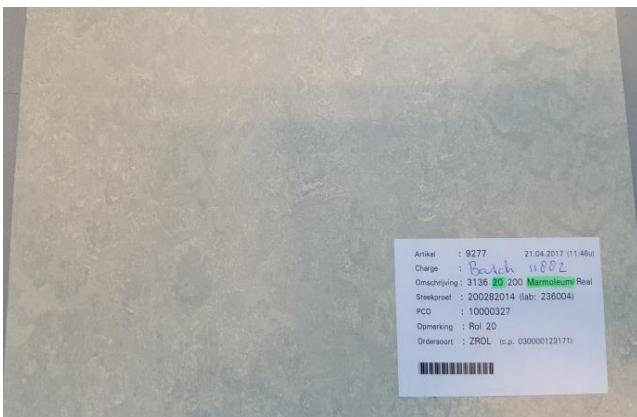



Prüfbericht-Nr.: <i>Test Report No.:</i>	89212885.01br-2	Auftrags-Nr.: <i>Order No.:</i>	180993	Seite 1 von 14 <i>Page 1 of 14</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	4500958564	Auftragsdatum: <i>Order date:</i>	04.01.2018		
Auftraggeber: <i>Client:</i>	Forbo Flooring B.V., PO Box 13, 1560 AA Krommenie, The Netherlands				
Prüfgegenstand: <i>Test item:</i>	Resilient floor covering				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Marmoleum 2.0				
Auftrags-Inhalt: <i>Order content:</i>	Classification of burning behaviour				
Prüfgrundlage: <i>Test specification:</i>	EN 13501-1:2007+ A1:2009 Classification of burning behaviour <i>Test methods: Ignitability of products subjected to direct impingement of flame (EN ISO 11925-2:2010/C1:2011) and determination of the burning behaviour using a radiant heat source (EN ISO 9239-1:2010)</i>				
Wareneingangsdatum: <i>Date of receipt:</i>	04.01.2018				
Prüfmuster-Nr.: <i>Test sample No.:</i>	MT17-180993.01				
Prüfzeitraum: <i>Testing period:</i>	05.01.2018 - 18.01.2018				
Ort der Prüfung: <i>Place of testing:</i>	Westervoortsedijk 73, 6827 AV Arnhem, Netherlands				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Nederland B.V				
Prüfergebnis*: <i>Test result*:</i>	Siehe Sonstiges / See Other				
geprüft von / tested by:	kontrolliert von / reviewed by:				
17.05.2018 M.A. van de Vlekkert	17.05.2018 E. Zwier				
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:	Test result: See clause 4 on page 5.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>				
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet	5 = mangelhaft
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested	5 = poor
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

v04

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Produktbeschreibung
Product description

Product identity	Marmoleum 2.0 mm*	Type of additional backings	None
Batch number	11882*	Total thickness (mm)	2.0*
Product type	Linoleum*	Total mass per unit area in (g/m ²)	2300*

* applicants declaration

Figure 1, Picture of the received sample

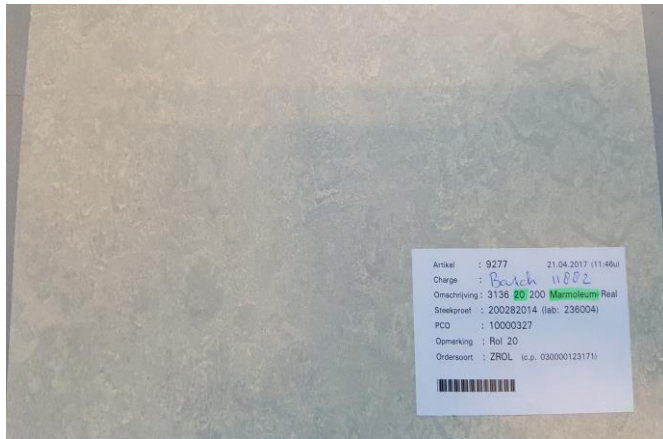


Figure 2, Picture of the received sample



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1	Construction data (indicative) of the product obtained by the testlaboratory after pre-conditioning 01-4.3-P.02-322-WI01		
	Test condition	23 ± 2°C and 50 ± 4% relative humidity	
	Pre conditioning, duration	≥ 48 h & until constant mass is achieved	
	Total thickness (mm)	2.0	
	Total mass (g/m ²)	2414	
	Density (kg/m ³)	1188	
	<i>Note: the determined construction data are used for determination of constant mass, the used testmethod is not in accordance with the determination of construction data according the specification standard. Therefore the testresults should be handled as indicative.</i>		

2	Ignitability of products subjected to direct impingement of flame EN ISO 11925-2:2010/C1:2011						
	Date of testing	18.01.2018					
	Pre-conditioning, climate	23 ± 2°C and 50 ± 4% relative humidity					
	Pre-conditioning, duration	≥ 48 h & until constant mass is achieved					
	Description of substrate	Particleboard, thickness 20 ± 2 mm, density 680 ± 50 kg/m ³ conforming to EN 13238:2010					
	Flame application	Surface					
	Flame application time (s)	15					
	Requirements according EN 13501-1:2007+A1:2009	See clause 5					
	Test result(s)						
	Orientation	Length			Width		
	Test sample	1	2	3	1	2	3
	Ignition of the sample	No	No	No	No	No	No
	Flame tip reached 150 mm above the application point	No	No	No	No	No	No
	Duration after application when the flame tip reached the 150 mm above the application point (s)	N/A	N/A	N/A	N/A	N/A	N/A
	Extent of damaged area, length (mm)	40	42	43	44	44	43
	Extent of damaged area, width (mm)	9	10	10	10	11	10
	Material melts	Yes	Yes	Yes	Yes	Yes	Yes
Shrinks away from flame without being ignited	No	No	No	No	No	No	
After glowing	No	No	No	No	No	No	
Flaming droplets/particles which caused ignition of filter paper	No	No	No	No	No	No	

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3	Determination of the burning behaviour using a radiant heat source EN ISO 9239-1:2010					
	Date of testing	08.01.2018				
	Pre-conditioning, climate	23 ± 2°C and 50 ± 4% relative humidity				
	Pre-conditioning, duration	≥ 48 h & until constant mass is achieved				
	Description of substrate	Particleboard, thickness 20 ± 2 mm, density 680 ± 50 kg/m ³ conforming to EN 13238:2010				
	Fixing method	The samples are glued to the substrate with Forbo Eurocol 614 Eurostar Lino Plus on 21.12.2017				
	Requirements according EN 13501-1:2007+ A1:2009	See clause 5				
	Test result(s)					
	Test sample	1	2	3	4	Mean
	Orientation (Length: ↑, Width: T)	↑	T	T	T	T
	Flame spread (cm)	35	37	37	40	38
	CHF / HF-30 (kW/m ²)	6.5	6.1	6.1	5.5	5.9
	Maximum light attenuation (%)	46.4	47.8	50.3	43.9	47.3
Smoke production (%.min)	243	231	236	238	235	
Observations: Specimen 1, 2, 3 and 4: Flashing, transitory- or sustained flaming are observed. Specimen 1, 2, 3 and 4: Extinguished naturally before the end of the test duration.						

4	Classification of burning behaviour EN 13501-1:2007+A1:2009	
	The product, Marmoleum 2.0 mm , in relation to its reaction to fire behaviour is classified:	C_{fl}
	The additional classification in relation to smoke production is:	s1
	Reaction to fire classification : C_{fl} – s1	
	Field of application <ul style="list-style-type: none"> - As a floor covering in accordance with the nominal product parameters given on page 3. - On end use substrates of classes A1 and A2-s1,d0 according to EN 13238:2010. - Glued down with Forbo Eurocol 614 Eurostar lino plus. 	
Statements <ul style="list-style-type: none"> - This document does not represent type approval or certification of the product. - The test results only relate to the behaviour of the test specimens of the examined product under the particular conditions of the test in laboratory conditions; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use. - The validity of this report will expire directly after alterations or modifications of the examined product (combination)(s) and/or the criteria. 		

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5	Potential classes of reaction to fire performance for floorings			
	EN 13501-1:2007+A1:2009			
	Class	Test method(s)	Classification criteria	
	A _{1fi}	EN ISO 1182 ^a and	$\Delta T \leq 30 \text{ °C}$; and $\Delta m \leq 50 \%$; and $t_f = 0$ (i.e. no sustained flaming)	-
		EN ISO 1716	$PCS \leq 2.0 \text{ MJ/kg}^a$ and $PCS \leq 2.0 \text{ MJ/m}^2^b$ and $PCS \leq 1.4 \text{ MJ/m}^2^c$ and $PCS \leq 2.0 \text{ MJ/kg}^d$	-
	A _{2fi}	EN ISO 1182 ^a or	$\Delta T \leq 50 \text{ °C}$ and $\Delta m \leq 50 \%$ and $t_f \leq 20 \text{ s}$	-
		EN ISO 1716 and	$PCS \leq 3.0 \text{ MJ/kg}^a$ and $PCS \leq 4.0 \text{ MJ/m}^2^b$ and $PCS \leq 4.0 \text{ MJ/m}^2^c$ and $PCS \leq 3.0 \text{ MJ/kg}^d$	-
		EN ISO 9239-1 ^e	$CHF \geq 8.0 \text{ kW/m}^2$	Smoke production ^g
	B _{fi}	EN ISO 9239-1 ^e and	$CHF \geq 8.0 \text{ kW/m}^2$	Smoke production ^g
		EN ISO 11925-2 ^h : Exposure = 15 s	$F_s \leq 150 \text{ mm}$ within 20 s	-
	C _{fi}	EN ISO 9239-1 ^e and	$CHF \geq 4.5 \text{ kW/m}^2$	Smoke production ^g
		EN ISO 11925-2 ^h : Exposure = 15 s	$F_s \leq 150 \text{ mm}$ within 20 s	-
	D _{fi}	EN ISO 9239-1 ^e and	$CHF \geq 3.0 \text{ kW/m}^2$	Smoke production ^g
EN ISO 11925-2 ^h : Exposure = 15 s		$F_s \leq 150 \text{ mm}$ within 20 s	-	
E _{fi}	EN ISO 11925-2 ^h : Exposure = 15 s	$F_s \leq 150 \text{ mm}$ within 20 s	-	
F _{fi}	No performance determined			
^a	For homogeneous products and substantial components of non-homogeneous products.			
^b	For any external non-substantial component of non-homogeneous products.			
^c	For any internal non-substantial component of non-homogeneous products.			
^d	For the product as a whole.			
^e	Test duration = 30 min.			
^f	Critical flux is defined as the radiant flux at which the flame extinguishes or the radiant flux after a test period of 30 min, whichever is the lower (i.e. the flux corresponding with the furthest extent of spread of flame).			
^g	s1 = Smoke $\leq 750 \%$ minutes; s2 = not s1.			
^h	Under conditions of surface flame attack and, if appropriate to the end use application of the product, edge flame attack.			

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6 Flooring Radiant Panel Single Specimen Report

Report produced with the Fire Testing Technology FRPSoft software

page 1

Flooring Radiant Panel Single Specimen Report

Standard : EN ISO 9239-1:2010
 Laboratory : TÜV Rheinland Nederland B.V.
 Sponsor : Forbo 89212885
 Date of test : Jan. 08 2018

Specimen description : Marmoleum 2.0 mm batch 11882 MT17-180993.01
 Test name : # 1 Prod
 File name : D:\FRPFILES\18010013.CSV
 Test number in series : 4

Flux calibration file name : C:\FRPSOFT2.9A\CALIB\FLX18001.CSV

Thickness (mm) :
 Density (kg/m³) :

Test duration : 23 minutes 23 seconds (1403 s)
 Substrate used? : Yes
 Substrate : Particle board
 Fixing method : adhesive
 Conditioned? : Yes
 Conditioning temp. (°C) : 23
 Conditioning RH (%) : 50

Test Results

Time to ignition : 2 minutes 04 seconds (124 s)
 Time to flameout : 22 minutes 59 seconds (1379 s)
 Extent of burning (mm) : 350
 Critical flux at extinguishment (kW/m²) : 6.51
 HF-10 (kW/m²) : 6.93
 HF-20 (kW/m²) : 6.51
 HF-30 (kW/m²) : Not calculated (test duration < 30 minutes)
 Flame spread at 10 minutes (mm) : 330
 Flame spread at 20 minutes (mm) : 350
 Flame spread at 30 minutes (mm) : Not measured
 Peak light attenuation (%) : 46.39
 Time to peak light attenuation : 6 minutes 05 seconds (365 s)
 Total integrated smoke (%.min) : 243.34

Potential classification : C(II)
Smoke production classification : s1

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

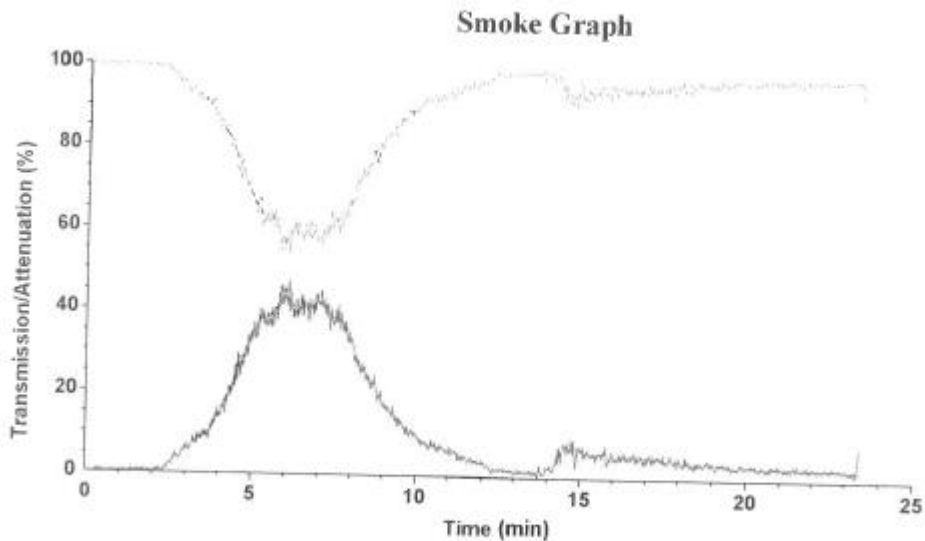
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Test name : # 1 Prod
File name : D:\FRPFILES\18010013.CSV

Rake Results

Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)	Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)
60	216	11.1	2.408	510	-	3.7	-
110	316	10.5	3.323	560	-	3.1	-
160	321	10.0	3.208	610	-	2.6	-
210	409	9.4	3.826	660	-	2.3	-
260	433	8.3	3.602	710	-	2.0	-
310	564	7.3	4.141	760	-	1.8	-
360	-	6.3	-	810	-	1.6	-
410	-	5.3	-	860	-	1.4	-
460	-	4.5	-	910	-	1.2	-

Comments

Specimen extinguished naturally

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

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Flooring Radiant Panel Single Specimen Report

Standard : EN ISO 9239-1:2010
 Laboratory : TÜV Rheinland Nederland B.V.
 Sponsor : Forbo 8921 2.905
 Date of test : Jan. 08 2018

Specimen description : Marmoleum 2.0 mm batch 11882 MT17-180993.01
 Test name : # 2 Cross
 File name : D:\FRPFILES\18010014.CSV
 Test number in series : 4

Flux calibration file name : C:\FRPSOFT2.9A\CALIB\FLX18001.CSV

Thickness (mm) :
 Density (kg/m³) :

Test duration : 14 minutes 27 seconds (867 s)
 Substrate used? : Yes
 Substrate : Particle board
 Fixing method : adhesive
 Conditioned? : Yes
 Conditioning temp. (°C) : 23
 Conditioning RH (%) : 50

Test Results

Time to ignition : 2 minutes 03 seconds (123 s)
 Time to flameout : 14 minutes 18 seconds (858 s)
 Extent of burning (mm) : 370
 Critical flux at extinguishment (kW/m²) : 6.11
 HF-10 (kW/m²) : 6.72
 HF-20 (kW/m²) : Not calculated (test duration < 20 minutes)
 HF-30 (kW/m²) : Not calculated (test duration < 30 minutes)
 Flame spread at 10 minutes (mm) : 340
 Flame spread at 20 minutes (mm) : Not measured
 Flame spread at 30 minutes (mm) : Not measured
 Peak light attenuation (%) : 47.82
 Time to peak light attenuation : 6 minutes 34 seconds (394 s)
 Total integrated smoke (%.min) : 230.71

Potential classification : C(f)
Smoke production classification : s1

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

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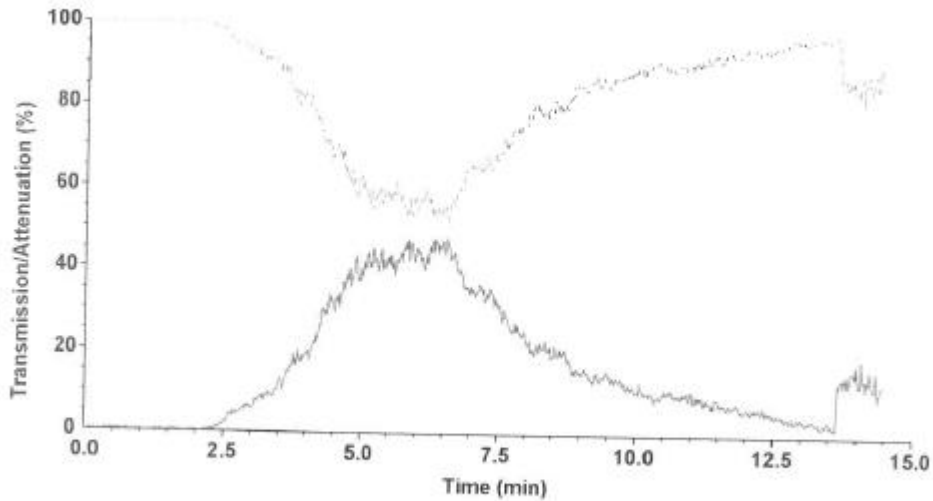
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page 2

Smoke Graph



Test name : # 2 Cross

File name : D:\FRPFILES\18010014.CSV

Rake Results

Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)	Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)
60	190	11.1	2.118	510	-	3.7	-
110	246	10.5	2.587	560	-	3.1	-
160	289	10.0	2.889	610	-	2.6	-
210	366	9.4	3.424	660	-	2.3	-
260	415	8.3	3.452	710	-	2.0	-
310	519	7.3	3.810	760	-	1.8	-
360	692	6.3	4.361	810	-	1.6	-
410	-	5.3	-	860	-	1.4	-
460	-	4.5	-	910	-	1.2	-

Comments

Specimen extinguished naturally.

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

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Flooring Radiant Panel Single Specimen Report

Standard : EN ISO 9239-1:2010
 Laboratory : TÜV Rheinland Nederland B.V.
 Sponsor : Forbo 8921 2005
 Date of test : Jan. 08 2018

Specimen description : Marmoleum 2.0 mm batch 11882 MT17-180993.01
 Test name : # 3 Cross
 File name : D:\FRPFILES\18010015.CSV
 Test number in series : 4

Flux calibration file name : C:\FRPSOFT2.9A\CALIB\FLX18001.CSV

Thickness (mm) :
 Density (kg/m³) :

Test duration : 19 minutes 28 seconds (1168 s)
 Substrate used? : Yes
 Substrate : Particle board
 Fixing method : adhesive
 Conditioned? : Yes
 Conditioning temp. (°C) : 23
 Conditioning RH (%) : 50

Test Results

Time to ignition : 2 minutes 06 seconds (126 s)
 Time to flameout : 19 minutes 22 seconds (1162 s)
 Extent of burning (mm) : 370
 Critical flux at extinguishment (kW/m²) : 6.11
 HF-10 (kW/m²) : 6.72
 HF-20 (kW/m²) : Not calculated (test duration < 20 minutes)
 HF-30 (kW/m²) : Not calculated (test duration < 30 minutes)
 Flame spread at 10 minutes (mm) : 340
 Flame spread at 20 minutes (mm) : Not measured
 Flame spread at 30 minutes (mm) : Not measured
 Peak light attenuation (%) : 50.27
 Time to peak light attenuation : 5 minutes 17 seconds (317 s)
 Total integrated smoke (%.min) : 236.31

Potential classification : C(fl)
Smoke production classification : s1

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

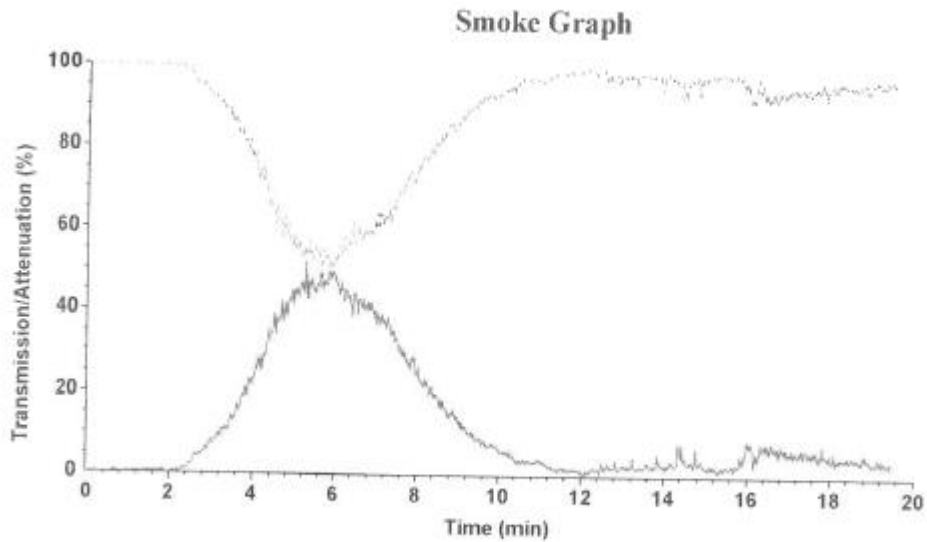
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Test name : # 3 Cross
File name : D:\FRPFILES\18010015 CSV

Rake Results

Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)	Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)
60	222	11.1	2.474	510	-	3.7	-
110	268	10.5	2.818	560	-	3.1	-
160	286	10.0	2.859	610	-	2.6	-
210	324	9.4	3.031	660	-	2.3	-
260	475	8.3	3.951	710	-	2.0	-
310	482	7.3	3.539	760	-	1.8	-
360	815	6.3	5.136	810	-	1.6	-
410	-	5.3	-	860	-	1.4	-
460	-	4.5	-	910	-	1.2	-

Comments

Specimen extinguished naturally.

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

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Flooring Radiant Panel Single Specimen Report

Standard : EN ISO 9239-1:2010
 Laboratory : TÜV Rheinland Nederland B.V.
 Sponsor : Forbo 89212885
 Date of test : Jan. 08 2018

Specimen description : Marmoleum 2.0 mm batch 11882 MT17-180993.01
 Test name : # 4 Cross
 File name : D:\FRPFILES\18010016.CSV
 Test number in series : 4

Flux calibration file name : C:\FRPSOFT2.9A\CALIB\FLX18001.CSV

Thickness (mm) :
 Density (kg/m³) :

Test duration : 22 minutes 13 seconds (1333 s)
 Substrate used? : Yes
 Substrate : Particle board
 Fixing method : adhesive
 Conditioned? : Yes
 Conditioning temp. (°C) : 23
 Conditioning RH (%) : 50

Test Results

Time to ignition : 2 minutes 07 seconds (127 s)
 Time to flameout : 22 minutes 11 seconds (1331 s)
 Extent of burning (mm) : 400
 Critical flux at extinguishment (kW/m²) : 5.53
 HF-10 (kW/m²) : 6.72
 HF-20 (kW/m²) : 5.53
 HF-30 (kW/m²) : Not calculated (test duration < 30 minutes)
 Flame spread at 10 minutes (mm) : 340
 Flame spread at 20 minutes (mm) : 400
 Flame spread at 30 minutes (mm) : Not measured
 Peak light attenuation (%) : 43.89
 Time to peak light attenuation : 5 minutes 23 seconds (323 s)
 Total integrated smoke (%.min) : 238.16

Potential classification : C(fl)
Smoke production classification : s1

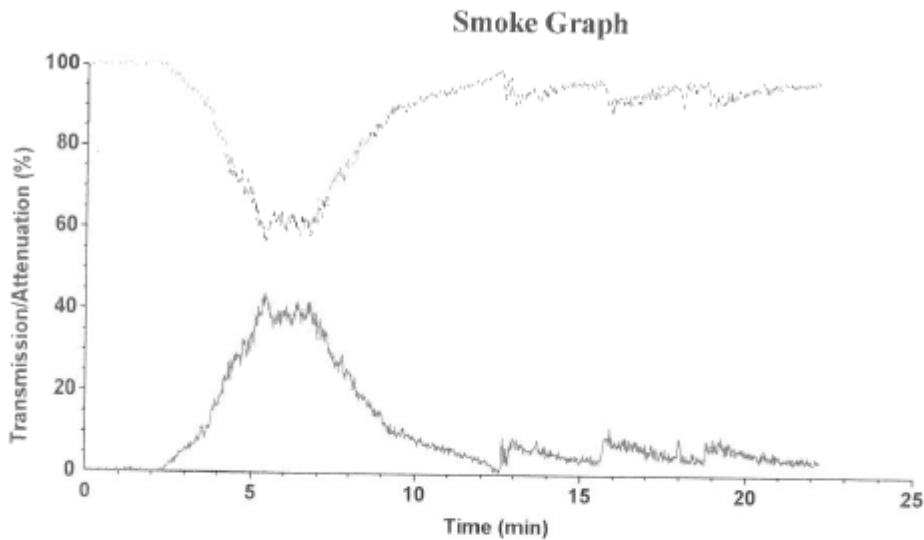
These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

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Test name : # 4 Cross
File name : D:\FRPFILES\18010016.CSV

Rake Results

Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)	Position (mm)	Time (s)	Flux (kW/m ²)	Qsb (MJ/m ²)
60	197	11.1	2.196	510	-	3.7	-
110	292	10.5	3.071	560	-	3.1	-
160	304	10.0	3.038	610	-	2.6	-
210	385	9.4	3.601	660	-	2.3	-
260	428	8.3	3.560	710	-	2.0	-
310	534	7.3	3.921	760	-	1.8	-
360	765	6.3	4.821	810	-	1.6	-
410	-	5.3	-	860	-	1.4	-
460	-	4.5	-	910	-	1.2	-

Comments

Specimen extinguished naturally.

These results relate only to the behaviour of the specimens of the product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.