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BRE Global Test Report

BS8414-2 : 2005 Test on a Kingspan Ltd BENCHMARK Engineered Façade system- Metallic Hook on Cassette

Prepared for:	**Kingspan Ltd**
Date:	**3 October 2014**
Report Number:	**297804 Issue: 1**

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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:	297804
Date of test:	20th August 2014
Sponsor:	Kingspan Ltd
Sponsor address:	Greenfield Business Park No 2 Greenfield , Holywell, Flintshire. CH8 7GJ.

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 with 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:

- Single layer of 12 mm wall board.
- 100mm steel frame.
- 100mm BENCHMARK Wall liner panels
- BENCHMARK Aluminium mullions KSHOM
- TENMAT FF102/50 Horizontal Intumescent expanding fire break
- TENMAT VFB Plus 30 x 75mm Intumescent Fire Barrier
- BENCHMARK Aluminium Hook-on Cassette

3.3 Installation of cladding System.

3.3.1 Steel substructure and fixings

A sectional steel frame system (SFS) was installed between the simulated floor slabs and floor slab hangers on the main cladding wall 4, with horizontal base and head tracks fixed to the steel substrate. Vertical rails were installed at nominal 600mm centres to from the steel fame. A single layer of 12mm plasterboard was installed on the rear of the SFS. The build-up of the cladding system is shown in Figure 3 to Figure 9.

3.3.2 Cladding system

A single layer of 100mm Kingspan BENCHMARK wall liner panel was attached to the SFS using SFS intec SXC5-L12-5.5 x 133 through fixings with 47 x 6 x 1.0mm temperature control washers. Detail of the panel is shown in Figure 6.

3.3.3 Fire breaks

Horizontal ventilated fire breaks (TENMAT FF 102/50 Intumescent fire barriers) were fixed in a continuous strip and fixed to the simulated slab edge with 7.5 x 72mm concrete frames screws at manufactures recommended spacing. Horizontal ventilated barriers (TENMAT VFB Plus 30 x 75mm cavity barrier) were installed at floor levels behind the metallic Cassette system and the front face of the BENCHMARK wall liner panel. Around the hearth opening mineral wool non-combustible insulation was installed between the bottom of the system and head flashings.

3.3.4 Rain screen

An array of metallic (Aluminium) hook-on cassettes was attached to the BENCHMARK panels using BENCHMARK Vertical mullions KSHOM and BENCHMARK Vertical end mullions KSHOEM, with the

cassettes held on BENCHMARK locating clips KSHOLC. The cassettes were mechanically held in place with a SAPHIR JT4 –ZT 4.4, 8 x19 self-drilling stainless steel screws.

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 was no requirement for conditioning before testing was undertaken.

3.6 Test Conditions

Test Date: 20th August 2014

Ambient Temperature: 16.8°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 1

Level 2 – Mid point of insulation (BENCHMARK panel)

Level 2 – Mid point of cavity 2

Level 2 – Mid point of plasterboard

Figure 10 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 11 to 16 provide the temperature profiles recorded during the test shows the sample during test.

Parameter	Result
T_s, Start Temperature	216.8 °C
t_s, Start time	3:05 mins : secs after ignition of the crib
Peak temperature/time at Level 2, 50mm external	822°C at 26:25 mins : secs after t_s
Peak temperature/time at Level 2, Cavity 1	834°C at 26:15 mins : secs after t_s
Peak temperature/time at Level 2, Insulation Layer	416°C at 26:25 mins : secs after t_s
Peak temperature/time at Level 2, cavity 2	131°C at 17:35 mins : secs after t_s
Peak temperature/time at Level 2, Plasterboard	29°C at 30:45 mins : secs after t_s

4.2 Visual Observations-

Table 1. Visual Observations – Refer to Figure 10 for height references.

Time (mins:secs)	Description
-5:00	Logger started.
0:00	Ignition of crib.
2:28	Flames out of hearth.
3:15	Flames to 1.5 m cladding wall main face.
4:11	Flames to 2m cladding wall main face.
5:00	Deformation of hearth surround.
8:17	Hearth surround starts to melt.
9:25	Hole in rain screen at 0 to 0.5m on cladding wall main face.
11:25	Hole rain screen to 1m cladding wall main face, small pool fire 10 seconds plus
12:00	Hole in rain screen to 2m cladding wall main face.
13:00	Flames to 3m cladding wall main face and on right hand side to 2.5m.
14:15	Flames in central joint to 2.5m
17:05	Glowing in panel at 3m cladding wall main face.

Time (mins:secs)	Description
18:25	Flame in corner joint to 3mright hand side panel falls away.
20:00	Flames to 4m cladding wall main face.
21:30	Flames in corner joint cladding wall wing face panel at 3.5m.
23:00	Flames to 4.5m cladding wall main face.
23:20	Hole in left hand side panel at 3.5m on cladding wall main face.
24:50	Flames to 4.5m on cladding wall main face.
30:00	Crib extinguished. Continued burning above 3m on right hand side to the cladding main face
43:45	All visible flaming ceased.
60:00	Test terminated.

5 Post-test damage report

5.1 External Layer

A schematic illustration of the damage to the system is shown in Figure 19 and the condition of the cladding system after the test is shown in Figure 18. It was noted that there was no observed burning on the external face of the system.

5.2 Insulation Layer

The condition of the panels after the test is shown in Figure 21. It was noted that the insulation layer continued to burn past the 30 minute mark with flaming combustion visible in the insulation at 4m mark until approximately 44 minutes.

5.3 Collapse

There was only partial collapse of rain screen metallic sheets up to 4 m on the cladding wall main face.

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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.

Figure 2. The system prior to testing

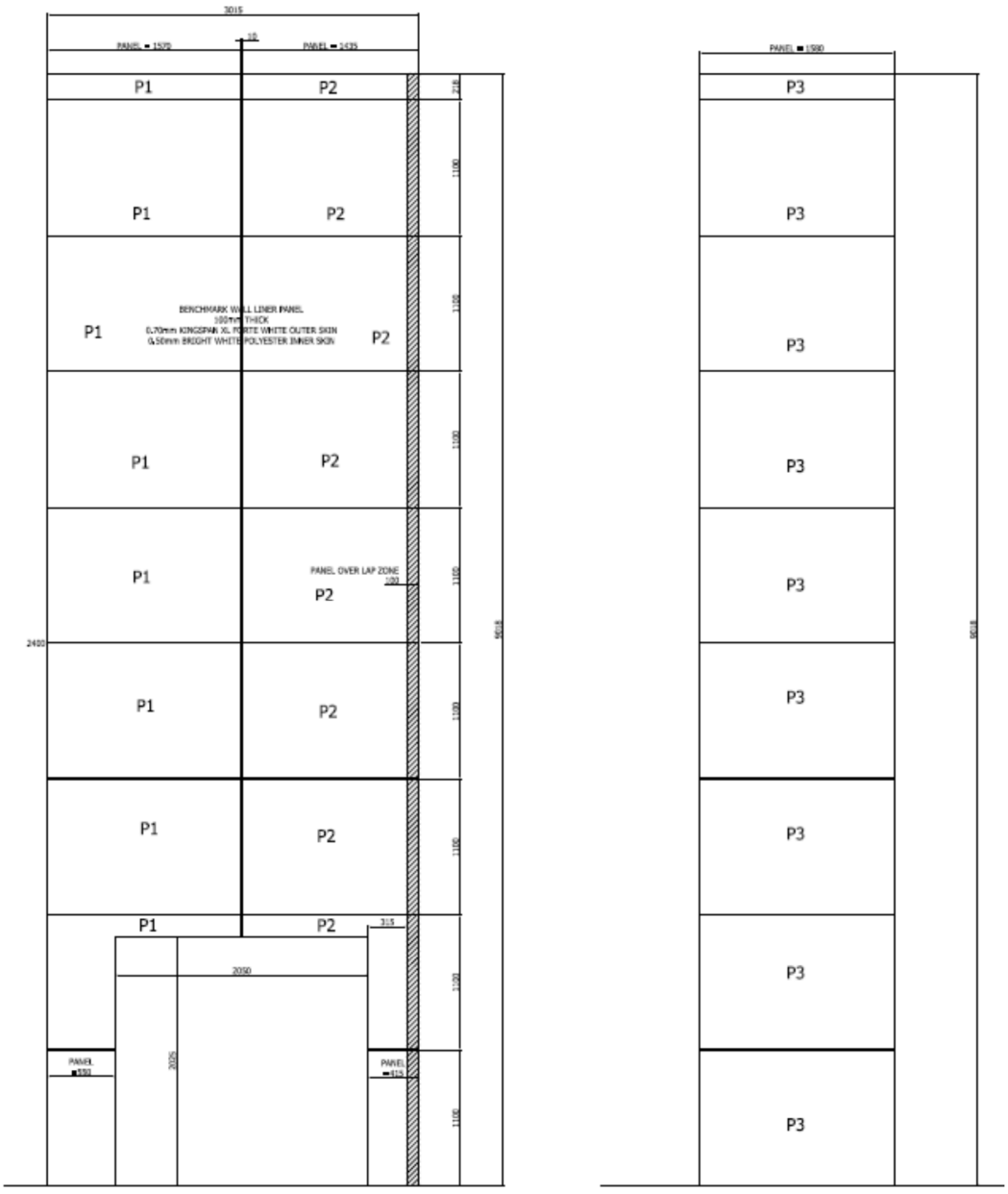

Figure 3. Construction of the System showing the BENCHMARK wall liner panels.

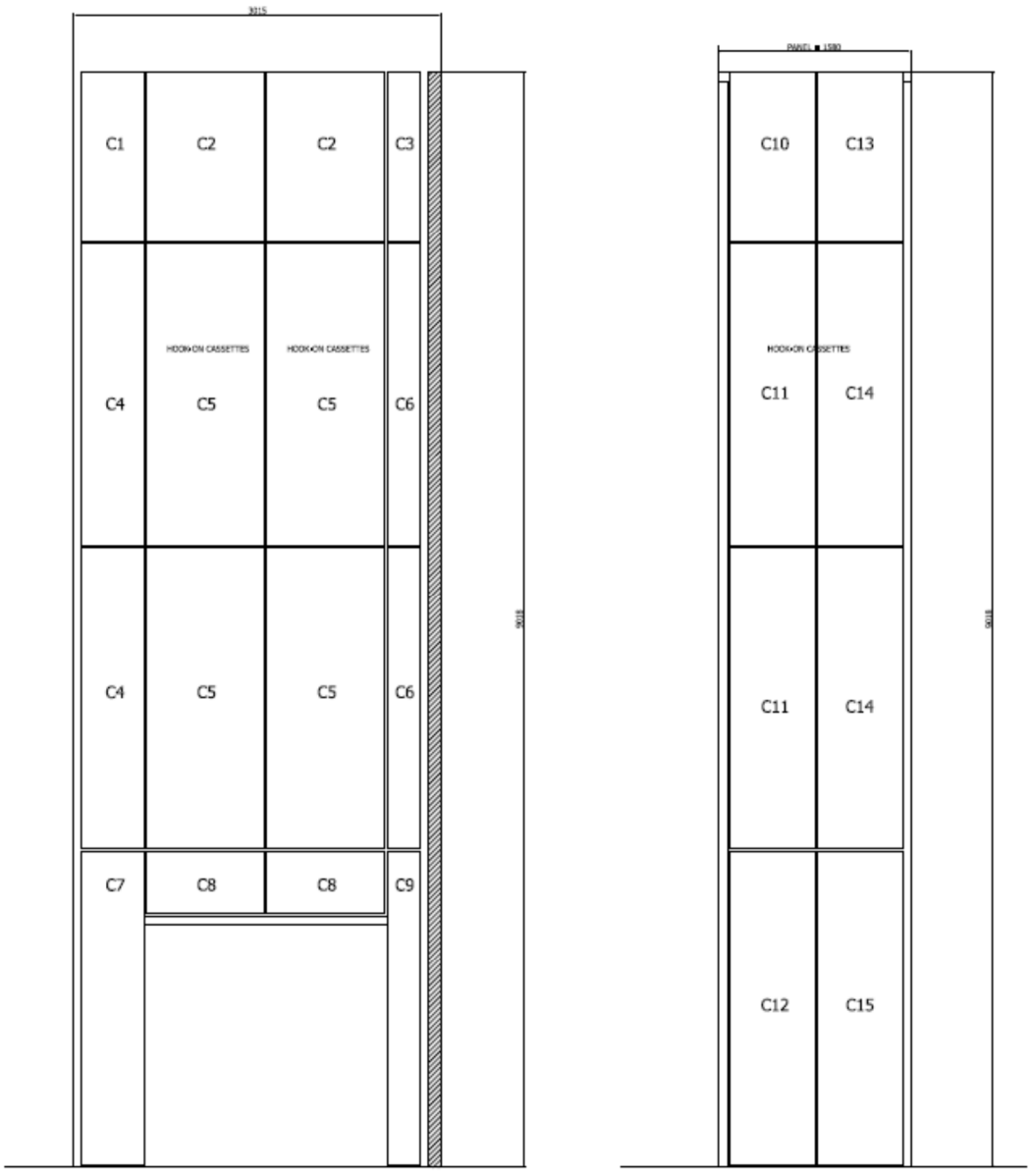

Figure 4. Construction of the System showing the Hook-on Cassette layout.

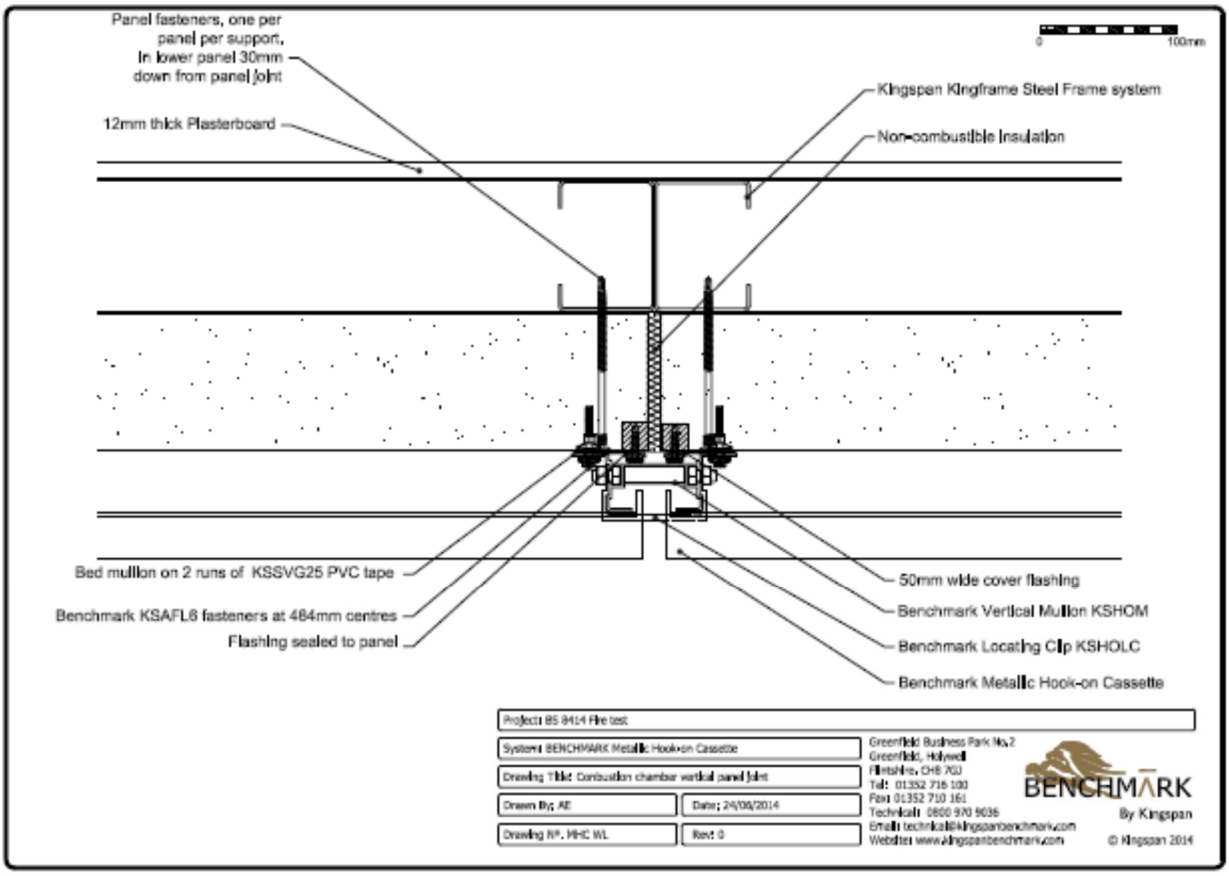

Figure 5. Construction of the System showing the vertical joints at the combustion chamber.

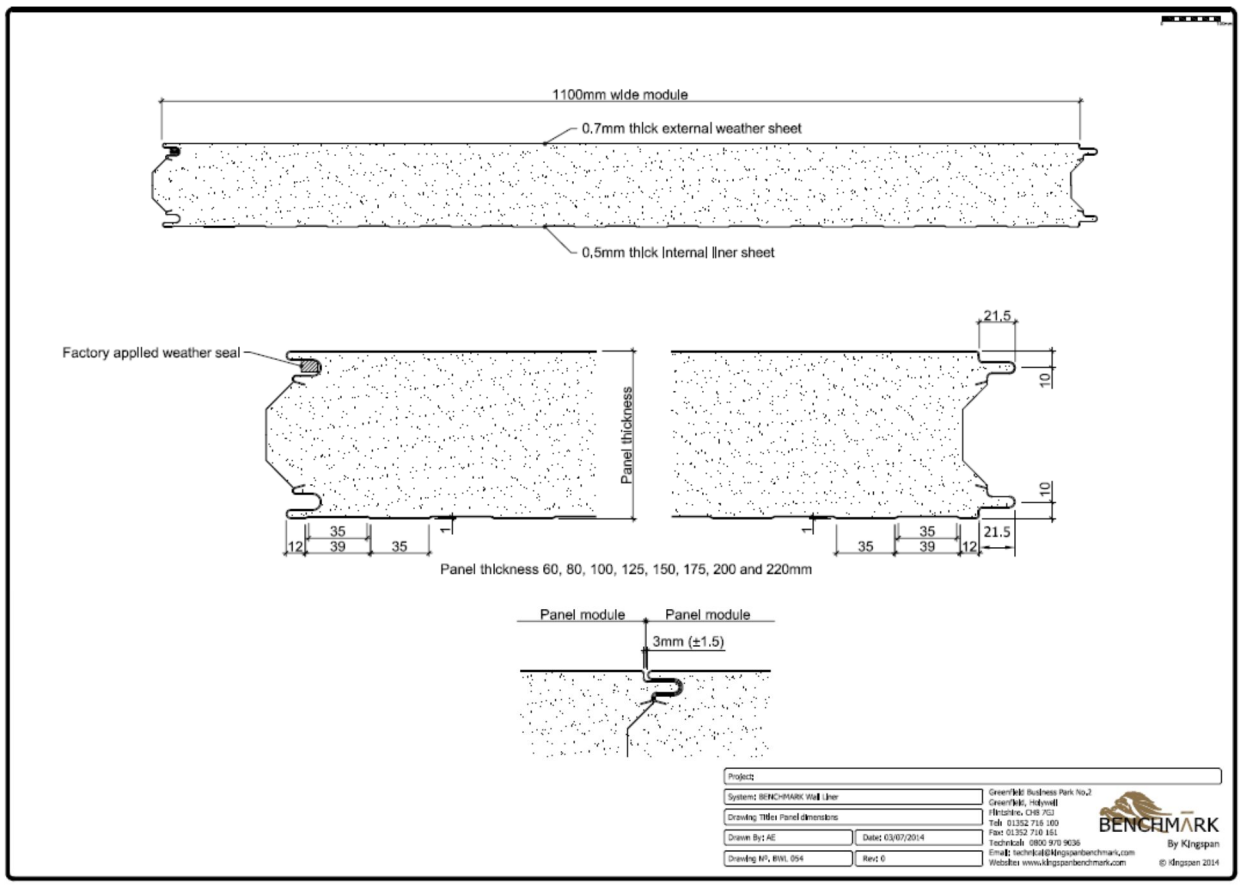

Figure 6. Construction of the System showing the key dimensions of the BENCHMARK wall liner panel.

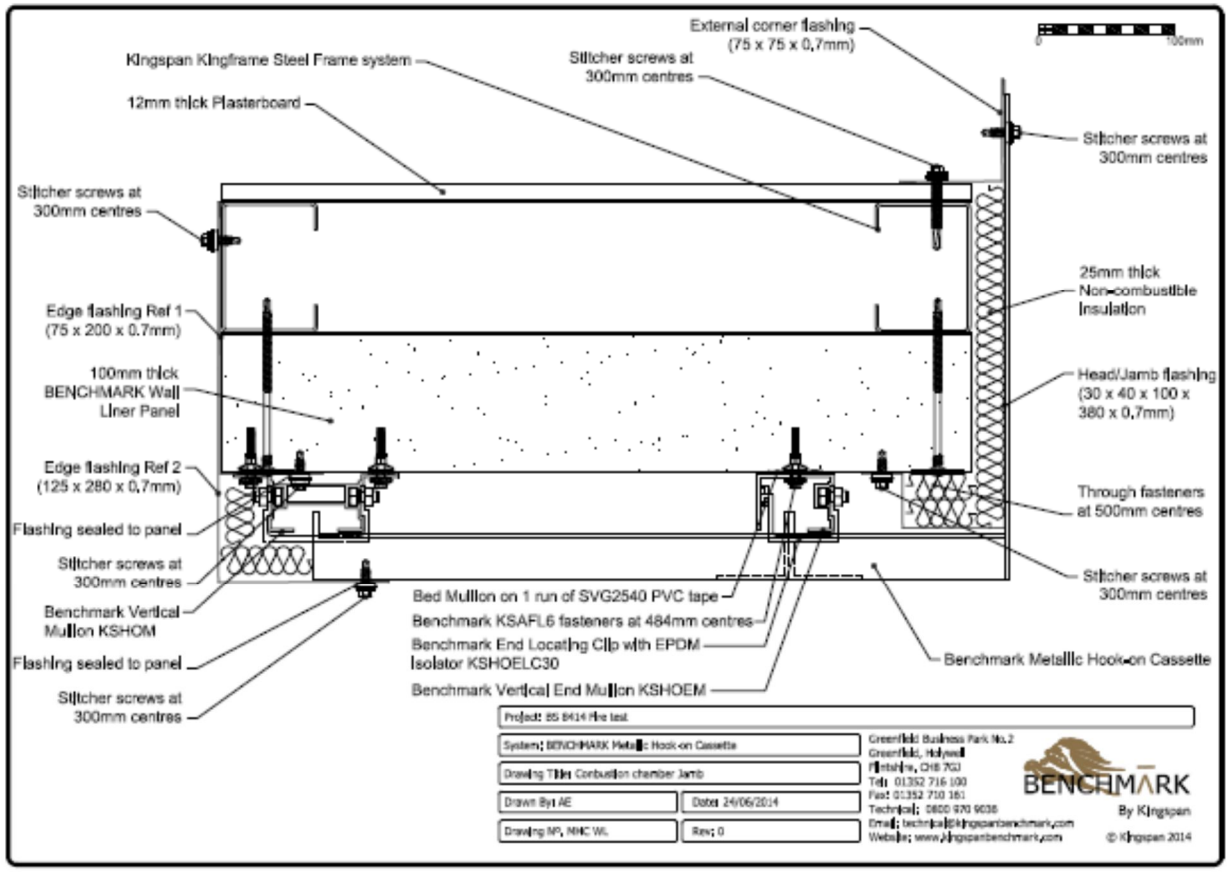

Figure 7. Construction of the System showing the combustion chamber jam.

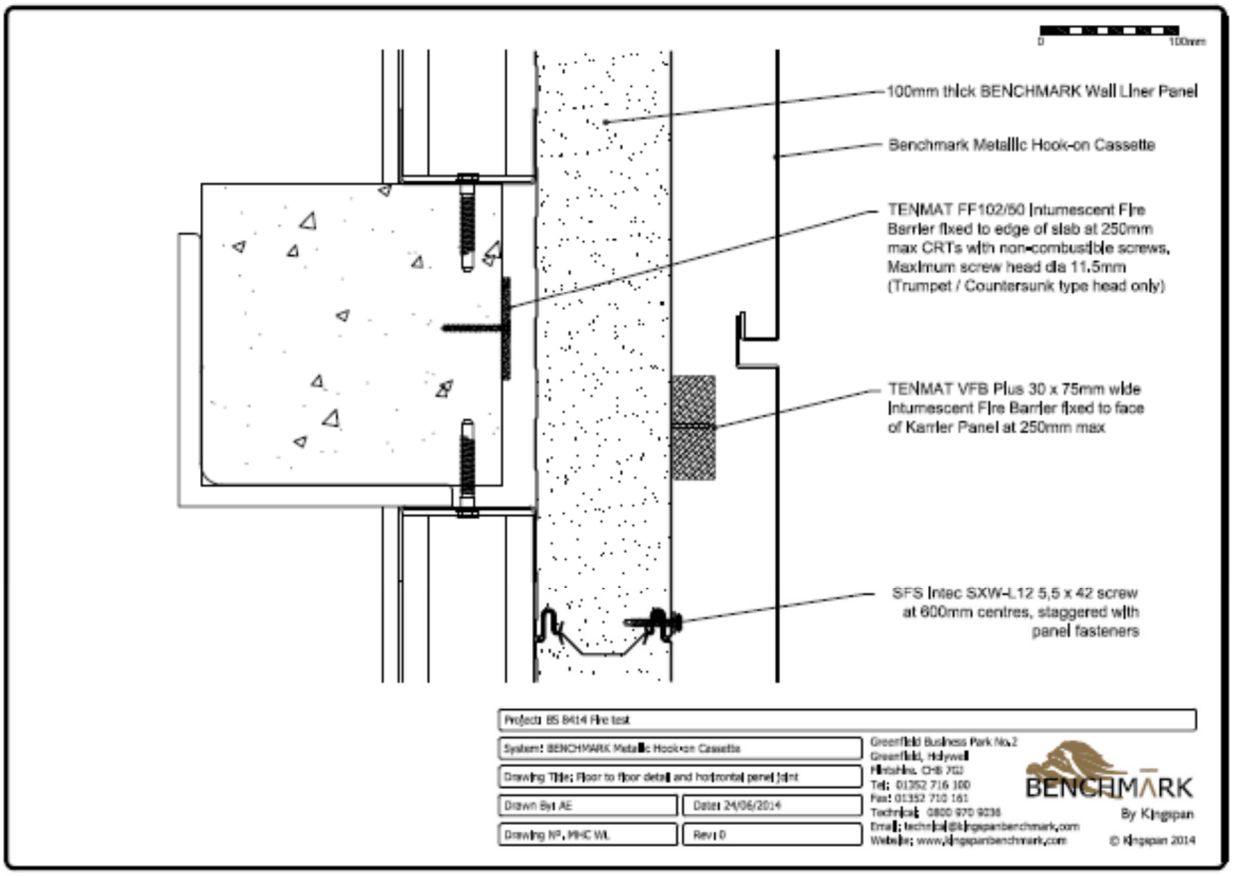

Figure 8. Construction of the System showing the layout of the fire barriers.

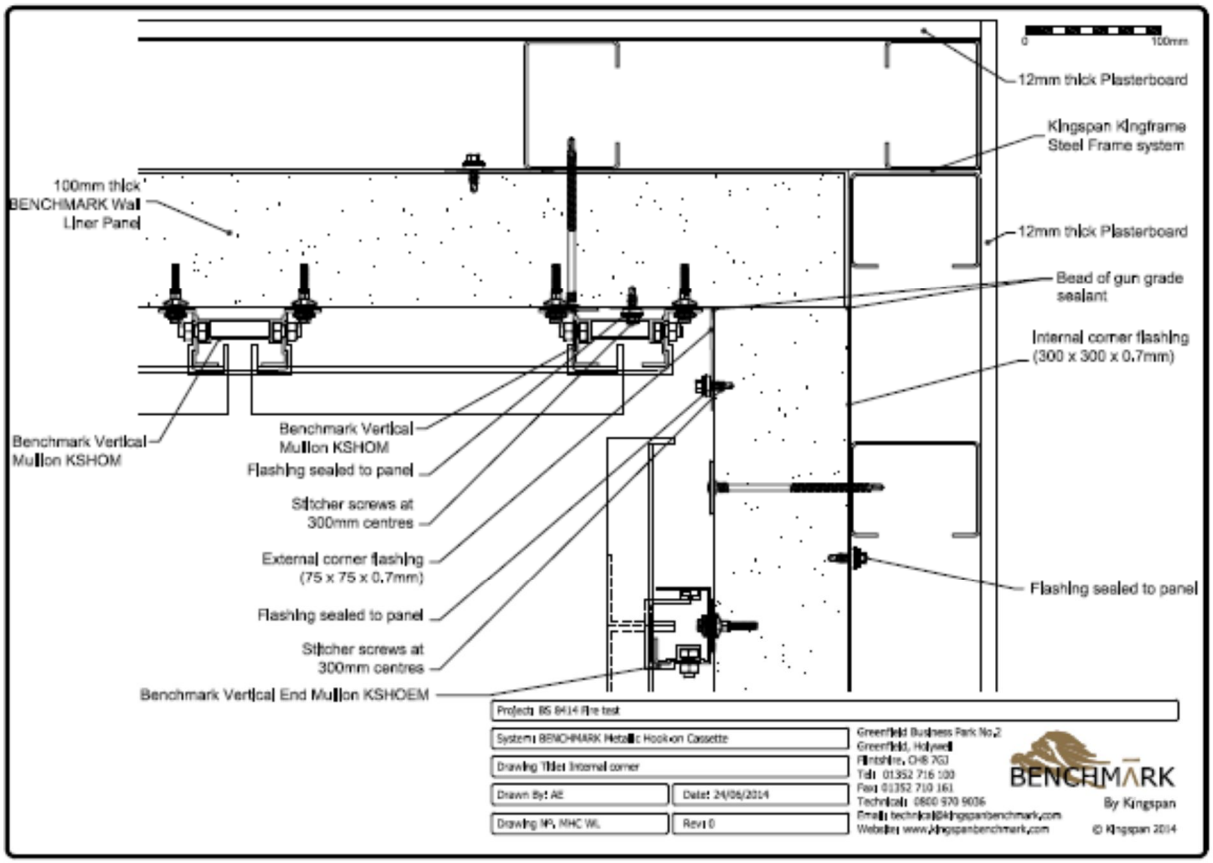

Figure 9. Construction of the System showing the internal corner details.

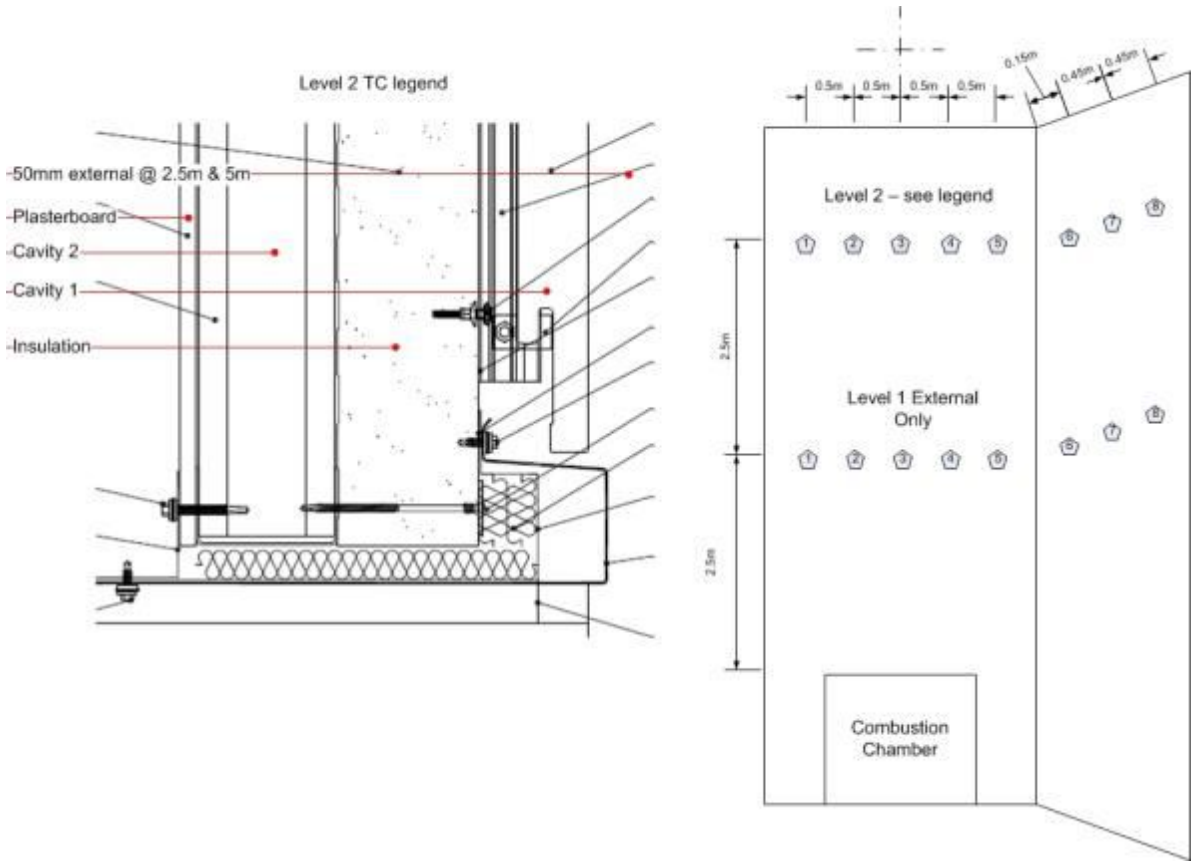

Figure 10. Location and identification numbers of thermocouples used (schematic only)

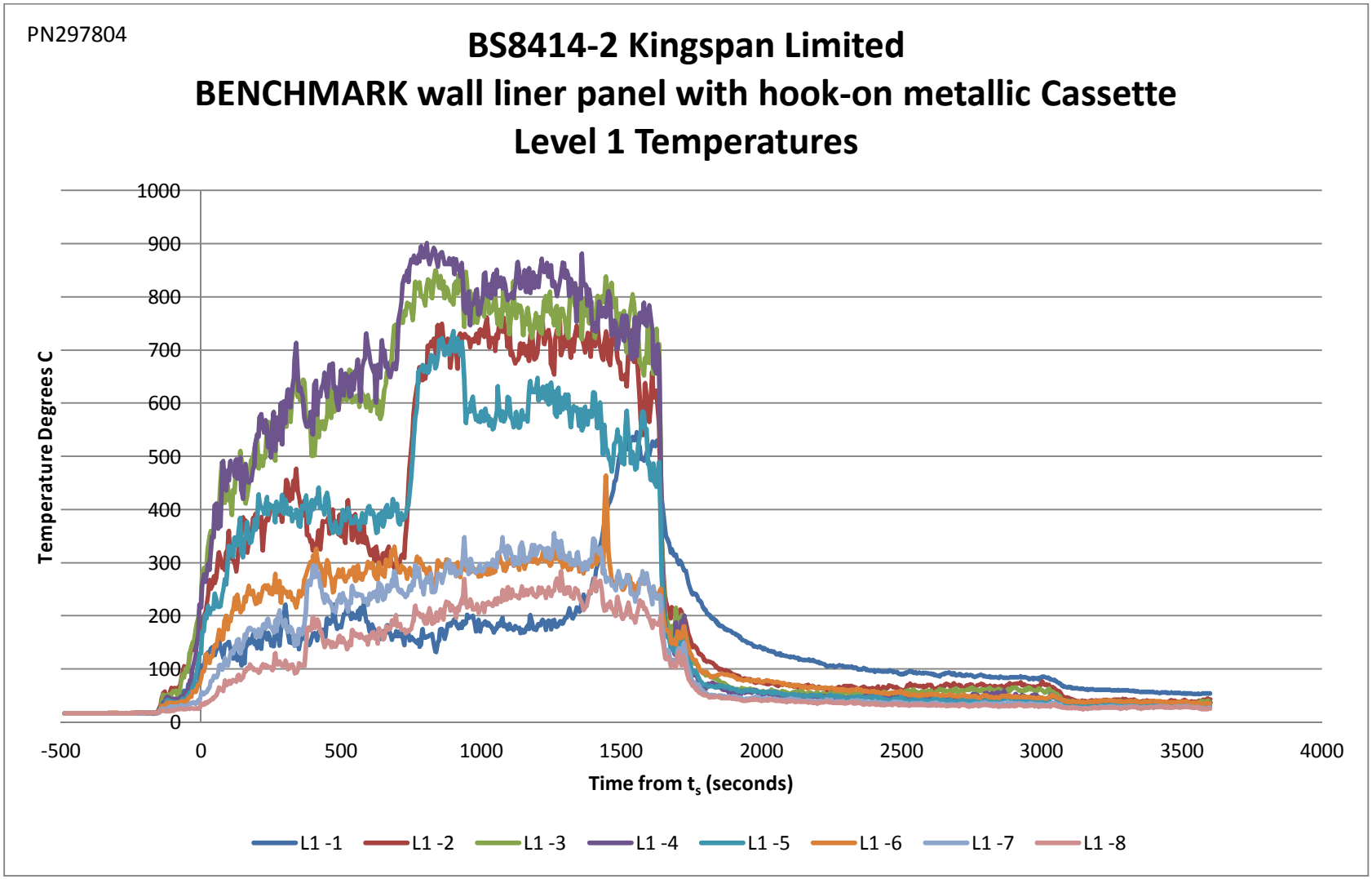

Figure 11. Temperatures Level 1 External

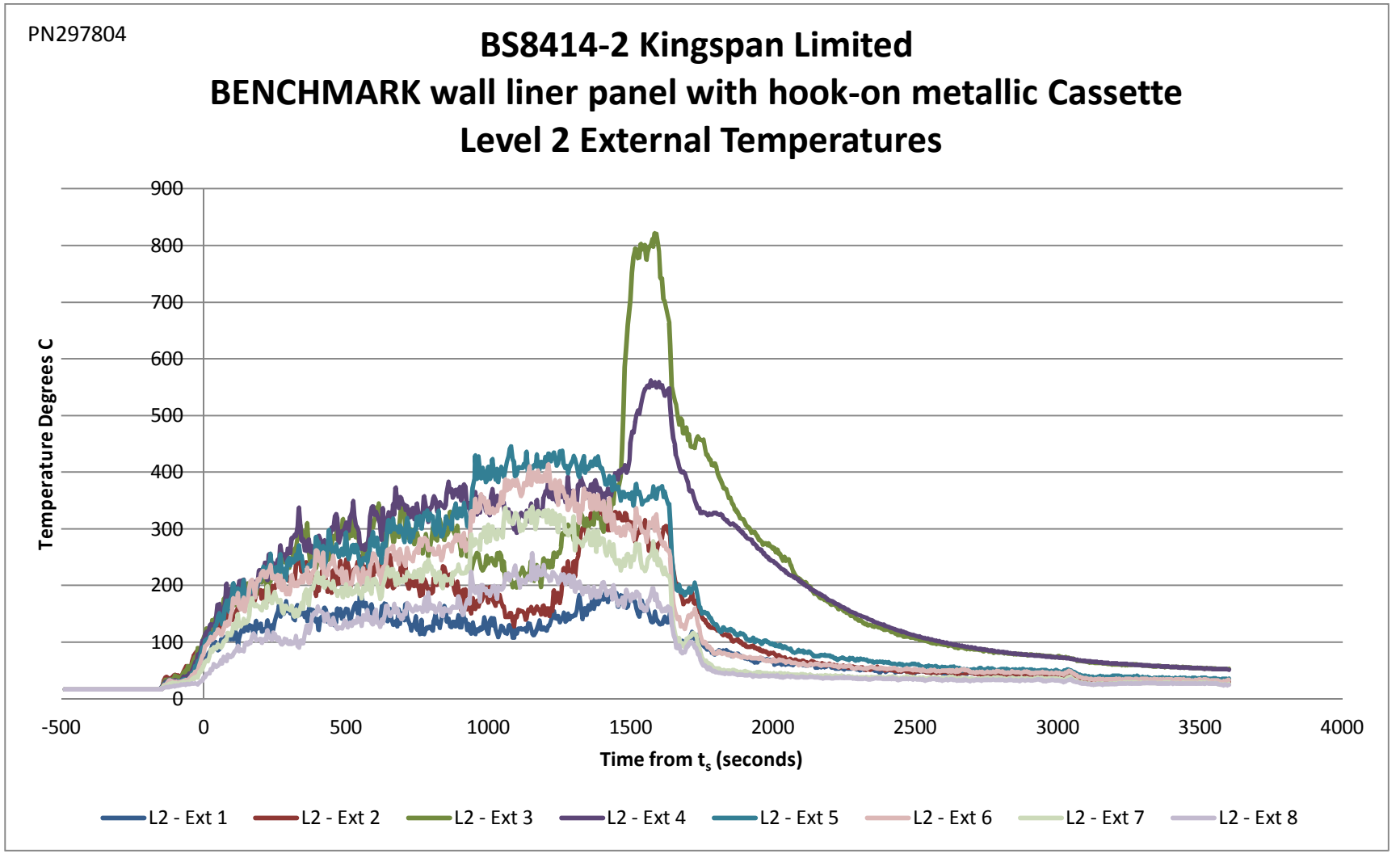

Figure 12. Temperatures Level 2 External Temperatures

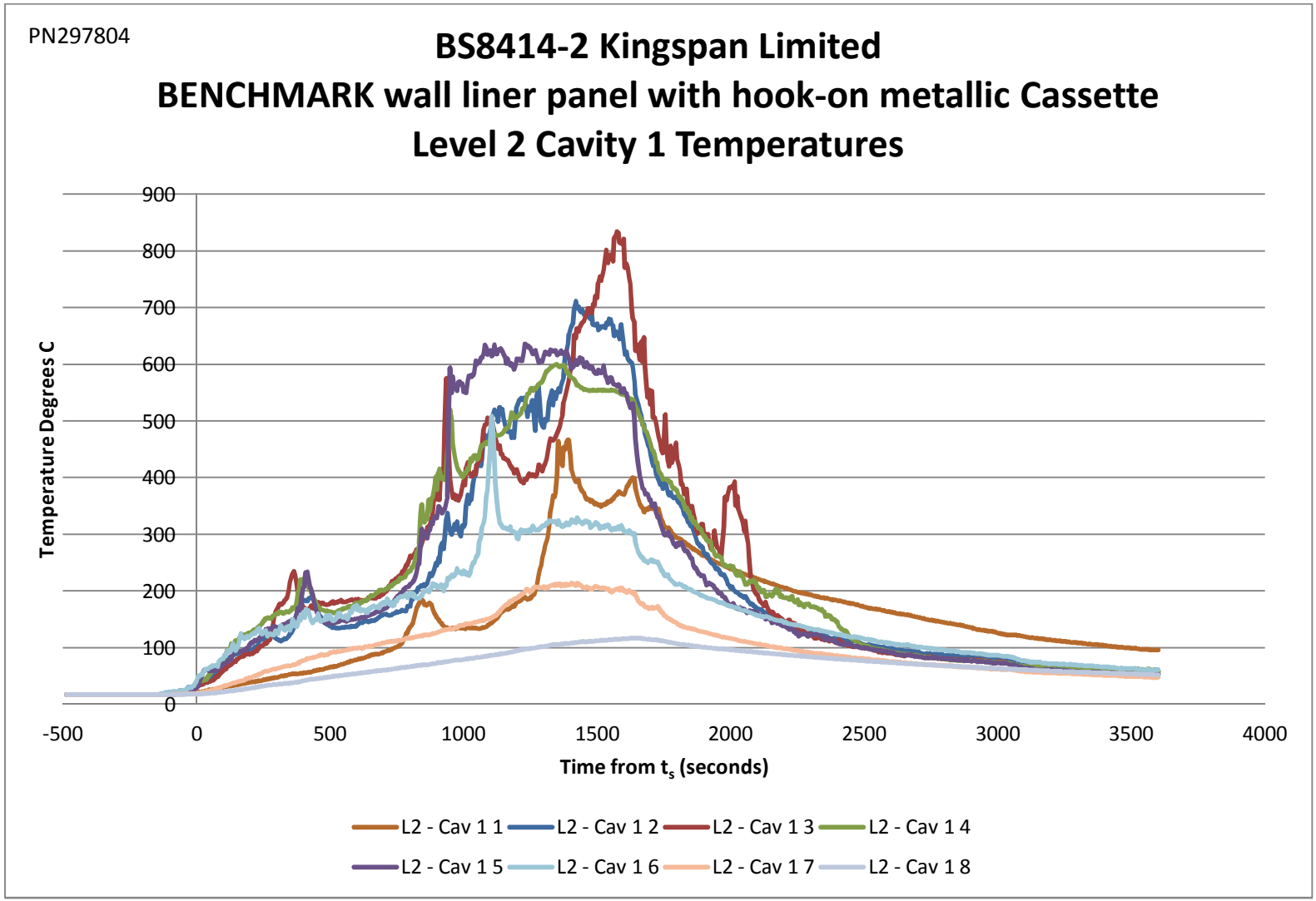

Figure 13. Temperatures Level 2 Cavity 1.

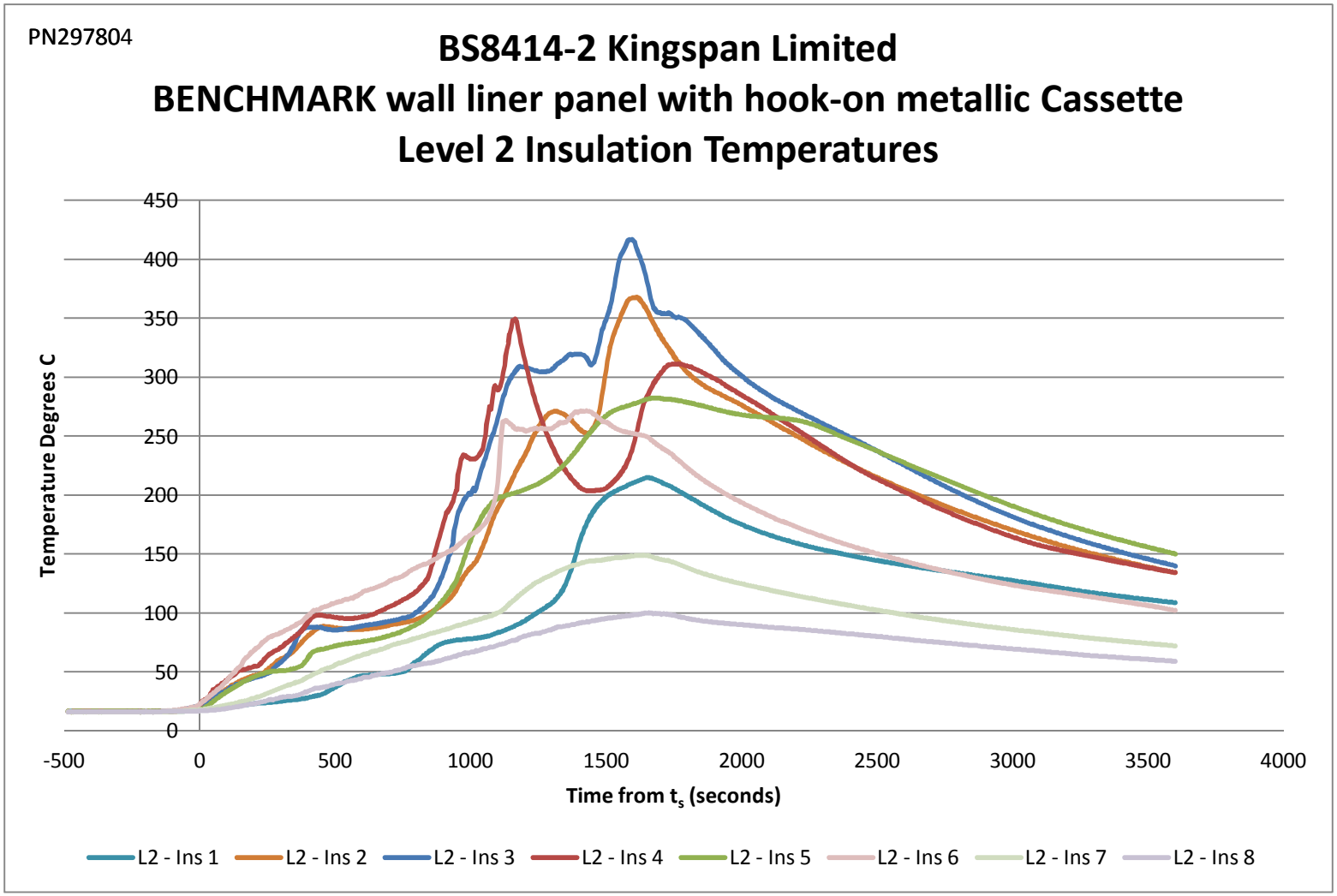

Figure 14. Temperatures Level 2 BENCHMARK wall liner panel Insulation.

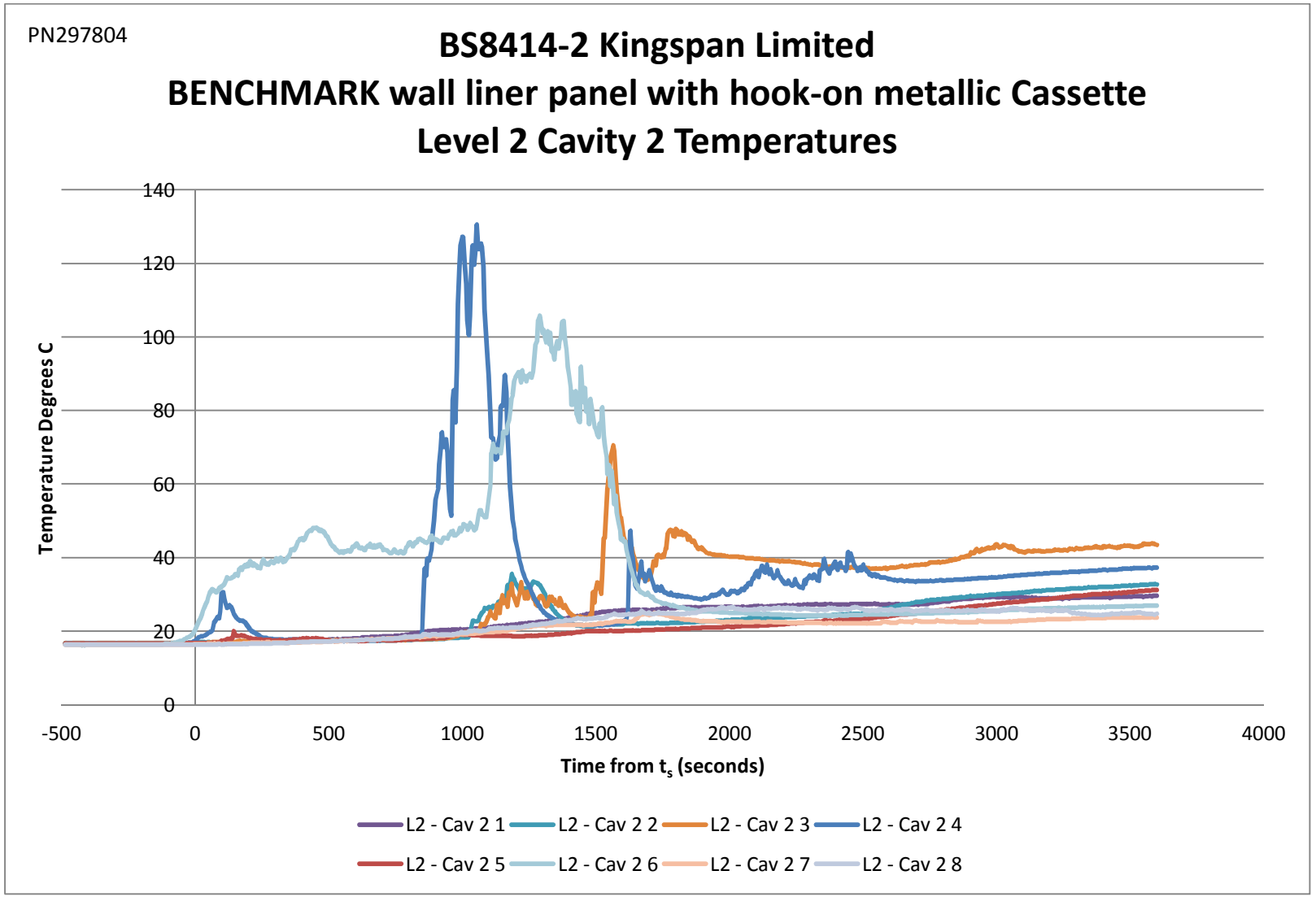

Figure 15. Temperatures Level 2 Cavity 2.

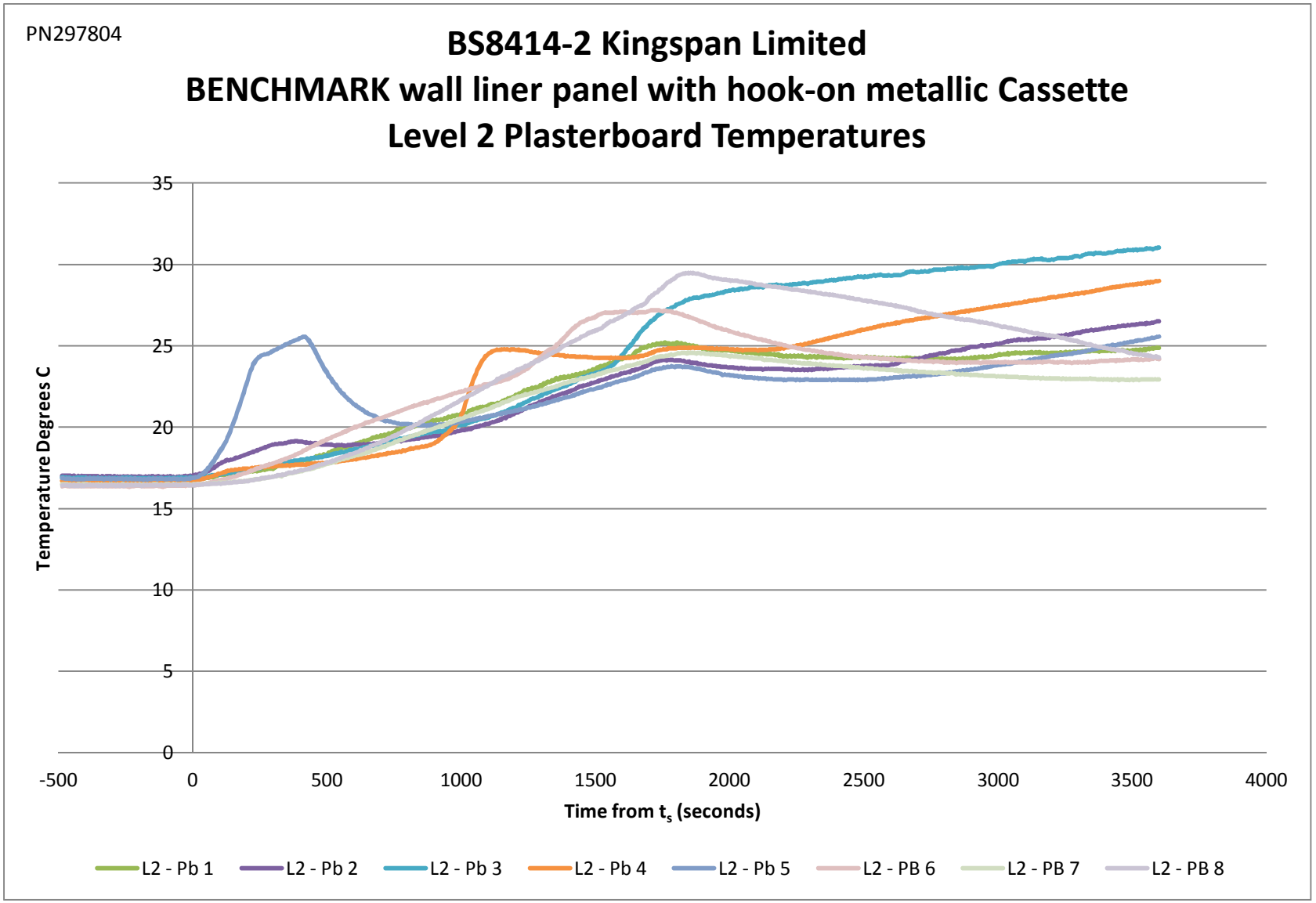

Figure 16. Temperatures Level 2 Plasterboard.

Figure 17. Cladding system during the test.

Figure 18. Photograph showing the condition of the cladding system post-test (Decorative Layer Full height).

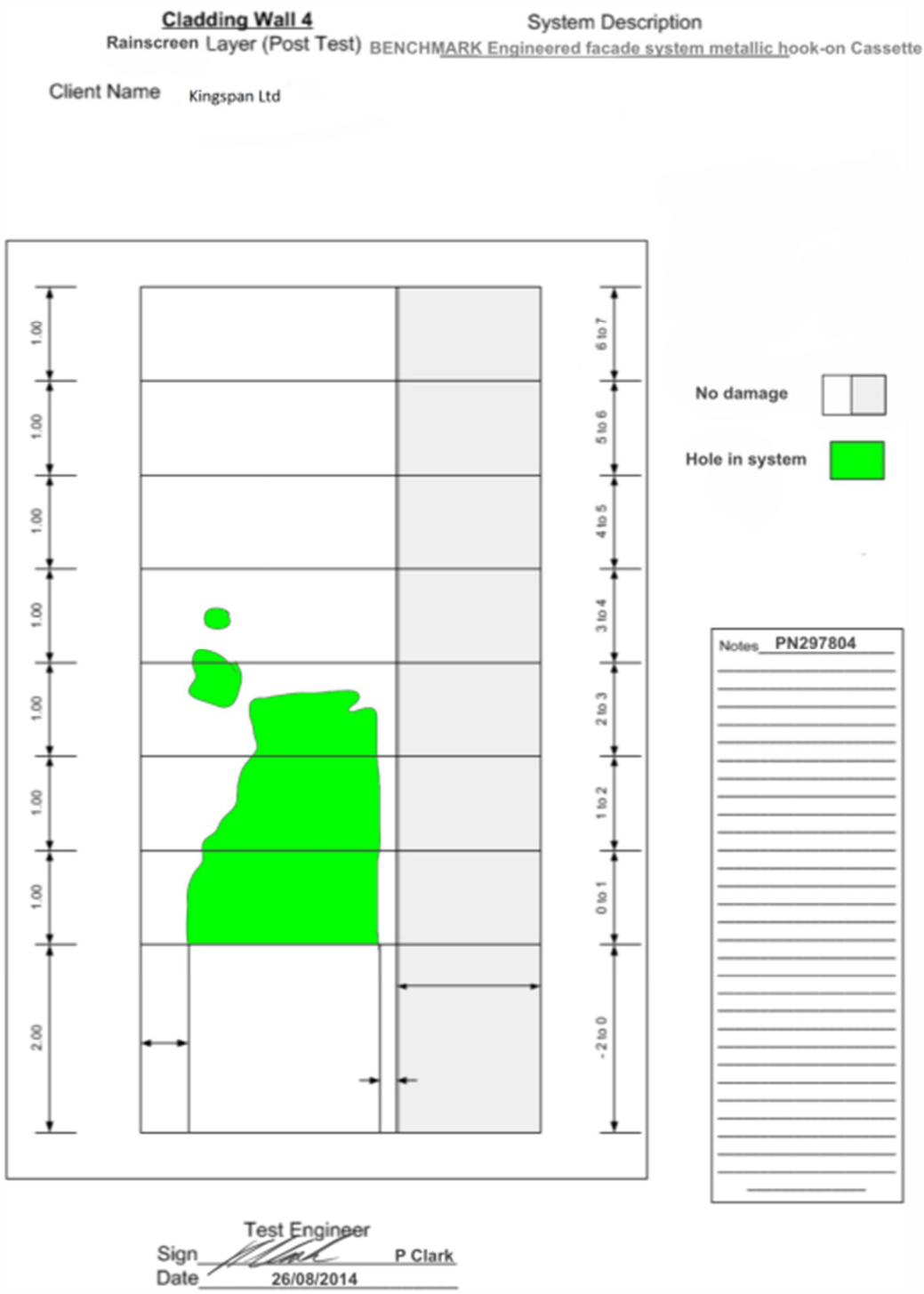

Figure 19. Schematic of the condition of the cladding system post-test (Surface coat layer).

Figure 20. Photograph showing the condition of the cladding system post-test (Insulation Layer Full height).

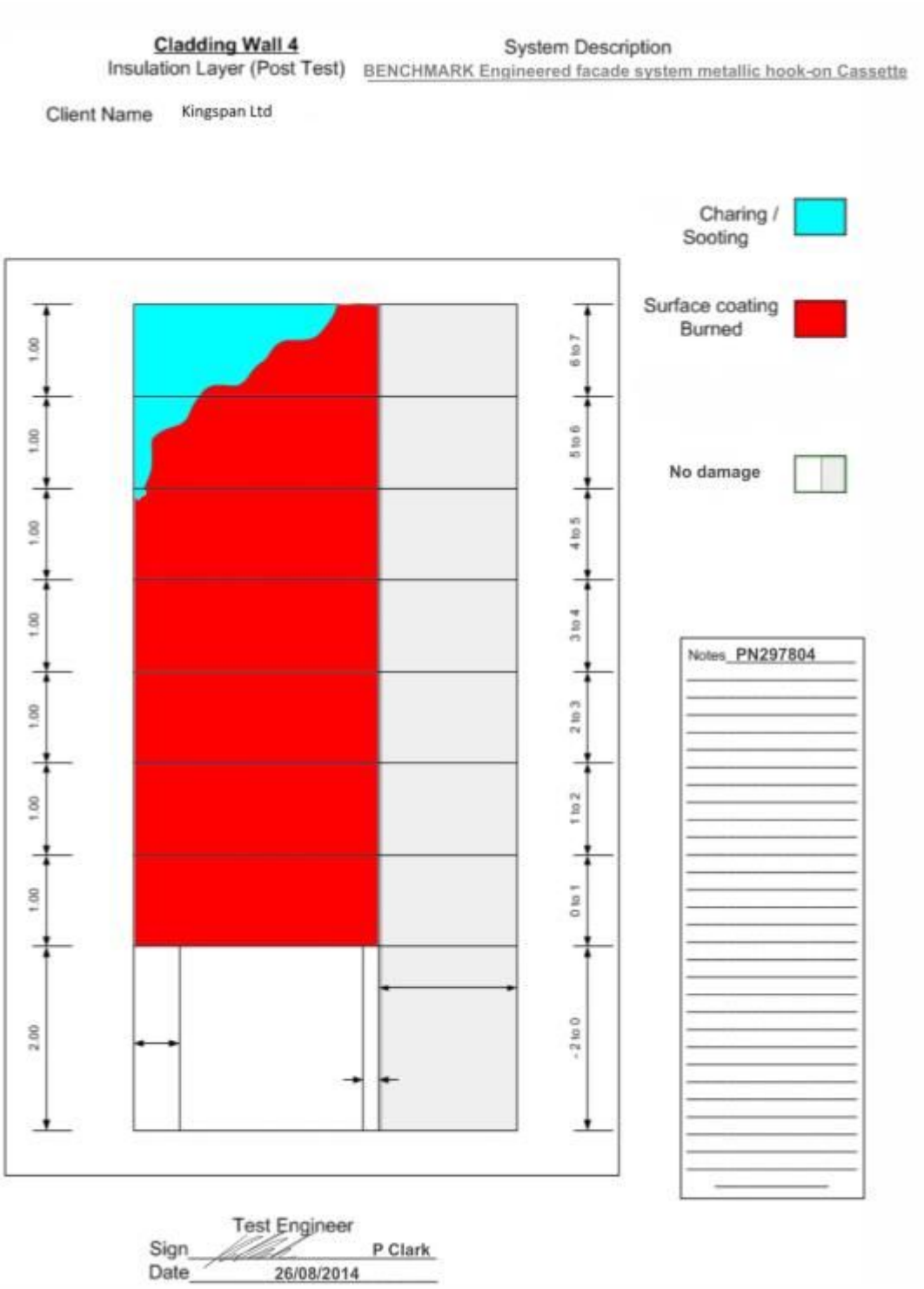

Figure 21. Schematic of the condition of the cladding system post-test (Insulation layer).

Report Ends