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**TNO report**

**2004-CVB-R0238(E)**

Examination on the reaction to fire and smoke production according to EN ISO 11925-2: 2002 and EN ISO 9239-1: 2002 of Forbo Novilon Prima vinyl floor covering, glued on the standard fibre cement substrate.

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**Product:**

Forbo **Novilon Prima** vinyl floor covering, glued on standard fibre cement substrate.

**Purpose of tests:**

Determination of the ignitability according to EN ISO 11925-2: 2002 and the reaction to fire and smoke production of floor coverings according to EN ISO 9239-1: 2002.

**Contractor/manufacturer:**

Forbo Novilon B.V.  
De Holwert 12  
NL-7741 KC COEVORDEN  
The Netherlands

**Period of examinations:**

June - July 2004.

**Month of issue and number of the report:**

August 2004; 2004-CVB-R0238(E)

**Material:**

*Composition:*

**Novilon Prima** is a heterogeneous PVC floor covering with an overall nominal thickness of 1.7 mm, provided with a 0.2 mm thick top layer and under the toplayer a wood imitation print.

The base of the product is an impregnated glass fleece web. The backing of the product consists of a white mechanical foam.

*Dimensions and density (according to info and determined on samples):*

Total product thickness: nominally 1.7 mm; determined: 1.7 – 1.75 mm.

Surface density: nominally: 1.45 kg/m<sup>2</sup>; determined 1.5 – 1.6 kg/m<sup>2</sup>.

**Sample:**

*Sampling:*

Sampling was carried out by the contractor.

The received specimens were coded with the numbers 12352 – 85955.

*Sample production period:*

May 2004.

*Date of receipt:*

May 27, 2004.

*Preparations:*

Prior to the examinations on reaction to fire the floor covering samples were glued on standard non-combustible substrate as specified in ISO 390 and EN 13238: 2001 par. 5.1.2 (1800 ± 200 kg/m<sup>3</sup> – 6 mm), with the aid of (Forbo 540) vinyl adhesive with an amount of 0.3 to 0.4 kg/m<sup>2</sup>, and thereafter cured for approx. 4 weeks at conditions of 23 ± 2 °C and 50 ± 5 % R.H..



**Method of examinations:**

The examination on flammability was carried out according to the EN ISO 11925-2: 2002 and the reaction to fire tests - horizontal fire propagation and smoke production of floor coverings - according to the EN-ISO 9239-1: 2002.

With the flammability examination the surface and edge flame application tests were carried out with 15 seconds and 30 seconds.

With the reaction to fire examination on the product at first two tests were carried out in each direction of the product; one on a specimen cut in the production direction and one cut perpendicular to the production direction.

Based on the test result found the examination was continued in the direction with the less positive result with two additional tests.

**Test results of EN-ISO 11925-2: 2002 and EN-ISO 9239-1: 2002 examination of 1.7 mm thick Forbo Novilon Prima vinyl floor covering, glued on standard fibre cement substrate.**

*A - Ignitability – EN-ISO 11925-2 - flame application times of 15 and 30 s.*

Test	Reaching or passing the "150 mm limit" within 20 sec.	Max. afterburning after 15 s	Max. flame height at 15 s	Max. burnt / damaged surface (height x width)
	t <sub>150</sub> [s]	[s]	mm	mm x mm
<i>Flame application time 15 seconds</i>				
Surface ignition 1 to 6	∞ (6x)	0 (6x)	65 to 75	[70 to 75] x 15
<b>Average</b>	<b>No passing</b>	<b>0</b>	75	75 x 15
Edge ignition 1 to 6	∞ (6x)	0 (6x)	55 to 60	[50 to 60] x 20
<b>Average</b>	<b>No passing</b>	<b>0</b>	60	60 x 20
<i>Flame application time 30 seconds (*)</i>				
Test	Reaching or passing the "150 mm limit" within 60 sec.	Max. afterburning after 30 s	Max. flame height at 30 s	Max. burnt / damaged surface (height x width)
	[s]	[s]	mm	mm x mm
Surface ignition 1 to 6	∞ (6x)	2; 2; 2; 3; 3	110 to 120	[100 to 105] x 20
<b>Average</b>	<b>No passing</b>	<b>3</b>	120	105 x 20
Edge ignition 1 to 6	∞ (6x)	2; 3; 3; 2; 0; 2	90 to 100	[85 to 90] x 30
<b>Average</b>	<b>No passing</b>	<b>3</b>	100	90 x 30

(\*) **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 "30 seconds" flame application examination was only carried out additionally. It is not a normative requirement within EN 13501-1: 2002.



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**Test results of EN-ISO 11925-2: 2002 and EN-ISO 9239-1: 2002 examination of 1.7 mm thick Forbo Novilon Prima vinyl floor covering, glued on standard fibre cement substrate.**

**B – Horizontal surface flame spread – EN ISO 9239-1:2002.**

Product Direction (*)	Test no.	Time of reaching "50 mm" marks		Maximum flame travel		Critical heat flux (HF-30) kW/m <sup>2</sup>	Smoke density %.min	
		mm	Mins.	distance	time			
				m	Mins.			
Cross	1	50	2¼	0.14	3	10.4	74	
		100	2½					
Production	2	50	2¼	0.16	3	10.1	72	
		100	2½					
		150	2¾					
	3	50	2¼	0.185	3½	9.7	111	
		100	2½					
		150	2¾					
	4	50	2¼	0.21	4	9.2	115	
		100	2½					
		150	2¾					
		200	3½					
	<b>Average values</b>		-	-	<b>0.185</b>	<b>3½</b>	<b>9.7</b>	<b>93</b>

(\*) 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. Depending on the less positive result that was found in either the production direction or the cross direction the examination was carried out completely in the less positive direction on which the average values over these tests results were determined.

**Observations during tests:** In the first stage up to 3 minutes of the tests slight blistering occurred in the flooring surface over the first 250 mm and also ripping of the surface layer in cross direction up to the first 200 mm was observed. The charred distance was max.340 mm.

**Assessment:**

Based on the test results the examined **Forbo Novilon Prima vinyl floor covering**, with a nominal thickness of 1.7 mm and a nominal surface density of 1.45 kg/m<sup>2</sup>, glued with Forbo vinyl adhesive on a non-combustible substrate, fulfils the criteria that have been given for **Euroclass B<sub>n</sub>-s1** (requirements: Meet the flammability criteria of Euroclass E<sub>fl</sub> and have a Critical Heat Flux (CHF) ≥ 8 kW/m<sup>2</sup> and a smoke production of ≤ 750 %. minutes) according to EN 13501-1: 2002.



**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 only valid for the use on supports or sub floors which are comparable to the examined one or which are in specifications comparable to the standard fibre cement substrate (ISO 390 -  $1800 \pm 200 \text{ kg/m}^3$  - 6 mm) according to § 5.1.2 of EN 13238: 2001.

Also they are not valid if the floor covering is used in combination with combustible supports or substrates.

**Remark 2:**

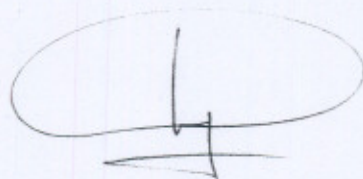
The followed test methods for determining of the "Reaction to fire performance of floorings" according to EN-ISO 11925-2: 2002 and EN-ISO 9239-1: 2002 are similar to the methods of:

A - The German **DIN 4102:1990, Teil 1 & 14**: "Brandverhalten von Baustoffen und Bauteilen; Bodenbeläge und Bodenbeschichtungen; Bestimmung der Flammenausbreitung bei Beanspruchung mit einem Wärmestrahler", by which the examined product met the criteria for Klasse B1, and

B - The Dutch standard **NEN 1775: 1991 + A1/1997**: "Determination of the contribution to fire propagation of floor surfaces - "*Brandvoortplanting van vloeroppervlakken*".

and for the EN-ISO 9239-1: 2002 to

C - The American **ASTM E 648-84/90**: "Standard test method for critical radiant flux of floor covering systems".



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Graph of the Critical Heat Flux (CHF) examination according to EN ISO 9239-1: 2002 and photograph of Forbo Novilon Prima - 1.7 mm - vinyl floor covering specimens, glued on standard substrate.

