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BRE Global Test Report

BS 8414-2:2015 + A1:2017 Test on a ventilated Marley Eternit rainscreen system with Celotex RS5000 insulation.

Prepared for: Celotex

Date: 30 April 2018

Report Number: P104852-1000 **Issue: 1**

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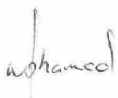
Signature 

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1 Introduction

The test method, BS8414-2:2015 + A1:2017 [1] describes a method of assessing the behaviour of non-load bearing external cladding systems, rainscreen 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.

The specification and interpretation of fire test methods is the subject of on-going development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 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 to ensure that they are consistent with current practices, and if required may endorse the test report.

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

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

2 Test Details

Name of Laboratory:	BRE Global Ltd.
Laboratory Address:	Bucknalls Lane, Garston, Watford, Hertfordshire. WD25 9XX
Test reference:	P104852-1000
Date of test:	4th April 2018
Sponsor:	Celotex
Sponsor address:	Lady Lane Industrial Estate, Hadleigh, Ipswich, IP7 6BA
Method:	The test was carried out in accordance with BS 8414-2:2015 + A1:2017
Deviations:	None

3 Details of Test Apparatus

The product was installed on to wall number 4 of the BRE Global test facility. This apparatus is representative of a structural steel framed building and consists of a structural steel test frame with a vertical main test wall and a vertical return wall at a 90º angle to and at one side of the main test wall - see *Figure 1*. The main wall includes the combustion chamber.

4 Description of the System

4.1 Summary

Generic cladding type	Ventilated rainscreen
Relevant test method	BS 8414-2:2015+A1:2017
Test frame	Structural steel test frame
Insulation	100mm-thick Celotex RS5000
Cavity depth	54mm
Vertical cavity barriers	Siderise RVG-090/030/151-159 stone wool cavity barrier (75mm-thick×155mm-deep)
Horizontal cavity barriers	Siderise RH25G-090/30/144-156 stone wool open state cavity barrier with intumescent strip (75mm-thick×130mm-deep)
External finish	Marley Eternit natura (12mm-thick)

4.2 Description of product

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

Item	Description
1	Horizontal 'U'-shaped base channel (40mm×104mm×40mm×1.2mm-thick).
2	Horizontal 'U'-shaped head channel (70mm×104mm×70mm×2mm-thick).
3	Vertical 'C'-shaped studding (50mm×100mm×50mm×1.2mm-thick).
4	Knauf standard wallboard (9.5mm-thick, fixed to internal face of partition).
5	MgO sheathing board. Versaliner (12mm-thick, fixed to external face of partition).
6	Siderise RH25G-090/30/144-156 stone wool open state horizontal cavity barrier with intumescent strip (130mm-deep×75mm-thick).
7	Siderise RVG-090/030/151-159 stone wool vertical cavity barrier (155mm-deep×75mm-thick).
8	Aluminium helping hand brackets (120mm-deep×62mm-wide×75mm-high×5mm-thick).
9	Celotex RS5000 (1200mm-wide×2400mm-long×100mm-thick).
10	'L'-shaped aluminium rails (60mm-deep×40mm-wide).
11	Marley Eternit natura (12mm-thick).

4.2.1 Installation sequence

40mm×104mm×40mm×1.2mm-thick horizontal 'U'-shaped base channel was fixed to the top of each 'floor slab' and into the ground using 6.3×45mm self-drilling screws at 420-440mm centres in two rows 40-50mm apart.

70mm×104mm×70mm×2mm-thick horizontal 'U'-shaped head channel was fixed to the base of each 'floor slab' using 5.5×38mm self-drilling screws at 400mm centres in two rows 45mm apart.

50mm×100mm×50mm×1.2mm-thick vertical 'C'-shaped studding (with a 12mm internal return) was fixed to the horizontal studding through the front using 5.5×25mm self-drilling screws. The vertical studding was fixed at 200-600mm centres on the main wall and 180-600mm on the wing wall. See *Figure 4*. The partition extended beyond the long edge of the main wall floor slab by 110mm and the wing wall floor slab by 220mm).

12mm-thick Versaliner sheathing boards with the long edge horizontal were fixed to the external face of the lightweight steel framework partition using 4.8×45mm self-drilling screws at 100-300mm vertical centres (five fixings per column per board) and 180-600mm horizontal centres.

4mm gaps were left between adjacent boards, the gaps were sealed using Versaseal-FS Euroform sealant.

Galvanised steel folded skewers (350mm-long×25mm-wide×1mm-thick) were fixed to the sheathing boards using 4.8×45mm self-drilling screws between 200-620mm horizontal centres in four rows located; 0mm, 660mm, 3210mm and 7050mm above the top of the combustion chamber.

Siderise stone wool horizontal cavity barriers with intumescent strip (130mm-deep×75mm-thick) were pressed onto the skewers in rows. A cut was made along the length of the skewers local to the tip and the ends were folded to opposite sides to secure the intumescent cavity barriers in place. All barrier edges were sealed with aluminium tape.

Galvanised steel folded skewers (320mm-long×25mm-wide×1mm-thick), folded to 195mm-wide×125mm-deep, were fixed to the sheathing boards using 4.8×45mm self-drilling screws at 275-620mm vertical centres in four columns located: 270mm and 2480mm from the main-wing wall junction on the main wall, 50mm and 1490mm from the main-wing wall junction on the wing wall.

Siderise stone wool vertical cavity barriers (155mm-deep×75mm-thick) were pressed onto the skewers in columns. Each column was bisected by the horizontal cavity barriers. All barrier edges were sealed with aluminium tape.

120mm-deep×62mm-wide×75mm-high×5mm-thick aluminium helping hand brackets each with plastic isolation pad were fixed to the sheathing boards at 210-600mm horizontal centres and 675-910mm vertical centres on the main wall, 365-600mm horizontal centres and 270-900mm vertical centres on the wing wall. The 'L'-shaped helping hand brackets were fixed using two 6.3×50mm self-drilling screws per bracket.

A double layer of 9.5mm-thick Knauf plasterboard was fixed to the internal face of the lightweight steel framework partition using Knauf 42mm-long drywall screws through both layers at 300mm vertical and 600mm horizontal centres.

A single layer of 100mm-thick Celotex RS5000 insulation was fixed to the Versaliner boards using 5.5×135mm self-drilling screws with IDR-70mm×70mm×0.6-0.8mm insulation retaining plates at 450-890mm horizontal and 160-690mm vertical centres. 3M Venture tape sealed all insulation board junctions on the exposed face in addition to the insulation core coincident with the combustion chamber opening.

60mm-deep×40mm-wide 'L'-shaped aluminium rails were fixed vertically to the 'L'-shaped helping hand brackets, using two 4.2×16mm self-drilling screws per bracket, at 210-600mm horizontal centres on the main wall and 365-600mm centres on the wing wall.

12mm-thick Marley Eternit natura boards, long edge horizontal, were fixed to the rails using 5.5×50mm self-drilling screws with Ø16mm EPDM washers at 150-310mm vertical centres (five fixings per column per board) and horizontal centres coincident with the lightweight steel frame studwork. Five full size boards, 1240mm-high, and one 1040mm-high board were installed above the combustion chamber opening with a horizontal panel joint nominally 2.5m above the opening. The main wall Marley Eternit natura boards were 79mm wider from the top of the combustion chamber upwards than those below.

There was a gap of 10mm between adjacent Marley Eternit natura boards on all sides and at the vertical junction between the main and wing wall.

12mm-thick Marley Eternit natura boards were fixed to the top and sides of the combustion chamber reveal using 5.5×50mm self-drilling screws with Ø16mm EPDM washers. At the top of the combustion

chamber reveal, there was a single line of fixings at nominal 300mm centres. At the vertical sides of the combustion chamber reveal, there were two columns of fixings: one at 300mm nominal vertical centres and one at 600mm nominal vertical centres. The columns were set 150mm apart.

The cladding system measured:

Requirement	Actual measurement
≥6000mm above the top of the combustion chamber	7248mm
≥2400mm width across the main wall	2850mm
≥1200mm width across the wing wall	1615mm
260mm (±100mm) wing wall-combustion chamber opening	253mm
2000mm×2000mm (±100mm) combustion chamber opening	1980mm-wide× 1986mm-high

5 Test Results

5.1 Test conditions

Test Date: 4th April 2018

Ambient Temperature: 12°C

Wind speed: 0 m/s

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

Thermocouple locations:

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

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

Level 2 – Midpoint of panel.

Level 2 – Midpoint of cavity.

Level 2 – Midpoint of insulation.

Level 2 – Midpoint of sheathing board.

Level 2 – Midpoint of lightweight steel frame.

Level 2 – Midpoint of plasterboard.

5.2 Temperature profiles

Figures 17-24 provide the temperature profiles recorded during the test. *Figure 10* shows the system before the test.

Parameter	Result
T_s, Start Temperature	12°C
t_s, Start time	2 minutes 0 seconds after ignition of crib.
Peak temperature / time at Level 2, External	422°C (13 minutes 0 seconds after t_s).
Peak temperature / time at Level 2, panel	263°C (27 minutes 40 seconds after t_s).
Peak temperature / time at Level 2, cavity	273°C (22 minutes 50 seconds after t_s).
Peak temperature / time at Level 2, insulation	130°C (24 minutes 10 seconds after t_s).
Peak temperature / time at Level 2, sheathing board	79°C (27 minutes 40 seconds after t_s).
Peak temperature / time at Level 2, partition	51°C (22 minutes 0 seconds after t_s).
Peak temperature / time at Level 2, plasterboard	27°C (23 minutes 30 seconds after t_s).

5.3 Visual observations

Table 1. Visual Observations – Refer to *Figure 2* for system schematic. Height measurements are approximate and given relative to a zero at the top of the combustion chamber. Unless otherwise specified, observations refer to the centre line above the combustion chamber on the main wall.

Time* (mm:ss)	t_s (mm:ss)	Description
00:00		Ignition of crib.
00:35		Flame tips to top of crib.
01:30		Flames escaping from the combustion chamber.
01:40		Flame tips to top of panel 1B.
02:00	00:00	Flame tips to mid-height of panel 2B. Start time (ts) crtiteria achieved: External temperature 2.5m above the top of the combustion chamber in excess of 212°C(=200°C+Ts).
02:10	00:10	Flame tips to top of panel 2B.
02:30	00:30	Flame tips to mid-height of panel 3B.
02:50	00:50	Flame tips to top of panel 3B.
03:30	01:30	Full-width flame emission from combustion chamber.
04:05	02:05	Flame tending towards wing wall 3m above the top of the combustion chamber.
06:00	04:00	Flame tips to mid-height of panel 4B. White discolouration along base of panel 2B.
07:30	05:30	No significant visual changes.
08:15	06:15	Sporadic flaming to mid-height of panel 4B.
09:00	07:00	Sporadic flaming to top of panel 4B.
10:15	08:15	White/pale discolouration to top of panel 2B.
11:15	09:15	White discolouration at base of panel 1B. Pale discolouration from mid-height.

Time* (mm:ss)	t_s (mm:ss)	Description
12:30	10:30	Discolouration of board in flame plume zone, approximately 1.8m wide at base, tapering to a height 3m above the top of the combustion chamber. Dark discolouration at top of combustion chamber sides, approximately 300mm-long.
13:50	11:50	Distortion at junction between panels 1B and 2B leading to increase in panel gap (nominally 20mm).
14:35	12:35	Cracks forming along bottom edge of panel 2B.
15:15	13:15	Sporadic flaming to mid-height of panel 5B.
15:45	13:45	Cracks forming along top edge of panel 1B. Gap between panels 1B and 2B increased to approximately 25mm.
16:30	14:30	Full-height vertical crack along panel 2B fixing locations (¼-width of combustion chamber from wing wall).
17:30	15:30	Full-height vertical crack along panel 1B fixing locations (¼-width of combustion chamber from wing wall). Dark discolouration up to 1.5m above the top of the combustion chamber on the wing wall.
19:00	17:00	Sporadic flaming to top of panel 5B.
19:30	17:30	Gap between panels 1B and 2B increased to approximately 30mm. White discolouration to top of panel 2B.
20:30	18:30	Dark discolouration on panel 3B. White discolouration at base of panel 4B.
21:25	19:25	Horizontal cracks forming at mid-height of panel 1B.
22:00	20:00	Flaming visible within cavity at junction between panels 1B and 2B.
24:30	22:30	Nominal 25mm gap at vertical crack on panel 2B. Distortion of panel 2B away from wall.
25:30	23:30	Gap between panels 1B and 2B increased to approximately 45mm.
26:00	24:00	Nominal 30mm gap at vertical crack on panel 1B.
27:25	25:25	Timber falls from crib.
28:00	26:00	Crack forming at base of panel 3B.
28:45	26:45	Nominal 50mm gap at vertical crack on panel 2B.

Time* (mm:ss)	t_s (mm:ss)	Description
30:00	28:00	Crib extinguished.
30:30	28:30	Continued flaming from beneath panel 2B. Flame tips to base of panel 4B.
31:50	29:50	Detachment of approximately 1.6m-wide×1.2m-high section of panel 2B (landed outside of 1.2m-deep×2.4m-wide fall zone).
33:00	31:00	Reduced intensity of flaming. Flame tips to top of panel 2B and flaming behind crack on panel 3B.
36:00	34:00	Flaming reduced to beneath panel 1B and perimeter of damaged zone on panels 2B and 3B.
42:00	40:00	Flaming continues (reduced intensity).
44:04	42:04	Detachment of approximately 500mm-wide×500mm-high section of panel 1B.
45:00	43:00	Reduced intensity of flaming. Flickering visible beneath right-hand side of panel 2B up to a height of 2m above the top of the combustion chamber.
48:00	46:00	Flame spread from beneath panel 2B (wing wall side of intact panels) onto face of insulation.
51:45	49:45	Flickering from centre of exposed insulation (panel 2B).
53:45	51:45	Flaming appears to have ceased in all areas except the remainder of panel 2B on the wing wall side of intact panels.
56:30	54:30	Flaming reduced to beneath top half of remainder of panel 2B. Flickering flaming has returned to exposed insulation.
60:00	58:00	Test terminated.

*Time from point of ignition.

6 Post-Test Damage Report

6.1 Marley Eternit panels

With reference to *Figure 2*, the damage observed to the Marley Eternit panels was as follows:

Panel 0A – 30% dark discolouration surrounded by brown discolouration, 30% pale discolouration with streaks of pale discolouration. A pattern of cracks was observed towards the main-wing wall junction.

Panel 0B – Mostly undamaged with light discolouration towards the top corner and dark discolouration towards the bottom corner adjacent to the combustion chamber opening.

Panel 0C – Mostly undamaged apart from a patch of light discolouration at the top corner adjacent to the combustion chamber opening.

Panel 1A – A patch of light discolouration (approximately 300mm-wide×900mm-high) towards the main-wing wall junction surrounded by brown discolouration. Dark discolouration towards the edge of the wing wall. A pattern of cracks was observed towards the main-wing wall junction.

Panel 1B – Detachment of a central section approximately 800mm-wide×1200mm-high. Light discolouration on the remainder of the panel surrounded by streaks of dark and pale discolouration. Patterns of cracks were observed on the remaining sections of the panel contained between the bounds of the combustion chamber opening.

Panel 2A – 20% dark discolouration towards the main-wing wall junction surrounded by brown discolouration.

Panel 2B – Detachment of a central section approximately 1200mm-wide×1200mm-high. Light discolouration on the remainder of the panel surrounded by localised areas of dark discolouration. Patterns of cracks were observed on the remaining section of the panel adjacent to the wing wall.

Panel 3A – Brown discolouration towards the base of the panel local to the main-wing wall junction.

Panel 3B – Localised areas of dark and pale discolouration covering a width of approximately 2000mm towards the main-wing wall junction. Cracks were observed near the centre of the panels.

Panel 4A – 70% minor discolouration.

Panel 4B – 5% white discolouration at base surrounded by 20% dark discolouration. 60% smoke discolouration. Cracks were observed near the base of the panels.

Panel 5A – 40% minor discolouration.

Panel 5B – 80% smoke discolouration.

Panel 6A – 10% minor discolouration.

Panel 6B – 70% smoke discolouration.

Combustion chamber surround.

On the panels fitted to the sides of the combustion chamber there was dark discolouration towards the base of the panels with streaks of pale discolouration and localised areas of smoke discolouration. A series of horizontal cracks were observed across the height of the panels.

On the panel fitted to the top of the combustion chamber there was a section of partial detachment due to cracking approximately 500mm-wide. On the remainder of the panel there was cracking near the centre with localised areas of smoke discolouration.

6.2 Insulation

6.2.1 Main wall

From the ground to the first horizontal cavity barrier there was no visible damage to the insulation either side of the combustion chamber.

Between the first and second row of horizontal cavity barriers

There was no visible damage to the insulation from the outside edge of the main wall to the vertical cavity barrier at the outside edge of the combustion chamber.

In line with the combustion chamber opening the insulation was 90% charred with localised areas of sheathing board visible. The remaining insulation had smoke staining and localised dark discolouration.

Between the vertical cavity barrier at the wing wall edge of the combustion chamber and the main-wing wall junction there was no visible damage.

Between the second and third row of horizontal cavity barriers

There was no visible damage from the outside edge of the main wall to the vertical cavity barrier in line with the outside edge of the combustion chamber.

In line with the combustion chamber opening the insulation was 80% charred with 15% dark discolouration and 5% smoke staining.

Between the vertical cavity barrier in line with the wing wall edge of the combustion chamber and the main-wing wall junction there was no visible damage.

Between the third and fourth row of horizontal cavity barriers

There was no visible damage between the outside edge of the main wall and the vertical cavity barrier at the outside edge of the combustion chamber.

In line with the combustion chamber opening there was smoke staining across the surface of the insulation with localised areas of dark discolouration near the rails.

Between the vertical cavity barrier at the wing wall edge of the combustion chamber and the main-wing wall junction there was no visible damage.

6.2.2 Wing wall

From the ground to the first row of horizontal cavity barriers there was no visible damage.

Between the first and second horizontal cavity barriers there was some smoke discolouration and distortion in the outer foil of the insulation local to the main-wing wall junction.

Between the second and third horizontal cavity barriers there was no visible discolouration with some distortion in the outer foil of the insulation local to the main-wing wall junction.

Between the third and fourth horizontal cavity barriers there were localised areas of minor discolouration.

6.3 Aluminium rail substructure

The aluminium rail at the centreline of the combustion chamber had been mostly consumed up to a height of approximately 2750mm above the combustion chamber. The supporting 'L'-shaped helping hand brackets had been partially consumed and the plastic isolation pads mostly melted. A section of rail remained intact between the first and second horizontal cavity barriers.

The aluminium rail to the right of the combustion chamber centreline had been consumed up to a height of approximately 2000mm above the combustion chamber. The supporting 'L'-shaped helping hand brackets had been substantially consumed and the plastic isolation pads mostly melted.

The aluminium rail in line with the wing wall edge of the combustion chamber had an area of partial consumption and distortion across an area, approximately 1200mm-high, above the second horizontal cavity barrier. The supporting 'L'-shaped helping hand brackets had been partially consumed and the plastic isolation pads mostly melted.

There was smoke discolouration to all rails across the width of the combustion chamber opening up to the height of the third horizontal cavity barrier. Above this, there were small areas of localised discolouration.

There was no evidence of damage or discolouration to rails positioned outside the width of the vertical cavity barriers in line with the combustion chamber opening.

6.4 Horizontal intumescent cavity barriers

6.4.1 First row of horizontal cavity barriers

Main wall

From the outside edge of the main wall to the vertical cavity barrier at the outside edge of the combustion chamber there was no activation of the intumescent strip.

In line with the combustion chamber opening there was full activation of the intumescent strip with 70% detachment of the barrier.

Between the vertical cavity barrier at the wing wall edge of the combustion chamber and the main-wing wall junction there was partial activation of the intumescent strip.

Wing wall

Between the main-wing wall junction and the vertical cavity barrier local to the main-wing wall junction there was no activation.

From the vertical cavity barrier local to the main-wing wall junction the intumescent strip had fully activated across a width of approximately 600mm. Beyond this the intumescent strip had only been partially activated.

6.4.2 Second row of horizontal cavity barriers

Main wall

From the outside edge of the main wall to the vertical cavity barrier in line with the outside edge of the combustion chamber there was no activation of the intumescent strip.

In line with the combustion chamber opening there was full activation of the intumescent strip with partial detachment of the cavity barrier.

Between the vertical cavity barrier at the wing wall edge of the combustion chamber and the main-wing wall junction there was partial activation.

Wing wall

Between the main-wing wall junction and the vertical cavity barrier local to the main-wing wall junction there was partial activation.

From the vertical cavity barrier at the main-wing wall junction the intumescent strip had fully activated across a width approximately 1000mm. Beyond this there was no activation of the intumescent strip.

6.4.3 Third row of horizontal cavity barriers

Main wall

From the outside edge of the main wall to the vertical cavity barrier in line with the outside edge of the combustion chamber there was no activation.

In line with the combustion chamber opening there was full activation.

Between the vertical cavity barrier at the wing wall edge of the combustion chamber and the main-wing wall junction there was partial activation.

Wing wall

From the main-wing wall junction the intumescent strip had partially activated across a width approximately 400mm. Beyond this there was no evidence of activation.

6.4.4 Fourth row of horizontal cavity barriers

Main wall

From the outside edge of the main wall to the vertical cavity barrier in line with the outside edge of the combustion chamber there was no activation.

From the vertical cavity barrier at the outside edge of the combustion chamber to the main-wing wall junction there was partial activation of the intumescent strip.

Wing wall

The intumescent strip showed the early signs of activation but no expansion.

6.5 Vertical cavity barriers

The vertical cavity barrier at the outside edge of the combustion chamber had no visible damage up to the height of the second horizontal cavity barrier. Above the second horizontal cavity barrier there were localised areas of discolouration.

The vertical cavity barrier at the wing wall edge of the combustion chamber had minor damage up to the height of the second horizontal cavity barrier except for an area of dark discolouration at ground level. Between the second and third horizontal cavity barriers there were localised areas of dark discolouration. Between the third and fourth horizontal cavity barriers there were localised areas of discolouration.

On the wing wall vertical barrier local to the main-wing wall junction there were localised areas of discolouration up to the height of the first horizontal cavity barrier. Between the first and second horizontal cavity barriers there was discolouration across the full height. From the second horizontal cavity barrier there was an area of discolouration approximately 600mm-high. From the third to the fourth horizontal cavity barriers there was no visible damage.

On the vertical barrier at the outside edge of the wing wall there was no visible damage across the full height.

6.6 Sheathing board

Main wall

Up to the height of the first row of horizontal cavity barriers there was smoke discolouration.

Between the first and second horizontal cavity barriers there was smoke discolouration with a pattern of dark discolouration approximately 600mm-wide aligned with the centreline of the combustion chamber.

Between the second and third horizontal cavity barriers there was a pattern of dark discolouration surrounded by smoke discolouration varying from approximately 1000mm to 2000mm-wide adjacent to the vertical cavity barrier at the wing wall edge of the combustion chamber. Above this height there was no visible damage except for a strip of smoke discolouration in line with the fourth horizontal cavity barrier.

Wing wall

Up to the height of the second row of horizontal cavity barriers there was no visible damage.

Immediately above the second row of horizontal cavity barriers there was an area of discolouration local to the main-wing wall junction. Above this there was no visible damage.

6.7 Lightweight steel framework partition

Up to the height of the second row of ‘floor slabs’ (approximately 3m above the combustion chamber opening) there were localised areas of dark and smoke discolouration. Above this there was no visible damage.

7 Conclusion

BS8414 -2:2015 + A1:2017 [1] does not contain acceptance criteria and therefore this test report does not indicate a pass or fail of the product.

8 Reference

1. BS 8414-2:2015 + A1:2017, 'Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame', British Standards Institution, London, 2015.

9 Figures

9.1 Dimensions of test apparatus

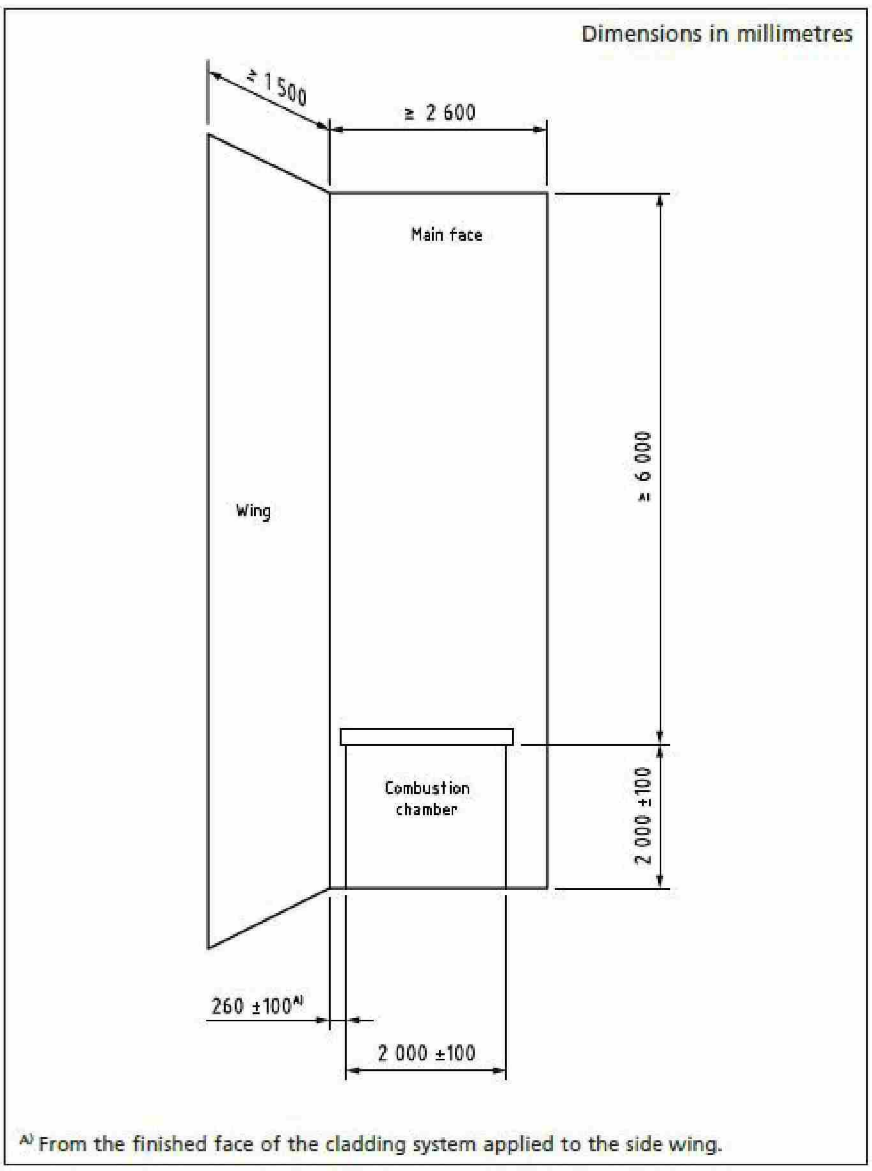

Figure 1. Test apparatus dimensions as specified by test Standard[1].

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

9.2 Diagrams of finished face of the cladding system

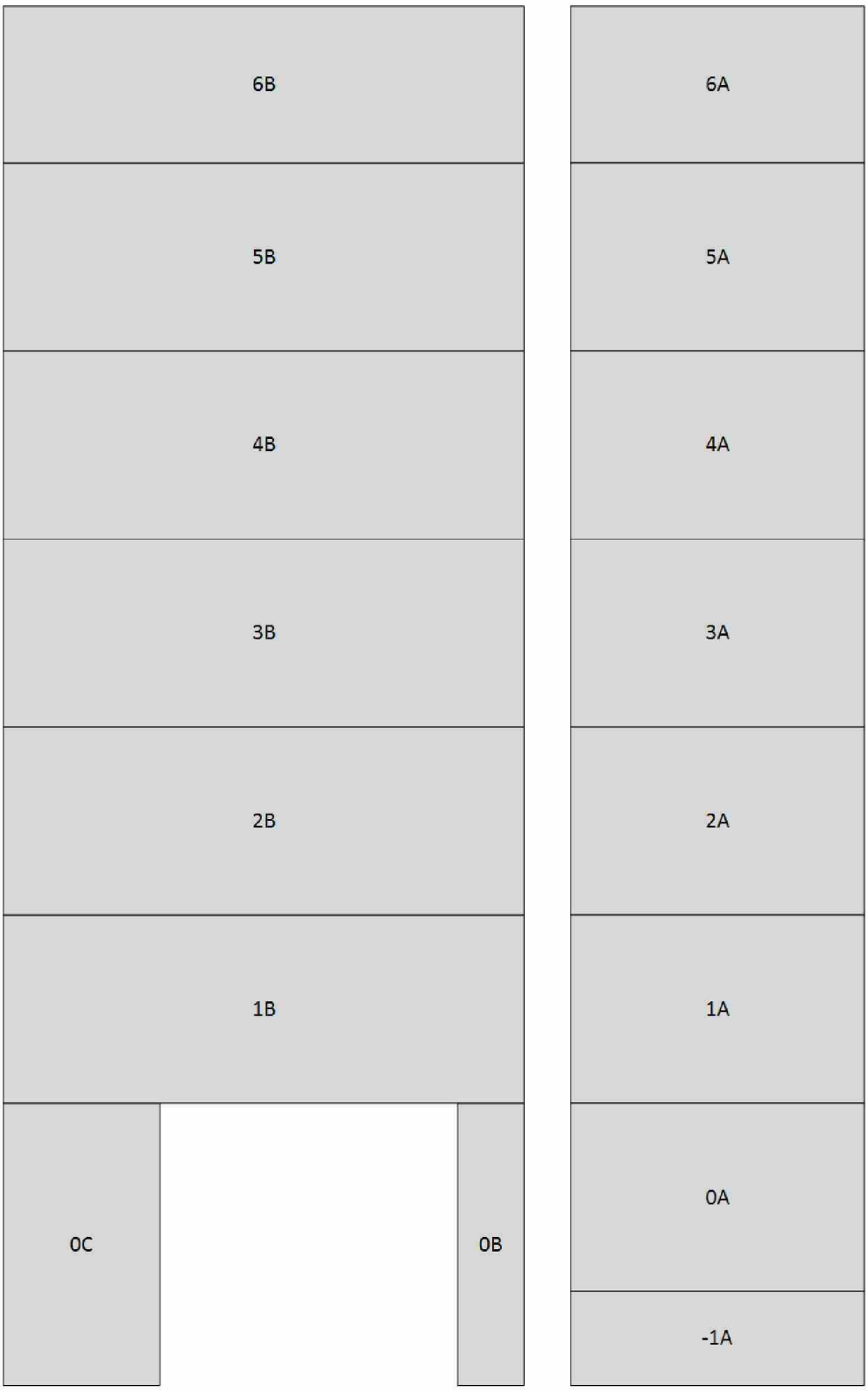

Figure 2. Layout of panels and numbering system used for reporting. Not to scale.

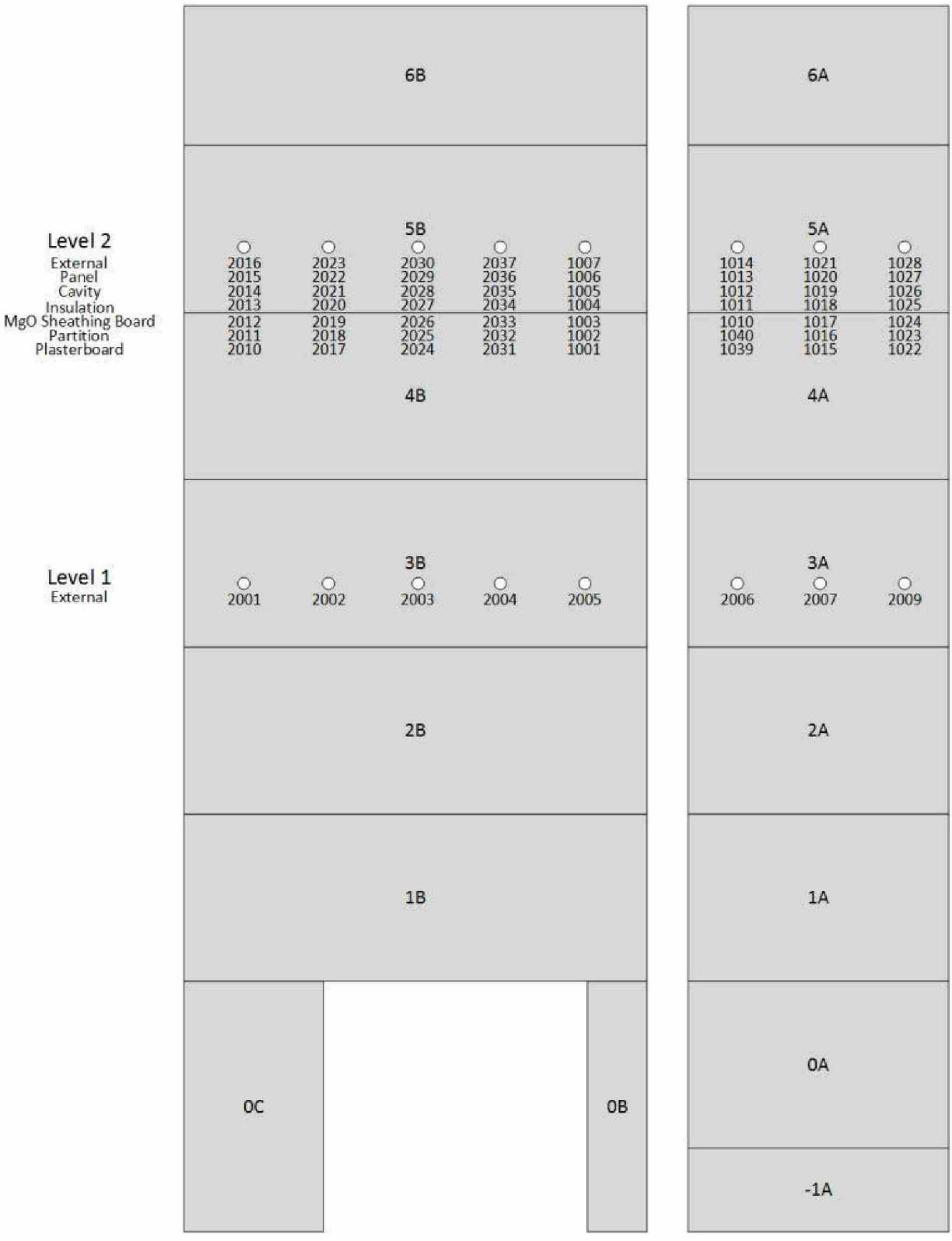

Figure 3. TC positions and panel numbering (-1A – 6B). Not to scale.

9.3 Installation photographs

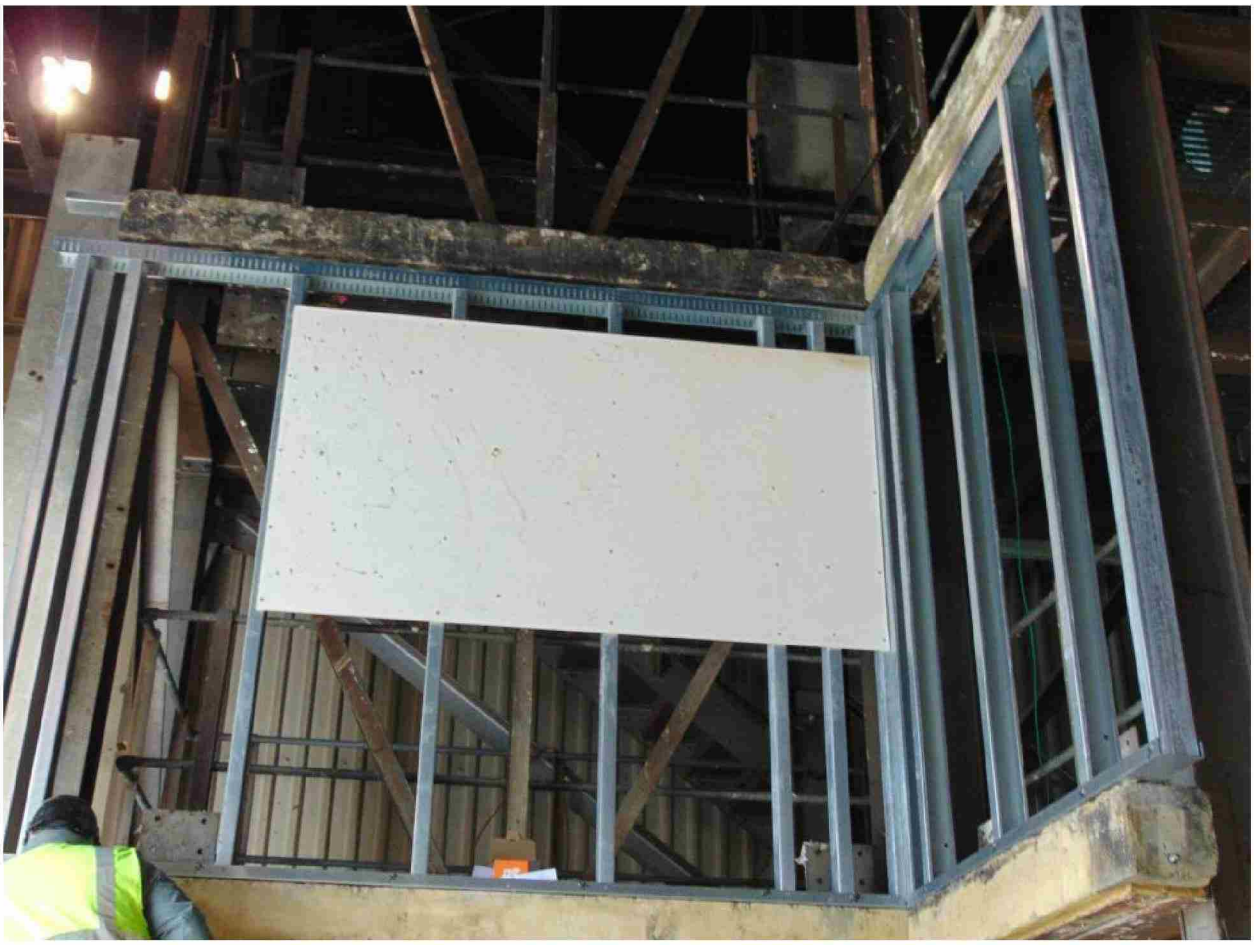

Figure 4. Lightweight steel framework partition between floor slabs with single sheathing board fitted.

Figure 5. Full-height view of sheathing board layer.

Figure 6. Second row of horizontal cavity barriers installed.

Note: First row of horizontal cavity barriers not yet installed.

Figure 7. Junction between horizontal and vertical cavity barriers.

Figure 8. 'L'-shaped helping hand brackets fitted to the sheathing board.

Figure 9. Insulation, cavity barriers and rail substructure fitted to the main wall.

Figure 10. Full-height view of complete system prior to test.

9.4 System drawings

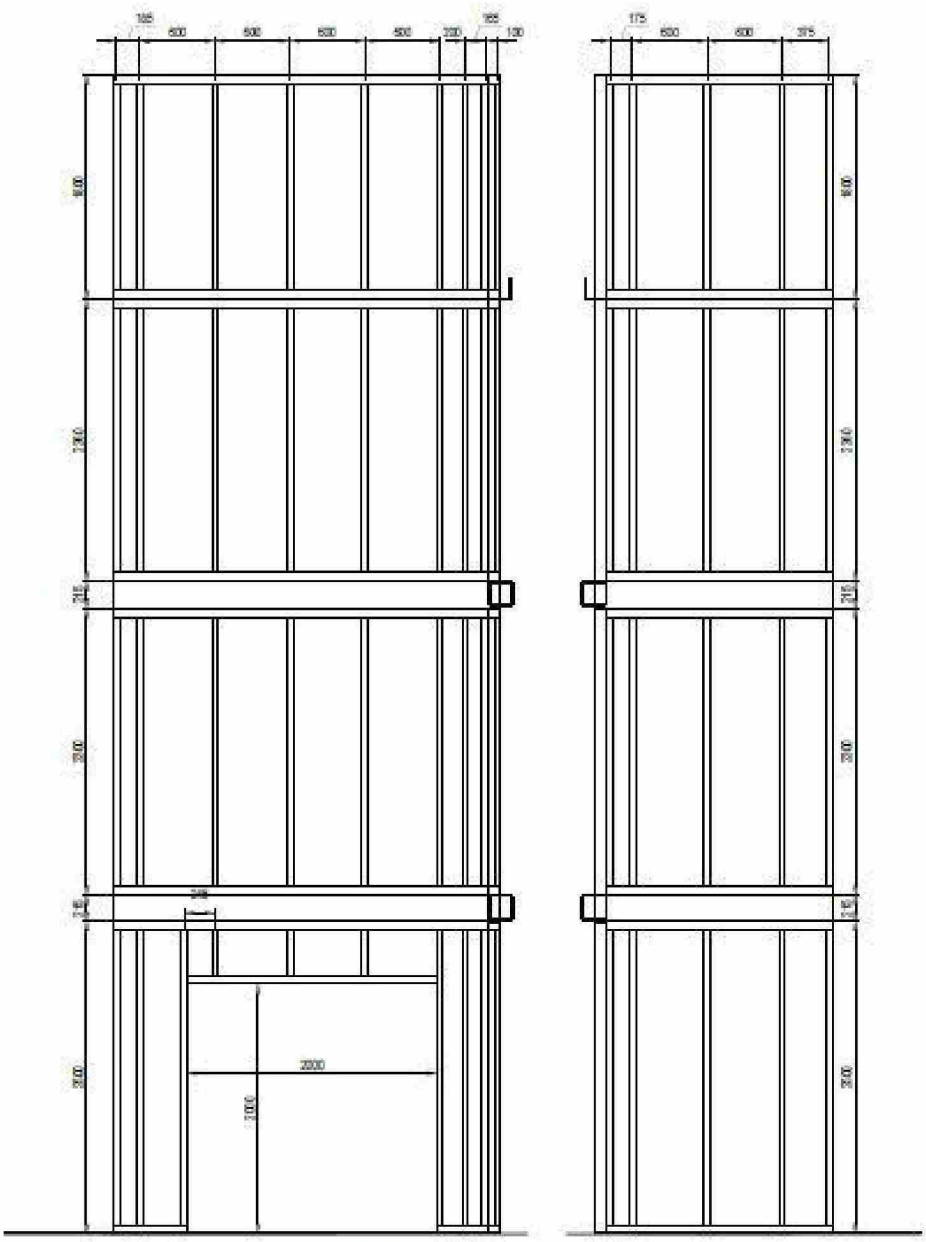

Figure 11. Partition layout (drawing supplied by Test Sponsor).

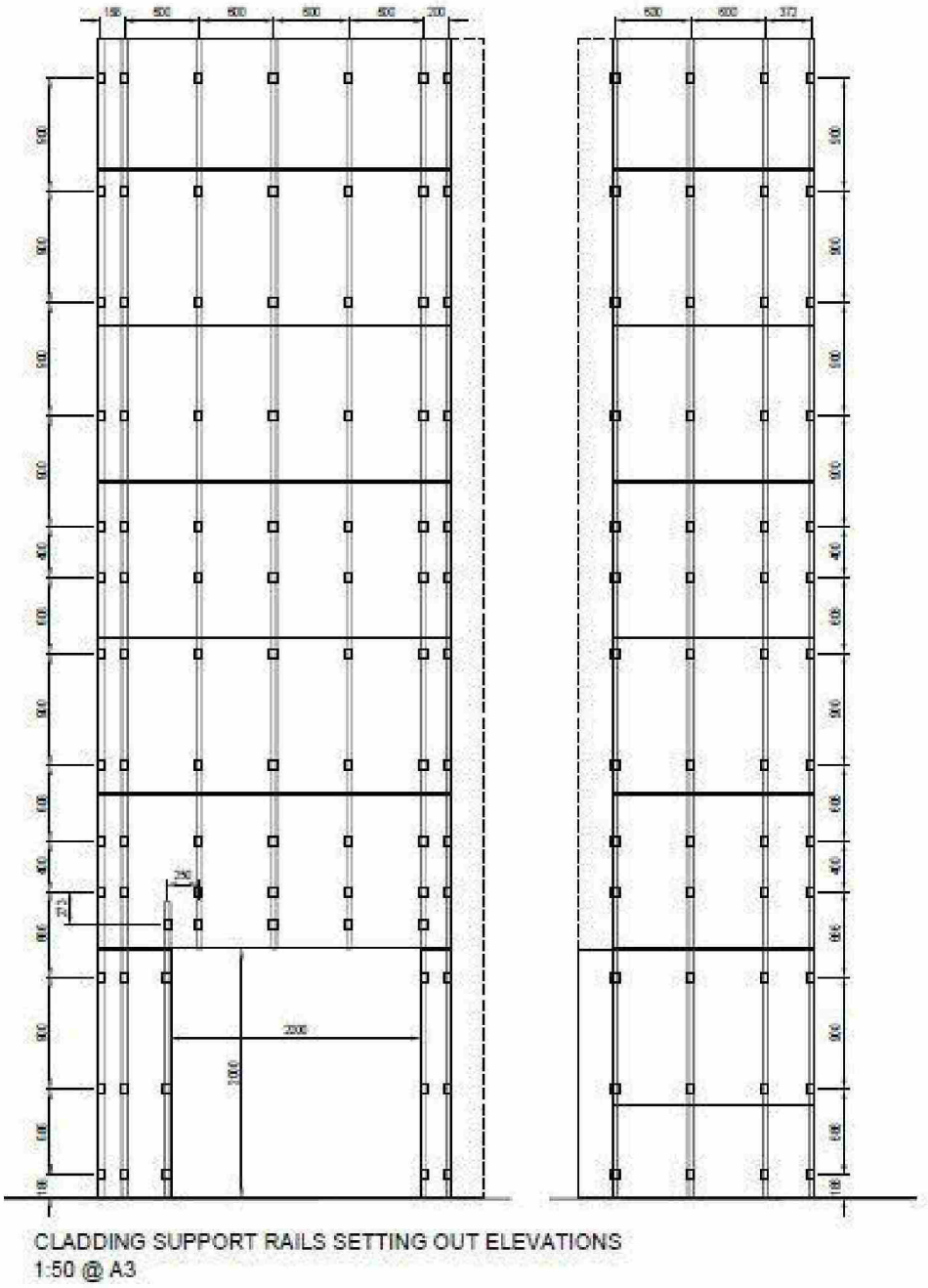

Figure 12. Rail layout (drawing supplied by Test Sponsor).

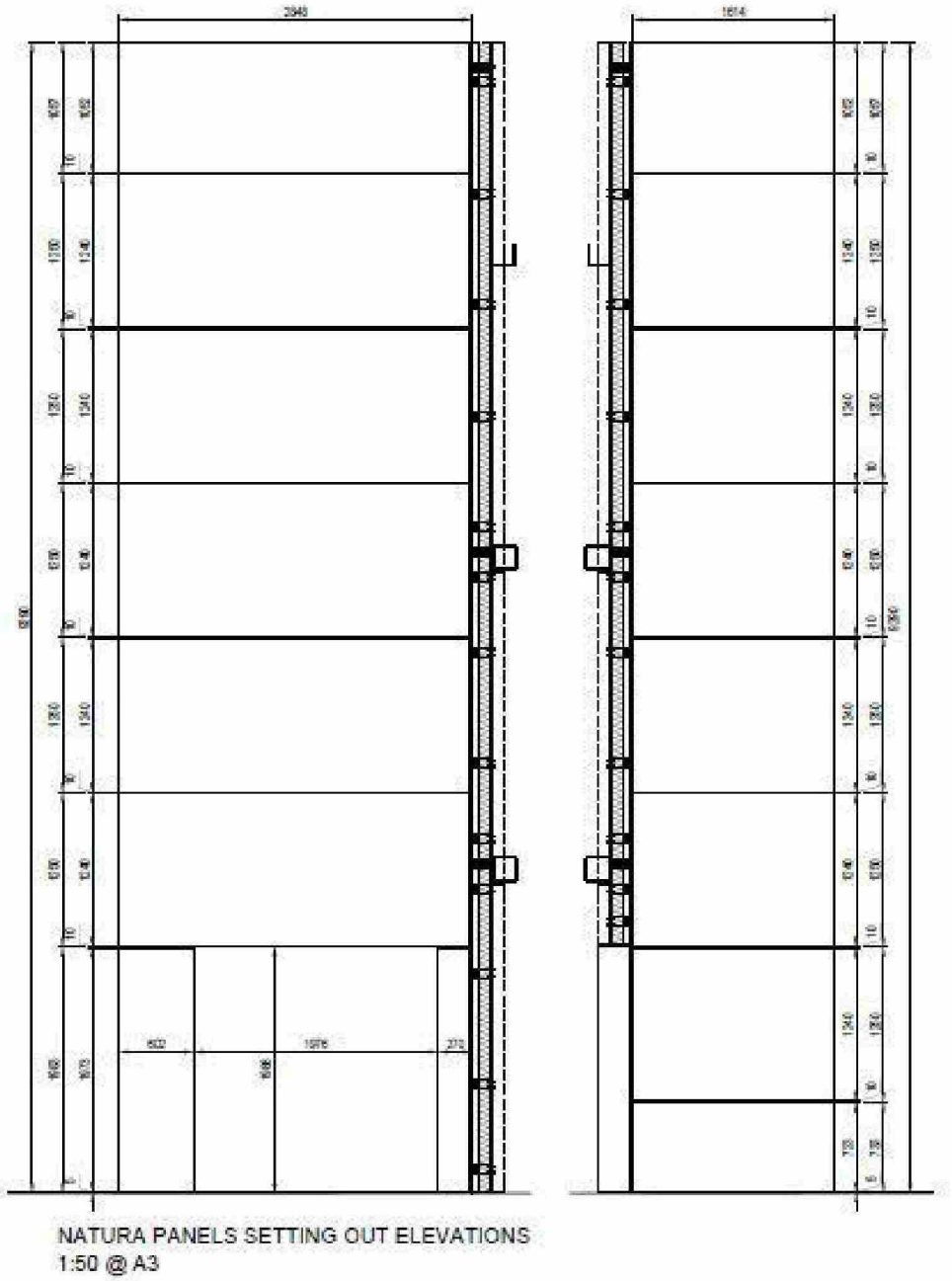

Figure 13. Panel layout (drawing supplied by Test Sponsor).

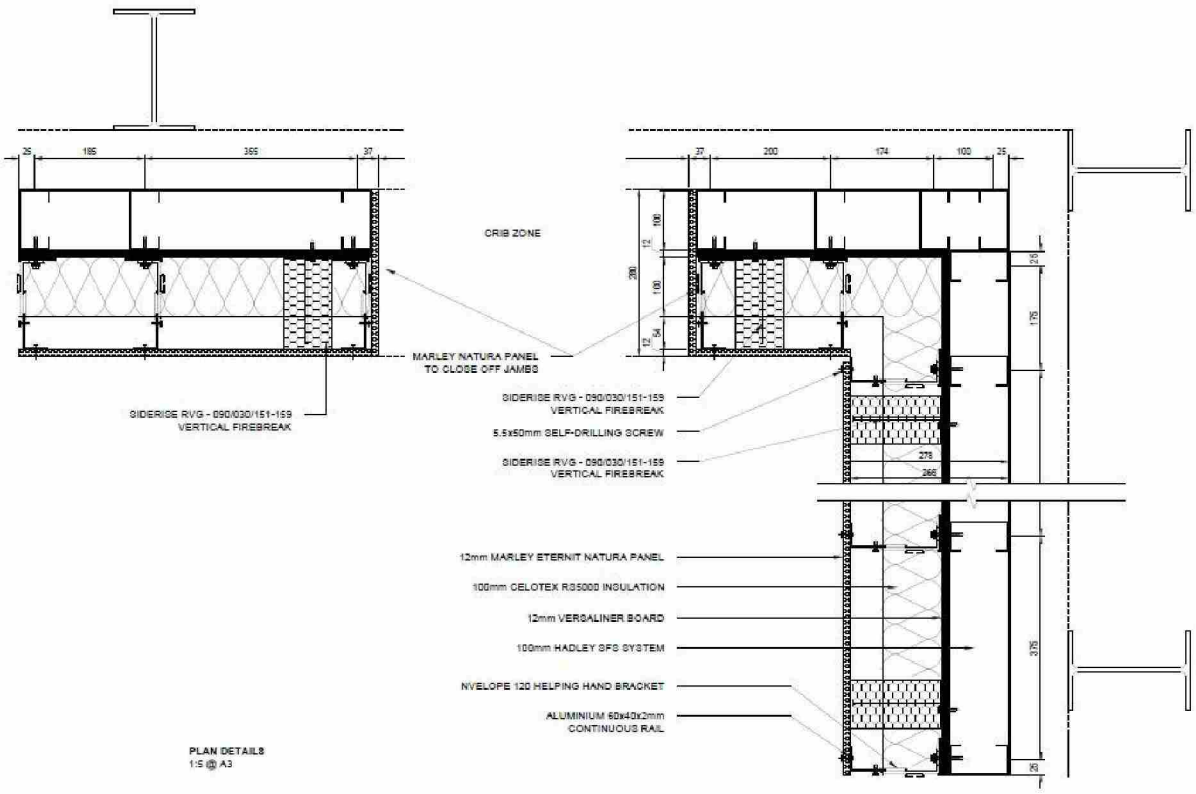

Figure 14. Plan view cross-section detailing layers of system (drawing supplied by Test Sponsor).

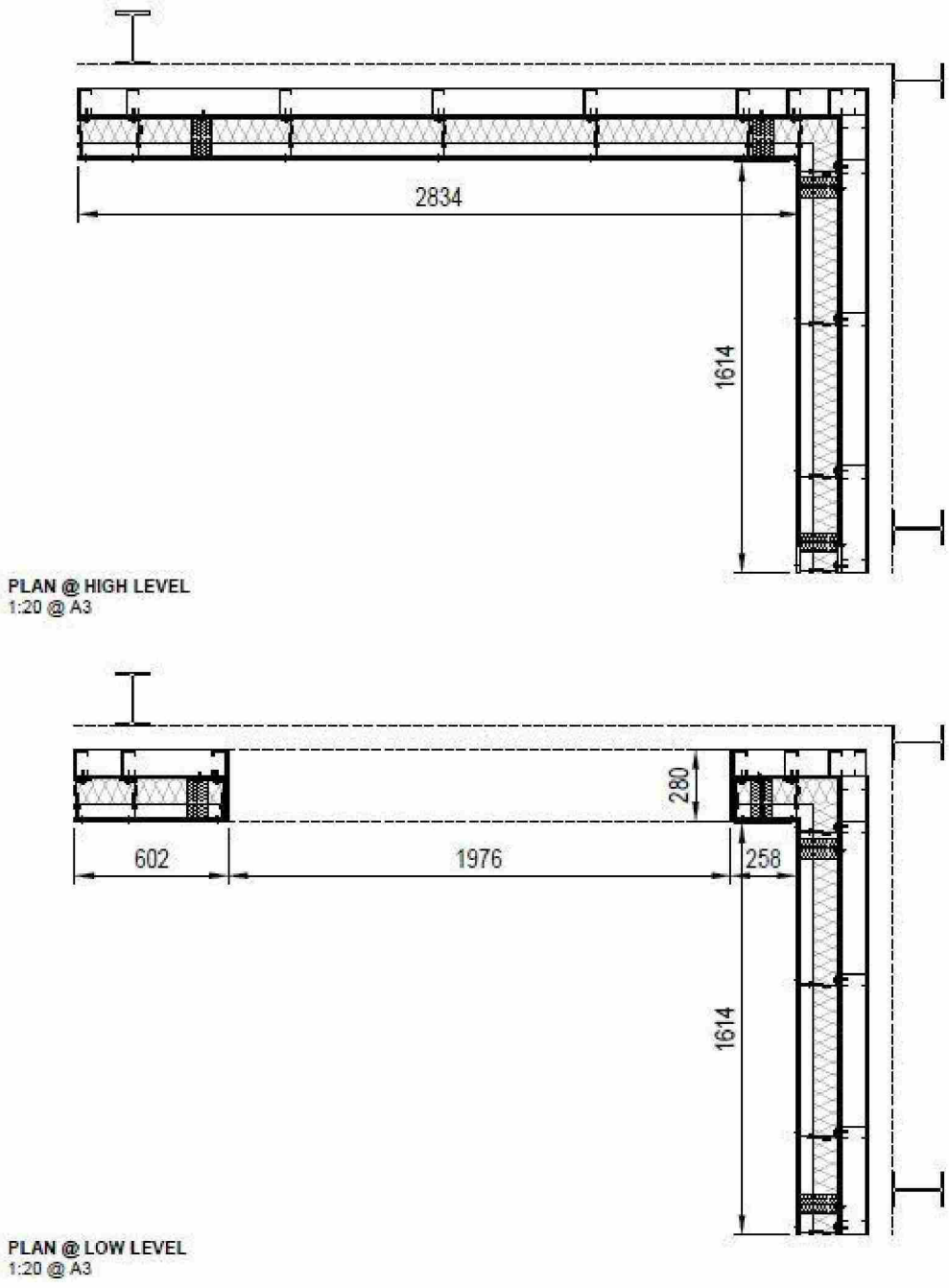

Figure 15. Plan view of system (drawing supplied by Test Sponsor).

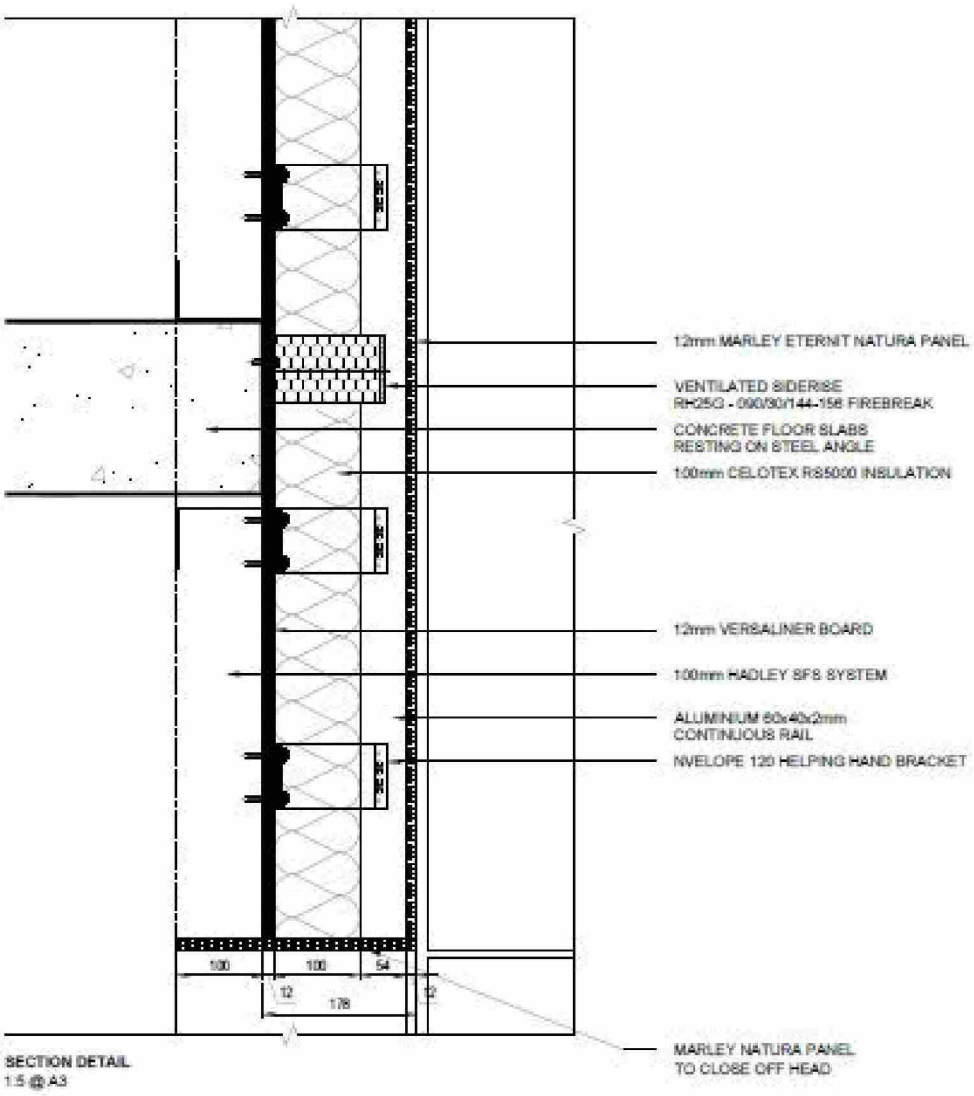

Figure 16. Side view cross-section detailing layers of system (drawing supplied by Test Sponsor).

9.5 Temperature data

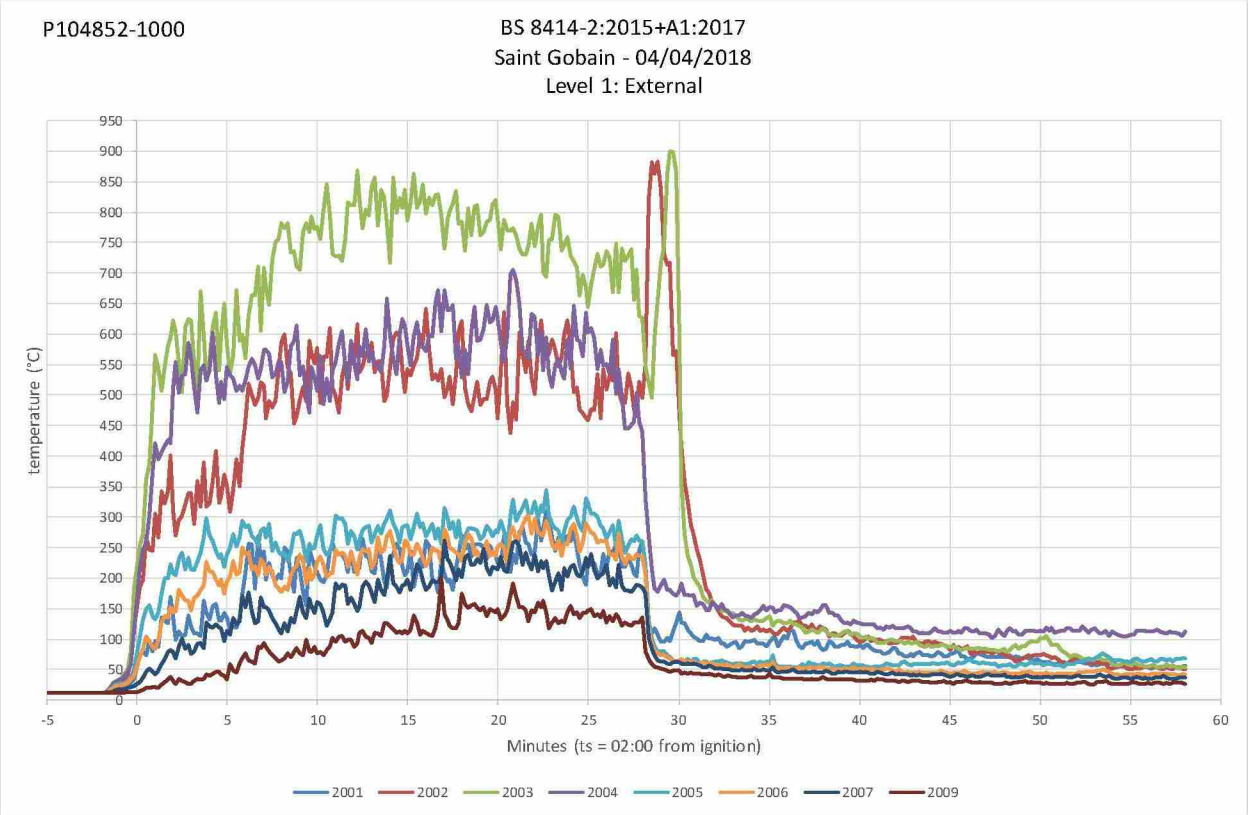

Figure 17. Level 1 external thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

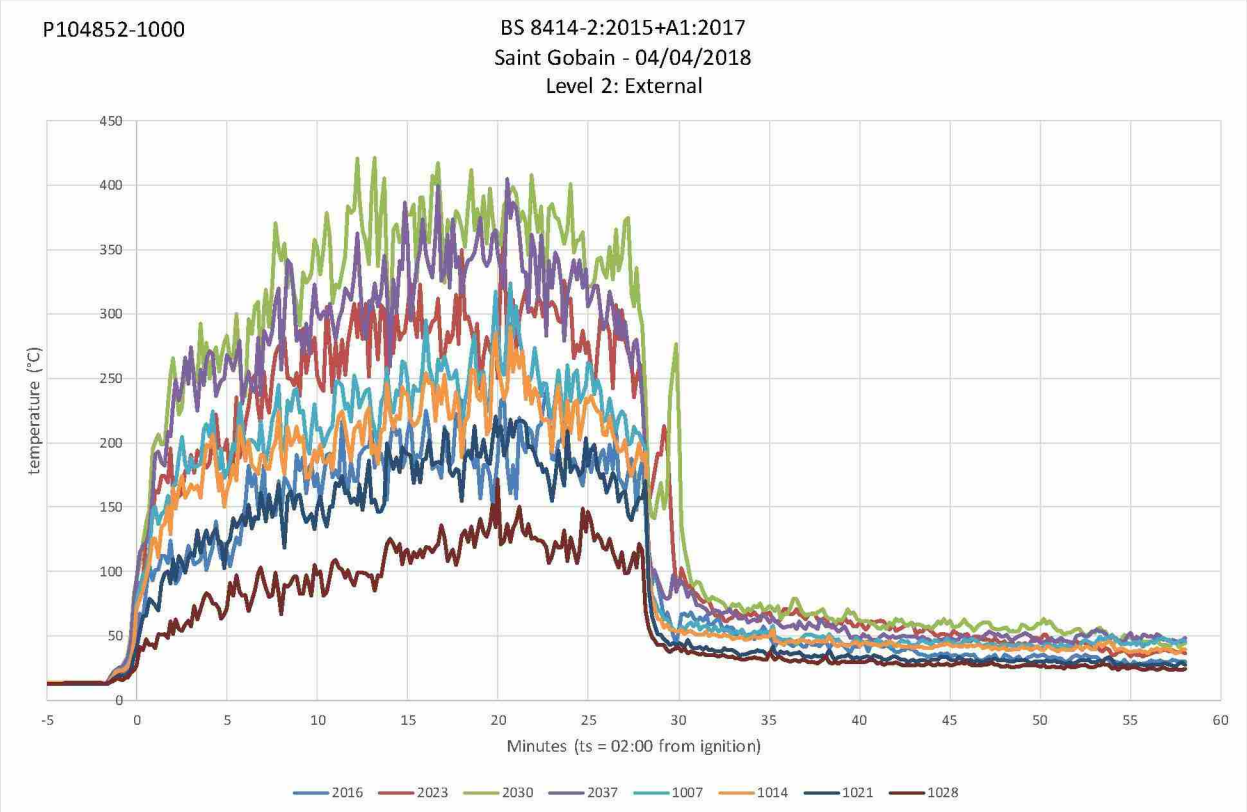

Figure 18. Level 2 external thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

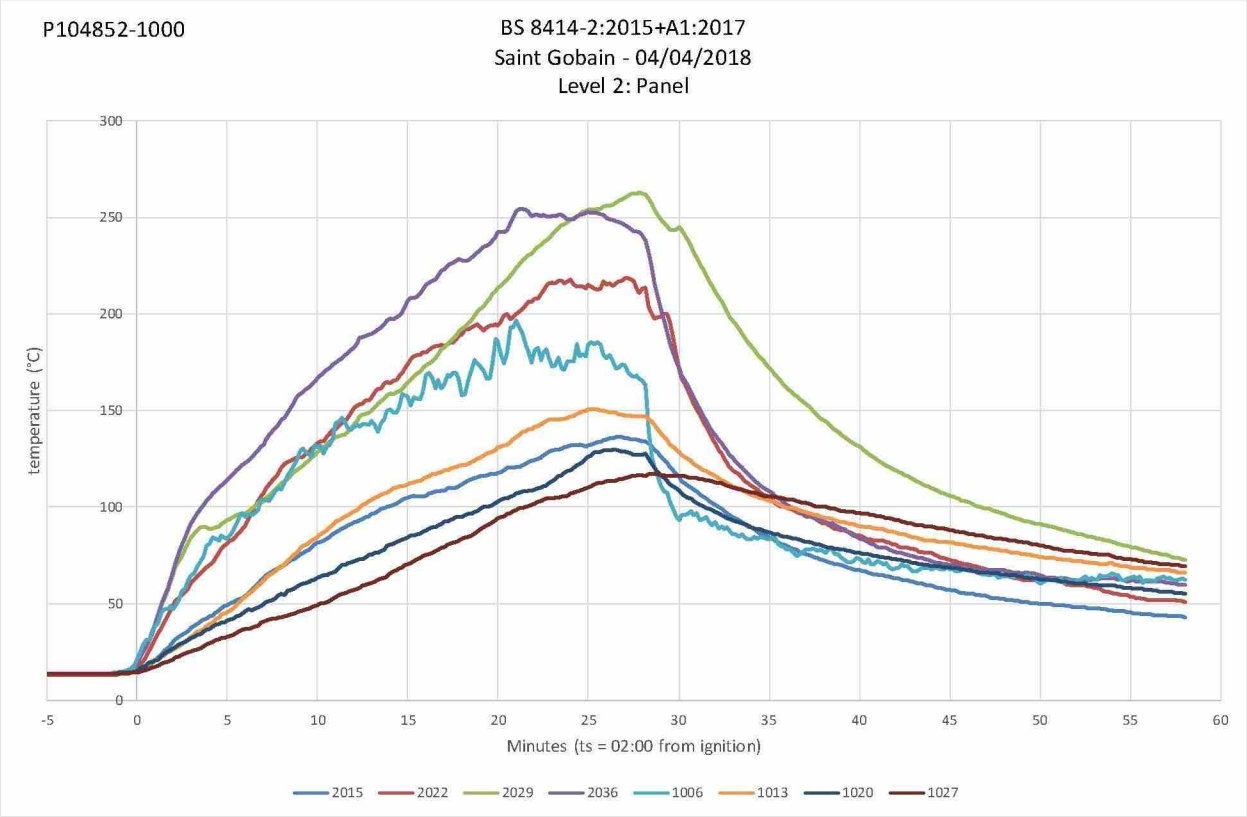

Figure 19. Level 2 panel thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

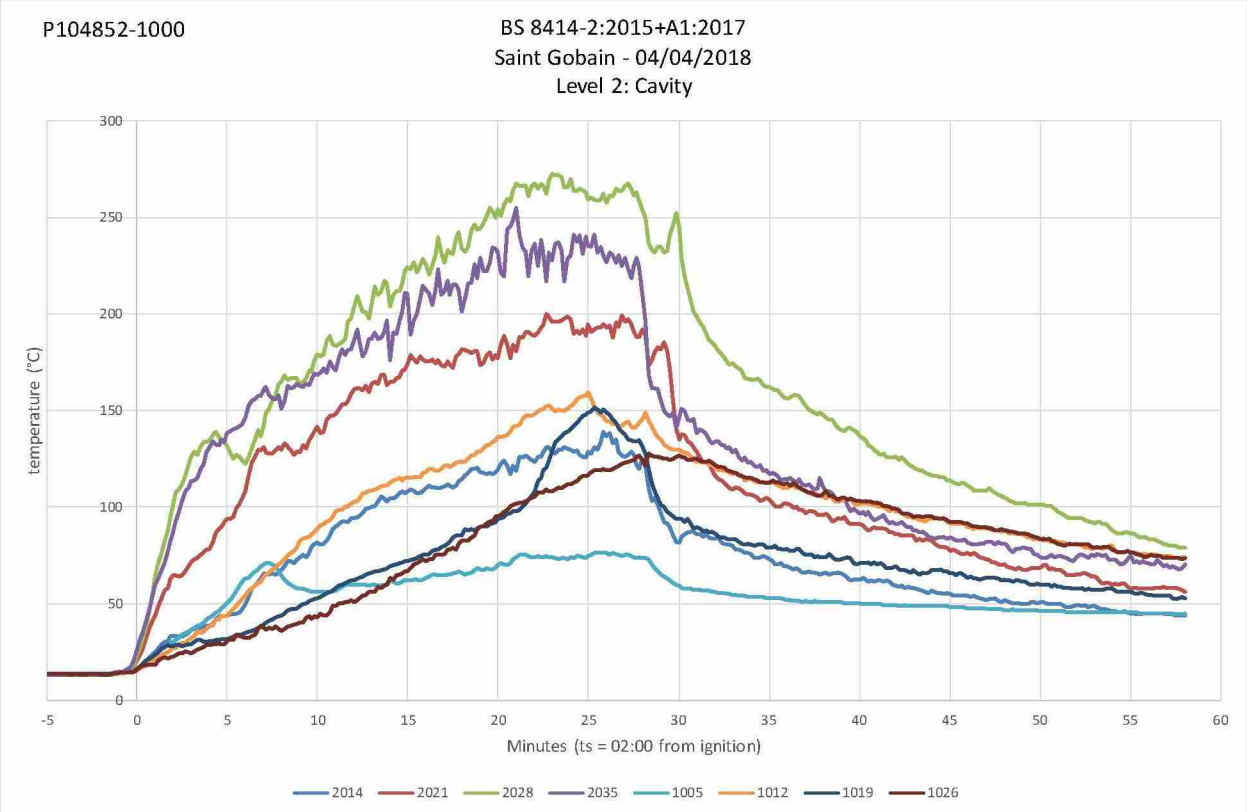

Figure 20. Level 2 cavity thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

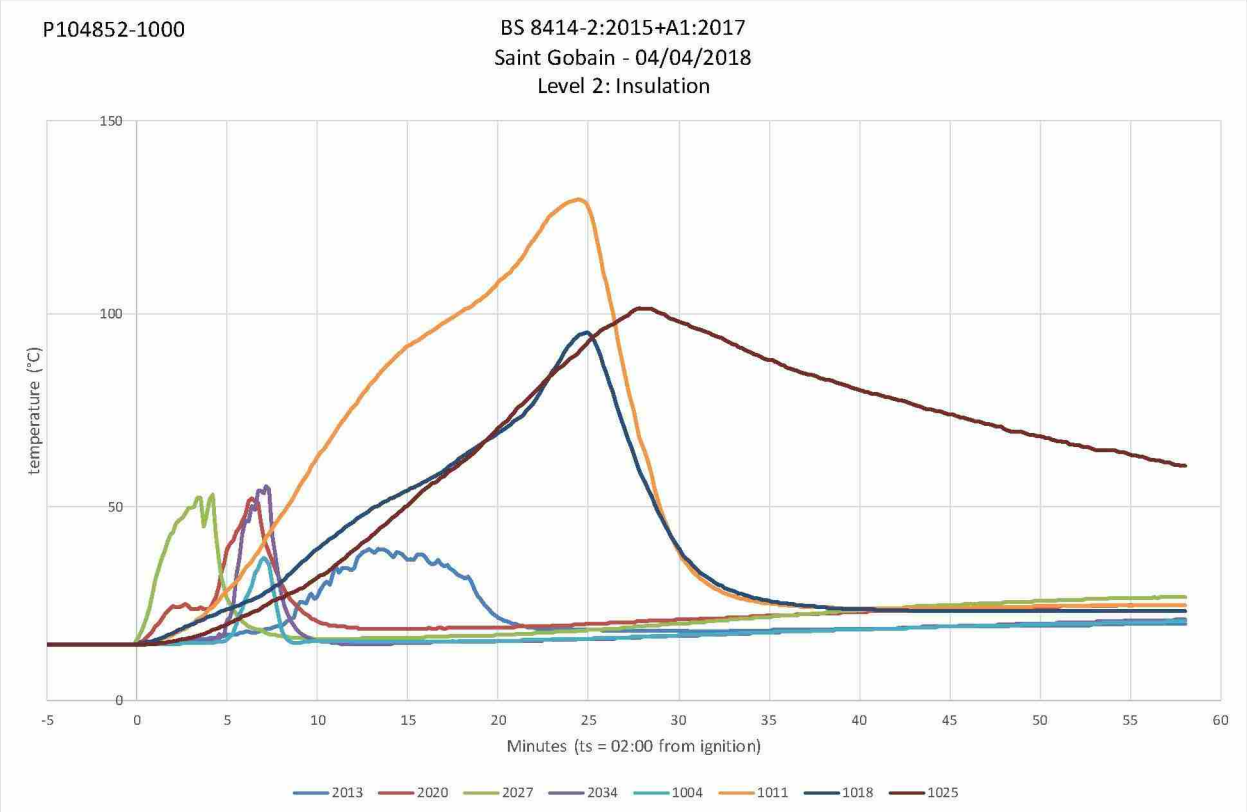

Figure 21. Level 2 insulation thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

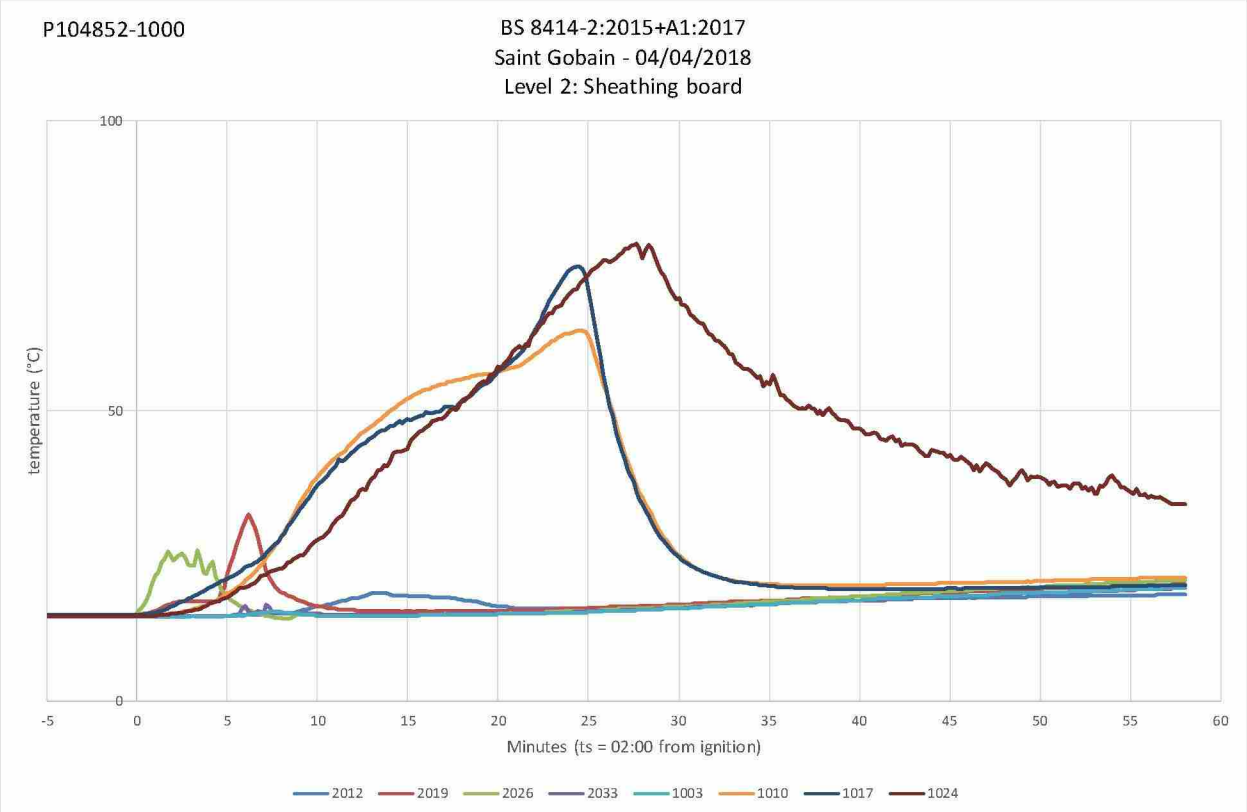

Figure 22. Level 2 sheathing board thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

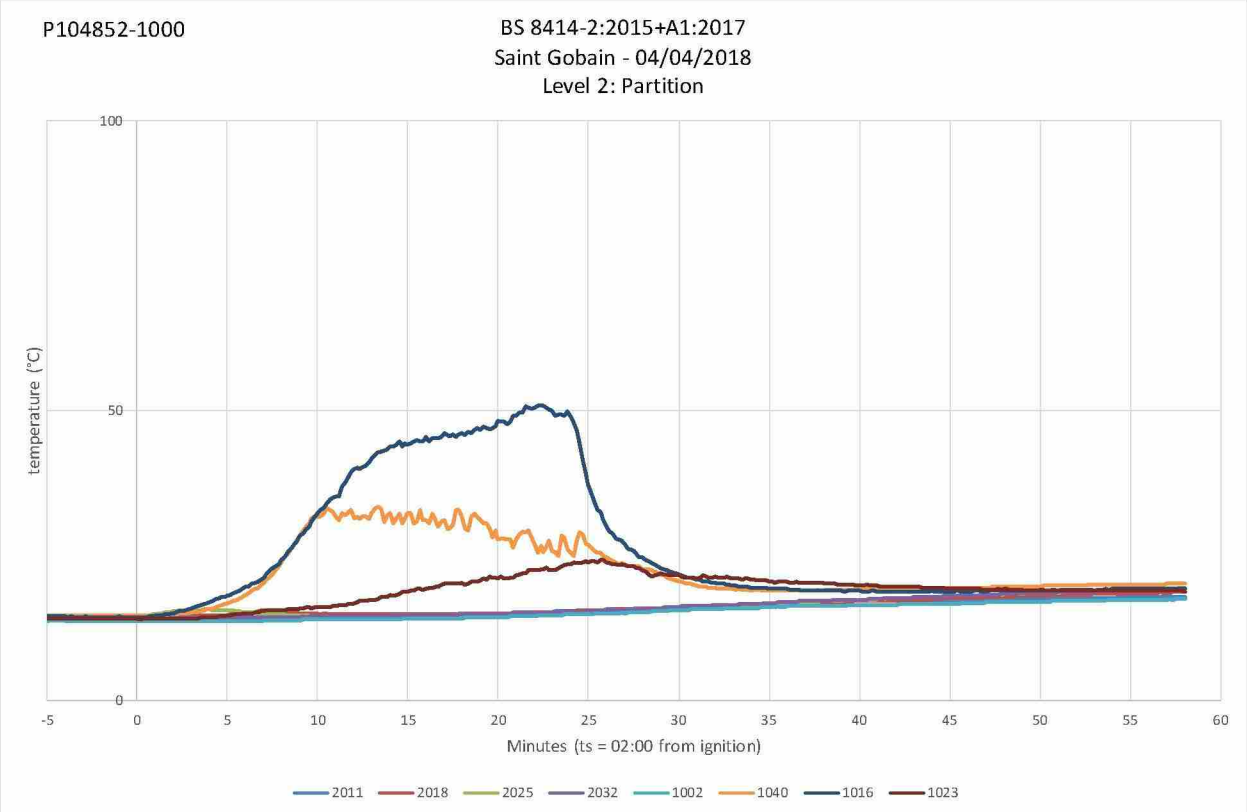

Figure 23. Level 2 partition thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

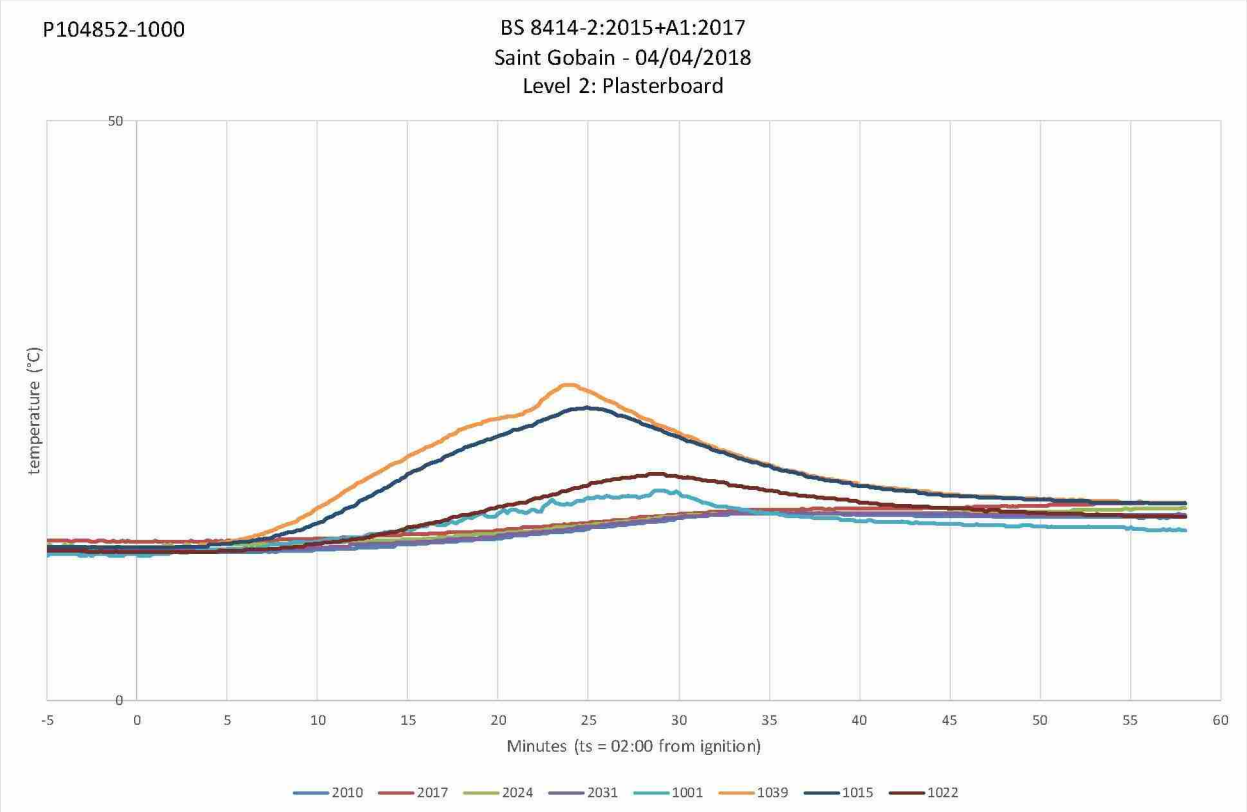

Figure 24. Level 2 plasterboard thermocouples.

t_s=2 mins 0 secs after ignition of the crib.

9.6 Post-test photographs

Figure 25. Post-test view of tested system from the top of the combustion chamber to the top of the cladding system.

Figure 26. Post-test view of panels adjacent to combustion chamber.

Figure 277. Post-test main wall view of insulation, rail substructure and cavity barriers from the top of the combustion chamber to the top of the cladding system.

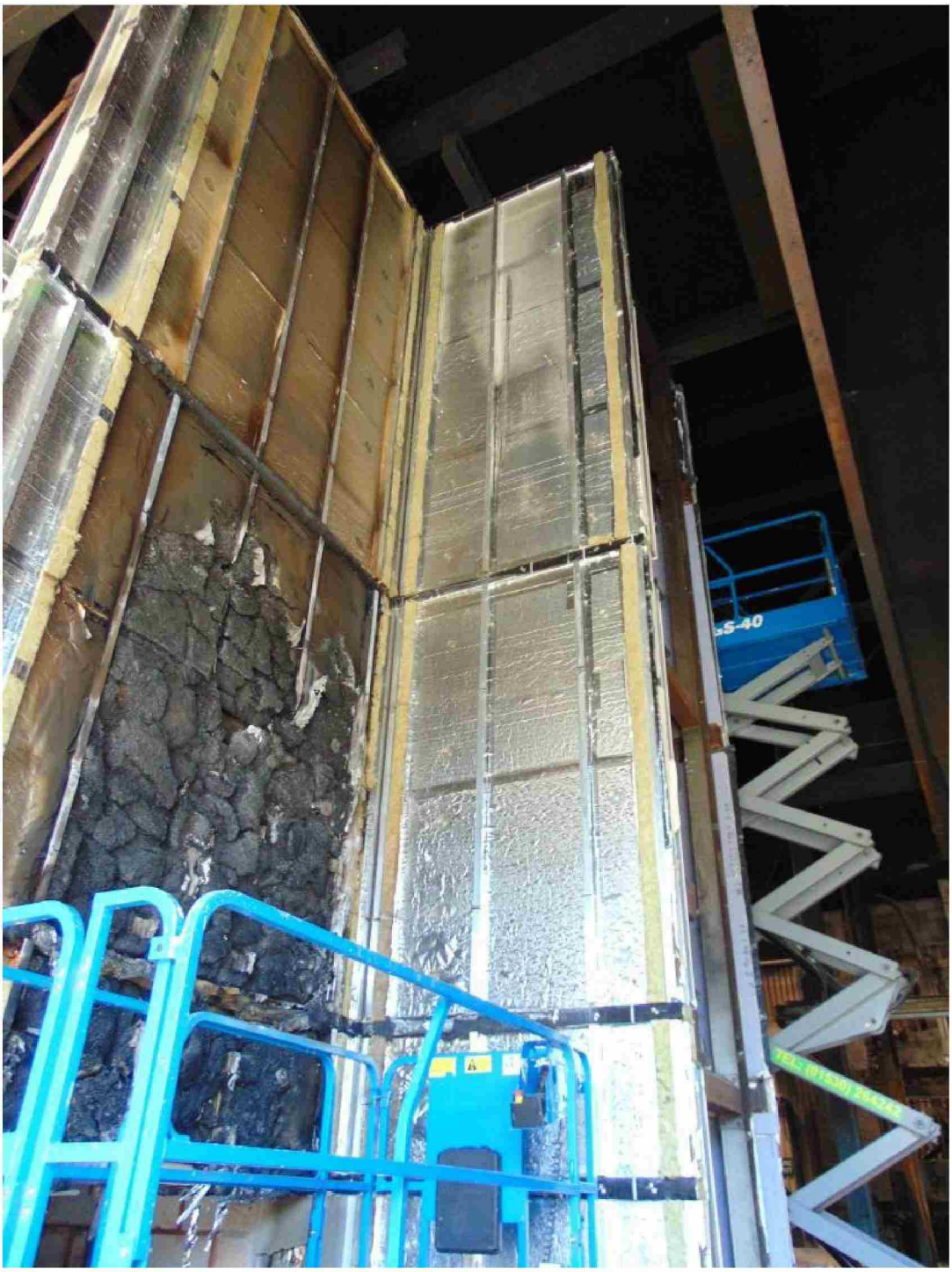

Figure 288. Post-test wing wall view of insulation, rail substructure and cavity barriers from the top of the combustion chamber to the top of the cladding system.

Figure 29. Post-test close up of main wall insulation, rail substructure and cavity barriers above the combustion chamber opening.

Figure 30. Post-test main wall view of sheathing board and brackets from the top of the combustion chamber to the top of the cladding system.

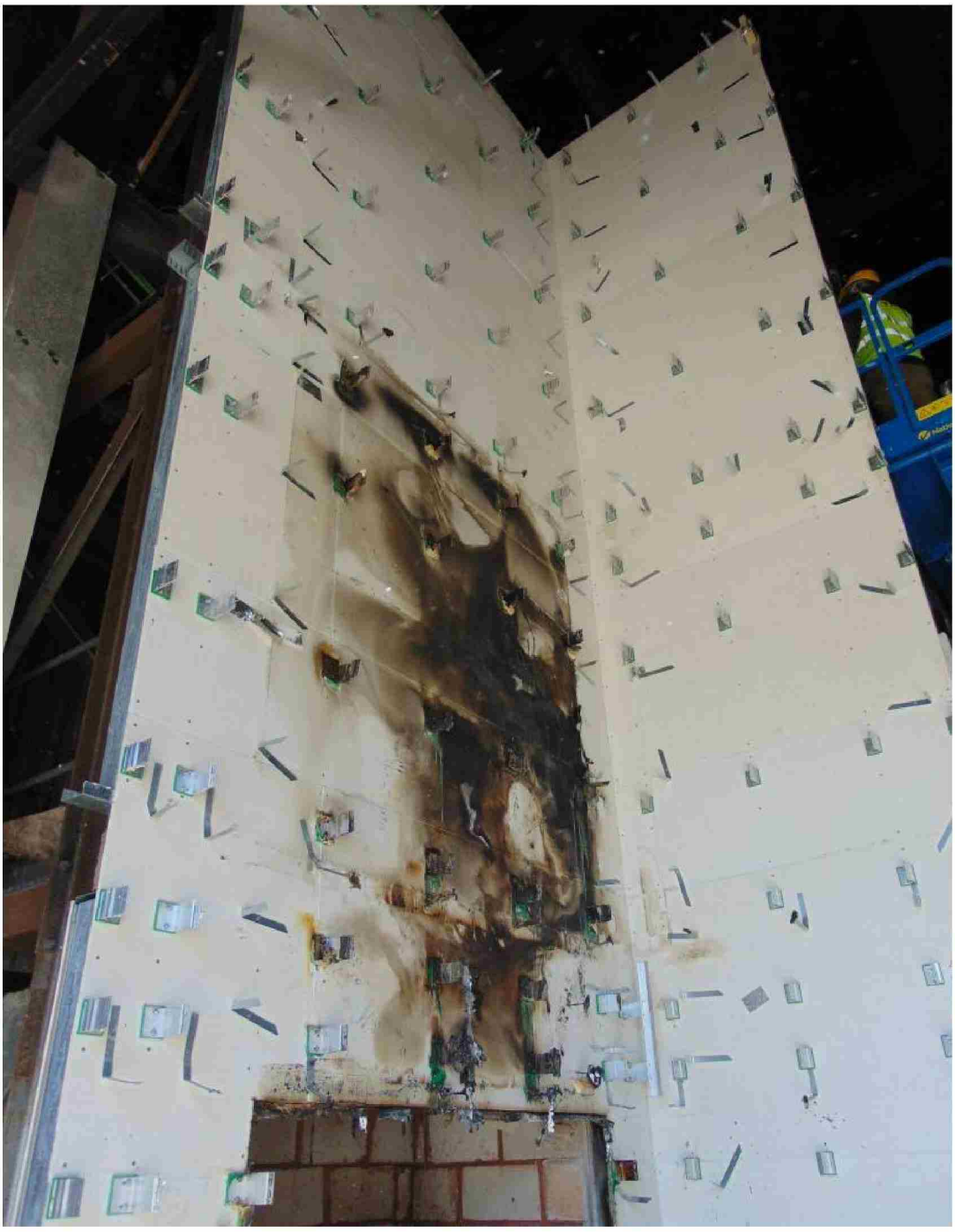

Figure 31. Post-test wing wall view of sheathing board and brackets from the top of the combustion chamber to the top of the cladding system.

Figure 32. Post-test view of lightweight steel framing system from the top of the combustion chamber to the top of the cladding system.

Report Ends