Results from laboratory tests of wind driven rain tightness in different types of façade systems

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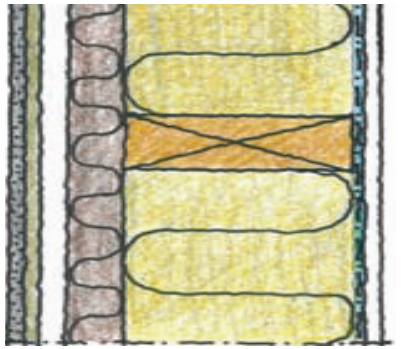
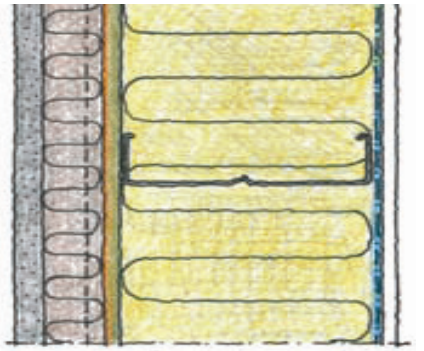
Experiences from testing - improved or new designs

- Over the past six years we have, for our customers, performed more than 100 wind driven rain tests in the laboratory of mock-ups both:
  - Rendered stud walls of existing and new designs.
  - And other types of façades have also been tested, such as metal sandwich, boards , wood panels and concrete, etc.

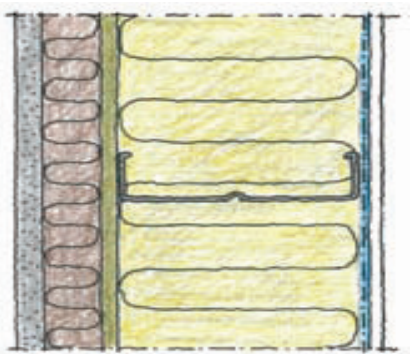
Different types of facade systems and second barrier systems have been tested



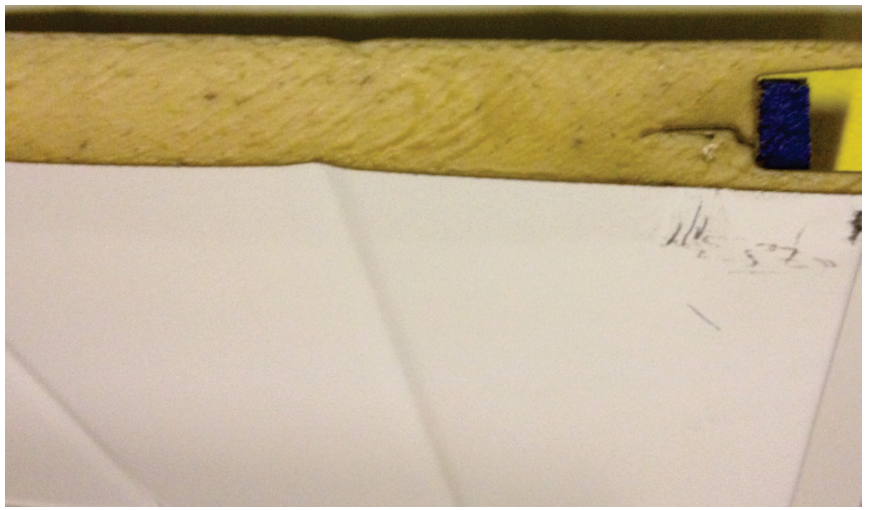
S3, Ventilated and drained



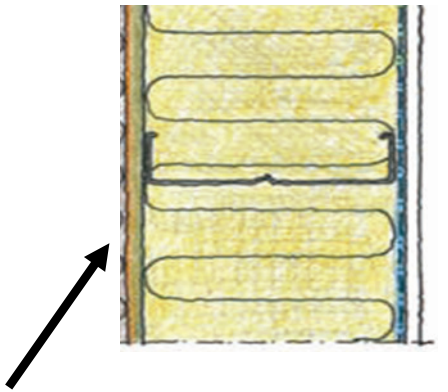
S2, Drained



S1, Undrained



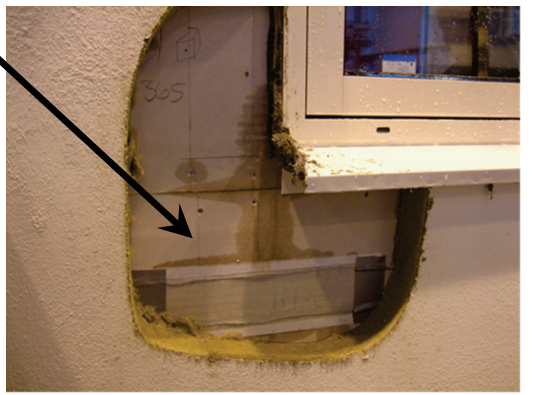
SW, Metal sandwich panel



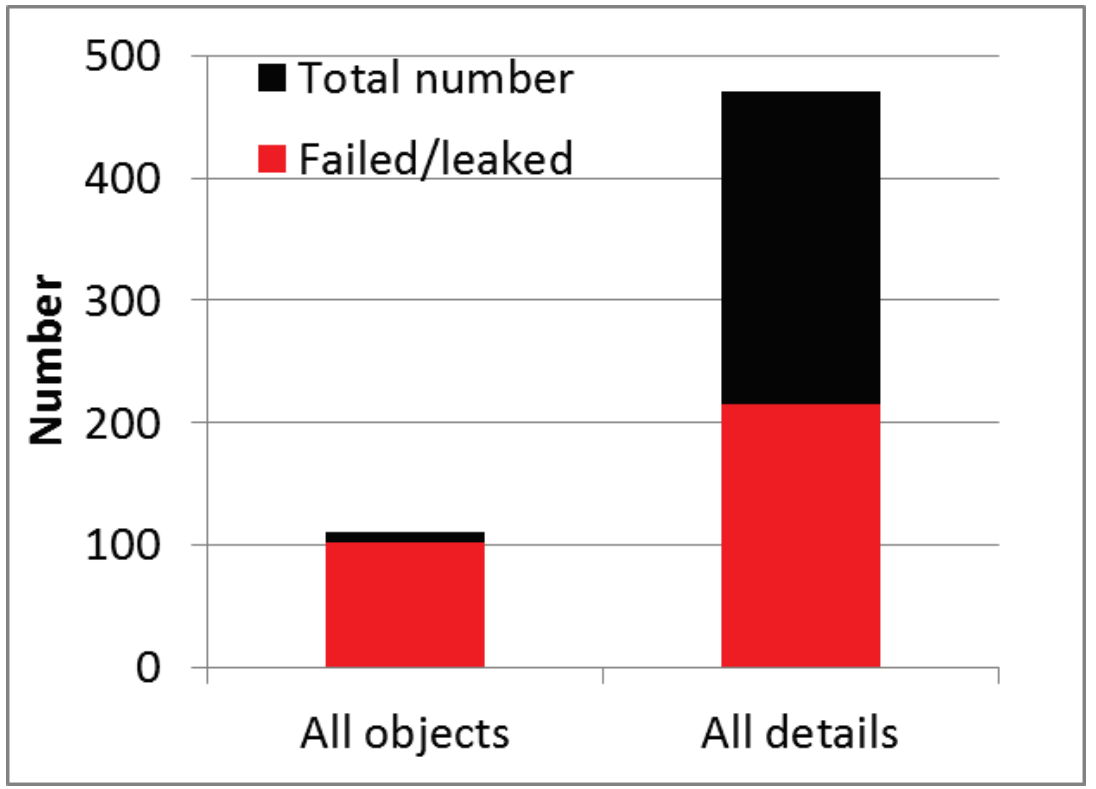
S, Second rain barrier

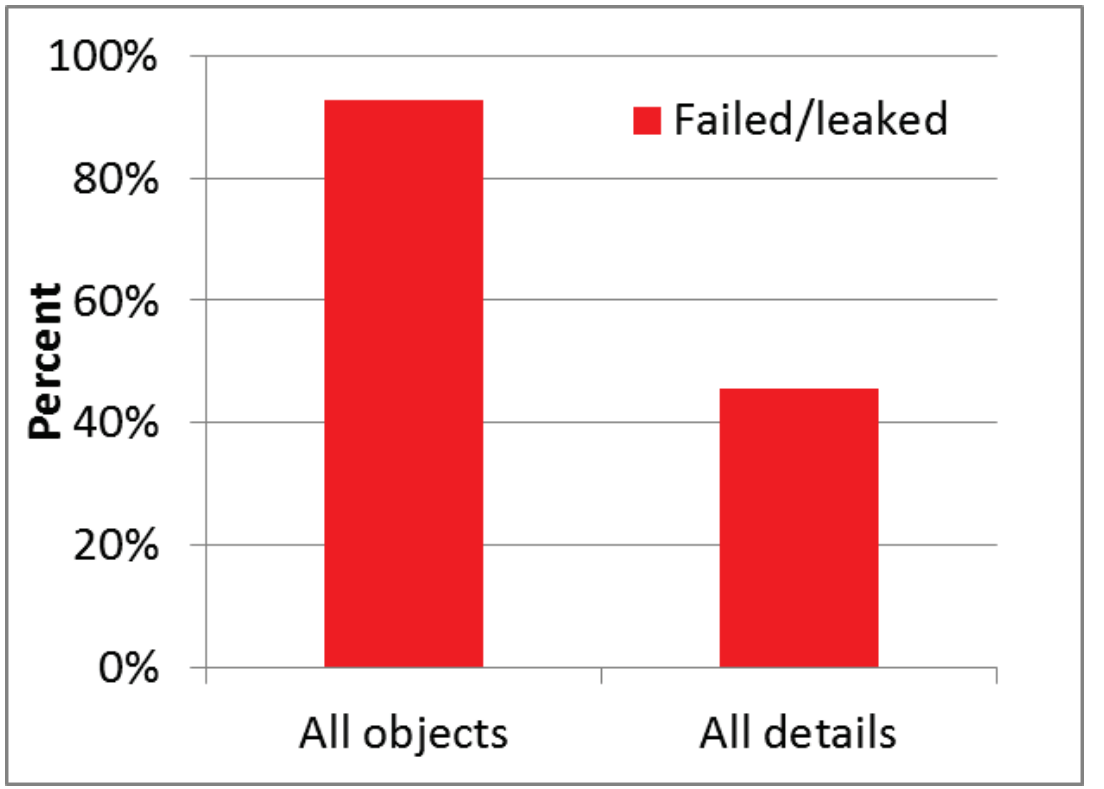
Testing method - Driving rain under pulsating air pressure

- Tests were carried out in accordance with EN 12865 ”Determination of the resistance of external wall systems to driving rain under pulsating air pressure” procedure B in steps of 150 Pa up to 600 Pa, during 5 hours.
- The test object is constructed with the desired or common details
- Verification was carried out both visually and with moisture indicators attached underneath of these details.

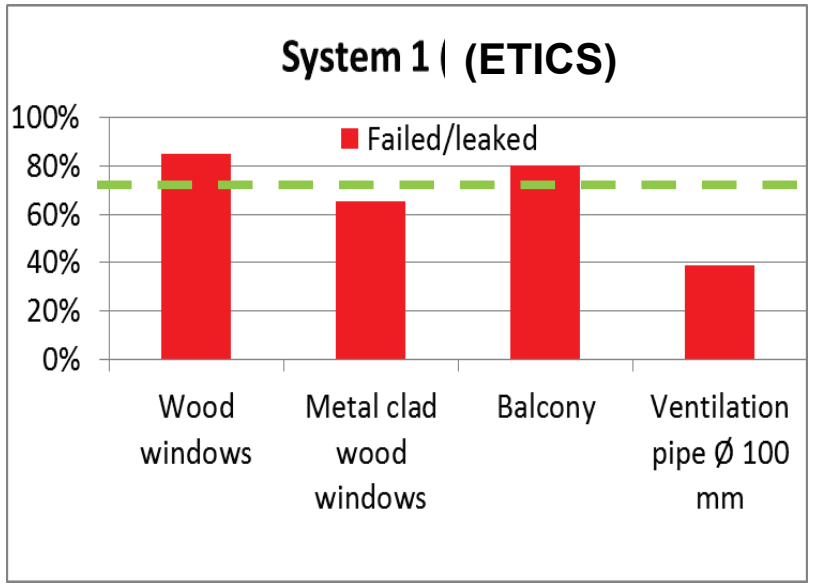


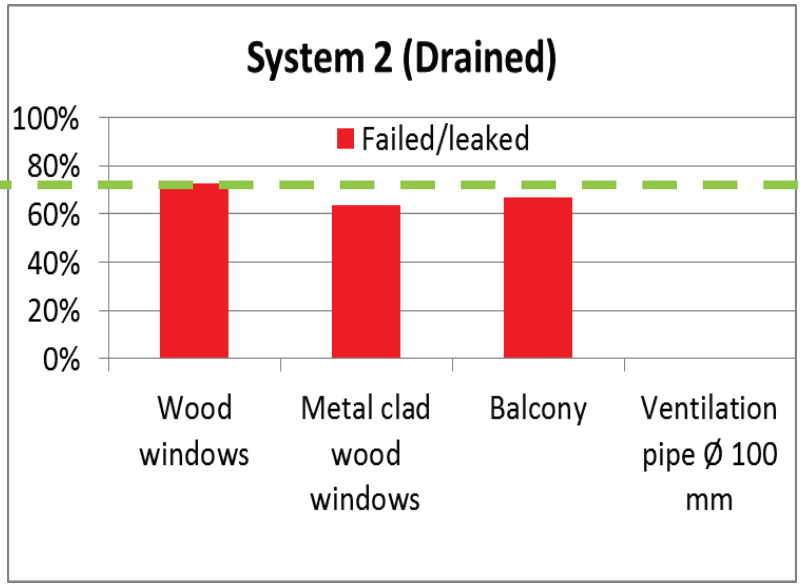
Results

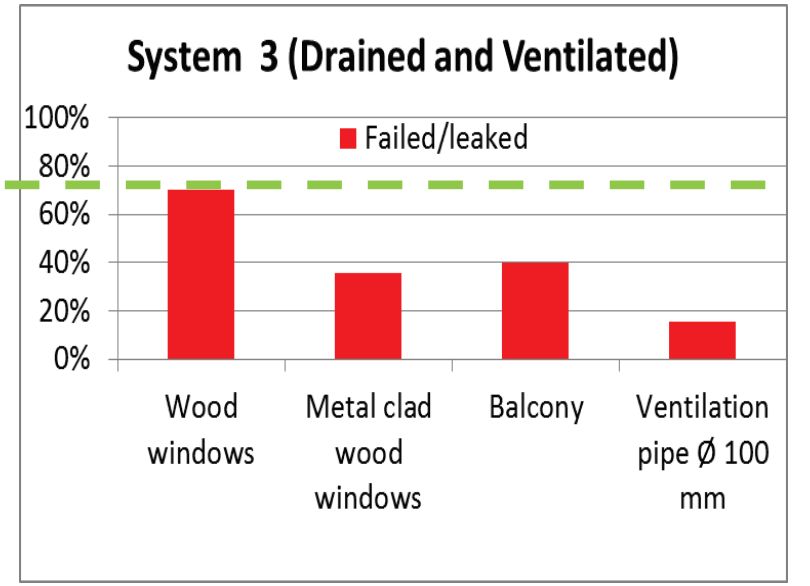

500
400
300
200
100
0
Number
Total number
Failed/leaked
All objects
All details


100%
80%
60%
40%
20%
0%
Percent
Failed/leaked
All objects
All details

Results

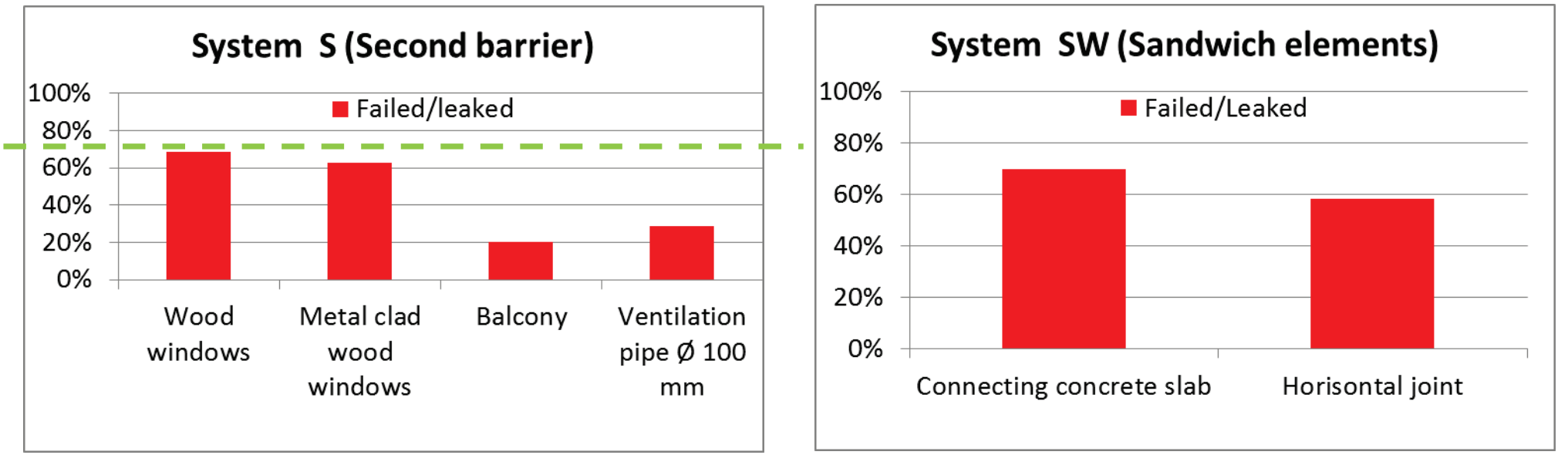






Failed = If water leaks into the air gap, drainage gap, second barrier or futher.

Results



Failed = If water leaks into the structure or further.

Results

Leakage rate for failed objects

Scale for leakage rate

0 - No leaks

1 - One or few drops

2- Continuously dripping

3 - Low flow

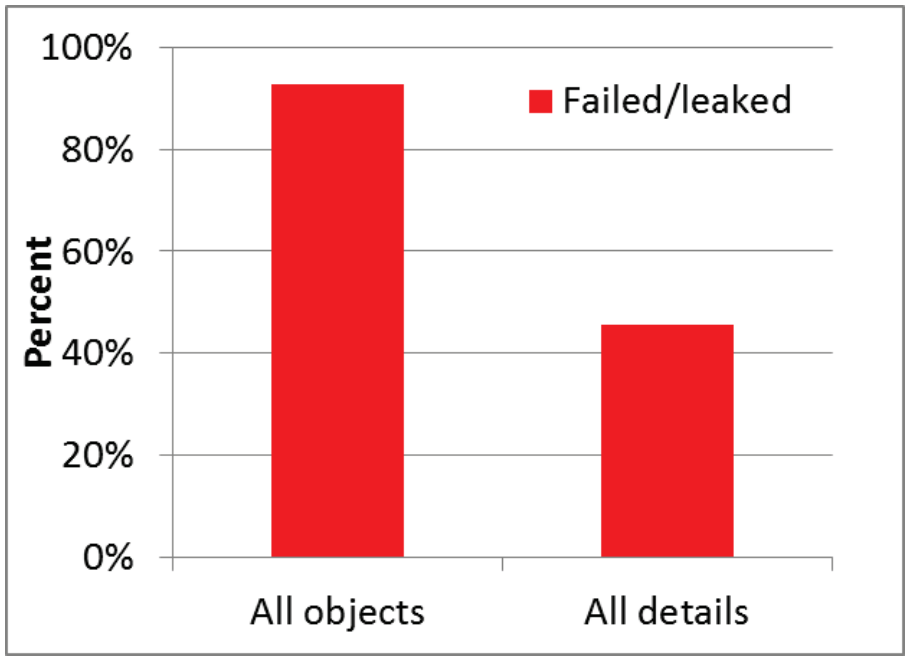
4 - Modest flow

5 - Heavy flow

Estimated rain intrusion rate	Objects with leaks %
1 (≤0,0001 l/min)	20
2 (0.001-0.01 l/min)	53
3 (0.02-0.05 l/min)	26
4 (0.06-0.1 l/min)	2
5 (≥0.2 l/min)	0

Conclusions

- > 90 % of all tested objects failed and nearly 50 % of all details failed.
- The building traditions and practices in force is not enough to build Rain-proof facades and exterior walls.



Further conclusions

- One can rarely visually determine whether detail solutions are rain tight before the test.
- Not either by theoretical assessment of drawings

Recommendations

- New designs and solutions need to be tested and evaluated. Theoretical assessment only is not enough.
- Rain tight solutions need to be very carefully done.
- Ideally, there should be robust designs :
  - that have at least two barriers against rain (even around details),
  - good drainage,
  - without moisture retaining material where water flows,
  - which can dry fast enough,
  - sealing products should be tested for durability and compatibility -

  (Sustain at least 25 years)

Thank you!

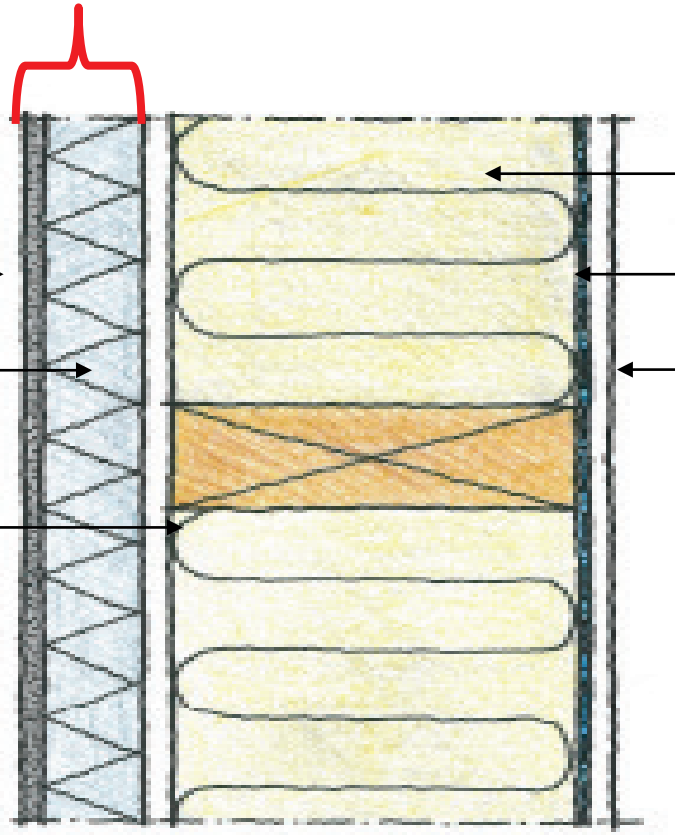
Why is it common with rain intrusion?

- Discuss with your closest classmate, in pair

Background

- During the last few decades well-insulated stud walls with rendered façade (ETICS) have been very popular in Sweden.

ETICS (External Thermal Insulation Composite Systems)



Render/plaster

EPS or MW

Board (gypsym, wood, mineralbased)

MW between studs

Air- and vapur barrier

Board

Outdoor

Indoor

Background

- Combination of these systems with a wood frame structure has shown itself to be sensitive to moisture - revealed in Sweden in 2007.

- Experiences from surveys of more than 1000 buildings show that the problem is moisture entering the structure - for example, at joints, poor connections to windows and doors etc.

(Ref: Jansson 2011)

Background

- The damage is never visible on the surface of the wall, but hidden within the wall.

Photo: Anders Jansson, SP