bre

Test Report:

Fire resistance test in accordance with BS EN 1364-1:1999 on a non-loadbearing wall incorporating Scolmore Doubled Switched electrical sockets

Prepared for:
Scolmore International Limited,
1,Scolmore Park,
Landsberg
Lichfield Road Industrial Estate,
Tamworth,
Staffordshire,
B79 7XB

14th November 2007

Test report number 239762

UKAS TESTING

0578

Prepared on behalf of BRE Testing by

Name I.A Walker

Position Consultant

Signature 

Approved on behalf of BRE Testing by

Name R. A. Jones

Position Associate Director

Date 14/11/2007

Signature 

BRE Certification Ltd
Garston
WD25 9XX
T + 44 (0) 1923 664100
F + 44 (0) 1923 664994
E enquiries@brecertification.co.uk
www.bre.co.uk

BRE Testing is not UKAS accredited to make opinions and interpretation. Any opinions and interpretations included as part of this report are clearly marked as such.

UKAS TESTING
0578

Contents

SUMMARY

A non-loadbearing steel stud wall, nominally 3000mm high x 3000mm wide and incorporating thirteen double switched electrical sockets, was submitted to a fire resistance test in accordance with BS EN 1364-1: 1999[1] on Thursday 25th October 2007, at BRE Laboratories, Garston for the duration of 99 minutes.

The wall was installed in a concrete lined test frame of nominal dimensions 3040mm x 3040mm and consisted of a light gauge steel track located at the head and base of the specimen into which were fitted six steel studs. The steel framework was covered with two layers of 12.5mm-thick Lafarge Firecheck tapered edge plasterboard on each face of the specimen, with all joints between boards staggered by 600mm. To the exposed face were fitted seven, double switched electrical sockets consisting of galvanised steel wall mounting boxes. Six of the wall boxes were fitted with white plastic facia panels, one wall box was fitted with a stainless steel facia panel.

To the unexposed face were fitted a further six double switched electrical sockets consisting of galvanised steel wall mounting boxes with white plastic facia panels.

In the orientation tested, the wall system was found to achieve the following fire resistance:

Insulation:		98 minutes: (time in completed minutes for which the specimen continued to restrict the temperature at the unexposed face from exceeding specified 180°C temperature rise limit, above start time ambient temperature).
Integrity:	Gap gauge:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)
	Cotton Pad:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)
	Sustained Flaming:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)

1 OBJECTIVE

To determine, at the request of Scolmore International Limited, the fire resistance of a, 3000mm-high x 3000mm-wide steel studded wall incorporating a total of thirteen double switched electrical sockets installed into exposed and unexposed faces of the specimen, when tested in accordance with BS EN 1364-1: 1999[1].

2 TEST CONSTRUCTION

2.1 General

The wall was built into the aperture of a concrete lined test frame, nominally 3040mm wide, x 3040mm high. The right hand vertical edge of the specimen as viewed from the unexposed face was left unrestrained (free edge) and the gap between the unrestrained edge and the concrete lining of the test frame was packed tightly with white calcium magnesium silicate blanket.

The construction is shown in Figures 2 to 6 and also before the test in Photos 1 and 2.

2.1.1 Materials and Fixings

Galvanised Steel Stud: supplied as 50mm wide x 35mm deep x 0.5mm thick x 3600mm long. A representative sample was marked “Speedline SPS50 x 3.6m stud, BS7364:1900 N 01-08-07”

Galvanised Steel Channel: supplied as 50mm wide x 50mm deep x 0.5mm thick x 3600mm long located at the head and base of test specimen, fixed into the concrete lining of the test frame using Thunderbolt M6 x 50mm-long countersunk Torx head screws at 600mm centres.

Galvanised Steel Fixing Strip: supplied as 100mm-wide x 0.65mm-thick x 3600mm-long flat strips of galvanised steel, fixed horizontally across the full width of the specimen to the flat face of each Speedline SPS50 steel stud at heights of 650mm and 2390mm centres above base of specimen, using self-tapping 3.5mm-diameter x 32mm-long screws.

Lafarge Firecheck plasterboard: 12.5mm thick tapered edge plasterboard, supplied in sheets of dimensions 1200mm wide x 2400mm long. Two layers of board were fixed to each face of the test specimen, joints between boards were staggered by 600mm. A representative sample marked “ Lafarge Plasterboard Firecheck 12.5mm TE 044715:32” and of dimensions 213mm x 213mm x 12.5mm was weighed and the density calculated to be 10.36 kg/m^2 (829 kg/m^3)

Scrim Tape: self-adhesive plasterers scrim tape, 48mm wide, formed from glass fibre mesh of grid size 3mm x 3mm. Used to cover all joints between top layers of Firecheck plasterboard

Gyproc Ready Mix Joint Cement: supplied in a 12L tub, used to cover top layer plasterboard joints

Click Mode Double Switched Electrical Sockets: double switched / pole electrical sockets consisting of 132.7mm-wide x 71.5mm-long x 47mm-deep galvanised steel wall box with white plastic facia panel of dimensions 145mm wide x 85mm long x 10mm thick, marked as “Scolmore UK, H07-02-2-B” and stainless steel facia panel of dimensions 146mm-wide x 85mm-long x 2mm-thick, marked as “Scolmore UK, FP036 G04-02-2”. The inside base of the wall box was lined with 2.25mm-thick Tecnofire 64854A high density intumescent mat. (Figure 4)

Thunderbolt M6 Countersunk Torx head screw: 7.6mm diameter x 50mm long.

Drywall screws: Phillips No.2 Recess: 3.5mm diameter x 42mm long, point SS, black, twin thread

Self-tapping drywall screws: 3.5mm diameter x 32mm long

2.1.2 Construction

The steel frame partition consisting of light gauge galvanised steel channel (head and base of specimen) and six Speedline SPS50 galvanised steel studs, was secured to the concrete lining of the test frame using 7.6mm-diameter x 50mm-long, M6 countersunk screws at 600mm centres.

Five of the steel studs were inserted into the head and base channel sections with the 50mm-wide flat face of each stud facing towards the left hand edge of the concrete lined test frame, as viewed from the unexposed face. The sixth steel stud making up the unrestrained edge of the specimen was reversed with the solid flat face towards the right hand edge of the concrete lining.

It was noted that the steel studs were cut 10 -15mm short of both the head and base channel sections to allow for expansion in fire and once inserted into the channel web, the channel was squeezed together to hold the vertical studs in place. No mechanical fixings were used to secure the studs to the channel.

Two lengths of galvanised flat steel fixing strip were secured horizontally across the full specimen width to each vertical steel stud using self-tapping drywall screws. One strip was located 650mm above the base and fixed to the unexposed face of the studs, the other strip was located 2390mm above the base and similarly fixed to the exposed face of the studs. These strips were included to help secure the plasterboard layers.

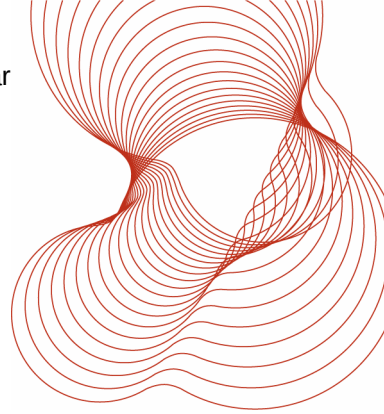
To both specimen faces were attached two layers of 12.5mm Lafarge Firecheck plasterboard with joints between boards staggered by 600mm, separating first and second layers.

The first layer of boards were secured to the framework using 32mm-long self-tapping drywall screws.

The second layer of boards were secured using 42mm-long Phillips drywall screws. All fixings were located 15mm in from the board edges and spaced at 300mm nominal centres.

The board arrangements for both exposed and unexposed faces are shown in Figures 1, 4, 5 and 6.

All joints in the second layer of plasterboard were then covered with plasterer’s scrim tape and covered with Gyproc ready mix joint cement.



Apertures of dimensions 134mm wide x 73mm high x 47mm deep were cut into the exposed and unexposed faces of the partition in order to accommodate the installation of Flameguard 47mm deep galvanised steel wall boxes for the mounting of double pole electrical sockets.

The location of these sockets is shown in Figure 1, 5, 6 and 7.

3 CONDITIONING

A representative sample of Lafarge Firecheck plasterboard of dimensions 213mm x 213mm x 12.5mm was weighed (initial weight W_1) and then heated in an oven at 50°C for 24 hours and re-weighed (W_2), in accordance with EN 1363-1: 1999.

The moisture content (W_1 - W_2) of the sample expressed as a percentage of the dried weight (W_2) was calculated to be 0.45%.

4 TEST PROCEDURE

4.1 General

The test, conducted in accordance with BS EN 1364-1:1999[1] for non-loadbearing elements, Part 1: walls, was carried out on Thursday 25th October 2007. The test was witnessed by Mr Karl Rawlins and Mr Phillip Gooch representing Scolmore International Ltd.

The ambient temperature at the start of the test was 15°C.

4.1.1 Furnace control

The furnace temperature was measured by means of eight plate thermometers arranged in the furnace in four staggered rows of two with their measuring junctions 100mm from the exposed face of the specimen. The furnace was controlled so that the average temperature followed the time/temperature relationship specified in BS EN 1363-1: 1999[2].

The furnace pressure was monitored at a point 2.4m above the base of the furnace. The pressure was maintained as closely as possible to 15.0 Pa so that the pressure at the top of the specimen did not exceed 20Pa, as required by BS EN 1363-1:1999[2], resulting in a neutral pressure axis approximately 500mm above the notional floor level (the bottom of the specimen)

4.1.2 Specimen temperature measurements

Unexposed face temperature.

The temperature of the unexposed face of the test construction was measured to determine the point of maximum temperature insulation failure (180°C rise) and mean temperature insulation failure (140°C rise).

Twenty-nine chromel/alumel thermocouples each soldered to a copper disk and covered with an insulating pad were attached to the unexposed face. The mean unexposed face temperature measurement was recorded as the average of thermocouples 12, 13, 15, 23 and 24.

The location of all unexposed face thermocouples are detailed in Table 1 below, and are shown in Figure 6.

Thermocouple number	Location of thermocouple
1	At the head of the wall, in line with a stud
2	At the head of the wall, at mid-width.
3	At the head of the wall, in line with a stud
4	600mm from head of the wall, adjacent to corner of joint between boards
5	700mm from the head of the wall, at mid-width, adjacent to horizontal joint in boards
6	20mm above electrical socket S2
7	20mm above electrical sockets S3/S4 (S4 fitted to exposed face)
8	Over centre of electrical socket S1 (S1 fitted to exposed face)
9	At centre of plastic facia of electrical socket S2
10	At centre of plastic facia of electrical socket S3
11	Over centre of electrical socket S5 (S5 fitted to exposed face)
12	At the centre of the upper left hand quarter section of the wall
13	At the centre of the upper right hand quarter section of the wall
14	At mid height, adjacent to fixed edge of specimen
15	Centre of specimen
16	At mid height of specimen, adjacent to a stud and joint in plasterboard, in line with TC4
17	At mid height of specimen, 100mm from the unrestrained edge
18	20mm above electrical socket S6
19	20mm above electrical sockets S7/S8 (S8 fitted to exposed face)
20	At centre of plastic facia of electrical socket S6
21	At centre of plastic facia of electrical socket S7
22	Over centre of electrical socket S9 (S9 fitted to exposed face)
23	At the centre of the bottom left hand quarter section of the wall
24	At the centre of the bottom right hand quarter section of the wall

Thermocouple number	Location of thermocouple
25	20mm above electrical socket S10
26	20mm above electrical sockets S11/S12 (S12 fitted to exposed face)
27	At centre of plastic facia of electrical socket S10
28	At centre of plastic facia of electrical socket S11
29	Over centre of electrical socket S13 (S13 fitted to exposed face)

Table 1: Thermocouple locations on unexposed face

Internal temperature

Additional internal temperature measurements inside each bay of the specimen were recorded for information purposes only.

Five bare wire thermocouples were inserted to mid depth of the air cavity inside each bay, a depth of 50mm below the unexposed plasterboard surface and approximately 50mm from the top corner of the top row of electrical sockets S1 – S5.

The locations of all internal thermocouples are detailed in Table 2 below, and are shown in Figure 6.

Internal Thermocouple number	Location of thermocouple
ITC1	50mm from and level with, top right hand corner of socket S1 (S1 fitted to exposed face)
ITC2	50mm from and level with, top right hand corner of socket S2
ITC3	At the centre of bay 3
ITC4	50mm from and level with, top right hand corner of sockets S3 / S4 (S4 fitted to exposed face)
ITC5	50mm from and level with, top left hand corner of socket S5 (S5 fitted to exposed face)

Table 2: Internal thermocouple positions

4.1.3 Specimen deflection measurements

Two linear deflection transducers were connected to the unexposed face of the wall, via a fine taut steel wire, to continuously monitor horizontal deflection of the specimen during the test. In accordance with EN 1364-1:1999, measurements were recorded at the centre of the specimen and at mid-height, 50mm in from the free edge. Positive and negative values denote the deflection of the wall toward and away from the furnace respectively.

5 RESULTS

5.1 Observations

Observations made during the test are given in Table 3. Unless specified, observations are of the exposed side of the partition. The arrangement of the boards was as shown below:

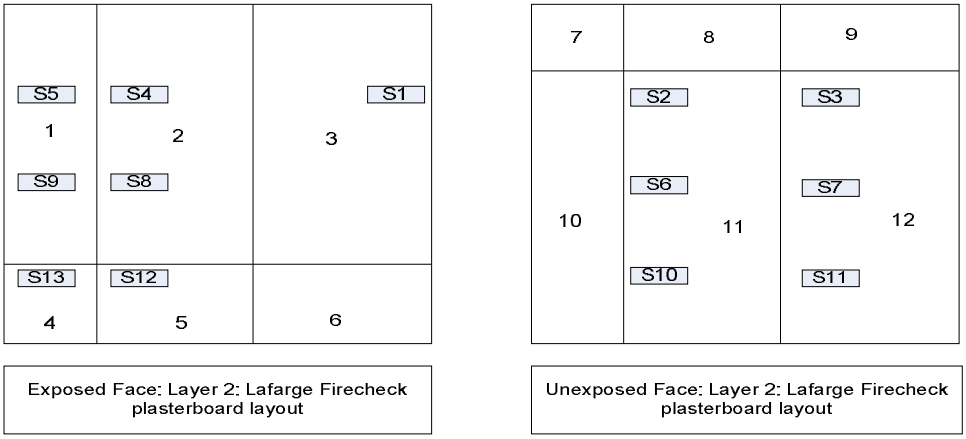


Figure 1: Arrangement of Top layer Firecheck plasterboard

Time		Observation
Mins	**Secs**	
0	00	Test started
3	00	Pink paper facing on exposed face plasterboard has burnt away – red glowing embers present in furnace
4	40	Unexposed Face: White smoke issuing from sockets S2/S3 & S6/S7
7	30	Facia of socket S8 cracked / split down centre of panel. Socket S9 cracked from top R.H corner diagonally down to On/Off switch.

10	30	Joint filler beginning to fall away, horizontal joint board 4, exposed face.
12	30	Large cracks appearing Socket S12, from top centre edge diagonally down to side edges (centre)
16	40	Vertical joint filler between panels 5 & 6 (exposed face) has fallen away. Horizontal joint filler also peeling away.
19	30	Plastic facia of socket S8 has melted away (exposed face) – intumescent sealant has expanded and is filling the metal wall box.
25	45	Gap developing between horizontal joint between top layer boards – full specimen width. Estimated gap size to be 7mm (exposed face)
28	00	Fascias of sockets S4 & S5 (exposed face) have melted away – expanded intumescent clearly visible
35	00	Large cracks appearing sockets S12/S13 from the top corners. S13 also cracked from top centre to bottom R.H quarter.
36	40	Bowing of top layer boards between fixings – full specimen width (boards 1, 2 & 3), along horizontal edge with boards 4, 5 & 6. All vertical joints still good.
40	00	Unexposed face, smoke now issuing from all sockets.
43	00	Exposed face, bottom L.H. corner of panel 3: cracking of board around fixings, gap beginning to widen with board 6.
47	00	Sockets S12/S13, facia panels have melted away – expanded intumescent sealant clearly visible (exposed face).
49	00	Unexposed face plasterboard surrounding sockets S3 & S7 is beginning to discolour. Surface appears brown / black and is oily / greasy to touch. Facia panels beginning to distort.
54	00	Plasterboard surrounding socket S12 is beginning to discolour along left hand V. edge of socket.
55	00	Exposed face: Vertical cracks, approx 60mm long appearing bottom R.H. corner of board 1, adjacent to boards 2 & 4.
58	00	Vertical joint between boards 2 & 3 beginning to widen, estimated gap width 5mm.
65	00	Facia panel of socket S3 (unexposed face) has distorted. R.H edge of metal wall box has been exposed. Roving TC adjacent to edge of box = 180°C
70	00	Gap developing between R.H.S facia panel S2 and plasterboard surface (unexposed face).
72	00	Section of plasterboard, approx 300mm x 300mm – has fallen away, top R.H. corner of board 5. Board 6 has split along vertical edge with board 5 and is pulling

		away from specimen face exposing layer 1 boards behind.
75	00	Vertical cracks appearing in surface of board 1.
76	00	Socket S2 (unexposed face): facia panel has distorted, exposing edges of metal wall box behind.
82	00	Facia panels of sockets S3 & S7 (unexposed face) are pulling away from specimen surface / metal wall boxes.
85	00	Facia panel of socket S3 has fallen away from specimen
88	00	Unexposed face: vertical crack, approx 500mm long, now visible in joint filler between panels 11 & 12. Raised scrim tape visible at centre of horizontal joint – full specimen width.
96	00	Boards detaching along vertical edges of boards 1,2,3 (exposed face)
98	30	Failure of Insulation: 180°C Max Temperature Rise has been exceeded by TC24
99	00	Test Terminated at Sponsor's request

Table 3: Observations

5.1.1 Furnace control

The mean furnace temperature recorded during the course of the test is shown plotted against time in Graph 1 together with the specified curve for comparison.

The furnace pressure recorded 600mm from the head of the wall during the test is shown plotted against time in Graph 2.

5.1.2 Temperatures recorded

Temperature on unexposed face

The maximum temperature recorded on the unexposed face is shown plotted against time in Graph 4 together with the mean temperature, calculated from thermocouples 12, 13, 15, 23 & 24.

The temperature recorded by each thermocouple attached to the unexposed face is shown plotted against time in Graphs 5 - 10

The maximum temperature rise for insulation (180°C) was exceeded after 98.5 minutes by thermocouple TC24.

The mean temperature rise for insulation (140°C) as measured by thermocouples 12, 13, 15, 23 & 24 was not exceeded throughout the duration of the test.

Internal Temperature recorded in each partition bay

The internal bay temperatures recorded by thermocouples ITC 1 to ITC 5 and which were for additional information purposes only, are shown plotted against time in Graph 11.

5.1.3 Deflection measurements

Horizontal Deflection

The horizontal deflection of the wall recorded by the transducers positioned at centre and the right-hand edge of the wall at mid height is shown plotted against time in Graph 3.

The maximum horizontal deflection of the wall towards the furnace was 90.8mm recorded by the centre transducer (Def C) after 96 minutes from the start of the test.

6 PERFORMANCE CRITERIA

The standards (ref 1and 2) state that a partition wall is regarded as having a fire resistance (expressed in minutes) that is equal to the elapsed time (in completed minutes) between the commencement of heating and either the termination of heating, or the time of failure with respect to the relevant criteria.

Integrity: Failure is deemed to occur:

a) When collapse or sustained flaming for not less than 10s on the unexposed face occurs;

b) When cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad, when applied for a maximum of 30s;

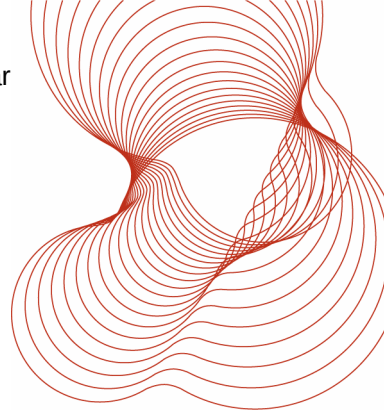
c) When a 6mm-diameter gap gauge can penetrate through a gap into the furnace and be moved in the gap for a distance of at least 150mm;

d) When a 25mm-diameter gap gauge can penetrate through a gap into the furnace

Insulation: Failure is deemed to occur:

a) When the mean unexposed face temperature increases by more than 140°C above its initial value;

b) When the temperature recorded at any position (including the roving thermocouple) on the unexposed face is in excess of 180°C above the initial mean unexposed face temperature;



c) When integrity failure occurs

7 CONCLUSION

A non-loadbearing, steel stud wall incorporating thirteen double switched electrical sockets, as described in this report, when tested in accordance with BS EN 1364-1:1999[1] achieved the following fire resistance:

In the orientation tested, the wall system was found to achieve the following fire resistance:

Insulation:		98 minutes: (time in completed minutes for which the specimen continued to restrict the temperature at the unexposed face from exceeding specified 180°C temperature rise limit, above start time ambient temperature).
Integrity:	Gap gauge:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)
	Cotton Pad:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)
	Sustained Flaming:	99 minutes, no failure (the test having been discontinued at the request of the sponsor)

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1363-1: 1999[1]. Any significant deviation with respect to size, construction details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

The specification and interpretation of fire test methods is the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test report's 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.

8 Field of direct application of test results

The standard[1] states that the results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and its stability.

a) Decrease in height.

b) Increase in the thickness of the wall.

c) Increase in the thickness of component materials.

d) Decrease in linear dimensions of boards or dimensions of panels except thickness.

e) Decrease in stud spacing.

f) Decrease in distance of fixing centres.

g) Decrease in the applied load.

h) Increase in the width provided that the test specimen was tested at full width or 3m wide, whichever is the larger

9 REFERENCES

1 Fire resistance tests. BS EN 1363-1:1999, Part 1: General requirements.

2 Fire resistance tests for non-loadbearing elements. BS EN 13634-1:1999, Part 1: Walls.

10 FIGURES

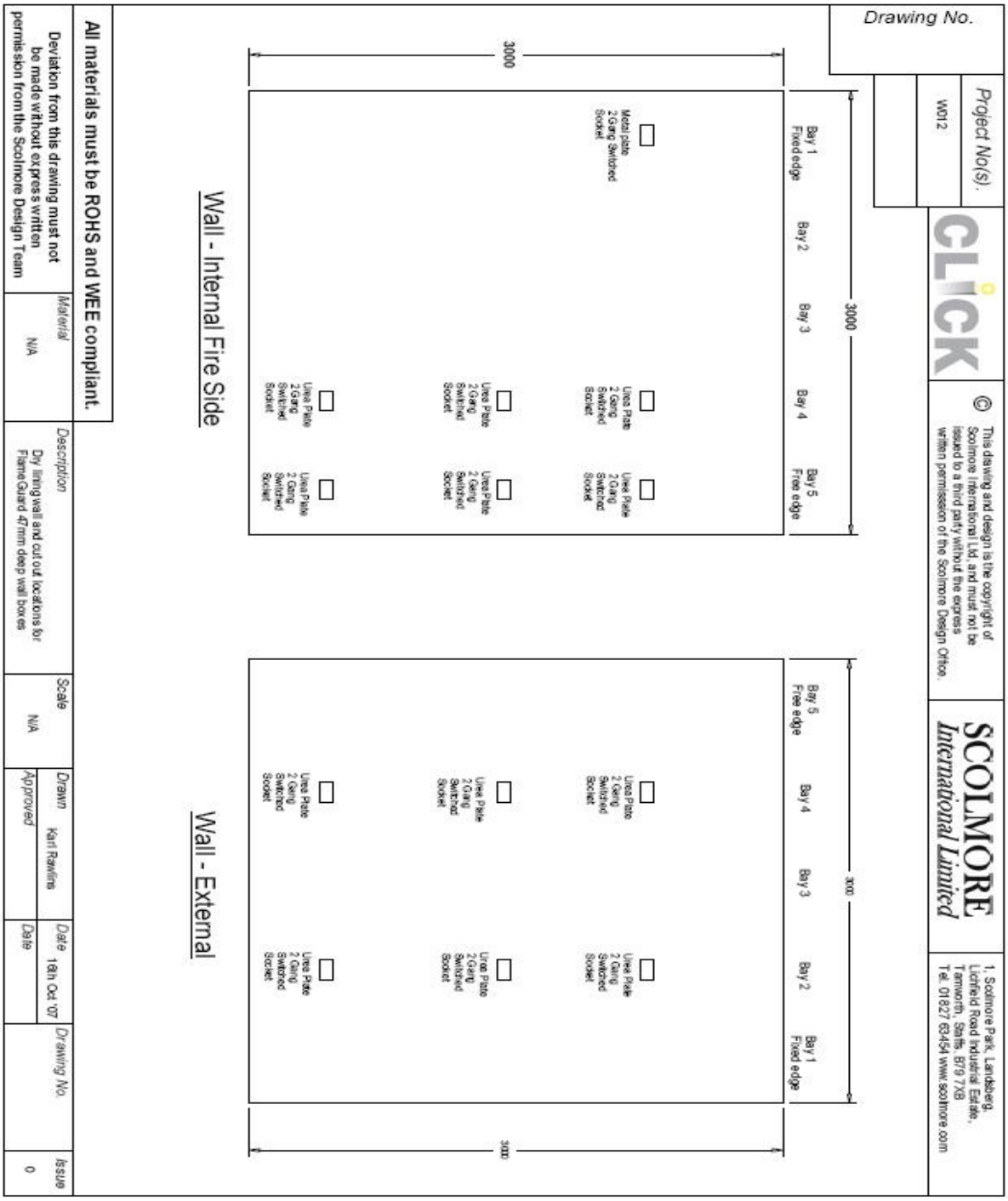


Figure 2: Wall with sockets positioned and fitted

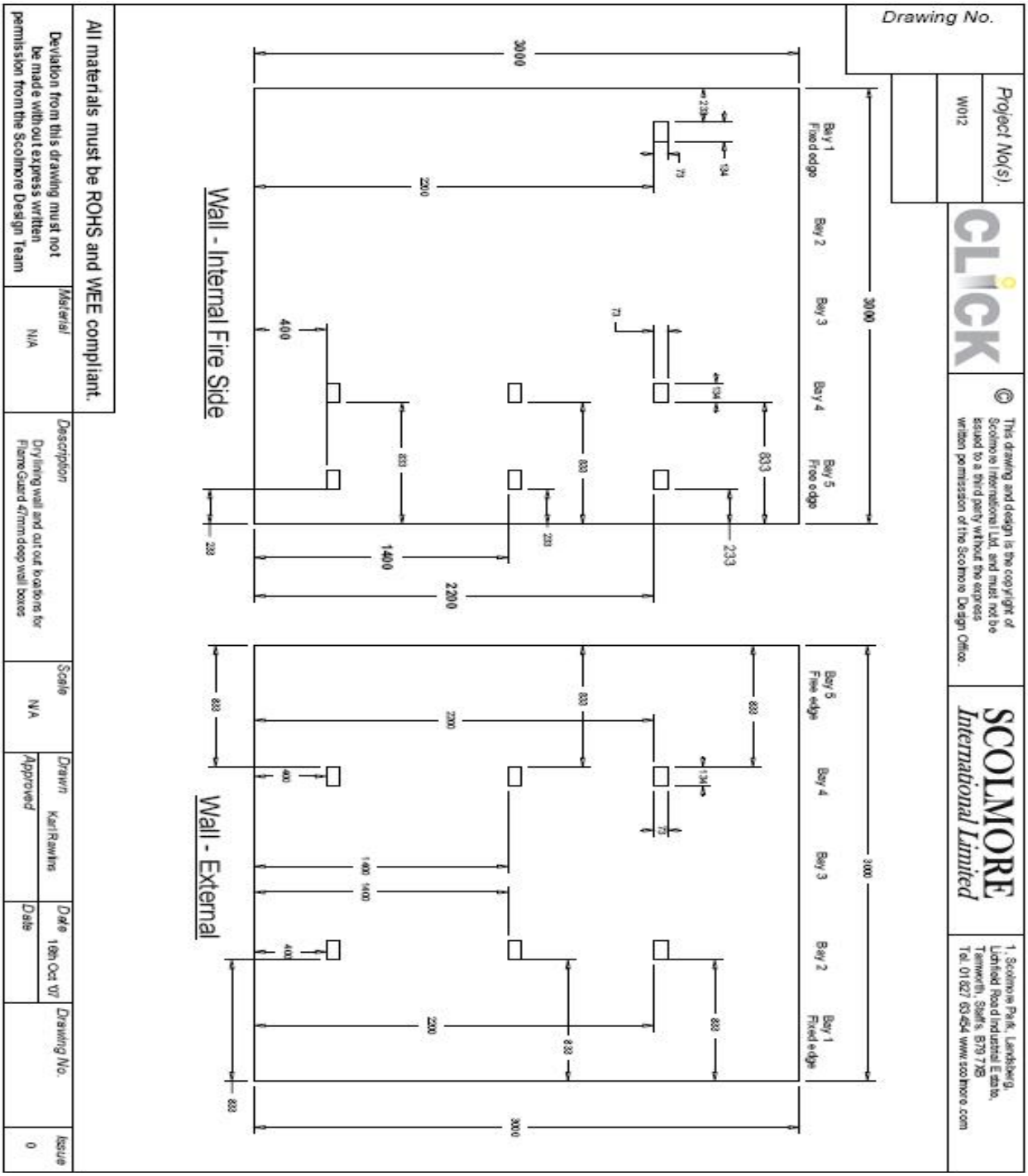
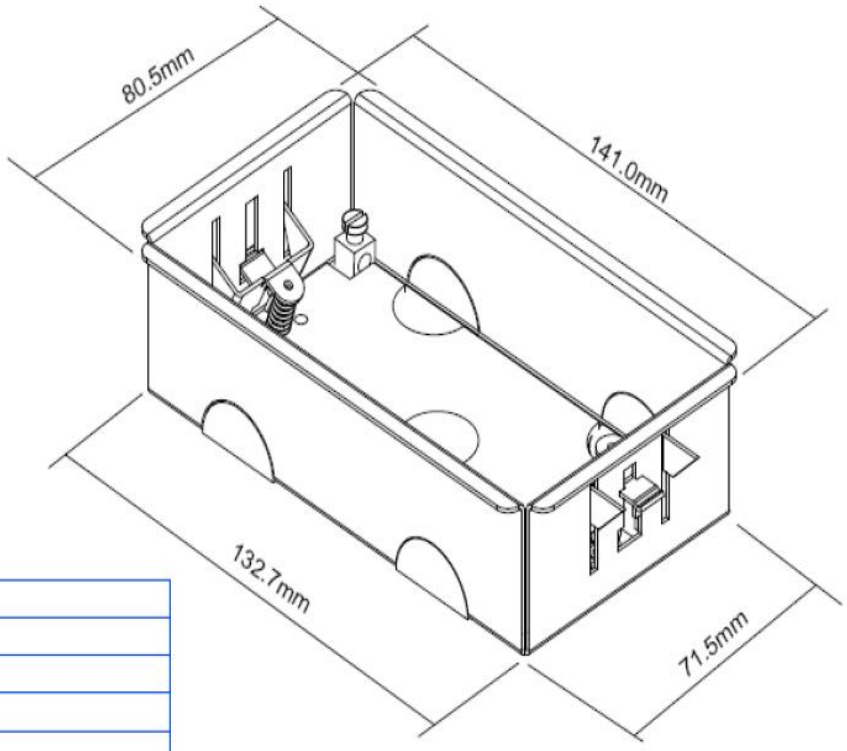


Figure 3: Wall Layout with cut-out positions

47mm Deep Box
Product Ref no. FR247

Cut out size 134mm x 73mm



Item	Qty	Part Name	Material
1	2	moving lug	Mild Steel
2	1	tapered spring compressed	Spring Steel
3	1	back box	Mild Steel
4	1	tapered spring	Spring Steel
5	1	intumescent lining	Technofire 60822A x 1mm thick or
0			Technofire 64845A x 2.25 mm thick
6	2	Earth terminal	Brass
7	2	lug retaining clip	Spring steel

Figure 4: Flameguard, 47mm deep wall box

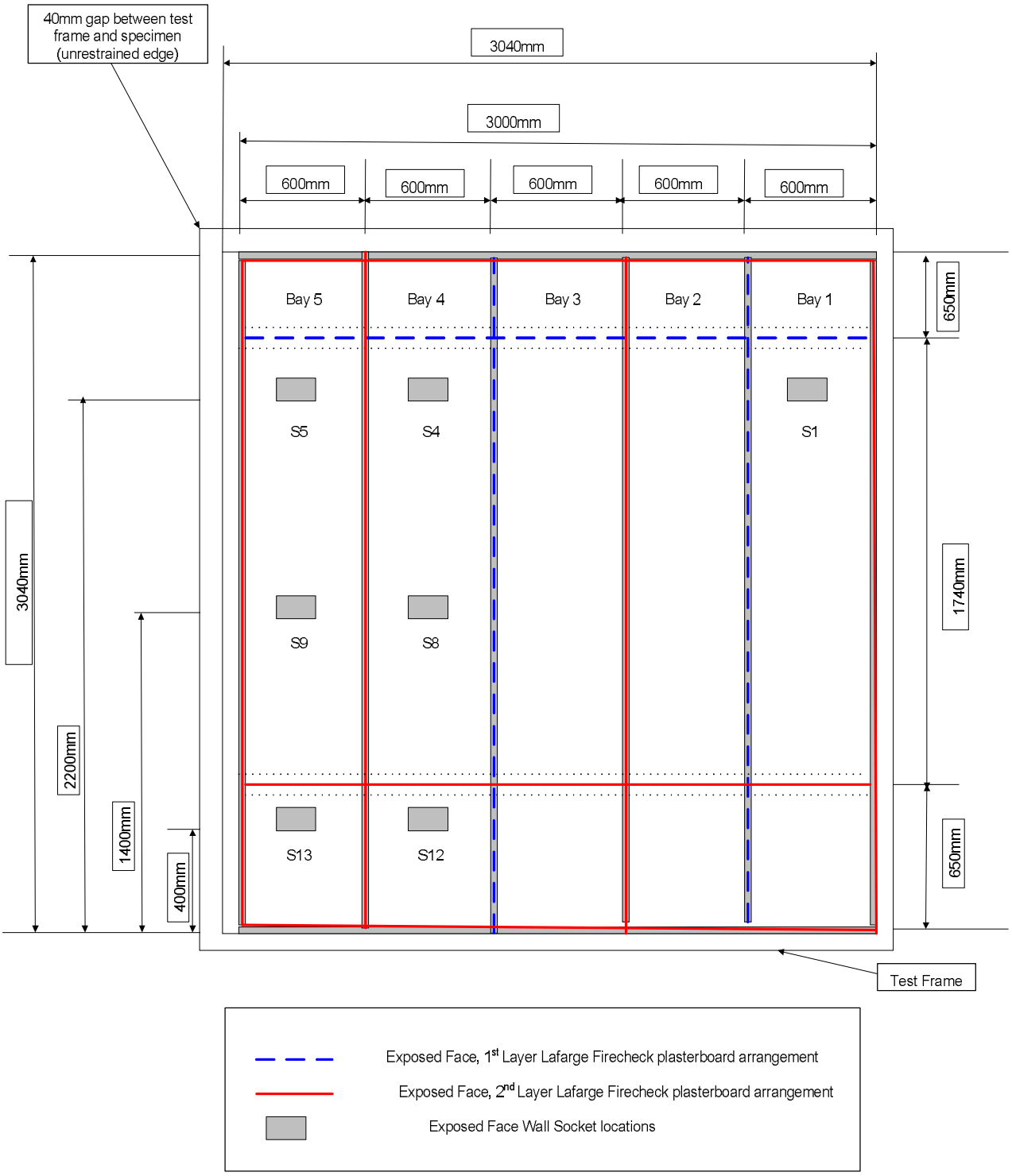


Figure 5: Showing the arrangement of Firecheck layers and wall box locations on the Exposed Face. (Drawing Not to Scale)

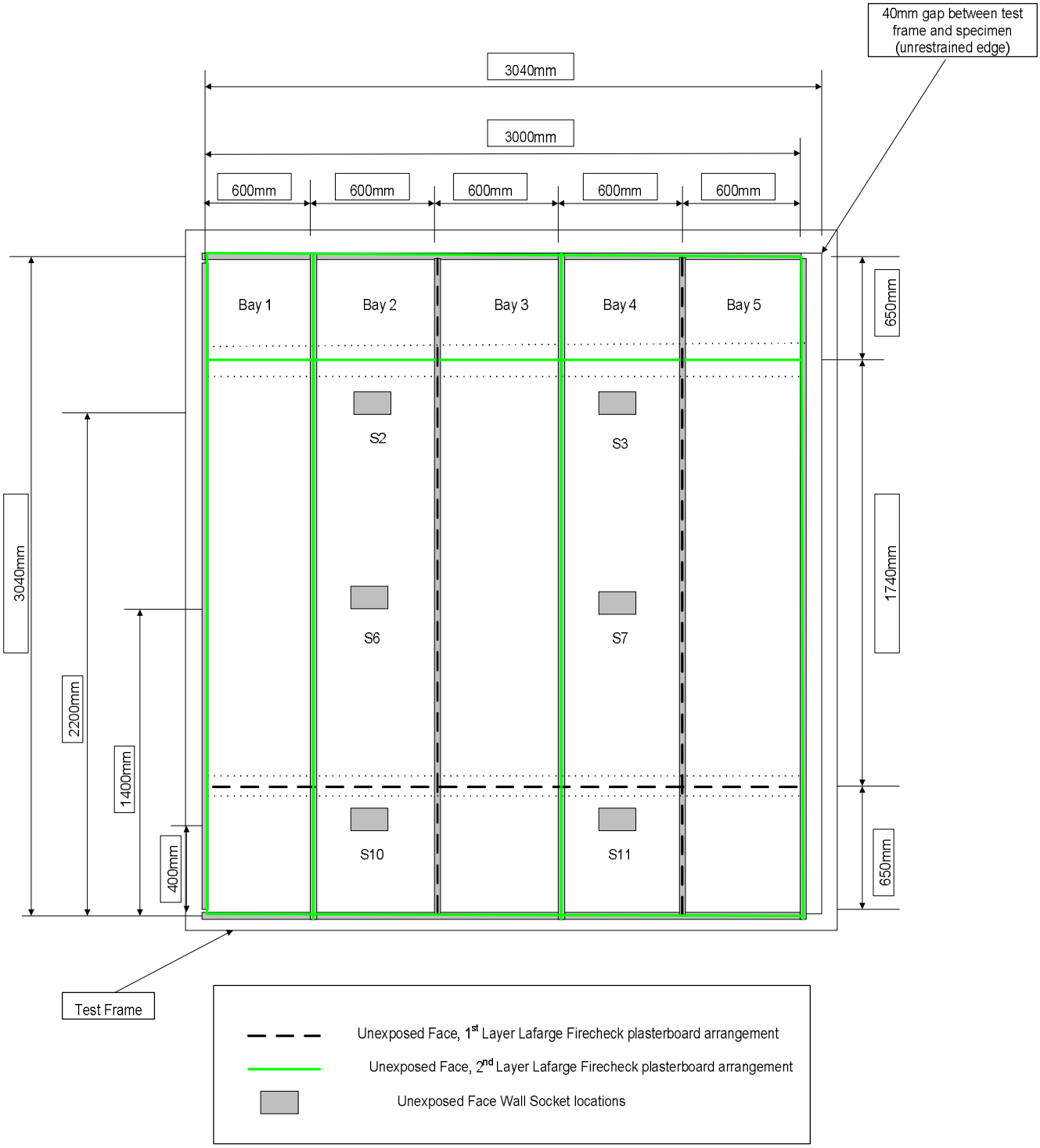
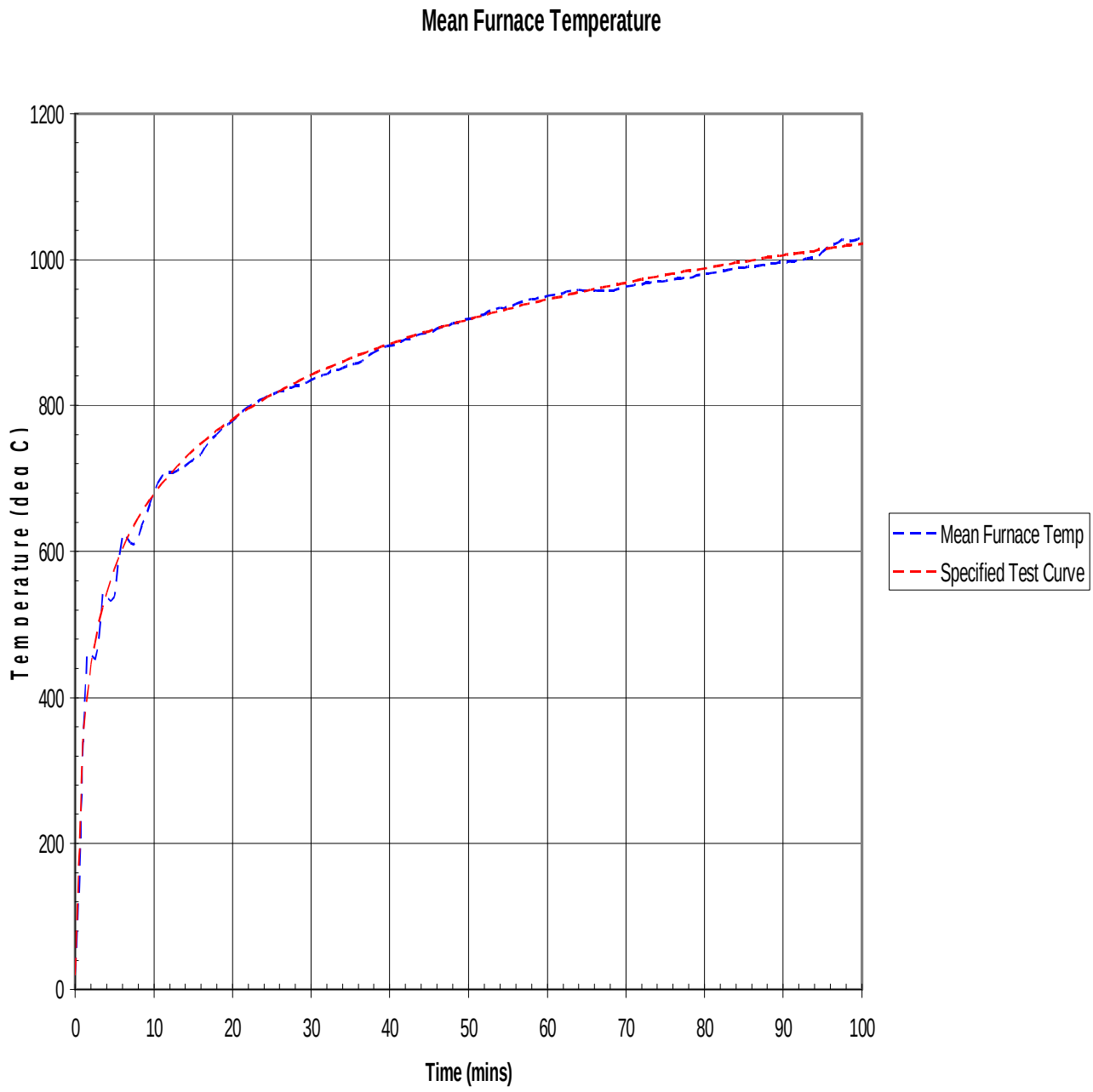


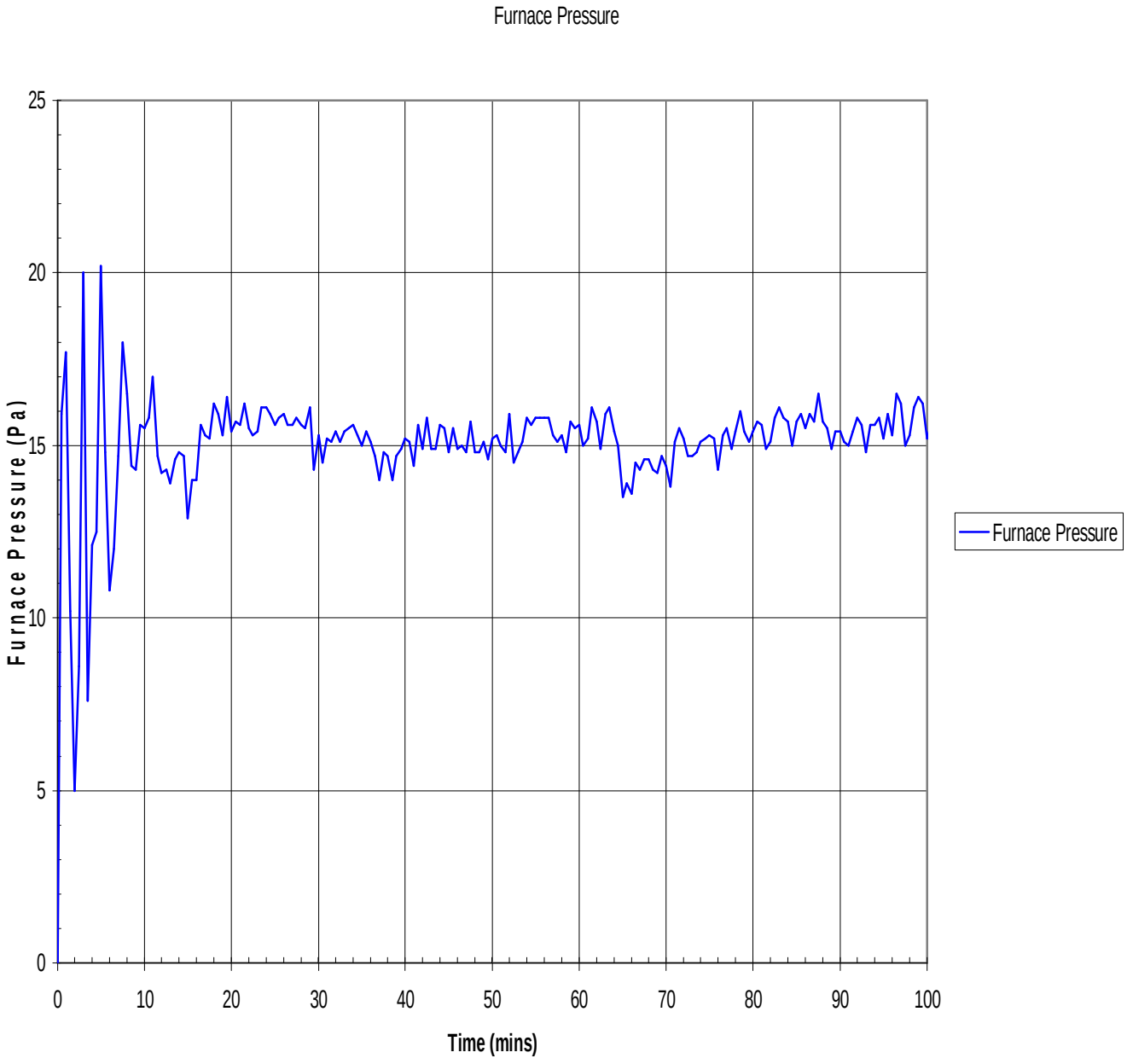
Figure 6: Showing the arrangement of Firecheck layers and wall box locations on the Unexposed Face. (Drawing Not to Scale)

Figure 7: Showing the Internal and External Thermocouple locations on the Unexposed Face. (Drawing Not to Scale)

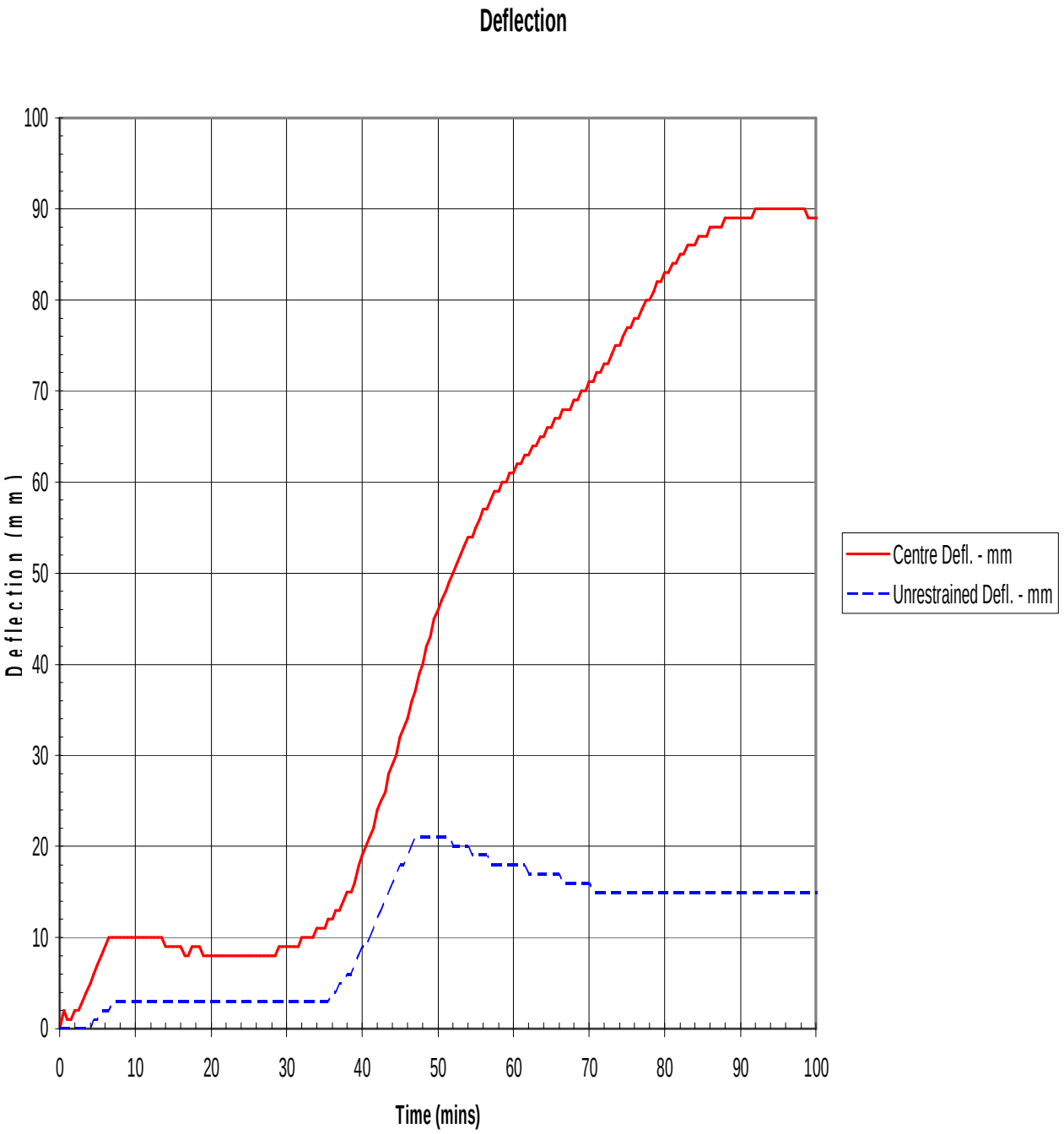
11 GRAPHS



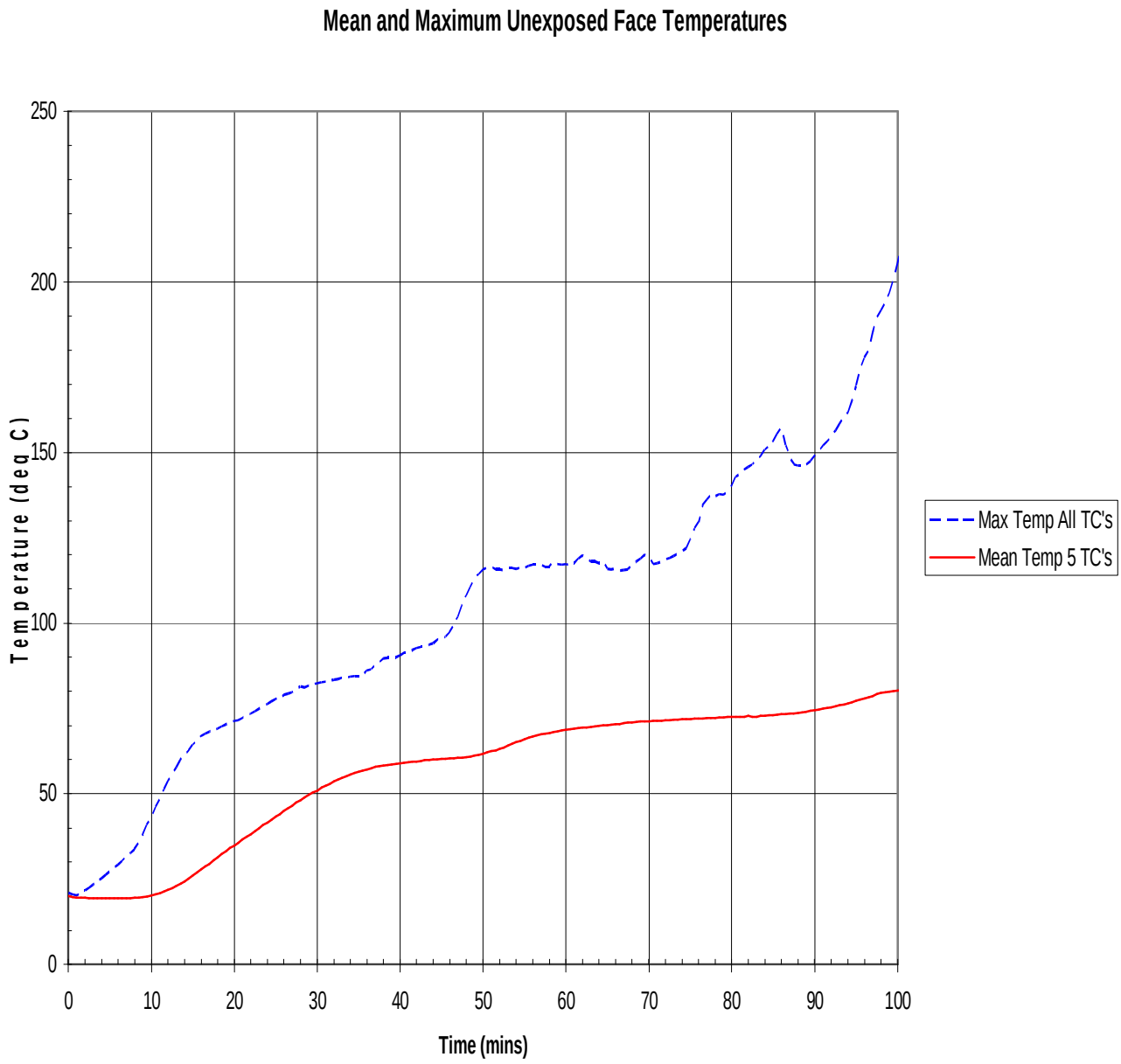
Graph 1: Mean furnace temperature with the specified furnace curve for comparison.



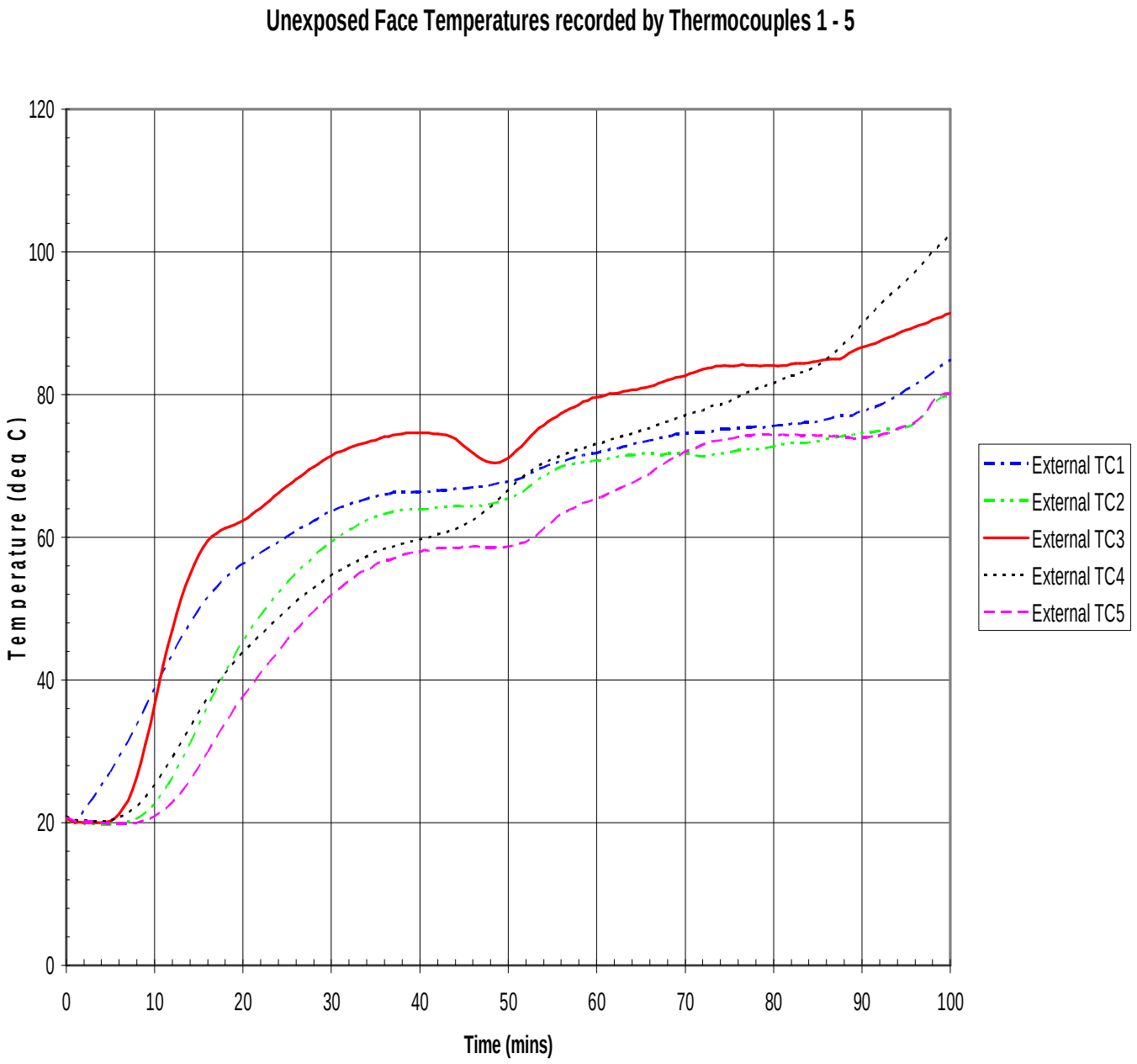
Graph 2: Furnace pressure recorded 600mm from the head of the partition.



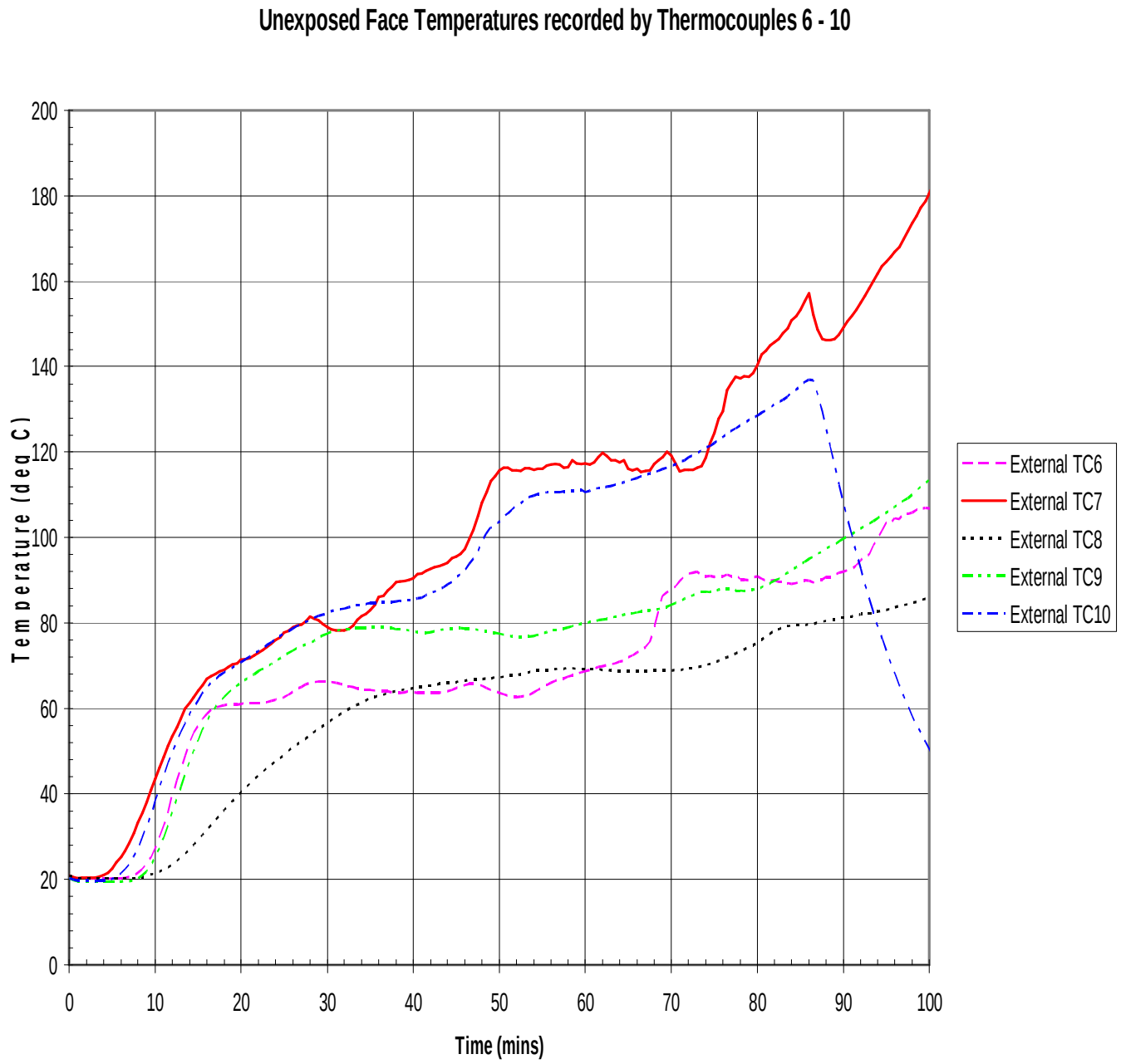
Graph 3: Horizontal Deflection recorded on the unexposed face of the partition.



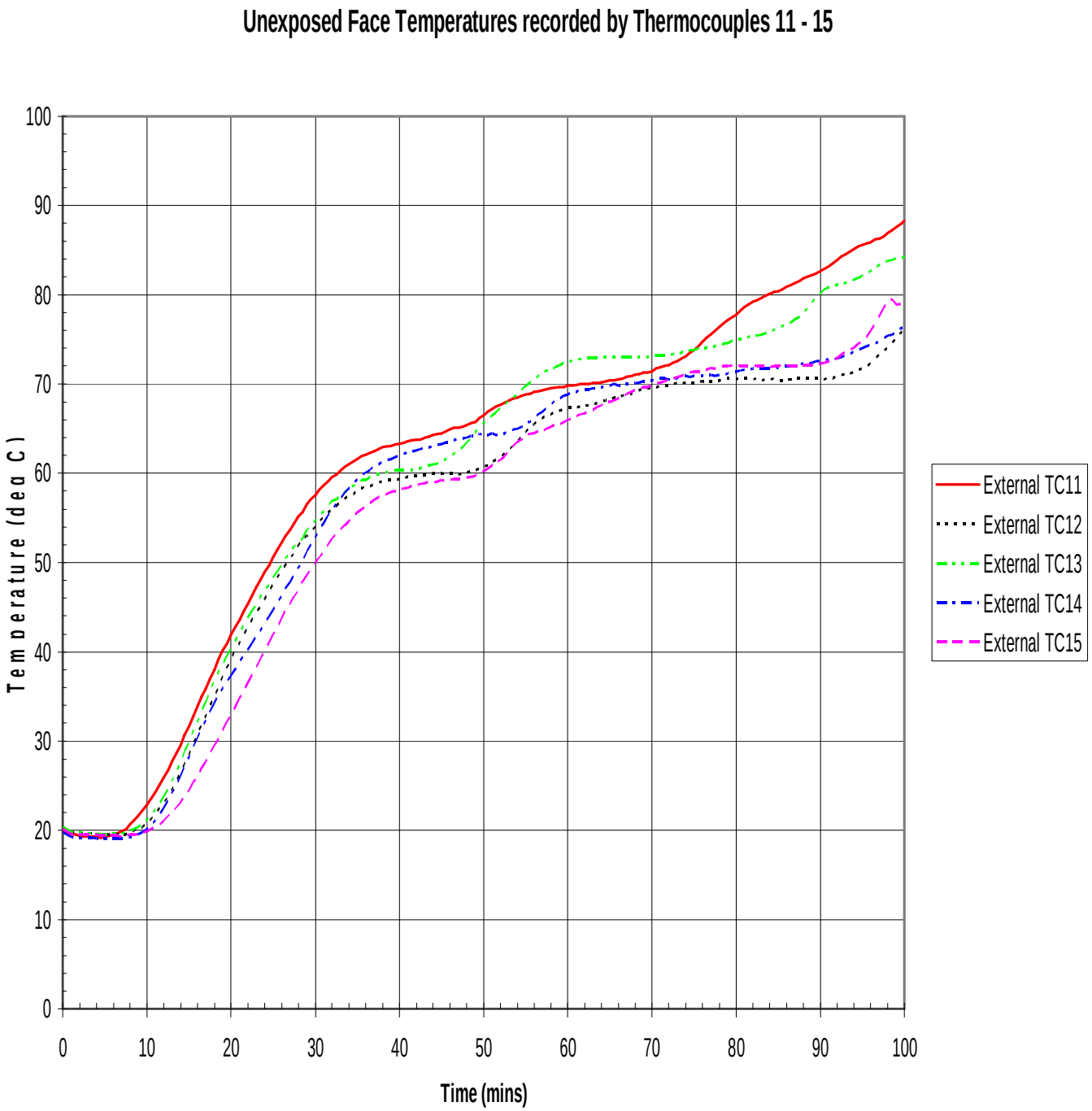
Graph 4: Mean and Maximum temperatures recorded on the unexposed face of the partition.



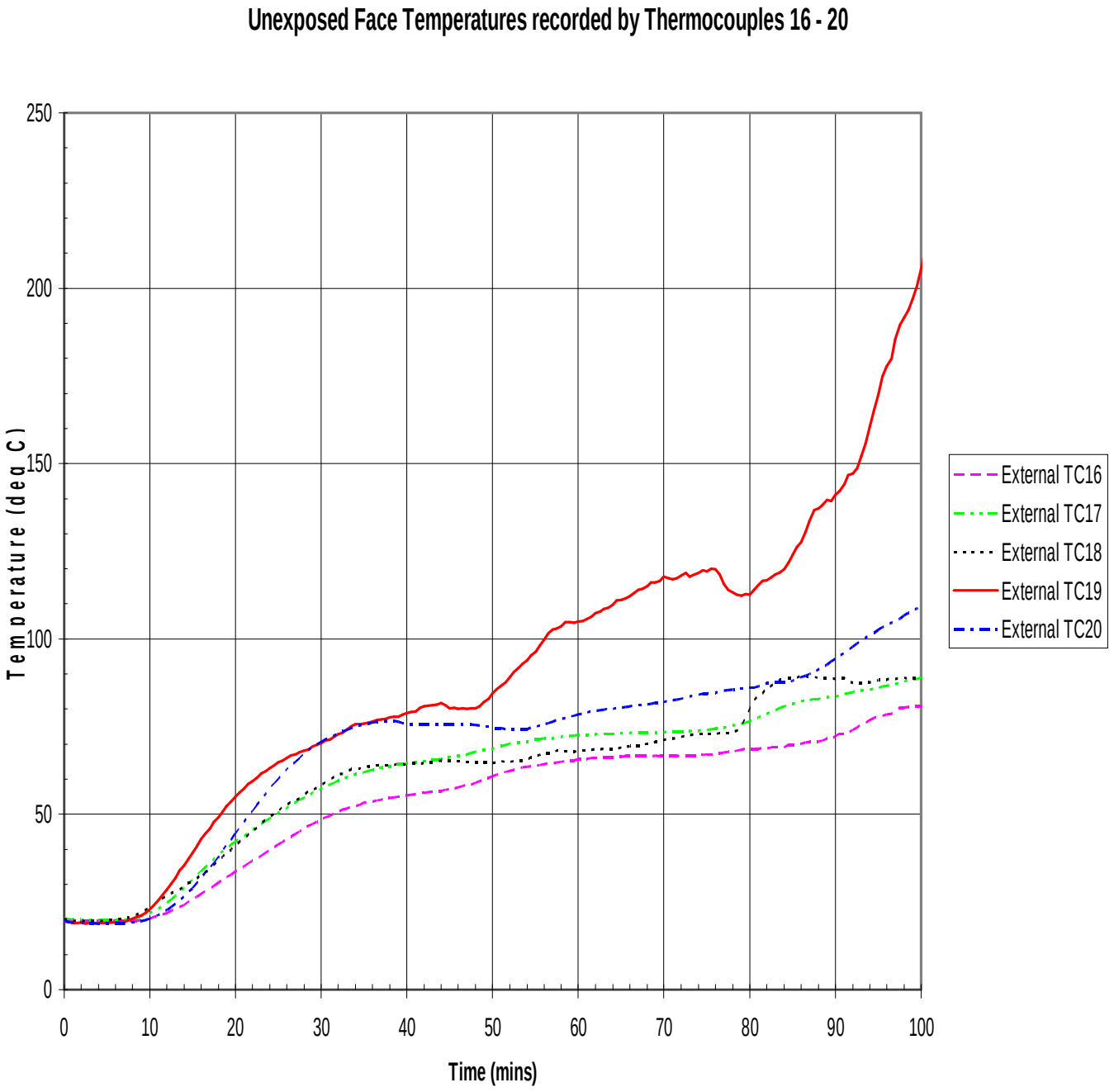
Graph 5: Temperature recorded by thermocouples 1 to 5 on the unexposed face of the partition.



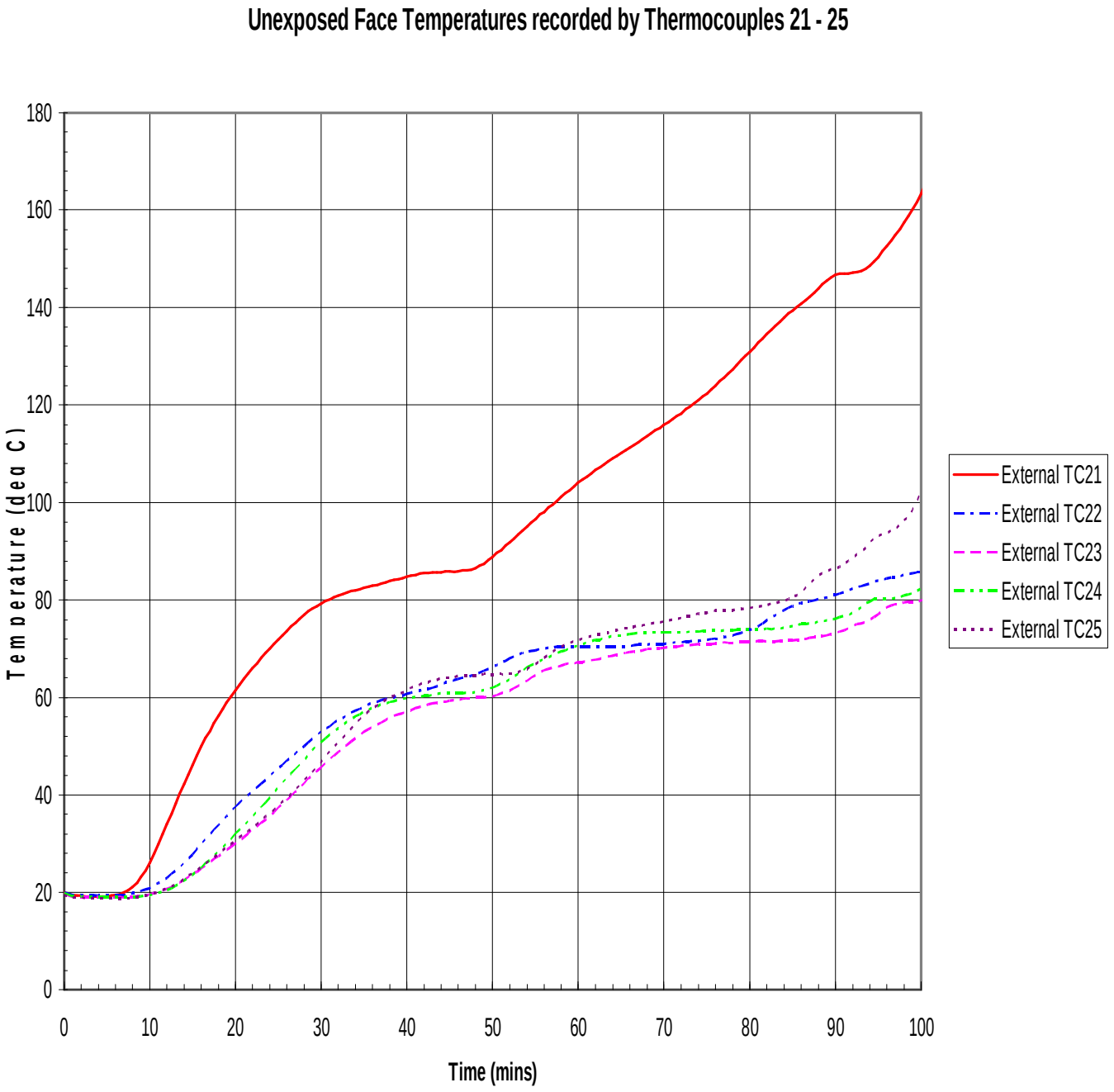
Graph 6: Temperature recorded by thermocouples 6 to 10 on the unexposed face of the partition.



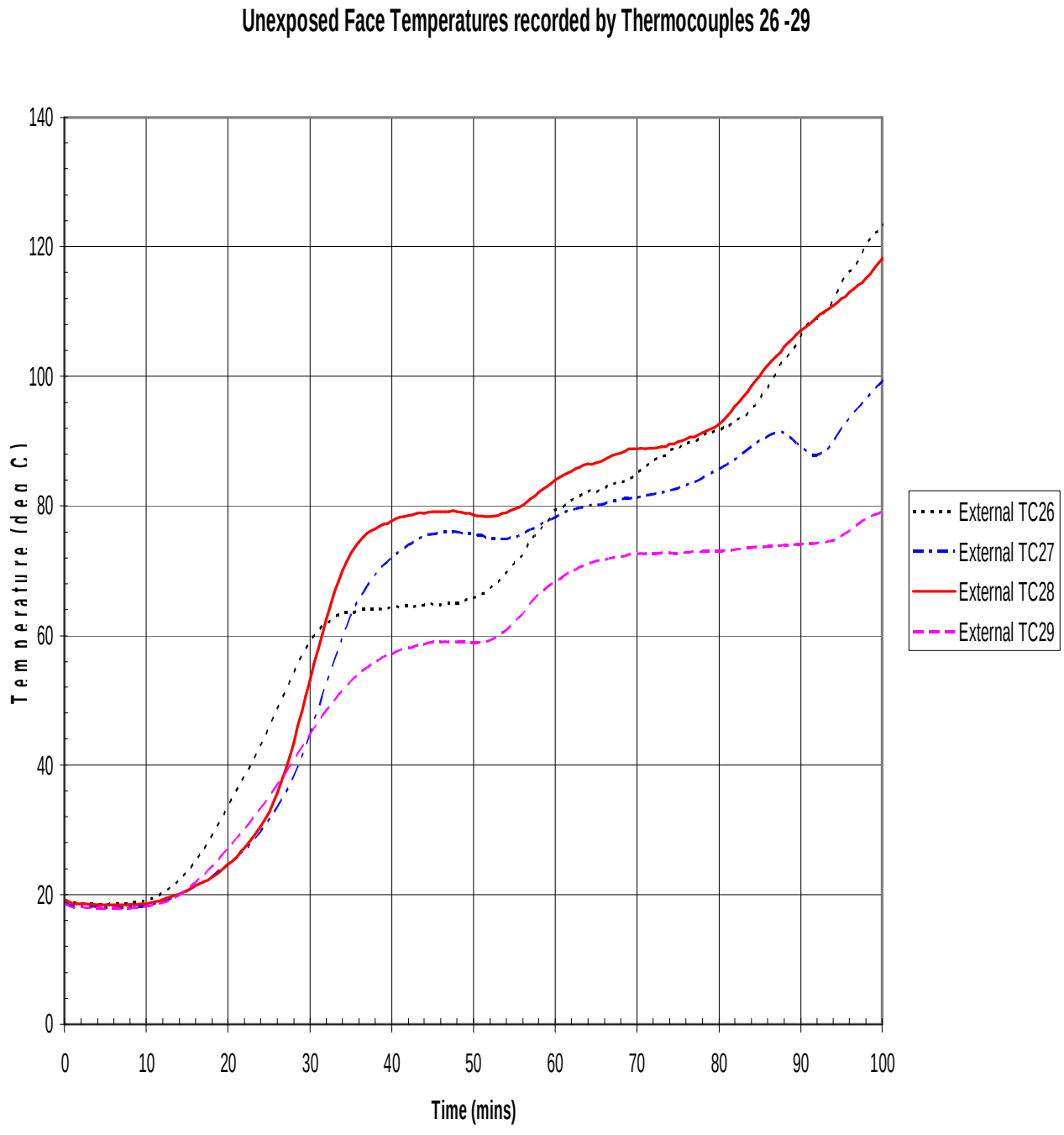
Graph 7: Temperature recorded by thermocouples 11 to 15 on the unexposed face of the partition.



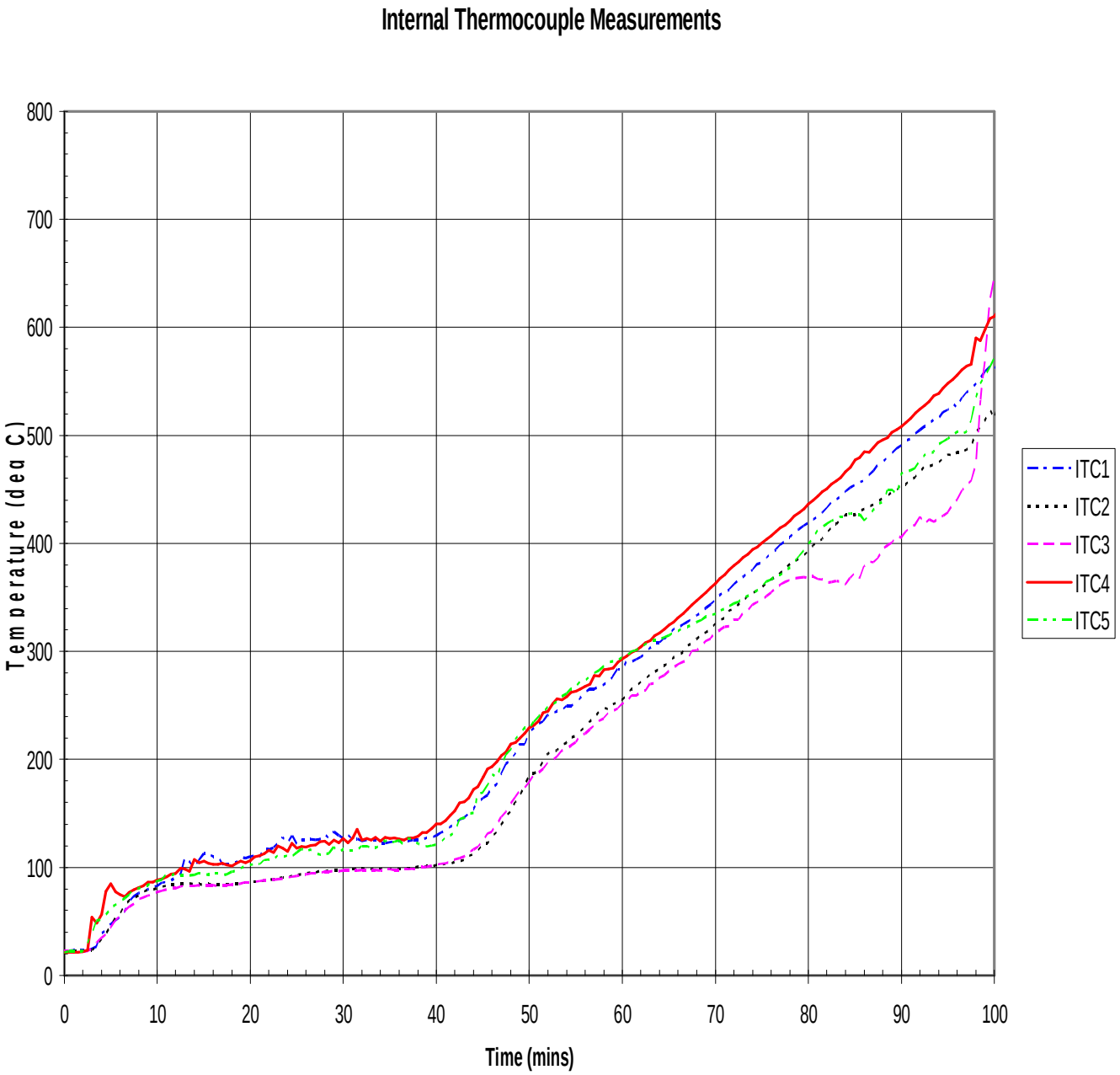
Graph 8: Temperature recorded by thermocouples 16 to 20 on the unexposed face of the partition.



Graph 9: Temperature recorded by thermocouples 21 to 25 on the unexposed face of the partition.



Graph 10: Temperature recorded by thermocouples 26 to 29 on the unexposed face of the partition.



Graph 11: Internal Temperatures recorded by thermocouples ITC1 – ITC5

12 Photographs

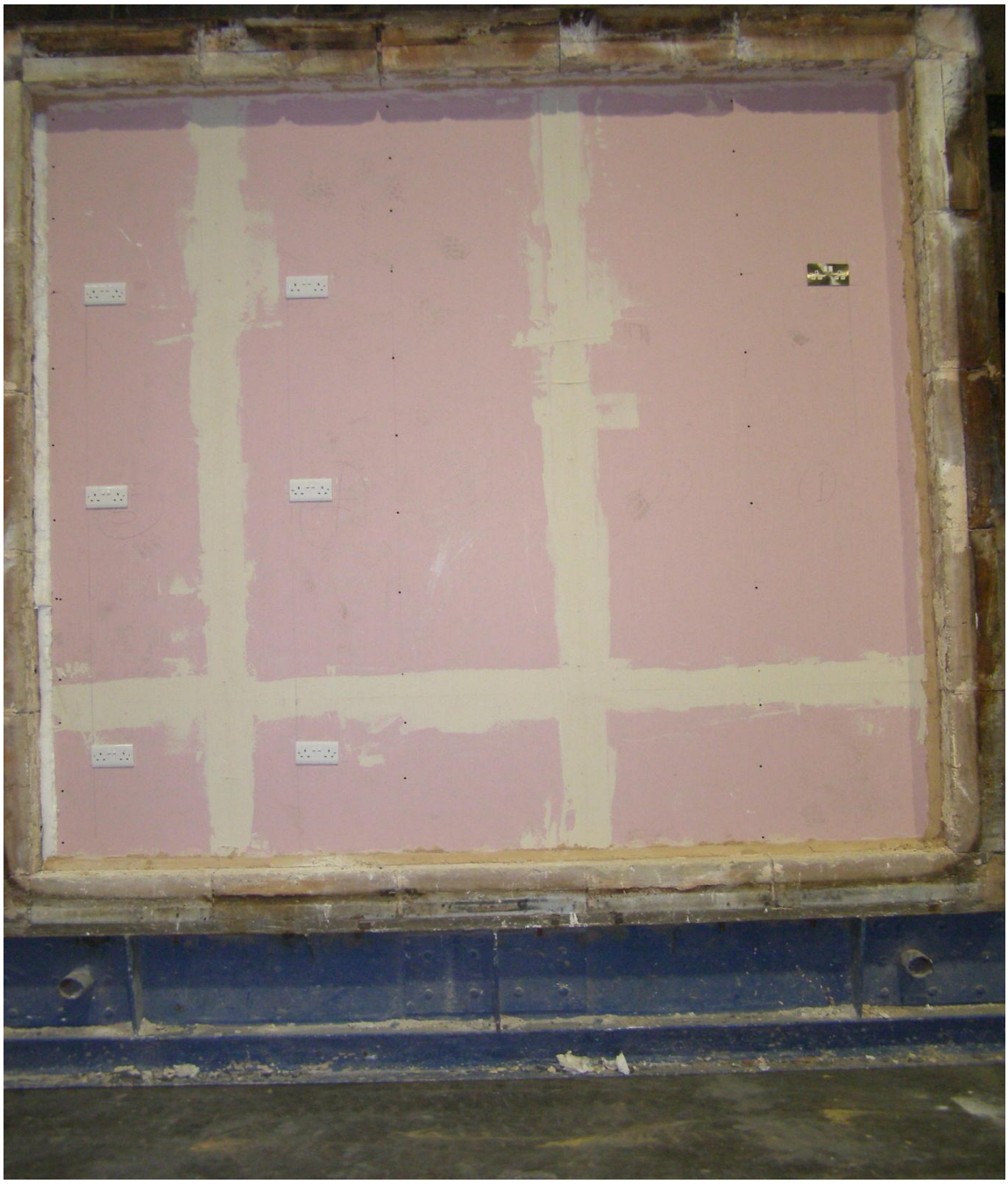


Photo 1: Exposed face of the wall prior to start of test showing electrical sockets –*from right to left*- S1, S4 and S5 (top row), S8 and S9 (middle row), S12 and S13 (bottom row)

Photo 2: Unexposed face of the wall prior to start of test showing electrical sockets – *from left to right*- S2 and S3 (top row), S6 and S7 (middle row), S10 and S11 (bottom row)

Photo 3: Unexposed face after 30 minutes from start of test

Photo 4: Unexposed face after 60 minutes from start of test

Photo 5: Unexposed face after 90 minutes from start of the test.

Photo 6: Unexposed face at termination of test, after 99 minutes duration

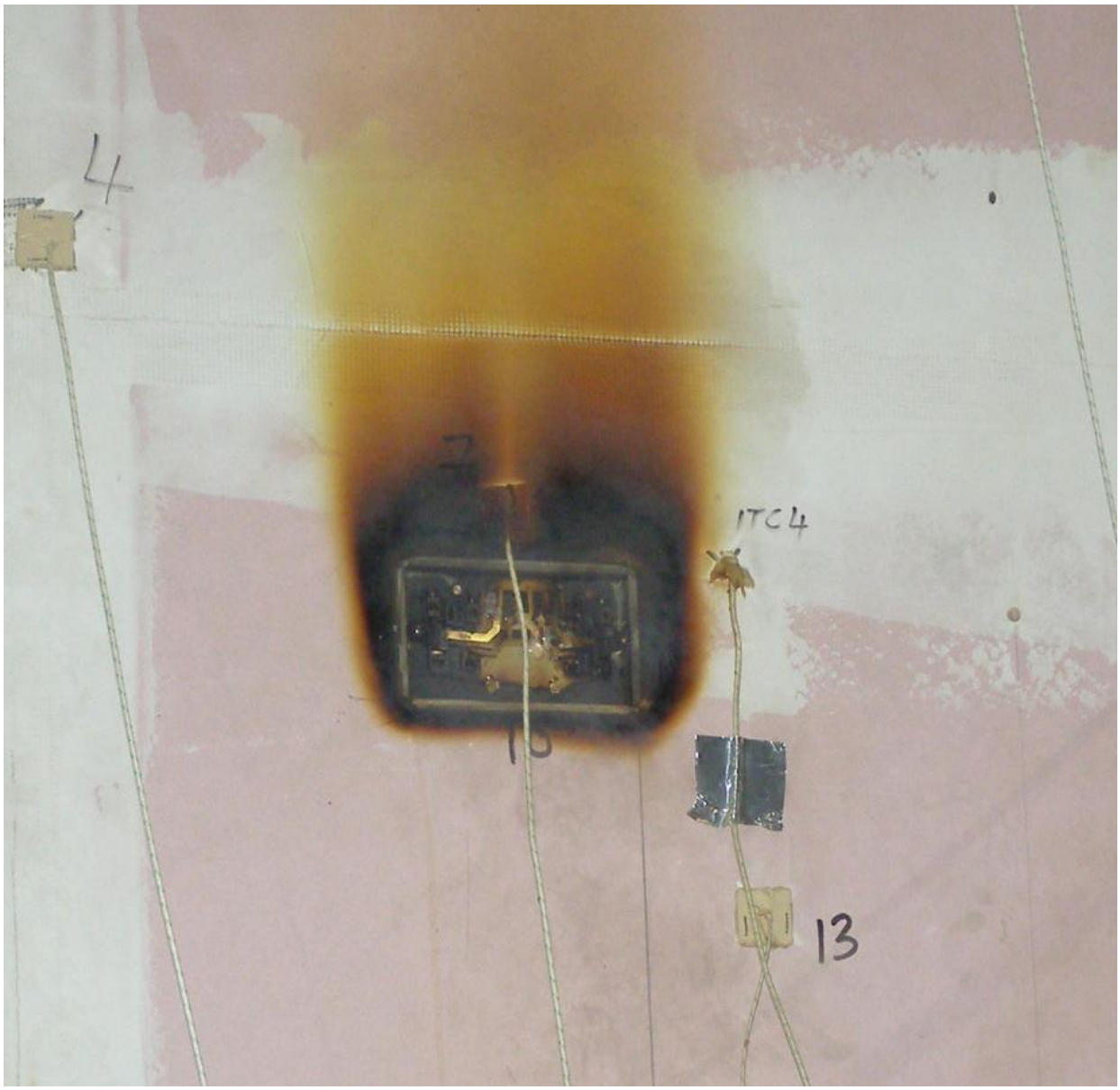


Photo 7: Unexposed face socket S3 after testing.

Photo 8: Exposed face after testing.

==========REPORT ENDS==========