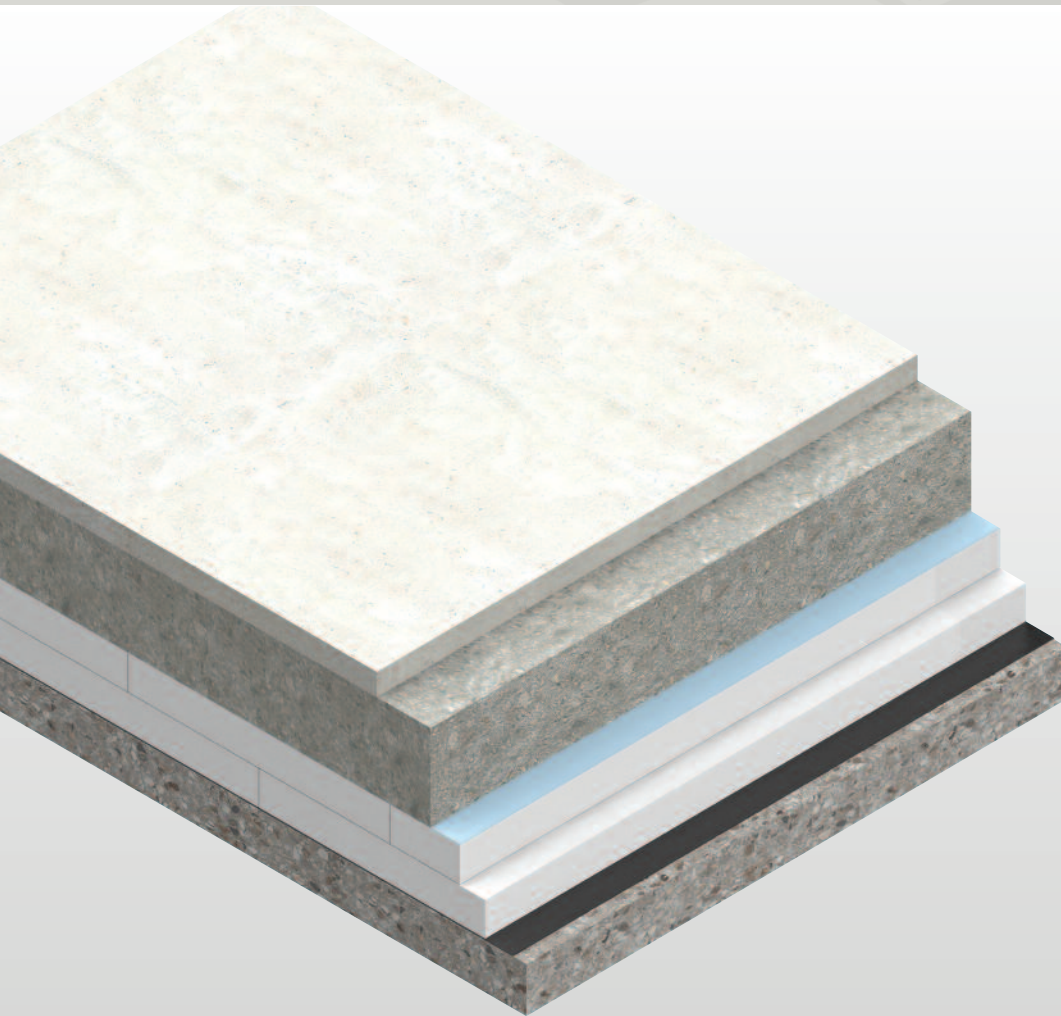




Styrozone[®] Heavy Duty Floors

INSULATION FOR HEAVY DUTY COMMERCIAL,
INDUSTRIAL AND COLD STORE FLOORING



- High performance rigid extruded polystyrene insulation – thermal conductivities as low as 0.029 W/m-K
- High compressive strength – available in a number of grades to suit a range of service loads
- Resistant to ground moisture penetration
- Unaffected by air infiltration
- Easy to handle and install
- Ideal for new build and refurbishment
- Non-deleterious material
- Manufactured with a blowing agent that has zero ODP



*Low Energy –
Low Carbon Buildings*

Typical Constructions and U-values

Heat Loss and Linear Thermal Bridging

For buildings with relatively small ground floor areas (primarily domestic properties), if the ground floor is left uninsulated, the thermal performance will be poor. To enhance the thermal performance, complete insulation of the ground floor should be adopted (Figure 1).

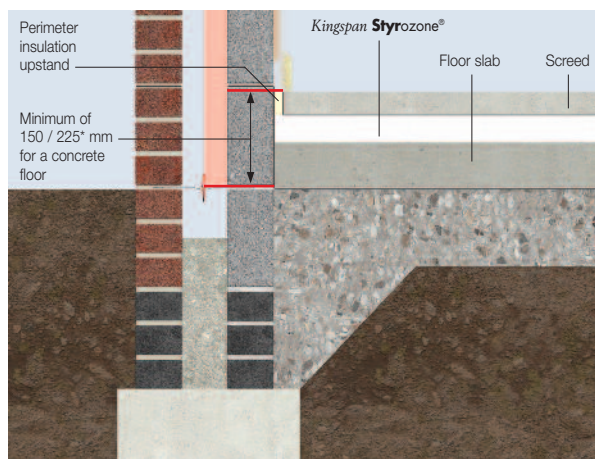


Figure 1 – Complete Masonry Floor Insulation

For buildings with large ground floor areas, complete insulation of the ground floor may be unnecessary. Insulating the perimeter in a 1.2 metre wide strip may provide adequate thermal performance (Figure 2).

Calculations in the tables that follow assume complete insulation of the floor area, please contact the Kingspan Insulation Technical Service Department for calculations with perimeter insulation only.

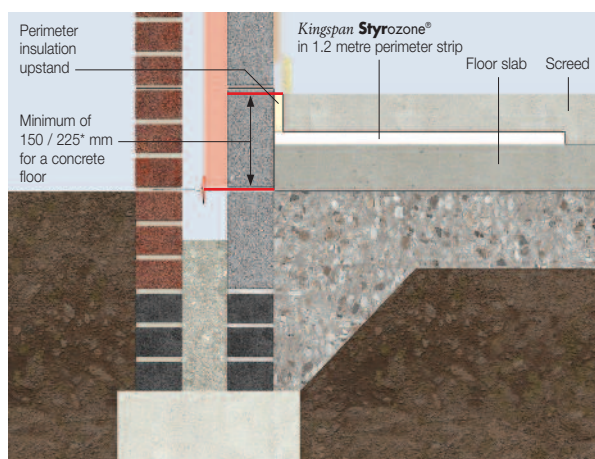


Figure 2 – Perimeter Strip Masonry Floor Insulation

In order to minimise cold bridging at the edge of the floor, the distance between the top of the floor insulation surface, or perimeter insulation upstand, and the bottom of the wall insulation must be 150 / 225* mm min. for a concrete floor (see Figures 1 & 2).

* 150 mm applies to the UK and 225 mm to the Republic of Ireland.

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 13370: 2007 (Thermal performance of buildings. Heat transfer via the ground. Calculation methods) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details immediately above each table.



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

Floor dimensions should be measured between the finished internal surfaces of the external walls. Non-usable heated space such as ducts and stairwells should be included when determining the area of the floor. Unheated spaces outside of the insulated fabric, such as attached garages or porches, should be excluded when determining the area of the floor, but the length of the wall between the heated building and the unheated space should be included when determining the perimeter. The floor dimensions of semi-detached, terraced or other joined premises / dwellings can be taken either as those of the premises / dwelling itself or those of the whole building. Where extensions to existing buildings are under consideration, the floor dimensions should be taken as those of the extension.

If the P/A ratio lies between two of the numbers shown in the tables to follow, for a safe estimate, please use the P/A ratio shown that is the next highest i.e. for 0.57 use 0.6.

NB The figures quoted are for guidance only. A detailed U-value calculation should be completed for each individual project.

NB For the purposes of these calculations, using the method as detailed in BS / I.S. EN ISO 13370: 2007, the soil has been assumed to be sand or gravel, the wall insulation is assumed to overlap the floor insulation by minimum 150 / 225 mm, and the standard of workmanship has been assumed good and therefore the correction factor for air gaps has been ignored.*

NB If your construction is different from those specified and / or to gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

U-value Table Key

Where an **X** is shown, the U-value is higher than the worst of the maximum new build area weighted average U-values allowed by the 2010 Editions of Approved Documents L to the Building Regulations (England & Wales), the 2010 Editions of Technical Handbooks Section 6 (Scotland), the 2006 Editions of Technical Booklets F (Northern Ireland), or the 2008 Editions of Technical Guidance Documents L* (Republic of Ireland).

* Excluding Change of Use and Material Alterations.

Solid Concrete Ground Floors

Medium Compressive Loads

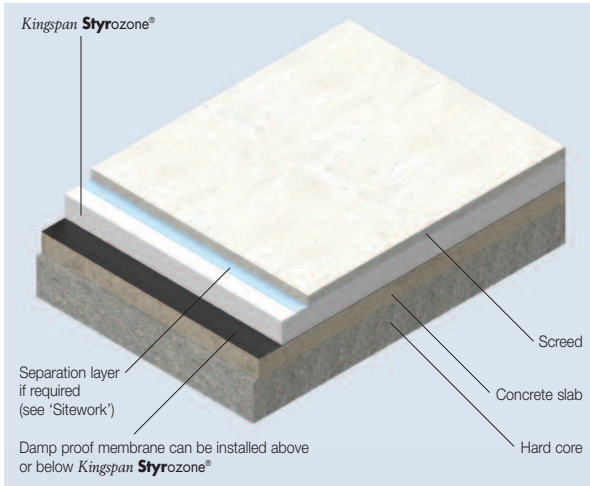


Figure 3

U-values (W/m ² -K) for Various Thicknesses of Kingspan Styrozone® and Floor Perimeter / Area Ratios					
Insulant Thickness (mm)	Perimeter / Area (m ⁻¹)				
	0.1	0.2	0.3	0.4	0.5
Kingspan Styrozone® N 300 R					
0	X	X	X	X	X
30	0.20	X	X	X	X
40	0.19	X	X	X	X
50	0.18	X	X	X	X
60	0.17	0.24	X	X	X
80	0.15	0.22	0.25	X	X
100	0.14	0.20	0.22	0.24	X
120	0.13	0.18	0.20	0.21	0.23
140	0.12	0.16	0.18	0.19	0.20
160	0.11	0.15	0.16	0.18	0.18
180	0.11	0.14	0.16	0.17	0.17
100 + 100	0.10	0.13	0.14	0.15	0.15
120 + 100*	0.10	0.12	0.13	0.14	0.14
120 + 120	0.09	0.11	0.12	0.13	0.13
140 + 120*	0.09	0.11	0.11	0.12	0.12
140 + 140	0.08	0.10	0.11	0.11	0.12
160 + 140*	0.08	0.09	0.10	0.11	0.11
160 + 160	0.08	0.09	0.10	0.10	0.10
Kingspan Styrozone® H 350 R					
0	X	X	X	X	X
30	0.19	X	X	X	X
40	0.18	X	X	X	X
50	0.17	0.24	X	X	X
60	0.16	0.22	X	X	X
80	0.14	0.19	0.22	0.23	0.25
100	0.13	0.17	0.19	0.20	0.21
120	0.12	0.15	0.17	0.18	0.18
140	0.11	0.14	0.16	0.17	0.17
160	0.10	0.13	0.14	0.15	0.16
100 + 80*	0.09	0.11	0.12	0.13	0.13
100 + 100	0.09	0.10	0.11	0.12	0.12
120 + 100*	0.08	0.10	0.11	0.11	0.11
120 + 120	0.08	0.09	0.10	0.10	0.10

* Where multiple layers of insulation of different thicknesses are used, the thickest layer should be installed as the outermost layer in the construction.

High to Severe Compressive Loads

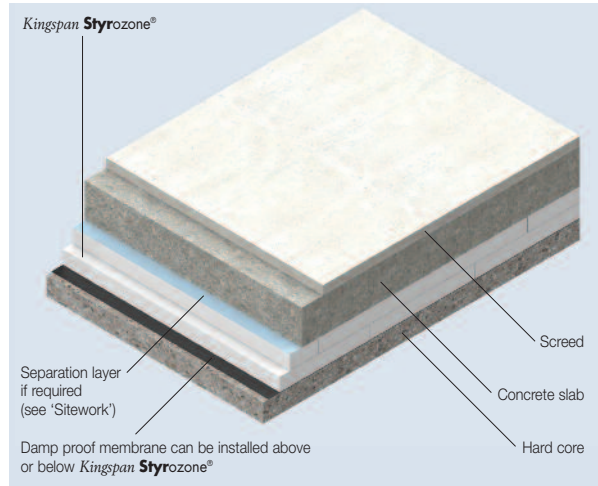


Figure 4

U-values (W/m ² -K) for Various Thicknesses of Kingspan Styrozone® and Floor Perimeter / Area Ratios					
Insulant Thickness (mm)	Perimeter / Area (m ⁻¹)				
	0.1	0.2	0.3	0.4	0.5
Kingspan Styrozone® N500 R					
0	X	X	X	X	X
50	0.18	X	X	X	X
80	0.15	0.22	X	X	X
50 + 50	0.11	0.19	0.22	0.23	0.25
120	0.13	0.18	0.20	0.21	0.23
80 + 50*	0.13	0.17	0.19	0.20	0.21
80 + 80	0.11	0.15	0.16	0.18	0.18
120 + 80*	0.10	0.13	0.14	0.15	0.15
120 + 120	0.09	0.11	0.12	0.13	0.13
120 + 120 + 50*	0.08	0.10	0.10	0.11	0.11
120 + 120 + 80*	0.08	0.09	0.10	0.10	0.10
Kingspan Styrozone® N700 R					
0	X	X	X	X	X
50	0.18	X	X	X	X
50 x 2	0.14	0.19	0.22	0.23	0.25
50 x 3	0.12	0.15	0.17	0.18	0.18
50 x 4	0.10	0.12	0.13	0.14	0.15
50 x 5	0.09	0.10	0.11	0.12	0.12
50 x 6	0.08	0.09	0.10	0.10	0.10

* Where multiple layers of insulation of different thicknesses are used, the thickest layer should be installed as the outermost layer in the construction.

Design Considerations

Sustainability & Responsibility

Kingspan Insulation has a long-term commitment to sustainability and responsibility: as a manufacturer and supplier of insulation products; as an employer; as a substantial landholder; and as a key member of its neighbouring communities.

A report covering the sustainability and responsibility of Kingspan Insulation Ltd's British operations is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

Specification Clause

Kingspan Styrozone[®] should be described in specification as:-

The floor insulation shall be *Kingspan Styrozone*[®] (insert grade) ____ mm thick: comprising high performance rigid extruded polystyrene insulation. The product shall be manufactured, with a blowing agent that has zero Ozone Depletion Potential (ODP), under a management system certified to EN ISO 9001: 2000, and shall be installed in accordance with the instructions issued by Kingspan Insulation Limited.

NBS Specifications

Details also available in NBS Plus.

NBS users should refer to clause(s):

E20 200, M10 290, M13 260

(Standard and Intermediate)

E20 30 (Minor Works)



Product Selection

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 severe.

Consideration must be given to which *Kingspan Styrozone*[®] product is most appropriate for the required application. A table of the key distinguishing features is shown below.

Product	Thermal Conductivity (W/m·K)	Density (kg/m ³)	Compressive Strength at 10% Compression (kPa)
<i>Styrozone</i> [®] H 350 R	0.029 – 0.031	30	300
<i>Styrozone</i> [®] N 300 R	0.035 – 0.040	30	300
<i>Styrozone</i> [®] N 500 R	0.036 – 0.038	35	500
<i>Styrozone</i> [®] N 700 R	0.036	45	700

Design Standards

Consideration should be given to the recommendations of BS 8102: 1990 (Code of practice for protection of structures against water from the ground), BS 8215: 1991 (Code of practice for design and installation of damp proof courses in masonry construction) and the information given in Building Research Establishment Digest 104 (Floor Screeds).

Compressive Loads

Kingspan Styrozone[®] H 350 R and N 300 R are suitable for use in floors with low and medium service loads e.g. domestic and industrial flooring applications such as cold stores.

Kingspan Styrozone[®] N 500 R is particularly suited for use in industrial floor constructions with relatively high compressive service loads, such as car parks.

Kingspan Styrozone[®] N 700 R is particularly suited for use in floors with considerable service loads, such as aircraft hangers.

Sitework

Installation Below a Floor Slab

- The site should be prepared and foundations, where appropriate, built to damp proof course (DPC) level.
- A thin sand blinding may be used to achieve a continuous level surface free from projections over rolled hardcore.
- The damp proof membrane (minimum 300 micron / 1200 gauge polythene) should be laid with joints well lapped and folded, to prevent the passage of ground water, either directly over the well compacted hardcore prior to laying the insulation boards, or over the insulation boards.
- The membrane should be brought up the surrounding foundation walls until it is sufficiently above the height of the wall DPC so that it will connect with or form the DPC.
- The insulation boards should always be loose-laid break-bonded, with joints lightly butted.
- If two or more layers of insulation are required, they should be horizontally offset relative to each other so that, as far as possible, the board joints in any two adjacent layers do not coincide with each other (see Figure 5).

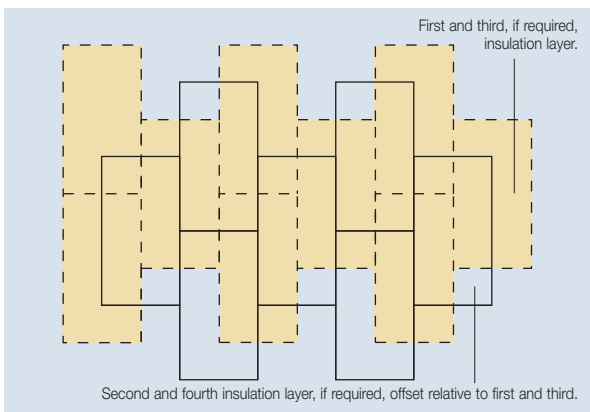


Figure 5 – Offsetting of Multiple Insulation Layers

- A strip of rigid insulation board (minimum 20 mm thick) should be placed vertically around the perimeter of the floor slab in order to prevent cold bridging. The top of the strip of insulation board should be level with the top of the floor screed and the bottom should be level with the bottom of the horizontal floor insulation, and closely butted up to it.
- If the damp proof membrane is laid directly onto the hardcore below the insulation boards, the boards should be overlaid with a polythene sheet (not less than 125 micron / 500 gauge), to prevent the wet concrete penetrating the joints between the boards, and to act as a vapour control layer. Ensure the polythene sheet has 150 mm overlaps, taped at the joints, and is turned up 100 mm at the walls.
- The subsequent installation of the concrete slab and screed or other flooring material is carried out in a manner similar to that for an un-insulated floor. The concrete slab and screed should be allowed to dry out prior to the installation of the floor finish.

Installation Below a Floor Screed

- Concrete slabs should be allowed to dry out fully prior to the installation of the insulation boards (average 1 day per mm of slab thickness).
- The surface of the slab should be smooth, flat and free from projections. Rough cast slabs should be levelled using a thin sand blinding to ensure boards are continuously supported.
- The damp proof membrane (minimum 300 micron / 1200 gauge polythene) should be laid with joints well lapped and folded, to prevent the passage of ground water, either directly over the floor slab prior to laying the insulation boards, or over the insulation boards.
- The membrane should be brought up the surrounding foundation walls until it is sufficiently above the height of the wall DPC so that it will connect with or form the DPC.
- The insulation boards should always be loose-laid break-bonded, with joints lightly butted.
- If two or more layers of insulation are required, they should be horizontally offset relative to each other so that, as far as possible, the board joints in any two adjacent layers do not coincide with each other (see Figure 5).
- A strip of rigid insulation board (minimum 20mm thick) should be placed vertically around the perimeter of the floor slab in order to prevent cold bridging. The top of the strip of insulation board should be level with the top of the floor screed and the bottom should be level with the bottom of the horizontal floor insulation, and closely butted up to it.
- Insulation boards should be overlaid with a polythene sheet (not less than 125 micron / 500 gauge), to prevent the wet screed penetrating the joints between the boards, and to act as a vapour control layer. Ensure the polythene sheet has 150 mm overlaps, taped at the joints, and is turned up 100 mm at the walls.
- Use sand and cement screed laid to a minimum thickness of 75 mm elsewhere.

Wheeled / Foot Traffic

- Ensure boards are protected during installation from wheeled / foot traffic by using scaffold planks or other protective measures.

General

Cutting

- Cutting should be carried out either by using a fine toothed saw, or by scoring with a 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 and Ireland.

Packaging and Storage

- The polyethylene packaging of Kingspan Insulation products, which is recyclable, should not be considered adequate for outside protection.
- Ideally, boards should be stored inside a well ventilated building. If, however, outside storage cannot be avoided, then the boards should be stacked clear of the ground and covered with a pale pigmented polythene sheet or weatherproof tarpaulin.
- **Kingspan Styrozone**[®] should not be 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 Safety Information Data Sheet for this product is available from the Kingspan Insulation website www.kingspaninsulation.co.uk/safety or www.kingspaninsulation.ie/safety

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

Product Details

Composition

Kingspan Styrozone[®] H 350 R, N 500 R is a high performance rigid extruded polystyrene insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and has a smooth, dense skin on both faces.



Kingspan Styrozone[®] N 300 R, N 500 R and N 700 R are high performance rigid extruded polystyrene insulants manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP) and have smooth, dense skins on both faces.

Standards and Approvals

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

Standard Dimensions

All products in the **Kingspan Styrozone**[®] range are available in the following standard size:

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*

* Straight edge boards are available on request.

Compressive Strength

The compressive strengths of **Kingspan Styrozone**[®] products typically exceed the following values:

Kingspan Styrozone[®] H 350 R – 300 kPa;

Kingspan Styrozone[®] N 300 R – 300 kPa;

Kingspan Styrozone[®] N 500 R – 500 kPa; and

Kingspan Styrozone[®] N 700 R – 700 kPa;

at 10% compression when tested to EN 826: 1996 (Thermal insulating products for building applications. Determination of compression behaviour).

Thermal Expansion

The linear thermal expansion coefficient of **Kingspan Styrozone**[®] is 0.07 mm/m.K.

Water Vapour Resistivity

The boards achieve a resistivity greater than 825 MN·s/g·m, when tested in accordance with EN 12086: 1997 (Thermal insulating products for building applications. Determination of water vapour transmission properties).

Absorption of Moisture

Kingspan Styrozone[®] is highly resistant to water absorption. It is very resistant to the passage of water vapour, and unaffected by repeated freeze / thaw cycles.

Durability

If correctly installed, *Kingspan Styrozone*[®] can have an indefinite life. Its durability depends on the supporting structure and the conditions of its use.

Resistance to Solvents, Fungi & Rodents

Kingspan Styrozone[®] is resistant to most commonly occurring construction materials such as lime, cement, plaster, anhydrous gypsum, solvent-free bituminous compounds, water-based wood preservatives, as well as alcohols, acids and alkalis. Certain organic materials such as solvent-based wood preservatives, coal tar and derivatives (creosote), paint thinners and common solvents (e.g. acetone, ethyl acetate, petrol, toluene and white spirit) will attack *Kingspan Styrozone*[®], resulting in softening, shrinkage and possible dissolution, with a consequent loss of performance.

Kingspan Styrozone[®] does not provide any food value to vermin and is not normally attractive to them.

Maximum Service Temperature

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

Thermal Properties

The λ -values and R-values detailed below are quoted in accordance with the EN 13164: 2008 (Thermal insulation products for buildings – Factory made products of extruded polystyrene (XPS) – Specification).

Thermal Conductivity

The boards achieve a thermal conductivity (λ -value) of *Kingspan Styrozone*[®] H 350 R is:

0.029 W/m·K (insulant thickness \leq 120 mm); and
0.031 W/m·K (insulant thickness $>$ 120 mm).

Kingspan Styrozone[®] N 300 R is:

0.035 W/m·K (insulant thickness $<$ 80 mm);
0.037 W/m·K (insulant thickness 80 mm);
0.038 W/m·K (insulant thickness 100–160 mm); and
0.040 W/m·K (insulant thickness $>$ 160 mm).

Kingspan Styrozone[®] N 500 R is:

0.036 W/m·K (insulant thickness \leq 70 mm); and
0.038 W/m·K (insulant thickness $>$ 70 mm).

Kingspan Styrozone[®] N 700 R is:

0.036 W/m·K (insulant thickness \leq 50 mm).

Thermal Resistance

Thermal resistance (R-value) varies with thickness and is calculated by dividing the thickness of the board (expressed in metres) by its thermal conductivity. The resulting number is rounded down to the nearest 0.05 (m²·K/W).

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)			
	H 350 R	N 300 R	N 500 R	N 700 R
30	1.00	0.85	–	–
40	1.35	1.10	–	–
50	1.70	1.40	1.35	1.35
60	2.05	1.70	–	–
80	2.75	2.15	2.10	–
100	3.40	2.60	–	–
120	4.10	3.15	2.60	–
140	4.50	3.65	–	–
160	5.15	4.20	–	–
180	–	4.50	–	–

NB Multiple layers of insulation are required for higher thermal resistances.

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

NB Where a hyphen is shown the thickness is not available.

NB Kingspan Styrozone[®] may be delivered in packaging bearing alternative product branding.

Contact Details

Customer Service

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

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK	- Tel:	+44 (0) 1544 387 384
	- Fax:	+44 (0) 1544 387 484
	- email:	literature@kingspaninsulation.co.uk
	- www.kingspaninsulation.co.uk/literature	
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie
	- www.kingspaninsulation.ie/literature	

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	- Tel:	+44 (0) 1544 387 383
	- Fax:	+44 (0) 1544 387 483
	- email:	tapered@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	tapered@kingspaninsulation.ie

Technical Advice / Design

Kingspan Insulation supports all of its 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 Technical Service Department 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 Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 387 382
	- Fax:	+44 (0) 1544 387 482
	- email:	technical@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	technical@kingspaninsulation.ie

General Enquiries

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

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	info@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4296
	- email:	info@kingspaninsulation.ie

Kingspan Insulation Ltd. reserves 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's Customer Service Department (see above left). 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 for 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 above), the advice of which should be sought for uses of Kingspan Insulation products that are not specifically described herein. Please check that your copy of this literature is current by contacting the Kingspan Insulation Marketing Department (see left).

Kingspan Insulation Ltd is a member of:
The National Insulation Association (NIA)



Kingspan Insulation Ltd

Pembridge, Leominster, Herefordshire HR6 9LA, UK
Castleblayney, County Monaghan, Ireland

www.kingspaninsulation.co.uk www.kingspaninsulation.ie