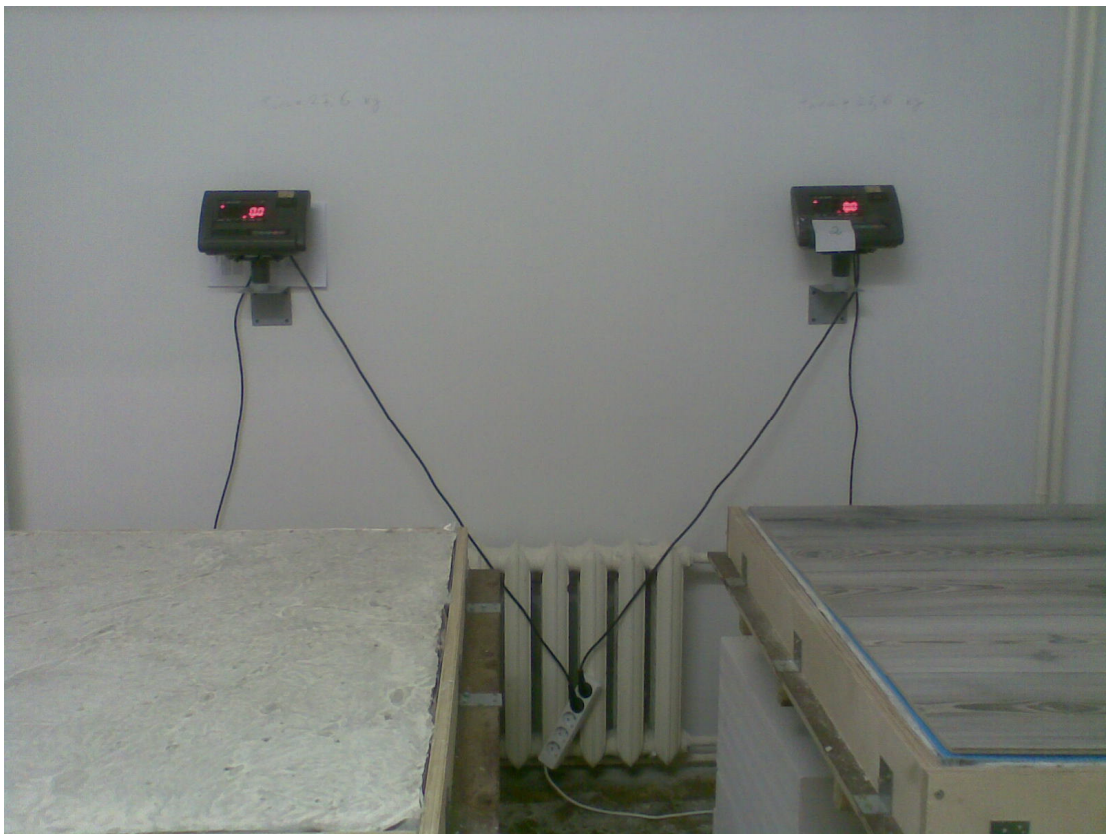
PEPI RER SIA



Determination of concrete drying underneath underlays with air channels/ventilation gap

Test No. **PRQC 100.003**
Material to be tested:

1. Underlay ProVent
2. Reference sample – uncovered concrete.

Test report No. **PEPI-DT2013/1**

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Test performed by: PEPI RER Quality Control Dept/ /VTV/
Name of the executer: Modris Mikelsons

For the drying of concrete is to separate the water in liquid- and steam-form. The liquid form is in the concrete included and transfer by vapour into the air. This "transfer" is called drying.

Vapour is pushing the liquid water from the surface into the air, while condensation makes from the moisture (water steam in the air) liquid water.

The air has limited possibilities to take water as steam which depends in closed systems only from the temperature. Only the exchange of the air ("open system") will support the drying of the concrete. Covering the concrete with a "standard vapour barrier material" will create a "closed system".

To make the drying permanent, like uncovered surface of the concrete, there has to be an exchange of the air between concrete surface and the vapour- / moisture barrier which protect the flooring material against moisture.

The exchange of the air will avoid the creation of condensation and therefore ensure a permanent drying like an uncovered surface.

The exchange of the air can be proofed by different methods but finally ensured simply by a "drying test of concrete".

Purpose of the test: Determination of concrete drying dynamics underneath underlay with different amount of air channels.

Sample: Underlay for laminated flooring and parquet

Material type: frilled polyethylene foam sheet with additional vapour barrier

Product name: ProVent™ (sample size 3×980×980 mm)

Producer: PEPI RER SIA
25 Parka str., LV-4701,
Valka, Latvia

Description of testing: room Separated room without windows. Outer walls made of concrete and stone, inner walls made of single layer gypsum board with mineral wool insulation. Floor material – reinforced concrete, Ceiling – reinforced concrete.
Dimensions (W x L x H) 2.90m x 3.20m x 2.90 m.
Area – 9.28 m^2.

Performance of the test:

During the test, changes in weight of the concrete layer are monitored as it dries under the laminate floor underlay.

The following materials and equipment were used for the test:

Concrete:

Concrete layer in watertight mould (1000×1000×100 mm)
The concrete is prepared according to the recipe and proportions recommended by the manufacturer of the cement noticing EN12620 and EN206:

1. Cement M500	18 kg
2. Sand / 0 - 2mm	45 kg
3. Gravel (broken stone) / 4 - 8mm	65 kg
4. Water	9 kg

Weight of samples of concrete	233,80 kg
Concrete dry mass	218,45 kg
Water	15,35 kg

There is equally the same weights for the covered and uncovered box.

Underlay:

Material type :	frilled bubble polyethylene with additional vapour barrier HDPE film 0,020mm thickness
Material name:	ProVent™
Producer:	PEPI RER SIA Parka iela 25, Valka LV-4701, Latvia

The relevant measurements from following list:

A. Total thickness of the underlay:	3,0 mm
B. Thickness of the solid part:	1,5 mm
C. Distance middle wave/edge/stamp to middle:	4,0 mm
D. Distance middle groove to next middle:	5,6 mm
Channels per one (1) m width:	177 pcs
Sample size	3×980×980 mm

Laminate floor:

Product name and –type:	TEKA parquet_DECK Laminared flooring
Producer's name and address:	PT Tanjung Kreasi Parquet Indus Jl. Pemuda Kav. 34 Rawamangun Jakarta 13220 -Indonesia
Thickness of the laminate:	7 mm thick laminate floor

Equipment:

Humidity measuring device

Producer's name:	Proceq
Model / type name:	Hygropin
Measuring unit:	RH%
Measuring area:	0 - 100% RH
Tolerance:	± 1,5%

Scales

Producer's name:	PCE Instruments
Model / type name:	U-600 A12E
Measuring unit:	kg
Measuring area:	4 - 600kg
Tolerance:	± 0,20kg

Thermometer + Hygrometer

Producer's name:	IROX
Model / type name:	HTG79
Measuring unit:	°C (deg. Celsius) %RH
Measuring area:	-50 °C - +70,0 °C 1% - 99%RH
Tolerance:	± 1,0 °C ± 5%RH

Hygrometer

Producer's name:	Denzel DNS
Model / type name:	G-809 Hydrotest
Measuring unit:	CM%
Measuring area:	- 20%
Tolerance:	>98%

Portable air conditioner

Producers name:	Electrolux
Model / type name:	EXP09HN1WI
function area for temperature:	20°C to 30 °C
measuring unit:	°C

Air humidifier

Producers name:	ARGO
Model / type name:	XJ-770
Misting rate	240ml/h

Results

Results of changes in weight are registered in table No. 1.

day	0	1	2	3	4	5	6	7	8	9	10	11	12	13
uncovered	0,0	-0,6	-1,2	-1,4	-1,8	-2,0	-2,2	-2,4	-2,6	-2,8	-3,0	-3,0	-3,2	-3,2
ProVent	0,0	-0,2	-0,2	-0,4	-0,4	-0,4	-0,4	-0,6	-0,6	-0,6	-0,6	-0,6	-0,8	-0,8
Temp. (°C)	23,0			23,0	23,0	23,0	22,8	22,6			23,0	24,0	23,0	23,0
RH%	44			42	39	42	43	44			36	35	32	39
date	29.11.	30.11.	01.12.	02.12.	03.12.	04.12.	05.12.	06.12.	07.12.	08.12.	09.12.	10.12.	11.12.	12.12.

day	14	15	16	17	18	19	20	21	22	23	24	25	26	27
uncovered	-3,2	-3,4	-3,4	-3,6	-3,6	-3,8	-3,8	-3,8	-3,8	-4,0	-4,0	-4,0	-4,0	-4,2
ProVent	-0,8	-0,8	-0,8	-0,8	-1,0	-1,0	-1,0	-1,0	-1,0	-1,0	-1,0	-1,2	-1,2	-1,2
Temp. (°C)				23,0		23,0								
RH%				34		36								
date	13.12.	14.12.	15.12.	16.12.	17.12.	18.12.	19.12.	20.12.	21.12.	22.12.	23.12.	24.12.	25.12.	26.12.

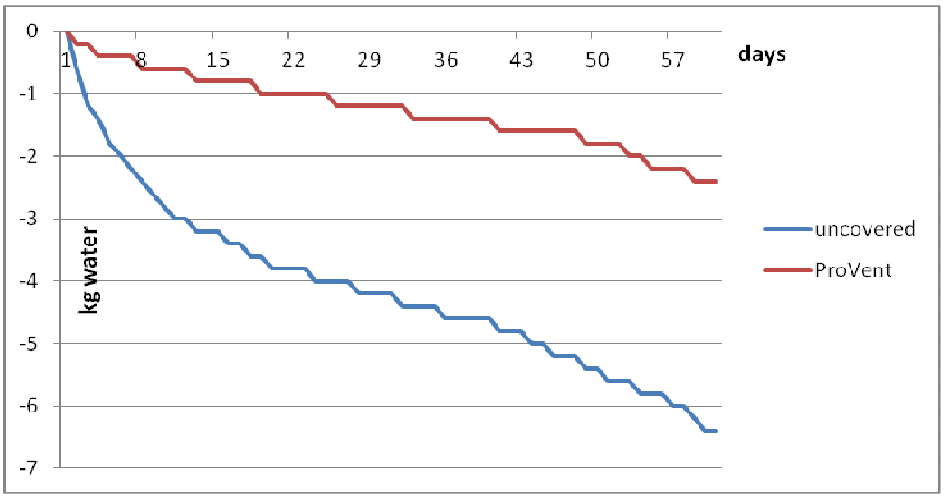
day	28	29	30	31	32	33	34	35	36	37	38	39	40	41
uncovered	-4,2	-4,2	-4,2	-4,4	-4,4	-4,4	-4,4	-4,6	-4,6	-4,6	-4,6	-4,6	-4,8	-4,8
ProVent	-1,2	-1,2	-1,2	-1,2	-1,4	-1,4	-1,4	-1,4	-1,4	-1,4	-1,4	-1,4	-1,6	-1,6
Temp. (°C)	21,7												22,0	
RH%	35												39	
date	27.12.	28.12.	29.12.	30.12.	31.12.	01.01.	02.01.	03.01.	04.01.	05.01.	06.01.	07.01.	08.01.	09.01.

day	42	43	44	45	46	47	48	49	50	51	52	53	54	55
uncovered	-4,8	-5,0	-5,0	-5,2	-5,2	-5,2	-5,4	-5,4	-5,6	-5,6	-5,6	-5,8	-5,8	-5,8
ProVent	-1,6	-1,6	-1,6	-1,6	-1,6	-1,6	-1,8	-1,8	-1,8	-1,8	-2,0	-2,0	-2,2	-2,2
Temp. (°C)					23,0		24,0							
RH%					30,0		29,0							
date	10.01.	11.01.	12.01.	13.01.	14.01.	15.01.	16.01.	17.01.	18.01.	19.01.	20.01.	21.01.	22.01.	23.01.

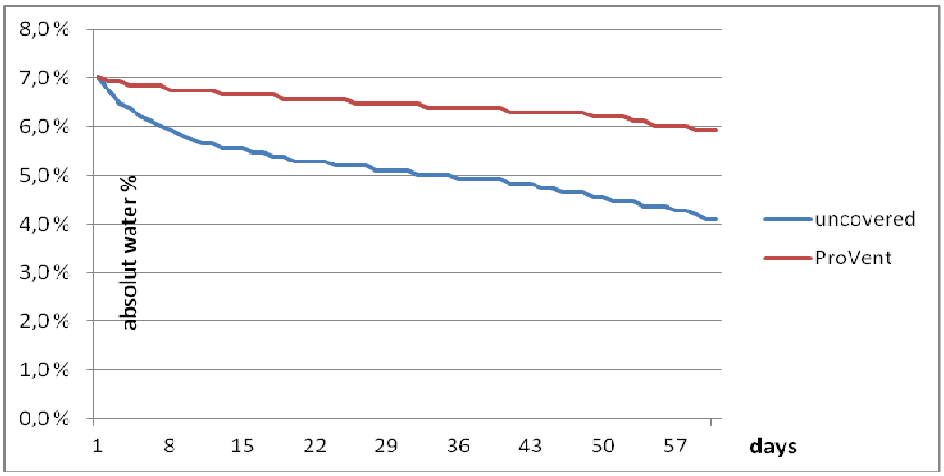
day	56	57	58	59	60	61	62	63	64	65	66	67	68	69
uncovered	-6,0	-6,0	-6,2	-6,4	-6,4									
ProVent	-2,2	-2,2	-2,4	-2,4	-2,4									
Temp. (°C)					25,0									
RH%					20									
date	24.01.	25.01.	26.01.	27.01.	28.01.	29.01.	30.01.	31.01.	01.02.	02.02.	03.02.	04.02.	05.02.	06.02.

due times / reading results results got by interpolation for graphs

Table 1: results



Graph 1 : - Decrease of water mass during drying process (kg)



Graph 2: Calculated decrease of absolute moisture of the concrete ($m_{water}/m_{dry\_concr} \times 100$ %)

Temperature of the test room: 21,7 – 25,0

RH% of the test room: 44 - 20

Period of the test: 29.11.2013 – 28.01.2014

Location of the test: PEPI RER Quality Control Department

Conclusions of the test

It can be derived from the test results (Graph 1 and 2) that the underlay ProVent ensures permanent concrete drying which compares to the drying dynamics of uncovered concrete.

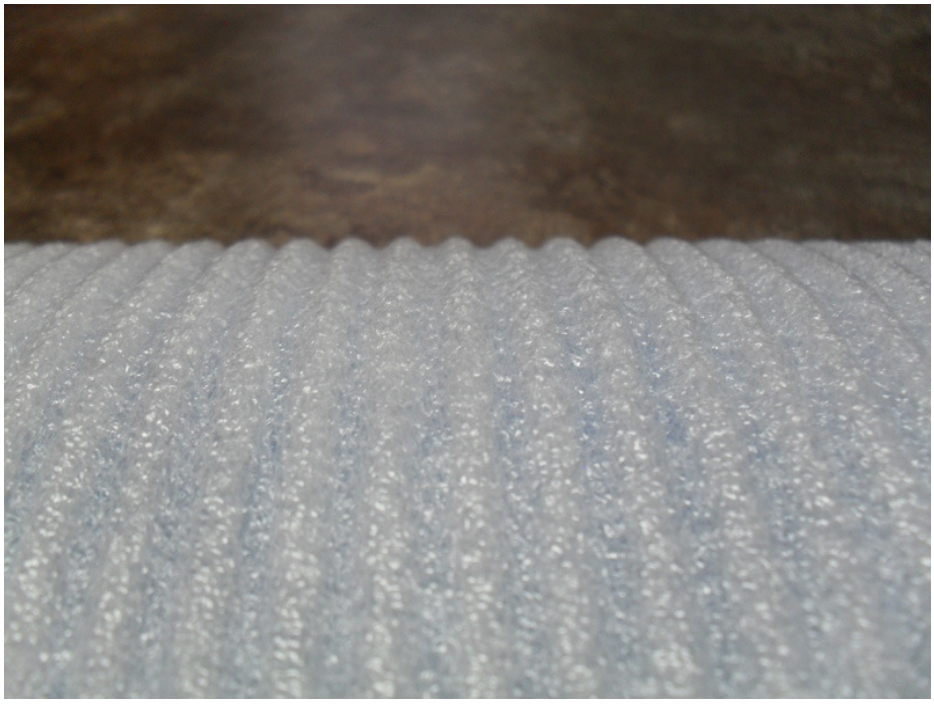
The test proved that the underlay did actually create an open system between the room air and the surface of the concrete. A permanent and stable drying process on the surface of the concrete was detected and no water condensate was established on the surface of the concrete at the end of the test.

Valka, 30.01.2014

_____	_____
Managing Director	Modris Mikelsons
Imants Šteins	Test performer

Annex

Picture 1: Control measurement on the surface of the concrete layer after 72 hours of hardening.



Picture 2: Structure / profile of the underlay.