

FIRE PERFORMANCE OF EXTERNAL THERMAL INSULATION - CLASSIFICATION REPORT No EUI-18-000131

FIRE PERFORMANCE OF EXTERNAL THERMAL INSULATION CLASSIFICATION IN ACCORDANCE WITH BS 8414-2:2015+A1:2017 and BR 135 third edition 2013.

Sponsor:	KINGSPAN INSULATION LTD
Prepared by:	Efectis UK/Ireland Ltd
System name:	Façade system incorporating 90 mm Kooltherm K15 Rainscreen and 90 mm K15 Black Kingspan Insulation, cavity and Branco Michaela Granite stone cladding panels
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1. INTRODUCTION

This classification report defines the classification assigned to Façade system incorporating 90 mm Kooltherm K15 Rainscreen and 90 mm K15 Black Kingspan Insulation, cavity and Branco Michaela Granite stone cladding panels, in accordance with the procedures given in BS 8414-2:2015+A1:2017 and BR 135 third edition 2013.

2. DETAILS OF CLASSIFIED SYSTEM

Technical data and drawings concerning the sample and its composition have been supplied by the sponsor who attests their accuracy.

All test materials were supplied and installed by the sponsor's and STONE SYSTEMS LTD construction crews.

EFFECTIS UK/IRELAND was not involved in the specimen selection process and therefore cannot take any responsibility for the relationship between specimen supplied for testing and product placed on the market.

2.1. GENERAL

The system, Façade system incorporating 90 mm Kooltherm K15 Rainscreen and 90 mm K15 Black Kingspan Insulation, cavity and Branco Michaela Granite stone cladding panels, is described below.

2.1.1. Deviation from BS 8414-2:2015+A1:2017

A concrete lintel of 200 mm x 200 mm cross section was fixed by sponsor just in front of the combustion chamber's lintel on the main face to support stone panels.

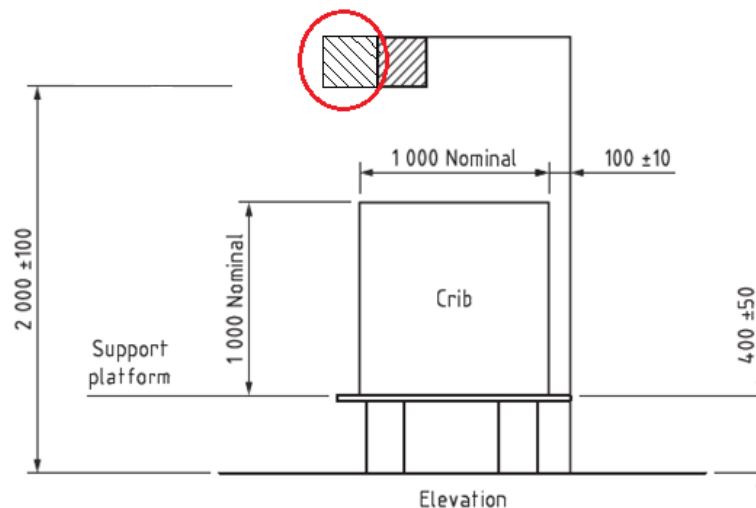


Figure 1. Concrete lintel located in front of the chamber's lintel; placed during construction.

2.1.2. Substrate

The tested cladding system was installed on a structural steel frame apparatus according to requirements of BS 8414-2:2015+A1:2017.

2.1.3. Description of tested system

Based on the information provided by the test sponsor, the materials as used on the as-built façade system are given in the following table.

Material	Reference	Composition	Characteristics	Supplier
Steel Formed Sections - studs	C100050120	gauge steel	100 mm x 50 mm x 1.2 mm thick	KINGSPAN
Steel Formed Sections – Head Track	U104067180	gauge steel	104 mm x 50 mm x 2 mm thick	KINGSPAN
Steel Formed Sections –Base Track	U104055120	gauge steel	104 mm x 50 mm x 1.2 mm thick	KINGSPAN
Plasterboards of non-exposed face	WallBoard	Gypsum board with ivory paper face	2400 mm x 1200 mm x 12.5 mm thick Reaction to fire: A2-s1,d0	KNAUF
Sheathing board layer	Multi-Pro	-	2400 mm x 1200 mm x 12 mm thick Reaction to fire: A1	RESISTANT BUILDING PRODUCTS LTD
Waterproof membrane Rubberclad EPDM	Rubberclad EPDM	EPDM	0.7 mm thick Black colour	MOY MATERIALS LTD
Adhesive used for membrane	BA-007	-	-	GISCOSA
Double insulation layer	Kooltherm K15 Rainscreen and K15 Black	Phenolic foam	90 mm thick; total 180 mm Black colour on the exposed face Reaction to fire Kooltherm K15 Rainscreen: C-s1,d0 Reaction to fire K15 Black: NPD	KINGSPAN
Vertical fire barriers (no3)	RV 120/120	Non-combustible stone-wool lamella core, with reinforced aluminium foil face	Reaction to fire: A1	SIDERISE
Horizontal open state fire barriers (no3)	RH25G 90/30	Non-combustible stonewool lamella core with aluminium foil face c/w intumescent	Reaction to fire: A1	SIDERISE
Brackets for fixing the fire stop barriers	B195	Galvanized	-	SIDERISE
Brackets for stone panel support	ML A5-100	Stainless steel	Combined with 100 mm cleats	METLOC SYSTEMS LTD
Restraint fixings	-	Stainless steel	-	-
Outer face cladding material	Branco Michaela Granite	Stone	40 mm thick Flamed finish surface Grey colour	STONE SYSTEMS LTD
Screws for fixing the studs on the head/base channels of SFS	CFC26 Tek Screws	-	5.5 mm x 25 mm	-
Screws for fixing head/base tracks on the lintels	Multi-Monti-S-7.5x75	-	7.5 mm x 75 mm	-

Screws for fixing the plasterboards on the SFS frame	SCS3/25-PH2-4.8-42 of Ø	-	4.8 mm x 42 mm	-
Screws for fixing the sheathing boards on the SFS frame	DF3-W-5.5 x 50	-	5.5 mm x 50 mm	-
Fixings used for insulation layers	SF-RS-SSA4-4.8 x 120 (layer 1) SF-RS-SSA4-4.8 x 200 (layer 2)	-	4.8 mm x 120 mm c/w 70 mm washers 4.8 mm x 200 mm	SureFast
Tube washers used on 2 nd insulation layer	SF-T-50 x 25 tube washers	-	50 mm x 25 mm	SureFast
Screws for fixing brackets on the lintels	standard self-drilling screw 4 x 40	-	4 mm x 40 mm	-
Anchors for fixing support brackets	FBN II 12/20 A4 Mechanical Anchor	Steel	12 mm x 116 mm	FISCHER
Fixings used for restraint fixings	E-X T25 BR 2 12 5.5 x 25	Steel	5.5 mm x 25 mm	END

2.1.4. Installation sequence

2.1.4.1. SFS Kingframe

The steel frame reference SFS Kingframe (KINGSPAN) was infill, constructed using 'C' section lipped channel stud reference C100050120 (KINGSPAN). Studs of dimensions 100 mm x 50 mm x 1.2 mm were fixed to the head and the base track at 300 mm and 600 mm centres using screws reference CFC26 Tek Screws of Ø 5.5 mm x 25 mm dimensions. The head track and the base track were made using rails references U104067180 and U104055120 (KINGSPAN) respectively, fixed on the concrete slabs using fixings reference Multi-Monti-S-7.5x75, were of Ø 7.5 mm x 75 mm dimensions. The assembly of the frame was performed according to client's specification. There were four lintels, of 200 mm wide, on the main face having (bottom to top) 200, 480, 280 and 280 mm heights respectively and three lintels of same width and 630, 280 and 280 mm heights respectively on the wing face.

2.1.4.2. Unexposed face of the facade

2.1.4.2.1. Plasterboard layer

A single layer of plasterboards reference WallBoard (KNAUF) of dimensions 2400 mm x 1200 mm and thickness 12.5 mm were installed on the unexposed face of the SFS system. The boards were fixed to the SFS studs using fixings reference SCS3/25-PH2-4.8-42 of Ø 4.8 mm x 42 mm dimensions evenly spaced at approx. 300 mm centres.

2.1.4.3. Exposed face of the facade

2.1.4.3.1. Sheathing board layer

A single layer of 12 mm thick board reference Multi-Pro (RESISTANT BUILDING PRODUCTS LTD) of dimensions 2400 mm x 1200 mm was installed on the exposed face of the SFS system. The boards were fixed to the SFS studs using fixings reference DF3-W-5.5 x 50 of Ø 5.5 mm x 50 mm dimensions evenly spaced at approx. 300 mm centres.

2.1.4.3.2. Waterproof membrane

The waterproof membrane layer, reference Rubberclad EPDM (MOY MATERIALS LTD) of 0.7 mm thickness was installed on top of the sheathing board layer. The membrane was adhesively fixed on the sheathing board using the adhesive reference BA-007 (GISCOSA).

2.1.4.3.3. Insulation layer

On top of the membrane layer, double layer of insulation was used, comprising insulation reference Kooltherm K15 Rainscreen (KINGSPAN) against the waterproof membrane and single layer of insulation reference K15 Black (KINGSPAN) with black side exposed. Insulation was fixed on the sheathing board layer using fixings reference SF-RS-SSA4-4.8 x 120 (SureFast) of Ø 4.8 mm x 120 mm (1st layer) dimensions combined with 70 mm diameter washers according to manufacturer's recommendations. Each layer of insulation was of 90 mm giving in total 180 mm thick layer. The outer layer was fixed using fixings SF-RS-SSA4-4.8 x 200 (SureFast) of Ø 4.8 mm x 200 mm dimensions along with reference SF-T-50 x 25 tube washers (SureFast).

2.1.4.3.4. Fire stop barriers

Horizontal open state cavity fire stop barriers (no3) were installed on the lintels behind the outer face cladding panels. The fire barriers reference RH25G 90/30 (SIDERISE) were fixed using galvanized brackets reference B195 (SIDERISE) as recommended by the manufacturer, fixed at 400-600 mm centres according to sponsor's locations. The brackets were screwed on the concrete lintels using fixings reference standard self-drilling screw 4 x 40 of Ø 4 mm x 40 mm dimensions combined with washer. Vertical cavity fire stop barriers reference RV 120/120 (SIDERISE) were installed vertically; two of them on the outer side of the combustion chamber on the main face and the last one close to the edge of the wing face. Installation followed manufacturer's recommendations.

2.1.4.3.5. Bracket support system

Supporting brackets were used to support stone cladding panels. The brackets reference ML A5-100 (METLOC SYSTEMS LTD) were fixed on the concrete lintels horizontally spaced at 467 and 1008 mm centres using fixings reference FBN II 12/20 A4 Mechanical Anchor (FISCHER) of Ø 12 mm x 116 mm dimensions. They were combined with 100 mm cleats.

In addition, stainless steel restraint fixings were fixed on SFS Kingframe using fixings reference E-X T25 BR 2 12 5.5 x 25 (END) of Ø 5.5 mm x 25 mm dimensions.

2.1.4.3.6. Air cavity

Air cavity of thickness 40 mm was created between the insulation layer and the inner face of the cladding stone panels.

2.1.4.3.7. Outer face

The outer face cladding stone panels reference Branco Michaela Granite (STONE SYSTEMS LTD) were of 40 mm thickness and flamed finished surface. They were clad on the support brackets following staggered pattern starting from the bottom of the rig up to the top on the main face. On the wing face were clad following straight pattern; vertical joint was running vertically up to the top of the system.

2.1.4.3.8. Flashings and closures

The side and top edges of the system were left open; no closing flashings were used. Around the opening a 2 mm aluminium pod-frame was used.

2.1.4.3.9. Joints

The outer face cladding panels were installed so that there were both vertical and horizontal open joints having thickness of 8 mm.

On the main face, a vertical joint incorporated to the system was located on the centreline above the combustion chamber, extending up to 592 mm high.

In addition, a horizontal joints incorporated to the system at distance 2400 mm above the combustion chamber's opening.

2.2. FAÇADE SYSTEM BEFORE THE TEST



Figure 2. Façade cladding system before starting the test.

3. REPORTS AND RESULTS IN SUPPORT OF THIS CLASSIFICATION

3.1. REPORTS

<i>Name of Laboratory</i>	<i>Name of sponsor</i>	<i>Report ref. no</i>	<i>Test method and date</i>
EFFECTIS UK/IRE	KINGSPAN INSULATION LTD	EUI-18-FF-000131	BS 8414-2:2015+A1:2017

3.2. RESULTS

3.2.1. Fire spread

Fire-spread start time, $t_s = 01:24$ min

<i>Test method and test number</i>	<i>Parameter(s)</i>	<i>No. Tests</i>	<i>Results</i>	
			<i>Fire spread test result time, t_s (min)</i>	<i>Compliance with parameters in Annex B of BR135:2013</i>
BS 8414-2-2015+A1-2017 EUI-18-FF-000131	External fire spread	1	> 15 minutes	Compliant
	Internal fire spread (cladding panels layer)		> 15 minutes	Compliant
	Internal fire spread (air cavity layer)		> 15 minutes	Compliant
	Internal fire spread (insulation layer)		> 15 minutes	Compliant
	Internal fire spread (sheathing board layer)		> 15 minutes	Compliant
	Internal fire spread (SFS layer)		> 15 minutes	Compliant
	Internal fire spread (plasterboard layer)		> 15 minutes	Compliant
	Internal fire spread (system burn through)		> 15 minutes	Compliant

3.2.2. Mechanical performance

The cladding system was examined when cooled (within 24 h of the test). Examination comprised of external surface and internal layers. Some cracks were only observed on the main face panels. No flames observed after fire source extinguishment nor any system collapse, spalling, delamination, flaming debris or pool fires.

3.2.3. System damage

3.2.3.1. Outer face cladding panels

On the main face:

On the main face of the cladding system, all panels were in-place after testing. Some cracks were observed on three panels located just above the combustion chamber's opening. Discolouration was observed up to a height of 3000 mm.

On the wing face:

On the wing face, all stone cladding panels were intact and in-place. No damage or discolouration was observed.

3.2.3.2. Brackets support system

Brackets and restraints were intact and in place after the test. Some minor discolouration only observed on the ones just above the chamber's opening on the main face.

3.2.3.3. Fire stop barriers

On the main face:

The bottom horizontal fire stop barrier installed was activated during the test along the two vertical fire stop barriers. It was partially damaged as about 15% was detached from the system. Only about 10% was intact; on the left hand side edge of the system's main face. The middle one was partially activated but was still in place without suffering any major damage. The top horizontal fire stop barrier was in place without been activated and without any damage or detachment.

The vertical fire stop barriers were in place after the test without major damage. Only the right hand side vertical fire stop barrier was suffered some damage above the combustion chamber up to the bottom horizontal fire stop barrier.

On the wing face:

All horizontal fire stop barriers were not activated and in-place after testing without any damage observed.

Same observation was made for the vertical fire stop barrier located close to the edge of the wing face.

3.2.3.4. Insulation layer

On the main face:

The reference Kooltherm K15 Rainscreen insulation layer on the main face was intact and in place after testing. There was no charring or damage observed on it. However, the layer of reference K15 Black insulation was charred and partially burnt on the area just above the combustion chamber up to a height of approx. 2500 mm above the chamber. That area was confined in the space between the two vertical barriers of the main face. Higher areas were without any damage or burning being observed.

On the wing face:

Insulation layer on the wing face was intact and in-place after testing. There was no charring or burnt observed on it.

3.2.3.5. Waterproof membrane

The waterproof membrane was in place and intact after testing. No damage was noted after removing the insulation layer from the system.

3.2.3.6. Sheathing board layer

The sheathing board layer sheets were intact and in place after testing. No discoloration was observed.

3.2.3.7. Plasterboard layer

No damage was observed to plasterboard layer installed on the unexposed side of the system. No discoloration was observed.

3.2.3.8. SFS Kingframe

No damage was observed to SFS Kingframe; all studwork was in place and intact after testing. No discoloration was observed.

4. CLASSIFICATION AND FIELD OF APPLICATION

4.1. REFERENCE OF CLASSIFICATION

This classification has been carried out in accordance with BS 8414-2-2015+A1-2017 and BR 135 third edition 2013.

4.2. CLASSIFICATION

The element, Façade system incorporating 90 mm Kooltherm K15 Rainscreen and 90 mm K15 Black Kingspan Insulation, cavity and Branco Michaela Granite stone cladding panels, described in this classification report and in the test report referenced in section 3.1 has been tested and met the performance criteria set in Annex B of BR135:2013.

4.3. FIELD OF APPLICATION

This classification is valid only for the system as installed and detailed in this classification report and in the test report referenced in section 3.1.

5. LIMITATIONS

This classification document does not represent type approval or certification of the system.

The classification applies only to the system as tested and detailed in the classification report. The classification report can only cover the details of the system as tested and should always be read in conjunction with the test report referenced in section 3.1.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons, it is recommended that the relevance of test and classification reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test or classification to ensure that they are consistent with current practices, and if required may endorse the report.

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