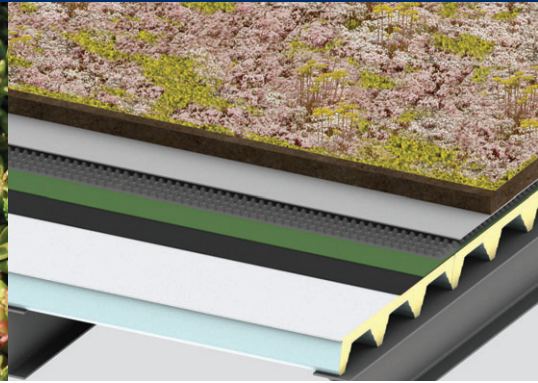


INSULATED **ROOF** SYSTEMS



Kingspan Envirodek[®]

Structural Green Roof System





Image courtesy of Alumasc Exterior Building Products Ltd.

Front cover left image: courtesy of ICB Ltd.
Front cover centre image: courtesy of Bauder Limited

The paper we have printed on is from 80% post-consumer waste and the remaining 20% pulp is TCF (Totally Chlorine Free). This fibre is FSC certified (see fsc.org for details). In recognition, the range has been awarded both the NAPM and Eugropa recycled marks, two of the most prestigious and recognisable recycled certificates available. The ink we have used is vegetable based, allowing the document to be recycled.



Sustainable Forest



Recyclable



Vegetable Based

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The Crofts Office Development, Rotherham



Image courtesy of ICB Ltd.



Image courtesy of ICB Ltd.

Introduction

Green roofs are increasingly being used on a wide variety of buildings including schools, healthcare and city centre buildings.

Kingspan Envirodek® is a structural green roof system that offers a range of sustainable and environmental benefits over traditional roofing systems. These benefits include:

- Enhancement of air quality, by lowering CO₂ levels
- Stormwater attenuation
- Increased acoustic performance
- Promotion of biodiversity or retention of existing biodiversity
- Increasing the life expectancy of the roof.

Kingspan Envirodek®

For many modern buildings the difficulty for designers has been to find a roofing system which can carry the load of a green roof whilst also being:

- Cost effective
- Quick and safe to install
- Well insulated and energy efficient
- Quickly weather tight
- A lightweight decking support to intensive green roofs (as opposed to reinforced concrete decks).

The development of the Kingspan Envirodek® structural insulated roof deck has resolved this difficulty and offers the following additional benefits:

- Installation rates of up to 1000m² per day with the aid of mechanical handling equipment
- Double spans of 6m can be achieved (see load span tables on page 7)
- Suitable for curved roofs down to 15m concave and 30m convex radius.



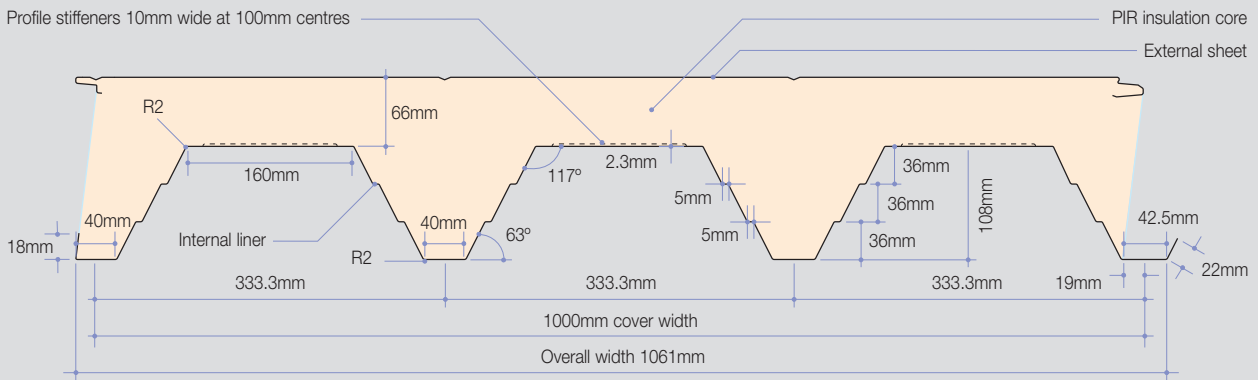
Product Data

Application

Kingspan Envirodek® structural insulated roof deck has been designed to support 'green roofs' for all building applications (with the exception of Cold Stores) with a minimum roof pitch of 1.5° after deflection. The chosen waterproofing layer as detailed by architect or other is applied on site.

Dimensions & Weight

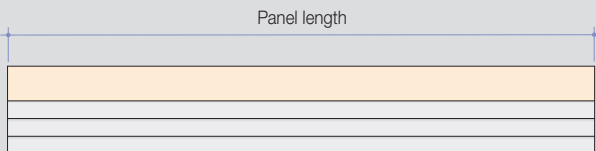
Profile stiffeners 10mm wide at 100mm centres



Dimension A - core thickness nominal (mm)	66
Weight kg/m ² steel/steel	21.26

Available Lengths

Standard lengths 1.8 up to 14 metres. Lengths over 14 metres up to 16 metres can be supplied but are subject to an additional transport charge.



Panel End Cut Back

All panels are produced flush-ended.

Materials

Substrate

Standard external and internal sheets are hot dipped zinc coated steel to Grade Fe E220G with S200 zinc coating to BS EN 10326:2004 (Continuously hot-dip coated strip and sheet of structural steels. Technical delivery conditions).

Coatings - External Weather Sheet

External finished with bright white polyester. Reverse of sheet coated with a light grey polyester coating.

Coatings - Internal Liner Sheet (Deep Deck)

Internal finished with bright white polyester coating developed for use for the internal lining of insulated panels. Reverse of sheet coated with a light grey polyester coating.

Product Tolerances

Cut to Length (mm)	-5	+5
Cover Width (mm)	-3	+3
Thickness (mm)	-2	+2
End Square (mm)	-3	+3
Flatness per metre (mm)	-2	+2

Insulation Core

The core of Kingspan Envirodek® is a closed cell PIR insulation which is non-deleterious with zero Ozone Depletion Potential (zero ODP).

Performance

Thermal Insulation

Panel Thickness (mm)	U-value* (W/m ² K)
66	0.25**

* Thermal transmittance W/m²K

** U-value calculated in accordance with the method required by the Building Regulations Approved Documents L2A & L2B (England & Wales) and Technical Handbooks Domestic and Non-domestic Sections 6 (Scotland), Part F2 (Northern Ireland) and Part L (Republic of Ireland – based on the Overall Heat Loss Method)

Biological

Kingspan Envirodek® panels are resistant to attack from mould, fungi, mildew and vermin. No urea formaldehyde is used in the manufacture of the panels.

Fire

Steel inner and outer facings have a Class 1 surface spread of flame to BS476-7: 1987, and are Class 0 as defined by Building Regulations.

The panel surfaces are rated FAA/SAA to BS476-3: 1975.

Acoustics

Kingspan Envirodek® panels have a predicted single figure weighted sound reduction $R_w = 27$ dB. The addition of the green roofing system will enhance the acoustic performance in practice.

Sound Reduction Index (SRI)

Frequency (Hz)	SRI (dB)
63	14
125	14
250	19
500	24
1000	27
2000	34
4000	43
8000	52

Specification

NBS Specifications are available from Kingspan **envirocare**® Technical Services.

Tel: 0800 587 0090 (UK) & +353 (0) 42 96 98529 (Ireland)

Email: envirocare@kingspanpanels.com



Quality

Kingspan Envirodek® panels are manufactured from the highest quality materials, using state of the art production equipment to rigorous quality control standards, approved to BS EN ISO 9001: 2000.

Kingspan manufacturing plants are ISO 14001 (Environmentally) and ISO 18001 (Health & Safety) accredited.

Kingspan is a member of the Green Roof Organisation (GRO).

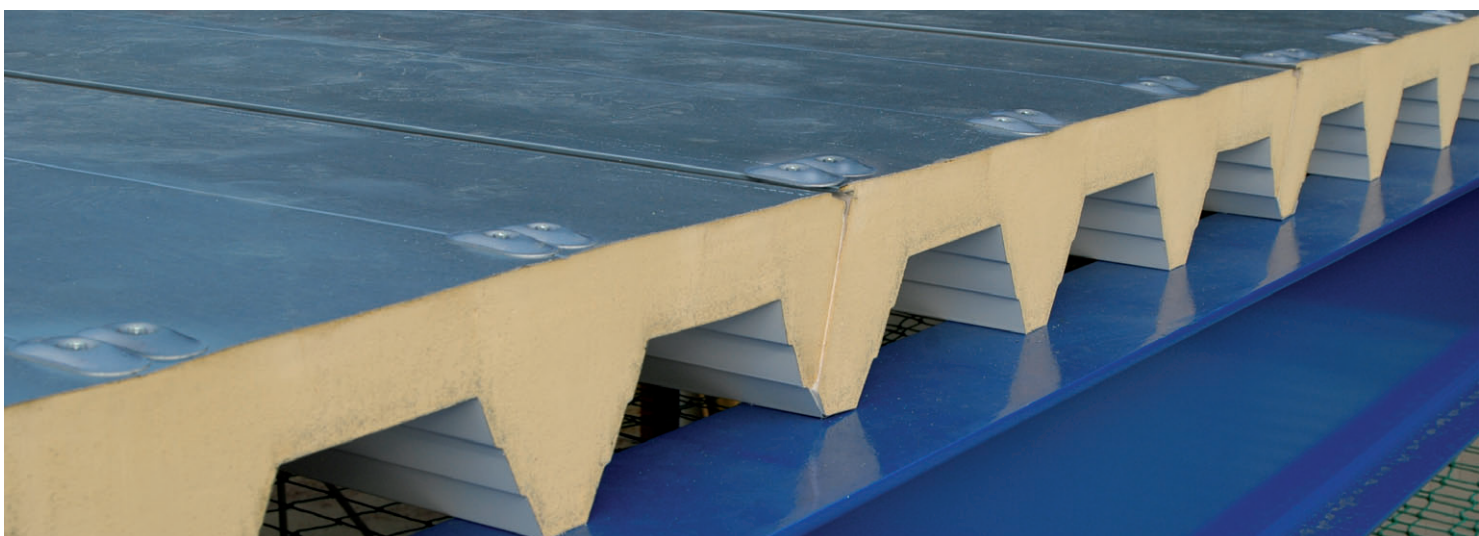


Guarantees

Kingspan Envirodek® panels are available with the Kingspan Total Guarantee, offering thermal and structural performance guarantee.

Delivery

All deliveries (unless indicated otherwise) are by road transport to project site. Off-loading is the responsibility of the cladding contractor or installer.





Structural

Unfactored Load/Span Table



(use calculated design windload values unfactored)

Extensive green roof with saturated green roof element weight of 55kg/m² (0.54 kN/m²)

Span Condition	System	Load Type	Uniformly Distributed Load (kN/m ²) Span L in Metres								
			2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Single Span 	Extensive*	Downwards	11.95	7.96	5.67	3.53	2.13	1.23	0.63	-	-
		Suction	12.60	8.69	6.47	5.05	4.08	3.38	2.85	-	-
Double Span 	Extensive*	Downwards	8.81	6.91	5.65	4.21	3.20	2.47	1.93	1.51	1.19
		Suction	9.67	7.79	6.47	5.05	4.08	3.38	2.85	2.44	2.12



* Downwards loading is likely to be snow either uniformly distributed or drifting, at parapets.

Extensive green roof with saturated green roof element weight of 95kg/m² (0.93 kN/m²)

Span Condition	System	Load Type	Uniformly Distributed Load (kN/m ²) Span L in Metres								
			2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Single Span 	Extensive*	Downwards	11.55	7.54	5.23	2.98	1.57	0.66	-	-	-
		Suction	12.58	8.67	6.44	5.03	4.06	3.35	-	-	-
Double Span 	Extensive*	Downwards	8.43	6.53	5.23	3.76	2.75	2.02	1.48	1.07	0.75
		Suction	9.64	7.76	6.44	5.03	4.06	3.35	2.83	2.42	2.10



* Downwards loading is likely to be snow either uniformly distributed or drifting, at parapets.

Intensive green roof with saturated green roof element weight of 250kg/m² (2.45 kN/m²)

Span Condition	System	Load Type	Uniformly Distributed Load (kN/m ²) Span L in Metres				
			2.0	2.5	3.0	3.5	4.0
Single Span 	Intensive*	Downwards	9.89	5.81	3.14	-	-
		Suction	12.58	8.67	6.44	-	-
Double Span 	Intensive*	Downwards	6.87	4.97	3.45	1.94	0.92
		Suction	9.64	7.76	6.44	5.03	4.06

* Downwards loading will be occupants and garden furniture, it is likely to be a uniformly distributed load of 1.5 kN/m²

Intensive green roof with saturated green roof element weight of 500kg/m² (4.91 kN/m²)

Span Condition	System	Load Type	Uniformly Distributed Load (kN/m ²) Span L in Metres				
			1.0	1.5	2.0	2.5	3.0
Single Span 	Intensive*	Downwards	28.67	15.71	7.22	3.02	-
		Suction	33.45	20.73	12.58	8.67	-
Double Span 	Intensive*	Downwards	14.07	7.55	4.35	2.45	0.57
		Suction	19.28	12.81	9.64	7.76	6.44

* Downwards loading will be occupants and garden furniture, it is likely to be a uniformly distributed load of 1.5 kN/m²

Notes:

- Values have been calculated using the limit state method described in the "European Recommendations for the Design of Sandwich Panels" (ECSS document No. 115 2001), taking imposed loads, temperature and creep into account.
- For each value individual and combined load cases with appropriate load factors and temperatures have been considered. These are detailed under "Structural Performance" in the Building Design Section of the Kingspan Design and Construction Guide.
- The following deflection limits have been used:
Downward loading - $l/250$
Suction loading - $l/150$
- For intermediate values linear interpolation may be used.
- The steel frame must be fabricated and assembled to an accuracy outlined in BCSA and SCI Publication No. 203/07 - 'National Structural Steelwork Specification for Building Construction, 5th Edition.'
- Load/Span tables for panel specifications not shown are available from Kingspan **envirocare**[®] Technical Services.
- Minimum panel bearing 65mm.

System Advantages

Environmental

- Masking buildings allowing them to blend into the local environment.
- Practical use of waste materials incorporated into the system build up.
- Reducing urban temperatures and controlling air humidity.
- Reduction of ground based ozone.
- Improved air quality due to reduced CO₂ levels.
- Aids stormwater management, used in conjunction with stormwater attenuation systems e.g. Kingspan Environmental's Stormwater Attenuation System.
- Aids noise reduction.
- Enhances thermal performance.

Ecological

- Can be designed to offer habitat for plants and birds.
- Aids biodiversity.

“The cultivation of plants which are wind, frost and drought resistant, which require very little maintenance and are self propagating the bulk of this type of vegetation will consist of mosses, succulents, herbaceous plants and grasses.”

(Courtesy of FLL (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V) Green Roof Guidelines)

Financial

- Reduced lifecycle costs by extending the life of the waterproofing.
- Cost effective installation.
- Internal polyester liner finish provided as standard.
- Can assist with planning consent.
- Can increase property values.
- Enhances workplace productivity by improving working environment.

Kingspan Support

Kingspan **envirocare**® Technical Services offer technical advice and support throughout the design and construction process. From the undertaking of Energy Performance calculations to the creation of specific junction details, Kingspan **envirocare**® Technical Services can help to ensure that your building complies with the building and thermal regulations.



Kingspan's Field Service Engineers offer free contractor training on the installation of Kingspan Envirodek® and new / existing products at our specially designed Kingspan energi centre in Holywell, North Wales, UK. A site inspection service throughout the construction period with advice on mechanical handling solutions is also available.



Image courtesy of Alumasc Exterior Building Products Ltd.



Stormwater Management

One of the main benefits of a green roof system, is the effect it has on water run-off. With more and more green belt land areas being swallowed up by new build construction, localised flooding within the UK is on the increase.

It is important that a green roof build-up comprises a substrate and drainage layer to maximise its retention. In line with FLL Green Roof Guidelines, an extensive green roof substrate should retain 2 litres every 10mm and a 25mm drainage layer should absorb 9 litres. Not only can a green roof retain rainwater and evaporate this back into the atmosphere but once completely saturated it acts as a buffer slowing the water run-off. The absorption capacity can be maximised by increasing the substrate depth and choosing the planting wisely.

Matured vegetation will contribute positively to the absorption figures. It goes without saying that if absorption is a main criteria in your design, any hard landscaping will reduce the impact of water retention.

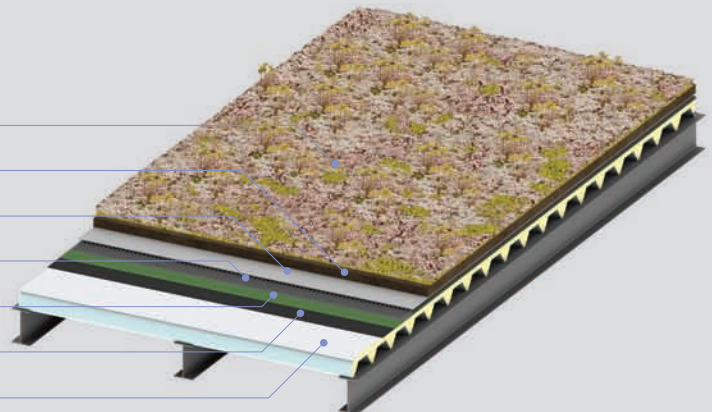
For areas with heavy rainfall, there are complimentary systems to help attenuate flash floods e.g. Kingspan Environmental's Stormwater Attenuation Systems. When rainfall exceeds the allowed discharge into the watercourse, the excess flow is attenuated on the site for the duration of the storm and released later after the storm, recycling the excess water.

Extensive & Intensive Details*

Extensive Green Roof Systems

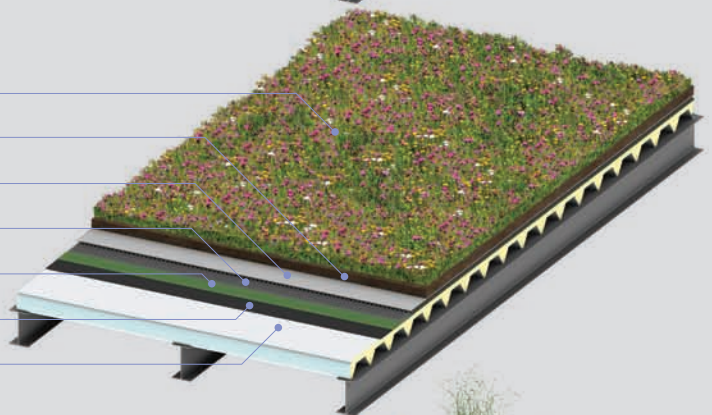
Sedum Blanket Roof

- Sedum blanket
- Extensive substrate
- Filter fleece
- Drainage layer
- Protection layer
- Waterproofing layer
- Kingspan Envirodek®



Plug/Hydroplanted/Seeded Roof

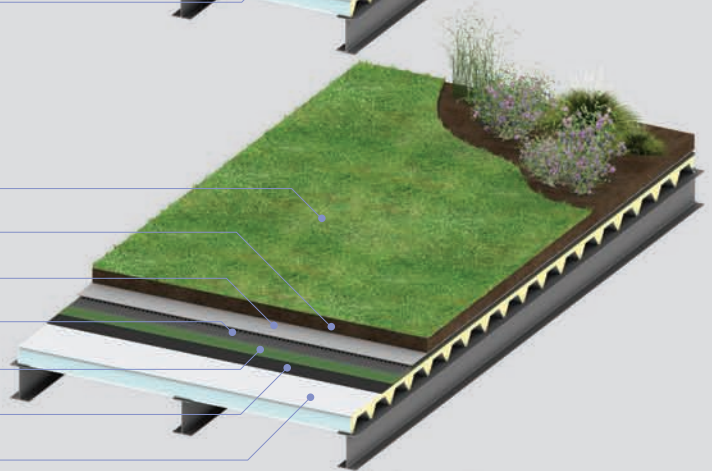
- Plug plants/hydroplanted/seeded
- Extensive substrate
- Filter fleece
- Drainage layer
- Protection layer
- Waterproofing layer
- Kingspan Envirodek®



Intensive Green Roof Systems

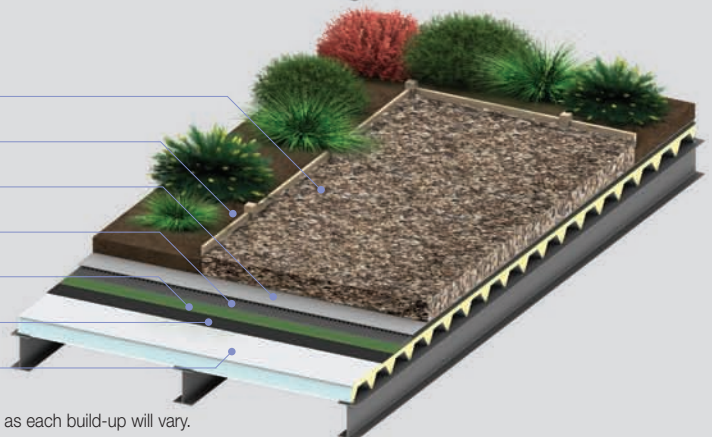
Garden Roof

- Turf/hard landscaping
- Intensive substrate
- Filter fleece
- Drainage layer
- Protection layer
- Waterproofing layer
- Kingspan Envirodek®



Public Roof

- Intensive landscaping
- Intensive substrate
- Filter fleece
- Drainage layer
- Protection layer
- Waterproofing layer
- Kingspan Envirodek®



* Please contact your waterproofing/green roof supplier for specific build-up as each build-up will vary.

Extensive Green Roof Systems

Information

- Typical sedum roof pitch of 1.5 – 30°
 - Fast, lightweight installation
 - Usually self sustaining, requiring minimal maintenance.
 - Instant visual effect
 - Enhances natural habitat
 - Design versatility
 - Improved acoustic performance
 - Energy efficient
 - Improved life expectancy of waterproofing
-
- Typical plug plants/hydroplanted/seeded roof pitch of 1.5 - 30°
 - Fast installation and cost effective for large roofs
 - Initial small plant coverage
 - Improved water retention
 - Enhances natural habitat
 - Design versatility
 - Improved acoustic performance
 - Energy efficient
 - Improved life expectancy of waterproofing

Finished Project



Image courtesy of Bauder Limited



Image courtesy of Bauder Limited

Intensive Green Roof Systems

Information

- Typical garden roof pitch of 1.5 - 5°
 - Can support shrub, lawn planting, patio, and decking etc.
 - Facilitates creation of leisure areas, providing additional space
 - Improved water retention
 - Design versatility
 - Improved acoustic performance
 - Energy efficient
 - Improved life expectancy of waterproofing
-
- Typical public roof pitch of 1.5 - 5°
 - Usually self sustaining, requiring minimal maintenance.
 - Facilitates creation of leisure areas, providing additional space
 - Improved water retention
 - Design versatility
 - Improved acoustic performance
 - Energy efficient
 - Improved life expectancy of waterproofing

Finished Project



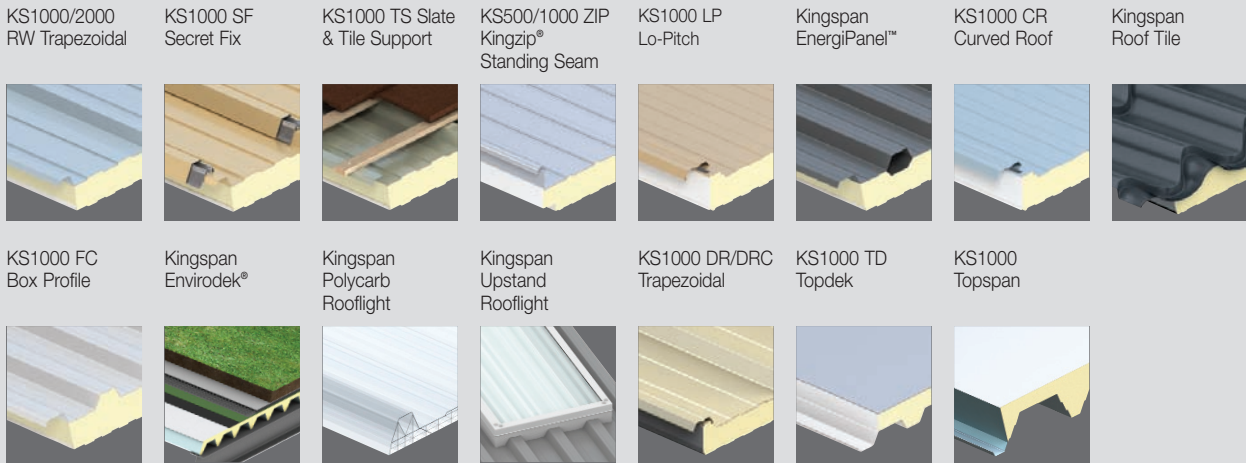
Image courtesy of Bauder Limited



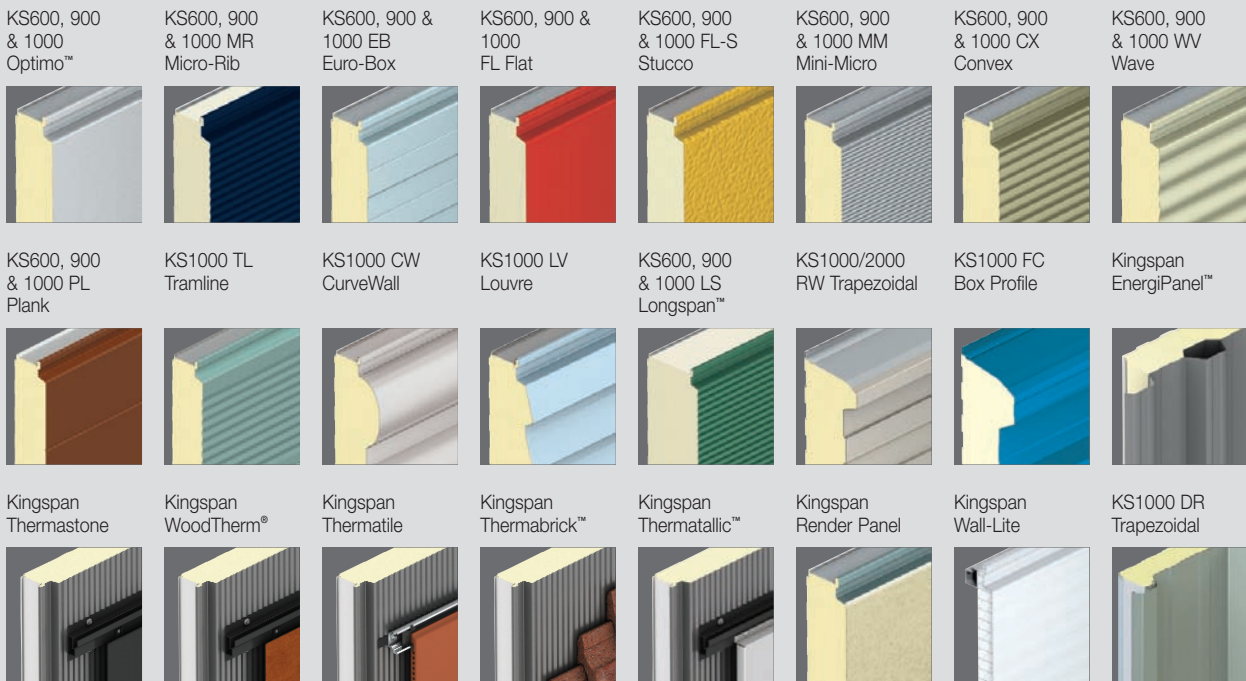
Image courtesy of ICB Ltd.

Kingspan Insulated Roof, Wall & Façade Systems

Roof Systems



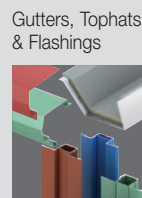
Wall & Façade Systems



Controlled Environment Systems



Ancillaries



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