Building Regulation Fire Performance Requirements for Insulated Panel and Façade Systems

UK & Ireland, 2018 Edition
Foreword

Fire is a complex phenomenon. How it develops depends on many different factors, only one of which is the fabric of a building.

For example, the fire performance of a facade system depends on the interaction of all the components (including fixings, fasteners and sealants) in that system in response to a fire, and also on other design and construction factors such as the position of fire barriers, the size of ventilation gaps and so on.

The Building Regulations governing fire safety are designed to preserve life, and this must always be the primary consideration in the design and construction of any building. To assist with this, there are prescribed tests and standards that can be used to classify building products, and guidance is provided to show which classifications are deemed to comply with the requirements of different building types.

The insurance industry recognises the importance of system testing for property protection in the event of a fire, and as far back as the 1980s developed its own suite of large-scale system tests and standards to ensure that a more accurate assessment of risk could be made of specific building constructions. Over the years, case studies by independent experts have shown that there is a very close correlation between the results of insurance industry large-scale testing, and actual building performance in real fires.

This document examines the different standards that are relevant to facades and roof and wall insulated panel systems, and demonstrates why large-scale testing, regardless of insulation type, should always provide the benchmark for fire safety performance.
Preface

Note: this document was published in January 2018 and the extracts below are taken from significant documents published to date as part of Dame Judith Hackitt’s Independent review of Building Regulations and Fire Safety. This preface will be updated if further significant guidance emerges.

On December 11th 2017, the Department for Communities and Local Government published a document called “Information note for landlords and building owners of tall residential buildings with ACM cladding”. This information note was “for the attention of anyone responsible for residential buildings over 18m in height with Aluminium Composite Material (ACM) cladding, who is concerned about the fire safety implications for those buildings.”

The following extract is taken from Chapter 3, which is titled “Progressing remedial works and maintenance”:

“The Independent Expert Advisory Panel maintain the view that the clearest ways of ensuring a cladding system adequately resists fire spread over the walls are to use materials either of limited combustibility, or a cladding system which can be shown to have successfully obtained BR135 classification via a large scale BS8414 test. This is on the basis that the construction of the building also meets the other provisions of building regulations guidance, including fire stopping between floors and the required cavity barriers being in place (see Section 9 of Approved Document B volume 2). The consolidated advice and BRE published test results may be helpful to building owners and their professional advisors in determining options for their potential remedial solutions.”

On December 11th, the following report was published by Dame Judith Hackitt DBE FREng: “Building a Safer Future - Independent Review of Building Regulations and Fire Safety: Interim Report”.

The extract below is taken from Chapter Interim Recommendations and Challenges:

While there is more work to be done to develop some of the ideas highlighted here and turn them into final recommendations, there are already some clear actions and initiatives which can and should be taken now, which would be entirely consistent with the likely future direction of travel. These are brought together below:

A. The government should consider how the suite of Approved Documents could be structured and ordered to provide a more streamlined, holistic view while retaining the right level of relevant technical detail, with input from the Building Regulations Advisory Committee. Given that reframing the suite of guidance may take some time, in the meantime I would ask the government to consider any presentational changes that will improve the clarity of Approved Document B as an interim measure. (Paragraph 1.63)

B. There is a need to be certain that those working on the design, construction, inspection and maintenance of complex and high-risk buildings are suitably qualified. The professional and accreditation bodies have an opportunity to demonstrate that they are capable of establishing a robust, comprehensive and coherent system covering all disciplines for work on such buildings. If they are able to come together and develop a joined up system covering all levels of qualification in relevant disciplines, this will provide the framework for regulation to mandate the use of suitable, qualified professionals who can demonstrate that their skills are up to date. This should cover as a minimum:

- engineers;
- those installing and maintaining fire safety systems and other safety-critical systems;
- fire engineers;
- fire risk assessors;
- fire safety enforcing officers; and
- building control inspectors.

I would ask these bodies to work together now to propose such a system as soon as practicable. I will launch this work at a summit in early 2018.

C. Consultation with the fire and rescue services is required on plans for buildings that are covered by the Fire Safety Order, but does not work as intended. Consultation by building control bodies and by those commissioning or designing buildings should take place early in the process and fire and rescue service advice should be fully taken into account. The aim should be to secure their input and support at the earliest stage possible so that fire safety can be fully designed in. (Paragraph 1.76)

D. Building developers need to ensure that there is a formal review and handover process ahead of occupation of any part of a new high-rise residential building. While there are legitimate reasons to allow occupation in a phased way, the practice of allowing occupancy of buildings without proper review and handover presents barriers to the implementation of any remedial measures identified as part of the completion process. (Paragraph 1.79)

E. There is a need for building control bodies to do more to assure that fire safety information for a building is provided by the person completing the building work to the responsible person for the building in occupation. Given the importance of such information for ongoing maintenance and fire risk assessment, proof should be sought that it has been transferred. (Paragraph 1.80)
Fire Safety
Building Regulations, Standards & Testing
Fire Safety Building Regulations, Standards & Testing

1.1 Introduction to Fire Safety Building Regulations

There are separate fire safety Building Regulations for England, Wales, Scotland, Northern Ireland and the Republic of Ireland, and each jurisdiction has its own, specific guidance on how to comply. The requirements for insulated panel and façade systems across all countries are broadly similar.

There is separate guidance for domestic and non-domestic buildings, and within that guidance there are classifications of Building Purpose Group, according to use. Those Building Purpose Groups that are considered to have greater potential levels of risk because of the type of occupancy, such as schools and hospitals, should meet additional requirements to be considered compliant.

Further requirements also come into play for buildings with habitable storeys over 18 metres, not including plant rooms on roofs (Figure 1). There are several ways to comply with these more stringent requirements (see Section 2.4).

Within each of the Regulations, there is provision for British and European standards such as EN 13501 and BS 476, reaction to fire and fire resistance tests. The primary focus of these tests and the Regulations they support is ensuring life safety.

Figure 1. Height of top storey in building

1.2 Building Regulation requirements in England, Wales, Scotland, Northern Ireland and Republic of Ireland

The mandatory Building Regulations that apply to insulated panel and façade systems are set out in:
- Part B, Fire Safety, of Schedule 1 to the Building Regulations 2010 in England and Wales;
- Regulation 9 of Schedule 5, Section 2 – Fire to the Building Standards 2010 in Scotland;
- Part E of regulation 2 of the Building Regulations (Northern Ireland) 2012; and

Additional guidance for highly sensitive buildings, such as schools and hospitals can be found in:
- British Standard BS 9999-2007 - Fire Safety in the design, management and use of buildings, code of practice;
- BB100 Designing against the risk of fire in schools (schools);

1.3 Compliance for external façades of Buildings under 18 metres

The mandatory guidance documents also set out the material requirements for buildings under 18m. Product performance requirements are typically set out in BS 476 (National Class) or EN 13501 (European Class).

European standards are often quoted by manufacturers and suppliers when evidencing the fire performance of their materials. These are typically acceptable and directly translate to UK Standards for Building Regulations purposes. However, other country specific tests and standards may not be directly comparable.

Overview of BS 476 Parts 6 and 7 tests used to determine surface spread of flame and fire propagation for buildings under 18 metres and rain screens in buildings over 18 metres (ref. Diagram 40 of Approved Document B)

BS 476 Part 6: Fire tests on building materials and structures - Method of test for fire propagation for products.
This is a lab based test, in which a small product sample is subjected to direct flame impingement and observed through a view window to measure propagation.

This comprises a large radiant heater with a wing on which a product sample is installed. The radiant heater is helped by a pilot flame which stimulates ignition across the sample. The test measures horizontal flame spread.

Overview of BS EN 13501-1 Fire Classification of construction products and building elements

Another standard enshrined within UK Building Regulations is BS EN 13501-1: Fire Classification of construction products and building elements.

Embedded within BS EN 13501-1 there is a test standard known as the Single Burning Item, or SBI test, which is performed in accordance with BS EN 13823. In this test one gets classifications for:
- Contribution to fire, (A1, A2, B, C, D, E & F Classifications);
- Smoke emissions (EI being the lowest, but also S2 and S3);
- Burning droplets (D0 represents no burning droplets, also classifications D1 and D4);

Typically, a very good performing PUR core, LPCB approved Insulated panel will achieve B1 or D0 - very limited contribution to fire, with the lowest possible smoke emissions and zero burning droplets.

Single Burning Item (BS EN 13823)
This test mimics the corner of a room. During the test there is a gas fire source in the corner of the test rig and after the test one can see the impact of the fire on the panels.

ISO 11925-2:2010
This specifies a method of test for determining the ignition of products by direct small flame impingement under zero impressed insulance using vertically oriented test specimens.
Also enshrined in BS EN 15001 are the following tests:

Table 1: Comparison of National Classes and European Classes

<table>
<thead>
<tr>
<th>National Classes (England &amp; Wales)</th>
<th>National Test Standard (England &amp; Wales)</th>
<th>Euroclass</th>
<th>European Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-combustible</td>
<td>BS 476 Part 4</td>
<td>A1</td>
<td>BS EN ISO 1182</td>
</tr>
<tr>
<td>Limited Combustibility</td>
<td>BS 476 Part 11</td>
<td>A2</td>
<td>BS EN ISO 1182</td>
</tr>
<tr>
<td>0</td>
<td>BS 476 Part 6</td>
<td>B</td>
<td>BS EN 11925-2</td>
</tr>
<tr>
<td>1/2</td>
<td>BS 476 Part 7</td>
<td>C</td>
<td>BS EN 11925-2</td>
</tr>
<tr>
<td>S</td>
<td>BS 476 Part 7</td>
<td>D</td>
<td>BS EN 11925-2</td>
</tr>
<tr>
<td>E</td>
<td>BS 476 Part 7</td>
<td>E</td>
<td>BS EN 11925-2</td>
</tr>
<tr>
<td>Unclassified</td>
<td>No Test</td>
<td>F</td>
<td>No performance determined</td>
</tr>
</tbody>
</table>
1.4 Compliance for external façades of Buildings over 18 metres

In the national guidance documents for England and Wales, Scotland and Northern Ireland, there are three potential routes to compliance for façade systems on buildings with a habitable storey over 18 metres:

1. Performance Route

Within the performance route there are two options: façade systems must meet the performance criteria set out in BR 135 when tested to BS 8414, or a desktop study from a suitably qualified fire specialist stating whether, in their opinion, BR 135 criteria would be met with the proposed system.

BR 135 classification is a direct and robust route to compliance based on large-scale testing of a complete system in accordance with BS 8414 - Fire Performance of External Thermal Insulation for Walls of Multi-storey Buildings.

An important aspect of the first option within the performance route as outlined above is that it does not look at the performance of insulation and cladding materials in isolation, instead it tests the complete wall system.

It also incorporates cavity barriers and fire stopping, testing the effectiveness of the construction design as well as the materials specified.

BR 135 is a comprehensive guidance document that provides a method of assessing the fire performance of cladding systems on multi-storey buildings from full-scale fire test data. It opens by considering the five key mechanisms of fire spread as shown in the diagram opposite, and continues to offer fire performance design principles for different system types based on recent full-scale research programmes. These principles consider robustness of installation and fixing methods; fire propagation of the external finish; and delamination or spall of the systems. System-specific details for different system types are also covered in BR 135.

The DCLG described the BS 8414 test as follows in their recent series of tests:

“This involves a 9 metre high demonstration wall with a complete cladding system – including panels and insulation – fixed to it, being subjected to a fire that replicates a severe fire in a flat breaking out of a window. The tests look at whether the system resists fire spread up the wall.”

Test overview:
- 9m test rig.
- Resembles two floors above the combustion chamber.
- The fire will release approximately 3MW during its peak heat release.
- Incorporates system-specific details, cavity barriers and fire stopping.
- 30 minute flame exposure.

Legend:
- External thermocouple 1.5 mm - BS 8414
- Internal thermocouple 1.5 mm - BS 8414
- Plate thermometer pointing outwards from the façade (PTO)
- Plate thermometer pointing towards fire source (PTT)
- Thermocouple (TCadd) 1mm; 3mm
- Load cell under the support platform legs (LC)
- Plate thermometer facing the fire source (PTF)

Figure 3: Drawing of BS 8414 system test.

This photograph shows a recent successful BS 8414 test on a Kingspan system. The construction detail illustrates the fact that the test prescribes the precise construction method including fire stopping, and specification of all components that should be used in the assembled system.
What is the BS 8414 Large-scale System Test?

The BS 8414 test is a large-scale assembly test mimicking a high-rise building and measuring fire spread.

Test set up - Kingspan BENCHMARK Dri-Design Metallic rainscreen with Karrier insulated panel.

During the test a large wooden crib makes up the fire load which can reach a peak heat release of 3MW.

End of test showing the façade system does not contribute to fire spread.

A detailed report is issued containing specifications for componentry and installation.

For video footage of our BENCHMARK BS 8414 large-scale system tests, contact fireinfo@kingspanpanels.com

Note regarding Desktop Studies

Desktop Studies are accepted under BCA technical guidance note 18 as a route to compliance with Building Regulations. The paragraph below is the relevant extract from this guidance note.

“If no actual fire test data exists for a particular system, the client may instead submit a desktop study report from a suitably qualified fire specialist stating whether, in their opinion, BR 135 criteria would be met with the proposed system. The report should be supported by test data from a suitable independent UKAS accredited testing body (BRE, Chiltern Fire or Warrington Fire), and so this option may not be of benefit if the products have not already been tested in multiple situations / arrangements. The report should also specifically reference the tests which have been carried out on the product.”

Competent fire engineers can carry out desktop studies to demonstrate compliance for specific projects. Today, desktop studies are based on fire engineering judgement without the need for large-scale fire testing. However, Kingspan Insulated Panels strongly recommends that desktop studies should be based on large-scale fire testing of similar façade systems to the one that is being proposed for the project.
2. Linear-based Route

Today, for buildings over 18 metres, regulatory guidance could be interpreted that façade systems, incorporating non-combustible or limited combustibility insulation materials along with an outer rainscreen that is as per Diagram 40 of Approved Document B or better, are automatically deemed compliant with the Building Regulations. Non-combustibility and limited combustibility are both determined by small, bench-scale tests. The photographs in the table below illustrate the laboratory nature of these tests. They test small samples of materials in isolation unlike BS 8414 which tests materials within full wall system assemblies.

It is worth noting that the Linear-based route fails to test how all components in a façade system interact with each other under a severe fire load to determine fire spread characteristics and structural integrity of the façade. This route to compliance focuses on small-scale fire testing of the insulation and the external rainscreen separately, ignoring the fact there are many more untested components that will impact fire spread such as glues, binder content, gaskets, paint, tapes, membranes, and thermal breaks on brackets. Under a realistic fire load condition, the thermal break on a helping hand bracket could result in structural failure of the external rainscreen and cause it, along with fire barriers, to fall off a building.

It is also worth noting that façade systems consisting of mineral fibre and PIR failed BS 8414 tests carried out by the Building Research Establishment for DCLG in 2017. This demonstrates that relying on small-scale materials tests, such as those used to determine ‘non-combustible’ or ‘limited combustibility’, are not as robust as a system performance based approach.

### The Small-scale Bench Tests that determine “Non-Combustible” and Limited Combustibility

<table>
<thead>
<tr>
<th>National Class (England &amp; Wales)</th>
<th>National Test Standard (England &amp; Wales)</th>
<th>Euroclass rating and relevant European Test Standards</th>
<th>Test apparatus for BS EN ISO 1182 and BS EN ISO 1716</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-combustible</td>
<td>BS 476 Part 4</td>
<td>A1: BS EN ISO 1182 Plus BS EN ISO 1716</td>
<td></td>
</tr>
<tr>
<td>Limited Combustibility</td>
<td>BS 476 Part 11</td>
<td>A2: BS EN ISO 1182 or BS EN ISO 1716 plus BS EN 13823</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>ACM Core</th>
<th>Insulation Material</th>
<th>Pass / Fail</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Polyethylene (PE)</td>
<td>PIR</td>
<td>Fail</td>
<td>8 mins 45 secs</td>
</tr>
<tr>
<td>2</td>
<td>Polyethylene (PE)</td>
<td>Stone Wool</td>
<td>Fail</td>
<td>7 mins 09 secs</td>
</tr>
<tr>
<td>3</td>
<td>Fire retardant Polyethylene (FR)</td>
<td>PIR</td>
<td>Fail</td>
<td>25 mins 12 secs</td>
</tr>
<tr>
<td>4</td>
<td>Fire retardant Polyethylene (FR)</td>
<td>Stone Wool</td>
<td>Pass</td>
<td>Full Time (30 mins)</td>
</tr>
<tr>
<td>5</td>
<td>Mineral</td>
<td>PIR</td>
<td>Pass</td>
<td>Full Time (30 mins)</td>
</tr>
<tr>
<td>6</td>
<td>Mineral</td>
<td>Stone Wool</td>
<td>Pass</td>
<td>Full Time (30 mins)</td>
</tr>
<tr>
<td>7</td>
<td>Fire retardant Polyethylene (FR)</td>
<td>Phenolic</td>
<td>Fail</td>
<td>28 mins 14 secs</td>
</tr>
</tbody>
</table>
3. Fire Safety Engineering Route
The Fire Safety Engineering Route is 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 human behavioural aspects, fire prevention and active and passive fire protection measures, e.g. effective means of egress and adequate measures for alarm, detection, control and extinguishment.

This route to compliance 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, the guidance given in a number of supporting published documents can be followed. However, Approved Document B Volume 2 (England) and Approved Document B Volume 2 (Wales) both refer directly to BS 7974: 2001 (Application of fire safety engineering principles to the design of buildings. Code of practice), while Technical Handbooks Section 2 refers directly to IFEG: 2005 (International Fire Engineering Guidelines).

1.5 Fire Resistance tests
Fire resistance tests refer to testing of systems designed to contain or resist fire over a specified period of time. They are very different to reaction to fire tests but are sometimes confused. Fire resistance classifications are often expressed as a period of time such as ‘1 hour fire resistance’ or two numbers such as 30/30 or a combination of letters and numbers such as EI30 or FR60. It is important to understand what each classification means.

Fire resistance criteria depend on application and proximity to boundary. These can be found in: Part B Building Regulations for England & Wales; Technical Handbook (non-domestic) for Scotland; Part E of regulation 2 of the Building Regulations (Northern Ireland) 2012; Building Regulations 2006 Technical Guidance Document B Fire Safety (Republic of Ireland).

What must be considered when it comes to fire resistance and which tests are applicable?
When it comes to fire resistance the most common elements to consider are integrity (E), insulation (I), heat radiation (W) and load bearing capacity (R).
- ‘Integrity’ is the length of time that the insulated panel systems retains its integrity against flames or hot gases in a standard fire. For example, if flames were to break through the system after 100 minutes, the insulated panel system would achieve E90 or 90 minutes integrity.
- ‘Insulation’ is the time it takes to produce an average increase in temperature of 140°C (250°F in ASTM E119) above the initial temperature or an increase in temperature at one point of 180°C (325°F in ASTM E119) above the initial temperature on the unexposed (cold) side of the insulated panel system. This rise in temperature is measured with multiple thermocouples. Each thermocouple is monitored carefully during the fire resistance test.
- ‘Heat Radiation’ refers to the ability of the insulated panel system to reduce the transmission of fire as a result of radiated heat from the unexposed surface to adjacent materials. Heat radiation is limited to a maximum of 15kW/m².
- ‘Load bearing capacity’ refers to the structural ability of a floor or roof system to resist fire attack.

Fire Resistance testing involves a suite of test standards, including LPCB LPS 1208, BS 476-22, BS EN 1350 and BS EN 13501-2.

The pictures below illustrate the test rig for fire resistance. Typically speaking the test rig will be 3m wide by 3m tall. Behind the unexposed surface of the insulated panel is a large furnace, which presents a large fire source to the exposed surface of the insulated panel system. Thermocouples are attached to the unexposed surface face, measuring temperature.
Considerations for Compliance to national guidance documents

Buildings Under 18 Metres

The relevant standards are BS 476 and BS EN 13501-1, but requirements vary by application and country.

However, Building Regulations for buildings under 18 metres do not exceed the requirements of either B,s3-d2 to BS EN 13501-1 or Class 0 to BS 476 Part 6 and 7, therefore Kingspan wall and façade systems are all compliant for this application in England, Wales, Scotland, Northern Ireland and Republic of Ireland, regardless of Building Purpose group.

Building Over 18 Metres

1. Performance

A straightforward route to compliance is achieved for a system which passes the criteria set out by BR 135 when tested to the BS 8414 large-scale system test.

If the exact system under consideration has not been tested to BS 8414, desktop studies are accepted under BCA Technical Guidance Note 18 from a suitably qualified fire specialist stating whether, in their opinion, BR 135 criteria would be met with the proposed system.

Kingspan Insulated Panels offers a suite of BR 135 classified systems for external wall and rainscreen façade applications.

2. Linear

A route focused on material or product classification using small scale tests. This route to compliance is open to interpretation as follows:

Interpretation 1
(Ref. Paragraph 12.7 & Diagram 40 in ADB):
Insulation should be classified as limited combustibility (Euroclass A2) or better when tested to BS EN ISO 1182, BS EN ISO 1716 and BS EN 13823 or BS 476-4 and BS 476-11.
Rainscreen should achieve Class 0 when tested to BS 476 Part 6 and BS 476 Part 7 or Euroclass B when tested to BS EN 13823 and BS EN 11925-2.

Interpretation 2
(Ref. Paragraph 12.7 in ADB):
Insulation should be classified as limited combustibility (Euroclass A2) or better when tested to BS EN ISO 1182, BS EN ISO 1716 and BS EN 13823 or BS 476-4 and BS 476-11.
Rainscreen “filler material” should be classified as limited combustibility (Euroclass A2) or better when tested to BS EN ISO 1182, BS EN ISO 1716 and BS EN 15823 or BS 476-4 and BS 476-11.

3. Fire Engineering

Holistic Scientific Fire Engineering Approach by a competent person requiring applicable fire testing.
This is a costly route and is typically suited to more complex buildings.

Guidance on compliance of Kingspan external façade systems with Building Regulations in England, Wales, Scotland and Northern Ireland.

Fire Resistance Compliance Criteria:
Additional fire resistance criteria will apply for compliance. These vary depending on application and proximity to boundary. Criteria can be found in: Part B Building Regulations for England & Wales; Technical Handbook (non-domestic) for Scotland; Part E of regulation 2 of the Building Regulations (Northern Ireland) 2012.
1.6 Requirements under Building Regulations for Fire Safety of Roof Constructions

The Building Regulations for England, Wales, Scotland, Northern Ireland and the Republic of Ireland require roofs exposed to external fires to provide protection against fire penetration into the space beneath the roof and against the spread of flames across the surface of the roof.

The relevant test is BS 476-3: 2004 - Fire test on building materials and structures - Part 3: Classification and methods of test for external fire exposure to roofs. The Building Regulations also make provision for European standards therefore EN 13501-5 is deemed to be comparable for compliance purposes for roof panel systems.

The performance of the roof construction in this test is predominantly measured by the application of an external fire source to measure fire propagation. Classification is designated by two letters, the first concerning fire penetration and the second fire spread.

First Letter - Fire Penetration classification
- A: Those specimens which have not been penetrated within 1 hour.
- B: Those specimens which are penetrated in not less than 30 minutes.
- C: Those specimens which are penetrated in less than 30 minutes.
- D: Those specimens which are penetrated in the preliminary flame test.

Second Letter - Spread of Flame classification
- A: Those specimens on which there is no spread of flame.
- B: Those specimens on which there is not more than 533mm, (21 inches), spread of flame.
- C: Those specimens on which there is more than 533mm, (21 inches), spread of flame.
- D: Those specimens which continue to burn for 5 minutes after the removal of the test flame or with spread of flame more than 381mm, (15 inches), in the preliminary test.

The fire performance classification achieved in BS 476-3: 2004 is used in the Building Regulations to limit the use, near a boundary, of roof coverings which will not give adequate protection against the spread of fire over or through them.

Overview of BS 476-3: 2004

The tests described in this standard are designed to give information concerning the ability of a roof to resist fire from a nearby fire outside the building itself from penetrating the roof and spreading across its surface.

A preliminary test is made in which a specimen section of the roof is subjected to the effects of flame in the absence of radiation. Unless the specimen is badly affected by this test further fire penetration and spread of flame tests are carried out with the surface of the test specimens exposed to radiant heat.

Test specimens are 840mm square (+/- 10mm) and must be representative of the complete "end use" roof construction including at least one specimen of any joints used in each of the materials to be tested.

The tests are conducted using a simulated town gas flame in a way that:
- Represents sloping and flat roofs respectively.
- Simulates the effect of a wind speed of 6.7 m/s by applying suction to the underside of the roof specimen to reduce the pressure on the underside by 1.5mm (+/- 0.1mm) of water below that on the upper side, for the duration of the test.

The test procedure includes the following stages and products are classified according to their performance in terms of fire penetration and spread of flame:
- A preliminary ignition test
- Fire penetration test
- Spread of flame test

Kingspan roof panel systems achieve an SAA (sloped roofs) and FAA (flat roofs) classification under BS 476-3: 2004 therefore can be used without restriction on all roof applications across across England, Wales, Scotland, Northern Ireland and Republic of Ireland.
Overview of Kingspan Tested & Accredited Systems

Building Regulation Fire Performance Requirements for Insulated Panel and Façade Systems
2.1 BR 135 Classified BENCHMARK
Architectural Façade Solutions

BENCHMARK Evolution: Panelised Façade System

Evolution has the look and feel of a super smooth rainscreen façade with the advantage of single point installation and the excellent thermal performance of an insulated wall panel. This secret-fix system comes in a wide range of colours, can be installed horizontally or vertically and is available in cover widths from 600mm to 1000mm.

BENCHMARK Karrier: Through-wall Insulated Panel & Rainscreen System

Our rainscreen systems combine the aesthetic flexibility of rainscreen façades with the practical benefits of a composite panel - quick installation, excellent light-fastness and low U-values coupled with enormous design choice in colour, shape and material.

These lightweight insulated wall panel systems are safe and easy to install, providing a weather tight building envelope in a fraction of the time of other systems. The rainscreen façade can then be added as the project reaches completion.

Our BR 135 classified solutions on insulated panels include Hook-on Cassette, a versatile metal cassette with wide colour options and large cassette sizes, and Corium brick slip tiles which replicate brickwork and come in a wide selection of finishes.

The most recent test report is on the revolutionary Dri-Design cassette system that allows designers to achieve easily interchangeable patterns without the need for complicated rail and bracket systems. Its simple one-piece engineering eliminates many of the complexities of other systems and is up to twice as fast to install as comparable systems.

We have a continuous programme of BS 8414 testing underway, so please visit the BRE online: https://www.bre.co.uk/regulatory-testing for an up-to-date listing of our BR 135 classified systems.

<table>
<thead>
<tr>
<th>BR 135 Classification Report Number</th>
<th>Relevant Test Method</th>
<th>Substrate</th>
<th>Insulation</th>
<th>Fire Breaks / Cavity Barriers</th>
<th>External Finish</th>
<th>Generic Cladding Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Panelised Façade System</td>
<td>289585 Issue 1</td>
<td>BS 8414-2:2005</td>
<td>Hot Rolled Frame</td>
<td>150mm steel-faced BENCHMARK Evolution Panel with PIR insulation core</td>
<td>None</td>
<td>Insulated Sandwich Panel Façade System</td>
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<tr>
<td>2. Metallic rainscreen with Karrier insulated panel</td>
<td>299571 Issue 1</td>
<td>BS 8414-2:2005</td>
<td>Lightweight Steel Frame</td>
<td>100mm steel-faced BENCHMARK Wall Liner panel with PIR insulation core</td>
<td>Horizontal Intumescent Cavity Barriers</td>
<td>3 mm Aluminium Cassette System (Hook-on)</td>
</tr>
<tr>
<td>3. Non-metallic rainscreen with Karrier insulated panel</td>
<td>P102340-1002</td>
<td>BS 8414-2:2005</td>
<td>Concrete Floor Slab</td>
<td>220mm steel-faced BENCHMARK QuadCore* Wall Liner Panel</td>
<td>Horizontal Intumescent Cavity Barriers</td>
<td>Corium brick slips (215mm x 65mm)</td>
</tr>
<tr>
<td>4. Dri-Design Metallic rainscreen with Karrier insulated panel</td>
<td>REPORT PENDING</td>
<td>BS 8414-2:2005</td>
<td>Lightweight Steel Frame</td>
<td>80mm BENCHMARK QuadCore Insulation Core Karrier Panel</td>
<td>No Cavity Barriers Used</td>
<td>Aluminium Dri-Design Cassette Façade System</td>
</tr>
</tbody>
</table>

By Kingspan
2.2 BR 135 Classified Kingspan Insulated Panel Solutions

Kingspan Insulated Wall Panel System

The architectural wall panel system is a versatile range of insulated panel profiles, delivering both aesthetic choice together with superior lifetime performance.

We have a continuous programme of BS 8414 testing underway, so please visit the BRE online: https://www.bre.co.uk/regulatory-testing for an up-to-date listing of our BR 135 classified systems.

1. Insulated Wall Panel System

<table>
<thead>
<tr>
<th>BR 135 Classification Report Number</th>
<th>Relevant Test Method</th>
<th>Substrate</th>
<th>Insulation</th>
<th>Fire Breaks / Cavity Barriers</th>
<th>External Finish</th>
<th>Generic Cladding Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST PENDING BS 8414-2:2005</td>
<td>Lightweight Steel Frame</td>
<td>70mm Kingspan KS1000 AWP QuadCore™ Insulation Core Wall Panel</td>
<td>No Cavity Barriers Used</td>
<td>70mm Kingspan KS1000 AWP QuadCore™ Insulation Core Wall Panel</td>
<td>Insulated Sandwich Panel Façade System</td>
<td></td>
</tr>
</tbody>
</table>

Please note that some of our BR 135 classified systems have had design variations assessed and deemed to meet BR 135 criteria by fire specialists.

For further details, please contact fireinfo@kingspanpanels.com
2.3 Reaction to Fire Testing

Kingspan FIREsafe® Insurer-Certified insulated panel and façade systems can achieve high levels of reaction to fire performance in the tests specified for regulatory purposes as outlined previously in this document including:

- Europe: EN 13501-1, particularly B-s1,d0. The ‘s1’ rating, being the best (lowest emission) smoke rating.
- Europe: EN 11925 Part 3 Ignitability of Building Products.
- UK: BS 8414 Part 2 – Façade testing.
- UK: BS 476, Parts 3,6 and 7.

In addition, Kingspan insulated panel and façade systems perform to high levels in large-scale tests developed by the insurance industry including:

- Global Insurance: FM 4880 – Class 1 Internal wall and ceiling panels without height restriction.
- Global Insurance: FM 4882 – Class 1 External wall panel systems without height restriction.
- Global Insurance: FM 4471 – Class 1 Roof panel systems.
- UK / Ireland Insurance: LPS 1181 Part 1 Approval for external wall and roof panel systems.
- UK / Ireland Insurance: LPS 1181 Part 2 for internal wall and ceiling applications.

* FM 4882 can only be achieved by Kingspan’s next generation hybrid insulation core: QuadCore™ Technology.

2.4 Fire Resistance Testing

Kingspan FIREsafe® Insurer-Certified insulated panel and façade systems are extensively tested for fire resistance in a variety of test methods that include ASTM E119, EN 1364 Parts 2 & 3, EN 1365 Part 2 and EN 1366 Part 3.

Kingspan insulated panel systems can achieve:
- up to 60 minutes fire insulation and integrity (EI60) according to EN 1364 Parts 2 & 3 and ASTM E119;
- up to FR60 according to UK Insurance Industry Standard LPS 1208;
- up to 180 minutes fire integrity and heat radiation (EI180 and EW180) according to EN 1364 Part 2;
- up to 30 minutes insulation, integrity and load bearing capacity (RE30) according to EN 1365 Part 2 on X-Dek panel systems; and
- up to 90 minutes insulation, integrity and load bearing capacity (RE90) according to EN 1365 Part 2 on Op-Deck panel systems.

The use of Kingspan’s next generation hybrid insulation core - QuadCore™ Technology - can deliver improved fire resistance performance as a result of the increased stability of the insulation when exposed to fire. For specific situations this can result in improved performance, greater spans and / or a reduction in fixings.

For information on the testing and accreditation of any Kingspan insulated panel or BENCHMARK façade system, contact our technical team or email: fireinfo@kingspanpanels.com
Building Regulation Fire Performance Requirements for Insulated Panel and Facade Systems

Further Resources & Support from Kingspan

03

Further Resources & Support from Kingspan
Further Resources & Support from Kingspan

CPDs, Workshops & Seminars
Our Fire Engineering Services Department delivers CPDs, bespoke workshops and seminars on request to a range of stakeholders including the insurance industry, fire engineers, architects, contractors and end users.

To enquire about an educational presentation for your business or association, please email: fireinfo@kingspanpanels.com

To view our list of Fire Performance CPDs, or to register for an upcoming webinar, or to attend a seminar please visit:

Great Britain website:
kingspan.co.uk/fire-education

Ireland website:
kingspan.ie/panels-fire-safety

Technical & Project Support
Our Building Technology and Technical Services teams provide support on project-specific issues relating to the fire safety of our insulated panel and façade systems, as well as information relating to our products and their compliance with Building Regulations.

For queries relating to the above, please email: fireinfo@kingspanpanels.com

Publications & Videos
Not All Insulation is the Same
This guidance document gives a comprehensive overview of the testing regime that Kingspan insulated products are subjected to as part of Building Regulatory compliance. It also includes LPCB and FM large-scale system testing for Insurance Industry approval.

Furthermore, it contains a series of independently assessed real fire case studies which demonstrate the high performance of Kingspan insulated panel systems in the event of a fire.

Please contact fireinfo@kingspanpanels.com for your copy.

QuadCore™ Fire Testing Video
QuadCore™ Technology is Kingspan’s next generation hybrid insulation core. This educational video explains the superior fire performance across a broad fire testing regime, including footage from live tests.

Online Fire Safety Information Area
For an overview of Building Regulations, Large-scale System Testing, Kingspan Tested and Accredited Systems, Real Fire Case Studies and much more, visit our website’s dedicated Fire Safety area:

Great Britain website:
kingspan.com/gb/en-gb/about-kingspan/
kingspan-insulated-panels/fire-safety

Ireland website:
kingspan.ie/panels-fire-safety

To view our QuadCore™ fire education video, please visit: http://bit.ly/2BG6LSU