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BRE Global Test Report

BS8414-2 : 2005 Test on a Celotex RS5000 insulated system with a ventilated Eternit rain screen

Prepared for: Celotex Insulation Ltd
Date: 1 August 2014
Report Number: 295369 **Issue: 1**

BRE Global Ltd
Watford, Herts
WD25 9XX

Customer Services [redacted]

From outside the UK:
T [redacted]
F [redacted]
E enquiries@bre.co.uk
www.bre.co.uk

Prepared for:

Celotex
Lady Lane Industrial Estate
Hadleigh
Suffolk

IP7 6BA

UKAS TESTING
0578

Produced on behalf of Celotex Limited

bre

Prepared by

Name Phil Clark

Position Senior Consultant, Fire Safety Engineering

Date 1 August 2014

Signature 

Authorised by

Name Tony Baker

Position Principal Consultant

Date 1 August 2014

Signature 

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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.

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2 Details of tests carried out

Name of Laboratory:	BRE Global Ltd.
Laboratory Address:	Bucknalls Lane, Garston, Watford, Hertfordshire. WD25 9XX
Telephone No.:	[redacted]
Fax No.:	
Test reference:	295369
Date of test:	2nd May 2014
Sponsor:	Celotex Ltd
Sponsor address:	Lady Lane Industrial Estate Hadleigh Suffolk IP7 6BA

Sponsors Reference No:

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

Deviations: None

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3 Description of the System

3.1 Description of substrate

The test specimen was installed onto face 1 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 2 shows the system during construction. The system prior to test is shown in Figure 3. 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:

- Two layers of 10mm wall board.
- Simco EFS 100mm Light steel frame system (LSF).
- 12mm magnesium oxide sheathing board.
- Aluminium Helping hand brackets,
- Aluminium L and T rails,
- Lamatherm CW-RHS Horizontal Intumescent expanding fire break,
- Lamatherm CW-RSV Vertical non expanding fire breaks,
- 100mm Celotex RS5000 insulation board.
- 12mm Marley Eternit Natura decorative rain screen board

3.3 Installation of cladding System.

3.3.1 Steel substructure and fixings

A sectional steel Light frame system (LFS) was installed between the floor slab hangers on the main cladding wall, with horizontal base and head tracks fixed to the steel and concrete substrate. Vertical rails were installed at nominal 600mm centres to from the steel fame. A double layer of 10mm wall board was installed on the rear of the LFS and a single layer of 12mm magnesium oxide sheathing board was fixed to the front of the LFS. The build-up of the cladding system is shown in Figure 1 to Figure 8.

3.3.2 Cladding system

An array of aluminium helping hand brackets were mechanically fixed to the sheathing board using 50mm self-tapping screws. A single layer of 100mm Celotex RS5000 insulation board was mechanically attached to the sheathing board with 100mm self-tapping screws and metal washers. The insulation board was pushed over the helping hand brackets through pre-cut slots in the insulation boards.

3.3.3 Fire breaks

Four horizontal ventilated fire breaks (Lamatherm CW_RHS Ventilated cavity barrier) were fixed in a continuous strip and fixed back to the sheathing board with the manufactures recommended fixings. Four vertical non ventilated barriers (Lamatherm CW_RHS Non ventilated cavity barrier) were installed at the outer edges of the cladding system and vertically around the hearth opening to the full height of the test frame. The layout of the fire breaks is shown in Figure 7.

3.3.4 Rain screen

An array of vertical carrier rails were fixed to the helping hand brackets with both L and T aluminium brackets used. A single layer of 12 mm Marley Eternit Natura board was mechanically attached to the carrier rails with self-tapping stainless steel screws and washers.

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: 2nd May 2014

Ambient Temperature: 11.6°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 1

Level 2 – Mid point of insulation

Level 2 – Mid point of magnesium oxide board

Level 2 – Mid point of cavity 2

Figure 9 shows the locations and identification numbers of the thermocouples for the test specimen and also the face references used to describe the system.

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4 Test results

4.1 Temperature Profiles

Figure 10 to Figure 15 provide the temperature profiles recorded during the test shows the sample during test.

Parameter	Result
T_s, Start Temperature	211.5 °C
t_s, Start time	2:55 mins : secs after ignition of the crib
Peak temperature/time at Level 2, 50mm external	385°C @ 16 mins : 55 secs after ignition of the crib
Peak temperature/time at Level 2, Cavity 1	134.5°C @ 27 mins : 00 secs after ignition of the crib
Peak temperature/time at Level 2, Insulation Layer	40.1°C @ 22 mins : 55 secs after ignition of the crib
Peak temperature/time at Level 2, magnesium board	23.7°C @ 49 mins : 45 secs after ignition of the crib
Peak temperature/time at Level 2, cavity 2	21.08°C @ 59 mins : 50 secs after ignition of the crib

4.2 Visual Observations-

Table 1. Visual Observations – Refer to Figure 9 for height references.

Time (mins:secs)	Description
-5:00	logger start
0:00	Ignition of crib
2:17	Flames out of hearth
2:49	Flames to 1m cladding wall main face
4:00	Flames to 1m cladding wall main face
4:50	Flames to 2m cladding wall main face
6:15	Flames to 2.5 m cladding wall main face
9:08	Flames to 3m cladding wall main face
11:52	Char in flame area to 2.5 m cladding wall main face
13:00	Joint opening cladding wall main face at 1.2 m
14:30	Smoke from joint at 3.5m right hand side cladding wall main face
15:44	Visible crack in lower board at 0 to 1.2 m and at 2.0 m

Time (mins:secs)	Description
16:00	Flames visible behind board at 1.5 m
18:00	Light char in corner cladding wall wing face at 0 m
19:20	Small area away right hand side at 1.2 m cladding wall main face
20:20	Flames out from the back of the Eternit board at 2.5m
23:00	Smoke from cladding wall wing face to 2.5m crib collapse
24:00	Hearth surround away
26:00	Flaming on wing behind board t 1.2 m
30:00	Crib extinguished
30:00	continued burning at 2.5 m cladding wall main face and cladding wall wing face
44:00	Board away at 1.2m right hand side of cladding wall main face
60:00	Flames on cladding face extinguished: test end.

5 Post-test damage report

5.1 External Layer

A schematic illustration of the damage to the system is shown in the condition of the cladding system after the test is shown in Figure 18. It was noted that the insulation layer continued to burn past the 30 minute with the flaming extinguished at 60 minutes.

5.2 Insulation Layer

The condition of the panels after the test is shown in Figure 19.

5.3 Collapse

There was minimal collapse of rain screen panel from 19 minutes from ignition and throughout the remainder of the test period.

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.

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7 Figures

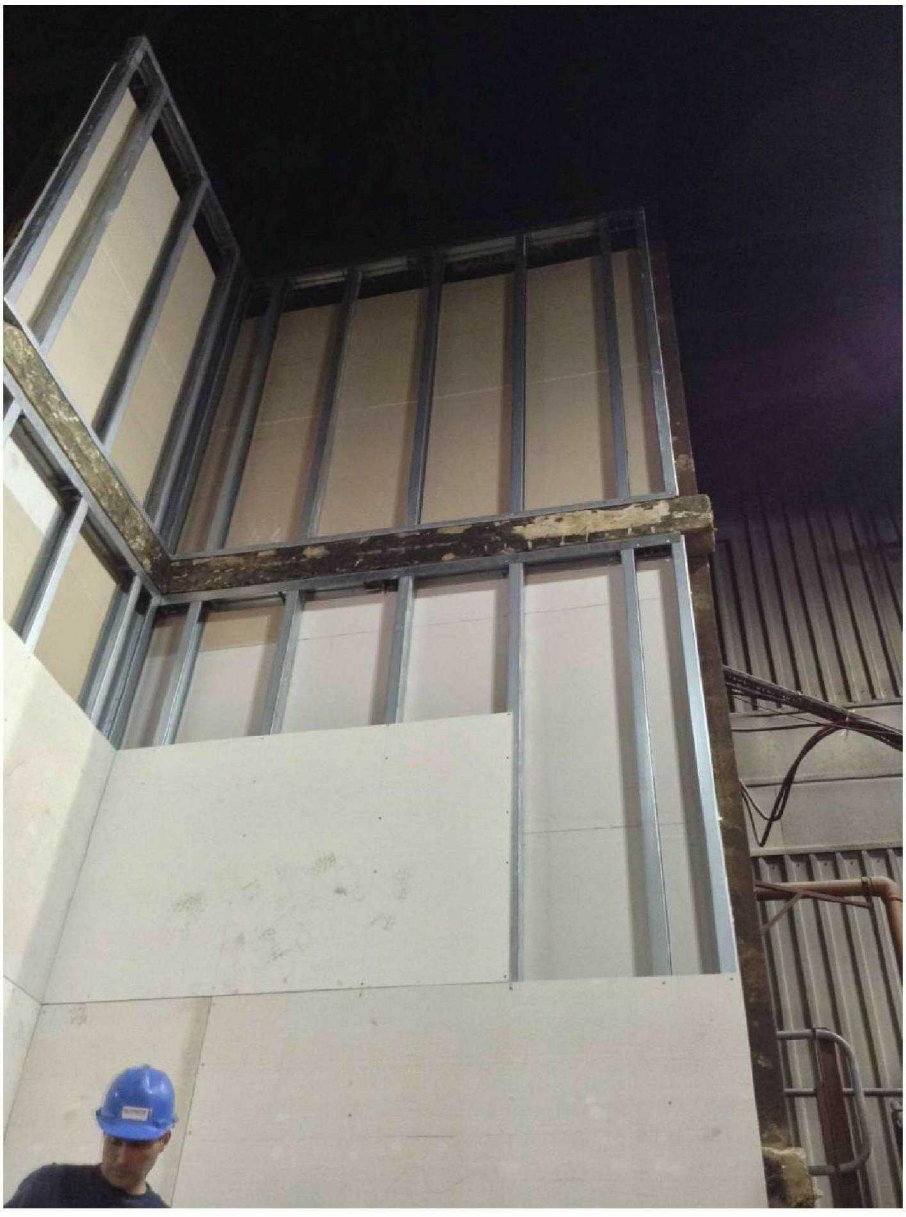

Figure 1. Photograph of the system showing the magnesium oxide sheathing boards and LSF system.

Figure 2. The system during construction.

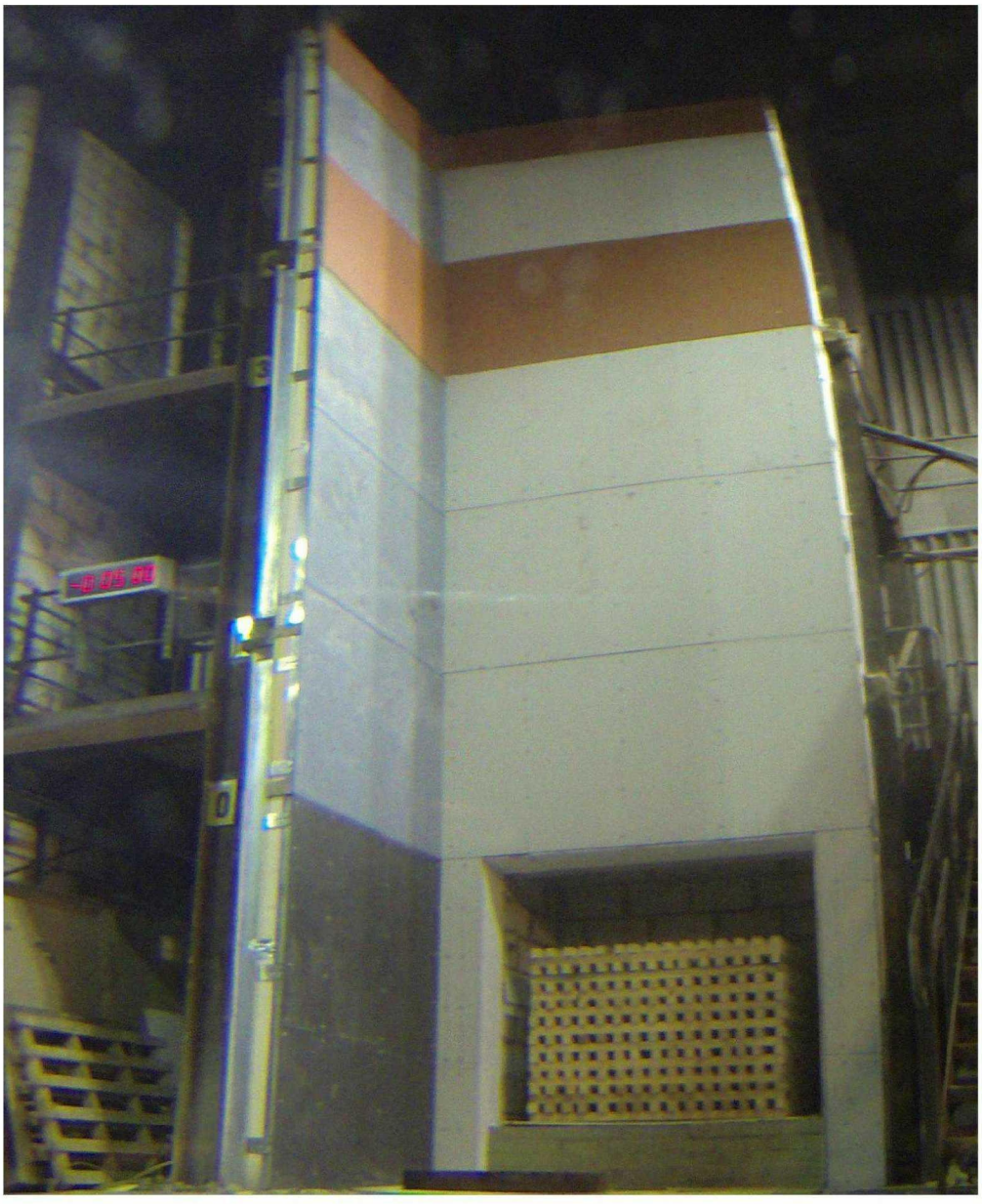

Figure 3. The system prior to testing

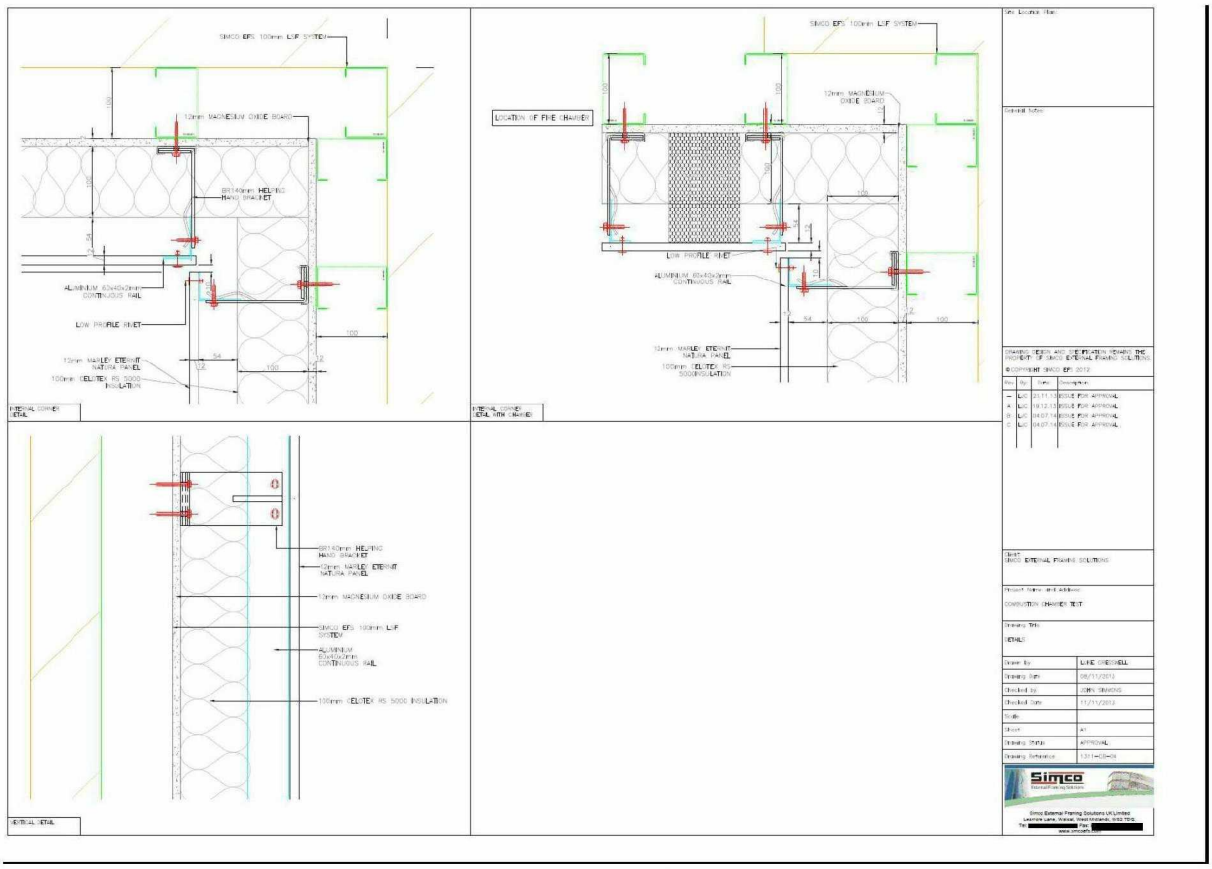

Figure 4. Construction of the System showing the key layers of the cladding system.

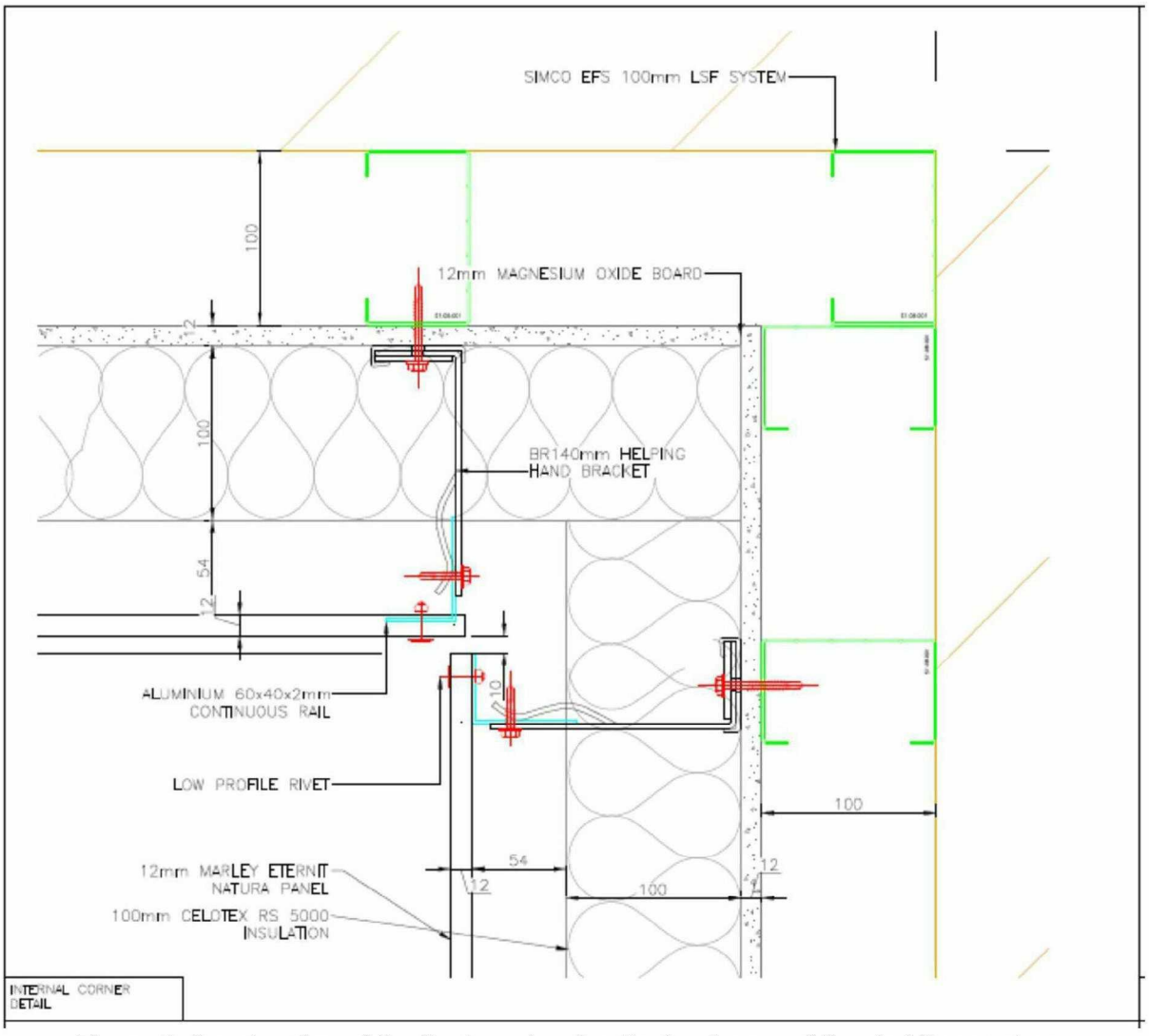

Figure 5. Construction of the System showing the key layers of the cladding system.

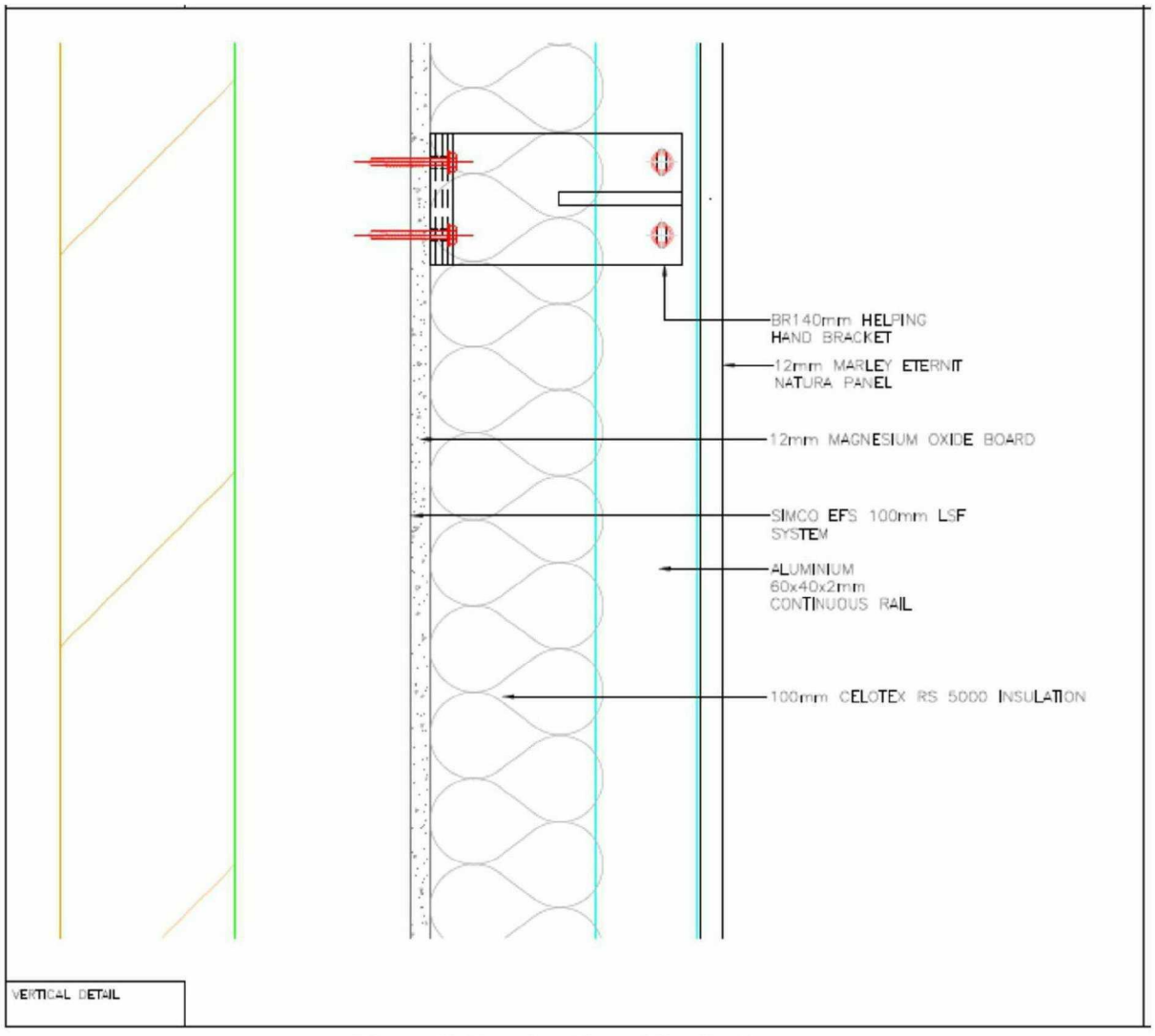

Figure 6. Construction of the System.

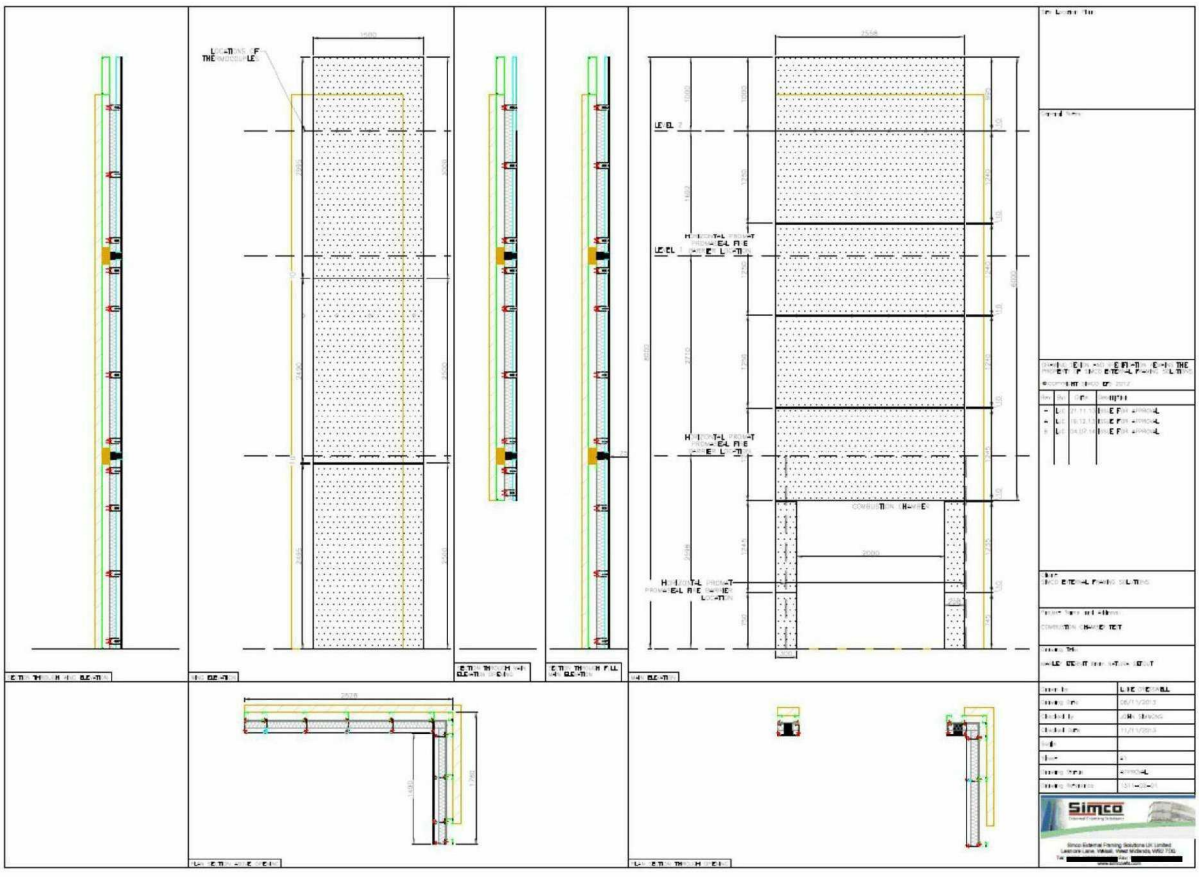

Figure 7. Construction of the System showing the fire break layout.

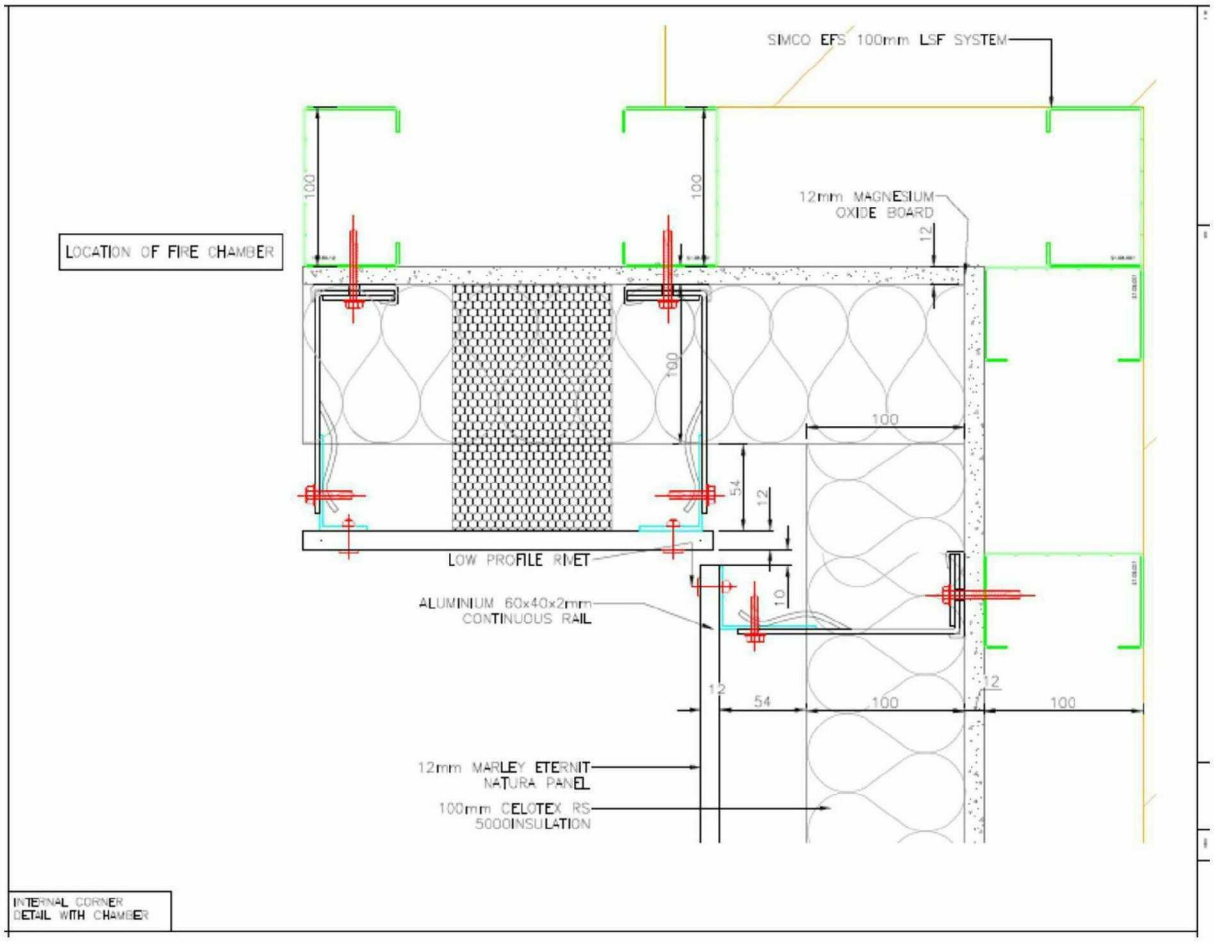

Figure 8. Construction of the System showing the internal corner details.

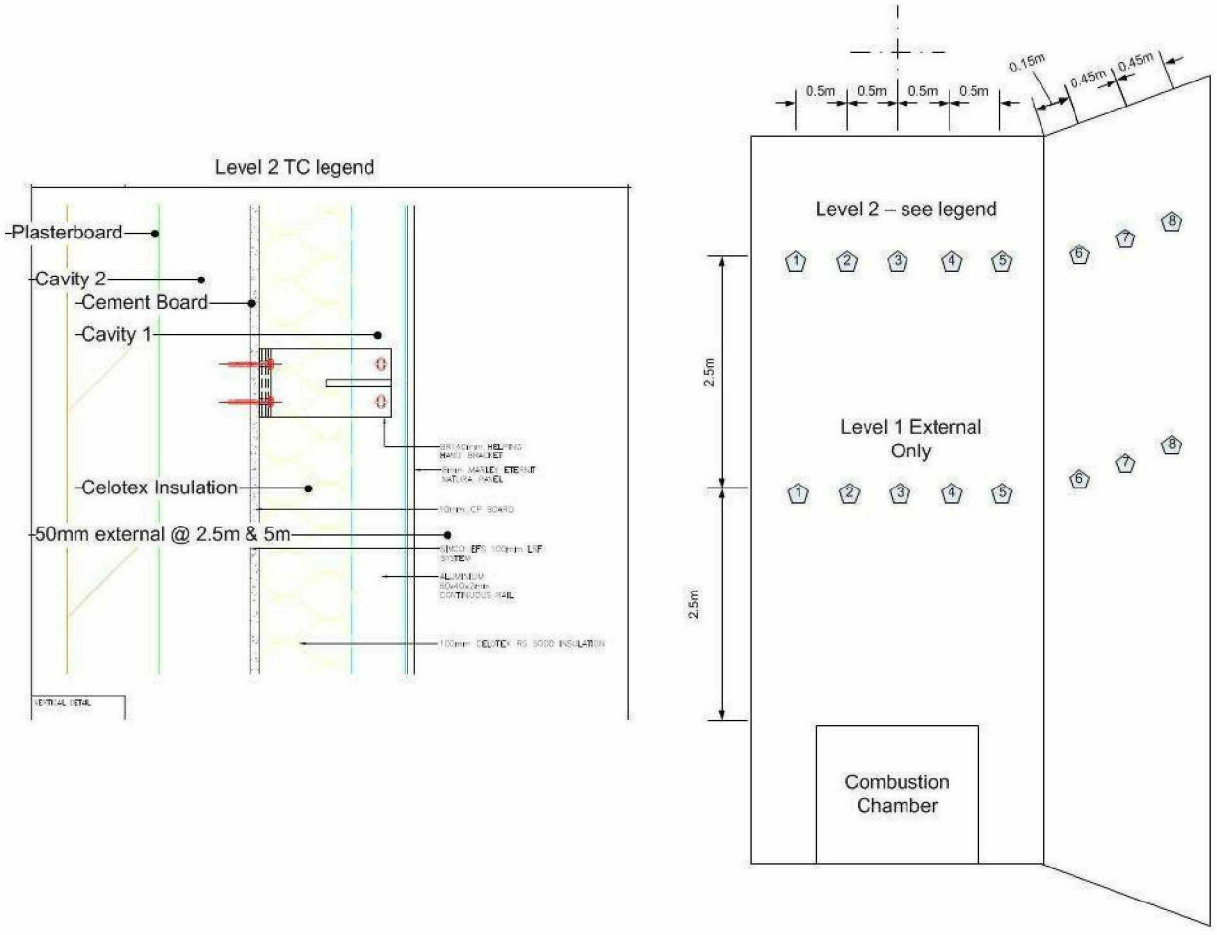

Figure 9. Location and identification numbers of thermocouples used (schematic only)

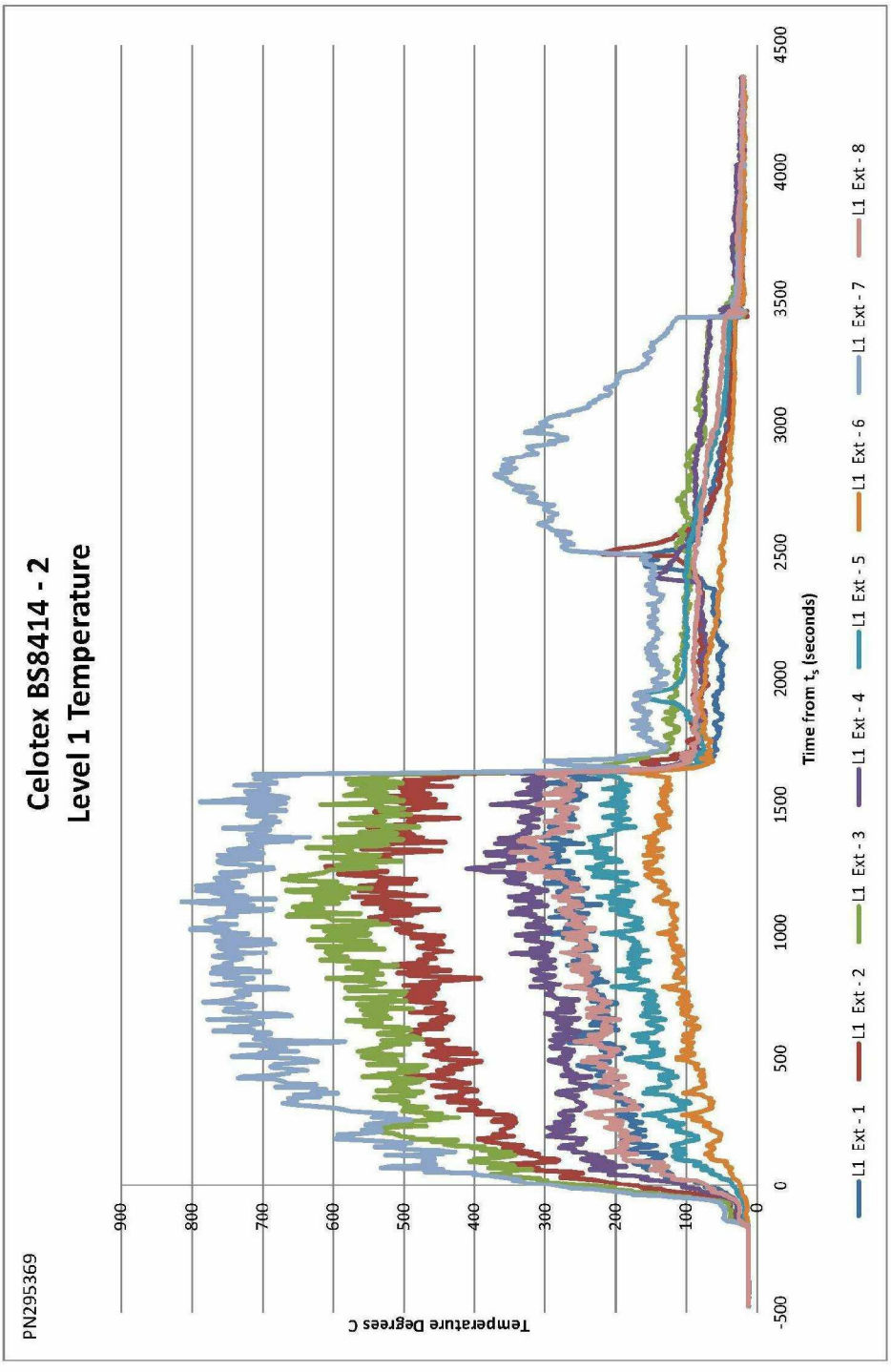

Figure 10. Temperatures Level 1 External

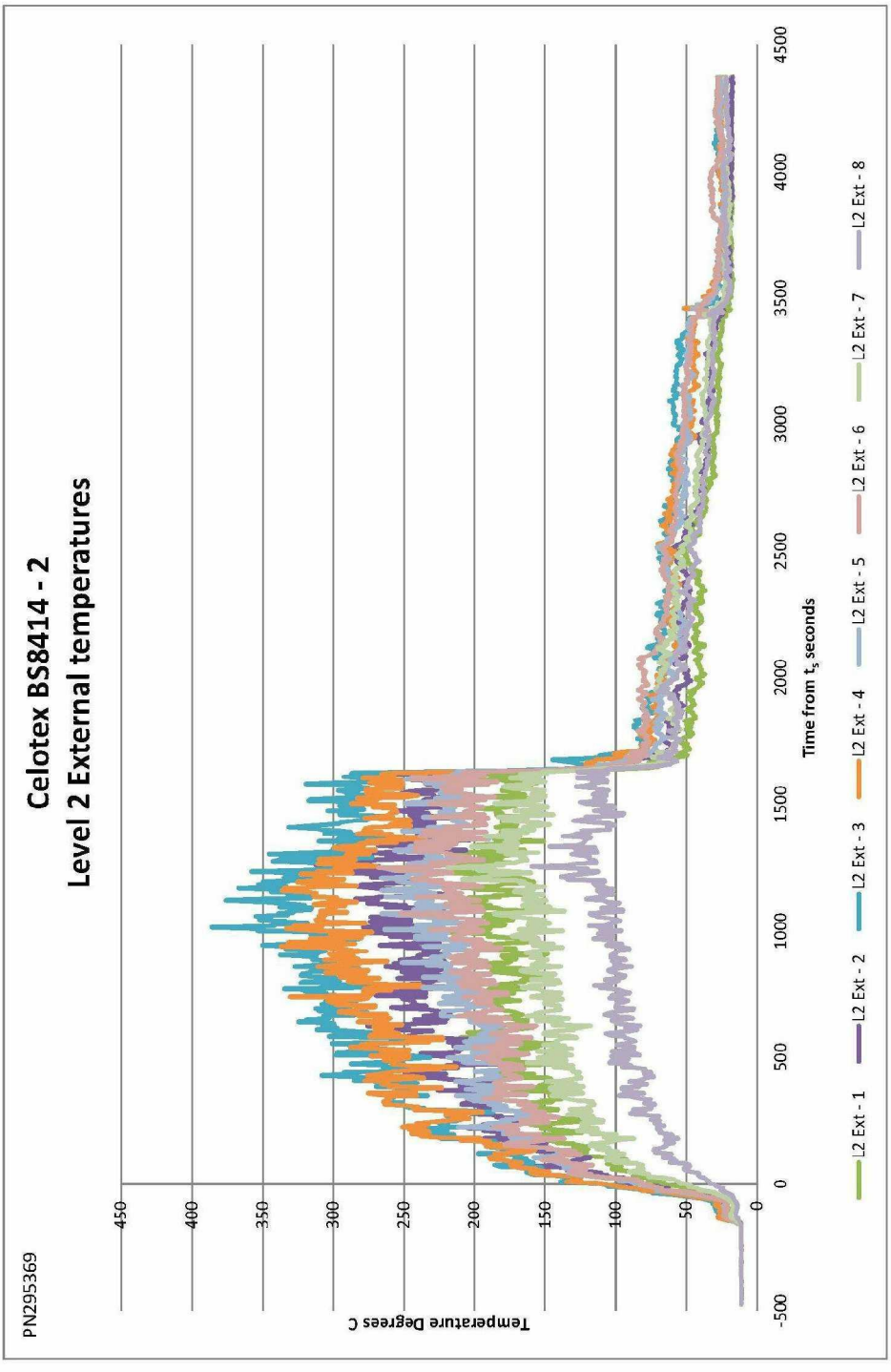

Figure 11. Temperatures Level 2 External

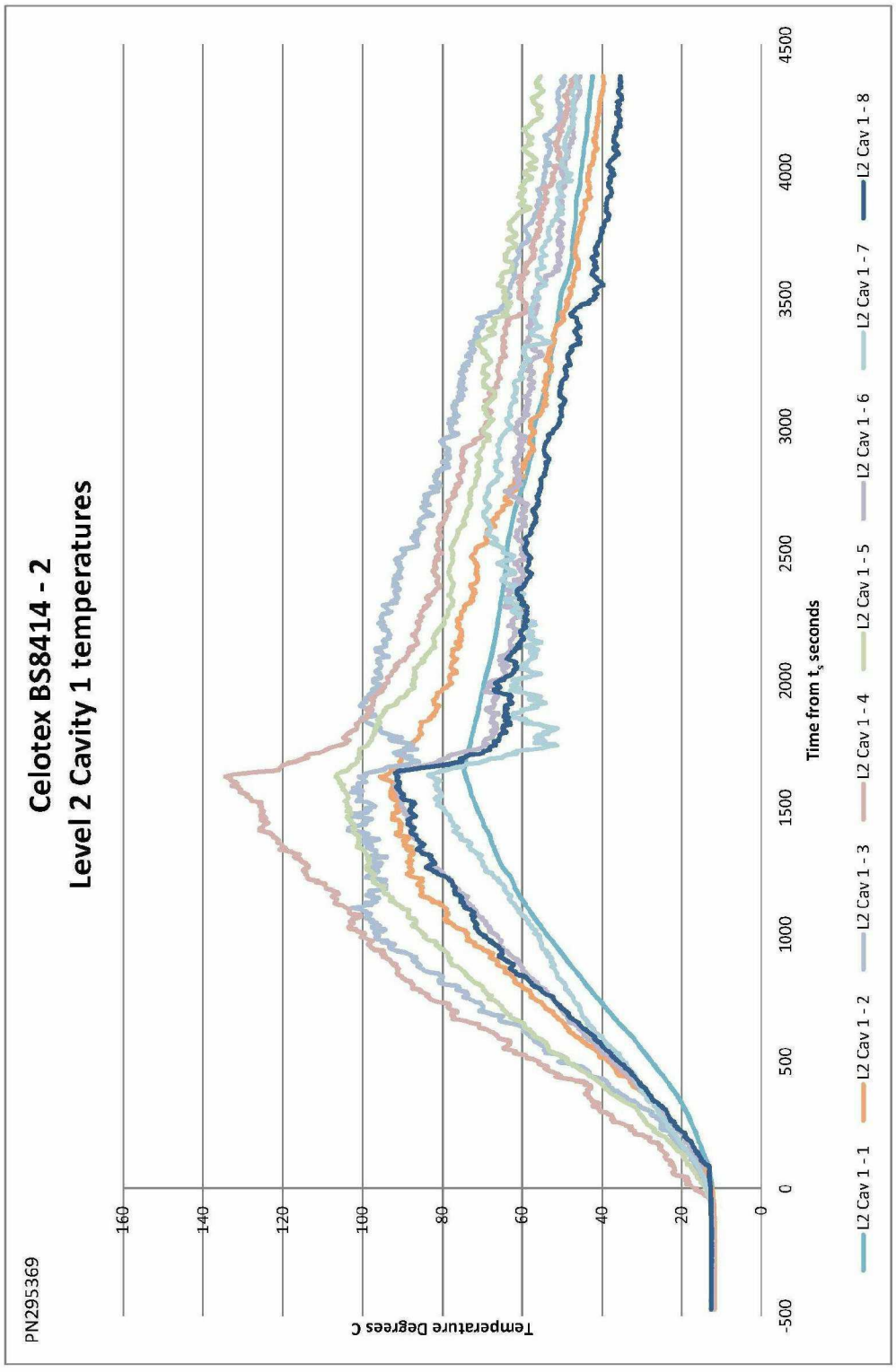

Figure 12. Temperatures Level 2 Cavity 1

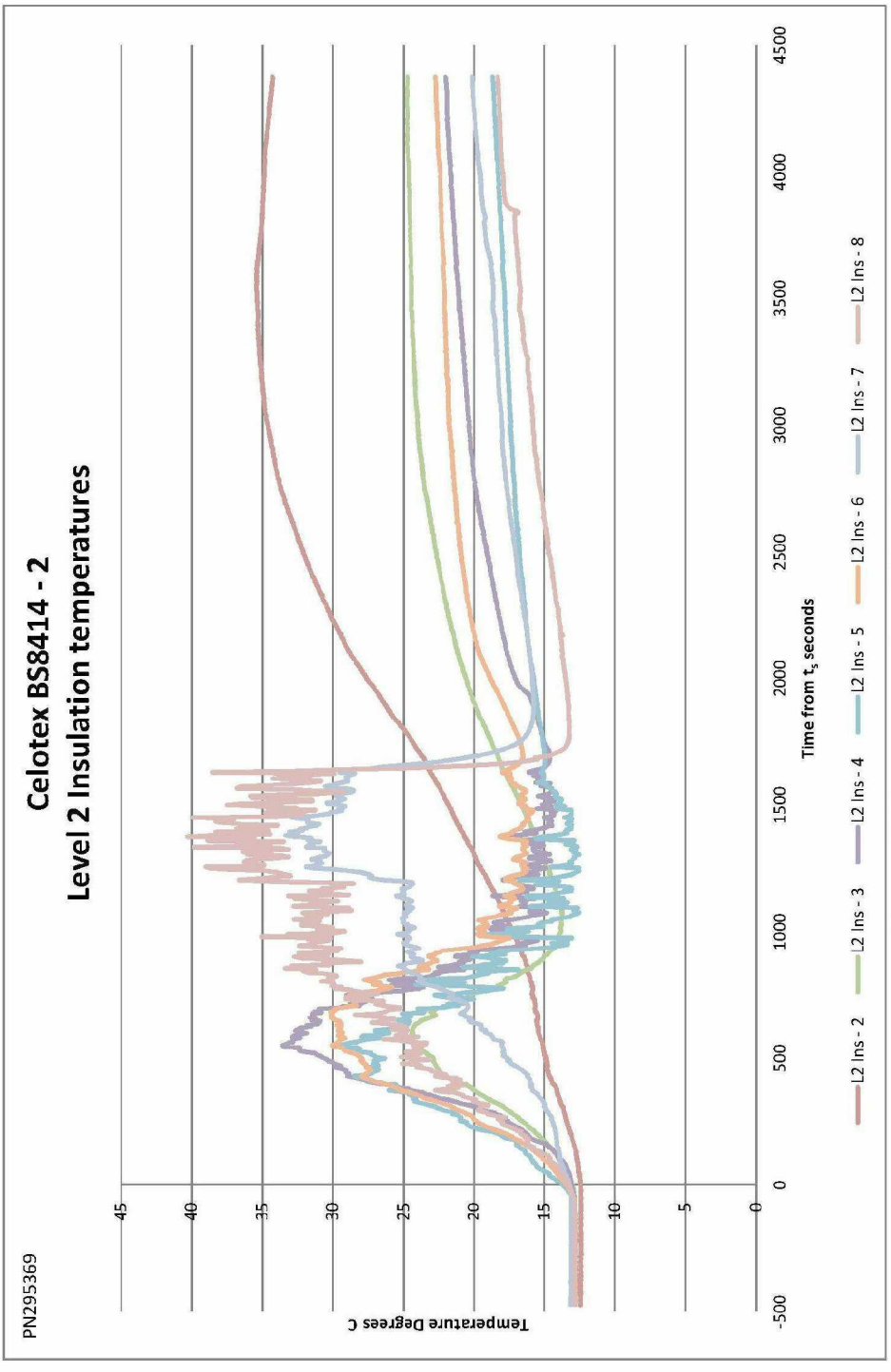

Figure 13. Temperatures Level 2 Insulation.

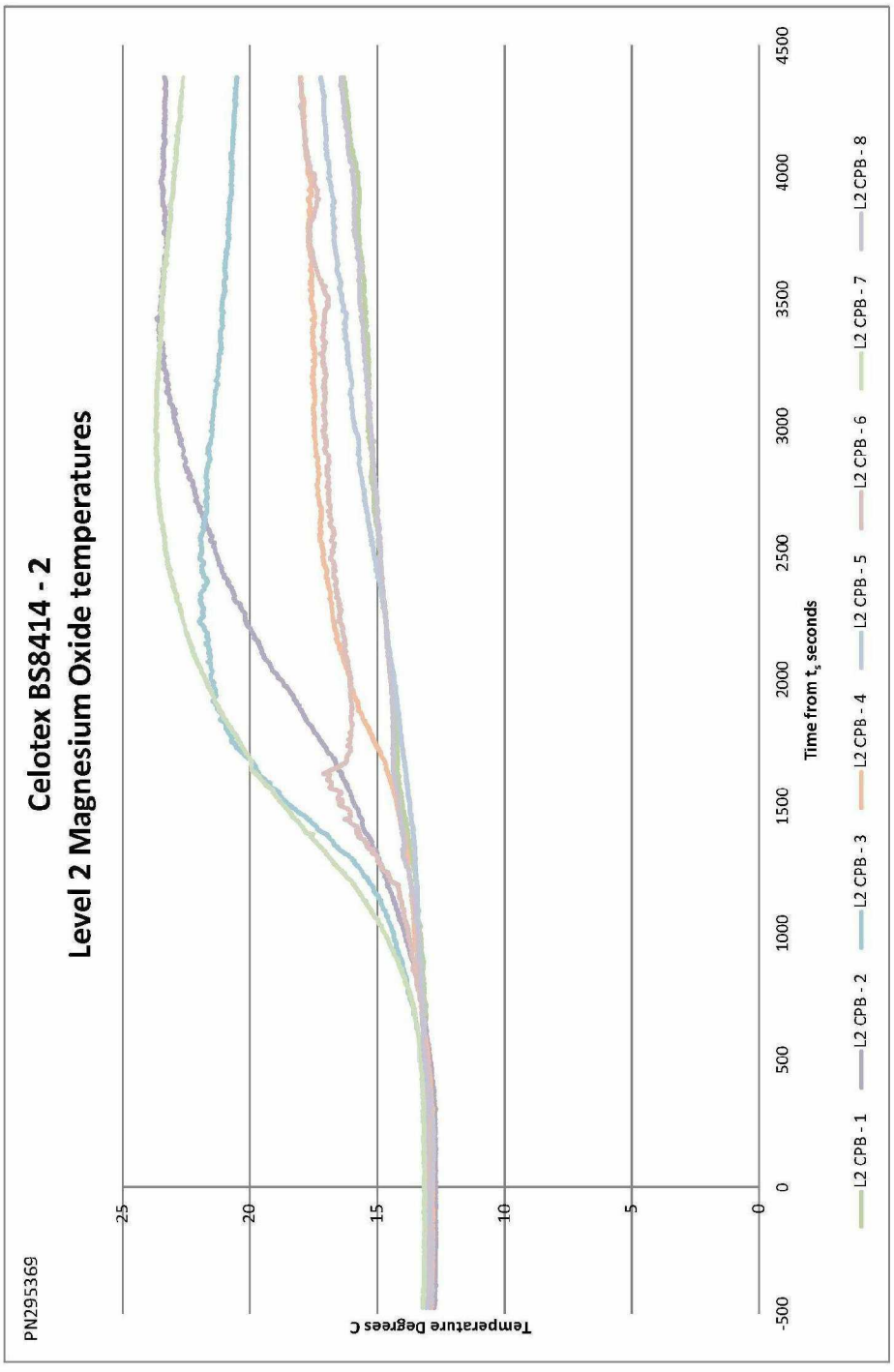

Figure 14. Temperatures Level 2 Magnesium oxide board.

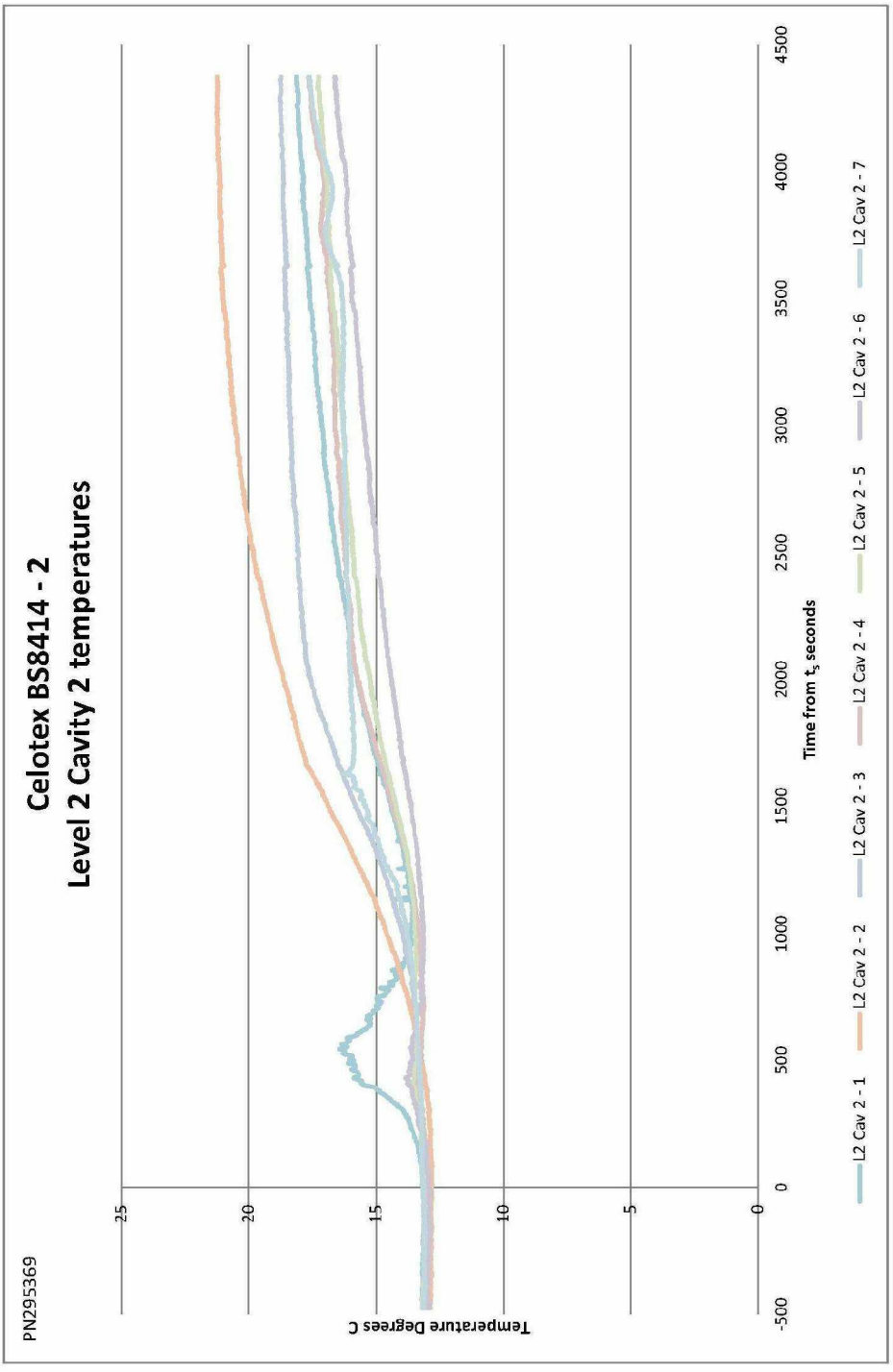

Figure 15. Temperatures Level 2 Cavity 2.

Figure 16. Cladding system during the test.

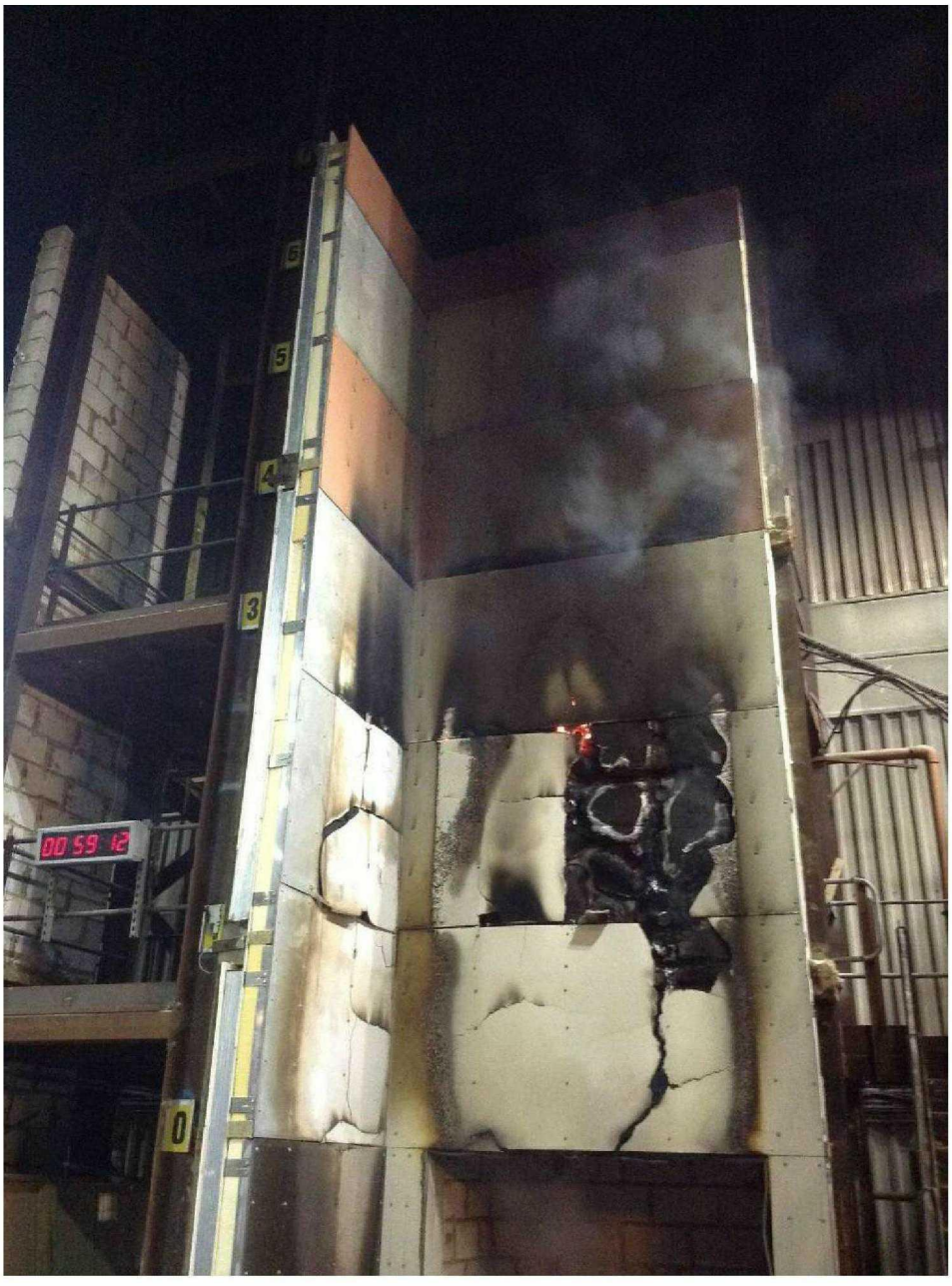

Figure 17. Photograph showing the condition of the cladding system post-test (Decorative Layer Full height).

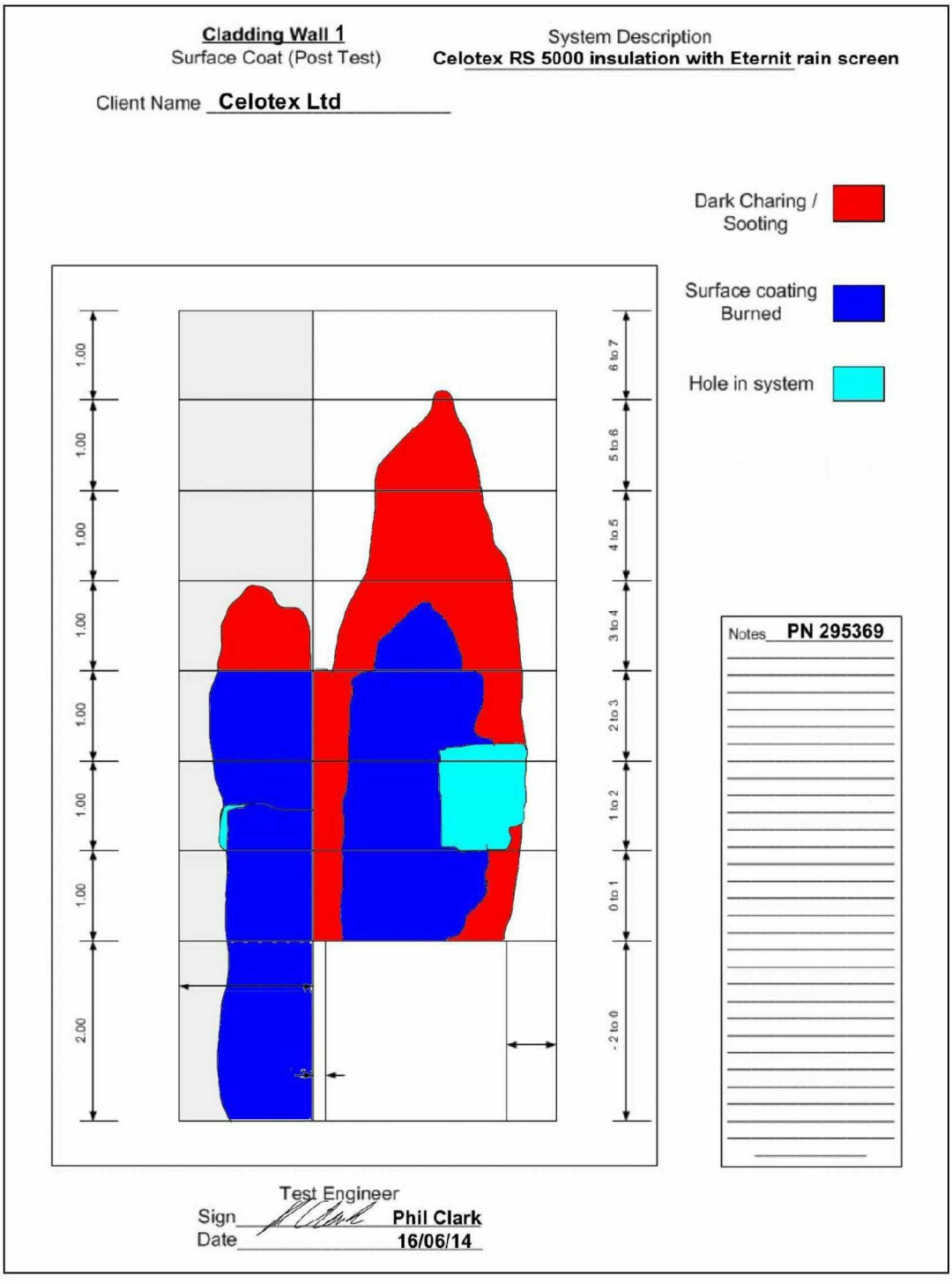

Figure 18. Schematic of the condition of the cladding system post-test (Surface coat layer).

Figure 19. Photograph showing the condition of the cladding system post-test (Insulation layer).

Figure 20. Photograph showing the condition of the cladding system post-test (Insulation layer) above and below the fire barriers.

Figure 21. Photograph showing the condition of the ventilated fire barrier post-test.

Figure 22. Photograph showing the condition of the fire barriers post-test.

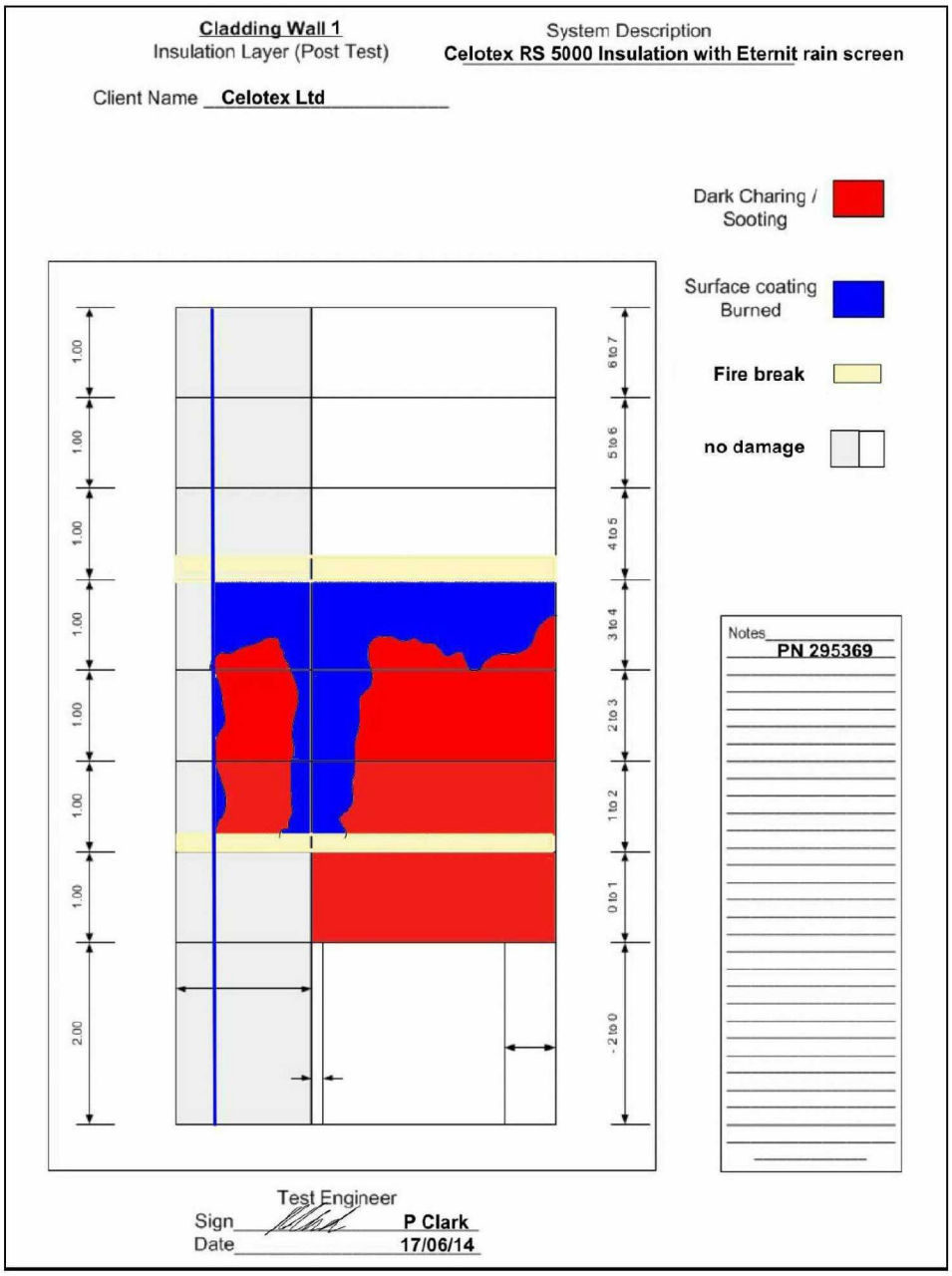

Figure 23. Schematic of the condition of the cladding system post-test (Insulation layer).

Report Ends