Research Fund for Coal & Steel

European Commission
Research Programme of the Research Fund for Coal and Steel

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FISHWALL

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

SESSION: Experimental campaign – Results and exploitation of fire tests

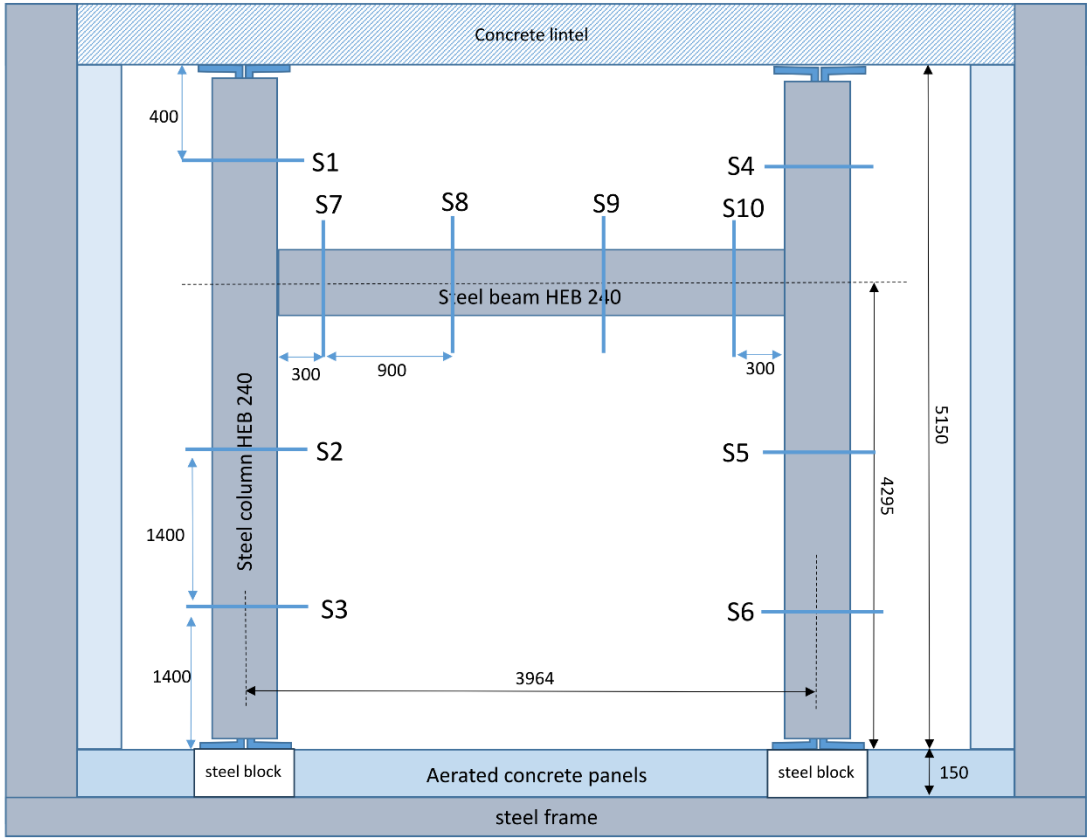
- **Title:** Sliding fire door systems with door frame in steel structure
- Jiri Vanek
- PAVUS, a.s.

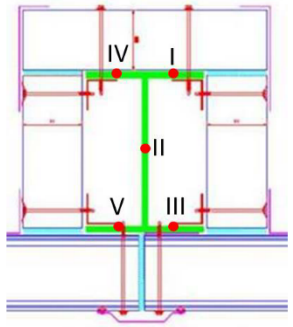
Introduction

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 expensive wall solution.

In this context, two fire tests according to EN 1634-1 were carried out at PAVUS fire 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 behavior 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 supplied by Novoferm. The fire door was tested from each side to establish its performance regardless of which side was exposed to the fire conditions.

Preparation of the thermocouples on the steel sections



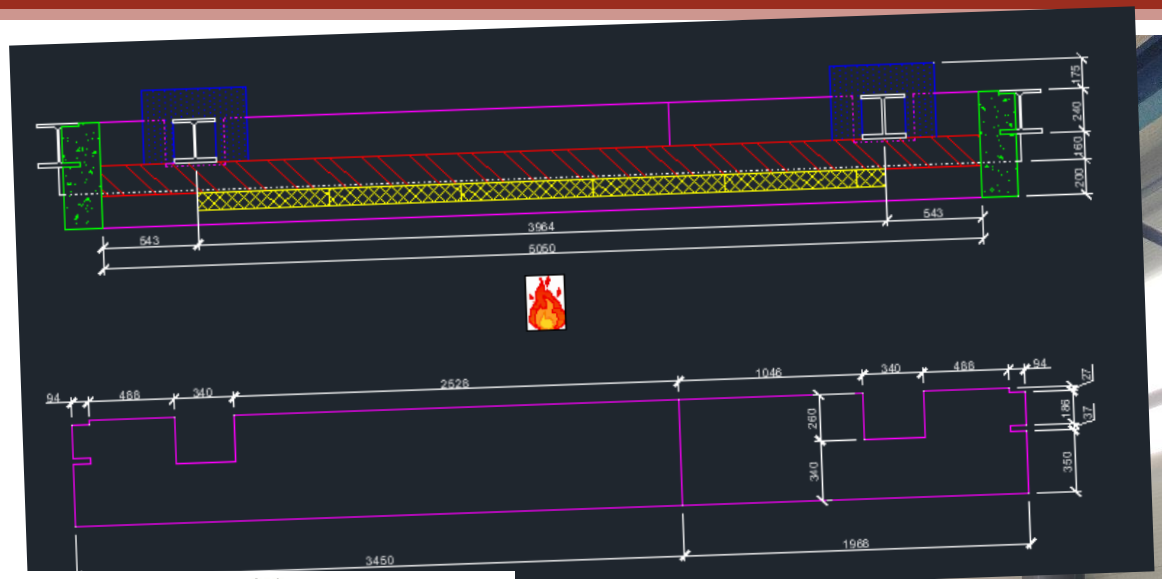


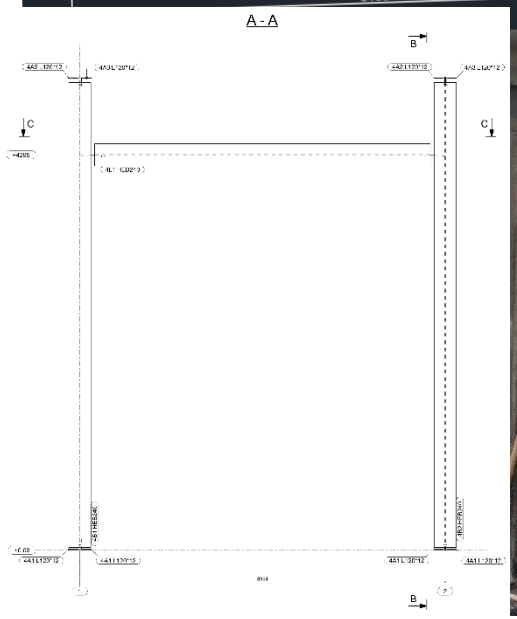
S1 to S10

Thermocouples :

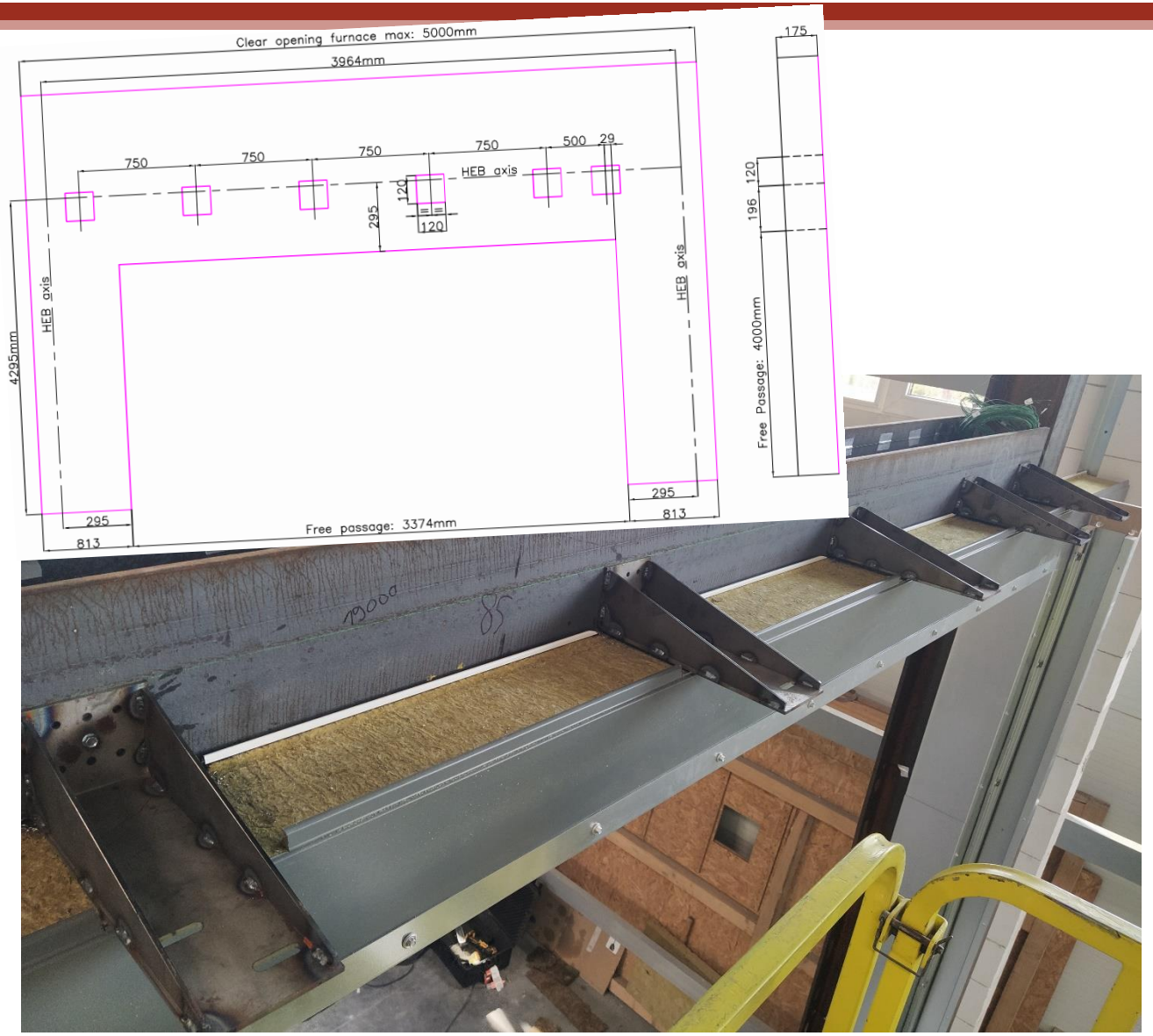
- I, II, III, IV and V to record the temperature of the steel profile

Masonry work and assembly of the steel frames





Build of the walls, fixing of the doors to the steel frames



Great cooperation of all participants

Fire protection of steel structure

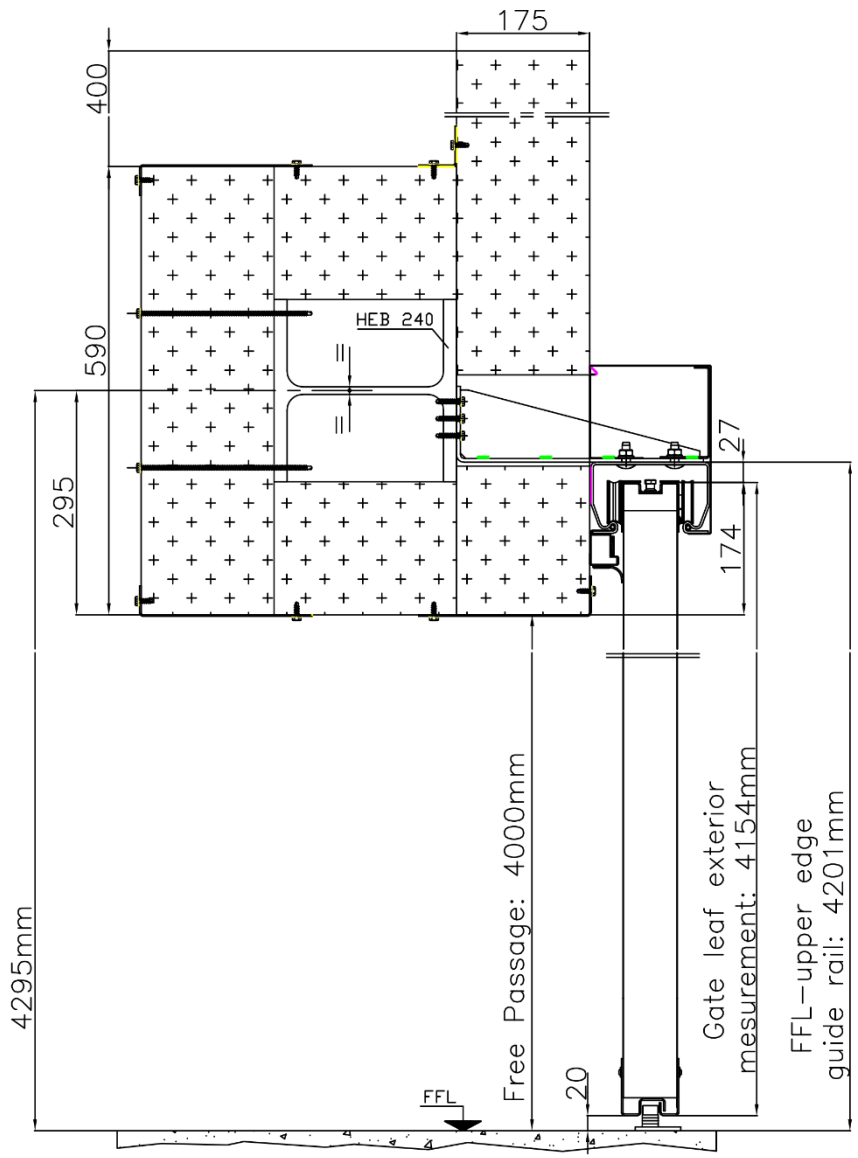


Plate thermometers in the furnace, transport of the specimen

Test 1 - specimen before the test and after 90 minutes

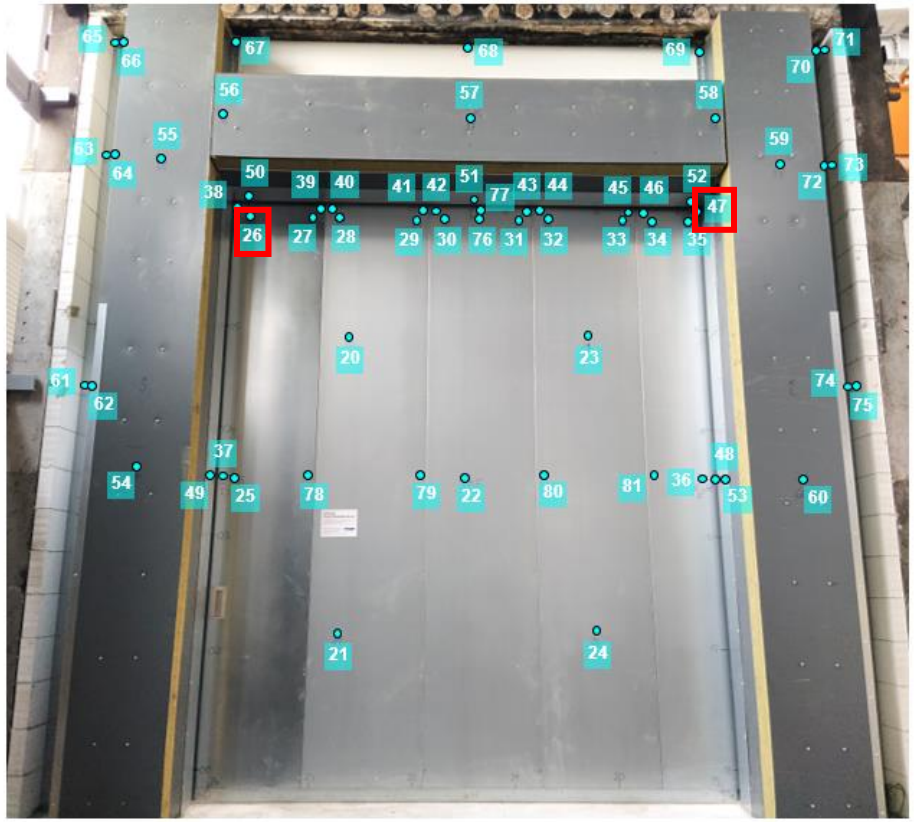
Using of cotton pad after 110 minutes of the test 1

Sustained flaming after 123 minutes of the test 1

Specimen after the test 1

Test results of the test 1

LAYOUT OF TC ON UF OF SPECIMEN 1

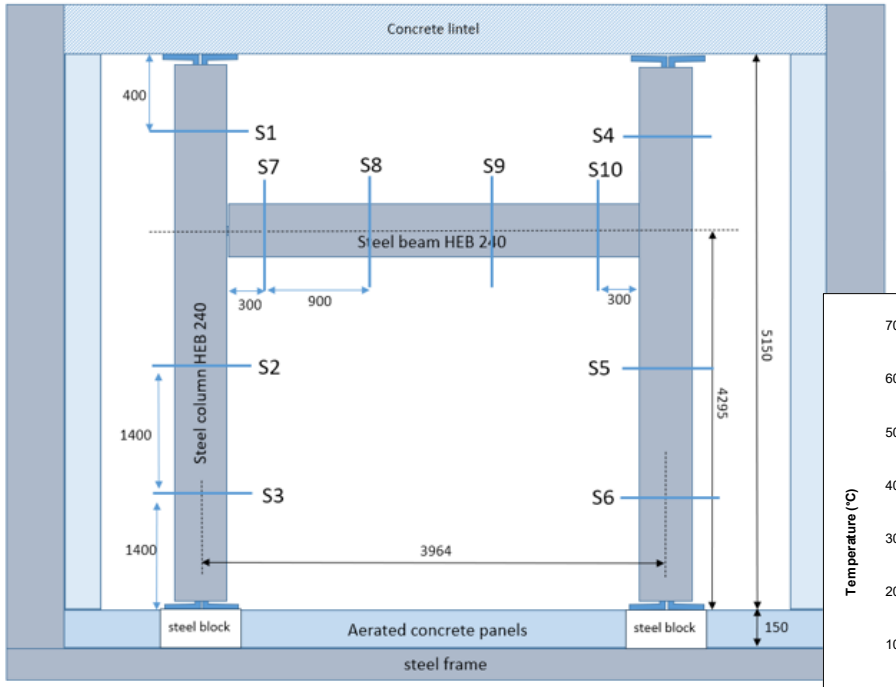


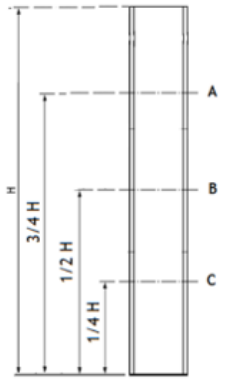
Key:

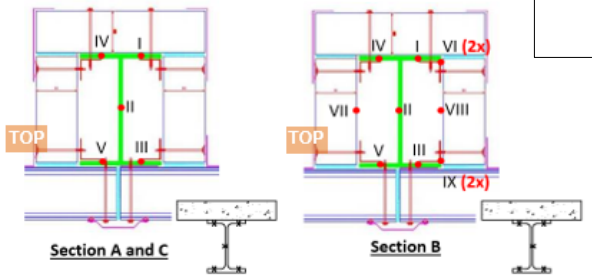
20 ÷ 24	- TC for T_{aver} and T_{max} on door leaf
25 ÷ 36, 76	- TC for T_{max} on door leaf (100 mm from the visible part of the edge)
37 ÷ 48, 77	- TC for T_{max} on door leaf - supplementary procedure (25 mm from the visible part of the edge)
49 ÷ 53	- TC on doorframe (informative)
54 ÷ 60	- TC for T_{max} on fire protection of steel structure
61 ÷ 75	- TC for T_{max} on wall made of sandwich panels (20 mm from the joint)
78 ÷ 81	- TC for T_{max} on door leaf (20 mm from the joint)

Test results of the test 1

LAYOUT OF TC ON THE SURFACE OF THE STEEL STRUCTURE

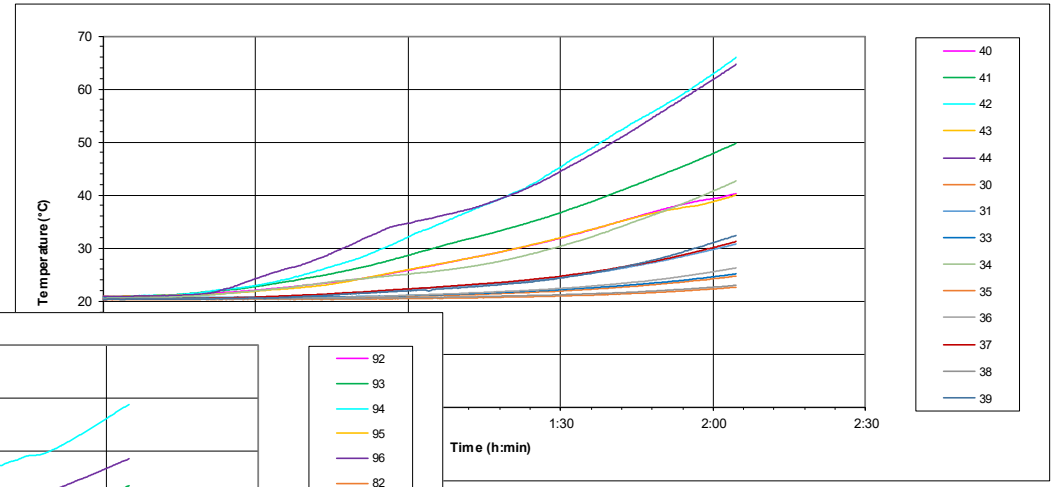


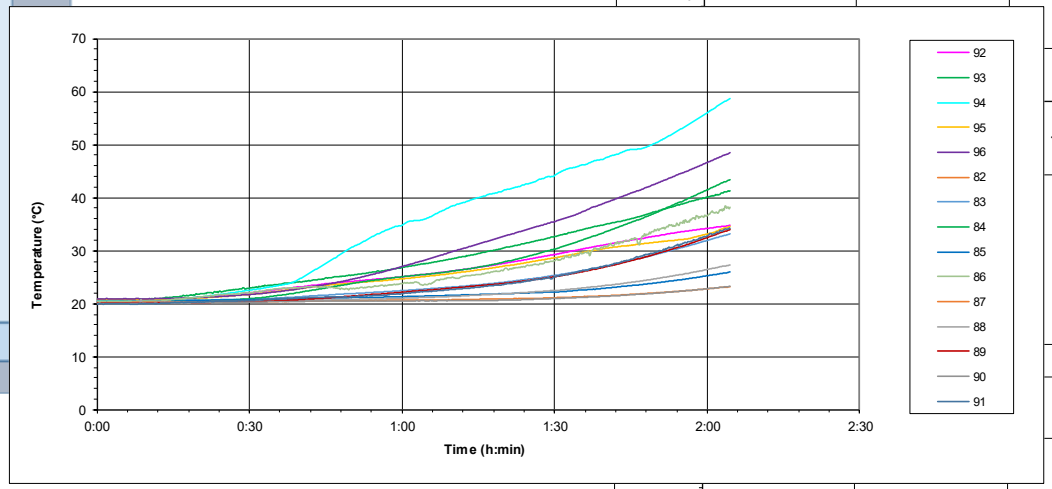


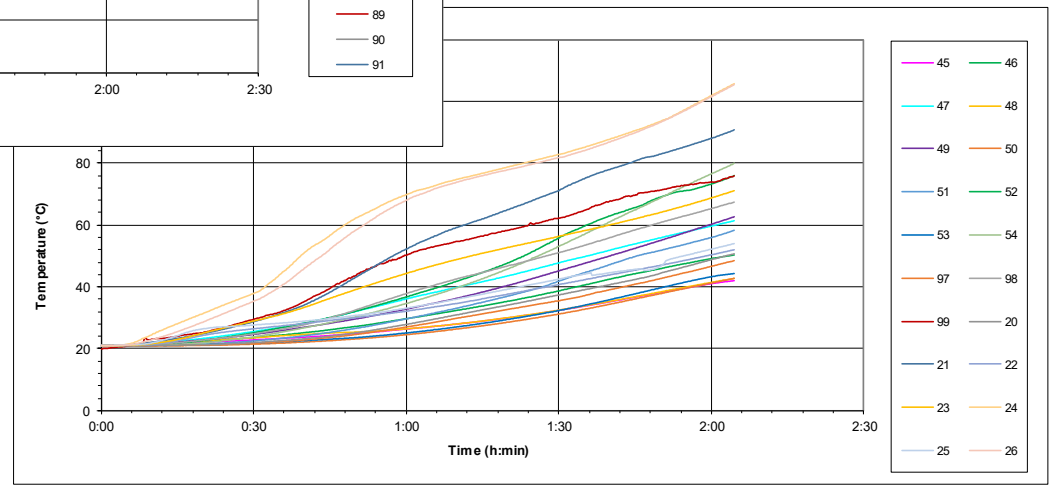


Thermocouples :

- 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

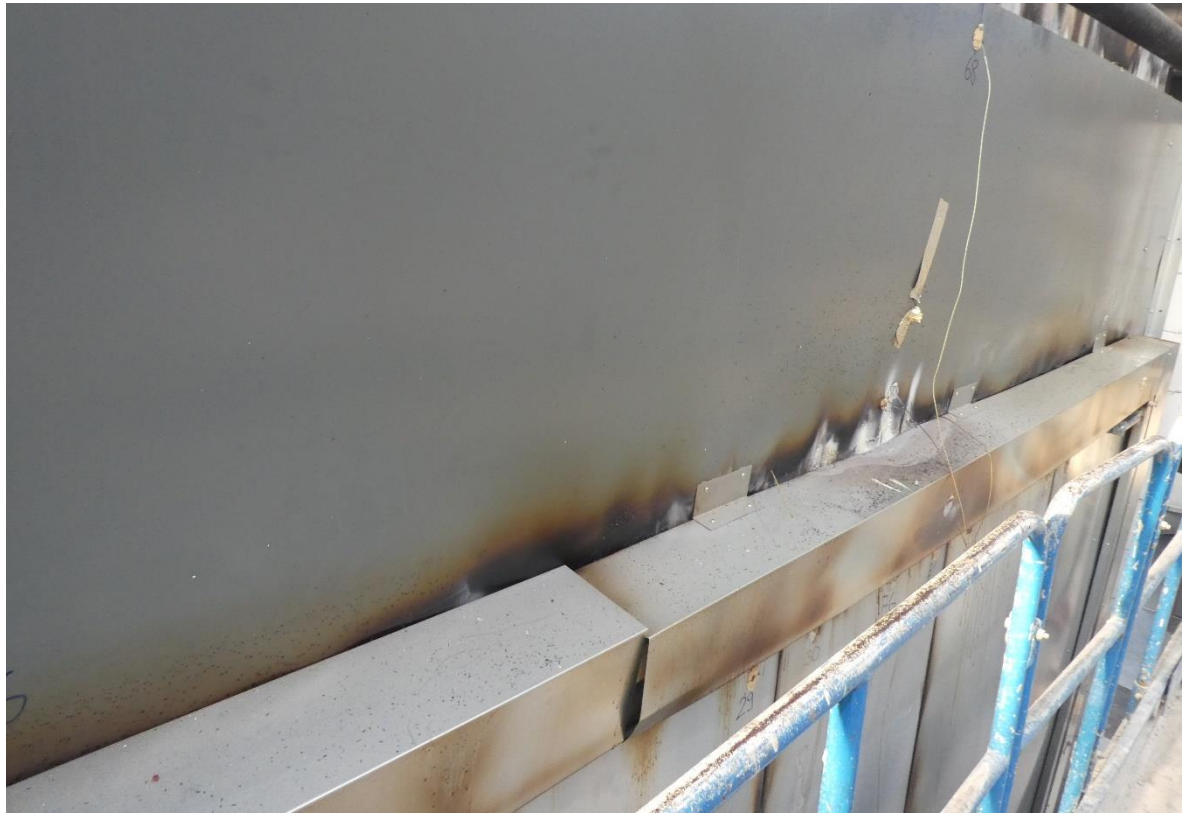






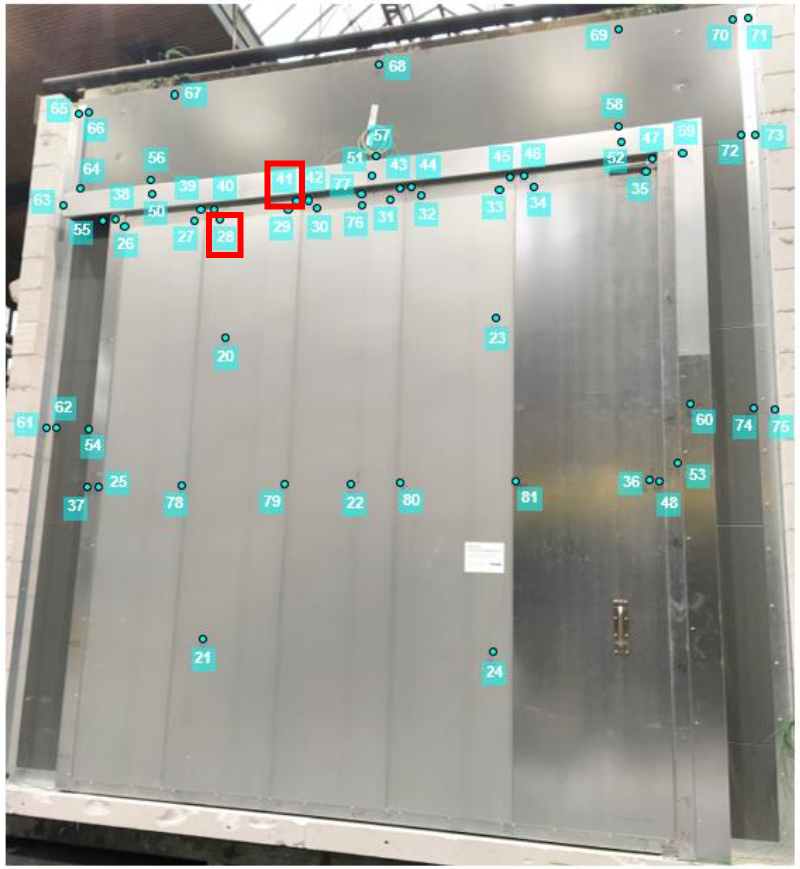
Test 2 - specimen before the test and after 144 minutes

Specimen after the test 2



Test results of the test 2

LAYOUT OF TC ON UF OF SPECIMEN 2

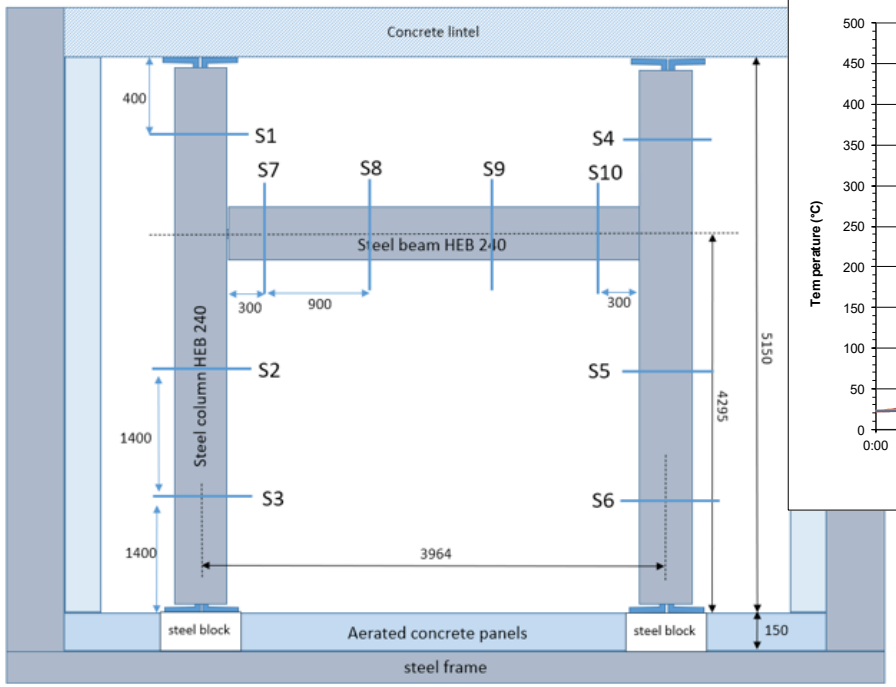


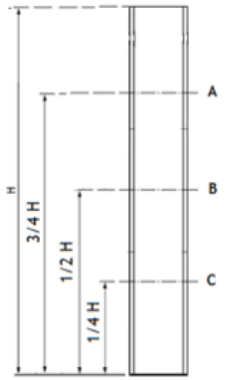
Key:

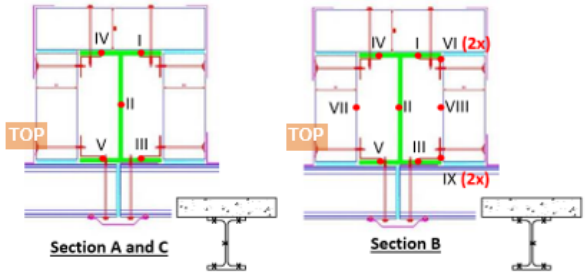
20 ÷ 24	- TC for T_{aver} and T_{max} on door leaf
25 ÷ 36, 76	- TC for T_{max} on door leaf (100 mm from the visible part of the edge)
37 ÷ 48, 77	- TC for T_{max} on door leaf - supplementary procedure (25 mm from the visible part of the edge)
50 ÷ 53	- TC on doorframe
54 ÷ 60	- TC for T_{max} in the area of steel structure (mirror positions to specimen 1)
61 ÷ 75	- TC for T_{max} on wall made of sandwich panels (20 mm from the joint)
78 ÷ 81	- TC for T_{max} on door leaf (20 mm from the joint)

Test results of the test 2

LAYOUT OF TC ON THE SURFACE OF THE STEEL STRUCTURE







Thermocouples :

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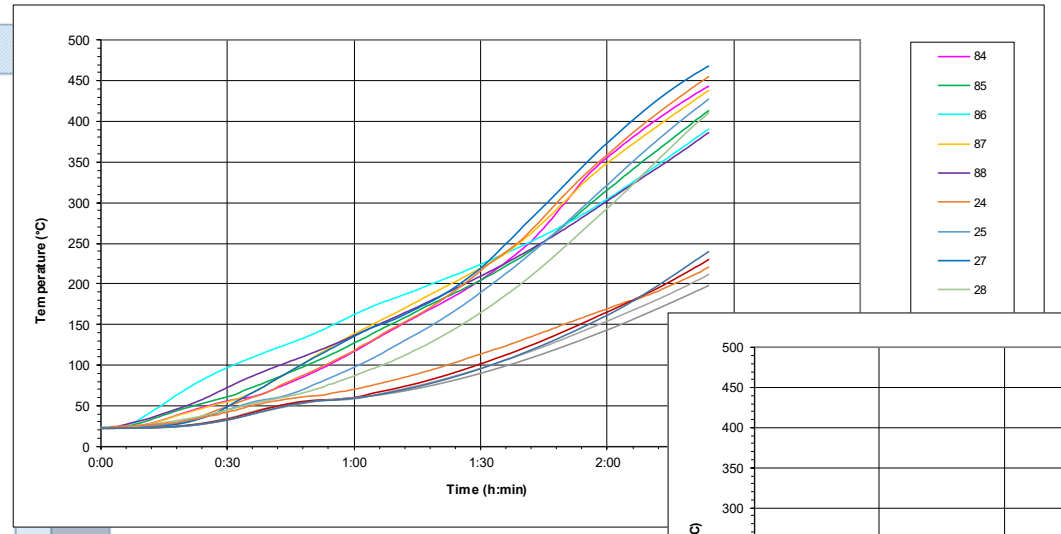

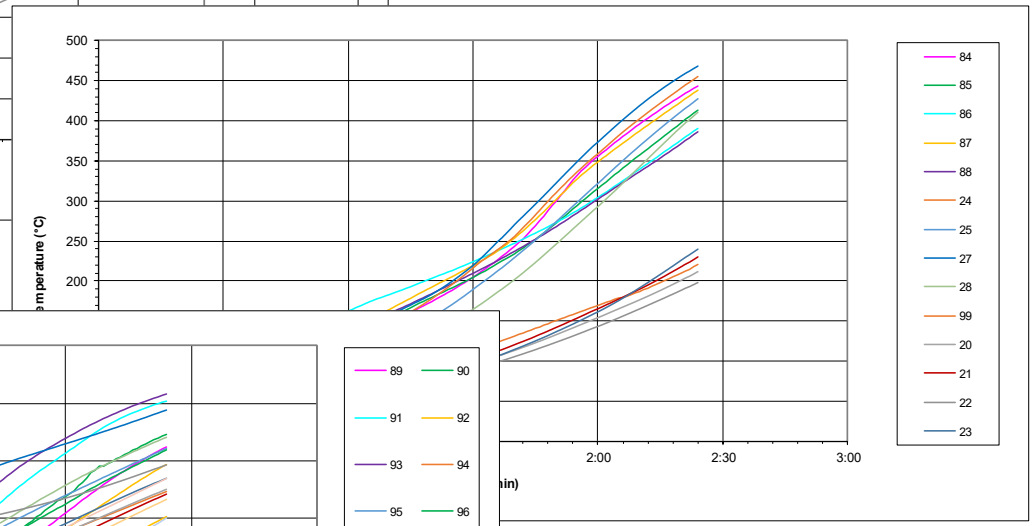

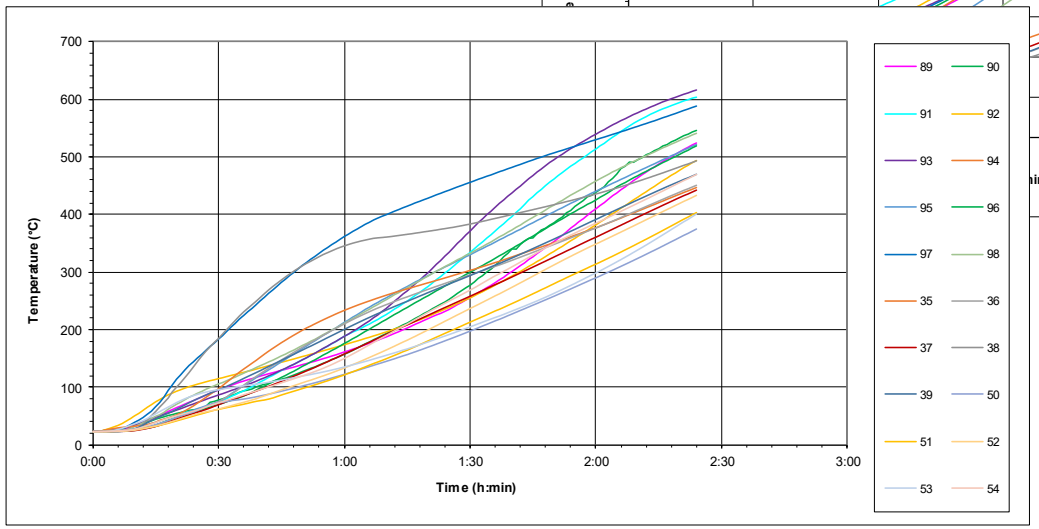

Summary in Test report Pr-24-2.194-En

PAVUS®
FIRE TESTING INSTITUTE

Order No.: Z210220040

PAVUS, a.s.
AUTHORIZED BODY 216
NOTIFIED BODY 1391
ACCREDITED TESTING LABORATORY
EGOLF MEMBER

ilac-MRA

L 1026

FIRE TESTING LABORATORY VESELÍ NAD LUŽNICÍ
Testing Laboratory No. 1026 accredited by ČIA
Notified Testing Laboratory
workplace Veselí nad Lužnicí

FIRE RESISTANCE TEST REPORT

No. Pr-24-2.194-En

issued on 2024-11-20

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**

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).

Classification report PK2-08-24-011-E-0

PAVUS, a.s.
AUTHORIZED BODY AB 216
NOTIFIED BODY 1391
CERTIFICATION BODY FOR PRODUCT CERTIFICATION No. 3041

PAVUS®
FIRE TESTING INSTITUTE

V 3041

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CLASSIFICATION REPORT OF FIRE RESISTANCE

Subject of classification: *Fire doors and shutters according to ČSN EN 13501-2:2024, clause 7.5.5*

Report No.: ***PK2-08-24-011-E-0***

Product name: *Sliding steel framed door system Novoferm Novoslide built into a lightweight sandwich wall panels Eurobond Rainspan (fire exposure from both sides)*

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

4 CLASSIFICATION AND FIELD OF APPLICATION

4.1 Reference of classification

This classification was carried out in conformity with Clause 7.5.5 of ČSN EN 13501-2:2024.

4.2 Classification

This element - *Sliding steel framed door system Novoferm Novoslide built into a lightweight sandwich wall panels Eurobond Rainspan* - is classified according to the example of the following combinations of performance parameters and classes as appropriate.

Fire resistance classification:

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)

Thank you for your attention!

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