



**BS 8414-2:2005 test on a
150mm BENCHMARK
Evolution Panel.**

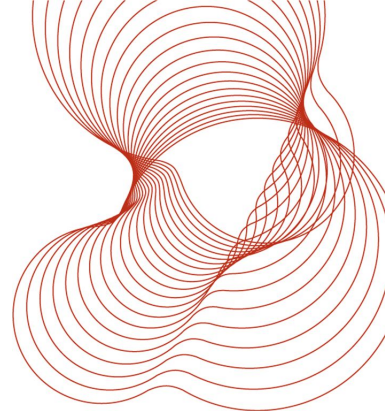
Prepared for:
Kingspan Ltd
Greenfield Business Park No 2,
Holywell,
Flintshire.
CH8 7GJ.

15th May 2014

Test report number 293939



0578



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Date 15th May 2014

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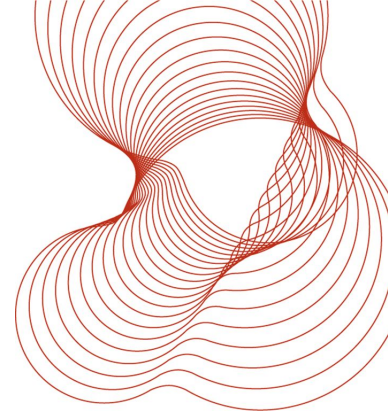
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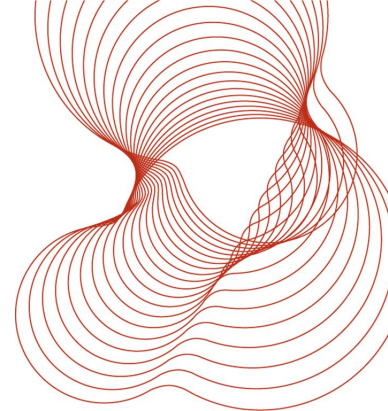


1 Introduction

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: 293939

Date of test: 10th March 2014

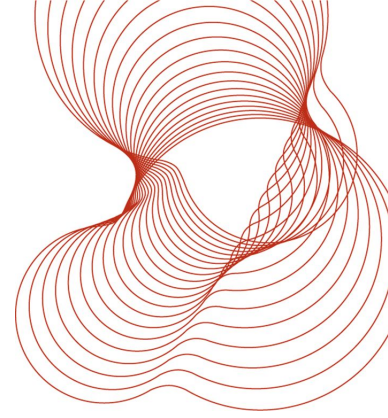
Sponsor: Kingspan Ltd

Sponsor address: Greenfield Business Park No 2,
Holywell,
Flintshire.
CH8 7GJ.

Sponsors Reference No:

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

Deviations: None



2.1 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, the cladding system was affixed to the steel substructure.

2.2 Description of product

Figure 1 shows the system during construction. 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 system, as tested, comprised of:

- BENCHMARK Evolution Panel with 0.595mm outer skin and 0.32mm inner skin constructed from double sided corrosion coated S220 grade steel, filled with Kingspan Ltd Ecosafe PIR of 150mm thickness.
- Arcelor External flashings of 0.595 mm thickness
- SFS Intec self-drilling, self-tapping screws
- SXC5 S16 – 5.5 x 160mm panel fixers
- SXC5 S16 – 5.5 x 185mm panel fixers
- SX14 S16 – 5.5 x 66mm panel fixers
- SL2 S S16 5.5 x 28mm stitcher fasteners
- Knauf Insulation Rocksilk Krimpack 200mm x 25mm thickness

2.2.1 Installation of cladding System.

2.2.1.1 Steel substructure and fixings

A substructure was constructed using mild steel 100 x 100 mm and 150 x 100 mm box sections. These were welded to the BRE cladding facility and the BENCHMARK panels were fixed to the sub-frame with 160mm and / or 185mm through fasteners. All flashings were fixed using 66mm and 28mm fasteners.

2.2.1.2 Panel Insulation layer

The insulation core was produced by Kingspan Ltd and was described as ECOSAFE HCFC Free Polyisocyanurate, with a nominal thickness of 150mm. The panel skins were auto-bonded to the insulation during the curing process.

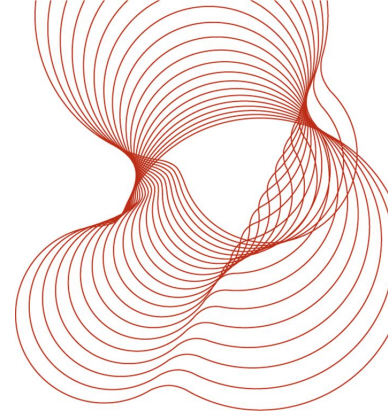
2.2.1.3 Fire breaks

There were no fire breaks installed in the system.

2.2.1.4 Panel Skins

Two metallic skins were used in the construction of panel and were described as:

- Arcelor double sided corrosion coated S220 grade steel of 0.595 mm (external face) with a coat thickness of 25 to 50 microns



- Dong Bu double sided corrosion coated S220 grade steel of 0.32 mm (internal face) with a coat thickness of 15 microns

2.3 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.

2.4 Conditioning of the Specimen

Once the system was completed it was allowed to condition for a period of at least 5 days before testing was undertaken.

2.5 Test Conditions

Test Date: 10th March 2014

Ambient Temperature: 11.5°C

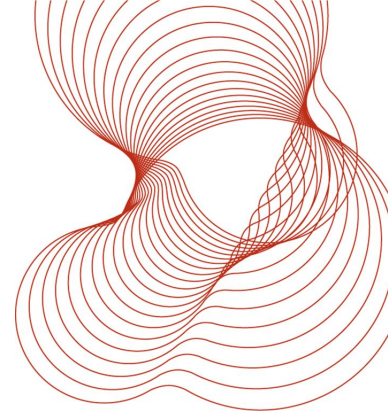
Wind speed: < 0.1 m/s, test undertaken indoors

Frequency of measurement: Data records were taken at five second intervals.

Thermocouple locations:

- Level 1 – External
- Level 2 – External
- Level 2 – Mid point of insulation

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.



3 Test results

3.1 Temperature Profiles

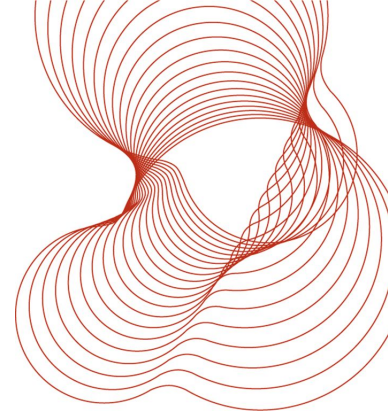
Figure 10 to Figure 12 provide the temperature profiles recorded during the test shows the sample during test.

Parameter	Result
T _s , Start Temperature	211.5 °C
t _s , Start time	2:37 mins : secs after ignition of the crib
Peak temperature/time at Level 2, 50mm external	521°C at 20:42 mins : secs after t _s
Peak temperature/time at Level 2, Insulation layer	245°C at 24:05 mins : secs after t _s

3.2 Visual Observations-

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

Time (mins:secs)	Description
-5:00	Logging started
0:00	Ignition
2:10	Flames out of hearth
2:38	Flames to 1m cladding wall main face
3:25	Flames to 1.5m cladding wall main face
4:00	Surface burn in hearth area cladding wall main face
4:32	Flaming in middle joint to 2.5m cladding wall main face
5:48	Flames from panel 0m right-hand side cladding wall main face buckling of panel on cladding wall wing face to 3 m
7:58	Flames to 3m cladding wall main face flames from joint at each level to 2.5m
9:30	Flames in centre joint to 2.5 m
10:30	Cladding wall wing face panel discolour from 0 to 2.5m
12:00	Flames to 3.5 m cladding wall main face
13:30	Flames to 3.5 m in centre joint
15:00	Flames to 4 m cladding wall main face
18:00	Flames in centre joint to 4m
22:00	Flames to 4.5m cladding wall main face
23:0	Flaming from cladding wall wing face at 0.5m and full width
24:00	Flames to 4.5m cladding wall main face
26:00	Fames on cladding wall wing face to 2.5m



Time (mins:secs)	Description
25:00	Crib collapse
30:00	Crib extinguished, continued flames to 3.5m
35:00	Continued flames at cl 2.5m out at 35:40
40:00	Continued flaming at 2m cladding wall main face centreline
50:00	No visible flames at 2m
60:00	Test end

3.3 Post-test damage report

3.3.1 External Layer

A schematic illustration of the damage to the system is shown in Figure 16. The condition of the cladding system after the test is shown in Figure 14 and Figure 15.

3.3.2 Insulation Layer

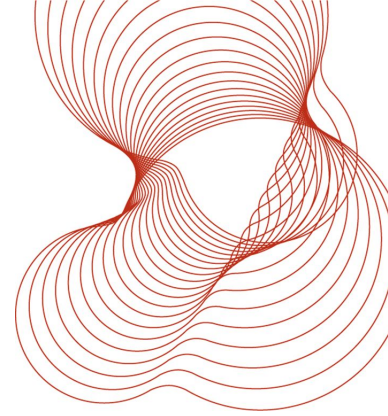
The condition of the panels after the test is shown in Figure 17 and Figure 18.

3.3.3 Collapse

There was no observed collapse of any part of the system.

4 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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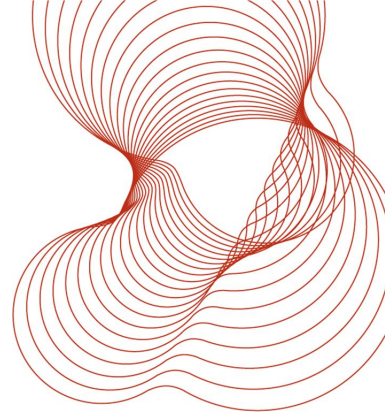


Figure 1. Photograph of the system.

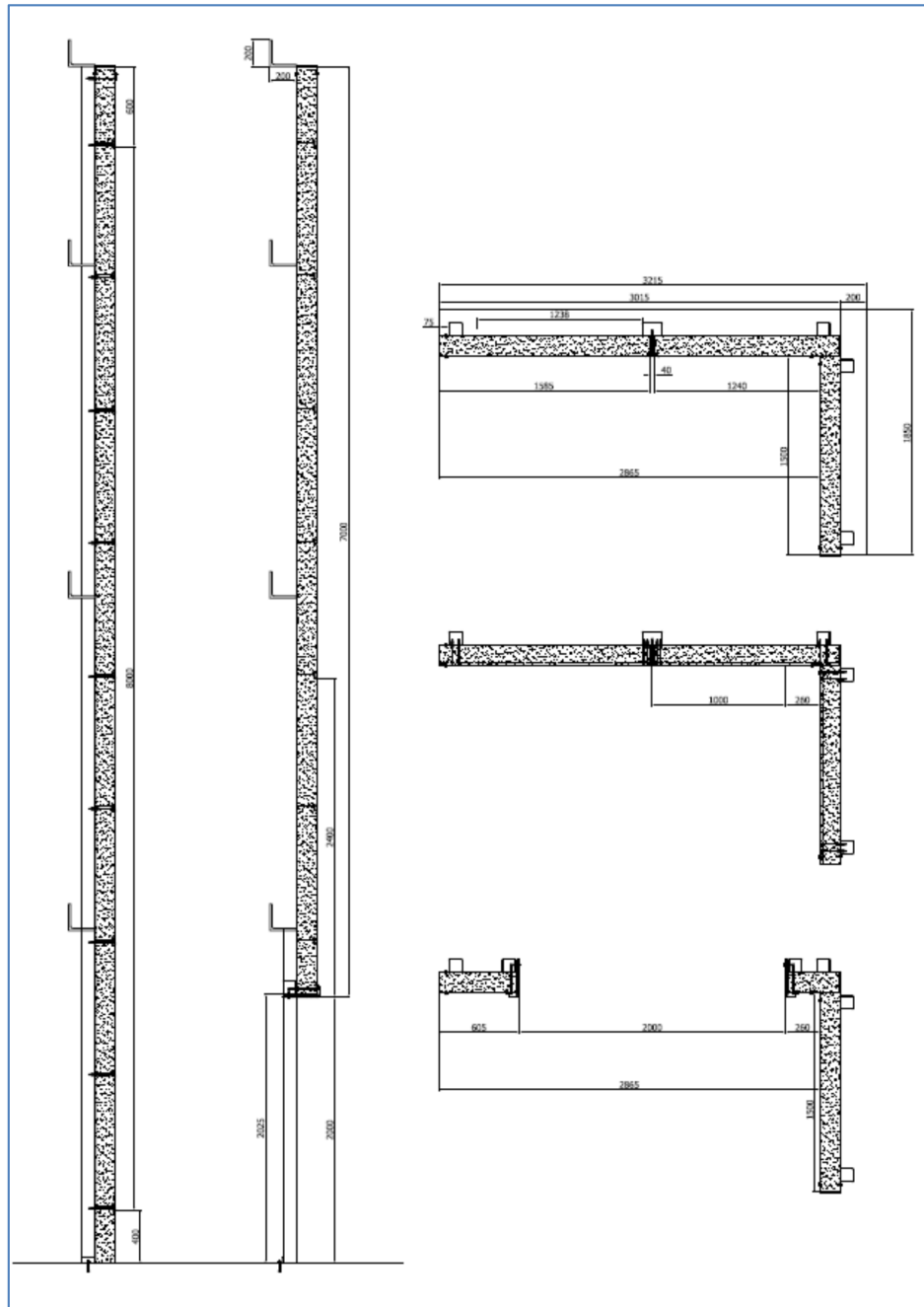
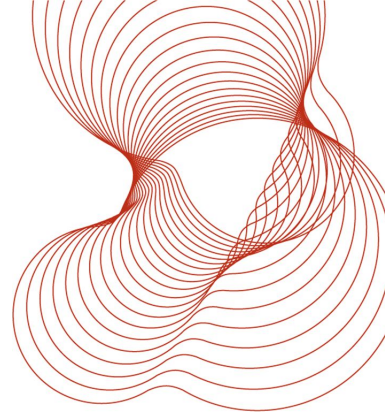


Figure 2. Construction drawing of the system showing corner detail.

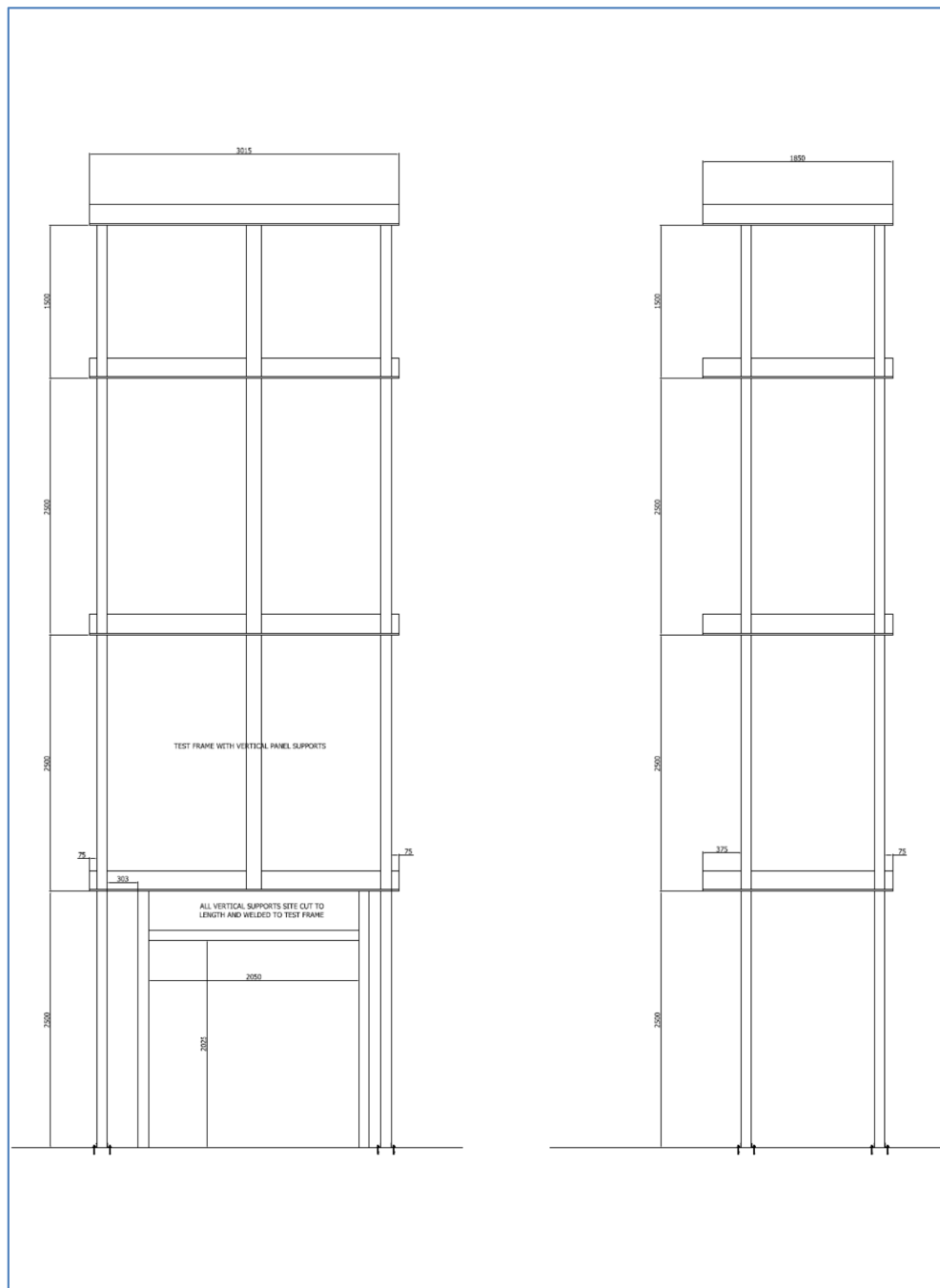
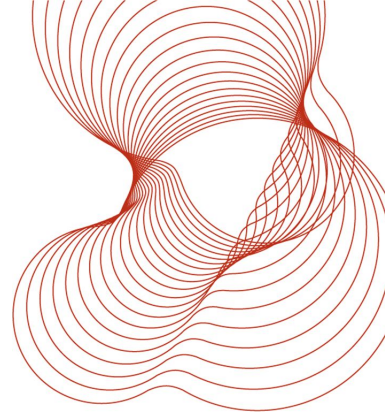


Figure 3. Construction drawing of the system showing the framing.

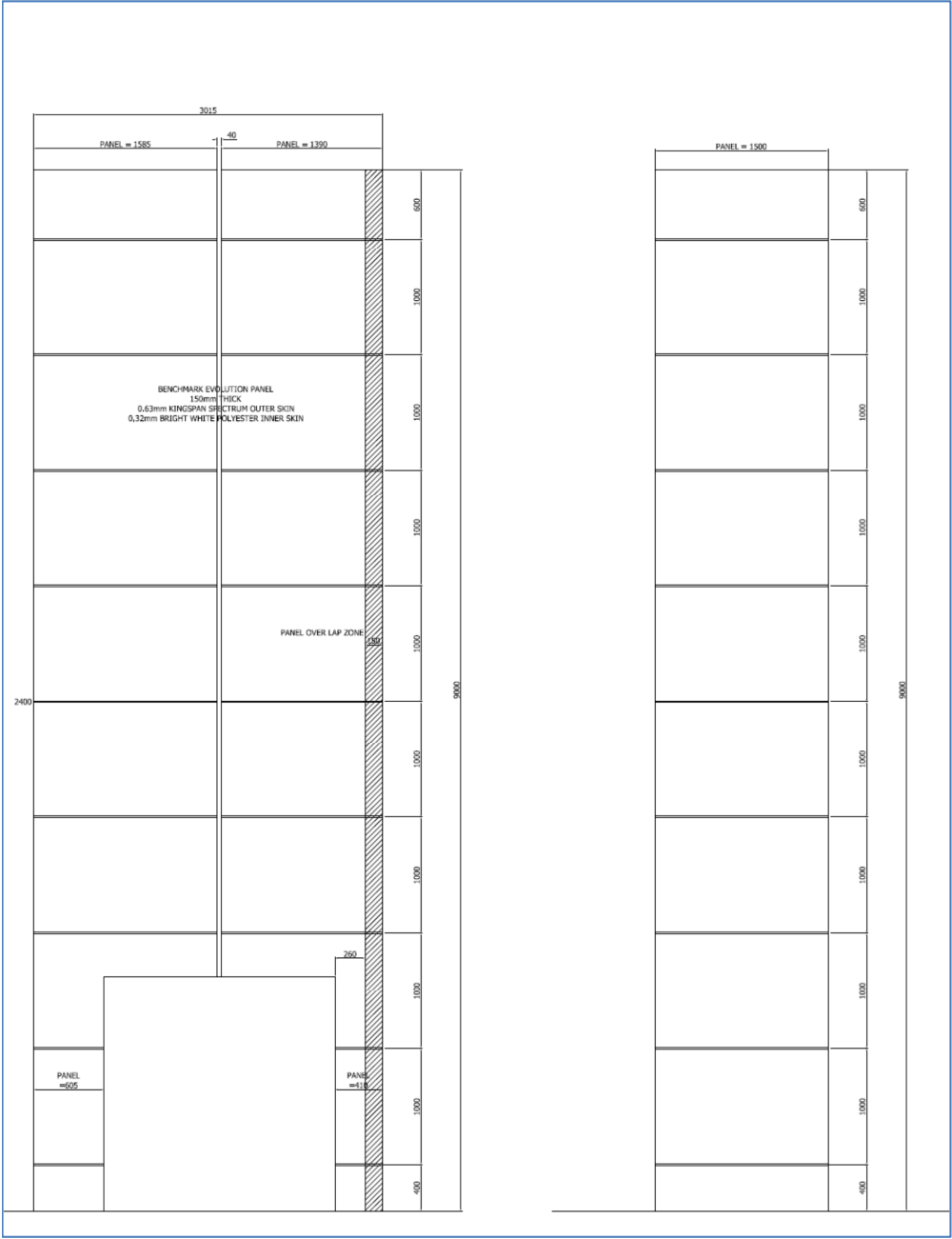
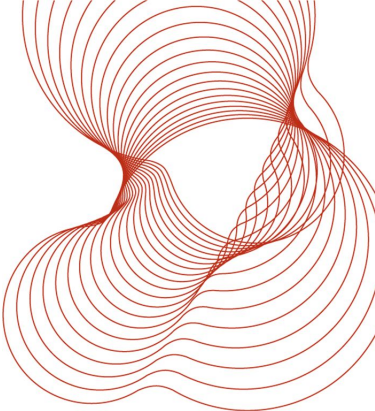


Figure 4. Construction drawing of the system showing the panel layout.

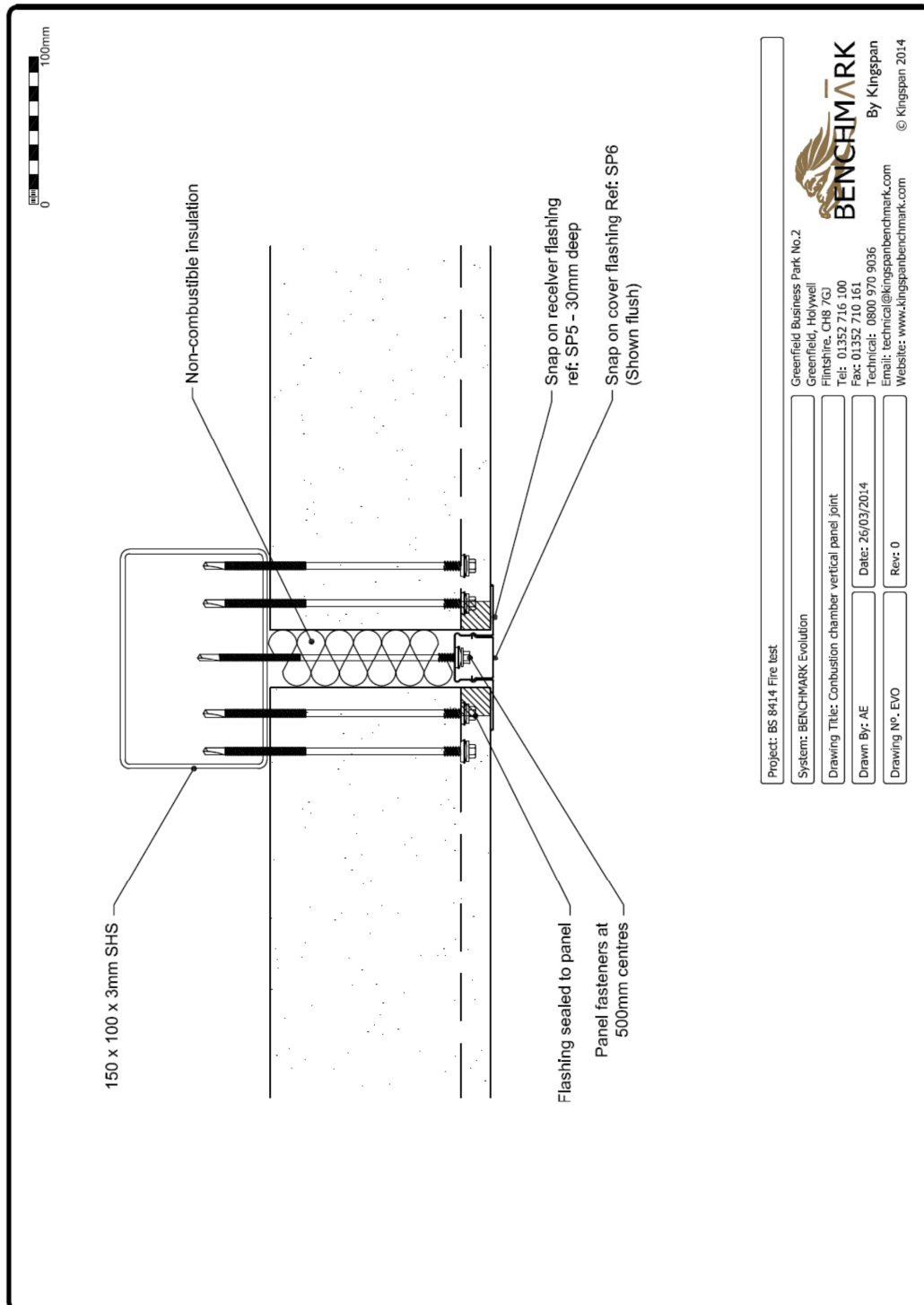
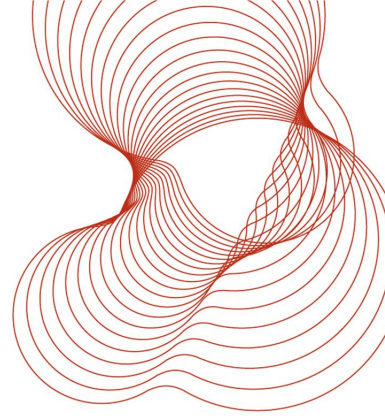


Figure 5. Construction drawing of the system showing the connection to the steel frame and centre joint details.

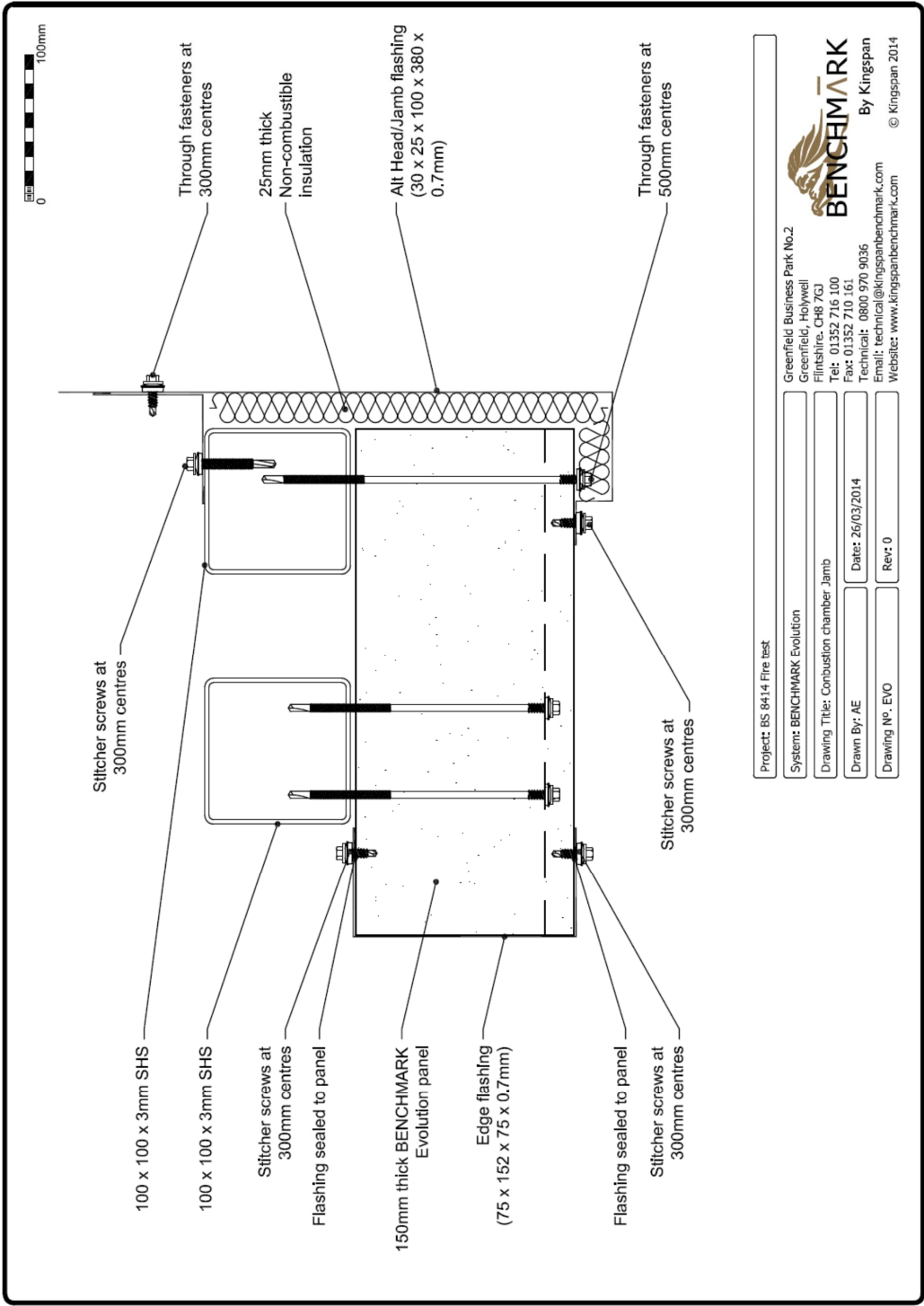
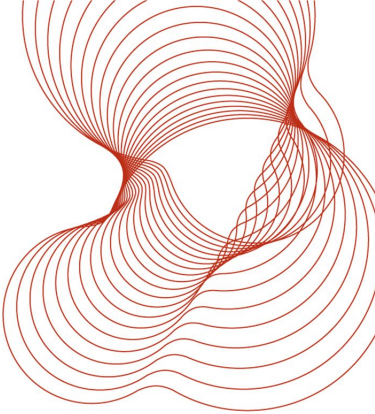


Figure 6. Construction drawing of the system showing combustion chamber detail.

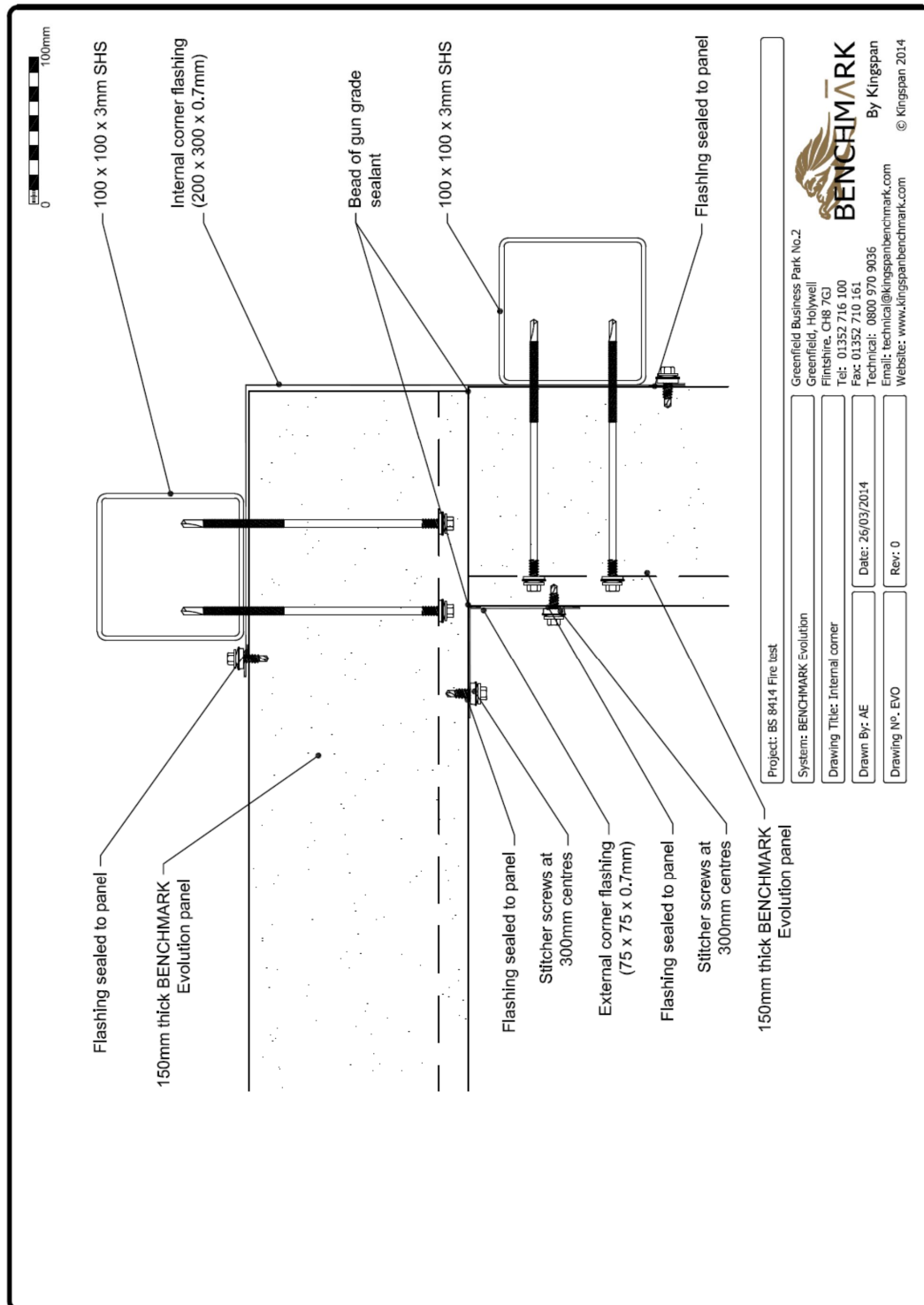
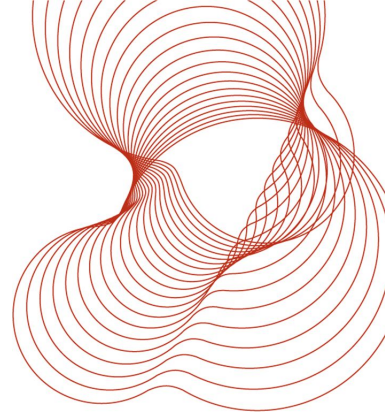


Figure 7. Construction drawing of the system showing the panel layout and corner joint.

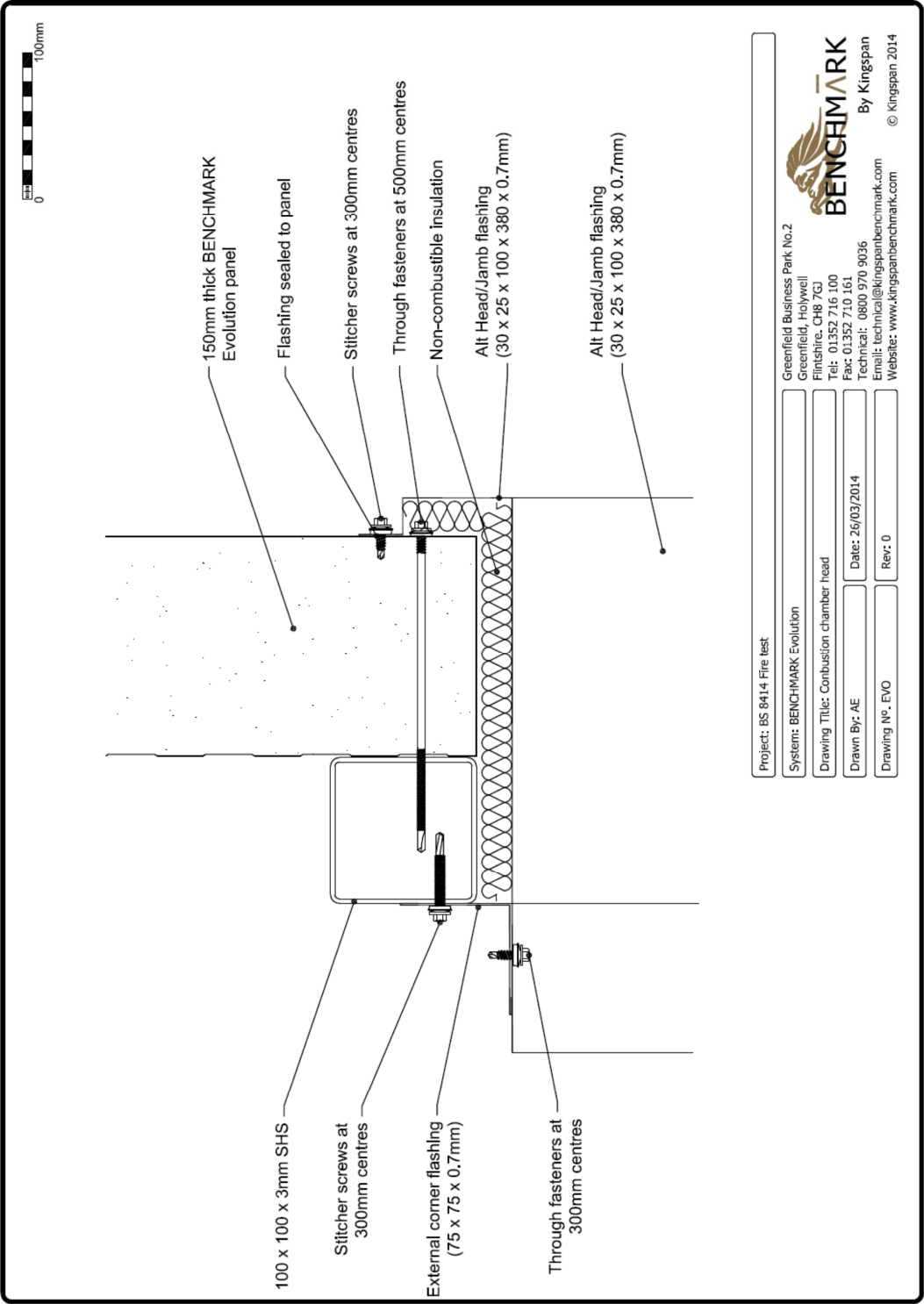
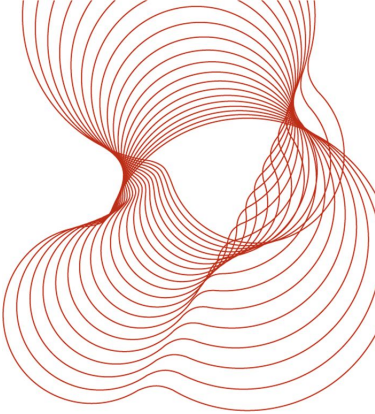


Figure 8. Construction drawing of the system the combustion chamber head.

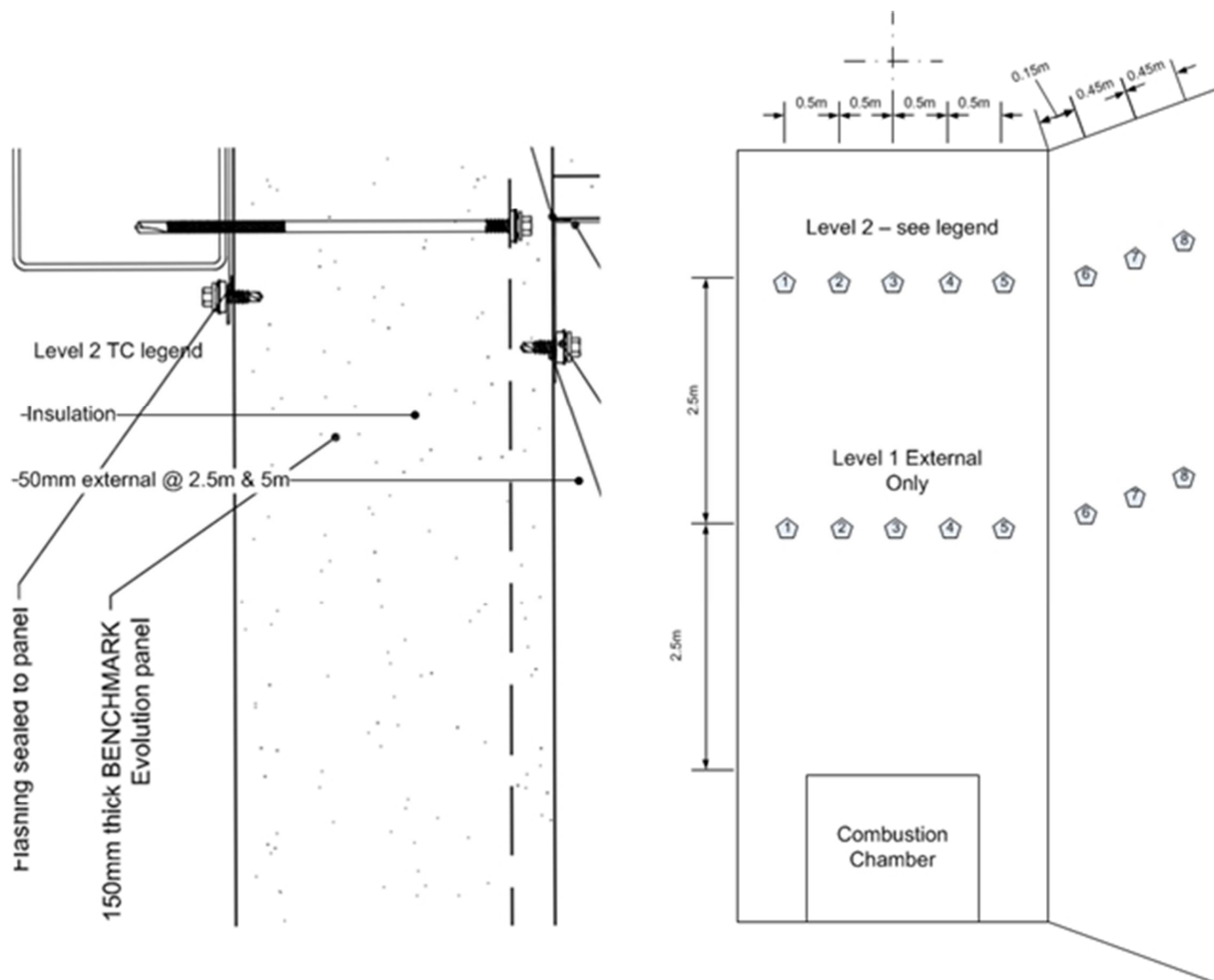


Figure 9. Location and identification numbers of thermocouples used (schematic only)

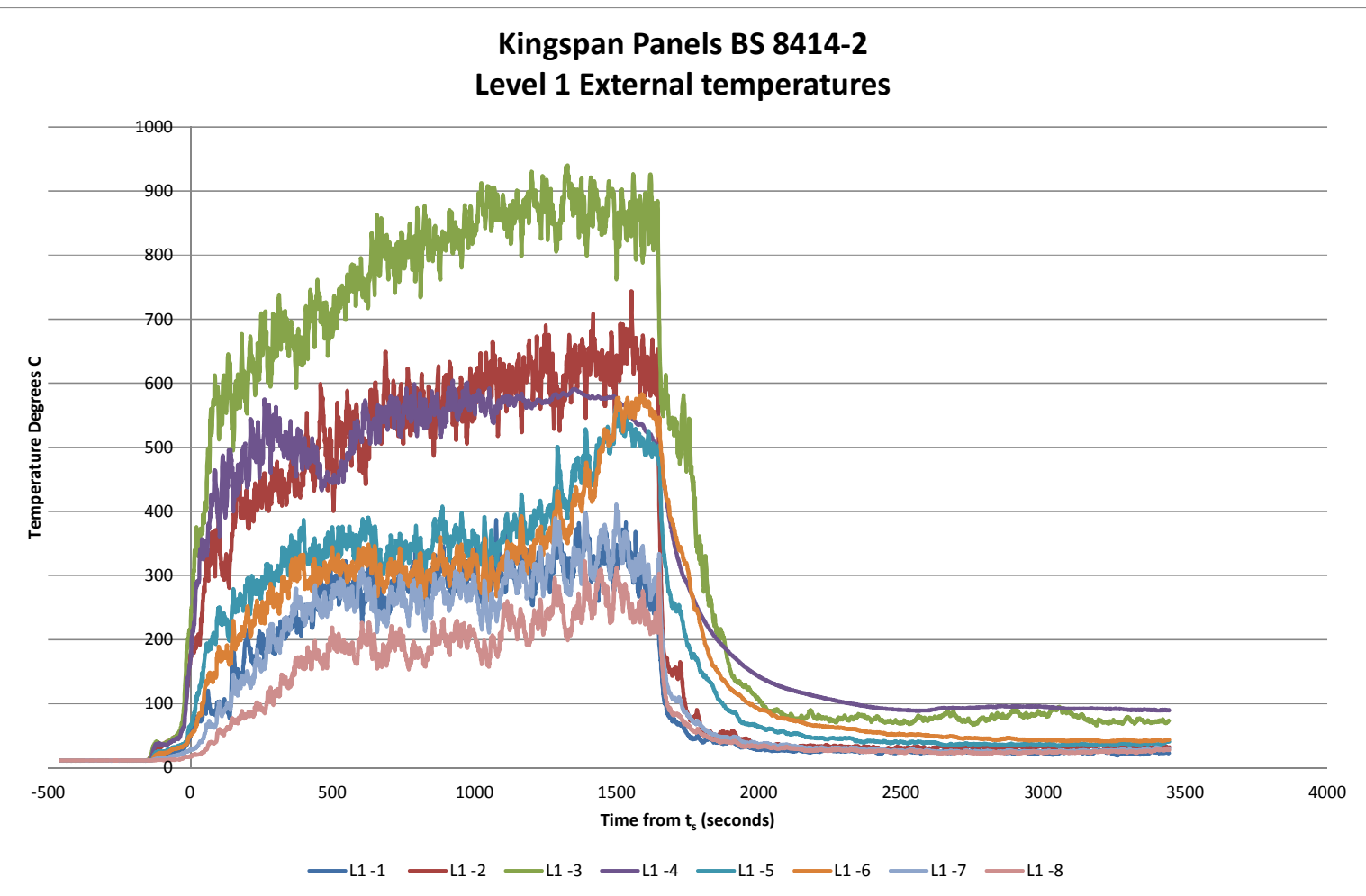


Figure 10. Temperatures Level 1 External

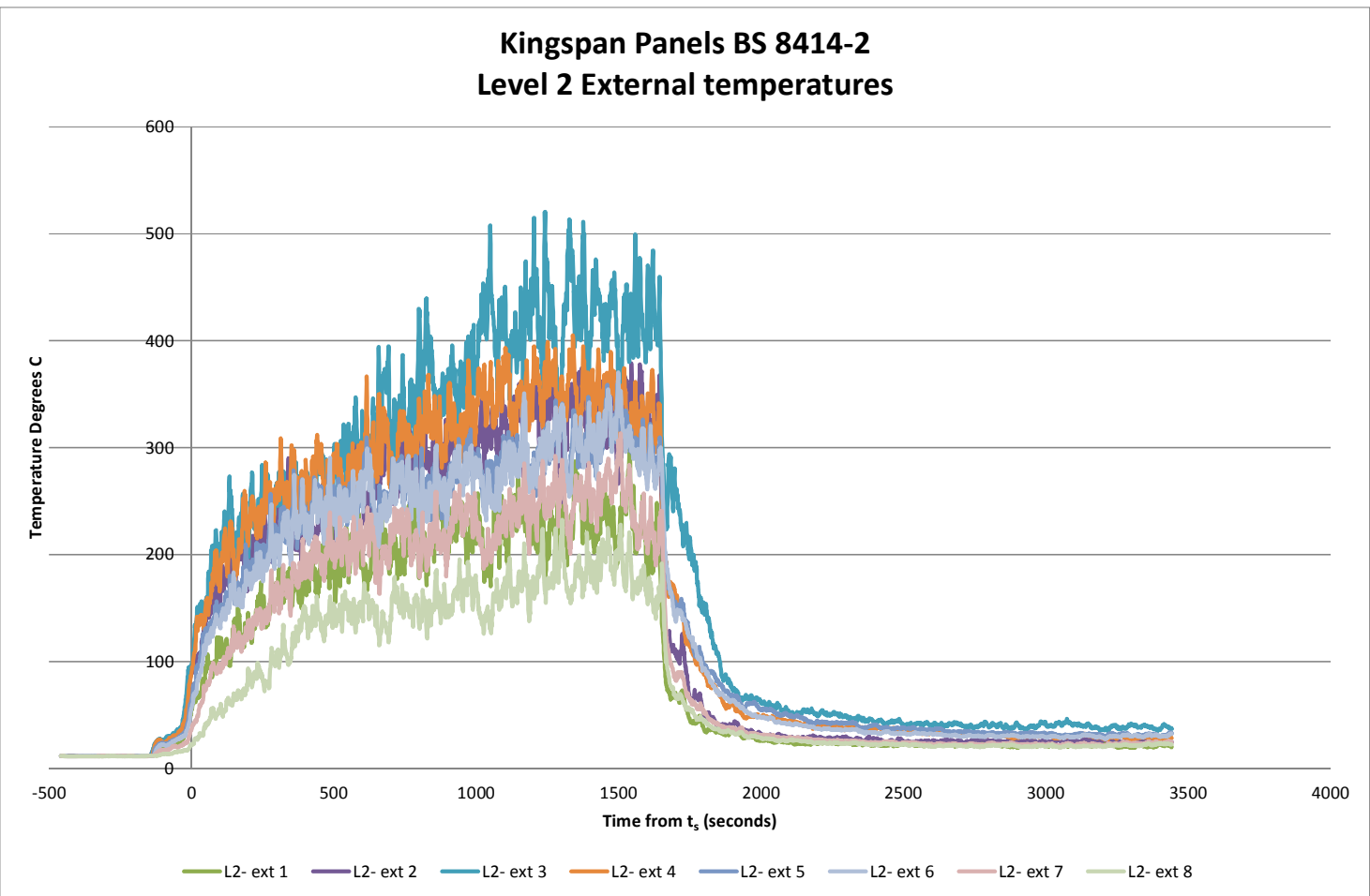
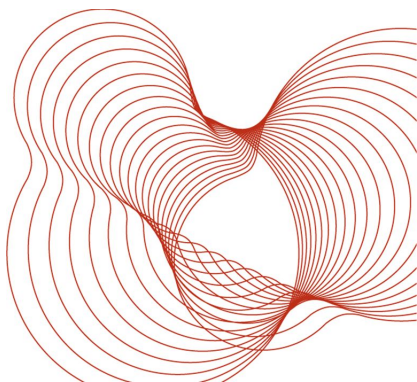


Figure 11. Temperatures Level 2 External



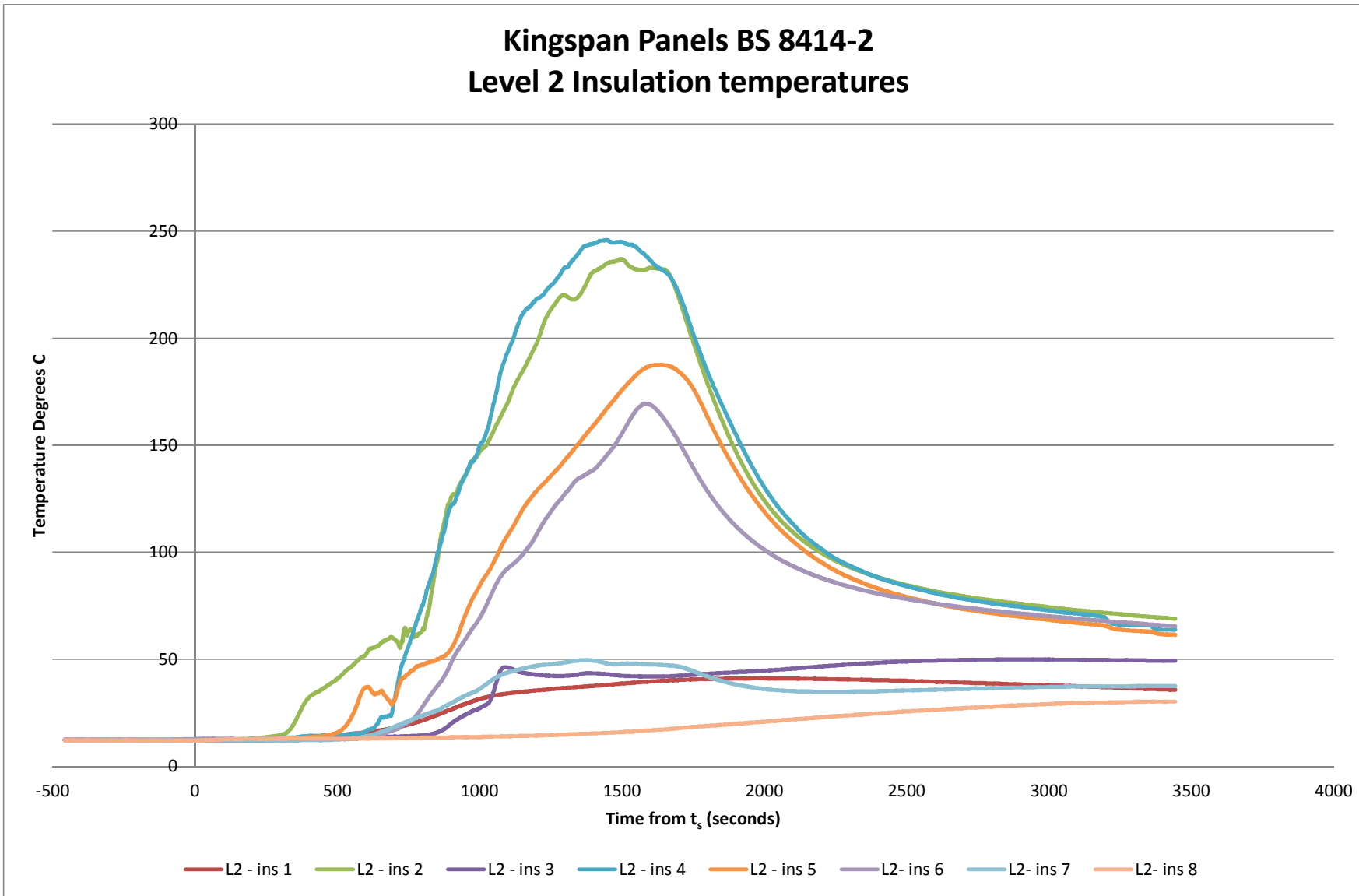


Figure 12. Temperatures Level 2 Insulation

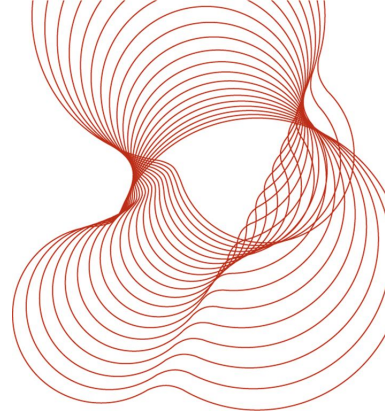


Figure 13. Cladding system during the test.

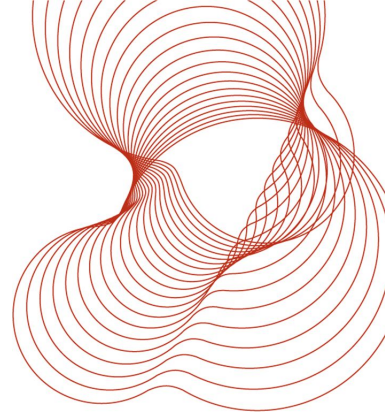


Figure 14. Photograph showing the condition of the cladding system post-test (Decorative Layer Full height).

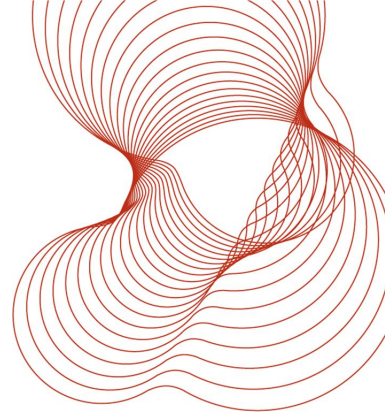


Figure 15. Photograph showing the condition of the cladding system post-test (Decorative Layer Lower level).

Figure 16. Schematic of the condition of the cladding system post-test (Surface coat layer).

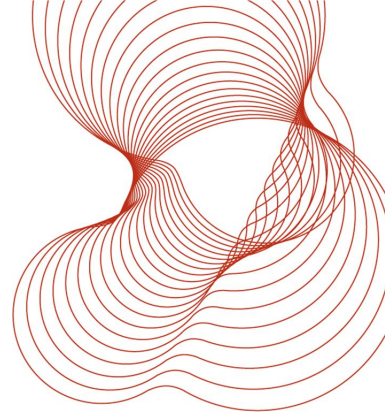


Figure 17. Photograph showing the condition of the insulation layer post-test (Insulation Layer removed from cladding wall).



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