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BRE Global Test Report

BS8414-2 : 2005 Test on a Stofix insulated facade system

Prepared for:	**Stofix Oy**
Date:	**5/11/2015**
Report Number:	**303931 Issue 1**

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1 Introduction

BS 8414-2:2005 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

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Laboratory Address:	Bucknalls Lane, Garston, Watford, Hertfordshire. WD25 9XX
Telephone No.:	[redacted]
Email	enquiries@bre.co.uk
Test reference:	303931
Date of test:	7 July 2015
Sponsor:	Stofix Oy
Sponsor address:	Ahlmaninkatu 2 E FIN – 40100 Jyväskylä FINLAND
Method:	The test was carried out in accordance with BS 8414-2:2005
Deviations:	None

3 Description of the system

3.1 Description of substrate

The test specimen was installed onto cladding test frame 3. This is a test frame 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 10. 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 1-5, and (in order from the structural frame to the outer panels) comprised of:

- Double layer of 12.5mm plasterboard.
- 100mm lightweight steel frame
- 12mm cement particle sheathing board
- Tyvec Supro membrane
- 120mm K15 Kingspan Insulation –installed in two layers 1200mm x 600mm x 60mm (thick).
- Horizontal firebreaks – AIM intumescent cavity barrier 133mm x 75mm
- Vertical firebreaks – mineral wool fire breaks - 170mm x 75mm
- Secondary frame consisting of rails to secure the insulation and decorative panels.
- Brick slip panels.

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

A sectional steel frame system (SFS) was installed between the floor slab hangers on the test frame, with horizontal base and head tracks fixed to the floor edge detail provided on the test frame. The vertical sections were at nominal 600mm centres, although in some areas this spacing was reduced to allow the frame to be fitted to the cladding test frame.

The horizontal sections 104mm x 70mm x 1.2mm and the vertical sections were 100mm x 75mm x 1.2mm. Both sections were formed from galvanised mild steel.

The rear of the framing system was clad with two layers of 12.5mm plasterboard.

12mm cement particle board was installed on the front face of the frame.

The breather membrane was installed over the cement particle board. This was installed with the long edge of the sheet vertical.

Right angle brackets (Stofix SK115) were installed mainly at 720mm centres in a vertical lines onto the cement particle board to carry vertical rails (Stofix J60). The vertical rails were secured to the brackets using M8 bolts.

Insulation in 1200mm x 600mm sections was friction fitted between the rails in two 60mm layers. The insulation was additionally secured onto the cement particle board using 155mm x 6.0mm screw fixings with a 75mm steel washer.

Horizontal rails were installed onto the vertical rails (Stofix AK25) at either 600mm or 400mm centres to carry the brick slip system, one rail carrying one panel.

The brick slip system was supplied in 1200mm x 600mm x 20mm (thick) sheets and was backed with a galvanised steel sheet. The galvanised sheet was formed to enable the brick slip system to be hooked onto the horizontal rails. The reference for the brick slip system was 285x85 1/3 S1200600, S1200400.

Adjacent panels were secured with self-tapping screws through the joint between panels and these joints were then finished with (Stofix site bonding grout). Horizontal expansion joints were placed to every floor slab level and vertical expansion joints to over centre of the fire chamber and to the inner corner of the test facade.

The hearth to wall joint was packed with mineral wool and covered with cement particle board.

The 38 mm gap behind the brick slip panels was giving a full length ventilated cavity from bottom to top of the façade.

The top of the system was covered with mild steel galvanised flashing with top ventilation.

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: 07 July 2015

Ambient Temperature: 19.4°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 11 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 12 to 18 provide the temperature profiles recorded during the test. Figure 19 shows the sample during test.

Parameter	Result
T_s, Start temperature	228.6°C
t_s, Start time	2 mins : 10 secs after ignition of the crib
Peak temperature/time at level 2, 50mm external	416.3°C at 14 mins : 41 secs after t_s
Peak temperature/time at level 2, cavity 1	205.6°C 30 mins : 19 secs after t_s
Peak temperature/time at level 2, insulation layer	130.3°C 27 mins : 46 secs after t_s
Peak temperature/time at level 2, cement particle board	91.2°C 27 mins : 28 secs after t_s
Peak temperature/time at level 2, cavity 2	53.4°C 26 mins : 16 secs after t_s
Peak temperature/time at level 2, plasterboard	48.7°C 20 mins : 20 secs after t_s

4.2 Visual observations

Table 1. Visual Observations – Refer to figure 11 for height references.

Time (mins:secs)	Description
-5:00	Logger start
0:00	Ignition of crib
2:28	Flames out of hearth
2:52	Flames to 1.5m
3:08	Smoke from right side of main face
3:35	Flames to 2m main wall centreline
5:07	Smoke clearing from right side on main face
7.45	Flames to 2.5m
8:50	Visible expansion joint
9:44	Burning above hearth main wall centreline
10:30	Discolouration to 2.5m main face wing wall
11:19	Flames from expansion joint on main face at 1m within flame plume
19:00	Burning of Mastic on wing wall
21:20	Crib starting to collapse
30:00	Crib extinguished
33:38	Flaming behind façade at 2.5m main face centreline

5 Post-test damage report

5.1 Rain screen – tiles

A vertical crack formed on the main face of the system, from immediately above the hearth to the second level fire break.

A second crack formed horizontally at the first level fire break level, extending from the middle of the main face to the width of the hearth on both sides of the centre.

A small horizontal crack also formed on the wing face of the wall at the same level as the main face horizontal crack, on the right hand side extending roughly 1m horizontally on the wall.

The remainder of the system above the hearth was not seen to be damaged.

No tiles or panels were observed to have detached from the system.

5.2 Rain screen - insulation.

After removing the brick slips, the damage assessment was as follows.

The insulation on the main face of the wall was melted and damaged up to the level 2 firebreak around the centreline of the wall (see figure 22). Insulation surrounding this area was lightly charred up to the level two fire break. The remainder of the insulation remained intact.

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

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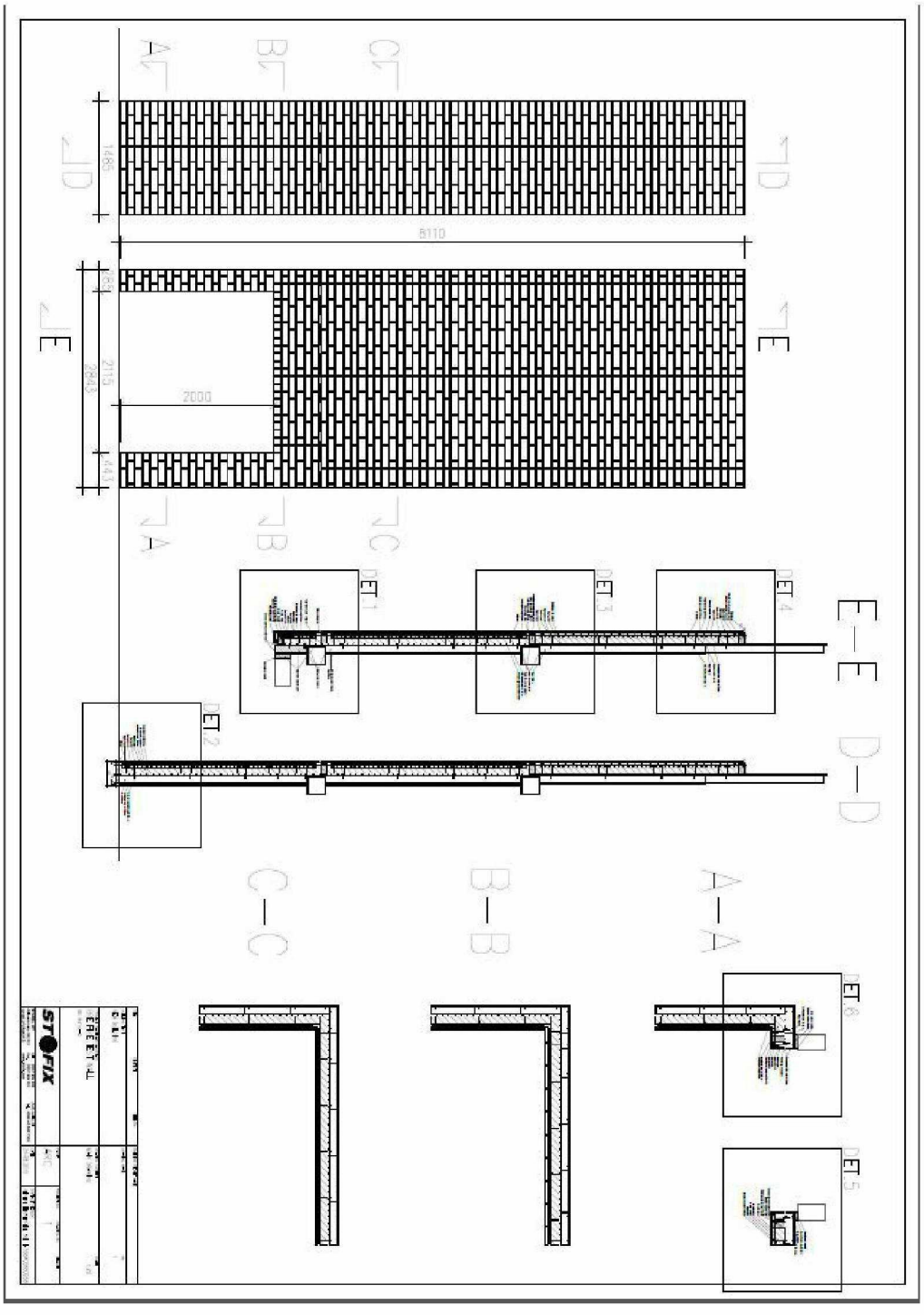

Figure 1. Main drawing

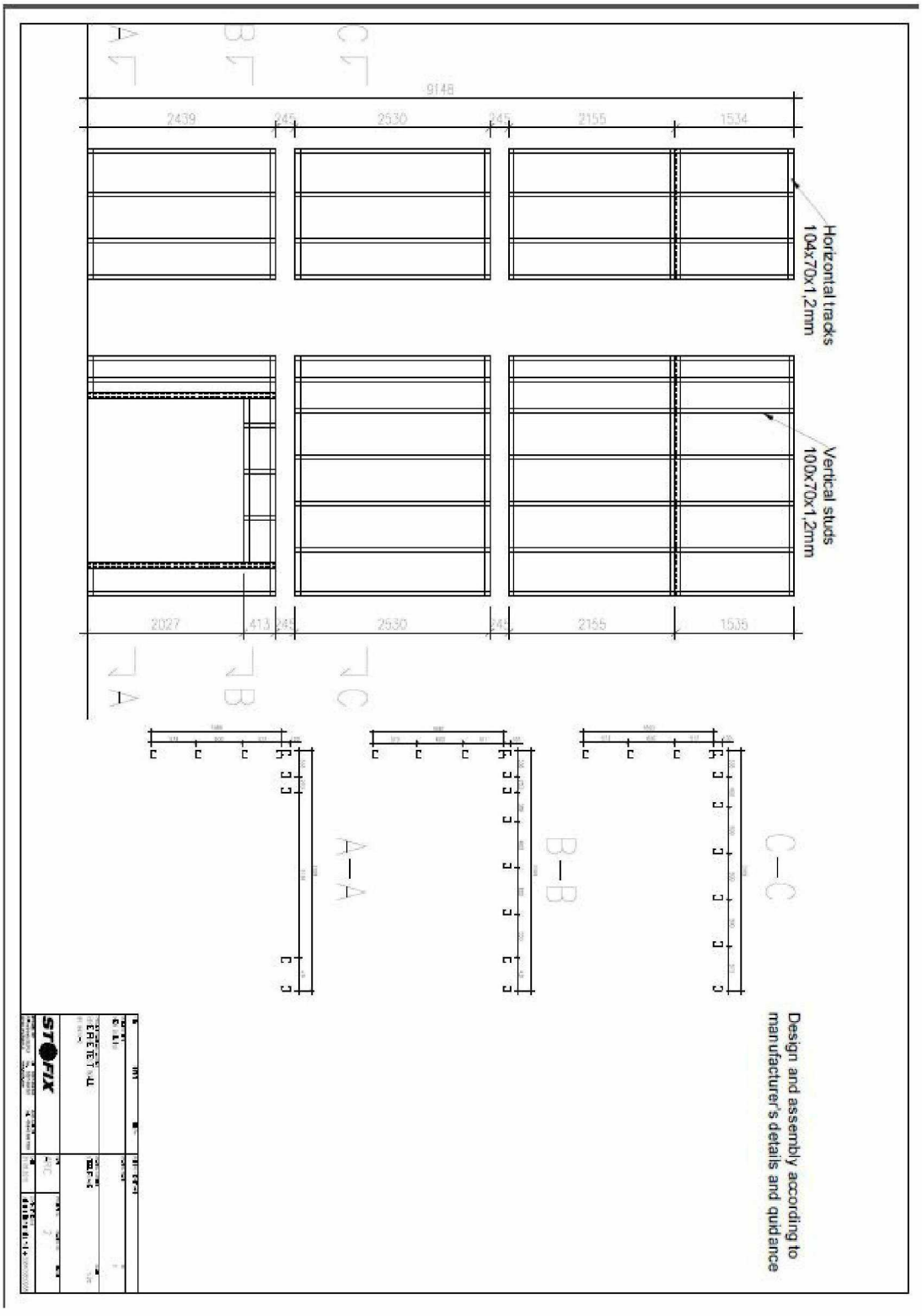

Figure 2. Steel framing

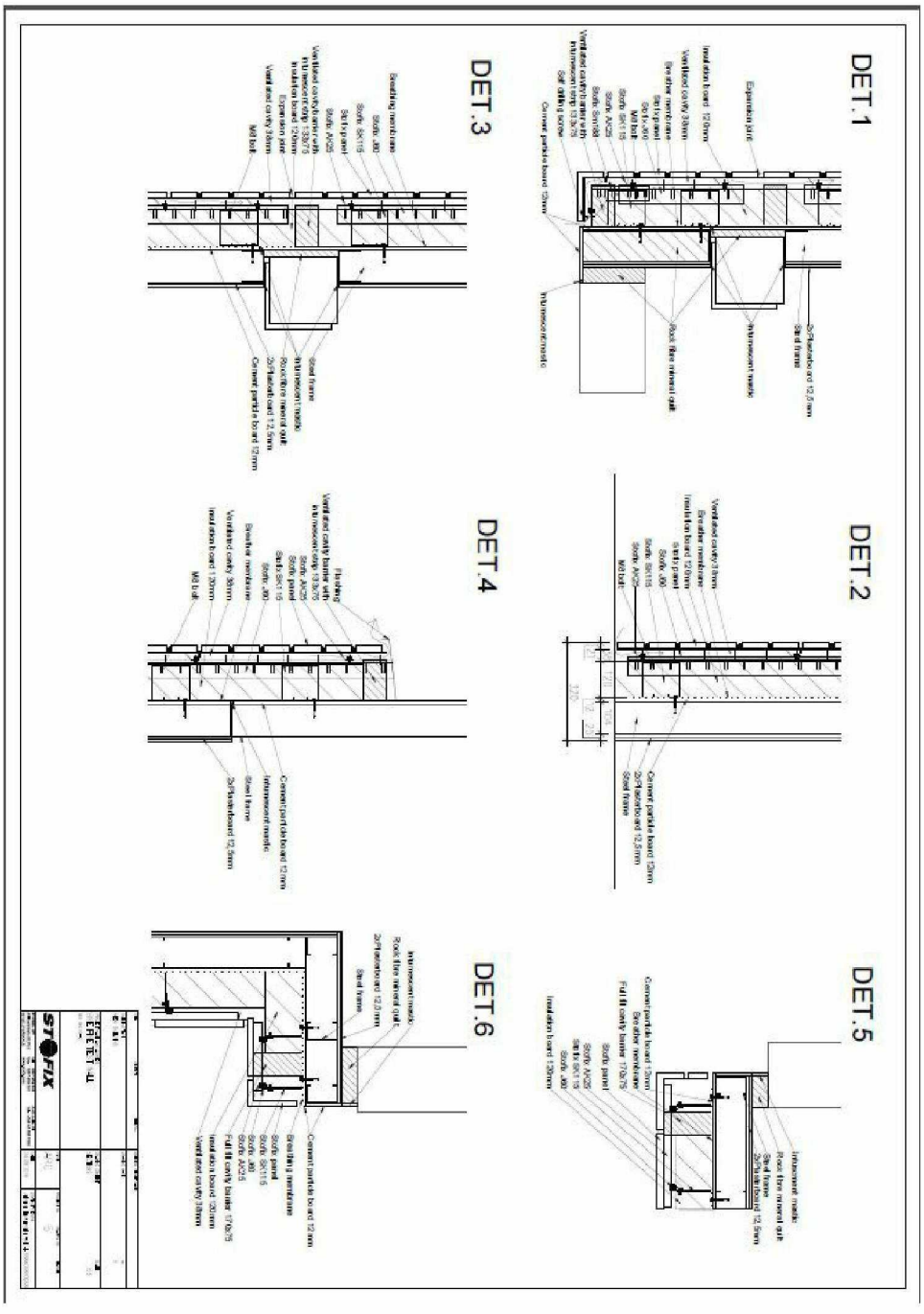

Figure 3. Detail sections of tested system

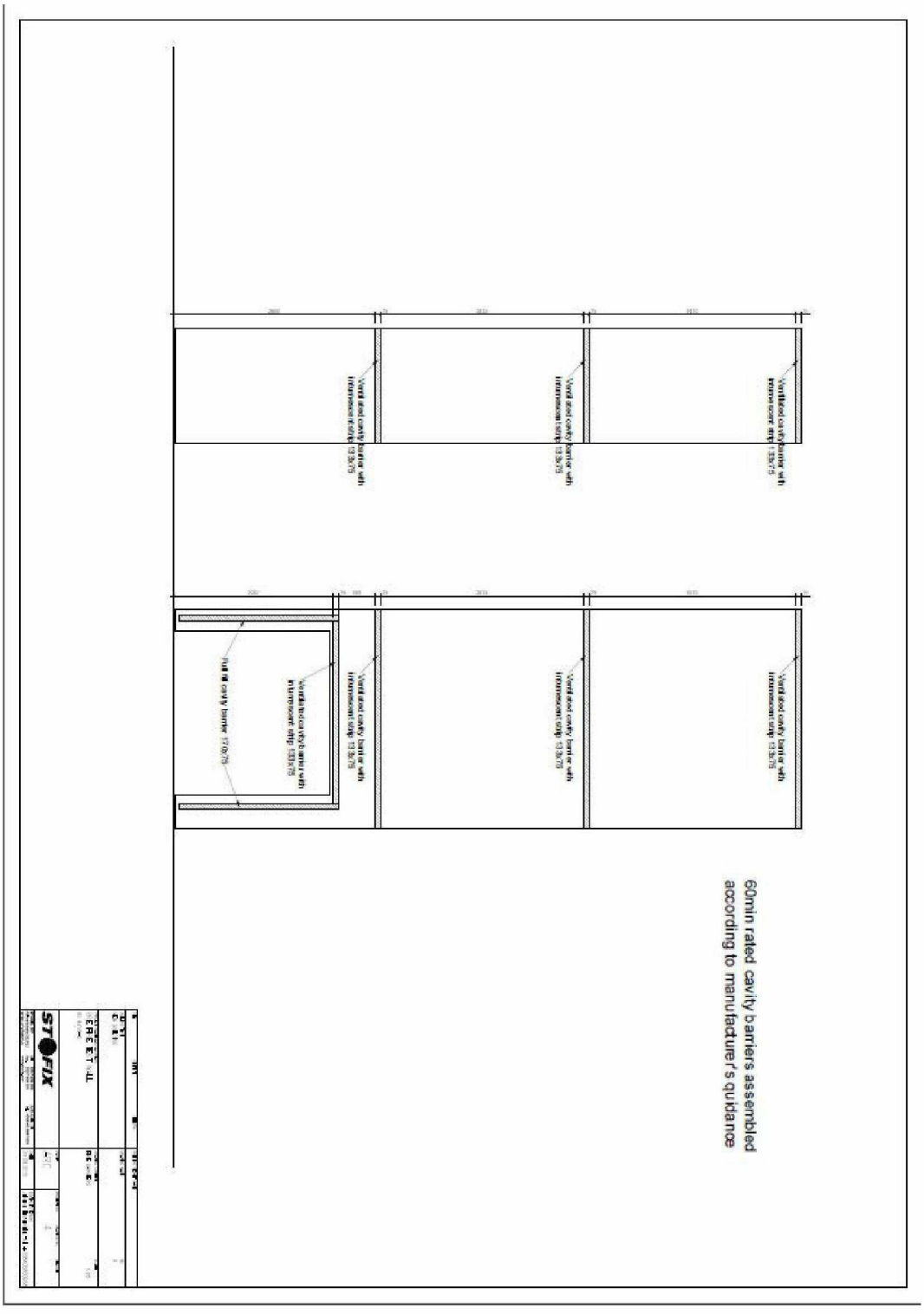

Figure 4. Fire break locations

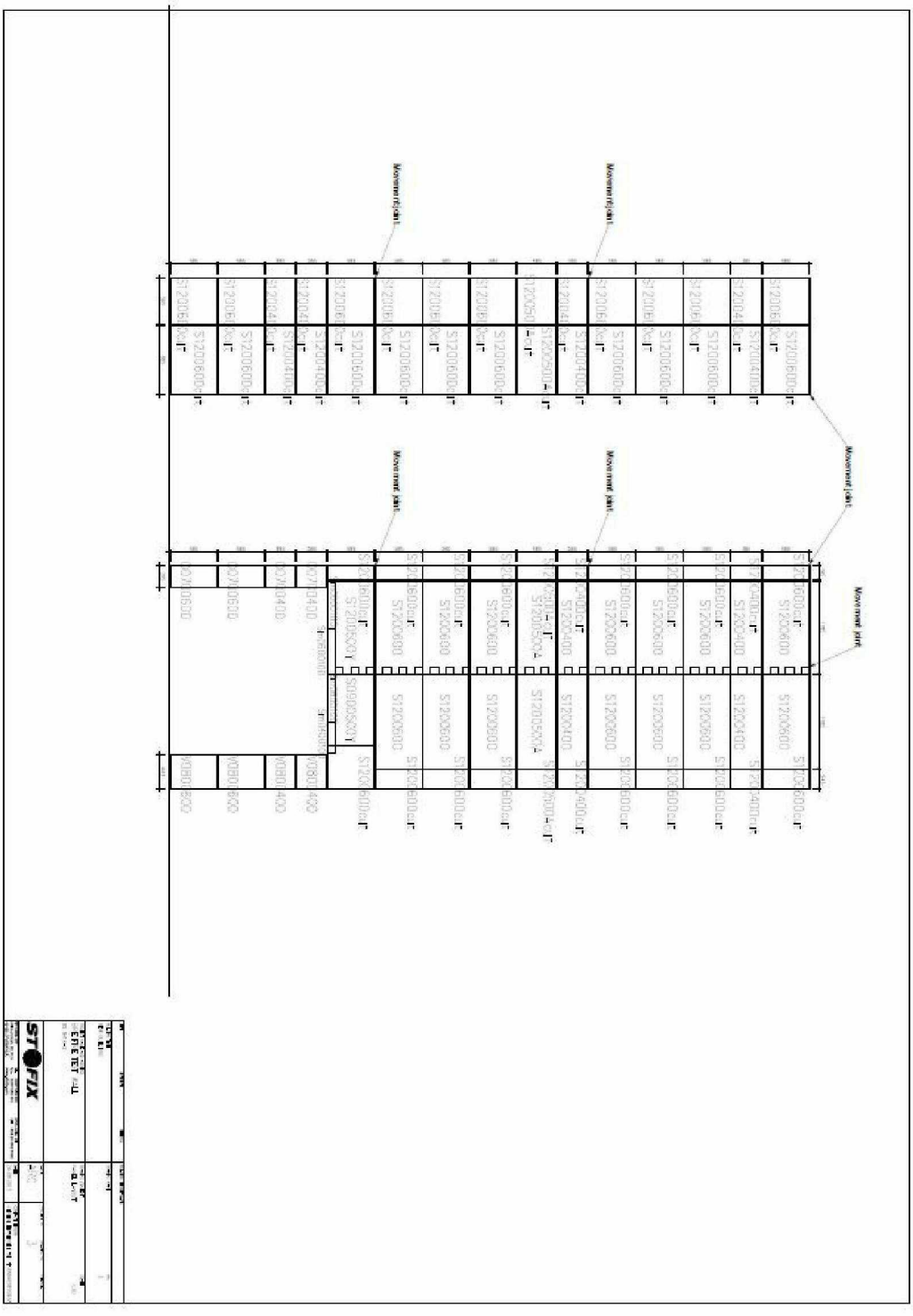

Figure 5. Layout of panels

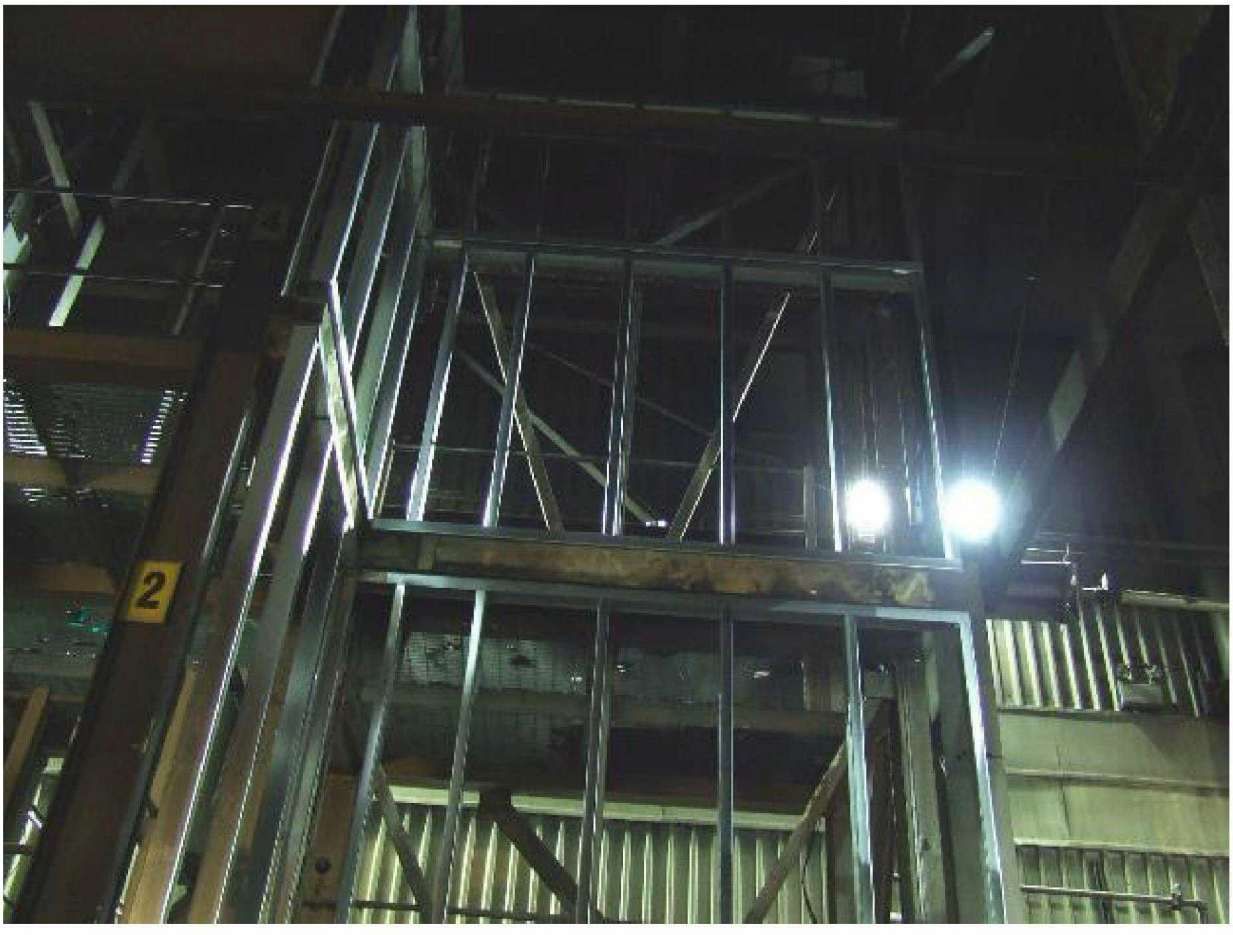

Figure 6. Photograph of framing system

Figure 7. Photograph showing membrane and insulation support brackets

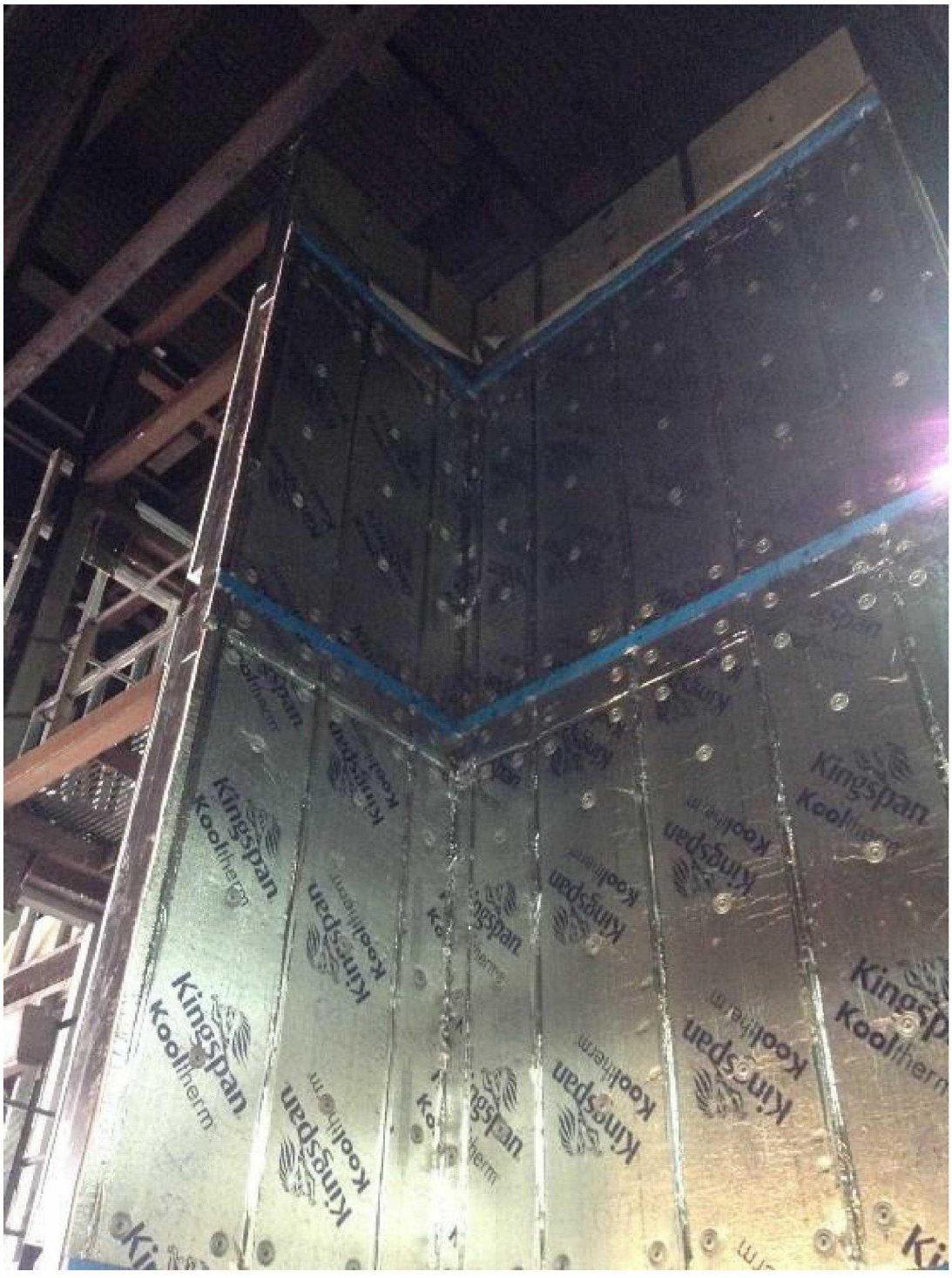

Figure 8. Photograph showing insulation and firebreaks

Figure 9. Photograph showing installation of the bricks slips on the support brackets

Figure 10. The system prior to testing

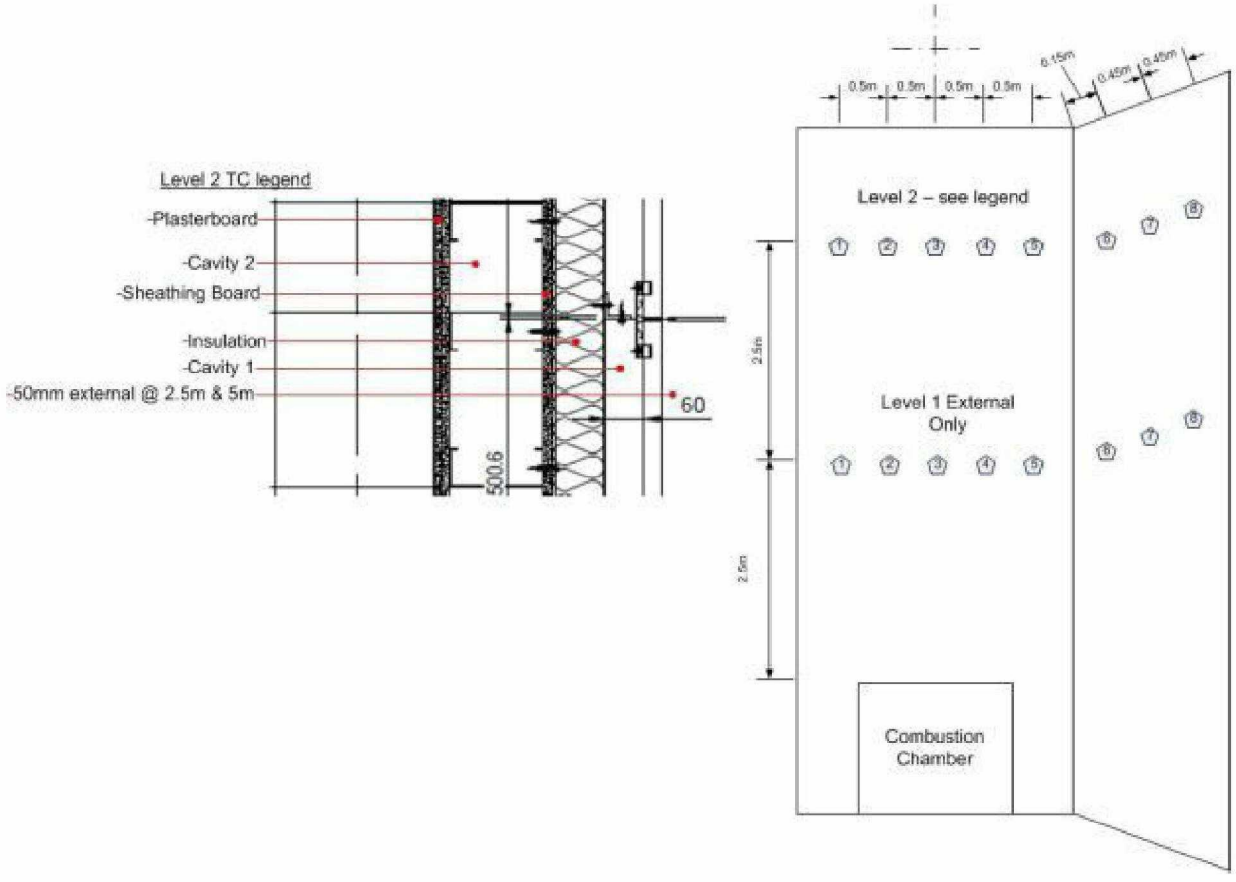

Figure 11. Locations of thermocouples

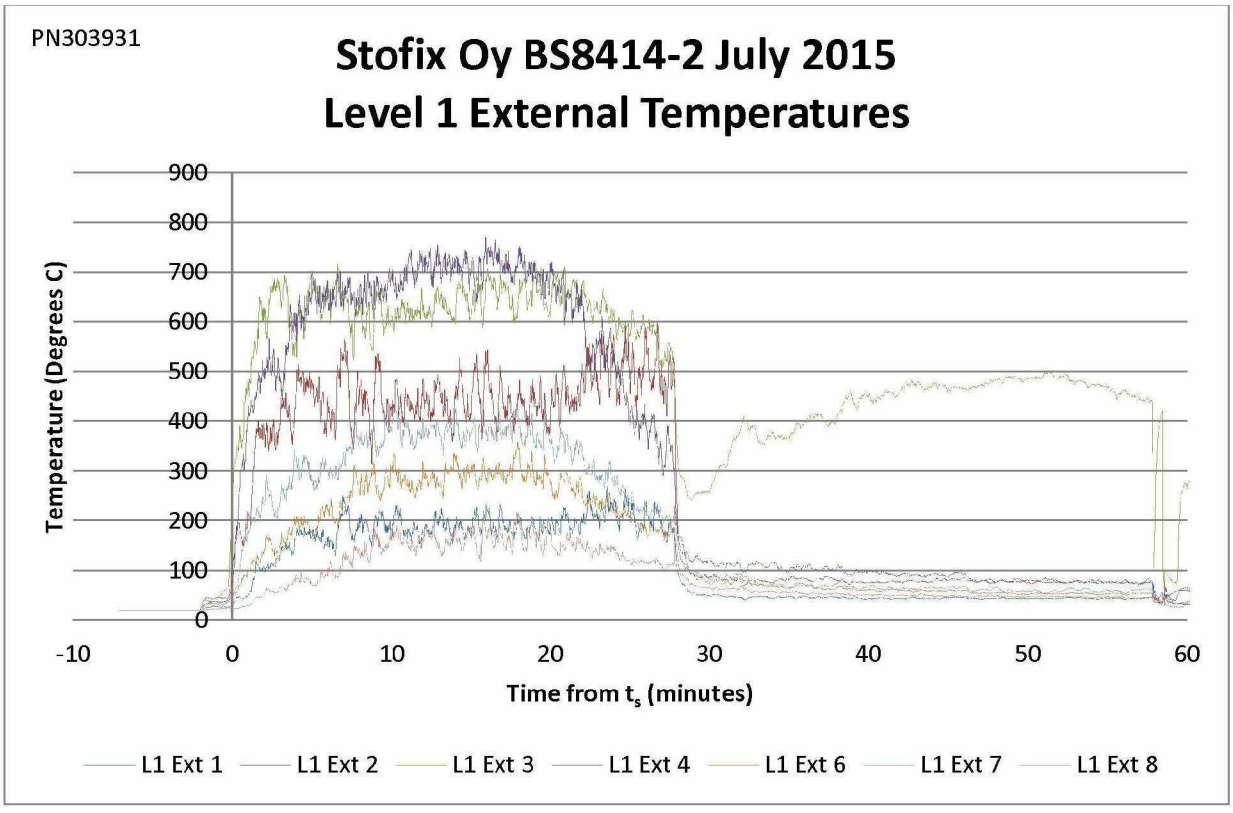

Figure 12. Temperatures level 1 external

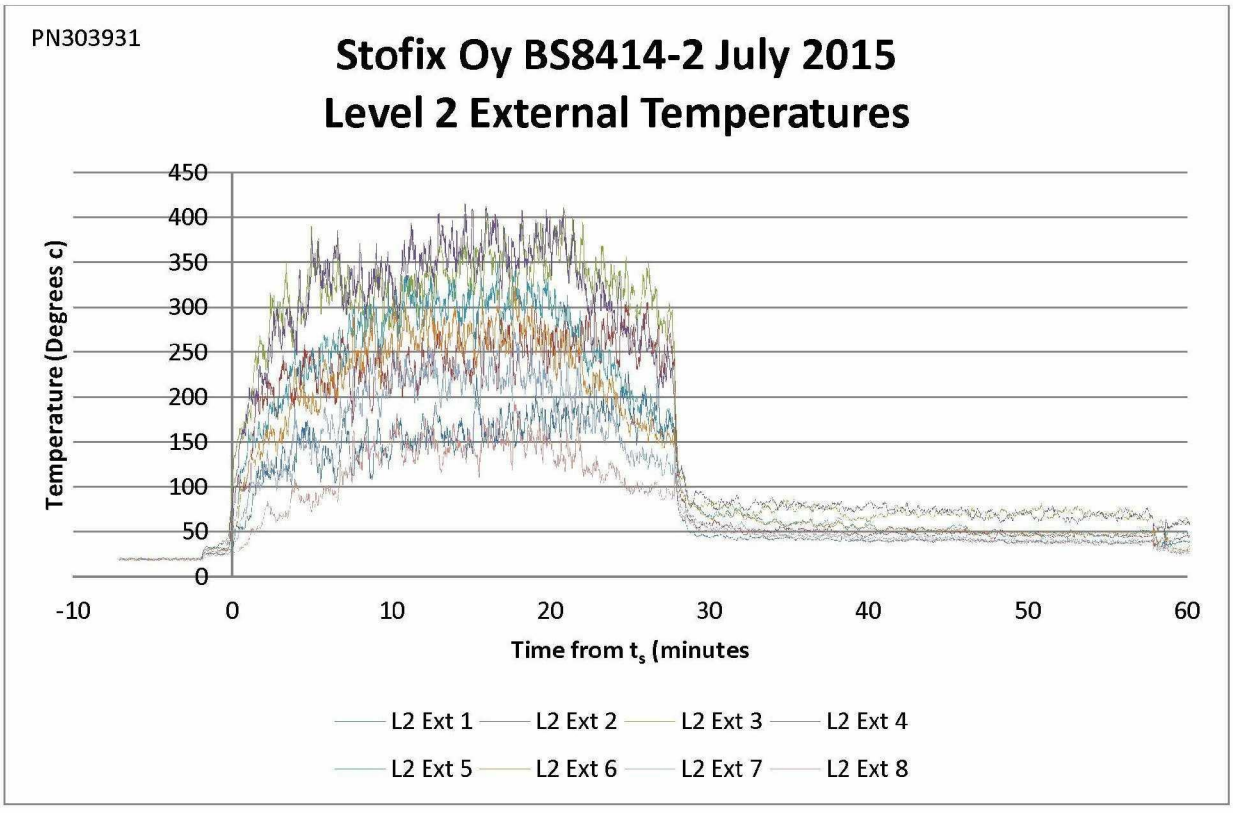

Figure 13. Temperatures level 2 external

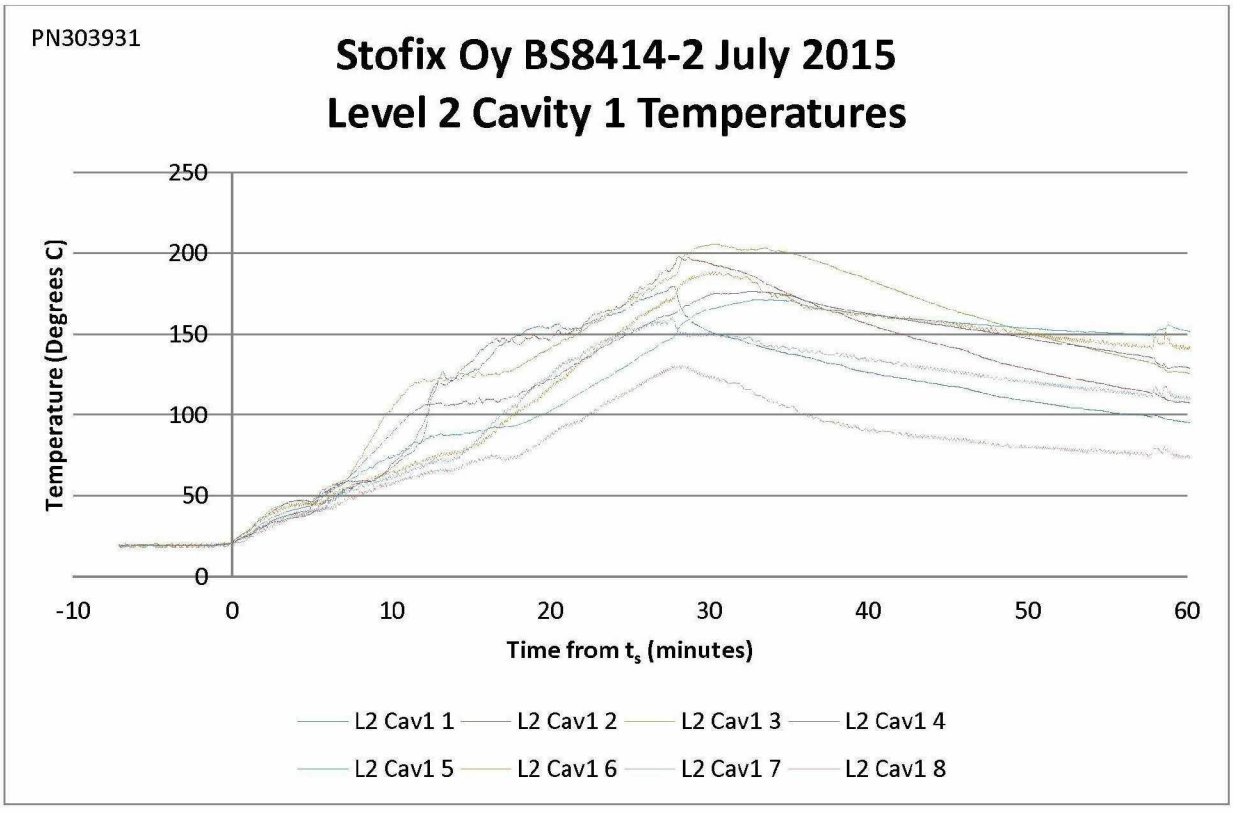

Figure 14. Temperatures level 2 cavity 1

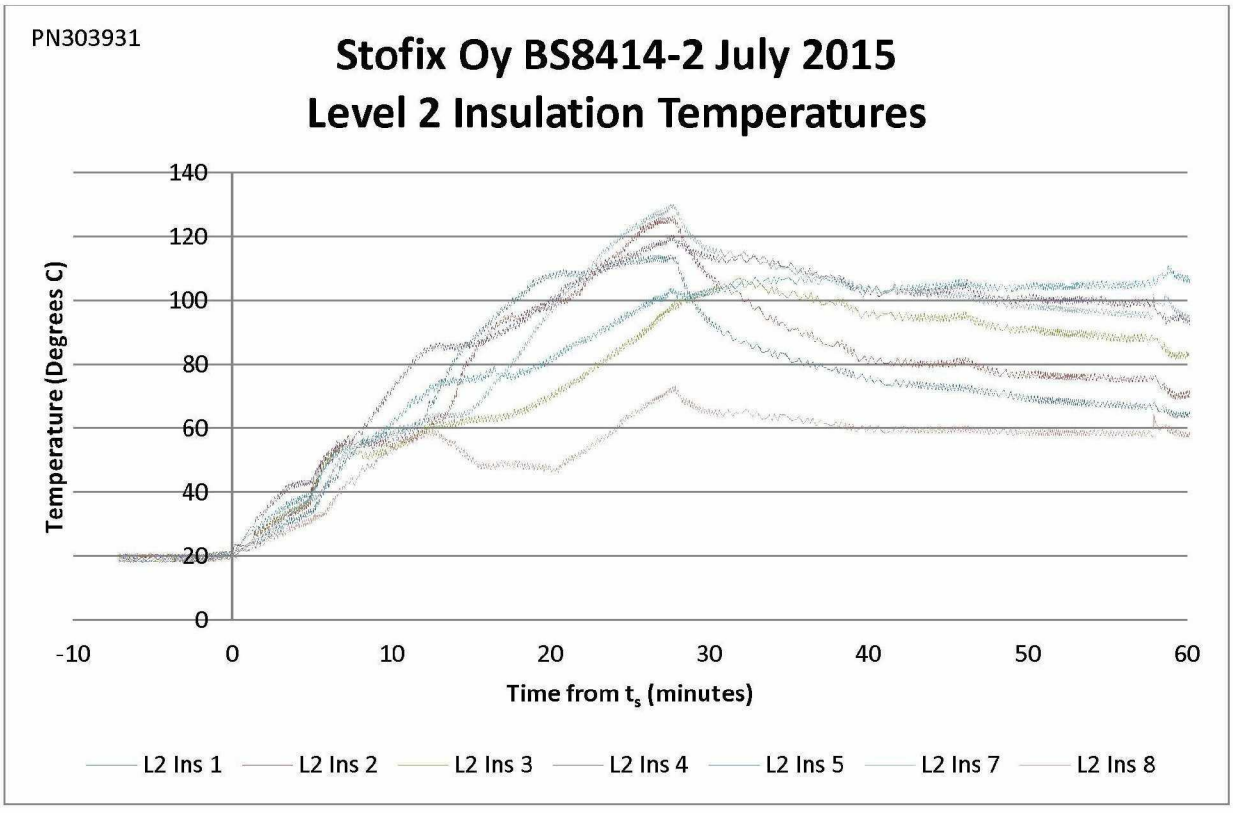

Figure 15. Temperatures L-level 2 insulation layer

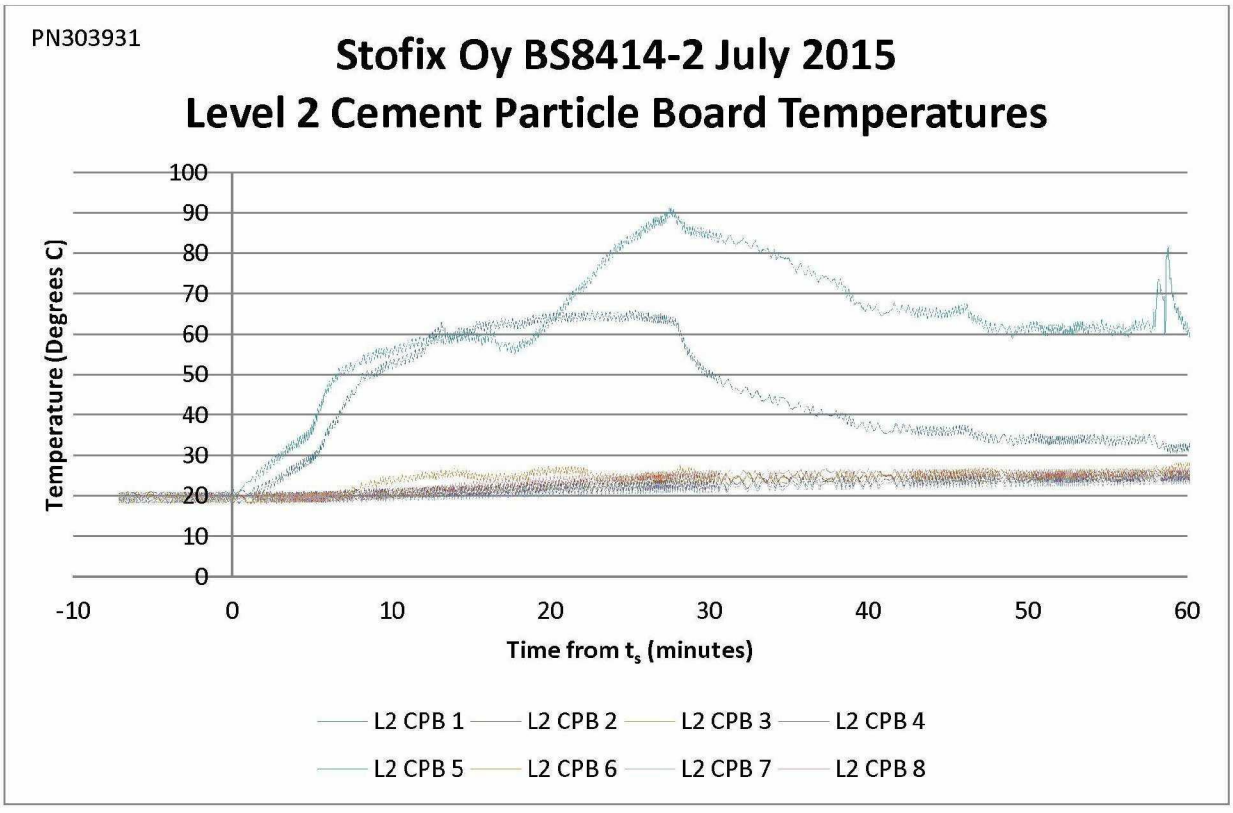

Figure 16. Temperatures level 2 cement particle board.

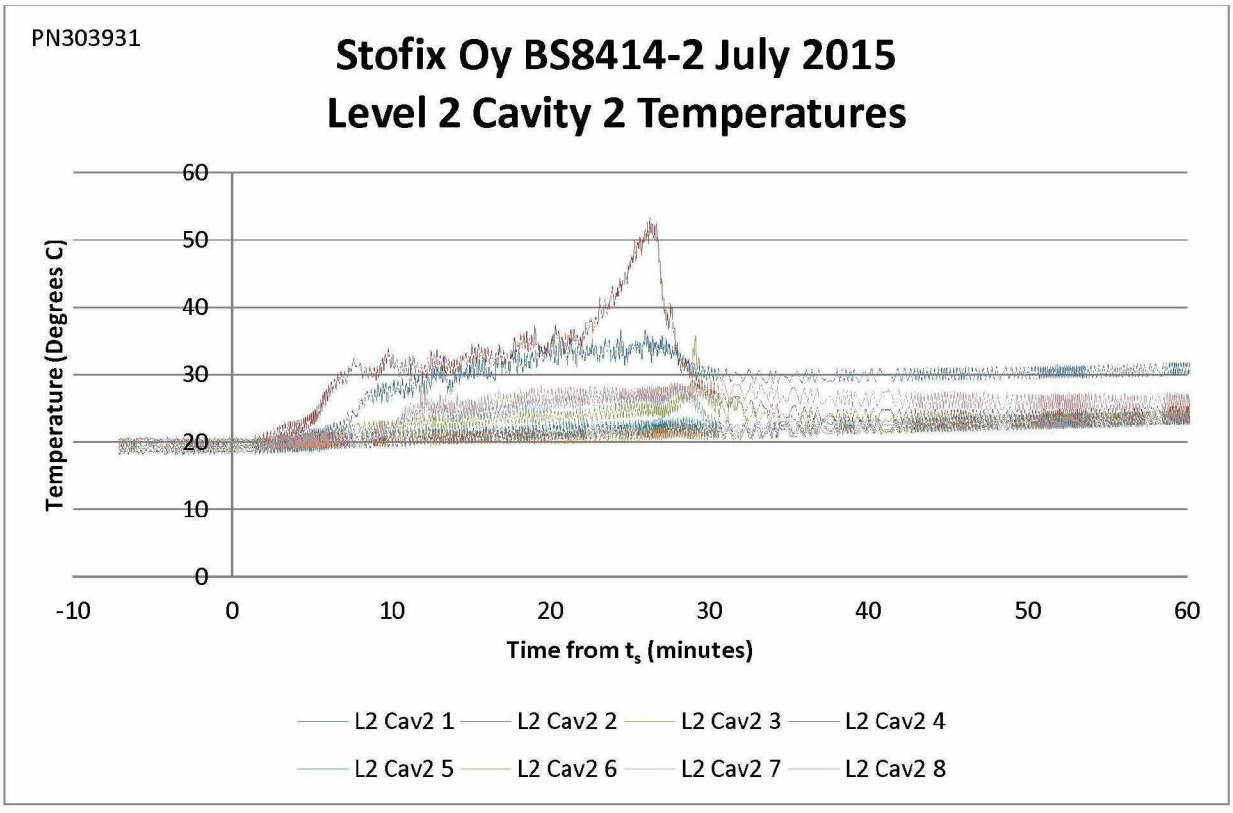

Figure 17. Temperatures level 2 cavity 2.

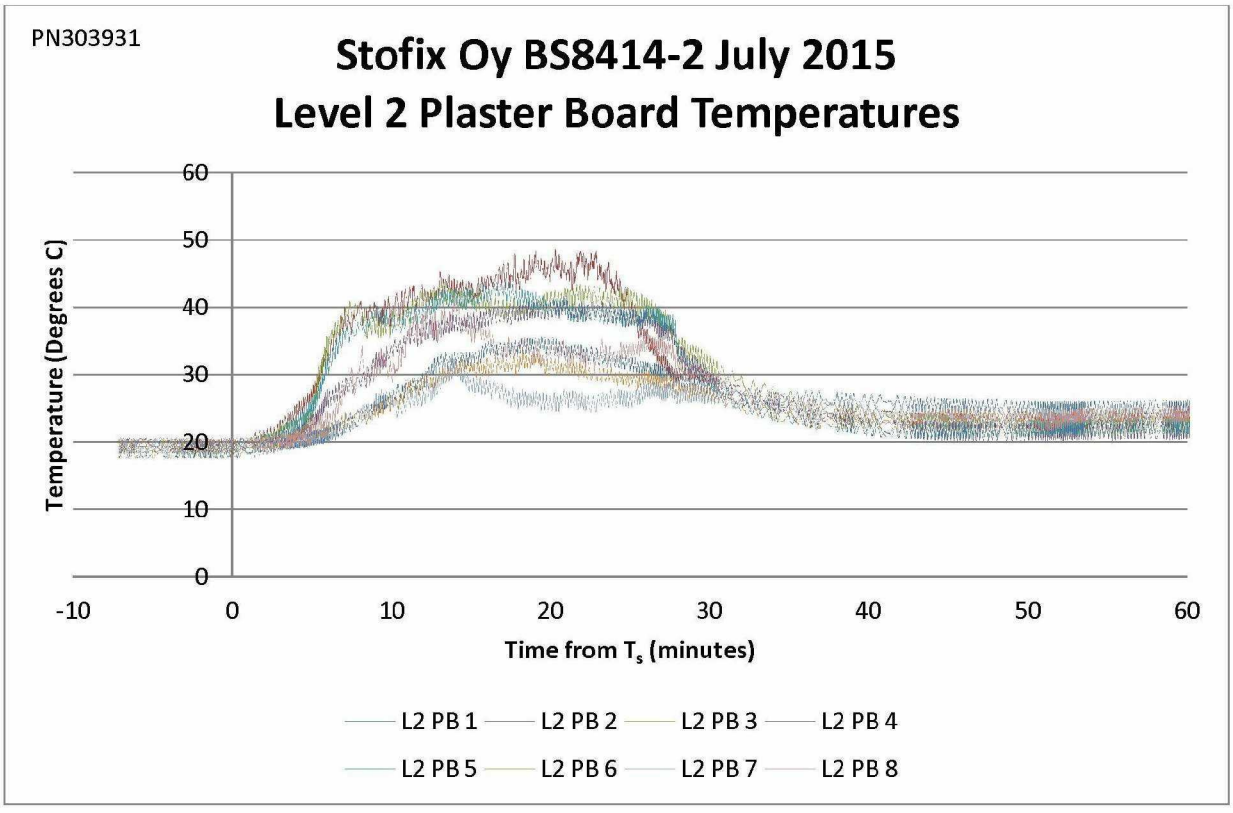

Figure 18. Temperatures level 2 plasterboard.

Figure 19. Cladding system during the test.

Figure 20. Tested system on completion of the test (1)

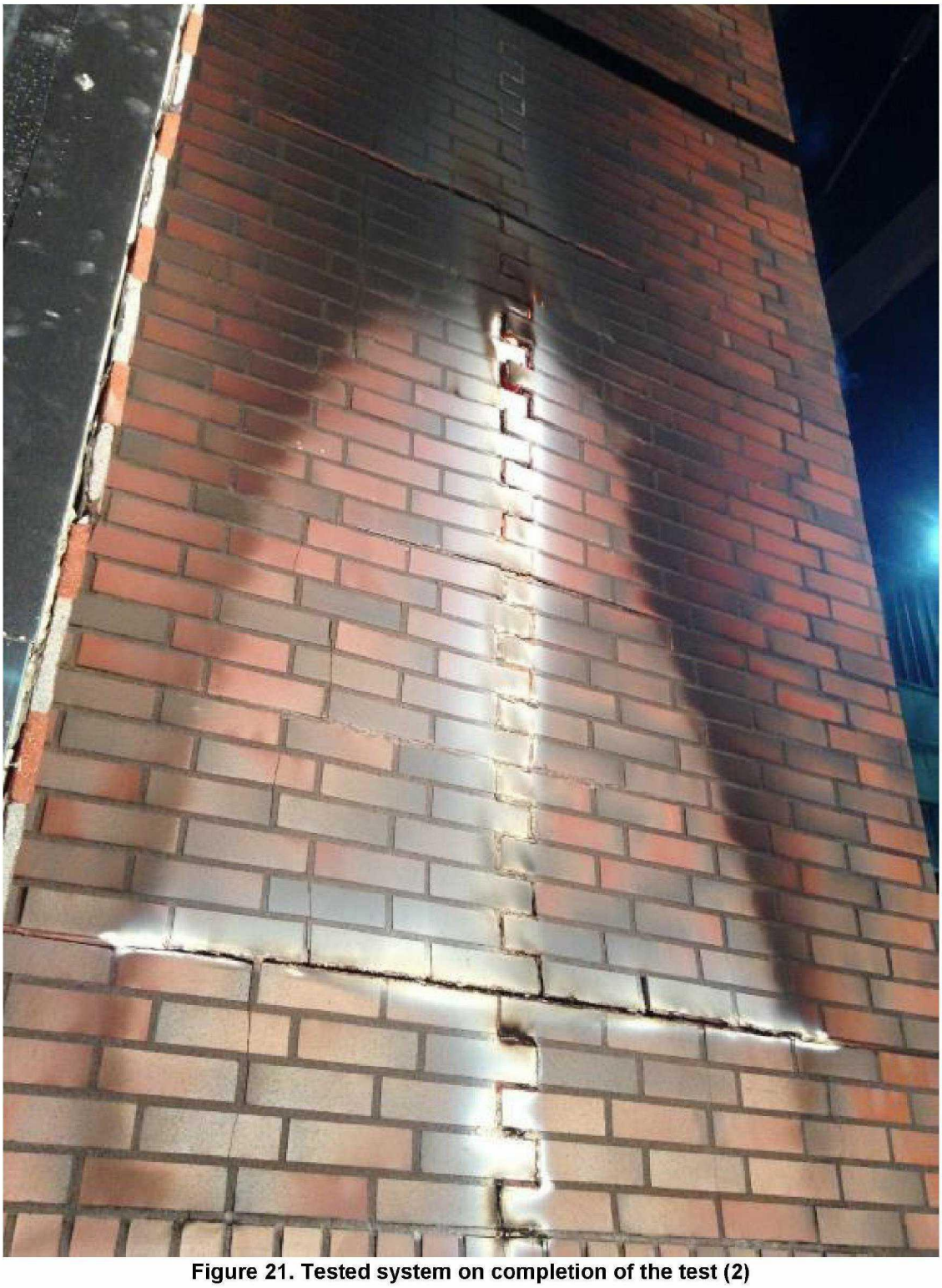

Figure 21. Tested system on completion of the test (2)

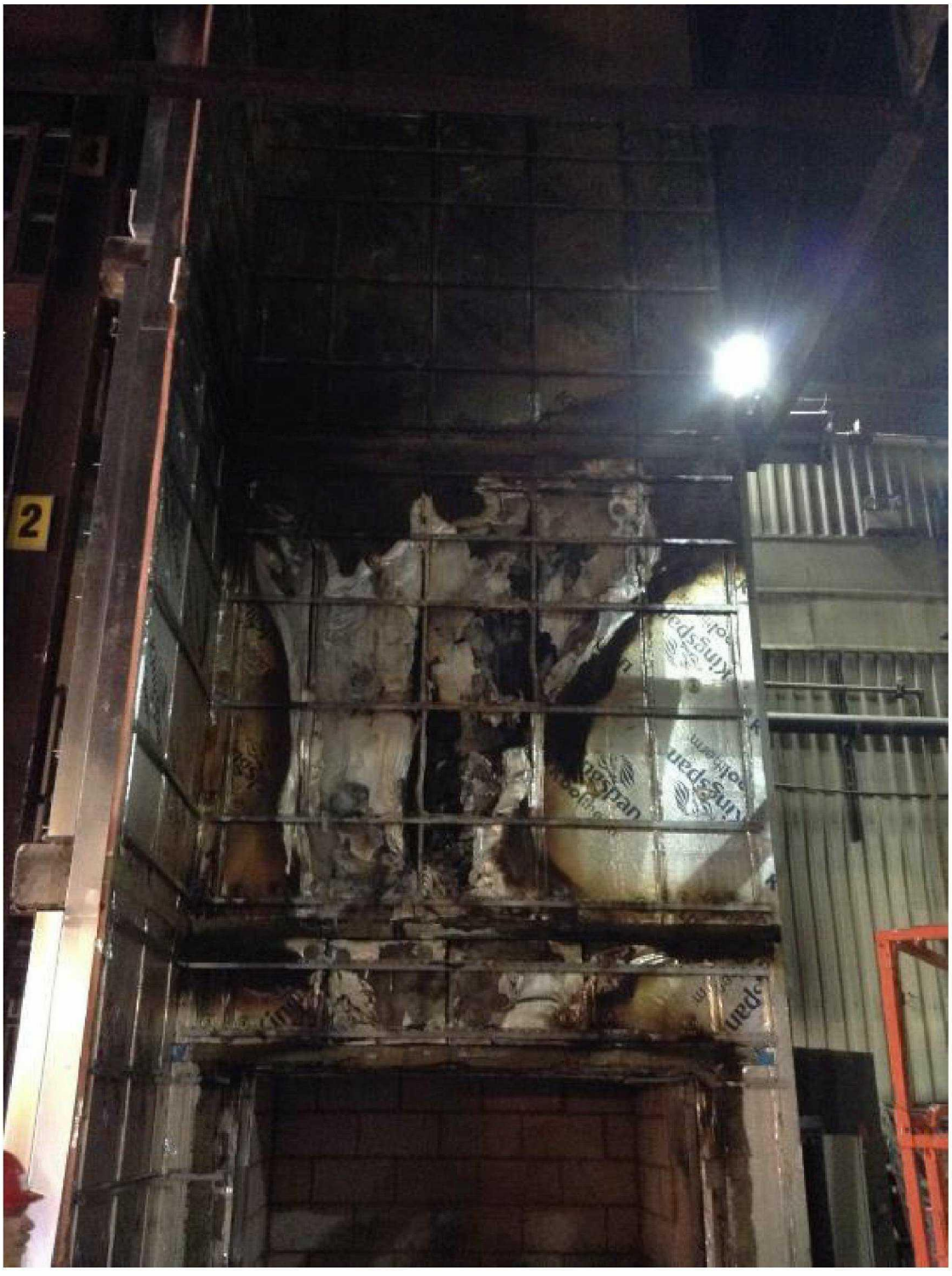

Figure 22. Photograph of insulation following removal of the brick slip panels.

End of report