

BRE Global Test Report

BS8414-2 : 2005 Test on a Carea Insulated facade system

Prepared for: Carea Façade.

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1 Introduction

BS8414-2:2005 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 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:	302995
Date of test:	23 March 2015
Sponsor:	Carea Façade
Sponsor address:	ZA Bel Air 49520 Combrée France
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 3 of the BRE Global External Cladding Test Facility. This is a multi-faced test facility constructed from steel, with the cladding system affixed to the steel substructure.

3.2 Description of product

The system prior to test is shown in Figure 1. Full details of the system specification and installation details have been provided by the client and are summarised in the following section. The build-up of the system is shown in figures 3-8, and (in order from the structural frame to the outer panels) comprised of:

- Double layer of 12.5mm plasterboard.
- 150mm Metsec steel frame
- 12mm cement sheathing board
- 140mm K15 Kingspan Insulation
- Horizontal firebreaks – Siderise RH25 open state cavity barriers
- Vertical firebreaks – Lamtherm -030/030/189-288
- Secondary frame consisting of rails to secure the decorative panels.
- Mineral composite grooved panels

Further detail of the composition of the wall is given below:

A sectional steel frame system (SFS) was installed between the floor slab hangers on the main cladding wall 3, with horizontal base and head tracks fixed to the steel substrate. Vertical rails were installed at varying centres to accommodate the cladding system on to the test rig. Refer to figure 3 for the actual spacing. A double layer of 12.5mm Plasterboard was installed on the rear of the SFS and a single layer of 12mm cement based calcium sheathing board was fixed to the front of the SFS.

'Helping hand' brackets were installed onto the cement particle board and the insulation was fitted over these brackets. The joints between the individual sheets and hole created by the bracket were tapped with aluminium tape.

The insulation was 140mm Kingspan K15 panels supplied in 2.4m x 1.2m sheets.

On to the helping hand brackets, a secondary rail system was installed to carry the decorative panels. A horizontal 'starter' bracket was installed just above the hearth which located the bottom of the first row of decorative panels. The top of the panel was secured with a second horizontal rail 'upper rail'. The rest of the panels were then installed on a repeating pattern of rails – the bottom of the panel located on an 'escape' rail and the top of the panel fixed to an 'upper rail'. The top and bottom of the panels were grooved to locate onto the rails and hence the horizontal rail spacing was 900mm.

The top row of panels was restrained using a 'Top stop claw' rail.



The decorative panels were 'Acantha Carea Grooved Panels'. The panels on the installed system were 900mm x 900mm and were polyester mortar. Panels were cut to size on the main wall right hand side and either side of the hearth opening.

Horizontal fire breaks, 75mm thick 'Siderise RH25 open state cavity barriers' were installed above the hearth (for the width of the main wall), approximately 900mm above the hearth (full width of main and wing walls), and aligned with the top of the level 2 'floor', and a final barrier was installed to close off the top of the system.

A vertical firebreak was installed on the main wall to the left hand side of the hearth (between the wing and main walls) for the full height of the system. This was located approximately 430mm from the cement particle sheeting board layer on the wing wall.

A second vertical fire break was installed on the wing wall for the full height of the system. This was located approximately 215mm from the cement particle sheeting board layer on the main wall.

A third vertical fire break was installed to the right of the hearth and terminated at the horizontal fire break across the top of the hearth. This was approximately 450mm from the right hand edge of the system.

The hearth opening was closed off with galvanised mild steel flashing.

3.3 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.

3.4 Conditioning of the Specimen

Once the system was completed there was no requirement for conditioning before testing was undertaken.

3.5 Test Conditions

Test Date: 23 March 2015

Ambient Temperature: 12.9°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 sheathing board

Level 2 – Mid-point of cavity 2



Level 2 – Mid-point of plasterboard

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.

4 Test results

4.1 Temperature Profiles

Figure 10 to Figure 16 provide the temperature profiles recorded during the test. Figure 17 shows the sample during test.

Parameter	Result
T_s , Start Temperature	228.1°C
t_s , Start time	2 mins : 30 secs after ignition of the crib
Peak temperature/time at Level 2, 50mm external	559.1°C at 18 mins : 15 secs after t_s
Peak temperature/time at Level 2, Cavity 1	640.1°C 17mins : 45 secs after t_s
Peak temperature/time at Level 2, Insulation Layer	360.3°C 25mins : 20 secs after t_s
Peak temperature/time at Level 2, cement particle board	220.5°C 27 mins : 0 secs after t_s
Peak temperature/time at Level 2, cavity 2	31.1°C 26 mins : 10 secs after t_s
Peak temperature/time at Level 2, Plasterboard	32.9°C 23 mins : 45 secs after t_s



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
2:27	Flames out of hearth
3:07	Flames to 1.5m cladding wall main face
3:48	Flames to 2m cladding wall main face
5:01	Flames to 2.5m cladding wall main face
6:31	Char on cladding wall wing face at 0m corner
7:41	Bowing of panels on left hand side of cl cladding wall main face
9:33	Flames to 3m cladding wall main face additional burning of system in plume area
10:05	10:05 small area of tile away 0 m cladding main face on centreline, flames to 3.5m.
12:20	Panel away. 0m cladding wall main face
13:05	Panel away to 2.5m cladding wall main face. Flames to 4.5m
15:00	Small pool fire (burning debris) lasting 10 seconds plus, smoke from cladding wall wing face.
17:15	Deformed panels at 4m cladding wall main face left hand side cl
19:50	Panels away at 5 m cladding wall main face, with large fire LHS of cladding wall main face (burning debris within 1.2 x 2.4m area)
23:00	Surface flaming on wing face with tile falling way
23:35	Tile away 2m on cladding wall wing face.
33:50	Flames out above barrier at 3m
37:00	Continue to burn left hand side cladding wall main face
60:00	Test Ends



5 Post-test damage report

5.1 External Layer

5.1.1 Rain screen main wall – tiles

Tiles had detached from the system and fallen to the floor at the following locations.

Tile row 1 is the line of tiles directly above the hearth.

Tile column 1 is adjacent to the wing wall. Tile column 4 is at the right hand edge of the system.

Row 1. Two full tiles and one ½ tile detached. The half tile remained in place in column 4.

Row 2. Two full tiles and one ½ tile detached. The half tile remained in place in column 4.

Row 3. Two full tiles and one ½ tile detached. The half tile remained in place in column 4.

Row 4. Tiles in columns 1, 2 and 3 detached. Tile in column 3 partially detached (but remained on frame).

Row 5. Tiles in columns 1 & 2 detached. Other tiles remained on the frame.

5.1.2 Rain screen main wall - Insulation.

Insulation charred across full width of system up to the level two fire break. All of the foil facing had been burnt away from the insulation. There were areas of unburnt insulation where the char had been removed/ fallen away.

Above the level 2 fire break, the foil facing of the insulation was intact except for an area approximately 900mm x 900mm below the row 5 column 2 tile. Unburnt insulation was visible at this location.

5.1.3 Rain screen main wall – rain screen carrier framing.

Vertical and horizontal framing on the main wall had melted away up to the level two fire break in the fire plume area.

5.1.4 Wing wall – tiles

Row 1 – first row of tiles above hearth

Column 1 - Left hand side of wing wall

Rows 1, 2 and 3. Tiles detached across the full width of system.

Row -1, column 1 tile detached

5.1.5 Rain screen wing wall - Insulation.

Foil facing on the insulation was intact to the full height of the system. Some surface heat damage was visible on the foil of the insulation above the hearth.



5.1.6 Rain screen wing wall - rain screen carrier framing

The framing was intact on the wing wall.

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 prior to testing

Figure 2. The system at ignition

Figure 3. Front view and vertical section view of Metsec Layout – 2500mm floor heights with 600mm centres on uprights

Figure 4. Ground floor section of double plasterboard layers and cement sheathing board

Figure 5. Ground floor section of Kingspan insulation layer

Figure 6. Ground floor section of the secondary frame and panels

Figure 7. Front view and vertical section of the secondary frame railings

Figure 8. Front view and Vertical section of the completed system

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 Layer

Figure 14. Temperatures Level 2 Cement Particle Board

Figure 15. Temperatures Level 2 Cavity 2

Figure 16. Temperatures Level 2 Plasterboard

Figure 17. Cladding system during the test

Figure 18. Tested system on completion of the test (1)

Figure 19. Tested system on completion of the test (2)



Figure 1. The system prior to testing



Figure 2. System at ignition

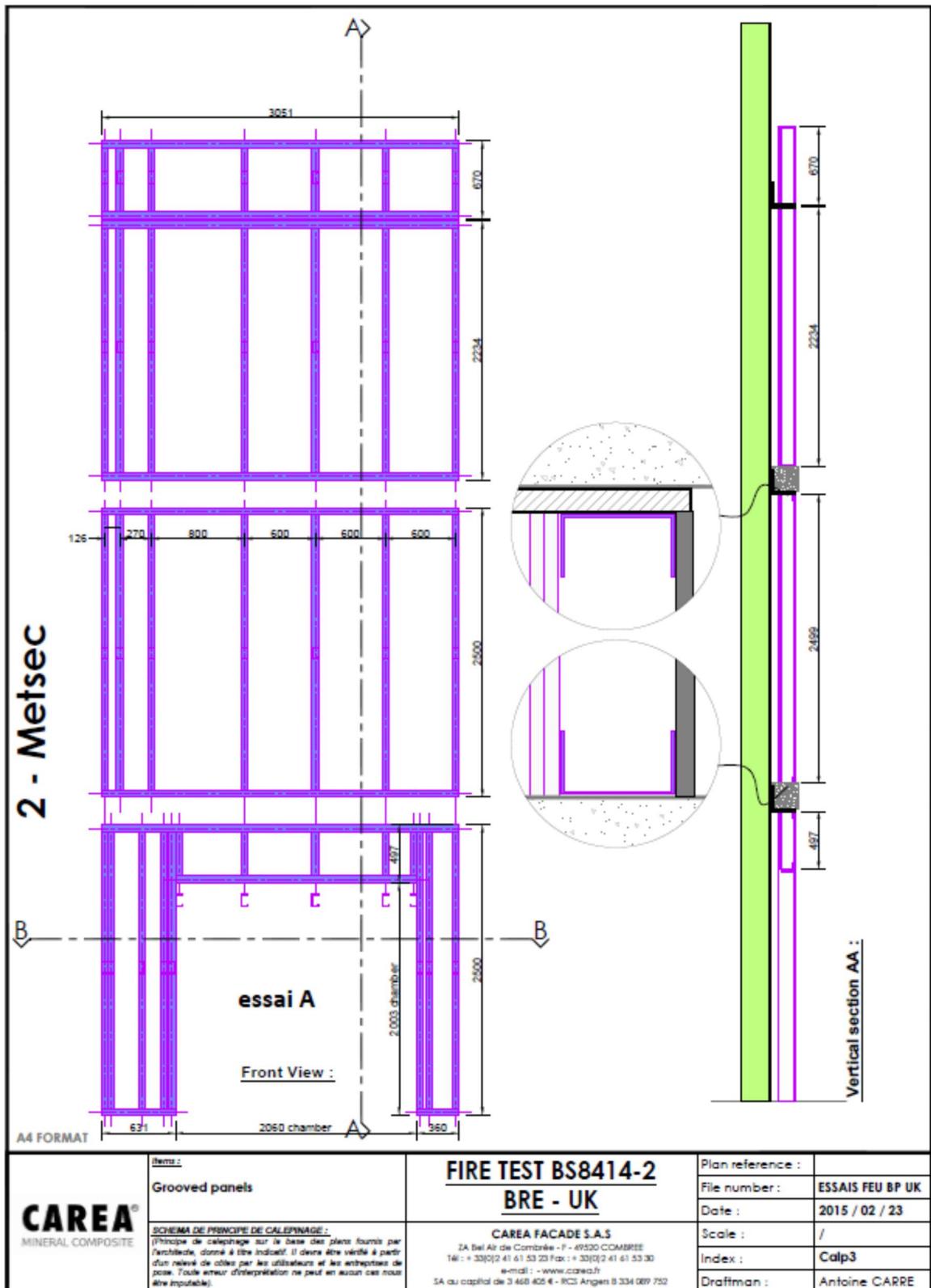


Figure 3. Front view and vertical section view of Metsec Layout – 2500mm floor heights with 600mm centres on uprights

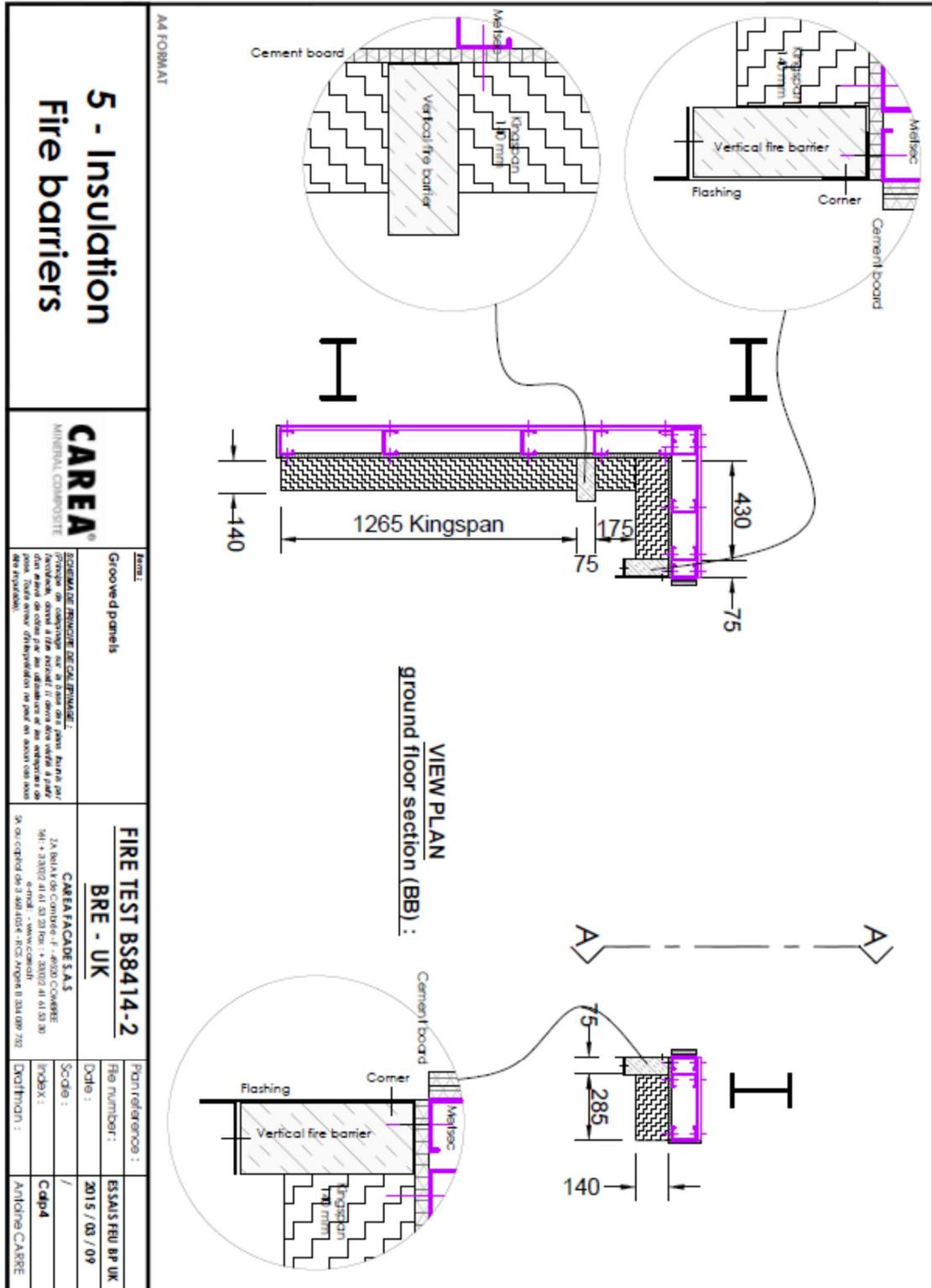


Figure 5. Ground floor section of Kingspan insulation layer

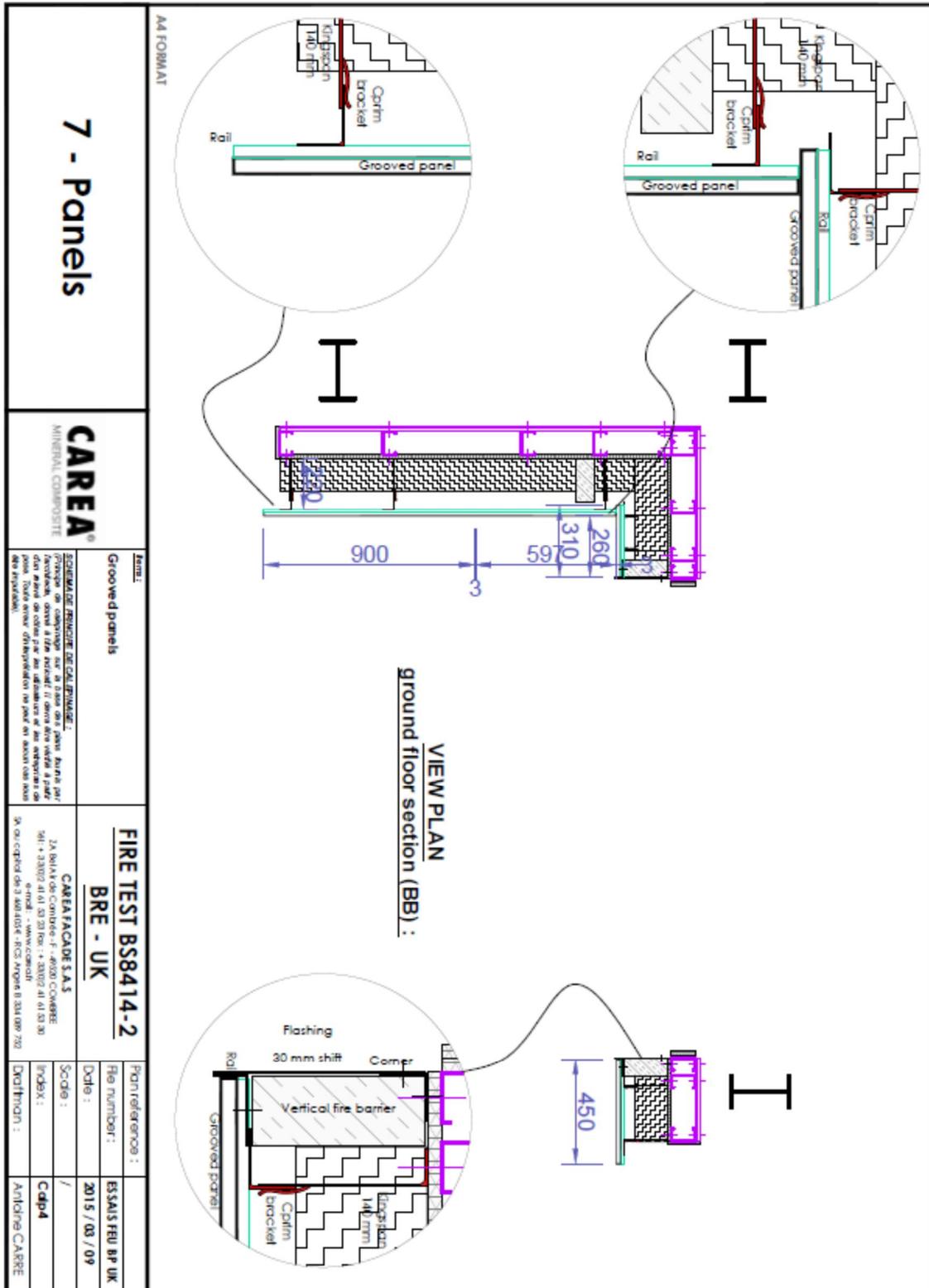


Figure 6. Ground floor section of the secondary frame and panels

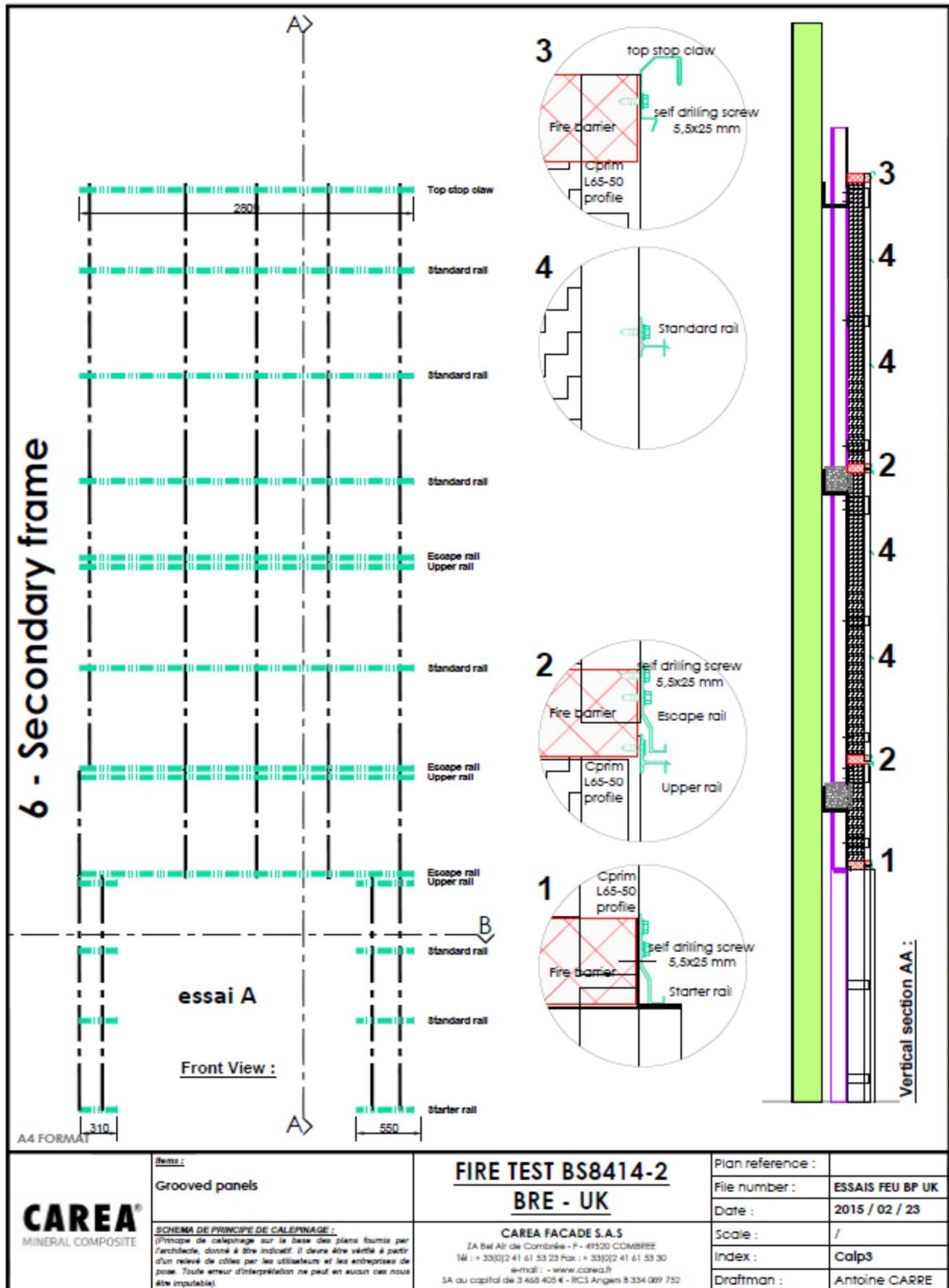


Figure 7. Front view and vertical section of the secondary frame railings

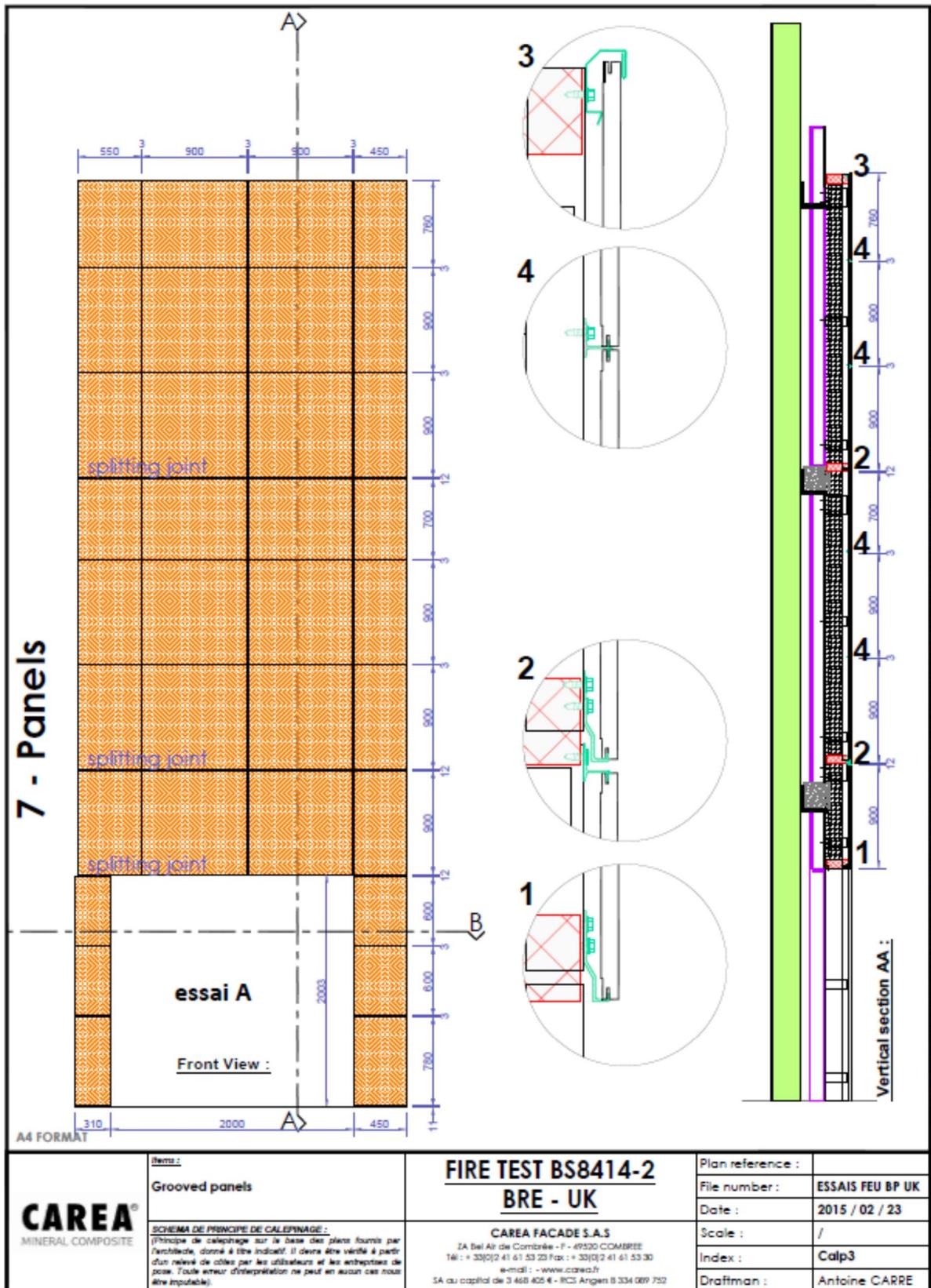


Figure 8. Front view and Vertical section of the completed system

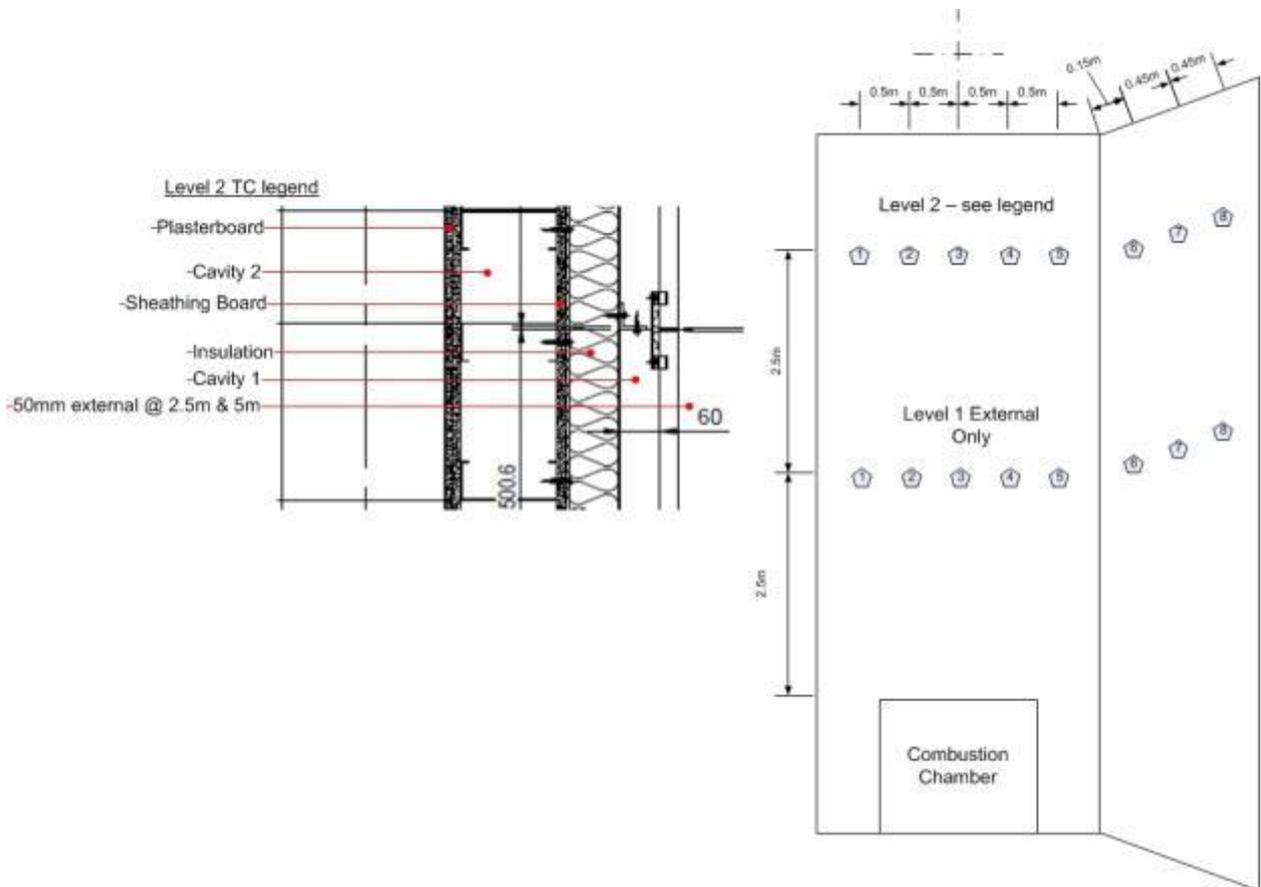


Figure 9. Location and identification numbers of thermocouples used (schematic only)

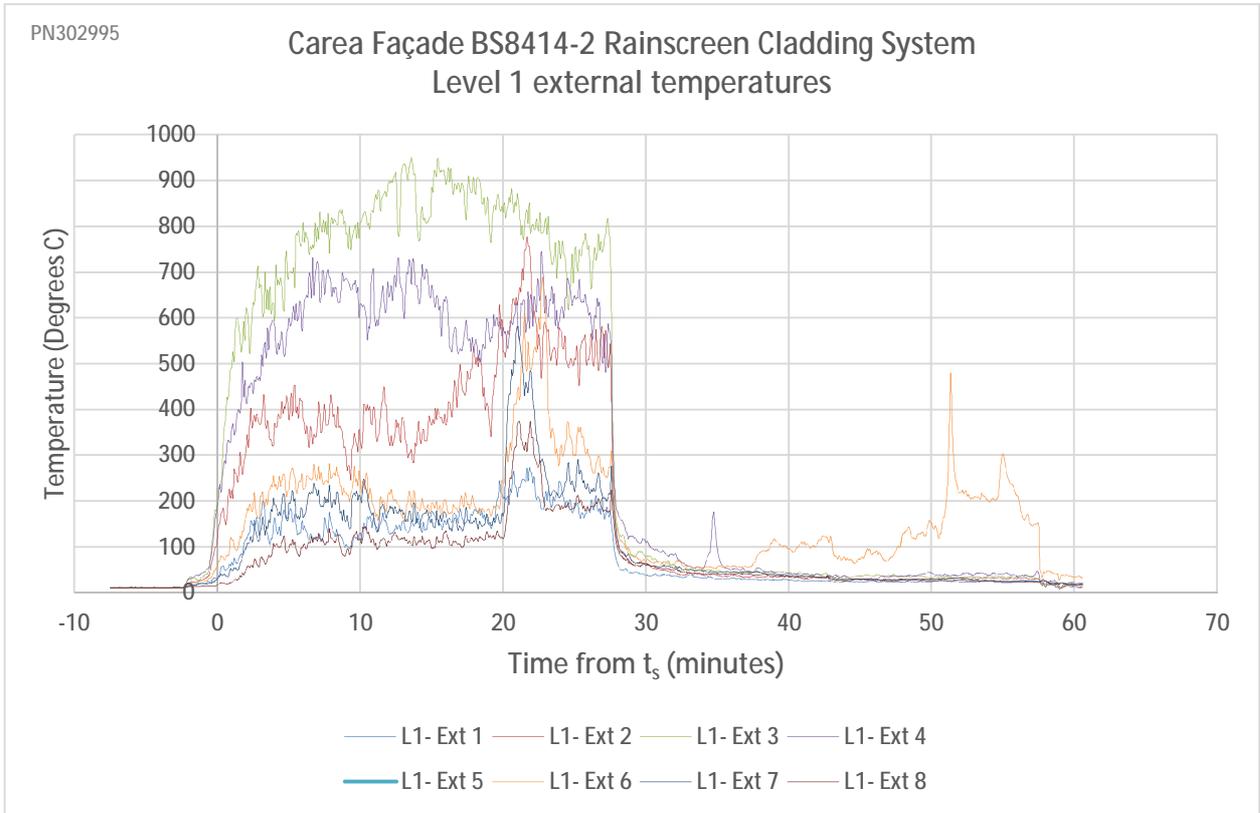


Figure 10. Temperatures Level 1 External

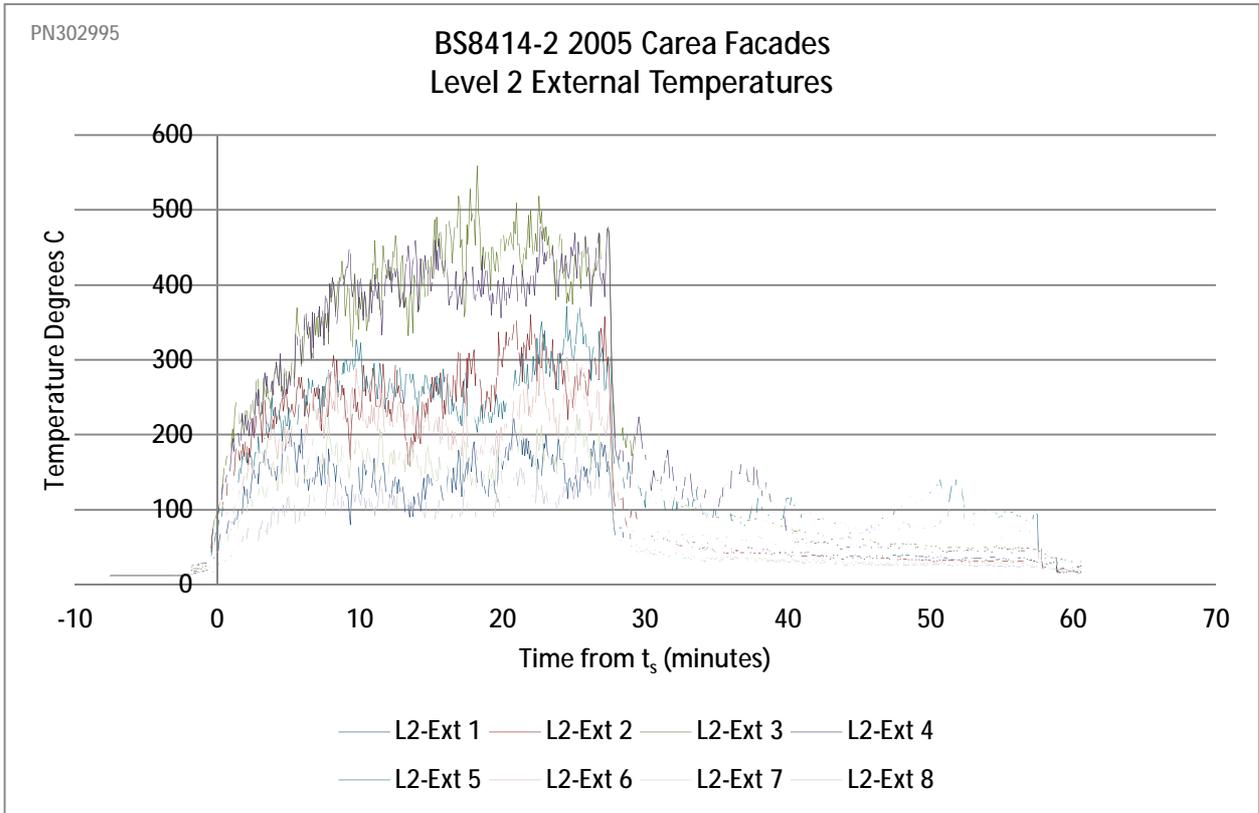


Figure 11. Temperatures Level 2 External

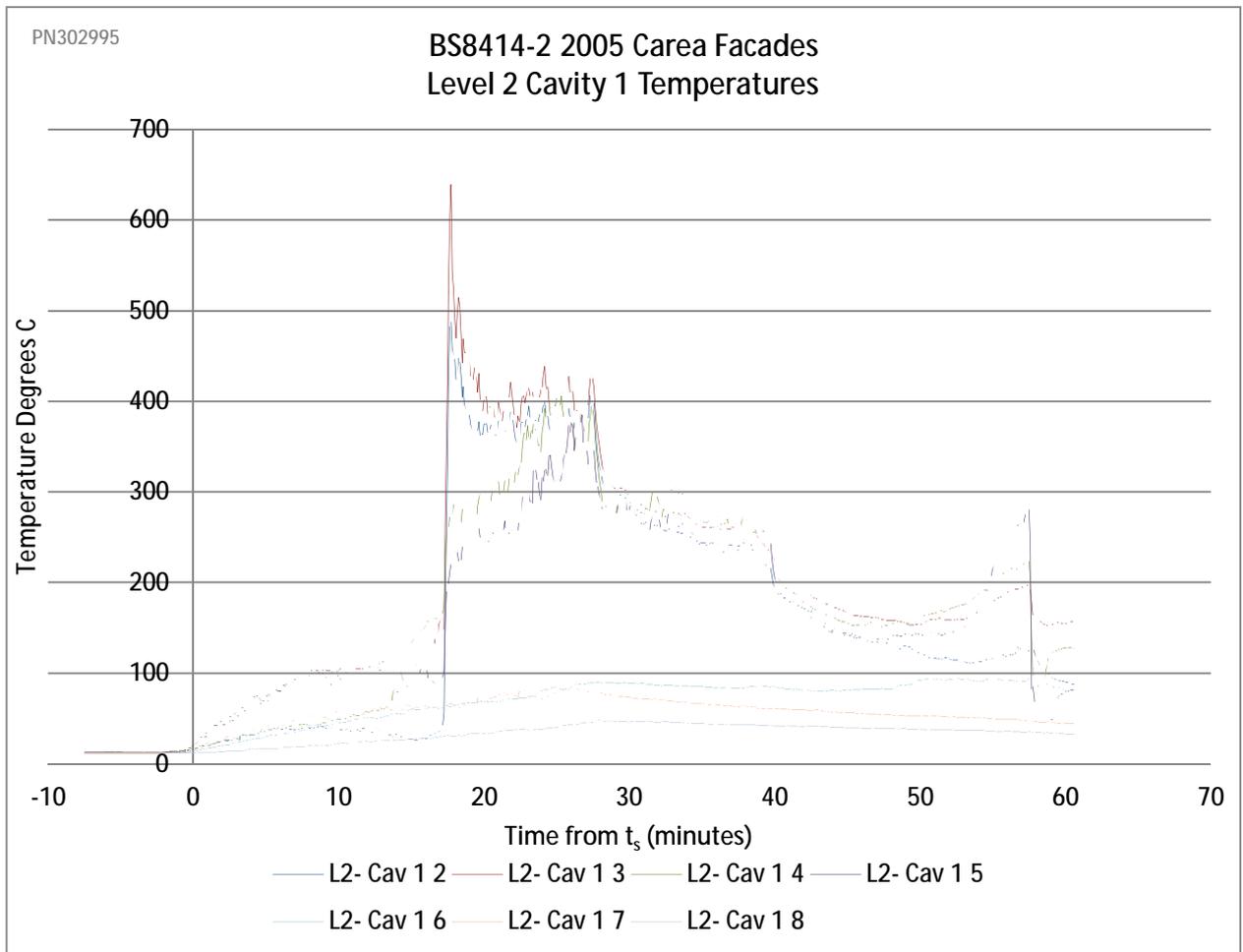


Figure 12. Temperatures Level 2 Cavity 1.

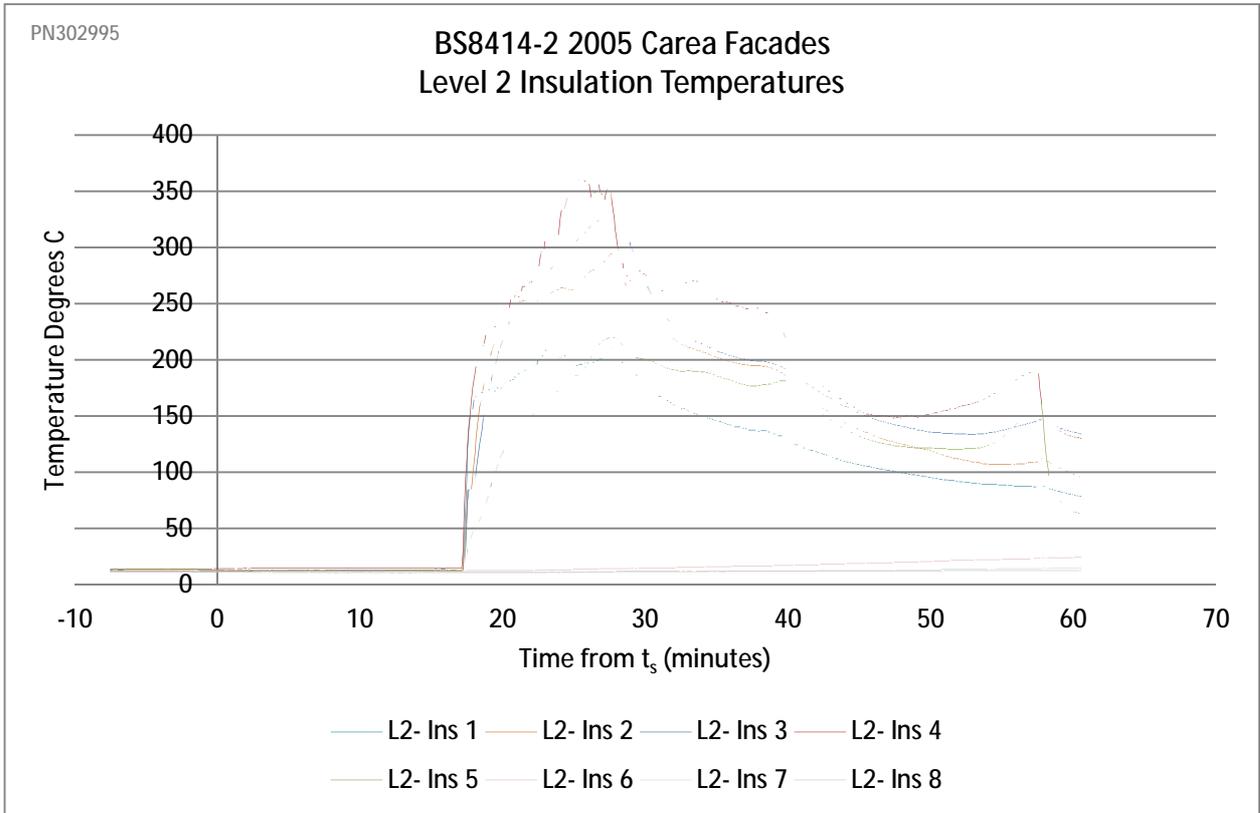


Figure 13. Temperatures Level 2 Insulation Layer

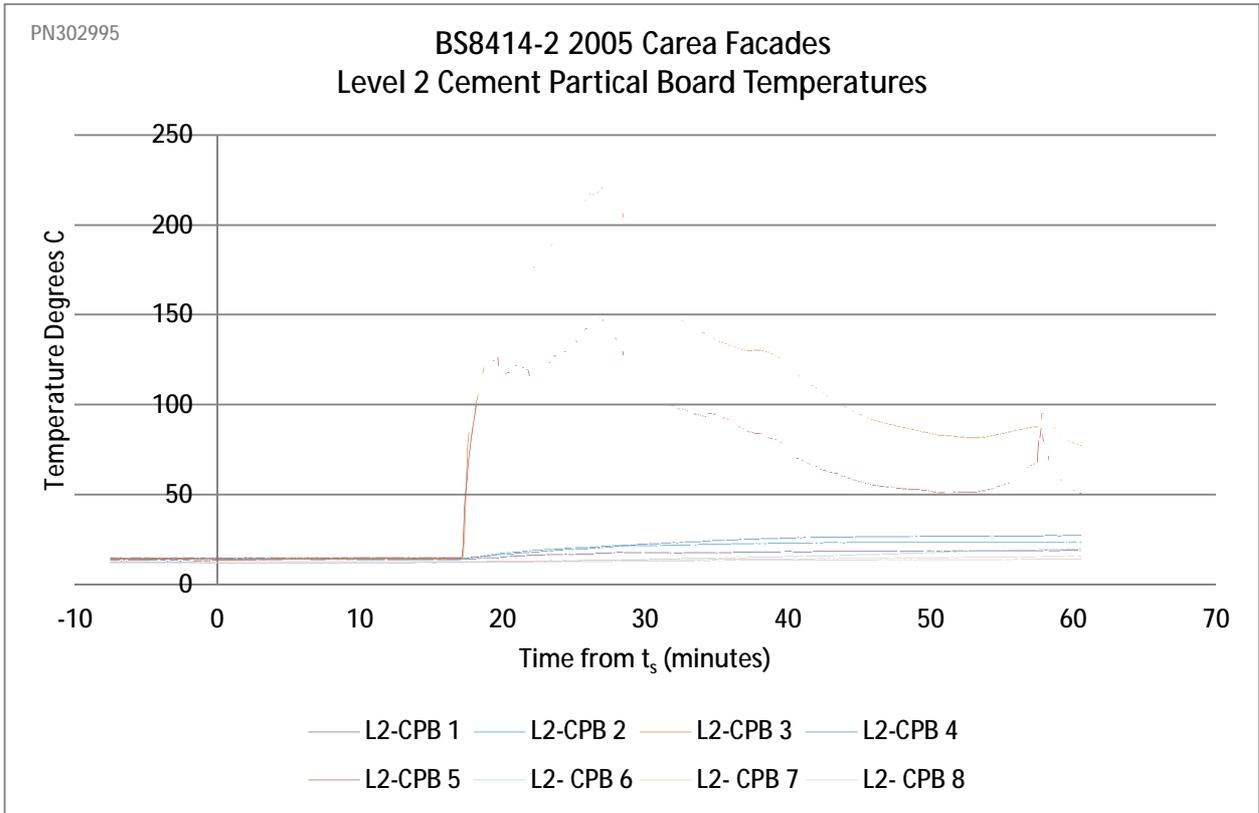


Figure 14. Temperatures Level 2 Cement Particle Board.

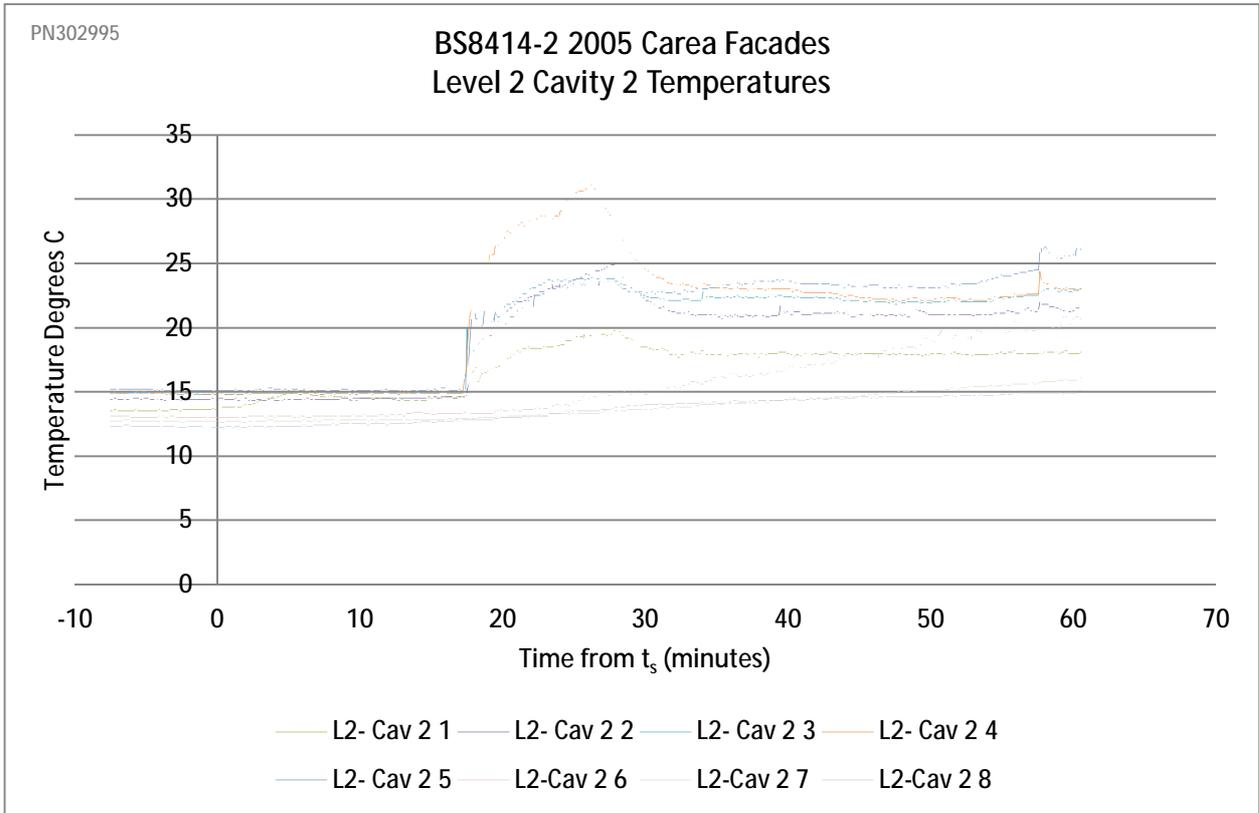


Figure 15. Temperatures Level 2 Cavity 2.

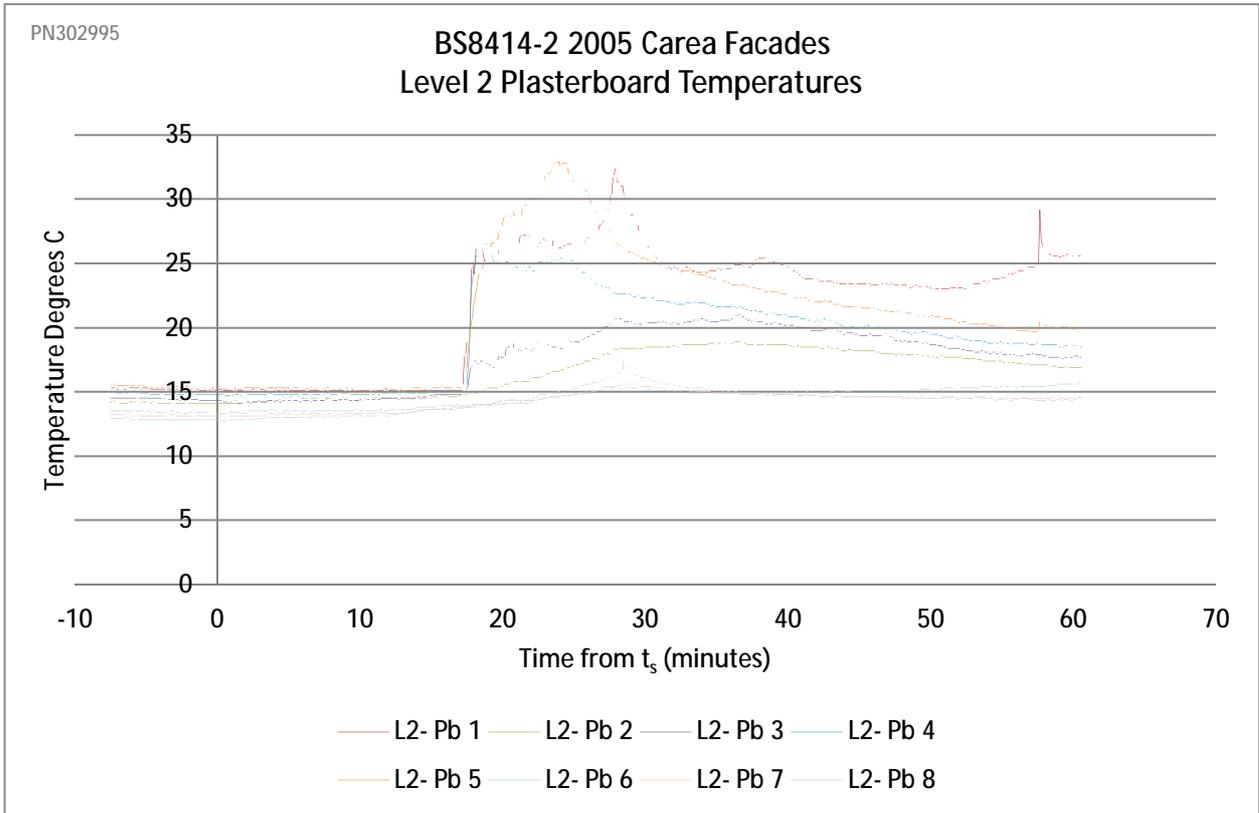


Figure 16. Temperatures Level 2 Plasterboard.



Figure 17. Cladding system during the test.



Figure 18. Tested system on completion of the test (1)



Figure 19. Tested system on completion of the test (2)

Report Ends