

# The Effect of Leakage Through the Sealant in the Cup Test Method

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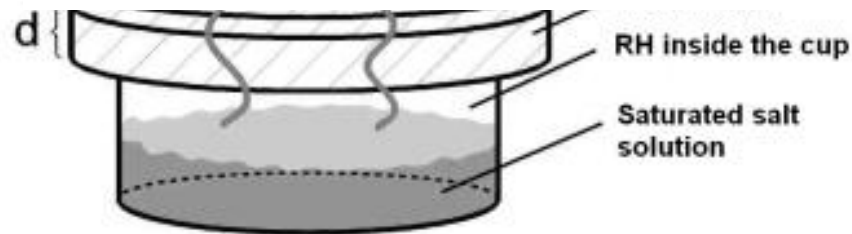


# Measuring method

According to EN ISO 12572 standard

$$g = \frac{\Delta m}{\Delta t}$$

## SEALING OF EDGES



$\Delta t$  change in time [s]



$$g = -\delta_v \frac{\partial v}{\partial x}$$

$g$  density of moisture flow rate [kg/(m<sup>2</sup>s)]  
 $\delta_v$  water vapour permeability [m<sup>2</sup>/s]  
 $v$  humidity by volume [kg/m<sup>3</sup>]

### Sources of errors:

- Barometric pressure changes
- Surface diffusion resistances
- Air layer inside the cup
- RH oscillations
- Errors in measuring instruments
- Calculation technique
- Sealing edges



# Measuring method at TUT

Circular test cups made from 1.25mm thick aluminium plate.



Sealing with a vapour tight wax  
40 % microwax  
60 % paraffin

**Conditions inside:** 75 % RH (sodium chloride)

**23°C**

**Conditions outside:** 33 % RH

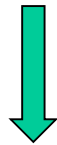
Weighing with a precision scale (0.001 g)

# Objective of research

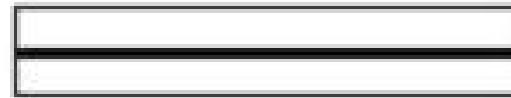
*Primary purpose:* To investigate the water vapour permeability of an adhesive



Two sheets of gypsum board



$$Z_{GB}=6970 \text{ s/m}$$



Layer of adhesive between two sheets of of gypsum board



$$Z_{ADH+GB}=41920 \text{ s/m}$$

$$Z_{ADH}=Z_{ADH+GB}-Z_{GB}$$

**Result:**  $Z_v=34950 \text{ s/m}$



# Other objectives

- 1 To investigate the amount of leakage through the sealant



Sheet of aluminium between two sheets of gypsum board



Density of moisture flow

$$g=1.2 \times 10^{-8} \text{ kg}/(\text{m}^2\text{s})$$



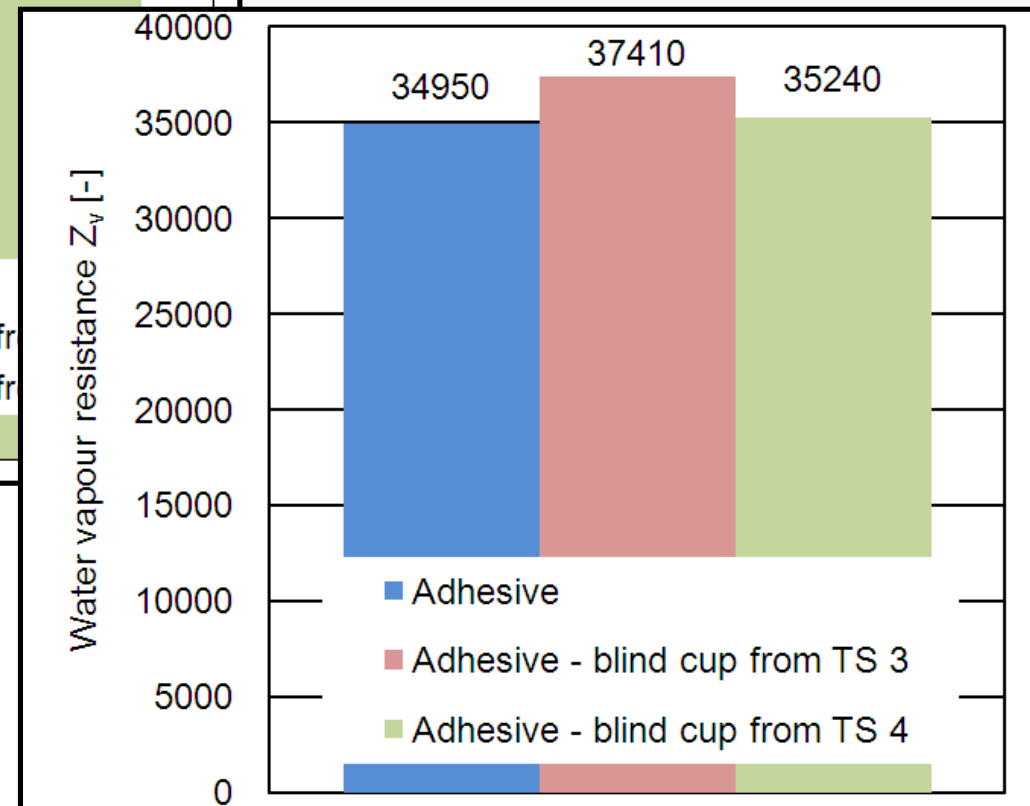
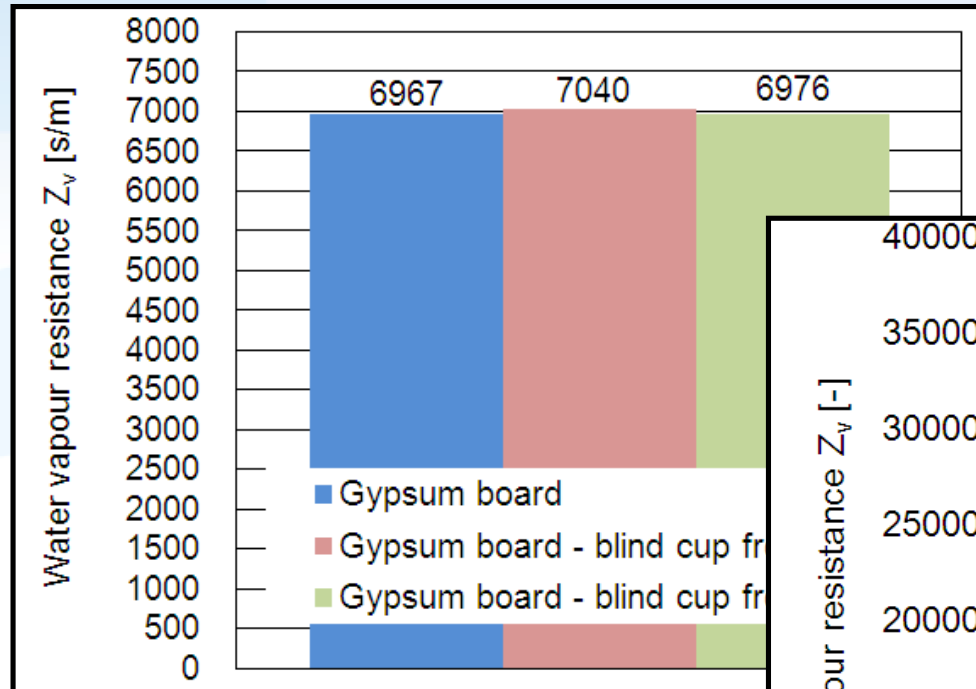
Sheet of aluminium on top and on bottom of two sheets of gypsum board



Density of moisture flow

$$g=1.5 \times 10^{-9} \text{ kg}/(\text{m}^2\text{s})$$

# The influence of leakage to the results



# Other objectives



## 2 To find out the influence of the tape

SFS-EN ISO 12572: "Molten sealants may penetrate far enough into porous materials to introduce errors into the effective area under test. The edge of these samples should be sealed with tape or an epoxy resin before sealing."



Layer of adhesive between two sheets of gypsum board. The edge of the specimen is sealed with aluminium tape.



Density of moisture flow  
 $g=4.0 \times 10^{-7} \text{ kg}/(\text{m}^2\text{s})$

$g=2.3 \times 10^{-7} \text{ kg}/(\text{m}^2\text{s})$



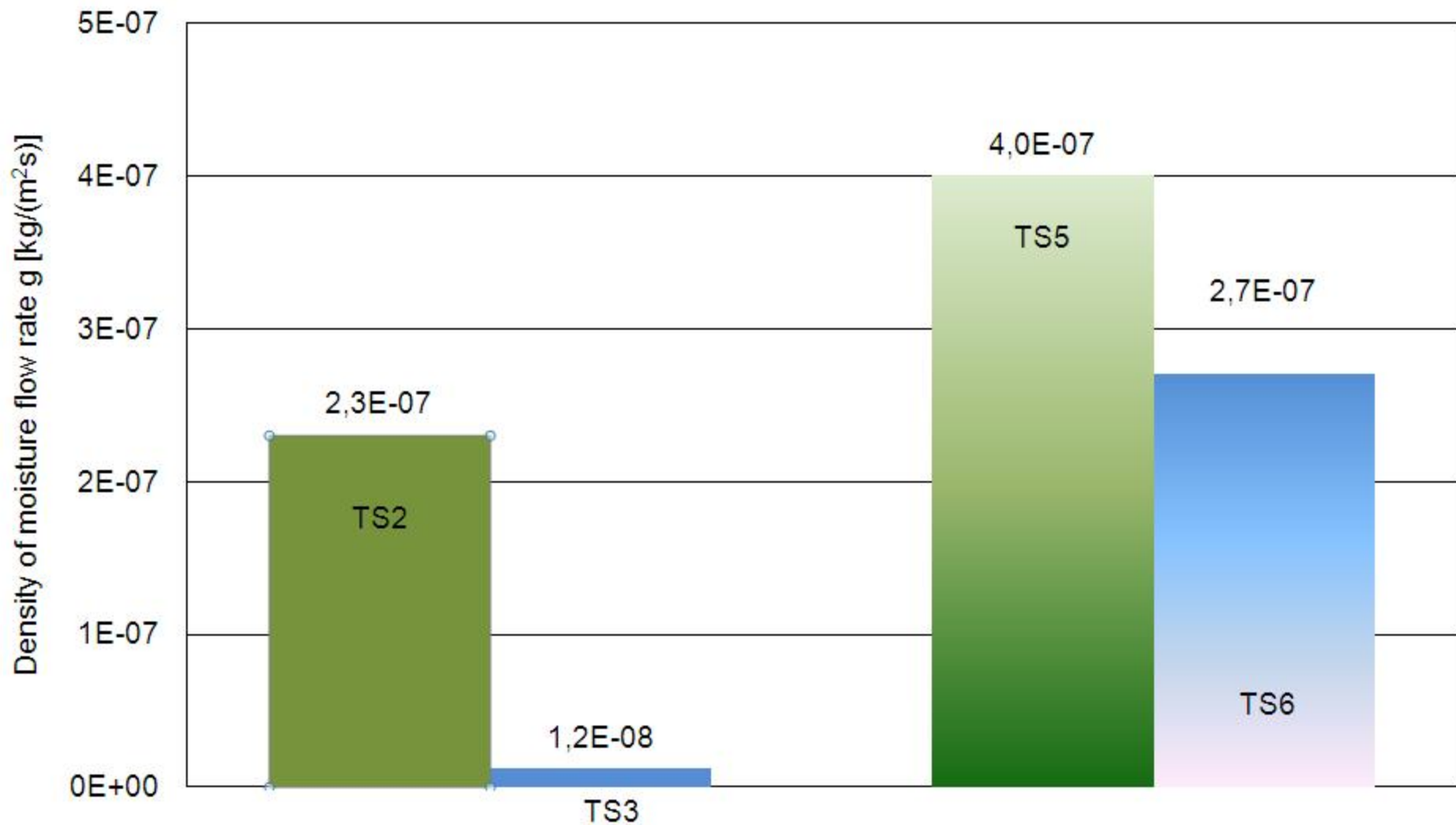
Sheet of aluminium between two sheets of gypsum board. The edge of the specimen is sealed with aluminium tape.



Density of moisture flow  
 $g=2.7 \times 10^{-7} \text{ kg}/(\text{m}^2\text{s})$

$g=1.2 \times 10^{-8} \text{ kg}/(\text{m}^2\text{s})$





- TS 2 (Layer of adhesive between two sheets of gypsum board)
- TS 3 (Sheet of aluminium between two sheets of gypsum board)
- TS 5 (Layer of adhesive between two sheets of gypsum board. The edge of the specimen is sealed with aluminium tape)
- TS 6 (Sheet of aluminium between two sheets of gypsum board. The edge of the specimen is sealed with aluminium tape)



# Conclusions

Leakages may cause significant errors to results if they are not taken into consideration

*The errors may be taken into account by measuring the moisture flow through the seal (by blocking the moisture through the specimen)*

The position of the aluminium plate has a strong impact on the amount of leakage

*The sealing of the edge of the specimen with an aluminium tape is not advisable*

The edge can also be sealed with the wax  
In any case, the leakage should investigated

