



Airtightness of the window-wall interface in masonry brick walls

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Van Den Bossche N., W. Huyghe, J. Moens, A. Janssens, M. De Paepe. 2012. Airtightness of the window-wall interface in cavity brick walls, *Energy and Buildings* 45 (2012), 32-42

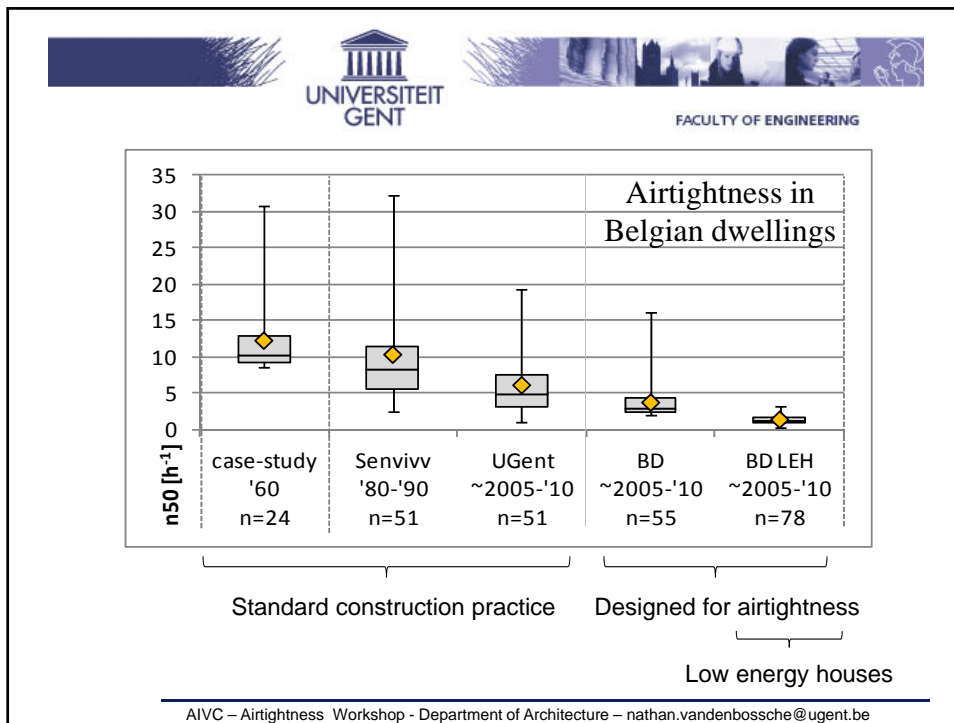
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Overview

- Introduction
- Experimental setup
- Results
- Conclusions

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Introduction

Airtightness in Belgium

Mean n_{50} -value of detached dwellings

1995: $10.0h^{-1}$

2010: $5.5h^{-1}$

2020: Nearly Zero Energy Buildings $0.6h^{-1}$?

The building industry requires practical guidelines!

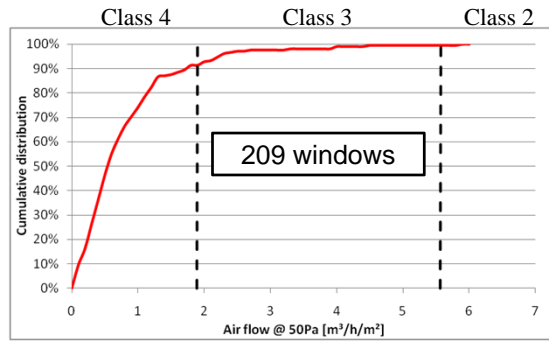
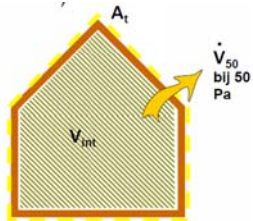
How important is the window-wall interface?

Which products perform well?

Little information on masonry walls in literature

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Introduction



An 'average' dwelling:

Exterior volume V_e : 617 m³

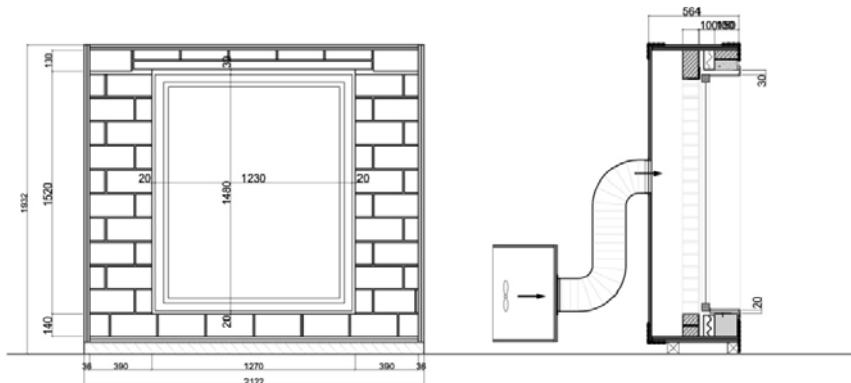
Interior volume V_i : 453 m³

Area building shell A_b : 426 m²

Area windows A_w : 43.4 m²

	n_{50} [h ⁻¹]	Class 1	Class 2	Class 3	Class 4
Air flow [m ³ /h]		1367.1	737.8	246.1	82.0
standard	11.28	27%	144%	5%	2%
low energy	2.00	150%	81%	27%	9%
passive house	0.60	503%	271%	91%	30%

Experimental setup: calibrated test rig





Experimental setup



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Experimental setup: measuring extraneous air leakage



No window sill

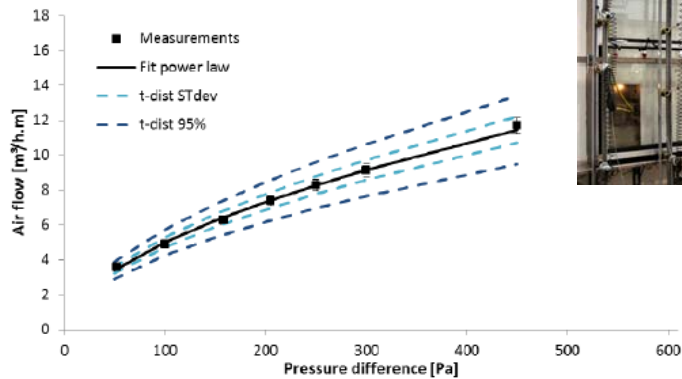


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Experimental set-up

EN 12207
EN 1026



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Results

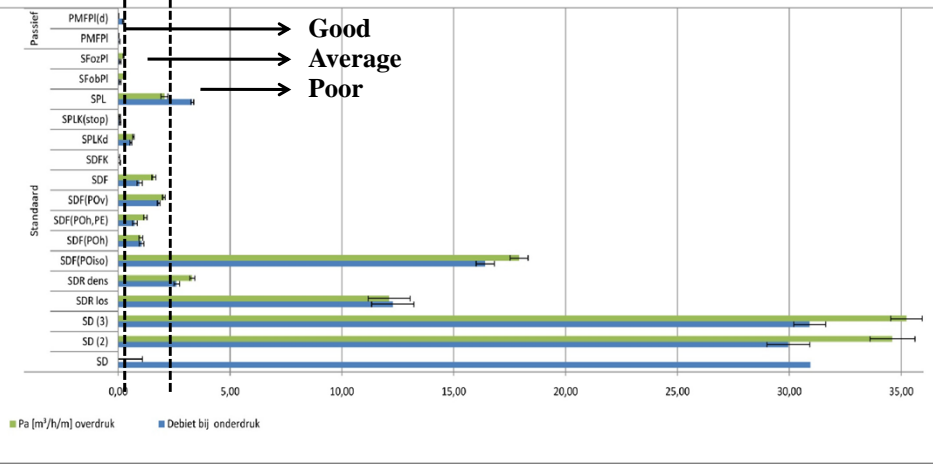
- Air leakage per meter @ 50Pa (including corners)
- 14 details tested for standard configuration
 - Window trim
 - Plastered reveal
- 1 detail tested in a passive house wall
- Collaboration with manufacturers and contractors
- Results: 0.00 to 33.07 m³/h/m

3 Classes:

- **Poor:** $q_{50} > 3.3 \text{ m}^3/\text{h}/\text{m}$
- **Average:** $0.33 \text{ m}^3/\text{h}/\text{m} < q_{50} < 3.3 \text{ m}^3/\text{h}/\text{m}$
- **Good:** $q_{50} < 0.33 \text{ m}^3/\text{h}/\text{m}$

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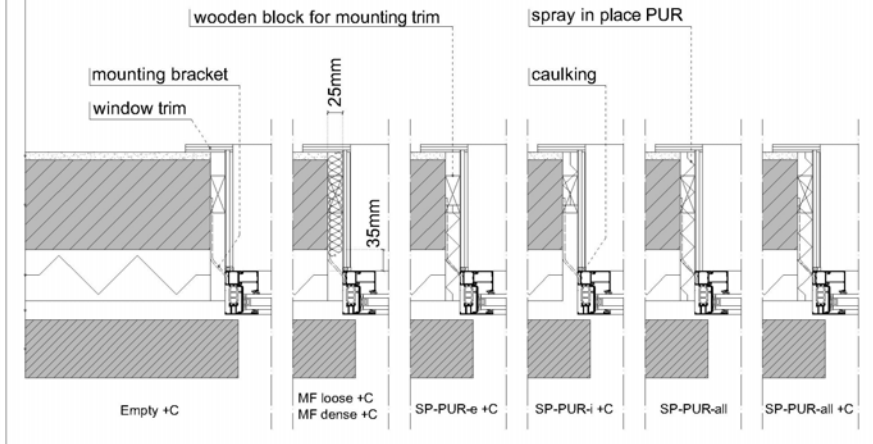
Results



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Window-wall interface details

- 12mm plaster
- 140mm perforated clay bricks
- 80mm insulation
- 30mm cavity
- 90mm masonry veneer



30.78m³/h/m
 11.64m³/h/m
 1.06m³/h/m
 1.36m³/h/m
 2.90m³/h/m
 1.77m³/h/m
 0.00m³/h/m

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Window-wall interface details

The diagram illustrates four different window-wall interface details. A photograph on the left shows a worker in a white coat applying a material to a window frame. Labels include 'wooden block for mounting trim', 'spray in place PUR', and 'caulking'. The cross-sections are labeled as follows:

- SP-PUR-e + C
- SP-PUR-i + C
- SP-PUR-all
- SP-PUR-all + C

1.06m³/h/m
 1.77m³/h/m
 1.36m³/h/m
 0.00m³/h/m

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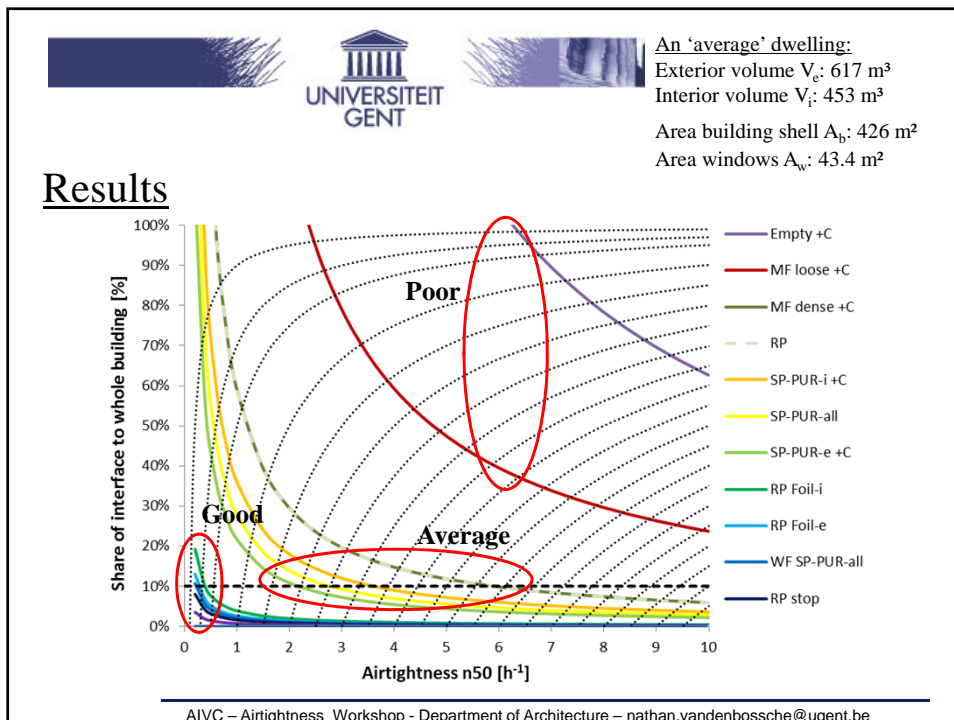
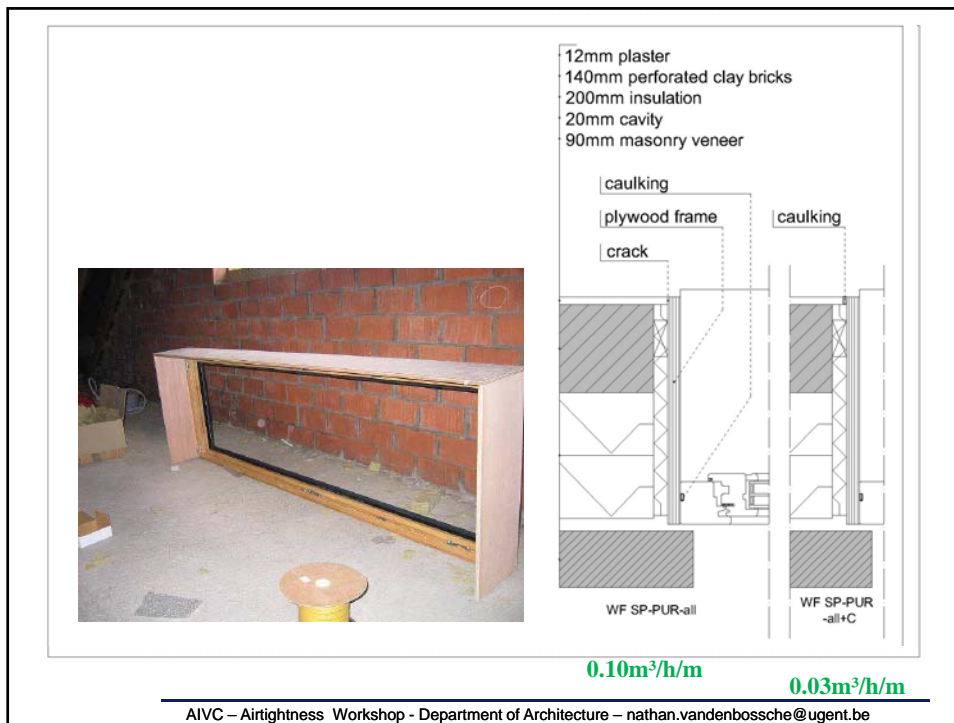
The diagram illustrates four different window-wall interface details. Labels include 'airtight membrane', 'crack', 'XPS', and 'caulking'. The cross-sections are labeled as follows:

- RP
- RP stop
- RP foil-e
- RP foil-i

2.90m³/h/m
 0.08m³/h/m
 0.13m³/h/m
 0.19m³/h/m

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Conclusions

- Airtight configurations are possible with
 - PU foam + caulking
 - Airtight membranes
 - multiplex siding + PU foam
 - plaster + profile + caulking
- Effect of sill?
- Effect of workmanship?



Thank you for your attention!



