Research Programme of the Research Fund for Coal and Steel

FIre and Seismic performances of Hybrid fire WALLs in case of single-storey industrial and commercial steel buildings (FISHWALL)

Fire test report on a sliding steel framed door system built into a lightweight sandwich wall panel

Jiří Vaněk

PAVUS

PAVUS FIRE TESTING INSTITUTE

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ABSTRACT

It is well known that the intrinsic fire resistance of single-storey unprotected steel-framed buildings is largely sufficient to guarantee the evacuation of occupants in the event of fire. In consequence, for this type of building, the main concern of national fire regulations in Europe is how to prevent the spread of fire to the whole building. To achieve this objective, two performances shall be usually satisfied, namely, the appropriateness of constructive systems to ensure that there is no progressive collapse between fire compartments, and the efficiency of fire walls to stop the fire inside the initial compartment regardless of the state of structures exposed to fire. In practice, many constructional solutions can be implemented in order to preserve the integrity of the fire walls, while accepting that the fire exposed part of the structure may collapse. One of the most common solutions is to place a non-load bearing wall between two independent steel structures and to connect it to them by means of "fusible" links. In fire situation, these fusible links have to allow the wall to be disconnected from the structure affected by fire without endangering the separating function of the wall, which shall remain fixed to the steel structure on the other side of the wall and therefore not exposed to fire. However, due to the lack of corresponding scientific evidence, questions are being very often raised about the real efficiency of such systems in fire situation, which, in certain cases, have also to provide an adequate seismic resistance, if they are used in seismic areas.

Today, concrete or masonry wall solutions are frequently used for the compartmentation of buildings, predominately for low-rise commercial and industrial steel buildings. However, as an alternative, lightweight sandwich panels (comprising two thin flat metal faces and an insulated core) could become an appropriate steel fire wall solution, offering numerous benefits in comparison to other solutions, including fire resistance, durability, flexibility, easy dismounting and fast construction times. But, there is an evident lack of technical information about the adequate fire performance of such type of wall solutions when they are implemented in single-storey buildings with unprotected steel structure, which constitutes a major obstacle for their large use.

In this context, the overall goal of the FISHWALL project is to develop a design guidance and recommendations for an innovative hybrid fire wall solution based on lightweight steel-faced sandwich panels associated with unprotected steel structure under both fire and seismic actions but considered individually. This will be achieved through the following specific tasks: i) Establishing of a full range of experimental evidence about the fire and seismic behaviour of the investigated hybrid fire wall solution by carrying out a number of tests; ii) Investigating intensively the fire and seismic performances of the above hybrid fire wall solution in combination with unprotected single-storey steel structures through a variety of parametric numerical studies by means of validated FE numerical models; iii) Developing both cost-effective and innovative “fusible” connection systems for fire walls to be used in combination with unprotected steel structures of single-storey buildings; and iv) Developing a design guidance and practical recommendations for the studied hybrid fire wall and fusible links solutions, on the basis of above studies, from which engineers can carry out very efficient design.

The present report aims at summing up the main results of fire tests carried out at the Testing Laboratory of PAVUS according to EN 1634-1 [1] on a steel-framed sliding door system installed in a lightweight sandwich wall panel. The detailed fire test report is provided in Annex of this report.

1 INTRODUCTION

Partition fire walls in commercial and industrial buildings have usually large openings equipped with sliding fire door systems to allow the passage of people and wares. To date, there is no experimental evidence showing the adequate fire performance of steel framed sliding door systems installed in lightweight sandwich panel wall solutions. Most of the fire doors that have been tested are usually installed in rigid partition fire walls (e.g. hollow concrete blocks). Consequently, when such fire doors are built into a flexible wall (such as lightweight sandwich panels), accredited fire testing laboratories commonly prescribe them to be installed in an additional rigid frame structure. This requirement, which is undoubtedly unnecessary, results in a more expansive wall solution.

In this context, two fire tests were carried out at the PAVUS testing laboratory on a steel-framed sliding door system installed in a lightweight sandwich wall panel to provide as far the most reliable evidence possible of the appropriate behaviour of the tested solution and its compliance with building regulations and standards. The sandwich panels were manufactured by Euroclad Group Ltd while the door system was supplier by Novoferm. The fire door was tested from each side to establish its performance regardless of which side was exposed to the fire conditions. This report contains all the results of these fire tests, with the detailed fire test report provided in the appendix.

2 TEST SPECIMENS AND TESTS ARRANGEMENT

Only a short description of test specimens and tests arrangement is given hereafter. More detailed information is provided in the annex containing the test report.

Each test specimen consisted of a steel sliding fire door system installed in a non-loadbearing fire wall fixed to the steel columns of the steel frame designed to support the door. The steel frame supporting the wall panels and fire doors consisted of two 5m high steel columns connected by a steel beam positioned approximately 4.3m above the floor. All the steel members were made from HEB 200 steel profiles. All of this was installed within a rigid frame construction, with dimensions 5×5.15m (width × height), placed in the front of the vertical furnace. Thus, specimens were exposed to fire on one side only.

The walls and the fire doors were mounted according to current practice. The non-load bearing wall was constructed of 175mm thick Eurobond Rainspan sandwich panels (manufactured by Euroclad Group Ltd), installed horizontally. There was an opening in the wall measuring approximately 3.4 × 4 m (width × height). The fire door systems were manufactured by Novoferm. Their external dimensions were approximately 3.9m (width) x 4.2m (height without rail).

The steel members of the steel frame supporting the wall panels and the fire door were fire-protected with a panel encasement fabricated with the same sandwich panels as the ones constituting the wall.

The tests were conducted according to EN 1634-1 [1] with respect to EN 1364-1. During the tests, integrity, thermal insulation and radiation performances of test specimens were checked. For this purpose, deflection of doors as well as the temperature rise at different locations on the fire-unexposed side were recorded according to the standard provisions. In addition, the occurrence of openings or sustained flaming on the fire-unexposed side as well as the ignition of a cotton pad placed against the specimen surface were continuously controlled. The failure and collapse of the test specimens was thus visually monitored and documented.

Some photos of the testing setup and test specimens are shown in Figure 1.

a) View of the support steel frame

b) View of the door opening in wall

a) View of the specimen n°1 – fire-unexposed side

b) View of the specimen n°2 – fire-unexposed side

Figure 1: Views of the test setup and test specimens

3 TEST RESULTS AND MAIN OBSERVATIONS

Only brief results and observations are given here. Detailed results of the tests are reported in Annex.

In the first test, with the door rail on exposed side, there was integrity failure in 120th minute caused by glowing of the cotton pad in left upper corner of the doors. In 124th minute, there was visible sustained flaming in through right upper corner of the doors and subsequently the test was stopped. Insulation failed after 108 minutes of the test on thermocouple placed nearby left upper corner of the doors, resp. after 91 minutes of the test in case of supplementary procedure (criterion I_1) on thermocouple placed nearby right upper corner of the doors. On the surface of the steel portal frame (under fire protection), there was measured temperature max. 100 °C in the end of the test (124 minutes). The highest values of deflection were measured in the middle of the door leaf's width, in the mid-height and on the bottom, around 170 mm after 124 minutes of the test.

The second test, with the door rail on unexposed side, was without integrity failure during whole testing time, i.e. 144 minutes. Time of insulation failure was similar to the first test, it failed after 105 minutes on the thermocouple placed on the top of the specimen, nearby joint in the door leaf. Insulation according to supplementary procedure failed after 45 minutes on the thermocouples placed on the top of the specimen, 25 mm from the visible edge of the door leaf, nearby joint in the door leaf. Maximum temperature of the steel portal frame was measured from 400 to 600 °C in the end of the test. The deflection was lower than measured in the first test, almost 130 mm in the centre of the specimen after 144 minutes of the test.

For both tests, there was no requirement to measure radiation from a surface with a temperature below 300 °C because the radiation emitted from such a surface is low. Average temperature on the specimen didn't exceed 300 °C and therefore no radiation failure was recorded. So, it is possible to classified the doors as EW 120 from both sides. Full fire resistance classification for this sliding steel framed door system built into sandwich wall panels is:

- E 120-C / EI_1 45-C / EI_2 90-C / EW 120-C (fire exposure from the side without rail),
- E 90-C / EI_1 90-C / EI_2 90-C / EW 120-C (fire exposure from the side with rail).

a) Test n°1

b) Test n°2

Figure 2: Views of the two specimens during tests

4 CONCLUSIONS

This report aimed at summing up the results of tests carried out at the Testing Laboratory of PAVUS on partition fire walls made of lightweight sandwich panels with span larger than the usually tested 3m span. For testing, Eurobond Rockspan Extra panels with 175mm thick produced by Euroclad were used.

During tests, deflection of specimens as well as the temperature rise at different locations on the fire-unexposed side were recorded. The overall behaviour of specimens was also monitored visually. Unfortunately, the tested specimen did not achieve the desired EI 120 fire resistance performance. However, the tested element can easily be improved by reinforcing the labyrinth at the top, given its behaviour during the tests. This can be achieved by reducing the operating clearances, changing the intumescent seal (type or thickness), or increasing the leaf thickness.

It should be noted that these improvements are specific to the tested element and cannot be guaranteed to apply to all sliding doors, given that their design and behaviour vary from one manufacturer to another.

5 REFERENCES

[1] EN 1634-1+A1, Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware - Part 1: Fire resistance test for door and shutter assemblies and openable windows, 2014+A1:2018.

[2] EN 15254-5:2019 Extended application of results from fire resistance tests - Non-loadbearing walls - Part 5: Metal sandwich panel construction, 2019.

[3] EN 1363-1: Fire resistance tests - Part 1: General requirement, 2021.

[4] Deliverable D1.4: Design of tests, RFSC project FISHWALL, 2020.

[5] Fire resistance test report n° Pr-22-2.085-En on non-loadbearing wall 5m×6m - External wall made of sandwich panels Eurobond Rockspan Extra (vertical cladding), 13-06-2022 and classification report of fire n° PK2-06-22-010-E-0, 28-09-2022.

[6] Fire resistance test report n° Pr-22-2.084-En on non-loadbearing wall 5m×6m - External wall made of sandwich panels Eurobond Rockspan Extra (horizontal cladding), 13-06-2022 and classification report of fire n° PK2-06-22-009-E-0, 28-09-2022.

[7] Fire resistance test report n° Pr-22-2.231-En on non-loadbearing wall 5m×6m - External wall made of sandwich panels Eurobond Rockspan Extra (vertical cladding with steel beam), 17-01-2023 and classification report of fire n° PK2-06-22-016-E-0, 24-01-2023.

[8] Fire resistance test report n° Pr-22-2.086-En on non-loadbearing wall 5m×6m - External wall made of sandwich panels Eurobond Rockspan Extra (horizontal cladding with steel column), 13-06-2022 and classification report of fire n° PK2-06-22-011-E-0, 28-09-2022.

APPPENDIX A. REPORT N°PR-24-2.194-EN

PAVUS
FIRE TESTING INSTITUTE

Order No.: Z210220040

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FIRE RESISTANCE TEST REPORT

No. Pr-24-2.194-En

public version issued on 2025-02-18

For product

Fire shutter

Sliding steel framed door system Novoferm Novoslide built into a lightweight sandwich wall panels Eurobond Rainspan

Sponsor: **Consortium of the RFCS project FISHWALL**

Test method:

ČSN EN 1634-1+A1
» Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware - Part 1: Fire resistance test for door and shutter assemblies and openable windows «

Test Report includes 58 pages (8 pages of text + 4 Annexes)

Number of copies: 2
Copy number: 1

Prosecká 412 / 74, 190 00 Praha 9 – Prosek, Czech Republic, e-mail: mail@pavus.cz, http:// www.pavus.cz
ID: 60193174, VAT: CZ60193174, in Commercial Register of the Municipal Court in Prague, Sec. B, File no. 2309
Phone: +420 286 019 587

Veselí nad Lužnicí Branch
Čtvrť J. Hybeše 879, 391 81 Veselí nad Lužnicí, Czech Republic, e-mail: veseli@pavus.cz
Phone: +420 381 477 418

1 INTRODUCTION

The fire resistance tests of the fire shutters were performed based on the order of Consortium of the RFCS project FISHWALL in Fire Testing Laboratory PAVUS, a.s. in Veselí nad Lužnicí.

The test was prepared, performed and assessed on the base of following documents:

[1] ČSN EN 1634-1+A1:2019 Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware – Part 1: Fire resistance tests for doors, shutters and openable windows

[2] ČSN EN 1363-1:2021 Fire resistance tests - Part 1: General requirement

[3] ČSN EN 1363-2:2000 Fire resistance tests - Part 2: Alternative and supplementary procedures

[4] ČSN EN 1364-1:2017 Fire resistance tests for non-loadbearing elements - Part 1: Walls

[5] ČSN EN 13501-2:2017 Fire classification of construction products and building elements - Part 2: Classification using test data from resistance fire tests, excluding ventilation services

[6] ČSN EN 16034:2015 Pedestrian doorsets, industrial, commercial, garage doors and openable windows – Product standard, performance characteristics – Fire resisting and/or smoke control characteristics

[7] ČSN EN 13381-4:2018 Test methods for determining the contribution to the fire resistance of structural members - Part 4: Applied passive protection to steel members

[8] ILAC-G17:01/2021 Guidelines for Measurement Uncertainty in Testing

[9] JCGM 100:2008 GUM 1995 with minor corrections, Evaluation of measurement data - Guide to the expression of uncertainty in measurement (Available from www.BIPM.org)

[10] Specimen-related technical documentation delivered by the test sponsor

For the purposes of this document, definitions given in [1] ÷ [9] together with following abbreviations apply:

ČIA	Český institut pro akreditaci, o.p.s. (Czech Institute for Accreditation)
ATL	accredited testing laboratory
TC	thermocouple
TM	thermometer (sheathed TC)
PTM	plate thermometer fit with a TM ∅ 2 mm
EF	exposed specimen face
UF	unexposed specimen face
RTC	roving thermocouple

2 TEST SUBJECT

Two specimens of single leaf sliding steel framed door were the subject of the tests. Specimens were embedded in the wall made of mineral wool sandwich panels, which were fixed to the steel supporting frame made of sections HEB 240. The perimeter of the test frame was built from rigid construction to have the opening with dimensions 5000 x 5150 mm (width x height):

- aerated concrete panels on the bottom side (floor), thickness 150 mm, density 650 kg/m^3,
- aerated concrete blocks on the vertical sides, thickness 250 mm, density 550 kg/m^3,
- concrete lintel on the top, thickness 250 mm, density 2 400 kg/m^3.

<u>Description of the steel structure:</u>

In distance 555 mm from the rigid construction, there were mounted two steel columns, section HEB 240, in length of 5 050 mm. The columns were screwed with one bolt M20 through two steel angles L 120x120x12 on both ends. On the bottom end, the steel angles were welded to the testing frame, on the top end, the steel angles were fixed to the concrete lintel with screws M16x102 (4 pieces / 1 angle). Slotted hole was drilled in the top end of each steel column for possibility of the thermal movement of the section.

In height of 4 295 mm, there was welded one steel plate 20x270 mm to each column from its inner side. Through these steel plates, there was mounted steel beam, section HEB 240, in length of 3644 mm. The beam was fixed at both ends with two bolt M20x60 to the column, slotted holes were drilled at one end of the beam for possibility of the thermal movement of the section.

Description of the wall:

Non-loadbearing external wall with horizontal cladding consisted of sandwich panels Eurobond Rainspan (manufacturer Euroclad Group Ltd.), th. 175 mm, with mineral wool as an insulation core, nominal density of mineral wool was 115 kg/m^3. In the wall, there was opening for doors with dimensions 3374 x 4000 mm (width x height).

Five panels had width of 1 200 mm (stock width), two bottom panels had width of 650 mm. The top panel had width of 900 mm, with four penetrations 120x120 mm in pitch of 750 mm, prepared for fixing of the anchors for the rail. On EF, the panels had flat metal sheet, th. 0.7 mm (interior side) and on UF, they had flat metal sheet, th. 0.7 mm (exterior side), both sheets without profiling were galvanized and coated.

On both vertical sides and on the bottom part of the rigid construction, L-profiles 100x50x2 were mounted on EF (and also on UF in the end of the assembly), aligned with the edge of the rigid construction. The profiles were anchored to the rigid construction using carbon steel screws TutFast HTF-6.3 x 57 (producer Fixfast Ltd) in spacing of 450 mm. The top part of the specimen was without mechanical fixing.

On the perimeter of the wall, the panels were anchored to the L-profiles using stainless screws DrillFast DF2-SS-LS-A15-6.3 x 25 (producer Fixfast Ltd) in the direction from EF, in spacing of 300 mm. The panels were anchored to the flanges of steel sections with stainless screws DrillFast DF3-SS-HT-A15-5.5 x 225 (producer Fixfast Ltd) in spacing of 500 mm.

The structural gaps between the test specimen and the rigid construction were filled up with mineral wool, width of the gap between 20 and 30 mm.

The upper horizontal edge was left unrestrained in order to enable free specimen moving. The gap between the specimen and the rigid construction of width 50 mm was filled up with mineral wool.

Description of the fire protection of the steel structure:

Boxed fire protection of the steel columns was made of the sandwich panels Eurobond Rainspan, th. 175 mm:

- 2 cut pieces of length 5 050 mm (1x width of 240 mm, 1x width of 590 mm) on outer side and on the forehead,
- 1 cut piece of length 4 145 mm (below the beam) and 1 cut piece of length 665 mm (above the beam) on inner side,

Boxed fire protection of the steel beam was made of the sandwich panels Eurobond Rainspan, th. 175 mm:

- 3 cut pieces of length 3 360 mm (2x width of 240 mm, 1x width of 590 mm).

Panels were fixed to the flanges of steel sections using stainless screws DrillFast DF3-SS-HT-A15-5.5 x 225 (producer Fixfast Ltd) in spacing of 500 mm. Flashings 40x225x2 mm and 50x50x2 mm were mounted on the corners of the fire protection to fix the wall and the fire protection together. Gaps between fire protection of columns and beam were filled up with mineral wool POWER-TEK BD 660 (manufacturer Knauf Insulation, spol. s r.o.), nominal density 100 kg/m^3, width of the gap around 20 mm.

Description of the single leaf sliding steel framed door:

External dimensions of the doorset were 3 961 (width) x 4 154 mm (height without rail). Clearance of the shutter was 3 374 x 4 000 mm, thickness of the door 71.5 mm. Manufacturer of the doorset was Novoferm.

The doorset consisted of 5 pieces of the panels, 4 pcs of width of 750 mm, one piece (on the side with handle) of width of 928 mm. Each panel made of 2 galvanized steel sheets, th. 0.75 mm, forming tongue and groove of the panel. At the top of the panel, there was multi-edged steel profile, th. 2 mm, with external dimensions 65 x 75.5 mm, across the entire panel width, connected to the door leaf sheet using 6 blind rivets 5x10 mm. Steel profile was filled with 2 strips of boards 20 x 35 x 361.5 mm and 2 strips of boards 15 x 22.5 x 361.5 mm.

End profiles at the bottom over the entire door leaf width, consisting of "B-profile", external dimensions 75 x 57.5 mm, th. 2 mm, and "A-profile", external dimensions 75 x 25.5 mm, th. 2 mm, each attached to the panel using drilling screws 4.8x16 mm in spacing of 300 mm.

The first panel, called as inlet panel, was mounted with door end profile, U-profile with external dimensions of 40 x 71.5 mm, over the entire panel height, attached on both sides to the panel sheet using blind rivets 4.8x10 mm, distance between each other in spacing of 600 mm.

The last panel, called as counter inlet panel, was mounted with door end profile, U-profile with external dimensions of 54 x 71 mm, over the entire panel height, attached to panel sheet using 4.2x32 mm drilling screws arranged on both sides, distance between each other 500 mm. Above the door end profile as a panel end was the door leaf labyrinth L-profile over the entire panel height. Between the door labyrinth and the panel end was a strip of board 15 x 101 mm. At the front side above the door labyrinth was another strip of board 15 x 101 mm, and above that the outer door end profile, dimensions 10.5 x 110 x 112 x 1.5 mm. Between the outer door end profile and the door leaf was a strip of board, dimensions 9.5 x 105 mm. The strips and the outer door end profile were attached together to the door leaf using drilling screws 4.8x68 mm (in pairs, front side of the door leaf) and 4.2x32 mm (side of the door leaf facing away from the wall) in spacing of 500 mm. There were no joints in the steel sheets.

Solid aerated concrete slabs th. 70 mm, were used as a core material. Gypsum stud "Groove" made of 2 layers of strips of boards outside, th. 12.5 mm and 3 layers of strips of boards inside, th. 15 mm, external dimensions 146 x 70 mm, stapled together, each inserted as a side panel end. Gypsum tunnel "Tongue" made of 3 layers of strips of boards (2x 9.5 mm, 1x 12.5 mm), external dimensions 53 x 31.5 mm. Tongue of inlet panel was covered with strip of board 15 x 50 mm from both sides. The end of the counter inlet panel laterally covered with two strips of boards 20 x 50 mm over the entire height of the leaf, held by drilling screw 4.2 x 32 mm in spacing of 500 mm. Connection of the panels (tongue-groove connection) using drilling screws with lens head and flange 4.8x68 mm in spacing of 625 mm.

Polyurethan adhesive was applied over the entire surface between the panel sheet and the core material.

The suspension device consisted of guide rail, which was made of galvanized steel C-profile with dimensions 93.5 x 156 x 3 mm. The rail was fixed to 6 steel angles (by specimen 1, resp. 4 angles by specimen 2) 325 x 100 x 106 x 5 mm with round-head screws M10x30 (2 screws per angle). The angles were fixed to steel beam HEB 240 by stainless screws, 3 screws per angle. The maximal distance between two steel angles was 750 mm by specimen 1 and 1 250 mm by specimen 2. The rail was covered by strip of mineral wool and by steel sheet 30 x 222 x 160 x 10, th. 1 mm. Steel axle Ø 18/20 with 2 rollers and deep groove ball bearings was used as a rolling apparatus.

The wall labyrinth profile was clamped behind the rail, labyrinth system consisted of a wall labyrinth profile made of multi-edged sheet steel, completely filled with 3 strips of boards, 1 piece 12.5 x 29 mm, 1 piece 12.5 x 38.5 mm and 1 piece 9.5 x 21.5 mm.

Two-part cover profile and inlet profile, each made of multi-edged sheet steel th. 1 mm, filled with strips of boards measuring 15 x 94 mm and 12.5 x 64 mm, 20 x 152 mm, two times 15 x 69 mm, at the top of the gate inlet "additional inlet component" consisting of angle 81 x 13.5 x 30 mm, together with strips of boards 12.5 x 30 x 80 mm fastened using drilling screw 4.2 x 25 mm.

Wall labyrinth “counter inlet”, made of folded steel sheet, dimensions 78 x 24 x 130 x 3 mm filled with a strip of board, dimensions 73 x 18 mm. Gate labyrinth, made of folded steel sheet, dimensions 106 x 65 x 2 mm.

Intumescent tape was attached to both sides of the panel tongue in the area of the bead, over the entire length of the tongue. Intumescent tape was used:

- 15 x 1.5 mm on both sides of the panel tongue, length 750, from the top edge of the panel sheet;
- 25 x 2 mm two strips in the inlet over the entire height; two strips on the panel suspension profile, over the entire length of the profile, several strips on the edge of the door leaf, applied on the reverse side, two strips glued to the top; one strip, length 80 mm, glued to the “additional component inlet" angle 81 x 13.5 mm;
- 25 x 4 mm strip glued to the insulation block, between the insulation block and the door leaf;
- 50 x 2 mm two strips on the wall labyrinth profile at the counter inlet, each on the wall side, one strip between the labyrinth and the wall and one strip on the labyrinth inlet; one strip on the door labyrinth profile at the counter inlet on the labyrinth inlet, on the wall side; one strip on the “door end profile spring" of the door leaf on the wall side between the door leaf and the wall labyrinth profile at the counter inlet, all over the entire height.

There was mounted also closing mechanism and the winding pulley. The bottom guidance directed by a ball-bearing 6403.

On the door leaf, there was mounted stainless-steel shell handle 200 x 90 mm and stainless-steel bar handle 300 x 80 mm.

The door sections and the doorframe were without surface treatment.

It was not possible to determine the weight of the specimens in the assembled state.

Test specimen related technical documentation delivered by the test sponsor is documented in Annex C.

The specimen was mounted as per [1] cl. 7 and Annex C of this Test Report.

The tested specimen was manufactured by companies Novoferm (doorset), Euroclad Group Ltd. (sandwich panels) and Briand Metal (steel sections).

The Testing Laboratory did not participate in extracting elements used for test specimen assembly.

The parts of the test specimen were delivered to the test laboratory from 2nd to 23rd August 2024 without any defects and mounted from 2nd to 5th September 2024 to the test frame by companies Euroclad Group Ltd. and Novoferm France in accordance with the delivered documentation.

3 TEST PERFORMANCE

3.1 General

The fire resistance tests were performed as per [1] on 11th September 2024 (specimen 1) and on 18th September 2024 (specimen 2) in Testing hall PO 1 in vertical wall furnace with inner dimensions of 5 000 mm (width) × 5 000 mm (height) × 1 500 mm (depth).

Specimen 1 was tested with the rail on EF, specimen 2 was tested with the rail on UF.

Used testing and gauging equipment is stated in Annex A.

The Sponsor’s representatives were present at the first test.

3.2 Furnace control

The test furnace was heated with a set of oil burners. In-furnace temperatures were measured by the help of PTMs and recorded at minute intervals. The measuring wires of PTM were distributed uniformly in a distance of 100 mm from EF according to [1] cl. 9.1.1.

In-furnace temperatures for standard heating curve according to [2] were controlled so that they conformed to the relation according to [2] cl. 5.1.1, within the specified limits (see [2] cl. 5.1.2):

$$T = 345 \log (8t + 1) + 20$$

where T (°C) = required in-furnace temperature in time °C
t (min) = time since the test beginning

The test furnace positive pressure was measured and controlled so that the values correspond to the conditions of [1] cl. 9.2 and [2] cl. 5.2.1 and 9.2.1.

3.3 Specimen measuring

The specimen unexposed face and inner temperatures were taken using K-type disc TCs and recorded at minute intervals. The TCs were fixed on the specimen surface and according to [1] cl. 9.1.2 and with respect to [4] cl. 9.1.2, on the surface of the steel sections with respect to [7] cl. 9.3.

The rate of the horizontal deflection was measured by deflectometers spaced according to [1] cl. 9.3.

Gap sizes were measured according to [1] cl. 10.1.2 using flat gap gauges and a calliper.

One RTC (see [2] cl. 4.5.1.3) was available to measure points where higher temperatures were expected.

Measurement of closing force exerted by winding pulley performed according to [1] cl. 10.1.3 by using a dynamometer attached to the handle of the doors.

The measured points of deflections and the TC positions are described and figured in Annex B.

The initial test conditions met the standard values as per [2] cl. 10.3.

3.4 Ambient temperature

During the test, the ambient temperature was measured using one K-type TM (see [2] cl. 4.5.1.5) according to the conditions of [2] cl. 5.6.

3.5 Conditioning

From the specimen delivery to the Fire Testing Laboratory until the test performance, the specimen was stored in the enclosed ambient of test hall at the air temperature of (15 ± 5) °C and at relative air humidity of (50 ± 5) %. Prior the fire resistance tests the specimen was subjected to 25 cycles of opening and closing according to [6] cl. A 2.2.

4 TEST COURSE

Test 11th September 2024

Time (min):	Observation:
1. to 5.	UF - occasionally audible cracking from sandwich panels, heavy smoke from the specimen, especially from the vertical joints in the door leaf
20.	UF - slight darkening of the vertical joints of the door leaf
72.	UF - parts of intumescent tape from the corner nearby TC 47 fell down on the ground
111.	UF - cotton pad test in the corner nearby TC 38 - without integrity failure
120.	UF - repeated cotton pad test nearby TC 38 - glowing of the pad - **integrity failure**
124.	UF - sustained flaming of right top corner (between door leaf and doorframe) **- integrity failure**
125.	end of the test at request of the Sponsor

Test 18th September 2024

Time (min):	Observation:
2.	UF - occasionally audible cracking from sandwich panels
8.	UF - heavy smoke from the vertical joints in the door leaf
15.	UF - slight darkening of the vertical joints of the door leaf
60.	UF - next slight darkening of the vertical joints of the door leaf, also on the top and bottom parts
90.	UF - increasing deflection of the bottom part of the door leaf
104.	UF - falling of small parts of intumescent tape on the left side of the door leaf
145.	end of the test at request of the Sponsor

Layout of TC, deflection and gap measurements of the specimens described in tables in Annex B.

The temperatures in the furnace met the requirements of [2] during the tests. Time relations to the measured temperatures are specified in Annex B.

5 TEST RESULTS

Retention force educed from the winding pulley measured as per [1] cl. 10.1.3 was 117.4 N by specimen 1 and 119.7 N by specimen 2.

5.1 Limit state attainment criteria

- **Integrity** (according to [2] cl. 11.2). This criterion means the time for which the test specimen continues to maintain its separating function during the test without either:
  a) causing the ignition of a cotton pad applied according to [2] cl. 10.4.5.2; or
  b) permitting the penetration of a gap gauge as specified in [2] cl. 10.4.5.3; or
  c) sustained flaming.
- **Insulation** (according to [1] cl. 11.2 and [2] cl. 11.3). This criterion means the time for which the test

specimen continues to maintain its separating function during the test without developing temperatures on its unexposed surface which either:

a) increase the average temperature above the initial average temperature by more than 140 °C; or
b) increase the temperature at any location above the initial average temperature by more than 180 °C with the exception of the case, in which the limit for the increase of the doorframe temperature 360 °C is.

- **Radiation** (according to [1] cl. 9.4 a [5] cl. 8). Radiation criterion is met until the measured radiation is not greater than 15 kW.m^{-2}. At each specific measurement location, the time for the measured radiation to exceed the value of 5, 10, 15, 20 and 25 kW.m^{-2} shall be reported. There is no requirement to measure the radiation from a surface with a temperature below 300 °C because the radiation emitted from such a surface is low (see [5] cl. 8.1).

5.2 Expression of test results

Specimen 1 - with the rail on EF

Criterion	Partial criterion	Measured value	Evaluation
Integrity	Cotton pad ignition	119 min	119 min
	Gap gauge passage	124 min, without failure	124 min
	Sustained flaming	123 min	123 min
Insulation – door leaf	Average temperature	124 min, without failure	119 min [2)]
	Maximum temperature	108 min	108 min
	Maximum temperature – supplementary procedure	91 min	91 min
Insulation – wall	Maximum temperature	124 min, without failure	124 min
Radiation	6 kW.m^{-2} (not measured) [1)]	124 min, without failure	123 min [3)]

Specimen 2 - with the rail on UF

Criterion	Partial criterion	Measured value	Evaluation
Integrity	Cotton pad ignition	144 min, without failure	144 min
	Gap gauge passage	144 min, without failure	144 min
	Sustained flaming	144 min, without failure	144 min
Insulation – door leaf	Average temperature	144 min, without failure	144 min
	Maximum temperature	105 min	105 min
	Maximum temperature – supplementary procedure	45 min	45 min
Insulation – doorframe	(ΔT = 180 °C)	105 min	105 min
	(ΔT = 360 °C)	130 min	130 min
Insulation – wall	Maximum temperature	128 min	128 min
Radiation	6 kW.m^{-2} (not measured) [1)]	144 min, without failure	144 min

Notes to the tables above:

[1)] There is no requirement to measure the radiation from a surface with a temperature below 300 °C because the radiation from such a surface is low (see [3] cl. 8.1). Average temperature on the UF of the specimen didn't exceed 300 °C.

[2)] The performance criteria "insulation" shall automatically be assumed not to be satisfied when the "integrity" criterion ceases to be satisfied (see [2] cl. 11.4.2).

[3)] Failure of integrity under the sustained flaming at unexposed side criteria means automatically failure of the radiation criterion. (see [5] cl. 5.2.4).

5.3 Field of direct application

According to ČSN EN 1363-1, cl. A.1 and A.2 and ČSN EN 1634-1, cl. 13, the field of direct application can be defined only in accordance with the classification. The field of direct application is a part of the Classification report.

5.4 Application of test results

The test results refer only to the tested specimen including the way of its mounting into the construction (see part 2 of this Report).

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 ČSN EN 1363-1, ČSN EN 1363-2 and ČSN EN 1634-1. 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.

The Report and Annex sheets
are valid with the embossed stamp only.

Elaborated by:	.... Jiří VANĚK Technical Officer	Approved by:	.... Jiří KÁPL ATL Manager

ANNEX A: TESTING AND GAUGING DEVICES, MEASUREMENT UNCERTAINTY

Test equipment:	**Device registration number:**
Vertical wall furnace PO 1 supplemented by modules increasing the size of the furnace to 5 m x 5 m (+ equipment for temperature and pressure control)	0127
Furnace pressure probe	0011
Test frames	0129/1, 0129/2
Gap gauge ∅ 6 mm	0112
Gap gauge ∅ 25 mm	0113
Cotton pad frame	0014
Gauging equipment:	**Metrological registration number:**
Differential pressure gauge AMR DPS	3 09 29
Datalogger Almemo 5990-2	3 10 85
PTM – in-furnace temperature (TM K ∅ 2 mm)	3 10 10
TC (K) – specimen UF temperature	3 10 14, 3 10 15
TM K ∅ 3 mm – ambient temperature	3 10 09
THERM 2260 + RTC (K)	3 10 13
Winding tape measure	3 01 29
Deflectometer Huggenberger	3 01 39÷42, 55÷58, 60÷62
Stop-watch	3 05 12
Thermo-hygro-barograph	3 13 06
Calliper	3 01 52
Flat gap gauge	3 01 48
Dynamometer	3 04 15

Measurement traceability of all measurement equipment is reported in the metrological registration card of the equipment; identified by the same metrological registration number as the equipment.

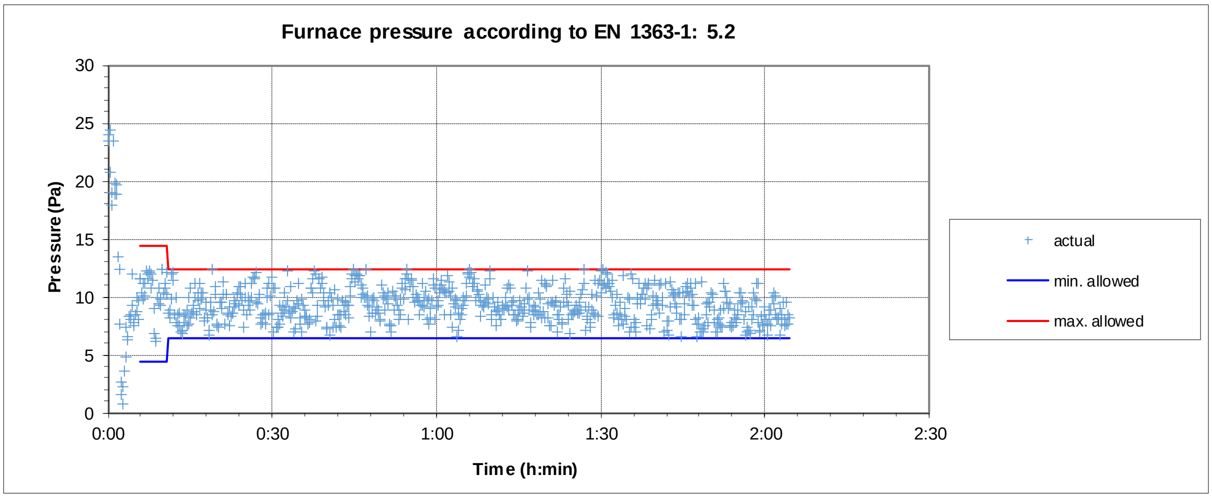
Quantity measured			**Extended measurement uncertainty**
Name	Symbol	Unit	
Time since the test beginning	t	(min)	3,4 10^{-2}min, for t ≤ 240 min
Integrity disruption time		(min)	< 0,5 min
Temperature: TC or K-type PTM + compensation cable (both of the 2nd tolerance class) + Almemo 5990-2	T	(°C)	$\sqrt{(6,40.10^{-6}.T^2 + 1,57.10^1 °C^2)}$, for 40°C ≤ T < 375°C $\sqrt{(8,04.10^{-5}.T^2 + 7,84°C^2)}$, for 375°C ≤ T ≤ 1000°C
Ambient-to-in-furnace pressure difference	p	(Pa)	$\sqrt{(5.3.10^{-4}.p^2+1,1.10^{-5}Pa^2)}$
Weight		(g)	1 g
Deflection (horizontal distortion)		(mm)	1,8 mm

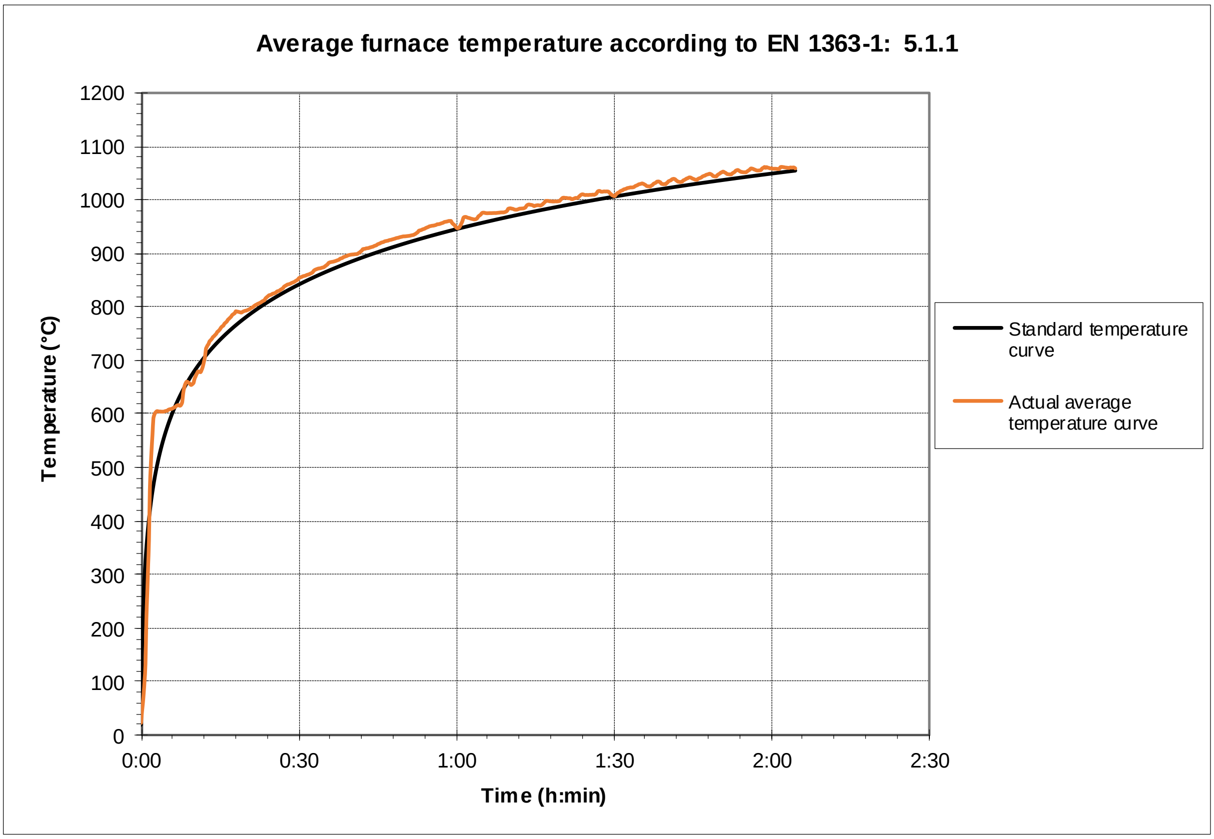
The reported expanded measurement uncertainty is stated as the combined standard measurement uncertainty multiplied by the coverage factor *k* = 2 such that the coverage probability corresponds to approximately 95 %.", see [7] and [8].

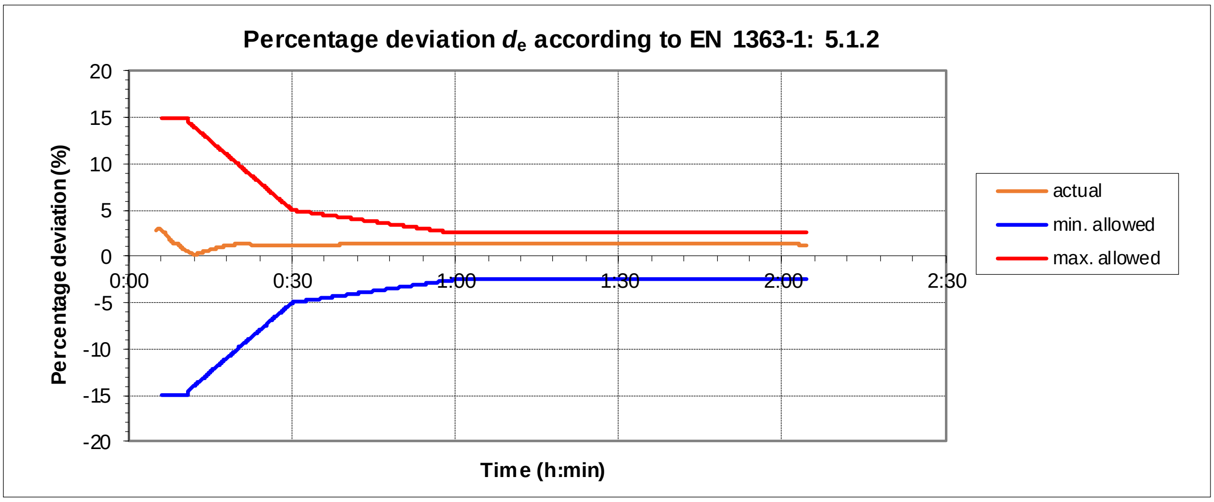
The measurement uncertainty arising from sampling is not included in the expanded measurement uncertainty. "Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible stated a degree of accuracy of the result", see EN 1363-1: 12.1 w).

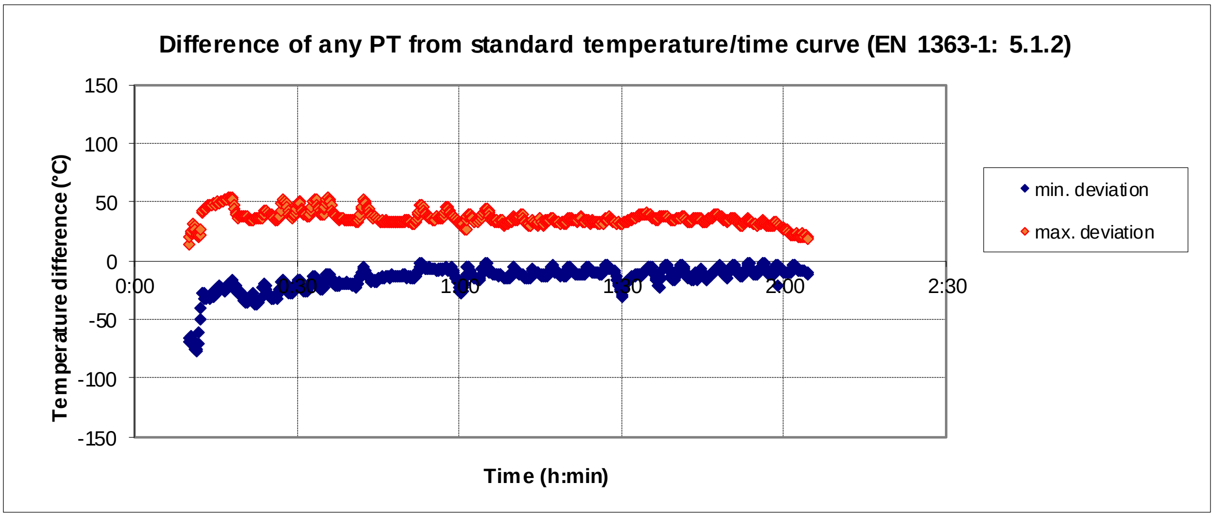
ANNEX B: MEASUREMENT

B.1 TEST 11th SEPTEMBER 2024 (SPECIMEN 1)

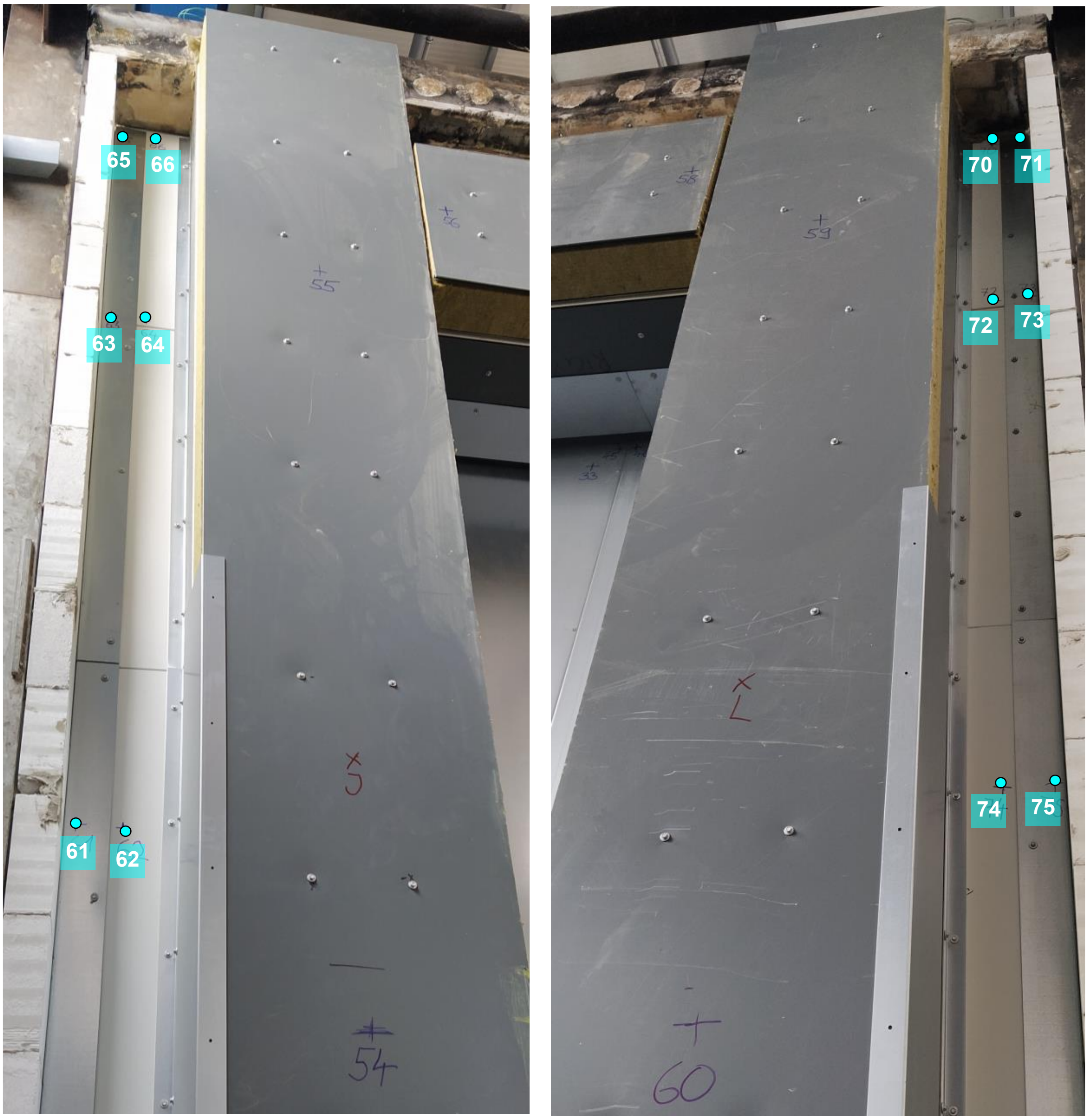





Percentage deviation d_e according to EN 1363-1: 5.1.2
Percentage deviation (%)
20
15
10
5
0
-5
-10
-15
-20
0:00
0:30
1:00
1:30
2:00
2:30
Time (h:min)
actual
min. allowed
max. allowed

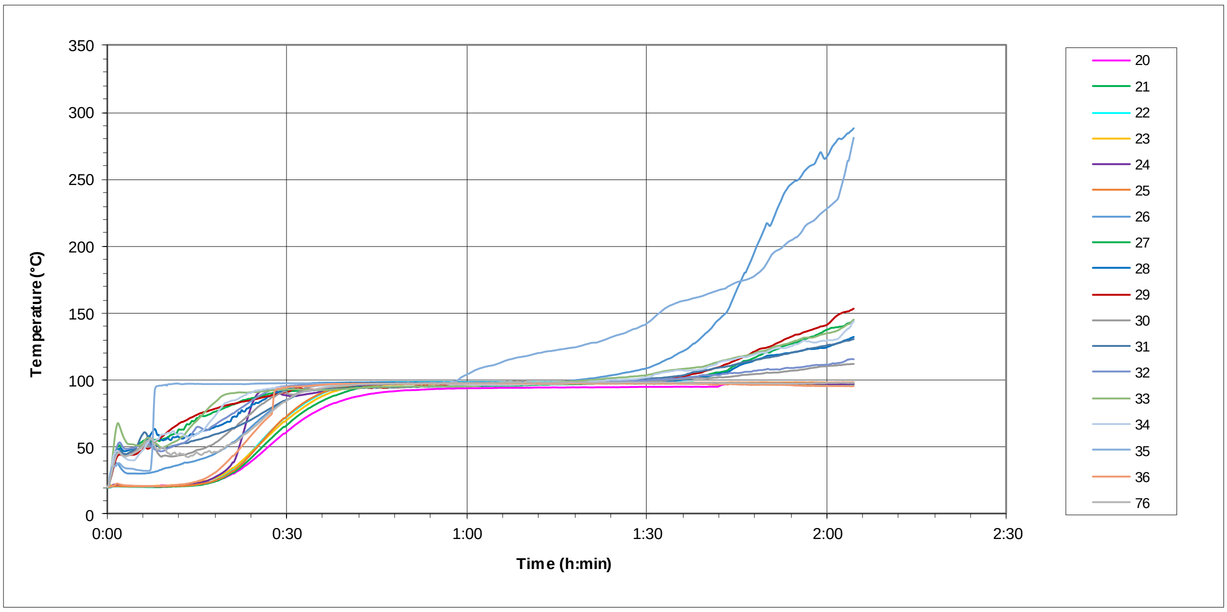

Difference of any PT from standard temperature/time curve (EN 1363-1: 5.1.2)
Temperature difference (°C)
150
100
50
0
-50
-100
-150
0:00
0:30
1:00
1:30
2:00
2:30
Time (h:min)
min. deviation
max. deviation

LAYOUT OF TC 61 TO 66 AND 70 TO 75 ON UF OF SPECIMEN 1 IN MORE DETAIL

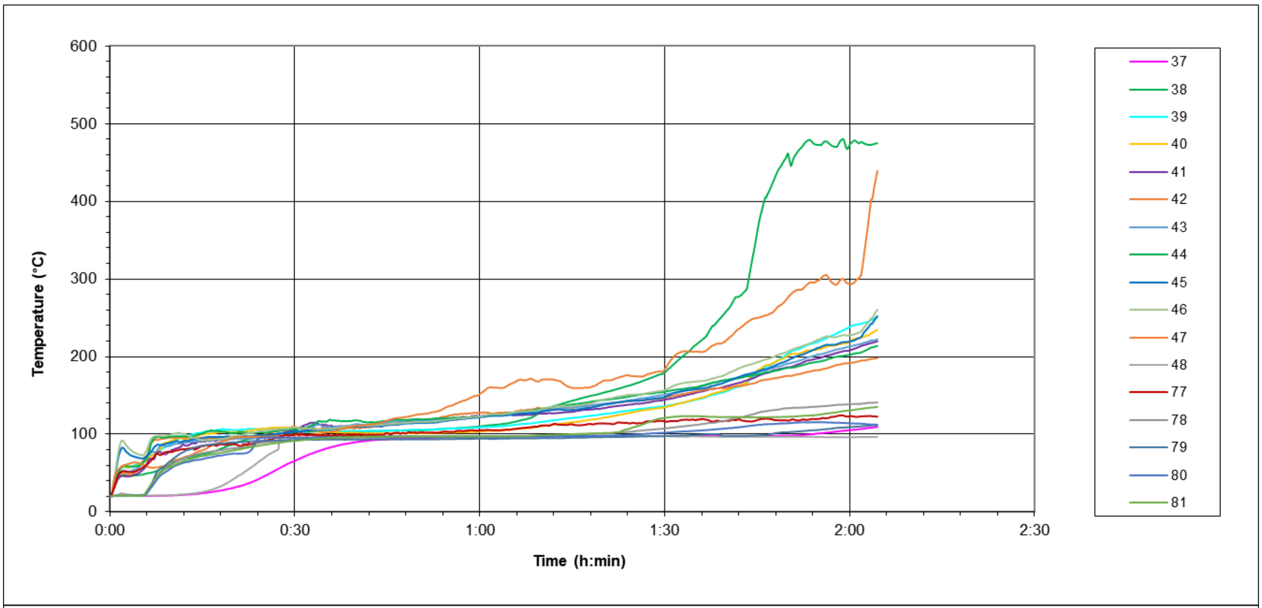


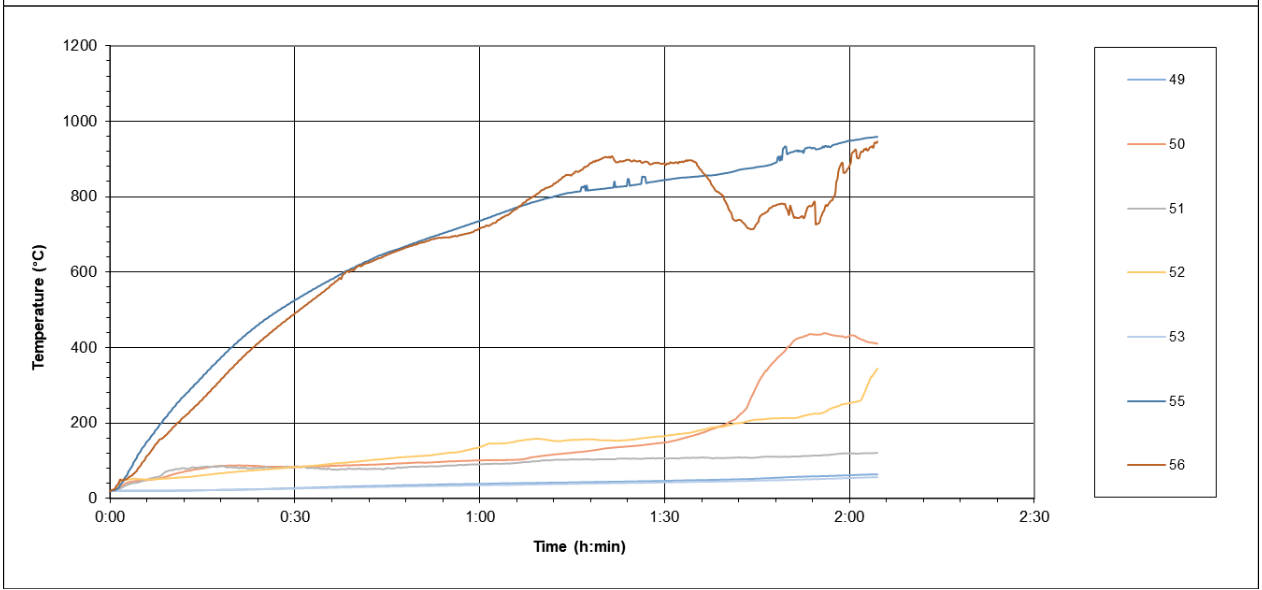
Key:

61 ÷ 66, 70 ÷ 75 - TC for T_{max} on wall made of sandwich panels



Temperatures on the unexposed face of doors





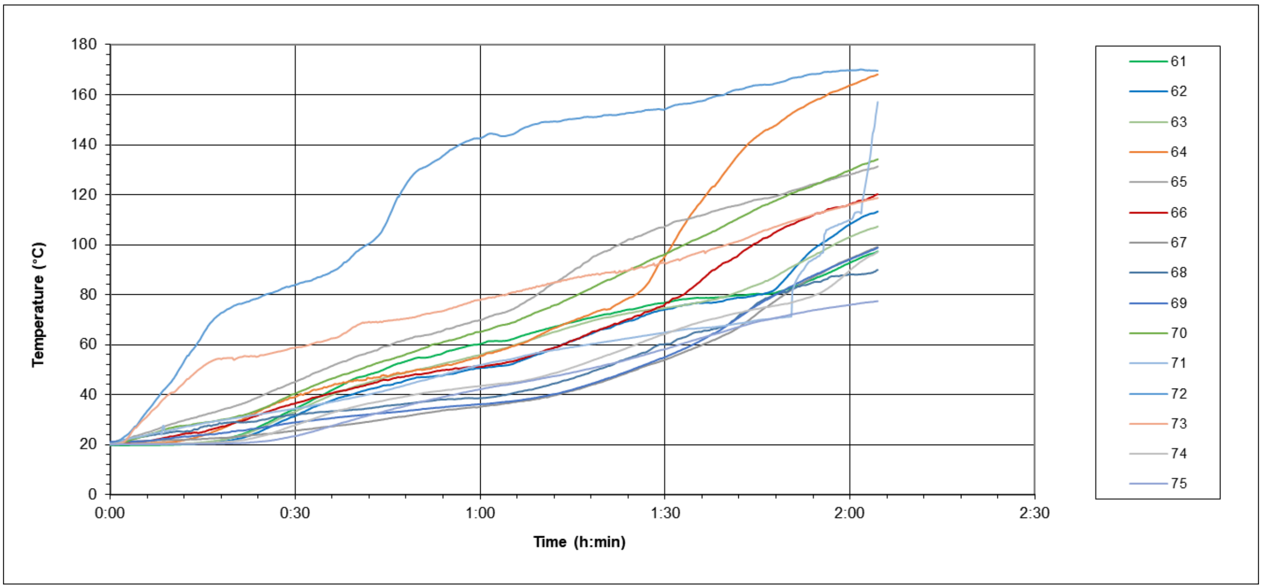
Temperature on the unexposed face of the doors / doorframe and temperature of fixing

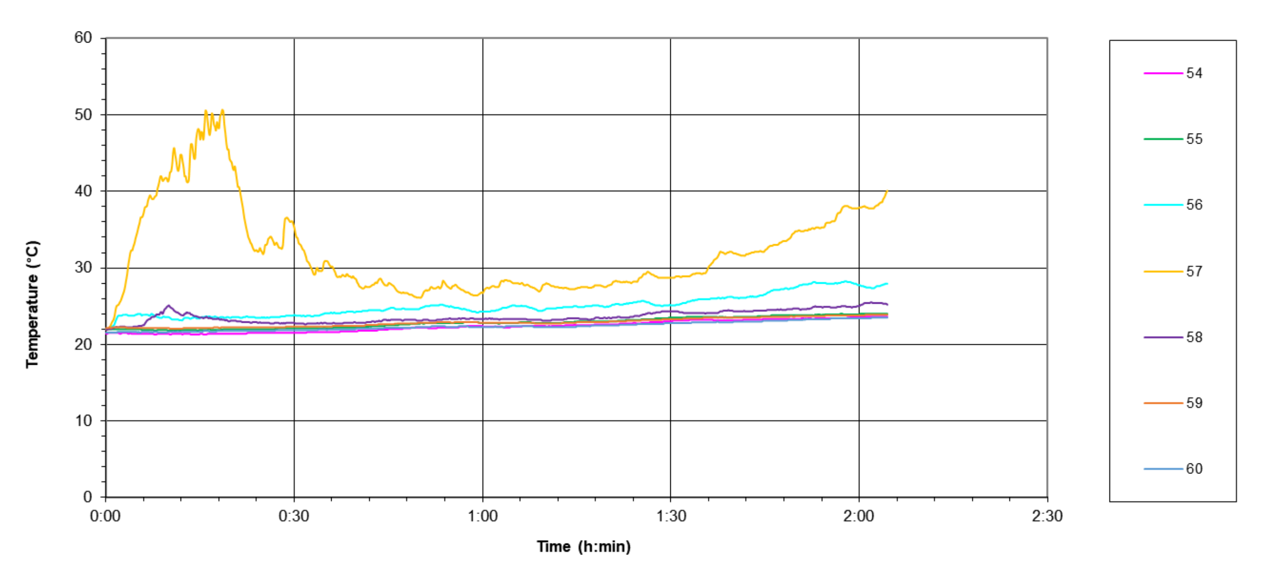
TC ON THE FIXING OF THE RAIL (TC 55 AND 56)

Time	Temperature on the unexposed face of the protected steel frame / wall (°C)																						
		T_{frame}							T_{max}														
(h:min:s)	T_{max}	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
0:00:00	**22**	21	22	22	22	22	22	22	20	20	20	21	20	20	21	21	21	20	20	20	20	20	20
0:05:00	**35**	21	22	24	35	22	22	22	20	20	20	21	24	21	21	23	21	23	23	30	29	20	20
0:10:00	**46**	21	22	24	42	25	22	22	20	20	20	21	28	23	22	25	23	27	26	46	41	20	20
0:15:00	**64**	21	22	24	47	24	22	22	21	21	21	24	32	25	22	27	24	29	29	64	51	21	20
0:30:00	**84**	22	22	24	35	23	22	22	34	32	33	39	45	37	26	32	29	40	34	84	59	28	24
0:45:00	**110**	22	23	25	28	23	23	22	51	44	47	47	60	46	30	36	33	54	42	110	70	38	34
1:00:00	**143**	22	23	24	27	23	23	22	60	51	56	55	70	51	35	39	36	65	52	143	78	44	42
1:15:00	**150**	23	23	25	27	23	23	22	69	62	67	70	89	62	42	47	42	79	59	150	87	51	49
1:30:00	**154**	23	24	25	29	24	23	23	77	74	75	95	107	76	54	60	55	96	65	154	93	64	58
1:45:00	**164**	23	24	27	32	24	24	23	80	80	84	144	118	101	73	77	76	115	70	164	105	74	69
2:00:00	**170**	24	24	28	38	25	24	23	93	108	103	164	128	116	95	88	94	130	110	170	116	90	76
2:04:30	**170**	24	24	28	40	25	24	24	97	113	107	168	131	120	99	90	99	134	157	170	119	97	77

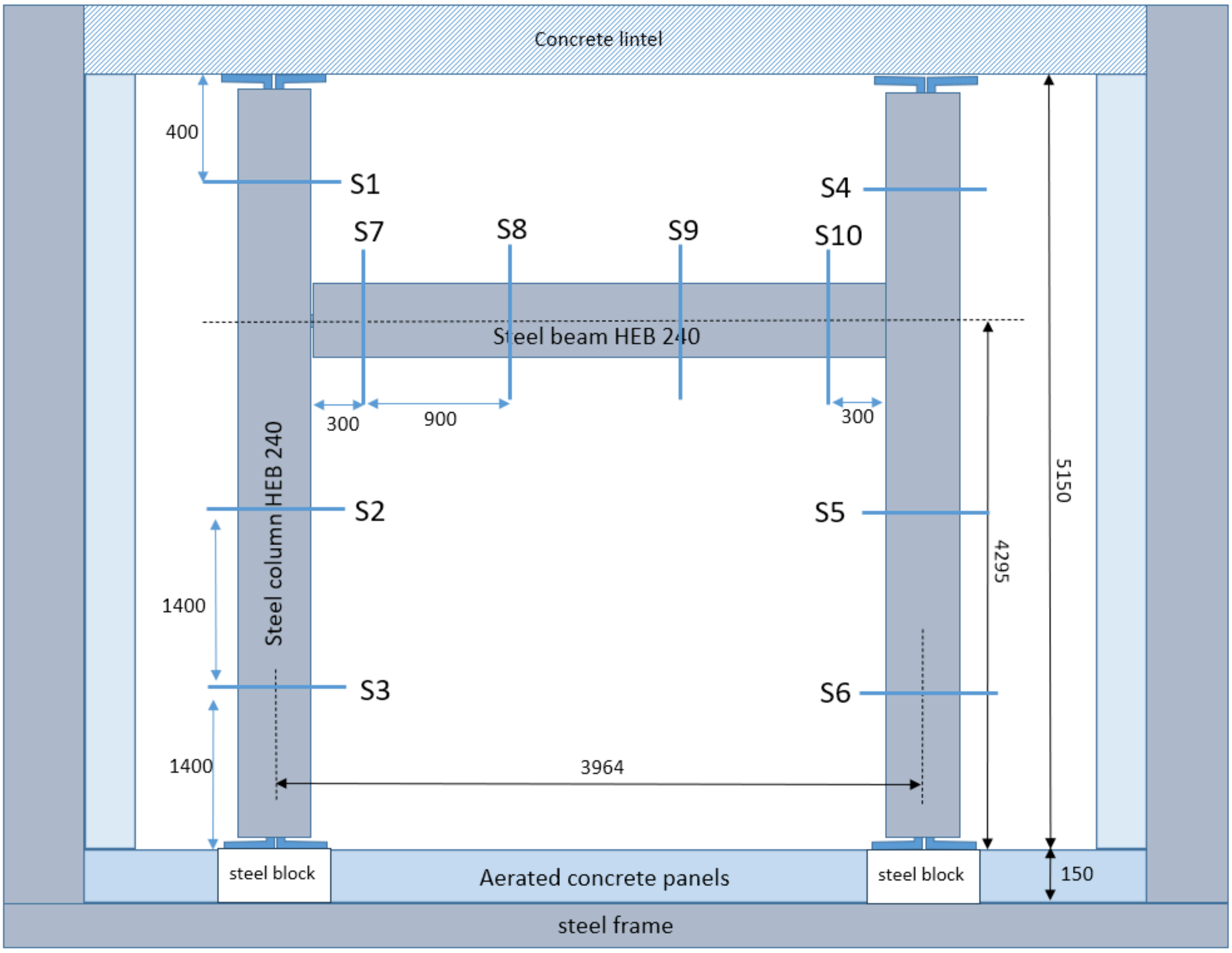
Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

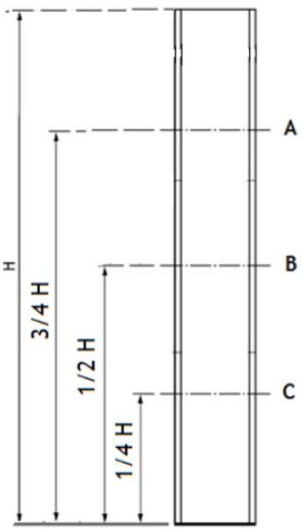
XX Designation of measuring joint of TC as figured in Annex B

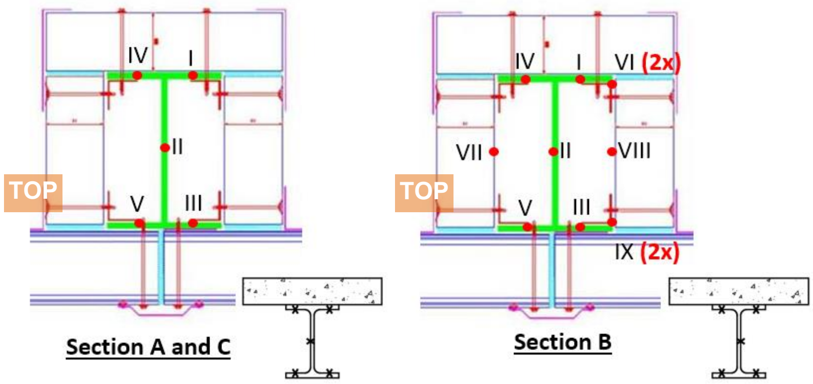



60
50
40
30
20
10
0
Temperature (°C)
0:00
0:30
1:00
1:30
2:00
2:30
Time (h:min)
54
55
56
57
58
59
60

LAYOUT OF TC ON THE SURFACE OF THE STEEL STRUCTURE







Thermocouples :

- I, II, III, IV and V to record the temperature of the steel profile
- VI, VII, VIII and IX to record the temperature at the surface of sandwich panels

Key:

Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S1 - I	*40*	S2 - I	*30*	S3 - I	*35*
S1 - II	*41*	S2 - II	*31*	S3 - II	*36*
S1 - III	*42*	S2 - III	*32*	S3 - III	*37*
S1 - IV	*43*	S2 - IV	*33*	S3 - IV	*38*
S1 - V	*44*	S2 - V	*34*	S3 - V	*39*

Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S4 - I	*92*	S5 - I	*82*	S6 - I	*87*
S4 - II	*93*	S5 - II	*83*	S6 - II	*88*
S4 - III	*94*	S5 - III	*84*	S6 - III	*89*
S4 - IV	*95*	S5 - IV	*85*	S6 - IV	*90*
S4 - V	*96*	S5 - V	*86*	S6 - V	*91*

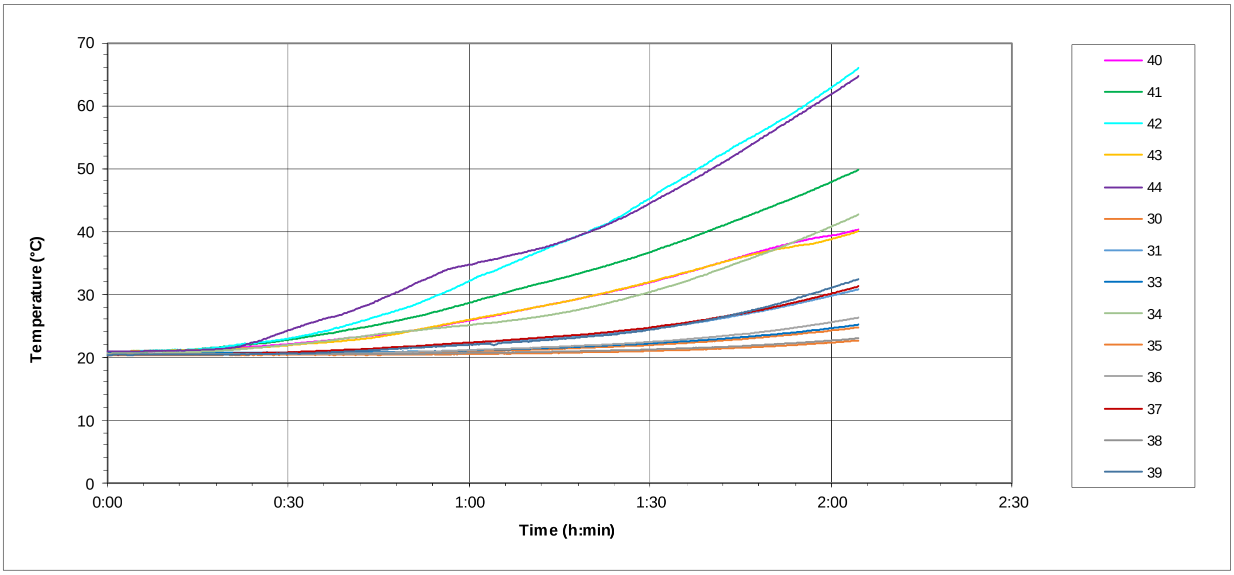
Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S7 - I	*45*	S8 - I	*50*	S9 - I	*97*	S10 - I	*22*
S7 - II	*46*	S8 - II	*51*	S9 - II	*98*	S10 - II	*23*
S7 - III	*47*	S8 - III	*52*	S9 - III	*99*	S10 - III	*24*
S7 - IV	*48*	S8 - IV	*53*	S9 - IV	*20*	S10 - IV	*25*
S7 - V	*49*	S8 - V	*54*	S9 - V	*21*	S10 - V	*26*

Time (h:min:s)	Temperature of the surface of steel column (under the fire protection) (°C) T_{steel}														
	40	41	42	43	44	30	31	32	33	34	35	36	37	38	39
0:00:00	21	21	21	21	21	21	20		21	21	20	20	20	20	20
0:05:00	21	21	21	21	21	21	21		21	21	20	20	20	20	20
0:10:00	21	21	21	21	21	21	21		21	21	20	20	20	21	20
0:15:00	21	21	21	21	21	21	21		21	21	20	20	21	21	20
0:30:00	22	23	23	22	24	21	21		21	22	20	21	21	21	21
0:45:00	24	25	27	23	29	21	21		21	24	20	21	21	21	21
1:00:00	26	29	32	26	35	21	22		21	25	21	21	22	21	22
1:15:00	29	33	38	29	38	21	23		22	27	21	22	23	21	23
1:30:00	32	37	45	32	45	22	25		22	30	21	22	25	21	24
1:45:00	36	42	54	36	53	23	27		23	35	22	24	27	22	27
2:00:00	39	48	63	39	62	24	30		25	41	22	26	30	23	31
2:04:30	40	50	66	40	65	25	31		25	43	23	26	31	23	32

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX Designation of measuring joint of TC as figured in Annex B

TC failure

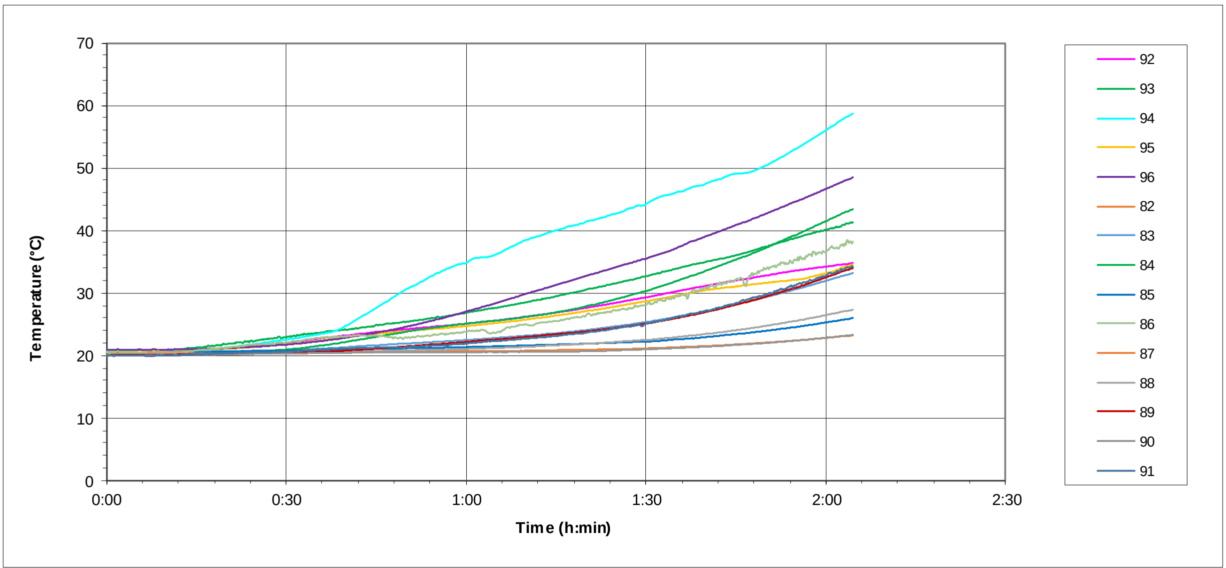


Time	Temperature of the surface of steel column (under the fire protection) (°C)														
	T_{steel}														
(h:min:s)	92	93	94	95	96	82	83	84	85	86	87	88	89	90	91
0:00:00	21	21	21	21	21		20	20	20	20	20	20	20	20	20
0:05:00	21	21	21	21	21		20	20	20	20	20	20	20	20	20
0:10:00	21	21	21	21	21		21	20	20	21	20	20	20	20	20
0:15:00	21	21	21	21	21		21	21	21	21	20	20	20	20	20
0:30:00	22	23	23	22	22		21	21	21	22	20	20	20	20	21
0:45:00	24	25	28	24	24		22	23	21	23	21	21	21	21	21
1:00:00	25	27	35	25	27		23	25	21	24	21	21	22	21	22
1:15:00	27	30	40	26	31		24	27	22	26	21	22	23	21	23
1:30:00	29	33	44	29	36		25	30	22	28	21	23	25	21	25
1:45:00	32	36	49	31	41		28	35	23	32	22	24	28	22	28
2:00:00	34	40	56	33	47		32	42	25	37	23	27	33	23	33
2:04:30	35	41	59	35	49		33	43	26	38	23	27	34	23	34

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX Designation of measuring joint of TC as figured in Annex B

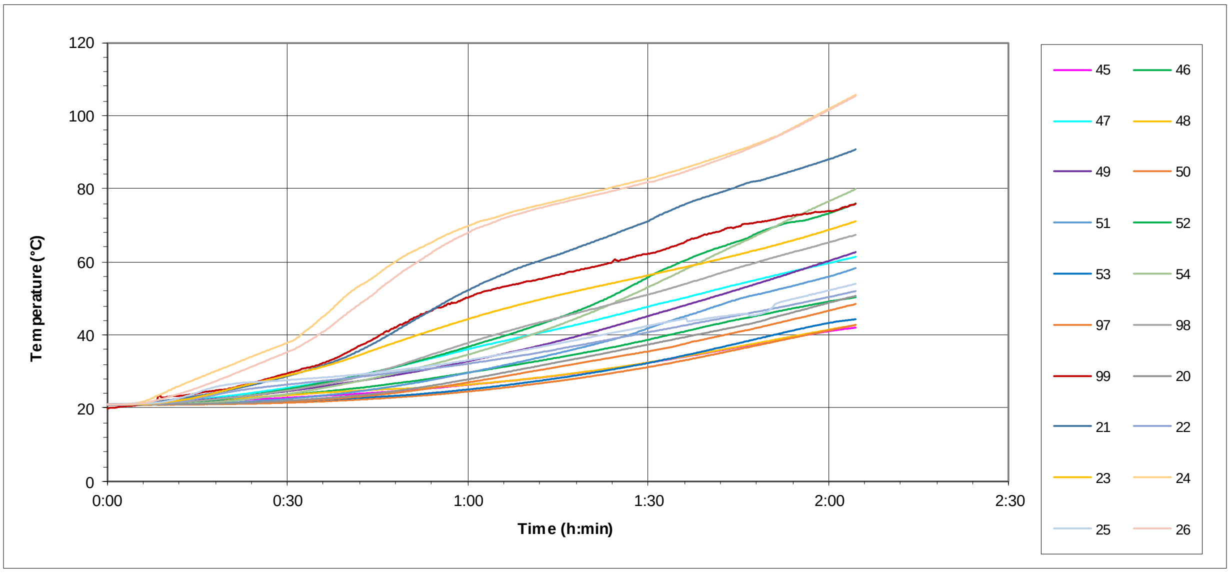
TC failure

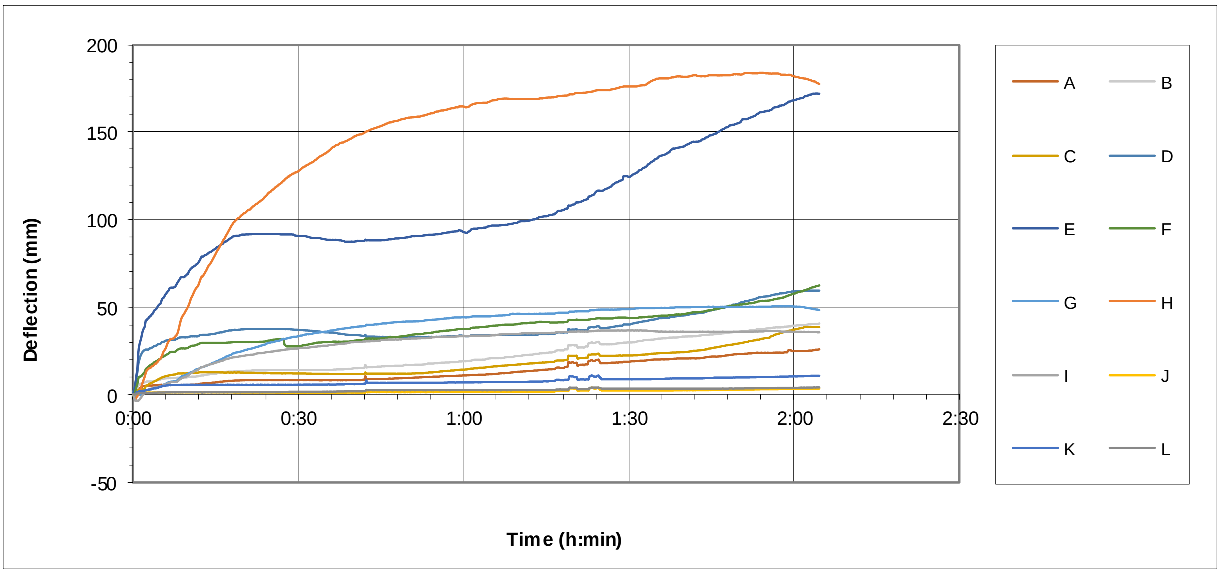


Time (h:min:s)	Temperature of the surface of steel beam (under the fire protection) (°C) T_{steel}																			
	45	46	47	48	49	50	51	52	53	54	97	98	99	20	21	22	23	24	25	26
0:00:00	21	21	21	21	21	21	21	21	21	21	21	21	20	21	21	21	21	21	21	21
0:05:00	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
0:10:00	22	22	22	22	22	21	21	21	21	21	21	21	23	21	22	21	22	25	22	23
0:15:00	22	22	22	22	22	21	21	22	21	21	21	22	24	21	23	23	23	28	24	26
0:30:00	23	24	26	24	25	22	23	25	22	24	22	25	30	22	29	26	29	38	28	35
0:45:00	24	26	30	25	28	23	25	30	23	29	24	30	40	24	38	29	36	57	30	52
1:00:00	26	30	36	26	33	25	30	37	25	35	27	38	50	28	52	32	44	70	33	68
1:15:00	29	34	42	29	38	27	35	45	28	43	31	45	56	33	62	36	51	77	38	76
1:30:00	32	39	48	33	45	31	42	56	32	53	36	51	62	37	71	41	56	83	43	82
1:45:00	37	44	54	37	52	36	50	66	38	65	41	58	70	42	81	45	62	91	46	90
2:00:00	41	49	60	41	60	41	56	73	43	77	47	65	74	49	88	50	69	102	52	101
2:04:30	42	50	61	43	63	43	58	76	44	80	49	67	76	51	91	52	71	106	54	105

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX Designation of measuring joint of TC as figured in Annex B





Deflection of the specimen

Values "+" - deflection in furnace
Values "-" - deflection away from furnace

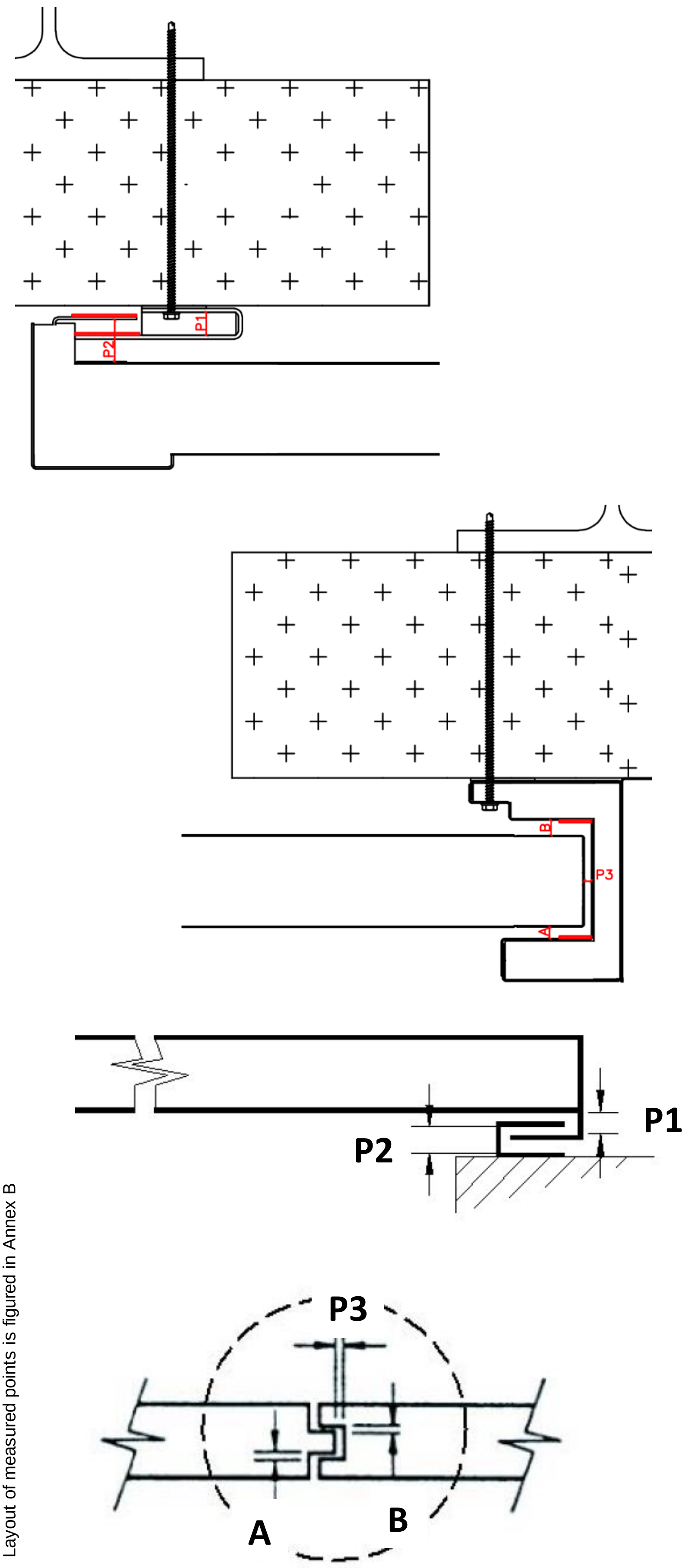
GAP MEASUREMENTS BETWEEN DOOR LEAF AND FRAME, SCHEME

GAP MEASUREMENTS BETWEEN DOOR LEAF AND FRAME BEFORE THE TEST - SPECIMEN 1

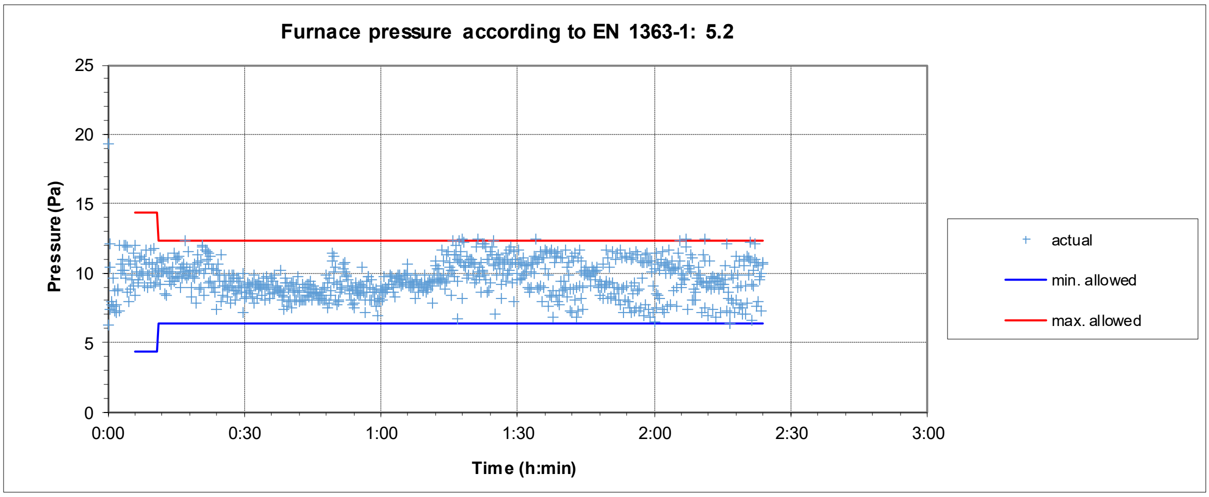
Gap (mm)	Measured point																							
	Closing labyrinth						Upper side (rail)						Vertical side (peripheral labyrinth)						Bottom side					
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
P1													**18.8**	**18.9**	**18.9**	**18.6**	**18.2**	**18.7**						
P2													**34.4**	**35.1**	**34.9**	**35.1**	**35.0**	**34.5**						
P3	**2.4**	**3.0**	**2.9**	**2.7**	**2.9**	**2.4**													**20.3**	**20.6**	**20.9**	**20.5**	**20.5**	**20.6**
A	7.0	6.8	6.3	7.0	6.6	6.3																		
B	14.4	14.5	14.8	14.1	14.8	14.5																		

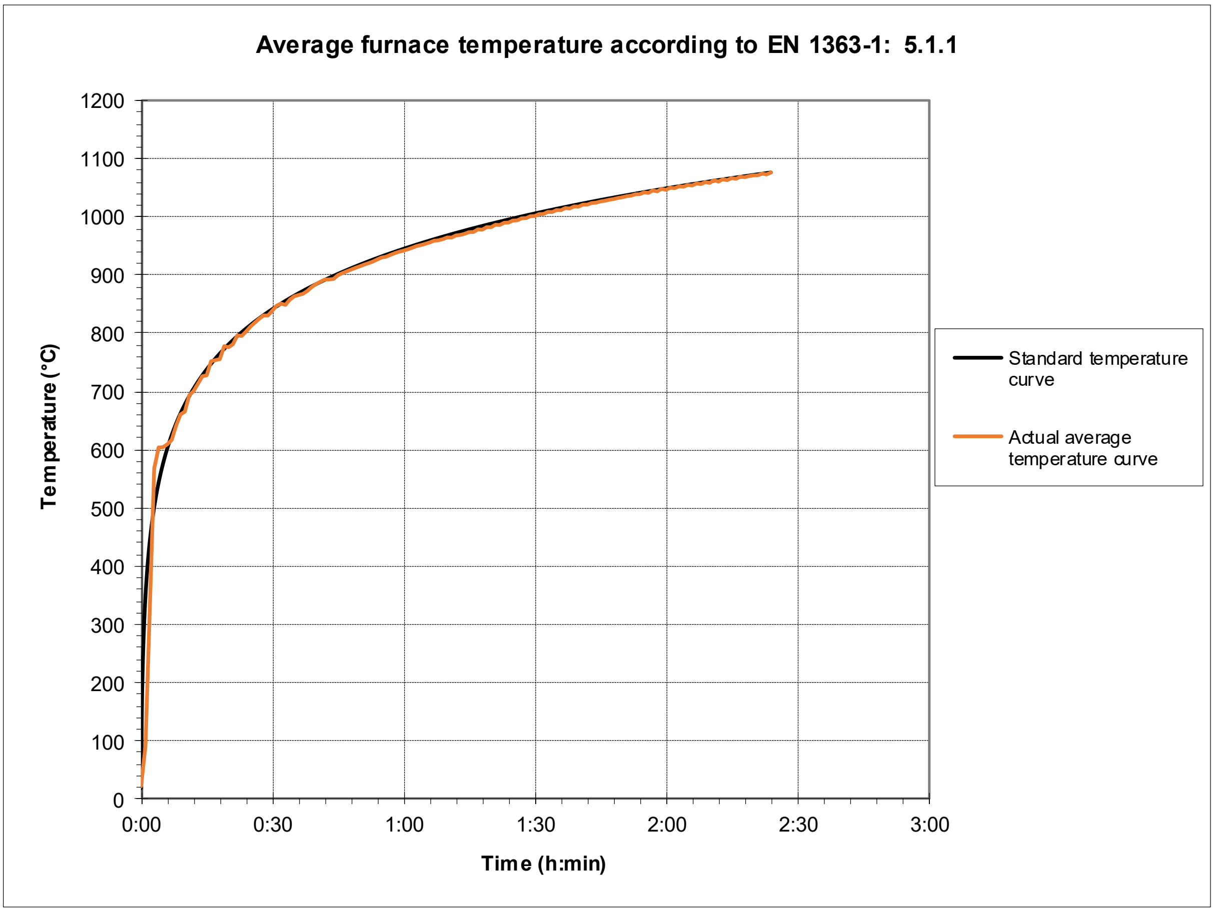
Primary gap measurements are highlighted in bold type

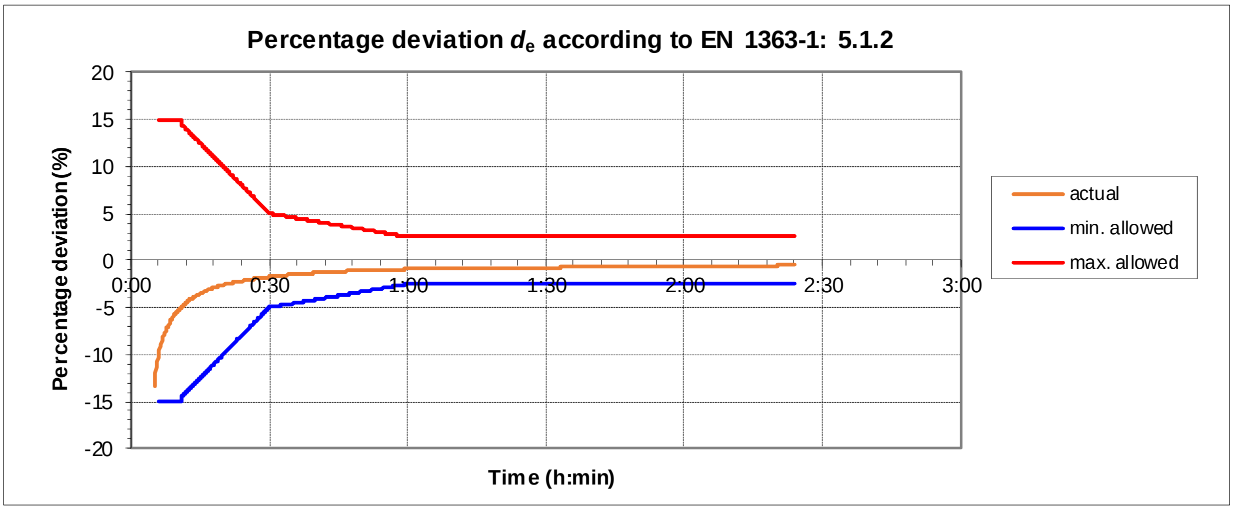
Layout of measured points is figured in Annex B

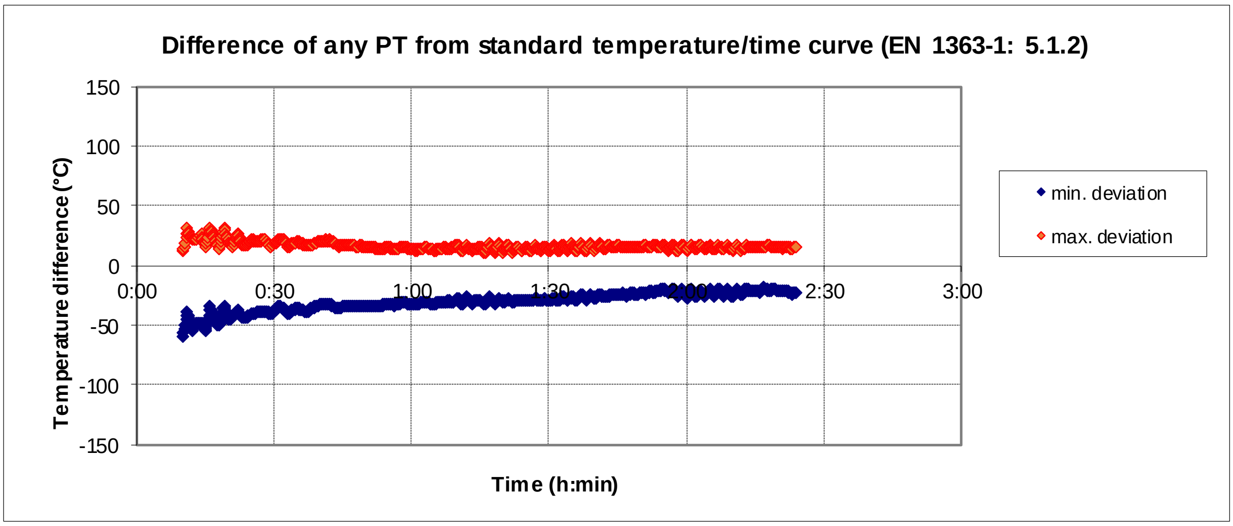


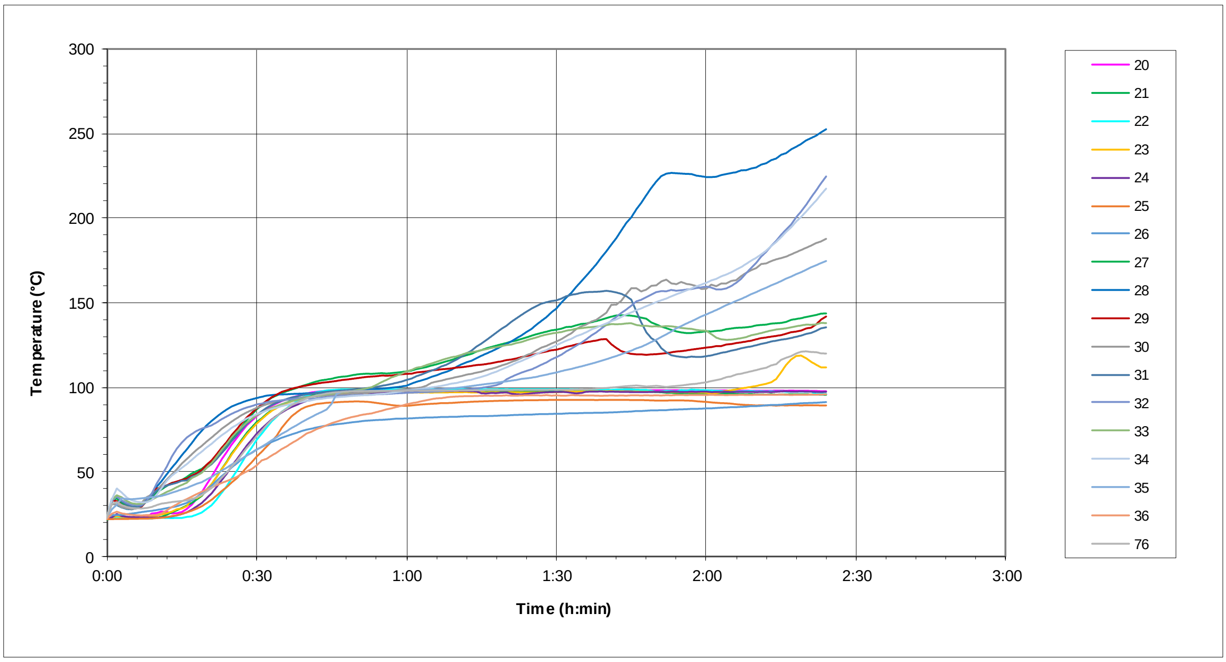
B.2 TEST 18th SEPTEMBER 2024 (SPECIMEN 2)



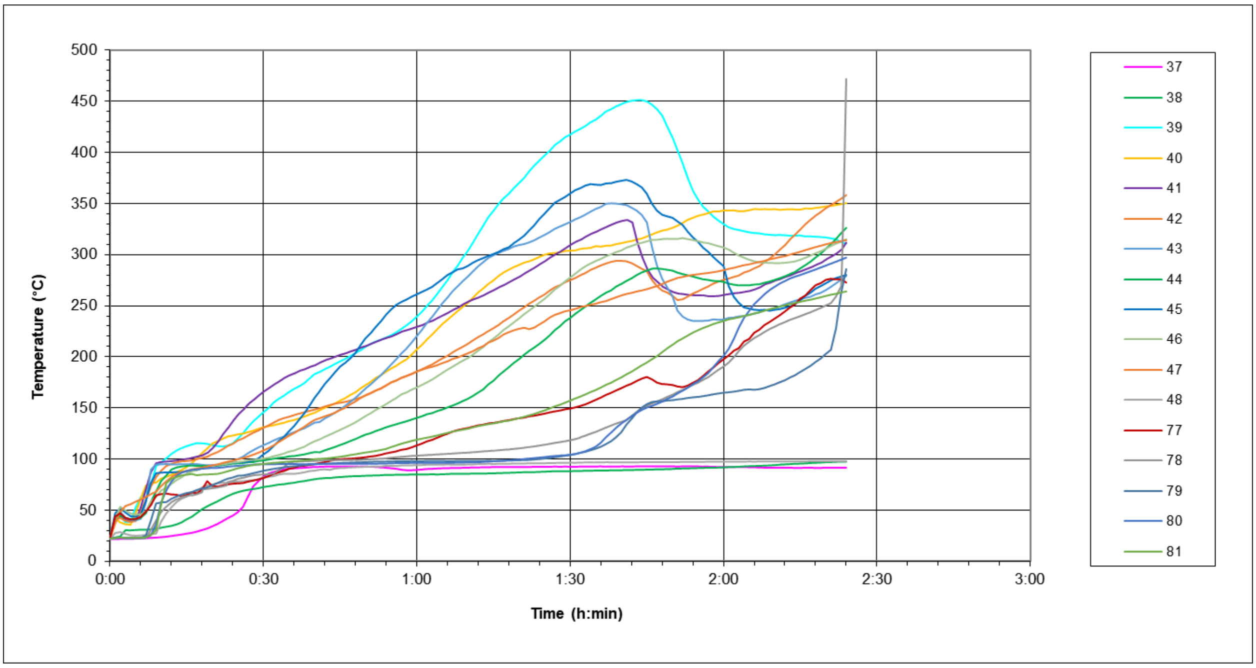


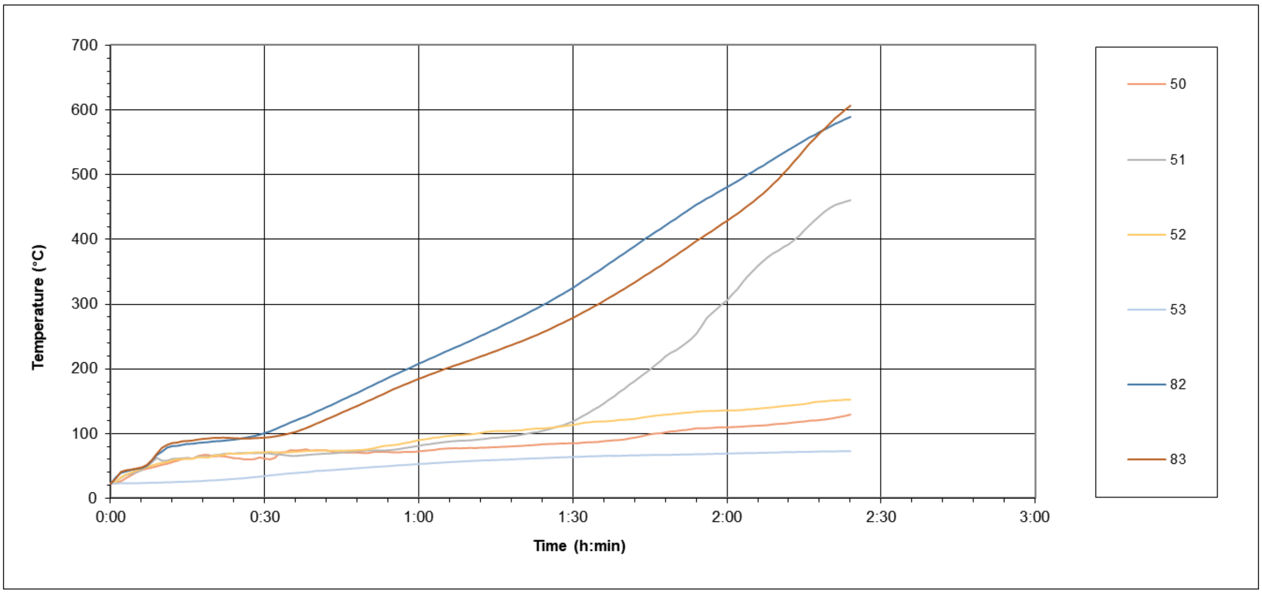

Percentage deviation d_e according to EN 1363-1: 5.1.2
Percentage deviation (%)
20
15
10
5
0
-5
-10
-15
-20
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time (h:min)
actual
min. allowed
max. allowed


Difference of any PT from standard temperature/time curve (EN 1363-1: 5.1.2)
Temperature difference (°C)
150
100
50
0
-50
-100
-150
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time (h:min)
min. deviation
max. deviation



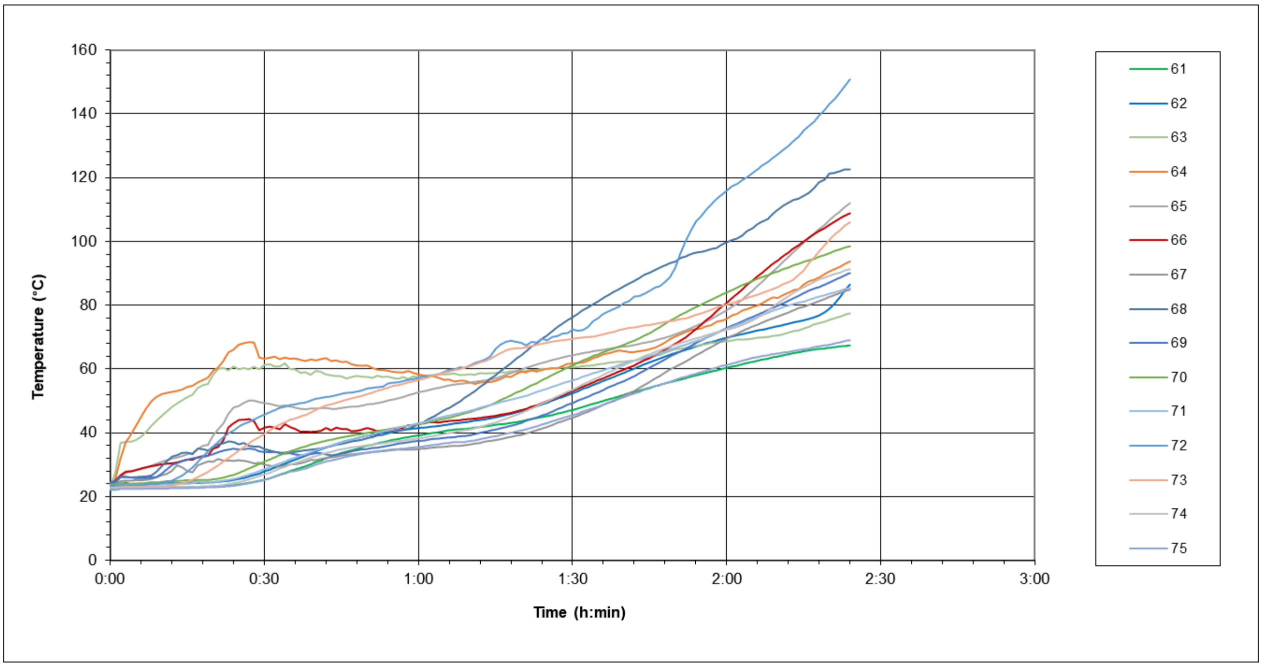
Temperature on the unexposed face of the doors

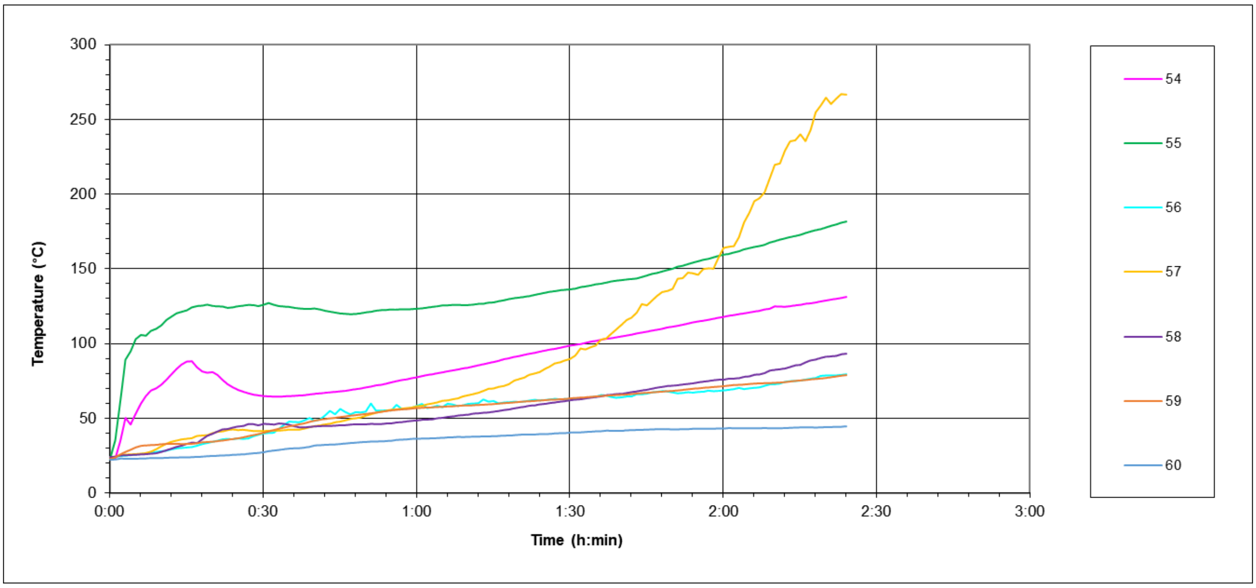




Temperature on the unexposed face of the doors / doorframe and temperature of fixing

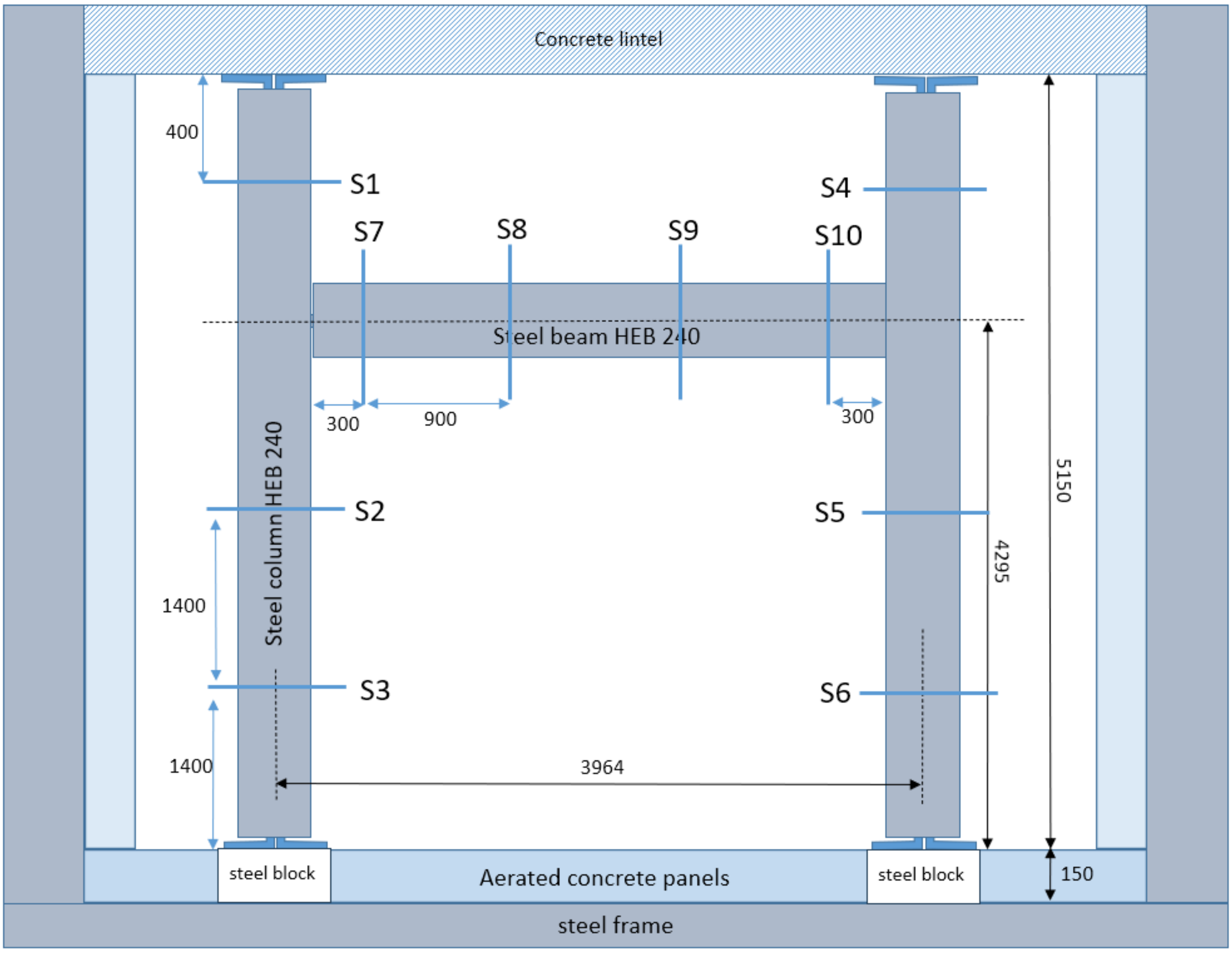
TC ON THE FIXING OF THE RAIL (TC 82 AND 83)

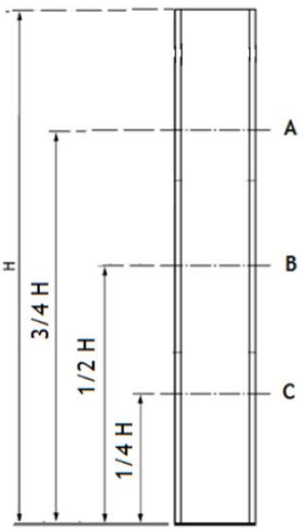


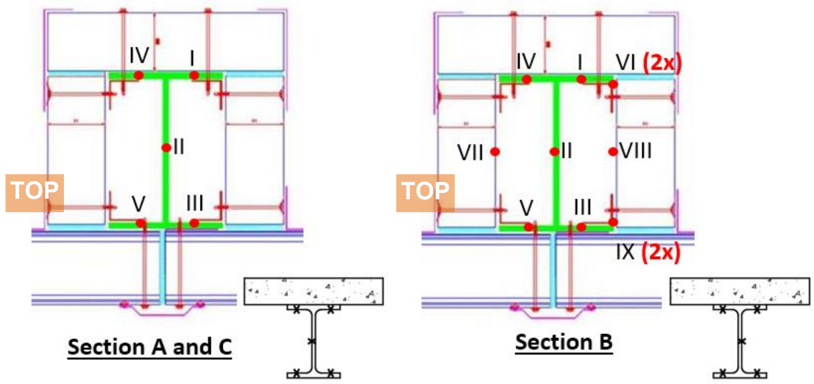


Temperature on the unexposed face of the protected steel frame / wall

LAYOUT OF TC ON THE SURFACE OF THE STEEL STRUCTURE







Thermocouples :

- I, II, III, IV and V to record the temperature of the steel profile
- VI, VII, VIII and IX to record the temperature at the surface of sandwich panels

Key:

Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S1 - I	*84*	S2 - I	*24*	S3 - I	*99*
S1 - II	*85*	S2 - II	*25*	S3 - II	*20*
S1 - III	*86*	S2 - III	*26*	S3 - III	*21*
S1 - IV	*87*	S2 - IV	*27*	S3 - IV	*22*
S1 - V	*88*	S2 - V	*28*	S3 - V	*23*

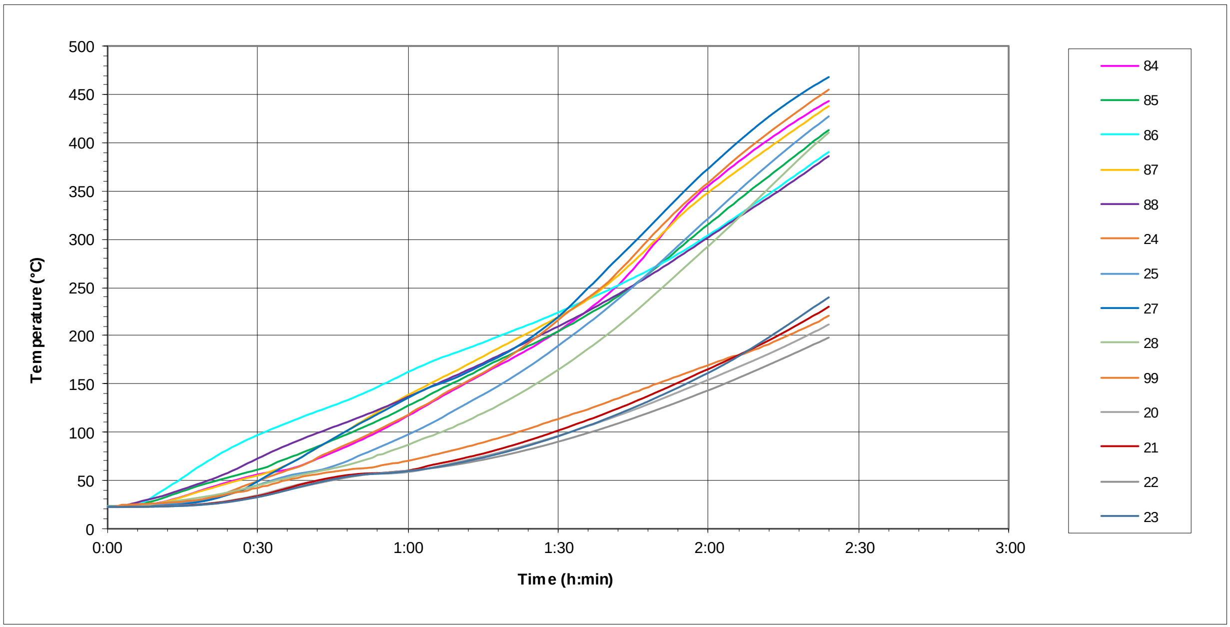
Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S4 - I	*30*	S5 - I	*40*	S6 - I	*45*
S4 - II	*31*	S5 - II	*41*	S6 - II	*46*
S4 - III	*32*	S5 - III	*42*	S6 - III	*47*
S4 - IV	*33*	S5 - IV	*43*	S6 - IV	*48*
S4 - V	*34*	S5 - V	*44*	S6 - V	*49*

Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger	Section/TC	Datalogger
S7 - I	*89*	S8 - I	*94*	S9 - I	*35*	S10 - I	*50*
S7 - II	*90*	S8 - II	*95*	S9 - II	*36*	S10 - II	*51*
S7 - III	*91*	S8 - III	*96*	S9 - III	*37*	S10 - III	*52*
S7 - IV	*92*	S8 - IV	*97*	S9 - IV	*38*	S10 - IV	*53*
S7 - V	*93*	S8 - V	*98*	S9 - V	*39*	S10 - V	*54*

Time (h:min:s)	Temperature of the surface of steel column (under the fire protection) (°C) T_{steel}														
	84	85	86	87	88	24	25	26	27	28	99	20	21	22	23
0:00:00	23	23	23	23	23	23	23	23	23	23	22	22	22	22	22
0:05:00	24	25	24	24	26	23	23	23	23	23	25	23	23	22	22
0:10:00	26	30	36	26	32	24	24	27	23	26	26	23	23	23	23
0:15:00	33	39	52	33	41	27	27	32	25	30	28	24	24	24	24
0:30:00	56	61	97	55	73	49	45	47	49	45	42	35	34	32	33
0:45:00	79	92	127	93	105	81	64	71	93	62	59	53	53	50	51
1:00:00	117	127	162	138	137	118	97	96	135	87	70	59	60	60	59
1:15:00	160	167	193	178	171	161	139	132	170	120	89	75	78	71	73
1:30:00	205	204	224	219	209	216	189	175	219	165	113	96	102	90	96
1:45:00	269	252	260	277	252	283	251	227	296	223	141	123	131	114	125
2:00:00	356	316	304	349	302	359	322	292	373	293	169	154	165	143	161
2:15:00	414	377	358	406	354	422	391	363	438	368	198	188	203	177	208
2:24:00	443	413	390	438	386	455	427	408	468	411	221	212	230	198	240

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX Designation of measuring joint of TC as figured in Annex B

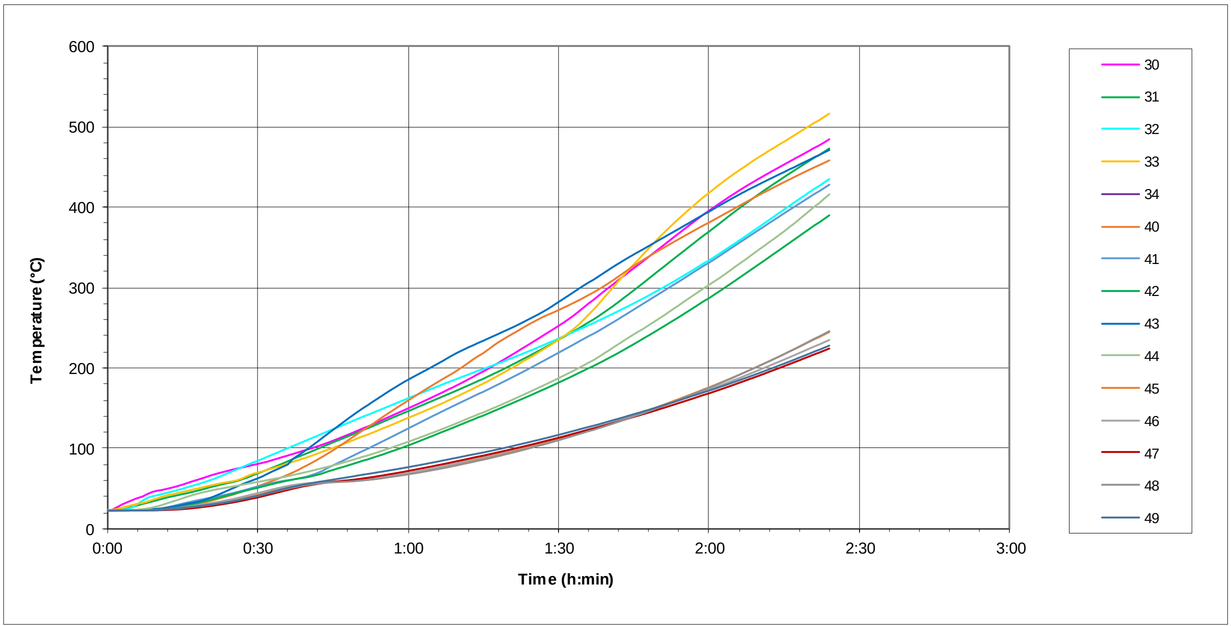


Time (h:min:s)	Temperature of the surface of steel column (under the fire protection) (°C) T_{steel} 30	31	32	33	34	40	41	42	43	44	45	46	47	48	49
0:00:00	23	23	23	23		23	23	23	23	23	22	22	22	22	22
0:05:00	35	27	26	29		23	23	23	23	23	23	23	23	23	23
0:10:00	47	35	42	38		24	25	24	25	28	23	23	23	23	23
0:15:00	55	43	50	46		27	31	28	30	38	25	27	24	26	26
0:30:00	80	69	84	70		53	52	51	62	58	42	44	39	41	41
0:45:00	109	107	124	100		97	79	73	123	79	59	58	58	58	61
1:00:00	150	146	162	138		159	125	103	185	108	68	69	72	68	76
1:15:00	196	186	199	180		218	170	141	234	145	87	89	91	86	95
1:30:00	252	235	236	235		272	219	182	282	187	112	113	113	110	117
1:45:00	324	296	280	329		327	273	229	341	242	141	141	139	140	142
2:00:00	395	369	334	418		381	331	287	394	303	176	173	168	175	172
2:15:00	453	437	397	481		431	392	351	444	370	217	210	202	217	205
2:24:00	484	473	435	516		458	428	390	471	416	245	235	224	246	228

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX Designation of measuring joint of TC as figured in Annex B

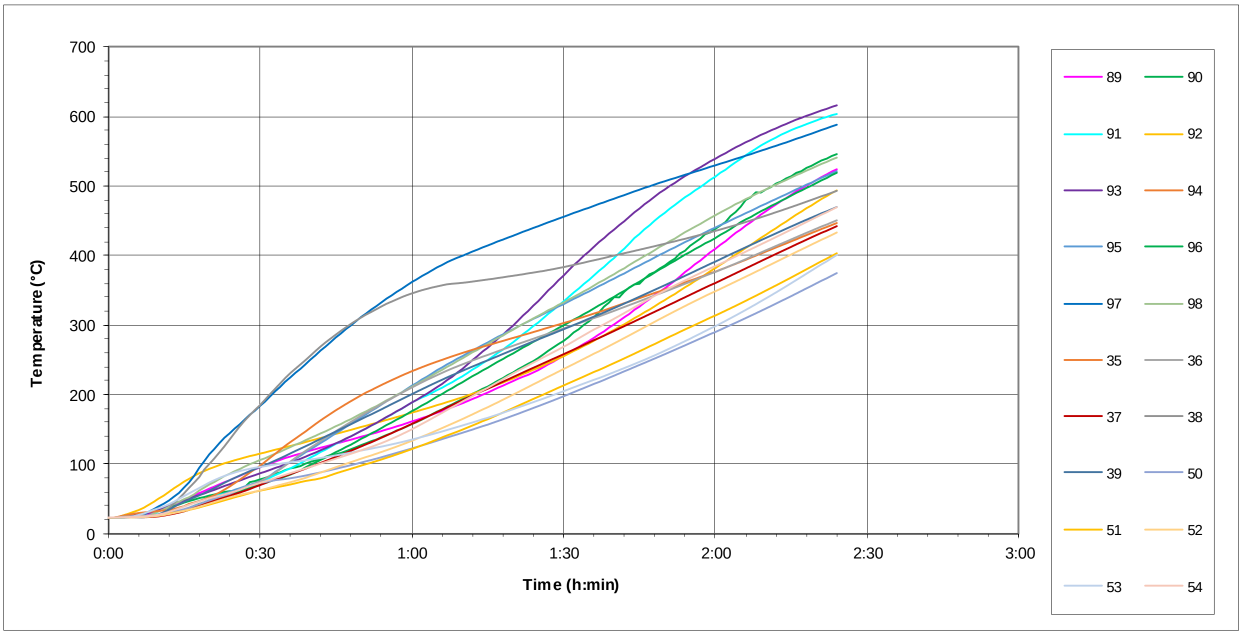
TC failure

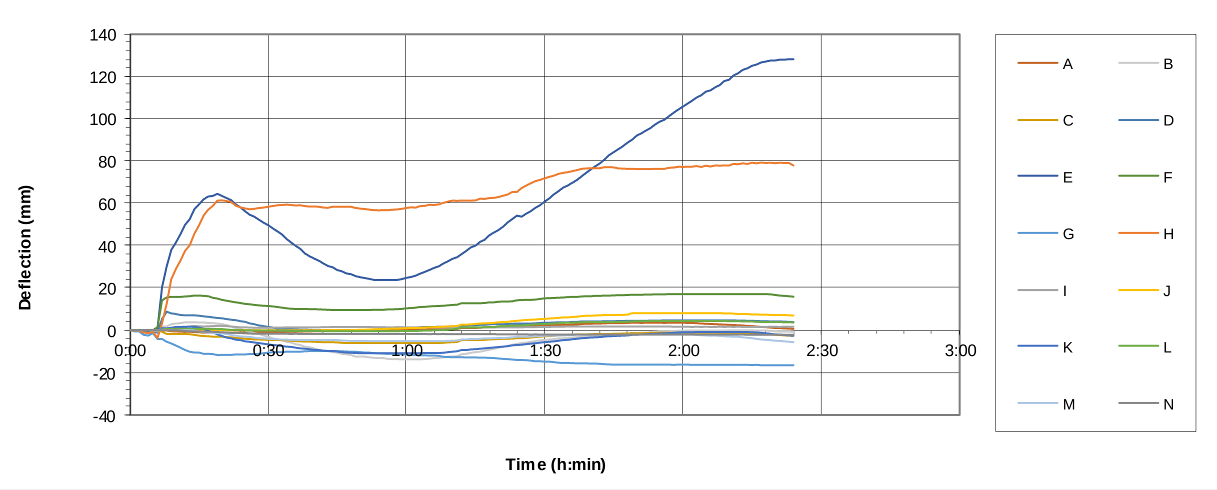


Time (h:min:s)	Temperature of the surface of steel beam (under the fire protection) (°C) T_{steel}																			
	89	90	91	92	93	94	95	96	97	98	35	36	37	38	39	50	51	52	53	54
0:00:00	23	23	23	23	23		23	23	23	23	23	23	23	23	23	23	23	23	23	23
0:05:00	24	25	24	31	26		25	23	24	23	28	25	23	23	23	23	24	23	25	24
0:10:00	33	35	28	51	34		27	26	39	32	33	27	25	27	28	27	27	26	37	27
0:15:00	48	45	39	75	48		34	34	66	50	39	32	32	58	46	35	33	33	54	39
0:30:00	95	78	74	115	87		75	70	184	106	97	75	70	185	96	73	62	62	96	73
0:45:00	130	114	129	144	130		144	117	282	155	177	147	110	286	147	93	87	96	113	108
1:00:00	161	158	189	174	189		213	176	362	211	234	210	158	345	201	122	122	133	135	150
1:15:00	203	211	250	209	267		275	239	414	273	271	257	208	366	249	157	164	182	167	210
1:30:00	255	277	334	255	371		330	299	456	332	303	295	258	383	294	198	213	237	205	269
1:45:00	326	359	431	314	468		386	362	495	395	339	334	309	408	341	243	262	293	247	330
2:00:00	410	438	513	382	539		440	425	530	458	377	376	360	435	391	290	314	349	298	385
2:15:00	487	514	580	454	592		492	486	565	512	420	423	413	470	442	342	368	402	360	437
2:24:00	524	546	604	494	616		521	519	588	541	447	451	442	493	470	375	403	433	401	469

Temperature recorded at 10 s intervals. In the table, they figure in 15 minute intervals

XX	Designation of measuring joint of TC as figured in Annex B
	TC failure





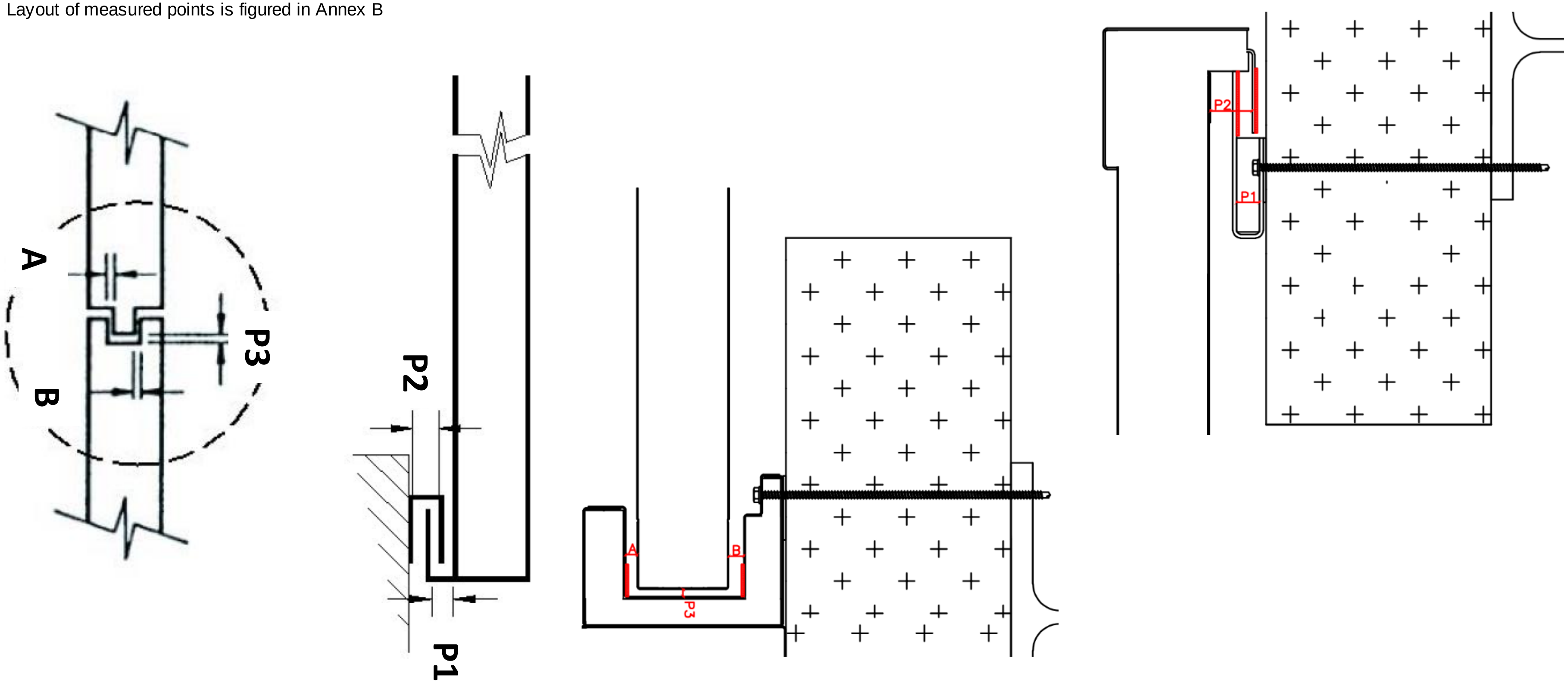
Deflection of the specimen

GAP MEASUREMENTS BETWEEN DOOR LEAF AND FRAME, SCHEME

GAP MEASUREMENTS BETWEEN DOOR LEAF AND FRAME BEFORE THE TEST - SPECIMEN 2

Gap (mm)	Measured point																							
	Vertical side (peripheral labyrinth)						Upper side (rail)						Closing labyrinth						Bottom side					
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
P1	**18.7**	**18.9**	**18.9**	**19.5**	**19.4**	**19.0**																		
P2	**32.9**	**32.6**	**32.6**	**33.0**	**33.3**	**33.6**																		
P3													**2.4**	**2.5**	**2.4**	**2.9**	**2.6**	**2.2**	**20.8**	**21.6**	**19.0**	**18.9**	**19.3**	**19.5**
A													8.9	8.9	9.2	9.1	8.9	8.9						
B													12.2	12.1	12.4	12.0	12.5	12.6						

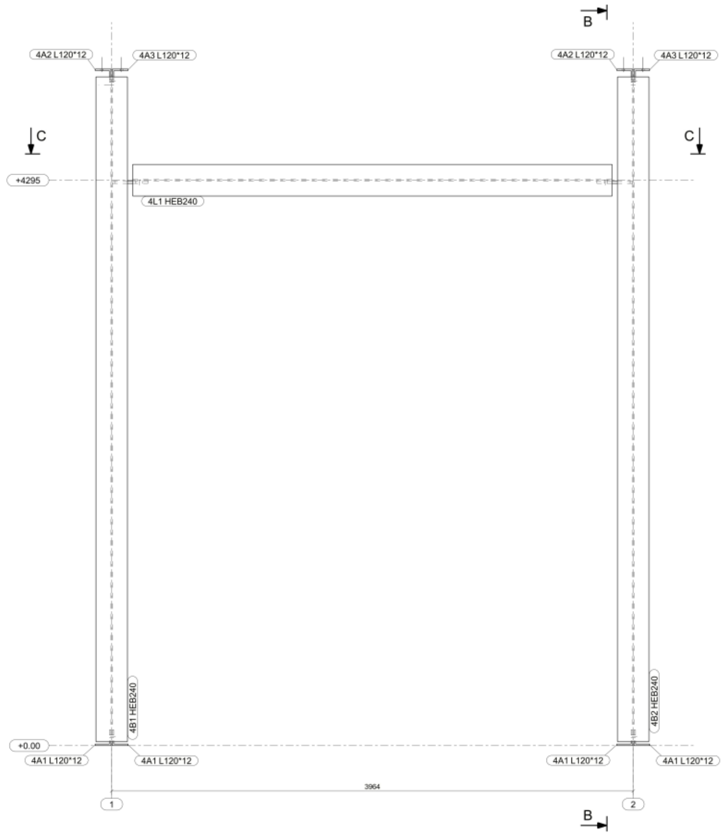
Primary gap measurements are highlighted in bold type
Layout of measured points is figured in Annex B



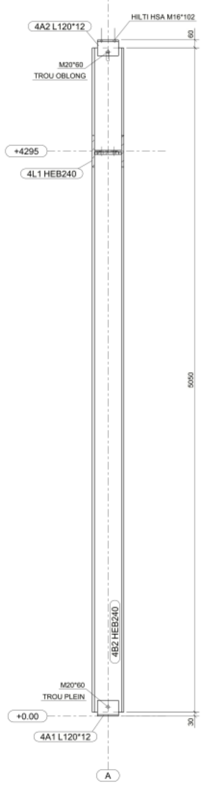
ANNEX C: DOCUMENTATION

Specimen-related documentation delivered by the test sponsor.

A - A



B - B



VUE EN PLAN

C - C

REMARQUES GENERALES

Sauf indications contraires

Cotation en millimétre

Nuances des aciers
S275JR pour les Cornières
S275JR pour les Profils I H U
S235JRH pour les Tubes
S355J0 pour les Tôles et les PRS
S350GD+Z pour les Profils PLS®
Classe d'exécution suivant NF EN 1090-2
EXC2

Soudures
a= 3 mini ou 0.58*ep mini à souder ou indication contraire ***

Boulonnerie
: SB8.8Z

Protection des Aciers

PEINTURE
Système : Teinte Finale:

Autres Informations

EMETTEUR

BRIAND MÉTAL

Briand Construction Métallique
29 avenue des Sables - CS 10117
85501 Les Herbiers Cedex
Tel : 02 51 91 03 73
email : secretariat-lesherbiers@briandmetal.fr
www.briandmetal.fr

MAITRE D'OUVRAGE

PROJET

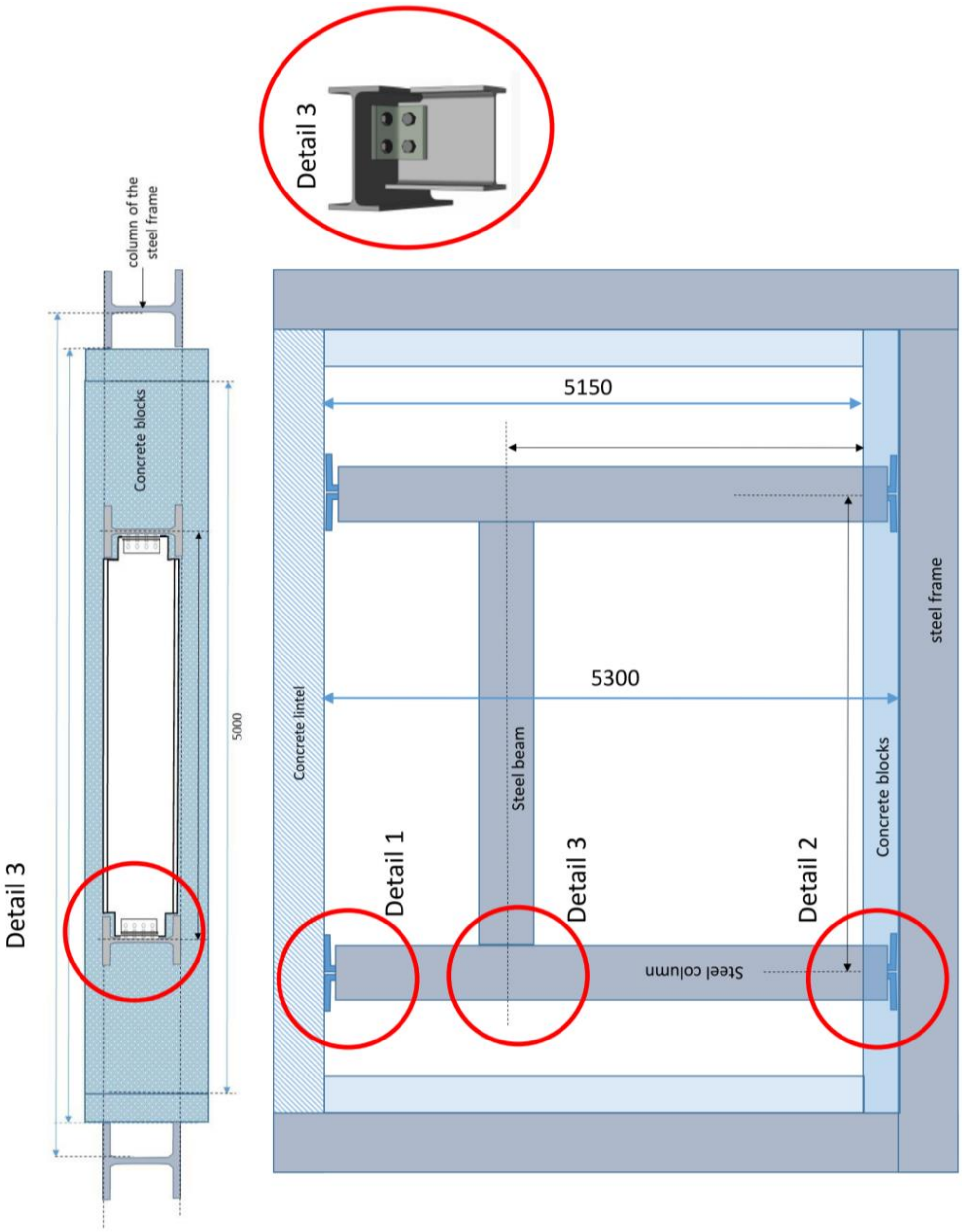
FISHWALL

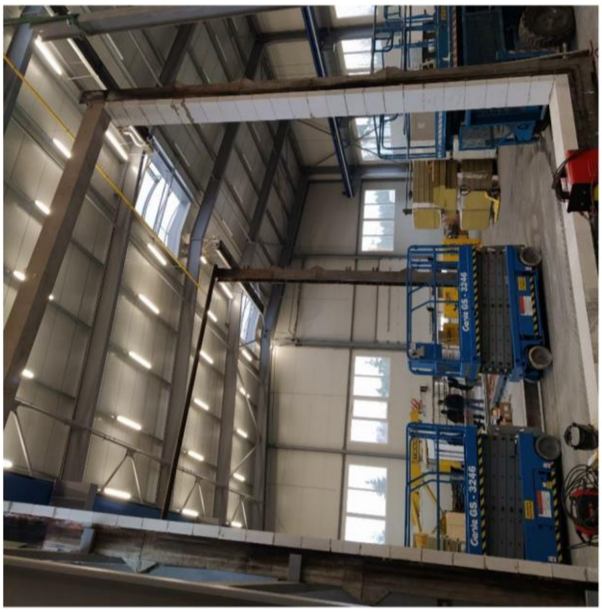
OSSATURE PORTAIL COULISSANT

Echelle(S) : 1:10 1:20

REV	DATE	NATURE DE LA MODIFICATION	Etab. Par	Verif. Par
B	19-06-24	Mise à Jour	M.BR	N.HE
A	11-06-24	Indice d'origine	M.BR	N.HE

EMETTEUR	N° DOSSIER	N° COMMANDE	NUMERO DU PLAN	REV
BCM	38757	14849	101	B





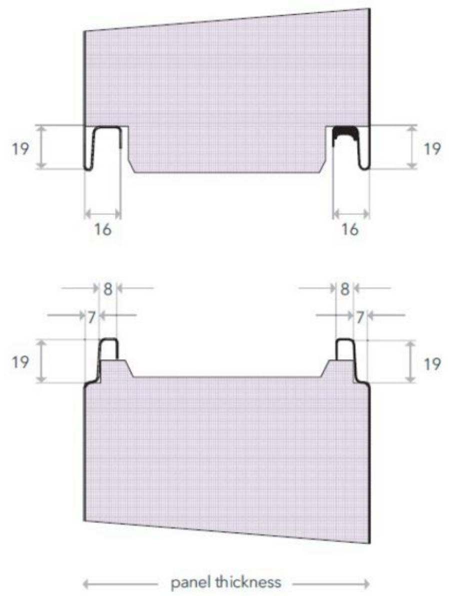
Detail 2

Detail 1

Rainspan® – Product Data Sheet

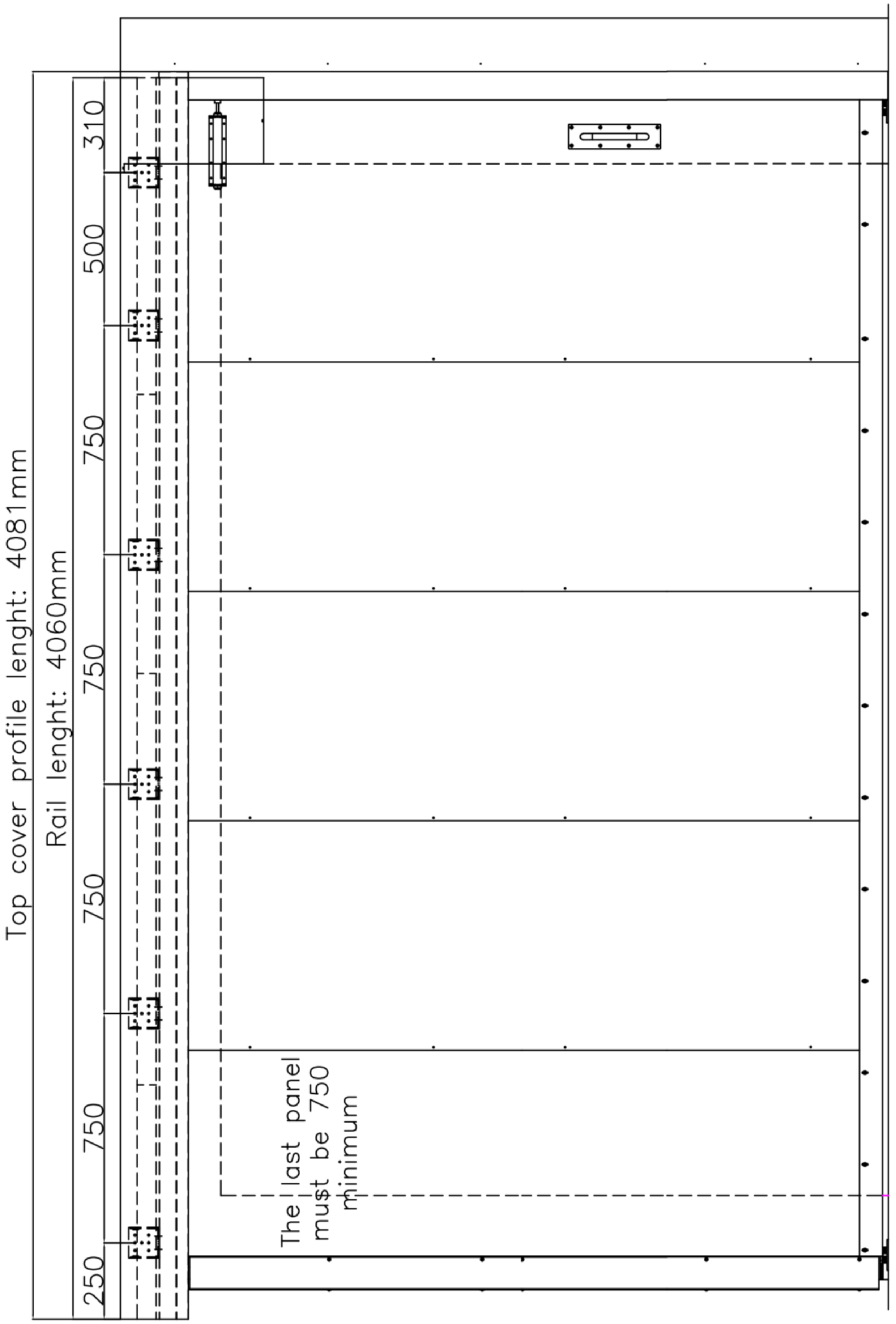
Application

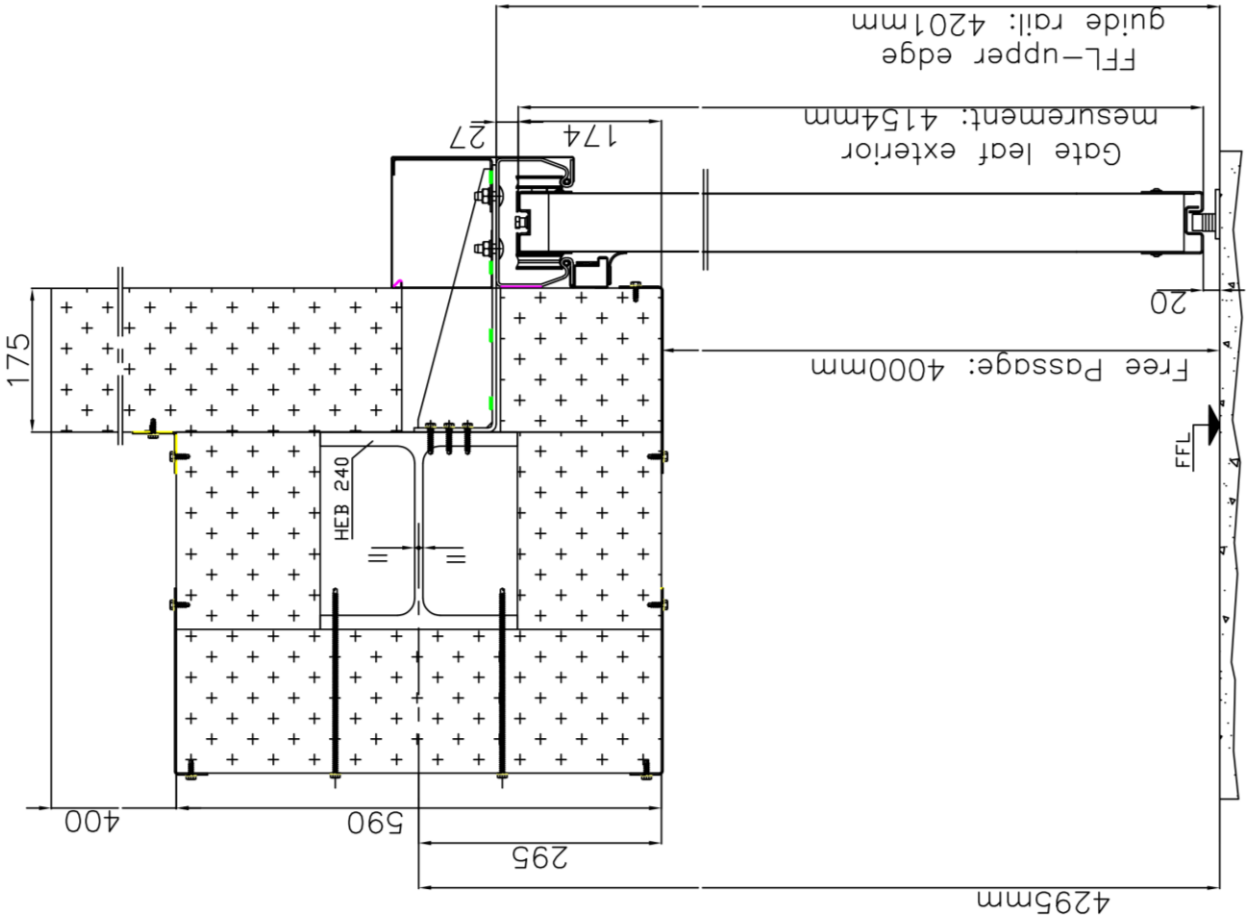
Rainspan is an external wall sandwich panel which allows rainscreens to be mechanically fixed to the exposed face. Rainspan combines the benefits of a sandwich panel with the ability of the customer to specify and face-fix marketplace rainscreen options in an array of colours, textures and materials. This provides greater freedoms of aesthetic and architectural expression.

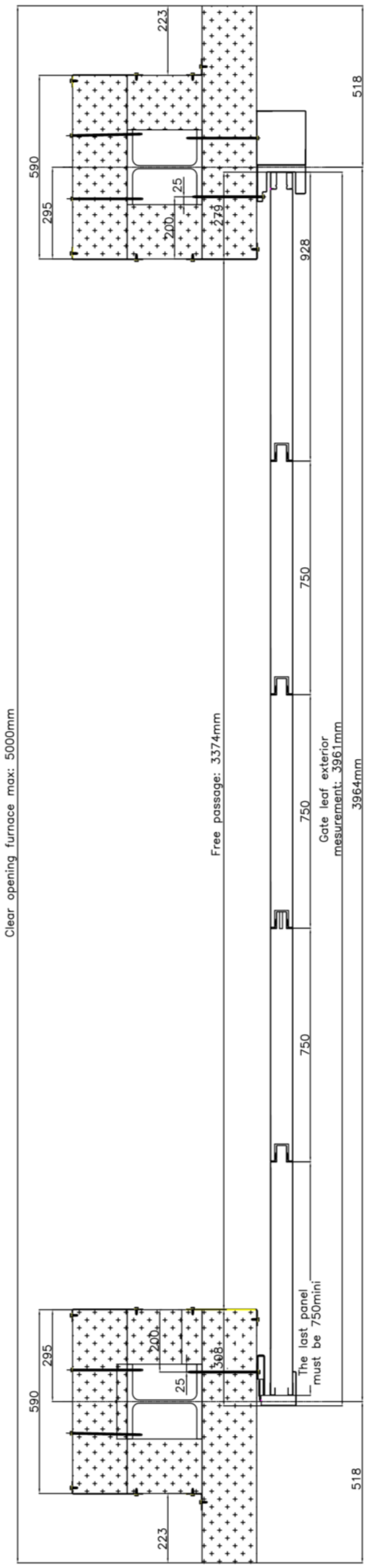


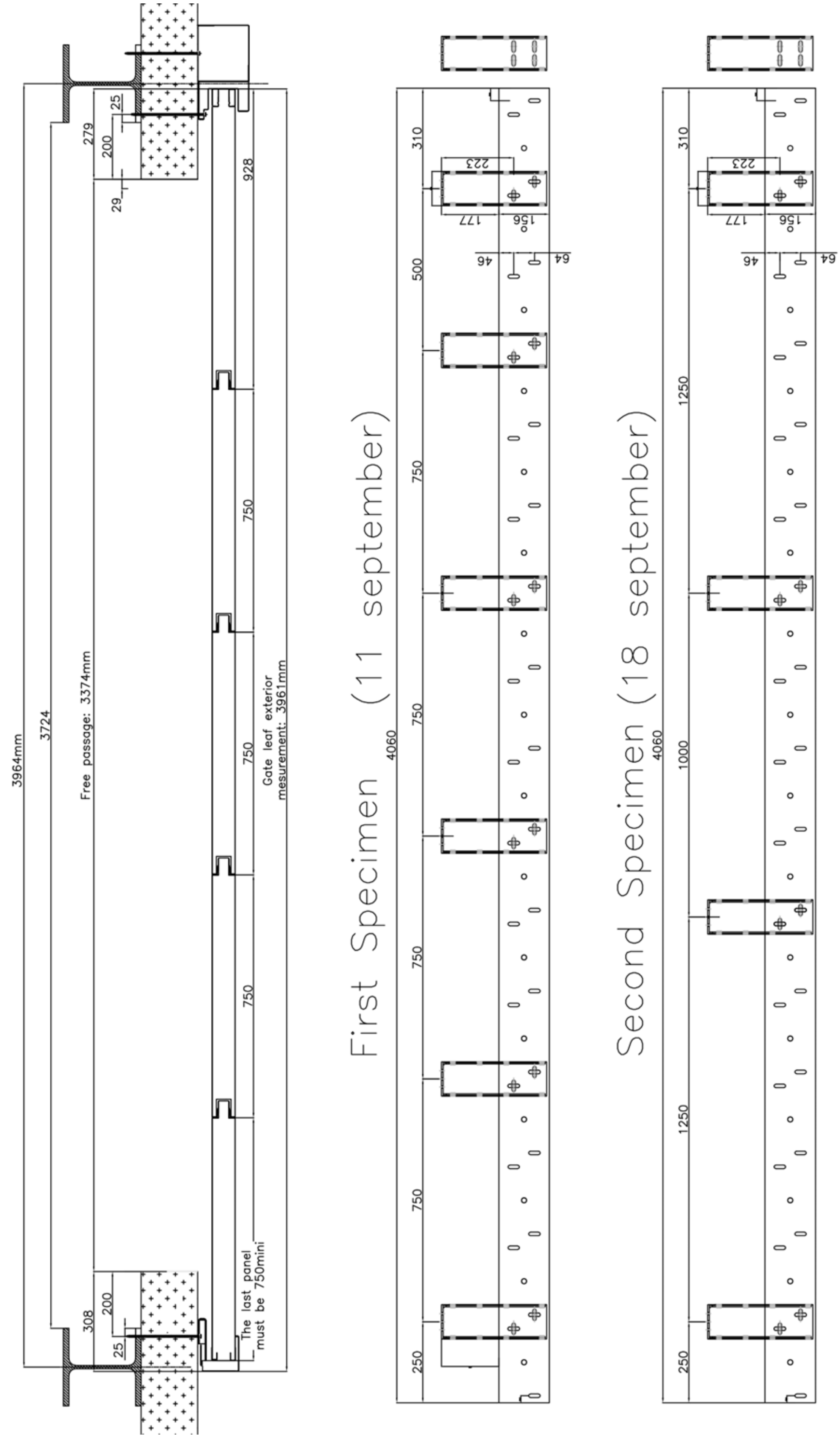
Product Tolerances

Product Tolerances	
Length	≤ 3m = ± 5mm , > 3m = ± 10mm
Width	± 2mm
Thickness	± 2mm
Facing Squareness	± 2mm
Corners (leg length)	± 2.5mm
Corners (angle)	± 1°
Flatness	± 1.5mm from theoretical flat plane over a distance of 700mm
Joint Gap	± 2mm


Top cover profile lenght: 4081mm
Rail lenght: 4060mm
310
500
750
750
750
750
250
The last panel must be 750 minimum


FFL–upper edge
guide rail: 4201mm
Gate leaf exterior
mesurement: 4154mm
27
174
20
Free Passage: 4000mm
175
HEB 240
FFL
400
590
295
4295mm


Clear opening furnace max: 5000mm
Free passage: 3374mm
Gate leaf exterior
mesurement: 3961mm
3964mm
The last panel
must be 750mini
223
518
590
295
25
200
279
928
750
750
750
308
518
223


3964mm
3724
Free passage: 3374mm
279
200
25
29
308
200
25
928
750
750
750
750
Gate leaf exterior mesurement: 3961mm
The last panel must be 750mini
First Specimen (11 september)
4060
310
500
750
750
750
750
250
223
177
156
46
64
Second Specimen (18 september)
4060
310
1250
1000
1250
250
223
177
156
46
64

ANNEX D: PHOTOS

Preparation of the testing frames

Assembly of the specimens

D.1 TEST 11th SEPTEMBER 2024

UF before the test

EF before the test

UF after 30 minutes of the test

UF after 60 minutes of the test

UF after 90 minutes of the test

UF in 111th minute of the test

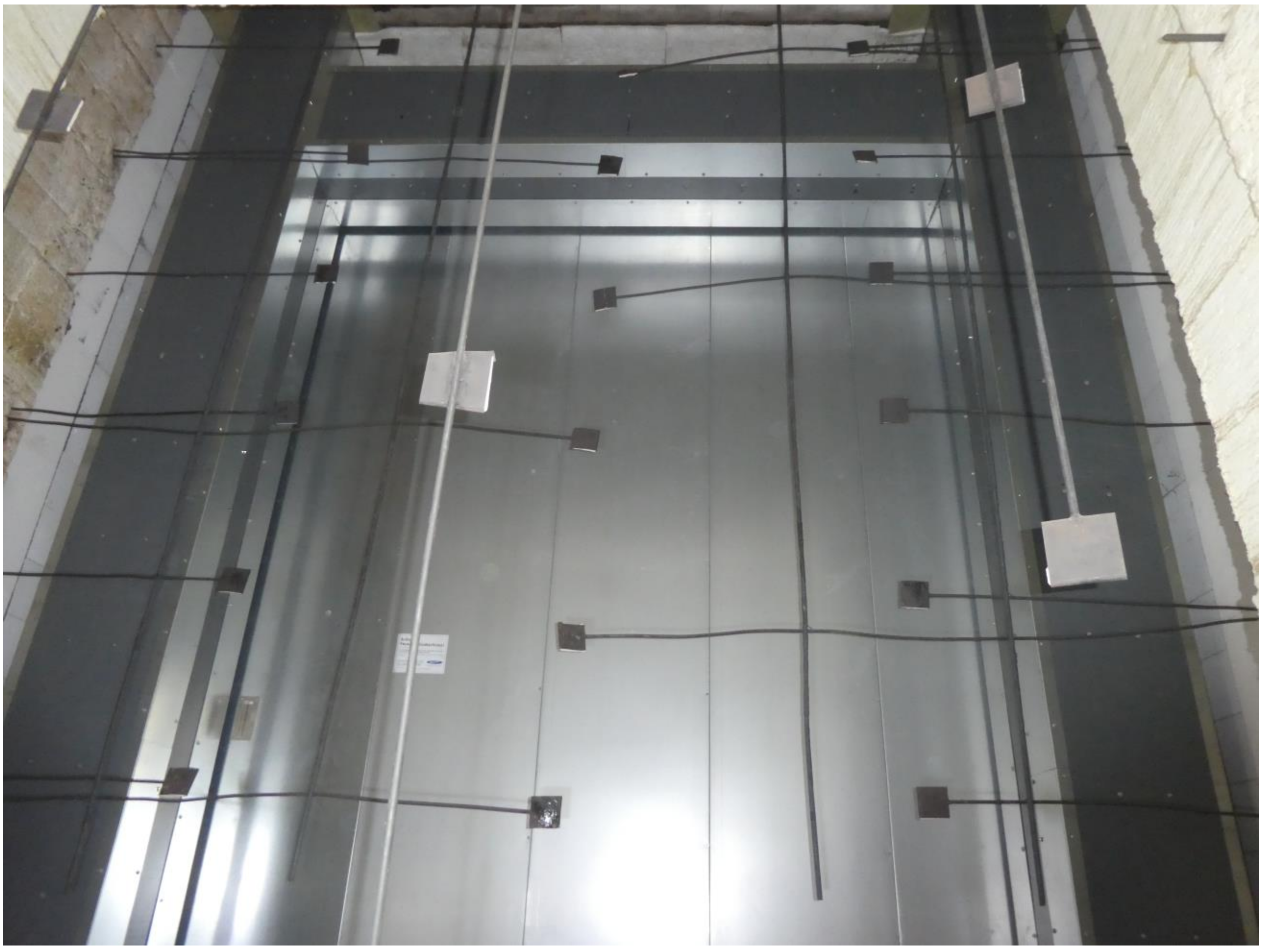
UF in 120th minute of the test

UF after 123 minutes of the test

Specimen the second day after the test

D.2 TEST 18th SEPTEMBER 2024

UF before the test



EF before the test

UF after 30 minutes of the test

UF after 62 minutes of the test

UF after 94 minutes of the test

UF after 120 minutes of the test

UF after 144 minutes of the test

Specimen the second day after the test