FIELD MEASUREMENTS IN LOW-ENERGY HOUSES

QUALITY OF METHODS FOR MEASURING VENTILATION AND AIR INFILTRATION IN BUILDINGS, 2014

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Much achieved in the Netherlands

How long does it take to retrofit?

Prefabricated facades back side

Prefabricated facades front side

Day 3

Prefabricated roof

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Day 6/7

Finishing zinc en roof trims

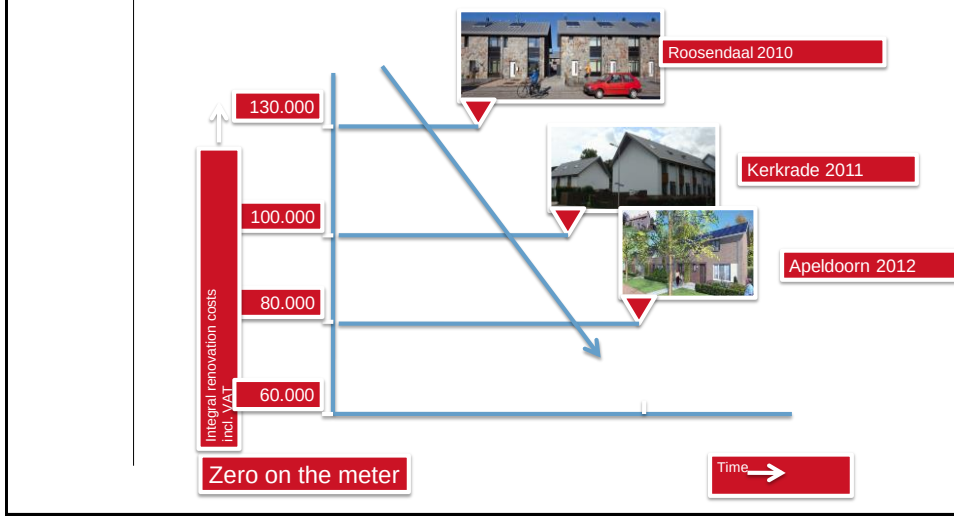
Moving scaffolding

Zero energy in 8 days!

How much Energy does an average dwelling consume in the Netherlands in 15 Years

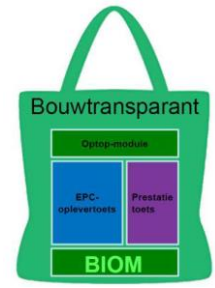
42.000 Euro

Development in retrofitting



Dutch quality method: Built Transparantly (Bouwtransparant)

- Check of the Energy performance calculation
- Near Infrared pictures
- Blower door and smoke tests
- Ventilation Flow
- Indicative noise measurement
- Digital construction mistakes (BIOM)
- Estimation Energy losses (TNO)



First results: Causes of leakages in 13 nearly zero energy projects

Cause of leakage:	number of times in project
Chimney	13
Window	9
Window frame	9
Door	9
Roof-facade	5
Ventilation grill	5
Hatch crawl space	3
Door frame	3

Leakages versus airtightness, how much uncertainty do we accept?

Dwelling	# types of leakage	total # leakages	measured ACH 50	Specification ACH	Renovation/ new	types of BIOM #
1	7	7	14,6		renovation	15
2	7	30	12		renovation	5
3	2	3	8		renovation	
4	5	5	7,9		renovation	
5	7	9	6		renovation	
6	3	4	5,6		renovation	
7	4	5	2,6	0,6	new	8
8	5	17	2,5	1,7	new	4
9	6	15	2,2	1,7	new	8
10	2	4	2	0,6	new	12
11	3	7	1,8	0,6	new	12
12	4	8	1,8		new	5
13	6	8	1,45		new	7

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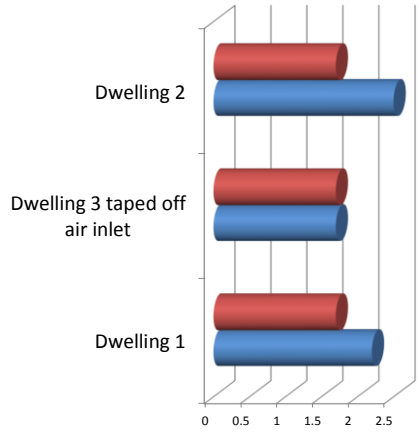
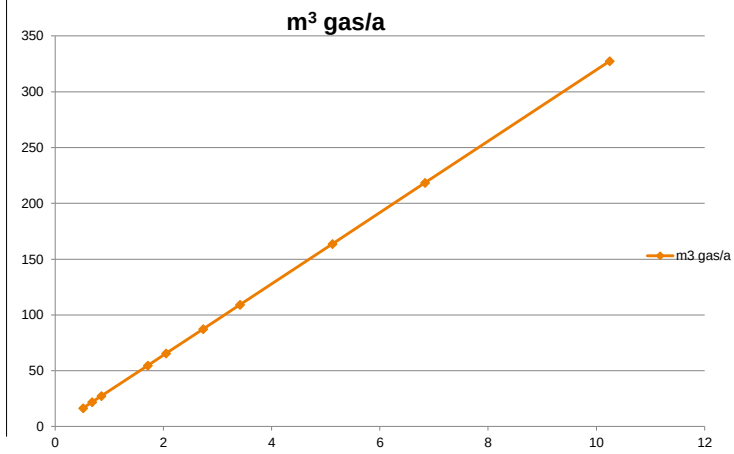
Differences in measurement methods in one building project



SKH-publicatie 13-01 “luchtdichtheids`-metingen”

Effect of ACH on heating in the Netherlands



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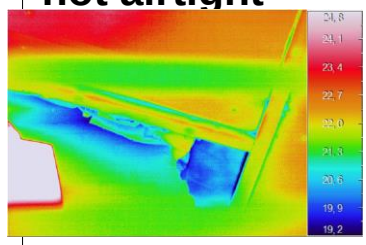
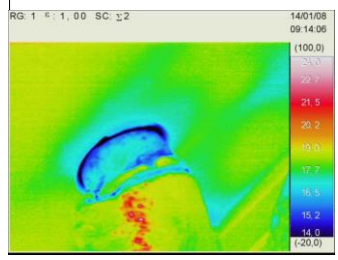
Ventilation flows in 14 dwellings, how much uncertainty we accept?

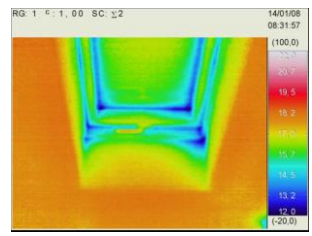
Dwelling	Renovation/ new	ventilation flow	Over flow
1	renovation	34 m³/h instead of 75 m³/h	-
2	renovation	ok	
3	renovation		
4	renovation		
5	renovation		
6	renovation		
7	new	-25% not balanced	-
8	new	ok	
9	new	ok	
10	new		-/+
11	new		-
12	new	ok	
13	new	ok	

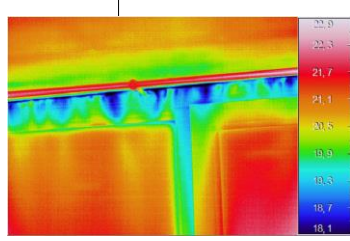
Chimney and roof outlets are mostly not airtight

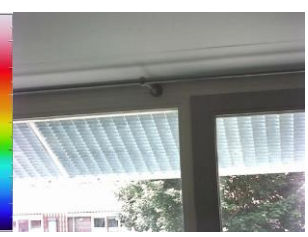


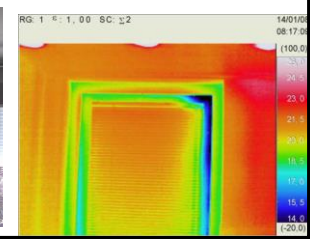


Air leakages at windows and window frames





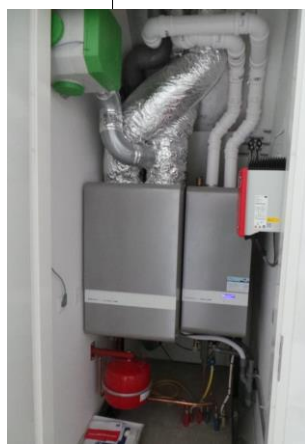




Good example hatch crawl space

Bad example hatch crawl space: radon

New dwellings and ventilation little space, many curves





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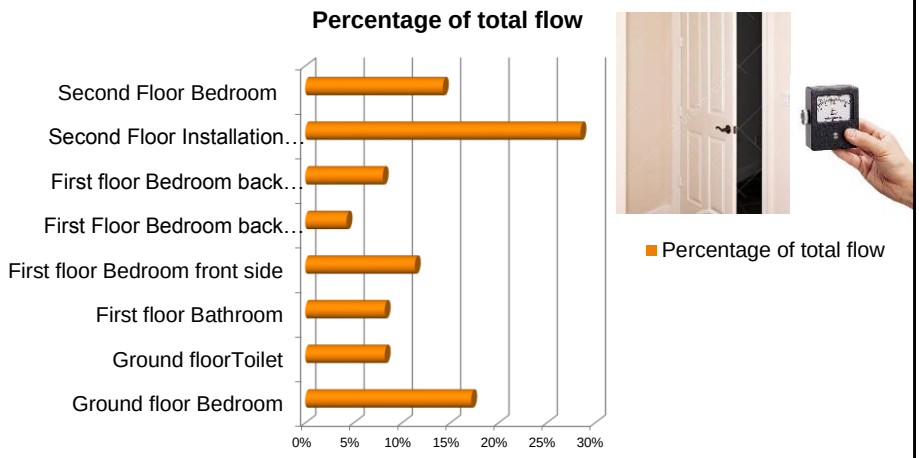
Renovation needs creativity

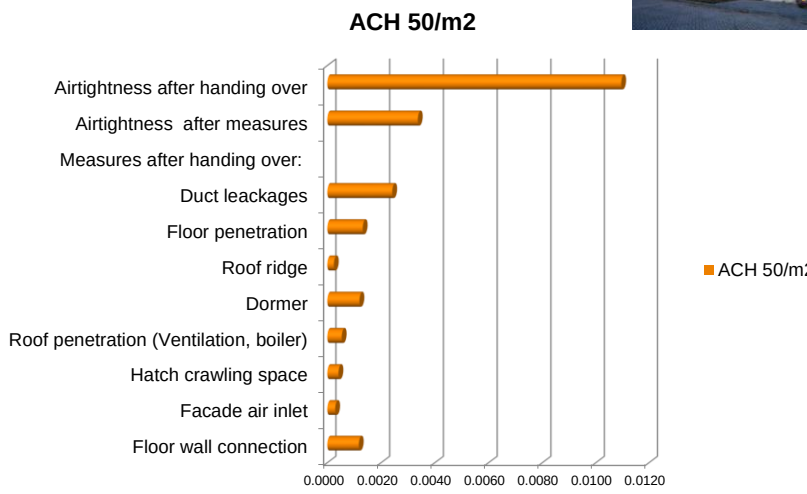
Use of PUR foam at façade-roof

Typical distribution of leakages

Example of distribution of leakages



Improve airtightness to passive house level: case Icoon-dwelling



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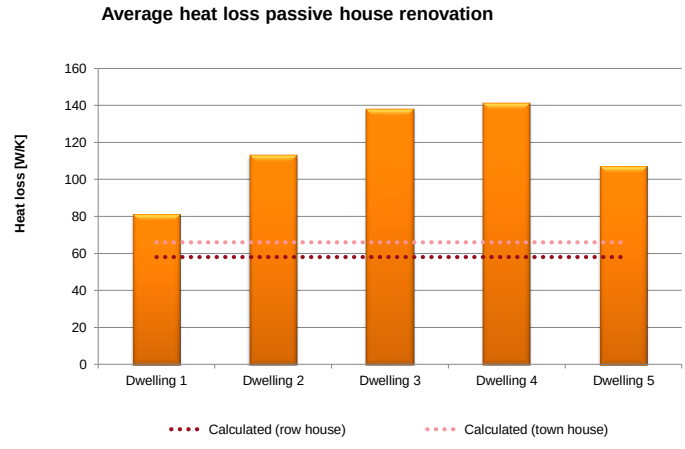
Differences in heat loss, possible by use of windows &ventilation



Do not forget the user