

TNO report

2006-CVB-R0419

Examination on reaction to fire and smoke
production according to EN-ISO 11925-2: 2002
and EN-ISO 9239-1: 2002 of Forbo Marmoleum
Ohmex 2.5 mm and 3.2 mm floor covering, glued
on particle board

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Subject:

Forbo Marmoleum Ohmex 2.5 mm and 3.2 mm floor covering, glued on 18 mm particle board.

Purpose of tests:

Determination of the reaction to fire and smoke production according to the examination methods of EN ISO 11925-2: 2002- 'Ignitability' and EN- ISO 9239-1: 2002 - 'Radiant panel test for floor coverings'.

Contractor:

Forbo Flooring B.V.
P.O. Box 13
NL-1560 AA KROMMENIE
The Netherlands

Period of examination:

January - April 2006.

Period of issue and report number:

July 2006; **2006-CVB-R0419**.

Description of the material:

Composition:

According to the manufacturer the **Marmoleum Ohmex** floor covering product is produced in accordance with EN 548 in a thickness range of **2.5 mm to 3.2 mm**.

It is based on a two-layer homogeneous mixture of linoleum cement, wood flour, anti static salt, limestone and pigments, applied on a fibrous backing.

The linoleum surface layer has a minimum thickness of 1.3 mm.

Linoleum cement is consisting of a mixture of linseed oil and/or other vegetable drying oils and rosin.

Dimensions and mass per unit area:

Nominal overall thickness range: 2.5 to 3.2 mm.

Mass per unit area: 3 kg/m² to 4.0 kg/m².

Sample:

Sampling:

On March 23, 2006 a number of **Marmoleum Ohmex** floor covering specimens with a thickness of 2.0 mm and 3.2 mm were received from the contractor.

The floor coverings had been glued on 18 mm particle board by the contractor with a prescribed standard linoleum adhesive.

Age:

No information received. At the time of examination: 5 weeks.

Conditioning:

Prior to the examinations the specimens were conditioned for approx. 5 weeks at 23 ± 2 °C and 50 ± 5 % relative humidity according to § 4.1 of EN 13238: 2001.

Method of examinations:

The examination on flammability and horizontal fire propagation of floor coverings were carried out according to the EN ISO 11925-2: 2002 and the EN-ISO 9239-2: 2002.

The flammability examination was carried out completely on the 3.2 mm thick and additionally on the 2.0 mm thick product combination with surface ignition with a flame application time of 15 seconds.

With the reaction to fire examination on each product thickness initially two tests were carried out in each direction of the products; one on a specimen cut in the production direction and one cut perpendicular to the production direction. Based on the test results found, the examination was continued in that direction and thickness of the type with the less positive result with two additional tests.

The specimens were examined in combination with a prescribed non-FR particle board substrate (EN 312-2 - $680 \pm 50 \text{ kg/m}^3$ - $20 \pm 2 \text{ mm}$) according to § 5.1.3 of EN 13238: 2001.

Test results of (A) the flammability according to EN-ISO 11925-2 and (B) the reaction to fire according to EN-ISO 9239-1: 2002 of Forbo Marmoleum Ohmex floor covering with a thickness of 2.0 mm and 3.2 mm, glued on 18 mm particle board.

A - Ignitability – EN-ISO 11925-2 – Surface ignition - flame application time 15 s.

Test	Ignition of sample	Maximum flame height	t ₁₅₀	Afterburning time	Ignition of filter paper
	[Y/N]	[mm]	[s]	[s]	Y/N
Thickness 2.5 mm					
1	Y	25	∞ not reached	0	N
2	Y	25			
3	Y	22			
Thickness 3.2 mm					
1	Y	22	∞ (6 x) not reached	0	N
2	Y	22		0	N
3	Y	20		0	N
4	Y	25		0	N
5	Y	25		0	N
6	Y	25		0	N
Value used for classification		23	Not reached	0	N

Remark: As within EN-ISO 11925-2: 2002 material is tested in a vertical position the “Edge ignition” is respected not to be relevant for floor coverings, when used in horizontal application(s).

The **Forbo Marmoleum Ohmex** floor covering / 18 mm particle board substrate combination with thickness of **2.5 mm** and **3.2 mm** complies with the flammability criteria of the Euroclass E_{fl} according to EN 13501-1: 2002.

Forbo Marmoleum Ohmex floor covering with a thickness of **2.5 mm** and **3.2 mm**, glued on 18 mm particle board.
 B - Horizontal surface flame spread – EN 9239-1:2002.

Product direction (*) and product thickness	Test no.	Time of reaching "50 mm" marks		Maximum flame travel		Critical heat flux	Smoke density
		mm	mins.	distance	time	(CHF)	%min
				m	mins.	kW/m ²	
Production 2.5 mm	1	50	3¼	0.11	5¾	10.6	109
		100	5¼				
Cross 2.5 mm	2	50	3¼	0.11	6¼	10.6	102
		100	5				
Production 3.2 mm	1	50	3⅛	0.36	15	5.9	210
		100	3¾				
		150	4				
		200	5¼				
		250	7				
		300	9¼				
		350	14¼				
	2	50	3⅛	0.37	16½	5.6	218
		100	3½				
		150	4¼				
		200	4¾				
		250	6¼				
		300	7½				
		350	14				
Cross 3.2 mm	3	50	3¼	0.45	29	4.3	299
		100	4				
		150	4¾				
		200	5¼				
		250	6½				
		300	8½				
		350	13¾				
	4	50	3¼	0.40	22¾	5.0	264
		100	4¼				
		150	5¼				
		200	6¼				
		250	7⅞				
		300	9½				
		350	13¼				
5	50	3¼	0.405	22	4.9	186	
	100	4					
	150	5⅛					
	200	6¼					
	250	7¼					
	300	11					
	350	13					
400	21½						
Average values		-	-	0.42	24¾	4.7	250

(*) *Production = specimens cut in the production direction of the floor covering. The tests indicated with Cross, the specimens had been cut perpendicular to the production direction. Due to the less positive result that was found in the Cross direction the examination was carried out completely in this direction on which the average values over the three test results were determined.*

Observations during tests: No specific or odd events were observed.

Heat flux (HF) values at xx minutes	Test no.	HF-10	HF-20	HF-30
kW/m^2	2.5 mm thick product			
	1 – Prod.	-	-	-
	1 – Cross	-	-	-
	3.2 mm thick product			
	1 – Prod.	7.0	-	-
	2 – Prod.	6.7	-	-
	1 – Cross	6.7	5.4	4.3
	2 – Cross	7.0	5.0	-
	3 – Cross	7.4	5.0	-

Assessment:

Based on the test results the examined **Forbo Marmoleum Ohmex** linoleum floor covering product, with a nominal thickness range of **2.5 mm** to **3.2 mm** and a mass per unit area of approx. 3.0 to 4.0 kg/m^2 , glued on a 18 mm thick particle board, fulfilled the criteria that have been given for Euroclass C_{fl} -s1 (requirements: *Meet the flammability criteria of Euroclass E_{fl} and have a Critical Heat Flux (CHF) ≥ 4.5 and $\leq 8.0 \text{ kW/m}^2$ and a smoke production of $\leq 750 \%$ minutes*) according to EN 13501-1: 2002).

A formal classification report according to EN 13501-1: 2002 will be issued separately.

Remark 1:

The results relate to the behaviour of the test specimens of a 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.

They are valid for the use on a wooden support or sub floor which is at least comparable to the examined one ($EN 312-2 - 680 \pm 50 \text{ kg/m}^3$) and also in combination with non-combustible supports ($ISO 390 - 1800 \pm 200 \text{ kg/m}^3 - 6 \pm 1 \text{ mm}$) according to respectively § 5.1.3 and 5.1.2 of EN 13238: 2001.

Remark 2:

The uncertainty of measurement of reaction to fire tests is an item under discussion within TC4 of EGOLF.

Pending the outcome of this process, we will not give an expression of the uncertainty of measurement of the results presented in this report.

A handwritten signature in blue ink, consisting of a large, rounded loop on the left, a vertical line in the center, and a horizontal line at the bottom.

W. Langstraat

Centre for Fire Research

A handwritten signature in blue ink, featuring a large, stylized 'P' followed by several loops and a long, sweeping tail.

Dr. F. Paap

Graph of the Critical Heat Flux (CHF) and photograph after examination according to EN ISO 9239-1: 2002 of Forbo Marmoleum Ohmex floor covering – nom. thickness 3.2 mm, glued on 18 mm particle board.

