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**Micropumping®**



**Vertical movement of the laminate flooring in a combination with different underlays under dynamic load (a simulated walking)**

**Test report, April 2012**

## Test objectives

- To estimate the exact values of vertical movement (deformation) of the laminate flooring above different underlays under dynamic load of 100 kg, and particularly:
  - vertical deformation under applied load (LOAD ON position)
  - return level of flooring after removed load (LOAD OFF position)
- To compare the performance of ProVent multifunctional underlay with the performance of other popular underlays:
  - 2mm polyethylene foam
  - 3mm polyethylene foam
  - Tuplex (3mm)
  - Arbiton XPS Plus (2mm)
  - eGEN Prestige cork (2mm)

## Test conditions

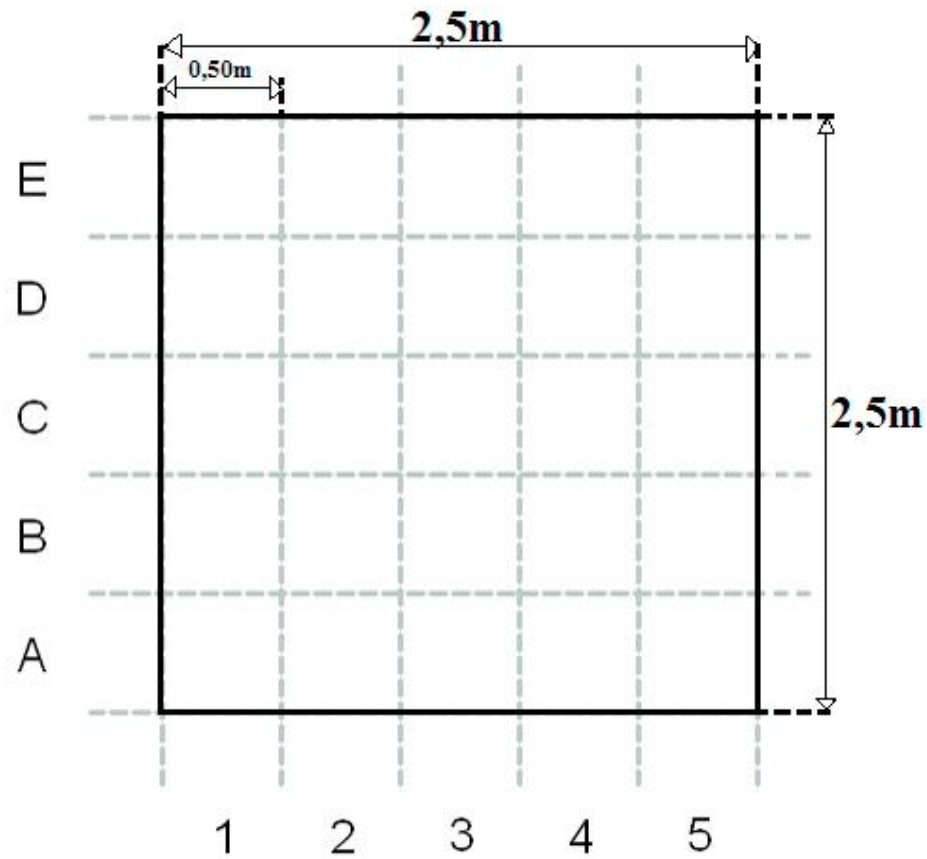
Type of floor base	<b>concrete*</b>
Square of sample flooring	<b>2.5 x 2.5m = 6.25m<sup>2</sup></b>
Laminate used for sample flooring	<b>Tiger floor class 31, 1212x194x8.3mm</b>
Floor base evenness	<b>not worse than 3mm/ 2.0m</b>

\*the same size area of floor base was used for the testing with all listed underlays

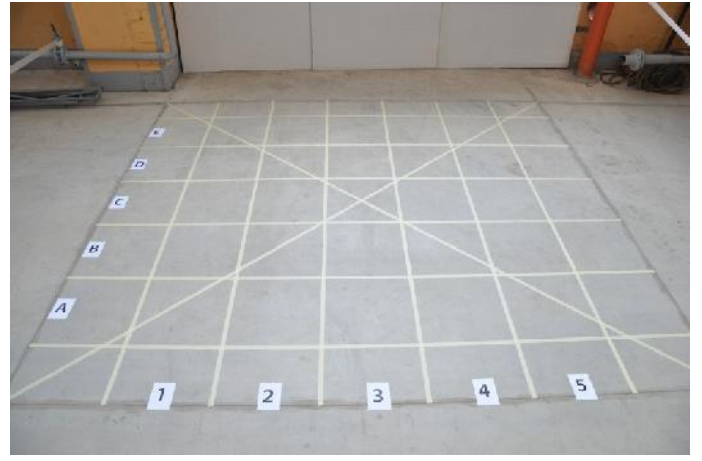
## Initial research of the floor base



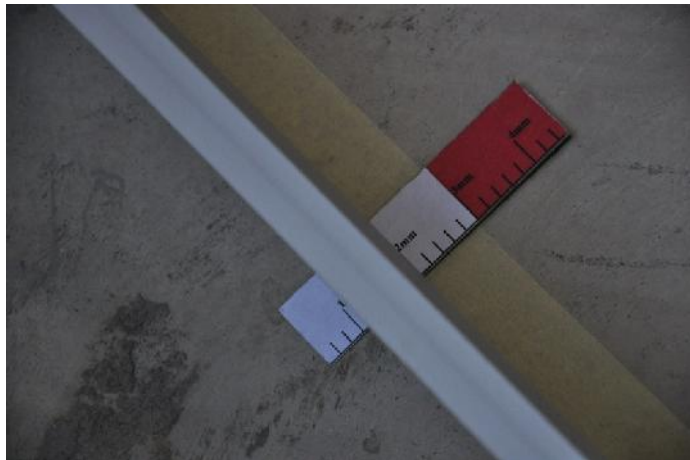
**Floor base is divided into 25  
measurement sectors**



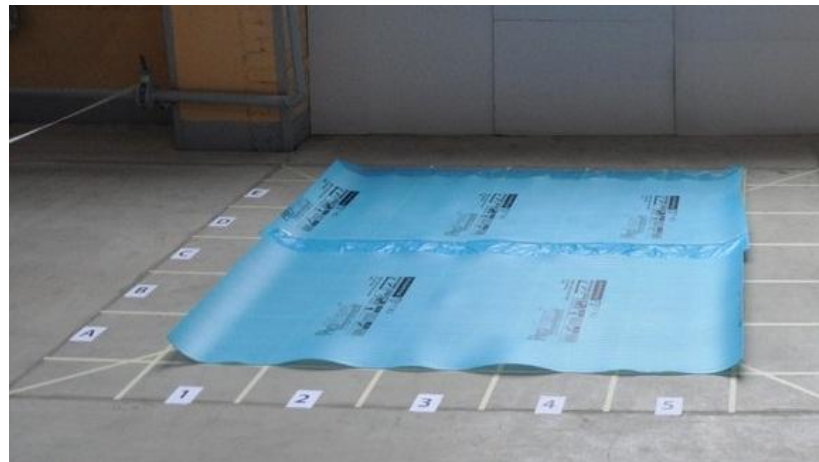
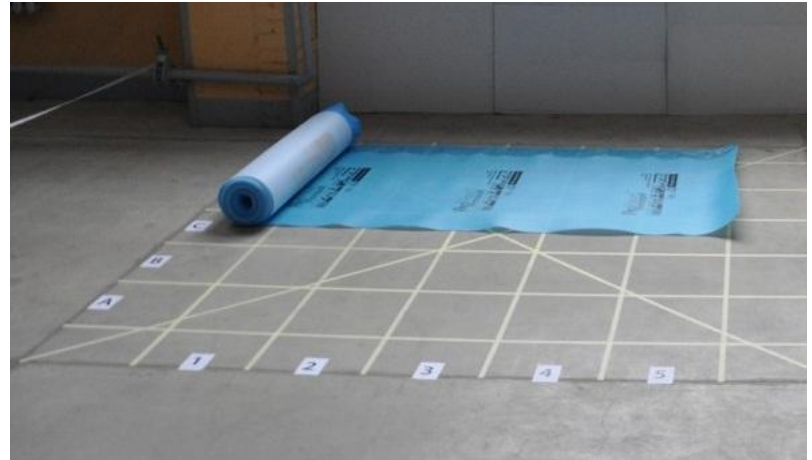
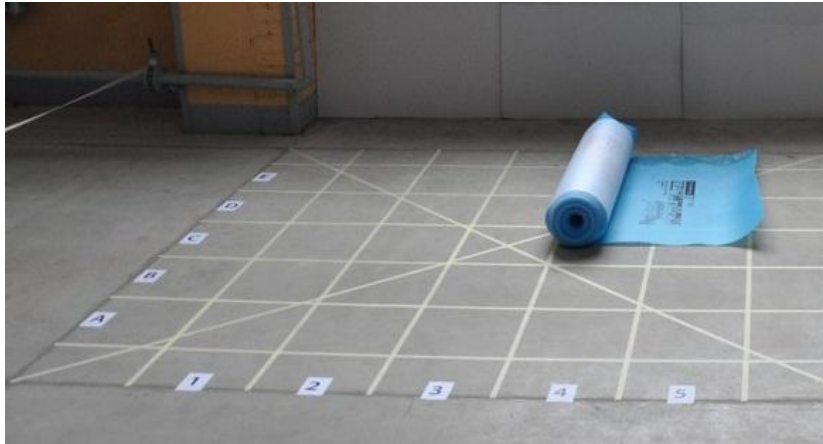
# Creating 25 measurement sectors



# Measuring the evenness of surface

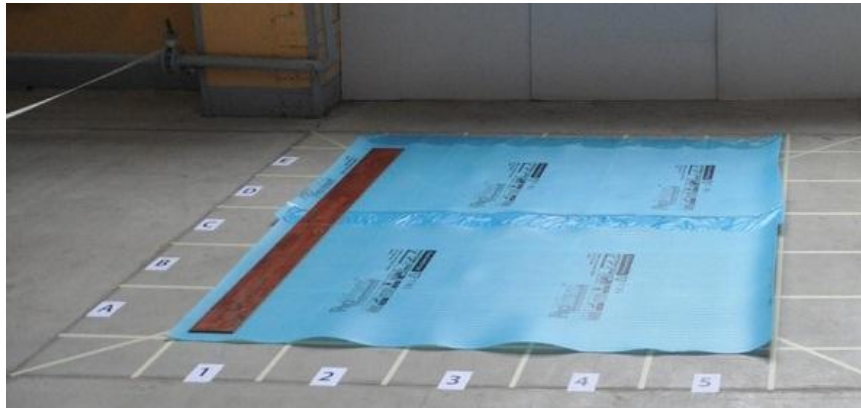


## Laying out underlay

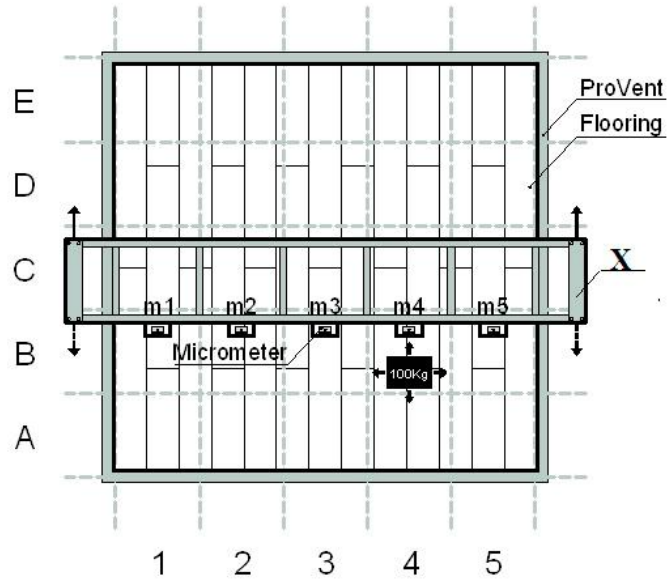




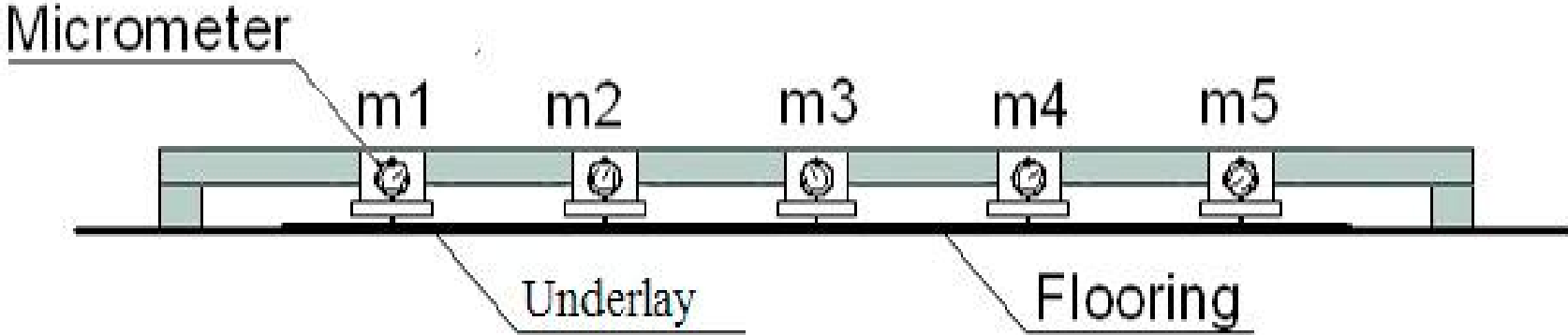
# Installing laminate flooring



5 micrometers were fixed to the measuring frame X and positioned against the flooring (one micrometer per a measuring sector). By moving frame X horizontally measurements were made in all 25 sectors.



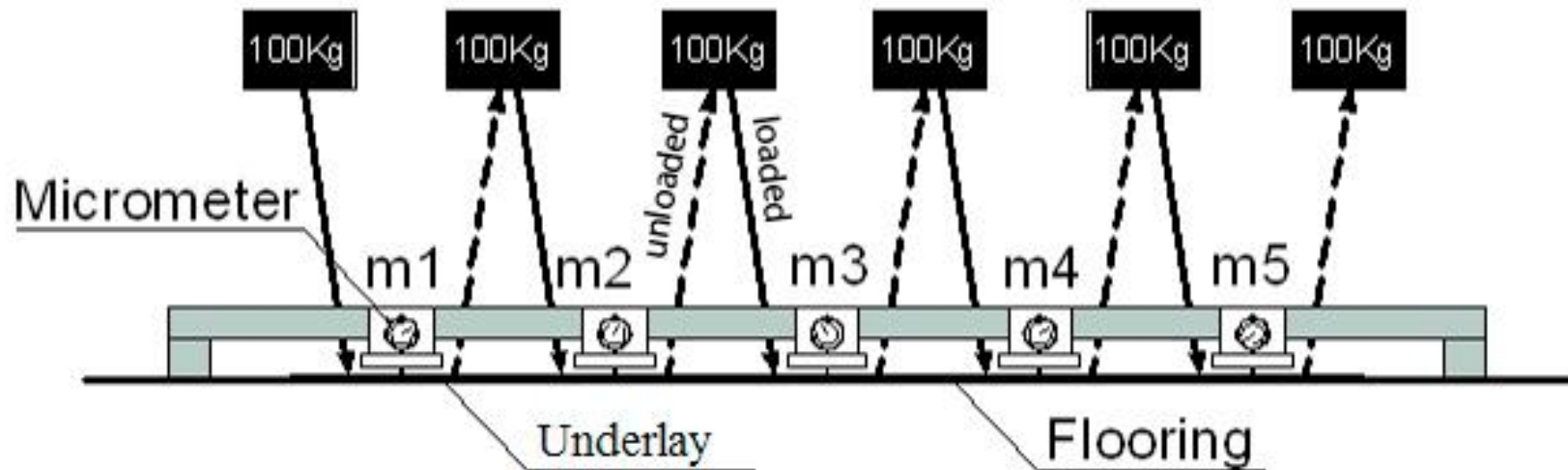
# Measuring frame X



Note: during testing the measuring frame X was not touching laminate

The vertical load was created with a 100 kg weight applied to a square of 275cm<sup>2</sup>. This corresponds to a **3.63t/m<sup>2</sup>** pressure.

During measurement process the load was applied to every sector of sample flooring



# Installing measuring equipment



## Measurement process (1)



- Measuring frame X with micrometers were positioned on the first 5 measuring sectors (A1,A2,A3,A4 and A5)
- Micrometers were adjusted to read zero level (original position of the sample flooring)
- Measurements would show the movement range of laminate in relation to the zero level

## Measurement process (2)



- the 100 kg load were applied to the flooring surface in sector **A1** (**LOAD ON** position) and readings were taken from all 5 micrometers wick were positioned in sectors: A1, A2, A3, A4, A5



## Measurement process (3)



- 100 kg load was removed from the flooring surface in sector **A1** (**LOAD OFF** position) and readings were taken from all 5 micrometers



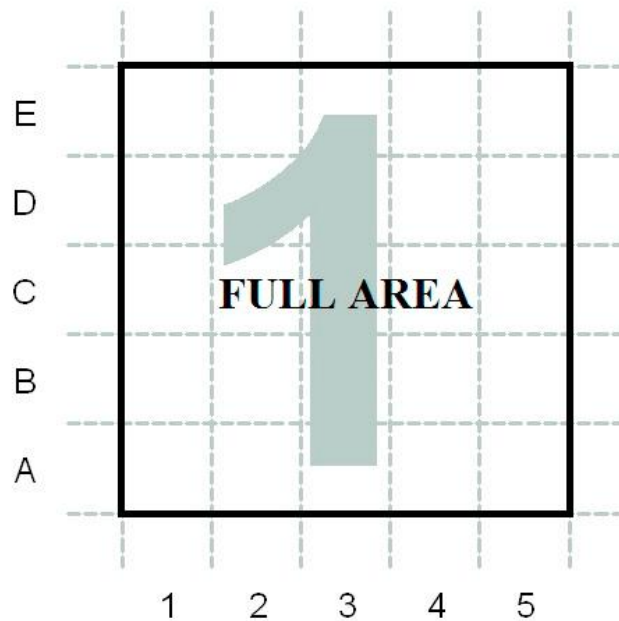


# Measurement process (4)

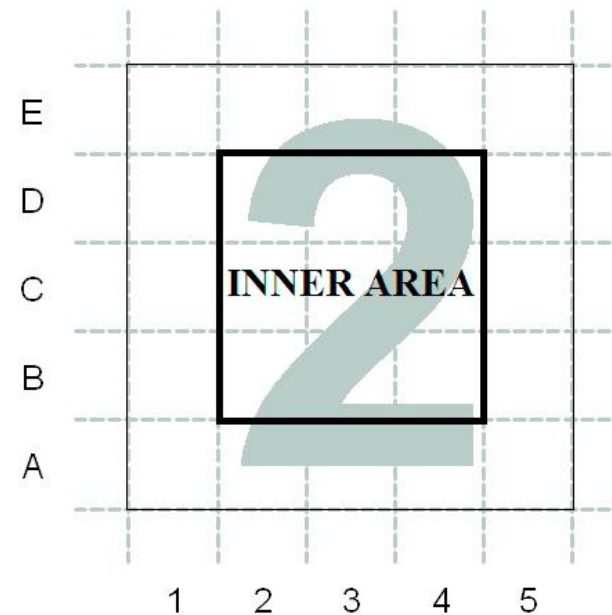
The same procedure is repeated in all 25 sectors



All measurements in LOAD ON (load applied) position and LOAD OFF (load removed) position are fixed and the **average values are determined** according to the two below formulas (one for the Full area and another for the Inner area):



$$= (A1+A2+\dots+E5) / 25$$



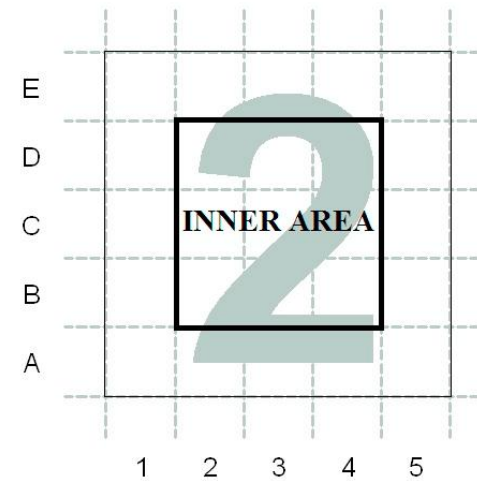
$$= ((B2+B3+B4)+(C2+C3+C4)+(D2+D3+D4))/9$$

## Summary results: vertical movement of laminate above each tested underlay (in mm)

	Full area		Inner area	
	LOAD ON position	LOAD OFF position	LOAD ON position	LOAD OFF position
<b>ProVent</b>	-0,39	-0,03	-0,36	-0,01
<b>2mm foam</b>	-0,44	-0,06	-0,35	-0,04
<b>3mm foam</b>	-0,45	-0,07	-0,36	-0,05
<b>Tuplex 3mm</b>	-0,58	-0,15	-0,44	-0,07
<b>Arbiton XPS plus 2mm</b>	-0,48	-0,09	-0,23	-0,03
<b>eGEN Prestige 2mm</b>	-0,39	-0,06	-0,27	-0,03

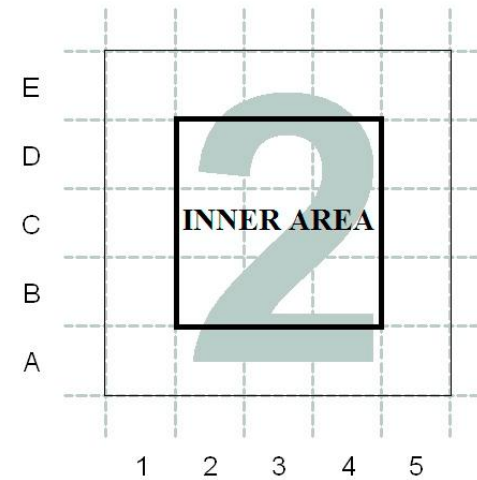
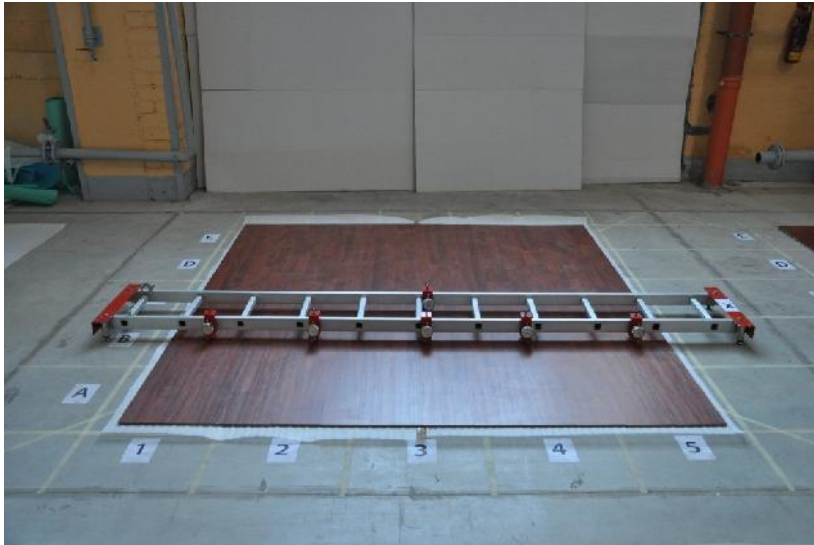
*Note: Further in the presentation we displayed data that was collected from the central area of the floor only for the reason that the results collected from the entire area were affected by the fact that the edges of the sample flooring were not stable as they would have been under normal circumstances. In conclusion the data collected would not have been accurate because of the additional movement in the flooring.*

# The results: vertical movement of laminate above **ProVent underlay** (in mm)



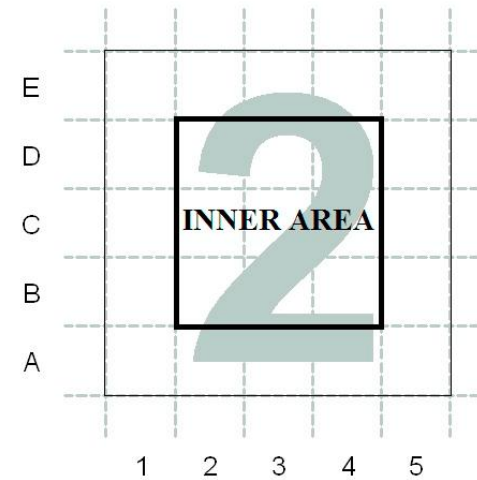
	Inner area
Level of laminate in LOAD ON position	-0.36
Level of laminate in LOAD OFF position	-0.01

## The results: vertical movement of laminate above 2mm foam underlay (in mm)



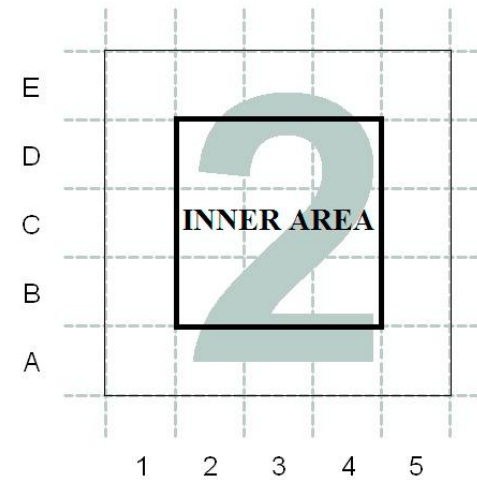
	Inner area
Level of laminate in LOAD ON position	-0.35
Level of laminate in LOAD OFF position	-0.04

# The results: vertical movement of laminate above **3mm foam underlay** (in mm)



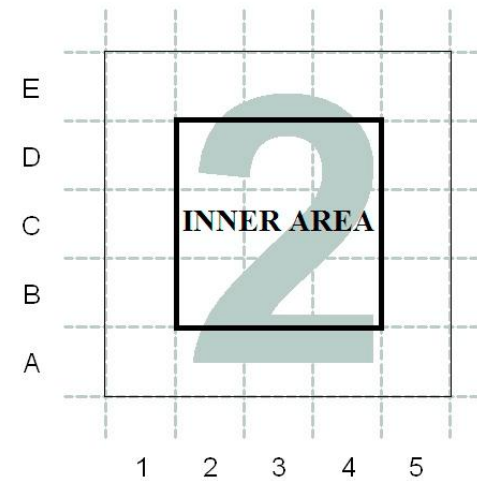
	Inner area
Level of laminate in LOAD ON position	-0.36
Level of laminate in LOAD OFF position	-0.05

# The results: vertical movement of laminate above **Tuplex underlay** (in mm)



	Inner area
Level of laminate in LOAD ON position	-0.44
Level of laminate in LOAD OFF position	-0.07

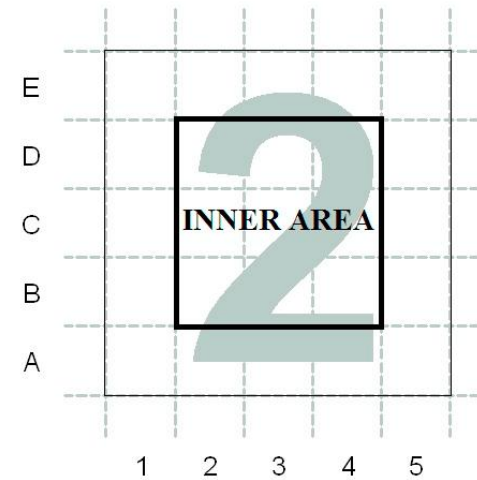
# The results: vertical movement of laminate above **Arbiton XPS Plus 2mm underlay** (in mm)



	Inner area
Level of laminate in LOAD ON position	-0.23
Level of laminate in LOAD OFF position	-0.03



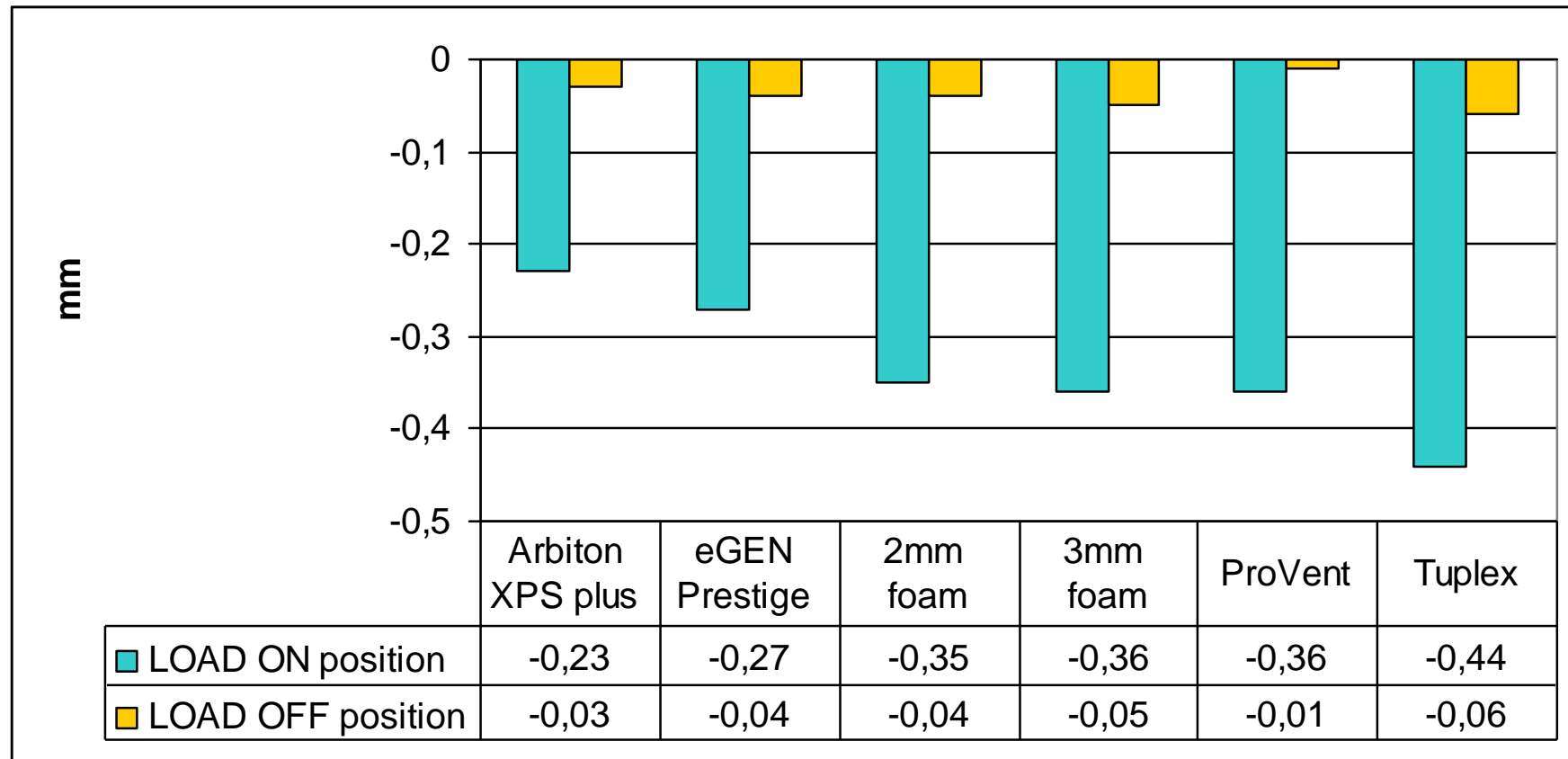
# The results: vertical movement of laminate above **eGEN Prestige Floor 2mm underlay** (in mm)



	Inner area
Level of laminate in LOAD ON position	-0.27
Level of laminate in LOAD OFF position	-0.04

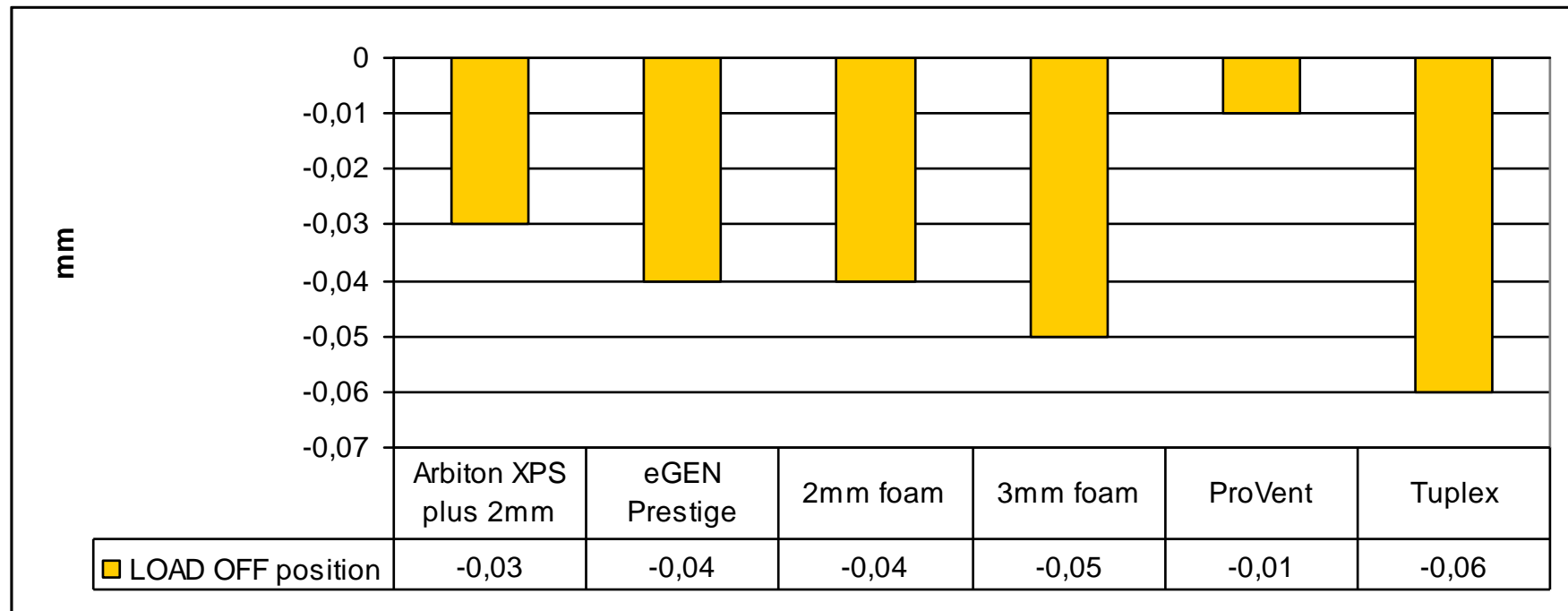
# Summary results: the range of vertical movement (deformation) of laminate above the tested underlays

NOTE: «0» level is the original position of sample flooring



# Summary results: return of laminate to the original position (zero level) after removed load

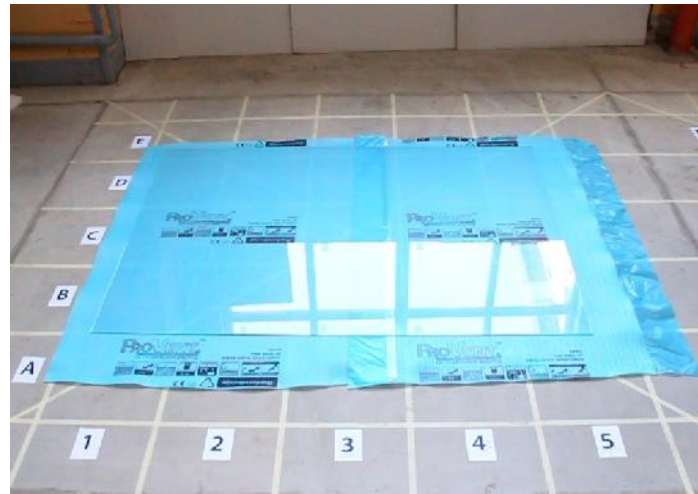
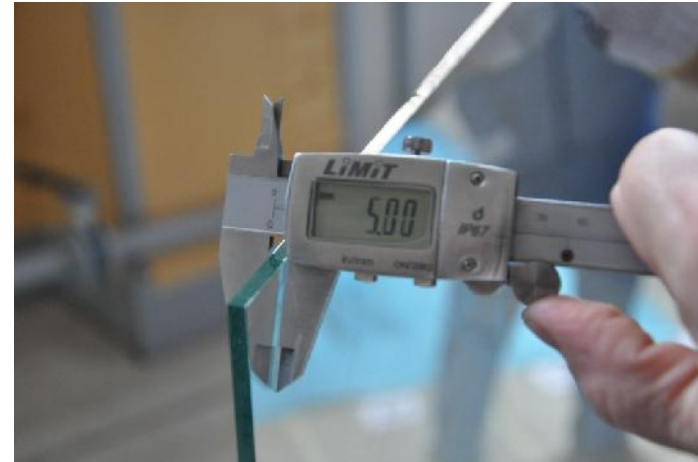
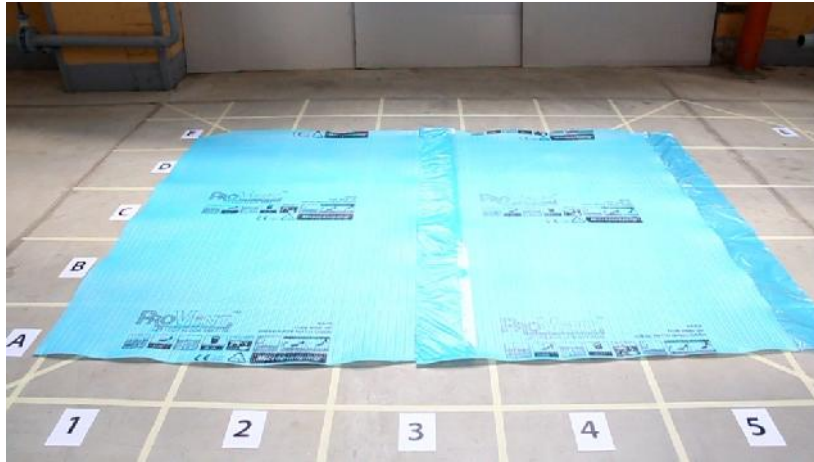
NOTE: «0» level is the original position of sample flooring



## Conclusions: PART 1

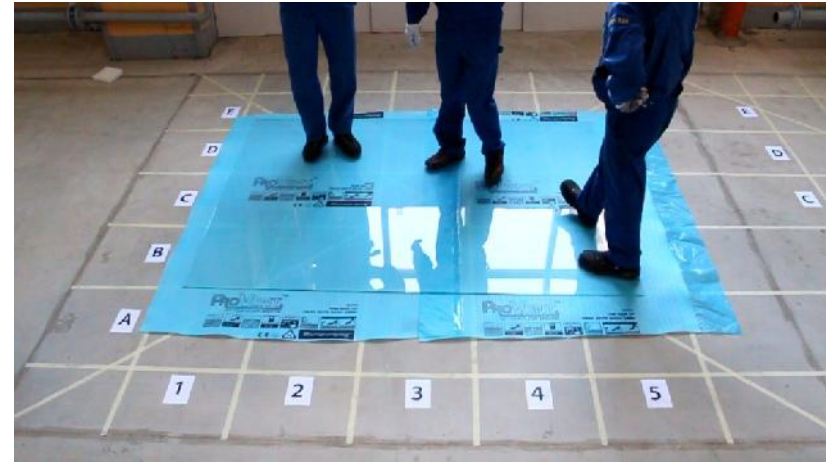
- Laminate had a vertical movement (deformation) with all tested underlays regardless their declared compressibility
- The difference in the range of movement with different underlays was insignificant
- All tested underlays may be used with laminate flooring
- Conclusions about ProVent:
  - ProVent showed a better (smaller) movement range in comparance with 3mm foam underlay
  - ProVent had the best «rate of return» (with removed load the flooring came back almost completely to the original level)
  - ProVent may be used under laminate without any risk for the flooring, including as a replacement for 2mm and 3mm foam underlay
  - the vertical movement of laminate above ProVent (unlike above the other underlays) features a beneficial «side effect» – it activates the «micropumping» ventilation!

# Follow-up test 1: a 5mm glass sheet layed on the top of ProVent underlay\*

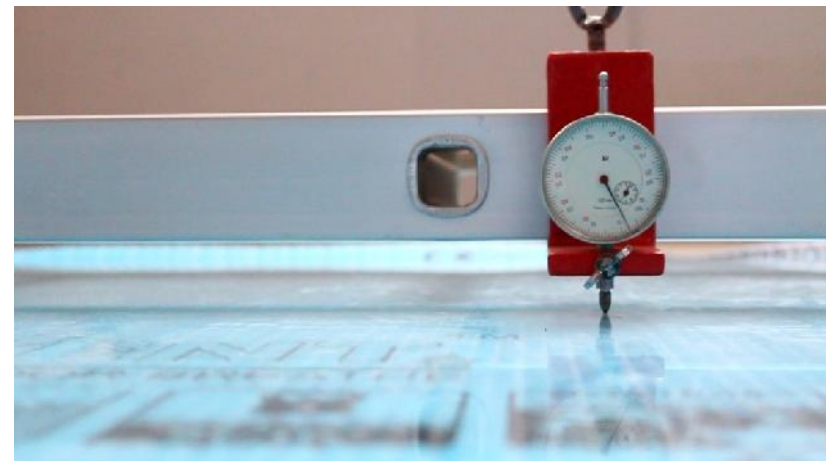
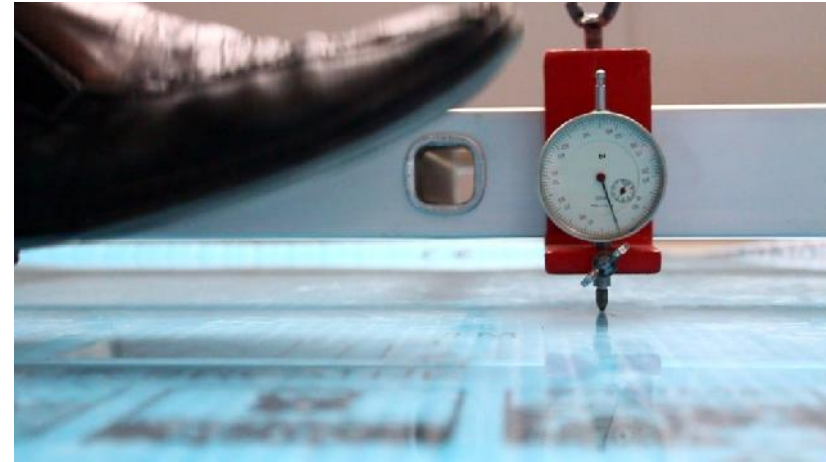
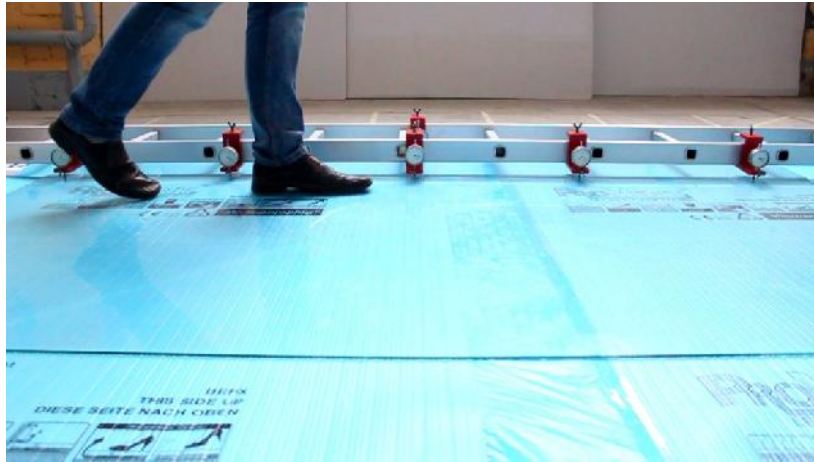


\*all testing conditions the same, including the same size area of floor base

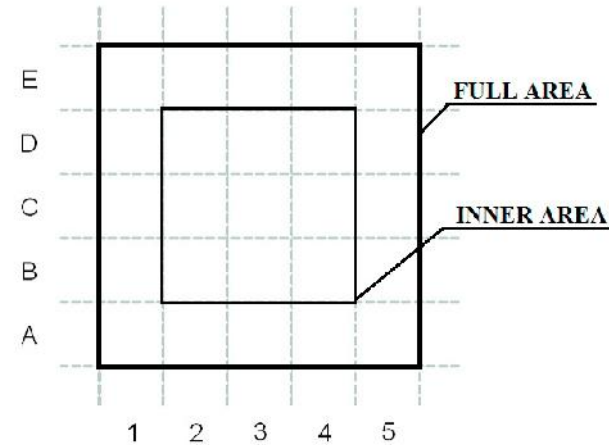
**... you may walk, dance and even jump  
on the glass...**



**... the range of vertical movement of the glass sheet was identical to that of laminate ...**



## Follow-up test 2: vertical movement of laminate with **no underlay used** (in mm)\*



	Full area	Inner area
Level of laminate in LOAD ON position	-0.31	-0.36
Level of laminate in LOAD OFF position	-0.04	-0.03

\*all testing conditions the same, including the same area of floor base



## Conclusions: PART 2

- most important factor determining the vertical movement (deformation) of flooring, and the range of it, is:

**evenness of floor base!**

- movement range of laminate above the tested underlays showed less than 0.5mm. **You can not feel this movement with your feet while walking.** Whenever you detect a substantial movement in your flooring the obvious suspects should be:

**uneven floor base  
and/or other  
installation mistakes**