

BRE Global Test Report

BS 8414-2: 2005 Test on a Kingspan BENCHMARK 220mm QuadCore™ Wall liner panel with a Corium brick system.

Prepared for: Kingspan Ltd
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1 Introduction

BS8414-2:2005 describes a method of assessing the behaviour of non-load bearing external cladding systems, rainscreen overcladding systems and external wall insulation systems when applied to a structural steel frame 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 measurements given in this report are nominal unless stated otherwise.



2 Details of tests carried out

Name of Laboratory: BRE Global Ltd.

Laboratory Address: Bucknalls Lane, Garston, Watford, Hertfordshire. WD25 9XX

Telephone No.: 01923 664000

Fax No.: 01923 664910

Test reference: P102340-1000

Date of test: 17th May 2016

Sponsor: Kingspan Ltd.

Sponsor address: Greenfield Business Park no.2 Holywell,
Flintshire, CH8 7GJ, UK

Sponsors Reference No:

Method: The test was carried out in accordance with BS8414-2:2005

Deviations: None



3 Description of the System

3.1 Description of substrate

The test specimen was installed onto face 4 of the BRE Global External Cladding Test Facility. This is a multi-faced test facility constructed from steel, the cladding system was affixed to the steel substructure.

3.2 Description of product

Figure 1 shows the system during construction. The system prior to test is shown in Figure 2. Full details of the system specification and installation details have been provided by the client and are summarised in the following section. The system, as built comprised of:

- Galvanised mild steel support brackets
- 220mm QuadCore™ wall liner panel.
- Powder coated top hat sections
- Support rails
- Intumescent fire barrier
- Corium brick system façade
- Parex Ltd Historic Pointing mortar KL

3.3 Installation of cladding System.

3.3.1 Steel substructure and fixings

A sectional steel sub frame was installed using 125mm x 50mm galvanised steel L angles which were fixed on the top and bottom of the floor slab hangers on the main cladding wall. The angles were fixed back the concrete using SFS Intec ISOFAST T1- 6.3 x 55 mm self-tapping concrete screws at 300mm centres. The L brackets were fixed to the steel brackets with Saphir HS 5.5 x 55mm hex head screws fixed at 300mm centres.

The build-up of the cladding system is shown in Figure 3 to Figure 11.

3.3.2 Insulated Panel

A single layer of Kingspan 220mm QuadCore™ wall liner panel was attached to the metal sub frame using SFS Intec SXC 14-5.5 x 275mm self-drilling and self-tapping screws. All panels were installed in a vertical orientation. Each panel had 5 fixings, with a sealing washer WM-40 EP/ 6.1 on each fixing. The exposed edges of each panel was covered using 75mm x 320mm x 0.7mm flashings, with each flashing fixed in place with SX3/9-S16-6 x 29mm fixing fixed at 300mm centres. Each joint on the panel was fixed using SXW- L12-5.5 x 42mm screws, fixed at 600mm centres. Standard 1100mm wide panels were installed and cut to width were required.

3.3.3 Cladding system

An array of powder coated top hat sections were fixed to the panel system at 275mm were fixed to the insulated panel using FL6 –S-8 x 34 expanding panel fixings. Each rail had two strips of PVC Isolation tape (KSSVG25) fixed to the flanges to isolate the rail from the insulated panel.



3.3.4 Fire breaks

Three horizontal ventilated fire breaks (Tenmat FF 102 /50. FF102 x 6.0 x 75 x 1000mm) in a continuous strip, were fixed back to the insulated panel with self-tapping counter sunk screws, drilled through the fire break with the fixings at the manufactures recommended spacing of 250mm centres.

3.3.5 Rain screen

Once all the rails were attached a layer of Corium support rails (KSBM – CORIUMCHHPS) were attached horizontally to the top rails using SX3/9 –S16-6 x 29 self-drilling fixings which were fixed at nominal 550mm centres. Standard, plain finish 215mm x 65mm, Corium 12000 bricks were clipped into the support rails to form the cladding façade, with the joints staggered between rows. Once complete, the layer of Corium brick were pointed using Historic pointing mortar KL, which was applied with a mortar gun and finished with a jointing tool. When the mortar was partially dried, the excess material was cleaned off and the full system wiped down with a damp cloth.

3.4 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.

3.5 Conditioning of the Specimen

Once the system was completed there were 4 days for conditioning before testing was undertaken.

3.6 Test Conditions

Test Date: 17th May 2016

Ambient Temperature: 15.6°C

Wind speed: < 0.1 m/s, test undertaken indoors

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

Thermocouple locations:

- Level 1 – External
- Level 2 – External
- Level 2 – Mid point of cavity
- Level 2 – Mid point of insulation

Figure 12 shows the locations and identification numbers of the thermocouples for the test specimen and also the face references used to describe the system.



4 Test results

4.1 Temperature Profiles

Figure 14 to Figure 17 provide the temperature profiles recorded during the test shows the sample during test.

Parameter	Result
T _s , Start Temperature	215.6°C
t _s , Start time	2:15 mins : secs after ignition of the crib
Peak temperature/time at Level 2, 50mm external	408°C at 19:35 mins : secs after t _s
Peak temperature/time at Level 2, Cavity 1	136°C at 44:05 mins : secs after t _s
Peak temperature/time at Level 2, Insulation Layer	93°C at 57:45 mins : secs after t _s

4.2 Visual Observations-

Table 1. Visual Observations – Refer to Figure 12 for height references.

Time (mins:secs)	Description
-5:00	logger start.
0:00	Ignition of crib.
2:08	Flames out of hearth.
4:23	Flames to 2.0m cladding wall main face centreline.
7:20	Spalling of brick small bits outside area. Rapid spalling from the Corium bricks.
12:40	Spalling of brick, small bits outside area flames to 2m cladding wall main face.
15:30	Spalling of brick, small bits falling outside of impact area.
21:45	Crib starts to collapse. Flames 2.5 m cladding wall main face.



Time (mins:secs)	Description
30:00	Crib extinguished.
60:00	Test completed.

5 Post-test damage report

5.1 External Layer

Damage to the outer layer of Corium brick was limited to the area within the flame plume and was limited to the loss of three full Corium brick on the main wall and five half bricks. The remaining damage consisted of minor spalling of the surface of seven bricks.

On the wing wall the damage consisted of minor spalling of the surface of fifteen bricks.

5.2 Corium support rails

Damage to this area was consistent in extent to that seen on the Corium bricks and did not extend beyond the area of damage caused by heat transfer from the direct heating of the Corium bricks within the flame plume area. On the wing wall an area with a width of around 0.5 m and a height of 2m was damaged. Again this was caused by heat transfer from the direct heating of the Corium bricks.

5.3 Insulation panel

Damage to this area was consistent with the damage to the Corium bricks and the Corium brick rails and did not extend beyond the area of damage caused by heat transfer from the direct heating of the Corium bricks within the flame plume area. On the wing wall an area with a width of around 0.5 m and a height of 1.5m was damaged. Again this was caused by heat transfer from the direct heating of the Corium bricks and through the Corium brick rails.

5.4 Collapse

There was no collapse of any part of the system throughout the duration of the test.

6 Reference

1. BS 8414-2:2005, 'Fire Performance of External Cladding Systems – Part 2: Test method for non-load bearing external cladding systems fixed to and supported by a structural steel frame', British Standards Institute, Chiswick, 2005.



7 Figures

Figure 1. The system during construction showing top hat rails and fire breaks.

Figure 2. The system prior to testing

Figure 3. Construction details showing an overview of the panel.

Figure 4. Construction of the System showing the panel layout.

Figure 5. Construction of the System showing the top rails layout.

Figure 6. Construction of the System.

Figure 7. Construction of the System showing the panel fixings, top hat and Corium brick details.

Figure 8. Construction of the System showing the fixings and hearth reveal.

Figure 9. Construction of the System showing the Corium Rails layout.

Figure 10. Construction of the System showing the layout of the fire barriers.

Figure 11. Construction of the System showing the top closure.

Figure 12. Location and identification numbers of thermocouples used (schematic only)

Figure 13. Cladding system during the test.

Figure 14. Temperatures Level 1 External.

Figure 15. Temperatures Level 2 External.

Figure 16. Temperatures Level 2 Cavity.

Figure 17. Temperatures Level 2 Insulation layer.

Figure 18. Damage to upper main wall (Corium bricks).

Figure 19. Damage to lower main wall (Corium bricks).

Figure 20. Damage to lower main and wing walls (Corium brick rail system).

Figure 21. Damage to upper main wall (insulation layer).

Figure 22. Damage to lower wing wall (insulation layer).



Figure 1. The system during construction showing top hat rails and fire breaks.



Figure 2. The system prior to testing

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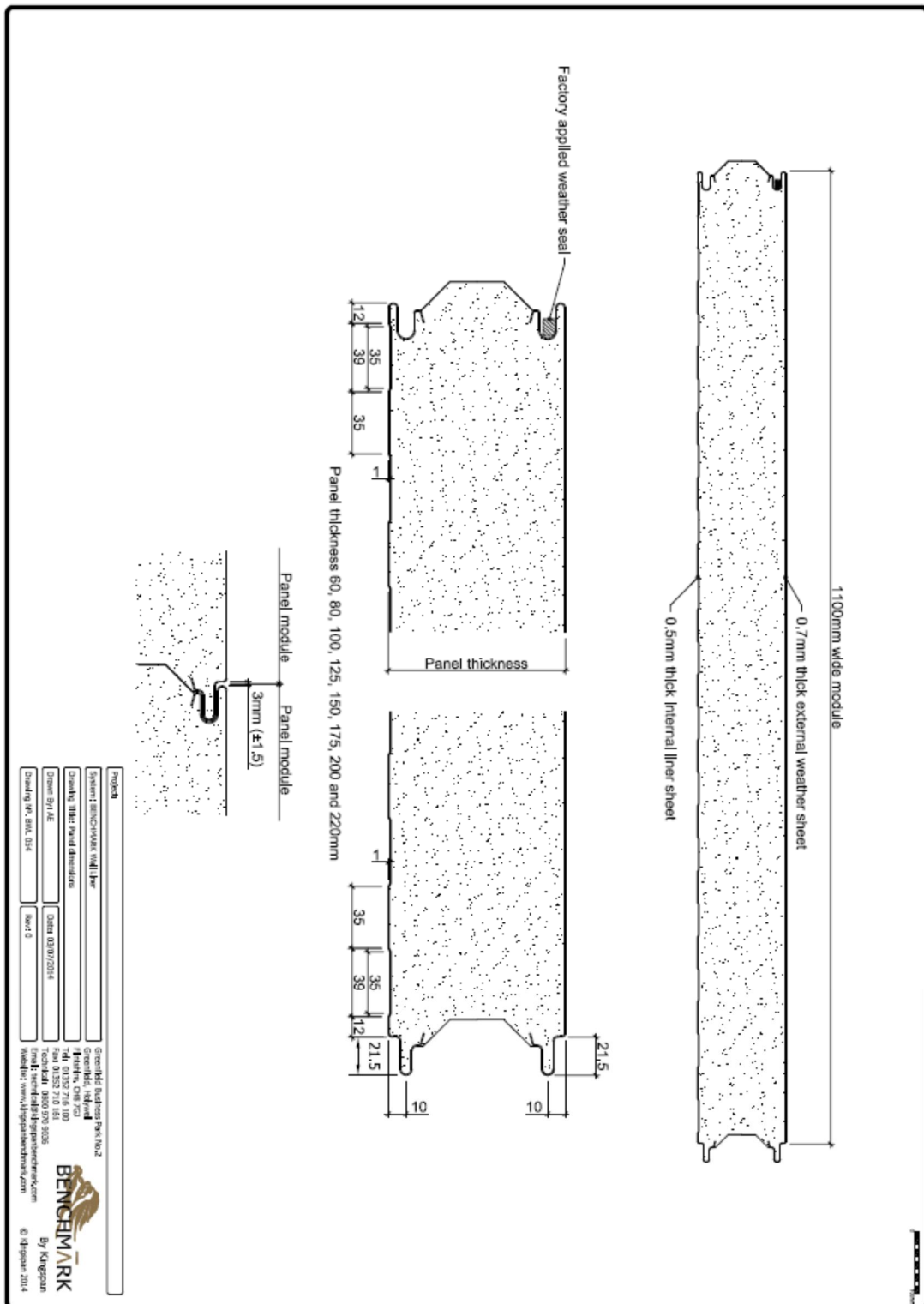


Figure 3. Construction details showing an overview of the panel.

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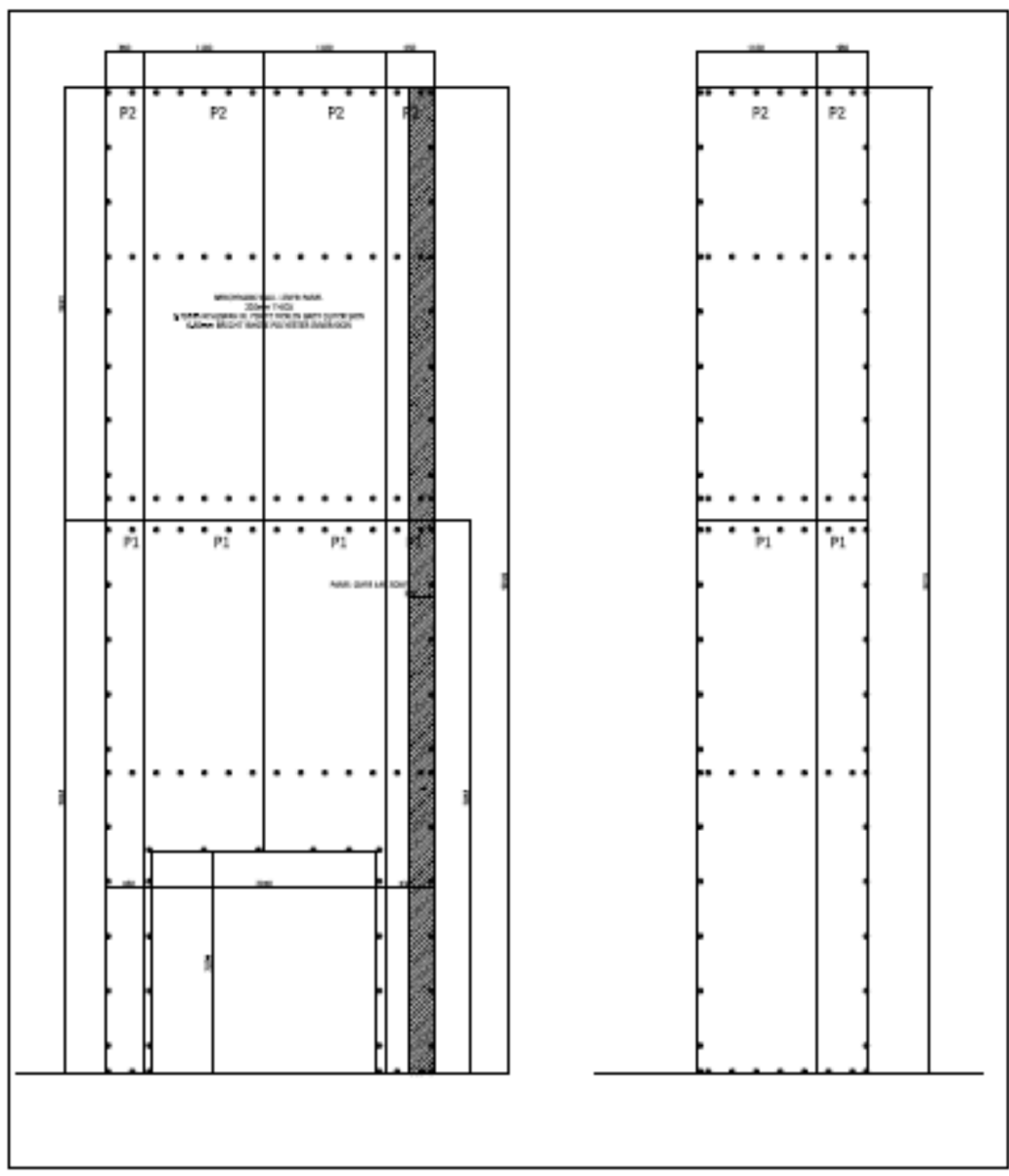


Figure 4. Construction of the System showing the panel layout.

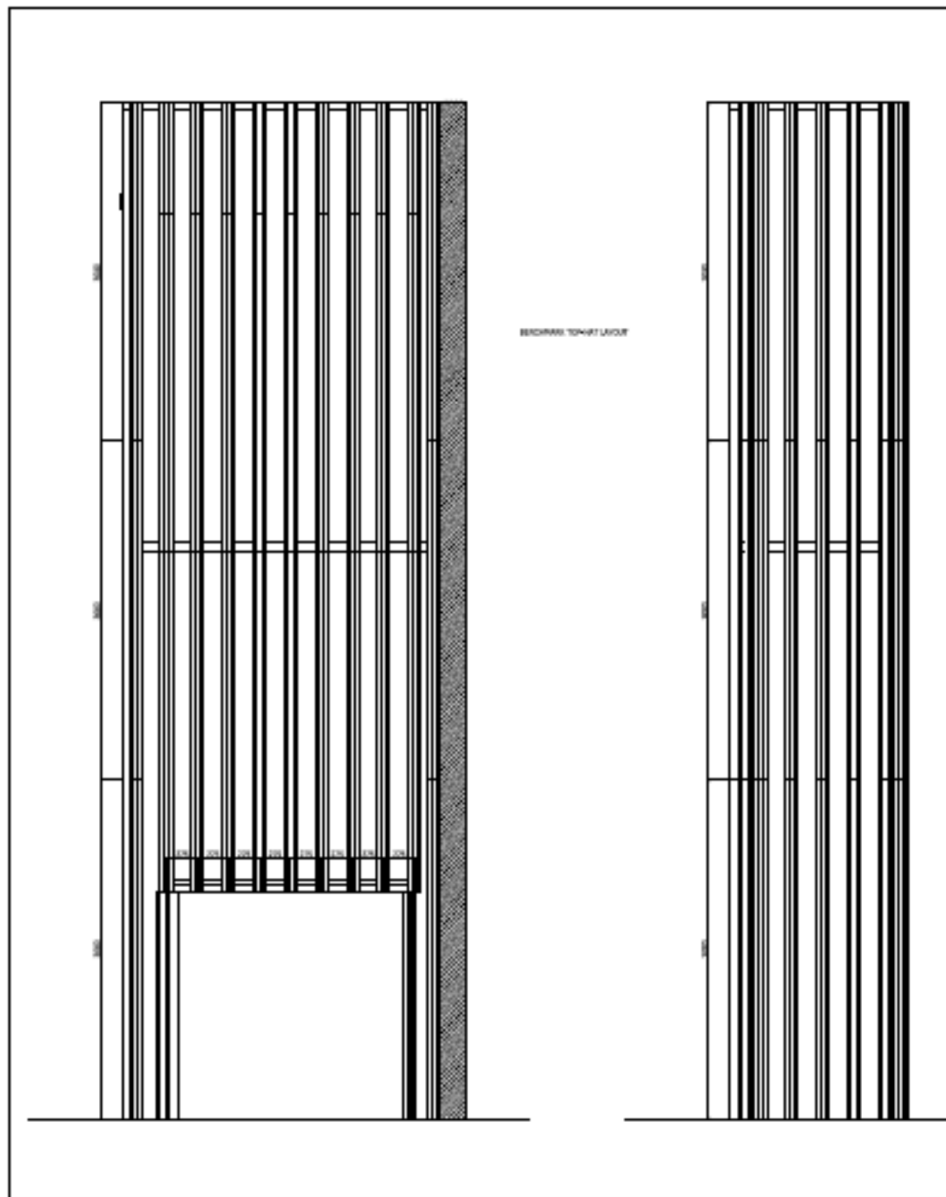


Figure 5. Construction of the System showing the top rails layout.

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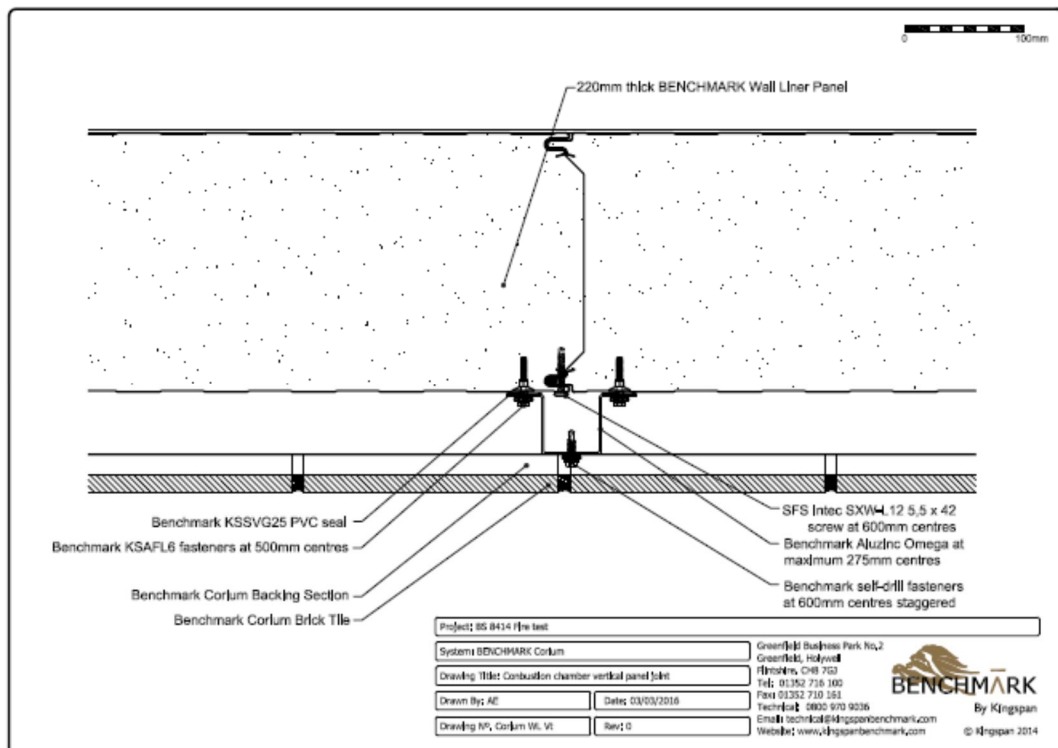


Figure 6. Construction of the System.

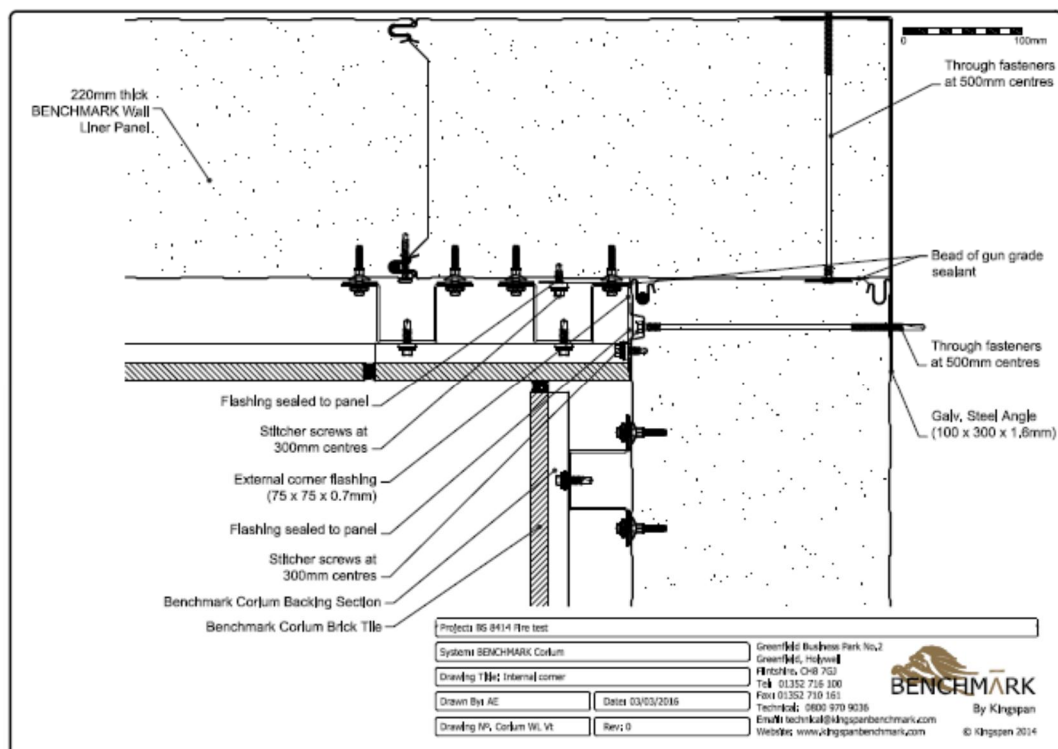


Figure 7. Construction of the System showing the panel fixings, top hat and Corium brick details.

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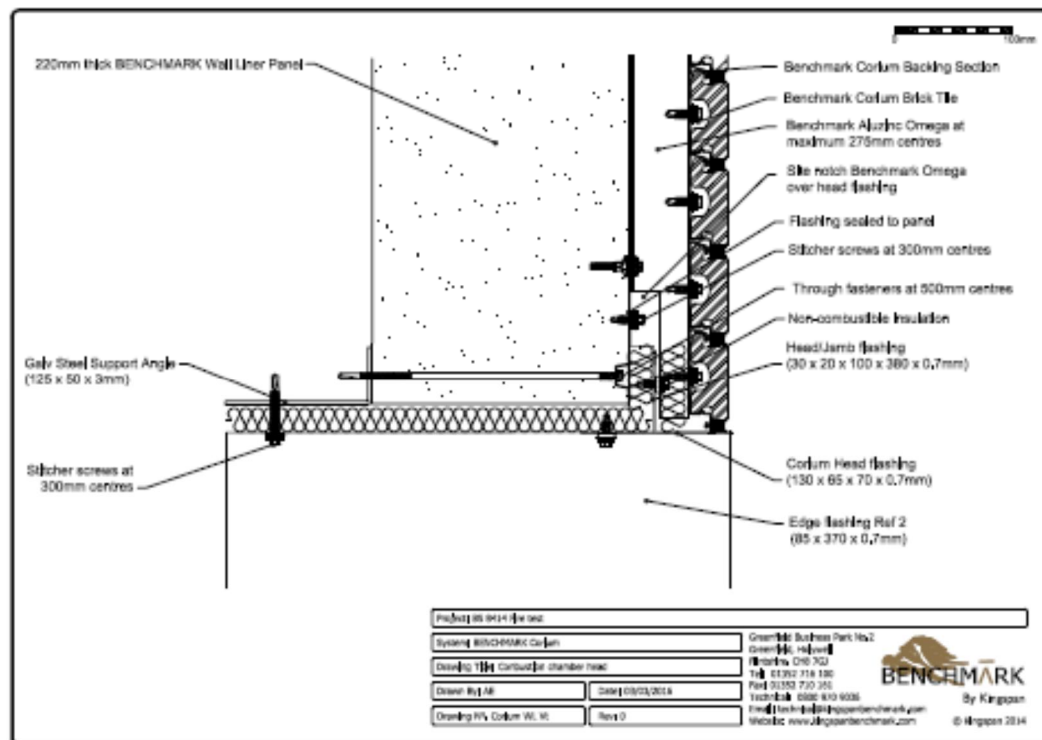


Figure 8. Construction of the System showing the fixings and hearth reveal.

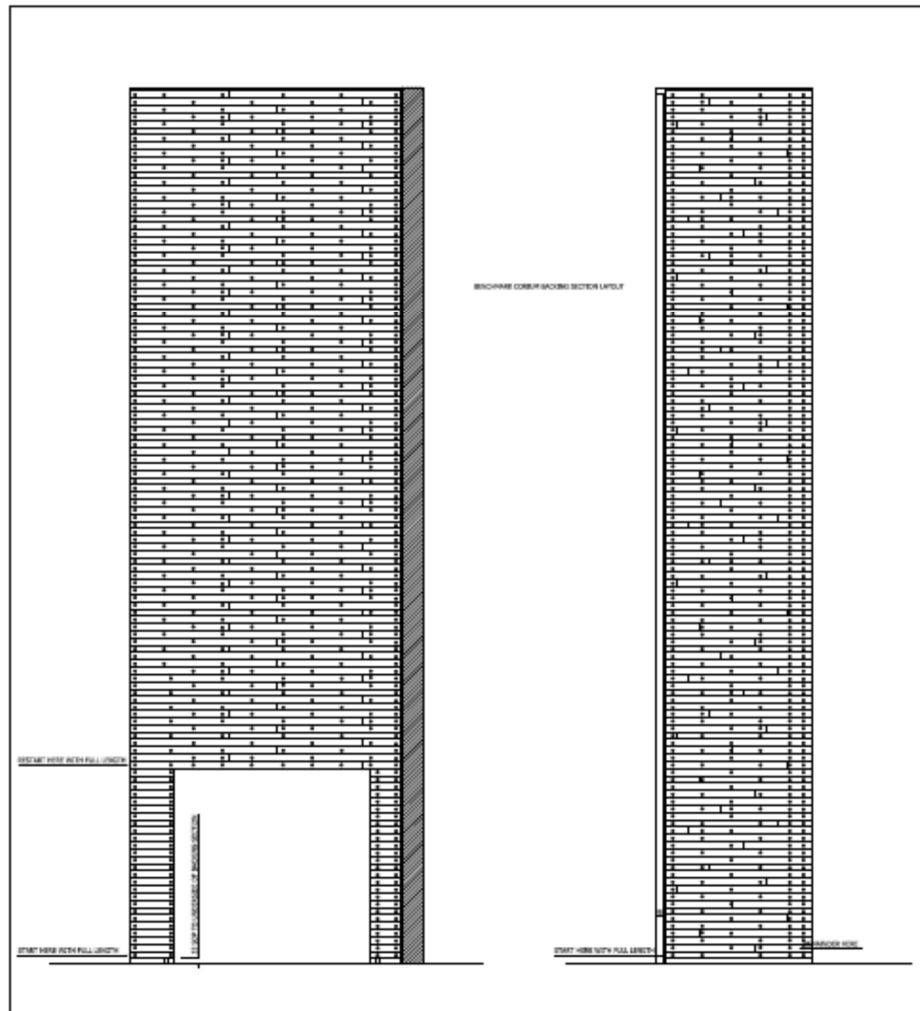


Figure 9. Construction of the System showing the Corium Rails layout.

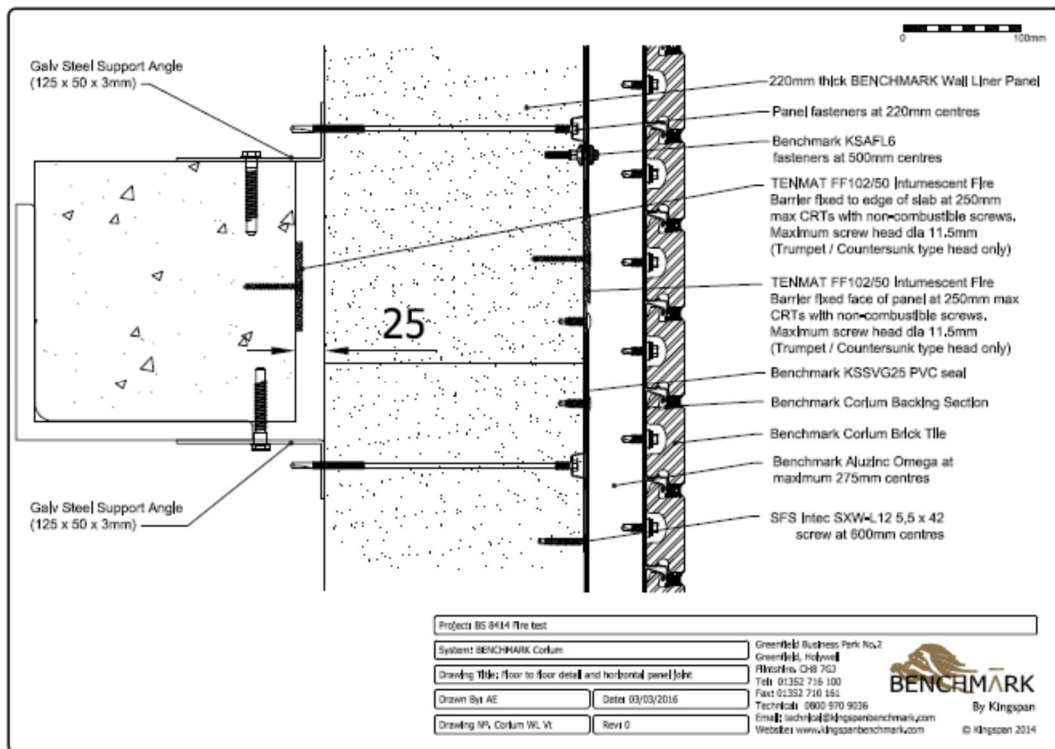


Figure 10. Construction of the System showing the layout of the fire barriers.

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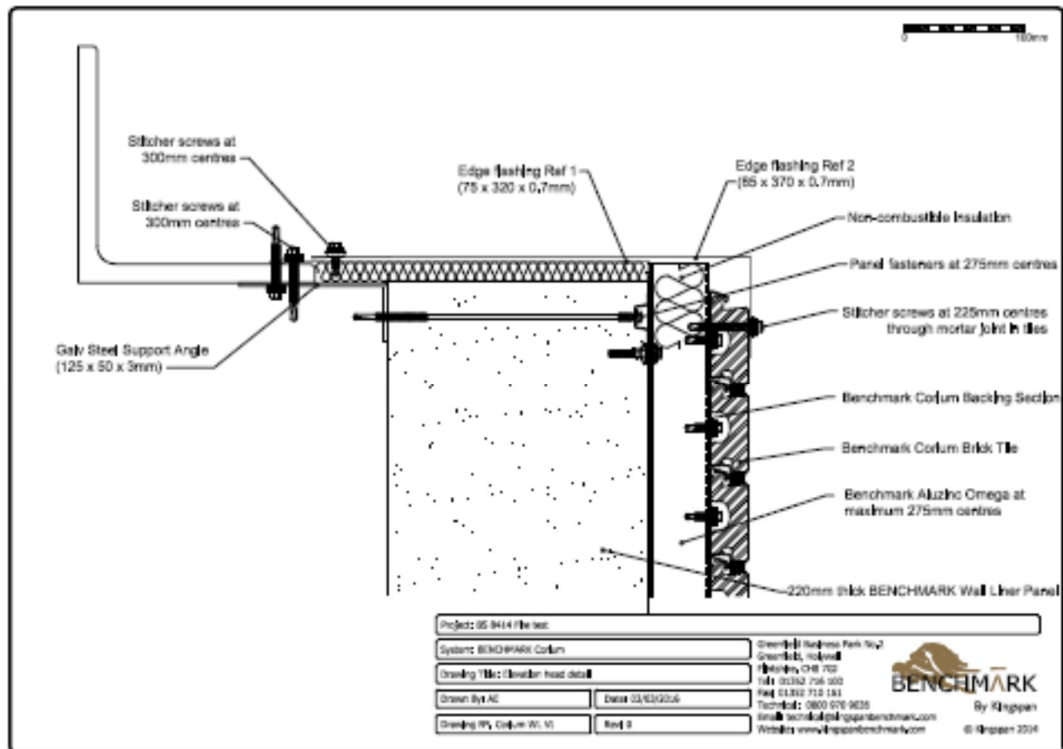


Figure 11. Construction of the System showing the top closure.

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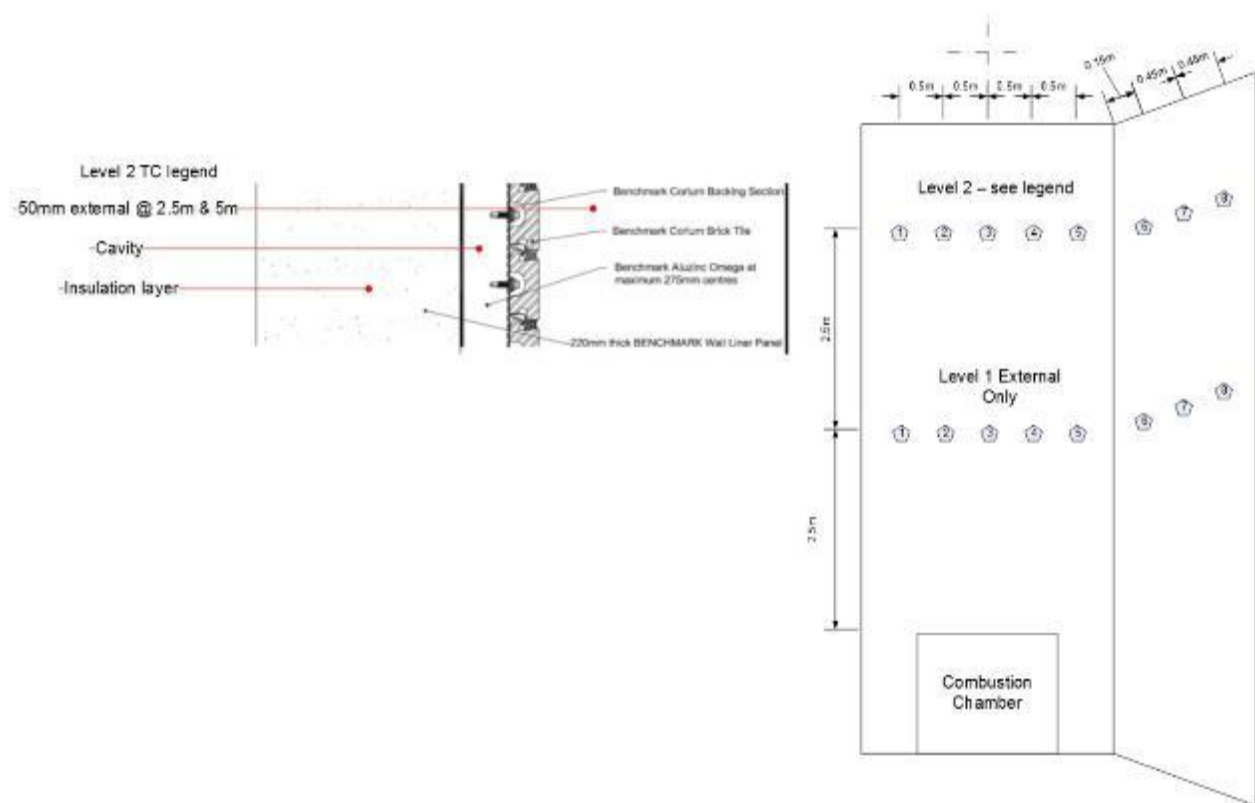


Figure 12. Location and identification numbers of thermocouples used (schematic only)



Figure 13. Cladding system during the test.

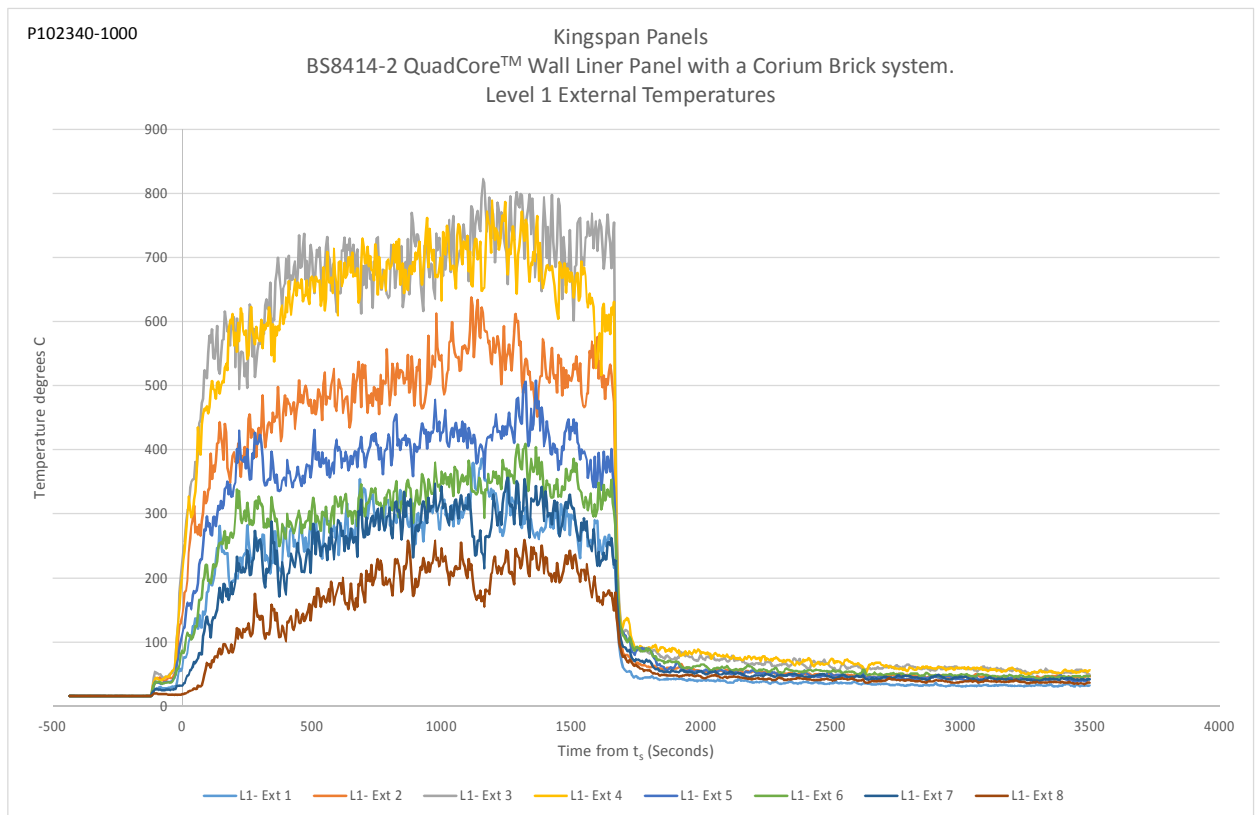


Figure 14. Temperatures Level 1 External.

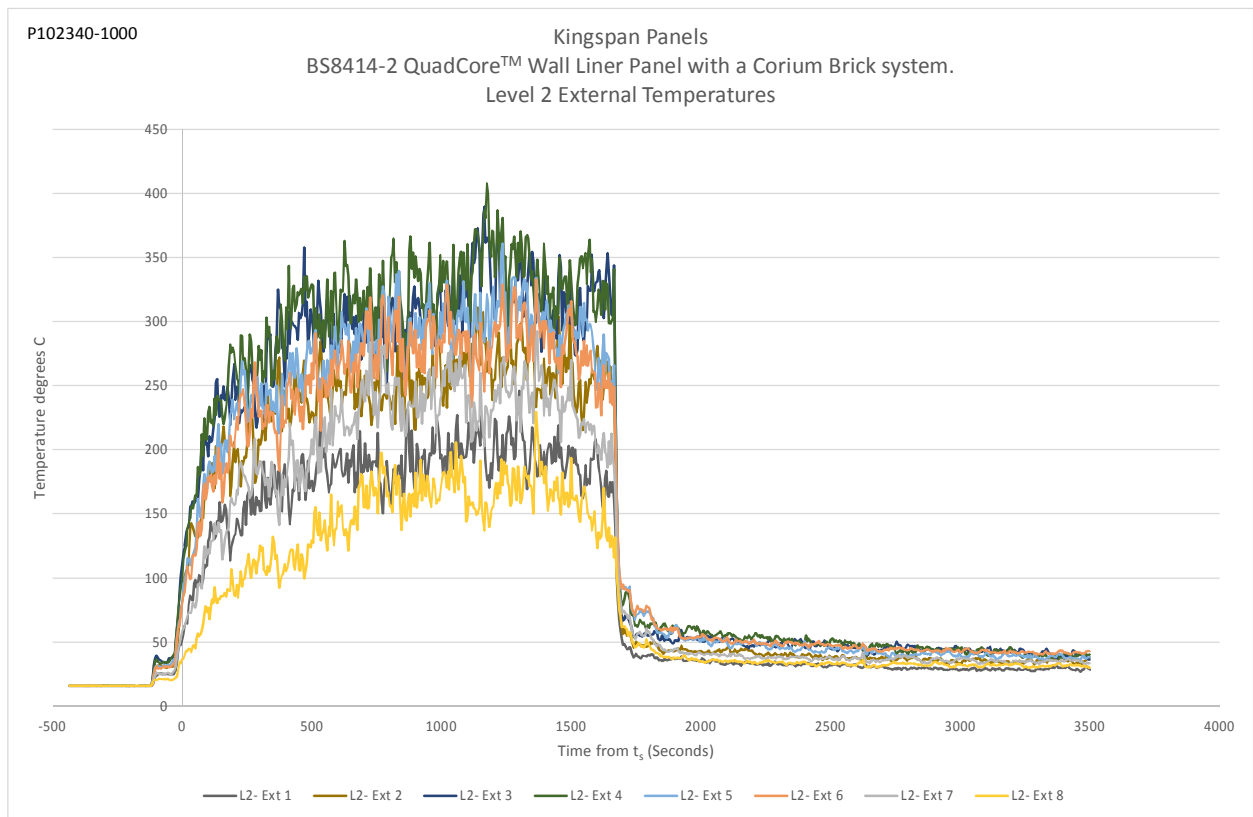


Figure 15. Temperatures Level 2 External.

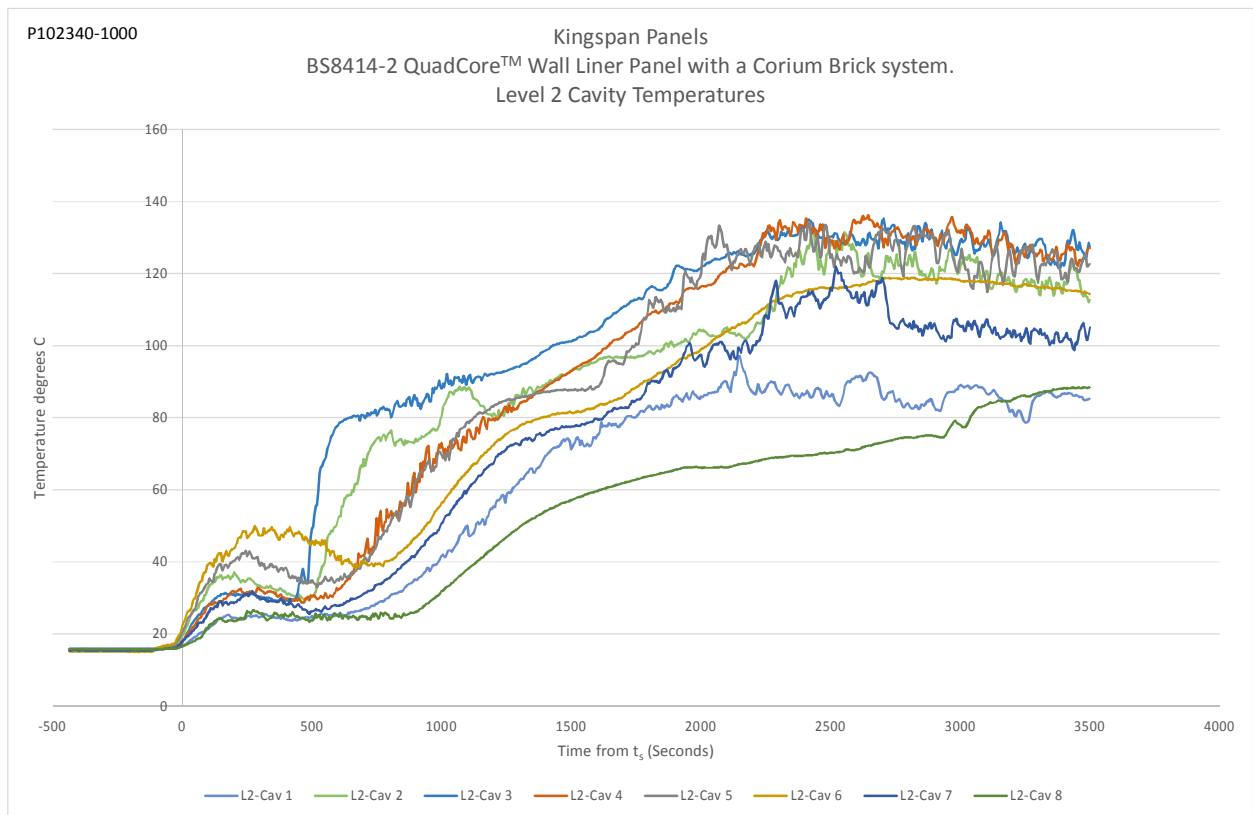


Figure 16. Temperatures Level 2 Cavity.

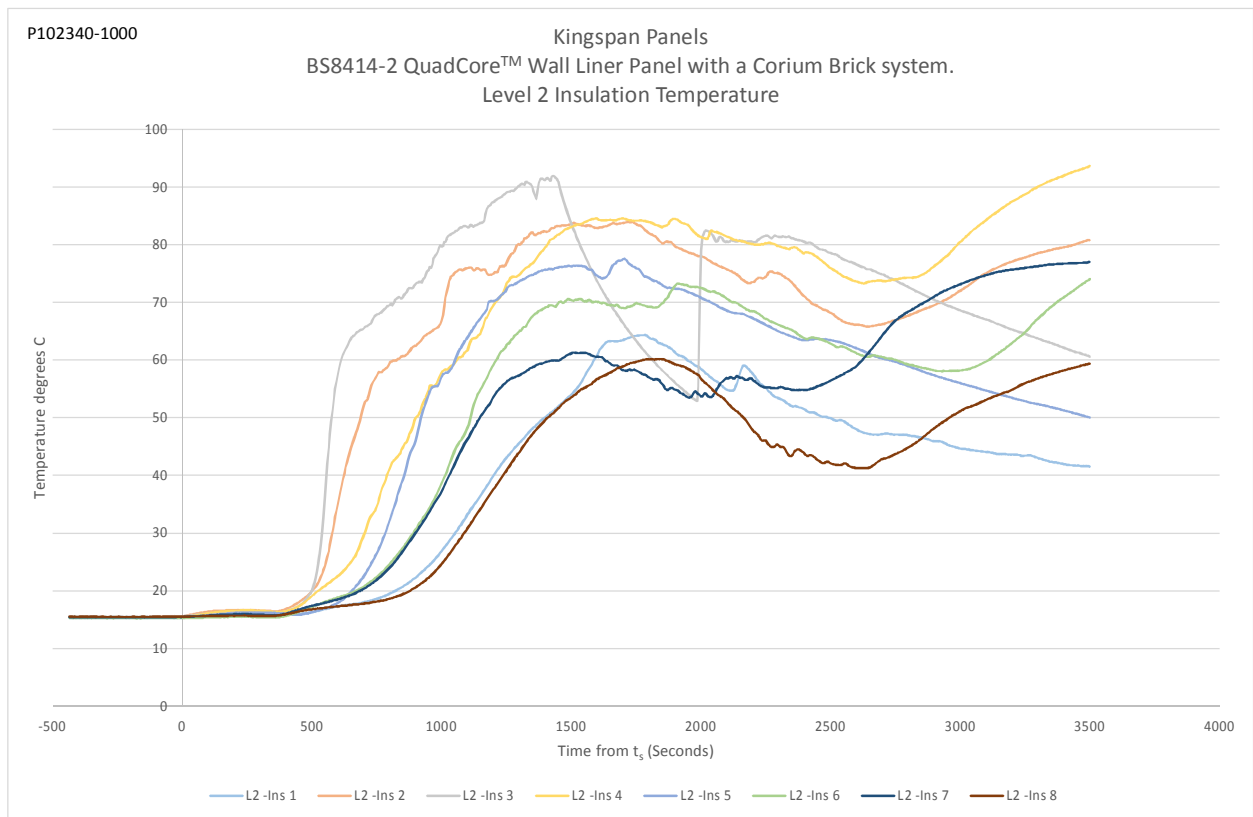


Figure 17. Temperatures Level 2 Insulation layer.



Figure 18. Damage to upper main wall (Corium bricks).



Figure 19. Damage to lower main wall (Corium bricks).



Figure 20. Damage to lower main and wing walls (Corium brick rail system).



Figure 21. Damage to upper main wall (insulation layer).



Figure 22. Damage to lower wing wall (insulation layer).