

TEST REPORT

Order no: 24.09.2024

Signature: SL/Z-922/EN45545-R1/0885a/2024- draft

Police, 16.10.2024

Test methods:

1. ISO 5658-2:2006/Amd.1:2011. Reaction to fire tests – Spread of flame – Part 2: Lateral spread on building and transport products in vertical configuration.
2. EN-ISO 5659-2:2017. Plastic – Smoke generation – Part 2: Determination of optical density by a single – chamber test.
3. ISO 5660-1:2015/Amd.1:2019. Reaction to fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method).
4. EN 17084:2018. Railway applications – Fire protection of railway vehicles – Toxicity test of materials and components.
5. EN 45545-2:2020+A1:2023. Railway applications – Fire protection on railway vehicles – Part 2: Requirements for fire behavior of materials and components.

Content of request: Tests according to EN 45545-2:2020+A1:2023 - requirement R1/HL3.

Sponsor: ASD LAMINAT A.Ş
YEŞİLKÖY MAH. ATATÜRK CAD. İSTANBUL DÜNYA TİCARET
MERKEZİ BLOKLARI A1 BLOK NO: 10/1 K:16 OFİS
NO: 463-465-466 BAKIRKÖY - İSTANBUL
TÜRKİYE

Material: CGF type compact laminate (for interiors)

Composition: High-pressure decorative laminate (HPL) - Sheets based on thermosetting resins (product standard: EN 438-2)
It is a building material consisting of impregnated kraft paper and impregnated decorative paper on the upper surfaces.
Color: grey
Thickness: 4 mm
Density: 1,4 g/cm³

Manufacturer/supplier: ASD LAMINAT A.Ş
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Assessment: The tested product fulfils the requirement R1 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

The reprint and the copying: only with the agreement of ASD LAMINAT A.Ş

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Report applies only to the sample tested and is not necessarily indicative of the qualities of apparently identical or similar products.

Content of test report: seven pages with signature and numbers.

1. Spread of flame according to ISO 5658-2

Substrate: without additional substrate.

Tested side: gray laminate side (both sides identical).

Table 1.1. Findings of critical heat flux at extinguishment CFE

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	770,0	761,8	763,8	765,2	4,3
Specimen thickness	mm	3,9	3,9	3,9	3,9	0
Ignition time	s	68	36	53	52	16
Extinction time	s	1519	1438	-	-	-
Duration of the test	s	1800	1800	1800	1800	0
Flame-spread distance	mm	320	290	280	297	21
Critical heat flux at extinguishment CFE	$\text{kW}\cdot\text{m}^{-2}$	27,7	31,4	32,7	30,6	2,6
Flaming particles or droplets	YES/NO	NO	NO	NO	NO	

Table 1.2. Time of the movement of the flame front

Distance from exposed of the specimen	Calibration flux levels at the specimen	Time of arrival of the flame front		
		Specimen		
mm	$\text{kW}\cdot\text{m}^{-2}$	1	2	3
		s		
50	50,5	80	84	78
100	48,5	91	89	79
150	46,4	99	98	95
200	41,4	313	139	134
250	36,4	441	488	639
300	30,2	573	-	-
350	23,9	-	-	-
400	18,2	-	-	-
450	12,5	-	-	-

Remarks: none.

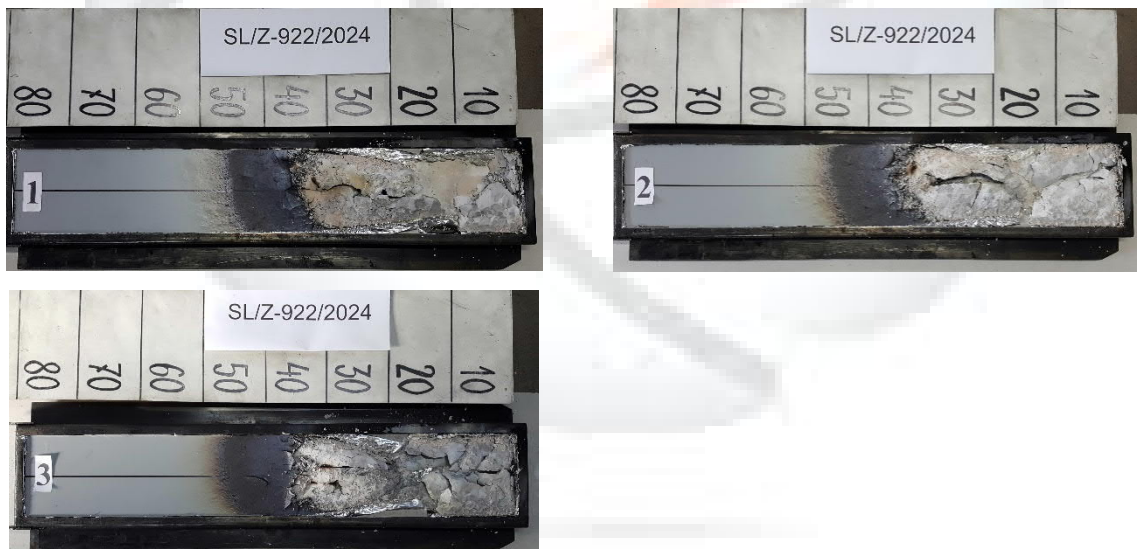


Figure 1. Appearance of the specimens after the test

2. Smoke generation according to EN-ISO 5659-2 + EN 45545-2

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Table 2. Final findings of smoke generation

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of specimen	g	34,7	34,8	34,9	34,8	0,1
Specimen thickness	mm	3,9	3,9	3,9	3,9	0
Ignition time - t_z	s	450	70	62	194	222
Extinction time	s	-	-	-	-	-
Duration of the test	s	600	600	600	600	0
Maximum of specific optical density - $D_{s,max}$	-	104	120	105	109	9
Time of arrival of the maximum of $D_{s,max}$	s	580	596	600	592	11
Specific optical density in the first 4 min of the test - $D_s(4)$	-	69	62	59	63	5
Cumulative specific optical densities in the first 4 min of the test - VOF_4	min	142	126	118	128	12

Remarks: none.

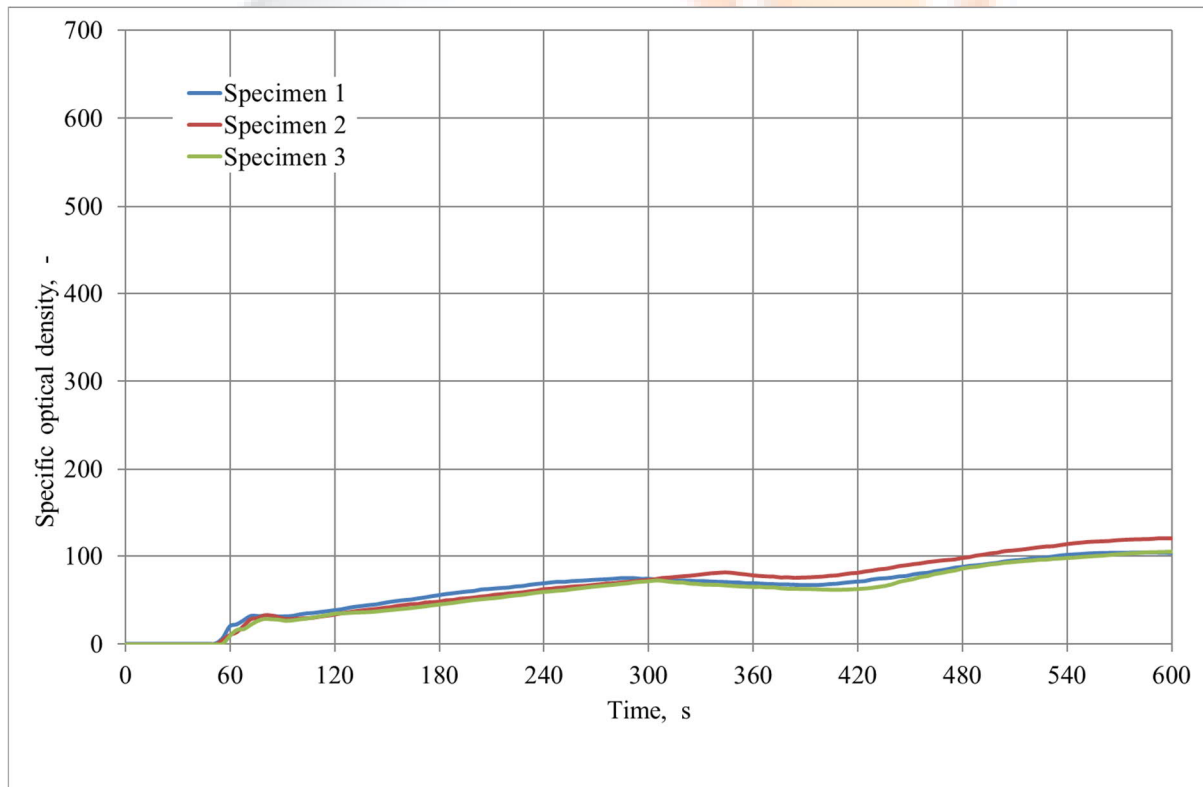


Figure 2. Specific optical density in the time

3. Results of toxic products emission of material decomposition and burning according to EN 17084, Method 1

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Table 3.1. Concentration of toxic products of material decomposition and burning after 4 min

Toxic component of burning products	Concentration of toxic products after 4 min				
	Specimen no.			Average	Standard deviation
	1	2	3		
	mg·m ⁻³				
CO ₂	4758	5137	5283	5059	271
CO	460	437	423	440	18
HCN	19	15	15	16	2
NO ₂	0	0	0	0	0
NO	16	12	16	15	2
HCL	0	0	0	0	0
SO ₂	0	0	0	0	0
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 3.2. Concentration of toxic products of material decomposition and burning after 8 min

Toxic component of burning products	Concentration of toxic products after 8 min				
	Specimen no.			Average	Standard deviation
	1	2	3		
	mg·m ⁻³				
CO ₂	16345	15331	16818	16165	760
CO	743	952	765	820	115
HCN	29	29	24	27	3
NO ₂	0	0	0	0	0
NO	44	36	44	41	5
HCL	0	0	0	0	0
SO ₂	0	0	0	0	0
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 3.3. Conventional index of toxicity

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Conventional index of toxicity CIT _G at 4 min	-	0,09	0,08	0,09	0,09	0,01
Conventional index of toxicity CIT _G at 8 min	-	0,20	0,19	0,19	0,19	0,00

Remarks: none.

4. Heat release rate of specimen according to ISO 5660-1

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Note 2: Because of intumescence of sample during the pretest, material was tested with the separation of 60 mm between upper surface of specimen and the bottom edge of cone heater (Clause 7.5 of ISO 5660-1).

Table 4. Heat release rate

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	62,7	62,5	62,1	62,4	0,3
Specimen thickness	mm	4,0	4,0	4,0	4,0	0
Ignition time	s	62	306	304	224	140
Extinction time	s	610	598	760	656	90
Duration of the test	s	1200	1200	1200	1200	0
Maximum heat release rate	$\text{kW} \cdot \text{m}^{-2}$	147	157	144	149	7
Total heat release	$\text{MJ} \cdot \text{m}^{-2}$	50,0	45,8	42,0	45,9	4,0
Maximum average rate of heat emission MARHE	$\text{kW} \cdot \text{m}^{-2}$	73,6	49,0	47,8	56,8	14,5
Fire integrity acc. 5.2.2.2 EN 45545-2	YES/NO	NO	NO	NO	NO	-

Remarks: none.

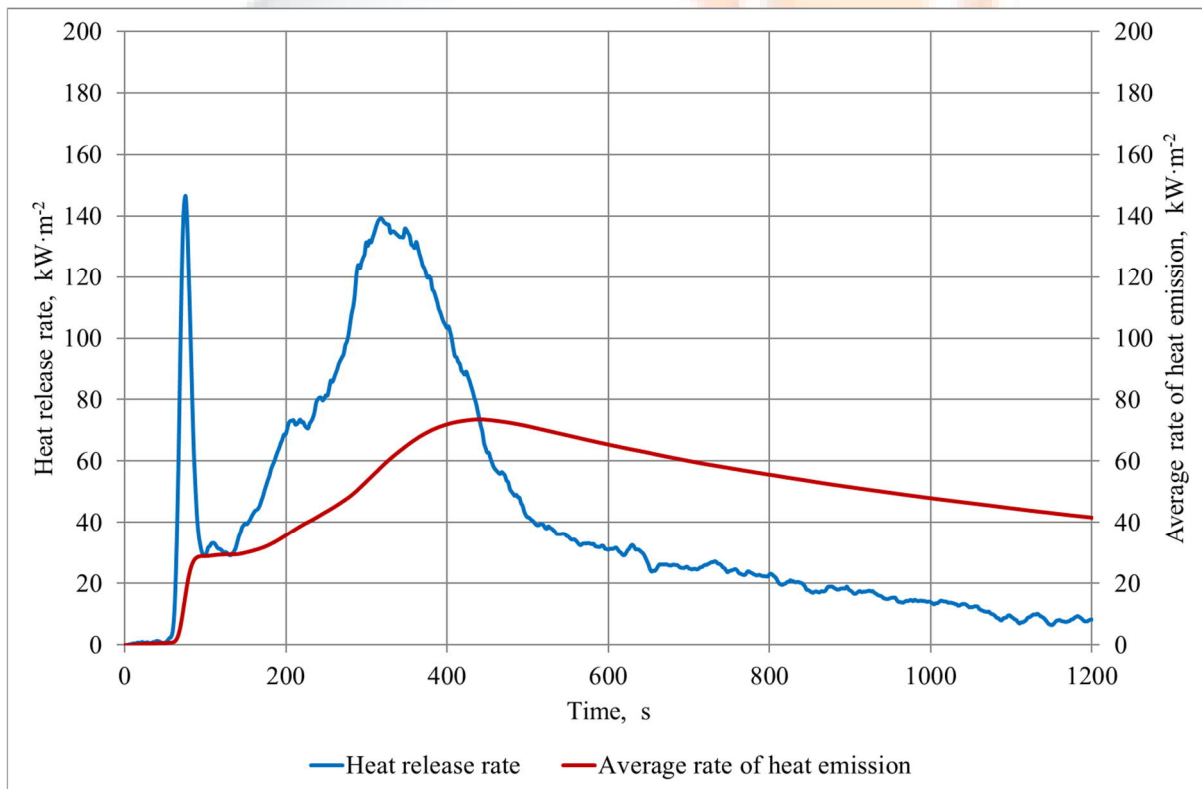


Figure 4.1. The relation of heat release rate and the time – specimen 1

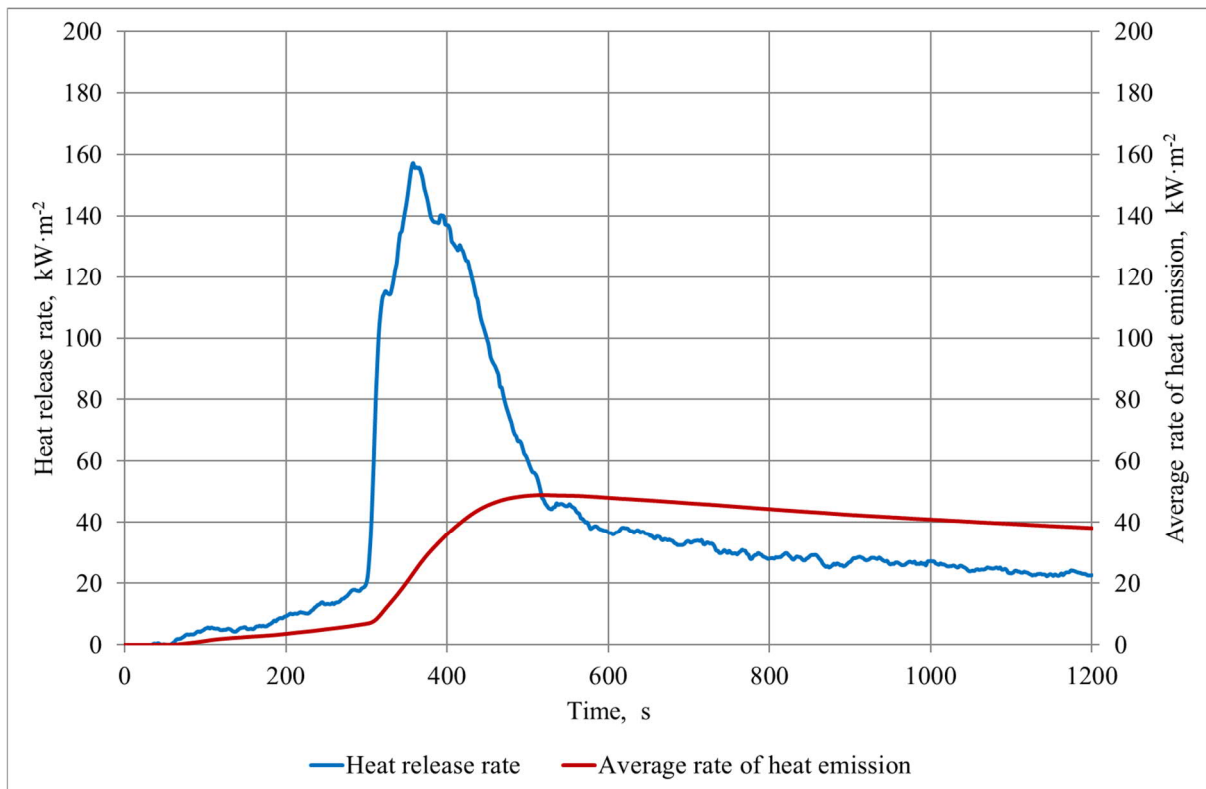


Figure 4.2. The relation of heat release rate and the time – specimen 2

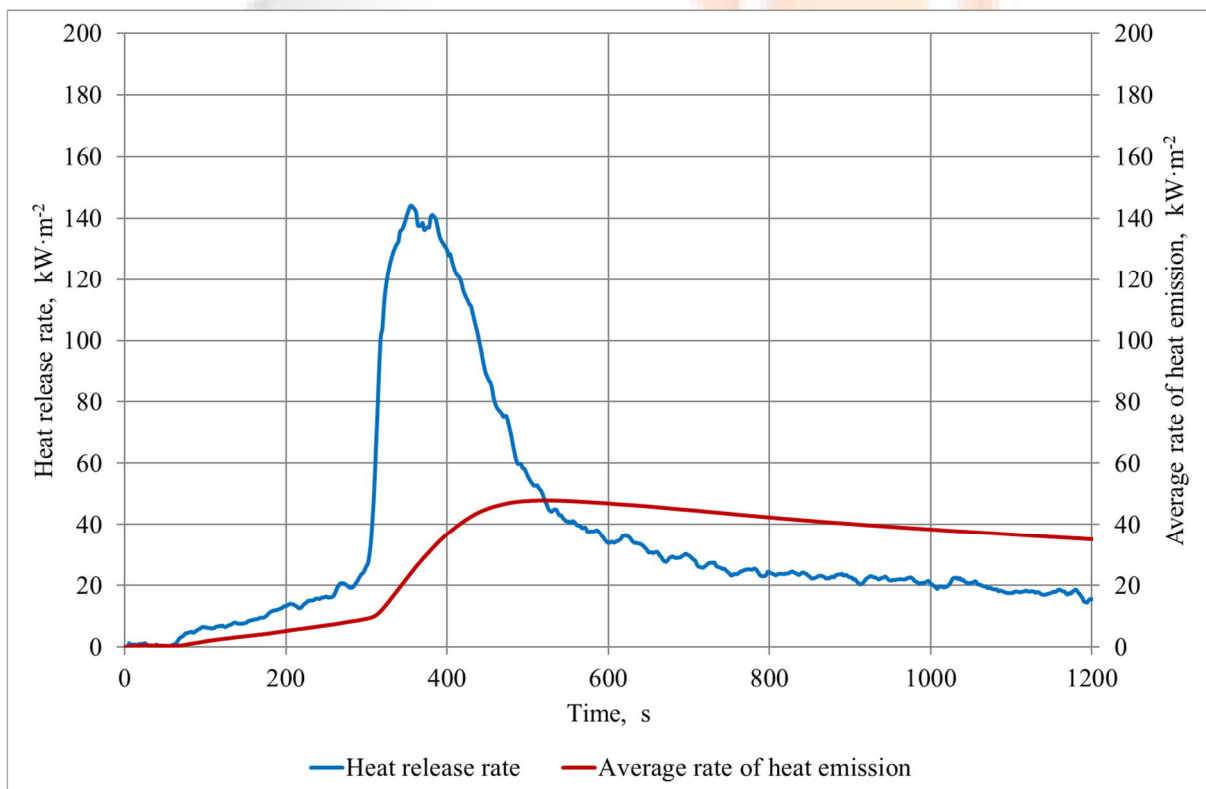


Figure 4.3. The relation of heat release rate and the time – specimen 3

5. Final findings

Requirement	Method/norm	Measured quantity	Unit	Measured value	Critical value			Crossing coefficient		
					HL1	HL2	HL3	HL1	HL2	HL3
R1	T02 ISO 5658-2	CFE	kW·m ⁻²	30,6	20	20	20	0,65	0,65	0,65
	T03.01 ISO 5660-1: 50 kW·m ⁻²	MARHE	kW·m ⁻²	56,8	-	90	60	-	0,63	0,95
	T10.01 EN ISO 5659-2: 50 kW·m ⁻²	D _s (4)	-	63	600	300	150	0,11	0,21	0,42
	T10.02 EN ISO 5659-2: 50 kW·m ⁻²	VOF ₄	min	128	1200	600	300	0,11	0,21	0,43
	T11.01 EN 17084 Method 1 50 kW·m ⁻²	CIT _G (4)	-	0,09	1,2	0,9	0,75	0,07	0,10	0,11
		CIT _G (8)	-	0,19	1,2	0,9	0,75	0,16	0,21	0,26

The tested product fulfils the requirement R1 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

6. Remaining required information

Date of receipt of samples: 10.10.2024

Sampling: sponsor took and delivered samples.

Description of the test material: laminate HPL with a dark grey coating on both sides with a thickness of 3,9-4,1 mm and a weight per unit area of 6,2 kg/m². Sponsor delivered 4 samples with dimensions of 800x155 mm, 12 samples with dimensions of 250x90 mm, 6 samples with dimensions of 100x100 mm and 6 samples with dimensions of 75x75 mm.



Conditioning of specimens: constant mass at a temperature of 23±2°C, and relative humidity of 50±5 %.

Declarations:

1. The test results relate to the behaviour of the test specimens under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the products in use.
2. The information provided on the first page of the report concerning the scope of research and identification of the tested object/objects were provided by the Sponsor.

Operators:

Authorised by:

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mgr inż. Andrzej Sychta

lic. Krzysztof Fidrysiak

Date and place of test - 15.10.2024, Police