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BRE Global Test Report

BS 8414-2 : 2005 Test on a Gebrik Rainscreen Cladding System

Prepared for:	**Isosystems and Aquarian Cladding Systems**
Date:	**21 September 2015**
Report Number:	**P100838-1000 Issue 2**

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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.

This report is issue 2 of report number P100838-1000. Report number P100838-100 issue 1 dated 4th September 2015 has been withdrawn following changes to the product description.

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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
Test reference:	P100838-1000
Date of test:	15 July 2015
Sponsor:	Isosystems & Aquarian Cladding Systems (UK)
Sponsor address:	Isosystems Malmedyer Weg 62 B-4770 AMEL-Schoppen Belgium and Aquarian Cladding Systems (UK) Eversea Business Centre 13 Gardens Road Clevedon North Somerset BS21 7QQ
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 4 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 light gauge steel frame (Kingframe) / 150mm Earthwool Flexi rock mineral wool insulation

12mm calcium silicate based cement building board (Y-wall)

15mm fire retardant battens

12mm calcium silicate based cement building board (Y-wall)

120mm K15 Kingspan insulation

1000mm x 75mm VRB Lite intumescent fire component installed both vertically and horizontally

60mm Gebrik panels, consisting of 43mm rigid polyurethane foam insulation (PUR) and 17mm façade brickslips and mortar

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

A sectional light gauge 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 spacings. Within the SFS was installed a 150mm layer of Earthwool Flexi.

A double layer of 12.5mm plasterboard was installed on the internal face of the SFS and a single layer of calcium silicate based cement building board was fixed to the front of the SFS. 15mm fire retardant battens were installed on the front of the calcium cement sheathing board, and on these was fixed a second layer of calcium silicate based cement building board. See figure 6 for a cross section of the system layout.

The insulation was directly fixed to the sheathing board using Ø4.8mm fixings and washers, incl 2no stainless steel washers. The joints between the individual sheets were taped with aluminium tape.

The insulation was 120mm Kingspan K15 panels supplied in 2.4m x 1.2m sheets.

The Gebrik cladding system was mechanically fixed directly into the sheathing board through Isofixing washers precast in the panels & corners and through the K15 using Gebrik system fixings. A horizontal 'starter' rail was installed at the base, which located the bottom of the first row of brick cladding panels and corners. The panels and corners were then installed row by row up the façade until the entire test area was fully clad. Once mechanically fixed, the horizontal and vertical chambers between panels and

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corners were fully filled with expandable PU foam prior to the 'stitching' slips being applied with cement-based system adhesive. The entire façade was then pointed with mortar and allowed to cure for 13 days.

The horizontal and vertical firebreaks located within the cavity were VRB Lite barriers, measuring 1000mm x 75mm, and were installed in the following locations:

Horizontal fire breaks 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 faced with a 120mm deep Gebrik head reveal to close the system and K15 insulation. The cavity was closed with the fire treated timber batten applied horizontally and the SFS was clad with calcium cement board.

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, it was allowed to cure in the BRE Burn Hall ambient conditions before testing.

3.5 Test Conditions

Test Date: 15 July 2015

Ambient Temperature: 17.7°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

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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

Figures 10 to 14 provide the temperature profiles recorded during the test. Figure 15 shows the system during the test.

Parameter	Result
T_s, Start Temperature	221.7°C
Peak Temperature in first 15 minutes of test	770.5°C 15 minutes after ignition of the crib at thermocouple "Level 1 Ext 3"
t_s, Start time	2 minutes; 1 second after ignition of the crib
Peak temperature/time at Level 2, 50mm external	651.2°C 23 minutes; 8 seconds after ignition
Peak temperature/time at Level 2, Cavity 1	154.6°C 60 minutes after ignition
Peak temperature/time at Level 2, Insulation Layer	295.6°C 57 minutes; 30 seconds
Peak temperature/time at Level 2, cement particle board	84.1°C 58 minutes; 48 seconds
Peak temperature/time at Level 2, cavity 2	27.5°C 41 mins; 15 seconds
Peak temperature/time at Level 2, Plasterboard	20.9°C 58 minutes; 12 seconds

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4.2 Visual Observations

Table 1. Visual Observations – Refer to figure 9 for system schematic.

Time (mins:secs)	Description
-5:00	Logger start
0:00	Ignition of crib
2:17	Flames out of hearth
2:59	Flames to 1.5m on main face
6:08	Flames to 2.5m on main face
8:15	Brick fallen from hearth surround
8:56	Brick fallen from 0.5m main face
9:15	Combustion within flame plume
10:10	Flaming on floor for more than 10 seconds
11:00	Flames to 3.5m
11:58	Bricks fallen from 1m
12:35	Pool fire on floor
13:07	Ignition of joint on wing wall 0.5m
15:56	Intermittent flaming at 4m
17:57	Bricks falling from 1.5m
19:27	Bricks falling from 2.5m Flames to 4.5m
20.09	Flaming on surface of wing wall 0.5m
21:18	Bricks falling from 3m. Flaming to 4.5m consistent
21:40	Large pool fire on floor
21:55	Flaming in corner to 3.5m
23:25	Bricks falling from 3.5m main face
23:54	Wing wall flaming from 0.5m to 2.5m
24:49	Bricks falling from wing wall 2.5m
26:00	Bricks falling from 4m main face
26:28	Wing wall flaming to 3m
26:48	Corner flaming to 4.5m
29:30	Wing wall flaming to 4m
30:00	Crib extinguished

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Time (mins:secs)	Description
35:21	Wing wall bricks falling from 4m
60:00	Continued burning of insulation where brick slips had fallen away till end of test on main wall

5 Post-test damage report

5.1 External Layer

Figure 16 shows the condition of the system following completion of the test. The following sections comprise a summary of visual observations made following the test.

5.1.1 Rain screen - Gebrik Brickslip exterior

Brickslip sections had detached from the system and fallen to the floor at the following locations:

On the main face of the wall, between the centreline and the right side of the face, up to ~4m above the hearth level

On the wing face of the wall, across the full width of the wall from ~0.5m up to ~4.5m above the hearth.

Sections of Brickslip were cracked (or beginning to detach) out-with these detached areas, above the fallen panels on the wing and main faces of the system.

5.1.2 Rain screen - Insulation.

On the main face of the system, insulation was charred beneath all of the areas where brickslip sections had fallen away up to the level 2 fire break (~4m above the hearth opening).

On the wing face of the system, the insulation had charred across the full width of the wall up to ~4m above the hearth opening height.

There was an area of non-charred insulation where the bricks had fallen away without flames impinging on the insulation surface. This area was on the wing face of the wall immediately below the second level fire break at ~4.5m, as evidenced in Figure 16.

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

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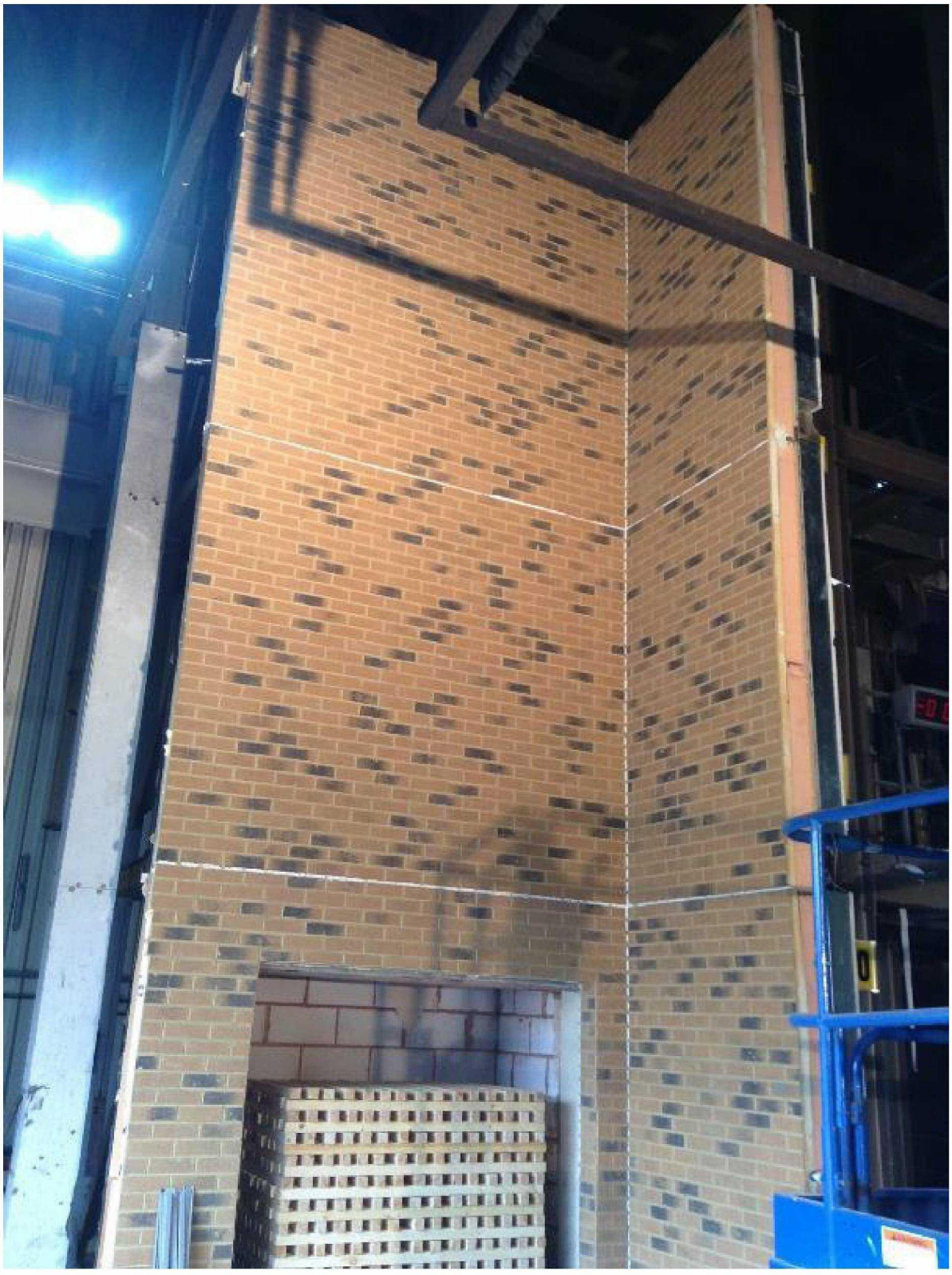

Figure 1. The system prior to testing

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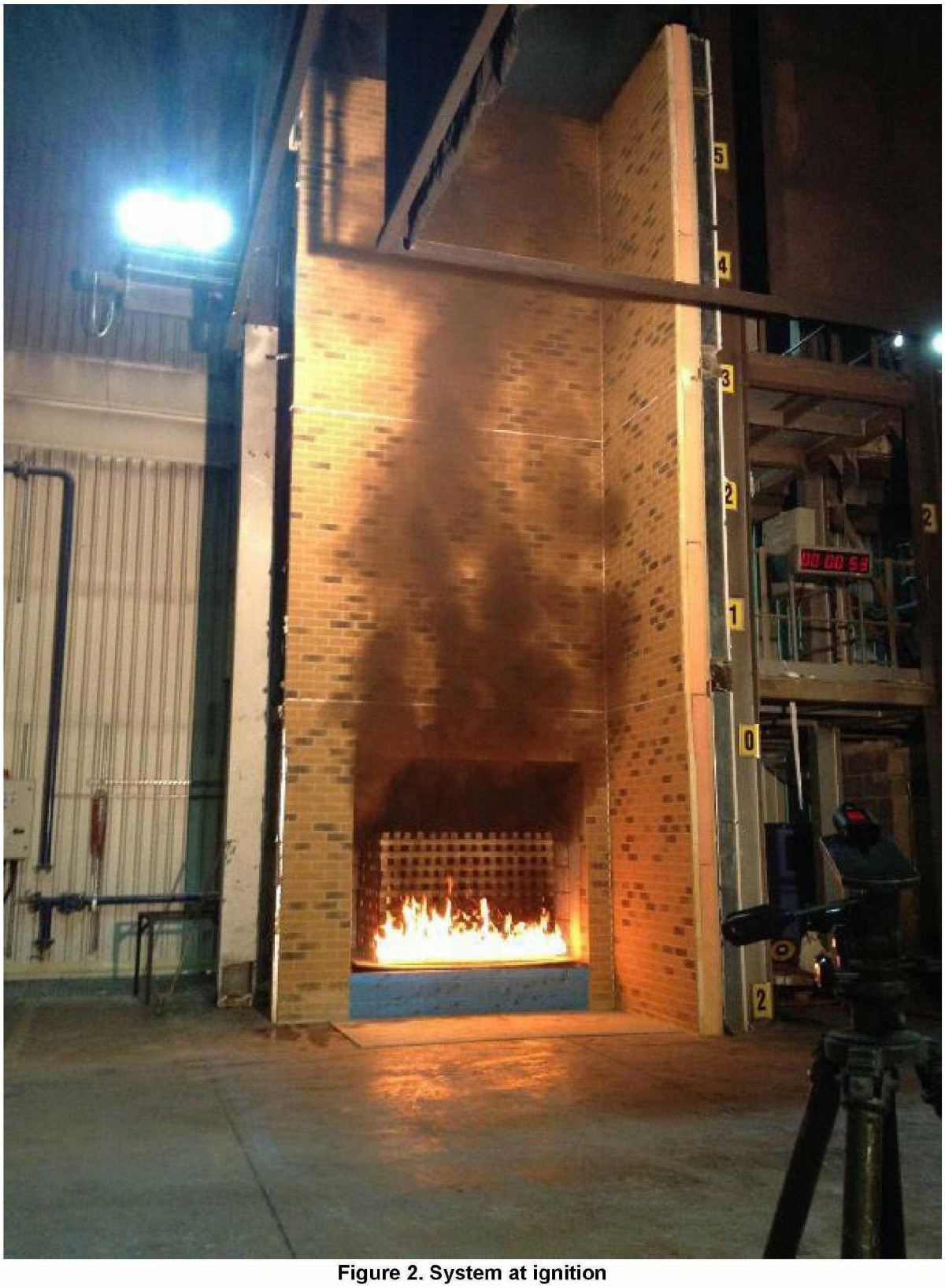

Figure 2. System at ignition

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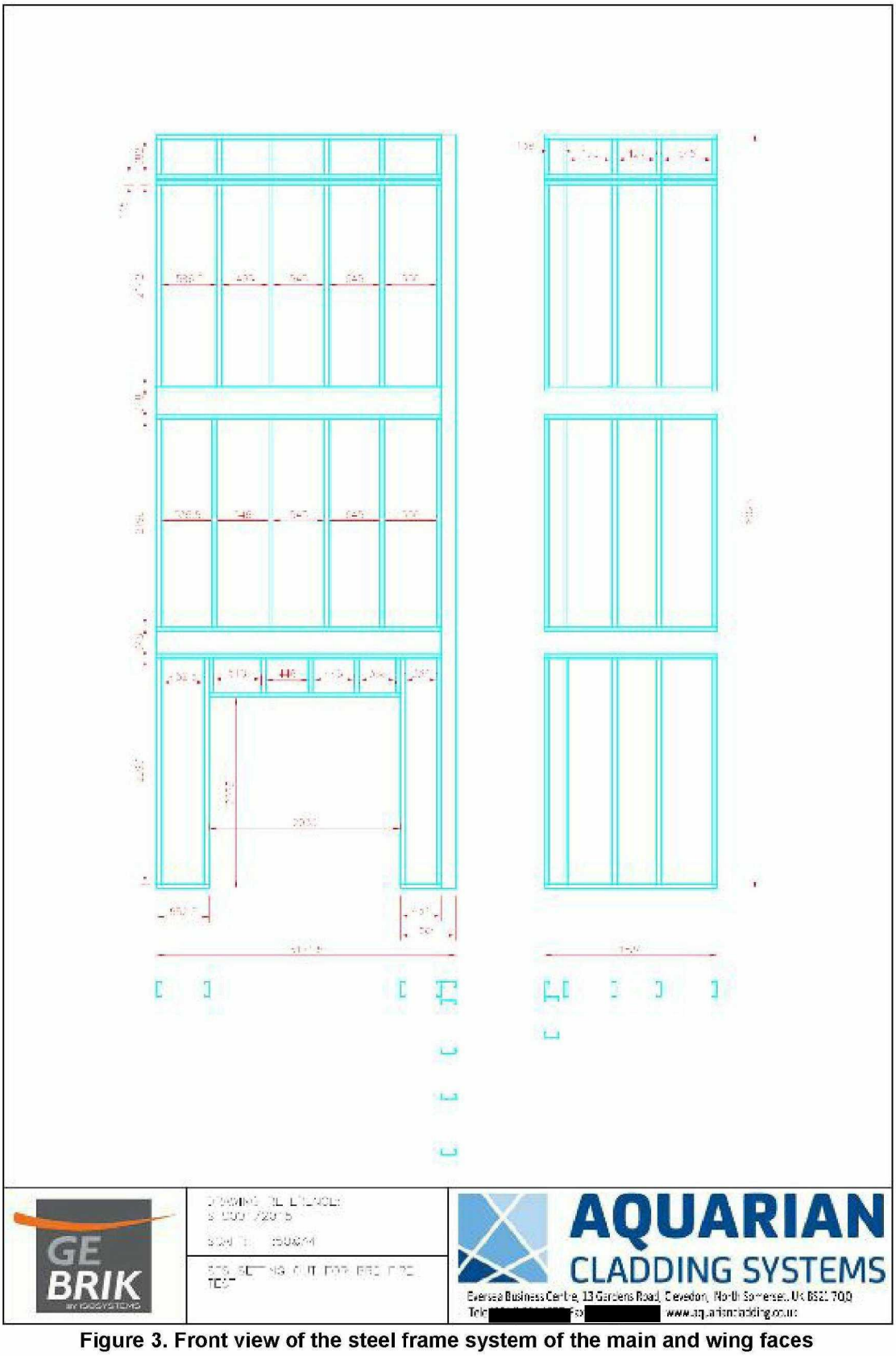

Figure 3. Front view of the steel frame system of the main and wing faces

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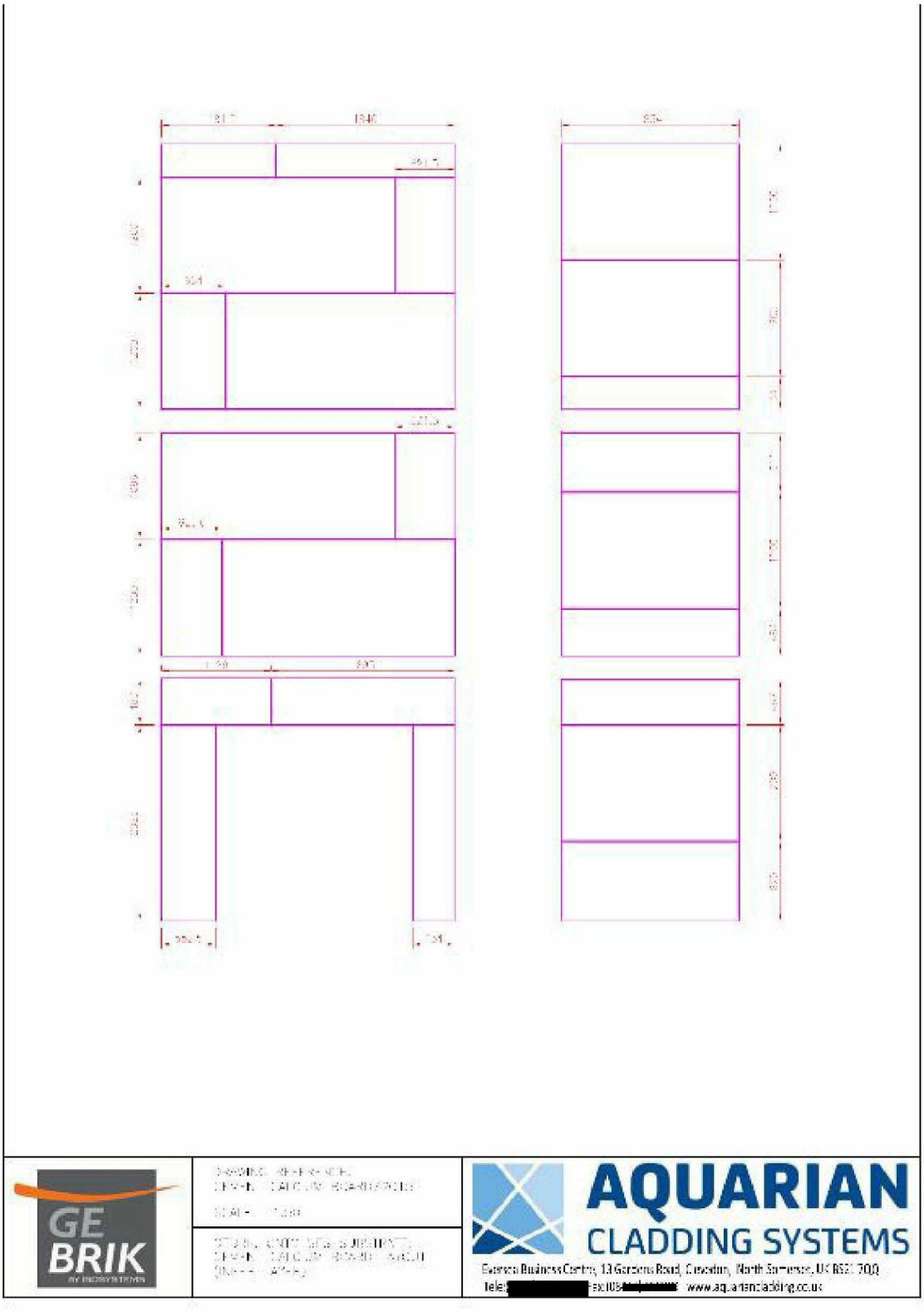

Figure 4. Front view of the cement particle board layout of the main and wing faces

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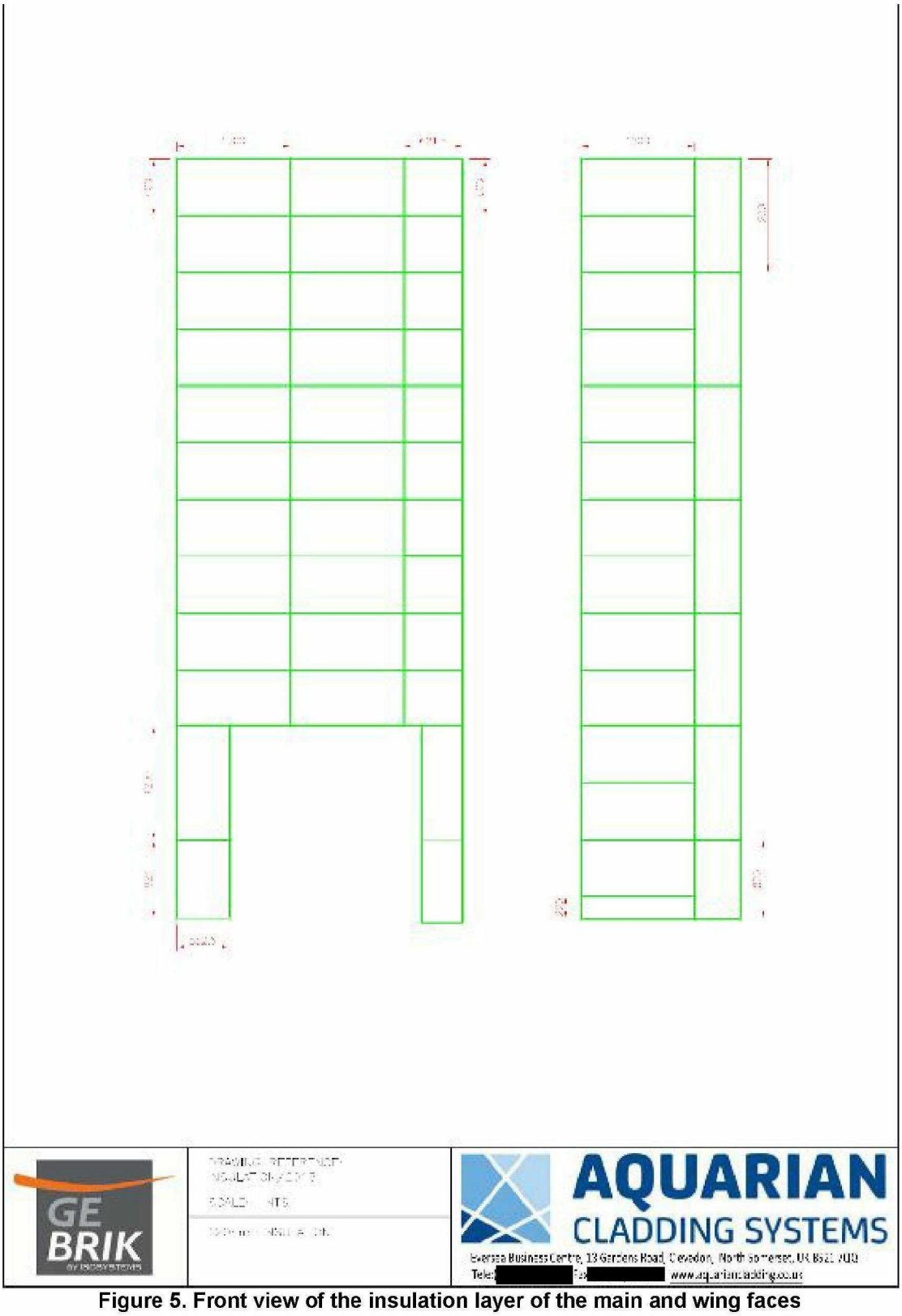

Figure 5. Front view of the insulation layer of the main and wing faces

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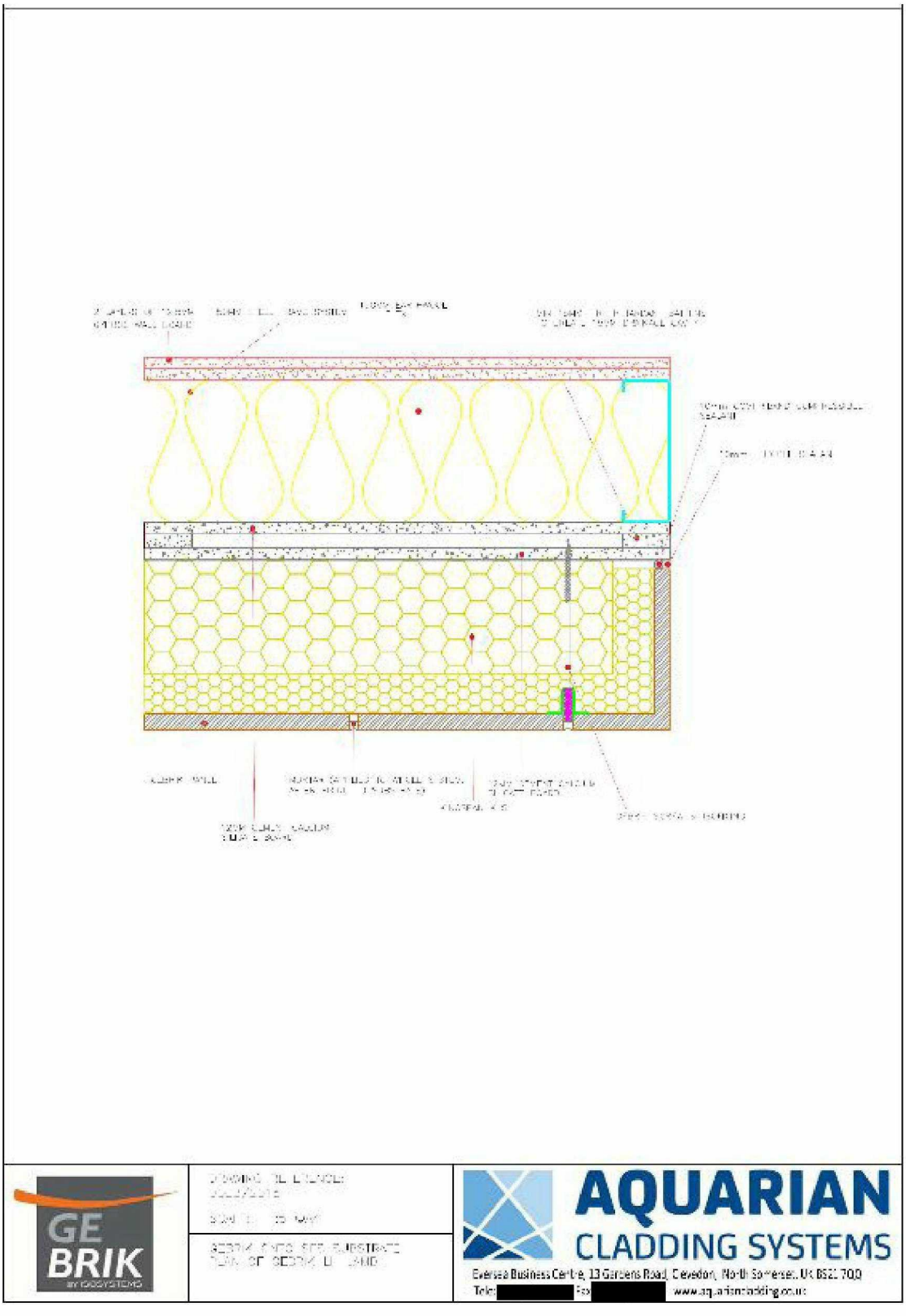

Figure 6. Horizontal section drawing of the completed system

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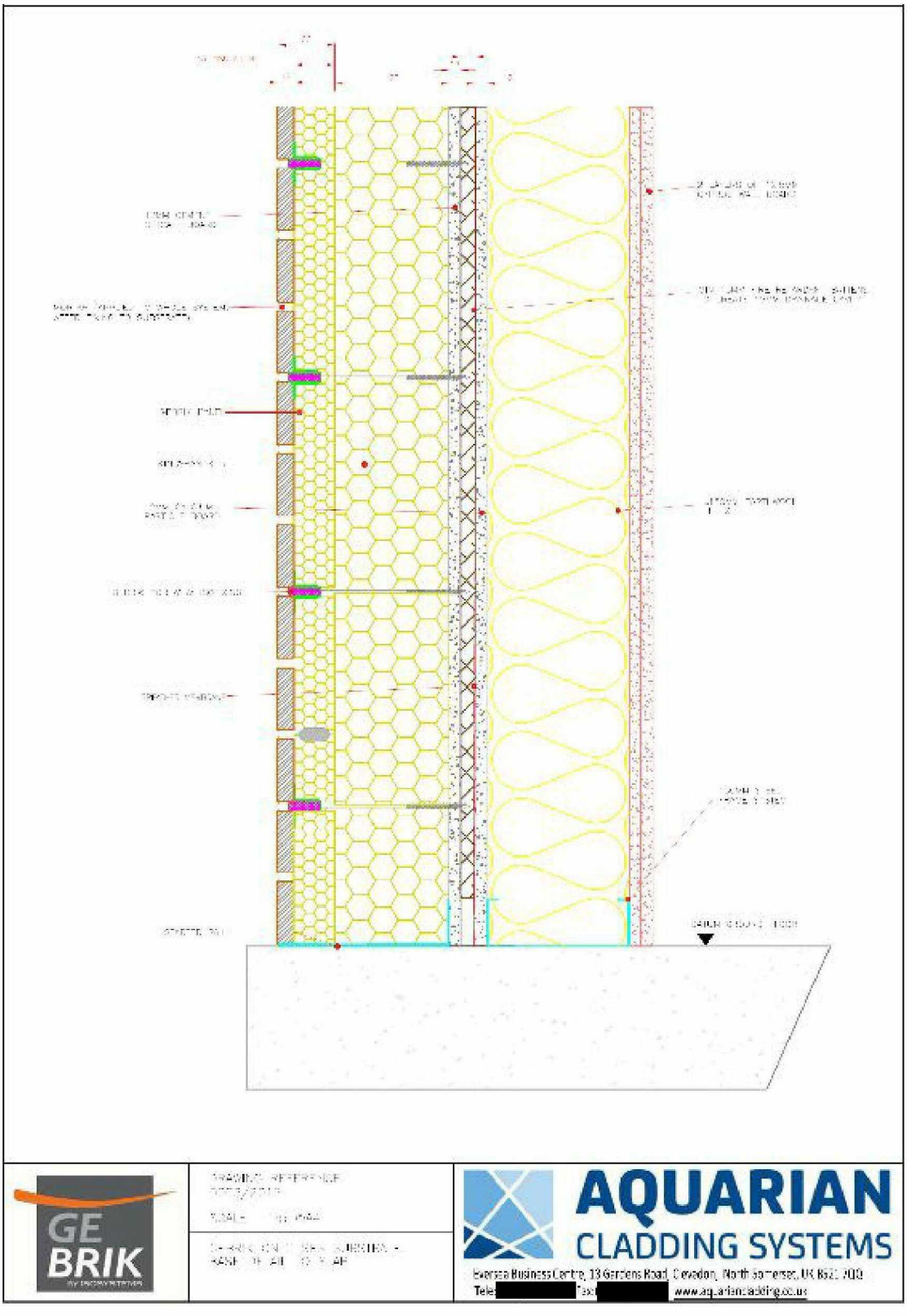

Figure 7. Vertical section drawing of the completed system

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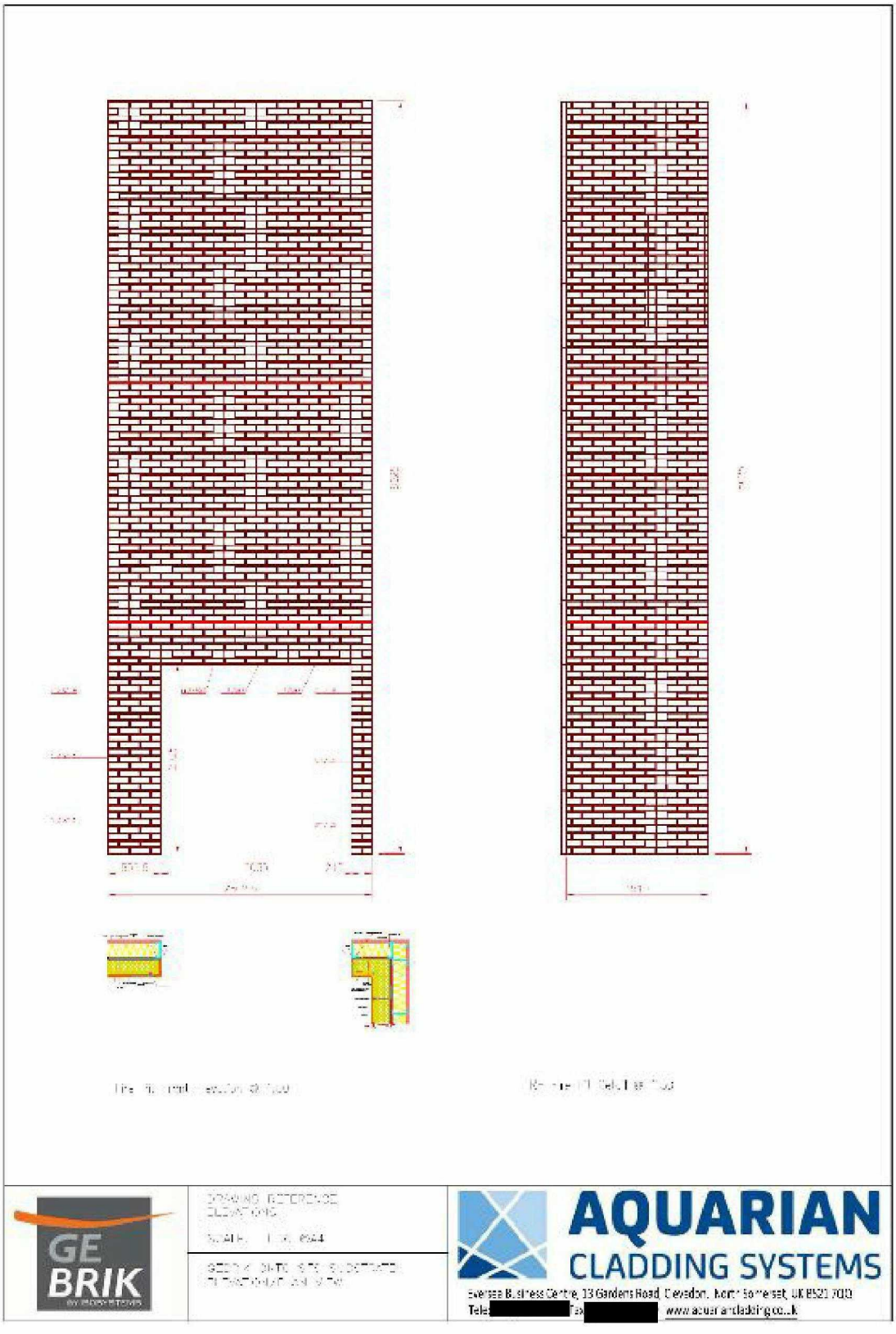

Figure 8. Front view of the Rainscreen face of the main and wing faces of the system

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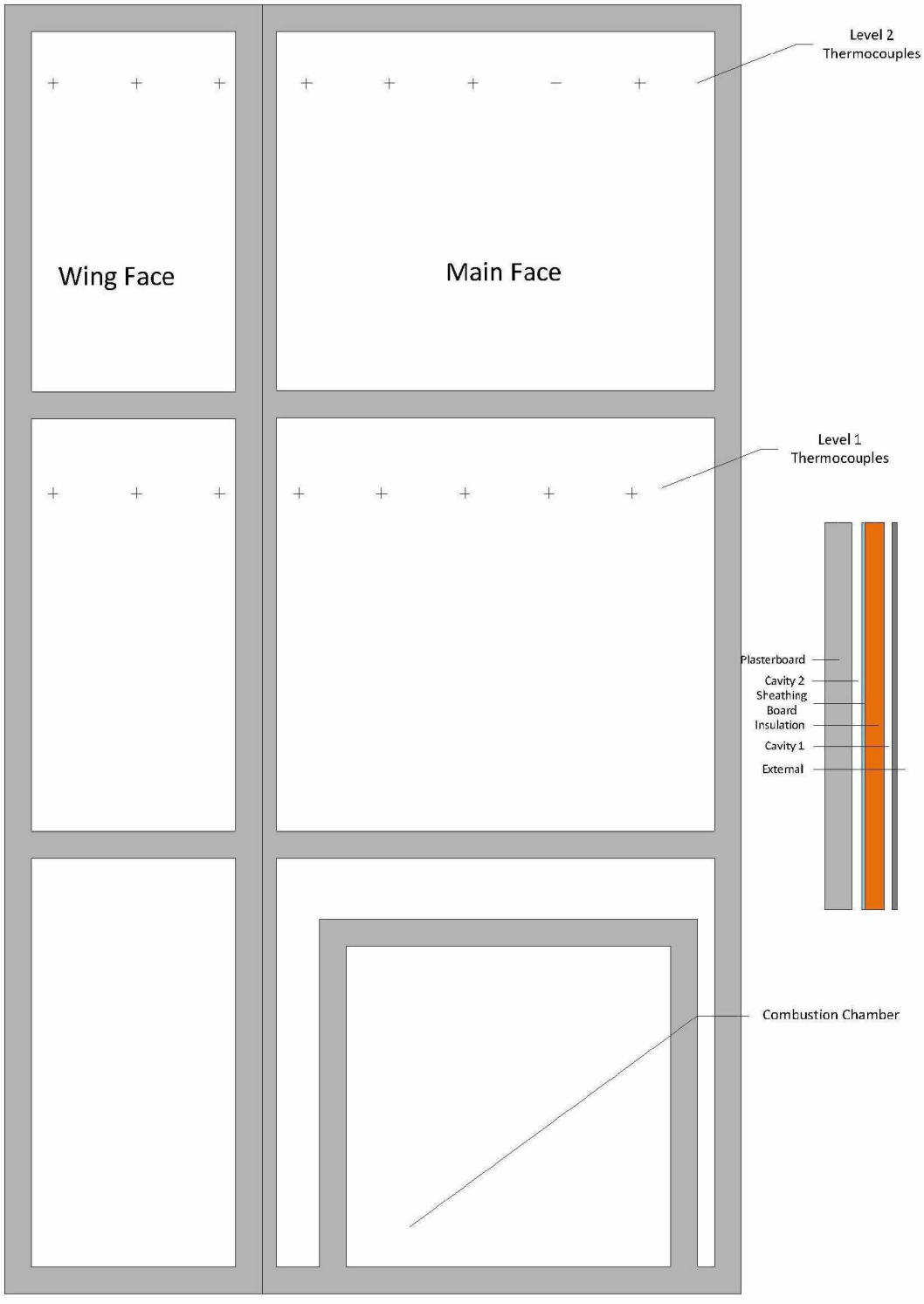

Figure 9. Location and identification numbers of thermocouples used (schematic only)

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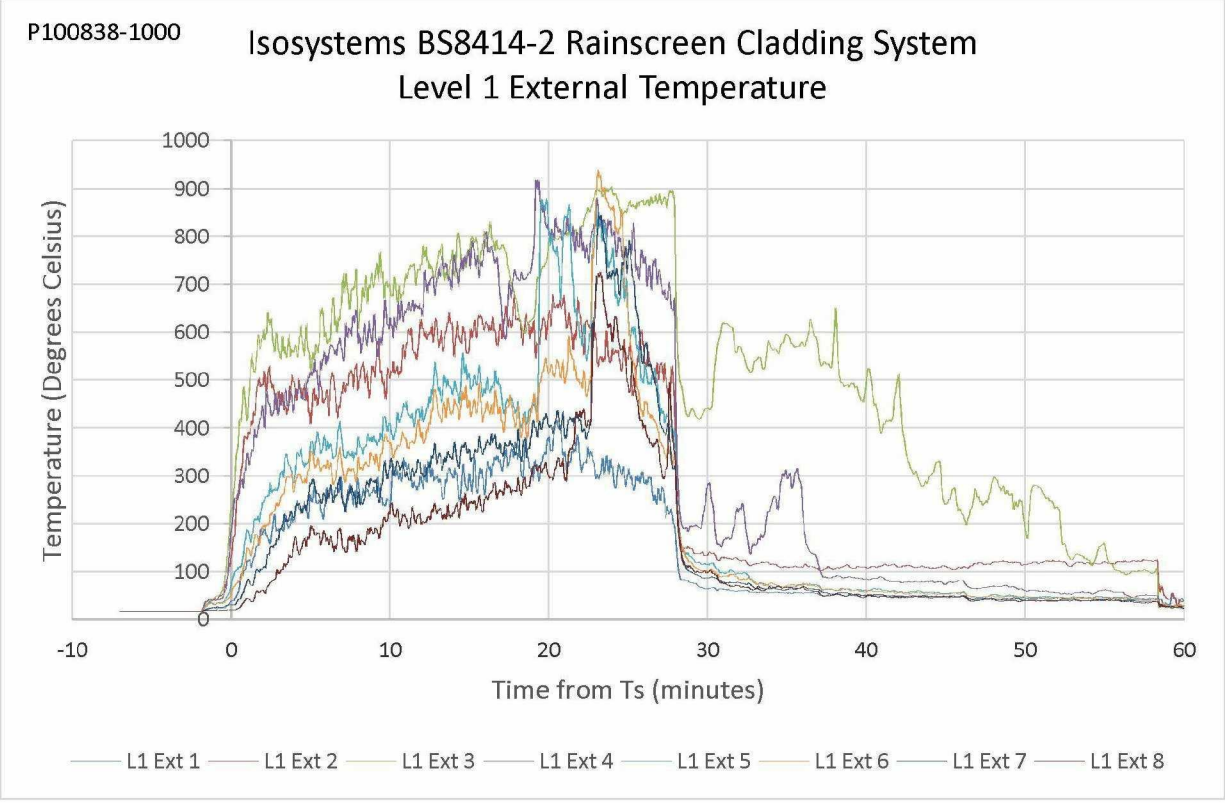

Figure 10. Temperatures Level 1 External

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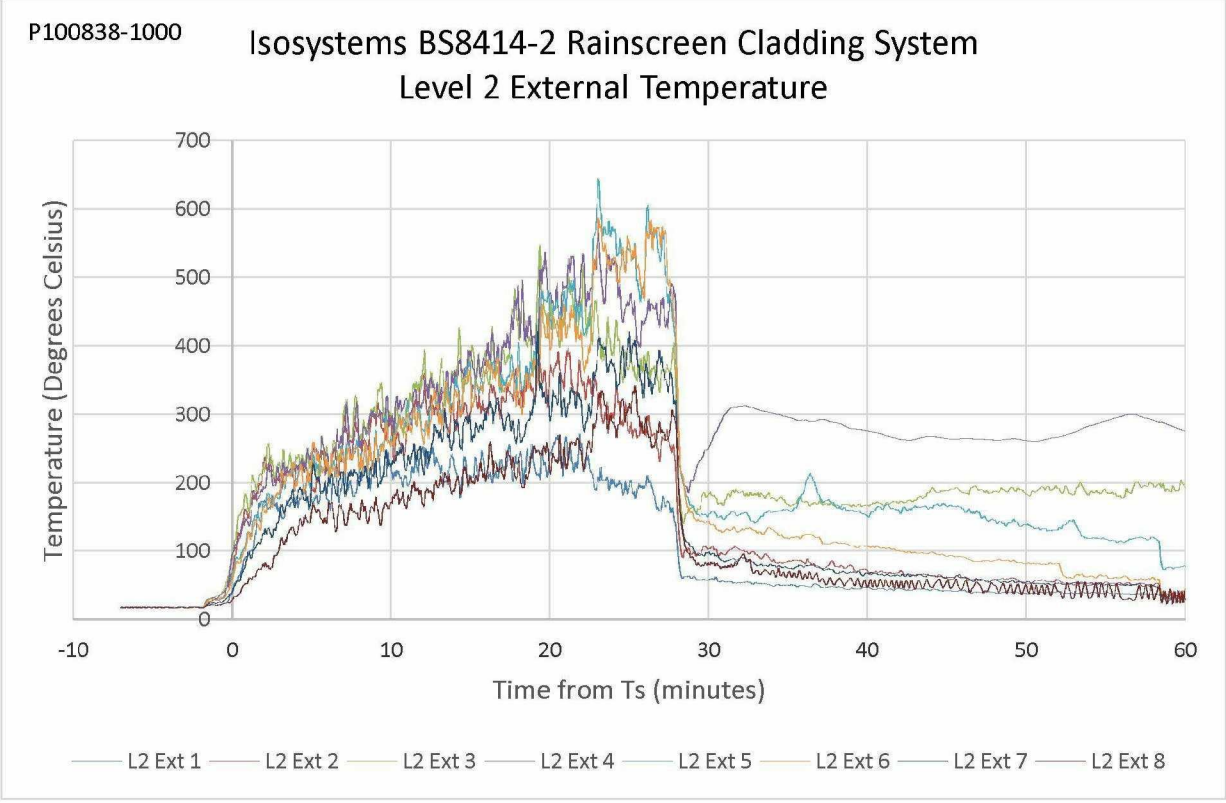

Figure 11. Temperatures Level 2 External

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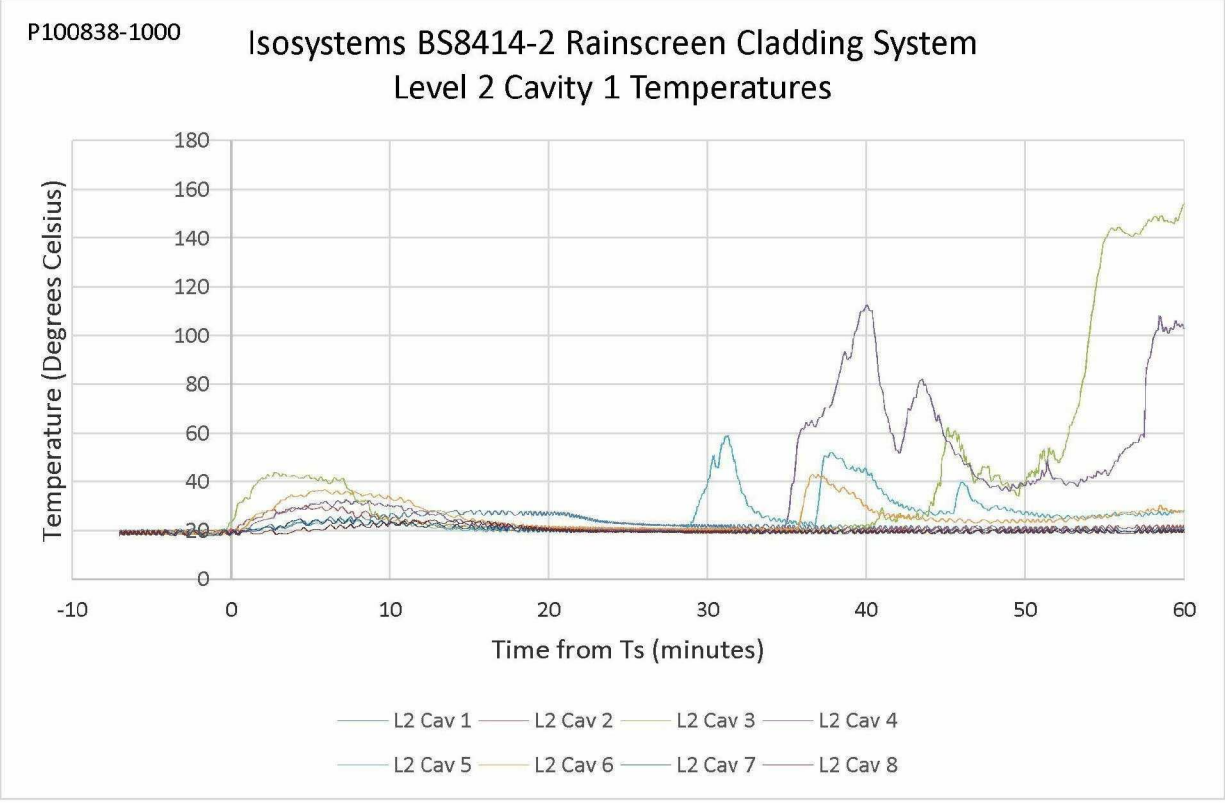

Figure 12. Temperatures Level 2 Cavity 1

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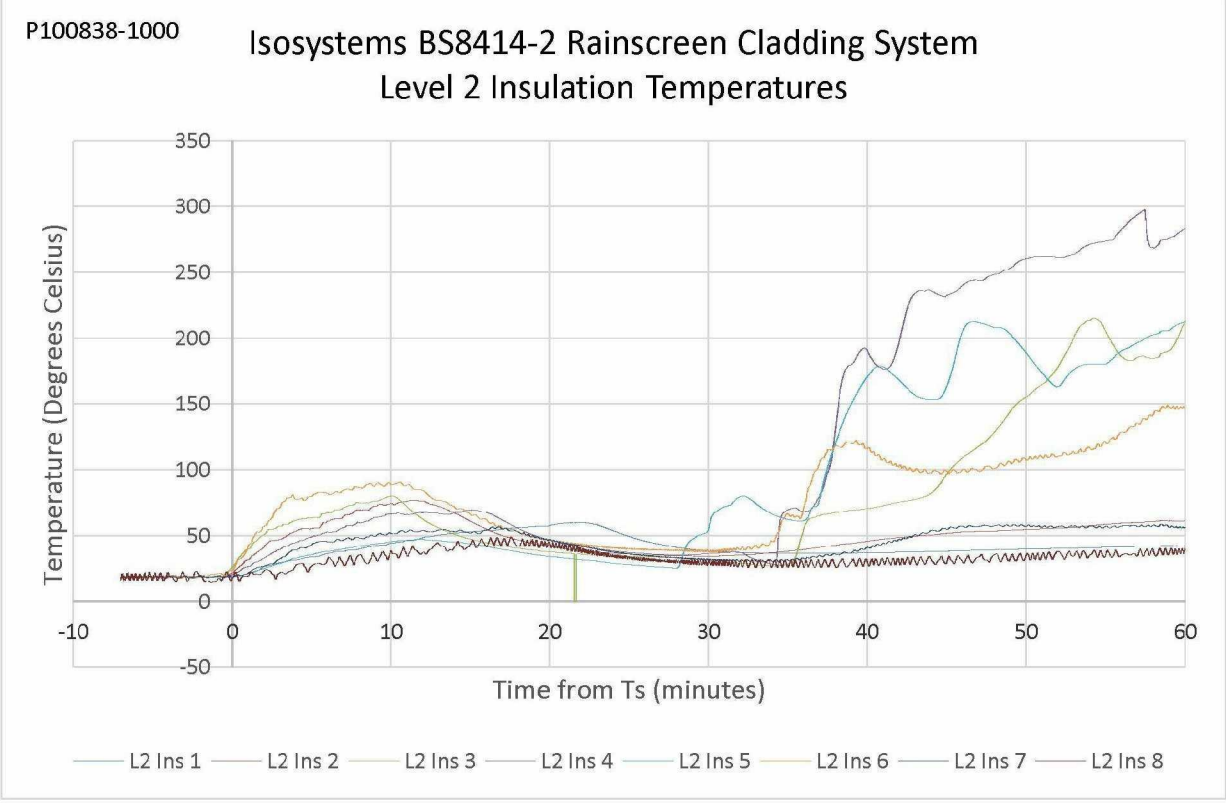

Figure 13. Temperatures Level 2 Insulation Layer

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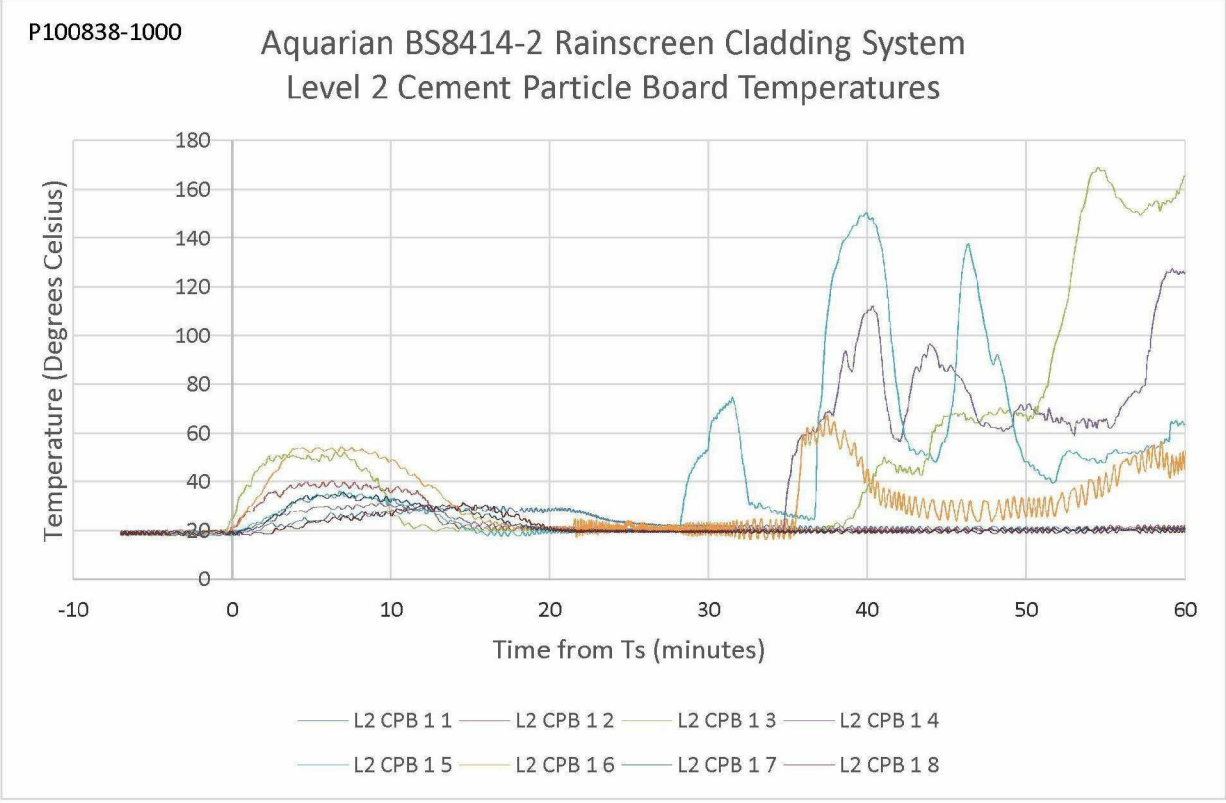

Figure 14. Temperatures Level 2 Cement Particle Board

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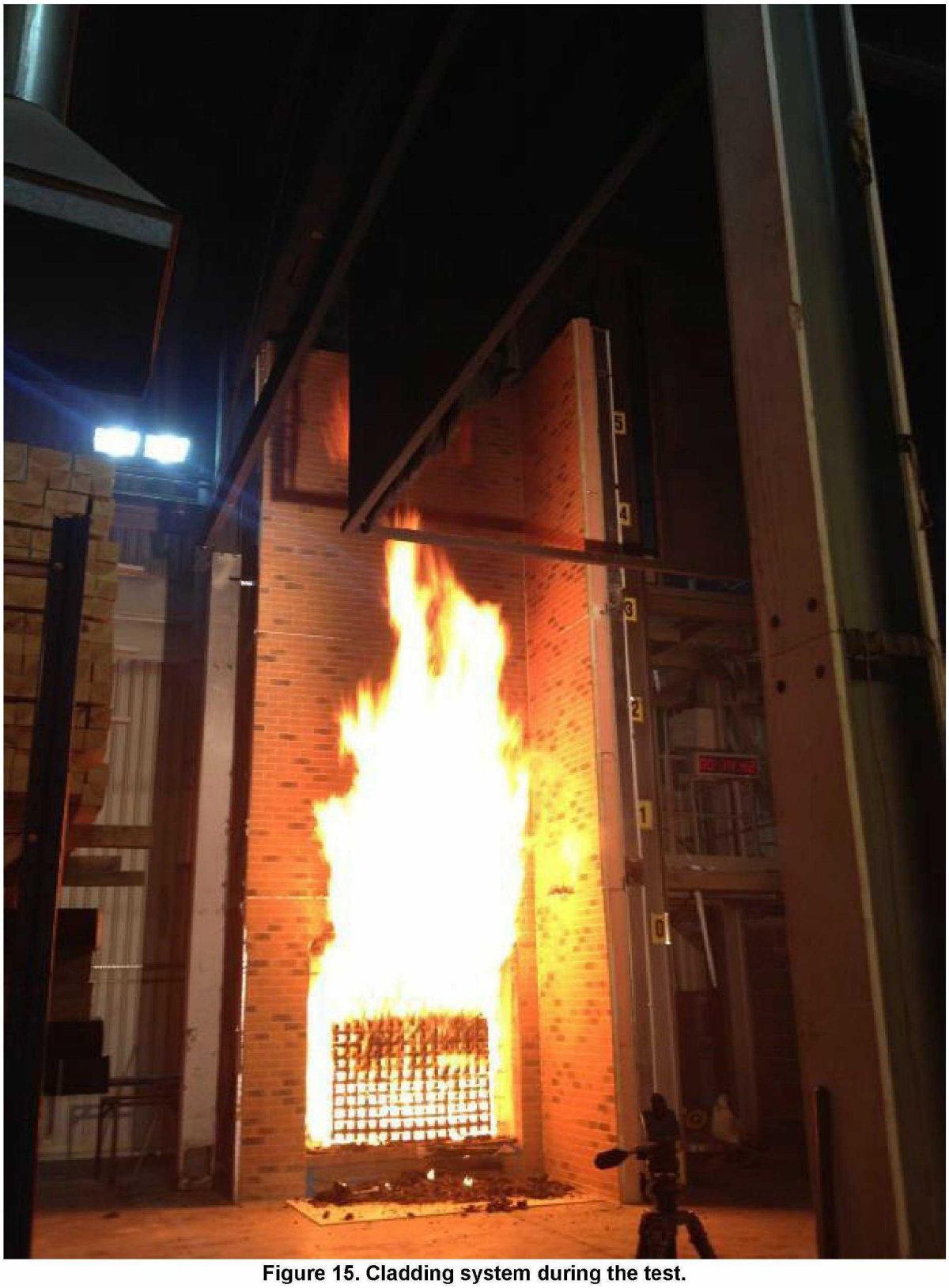

Figure 15. Cladding system during the test.

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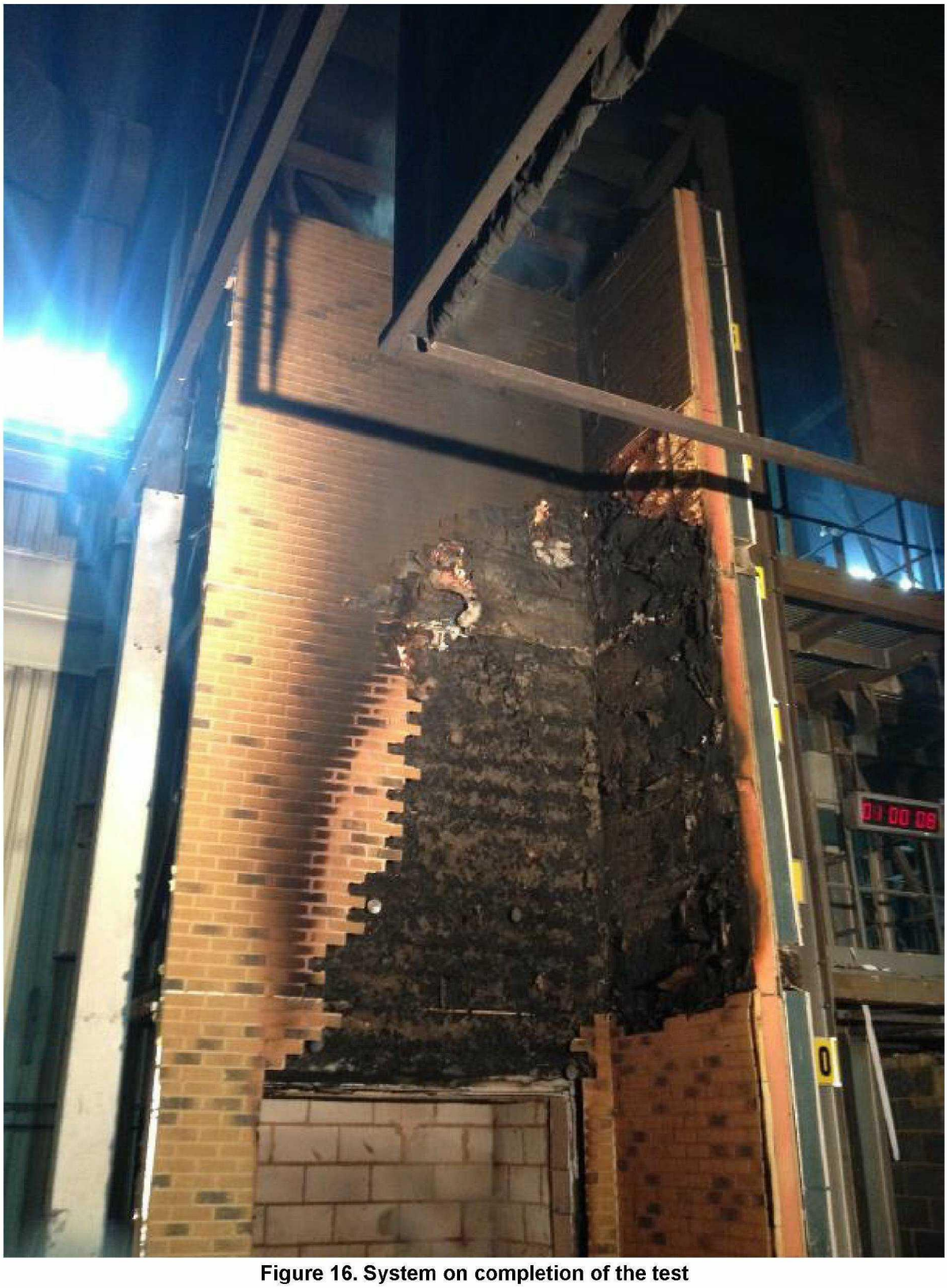

Figure 16. System on completion of the test

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Report Ends