



Routes to Compliance: Fire Safety

FOR FAÇADES INCORPORATING KINGSPAN KOOLTHERM K15 RAINSCREEN BOARD ON BUILDINGS WITH A HABITABLE STOREY 18 M, OR GREATER, ABOVE GROUND LEVEL



*Low Energy –
Low Carbon Buildings*

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Introduction

About this Document

Rainscreen and masonry façades are popular building envelope specifications, particularly in high-rise applications. They allow architectural freedom, whilst providing suitable protection against the elements.

However, choosing the best route to compliance, with fire safety regulatory requirements in Great Britain, necessitates a clear understanding of the complexities and the common misconceptions that surround the use of insulation in these constructions. The route that best serves the purpose of the building and the needs of stakeholders, whilst producing a well-balanced result, may not always be the most obvious option.

This technical bulletin examines the use of insulation in the façades of buildings with a habitable storey 18 metres, or greater, above ground level. It also advises on how to interpret the guidance given Approved Documents B2 and Technical Handbooks Section 2 for meeting the fire safety requirements of the Building Regulations / Standards for external fire spread.



Ronald McDonald House, Birmingham Children's Hospital, Birmingham.

Routes to Compliance

Approved Documents B2 & Technical Handbooks Section 2

There are three routes to compliance with the fire safety requirements of the Building Regulations / Standards regarding the insulation in façades on buildings with a habitable storey 18 metres, or greater, above ground level.

Linear Route

Firstly, a linear route to compliance is offered by the technical guidance given in Approved Documents B2: Fire Safety – Buildings other than Dwellinghouses (separate editions for England and Wales), and Technical Handbooks Section 2: Fire – Domestic & Non-domestic (Scotland).

This route requires the insulation to be of limited combustibility (England & Wales) or non-combustible (Scotland), which, in this context, is defined by being a material that either is 'listed' or has met the required performance criteria after having been subjected to specific small scale fire tests. Unlike in large scale fire tests, testing is performed on the insulation in isolation from all other materials comprising the façade system. As such, material performance determined via this route is not wholly representative of that for the complete system build-up.

Notwithstanding the classification of the insulation in terms of combustibility, there are separate provisions for the external surfaces of the façade system in relation to the building height, use and boundary. For instance, where the boundary of a building is no greater than one metre, the façade should be Class 0 / Low Risk / Euroclass B-s₃d₂ or better, regardless of whether the insulation is of limited combustibility or non-combustible.

NB Approved Documents B1: Fire Safety – Dwellinghouses (single edition for both England and Wales) refers to Approved Document B2 for supplementary guidance in relation to unusual or very large buildings i.e. those greater than 18 metres in height.

Performance-based Route

Secondly, a performance-based route is also offered. The guidance requires that the complete façade build-up meets the criteria set out in BR 135 (Fire performance of external thermal insulation for walls of multi-storey buildings), using large scale test data from:

- BS 8414-1: 2002 (Fire performance of external cladding systems. Test methods for non-loadbearing external cladding systems applied to the face of a building); or
- BS 8414-2: 2005 (Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame).

Fire Safety Engineering Route

Thirdly, compliance with the functional fire safety standards may also be demonstrated by alternative means i.e. the adoption of a Fire Safety Engineering approach.

Based upon scientific principles from an integrated or a 'whole building' perspective, Fire Safety Engineering not only considers the performance of structures, systems, products and materials when exposed to fire, it also includes fire prevention and active and passive fire protection measures e.g. effective means of egress and adequate measures for alarm, detection, control and extinguishment.

Furthermore, it can facilitate innovation in building design without compromising fire safety, particularly in some large and complex buildings, as well as multi-purpose buildings, where it may be the only practical way to achieve a satisfactory level of fire safety.

If taking this advanced route to compliance, it is recommended that the guidance given in BS 7974: 2001 (Application of fire safety engineering principles to the design of buildings. Code of practice), and IFEG: 2005 (International Fire Engineering Guidelines), is followed.



Coleg Cymunedol Y Dderwen Comprehensive School, Bridgend, Wales.

Building Control Alliance (BCA)

With the aim of addressing common misconceptions as regards to the use of combustible materials within the façade system of residential buildings containing a storey 18 metres, or greater, above ground level, industry group, BCA, issued its Technical Guidance Note 18: Use of Combustible Cladding Materials on Residential Buildings (Issue 1: June 2015).

Whilst it reiterates the guidance given in Approved Document B2 (England) for both the linear and Fire Safety Engineering routes to compliance, it, however, expands, in an advisory manner, upon the guidance given for the performance-based route.

BCA Technical Guidance Note 18 advises that the preferred method of demonstrating compliance is to submit evidence to the Building Control Body (BCB), showing that the complete proposed façade system has been assessed in accordance with the acceptance criteria (i.e. external fire spread, internal fire spread and mechanical performance,) set out in BR 135, using data from tests carried out by an independent United Kingdom Accreditation Service (UKAS) accredited testing body, to BS 8414-1: 2002 and BS 8414-2: 2005.

However, given the sheer number of possible façade build-ups, combined with increasingly elaborate and innovative materials, fire test data may not exist for every possible build-up. In circumstances where such empirical data is absent, another option for demonstrating compliance is offered.

This option allows the submission of a Desktop Study Report from a suitably qualified fire specialist, which states whether, in their professional opinion, the acceptance criteria of BR 135 would be met with the proposed system. It requires the report to be supported by the results of testing by a suitable UKAS accredited testing body, and to specifically reference any tests that have been carried out on the product.

Independent standard-setting body and provider of warranty and insurance for new UK homes, National House Building Council (NHBC), upholds the guidance given in BCA Technical Guidance Note 18. It deems the adoption of a Fire Safety Engineering approach, and the provision of evidence by means of a Desktop Study Report submission, as acceptable methods of demonstrating compliance for both building control and Buildmark warranty purposes.



The Royal Veterinary College (RVC) Student Village, Hertfordshire.

Compliance Route for *Kingspan Kooltherm*[®] K15 Rainscreen Board

Kingspan Kooltherm[®] K15 Rainscreen Board is designed for use in façade systems with either a proprietary or non-proprietary external finish and in both masonry and steel frame system (SFS) constructions. *Kingspan Kooltherm*[®] K15 Rainscreen Board is ideal for both new build and refurbishment.

Step-by-Step Guide to Compliance

To assist in identifying the most appropriate route to take for compliance with the fire safety requirements of the Building Regulations / Standards, when using *Kingspan Kooltherm*[®] K15 Rainscreen Board in the façades of buildings with a habitable storey 18 metres, or greater, above ground level, Kingspan Insulation has developed a step-by-step guide.

Kingspan Insulation recommends checking with the warranty provider in the first instance, as the specified construction may already meet the requirements for a number of applications.

Refer to Appendix A for details of the Step-by-Step Guide to Compliance.

Linear Route

Although *Kingspan Kooltherm*[®] K15 Rainscreen Board, and its rigid thermoset insulation core, are Class 0, as defined by the Building Regulations, the linear route to compliance is not open.

Performance-based Route

Large Scale Test Data

Kingspan Kooltherm[®] K15 Rainscreen Board has been tested in differing thicknesses with a range of cladding materials to BS 8414-1: 2002 and BS 8414-2: 2005, in accordance with the performance criteria set out in BR 135.

Refer to Appendix B for details of the build-ups that have been successfully tested.

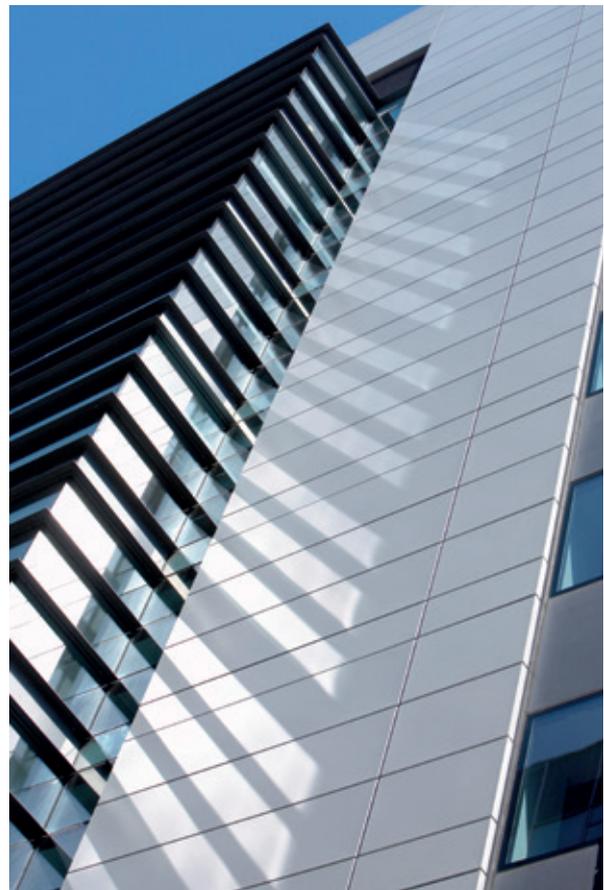
Desktop Study Reports

A cohort of qualified fire specialists have carried out a large number of desktop studies assessing the suitability of *Kingspan Kooltherm*[®] K15 Rainscreen Board, in differing façade build-ups, for use in buildings with a storey height 18 metres, or greater.

Refer to Appendix C for examples of build-ups that have undergone an assessment.

For the full database of build-ups, go to

www.kingspaninsulation.co.uk/routestocompliance.



Bauhaus Rossetti Place, Manchester.

Fire Safety Engineering Route

This route requires every factor of the design, construction, use and management of the building to be fully considered.

Whilst it does not rely solely on the standalone fire performance of individual products, the data that is available for *Kingspan Kooltherm*[®] K15 Rainscreen Board can form an essential part of the information that would be needed if adopting this approach.

Kingspan Insulation's Commitment

Kingspan Insulation is committed to a continuing program of testing, both independently and collaboratively, to increase the breadth of BS 8414 fire test data for *Kingspan Kooltherm*[®] K15 Rainscreen Board in common façade build-ups. The results of these tests will also provide valuable additional data to help those engaged in desktop studies.

Furthermore, Kingspan Insulation has a dedicated technical advisory service for those seeking assistance on projects where *Kingspan Kooltherm*[®] K15 Rainscreen Board is specified for use in high-rise buildings.

Other Design Considerations

Factors to Consider

Irrespective of the chosen route to compliance, there are other fundamental aspects of the building design that must be considered. For example, use of compartmentalisation to limit internal fire spread or the separation distance between buildings so as to limit the risk of fire spreading from one building to another.

Whilst the fire performance of the building envelope is a vital element of good construction, it is just one of a number of factors that should influence the façade insulation specification. Since the primary role of the insulation is to conserve energy, thermal performance must also be a key consideration. Other considerations include:

- BBA Certification;
- LABC Registered Detail status;
- environmental impact and responsible sourcing;
- moisture resistance, air-infiltration and durability;
- insulant thickness and weight, thus associated load implications;
- cost and Return on Investment (ROI);
- ease of installation;
- availability and logistics; and
- access to technical support from specification through installation to maintenance.

None of these elements should be regarded in isolation. They should be considered in the context of the building as a whole – its overall design, its intended use, and any associated risks or benefits arising from selected materials in situ.

Kingspan **Kooltherm**® K15 Rainscreen Board Benefits

Kingspan **Kooltherm**® K15 Rainscreen Board comprises a premium performance rigid thermoset fibre-free phenolic insulation core faced on both sides with a low emissivity composite foil. The core is manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

Kingspan **Kooltherm**® K15 Rainscreen Board, produced at Kingspan Insulation's Pembroge, UK, manufacturing facility offers the following benefits:

- **thermally efficient** – a thermal conductivity as low as 0.020 W/m·K makes it the most thermally efficient insulation product commonly used in façade systems;
- **thin insulation** – the thinnest commonly used rainscreen insulation product for any specific U-value;
- **BBA certified** – its use is covered by BBA Certificate 08/4582;
- **LABC Registered Detail** – certified as a Registered Detail with LABC it is the first insulation board to achieve LABC Registered Detail status as a thermal insulation layer in a rainscreen cladding system;
- **'A+' Green Guide Rating** – an Ecoprofile, certified by BRE Certification to the 2008 BRE Environmental Profiles Methodology has been created for the product and BRE has assigned the boards a Green Guide Summary Rating of A+;
- **BES 6001 certified** – certified 'Very Good' to BES 6001 (Responsible Sourcing of Construction Products);
- **manufactured to the highest standards** – under a management system certified to ISO 9001: 2008 (Quality management systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and BS OHSAS 18001: 2007 (Health & Safety Management Systems. Requirements);
- **closed cell structure** – resists moisture and water vapour ingress – a problem which can be associated with open cell materials such as mineral fibre and which can result in reduced thermal performance;
- **unaffected by air infiltration** – a problem that can be experienced with mineral fibre and which can reduce thermal performance;
- **safe and easy to install** – fibre-free insulation core; and
- **Return on Investment (ROI) up to 4250%** – when compared with common insulation solutions, its use in new commercial buildings can provide an ROI of over 4000% on the additional cost of the insulation by creating greater marketable internal floor area, without compromising the designed building footprint, for details go to www.kingspaninsulation.co.uk/RealValueofSpace.

Case Studies

Creating a New Pendleton, Residential Tower Blocks, Salford

Nine 1970s residential blocks in central Salford are being given a new lease of life with both the inside and out being revitalised thanks to a major retrofit scheme, which incorporates premium performance *Kingspan Kooltherm*® K15 Rainscreen Board in the over-cladding of external walls.

The £650 million 'Creating a new Pendleton' scheme, a partnership between Salford City Council and Pendleton Together (Together Housing), is well underway and will include the refurbishment of 1,253 dwellings along with new public spaces, roads and landscaping.

The tired brick façades of the mid and high level apartment blocks are being replaced by modern aluminium rainscreen cladding. The first tower, the 12 storey 'Whitebeam', was completed in July, and is soon to be followed by the 23 storey 'Spruce'.

Michael Hyde and Associates were appointed by Keepmoat as architects for the existing residences. They specified 110 mm *Kingspan Kooltherm*® K15 Rainscreen Board as part of a cladding system solution, which is being supplied and installed by supply chain partner Simco External Framing Solutions Ltd, who have employed four local apprentices as part of their commitment to the regeneration agenda.

The low thermal conductivities of *Kingspan Kooltherm*® K15 Rainscreen Board helps to maintain internal space and should also help to minimise heating bills for the residents. The insulation boards are being fitted tightly to the original brick and block walls. The aluminium cladding is then being installed on Simco's helping hand system with a 50 mm gap left to ventilate the rainscreen.



Fire performance was also a central design focus for the towers and fire barriers are being installed within the rainscreen at floor level on each storey.

Paul Chadwick from Michael Hyde and Architects commented:

“Our main concern when designing the refurbished towers was to create properties that the residents could be proud to live in and which enhanced their lives. The thermal performance provided by the Kingspan Insulation products will increase the energy performance of the homes whilst also being compliant with fire regulations above 18 metres.”

Bilfinger GVA advised on planning for the project on behalf of Pendleton Together (Together Housing), with Latham Architects providing additional designs for 239 new residential properties.



Windsor DENTAL
SAFFORD
0161 736 1397
windsordental.co.uk

Case Studies

Brook House, Rivers Apartments, Tottenham

Kingspan Kooltherm® K15 Rainscreen Board has been installed as part of a multi-million pound development in North London, providing 222 new affordable dwellings along with commercial space and a new primary school.

Constructed by main contractor, Galliford Try Partnerships, on behalf of Newlon Housing Trust, the development is situated on the site of a former rubber factory and forms part of Haringey Council's 20 year plan to reinvigorate the Tottenham area. The high quality development includes 100 shared ownership homes within a 22 storey tower called Rivers Apartments, and a further 122 intermediate rent apartments spread across three blocks of between 5 and 9 storeys.

All four blocks feature a concrete frame with rainscreen cladding to the tower, and a mixture of brick and rainscreen cladding to the lower blocks. To ensure excellent building fabric performance, KSS Design specified *Kingspan Kooltherm*® K15 Rainscreen Board.

For the Rivers Apartments, Gypcraft installed 60 and 100 mm *Kingspan Kooltherm*® K15 Rainscreen Board within a steel frame infill system. To complete the building envelope, Gypcraft then fitted an aluminium composite material façade.

The same thicknesses of *Kingspan Kooltherm*® K15 Rainscreen Board were also installed within the steel frame cladding system of the other three blocks. To complement the surrounding architecture these lower level blocks were mainly clad using brick slips.

Daniel Blackburn from KSS Design commented:

“In order to meet the energy requirements of the London Plan we used a fabric first-approach in combination with a district heating plant. *Kingspan Kooltherm*® K15 Rainscreen Board met the fire performance requirements for the high level buildings and helped us to achieve the target U-values across the properties without eating into the indoor living space of residents.”





Case Studies

Barnsley College, Old Mill Lane Campus, South Yorkshire

With its modern design and bright red façade, the Old Mill Lane Campus of Barnsley College sets out a vibrant, energy efficient vision for the town, incorporating a number of high and premium performance Kingspan Insulation products.

The campus has received a number of awards including 'Project of the Year' at the 2011 CIOB Celebrating Construction in South Yorkshire awards and a Highly Commended at the SCALA Civic Building of the Year Awards 2012.

The site is centred around an eight storey main building and provides 18,405 sq.m of vocational teaching space helping to support learning in a wide range of work-like environments. Onsite facilities including everything from state of the art training kitchens to radio, TV and sound recording studios.

Jefferson Sheard aimed to maximise the energy efficiency within the budgetary constraints of the project by choosing building materials that were both low maintenance and which offered excellent life cycle costings. To help achieve this they specified over 5,000 sq.m of *Kingspan Kooltherm® K15 Rainscreen Board*.

The product was installed by cladding contractors Chemplas and Wetherby Building Systems, and delivered outstanding U-values to several areas of the campus including the eye-catching façade of the flagship building.

With its highest possible BRE Green Guide rating of A+, the product also contributed, both directly and indirectly to the award of a number of credits as part of the BREEAM assessment, helping the campus to achieve a rating of 'Very Good'.

To complete the building envelope *Kingspan Thermaroof® TR26 LPC/FM* and *Kingspan Styrozone® N300 R* were also installed as part of the roof and floor build-ups respectively.

"Barnsley College delivers a multitude of apprenticeships and training courses including the hands-on, one day *Kingspan Kooltherm® Internal Wall Insulation (IWI) Systems Training Course* for existing dry-wall contractors or plasterers at its Barugh Green site."





Case Studies

The Fold, Mixed-use Development, Sidcup, Kent

A stunning new 6,500 sq.m mixed-use development in Sidcup is the latest project to benefit from the outstanding thermal performance provided by Kingspan Insulation's *Kingspan Kooltherm® K15 Rainscreen Board*.

The Fold, created by award-winning developer United House Developments, features an eye catching façade which combines smooth curves with weather and boil proof plywood panels with a copper gold finish. It was designed through a collaboration between Studio Egret West and KDS Associates. The completed development includes a restaurant, office and shop along with 69 private flats and a further 29 affordable flats offered by Gallions Housing Association.

To help minimise heat loss, 70 mm *Kingspan Kooltherm® K15 Rainscreen Board* was specified behind the ventilated cladding system as part of the glistening façade. The LABC Registered Detail status held by *Kingspan Kooltherm® K15 Rainscreen Board* for use as part of a rainscreen cladding system, helped to streamline the building control checking and approvals process on the project, saving both time and cost.

With the building standing at over 29 metres tall, fire safety was also a key concern.

Juan Alberts from KDS Associates commented:

“The site is situated next to the main rail station so it was really important that it set a positive first impression for visitors. The *Kingspan Kooltherm® K15 Rainscreen Board* formed part of our high quality approach and we knew could rely on the product to deliver both the thermal and fire performance we required. In addition, its BRE Green Guide rating of A+ also helped us to meet Code for Sustainable Homes Level 3.”

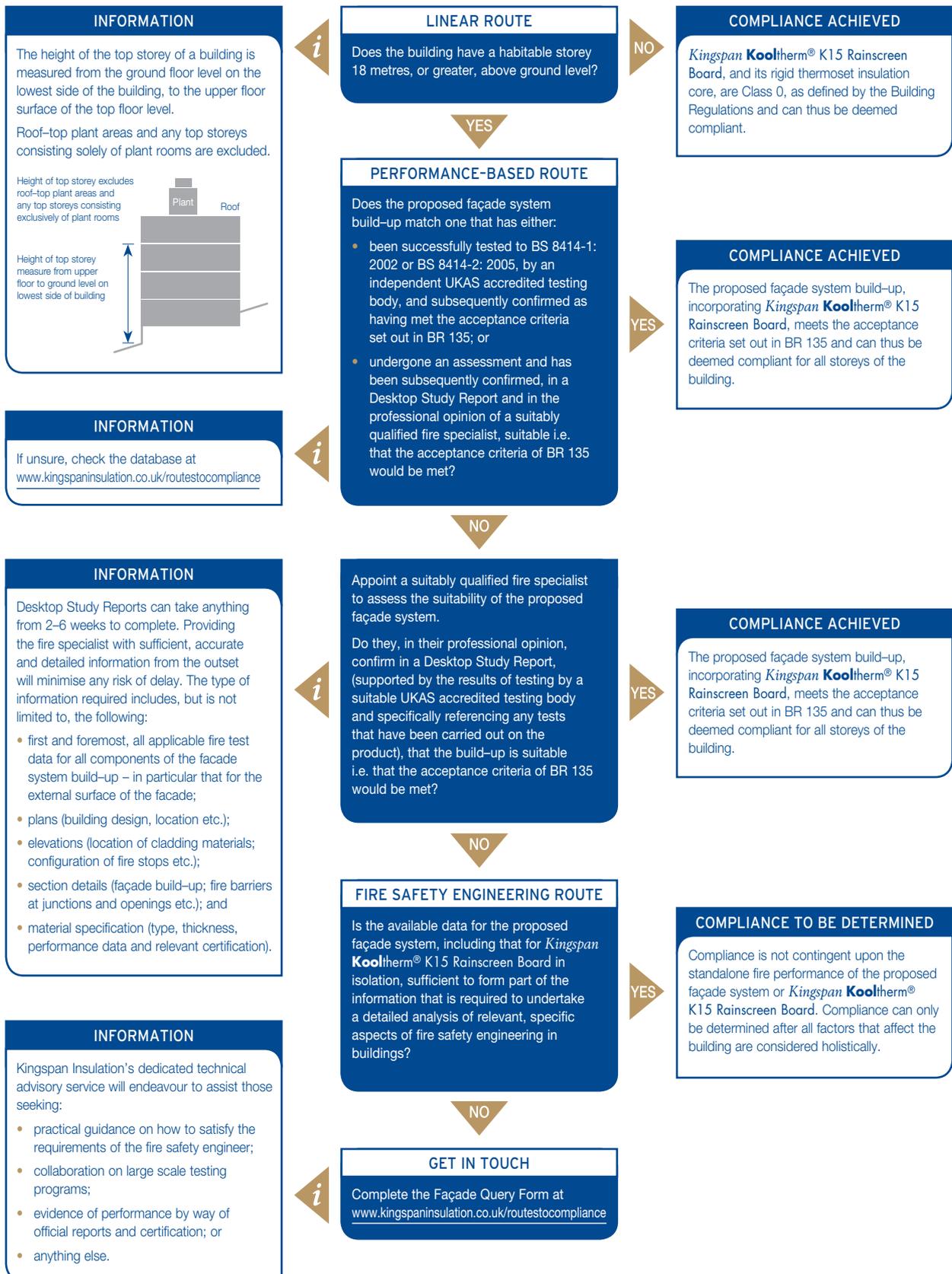




Appendix A

Step-by-Step Guide to Compliance

Step-by-step guide to compliance with the fire safety requirements of the Building Regulations / Standards when using *Kingspan Kooltherm*® K15 Rainscreen Board in the façades of buildings.



Appendix B

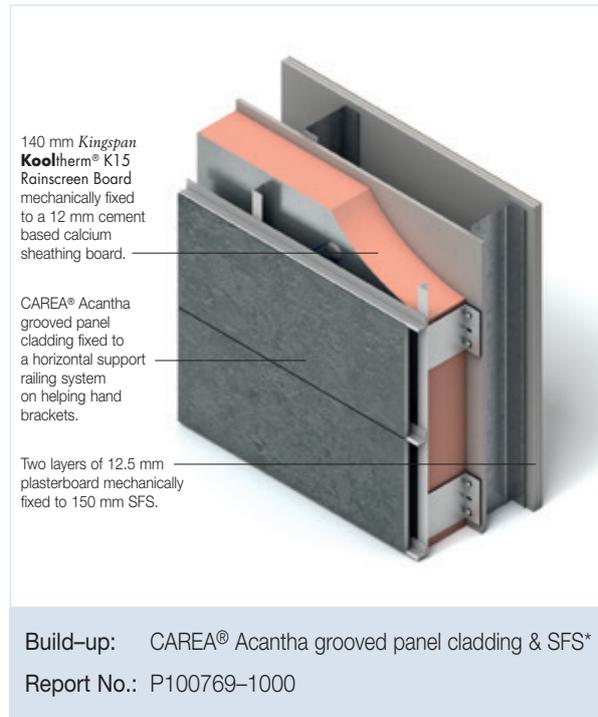
Large Scale Test Data

Build-ups incorporating *Kingspan Kooltherm*[®] K15 Rainscreen Board successfully tested to BS 8414-1: 2002 and BS 8414-2: 2005, in accordance with the performance criteria set out in BR 135. In all cases shown, fire stopping was provided by intumescent fire breaks positioned at floor level and around all openings, in accordance with the guidance given in Approved Documents B2 and Technical Handbooks Section 2.

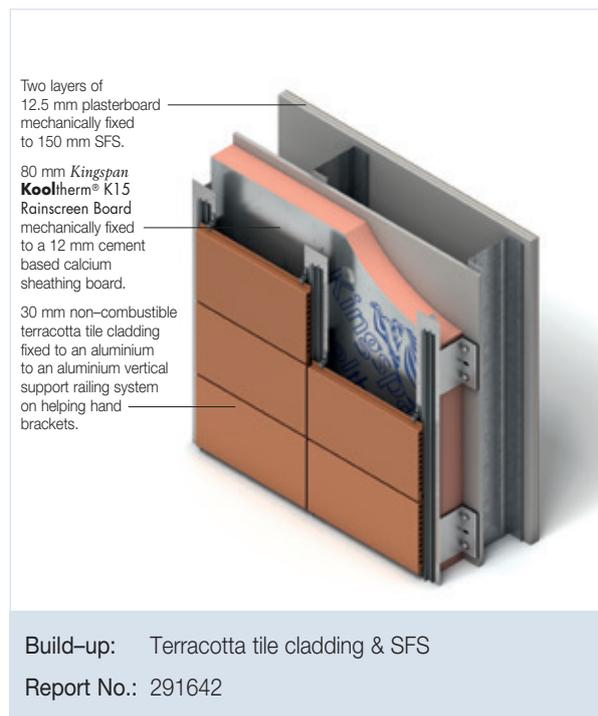
BS 8414-1: 2002



BS 8414-2: 2005



**Report prepared for CAREA[®] Façade, ZA Bel Air, 49520, Combrée, France
 (UK Office: CAREA[®] Ltd, 85 Fleet Street, 7th Floor, London EC4Y 1AE)*



Appendix C

Desktop Study Reports

Examples of façade system build-ups incorporating *Kingspan Kooltherm*® K15 Rainscreen Board successfully assessed by qualified fire specialists for use in buildings with a habitable storey 18 metres, or greater, above ground level. NB Where a breathable membrane is specified, seek advice from the cladding manufacturer as regards to its location within the façade system.

Two layers of 15 mm plasterboard mechanically fixed to SFS filled with acoustic mineral fibre.

Glass panel on polished 190 mm pre-cast concrete cladding.

100 mm *Kingspan Kooltherm* K15 Rainscreen Board.

Build-up: Glass panel on pre-cast concrete cladding & SFS
Report No.: CC302787

Two layers of 12.5 mm plasterboard on 100 mm SFS fully filled with 100 mm rock mineral fibre.

110 mm *Kingspan Kooltherm* Rainscreen Board mechanically fixed to a 12.5 mm sheathing board with a breathable membrane e.g. *Kingspan nilvent*®, between.

Pre-oxidised copper cladding on 18 mm plywood fixed to a vertical support railing system on helping hand brackets.

Build-up: Copper cladding panel on plywood & SFS
Report No.: CC351838

One layer (inner) of 12.5 mm plasterboard and one layer (outer) of 15 mm plasterboard mechanically fixed to independent I section SFS filled with mineral fibre.

90 mm *Kingspan Kooltherm* K15 Rainscreen Board fixed to a 15 mm sheathing board.

Brickwork facing.

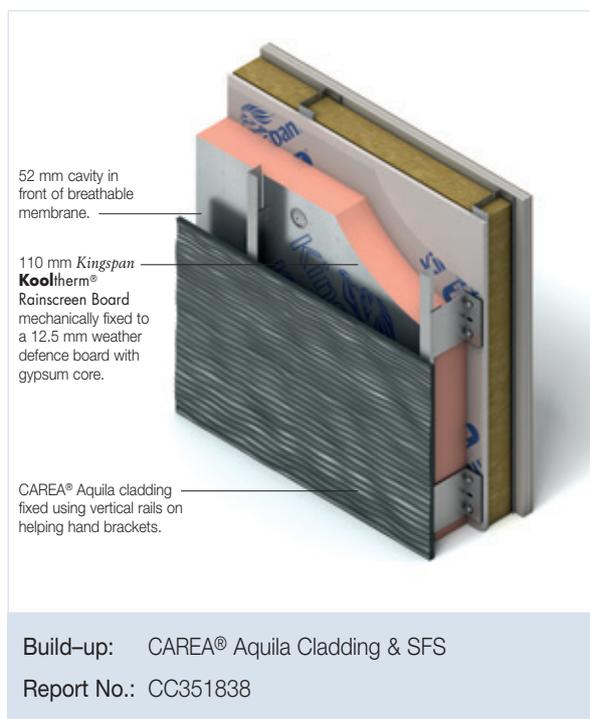
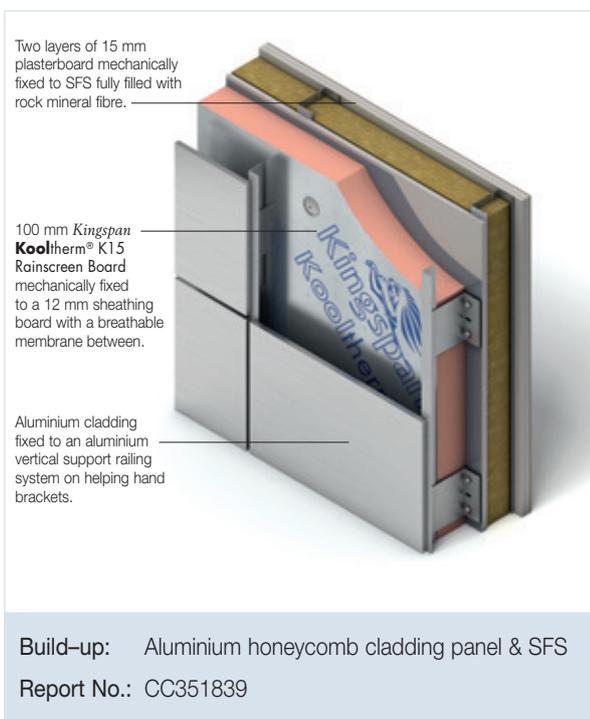
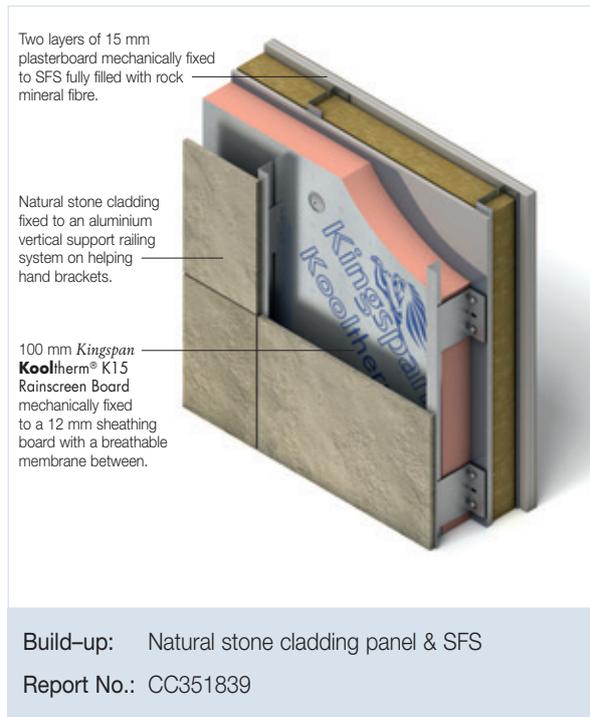
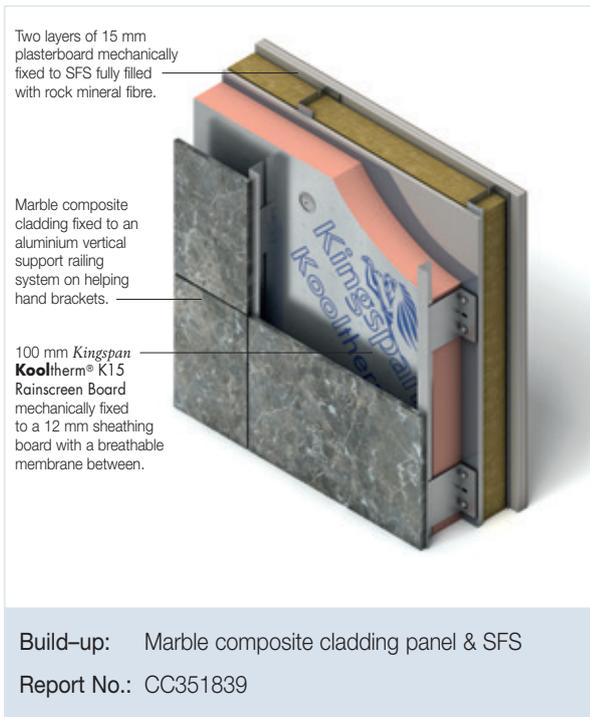
Build-up: Brickwork facing & SFS
Report No.: 301393

Two layers of 12.5 mm plasterboard on 100 mm SFS partially filled with 50 mm rock mineral fibre.

80 mm *Kingspan Kooltherm* Rainscreen Board mechanically fixed to a 12.5 mm sheathing board with a breathable membrane e.g. *Kingspan nilvent*®, between.

Brickwork facing.

Build-up: Brickwork facing & SFS
Report No.: CC351838



Contact Details

Customer Service

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

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Literature & Samples

Kingspan Insulation produces a comprehensive range of technical literature for designers, 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, go to the Kingspan Insulation website or contact the Kingspan Insulation Marketing Department:

Tel: +44 (0) 1544 387 384

Fax: +44 (0) 1544 387 484

email: literature@kingspaninsulation.co.uk

www.kingspaninsulation.co.uk/literature

Tapered Roofing

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

Tel: +44 (0) 1544 387 383

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email: tapered@kingspaninsulation.co.uk

Technical Advisory Service

Kingspan Insulation supports all of its products with a comprehensive Technical Advisory Service for designers, specifiers, stockists and contractors.

This includes a computer-aided service designed to give fast, accurate technical advice. Upon receipt of 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 online U-value Calculator is also available for pitched and flat roofs, walls and floors. It contains calculations carried out by persons approved under the Scheme for Calculation Competency Part 1 – U-value and condensation risk. The tool is free, easy to use and requires no registration.



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.



For U-value calculations, go to the Kingspan Insulation website or contact the Kingspan Insulation Technical Service Department:

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email: technical@kingspaninsulation.co.uk

www.uvalue-calculator.co.uk

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