SYCHTA LABORATORIUM Sp. J.
Laboratorium Badań Palności Materiałów
ul. Ofiar Stutthofu 90
72-010 Police

AB 1501

TEST REPORT

Order no: 81A21884 Signature: SL/Z-255/EN45545-R21/0246a/2023 Police, 12.04.2023 r.

Tests methods:

1. EN ISO 5659-2:2017. Plastic – Smoke generation – Part 2: Determination of optical density by a single – chamber test.
2. ISO 5660-1:2015. Reaction to fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method).
3. EN 17084:2018. Railway applications – Fire protection of railway vehicles – Toxicity test of materials and components.
4. EN 45545-2:2020. 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 - requirement R21.

Sponsor: Camira Transport Fabrics Ltd
Hopton Mils
Mirfield HD9 4 AY
United Kingdom

Material: Vigor / 348 / 347 + NitroPhlam365 + Acrylic Backcoat

Composition/specification: Pile: 85% Wool, 15% Nylon. Ground: 100% Cotton. Batch No. C15951 (200). Pattern reference: D1428. Fabric Type: Upholstery Fabric. Barrier: Plain woven fiberglass fire barrier with a low smoke emission silicone coating. Foam: Graphite impregnated foam.
Product Reference: iFoam DX.

Manufacturer/supplier: Camira Transport Fabrics Ltd
Hopton Mils
Mirfield HD9 4 AY
United Kingdom

Assessment: The tested product fulfils the requirement of R21 according to EN 45545-2:2020 for hazard level HL1, HL2 and HL3.

The reprint and the copying: only with the agreement of Camira Transport Fabrics Ltd

Without the written consent of the Sychta Laboratory the report can be copied only in one piece.

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: six pages with signature and numbers.

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

Tested side: fabric side.

Test conditions - irradiance of 25 $kW \cdot m^{-2}$ with pilot flame

Table 1.1. Final findings of smoke generation

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of specimen	g	17,3	17,5	17,6	17,5	0,1
Specimen thickness	mm	25,0	25,0	25,0	25,0	0,0
Ignition time - t_z	s	0	10	0	3	6
Extinction time	s	-	-	-	-	-
Duration of the test	s	600	600	600	600	0
Maximum of specific optical density - $D_s max$	-	30	40	38	36	6
Time of arrival of the maximum of $D_s max$	s	600	596	600	599	2
Specific optical density in the first 4 min of the test - Ds(4)	-	15	21	16	17	4
Cumulative specific optical densities in the first 4 min of the test - VOF_4	min	21	33	24	26	6

Remarks: none.

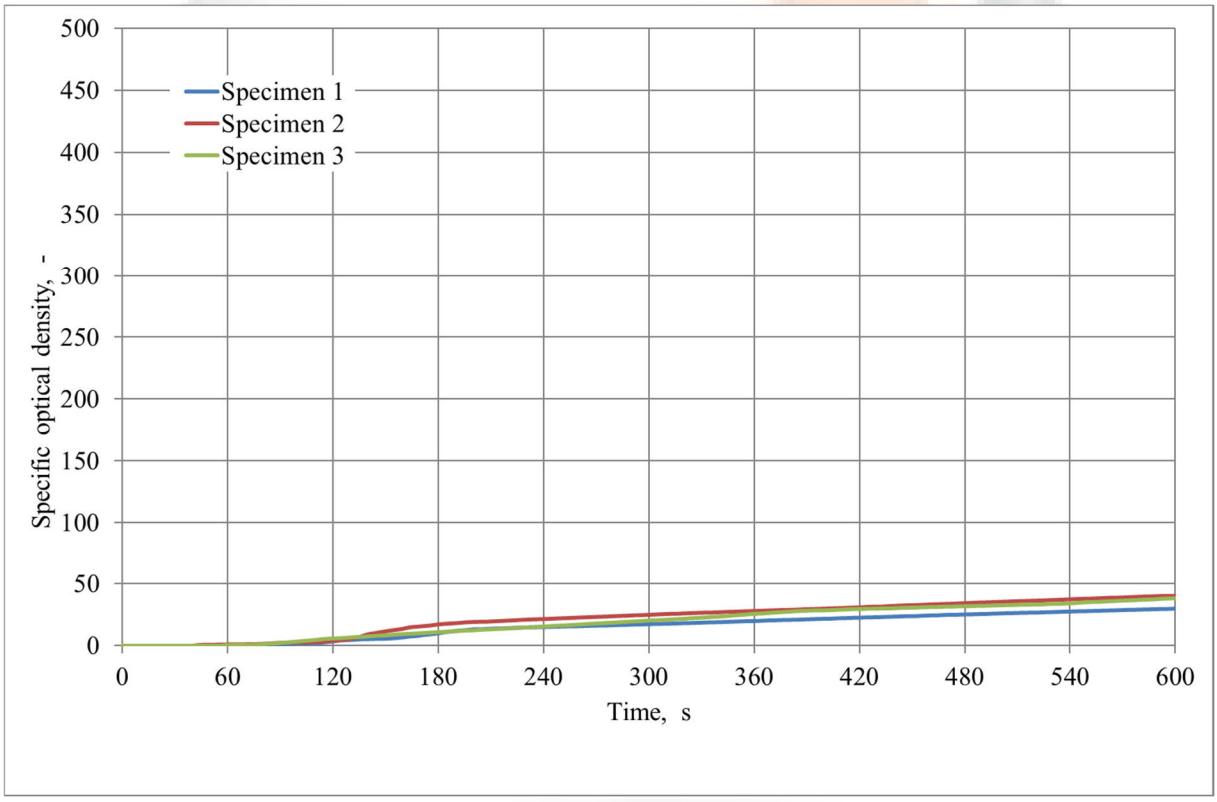

Figure 1.1. Specific optical density in the time

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

Test conditions - irradiance of 25 $kW \cdot m^{-2}$ with pilot flame

Table 2.1. 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		
	$mg \cdot m^{-3}$				
CO_2	8388	6517	7187	7364	948
CO	72	67	80	73	7
HCN	9	5	10	8	3
NO_2	0	0	0	0	0
NO	35	29	28	31	4
HCL	0	0	0	0	0
SO_2	88	47	33	56	29
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 2.2. 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		
	$mg \cdot m^{-3}$				
CO_2	13306	9583	11729	11539	1868
CO	144	141	157	147	8
HCN	12	19	16	15	3
NO_2	0	0	0	0	0
NO	47	35	38	40	6
HCL	0	0	0	0	0
SO_2	60	7	0	22	33
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 2.3. 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	-	0,13	0,09	0,10	0,11	0,02
Conventional index of toxicity CIT_G at 8 min	-	0,16	0,12	0,13	0,13	0,02

Remarks: none.

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

Test conditions - irradiance of 25 kW·m^{-2}

Table 3.1. Heat release rate

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	53,4	54,6	54,0	54,0	0,6
Specimen thickness	mm	49,9	50,0	50,0	50,0	0,1
Ignition time	s	80	78	80	79	1
Extinction time	s	962	1074	855	964	110
Duration of the test	s	1200	1200	1200	1200	0
Maximum heat release rate	kW·m^{-2}	115,9	96,1	91,1	101,0	13,1
Total heat release	MJ·m^{-2}	25,6	27,9	24,8	26,1	1,6
Maximum average rate of heat emission MARHE	kW·m^{-2}	32,0	34,9	28,4	31,8	3,3
Fire integrity acc. 5.2.2.2 EN 45545-2	YES/NO	YES	YES	YES	YES	-

Remarks: none.

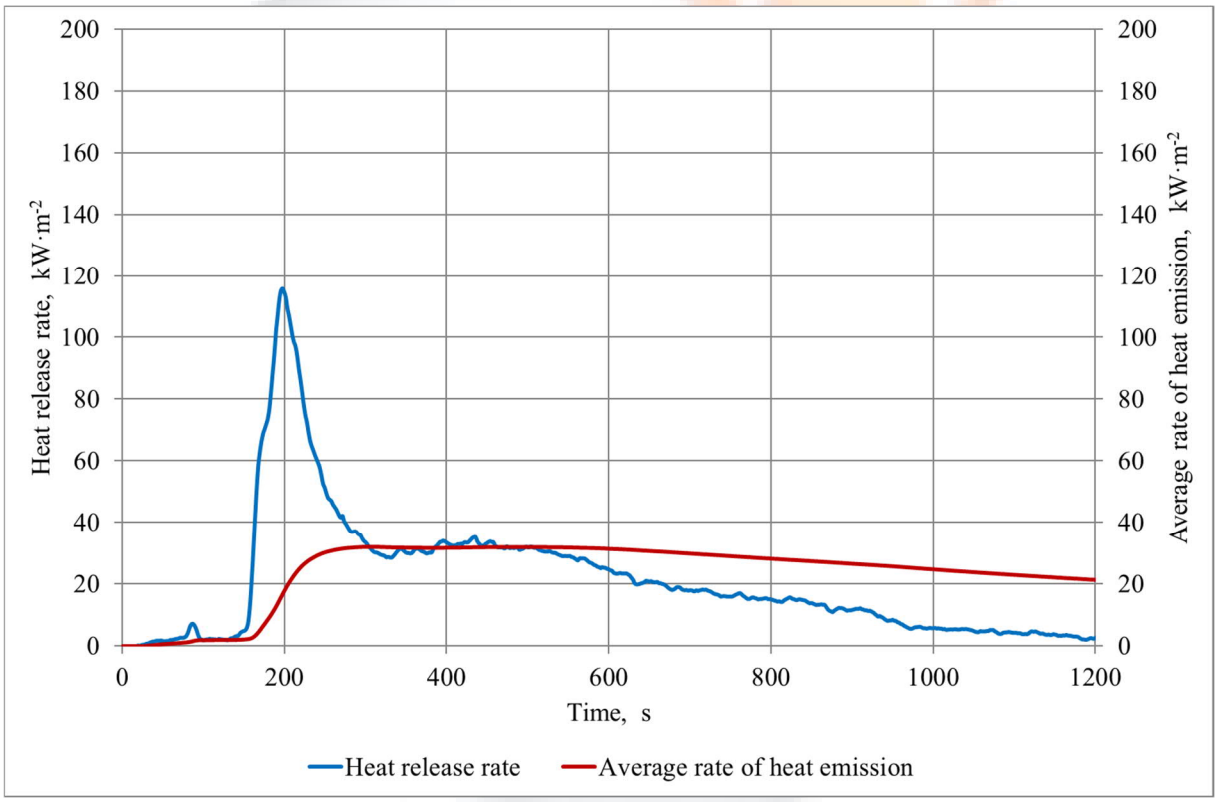

Figure 3.1. The relation of heat release rate and the time – specimen 1

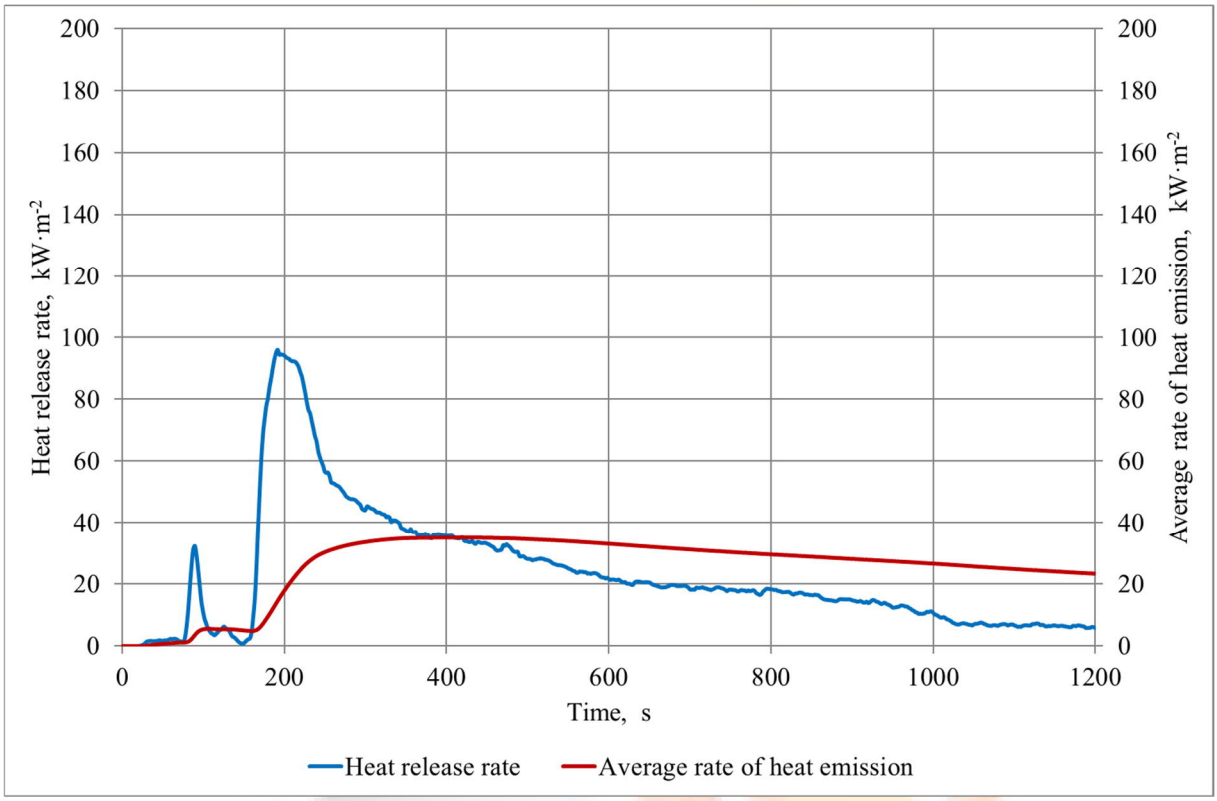

Figure 3.2. The relation of heat release rate and the time – specimen 2

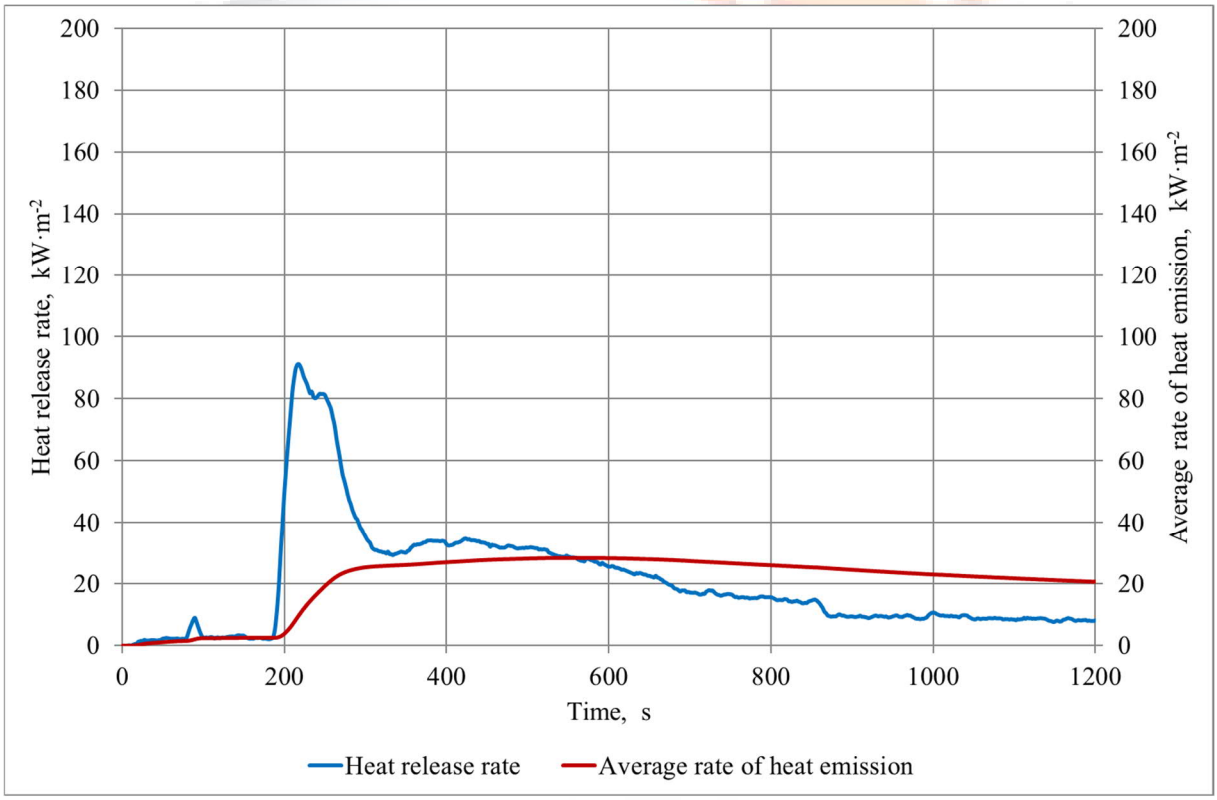

Figure 3.3. The relation of heat release rate and the time – specimen 3

4. Final findings

Requirement	Method/norm	Measured quantity	Unit	Measured value	Critical value			Crossing coefficient		
					HL1	HL2	HL3	HL1	HL2	HL3
R21	T03.02 EN ISO 5660-1: 25 kW·m^{-2}	MARHE	kW·m^{-2}	31,8	75	50	50	0,42	0,64	0,64
	T10.03 EN ISO 5659-2: 25 kW·m^{-2}	$D_s$max	-	36	300	300	200	0,12	0,12	0,18
	T11.02 EN 17084 Method 1 25 kW·m^{-2}	CIT_G (4)	-	0,11	1,2	0,9	0,75	0,09	0,12	0,14
		CIT_G (8)	-	0,13	1,2	0,9	0,75	0,11	0,15	0,18

The tested product fulfils the requirement of R21 according to EN 45545-2:2020 for hazard level HL1, HL2 and HL3.

5. Remaining required information

Date of receipt of samples: 03.04.2023

***Sampling*:** sponsor took and delivered samples.

Description of the test material: upholstery set, consisting of beige-brown fabric (~4,2 mm thick and weight per unit area 1,1 kg/m^2), white fire barrier fabric (~ 0,2 mm thick and weight per unit area approx. 250 g/m^2) and graphite foams (thickness of 45,5 mm and 20,2 mm and density 89-92 kg/m^3). Sponsor delivered one piece of fabric in beige-brown colour with dimensions of 900x603 mm, one white fire barier with dimensions of 450x420 mm, 6 samples of graphite foam with dimensions of 100x100 mm and 6 samples with dimensions of 75x75 mm. Laboratory prepared samples for the tests.

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:

dr hab. Zygmunt Sychta

mgr inż. Andrzej Sychta

SYCHTA LABORATORIUM Sp. J.
72-010 Police, ul. Ofiar Stutthofu 90
tel./fax +48 91 4210 214, tel. 502078855
e-mail: biuro@sychta.eu www:sychta.eu
KRS 0000387681 REGON 321023120
NIP 8513152392

Authorised by:

KIEROWNIK TECHNICZNY
dr inż. Krzysztof Sychta

Date and place of test - 07.04.2023, Police