



Styrozone™ N 500 R/N 700 R

PROTECTED MEMBRANE CAR PARK DECKS



- ▼ High performance rigid extruded polystyrene insulation – thermal conductivity 0.035-0.037 W/m.K
- ▼ Protects waterproofing membrane
- ▼ Closed cell structure minimises water absorption
- ▼ High compressive strength withstands vehicle loads
- ▼ Withstands freeze/thaw cycling
- ▼ 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)



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TYPICAL DESIGN DETAILS

Figure 1 CONCRETE SLAB FINISH PARKING DECKS, CARS AND LIGHT COMMERCIAL VEHICLES (NON HGV) (maximum individual wheel load – 1 tonne)

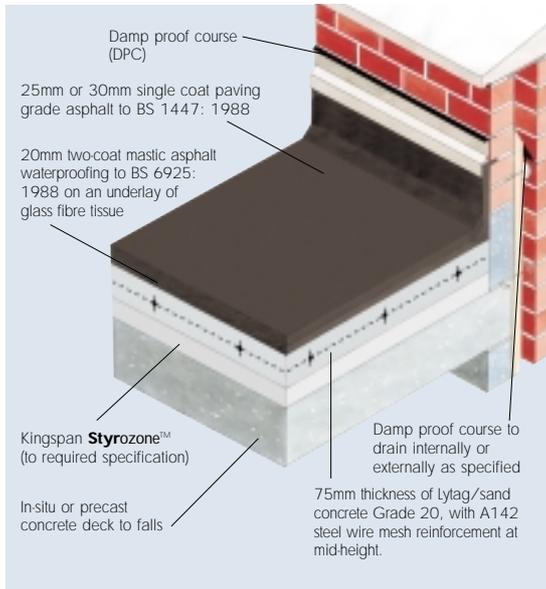


Figure 2 CONCRETE SLAB FINISH LOADING BAYS AND SERVICE DECKS COMMERCIAL VEHICLES (design should be verified as to suitability for specific wheel loads)

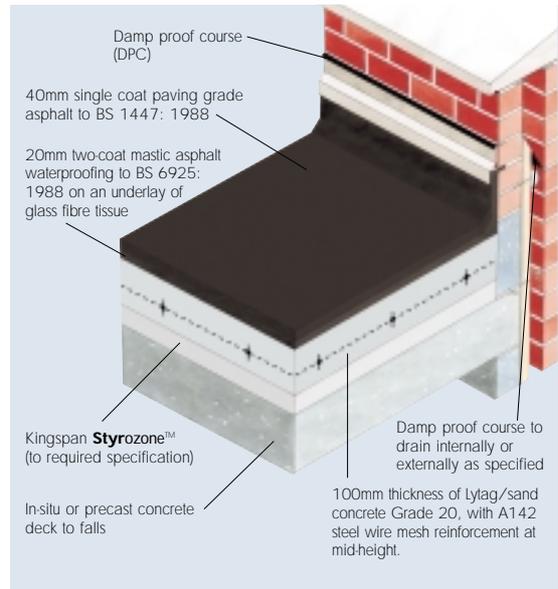
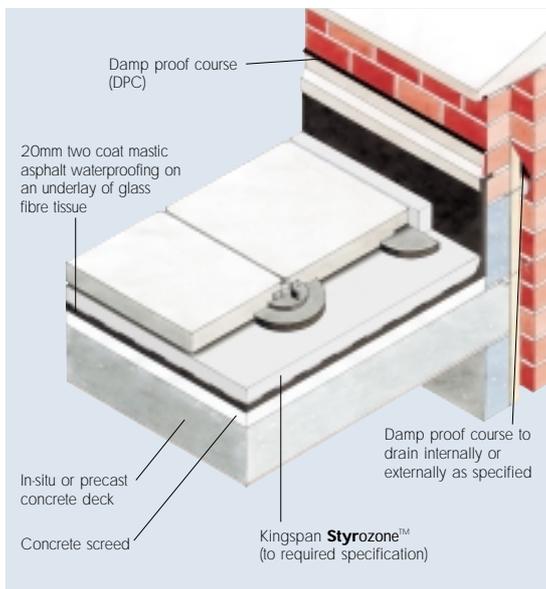


Figure 3 PAVING SLAB FINISH



SPECIFICATION CLAUSE

Kingspan Styrozone™ should be described in the specification as:-

The protected membrane roof insulation shall be *Kingspan Styrozone™ N 500 R/N 700 R** comprising ____mm thick CFC/HCFC-free rigid extruded polystyrene insulation manufactured to EN ISO 9002: 1994 and shall be applied in accordance with the instructions issued by Kingspan Insulation Limited.

*delete as applicable

Details also available in NBS PLUS.

NBS users should refer to clause(s):

J21 150, J21 710, J41 150, J41 710,

J42 120, J42 810 (Standard and Intermediate)



DESIGN CONSIDERATIONS

GENERAL

This brochure shows the use of **Kingspan Styrozone™** in a protected membrane roofing system for car park decks using both cast in-situ concrete slab (Figure 1 & 2) and paving slab (Figure 3) finishes.

Protected membrane roofing systems place the insulation above the waterproof system and offer several advantages over traditional warm flat roofs.

The waterproofing system can be expected to have a life in excess of that obtained in an exposed situation as it is protected from mechanical damage, solar radiation, ultra-violet degradation and temperature extremes (both daily and seasonal). Extruded polystyrene with its closed cell structure and minimal water absorption is the only material suitable and approved for this application where it will be subject to wetting/drying and freeze/thaw cycles.

Within the **Kingspan Styrozone™** range two grades are available for car park deck applications – **Kingspan Styrozone™ N 500 R** and **Kingspan Styrozone™ N 700 R** (Other grades of **Kingspan Styrozone™** are also available for applications where excessive loadings are unlikely to occur. Please contact our Technical Services Department for further information). These grades encompass the properties required for specifications ranging from cars and light commercial vehicles to loading bays and service decks for heavy goods vehicles.

Insulation systems can be designed to maintain a protected membrane roofing system or to utilise a combined waterproof and traffic wearing asphalt.

WEARING SURFACE

Data on specific concentrated loads is contained in BS 6399: Part 1: 1996 (Code of practice for dead and imposed loads). Department of Transport departmental standard BD 21/84 gives typical single wheel loads, depending on the type of vehicle, that act over a 150 mm square or 1760 mm diameter contact area. The tyre pressure is taken as 1.1 N/mm², in practice real tyre pressures are lower than this thus giving a lower load intensity.

Vehicle type (weight in tonnes)	Nominal single wheel load (kN)
Cars and vans (<3)	25
Vehicles generally (3-7.5)	50
Vehicles generally (7.5-40)	100
Fire engines (up to 60 kN axle load)	30
Fire engines (up to 120 kN axle load)	60

ROOF STRUCTURE

Whilst almost any form of roof deck (timber, metal or concrete) can be used with protected membrane roofing systems, the traffic load and additional dead load from the ballast layer invariably limits this type of roof to concrete decks.

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THERMAL PROPERTIES

The R-values and λ -values quoted in this document 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 13164, 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 (λ -value) of **Kingspan Styrozone™ N 500 R** and **N 700 R** is 0.035 W/m.K for thicknesses ≤ 60 mm and 0.037 W/m.K for thicknesses > 60 mm.

THERMAL RESISTANCES

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

Additionally, an allowance of 20% of the calculated resistance is made to compensate for saturated roofs during long periods of rain in accordance with BS 5250: 1989 (1995) (Code of practice for control of condensation in buildings). The following table of design resistance values takes this allowance into account.

Insulant Thickness (mm)	Thermal Resistance (m ² .K/W)
75	1.689
80	1.802
90	2.027
100	2.252
110	2.477
120	2.703
125	2.815
130	2.928
140	3.153
150	3.378
160	3.604
170	3.829
175	3.941

TYPICAL U-VALUES

The following examples have been calculated using both the combined method and the proportional area method. The combined method is required for compliance with Building Regulations / Standards revised after the year 2000. These examples are based on the use of 150 mm concrete deck, 50 mm screed and mastic asphalt waterproofing with paving slab finish. The ceiling is taken to be 12.5 mm plasterboard with a cavity between it and the underside of the deck.

If your construction is any different or you need Hazardous to Health Regulations 1988 (COSHH) information, please consult our Technical Services Department.

Combined 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 / IS EN ISO 6946: 1997 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method).

Proportional Area Method – the U-values shown below were calculated using the proportional area method as detailed in The Chartered Institute of Building Services Engineers (CIBSE) Guide A3 (Thermal Properties of Building Structures).

NB when calculating U-values using the combined method as detailed in BS / IS EN ISO 6946: 1997, the type of mechanical fixing used may change the thickness of insulation required. The effect of fixings has been ignored for the purposes of these calculations. Please contact the Kingspan Insulation Technical Services Department (see rear cover) for project calculations.

NB for the purposes of these calculations 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 condensation risk analysis should be completed for each individual project. Please call our Technical Services Department for assistance (see rear cover).

DENSE CONCRETE DECK WITH SUSPENDED PLASTERBOARD CEILING AND PAVING SLAB FINISH (see figure 3)

Insulant Thickness (mm)	U-value (W/m ² .K)	
	Combined Method	Proportional Area Method
75	0.44	0.44
80	0.42	0.42
90	0.39	0.38
100	0.35	0.35
110	0.33	0.32
120	0.31	0.30
125	0.30	0.29
130	0.28	0.28
140	0.27	0.27
150	0.25	0.25
160	0.24	0.24
170	0.23	0.22
175	0.22	0.22

NB at greater thicknesses it may prove more cost effective to use a double layer system of thinner boards.

SITWORK

GENERAL

Prior to installing the insulation it is essential to ensure that the waterproofing system has been installed correctly and that the roof is watertight and clean. Single-ply membranes in particular need careful attention to ensure that there has been no damage from following trades and that puncturing from below the membrane (from nail heads or debris) cannot occur. Existing roofs should be swept clean and any loose gravel chippings removed, if the chippings are bonded a foamed polyethylene cushion layer should be used prior to laying the insulation.

Filtration and cushioning membranes should be installed in accordance with recommendations above depending upon the insulation and ballast system used. The boards should be laid tightly butted and there must be no gaps where they meet upstands, rooflights etc. The boards are easily cut and shaped using a fine toothed saw, sharp knife or a rasp.

Start laying the boards from the point of access to the roof and as soon as possible apply the ballast layer. This ensures that the waterproof membrane is always protected and excessive heat build up or high winds do not damage boards. Ensure that ballast awaiting laying is not concentrated in one area where it may overload the roof structure.

Kingspan Styrozone™ insulation boards can be laid in any weather, but due to the light weight of the boards care must be taken in windy conditions.

CAST IN-SITU CONCRETE SLAB

A 25 mm layer of washed, rounded gravel, nominal 6 mm diameter, is laid on a filtration membrane laid on the insulation boards. A building paper is then loose laid on to gravel this prevents mixing of the concrete and gravel during placing and compaction. The reinforcement can then be fixed and the concrete placed and compacted in accordance with BS 8110: Part 1: 1997 (Structural use of concrete code of practice for design and construction).

PAVING SLAB BALLAST

Paving slabs, minimum 50 mm thick, are laid on proprietary paving slab supports of minimum diameter 300 mm (or equivalent base area) in order to maintain drainage below the slabs and to ensure that moisture vapour can escape.

SITE PROTECTION

Where the roof deck is to be used by other trades as a working platform after the **Kingspan Styrozone™** has been laid, the roof should be close-boarded to prevent any damage to the completed deck.

SITE PRACTICE

On completion the roof should be swept clean and all contractual equipment or debris removed.

AVAILABILITY

Kingspan Styrozone™ is available through specialist insulation distributors and selected builders merchants throughout Britain and Ireland.

PACKAGING

The panels are supplied in labelled packs shrinkwrapped in polythene.

STORAGE

The packaging of **Kingspan Styrozone™** 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 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 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).

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

Kingspan Styrozone™ N 500 R/N 700 R

PRODUCT DESCRIPTION

COMPOSITION

Kingspan Styrozone™ N 500 R and N 700 R are high performance rigid extruded polystyrene insulants of typical density 40 and 45 kg/m³ respectively, with a smooth, dense skin on both faces.

CFC/HCFC-FREE

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



PRODUCT DESCRIPTION

STANDARDS AND APPROVALS

Kingspan Styrozone™ is manufactured to the highest quality standards under a quality control system approved to EN ISO 9002: 1994 (Quality systems, Model for quality assurance in production, installation and servicing). Its use in protected membrane roofing is covered by BBA Certificate O2/3877.



STANDARD DIMENSIONS

Kingspan Styrozone™ 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
Thickness* (mm)	75, 80, 90, 100, 110, 120, 125, 130, 140, 150, 160, 170, 175
Edge Profile	Rebated to all four edges

* Other thicknesses are available subject to enquiry

INSULATION COMPRESSIVE STRENGTH

The compressive strengths of **Kingspan Styrozone™** N 500 R and N 700 R typically exceed 500 and 700 kPa respectively at 10% compression when tested to BS 4370: Part 1: 1988(1996) (Methods of test for rigid cellular materials).

THERMAL EXPANSION

The linear thermal expansion coefficient of **Kingspan Styrozone™** is 0.07 mm/m.K when tested to BS 4370: Part 3: 1988 (1996) (Methods of test for rigid cellular materials).

WATER VAPOUR RESISTANCE

The boards achieve a resistance greater than 350 MN.s/g when tested in accordance with BS 3837: Part 2: 1990 (1996) (Specification for extruded boards).

ABSORPTION OF MOISTURE

Kingspan Styrozone™ 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 3837: Part 2: 1990 (1996) (Specification for extruded boards).

DURABILITY

If correctly applied, **Kingspan Styrozone™** has an indefinite life. Its durability depends on the supporting structure, waterproofing and the conditions of its use.

RESISTANCE TO SOLVENTS, FUNGI & RODENTS

Kingspan Styrozone™ 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 products. 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™ resists attack by mould and microbial growth.

Kingspan Styrozone™ does not provide any food value to vermin and they are not normally attractive to them.

FIRE PERFORMANCE

Flat roofs incorporating **Kingspan Styrozone™** N 500 R or N 700 R protected membrane roof insulation and waterproofed using built-up felt or mastic asphalt, when subjected to British Standard fire tests, achieves the results given below. Further details on the fire performance of rigid extruded polystyrene can be obtained from our Technical Services Department (see rear cover).

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

Test	Result
BS 476: Part 3: 1975 (External fire exposure roof test)	FAA rating

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.

NB Styrozone will be delivered in packaging bearing the Uralita Batifoam or Poliglas Glascofoam names.

KINGSPAN INSULATION

Kingspan Insulation offers an extensive range of premium and high performance insulation products, breathable membranes and pre-fabricated / pre-insulated systems for the construction industry. Following an extensive investment programme, Kingspan Insulation is continuing to lead the insulation industry by manufacturing the majority of its insulation products with zero Ozone Depletion Potential (ODP) and quoting thermal performance data in accordance with the new harmonised European Standard.

Kingspan Insulation Limited specialise in the solution of insulation problems. Our range of insulation products which meet the exacting requirements of the construction industry are produced to the highest standards, including BS EN ISO 9002: 1994 and IS EN ISO 9002: 1994. Each product has been designed to fulfil a specific need and has been manufactured to precise standards and tolerances.

INSULATION FOR:

- PITCHED ROOFS
- FLAT ROOFS
- CAVITY WALLS
- TIMBER AND STEEL FRAMING
- EXTERNALLY INSULATED CLADDING SYSTEMS
- FLOORS
- SOFFITS

INSULATED DRY LINING

TAPERED ROOFING SYSTEMS

Kingspan KoolDuct® PRE-INSULATED DUCTING

Kingspan nilvent™ BREATHABLE MEMBRANES

Kingspan TEK Haus™ BUILDING SYSTEM

THE KINGSPAN INSULATION PRODUCT RANGE

THE KINGSPAN KOOLTHERM® K-RANGE

- With a thermal conductivity of 0.018 W/m.K rigid phenolic insulation is the most thermally efficient insulation product commonly available.
- Utilises the thinnest possible insulation board to achieve required U-values.
- Fire performance can be equivalent to mineral fibre.
- Achieves a Class O fire rating to the Building Regulations.
- Achieves the best possible rating of <5% smoke emission when tested to BS 5111: Part 1: 1974.
- CFC-free / available CFC/HCFC-free with zero Ozone Depletion Potential subject to enquiry.

THE KINGSPAN THERMA ZERO ODP RANGE

- With a thermal conductivity of 0.022-0.026 W/m.K zero ODP rigid urethane insulation is one of the most thermally efficient insulation products commonly available.
- Easily achieves required U-values with minimum board thickness.
- Achieves the required fire performance for the intended application.
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP).

THE KINGSPAN STYROZONE™ & PURLCRETE ZERO ODP RANGES

- Rigid extruded polystyrene insulation (XPS) has the highest compressive strength of any commonly available insulant.
- Ideal for specialist applications such as inverted roofing and heavy-duty flooring.
- Easily achieves required U-values with minimum board thickness.
- Achieves the required fire performance for the intended application.
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP).

ALL PRODUCTS

- Their closed cell structure resists both moisture and water vapour ingress – problems which can be associated with open cell materials such as mineral fibre and which can result in reduced thermal performance.
- Unaffected by air movement – problems that can be experienced with mineral fibre and which can reduce thermal performance.
- Safe and easy to install – masks are not required, as Kingspan Insulation products do not produce loose dust or irritant fibres.
- Provide reliable long term thermal performance over the lifetime of the building.

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) 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

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:



UK: – Telephone: +44 (0) 870 850 8555
– Fax: +44 (0) 1544 387 278
– 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:

UK – Telephone: +44 (0) 1544 387 210
– Fax: +44 (0) 1544 387 299
– email: literature.uk@insulation.kingspan.com
Ireland – Telephone: +353 (0) 42 97 95038
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– email: literature.ie@insulation.kingspan.com

GENERAL ENQUIRIES

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

UK – Telephone: +44 (0) 870 850 8555
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– Fax: +353 (0) 42 97 46129
– email: info.ie@insulation.kingspan.com

Kingspan Insulation reserve the right to amend product specifications without prior notice. 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 free 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 our Marketing Department (see above).



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