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BRE Global Classification Report

Classification of fire performance in accordance with BR 135: 2013 Annex A for a ventilated façade system with phenolic thermal insulation and ACM (ALPOLIC/A2) Cassette panels BML 100 Hook On

Prepared for: Mitsubishi Chemical Corporation

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CLASSIFICATION OF FIRE PERFORMANCE IN ACCORDANCE WITH BR 135:2013 Annex A

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Product name: Ventilated façade system with Rockwool thermal insulation and ACM Cassette panels BML 100 Hook On

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This classification report consists of 17 pages and may only be used or reproduced in its entirety.

1 Introduction

This report presents the classification of the system detailed in Section 2. The classification is carried out in accordance with the procedures given in BR 135 – 'Fire performance of external thermal insulation for walls of multi-storey buildings', Third edition, Annex A 2013. This classification should be read in conjunction with this document and the associated test reports referenced in Section 4.

2 Details of the Classified System

2.1 Description of substrate

The test specimen was installed onto wall number 1 of the BRE Global External Cladding Test Facility.

This is a multi-faced test facility constructed from steel with the cladding system affixed to the masonry substructure.

2.2 Description of product

Table 1. List of component parts used in the construction of the system.

Item	Description
1	90mm-high×64mm-wide×100mm-deep×4mm-thick aluminium 'L' shaped brackets fixed with a single 90mm-long×ϕ8mm stainless steel screw anchor with plastic plug
2	100mm-thick K15 phenolic insulation boards
3	120mm-wide×60mm-deep×2mm-thick aluminum 'Y'-section framing
4	75mm-wide×150mm-deep stone wool vertical cavity barriers with 10mm compression (Siderise RSV90/30 labeled "Lamatherm")
5	75mm-wide×115mm-deep stone wool with intumescent horizontal cavity barriers (Siderise RH25G90/30 labeled "Lamatherm")
6	4mm-thick front face Aluminum Composite Material (ACM) cassette panels (Booth Muirie BML100 Hook On) ALPOLIC/A2. The mean calorific value measured for the core was 2.2277 MJ/Kg. BRE Report P110396-1002[2].

2.3 Installation sequence

Onto the masonry support structure the aluminium 'L'-shaped brackets were fixed in position on low density polyethylene isolation pads (5mm-thick) using a single stainless steel screw anchor and plastic plug. On the main face the horizontal spacing between the brackets varied between 300mm and 500mm and on the wing wall the spacing between the brackets was approximately 500mm as specified in the manufacturer's details. The vertical spacing between the brackets varied between 720mm and 970mm and where horizontal cavity barriers were present a spacing of 420mm was used.

The system included vertical and horizontal cavity barriers. On the main face, two 75mm-wide×150mm-deep stone wool vertical cavity barriers, with 10mm compression, were fixed in position either side of the combustion chamber opening with a clear distance of 2100mm between them.

The vertical cavity barriers were skewered to ¾-depth on steel brackets fixed into the masonry wall with one 70mm-long×ϕ4mm anchor. Two steel brackets were used for each length of 1200mm of stone wool cavity barrier.

On the wing wall, one 75mm-wide×150mm-deep stone wool vertical cavity barrier, with 10mm compression, was fixed in position at the edge of the system, approximately 1330mm from the external face of the main wall. Once installed in position the stone wool vertical cavity barriers were compressed by the ACM panels to fully close the 38mm ventilated cavity.

A set of four 75mm-wide×115mm-deep intumescent horizontal cavity barriers were butted up to the continuous vertical barriers and fixed in rows at approximate heights of:

- 80mm above the combustion chamber opening;
- 2395mm above the combustion chamber opening;
- 4725mm above the combustion chamber opening;
- 6360mm above the combustion chamber opening (close to the top of the ventilated system).

The horizontal cavity barriers were fixed through the entire depth on face turned steel brackets. Two steel brackets were used per 1200mm length of stone wool cavity barrier, each fixed into the masonry wall with one 70mm-long×ϕ4mm anchor, positioned above the cavity barrier. The horizontal intumescent cavity barriers were installed with a maximum gap of 25mm to the back face of the panel in accordance with the manufacturer's recommendation.

The 100mm-thick K15 insulation boards (supplied in 1200mm×600mm and cut to fit) were installed in position through the substructure bracket fixing systems and fixed to the support structure (masonry wall) using six 125mm-long×ϕ8mm plastic anchors and six 140mm-long×ϕ8mm stainless steel anchors per full size panel. On the main wall the insulation panels were installed with the long edge orientated horizontally. On the wing wall the insulation panels were installed with the long edge orientated vertically. All the gaps between the insulation panels and the intersection with aluminium brackets or fixings were sealed with aluminium tape as recommended by the manufacturer.

After the insulation was fixed in position the 'Y'-section framing were installed at horizontal spacings ranging from 300mm to 500mm. The aluminum vertical rails, with a typical length of 2300mm, were positioned 10mm inside the thermal insulation with each rail fixed to the brackets with 2×4.8×16mm self-drilling, self-tapping, stainless steel screws. The aluminum rails were installed with a 30mm gap at the floor levels to allow for structural movement. Three brackets supported each section of rail: the middle bracket was fixed while the top and bottom brackets were connected with movement holes.

The external ACM cassette panels (Booth Muirie BML100 Hook On) of the system were installed on to the rail substructure with hook clips (12 hook clips per full size panel), at 500mm horizontal spacings and 450mm-750mm vertical spacings. A nominal vertical and horizontal gap of 20mm was provided between the panels. The measured gaps after installation varied between 18mm and 23mm.

Inside the Booth Muirie BML100 Hook On cassette panels a continuation of the cavity barrier was provided through a mineral wool insert-Siderise Cassette Insert 100mm-wide×50mm-deep. A 25mm horizontal intumescent strip is applied on the back face lower edge of the panel underneath the Siderise Cassette insert in order to seal the ventilation gaps in case of fire exposure, as described by the manufacturer. The full-size ACM cassette panel (Booth Muirie BML100 Hook On) dimensions measured 995mm-wide×2280mm-high.

A pre-fabricated, welded window pod constructed from 5mm-thick aluminium was fixed onto the edge of the combustion chamber opening with eight (two on top, three on both vertical edges) 90mm-long×ϕ8mm stainless steel screw anchor and plastic plugs.

The cladding system measured:

Requirement	Actual measurement
≥6000mm above the top of the combustion chamber	6530mm
≥2400mm width across the main wall	2465mm
≥1200mm width across the wing wall	1315mm
260mm (±100mm) wing wall-combustion chamber opening	245mm
2000mm (H) x 2000mm (W) (±100mm) combustion chamber opening	2000(H)mm×2000(W)mm

2.4 Installation of Specimen

All test materials were supplied and installed by the sponsor. BRE were not involved in the sample selection process and therefore cannot comment upon the relationship between samples supplied for test and the product supplied to market.

3 Product Specification

Figure 1. Completed installation prior to test.

3.1 System drawings

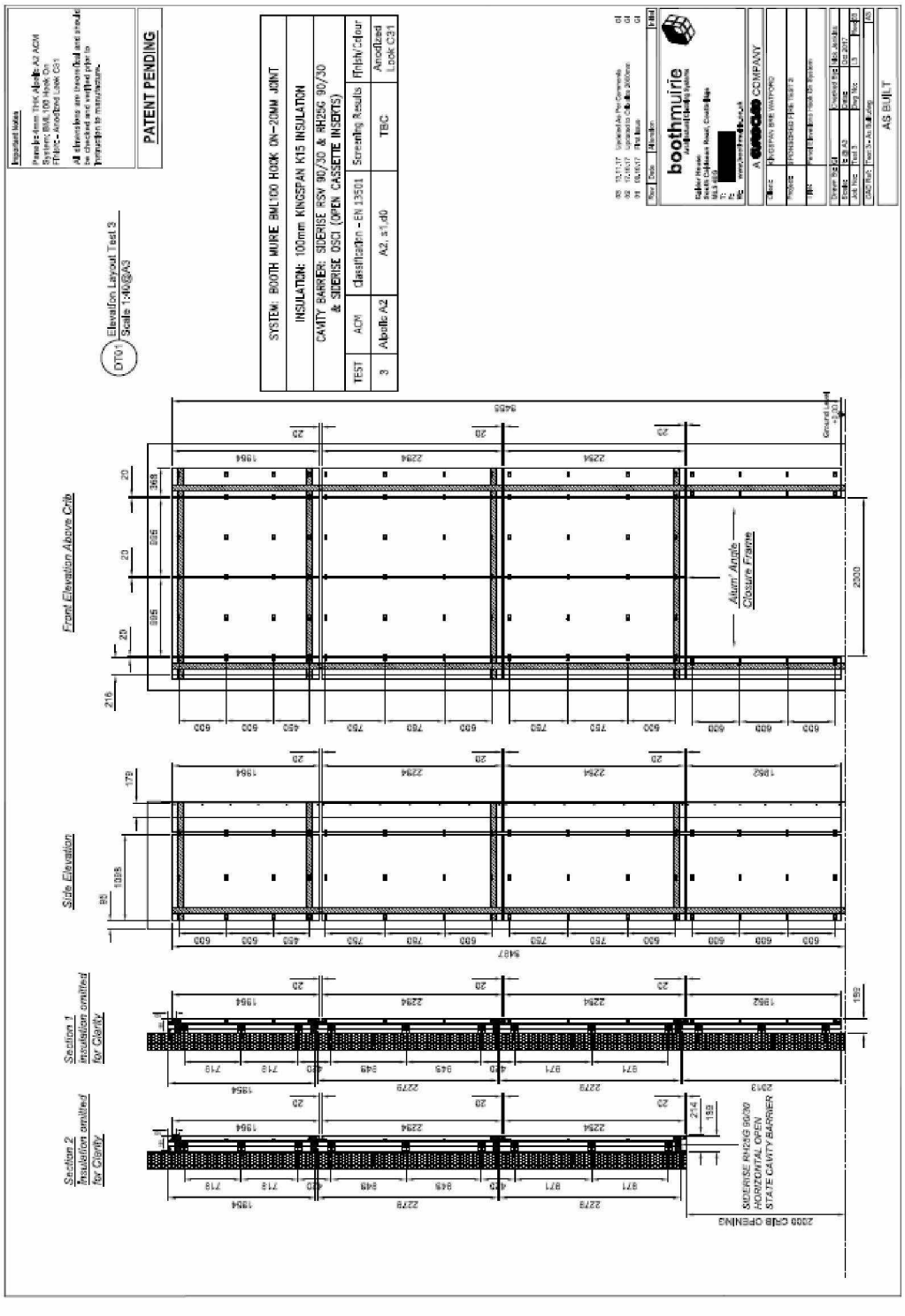

Figure 2 Front elevation, side elevation and vertical sections through the system (supplied by the Test Sponsor).

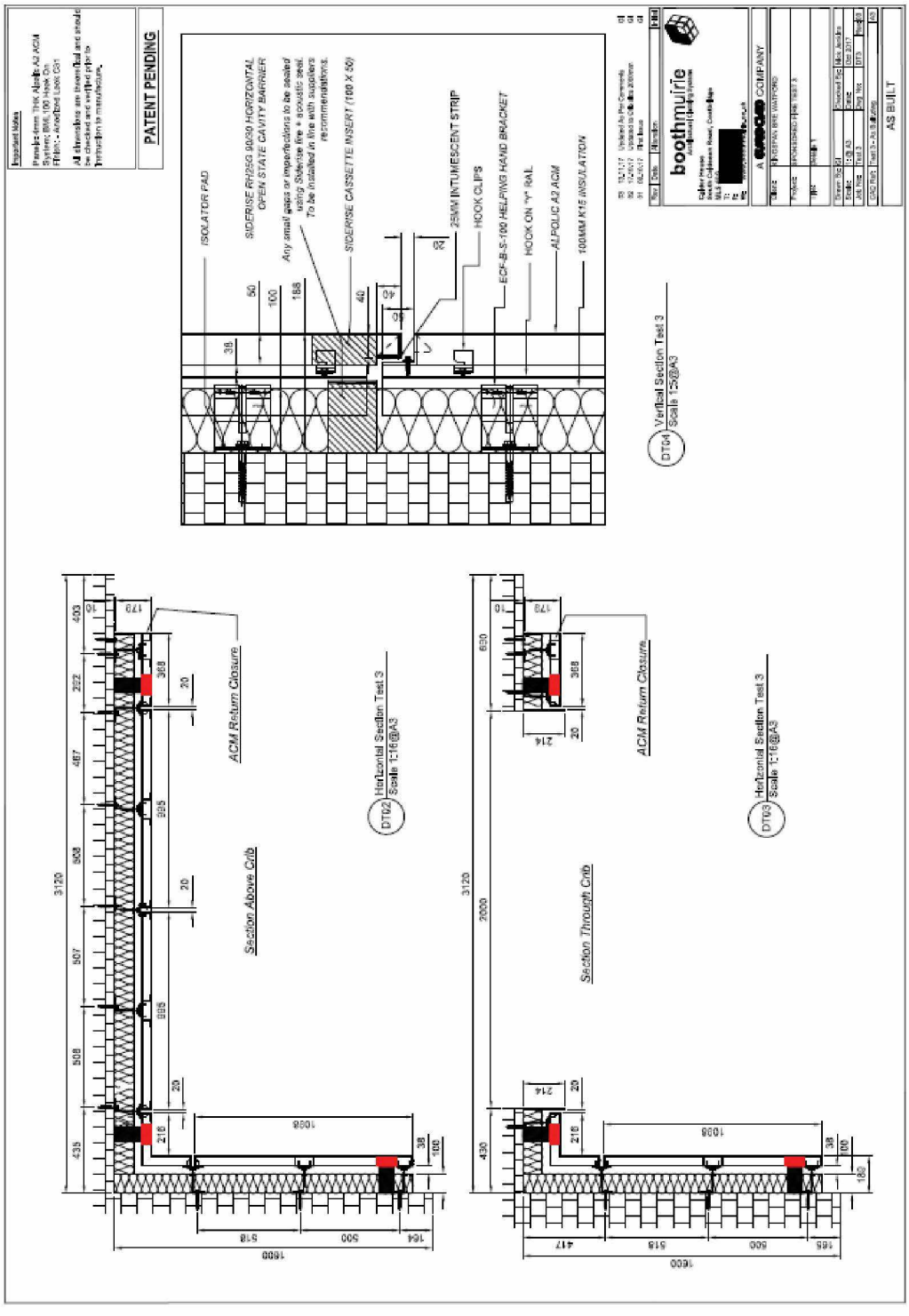

Figure 3. Horizontal section through and above the combustion chamber, vertical section through the cladding system and insulation details for tested system (supplied by the Test Sponsor).

4 Supporting Evidence

4.1 Test reports

Name of Laboratory	Name of sponsor	Test reports/extended application report Numbers	Test method / extended application rules & date
BRE Global, BRE	Mitsubishi Chemical Corporation	P109973-1000 Issue: 1.0	BS 8414 Part 1:2015 + A1:2017

4.2 Test results

Test method	**Parameter**	**No. tests**	**Results**	
			Fire spread test result time, t_s (min)	**Compliance with parameters in Annex A BR135:2013**
BS 8414 Part 1: 2015 + A1:2017	External fire spread	1	>15 minutes	Compliant
	Internal fire spread		>15 minutes	Compliant

4.3 Mechanical performance

Flaming debris from the system was observed after 10 minutes and 30 seconds from ignition.

Detachment of panel parts (row 1) was observed after 13 minutes and 10 seconds from ignition.

Detachment of panel parts (row 2) was observed after 16 minutes from ignition.

Sporadic flaming on the insulation behind panels 2C&2D and above the combustion chamber (panels 1C&1D area) was observed after 2 minutes from the time that the fire source has been extinguished.

All visible flaming was ceased and the insulation was glowing red behind panels 2C&2D for 20 minutes from the time that the fire source has been extinguished.

4.4 System damage

4.4.1 ACM ALPOLIC/A2 cassette panels

Row 0

Panel 0A had significant distortion and approximately 90% discoloration.

Panel 0B had visible distortion and discoloration (<40%).

Panel 0E did not sustained any visible damage.

Row 1

Panel 1A had significant distortion and approximately 90% discoloration.

Panel 1B had distortion and discoloration on surface.

Panel 1C had significant damage and consumption up to 95%-100%.

Panel 1D had significant damage and consumption approximately 90%-95%.

Panel 1E had minor distortion on the surface.

Row 2

Panel 2A had distortion and discoloration on surface (up to 30%-35%).

Panel 2B had distortion and discoloration on surface (approximately 25%-30%).

Panel 2C had significant damage and consumption of approximately 55%-60%.

Panel 2D had significant damage and consumption up to 40%-45%.

Panel 2E had minor discoloration on the left hand edge (looking to main wall).

Row 3

Panel 3A did not sustained any visible damage.

Panel 3B did not sustained any visible damage.

Panel 3C had distortion and discoloration at the bottom edge (horizontal joint between 2C&3C).

Panel 3D had distortion and discoloration at the bottom edge (horizontal joint between 2D&3D).

Panel 3E did not sustained any visible damage.

4.4.2 Aluminium rail substructure

The central aluminium 'Y'-shaped rail on the main wall was intact from a height of approximately 4.0m-4.4m. The adjacent aluminium 'Y'-shaped rails (500mm offset from central rail to left and right) were fully consumed up to a height of approximately 2.3m-2.4m (behind panels 1C&1D).

Behind panels 2C&2D and 3C&3D, the aluminium rails (500mm offset from central rail to left and right) were discoloured and slightly distorted.

Behind panels 3C&3D, the aluminium rails were intact and slightly discoloured.

The aluminium brackets situated immediately above the combustion chamber were severely damaged or melted.

Following the removal of the ACM panels from the wing wall the aluminium substructure which held the panels in place had not sustained significant damage.

4.4.3 Thermal insulation (K15 phenolic insulation)

Row 0

Panel 0A Panel 0E had not sustained any visible damage.

Panel 0B had not sustained any visible damage.

Panel 0E had not sustained any visible damage.

Row 1

Panel 1A had not sustained any significant damage.

Panel 1B had not sustained any significant damage.

Panel 1C had sustained significant damage and was consumed up to 90%-95%. The rear aluminum foil of the insulation was visible.

Panel 1D had sustained significant damage and was consumed up to 90%-95%. The rear aluminum foil of the insulation was visible.

Panel 1E had not sustained any visible damage.

Row 2

Panel 2A had not sustained any visible damage.

Panel 2B had not sustained any visible damage.

Panel 2C had sustained significant damage and was consumed between 30%-80%. Uncharred material was visible to the top edge of the panel (underneath the horizontal cavity barrier).

Panel 2D had sustained significant damage and was consumed between 40%-80%. Uncharred material was visible to the top edge of the panel (underneath the horizontal cavity barrier).

Panel 2E had not sustained any visible damage.

Row 3

Panel 3A had not sustained any visible damage.

Panel 3B had not sustained any visible damage.

Panel 3C had discoloration on surface, from white to dark yellow. The aluminium foil remained attached to the insulation.

Panel 3D had discoloration on surface, from white to dark yellow. The aluminium foil remained attached to the insulation.

Panel 3E did not sustained any visible damage.

4.4.4 Horizontal cavity barriers (Siderise RH25G 90/30)

The horizontal cavity barrier at the base of level 1 panels (directly above the combustion chamber) was intact and undamaged. The cavity barrier detached when water was sprayed onto the system.

The horizontal cavity barrier at the base of level 2 panels remained in position after the fire exposure. The intumescent material reacted across the entire length of the cavity barrier. Behind panel 2E the cavity barrier did not activate. On the wing wall the cavity barrier was partially activated.

The horizontal cavity barrier at the base of level 3 panels remained in position after the fire exposure. The intumescent material reacted on the entire width of the cavity barrier. Behind panel 2E the cavity barrier did not activate. On the wing wall the cavity barrier did not activate.

4.4.5 Vertical (compression) cavity barriers (Siderise RSV90/30)

The fire damage to the cladding system on the main wall was contained within the bounds of the vertical cavity barriers across the combustion chamber opening. The cavity barriers remained intact. There was significant charring and discolouration along the inside edges running parallel to the vertical edges of the combustion chamber.

5 Classification and field of application

5.1 Reference of classification

This classification has been carried out in accordance with Annex A of BR 135 – 'Fire performance of external thermal insulation for walls of multi-storey buildings.' Third Edition 2013.

5.2 Classification

The system described in this classification report has been tested and met the performance criteria set in Annex A of BR 135:2013.

5.3 Field of application

This classification is valid only for the system as installed and detailed in Section 2 of this classification report and the associated details found in the related test reports, referenced in Section 4.

6 Limitations

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

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. It cannot state what is not covered. When specifying or checking a system it is important to check that the classification documents cover the end-use application.

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.

7 References

1 BS 8414-1:2015 + A1:2017, 'Fire performance of external cladding systems – Part 1: Test method for non-load bearing external cladding systems applied to the masonry face of the building', British Standards Institution, London, 2015.

2 BRE Test report P110396-1002. BS EN ISO 1716 Gross heat of combustion (calorific value).

Report Ends