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**TNO report**

**2005-CVB-R0162**

# Examination on reaction to fire and smoke production according to EN-ISO 11925-2: 2002 and EN-ISO 9239-1: 2002 of Forbo ColoRex Plus flooring tiles; overall thickness – 10 mm

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Project name Reaction to fire of floorings
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**Subject**:
**Forbo ColoRex Plus PVC flooring tiles** - overall thickness of 10 mm.

**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**:
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**Period of examination**:
February 7 till 9, 2005.

**Period of issue and report number**:
May 2005; **2005-CVB-R0162.**

**Description of the material**:
*Compositon*:
According to the manufacturer the **ColoRex Plus** is a rigid flooring tile provided with a standard 2 mm thick toplayer coupled up by injection moulding with a homogeneous PVC honeycomb backing complex. The tiles are dovetailed and can be loose laid without glue.

*Dimensions and surface density*:
Overall product width and thickness: 610 x 610 x 10 mm.
Surface density: approx. 12.0 kg/$m^2$.

**Sample**:
*Sampling*:
On January 6, 2005 grey coloured **ColoRex Plus** flooring tile specimens were submitted by the contractor.

*Age*:
No information received. At the time of examination: 4 weeks.

*Conditioning:*
Prior to the examinations the specimens were conditioned for approx. 4 weeks at 23 ± 2 ºC 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 9239-2: 2002 and the EN ISO 11925-2: 2002.
With the flammability examination the surface and edge flame applications were carried out with 15 seconds and, additionally, with 30 seconds.
The reaction to fire examination was carried out in two directions of the product; two on specimens cut in cross-section and two on specimens cut to the former direction.
The tiles are tested with a joint over the centre of the specimens. The specimens were examined in combination with the standard fibre cement substrate (ISO 390) (1800 ± 200 kg/$m^3$ – 6 mm) according to § 5.1.2 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 ColoRex Plus flooring tiles – overall thickness 10 mm.**

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

| Test | Ignition of sample | Maximum flame height | $t_{150}$ | Afterburning time | Ignition of filter paper |
|---|---|---|---|---|---|
| | [Y/N] | [mm] | [s] | [s] | Y/N |
| 1 | Y | 30 | ∞ (6 x) not reached | 0 | N |
| 2 | Y | 35 | | 0 | N |
| 3 | Y | 32 | | 0 | N |
| 4 | Y | 25 | | 0 | N |
| 5 | Y | 30 | | 0 | N |
| 6 | Y | 30 | | 0 | N |
| Value used for classification | | **30** | **Not reached** | **0** | **N** |
| *Flame application time **30 seconds (*)*** | | | | | |
| 1 to 6 | Y | 45 - 50 | ∞ not reached | **1** | **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 "*30 seconds*" flame application examination was only carried out additionally. It is not a normative requirement within EN 13501-1: 2002.

The **Forbo ColoRex Plus** flooring tile complies with the flammability criteria of the **Euroclass E** according to EN 13501-1: 2002.

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

| Product direction (*) | Test no. | Maximum flame travel | | Critical heat flux (CHF) | Smoke density |
|---|---|---|---|---|---|
| | | distance | time | | |
| | | m | min | $kW/m^2$ | %.min |
| Cross + longitudinal joint | 1 | 0.20 | 25 | 9,2 | 396 |
| | 2 | 0.28 | 27 | 7,4 | 651 |
| Production + Cross joint | 3 | 0.18 | 24 | 9.7 | 377 |
| | 4 | 0.20 | 25 | 9,2 | 437 |
| **Average** | | **0.22** | **-** | **8.9** | **465** |

(*) See next page.

**(*)** *Production = specimens cut in the production direction of the floor covering. The tests indicated with Cross, the specimens had been cut perpendicular to the former direction. As there was only found a slight difference in reaction to fire with respect to the directions two tests were carried out in each direction. The average values for the assessment were determined over all four tests.*

*Observations during tests*: Charring was observed over the surface up to a maximum distance of 300 mm to 350 mm.

**Assessment:**
Based on the test results the examined **Forbo ColoRex Plus** rigid flooring tiles, with a overall thickness of 10 mm and a surface density of approx. 3.0 kg/m$^2$, loose laid without glue on a non-combustible substrate, fulfilled the criteria that have been given for Euroclass $B_{fl}$/s1 (requirements: *Meet the flammability criteria of Euroclass $E_{fl}$ and have a Critical Heat Flux (CHF) $\geq$ 8 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 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 kg/m$^3$ – 6 mm) according to § 5.1.2 of EN 13238: 2001.
Also they are <u>not</u> valid if the flooring tile is used in combination with combustible supports or substrates.

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.

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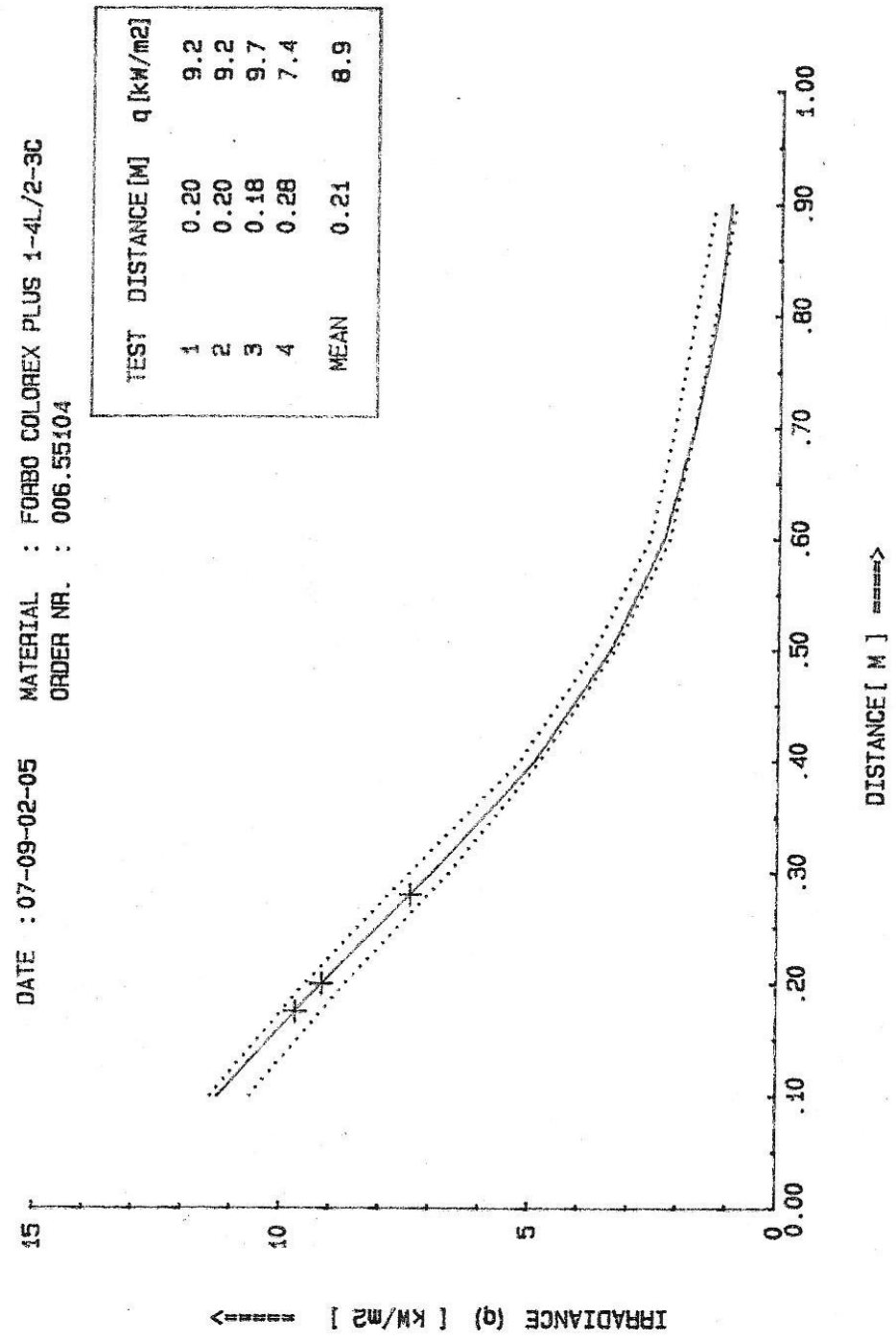
# A Graph

**Graph of the Critical Heat Flux (CHF) examination according to EN ISO 9239-1: 2002 of Forbo ColoRex Plus PVC flooring tile - overall thickness 10 mm – loose laid on standard substrate.**



# B Photo

**Photograph of Forbo ColoRex Plus PVC flooring tile specimens – overall thickness 10 mm – after EN-ISO 9239-1: 2002 reaction tot fire examination.**