FIRE TEST REPORT EUI-23-B-000462

According to BS EN 1363-1: 2020 and BS EN 1365-1: 2012.

Test	EUI-23-B-000462
Performed on	19th December 2023
Regarding	ECOLIT – Loadbearing wall Total Load applied: 56kN.
Sponsor	ECOLIT Lismullen, Garlow cross C15 R273 Navan IRELAND

UKAS TESTING

10169

1. DOCUMENT TRACKING

Revision Index.	*Modification*
0	Original document

2. SCOPE OF THIS TEST REPORT

Fire resistance test regarding a loadbearing wall, according to the general requirements of the standards BS EN 1363-1:2020 and to the specific requirements of the standard BS EN 1365-1: 2012.

The results reflect the loading, heating and pressure conditions described in Chapter 8, and only to the sample tested with fire on a particular side, as described in sub-section 8.5. Additional testing might be required to fully evaluate the fire resistance performance of the element when exposed to the opposite side.

3. TEST LABORATORY

EFECTIS UK & IRELAND
Shore Road
Jordanstown
BT37 0QB County Antrim
Northern Ireland

4. REFERENCE AND MANUFACTURER OF THE TESTED SPECIMEN

Reference: ECOLIT – Loadbearing wall
Total Load applied: 56kN.

Manufacturer: ECOLIT
Lismullen, Garlow cross
C15 R273 Navan
IRELAND

5. FURTHER INFORMATIONS FOR UKCA/UKNI MARKING

(Chapter not covered under the UKAS's accreditation)

The tested sample has not been subject of a sampling; thus, the results apply to the sample as received.

6. DESCRIPTION OF THE TESTED SPECIMEN

Technical data in this chapter and drawings in Appendix A concerning the sample and its composition have been supplied by the sponsor who attests their accuracy.

6.1. GENERAL

See Appendix A for a detailed description of the sample.
The element is an asymmetrical load-bearing wall composed of the following layers:

A 150mm Terrakon Steel Frame with 9 studs.
A layer of 12 mm Cemrock Extreme x4 with Airflex Insulation on the exposed side.
A layer of 12 mm Cem-Rock with a 25mm steel top and Airflex Insulation on the unexposed side.
A layer of HOME ISO insulation, which consists of a single 140mm thick layer made from polyester fibres, positioned between the steel frames.

- Element: 3000 x 3000 x 221mm (w x h x th).
- Clear opening: 3060 x 3000mm (w x h).

6.2. LIST OF THE COMPONENTS

According to the information supplied by the sponsor.

Name	*Reference*	*Characteristics*	*Material*	*Supplier*
Steel Frame	Terrakon Ecolit Steel Framed System	150 x 50 x 1.6mm (d x w x th)	Galvanised Steel	MERIDIAN STEEL UK
Frame Fixing	Evolution Panhead Screw	5.5 x 19mm (Ø x L) Self drilling screw	Galvanised Steel	EVOLUTION
Insulation Between Studs	Airgreen HOME ISO	Thickness: 140mm Thermal conductivity: 0.035 W/mK Thermal resistance: 1,71–5,14 m^2K/W Density: 20 kg/m^3 (stated)	Nonwoven Fabric made from100% Polyester Fibres	AIRGREEN
Vapour Control Layer	Airflex Insulation	Thermal Conductivity: 0.032 W/mk Thermal Resistance: 0.30 mk/w Fire Resistance Classification: Euroclass C	Aluminium Vapour Control Layer	
Adhesive to Secure VCL	Insulation Sealing Tape	70mm wide	Aluminium Tape	
Strips over studs/ Board joints Board (Exposed side)	Cem-Rock eXtreme X4 12mm	12 x 1200 x 2400mm (th x w x L) Reaction to fire classification (EN 13501-1:2013) A1 (non-combustible) Thermal Conductivity (EN ISO 10456): 0.23 W/Km Density : 935 kg/m^3 (stated)	Cement Board	CEMROCK
Strips Fixing	Evolution 40 x 5.5mm screw	5.5 x 40mm (Ø x L) Self drilling screw	Galvanised Steel	EVOLUTION
Board Fixing	Evolution 50 x 5.5mm screw	5.5 x 50mm (Ø x L) Self drilling screw		
Steel Top Hut	SFS Hat Channel	25 x 3000mm (D x L)	Steel Formed Sections	MONAGHAN
Board (Unexposed Side)	Cem-Rock 12mm	12 x 1200 x 2400mm (th x w x L) Reaction to fire classification (EN 13501-1:2013) A1 (non-combustible) Thermal Conductivity (EN ISO 10456): 0.2 W/Km Density : 950 kg/m^3 (stated)	Cement Board	CEMROCK

Intumescent Sealant	Firecryl FR	Density: Ca. 1,57 g/ml Fire resistance: (EN 13501-2) 310 ml cartridge	Acrylic Dispersion	SOUDAL
Jointing Tape	Gyproc – Paper joint tape	Width: 50mm Reaction to fire: Type 1B/3B: A1 Type 3A: A2-s1, d0	Paper Tape	GYPROCK
Jointing Compound	Light wieght Jointing Compound	Nominal weight: 17 kg Colour: Off-White	Limestone filler with a lightweight aggregate and additives	Panel-Rock

th = Thickness --- Ø = Diameter --- L = Length --- h = Height --- th = Thickness --- w = Width --- d = Depth

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. Steel framing system

The light-gauge steel frames were constructed using nine galvanized steel studs as a referenced as, Terrakon Ecolit Steel Framed System (MERIDIAN STEEL UK) stud profiles measuring 150 x 50 x 1.6mm (d x w x th). The studs were positioned at 400mm centres (intermediate) and 200mm from the perimeter to the centreline on the first studs. They were installed between the head and floor track.

In addition, one horizontal nogging was placed between stud 1 and stud 3, positioned 600mm from the top horizontal head. Another horizontal nogging was placed between stud 3 and stud 6, positioned 600mm from the bottom horizontal head. Finally, one horizontal nogging was placed between stud 6 and stud 9, positioned 600mm from the top horizontal head.

The frame elements were secured together using self-drilling screws, specifically the reference panhead screw (EVOLUTION), measuring 5.5 x 19mm (Ø x L). One screw was used at each intersection.

Refer to Appendix A, Drawing 01.

6.3.2. Insulation between the steel frames

A single layer of 160mm thick HOME ISO (AIRGREEN), polyester fibre wool insulation, was installed between the light-gauge steel frames.

6.3.3. Exposed side

The vapor control layer, referred as Airflex Insulation (AIRGREEN) and measuring 6mm in thickness, was positioned above the steel frame system and secured using an Aluminium tape sealing adhesive tape (AIRGREEN).

Additionally, strips, referenced as Cem-Rock eXtreme X4 (CEMROCK) and measuring 50 x 12mm (w x th), were vertically affixed over the studs and at horizontal board joints. These strips were attached to the panels using 5.5 x 40mm (Ø x L) screws, referenced as Evolution 40 x 5.5mm screw (EVOLUTION), at 300mm intervals.

The cement board, referenced as Cem-Rock eXtreme X4 (CEMROCK) and measuring 12mm in thickness, was secured using 5.5 x 50mm (Ø x L) self-drilling screws, referenced as Evolution 50 x 5.5mm screw (EVOLUTION). These screws were placed at 300mm intervals into the strips.

An intumescent sealant, referenced as Firecryl FR Intumescent Sealant (SOUDAL), was applied at every joint.

6.3.4. Unexposed side

The vapor control layer, referred as Airflex Insulation (AIRGREEN) and measuring 6mm in thickness, was positioned above the steel frame system and secured using an adhesive referenced as an Aluminium tape sealing adhesive tape (AIRGREEN).

The Steel Top Hat, identified as SFS hat channel (MONAGHAN) with dimensions of 25 x 3000mm (d x L), was a steel-formed section intended to establish a cavity for the Airflex and offer support for the outer cement board attached to the frame. These top hats were positioned at 600mm horizontal intervals.

Additionally, the strips, referenced as Cem-Rock eXtreme (CEMROCK) measuring 50 x 12mm (w x th), were vertically fixed over studs. They were affixed to the panels using 5.5 x 40mm (Ø x L) screws, referenced as Evolution 40 mm x 5.5mm screw (EVOLUTION), at 300mm intervals.

The cement board, referenced as Cem-Rock board (CEMROCK) and measuring 12mm in thickness, was secured using 5.5 x 55mm (Ø x L) self-drilling screws, referenced as Evolution 50 x 5.5mm screw (EVOLUTION). These screws were placed at 300mm intervals into the strips.

An intumescent sealant, referenced as Firecryl FR Intumescent Sealant (SOUDAL), was applied at every joint.

6.3.5. Finishing

The joints on both the exposed and unexposed sides were taped using paper joint tape (GYPROCK) and finished with Lightweight Jointing Compound (PANEL-ROCK) Screw fixings were also finished with jointing compound.

6.4. VERIFICATION

The tested element was constructed in the lab 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 have been carried out by the sponsor.

7.2. RESTRAINT/FREE EDGE

Both vertical edges of the specimen were left unrestrained by packing the gaps between the frame and the sample with high-density stone mineral wool, to provide a seal without restricting freedom of movement.
The sample was kept in place by the testing frame loading beam.

7.3. ASSEMBLY OF THE TESTED SPECIMEN

7.3.1. 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: 3060 x 3000 mm (w x h).

7.3.2. Staff

The supporting construction has been 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. LOAD APPLIED

The total loading applied to the test specimen during the test was 56 kN. The applied loading was based on the calculation done by the sponsor. The loading was calibrated in advance of the test and was applied uniformly across the top horizontal edge via a loaded beam.

The following loadbearing failure criteria were calculated according to the standard BS EN 1363-1:2020.

- Limiting total deflection: 30 mm.
- Limiting rate of deflection: 9 mm/min.

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 500mm 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 15.7Pa, equating to a pressure of 20 Pa at the head of the sample.

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

Where :

t = *Time (min).*
T = *Furnace temperature at time t (°C).*

8.5. FIRE SIDE

The fire test was performed with the following fire side exposed:
Single layer of Cem-Rock eXtreme X4, 12mm thick cement board.

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 six 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 19 external thermocouples according to the requirements of the standard BS EN 1363-1:2020 and located according to the standard BS EN 1365-1:2012.

See Diagram 1, Appendix B for the plot of the instrumentation, and Charts 5 to 6, Appendix C for the measurements recorded during the test.

Location	*Markings*	*Appendix*
On the centre of the quadrant	1, 2, 4, 5	B
On the geometric centre of the specimen	3	
At the head of the specimen in line with a stud	6, 7, 9, 10	
At the head of the sample, at mid-width	8	
At mid-height, 150mm in from the free edges	11, 14	
At mid height of the specimen in line with a stud - adjacent to a vertical joint	12, 13	
At the head of the sample, in line with a stud - adjacent to a vertical joint	15, 17, 18, 19	
At the mid-width - adjacent to a vertical joint	16	

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, the deflection located in both vertical and horizontal orientations 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 vertical deflection was measured using two gauges at the top left and top right corners, 50 mm from the edge of the sample. The horizontal deflection was measured at mid-height, 50 mm from the edges of the sample and at its geometric centre.

Location	*Markings*	*Appendix*
Vertical deflection – 50 mm from the edge of the sample	1 (left), 2 (right)	B
Horizontal deflection – 50 mm from the edge of the sample	3 (left), 5 (right)	
Horizontal deflection – centre of the sample	4	

See Diagram 1, Appendix B for the plot of the instrumentation and Charts 7 to 9 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

Time (min)	Specimen	Observations
-15	ES/NES	Load applied.
00	ES/NES	Start of the test.
15	ES/NES	NSC
23	ES	The board joint 600mm from the left-hand side widened.
30	NES	NSC
33	ES	The gaps between the board joints have widened.
41	ES	There were flames between the board joints.
45	NES	NSC
51	ES	The gaps between the joints widened further. More flames were visible.
60	NES	Smoke was released from the screw holes on the mid full board.
62	ES	The gaps between the joints widened further.
87	ES	There were more flames from the board joints on the mid portion.
90	NES	NSC
90	NES	**End of test at the request of the sponsor.**

ES = exposed side --- NES = non-exposed side --- NSC = No significant change.

10.3. AFTER THE TEST AND COOL DOWN

Please see Appendix D, Photograph 17 & 18.

11. FIRE RESISTANCE CRITERIA

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

11.1.1. Cotton wool pad

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

11.1.2. Gap gauges

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

11.1.3. Sustained flaming.

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

11.2. THERMAL INSULATION

11.2.1. Thermal insulation

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

11.3. LOAD-BEARING CAPACITY

11.3.1. Deflection

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

11.3.2. Rate of deflection

Duration: **NINETY MINUTES (90 Min)**
Cause of limitation: No Failure - End of test at the request of the sponsor.

12. FIELD OF DIRECT APPLICATION OF THE TEST RESULTS

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 sample as tested.

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:

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 of 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.~~
h) decrease in the applied load.
i) increase in the width provided that the specimen was tested at full width or 3 m wide, whichever is the larger.

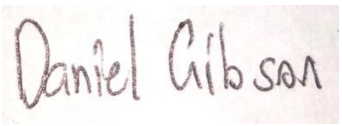
13. STATEMENT

"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".

14th March 2024

SIGNED **APPROVED**

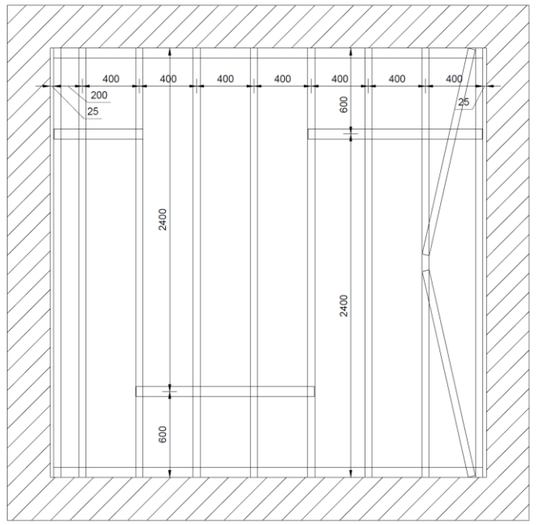


Daniel Gibson
Project leader

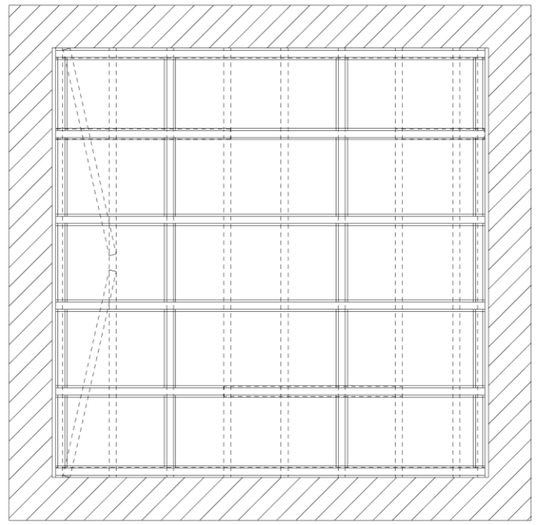
Maurice McKee
Lab Manager

APPENDIX A: DRAWINGS

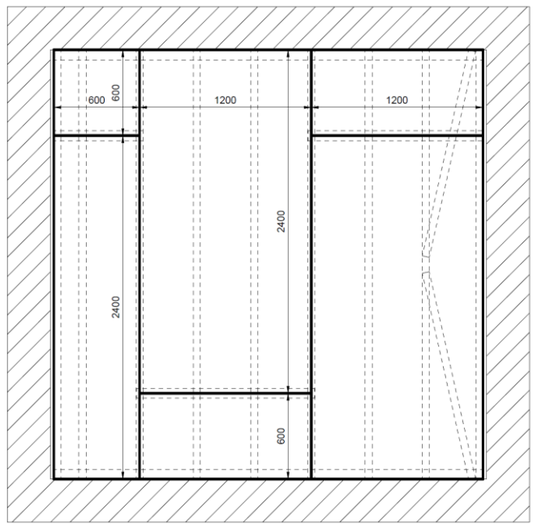
Frame layout
Exposed side view (Inside)



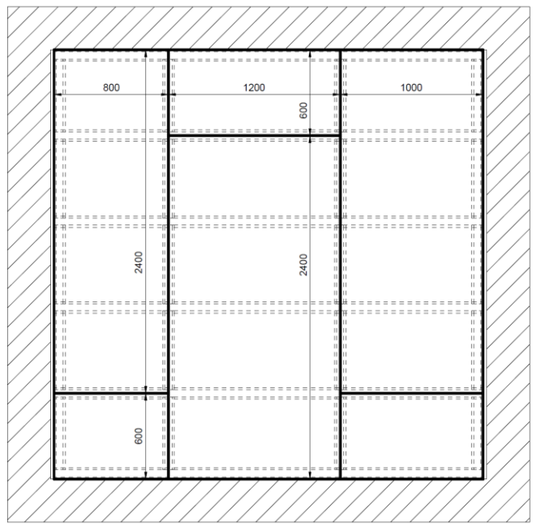
Frame layout (top hut)
Unexposed side view (Outside)



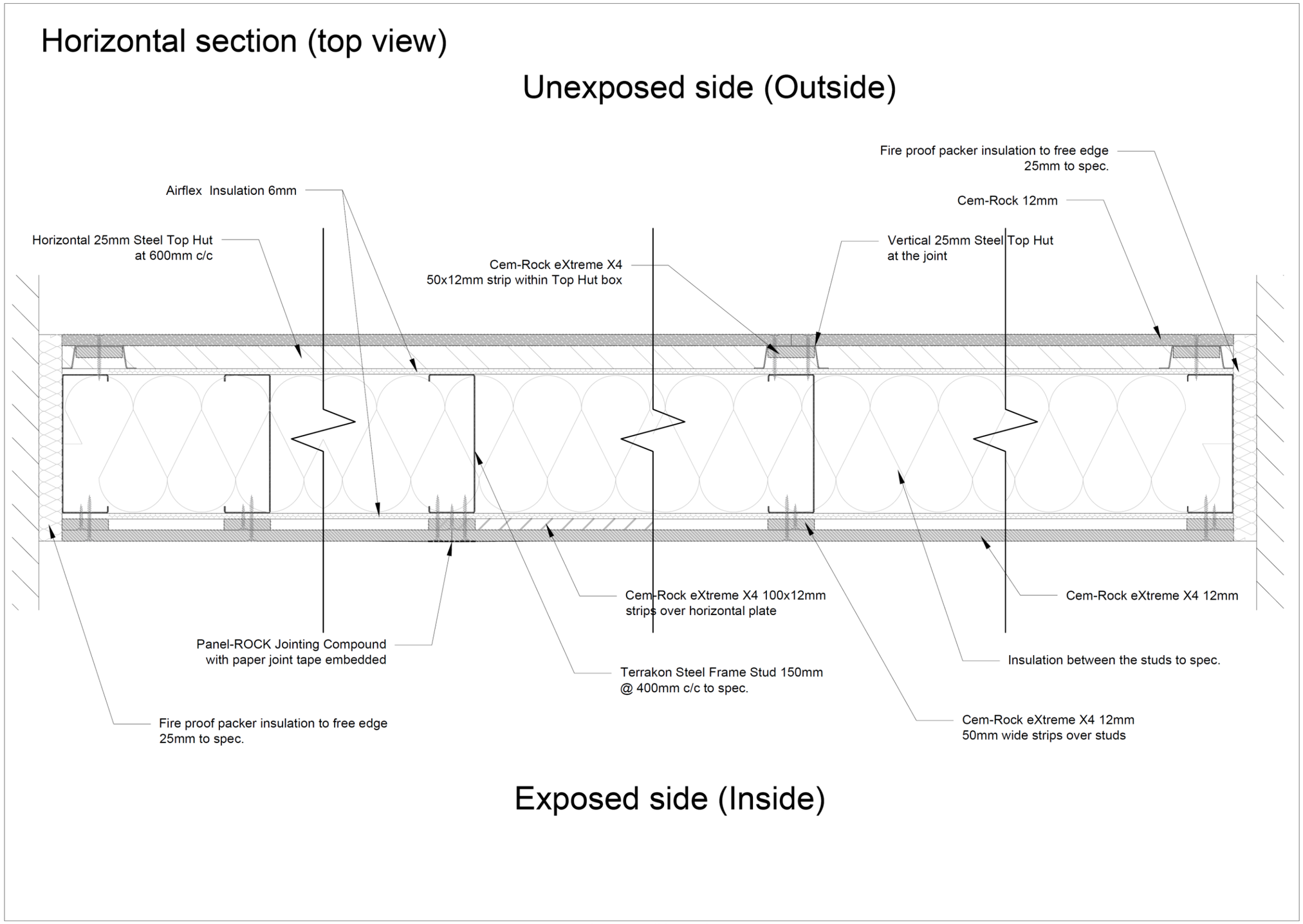
Boards layout - Exposed side (Inside)
12mm Cem-Rock eXtreme X4 board



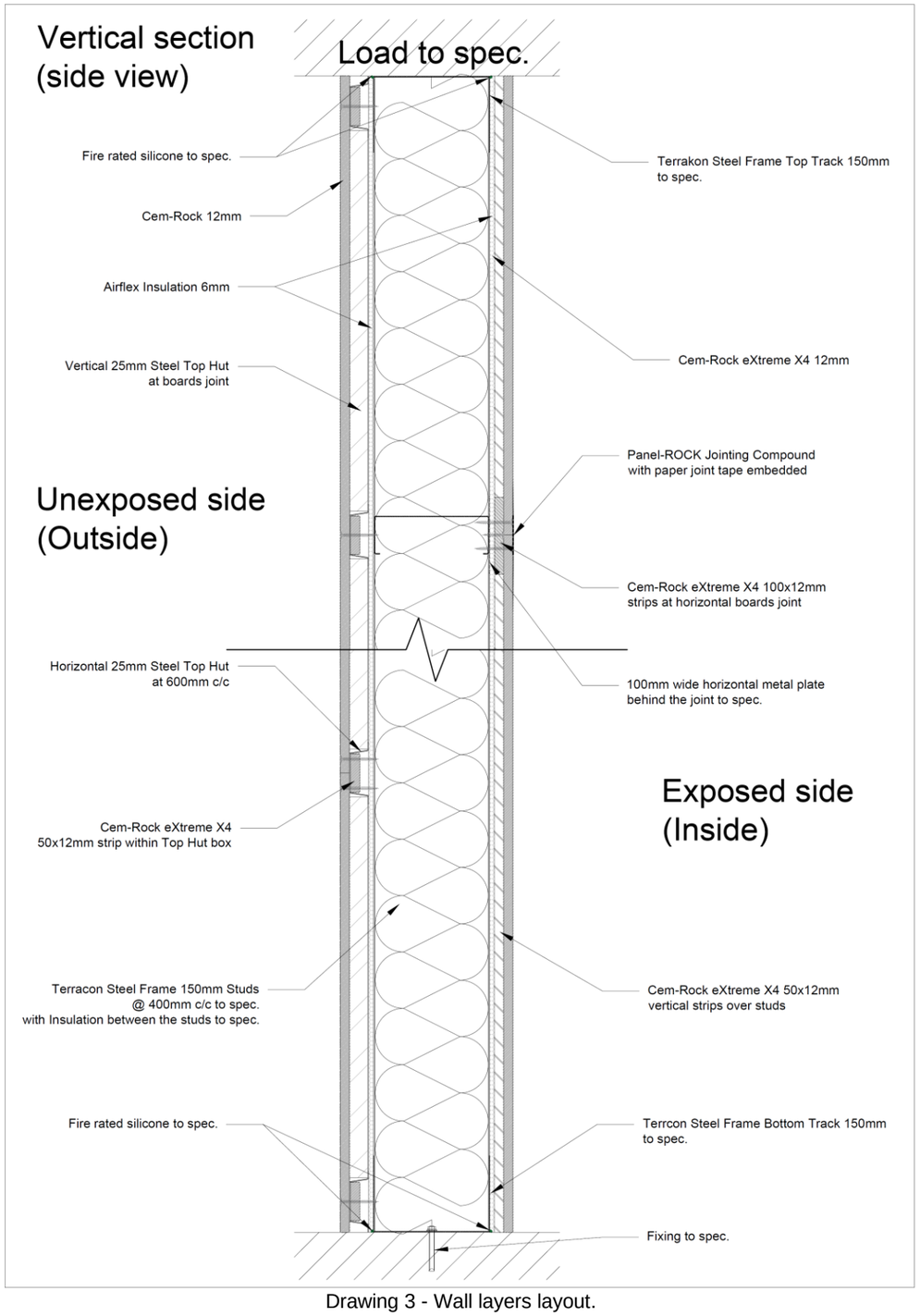
Boards Layout - Unexposed side (Outside)
12mm Cem-Rock board



Drawing 1 - Wall layers layout.

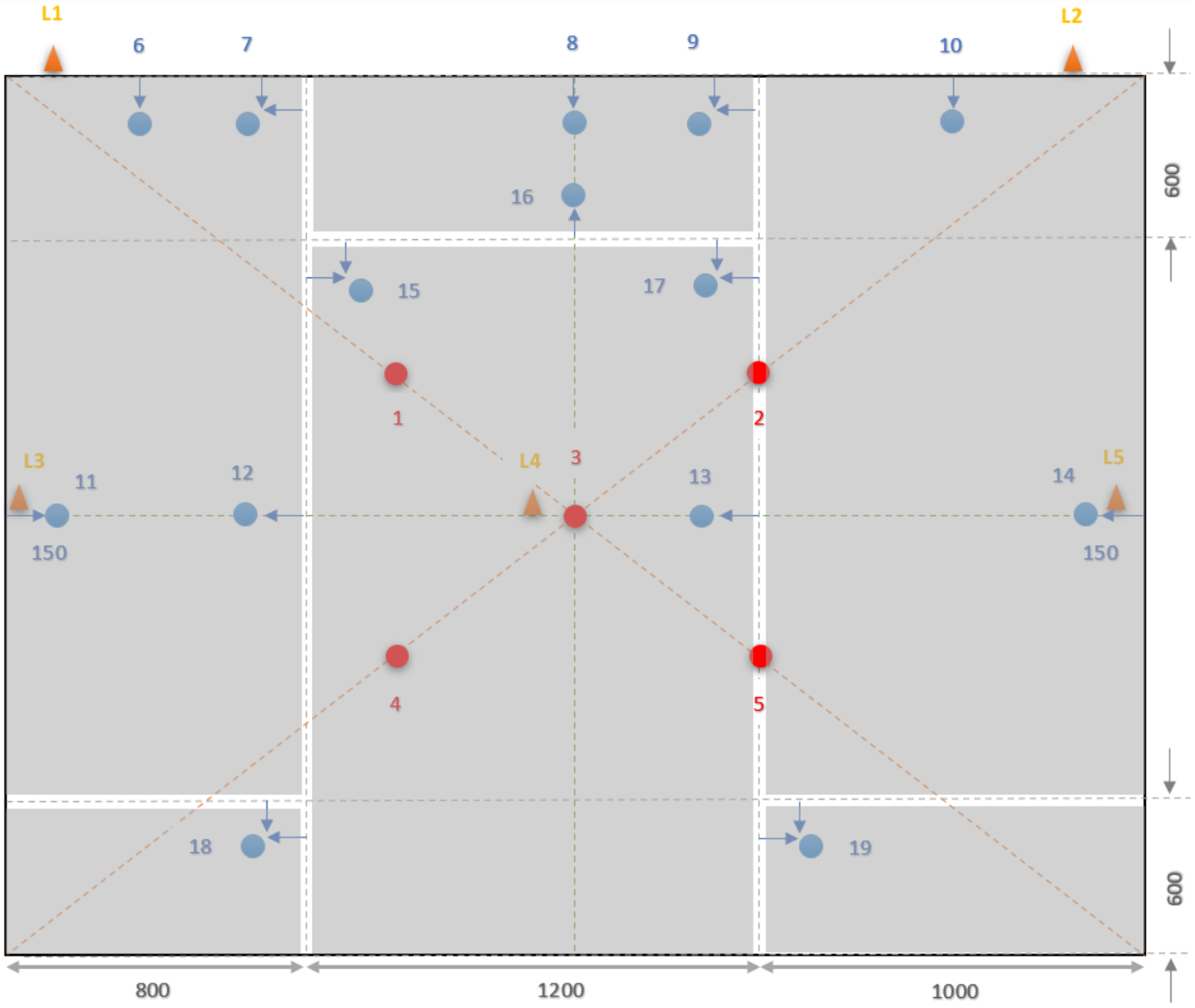


Drawing 2 - Wall layers layout.



Drawing 3 - Wall layers layout.

APPENDIX B: INSTRUMENTATION



All Distance in mm, drawing not to scale.

Thermocouples 1 to 5 to be installed no less than 50mm from hotspots(joints, screws, etc).

Remaining thermocouples to be installed no less than 20mm from hotspots.

- Thermocouples for average Temperature rise (1 – 5).
- Thermocouples for maximum Temperature rise (6 – 19).
- LVDTs (L1 – L5).

Figure 1 - Thermocouple Layout.

APPENDIX C: CHARTS

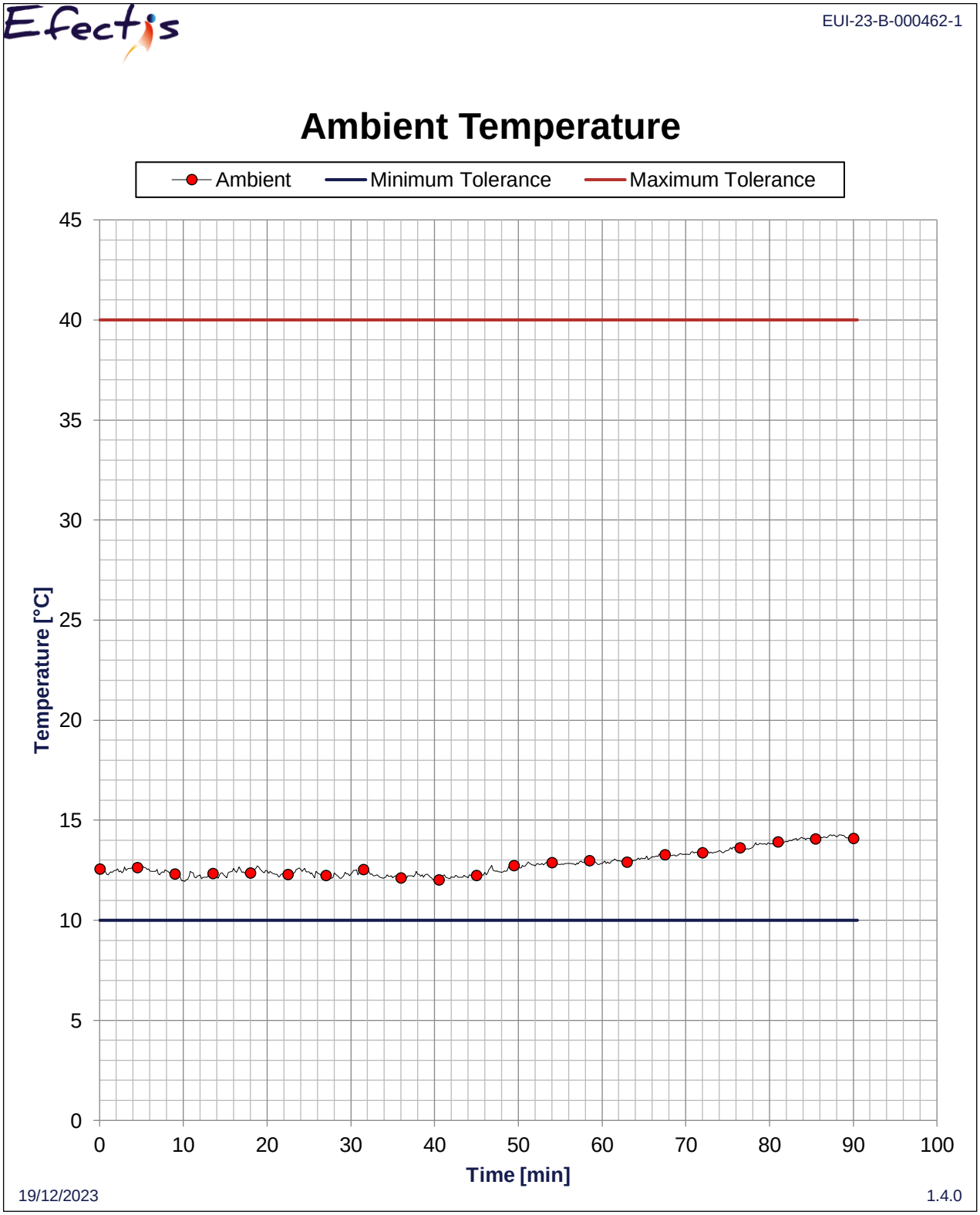


Chart 1 - Ambient Lab Temperature.

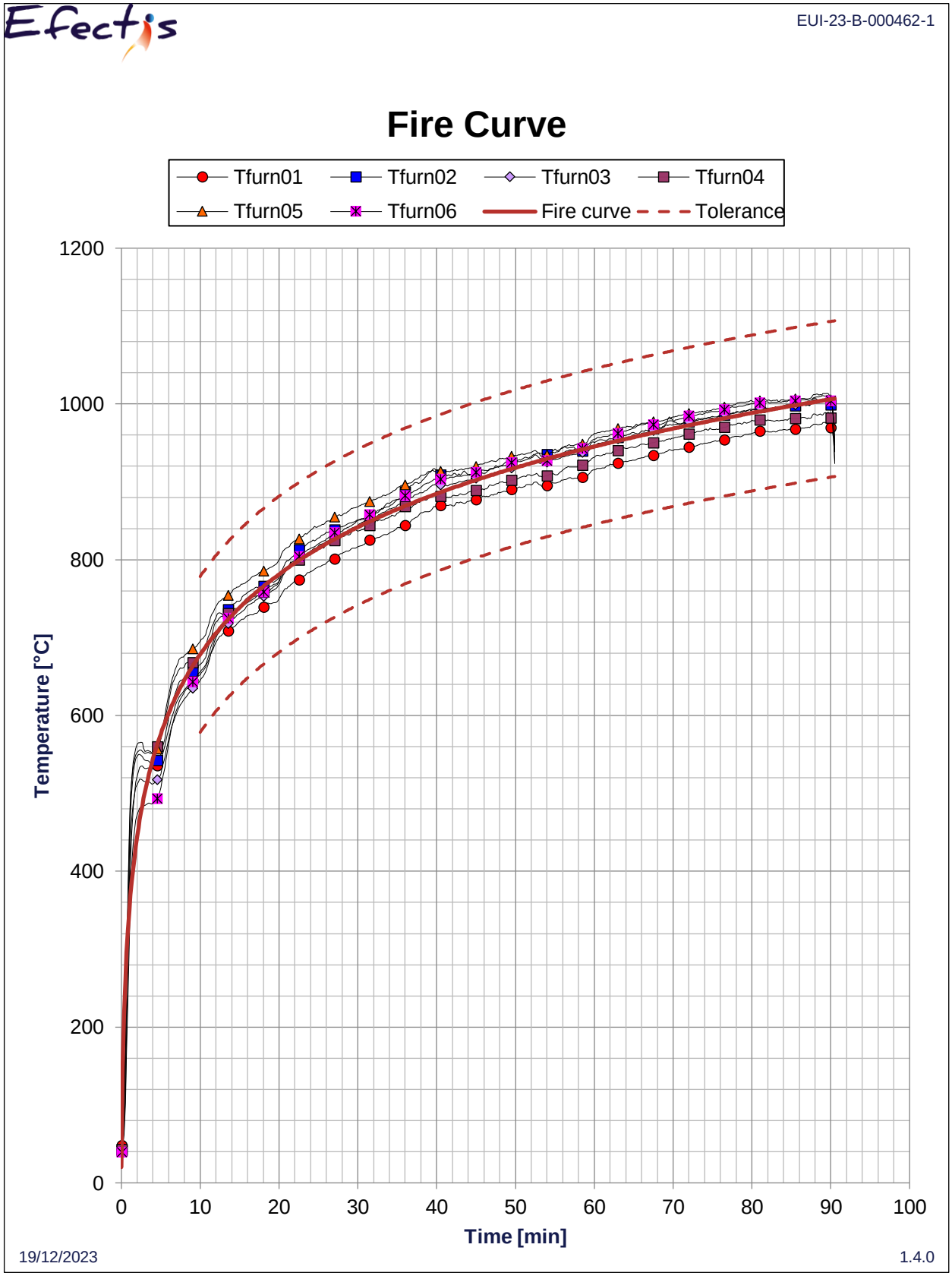


Chart 2 - Furnace Temperature.

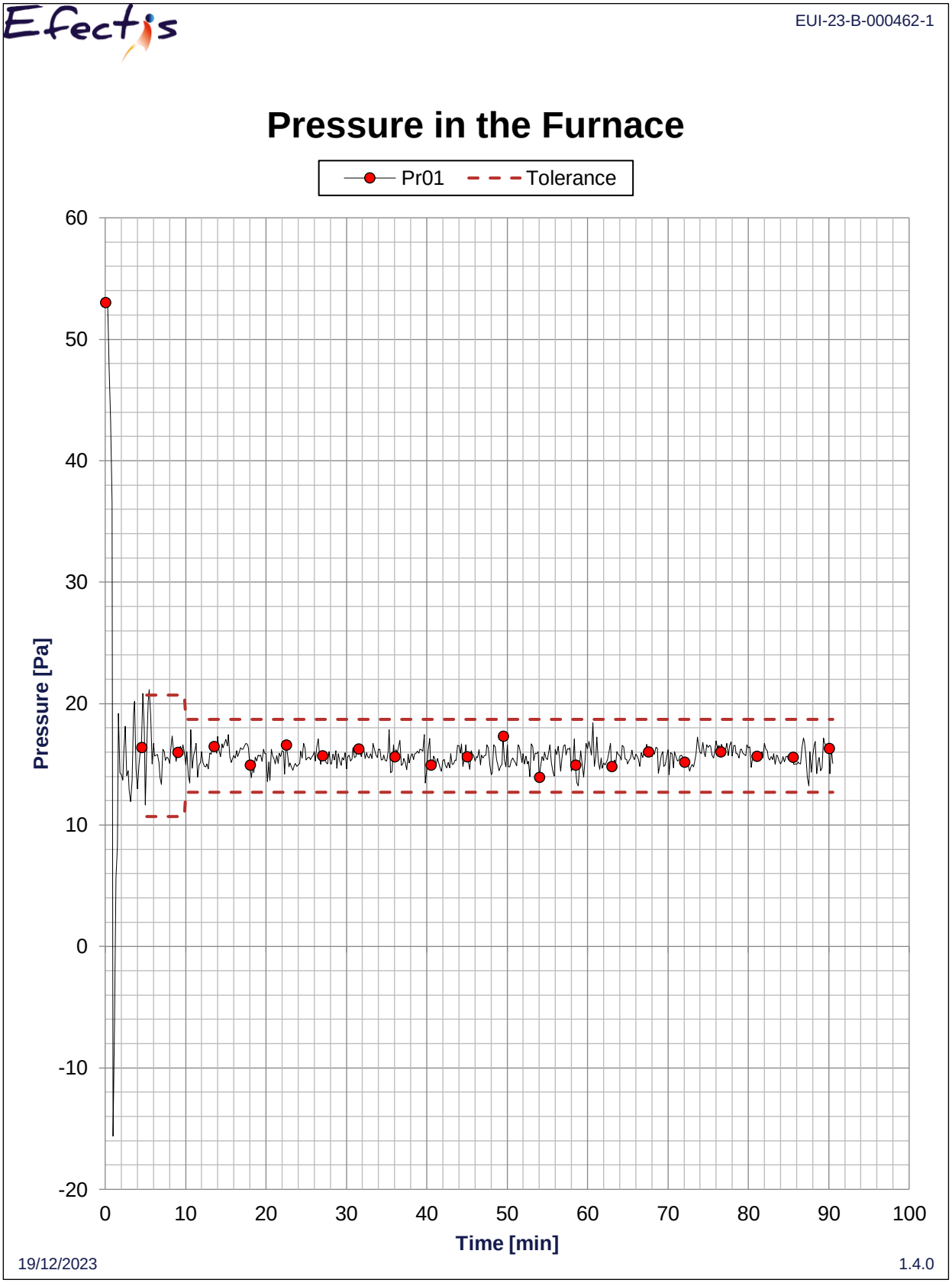


Chart 3 - Furnace Pressure.

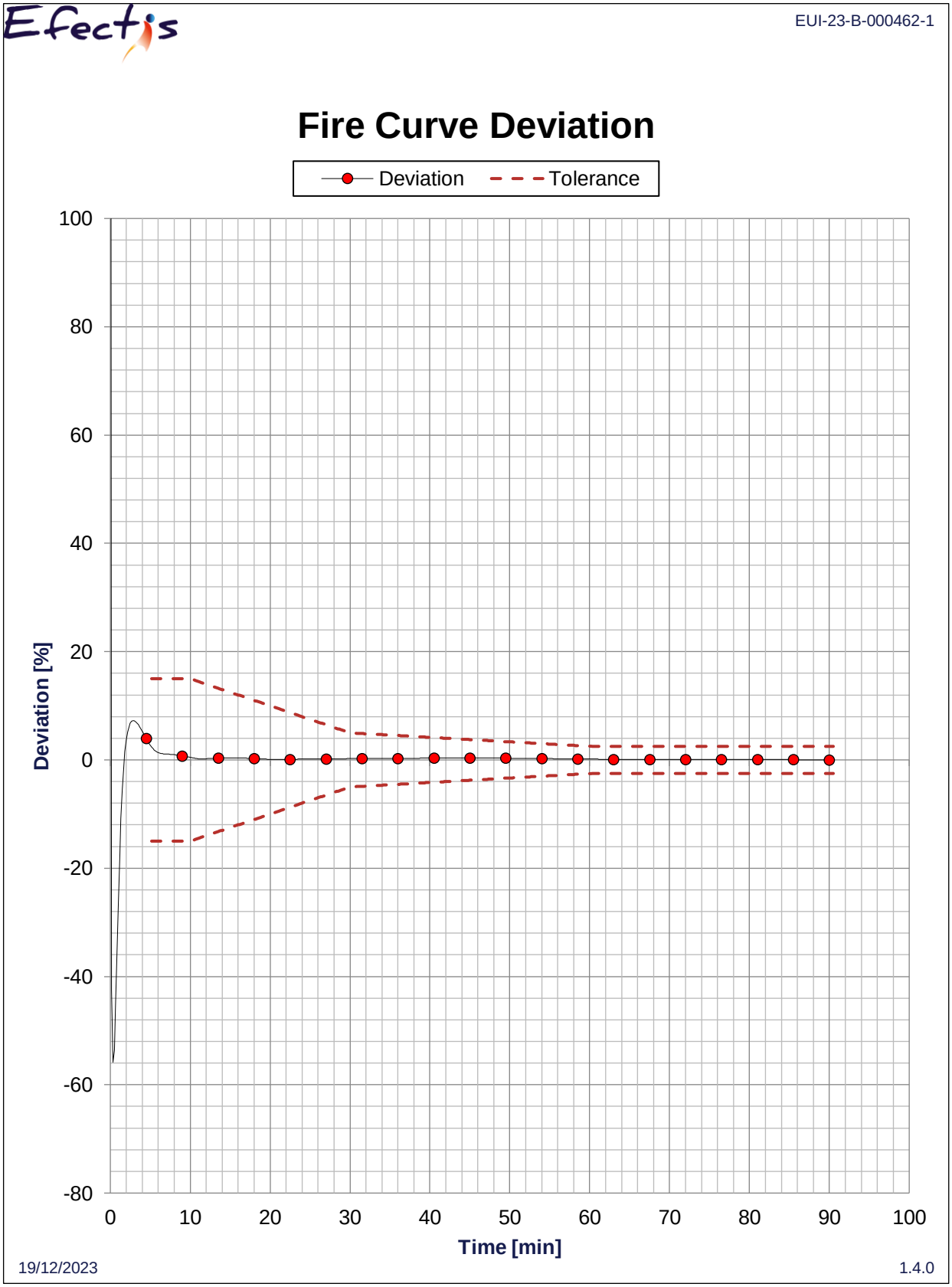


Chart 4 – Deviation.

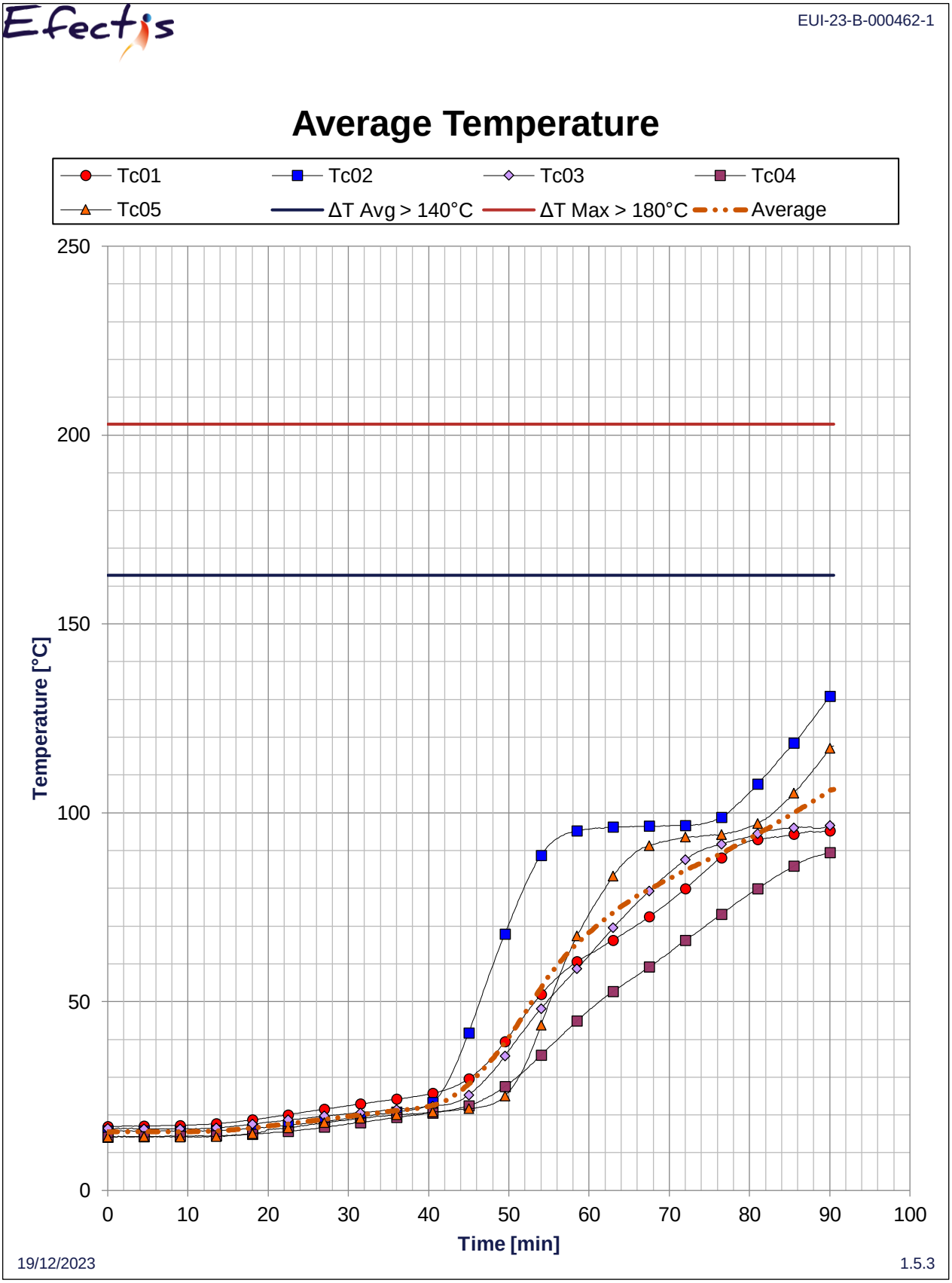


Chart 5 - Average Thermocouples Temperature TC1-TC5.

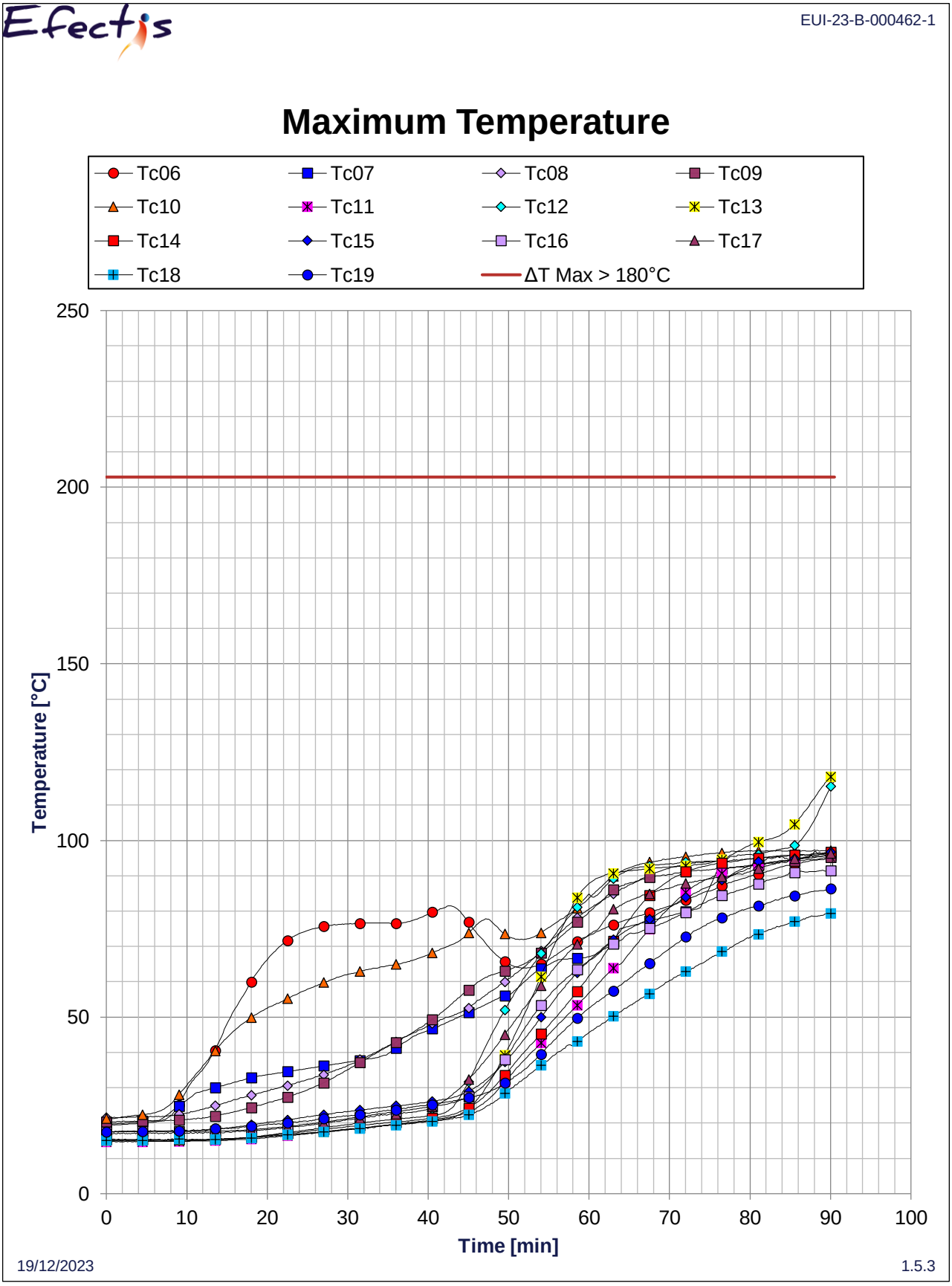


Chart 6 - Maximum Thermocouple Temperatures TC6-TC19.

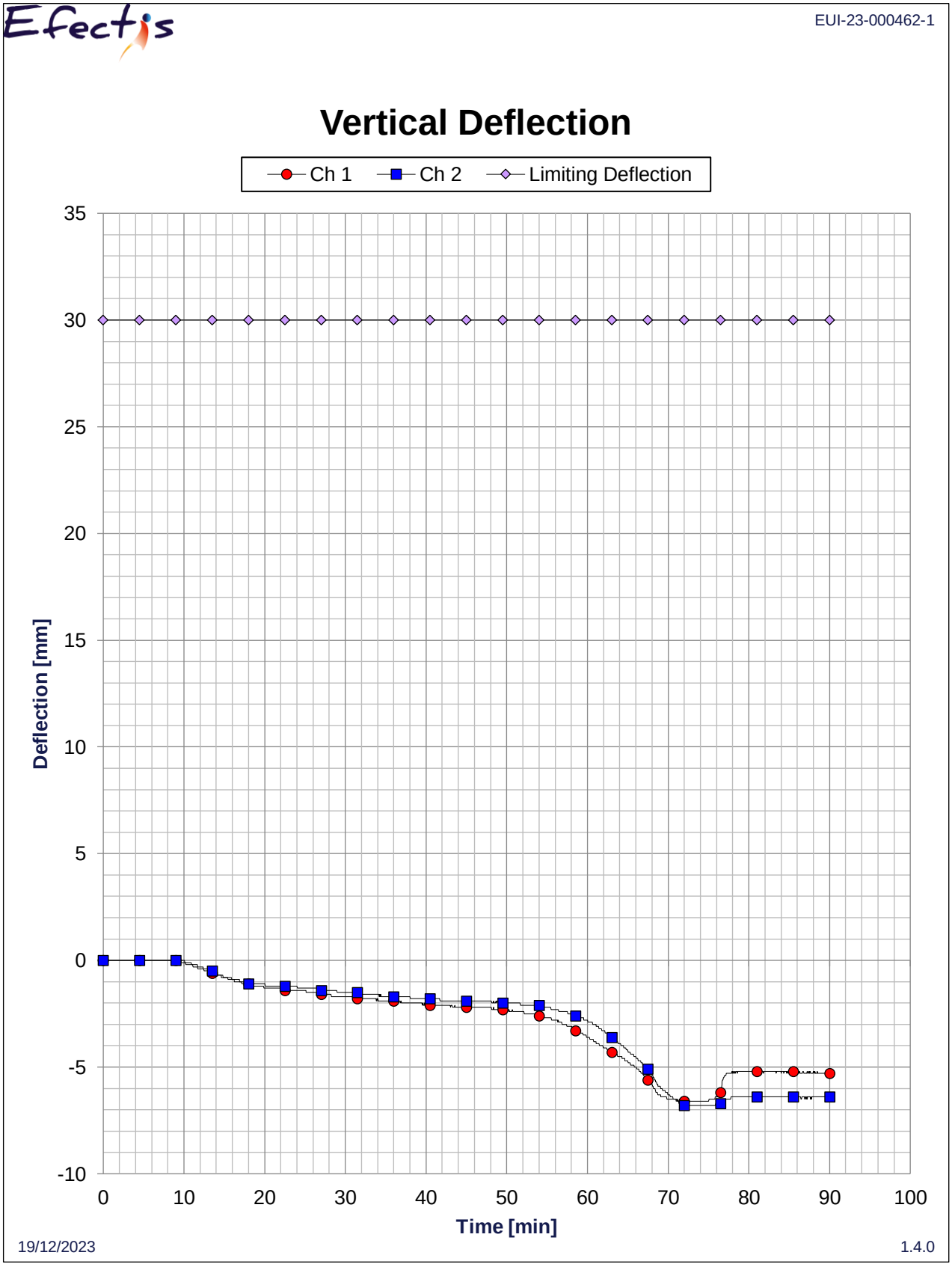


Chart 7 - Vertical Deflection Data.

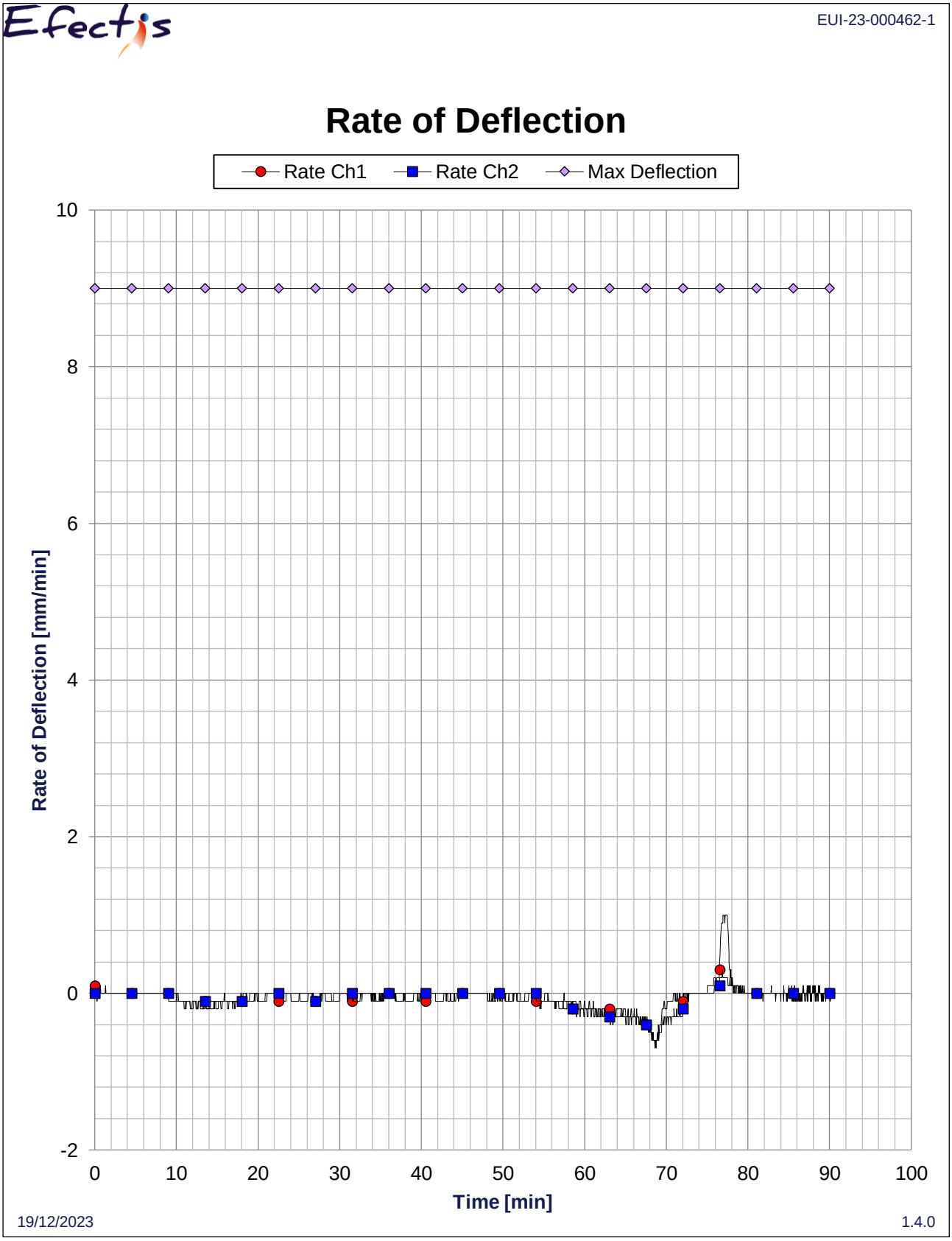


Chart 8 - Rate of Deflection Data.

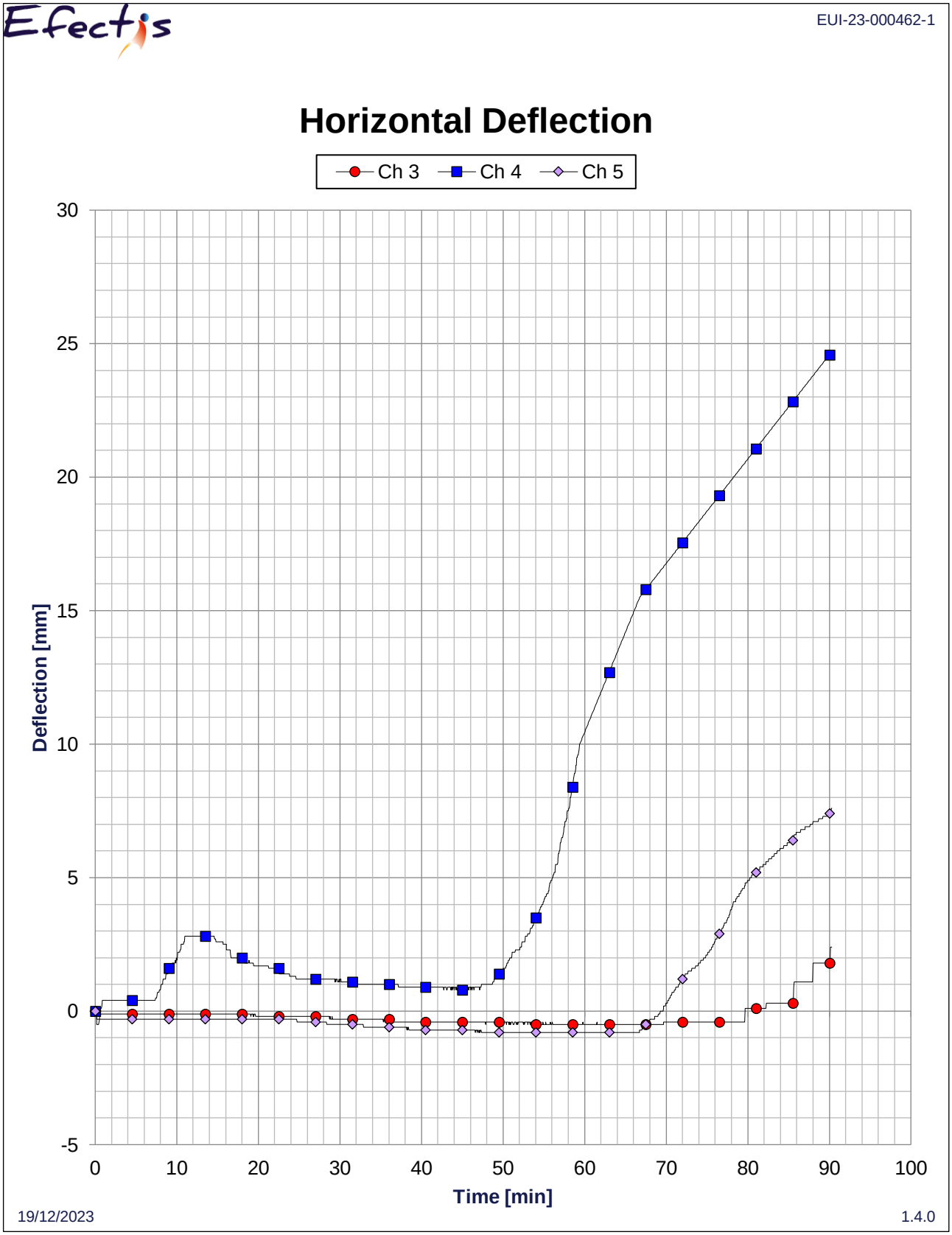


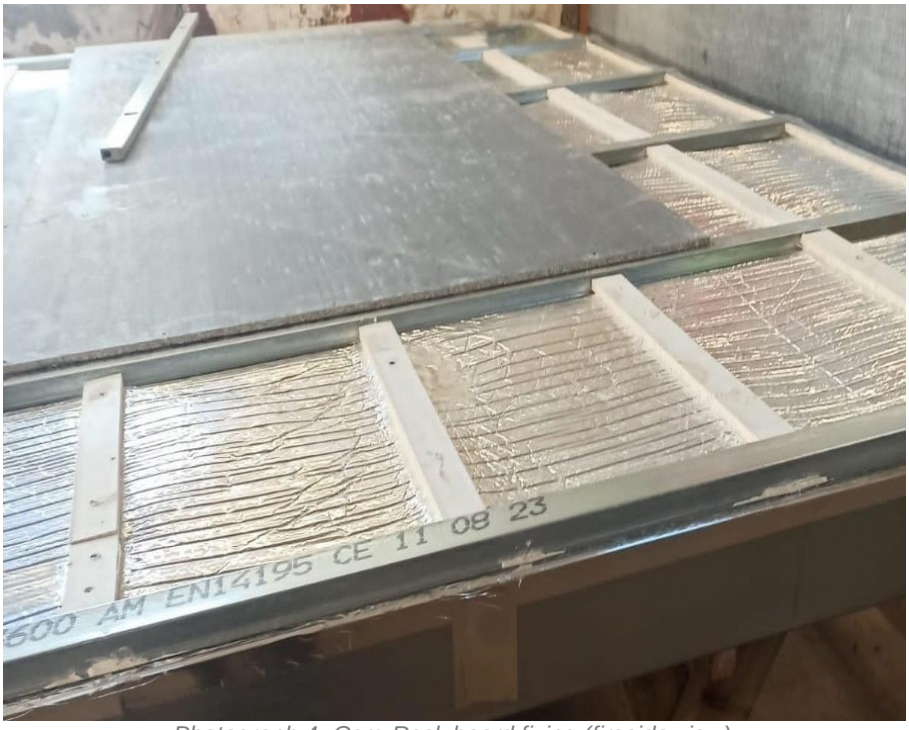
Chart 9 - Horizontal Deflection Data.

APPENDIX D: PHOTOGRAPHS

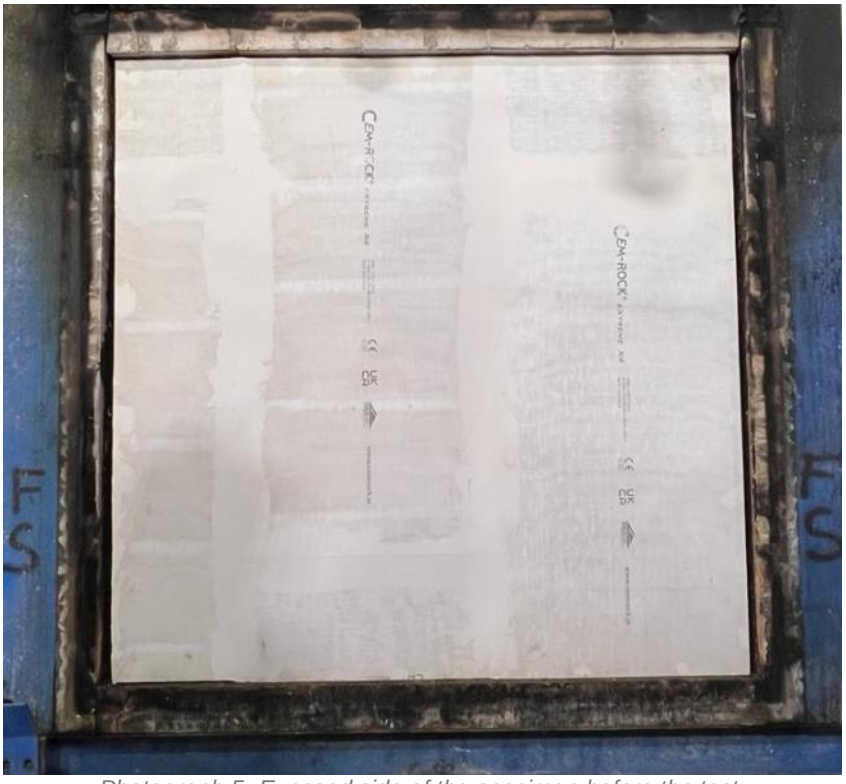
Photograph 1- First layer board fixing to the frame (fireside view).

Photograph 2- Insulation in between the frames (fireside view).

Photograph 3- Steel top hat placement with Cem-Rock eXtreme X4 strip placed above Airflex Insulation (fireside view).



Photograph 4- Cem-Rock board fixing (fireside view).



Photograph 5- Exposed side of the specimen before the test.

Photograph 6- Unexposed side of the specimen before the test.

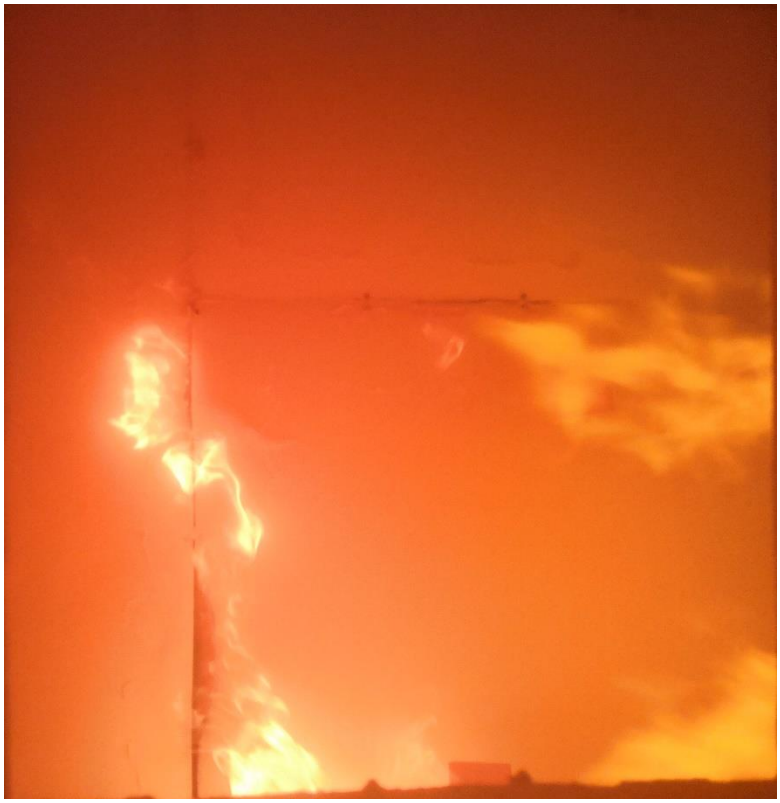
Photograph 7- Unexposed side of the specimen at minute 15.

Photograph 8- Exposed side of the specimen at minute 23.

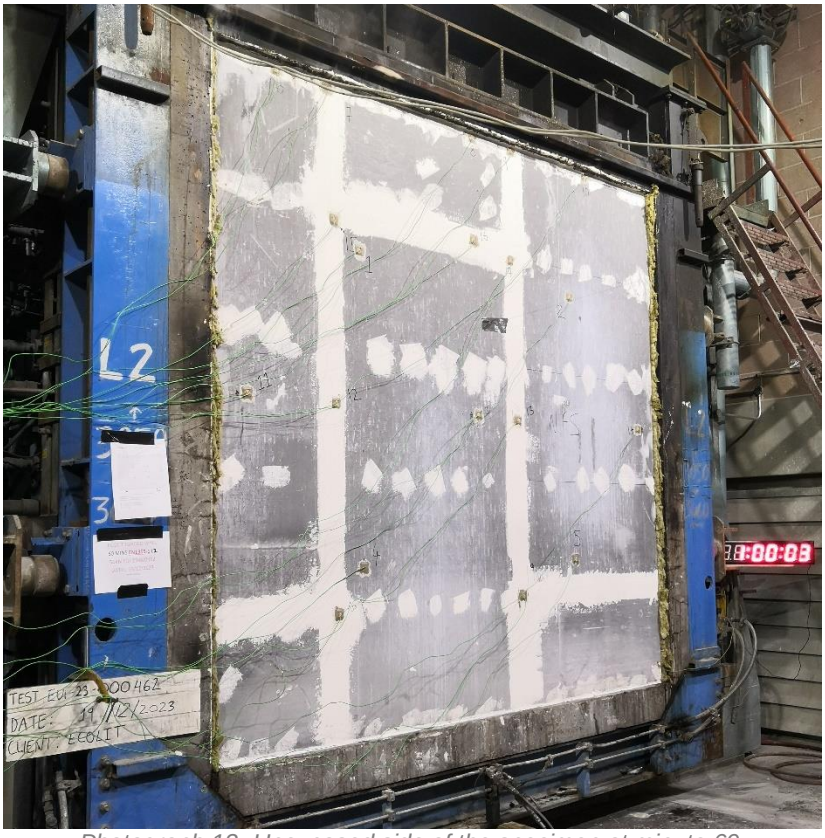
Photograph 9- Unexposed side of the specimen at minute 30.

Photograph 10- Exposed side of the specimen at minute 33.

Photograph 11- Unexposed side of the specimen at minute 45.



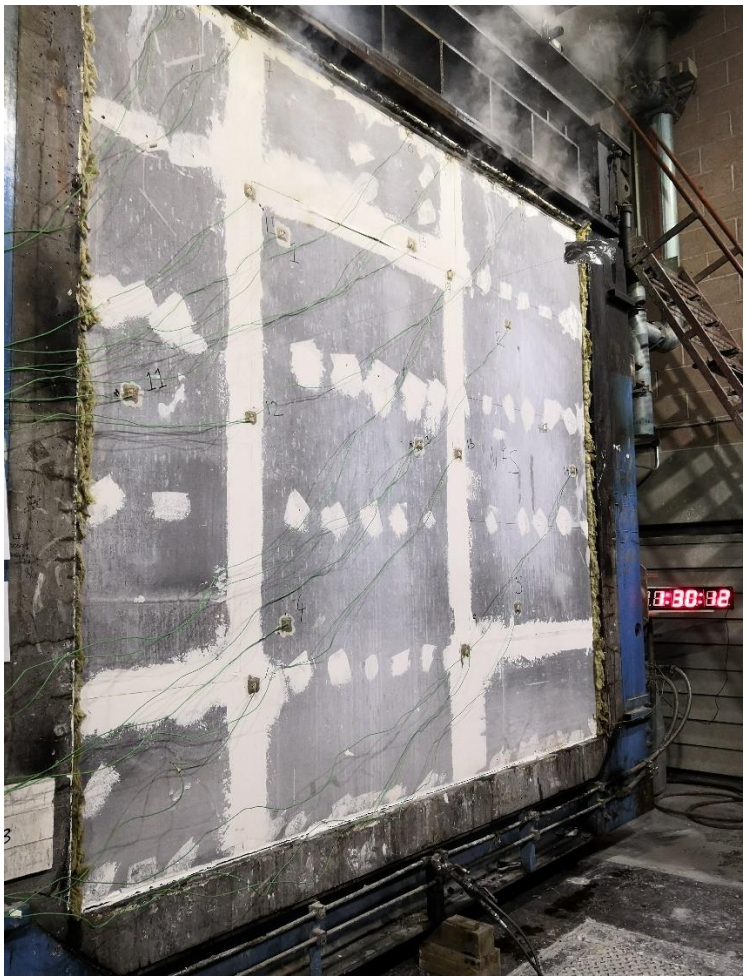
Photograph 12- Exposed side of the specimen at minute 51.



Photograph 13- Unexposed side of the specimen at minute 60.

Photograph 14- Exposed side of the specimen at minute 62.

Photograph 15- Exposed side of the specimen at minute 87.



Photograph 16- Unexposed side of the specimen when test was stopped.

Photograph 17- After the test (fireside view).

Photograph 18- After the test (fireside view).

END OF THE TEST REPORT