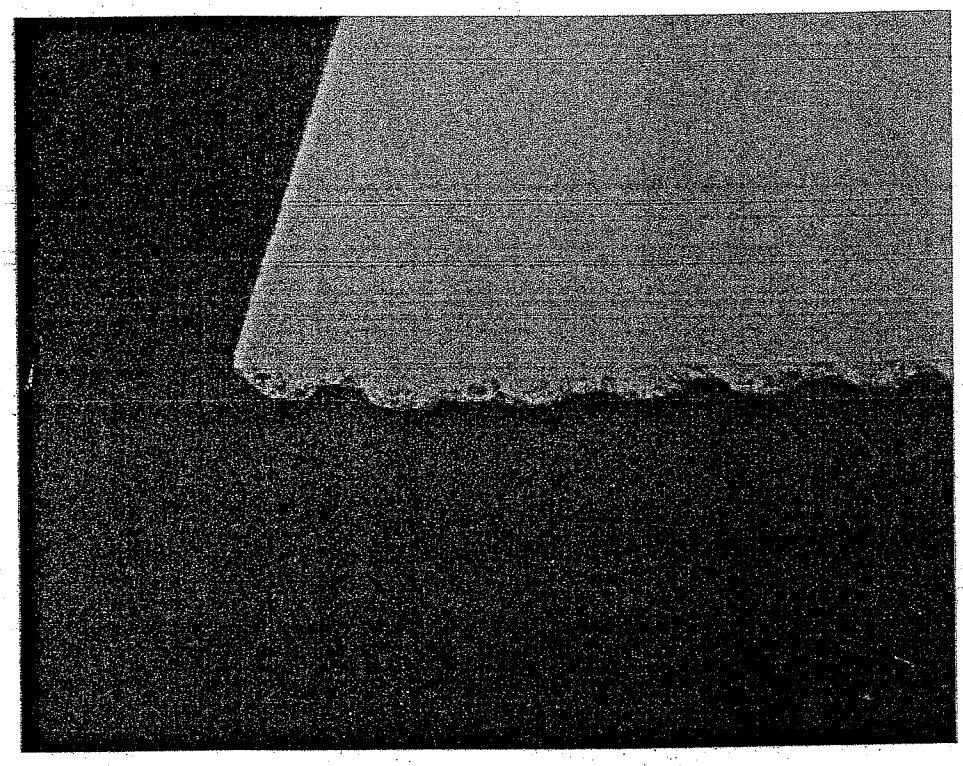

Verification of the air movements under laminate parquet when the PROVENT-underlay (parquet underlay) is used

Requested by: SIA PEPI RER Ldt

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Order

Literal 29.11.2006/ Helmut Wiemers

Contact person at VTT

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Task

Verification of the air movements under laminate parquet when the PROVENT- underlay (parquet underlay) is used

Sample

The customer delivered the sample of parquet underlay to VTT 30.11.2006. The parquet underlay sample consisted of one 1200 mm wide roll of white polyethylene cell plastic sheet. With surface load 250 Pa the measured thickness of the sheet was 3.6 mm and its surface mass was circa 70g/m^2. The product has been coated from the side of the parquet with 0.020 thick HDPE plastic foil.

Execution of task

Test arrangements

Provent-underlay was laid on an even and tight concrete test surface, dimensions of which were 3.05 by 3.91 m and area 11.9 m^2. A 7 mm thick HDF laminate flooring having surface mass of around 6.6 kg/m^2 was installed on the underlay. Test arrangements are illustrated in Appendix 1.

Measurements

The movements of air due to walking or dead loads was verified by measuring the pressure changes the clearance between the parquet underlay and the concrete sub floor. The pressure changes were measured by micro manometer MIKOR-TT 470 S, the reading accuracy of which was 0.6 Pa. Pressure changes induced by walking over parquet both in longitudinal (in the middle from end to end) and cross direction (in both end and in the middle) were measured. Walking tests (male person having weight of 90 kg walked normally) were carried out with preloading of 21 kg/m^2 or without it. Also the changes due to weights of 100 kg imposed on the middle and quarter points of the area (in the longitudinal direction) were measured.

The stationary volume change was estimated from the pressure change using Boyle's law using for air the assumption of the ideal gas (Appendix 1.). For the atmospheric pressure the value of 100 kPa was used. The total air volume needed in the estimation was assessed by measuring the thickness of the underlay (3.6 mm) and by determining the net volume of the material.

In addition, the air movements due to walking was verified directly by gathering the air with the help of a horizontal glass pipe (diameter 6 mm) and by observing the movement of a water drop in the pipe.

Results

The pressure changes in the air clearance between the parquet and the concrete during the walking are illustrated graphically in Figures 1 – 3. The initial data and the volume changes calculated by the Boyle's law supposing, that the measured air pressure would represent that of steady state condition are presented in Table 1. Besides these result also the volumes derived from the observed movements of the water drop in the pipe are presented.

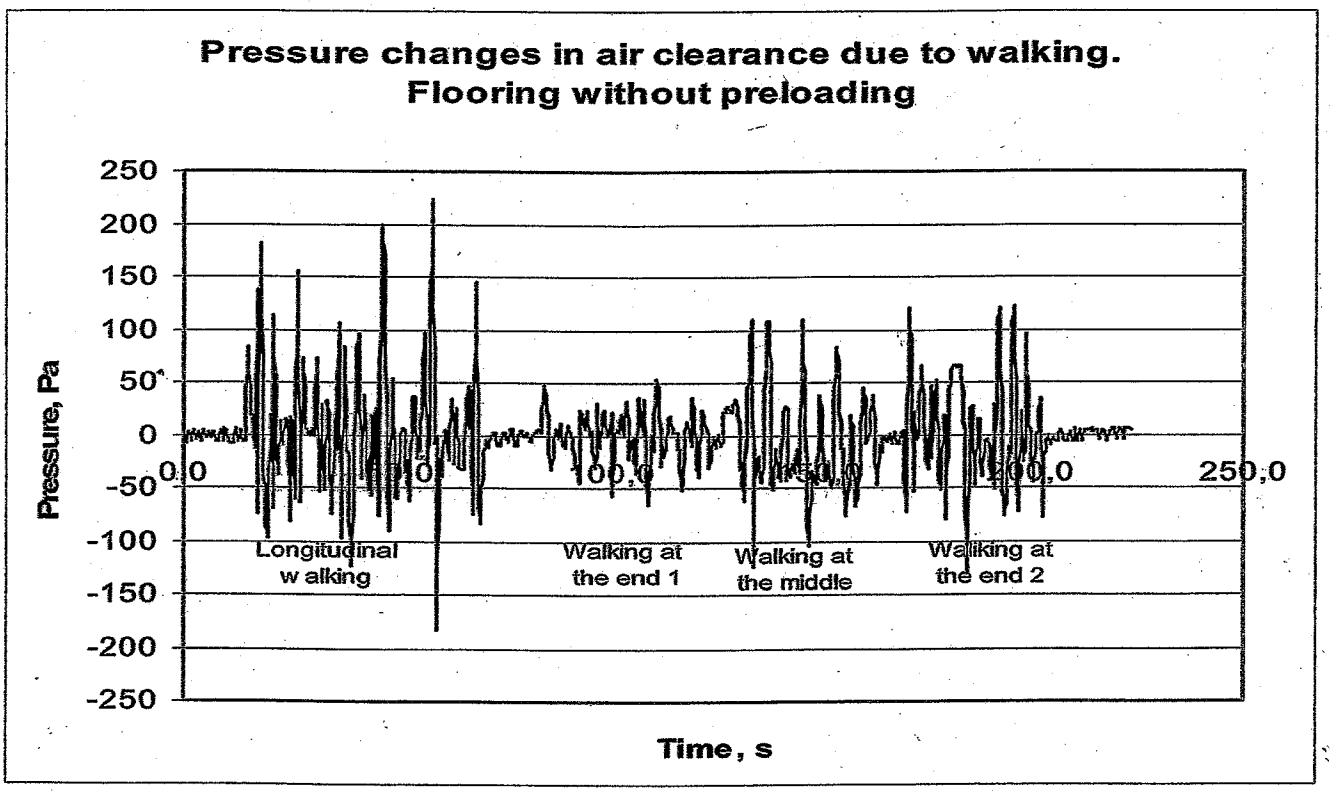


Figure 1. Pressure changes in air clearance due to walking. Flooring without preloading.

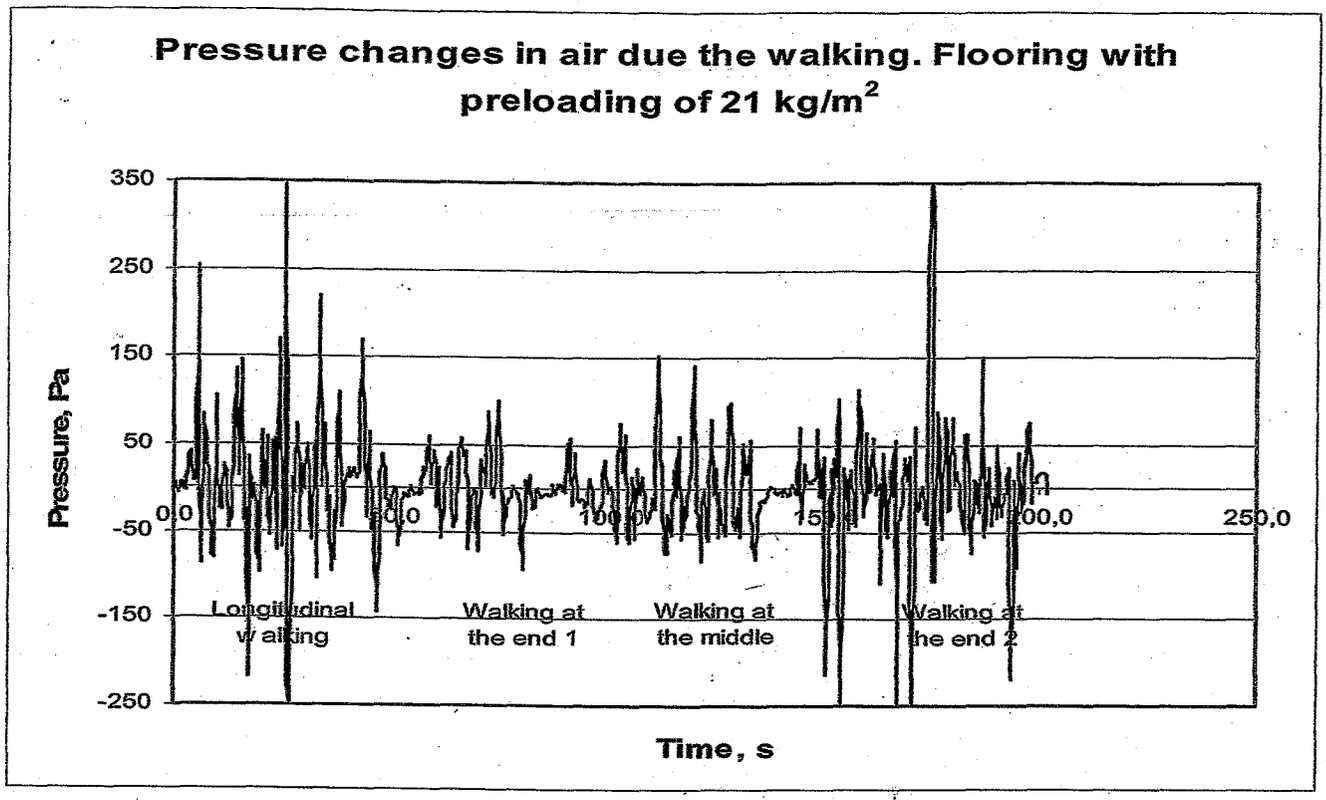


Figure 2. Pressure changes in air clearance due to walking. Flooring with preloading of 21 kg/m^2.

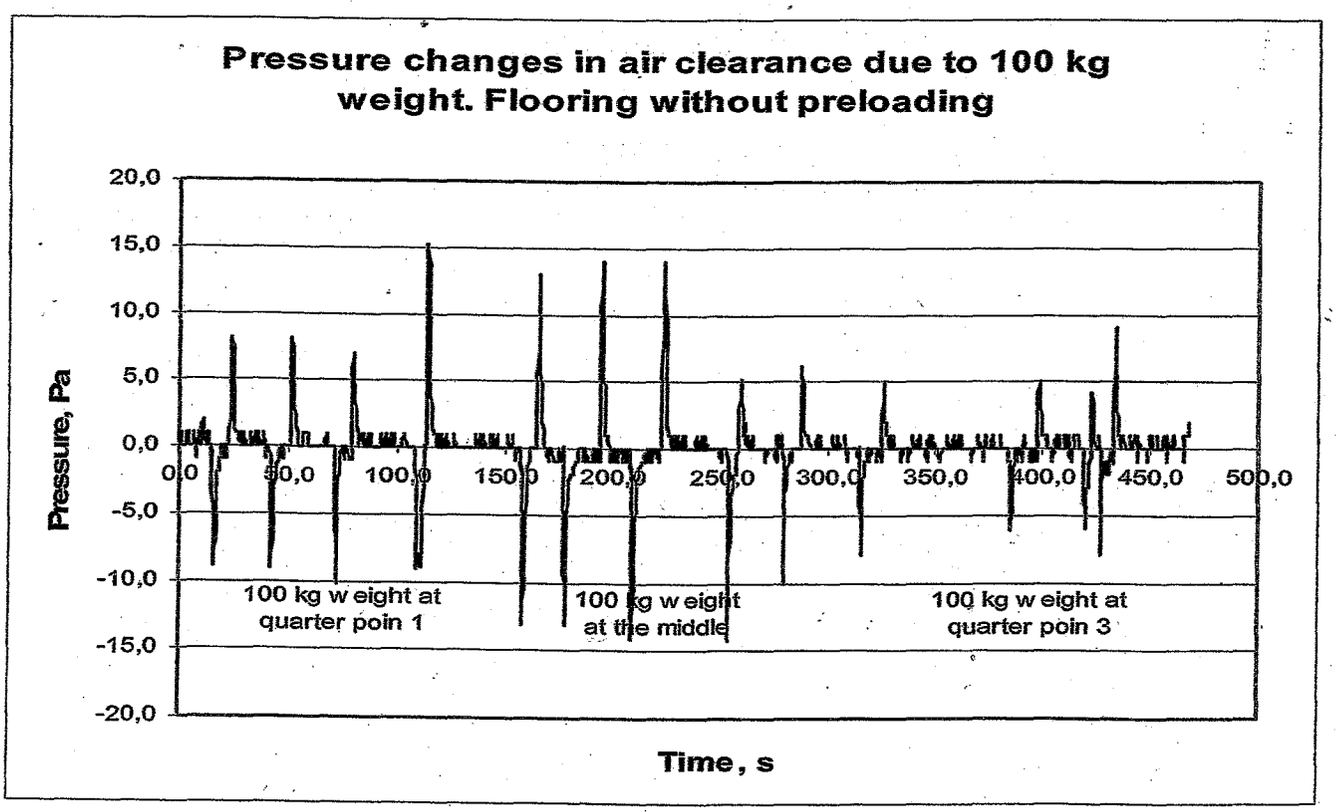


Figure 3. Pressure changes in air clearance due to 100 kg weights. Flooring without preloading.

Table 1. *Initial data, volume changes calculated with help of Boyle's law and those estimated from movement of water drop*

Product	Thick-ness d (mm)	Free air space under the parquet (l/m^2)	Free air space under the test floor V1 (l)	Kind of the loading of the floor	Average change of pressure, Δp (Pa)	Change of volume estimated from change of pressure /11,9 m^2:test area, ΔV(ml)	Estimated from movement of the water drop, ΔV(ml)
PROVENT-underlay	3.6	1.02	12.19	Walking on the test floor. Floor without preload.	35	4	0.1
				Walking on the test floor. Preload 21 kg/m^2.	45	5	
				100 kg weight on quarter point of the test floor.	5-15	0.6 - 2	

The theoretic volume change of the air clearance with the pressure change of 100 Pa, which was usually noticed in the walking tests would become 12 ml. According to observations of the movement of the water drop (at maximum 3-4 mm) the volume change would be only 0.1 ml- i.e. one percent from the former.

It can be stated that the tested parquet underlay enables the air to move in the canals formed beneath the underlay and that air moves beneath laminate parquet due to micro-pumping caused by walking.

Espoo, 7.3.2007

Eero Punakallio
Service Manager

Pekka Sipari
Research Scientist

APPENDIX 1 Illustration of test arrangements

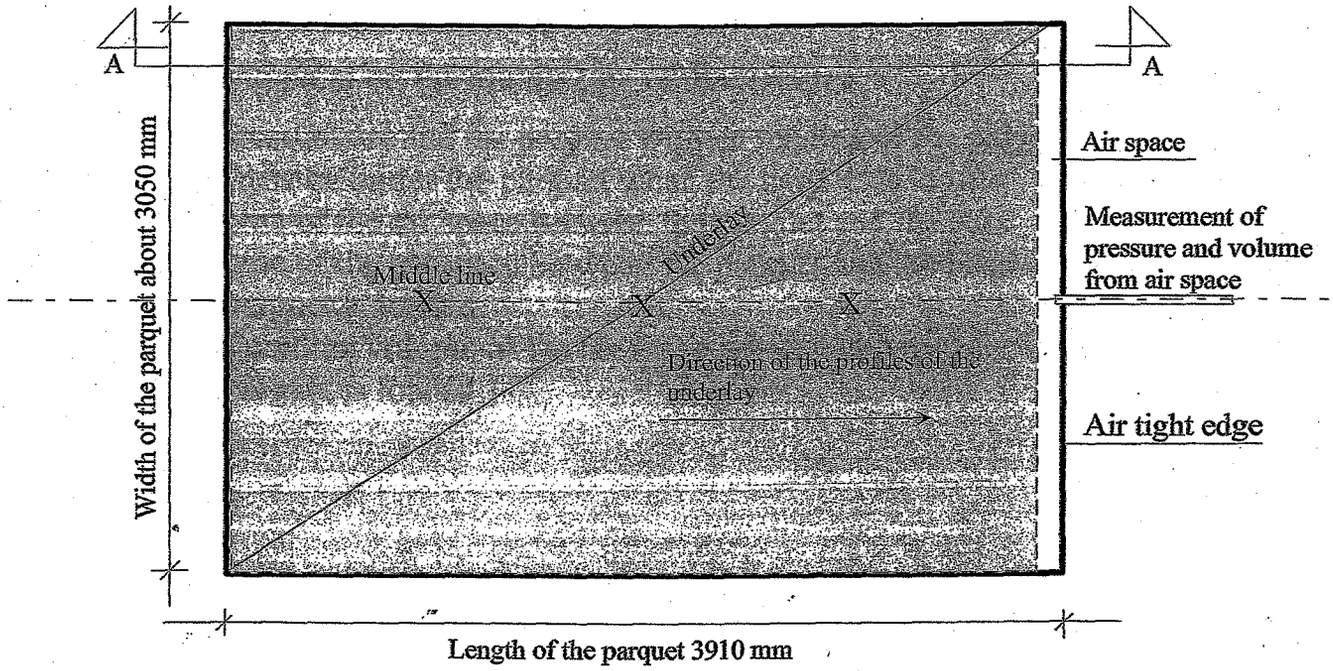
DISTRIBUTION

Customer	Original
VTT	Original
Helmut Wiemers	Copy

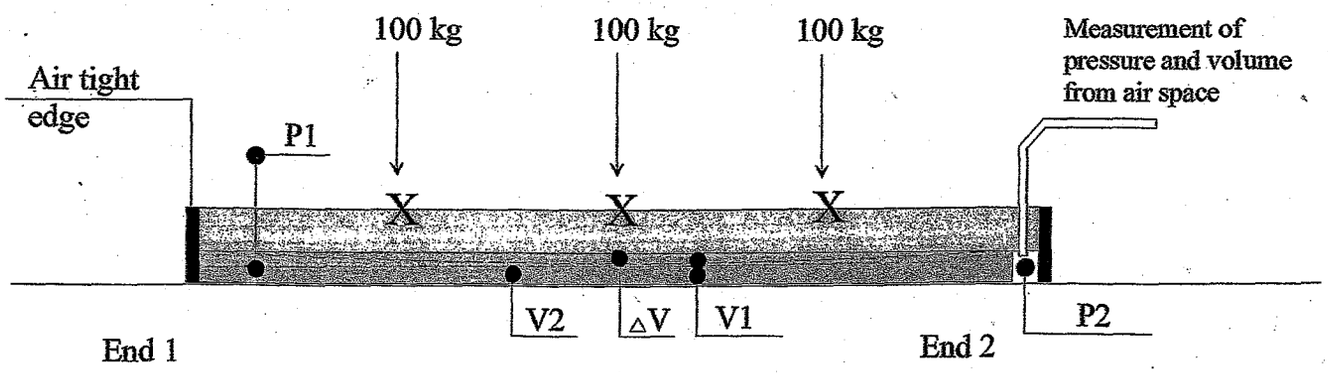
Appendix 1
1(2)

TEST ARRANGEMENT FOR TESTING OF VENTILATION EFFECT

Test arrangement seen from the upper side



A-A



All the borders were tightened with sealing compound and laths
On the borders under and around the parquet there were air cavities to gather and lead the pumping air from both end to the end where measuring was carried out.

Appendix 1
2(2)

X is the loading point on the middle line of the test area

P1 is the air pressure around the parguet without loading of the parguet
P2 is the air pressure under the parguet when the parguet is loaded
V1 is the volume of the air space between the parguet and the base
V2 is the volume of the air space between the parguet and the base when the parguet is loaded
$\triangle V$ is the change of the volume of the air space between the parguet and the base when the parguet is loaded

Formula 1:

$$P1 \times V1 = P2 \times V2$$

$$V2 = V1 - V$$

$$P1 \times V1 = P2 \times (V1 - V)$$

$$\triangle V = V1 - (P1 \times V1) / P2$$