 (0) 870 733 8333  
– Fax: +44 (0) 1544 387 299  
– email: literature.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95038  
– Fax: +353 (0) 42 97 46129  
– email: literature.ie@insulation.kingspan.com

## Tapered Roofing

For technical guidance, quotations, order placement and details of despatches please contact the Kingspan Insulation Tapered Roofing Department on the numbers below:

UK – Telephone: +44 (0) 870 761 7770  
– Fax: +44 (0) 1544 387 289  
– email: tapered.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95032  
– Fax: +353 (0) 42 97 95669  
– email: tapered.ie@insulation.kingspan.com

## Technical Advice/Design

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

This includes a computer-aided service designed to give fast, accurate technical advice. Simply phone the Kingspan Insulation **TECHLINE** with your project specification. Calculations can be carried out to provide U-values, condensation/dew point risk, required insulation thicknesses etc... Thereafter any number of permutations can be provided to help you achieve your desired targets.

The Kingspan Insulation Technical Services Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

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

UK – Telephone: +44 (0) 870 850 8333  
– Fax: +44 (0) 1544 387 278  
– email: techline.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95032  
– Fax: +353 (0) 42 97 95669  
– email: techline.ie@insulation.kingspan.com

## General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK – Telephone: +44 (0) 870 850 8555  
– Fax: +44 (0) 870 850 8666  
– email: info.uk@insulation.kingspan.com

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

*Kingspan Insulation reserve the right to amend product specifications without prior notice. Product thicknesses shown in this document should not be taken as being available ex-stock and reference should be made to the current Kingspan Insulation price-list or advice sought from Kingspan Insulation Sales Department. The information, technical details and fixing instructions etc. included in this literature are given in good faith and apply to uses described. Recommendations for use should be verified as to the suitability and compliance with actual requirements, specifications and any applicable laws and regulations. For other applications or conditions of use, Kingspan Insulation offers a Technical Advisory Service (see left) whose advice should be sought for uses of Kingspan Insulation products that are not specifically described herein. Please check that your copy of the literature is current by contacting the Kingspan Insulation Marketing Department (see above).*



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