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Erik Olofsson Augustsson
erik.olofsson.augustsson@sweco.se

FIELD MEASUREMENT TESTING OF AIR TIGHTNESS – EXAMPLE FROM A HOSPITAL PROJECT IN SWEDEN

University Hospital in Linköping Sweden

- 65 000 m^2 new construction
- Goal of total annual energy demand (including operational energy) below 100 kWh/m^2
- Well insulated. U-values for walls about 0.12 W/m^2, K
- The mean air leakage rate at 50 Pa should not exceed **0,2 l/s, m^2** (envelope area). If this number converts into air changes per hour (n_{50}) it is equal to **0,116 h^{-1}.**

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Field measurment testing of air tightness on site in early stage of production

Measurments

1) Spot-checks of parts of the building envelope, for example a floor divided into parts by temporary stud walls with plastic film
2) Measurement of building parts
3) Measurement of a whole floor and techniques to identify leakage sources with smoke machine and infrared camera

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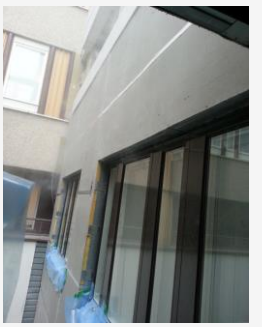
- Spot checks, temporary box, smoke machine





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- Testing of individual building parts

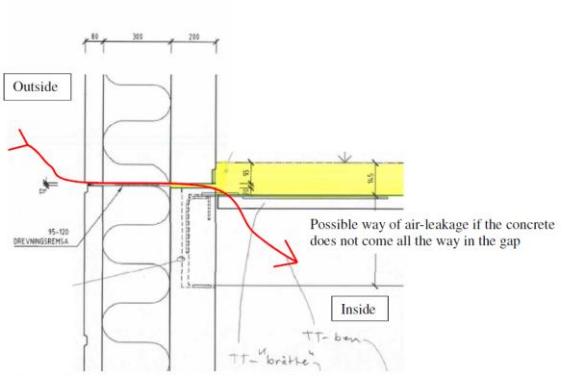

Figure 5. Outer wall construction drawing with possible air leaks in the gap between concrete elements

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- Testing of a whole floor

Date	Floor nr	Envelope area	Pressure in test (Pa)	Leakage flow (l/s)	Air permeability at 50 Pa (l/s, m^2)
2014-02-09	15	2267	-50	930	0,41

Conclusions

- Qualitative results as well as quantitative results can be used to improve the building process
- Smoke visualisation in combination with thermal imaging gives a good understanding for most people were the leakage is and if it is large or small
- Qualitative results does not relate to the goal for air-tightness that the project aim to achieve.
- Measurement of air-tightness of a whole floor is connected to some major difficulties as the potential leakage area is large and possible air-leakage to other floors through shafts etc. are many. The results from the measurement can be improved if it´s possible to perform back pressure on the adjacent floors.

Conclusions

- The results show, after that the air-tight measurements was started, that the building process has improved. A clear work preparation description can be a way to achieve a better standardization of the work. The work preparation should include figures and photos that show how different constructions should be sealed and what should be done if the plastic is broken.
- Another problem to achieve an air-tight building is that nevertheless the building is air-tight after the construction work, there is still a problem with other entrepreneurs that provide electrics or ventilation that might broke the air-sealing
- Last, a design that emphasise air-tightness is the first step to achieve an air-thigh building