Laboratory Study of Rates of Inward Leakage in 7 Gaps in a Façade Exposed to Driving rain or Water splash

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Background

- It is more of a rule than an exception that leakage/rain penetrations occurs.

- We don't know exactly how much water usually penetrates.

- More data is needed to be able to do reliable risk assessments.

Purpose

- Investigate the significance of:
  - Water splash
  - Different wind pressures (dynamic)
  - Different rain loads
 - Façade details in combination with small gaps/deficiencies

Method

- EN 12865 *Determination of the resistance of external wall systems to drivning rain under pulsating air pressure* (0, 75, 150, 300, 450, 600 Pa).

- Driving rain: 0 / 0.55 / 1.2 / 1.7 / 2.9 and, 3.6 l/min-m (1,2 l/min-m + 1,5 l/min-m²)

- Procedure A, non-moisture absorbing materials, 20 min/step.

- Water drops were created on outer flashing -water splash.

- In total-100 tests (each conditions were repeted at least 3 times).
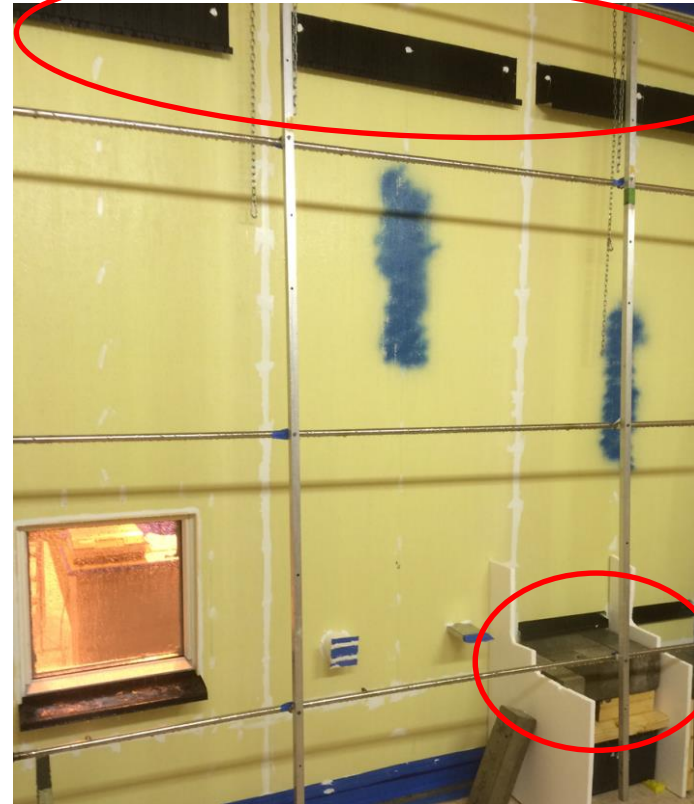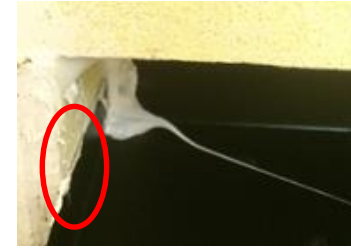
7 small gaps/deficiencies
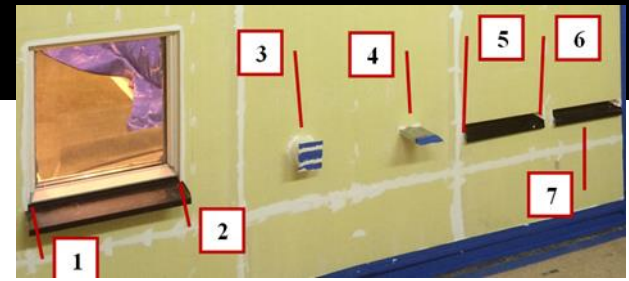
	Gap [mm]
1	(1,5 x 1,5) + (9 x 0,2) + (50 x 0,1)
2	2 x 2
3	35 x 0,9
4	30 x 2
5	40 x 0,1
6	"Not measurable"
7	120 x 0,3

Detail 1

Detail 3

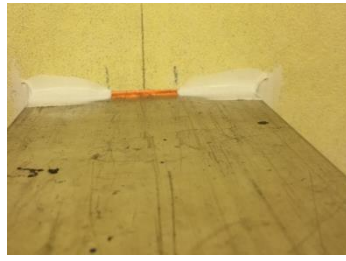

Detail 5

Detail 6

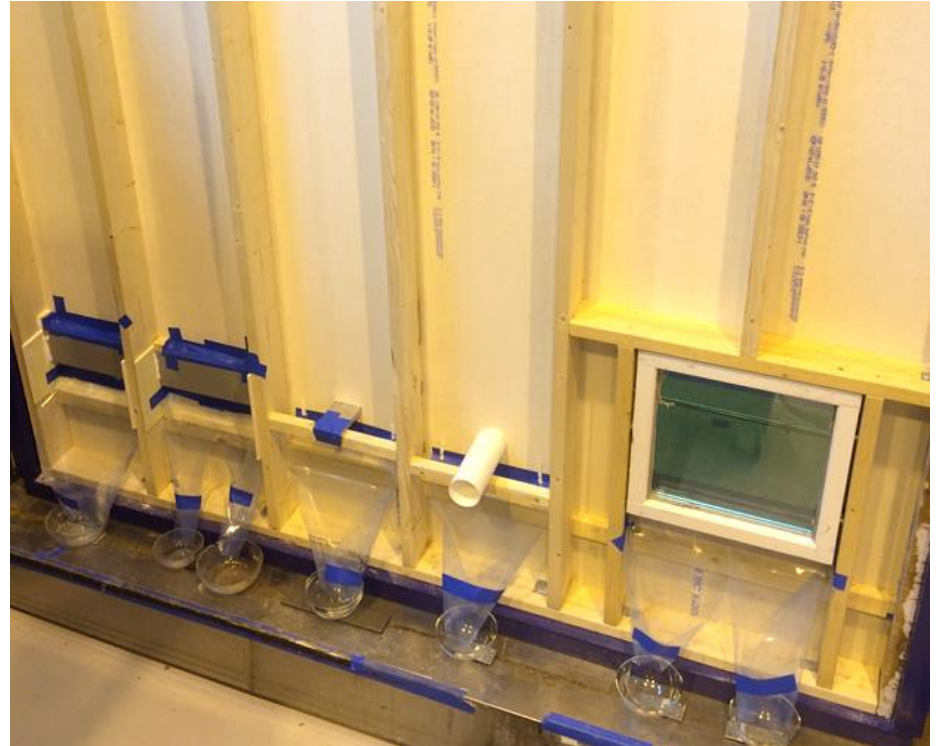Detail 1, backside

Detail 4

Detail 7, backside
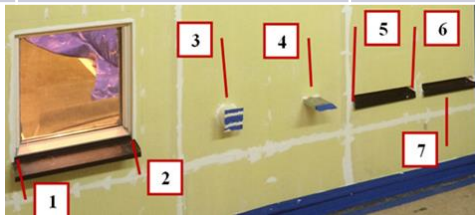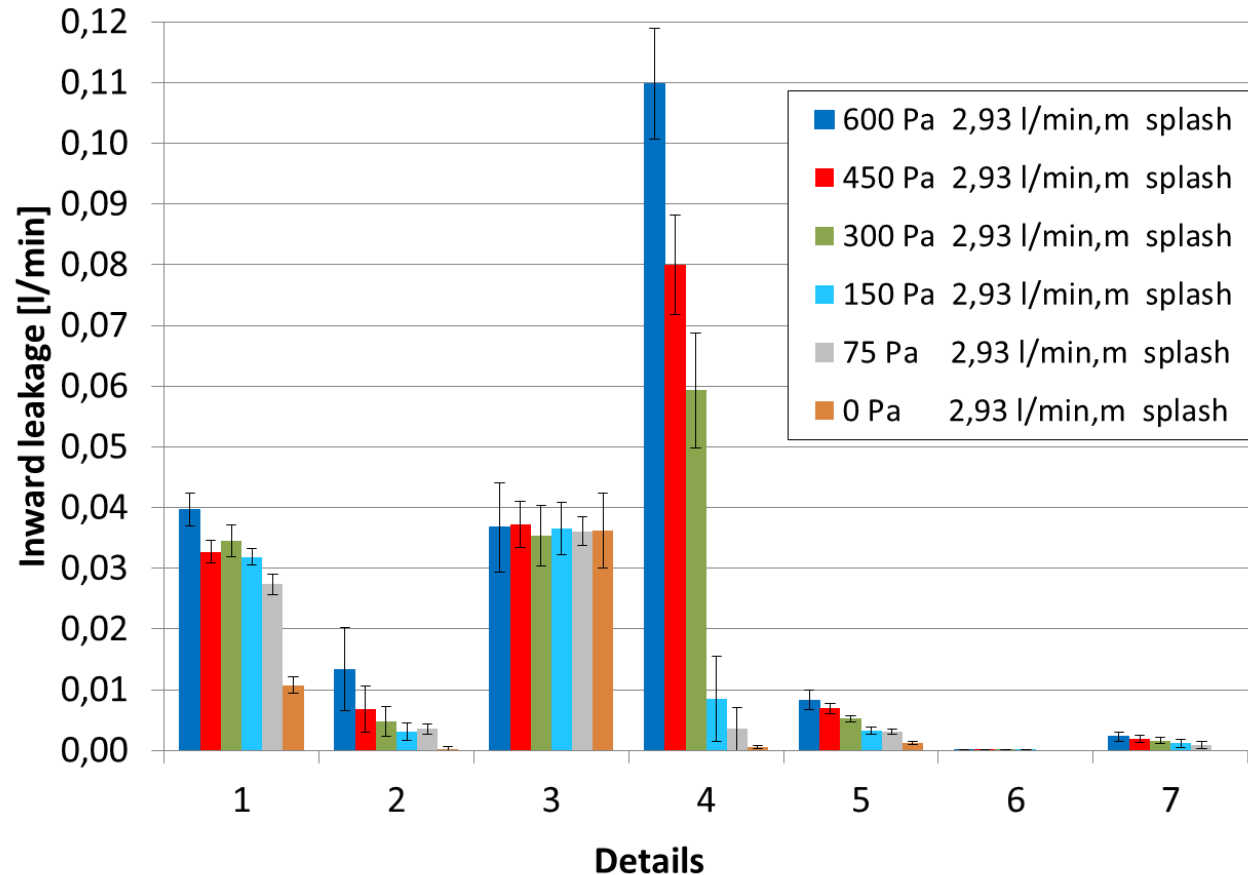

Detail 6, backside

Collecting water on the rear of the façade

Results

	Gaps [mm]	Comments
1	(1,5 x 1,5) + (9 x 0,2) + (50 x 0,1)	Concealed position
2	2 x 2	Concealed position
3	35 x 0,9	Visible
4	30 x 2	Visible
5	40 x 0,1	Not visible
6	"Not measurable"	Not visible
7	120 x 0,3	Concealed position

Results – Water splash
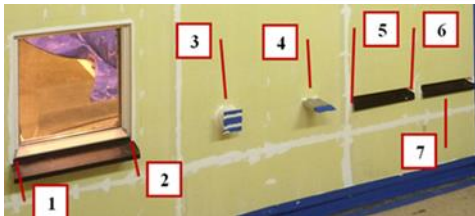
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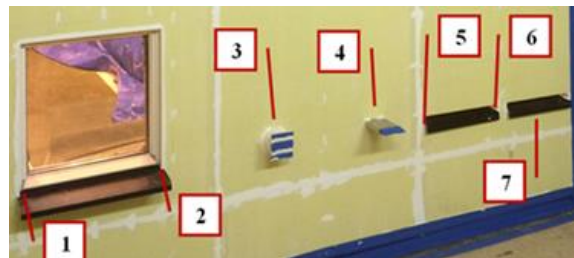Percentage (%) of rain load 2,93 vs 1,22 (l/min-m)
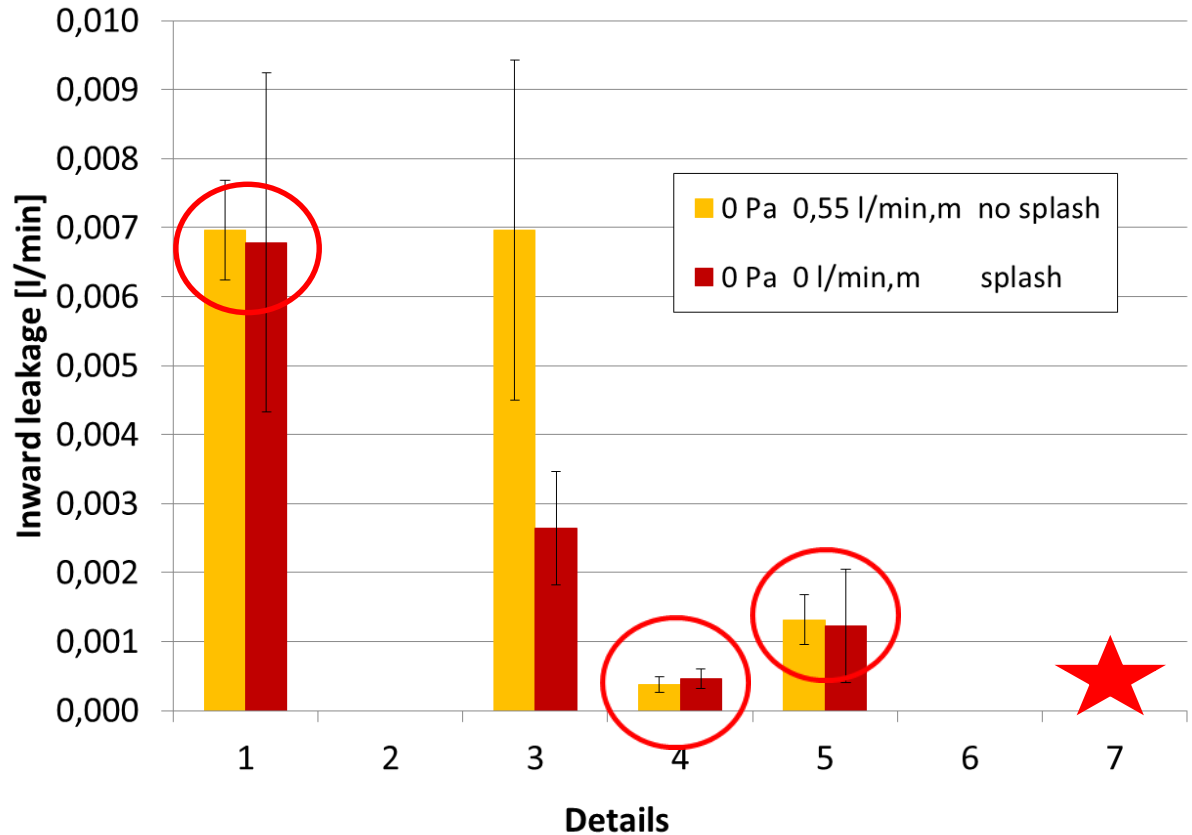
Conclusions

- Significant leakage rate, 0.03 l/min per gap,
  - even small gaps,
  - even without wind pressure (pressure-equalized ventilated façades).

- Leakage rate of 2 % of the applied rain load.

- Water splash on its own can bring leakage - driving rain is not needed.

Further conclusions

Factors
- Run-off
- Surface tension
- Water splash
- Projecting details
- Different gaps
- etc.

	Gap [mm]	0*	75*	150*	300*	450*	600*	No splash	% 1,22 l/min
1	(1,5 x1,5) + (9 x 0,2) + (50 x 0,1)	↑	↑	→	→	→	↗	↘	↑
2	2 x 2	0	↑	→	→	↑	↑	↓	↓
3	35 x 0,9	↑	→	→	→	→	→	→	↑
4	30 x 2	0	↗	↗	↑	↑	↑	↗	↑
5	40 x 0,1	↗	↑	↗	↑	↑	↑	→	↑ ****
6	"Not measurable"	0	0	0	0	↗	↗	→	0
7	120 x 0,3	0	↗	↗	↗	↗	↗	0	→

*Applied rain load 2,93 l/min-m

Thank you!