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

TEST REPORT ON ROOFS EXPOSED TO EXTERNAL FIRE

No. Pr-22-2.172-En

issued on 2022-10-24

for product

Roof

COMPOSITION OF THE EXTENSIVE GREEN ROOF WITH ENVIRET SH

Test Sponsor: **RETEX a.s.**
U nádraží 894
672 01 Moravský Krumlov
Czech Republic

Test method:

ČSN P CEN/TS 1187
»Test methods for external fire exposureto roof.
Test 3: Method with burning brands, wind
and supplementary radiant heat «

Test Report includes: 8 pages
(5 pages of text + 2 Annexes)

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Prosecká 412 / 74, 190 00 Praha 9 - Prosek, e-mail: mail@pavus.cz, http:// www.pavus.cz
ID: 60193174, VAT ID: CZ60193174, in Commercial Register of the Municipal Court in Prague, section B, inset 2309, Phone: +420 286 019 587

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

1 INTRODUCTION

The tests for a roof exposed to external fire were performed based on the order of company RETEX a.s. in Fire Testing Laboratory PAVUS, a.s. Veselí nad Lužnicí.

The tests were prepared, performed and assessed on the base of following documents:

[1] ČSN P CEN/TS 1187:2012 Test methods for external fire exposure to roof. Test 3: Method with burning brands, wind and supplementary radiant heat

[2] Specimen-related technical documentation delivered by the sponsor.

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

[4] JCGM 100:2008 GUM 1995 with minor corrections, Evaluation of measurement data – Guide to the expression of uncertainty in measurement (available under www.BIPM.org)

For the purposes of this document, the definitions given in [1] a [2] together with following abbreviations apply:
ČIA Český institut pro akreditaci, o.p.s. (Czech institute for Accreditation)
ATL Accredited Testing Laboratory

2 SUBJECT MATTER OF THE TEST

The subject matter of the test were 2 identical roof specimens of 1,200 x 3,000 mm in size.

Roof assembly composition from the top layer:

- **TopMat/S5 blanket with sedum plants**, grown on a coconut mat interwoven with a PP mesh with a layer of growing medium and mixture of sedum plants, total thickness 40 mm (20 mm vegetation and 20 mm substrate),, weight of the blanket in raw condition (specimen size 250x300 mm) 1.2705 kg, weight after drying - kg (values determined by the testing laboratory).
- **BBCom mineral growing medium for green roofs**, liadrain (fraction 2/8) lightweight crushed stone, clean brick rubble from non-standard products of the brickyard (fraction 2/12), porous slag aggregate (fraction 2/8), peat (fraction 0/7), compost, dolomitic limestone, nutrients, thickness 40 mm, volume density 627 kg/m^3
- **ENVIRET SH retention slabs**, non-woven fabric from recycled synthetic fibers, bonded with bicomponent polyester fibers, thickness 20 mm, volume density 100 g/m^3.
- **Geotextile MOKRUTEX HQ PES 300 gsm**, (polyester PET)
- **FATRAFOL 810**, PVC, thickness 1.5 mm, roof waterproof membrane, it was fixed to the substrate by weighting with additional layers. (Foil manufacturer: Fatra a.s.)
- **Standard chipboard substrate**

The roof substrate was manufactured according to [1] cl. 6.4.2.2 b from chipboards of 16 mm in thickness and cut into 250 mm wide boards with straight edges. The gaps between the individual boards were (5.0 ± 0.5) mm.

Manufacturer of roof test specimens: RETEX a.s.

No special measures to protect the edges of specimen as per [1] cl. 6.4.4 were taken.

The Fire Testing Laboratory did not participate in test material sampling.

The specimen assembly was performed by the test sponsor under the supervision of the Testing Laboratory and in compliance with the relevant technology procedure on October 10, 2022.

3 TEST PERFORMANCE

The tests were performed in the test hall PO 3 for roof testing according to [1] Test 3 on October 10, 2022.

The initial ambient temperature 11 °C.

Both test specimens were exposed to fire at the pitch of 5°.

Used testing and gauging equipment is stated in Annex A.

In addition to the requirements of the test standard, temperatures inside the roof construction were measured for information using 4 pieces of TC. The Tcs were placed under the top blanket in vertical axis below and above the brands and the radiation panel.

The temperatures measured on the thermocouples were a maximum of 22°C on the first pad and 28°C on the second.

Test sponsor representatives were present at the test.

4 TEST RESULTS

4.1 Test specimen No. 1

Tab. 1.1 Behaviour of test specimen during the test / pitch 5°

Time (min)	Observation
0. – 3.	The specimen is exposed to the radiant heat from radiation panel, there are no changes for the surface.
4. – 14.	On the surface the brands are burning, the flame is spreading upwards due to the flow of air from the fan, the plants are burned at the point of the flame and around the brands, the fire is no more spreading, there is a slight development of smoke.
15. – 17.	The brands are burning out, their remnants continue to glow, there is no flame on the surface, the plants begin to get dry and brown under the radiation panel, there is a slight development of smoke.
18. – 30.	There is no flame on the surface, the plants are dry, brown and partially black under the radiation panel, there is a slight development of smoke.
31.	End of test and subsequent specimen opening.

Tab. 1.2 External fire spread

Fire spread upwards		Fire spread downwards	
Distance (mm)	Attainment time (min:s)	Distance (mm)	Attainment time (min:s)
100	5:10	100	-
300	-	300	-
500	-	500	-
700	-	-	-
900	-	-	-
1,100	-	-	-
1,300	-	-	-
2,000	-	-	-

Tab. 1.3 Specimen damage

Description of damage	Value
Maximum length of burnt material - upwards (mm)	150
Maximum length of burnt material - downwards (mm)	20
Extent of internal damage - upwards - mineral growing medium (mm)	0

Extent of internal damage - downwards - mineral growing medium (mm)	0
Damaged external surface - burnt plants due to the heat (m^2)	0.77
Falling flaming materials from the surface of the roof	none
Falling flaming materials from the underside	none
Fire penetration, openings	none

4.2 Test specimen No. 2

Tab. 2.1 Behaviour of test specimen during the test / pitch 5°

Time (min)	Observation
0. – 3.	The specimen is exposed to the radiant heat from radiation panel, there are no changes for the surface.
4. – 13.	On the surface the brands are burning, the flame is spreading upwards due to the flow of air from the fan, the plants are burned at the point of the flame and around the brands, the fire is no more spreading, there is a slight development of smoke.
14. – 19.	The brands are burning out, their remnants continue to glow, there is no flame on the surface, the plants begin to get dry and brown under the radiation panel, there is a slight development of smoke.
20. – 30.	There is no flame on the surface, the plants are dry, brown and partially black under the radiation panel, there is a slight development of smoke.
31.	End of test and subsequent specimen opening.

Tab. 2.2 External fire spread

Fire spread upwards		Fire spread downwards	
Distance (mm)	Attainment time (min:s)	Distance (mm)	Attainment time (min:s)
100	4:40	100	-
300	-	300	-
500	-	500	-
700	-	-	-
900	-	-	-
1,100	-	-	-
1,300	-	-	-
2,000	-	-	-

Tab. 2.3 Specimen damage

Description of damage	Value
Maximum length of burnt material - upwards (mm)	180
Maximum length of burnt material - downwards (mm)	30
Extent of internal damage - upwards - mineral growing medium (mm)	0
Extent of internal damage - downwards - mineral growing medium (mm)	0
Damaged external surface - burnt plants due to the heat(m^2)	0.77

Falling flaming materials from the surface of the roof	none
Falling flaming materials from the underside	none
Fire penetration, openings	none

The informative value of the moisture content of the top blanket was determined by drying the collected specimen. The loss of weight was 29,8 %.

5 FIELD OF DIRECT APPLICATION OF TEST RESULTS

5.1 Roof pitch

The results obtained at 5° apply to roofs with pitches <10°.

5.2 Nature of deck

The results of test obtained with standard supporting decks shall apply to all systems with the same components (including the thickness) installed in the same way, but with different decks as follows:

with chipboard with gaps between the boards of (5.0 ± 0.5) mm applies to:

- any wooden continuous deck;
- any deck made of wooden planks with straight edges;
- any non-combustible deck with gaps not exceeding 5.0 mm.

The sheets of this Report and Annexes are valid with an embossed stamp only.

Elaborated by:	Checked by:	Approved by:
Ing. Roman Dedek	Vladimír BENEŠ	Ing. Jiří KÁPL
ATL Engineer	ATL Technician	ATL Manager

ANNEX A: TESTING AND MEASURING EQUIPMENT, MEASUREMENT UNCERTAINTY

Test device	Registration number
Radiating panel with accessories	0016
Testing equipment for the roofs exposed to external fire	0017
Pitch measure 5°, 30°	0019

Gauging device	Metrological registration No.	Extended measurement uncertainty
Stop-watch	3 05 13	<0.04 s
Vane anemometer	3 08 32	<0.5 $m.s^{-1}$
Datalogger Almemo 2590-9	3 10 32	-
K-type thermocouple	3 10 93	0.18 °C
Winding tape measure (10 m)	3 01 67	2.5 mm
Sartorius scale	3 04 10	0.16 g
Thermohygrograph THZ 1int	3 13 07	<2 °C, 3%
Radiometer Schmidt - Boelter	3 14 01	3%
Radiometer Schmidt - Boelter	3 14 03	3%
Radiometer Schmidt - Boelter	3 14 04	3%

The specified extended measurement uncertainties are a product of standard measurement uncertainty and of the extension coefficient $k = 2$, which, for normal distribution, corresponds to the coverage probability of 95%, see [3] and [4].

The measurement uncertainty resulting from sampling is not included in the extended measurement uncertainty.

ANNEX B: PHOTOGRAPHIC DOCUMENTATION

In the Annex, the photographs representing specimen No. 1 are documented.
Results of specimen No. 2 are similar.

Test specimen No. 1 prior to the test beginning

Test specimen No. 1, 7th test minute

Test specimen No. 1, 16th test minute

Test specimen No. 1 after opening