

## **FIRE TEST REPORT EUI-21-B-000335-A – Revision 1**

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According to BS EN 1363-1:2020 and BS EN 1364-1:2015

**This report cancels and replaces the test report EUI-21-000335-A.**

<b>Test</b>	EUI-21-B-000335-A– REVISION 1
<b>Performed on</b>	3 <sup>rd</sup> November 2021
<b>Regarding</b>	<p>Hybrid LGS frame with MW insulation between the frame and on the face Fire side: Internal layer of VCL membrane Visqueen Vapour Barrier (VISQUEEN) and intermediate and external layer of Gyproc FireLine (BRITISH GYPSUM), 15mm thick (per layer)</p> <p>Non-fire side: Internal layer of Y-Wall (RCM), 12 mm thick, intermediate layer of breather membrane Nilvent (KINGSPAN) and external layer of K-Roc RS (KINGSPAN), 100 mm thick</p>
<b>Sponsor</b>	<p>KINGSPAN INSULATION LTD Torvale Industrial Estate Pembroke, Herefordshire HR6 9LA UNITED KINGDOM</p>





One layer of stone mineral wool insulation reference K-Roc FS (KINGSPAN), 100 mm thick, was friction fitted between the studs.

The unexposed side of the sample was made of 3 distinct layers:

- . internal layer of calcium silicate-based cementitious board reference Y-Wall (RCM), 12 mm thick.
- . intermediate layer of breather membrane reference Nilvent (KINGSPAN).
- . external layer of stone mineral wool insulation reference K-Roc RS (KINGSPAN), 100 mm thick.

Overall dimensions:

- Element: 2975 x 3000 x 246 mm (w x h x th)
- Clear opening: 3000 x 3000 mm (w x h)

## 6.2. LIST OF THE COMPONENTS

According to the information supplied by the sponsor.

Name	Reference	Characteristics	Material	Supplier
LGS frame	C10005012	“C”-section profile 100 x 50 mm with slotted ends Th. 1.2 mm; Length: 2975 mm	LGS	KINGSPAN
	U1045512	“U”-section profile 55 x 104 mm; Th 1.2 mm		
	U1046718	“U”-section profile 67 x 104 mm; Th 1.8 mm		
Fixing strap	Gypframe GFS1	2400 x 70 mm (L x w); 0.5 mm thick		BRITISH GYPSUM
“L” bracket	Gypframe GA4	“L”-section profile 50 x 25 mm 0.7 m thick		
Exposed side – internal layer	Visqueen Vapour Barrier	2 x 50 m (w x L) – full roll Green tinted, translucent membrane	Polyethylene membrane	VISQUEEN
Exposed side – intermediate and external layer	Gyproc FireLine	1200 x 2400 x 15 mm (w x h x th) Tapered edges. Surface mass: 12.9 kg/m <sup>2</sup> measured Density: 862 kg/m <sup>3</sup> measured Reaction to fire: A2,s1-d0 (stated) $\lambda_D=0.24$ W/m.K (stated). $R_D=0.06$ m <sup>2</sup> K/W (stated);	Glass-fibre reinforced plasterboard	BRITISH GYPSUM
Unexposed side – internal layer	Y-Wall	1200 x 2400 x 12 mm (w x h x th) Surface mass: 16.7 kg/m <sup>2</sup> measured Density: 1390 kg/m <sup>3</sup> (measured) Reaction to fire: A1 (stated) $\lambda_D\leq 0.30$ W/m.K (stated)	Calcium silicate-based cementitious board	RCM
Unexposed side – intermediate layer	Nilvent	1.5 x 50 m (w x L) – full roll 0.6 mm thick Reaction to fire class E (stated)	Laminated 3-layer polyolefin membrane	KINGSPAN
Unexposed side – external layer	K-Roc RS	600 x 1200 mm (slab size) Th. 100mm. Density: 45.6 kg/m <sup>3</sup> (stated) Reaction to fire: A1 (stated) $\lambda_D=0.034$ W/m.K (stated). $R_D=2.90$ m <sup>2</sup> K/W (stated)	Stone mineral wool	
Insulation between studs	K-Roc FS	610 x 1220 mm (slab size) Th. 100 mm. Density: 30.64 kg/m <sup>3</sup> (stated) Reaction to fire: A1 (stated) $\lambda_D=0.036$ W/m.K (stated); $R_D=2.75$ m <sup>2</sup> K/W (stated)		
Insulation on the deflection detail	RW5	Cut to strips of 15 x 25 mm Density: 100 kg/m <sup>3</sup> (stated) Reaction to fire: A1 (stated)		ROCKWOOL

		$\lambda_D=0.034$ W/m.K (stated)		
Double sided tape (VCL to frame)	Double sided vapour tape	20 mm x 50 m Self-adhesive, double-sided tape	Information not available	VISQUEEN
Overlapping tape	Vapour Tape System	75 mm wide Self-adhesive, single sided	Single sided foil tape	VISQUEEN
Tape – sheathing boards	DAFA UV tape	60 mm wide Self-adhesive, single sided	Acrylic tape	DAFA
Screw LGS to LGS	TEKS screw Product code: 921166	5.5 x 25 mm (Ø x L) Low profile pancake head screw	Coated steel	SPIT
Screw floor track and stud to testing frame	TAPCON 6x32	6 x 32 mm (Ø x L) Hex-head masonry screw		
Screw head track to testing frame	TAPCON DOME 6x40	6 x 40 mm (Ø x L) Low profiled, dome-head masonry bolt	Zinc plated steel	TIMCO
Screw internal layer of plasterboard to LGS	00032PSDD	3.5 x 32 mm (Ø x L) Self-drilling drywall screw		
Screw external layer of plasterboard to LGS	00042PSDD	3.5 x 42 mm (Ø x L) Self-drilling drywall screw		
Screw sheathing board to LGS	Wingdriller WDLS 5.5x50	5.5 x 50 mm (Ø x L) Wing-tipped, self-drilling screw	Coated steel	EJOT
Insulation fixing – edge of slabs	SUREFAST SF-T-75 x 75	Head flange diameter 75 mm Tube length 75 mm	Polypropylene	FIXFAST
	SF-RS-SSA4-4.8x80	4.8 x 80 mm (Ø x L) Self-drilling screw	Stainless steel	
Insulation fixing – centre of the slabs	SF-P-SS-70-D	70 mm (overall Ø)		
		SF-RS-SSA4-4.8x160	4.8 x 160 mm (Ø x L) Self-drilling screw	
Jointing tape	Gyproc Joint Tape	50 mm wide	Paper tape	BRITISH GYPSUM
Jointing compound	Gyproc Promix Lite	Ready-mixed jointing compound 17 litre tub	Gypsum-based jointing compound	

*w = width --- h = height --- th = Thickness --- Ø = diameter --- LGS = Light Gauge Steel*

See Appendix E for additional information on the components used on the test sample. The information in Appendix E was requested to be added by the Sponsor. The testing lab could not verify the information in Appendix E.

### 6.3. DETAILED DESCRIPTION OF THE SPECIMEN

The drawings in the appendix A have been supplied by the Sponsor, checked by the test laboratory EFECTIS, and are in conformity with the tested specimen.

#### 6.3.1. Sample frame

The sample frame was made using the following LGS elements:

- . six “C”-section studs’ reference C10005012 (KINGSPAN), 100 x 50 mm, 1.2 mm thick, 2975 mm long, with slotted top end.
- . one “U”-section floor track reference U1045512 (KINGSPAN), 104 x 55 mm, 1.2 mm thick, 2975mm long.
- . one “U”-section head track reference U1046718 (KINGSPAN), 104 x 67 mm, 1.8 mm thick, 2975mm long.

The framing elements were fixed together with low profile pancake head screws reference TEKS screw – product code 921166 (SPIT), 5.5 x 25 mm (Ø x L), using one screw on each side, per junction. The studs were fixed to the top track on their slotted end and the frame included a 25 mm head deflection detail.

The floor track and one of the studs were fixed to the testing frame using hex-head masonry screws reference TAPCON 6x32 (SPIT), 6 x 32 mm ( $\varnothing$  x L), evenly spaced at 600 mm centres.

The head track was fixed to the testing frame using low-profiled dome-head masonry bolt reference TAPCON DOME 6x40 (SPIT), 6 x 40 mm ( $\varnothing$  x L), evenly spaced at 600 mm centres.

The overall dimension of the frame was 2975 x 3000 x 100 mm (w x h x th).

See Photograph 1, Appendix D for the layout of the sample frame.

#### 6.3.2. Exposed side

The exposed side of the sample was made of three distinct layers:

- . internal layer of polyethylene membrane reference Visqueen Vapour Barrier (VISQUEEN), 2000mm wide.

- . intermediate and external layer of glass-fibre reinforced gypsum board reference Gyproc FireLine (BRITISH GYPSUM), 1200 x 2400 x 15 mm (w x h x th), with tapered edges, surface mass 12.9 kg/m<sup>2</sup> and density 862 kg/m<sup>3</sup> (measured by the lab), stated reaction to fire class A2-s1,d0,  $\lambda_D=0.24$  W/m.K and  $R_D=0.06$  m<sup>2</sup>K/W.

The membrane was fixed to the studs and tracks using self-adhesive tape reference Double sided vapour tape (VISQUEEN), 20 mm wide.

The layers of plasterboard were installed to stagger vertical and horizontal joints between layers.

The boards were left 25 mm from the head of the sample, creating a head deflection detail. The gap was filled using stone mineral wool strips reference RW5 (ROCKWOOL). The strips of stone mineral wool were kept in place by a "L" bracket, fixed to the testing frame, using masonry bolts, evenly spaced at 600 mm centres.

The internal layer of plasterboard was fixed using self-drilling drywall screws reference 00032PSDD (TIMCO), 3.5 x 32 mm ( $\varnothing$  x L). The screws were evenly spaced at 300 mm centres along the floor track, studs and a fixing strap reference Gypframe GFS1 (BRITISH GYPSUM), 70 mm wide, 0.5 mm thick, installed below the head of the sample. The internal layer of plasterboard was not fixed to the head track.

The external layer of plasterboard was fixed using self-drilling drywall screws reference 00042PSDD (TIMCO), 3.5 x 42 mm ( $\varnothing$  x L). The screws were evenly spaced at 300 mm centres along the floor track, studs and a fixing strap reference Gypframe GFS1 (BRITISH GYPSUM), 70 mm wide, 0.5 mm thick, installed between the two layers of plasterboard, in line with the horizontal joint on the external layer.

See Photographs 2 and 3, Appendix D for the layout of the plasterboard on the exposed side.

#### 6.3.3. Insulation between studs

One layer of stone mineral wool insulation K-Roc FS (KINGSPAN), 610 x 1220 mm (w x L), 100 mm thick, with stated density 28-32 kg/m<sup>3</sup>, Reaction to fire Euroclass A1,  $\lambda_D=0.036$  W/m.K and  $R_D=2.75$  m<sup>2</sup>K/W, was friction fitted between the LGS studs.

See Photograph 4, Appendix D.

#### 6.3.4. Unexposed side

The unexposed side of the sample was made of three distinct layers:

- . internal layer of calcium silicate-based cementitious sheathing board reference Y-Wall (RCM), 1200 x 2400 x 12 mm (w x h x th), with measured surface mass 16.7 kg/m<sup>2</sup> and density 1390 kg/m<sup>3</sup>, and stated reaction to fire: A1 (according to EN 13501-1) and  $\lambda_D \leq 0.30$  W/m.K.
- . intermediate layer of breather membrane reference Nilvent (KINGSPAN).
- . external layer of stone mineral wool rainscreen slabs reference K-Roc RS (KINGSPAN), 600 x 1200 x 100 mm (w x h x th), with declared density 45 kg/m<sup>3</sup>, 0.034 W/m.K and  $R_D = 2.90$  m<sup>2</sup>K/W.

The sheathing board was installed to stagger vertical and horizontal joints with the internal layer of plasterboard.

The sheathing board was fixed to the LGS frame using wing-tipped self-drilling screws reference Wingdriller WDL5 5.5x50 (EJOT), 5.5 x 50 mm ( $\varnothing$  x L). The screws were evenly spaced at 300 mm centres along the studs and floor track. The sheathing board was not fixed to the head track.

A layer of self-adhesive, single sided tape, reference DAFA UV Tape (DAFA), 60 mm wide was applied over the joints of the boards.

See Photograph 5, Appendix D for the layout of the sheathing boards.

The intermediate layer was fixed to the sheathing boards using double sided tape reference Double sided vapour tape (VISQUEEN).

The rainscreen slabs were fixed to the studs, through the breather membrane and sheathing boards. The slabs were fixed using one stainless steel round retainer reference SF-P-SS-70-D (FIXFAST), 70 mm wide, placed in the centre of the slab. The retainers were fixed to the studs using self-drilling stainless steel screw reference SF-RS-SSA4-4.8x160 (FIXFAST), 4.8 x 160 mm ( $\varnothing$  x L). Polypropylene insulation retainers' reference SUREFAST SF-T-75 x 75 (FIXFAST), with 75 mm diameter head flange and 75 mm deep tube were installed between adjacent slabs. The polypropylene retainers were fixed to the studs using self-drilling stainless steel screws reference SF-RS-SSA4-4.8x80 (FIXFAST), 4.8 x 80 mm ( $\varnothing$  x L).

See Photograph 6, Appendix D for the layout of the rainscreen slabs and insulation retainers.

#### 6.3.5. Additional equipment

No additional equipment was installed on the sample

#### 6.3.6. Finishing

The joints of the external layer of the exposed side were covered using paper jointing tape reference Gyproc Joint Tape (BRITISH GYPSUM) and ready-mixed jointing compound Gyproc Promix Lite (BRITISH GYPSUM). The screw heads on the external layer of the exposed side were covered with a layer of ready-mixed jointing compound Gyproc Promix Lite (BRITISH GYPSUM)

### 6.4. MEASUREMENTS TAKEN BY THE TESTING LAB

The following additional measurements were taken by the testing lab on random cuts of the materials mentioned below. The samples were supplied by the sponsor. The samples were kept in close proximity to the sample during the construction until the test, to allow similar conditioning.

The surface mass of the sample was calculated based on the mass of the samples, before conditioning. The samples were conditioned until mass stability was verified – no variation within 24 hours.

<i>Reference/ Manufacturer</i>	<i>Surface mass or density (before conditioning)</i>	<i>Conditioning temperature</i>	<i>Moisture content (%)</i>
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Gyproc FireLine – 15 mm (BRITISH GYPSUM)	12.9 kg/m <sup>2</sup> 862 kg/m <sup>3</sup>	50 ± 5 ° C	0.45 %
Y-Wall – 12 mm (RCM)	16.7 kg/m <sup>2</sup> 1390 kg/m <sup>3</sup>	105 ± 5 ° C	11.50%

## 6.5. VERIFICATION

The tested element was collected as described in chapter 6. of this report.

## 7. TEST ASSEMBLY

### 7.1. DEFINITION OF THE TESTED SPECIMEN

The choice and the definition of this test specimen were carried out by the sponsor.

### 7.2. ASSEMBLY OF THE TESTED SPECIMEN

#### 7.2.1. Supporting construction

The tested specimen has been assembled within a reinforced concrete frame supplied by EFECTIS.

- Drying duration: more than 28 days.
- Thickness of the frame: 320 mm.
- Opening in the frame: 3000 x 3000 mm (w x h).

#### 7.2.2. Restraint/Free edge

One of the vertical edges of the specimen was left unrestrained by packing the gaps between the testing frame and the sample with high-density stone mineral wool, to provide a seal without restricting freedom of movement. The remaining vertical edges and both horizontal edges of the sample were fixed to the testing frame as detailed in section 6.3. A layer of acrylic sealant reference FireMate (EVERBUILD) was applied between the edges of the sample and the testing frame on the exposed side to prevent smoke leakage.

#### 7.2.3. Staff

The testing frame was supplied and installed on the furnace by the staff of the test laboratory.

The assembly of the sample was done by the staff of the sponsor.

## 8. TEST METHOD

### 8.1. PRELIMINARY CONDITIONING

The specimen was conditioned inside the test laboratory, in conformity with the statement in paragraph 8.1 of the BS EN 1363-1:2020, the weight stability was therefore estimated to be reached on the day of the test.

### 8.2. THERMAL PROGRAM

The temperature rise inside the furnace above the ambient temperature has been controlled according to the **standard thermal program** represented by the following function:

$$T = 345 \log_{10} (8t + 1) + 20$$

where:

$t$  = Time (min)

$T$  = Furnace temperature at time  $t$  (°C)

### 8.3. PRESSURE

In conformity with the requirements of the standard BS EN 1363-1:2020, the pressure inside the furnace was continuously controlled throughout the whole test.

The neutral pressure place (pressure of zero) was established 647 mm above the notional floor level.

Taking into account the dimensions of the specimen and the location of the pressure sensor, the prescribed value was established at 15.7 Pa, equating to a pressure of 20 Pa at the head of the sample.

### 8.4. FIRE SIDE

The fire test was performed with the following fire side:

- For the specimen : fire on Gyproc FireLine boards

## 9. MEASUREMENTS DURING THE FIRE TEST AND TEST RESULTS

This section provides the details of the sensors used during the fire test. The locations of the sensors are shown in Appendix B.

The graphic measurements are shown in Appendix C.

### 9.1. TEMPERATURE MEASUREMENTS

#### 9.1.1. Ambient temperature in the laboratory

The ambient temperature was measured according to the requirements of the standard BS EN 1363-1:2020.

See Chart 1, Appendix C for the measurements recorded during the test.

#### 9.1.2. Ambient temperature in the furnace

It was measured in conformity with the standard BS EN 1363-1:2020 by 6 plate thermocouples in the furnace, with the metal plate facing towards the back of the furnace.

See Chart 2, Appendix C for the measurements recorded during the test.

#### 9.1.3. Temperatures of the specimen

The temperatures were measured by 20 external thermocouples according to the requirements of the standard BS EN 1363-1:2020 and located according to the standard BS EN 1364-1:2015 and by 12 internal thermocouples for additional data gathering, requested by the test Sponsor.

**Note:** The following thermocouples malfunctioned during the mentioned times. All data recorded by the mentioned instruments during that interval was disregarded.

- . Internal thermocouple 7 – malfunctioned between minute 88 and 91.
- . Internal thermocouple 10 – malfunctioned between minute 86 and 93.

<i>External thermocouples</i>	<i>Markings</i>	<i>Appendix</i>
On the centre of the quadrant	1, 2, 4, 5	B
On the geometric centre of the specimen	3	
At the head of the sample, adjacent to a vertical joint on the rainscreen insulation	6, 10	
At the head of the sample, in line with a stud	7, 9	
At the head of the specimen, at mid-width	8	

At the intersection of vertical and horizontal joints on the rainscreen insulation (near the mid-width line of the sample)	11, 12, 20	
At mid-height, 150 mm in from the free vertical edge	13	
At mid-height, adjacent to a vertical joint	14, 15, 16, 18	
At mid-height, in line with a stud	17	
At mid-height, adjacent to the fixed vertical edge	19	
<b>Internal thermocouples</b>	<b>Markings</b>	<b>Appendix</b>
On the central studs, 750 mm below the head of the sample	1, 4 (exposed flange) 2, 5 (web) 3, 6 (unexposed flange)	<b>A</b>
On stud S3, at mid-height	7 (exposed flange) 8 (web) 9 (unexposed flange)	
On stud S3, 2000mm below the head of the sample	10 (exposed flange) 11 (web) 12 (unexposed flange)	

For reference regarding the location of the internal thermocouples, the studs were numbered from S1 (fixed edge) to S6 (free edge).

See Figure 1, Appendix A for the plot of the internal instrumentation, Figure 2, Appendix B for the plot of the external instrumentation, and Charts 5 and 6 and 8 to 10, Appendix C for the measurements recorded during the test.

## 9.2. PRESSURE MEASUREMENTS

In conformity with the requirements of the standard BS EN 1363-1:2020, the pressure inside the furnace was continuously controlled throughout the whole test, according to the conditions described in section 8.3 of this document.

See Chart 4, Appendix C for the measurements recorded during the test.

## 9.3. DEFLECTION MEASUREMENTS

In conformity with the requirements of the standard BS EN 1363-1:2020 and BS EN 1364-1:2015, the deflection located in the horizontal orientation was measured and recorded throughout the test.

The deflection was measured using calibrated wire type displacement gauges and recorded via a data acquisition system. The horizontal deflection was measured at the geometric centre of the sample and at mid-height at  $\frac{1}{4}$  width, from the left and right sides, at 50 mm from the free edge, and at mid-width at  $\frac{1}{4}$  height from the top and bottom.

<b>Location</b>	<b>Markings</b>	<b>Appendix</b>
Mid-width, at $\frac{1}{4}$ height	1 (top), 6 (bottom)	<b>B</b>
Mid-height, 50 mm from the free edge	2	
Mid-height, at $\frac{1}{4}$ width	3 (left), 5 (right)	
Centre of the sample	4	

See Figure 2, Appendix B for the plot of the instrumentation and Chart 7, Appendix C for the measurements recorded during the test.

## 10. OBSERVATIONS

### 10.1. BEFORE THE TEST

- Ambient temperature inside the laboratory : 13 °C.
- Specimen temperature before the test : 14 °C.

**10.2. DURING THE TEST**

<i>Time (min)</i>	<i>Specimen</i>	<i>Observations</i>
00	ES/NES	<b>Start of the test</b>
08	ES	Jointing tape and compound falling
	NES	Smoke leaking from the horizontal edge at the head, between the sample and the testing frame
15	ES/NES	NSC
18	ES	Joints between boards widening
22	ES	Majority of the jointing tape and compound no longer visible – some remaining near the head of the sample
28	ES	Joints progressively wider. Minor cracks on the edge of the boards, near the fixings – see Photograph 7, Appendix D
30	ES/NES	NSC
38	ES	Joints between boards wider. Cracks on the edge of the boards longer and wider, especially near the corners of the boards
45	ES	Top corners of the full board installed in the centre of the sample no longer fixed
	NES	NSC
50	ES	Top horizontal edge of both full boards no longer fixed
60	ES/NES	NSC
69	ES	Boarding starting to move towards the inside of the furnace
72	ES	Subtle flaming along the joints. Top right corner of the full board installed in the centre starting to sag
75	NES	NSC
76	ES	Top right quadrant of the full board installed in the centre of the sample collapsed – see Photograph 8, Appendix D. Where visible, the internal layer of plasterboard showing superficial cracks and wide joints between boards.
80	ES	Almost all the area of the full board in the centre of the sample collapsed
85	ES	Top left corner of the full board installed on the free edge sagging
90	NES	Visible buckling of the sample towards the fire side
95	ES	Part of the internal layer of plasterboard collapsed, near the centre of the sample. Insulation between studs visible and showing a recessed aspect - see Photograph 9, Appendix D
98	ES	Exposed side of the sheathing board visible – see Photograph 10, Appendix D
101	NES	Steam released from the surface of the sample
105	ES	Cracks visible on the sheathing board – see Photograph 11, Appendix D
110	ES	Discolouration on the rainscreen slabs, near mid-width – see Photograph 12, Appendix D
112	NES	Glowing patch forming near mid-width, between TCs 11 and 12 (approximately 900mm from the head of the sample) <b>Loss of fire integrity – cotton pad test positive</b> on the glowing area described above – see Photograph 13, Appendix D. <b>Test stopped</b>

ES = Exposed side --- NES = Non-exposed side --- NSC = No Significant Change --- TC = Thermocouple

**10.3. AFTER THE TEST AND COOL DOWN**

Unexposed side: Rainscreen slab layer presenting a hole in the location where the cotton pad test was performed. Sheathing board deformed and discoloured, and breather membrane partially molten, visible after removal of the rainscreen slab.

Exposed side: External layer of plasterboard only visible above the horizontal joint. Part of the stone wool insulation between the studs no longer present. Sheathing board cracked and discoloured, especially in the areas where insulation was missing. Deformation of the sheathing board in the area associated with the glowing visible of the unexposed side of the sample at the end of the test.

See Photographs 14 to 17, Appendix D.

## 11. FIRE RESISTANCE CRITERIA

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In conformity with the standards mentioned in chapter 1, the times during which the specimen meets the fire resistance criteria may be regarded as follows:

### 11.1. FIRE INTEGRITY

In conformity with the standards mentioned in chapter 1, the times during which the specimen meets the fire resistance criteria may be regarded as follows:

### 11.2. FIRE INTEGRITY

#### 11.2.1. Cotton wool pad

Duration: **ONE HUNDRED AND TWELVE MINUTES** (112 min)  
Cause of limitation: **Cotton pad test positive** on a glowing patch, presented near mid-width of the sample, approximately 900 mm below the head of the sample

#### 11.2.2. Gap gauges

Duration: **ONE HUNDRED AND TWELVE MINUTES** (112 min)  
Cause of limitation: Test stopped due to loss of fire integrity

#### 11.2.3. Sustained flaming

Duration: **ONE HUNDRED AND TWELVE MINUTES** (112 min)  
Cause of limitation: Test stopped due to loss of fire integrity

### 11.3. THERMAL INSULATION

#### 11.3.1. Thermal insulation

Duration: **ONE HUNDRED AND TWELVE MINUTES** (112 min)  
Cause of limitation: Loss of fire integrity

## 12. FIELD OF DIRECT APPLICATION OF THE TEST RESULTS

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The direct application field of the test results is limited to the determination of the permissible modifications of the test specimen following a successful fire resistance test. These modifications may be automatically introduced without the sponsor having to apply for any additional assessment, calculation, or agreement.

**Note:** When extended prescriptions concerning the dimensions of the element are considered, lower dimensions than the actual dimensions may be used for some elements of the test specimen in order to maximize the extrapolation of the test results by modelling the interaction between the elements at the same scale.

As the laboratory was not responsible for the sampling stage, thus the test results only apply to the tested specimen.

### General

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 stability, except with respect to the construction types covered in Annex A and Annex B of BS EN 1364-1:2015 where specific direct field of application rules are given.

- 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 panels but not thickness.
- e) decrease in stud spacing
- f) decrease in distance of fixing centres.
- g) increase in the number of horizontal joints, of the type tested, when tested with one joint not more than (500±150) mm from the top edge
- h) increase in the number of vertical joints, of the type tested.
- i) ~~the use of installations such as electrical sockets, switches, etc. when tested as illustrated in Figures 9, 10 and 11 of BS EN 1364-1:2015 with the installations not more than 500 mm from the top edge – not applicable~~
- j) horizontal and/or vertical joints, of the type tested.

### Extension of width

For test specimens tested without a supporting construction, the width of an identical construction may be increased if the specimen was tested at a minimum of nominally 3 m wide with one vertical edge without restraint.

~~For test specimens tested with a supporting construction, the width of an identical construction may be increased if the specimen was tested at a minimum of nominally 2,8 m wide with one vertical edge without restraint. – not applicable.~~

~~In case of EW classification, an increase in width of an identical construction is only allowed when the average unexposed surface temperature of any discrete area of the test specimen remains below 300 °C or the measured radiation remains below 6 kW/m<sup>2</sup>. In any other case, no increase in width is allowed. – not applicable.~~

### Extension of height

The height of the construction may be increased by 1,0 m under the following conditions:

- a) minimum tested height is 3 m when tested without a supporting construction or 2,8 m when tested with a supporting construction
- b) the maximum deflection of the test specimen was not in excess of 100 mm
- c) the expansion allowances are increased pro-rata

~~In case of EW classification, an increase in height of an identical construction is only allowed when the average unexposed surface temperature of any discrete area of the test specimen remains below 300 °C or the measured radiation remains below 6 kW/m<sup>2</sup>. In any other case, no increase in height is allowed – not applicable.~~

### Supporting constructions

The following rules for the field of application apply.

#### Standard supporting constructions – not applicable

~~a) For specimens tested in the test frame without any supporting construction, the result is applicable to high density rigid supporting constructions with at least the same fire resistance as the test specimen.~~

~~b) For specimens tested with any standard supporting construction as defined in EN 1363-1, the result is applicable to any other supporting construction of the same type (flexible or rigid) that has the same or a greater classified fire resistance (thicker, denser, more layers of boards, as appropriate) than the one used in the test and the same horizontal and/or vertical orientation, i.e.:~~

- ~~• only vertical if the specimen was tested with the standard supporting construction fixed along the vertical edge.~~
- ~~• only horizontal if the specimen was tested with the standard supporting construction fixed along the horizontal edge.~~
- ~~• both if the specimen was tested with the standard supporting construction fixed along both the horizontal and the vertical edge.~~

**Non-standard supporting constructions – not applicable**

~~The result of a test on a non-loadbearing wall tested in a non-standard supporting construction is only applicable to that construction.~~

### 13. STATEMENT

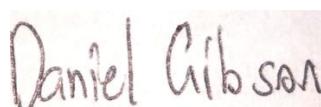
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This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, constructional 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.

27<sup>th</sup> October 2023

**SIGNED**



Daniel Gibson

Project leader

**APPROVED**



Maurice McKEE

Lab Manager





APPENDIX C: CHARTS

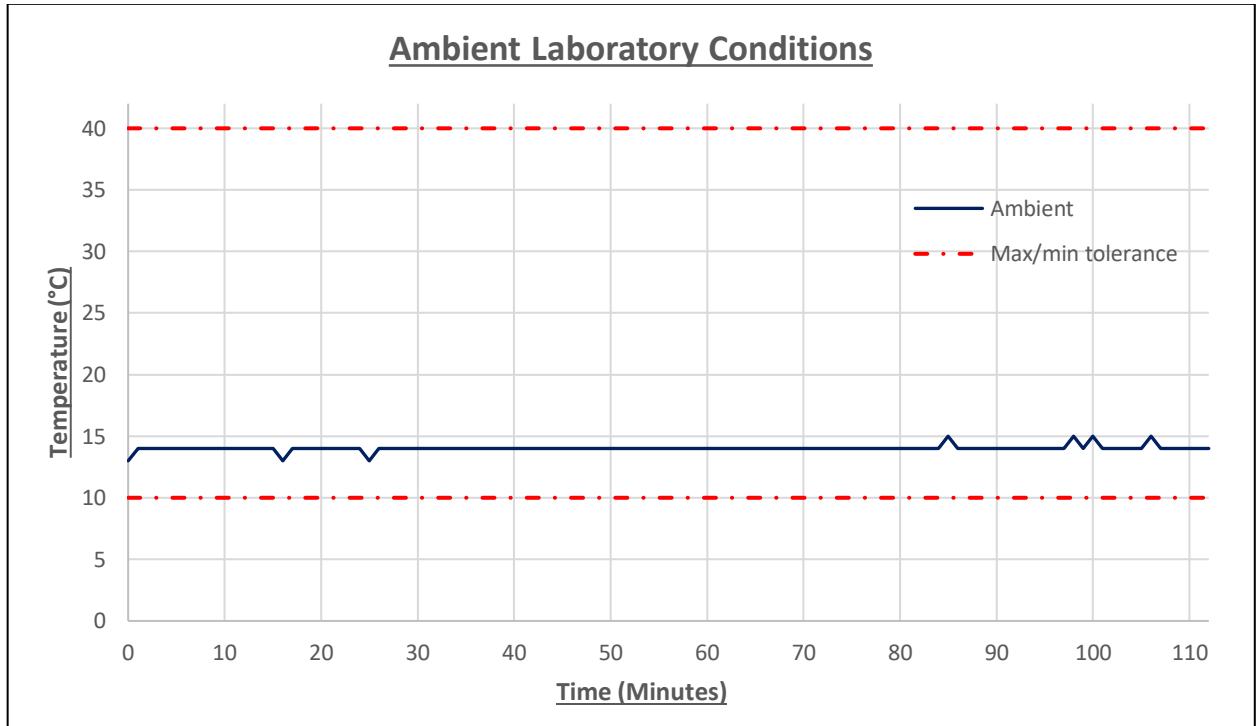


Chart 1 - Ambient temperature inside the laboratory during the test

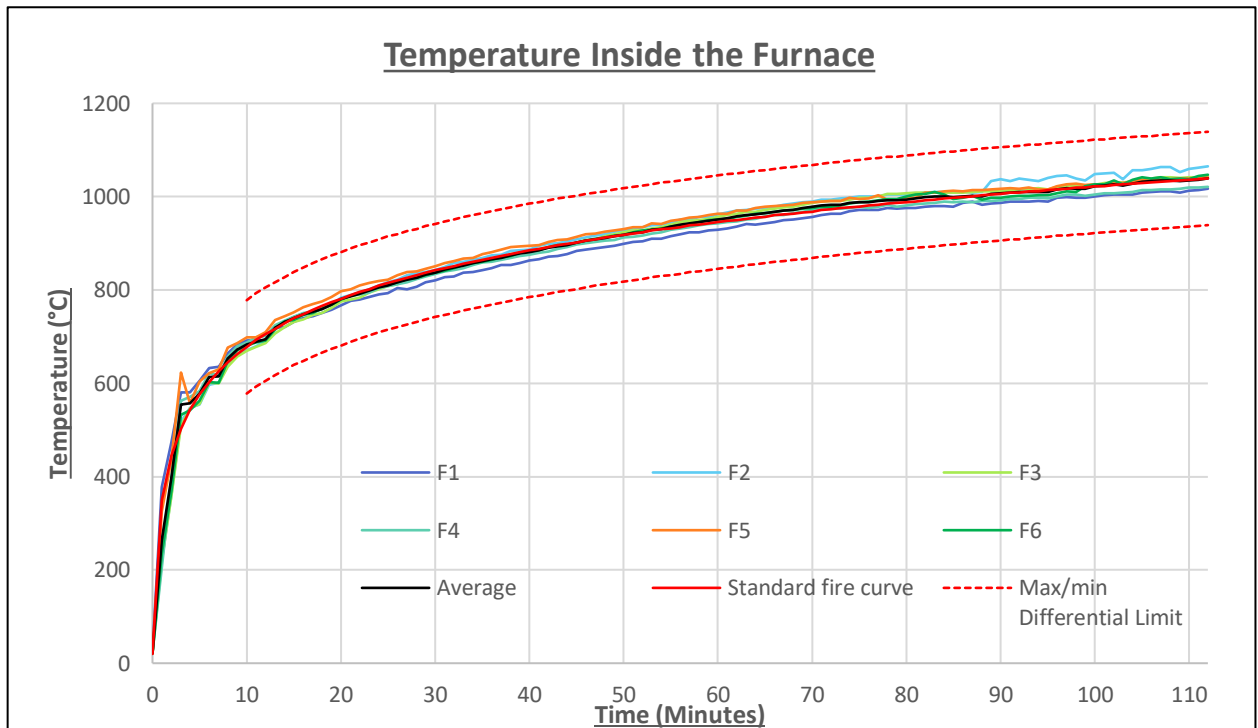


Chart 2 - Temperature inside the furnace, including the standard curve as reference.

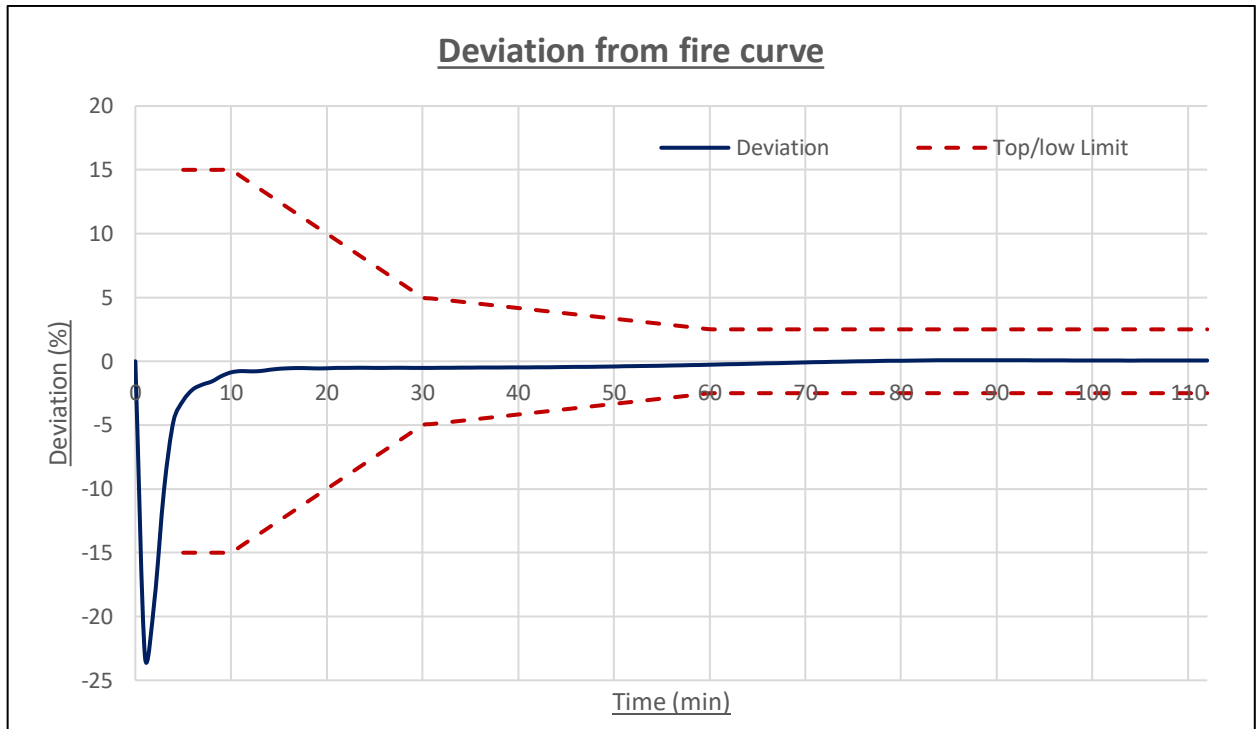


Chart 3 - Deviation from the theoretical fire curve

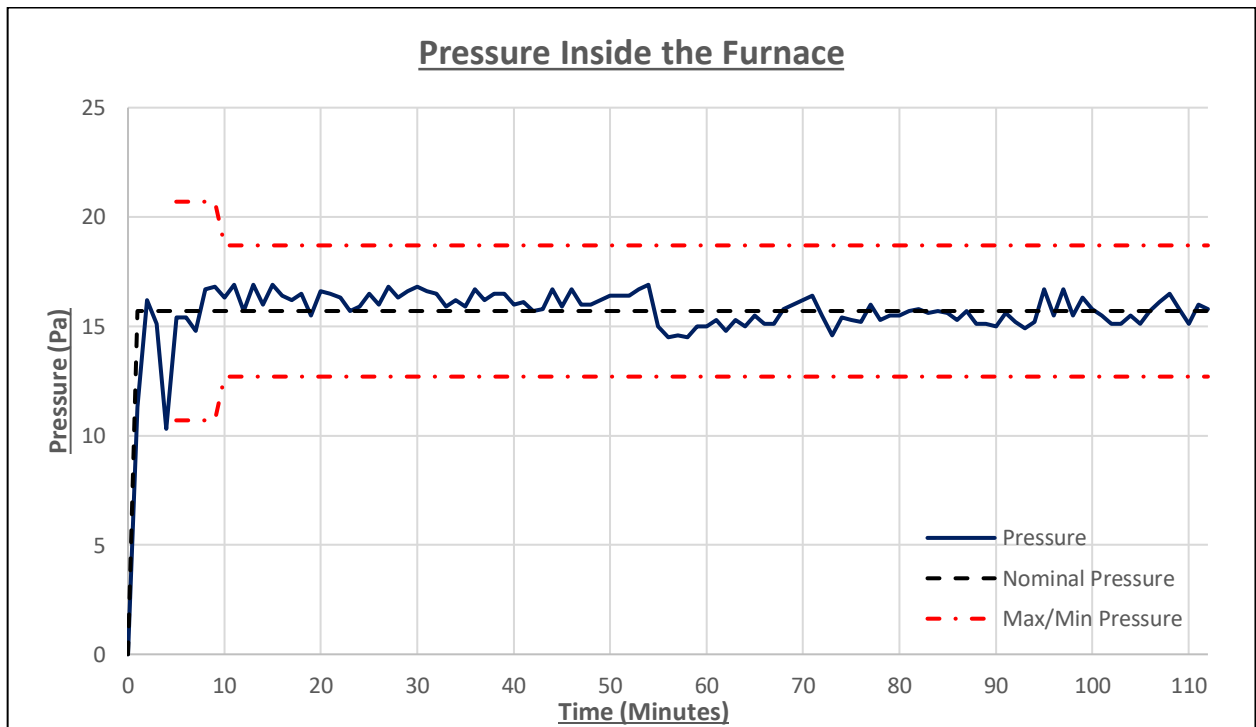


Chart 4 - Pressure conditions inside the furnace

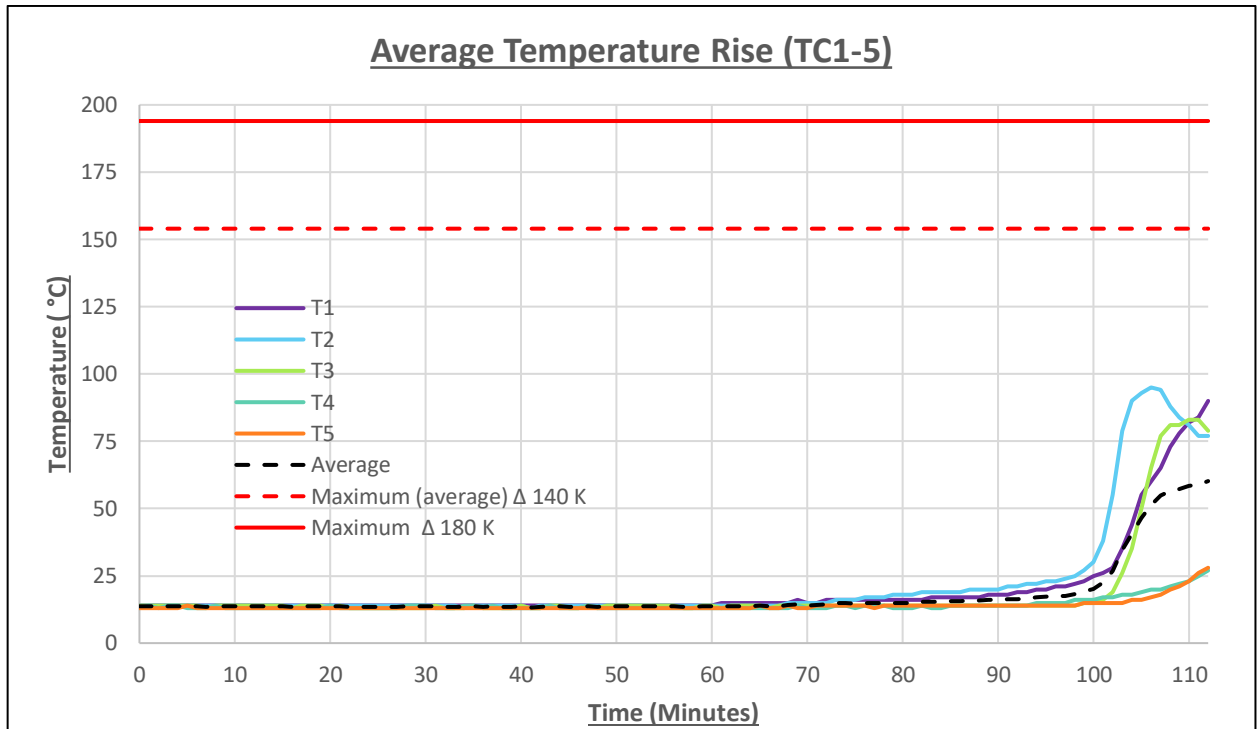


Chart 5 - Average temperature rise on unexposed surface of the specimen

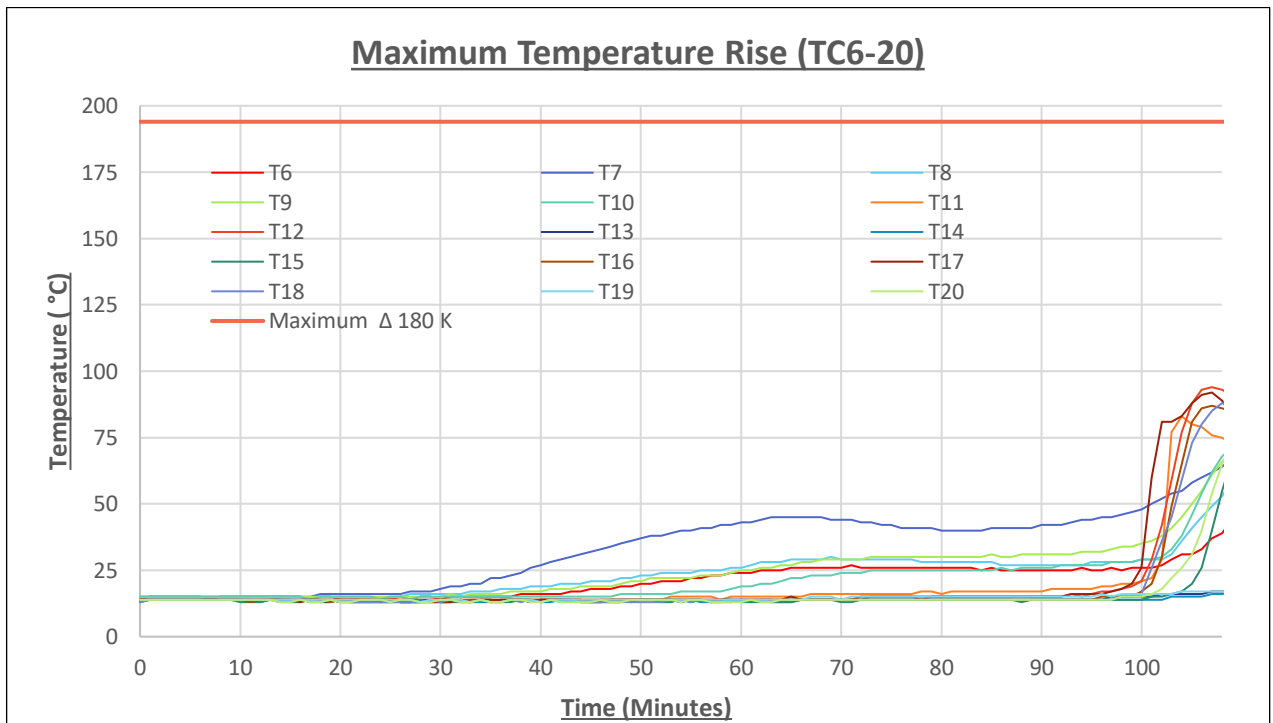


Chart 6 - Maximum temperature rise on the unexposed surface of the specimen

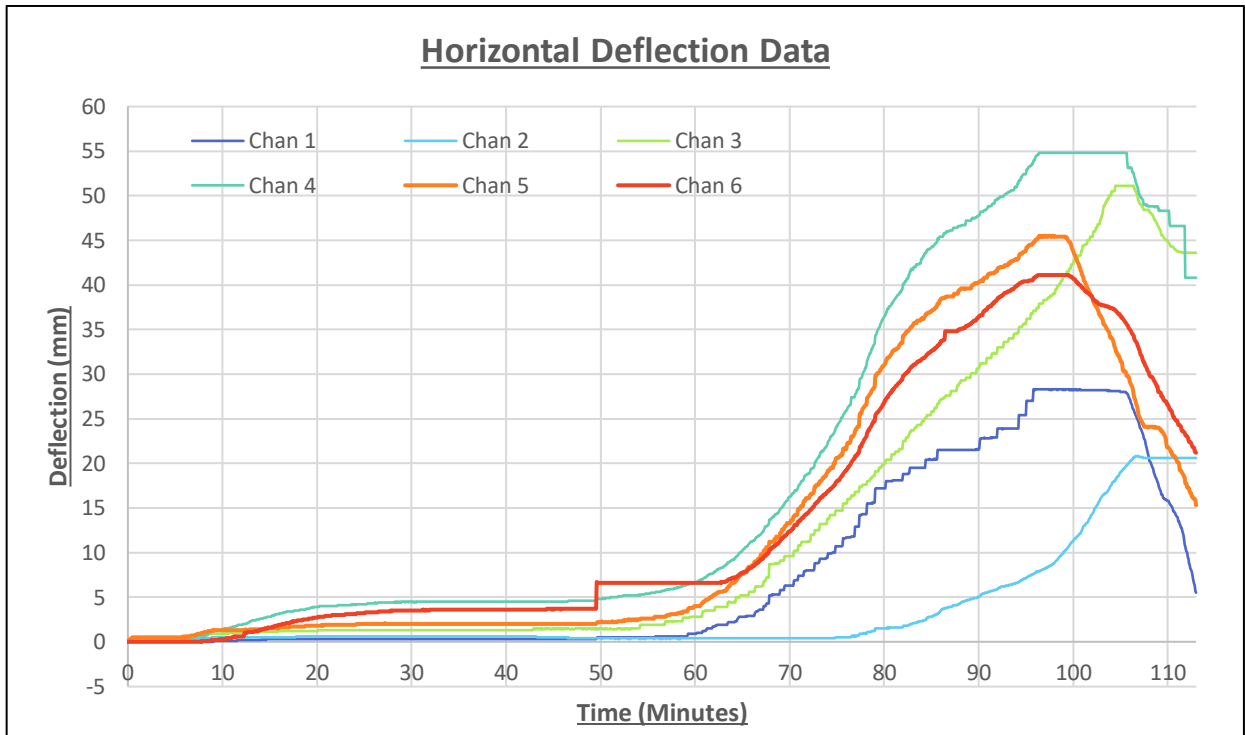


Chart 7 – Horizontal deflection recorded during the test

**Note:** Increase in value represents movement towards the inside of the furnace.

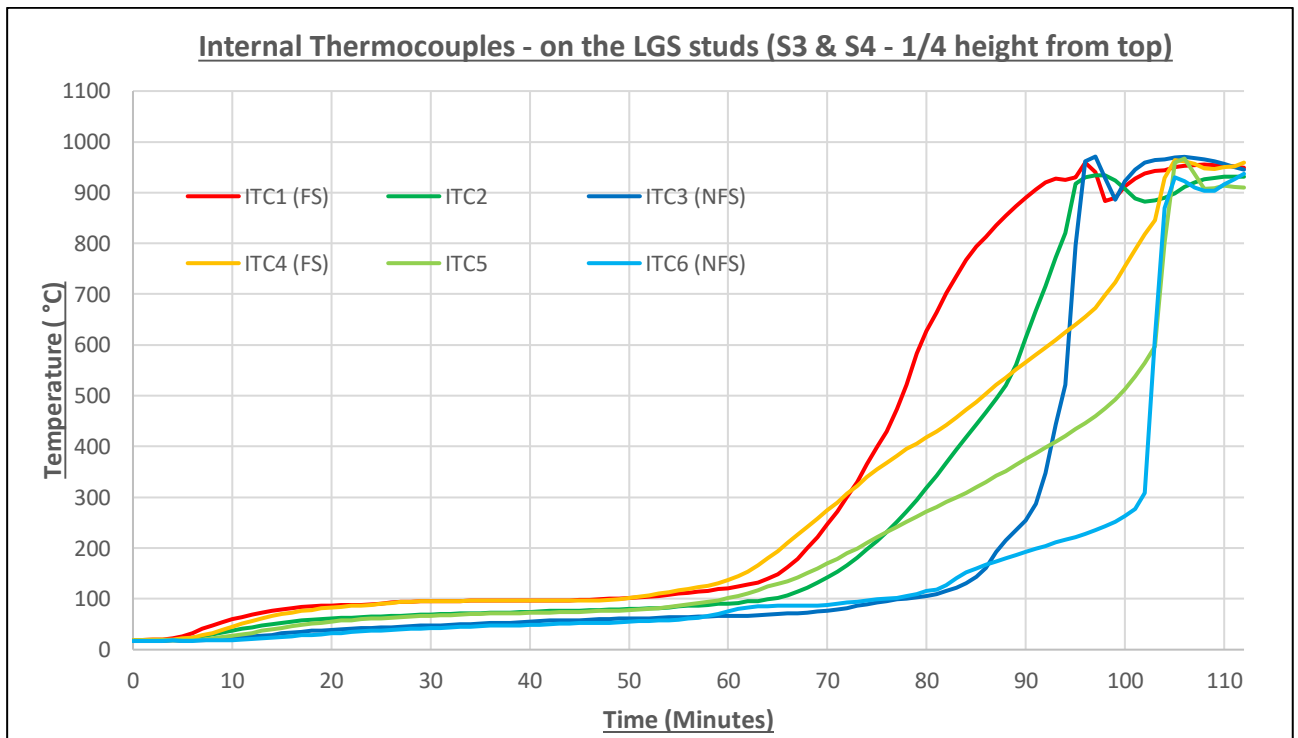


Chart 8 - Informative chart for the Sponsor - Temperature on the LGS frame – Stud 3 and 4 – 750 mm below the head of the sample

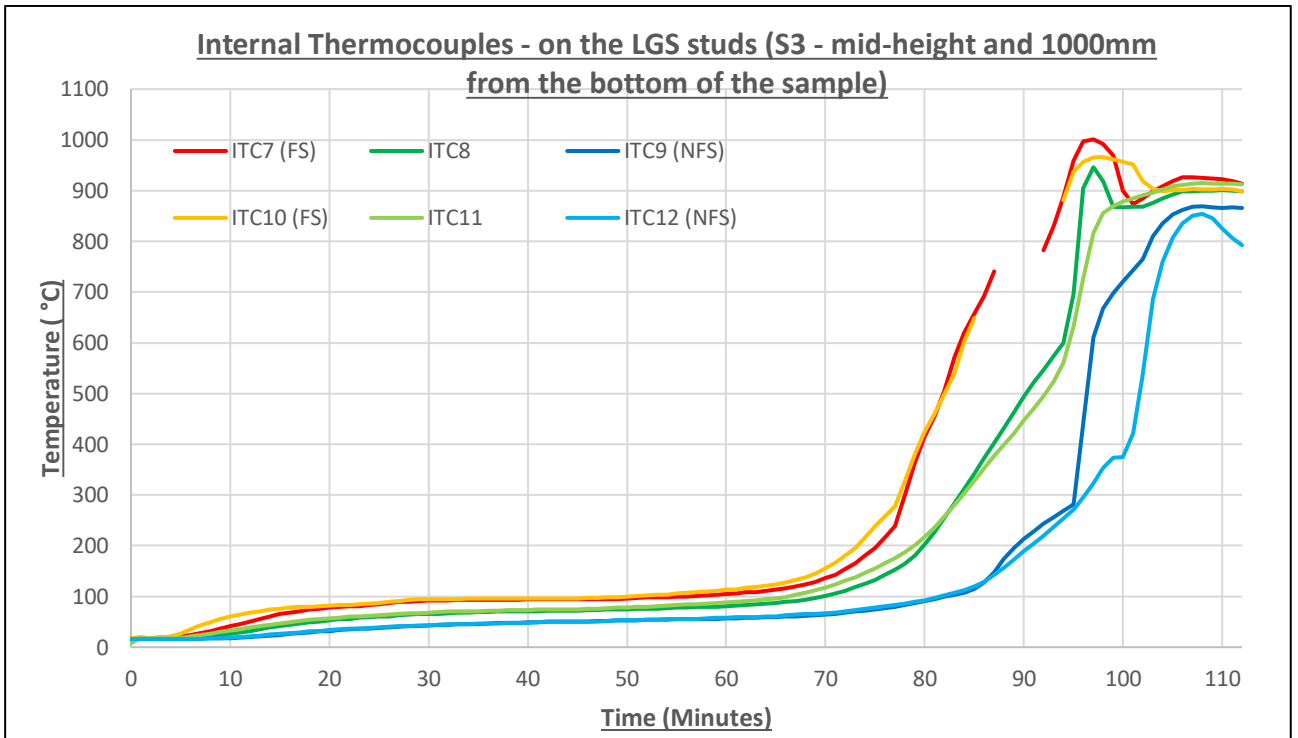


Chart 9 - Informative chart for the Sponsor - Temperature on the LGS frame – Stud 3 – mid-height and 1000 mm from the bottom of the sample

**Note:** Internal thermocouples 7 and 10 malfunctioned during minutes 88 and 91 (ITC 7) and between minutes 86 and 93 (ITC10). All data recorded in that interval was disregarded

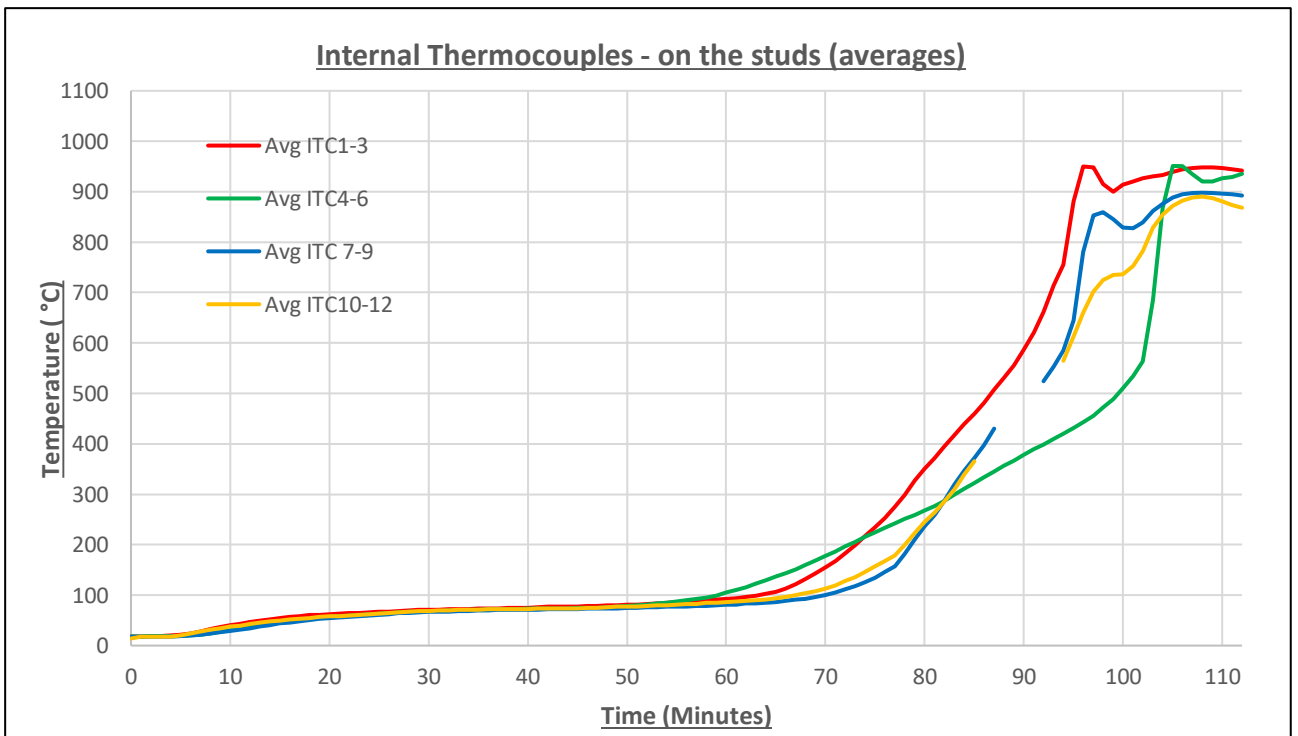
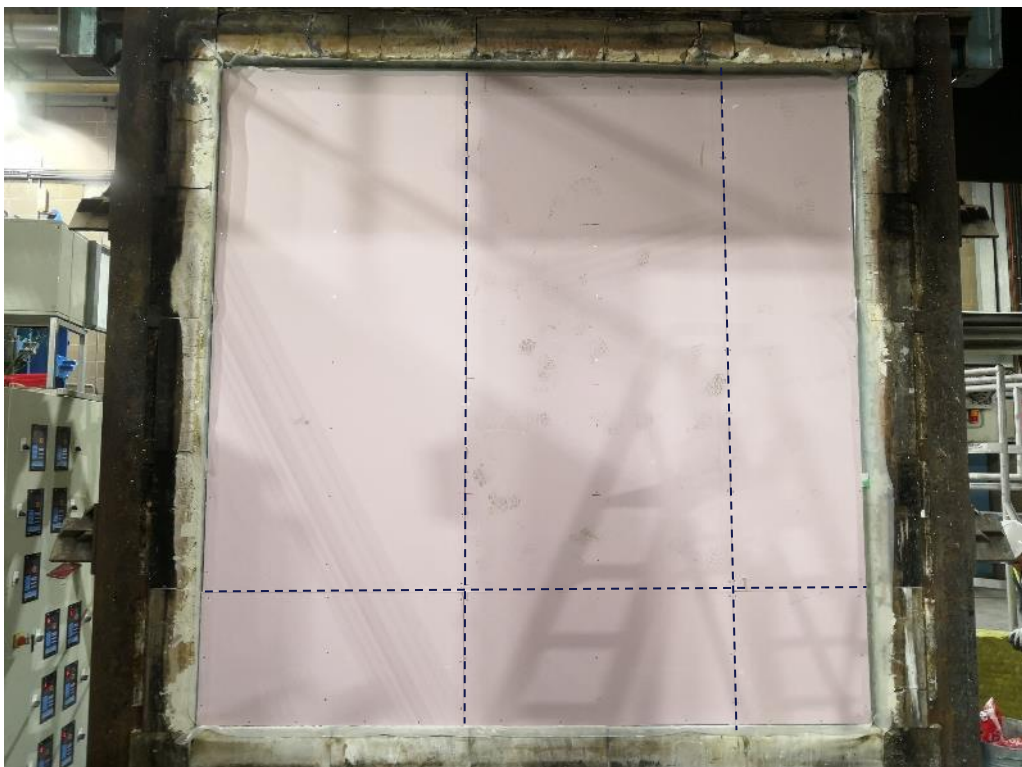


Chart 10 - Informative chart for the Sponsor - Temperature on the LGS frame – averages

**APPENDIX D: PHOTOGRAPHS**



Photograph 1 – Overall view of the sample frame during construction (viewed from the unexposed side). Note the layout of the frame and the installation of part of the VCL membrane – free edge on the left-hand side



Photograph 2 – Overall view of the exposed side of the sample during construction. Note the layout of the internal layer of plasterboard (highlighted) – free edge of the sample on the right-hand side.



Photograph 3 – Detail of the exposed side of the sample during construction. Note the location of the fixing strap and staggered layout of the boards between layers.



Photograph 4 – Overall view of the sample during construction. Note the stone mineral wool installed between the studs.



Photograph 5 – Overall view of the unexposed side of the sample during construction. Note the layout of the sheathing boards (tape applied over the joints) – free edge of the sample on the left-hand side



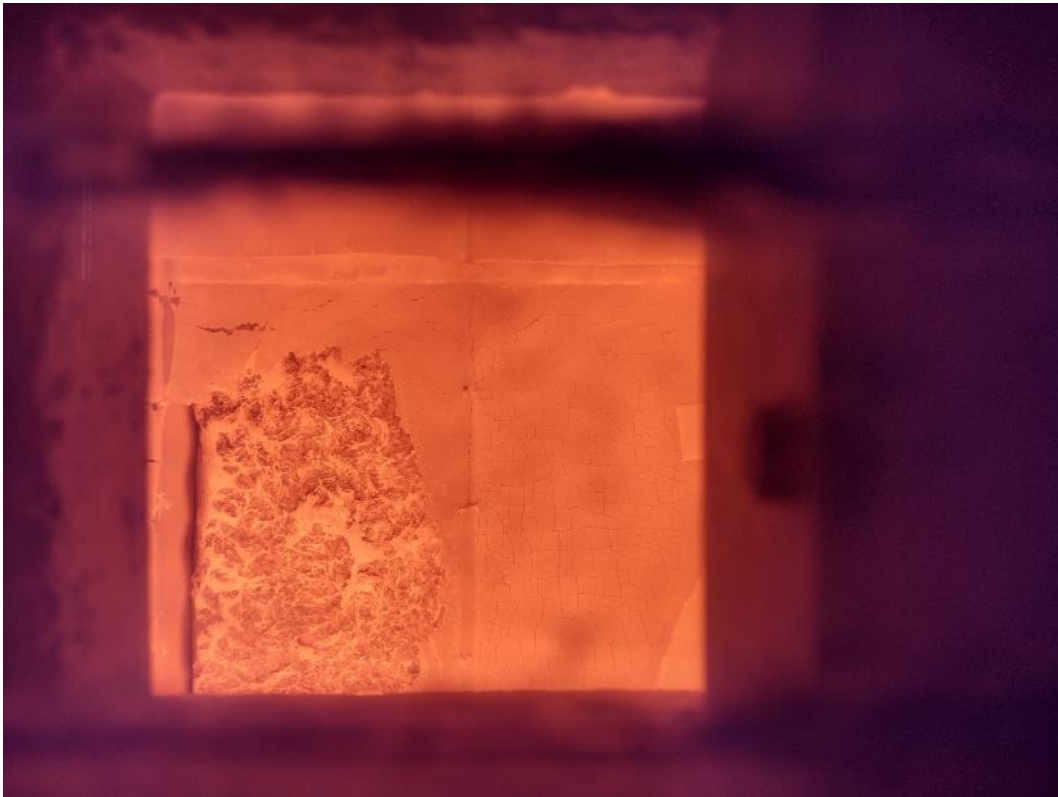
Photograph 6 – Overall view of the sample before the test. Note the layout of the rainscreen slabs and the location of the fixings.



Photograph 7 – Detail of the exposed side of the sample during the test. Note the general aspect of the joints. Photograph taken during minute 28.



Photograph 8 – Detail of the exposed side of the sample during the test. Note the internal layer of plasterboard visible, after the collapse of the external layer. Photograph taken during minute 76.



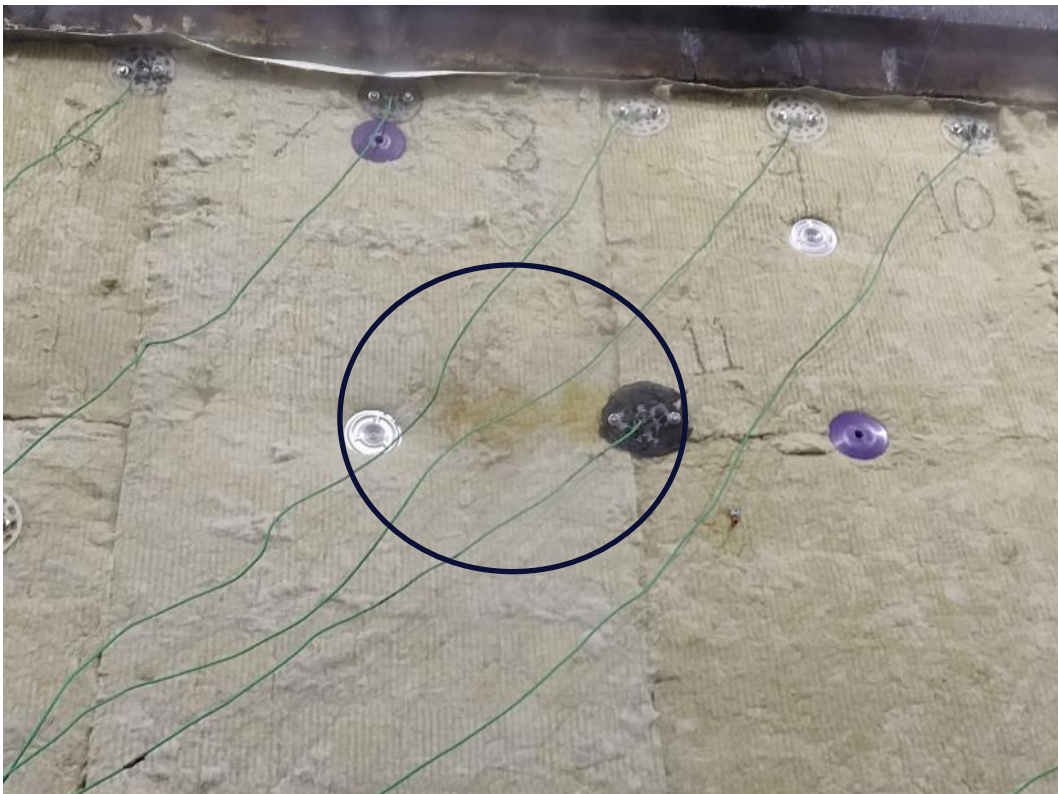
Photograph 9 – Detail of the exposed side of the sample during the test. Note insulation visible after the collapse of part of the internal layer of plasterboard. Photograph taken during minute 95.



Photograph 10 – Detail of the exposed side of the sample during the test. Note exposed side of the sheathing board visible after the collapse of part of the insulation fitted between the studs. Photograph taken during minute 98.



Photograph 11 – Detail of the exposed side of the sample during the test. Note the cracks on the sheathing board (highlighted). Photograph taken during minute 105.



Photograph 12 – Detail of the unexposed side of the sample. Note discolouration of the surface of the rainscreen slabs. Photograph taken during minute 110.



Photograph 13 – Overall view of the unexposed side of the sample. Note the time and location of the positive cotton pad test used to determine loss of fire integrity.



Photograph 14 – Overall view of the unexposed side of the sample before cooldown and removal from the furnace.



Photograph 15 – Overall view of the exposed side of the sample after cooldown and removal from the furnace.



Photograph 16 – Detail of the exposed side of the sample after cooldown and removal from the furnace. Note the discolouration on the sheathing boards, visible after removal of the insulation.



Photograph 17 – Detail of the unexposed side of the sample after cooldown and removal from the furnace. Note the aspect of the sheathing board and breather membrane after removal of the rainscreen insulation

## APPENDIX E: ADDITIONAL INFORMATION ON THE COMPONENTS USED

The following information was supplied by the Sponsor, who requested to have it included in this test report. The testing lab could not verify this information.

Name of layer	Brand name	Batch no	Density or weight of product	D.O.M	Thickness	Product standard
Head track high density mineral wool	RW5 (or equivalent density stonewool)	181200001 FO-NO 45544802	100kg/M3	NOT ON THE PACK	original product 100mm cut to fit deflection head detail	BS EN 13162
Breather membrane	Kingspan Nilvent	1210769 1225/1/2014	N/A		Less than 1mm	EN 13859-1
Mineral wool between the metal frame	Kingspan K-Roc FS	8584708 - 2803683	28-32 kg / m3	10.09.2021	100mm	BS EN 13162
Mineral wool fixed over the y wall sheathing	Kingspan K-Roc RS	8573339 - 2757905	45 kg/m3	28.05.21 15.41	100mm	BS EN 13162
Calcium Silicate, fibre cement sheathing board	RCM – Y-Wall	8331210226024	1200kg/m3	09/04/2021	12mm	BS EN 12467
Tapcon Anchor for concrete	Spit - 4H32	921501	N/A	Unknown	N/A	EAD 330747-00-0601
Self Drilling Fixing - SFS	Spit - CFC26	1DD160041A02	N/A	Unknown	N/A	
Self Drilling Fixing - Plasterboard	TIMco 00032PSDD	T2008/7162	N/A	Unknown	N/A	BS EN 14566:2008
Self Drilling fixing - Plasterboard	TIMco 00042PSDD	T2008/7071	N/A	Unknown	N/A	BS EN 14566:2008
Self Drilling fixing – Sheathing Board	Ejot – WDLS 5.5 x 50	QC3534090 9900102415	N/A	Unknown	N/A	
Gypsum Plasterboard with glass fibre	Gyproc Fireline board 15mm	5015341017261	11.7kg/m2		15mm	EN 520
Ready Mixed Jointing cement	Gyproc Promix Lite Joint Cement	A/N27604/0 5015341276040	N/A	TBC	N/A	EN 13963

Paper jointing tape	Gypsum Gyproc Joint Tape	<b>No batch</b>	N/A	29/04/2021	N/A	EN 13963
Plasterboard fixing strap	Gyproc Fixing Strap	<b>No markings</b>	N/A	No markings	N/A	EN 14195
Plasterboard securing angle	Gypsum Gypframe Steel Angle	<b>No markings</b>	N/A	TBC	N/A	EN 14195
Visqueen AVCL	Visqueen	<b>RS010237</b>				EN 13984
AVCL tape	Visqueen vapour lap tape And pro double sides tape	<b>RS 020737</b> <b>Double sided</b> <b>RS 060717-</b> <b>50m -20mm</b> <b>wide</b>			<b>75mm wide</b> <b>-15 metre</b> <b>roll</b>	EN 13984
SFS	Kingspan metal frame	<b>C100050120</b> <b>Floor track-</b> <b>U104055120</b>			<b>1.2mm</b>	EN 1090-1
	Kingspan metal frame-head track	<b>U104067180</b>			<b>1.8mm</b>	EN 1090-1

END OF TEST REPORT