

DEPARTMENT FOR BUILDING PHYSICS

Fire Laboratory and Fire Engineering

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Member of egolf - European Group of Organisations for
Fire Testing, Inspection and Certifications**CLASSIFICATION REPORT****780/22-530-2-EN**CLASSIFICATION OF FIRE RESISTANCE
PERFORMANCE IN ACCORDANCE WITH
SIST EN 13501-2:2016of a non-loadbearing wall made of 100 mm thick
mineral wool horizontally mounted self-supporting
double skin metal faced insulating panels**MINERAL WOOL WALL COVERING PANEL
100 mm**Orderer: **METALLEMPORIKI – TH. MAKRIS S.A.,
6th km Larissa-Sikurio, GR-41004 Larissa**Order/contract: **Offer No. 715/2022 / 28.06.2022**Responsible investigator: **Simon Grum, mag. inž. str.**Head of laboratory: **Friderik Knez, univ. dipl. fiz.**Director:  **doc. dr. Aleš Žnidarič, univ. dipl. inž. grad.**Date: **15.12.2022**The report was internally reviewed and approved by all listed persons, which is confirmed by the electronic signature.
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Total number of pages: 9; total number of annexes: /.

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1. Introduction

This classification report defines the resistance to fire classification assigned to non-loadbearing wall made of horizontally mounted self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm** in accordance with the procedures given in SIST EN 13501-2:2016 (identical to EN 13501-2:2016).

2. Information about the product

2.1 General

The non-loadbearing wall made of horizontally mounted self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm** prevents spread of fire from room of origin considering resistance to fire performance characteristics stated in Clause 5 and 7.5.2 of SIST EN 13501-2:2016.

2.2 Product description

2.2.1 Composition of the panel

The composition of the insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm** is fully described below and is the following:

- 25 µm thick polyester coating;
- lightly profiled sheet-steel Zn coated facing, quality S250, Z100, measured thickness approximately 0,50 mm (exposed side);
- adhesive (glue) made of two components, VORAMER AA 3042 Polyol and VORACOR CD 526 Isocyanate produced by DOW EUROPE GmbH, application ratio 170 g/m².
- rock wool lamella core Fibrangeo BL-50c produced by Fibran S.A., (nominal density 100 kg/m³, measured average density 103 kg/m³, measured moisture content 0,34 mass %, measured binder content 4,91 mass %);
- adhesive (glue) made of two components, VORAMER AA 3042 Polyol and VORACOR CD 526 Isocyanate produced by DOW EUROPE GmbH, application ratio 170 g/m².
- lightly profiled sheet-steel Zn coated facing, quality S250, Z100, measured thickness approximately 0,50 mm (unexposed side);
- 25 µm thick polyester coating.

2.2.2 Sealing materials

The bottom gap between the test frame and adjacent face of the L-profiles were sealed with fire rated sealant SikaSeal 623 Fire and 25 mm thick rock wool Knauf Insulation DAP Needled.

Over the bottom three L profiles, 25 mm thick ceramic wool and over the ceramic wool 21 mm mineral wool were laid and protected with fire stopping coating Promat PROMASTOP CC. On that lining the test wall was placed.

Gaps between the test specimen and the restrained test frame at the top horizontal and two vertical edges were filled with ceramic and rock wool.

All visible rock wool joint faces (male and female faces) between the panels were covered with water-based "hybrid" fire stopping coating Promat PROMASTOP CC with application ratio of approximately 3150 g/m².

Cut rock wool joint face on the top edge was covered with water-based "hybrid" fire stopping coating Promat PROMASTOP CC with application ratio of approximately 2570 g/m².

In the grooves of female joints fire resistant intumescent sealant SikaSeal 623 Fire produced by Sika was placed with application ratio of approximately 36 g per meter of a joint.

2.2.3 Fixing of the panels

Panels are fixed to the support construction by means of:

- self-drilling screws 6,3 × 130 mm with lining of ceramic wool and storm washers;
- At the bottom horizontal edge of the test wall three support perforated steel L-profile 70 × 210 × 1,5 was placed from the exposed side under the bottom edge of the test wall;
- three support perforated steel L-profiles were fixed to the restrained test frame on the unexposed side of the test wall by means of M12 × 120 fixing bolts at the distance approximately 320 mm between thread bolts respectively;
- The panels were fixed to the vertical supporting L-profile by means of 130 mm long self-drilling screws 6,3 × 130 with lining of ceramic wool and storm washers;
- Each panel was through-fixed from the exposed side to each vertical support steel L profile by means of three self-drilling screws at a maximum distance of 424 mm between screws respectively;
- The panel was fixed to the bottom horizontal supporting L-profiles by means of four 30 mm long self-drilling screws of dimensions 6,3 × 30 mm from exposed and unexposed side at a maximum distance of 900 mm between screws respectively;
- On the unexposed side at the top free edge L-profile of dimensions 70 × 110 was fixed to the top panel with six self-drilling screws of dimensions 6,3 × 30 mm at a maximum distance of 703 mm between screws respectively.

2.2.4 Joint fixing

The panels were connected to each other by means of longitudinal joint Type V., according to SIST EN 14509:2014 (identical to EN 14509:2013) with dimensions as shown in the drawing of the joint provided by the sponsor.

Sheet metal joints on the unexposed and exposed side of the panels were not fixed together. The non-loadbearing wall, made of horizontal mounted self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm**, is fully described in the test report provided in support of classification detailed in clause 3.1.

3. Test reports and test results in support of the classification

3.1 Test reports

No	Laboratory	Name of sponsor	Test reports No.	Test method
[1]	ZAG Ljubljana	METALLEMPORIKI TH. MAKRIS S.A.	780/22-530-1	SIST EN 1364-1:2015 (identical to EN 1364-1:2015)

3.2 Test results

The wall is symmetrical; the geometry of the joints between the panels is symmetrical.

Test report	Parameter	Results
[1]	Integrity (E)	104 minutes
	- Sustained flaming on the unexposed side	105 minutes no failure
	- Ignition of cotton pad	104 minutes
	- Gap gauge ϕ 6 mm	105 minutes no failure
	- Gap gauge ϕ 25mm	105 minutes no failure
	Insulation (I)	105 minutes no failure
	- mean temperature rise >140 °C	105 minutes no failure
	- maximum temperature rise >180 °C	105 minutes no failure
	Radiation (W)	-
	- time to exceed 15 kW/m ²	-

4. Classification and field of application

4.1 Reference of classification

This classification has been carried out in accordance with Clause 7.5.2 of SIST EN 13501-2:2016.

4.2 Classification

The non-loadbearing wall made of horizontally mounted self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm** is classified according to the following combinations of performance parameters and classes as appropriate. No other classification is allowed.

E		20	30		60	90
EI	15	20	30	45	60	90
EW		20	30		60	90

Fire resistance classification: E 90 / EI 90 / EW 90

4.3 Field of application

This classification is valid for non-loadbearing walls made of horizontally mounted self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANEL 100 mm**.

According to SIST EN 1364-1:2015, The test results 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. Other changes are not permitted.

- a) decrease in height;
- b) increase in the thickness of the wall;
- c) increase in the thickness of component materials;
- d) decrease in linear dimensions of boards or panels but not thickness;
- e) decrease in distance of fixing centres;
- f) increase in the number of vertical joints, of the type tested;
- g) horizontal and/or vertical joints, of the type tested.

4.3.1 Support construction

- the test results are applicable to high density rigid supporting constructions with at least the same fire resistance as the test specimen.

4.3.2 Extension in width

- the width of an identical construction may be increased.

4.3.3 Extension in height

- the height of an identical construction may be increased up to 4,0 m.

Extension of the field of application 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 are made according to SIST EN 15254-5:2018 (identical to EN 15254-5:2018). Other changes are not allowed.

4.3.4 Variations in the facing thickness

- the thickness of the facing on the exposed and unexposed side may vary from 0,30 mm to 0,70 mm.

4.3.5 Variations in the coatings

- change to non-coated facings is not allowed;
- on the exposed facing any changes of the type and colour of the coating are allowed;
- on the unexposed facing modifications in the coating are allowed only if the reaction to fire classification of the panels shall be the same or better than for the tested one;
- on the unexposed facing any changes in the colour of the same type of coating are allowed.

4.3.6 Variations in the metal material

- the test results are valid for all grades of steel facings;
- change to other facings metal material is not allowed.

4.3.7 Variations in profile geometry of facing

- the test results are valid and panels are regarded as symmetrical for any change in the range from 0 mm to 5 mm profiling on both sides of the panels but only if the declared tensile strength value is equal to or higher than for the tested panel.

4.3.8 Variations in the adhesive

- the results are valid for all adhesives with PCS value below 4 MJ/m².

4.3.9 Variations in the mineral wool core material

- change from one core material to another core material is not allowed;
- change from one core material producer to another core material producer is not allowed;
- the test results are valid for density of the tested mineral wool core in range from 93 kg/m^3 to 150 kg/m^3 ;
- change of orientation of the tested mineral wool fibres is not allowed;
- the test results are valid for panels with a decrease in the number of lamella or slab joints of the tested mineral wool core;
- the test results are valid if the organic binder content of the mineral wool core is up to 4,91 % or lower;
- the nature and the proportions of materials used to manufacture the mineral wool fibres of the tested mineral wool core shall not be different from those used in the reference test.

4.3.10 Variation in span length

- a decrease in span length is always allowed;
- increase of the span length is allowed up to 4,0 m for E 90 / EI 90 / EW 90 classifications and 7,5 m for all other classifications allowed in Clause 4.2 of this report, with increased amount of fasteners. Extension of span length is only allowed with horizontal orientation of the panels;
- the required amount of fasteners per each edge shall always be calculated in accordance with this formula:

$$n k_{y,\theta} \geq F_{v,Ed}/F_{v,Rd} + F_{t,Ed}/F_{t,Rd}$$

n = number of fasteners;

$k_{y,\theta}$ = decrease on the yield strength $k = 1$ (defined by the EXAP standard);

Shear:

$$F_{v,Ed} = (F_1^2 + F_2^2)^{1/2}$$

$$F_1 = \frac{Lbq}{2}$$

$$F_2 = Lb(q + \frac{gL}{8b});$$

$F_{v,Rd}$ = the design value of shear strength of the fasteners in normal temperature stated by the producer of the fasteners;

Tensile: $F_{t,Ed} = (L b q)/2$;

$F_{t,Rd}$ = the design value of tensile strength of the fasteners in normal temperature stated by the producer of the fasteners;

q ...air pressure in fire $q = 0,3 \text{ kPa}$, (defined by the EXAP standard);

g ...panels weight in kPa g = calculated from the weight of a panel;

L ...span length in meters;

b ...panel width in meters.

According to SIST EN 15254-5:2018, Annex B, the following measurements and calculations were carried out, based on measurements presented in the test report provided in support of this document detailed in clause 3.1.

Classification time [min]	Deflection differences [mm] and Δ calculations [/]										
	f_1	$f_{1,2}$	f_2	$f_{2,3}$	f_3	$\Delta f_{1,2}$	$\Delta f_{2,3}$	$(c_2-c_1)_{1,2}$	$(c_2-c_1)_{2,3}$	$\Delta c_{1,2}$	$\Delta c_{2,3}$
15	38	42	44	43	27	0,001	0,008	1,0	0,0	0,045	0,000
20	35	38	40	40	24	0,001	0,008	1,0	-0,5	0,045	-0,023
30	33	32	34	37	22	-0,002	0,009	1,0	0,0	0,045	0,000
45	45	33	49	42	40	-0,014	-0,003	1,5	0,0	0,068	0,000
60	49	43	61	55	51	-0,012	-0,001	2,0	0,5	0,091	0,023
90	52	64	72	70	55	0,002	0,007	2,0	0,5	0,091	0,023

f_ideflection of panel i;

$f_{ji,i+1}$deflection of joint of panel i and panel i+1;

$\Delta f_{i,i+1}$ relative difference of deflection of joint of panel i and panel i+1;

$(c_2-c_1)_{i,i+1}$opening of joint of panels;

$\Delta c_{i,i+1}$relative difference of joint covering of panel i and panel i+1;

$L_{1:1,2}$ distance between deflection f_1 and f_2 measuring points $L_{1:1,2}=970$ mm;

$L_{1:2,3}$ distance between deflection f_2 and f_3 measuring points $L_{1:2,3}=1000$ mm;

$L_{2:1,2}$ steel sheet covering in panels joints $L_{2:1,2}=L_{2:2,3}=22$ mm

4.3.11 Variations in orientation

- the test results are not valid for vertically mounted panels.

4.3.12 Variations in the panel width

- the test results are valid if the width of the panels, using the same core as the tested, is 1200 mm or less.

4.3.13 Variations in the panel thickness

- the test results are valid if the thickness of the panels, using the same core material as the tested, is 100 mm or more;
- a decrease in thickness is not allowed.

4.3.14 Variations in the longitudinal joint construction

- an increase in the overlap in the steel facing at the joint is allowed, if other dimensions remain unchanged;
- an increase in the amount of joint fixing screws is always allowed, decrease is not allowed;
- use of tongue and groove joint in the core material is allowed;
- the test results are valid when the panel joints are sealed with water-based "hybrid" fire stopping coating Promat PROMASTOP CC with application ratio of 3150 g/m² of a joint face and with fire rated sealant SikaSeal 623 Fire with application ratio of 36 g/m of a joint groove;
- the test results are not valid for joints without sealants.

4.3.15 Variations in the boundary conditions and fixing system

- an increase in the amount of self-drilling fasteners is always allowed;
- an increase in the diameter of self-drilling fasteners is always allowed;
- change of the material of self-drilling fasteners is not allowed;
- an increase in protection ability of self-drilling fasteners is always allowed;
- if the thickness of the panel is increased the length of the self-drilling fasteners shall be increased pro rata;

- load per fastener imposed by the changes made is less than those tested.

4.3.16 Height of wall construction

- the height of the wall can be freely increased, provided that each panel is fixed to the bearing structure in such a way that the load is not accumulated from above to the lower parts of the wall.

4.3.17 Support structure

- the test results are valid if the support structure has at least the same fire resistance classification time for loadbearing capacity (R) as the panel assembly has for insulation and/or integrity;
- the test results are valid if the fixing system has the same loadbearing capacity (R) in the support structure as in the frame used in the reference test;
- the test results are valid if the fixation areas are thermal insulated.

4.3.18 Heating conditions

- the test results are valid also for the external fire exposure curve.

4.3.19 Additional statement

The extended application results relate to the behaviour of non-loadbearing wall made of horizontally mounted 100 mm thick rock wool self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm** under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the non-loadbearing wall made of horizontally mounted 100 mm thick rock wool self-supporting double skin metal faced insulating panels **MINERAL WOOL WALL COVERING PANELS 100 mm**.

5. Limitations

This classification document does not represent type approval or certification of the product.

	Name	Signature	Date
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