

Air permeability requirements for air barrier materials in Passive Houses

Comparison of the air permeability of 8 brands of OSB

J. Langmans, R. Klein, S. Roels

jelle.langmans@bwk.kuleuven.be

Catholic University of Leuven, Laboratory of Building Physics
Department of Civil Engineering
Kasteelpark Arenberg 40 - bus 02448
BE-3001 Heverlee, Belgium

6th International Symposium on Building and Ductwork Air-tightness, May, 2011, Berlin, Germany

Content

Introduction

Methodology

Laboratory

Impact on building

Recommendations

Conclusion

- Introduction – Problem Statement
- Methodology
- Laboratory Investigation
- Impact on building airtightness
- Recommendations
- Reaction in building practice
- Conclusions



KATHOLIEKE UNIVERSITEIT LEUVEN 

Introduction and Problem Statement

- Content
- Introduction**
- Methodology
- Laboratory
- Impact on building
- Recommendations
- Conclusion

- Passive Houses are increasingly applied
- Predominately timber frame constructions



3

KATHOLIEKE UNIVERSITEIT LEUVEN 

Introduction and Problem Statement

- Content
- Introduction**
- Methodology
- Laboratory
- Impact on building
- Recommendations
- Conclusion

Passive House Standard

↓

Strict requirement regarding building airtightness : $n_{50} < 0.6$ ACH



4

KATHOLIEKE UNIVERSITEIT LEUVEN  

Introduction and Problem Statement

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Conclusion



Air barrier system
=
Sealing joints in structural board: mostly OSB



5

KATHOLIEKE UNIVERSITEIT LEUVEN  

Methodology

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Conclusion

- Eight brands of OSB from the major West-European manufacturers selected
- Laboratory investigation of the air permeability
- Estimation of the impact on the airtightness of typical buildings: $n_{50,OSB}$



6

KATHOLIEKE UNIVERSITEIT LEUVEN
SINT-LEUVEN HOGESCHOOL

Laboratory Investigation

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Conclusion

OSB in Europe: 11 major producers in 9 countries

- Belgium
- Germany
- France
- United Kingdom
- Ireland
- Luxembourg
- Poland
- Bulgaria
- Czech Republic

OSB tested in this study:
8 brands from 6 countries

www.europanel.org



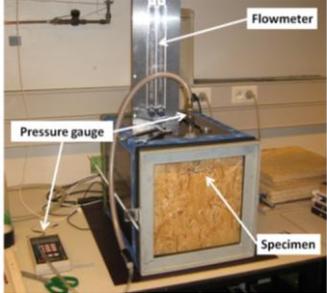
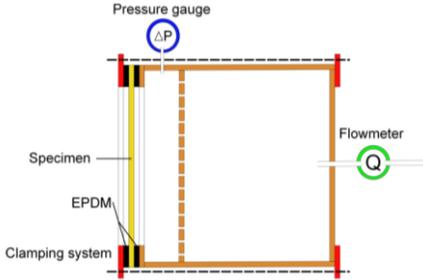
7

KATHOLIEKE UNIVERSITEIT LEUVEN
SINT-LEUVEN HOGESCHOOL

Laboratory Investigation

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Conclusion

Specimen of 35 by 35 cm



Accuracy limit of the test-setup:

→ $K_{a,box}=0.0007 \text{ m}^3/\text{m}^2/\text{h}/\text{Pa}$



8




Laboratory Investigation

Content

Introduction

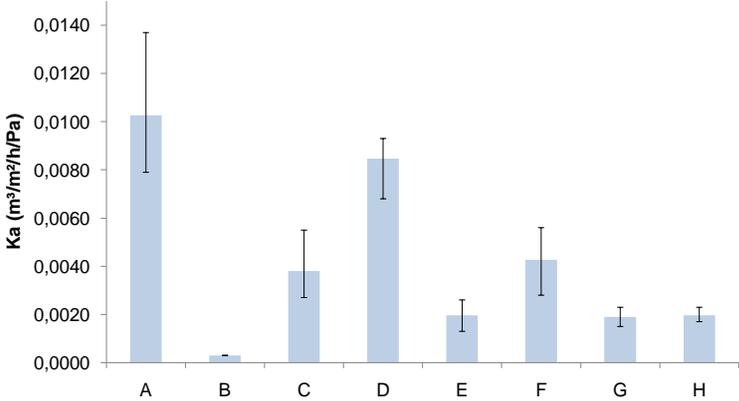
Methodology

Laboratory

Impact on building

Recommendations

Conclusion



Category	Ka (m³/m²/h/Pa)
A	0.0105
B	0.0005
C	0.0038
D	0.0085
E	0.0020
F	0.0045
G	0.0018
H	0.0020

9




Impact on building airtightness

Content

Introduction

Methodology

Laboratory

Impact on building

Recommendations

Conclusion

?

$$n_{50,OSB} = \frac{A_{OSB}}{V} \cdot K_a \cdot \Delta P_a$$

- Compactness
- Size
- Surface OSB in the air barrier system

Data from 10 recently building Passive Houses

}

Min: 0.6 1/m

Average: 0.8 1/m

Max: 1.1 1/m

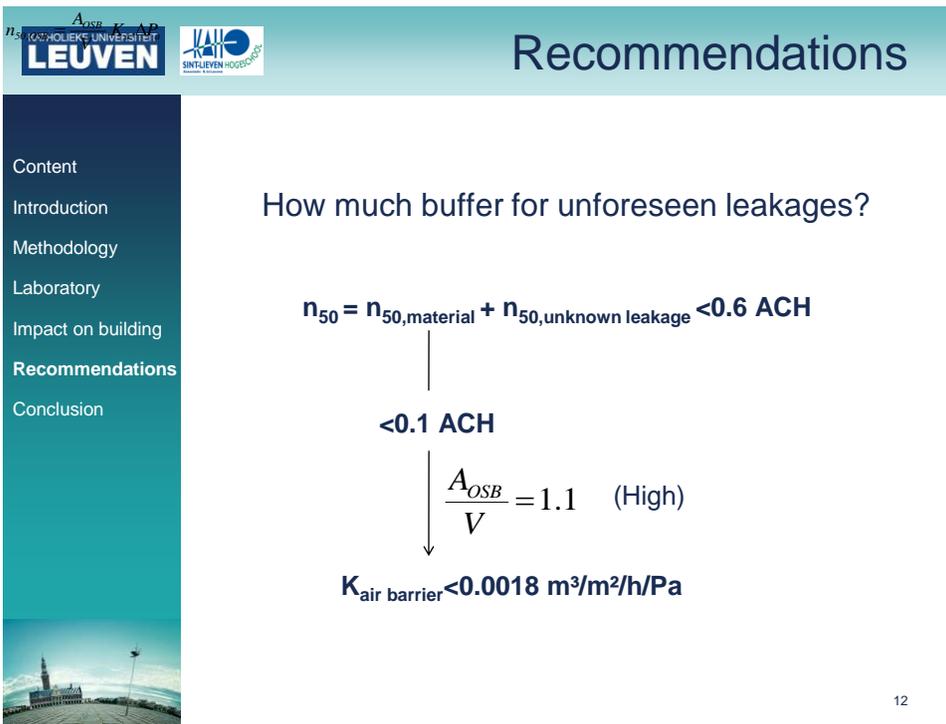
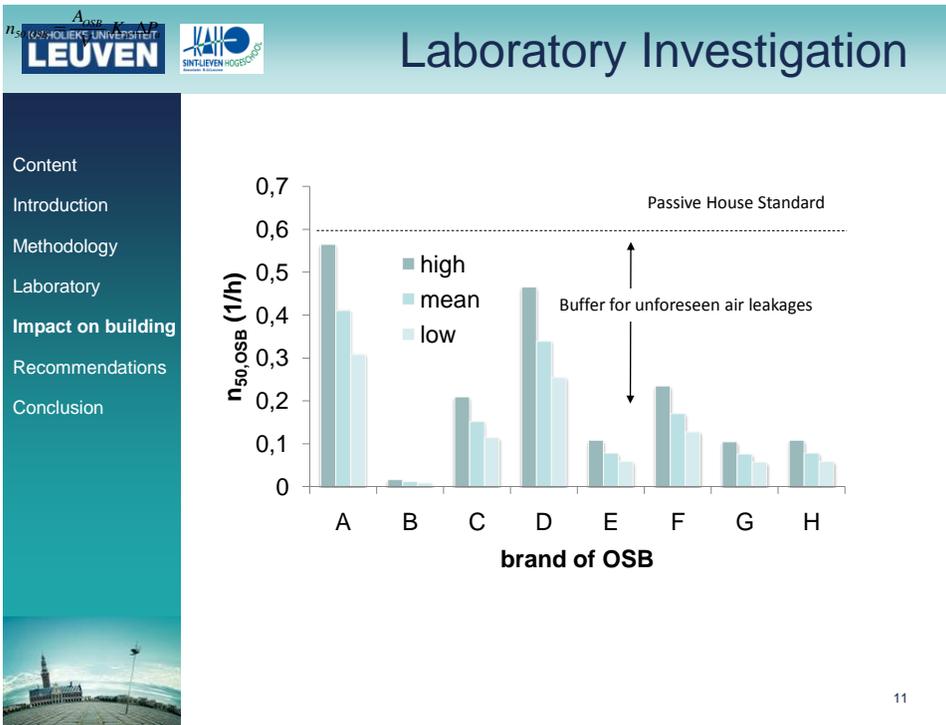
→

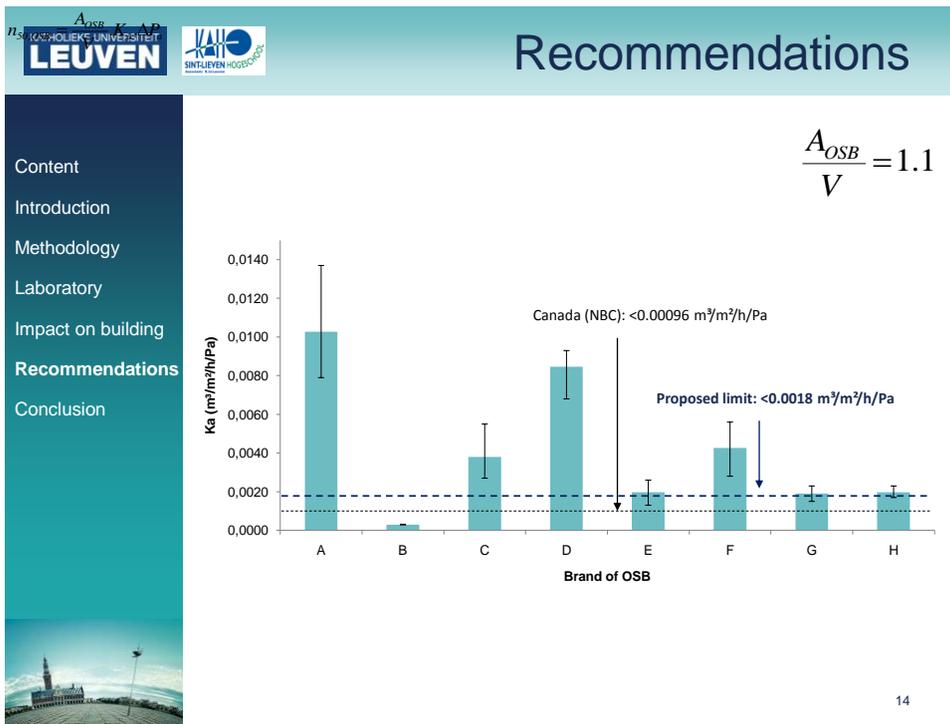
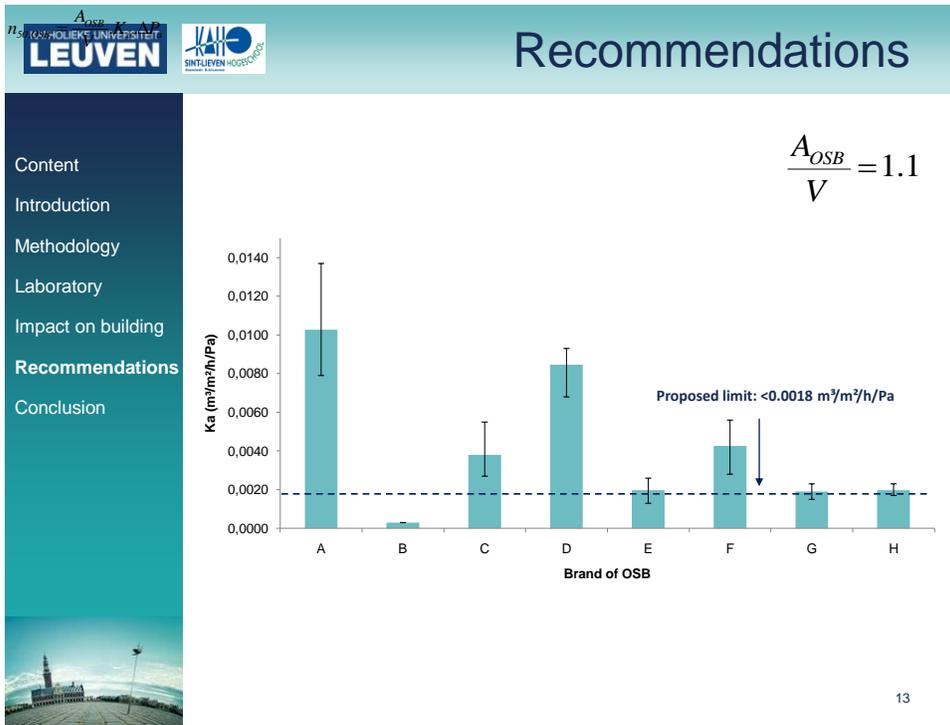
Low

Mean

High

10





  **Reaction in building practice**

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Reaction
Conclusion

High uncertainty on K_{osb}



Shift towards other materials/solutions to achieve the airtightness in passive houses in Belgium



15

  **Reaction in building practice**

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Reaction
Conclusion

Recycled wood based panels with an additional top layer to meet the air permeability requirements



16

LEUVEN   **Reaction in building practice**

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Reaction
Conclusion

An additional membrane is put on top of the osb to meet the air permeability requirements



17

LEUVEN   **Conclusions**

Content
Introduction
Methodology
Laboratory
Impact on building
Recommendations
Conclusion

- Air permeability of eight brands of European OSB were tested
- Significant difference between different brands
- Large variations within one brand
- OSB as air barrier material for Passive House is questionable
- Need for regulation of air barrier materials in Passive Houses
- Shift towards other materials/solutions to achieve airtightness



18