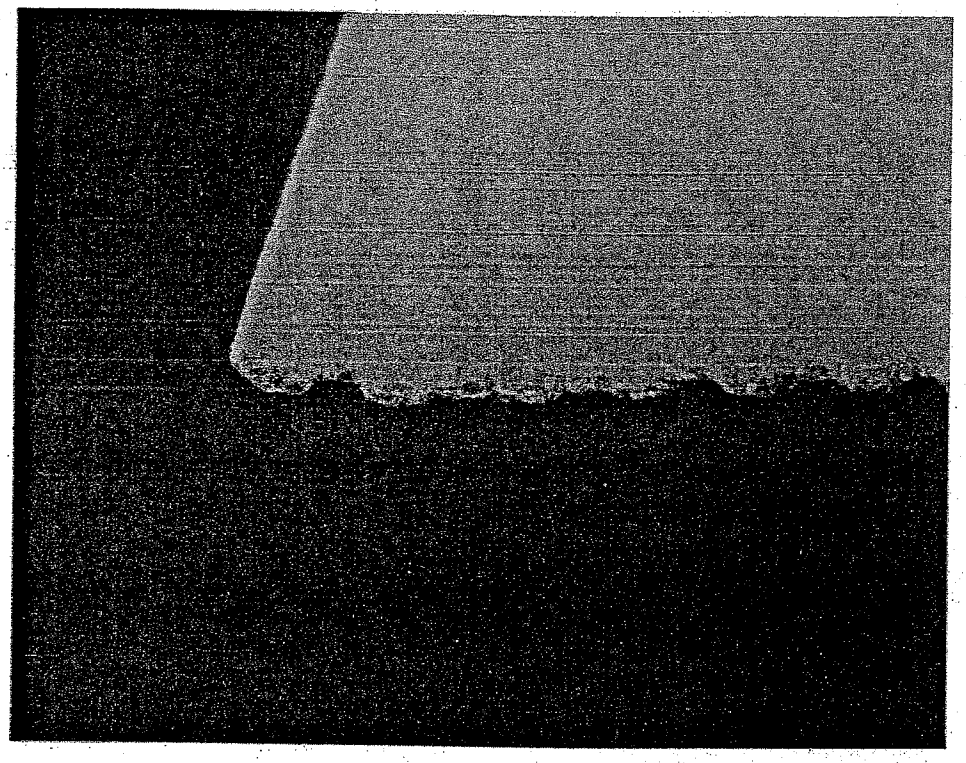

Determination of the water vapour permeability of PROVENT-cushion

Requested by: SIA PEPI RER Ltd

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Order Letter 29th November 2006 / Helmut Wiemers

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Task **Determination of the water vapour permeability of PROVENT-cushion**

Sample The orderer delivered to VTT on 30th November the sample of the parquet's cushion.
The sample was consisted of one roll of parquet's cushion, which width was 1200 mm. The cushion was white polyethylenecellular plastic.
The measured thickness of the product (under the surface pressure of 250 Pa) was 3.6 mm and the square weight about 70 g/m^2.
The product was faced with HDPE-film, which thickness was 0.020 mm. The film was towards the parquet.

Performance of the task

Test specimens

From the sample were cut six circular test specimens having a diameter of about 150 mm. The test specimens were marked with numbers 1-6.

Test method

Water vapour transmission properties of the test specimens were determined according to the standard EN ISO 12572 (2001), Set C (23°C, 50/93 % R.H.): "Hygrothermal performance of building materials and products-Determination of water vapour transmission properties"
The sixth test specimen was so-called "blind" specimen according to test standard.
During measurements the HDPE-film was towards the condition 50 % R.H..

The water vapour permeance W (kg/(m^2·s·Pa)), the water vapour resistance Z ((m^2·s·Pa)/kg), the water vapour permeability δ (kg/(m·s·Pa)) and the water vapour diffusion factor μ of the test specimens are calculated using formulas 1-4:

$$W = G / (A \cdot \Delta p) \quad (1)$$

$$Z = 1 / W \quad (2)$$

$$\delta = W \cdot d \quad (3)$$

$$\mu = \delta_{air} / \delta$$

$$\delta_{air} = (0{,}083 / (R_D \times T)) \times (p_o / p) \times (T / 273)^{1{,}81} \quad (4)$$

where:

G is water vapour flow rate through the specimen(kg/s)
A is area of the specimen (m^2)
Δp is water vapour pressure difference across the specimen (Pa)
d is thickness of the specimen (m)
R_D is gas constant for water vapour (462 x 10^{-6} Nm / (mg · K))
T is average thermodynamic temperature (K)
p is average barometric pressure (hPa)
p_o is standard barometric pressure (1013,25 hPa)

Measurements

The test conditions were:
- (+ 23 ± 1)°C, (50 ± 3) % R.H. / (93 ± 3) % R.H.
- water vapour pressure difference across the specimens was 1084 Pa

The test specimens were weighed to an accuracy of 1 mg at predetermined times.

In order to calculate the water vapour flow G, the regression line of weight-time pairs of points was first determined. The water vapour flow was then obtained from the slope of the regression line.

Laboratory (T018) is given an accreditation to these methods by Centre for Metrology and Accreditation.

Time of measurements

8th December 2006 – 2nd January 2007.

Results

The mean thicknesses, the water vapour permeance, the water vapour resistance, the water vapour permeability and the water vapour diffusion factor of the test specimens are presented in table 1.

Table 1. *Water vapour transmission properties of the PROVENT- cushion in test conditions 22 °C, 52 %R.H. / 92 % R.H.*

Test specimen	Thickness of the specimen d (mm)	Water vapour flow G (kg/s)	Density of water vapour flow rate g ($kg/(m^2 \cdot s)$)	Water vapour permeance W ($kg/(m^2 \cdot s \cdot Pa)$)	Water vapour permeability δ ($kg/(m \cdot s \cdot Pa)$)	Water vapour resistance Z=1/W ($(m^2 \cdot s \cdot Pa)/kg$)	Water vapour diffusion factor μ
1	3.60	1.87×10^{-10}	1.12×10^{-8}	10.14×10^{-12}	3.65×10^{-14}	9.87×10^{10}	5373
2	3.65	2.01×10^{-10}	1.20×10^{-8}	11.05×10^{-12}	4.03×10^{-14}	9.05×10^{10}	4862
3	3.62	2.06×10^{-10}	1.23×10^{-8}	11.32×10^{-12}	4.10×10^{-14}	8.84×10^{10}	4785
4	3.67	1.97×10^{-10}	1.18×10^{-8}	10.83×10^{-12}	3.98×10^{-14}	9.23×10^{10}	4932
5	3.63	2.25×10^{-10}	1.34×10^{-8}	11.10×10^{-12}	4.03×10^{-14}	9.01×10^{10}	4867
Mean value	**3.63**	-	-	**10.89×10^{-12}**	**3.96×10^{-14}**	**9.20×10^{10}**	**4964**

The estimated uncertainly of the results is ± 5 %.

Conclusions The results concern only the test specimen studied.

Espoo 16th January 2007

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