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BRE Global Client Report

BS 8414-1:2015 + A1:2017 test referred to as DCLG test 2.

Prepared for: DCLG

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BRE Global Ltd
Watford, Herts
WD25 9XX

Customer Services [redacted]

Prepared for:
Department for Communities and Local Government
2 Marsham Street
London
SW1P 4DF

Version History

30/08/2017	Issue 1.1	Amendments to Appendix A and Figure 14.
12/09/2017	Issue 1.2	Amendment to Section 4.4.

Table of Contents

1 Introduction

This report is one of a series, commissioned by the Department for Communities and Local Government (DCLG) intended to establish how different types of Aluminium Composite Material (ACM) panels in combination with different types of insulation behave in a fire.

Following the fire at Grenfell Tower in London on 14 June 2017, the Government established an Independent Expert Advisory Panel to advise on immediate measures that should be put in place to help make buildings safe. On 6 July the Independent Expert Advisory Panel recommended a series of full scale BS 8414 tests be carried out in order to help building owners make decisions on any further measures that may need to be put in place.

This series of tests includes 6 combinations of cladding systems. The detailed design of each test specimen was carried out by a cladding company appointed by DCLG. The design of the cladding systems have been reviewed by the Independent Expert Advisory Panel and other industry bodies to ensure that they are representative of the systems that are in common use on buildings, including the way they are fixed. The cladding systems have been or will be installed by a Company appointed by DCLG and each one has been or will be independently assessed during the installation to ensure that it meets the design specification.

The six test specimens incorporate each of the three common types of ACM panel, with core filler materials of unmodified polyethylene, fire retardant polyethylene and limited combustibility mineral. The two insulation materials specified for use in the testing are rigid polyisocyanurate foam (PIR) or stone wool.

The test method, BS8414 Part 1:2015 + A1:2017[1] describes a method of assessing the behaviour of non-load bearing external cladding systems, rain screen over cladding systems and external wall insulation systems when applied to the face of a building and exposed to an external fire under controlled conditions. The fire exposure is representative of an external fire source or a fully developed (post-flashover) fire in a room, venting through an opening such as a window aperture that exposes the cladding to the effects of external flames.

This report applies to the cladding system as detailed. The report only covers the details as tested. It is important to check that the cladding system tested relates to the end use application when installed on a building. Such checks should be made by a suitably competent person.

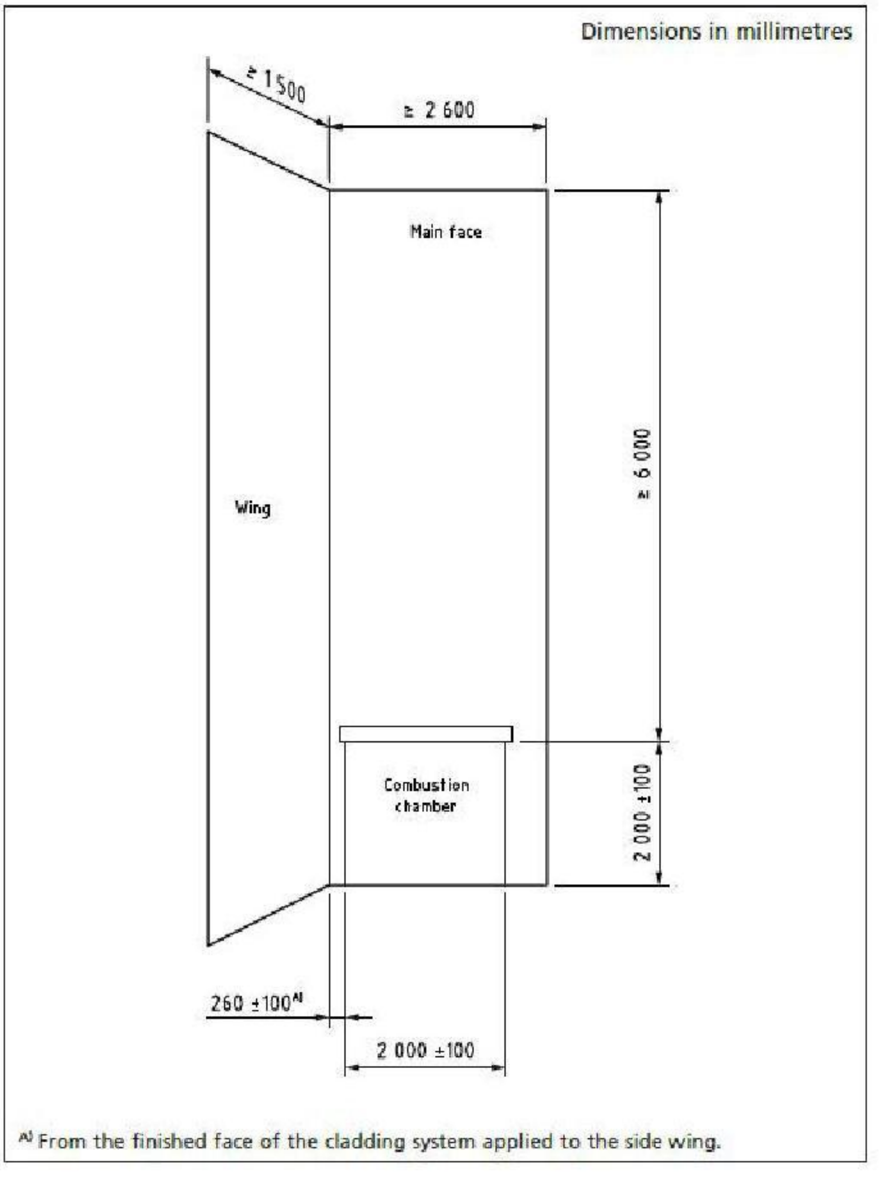
All measurements quoted in this report are nominal unless stated otherwise.

2 Details of test carried out

Name of Laboratory:	BRE Global Ltd.
Laboratory Address:	Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX.
Test reference:	DCLG test 2
Date of test:	30/07/2017
Sponsor:	Department for Communities and Local Government
Sponsor address:	2 Marsham Street, London, SW1P 4DF.
Method:	The test was carried out in accordance with BS 8414-1:2015 + A1:2017
Deviations:	None

3 Details of test apparatus used

The product was installed to wall number 2 of the BS 8414-1 BRE Global test facility. This apparatus is defined in the test Standard[1] and consists of a masonry structure with a vertical main test wall and a vertical return wall at a 90° angle to and at one side of the main test wall. See *Schematic 1*. The main wall includes the combustion chamber.



Schematic 1. Test apparatus dimensions as specified by test Standard[1].

Note: The test apparatus may be constructed left- or right-handed.

4 Description of the system

4.1 Installation of specimen

BRE was not involved in the design, installation, procurement or specification of the materials and cladding system that was submitted for testing. The tested system was defined by the Test Sponsor.

4.2 Description of substrate

The test specimen was installed to wall number 2 of the BRE Global Cladding Test Facility. This is a multi-faced test rig constructed from steel with a masonry finish onto which the cladding system was applied.

4.3 Description of product

Figures 12-16 were provided by the Test Sponsor to show the design and detailing of the installed system.

The tested cladding system build up is given in order from the masonry substrate to the external finish:

- 90mm-high×64mm-wide×220mm-deep×4mm-thick aluminum 'L'-shaped brackets fixed with a single 90mm-long×ϕ8mm stainless steel screw anchor and plastic plug – see *Figures 7&8*;
- 180mm-thick stone wool dual density insulation board (supplied 1200mm×600mm and cut to size) – see *Figures 5&6;*
- 120mm-wide×60mm-deep×2mm-thick aluminum 'T'-section framing and 40mm-wide×60mm-deep×2mm-thick aluminum 'L'-section framing – see *Figure 9;*
- 75mm-wide×240mm-deep stone wool vertical cavity barriers (stated integrity/insulation performance: 90/30mins), with 10mm compression – see *Figure 3,5&6*;
- 75mm-wide×205mm-deep stone wool with intumescent horizontal cavity barriers (stated integrity/insulation performance: 90/30mins) – see *Figures 5&6*;
- 4mm-thick front face Aluminum Composite Material (ACM) panels, with a white finish – see *Figure 11*.

The densities of the insulation and the cavity barriers have been determined and are reported in *Appendix A*.

The 4mm-thick ACM panels consisted of, from outward face in:

- 0.5mm-thick aluminium sheet;
- 3.0mm-thick polyethylene (PE) filler;
- 0.5mm-thick aluminium sheet.

The filler between the aluminium sheets was screened using the BS EN ISO 1716:2010[3] test methodology. The results are given in *Appendix B*.

4.4 Installation sequence

Onto the masonry support structure the 90mm-high×64mm-wide×220mm-deep×4mm-thick aluminium 'L'-shaped brackets were fixed in position on low density polyethylene isolation pads (5mm-thick), with a single 90mm-long×ϕ8mm stainless steel screw anchor and plastic plug – see *Figures 7&10*. On the main face the horizontal spacing between the brackets varied between 340mm and 500mm. On the wing wall the horizontal spacing between the brackets was 600mm as specified in the manufacturer's details. The vertical spacing between the brackets was 960mm and where horizontal cavity barriers were present a spacing of 410mm was used - see *Figures 3&5*.

The system included vertical and horizontal cavity barriers. On the main face, two 75mm-wide×240mm-deep stone wool vertical cavity barriers, with 10mm compression, were fixed in position with a clear distance of 1980mm between them – see *Figures 3&5*. 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 – see *Figure 5*.

On the wing wall, one 75mm-wide×240mm-deep stone wool vertical cavity barrier, with 10mm compression, was fixed in position at the edge of the system, approximately 1250mm 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 50mm ventilated cavity. *Figure 3* demonstrates the installed 'L' brackets and vertical cavity barriers.

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 – see *Figure 4*.

A set of four 75mm-wide×205mm-deep intumescent horizontal cavity barriers were butted up to the continuous vertical barriers and fixed in rows at approximate (top-top) heights of:

- 0m above the combustion chamber opening,
- 2395mm above the first cavity barrier,
- 2330mm above the second cavity barrier,
- and close to the top of the ventilated system (1635mm above the third cavity barrier, 6360mm above the combustion chamber opening).

The horizontal cavity barriers were fixed through the entire depth on face turned steel brackets – see *Figure 4*. Two steel brackets were used for a length of 1200mm of stone wool cavity barrier 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 180mm-thick stone wool insulation boards (supplied 1200mm×600mm and cut to fit) were installed in position through the substructure bracket fixing systems and fixed to the support structure (masonry wall) with two 225mm-long×ϕ8mm plastic anchors, with 30mm embedment (at each horizontal joint) and one 250mm-long×ϕ8mm stainless steel anchor with a 80mm-diameter washer per full size panel. The insulation panels were installed with the long edge orientated vertically - see *Figure 6*.

After the insulation was fixed in position, the 120mm-wide×60mm-deep×2mm-thick aluminium 'T'-section and 'L'-section framing were installed at horizontal spacings of 480mm. The horizontal spacing between successive sections of aluminium 'T'-section or 'L'-section framing was 970mm as shown in *Figure 9*. The aluminum vertical rails, with a typical length of 2300mm, were positioned to compress the stone wool insulation with approximately 10mm embedment, 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 – see *Figures 7&8*.

The external ACM panels of the system were installed on to the rail substructure with one fixed point (ϕ6mm hole) in the middle and twenty (per full size panel) oversize (ϕ8.5mm holes) fixings into the rail substructure, at 450mm horizontal spacings and 375mm vertical spacings. A nominal gap of 20mm was provided between the panels to maintain the ventilation of the cavity – see *Figure 10*. The measured gaps after installation varied between 18mm and 21mm. The full size ACM panel dimensions measured 950mm-wide×2310mm-high.

In accordance with the requirements of the test Standard[1], the cladding system measured:

Requirement	Actual measurement
≥6000mm above the top of the combustion chamber	6497mm
≥2400mm width across the main wall	2560mm
≥1200mm width across the wing wall	1260mm
260mm (±100mm) wing wall-combustion chamber opening	165mm
2000mm x 2000mm (±100mm) combustion chamber opening	2000mm × 1960mm

4.5 Test conditions

Test Date: 30/07/17

Ambient Temperature: 18.0°C

Wind speed: < 2 m/s

Frequency of measurement: Data records were taken at five second intervals.

Thermocouple locations *(Figure 2)*:

Level 1 – External (50mm in front of the finished face).

Level 2 – External (50mm in front of the finished face).

Level 2 – Midpoint of cavity between panel and insulation.

Level 2 – Midpoint of insulation layer.

5 Test results

5.1 Temperature profiles

Figures 17-20 provide the temperature profiles recorded. *Figure 11* shows the system before the test.

Parameter	Result
T_s, Start Temperature	18°C
t_s, Start time	115 seconds after ignition of crib.
Peak temperature / time at Level 2, External	675°C at 310 seconds after t_s.
Peak temperature / time at Level 2, Cavity	334°C at 310 seconds after t_s.
Peak temperature / time at Level 2, Insulation	46°C at 225 seconds after t_s.

Note: The data reported in this table relates to the period up to the point of test termination. The test was terminated at 314s. The last reported data points are at 310s.

5.2 Visual observations

<u>**Table 1**</u>: Visual Observations – refer to *Figure 1*.
Height measurements are given relative to the top of the combustion chamber.
Unless otherwise specified, observations refer to the centre line above the combustion chamber.

Time* (mins:secs)	t_s (seconds)	Description
00:00		Ignition of crib.
01:40		The flames from the combustion chamber are impinging on the cladding system.
01:45		Flame tips to mid-height of panels 1C&1D.
01:55	0	Start time (t_s) criteria achieved: External temperature 2.5m above the top of the combustion chamber in excess of 218.0°C (=200°C+T_s).
02:00	5	Flame tips to mid-height top of panels 1C&1D.
02:05	10	A small amount of distortion can be observed at the base of panels 1C&1D.

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Time* (mins:secs)	t_s (seconds)	Description
		Flames impinging on panel1A directly adjacent to the main wall at the height of the combustion chamber opening.
02:10	15	Flame tips to Level 1 thermocouples.
02:30	35	Flame tips to mid-height of panels 2C&2D.
02:40	45	Discolouration at the base of panels 1C&1D from white to dark grey.
03:00	65	Flame tips to top of panels 2C&2D. Discolouration extends to the top of panels 1C&1D.
03:40	105	A small amount of distortion can be observed at the base of panels 2C&2D.
04:15	140	Intermittent flaming is observed coming out through the joint between C1&D1 panels.
04:45	170	Flickering of flames towards wing wall panel 1A.
04:50	175	Sporadic burning droplets from cladding system.
05:10	195	Steady rate of burning droplets released from the system, with a self-sustained burning duration longer than 20 seconds. Flame tips to Level 2 thermocouples.
05:30	215	Flames can be observed in the cavity behind panels 2C&2D. Increased production of burning droplets from the base of panels 1C&1D.
06:00	245	Continuous flaming from mid-height of the vertical panel junction between panels 2C&2D. Sporadic flame emission to the top of the cladding system.
06:05	250	Increased production of the burning droplets and melting of the aluminium at the base of the system.
06:25	270	Melting at base of panel 2C. Continuous flaming to the top of the rig.
06:30	275	Continuous flaming from the top of the vertical panel junction between panels 2C&2D. Sporadic flaming off the top of the cladding system.

Time* (mins:secs)	t_s (seconds)	Description
07:00	305	Sporadic flaming >1m off the top of the cladding system.
07:09	314	Test terminated.

*Time from point of ignition.

6 Analysis of fire performance and classification

The primary concerns given in BR 135[2] when setting the performance criteria for these systems are those of fire spread away from the initial fire source and the rate of fire spread.

In order for a classification to BR 135[2] to be undertaken, the cladding system must have been tested to the full test duration requirements of BS 8414-1[1] without any early termination of the test. If the test criterion is met, then the performance of the system under investigation is evaluated against the following three criteria;

- External fire spread
- Internal fire spread
- Mechanical performance

Failure due to external fire spread is deemed to have occurred if the temperature rise above T_s (the mean temperature of the thermocouples at level 1 during the 5 minutes before ignition) of any of the external thermocouples at level 2 exceeds 600°C for a period of at least 30 seconds within 15 minutes of the start time (t_s).

Failure due to internal fire spread is deemed to have occurred if the temperature rise above T_s of any of the internal thermocouples at level 2 exceeds 600°C for a period of at least 30 seconds within 15 minutes of the start time (t_s).

No failure criteria are defined for mechanical performance. However, BR 135[2] notes that ongoing system combustion following extinguishing of the ignition source shall be included in the test and classification reports together with details of any system collapse, spalling, delamination, flaming debris and pool fires. The nature of the mechanical performance should be considered as part of the overall risk assessment when specifying the system.

In accordance with BS 8414-1[1] (and reported above in *Section 5*), the test of this cladding system was terminated after 7 minutes and 9 seconds from ignition of the fire load (timber crib) due to flame spread above the test apparatus. Therefore this cladding system failed to meet the minimum test duration as detailed in BS 8414-1[1]. A classification to BR 135[2] is therefore not possible for this cladding system.

In addition, *Figure 18* shows that the level 2 external thermocouples having exceeded a 600°C temperature rise above T_s after 305s, would have sustained this temperature rise, for a minimum of 30s, within 15mins from test start time (t_s) had the test not been terminated early due to flame spread off the top of the cladding system.

7 Post-test damage report

7.1 Summary

Figures 21-23 show that the main damage areas spanned the majority of the combustion chamber opening (2000mm-width) tapering to a point approximately 5000mm above, leaning slightly (approximately 300mm at the top) in the direction of the wing wall. The extent of the damage increased from black discolouration at the edges of the damage zone to complete consumption of sections of the ACM panels, a small amount of distortion to the rail substructure and some discolouration of the insulation at the centre of the main wall – see *Figures 21-31*. On the wing wall, slight distortion to ACM panels 1A&2A, either side of the panel joint and immediately adjacent to the main wall, was the only visible external damage on this face of the cladding - see *Figures 21-23*.

7.1.1 ACM panels

On the main wall, approximately 20% of ACM panel 1C was consumed - see *Figures 1, 21&22*. This damage was sustained in a strip approximately 250mm-wide×1800mm-high positioned directly adjacent to the centre line of the combustion chamber, and extended from 500mm above the opening to the height of the second cavity barrier – see *Figures 21&22*. Partial consumption (inner aluminium layer of panel remained intact) affected a 200mm-high x 450mm-wide strip at the base of the fully consumed section of panel 1C.

Partial consumption (inner aluminium layer of panel remained intact) of panel 1D affected approximately 15% of the surface area. The PE core was completely lost from this area and, where visible, between the distorted aluminium layers directly adjacent –see *Figure 24*. A small section (<0.05m^2) of panel 1D had been fully consumed approximately 450mm above the combustion chamber opening – see *Figure 22*.

Partial consumption (inner aluminium layer of panel and some filler material remained intact) at the base of panel 2C affected approximately 30% of the surface area – see *Figure 23*. The PE core had been completely lost in a 100mm strip along the lower and central edges of this area but the majority, approximately 25% of the total panel surface area, remained intact and visible – see *Figure 25*.

The surface finish of the panel was burnt away revealing a shiny metallic surface in a typically 300mm-wide strip adjacent to the consumed areas of the ACM panel which increased to approximately 1000mm at the tip of the flame impingement zone. Adjacent to the ‘metallic’ strip, a strip of dark discolouration, approximately 100mm-wide, which increased to approximately 1000mm at the tip of the flame impingement zone, extended to a height of 5000mm above the combustion chamber – see *Figure 21*.

Slight distortion of the ACM panels was sustained on the wing wall, directly adjacent to the main wall, in the region approximately 2000mm-2500mm above the height of the combustion chamber opening – see *Figures 22&23*.

7.1.2 ‘T’ and ‘L’ rail substructure

A 100mm-tall section of the central ‘T’ rail was distorted and partially melted at a height of 1000mm above the top of the combustion chamber – see *Figures 26&27*. This was the only structural damage observed to the rail substructure.

7.1.3 Stone wool insulation

Discolouration of the stone wool insulation was observed in the central 1000mm-width above the combustion chamber which was contained by consecutive sections of ‘L’ rail, up to the height of the second row horizontal cavity barrier – see *Figure 29*. Lighter discolouration of the stone wool boards from approximately 400mm below and up to the height of the second row horizontal cavity barrier between the 'L' rails and external 'T' rails on the main wall face was noted.

Discolouration of the stone wool insulation affected approximately 40% of the area contained between the second and third row horizontal cavity barriers and the vertical cavity barriers - see *Figure 30.* The areas of damage were concentrated:

- Bottom left corner directly above second row cavity barrier (200mm-wide×1000mm-high)
- Central 1000mm-width extending approximately 100mm below the third cavity barrier
- Central 1000mm-width extending 1000mm above the second cavity barrier

No damage was observed outside the bounds of the main wall vertical cavity barriers (including the full-height of the wing wall) or beyond the third row horizontal cavity barrier – see *Figure 28.*

7.1.4 Horizontal (intumescent) cavity barriers

The first row of horizontal intumescent cavity barriers expanded across the central 1000mm of the combustion chamber width with initial signs of activation across the remainder of the opening – see *Figure 29*.

Activation of the second row of horizontal intumescent cavity barriers occurred across the full width of the combustion chamber opening – see *Figures 28&29*.

Partial activation of the third row of horizontal intumescent cavity barriers occurred across the full width of the combustion chamber opening – see *Figure 29*.

No intumescent cavity barrier activation was observed outside the bounds of the main wall vertical cavity barriers (including the full-height of the wing wall) or beyond the third row horizontal cavity barrier.

7.1.5 Vertical (compression) cavity barriers

The fire damage to the ACM panels and stone wool insulation was confined within the bounds of the vertical cavity barriers either side of the combustion chamber opening – see *Figure 28*. Minimal damage to the vertical cavity barriers was observed.

8 Reference

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. Colwell, S and Baker, T. BR 135, "Fire performance of external thermal insulation for walls of multistorey buildings", Third Edition, published by IHS BRE press, 2013.

3. BS EN ISO 1716:2010 (*"Reaction to fire tests for products. Determination of the gross heat of combustion (calorific value)"*, British Standards Institution, London, 2010.

9 Figures

9.1 Diagrams of finished face of the cladding system

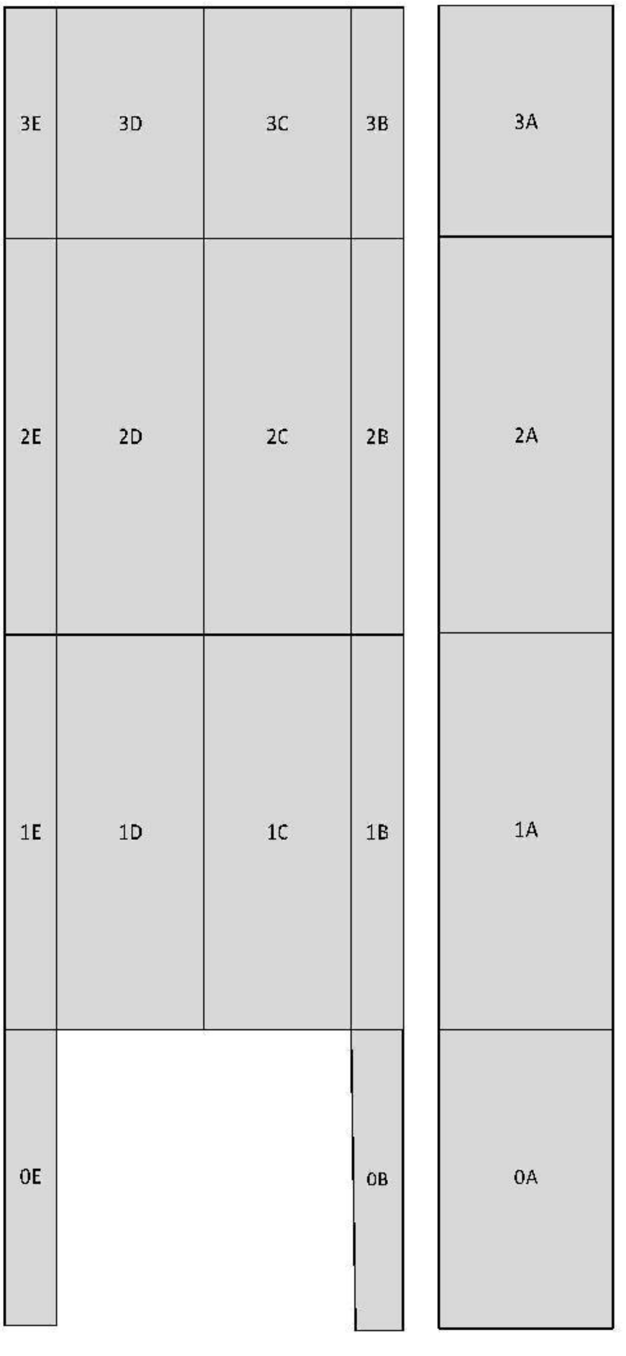

Figure 1. Layout of panels and labelling system used for reporting purposes. Not to scale.

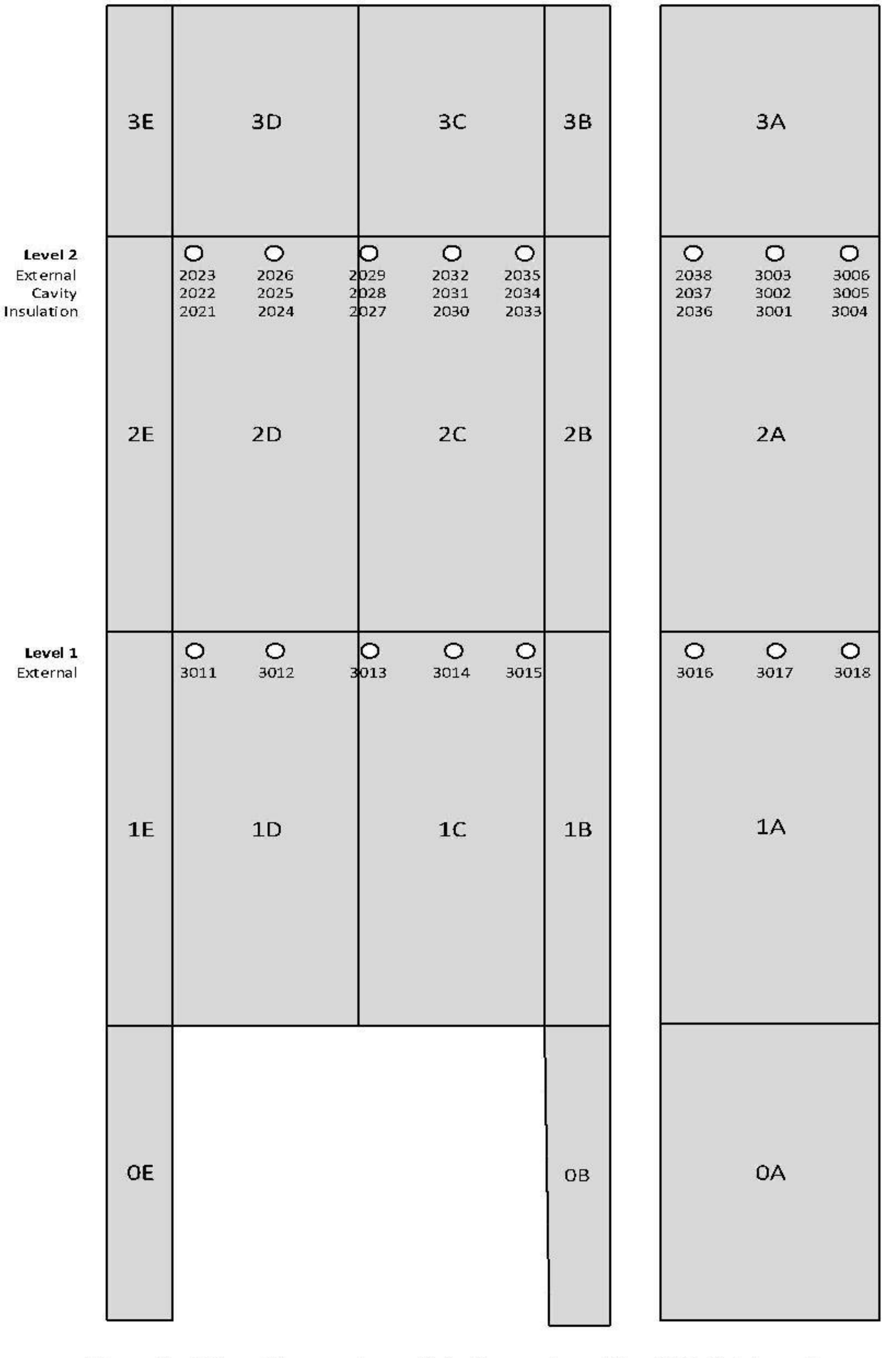

Figure 2. TC positions and panel labelling system (0A – 3E). Not to scale.

9.2 Installation photographs

Figure 3. Location of 'L' brackets and vertical cavity barriers.

Figure 4. Installed window pod lining combustion chamber.

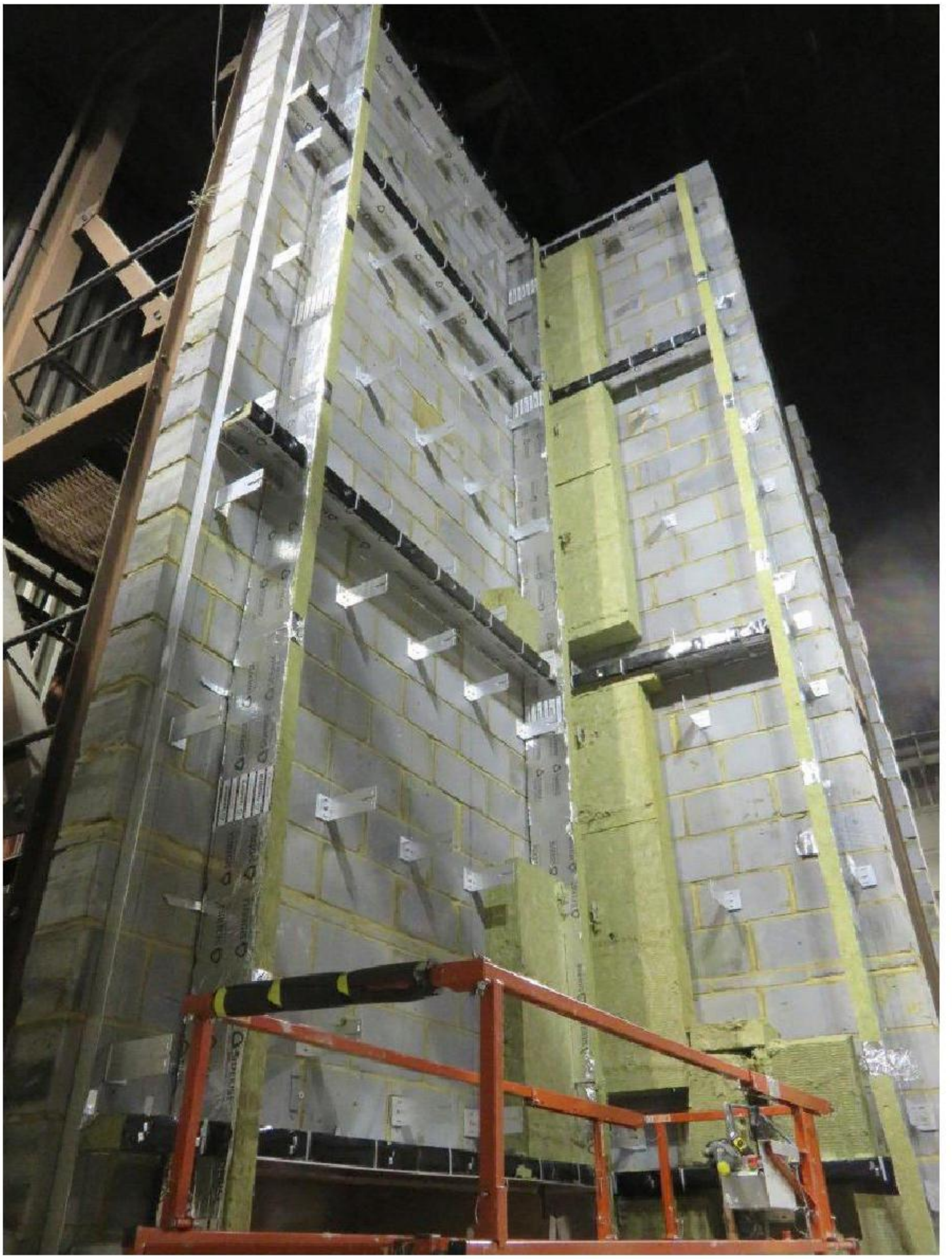

Figure 5. Horizontal intumescent cavity barriers fixed through the entire depth on face turned steel brackets, fitted between vertical cavity barriers.

Figure 6. Installed cavity barriers and stone wool insulation.

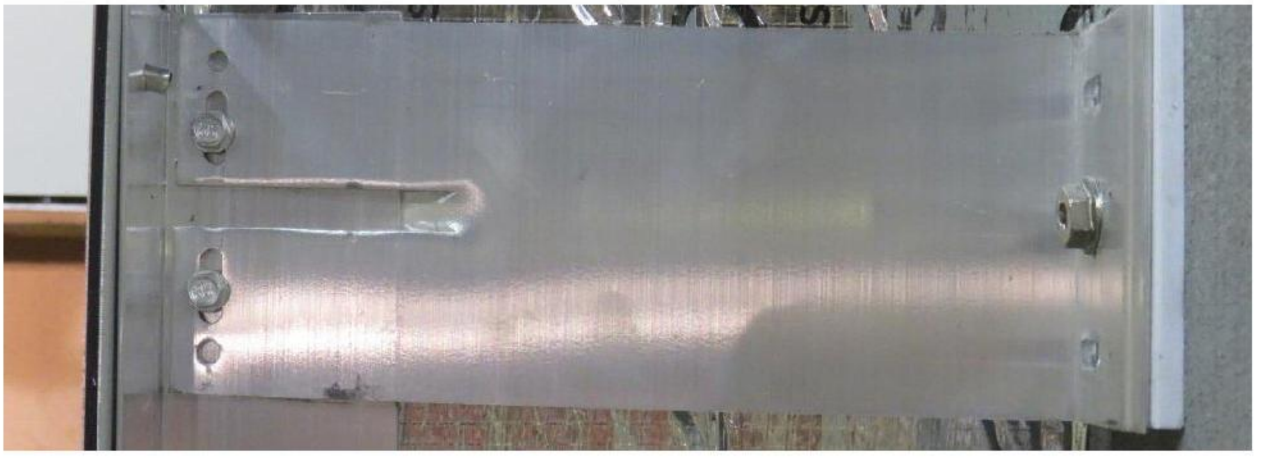

Figure 7. Example of aluminium rail fixed to 'L' bracket through movement holes.

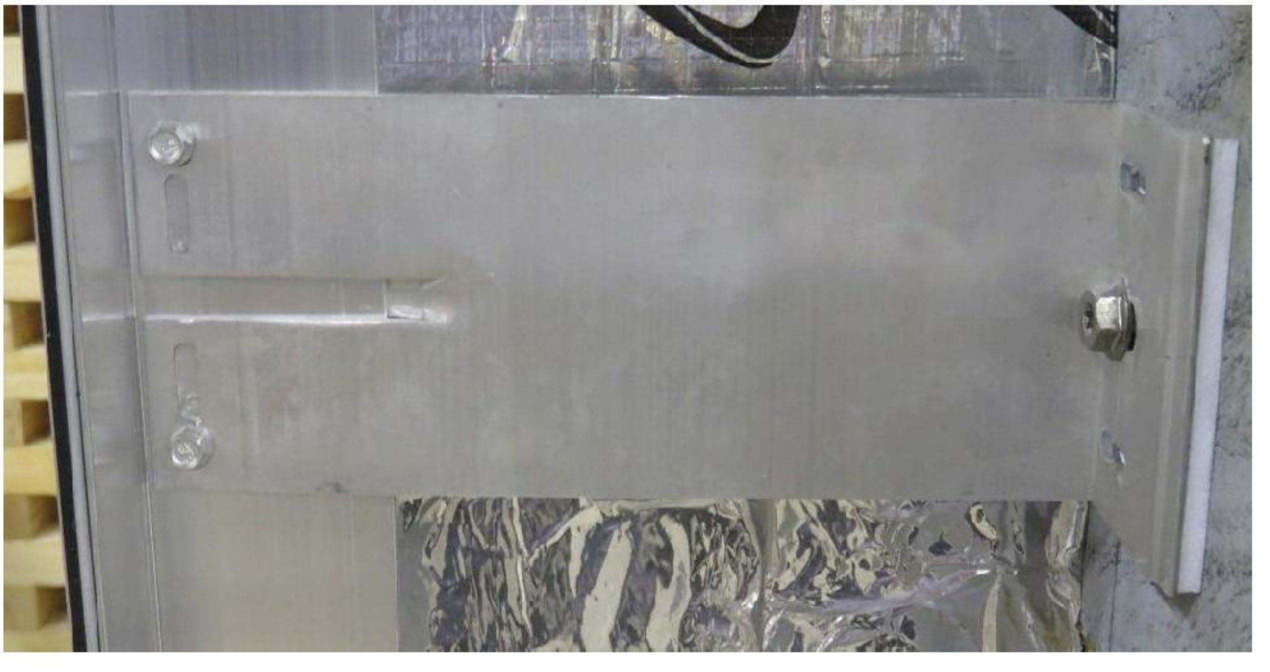

Figure 8. Example of aluminium rail fixed to 'L' bracket through fixed holes.

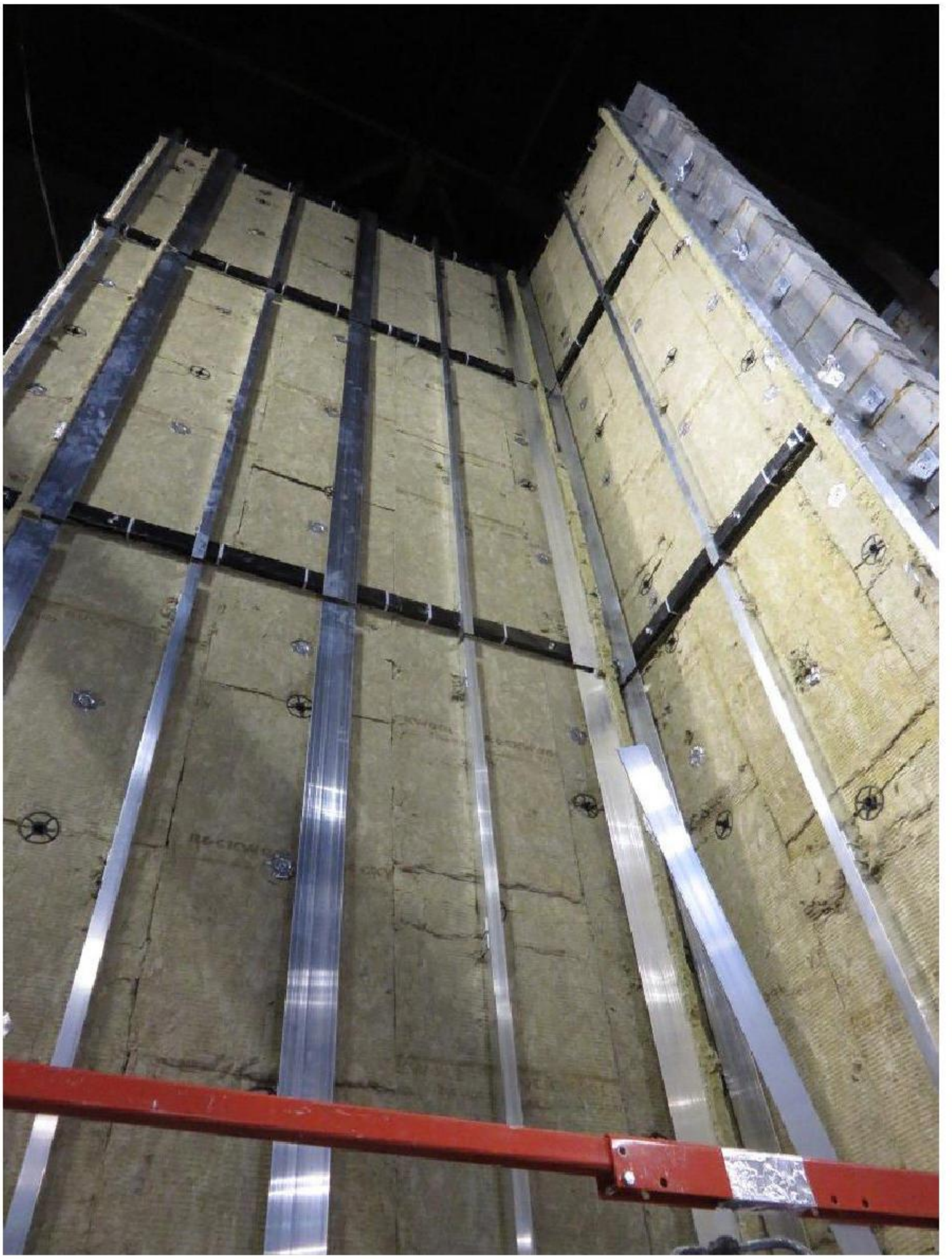

Figure 9. Completed installation of railing substructure visible on main wall.

Figure 10. Detail at corner of combustion chamber opening. Panels riveted in place and nominal 20mm vertical gap left for ventilation purposes.

Figure 11. Completed installation prior to test.

9.3 System drawings

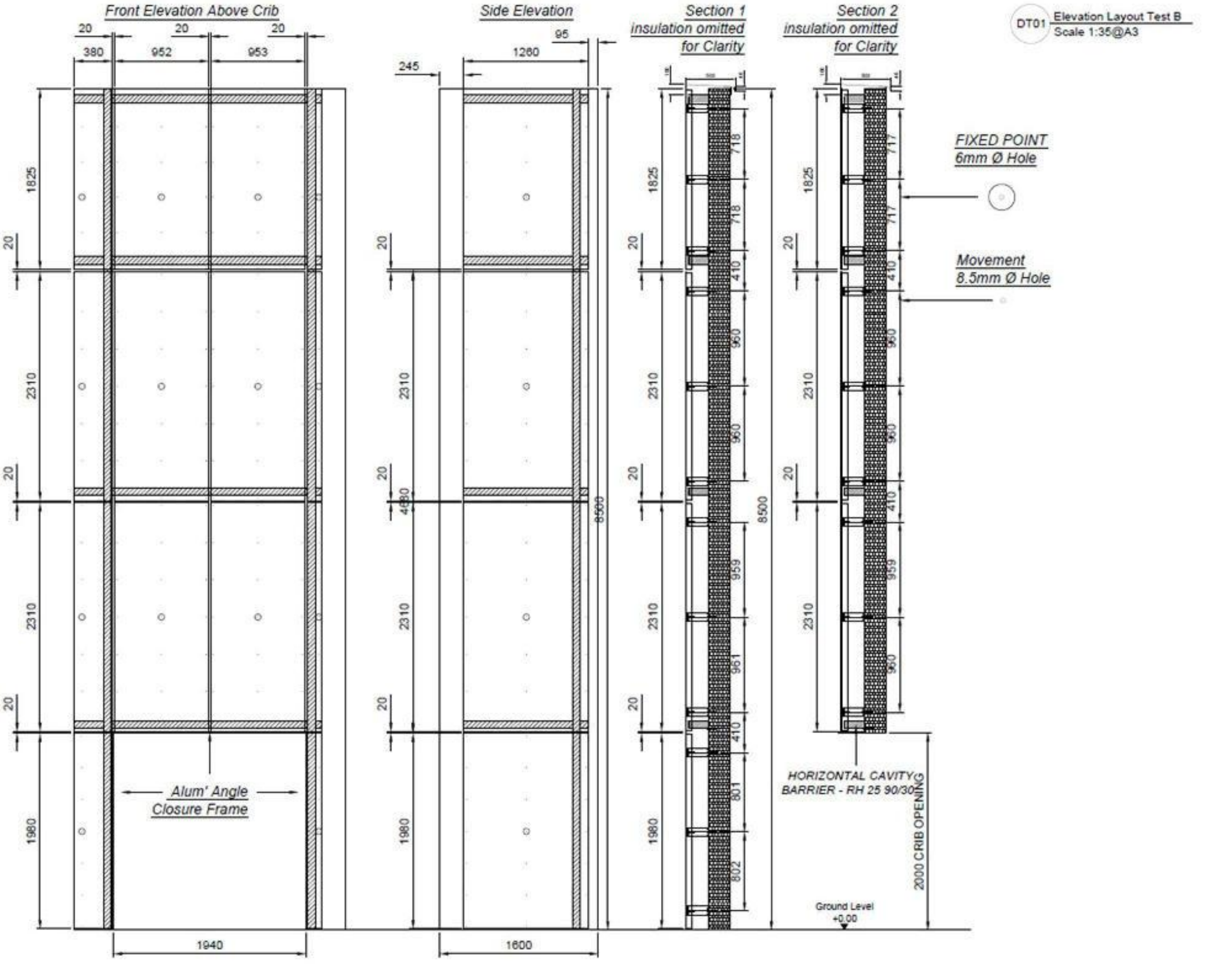

Figure 12. Front elevation, side elevation and vertical sections for the system (supplied by the Test Sponsor).

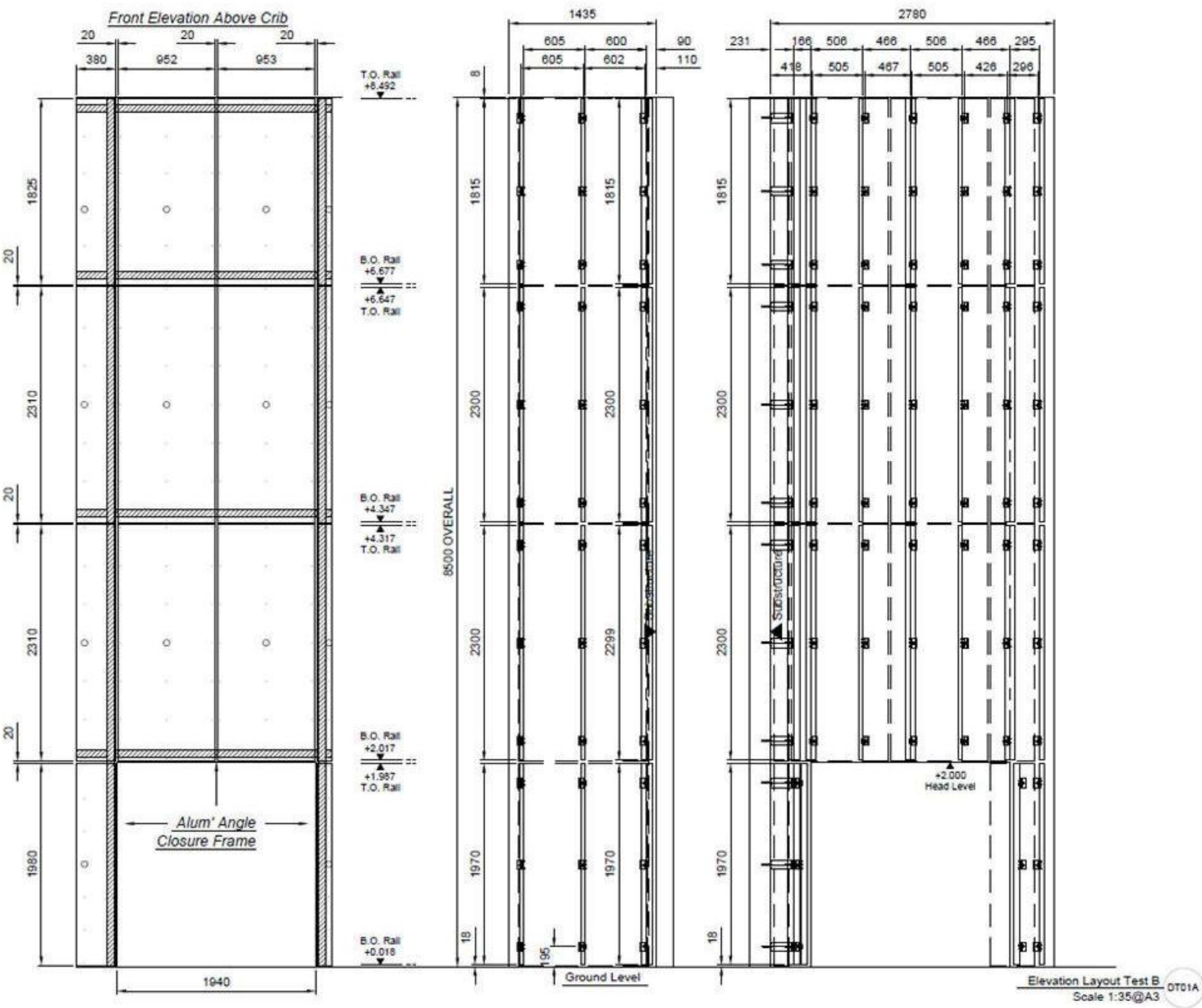

Figure 13. Front elevation, side elevation and vertical sections for the substructure system (supplied by the Test Sponsor).

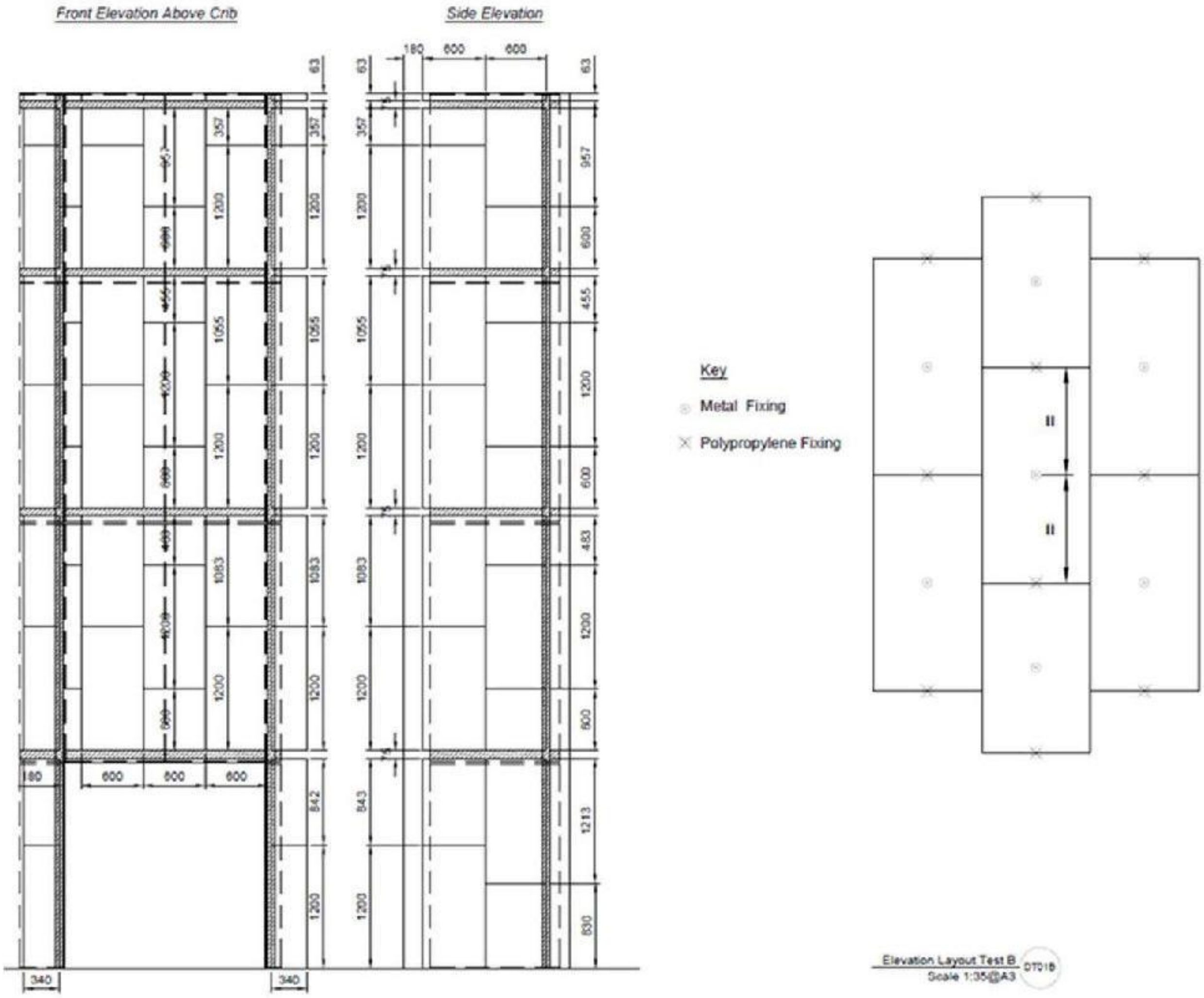

Figure 14. Front elevation, side elevation for the insulation panels installation (supplied by the Test Sponsor).

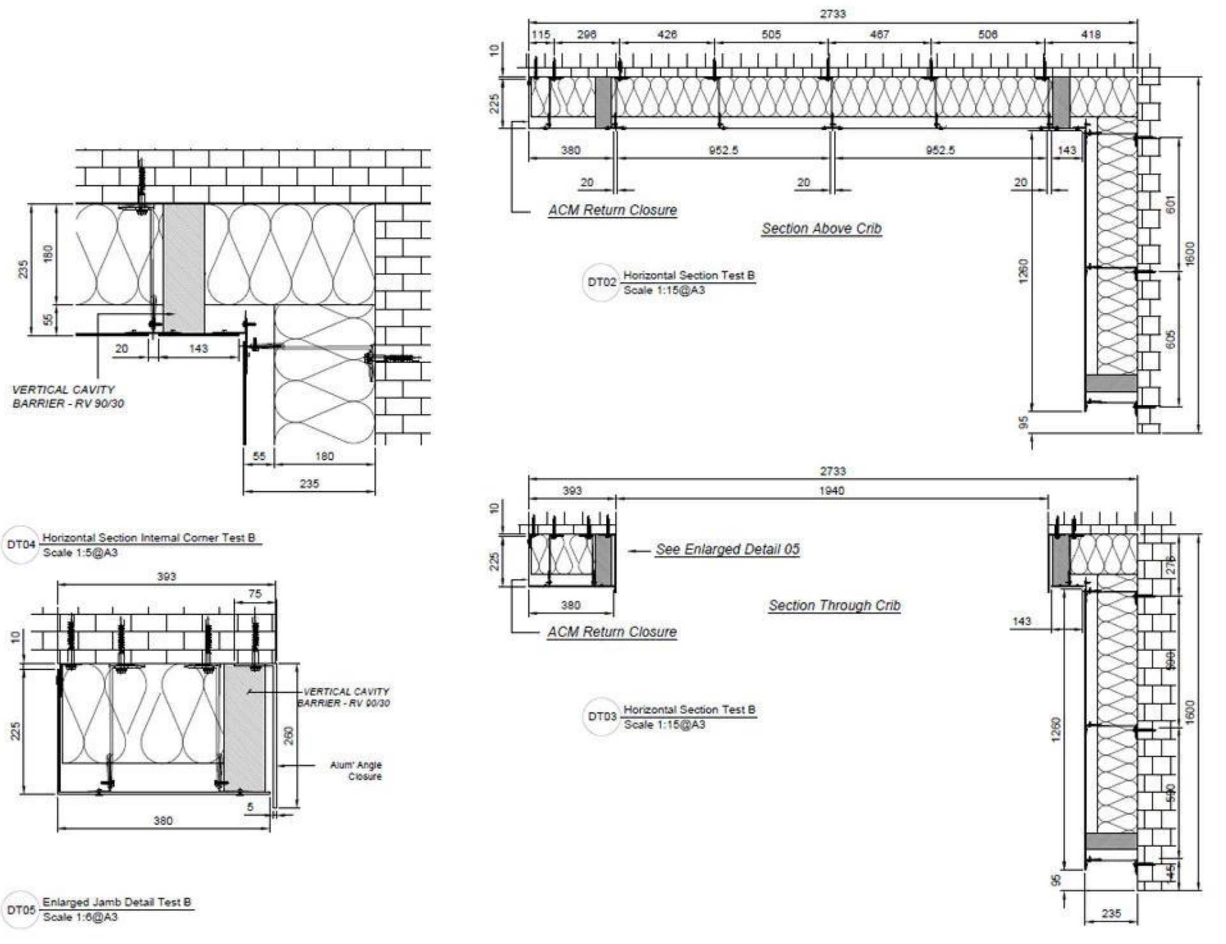

Figure 15. Horizontal section through and above the combustion chamber, and installation details for the system (supplied by the Test Sponsor).

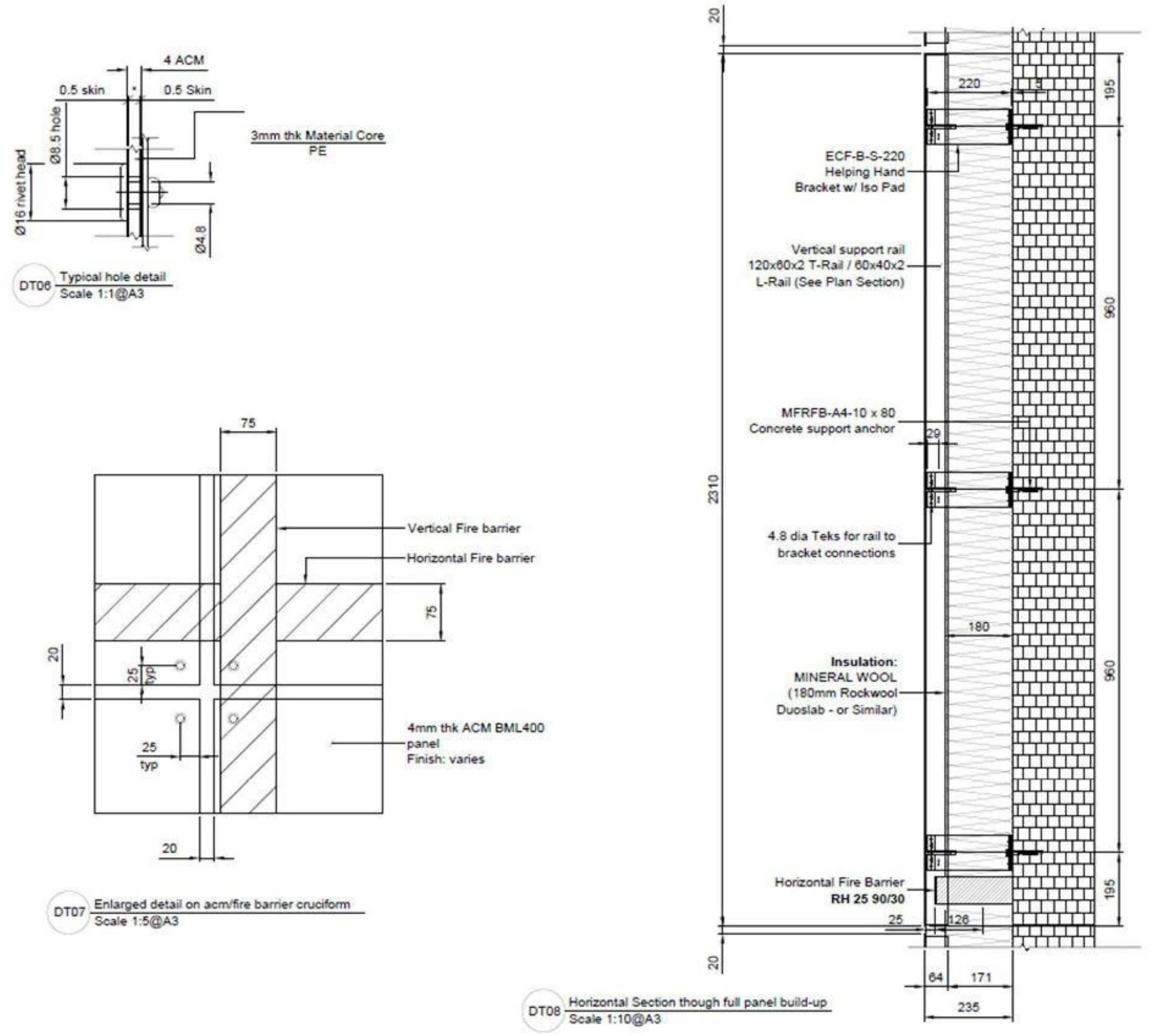

Figure 16. Vertical section through the cladding system, ACM panel detail and vertical and horizontal fire barriers intersection (supplied by the Test Sponsor).

9.4 Temperature data

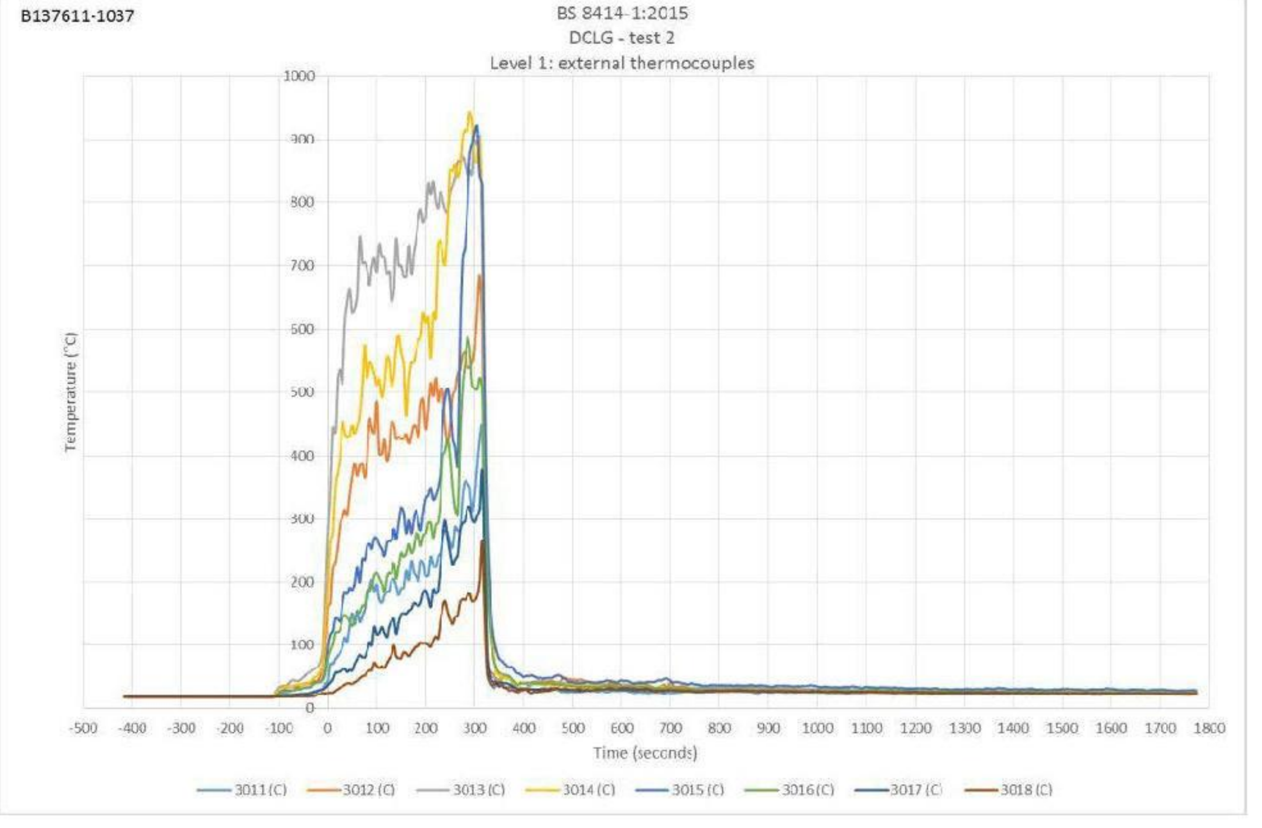

Figure 17. Level 1 external thermocouples.

t_s=115s after ignition of the crib.

Note: Test terminated after 314s.

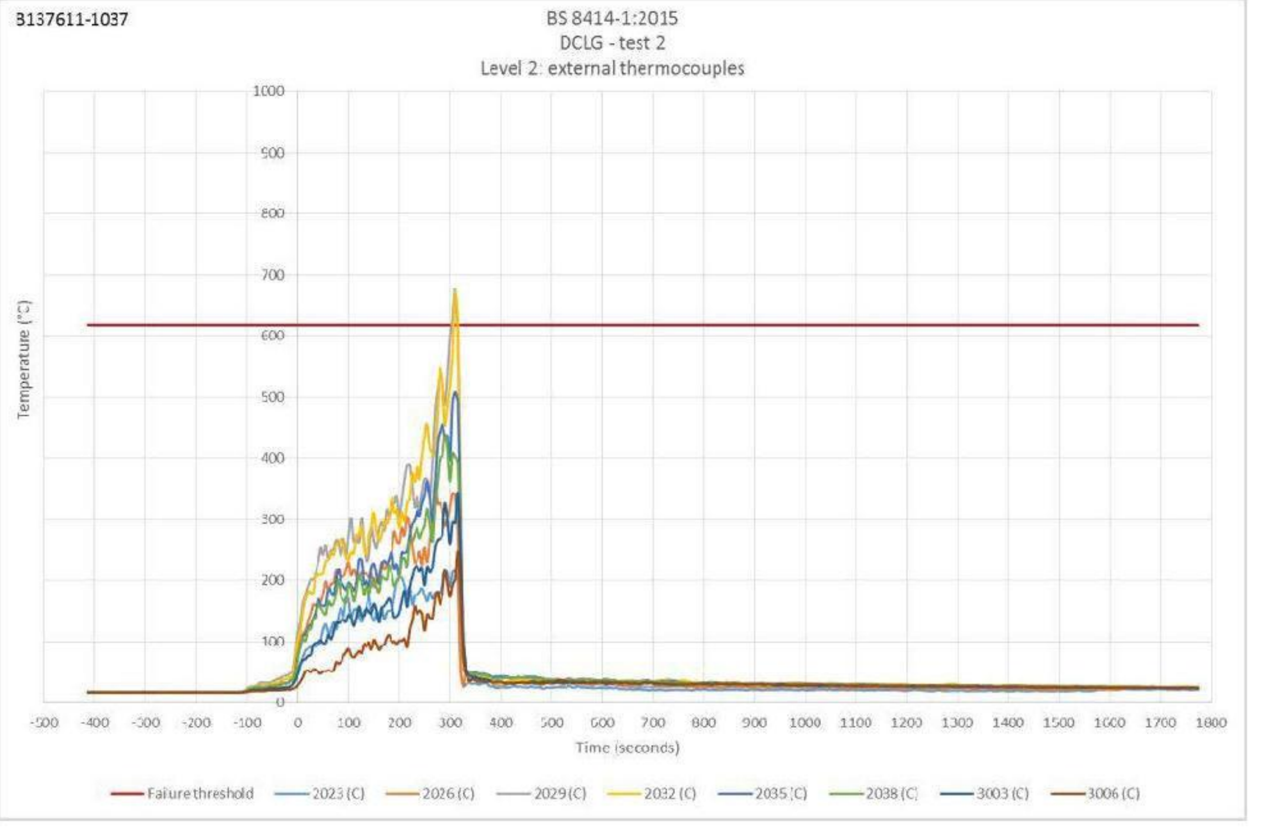

Figure 18. Level 2 external thermocouples.

t_s=115s after ignition of the crib.

Note: Test terminated after 314s.

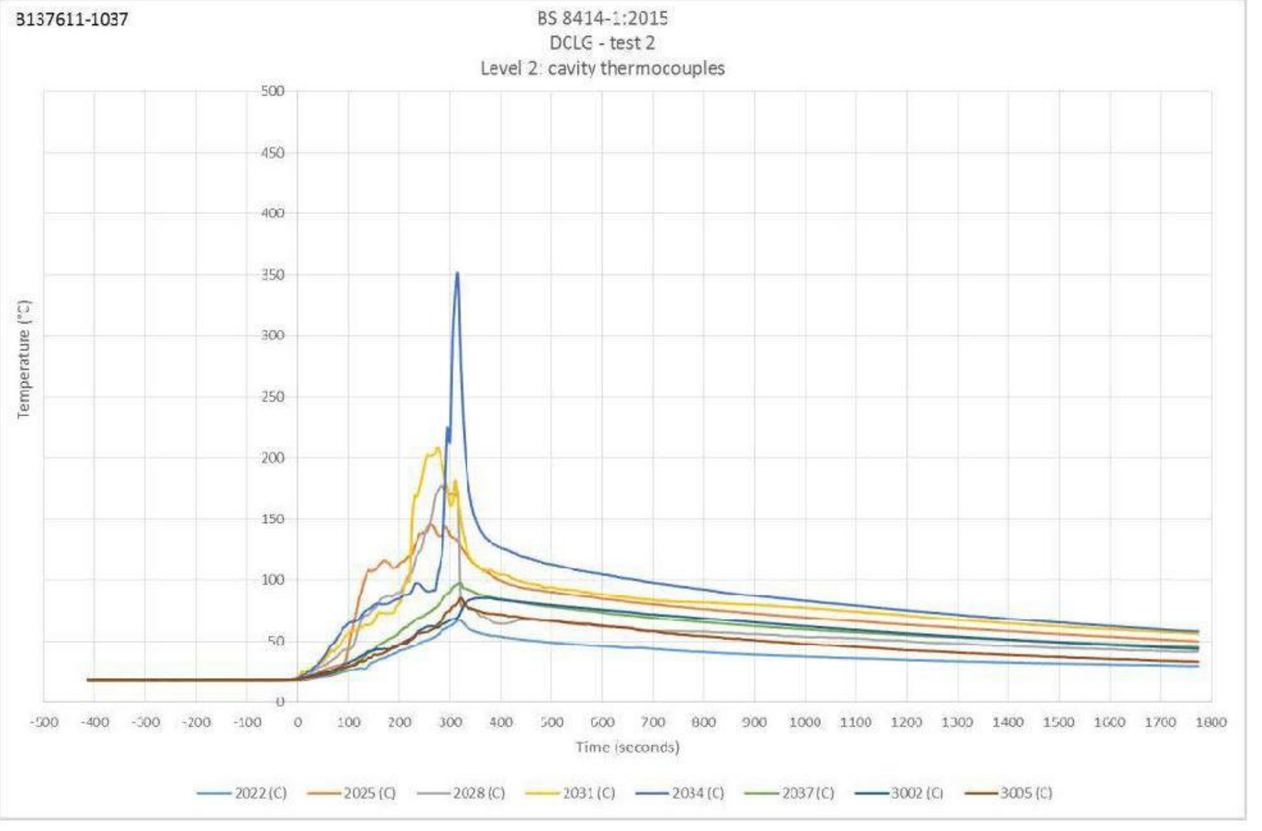

Figure 19. Level 2 cavity thermocouples.

t_s=115s after ignition of the crib.

Note: Test terminated after 314s.

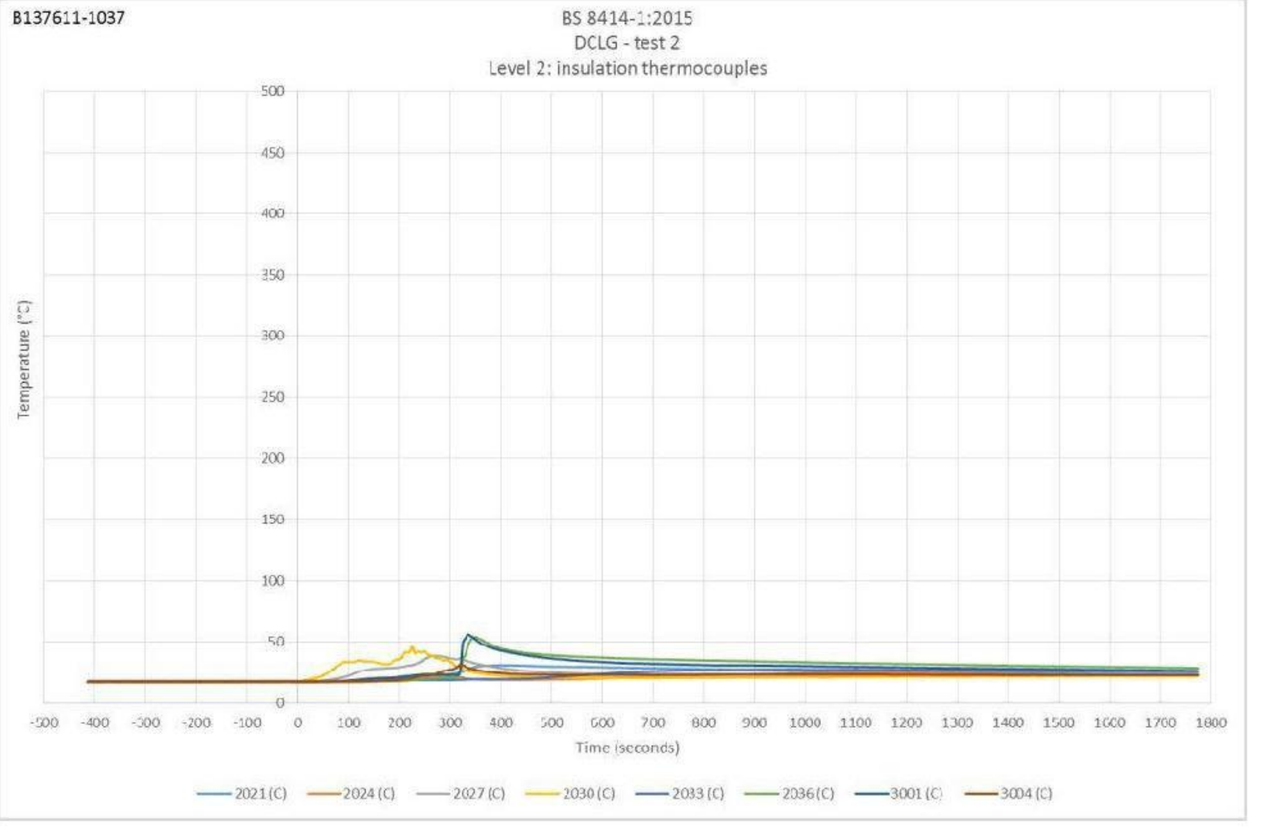

Figure 20. Level 2 insulation thermocouples.

t_s=115s after ignition of the crib.

Note: Test terminated after 314s.

9.5 Post-test photographs

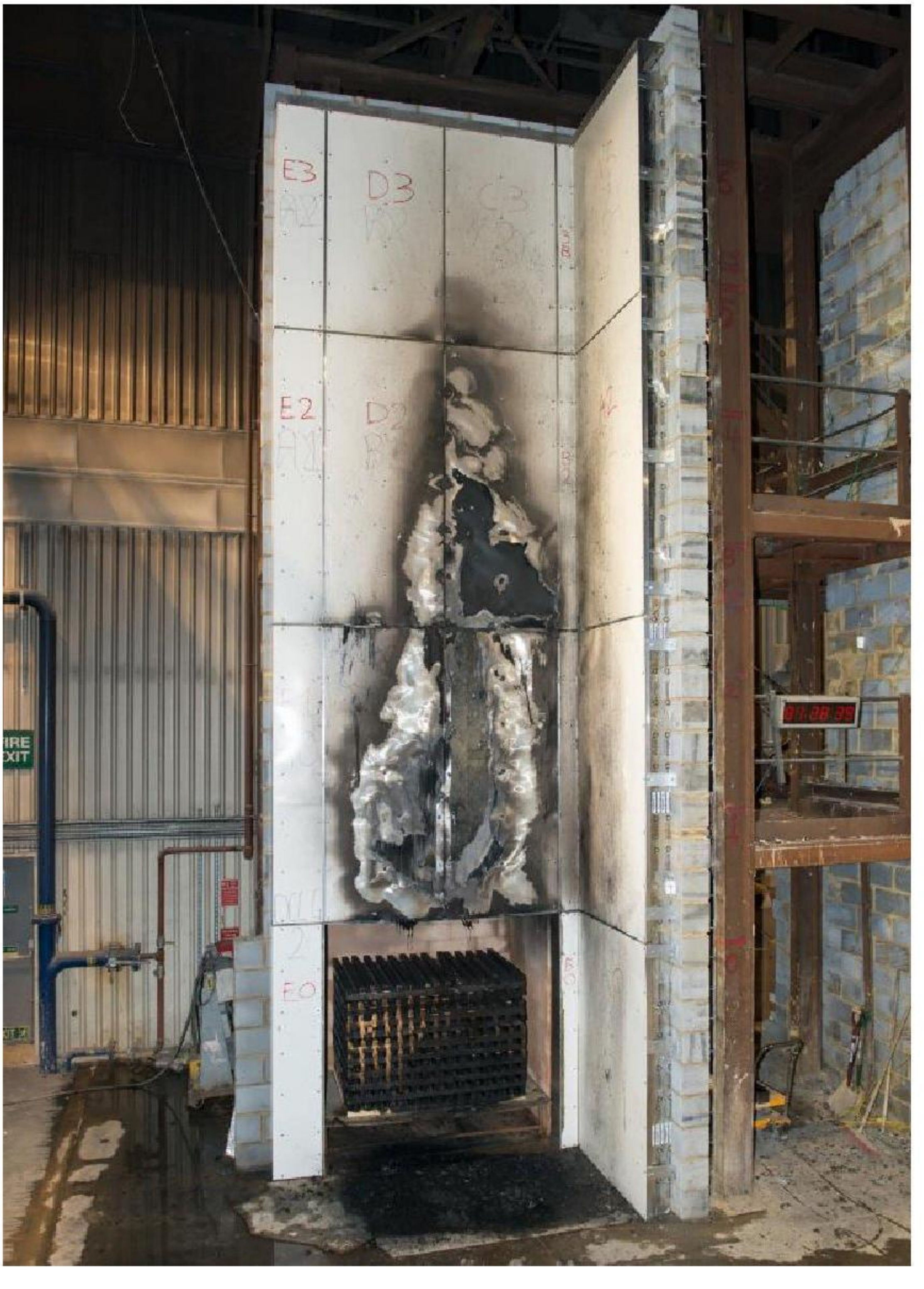

Figure 21. Full height photograph of system soon after test termination.

Note: Test terminated after 314s.

Figure 22. First row ACM panels (directly above combustion chamber).

Figure 23. Second row ACM panels (approximately 2300mm-4600mm above combustion chamber).

Figure 24. View between distorted aluminium layers of panel 1D (approximately 1000mm above the top of the combustion chamber) showing absence PE core material.

Figure 25. Close up of panel 2C (approximately 4600mm above the top of the combustion chamber) showing melted aluminium outer face with intact PE core material.

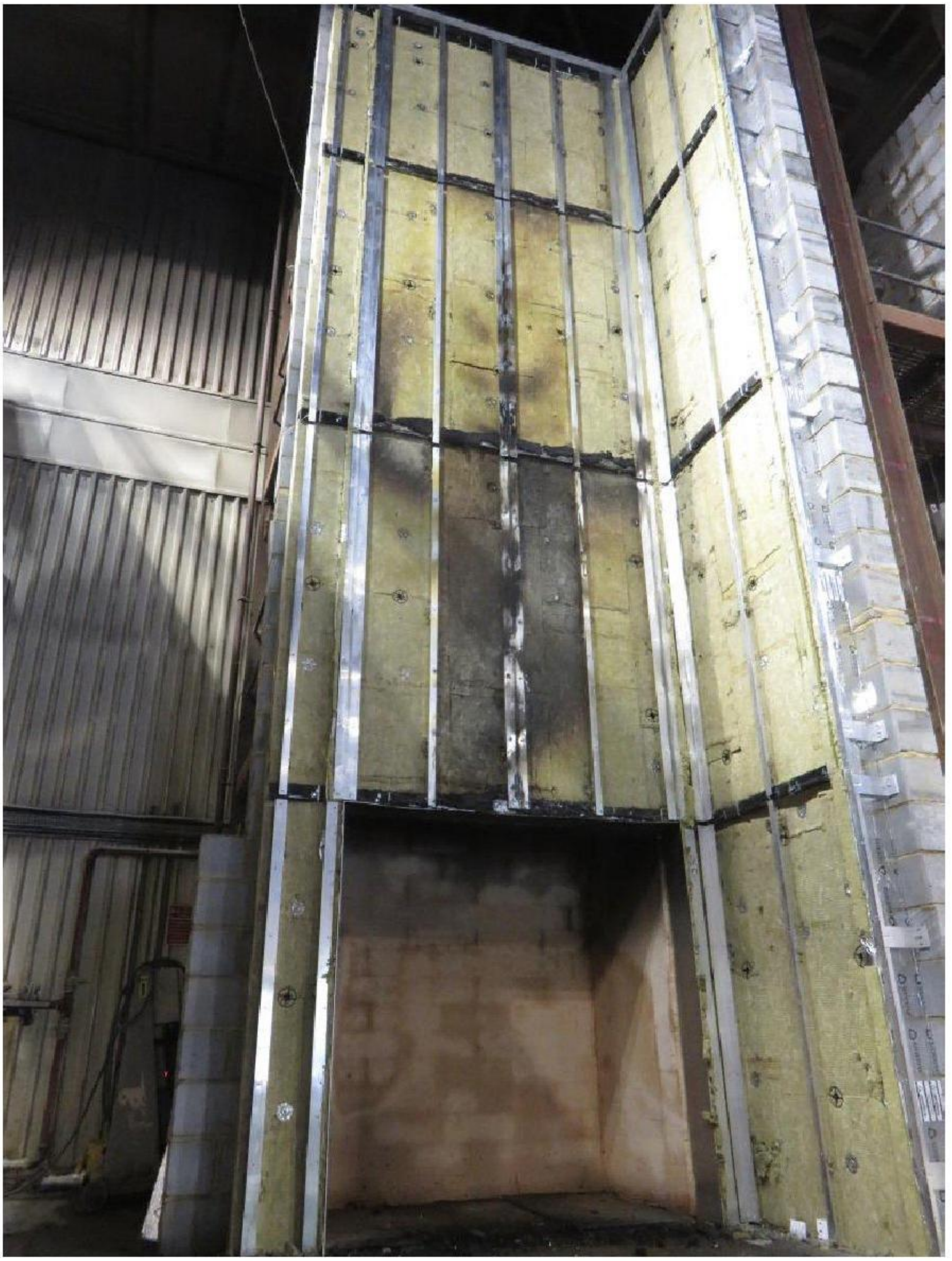

Figure 26. Full height photograph of cladding system following removal of ACM panels.

Figure 27. Damage to cladding system beneath ACM panels directly above the combustion chamber.

Figure 28. Full height photograph of cladding system following removal of ACM panels and rail substructure.

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Figure 29. Cladding system beneath ACM panels and rail substructure between the first and second horizontal cavity barrier (approximately 0-2400mm above combustion chamber).

Figure 30. Cladding system beneath ACM panels between the second and third horizontal cavity barrier (approximately 2400-4700mm above combustion chamber).

Figure 31. Cladding system beneath ACM panels between the third and fourth horizontal cavity barrier (approximately 4700-6360mm above the combustion chamber).

Appendix A – Material densities

Representative samples of the construction materials were taken during construction.

The free moisture content ($W_1 - W_2$) of the samples expressed as a percentage of the dried weights (W_2), and density (kg/m^3) are given in *Table 2*.

Table 2: Conditioning and material information.

Sample Material	Oven drying temperature	Moisture content by dry weight (%)	Density (kg/m^3)
Stone wool dual density insulation board	105 ± 5ºC	0.6	47.7
Vertical cavity barrier	105 ± 5ºC	0.5	80.1
Horizontal cavity barrier	105 ± 5ºC	0.3	79.9

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Appendix B – ACM panel screening test results

The screening test indicates whether the core or filler of the ACM panel used as part of the cladding system has properties which indicate flame retardant properties based on testing in BS EN ISO 1716:2010[3]. As the purpose of this testing was to quickly and reliably screen the core material, the full procedures set out in the BS EN ISO 1716:2010 (*"Reaction to fire tests for products. Determination of the gross heat of combustion (calorific value)"* test standard have not been followed as they are unnecessary to confirm which type of panel has been used. These results should therefore be considered to provide a high degree of certainty as to the type of panel screened.

The result indicates the performance achieved for the core in terms of a category

- **Category 1** means that the result is in line with the requirements for a material of limited combustibility (Calorific potential ≤3 MJ/kg)
- **Category 2** means that the result does not achieve the requirements of category 1 but that it does have some limited flame retardant properties (Calorific potential > 3MJ/kg and ≤35MJ/kg)
- **Category 3** means that the result does not achieve the requirements of Category 1 or 2 and that it has no flame retardant properties (Calorific potential >35MJ/kg)

DCLG Advice - ***The Department's view is that cladding material found to be in either Category 2 or Category 3 in the screening test would not meet the requirements for limited combustibility set out in Approved Document B guidance.***

The samples were taken from aluminium composite material panels that were part of the cladding system tested and they had the following characteristics:

Overall dimensions (H×W mm)	Total thickness including Al facings (mm)	Code
2310×953	4.0	CT002-01 CT002-02 CT002-03

The ambient conditions in the testing room, prior to the test, were:

Ambient temperature (°C)	Relative humidity of the air (%)
23.1	50.1

Test results:

Test No.	Calorific value (MJ/kg)	Category	Standard deviation (%)
1	46.3341	CAT 3	0.01
2	46.3586	CAT 3	
3	46.3525	CAT 3	

Report Ends