

Mold Growth Risk in Wall Retrofitted with Vacuum Insulation Panels

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Introduction

- EU 2020: 20% reduction of GHG emissions
- Existing building stock energy retrofitted
- Listed buildings exterior appearance should not be altered
- Interior insulation might cause moisture problems in the construction
- Vacuum insulation panels applied on the exterior of an existing wooden wall



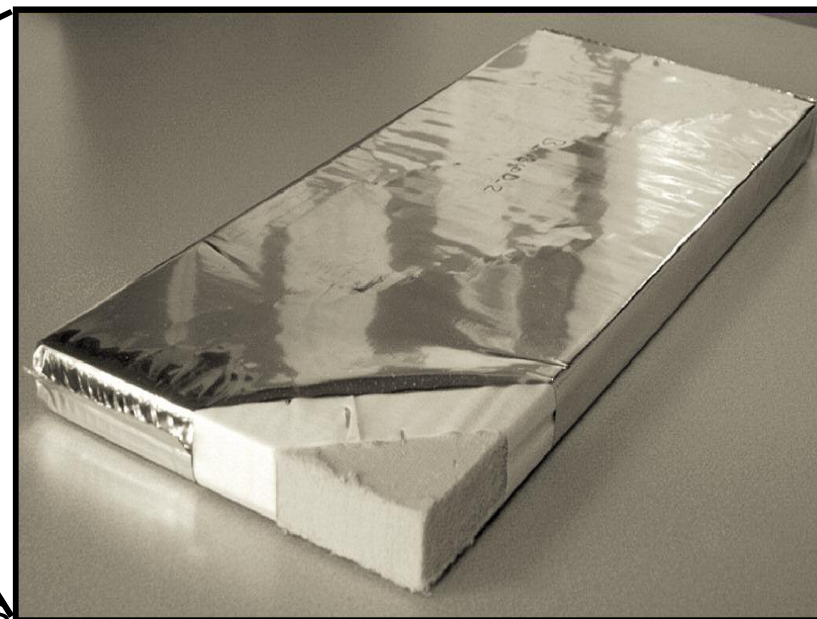
Before



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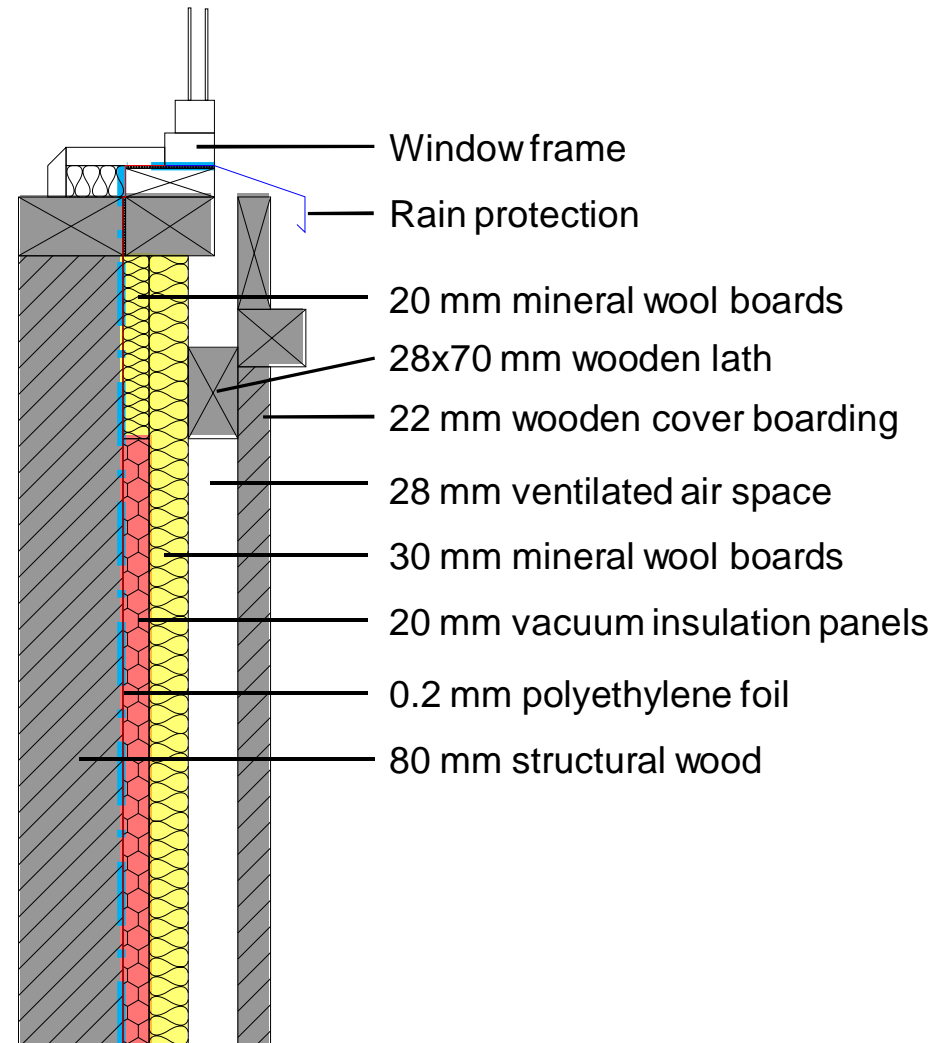
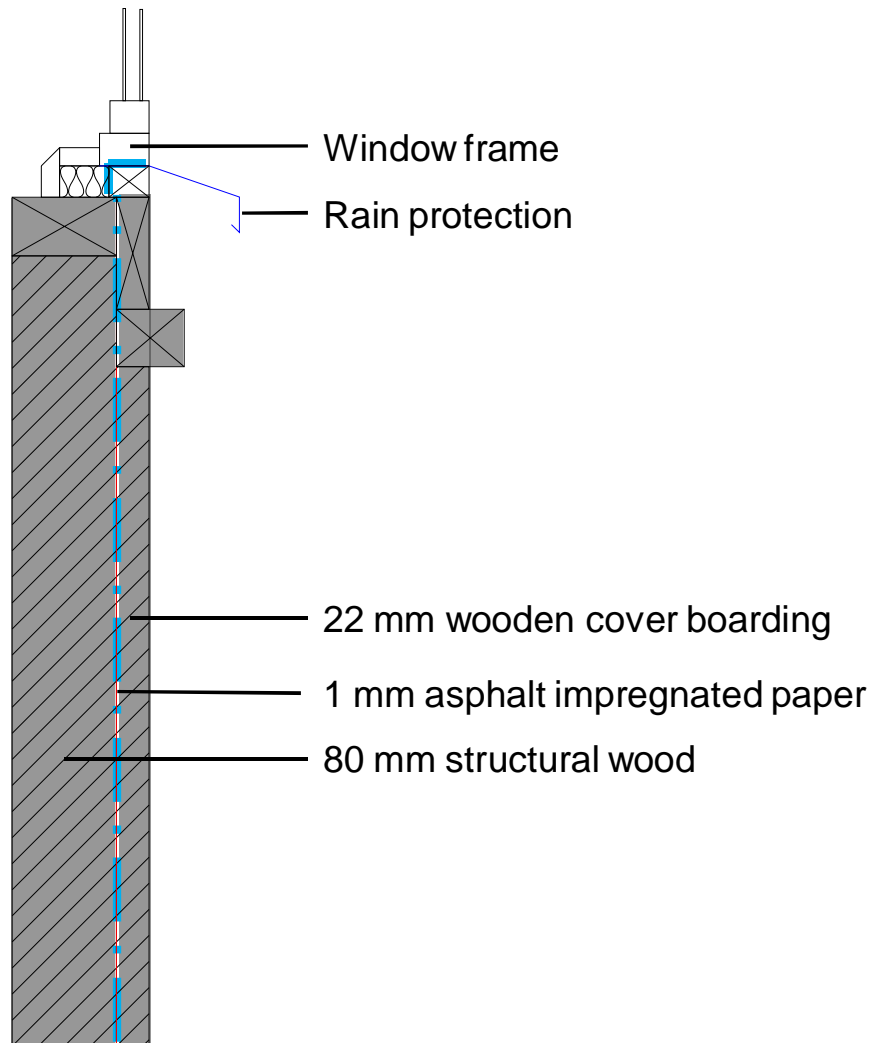
After



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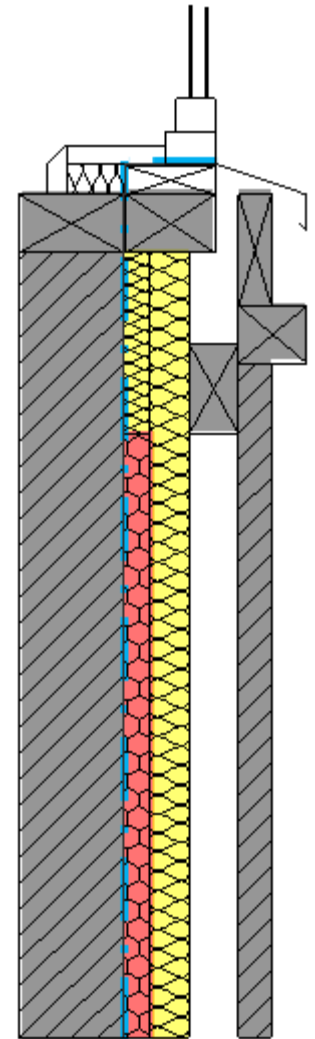
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Wall section

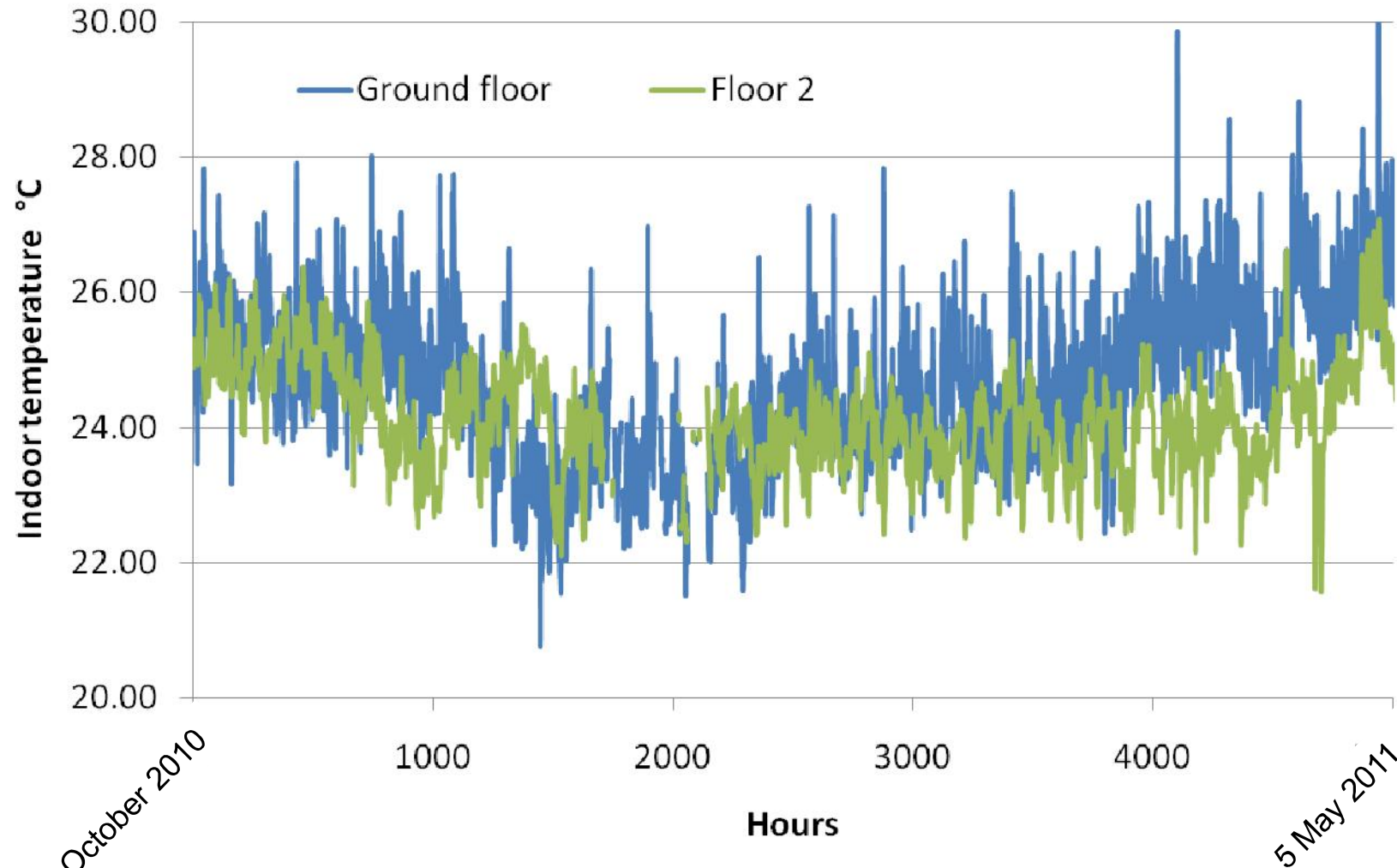


Research questions

- Original wooden wall was diffusion open and a vapour barrier was added after retrofitting, built in moisture
- Influence on the hygrothermal state by punctured panels
- Thermal bridges, 5 cm mineral wool around windows
- Measurements in the apartments showed a higher temperature in the apartments than normal
- Measurements in the wall → simulations give expected results

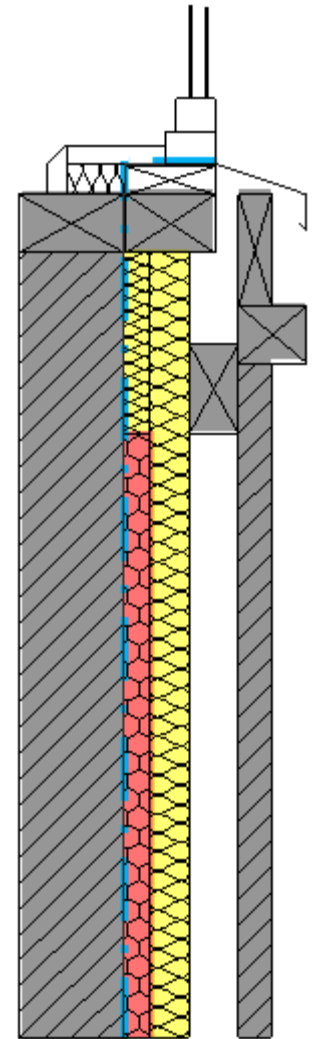


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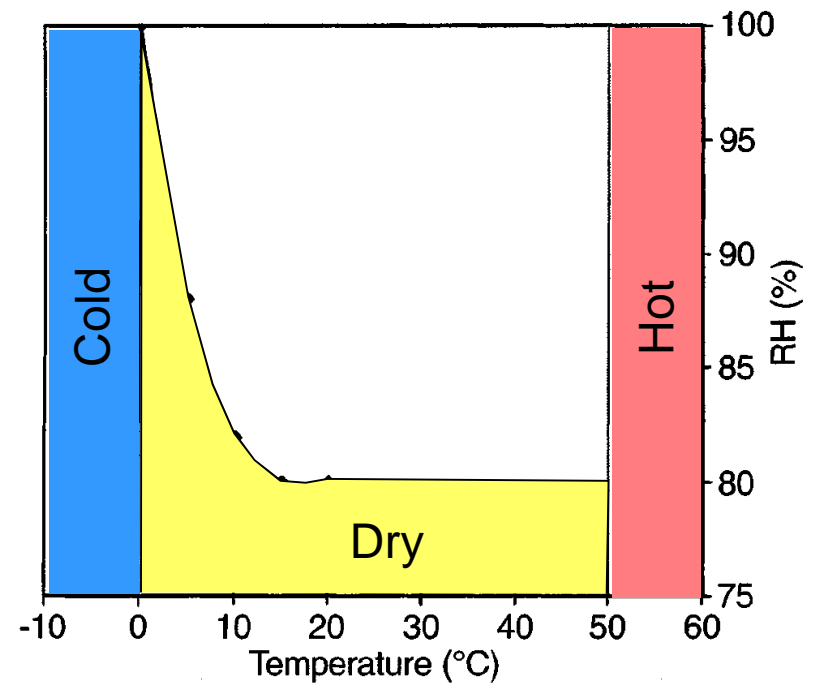
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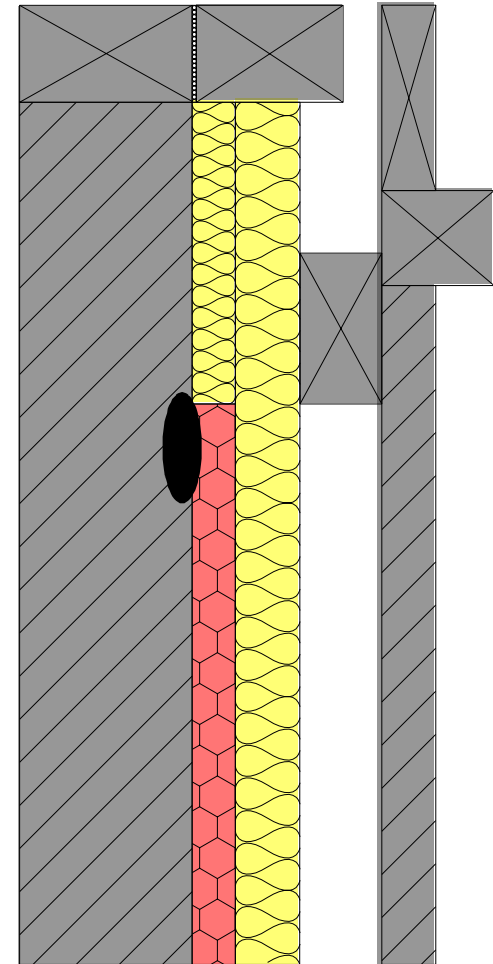
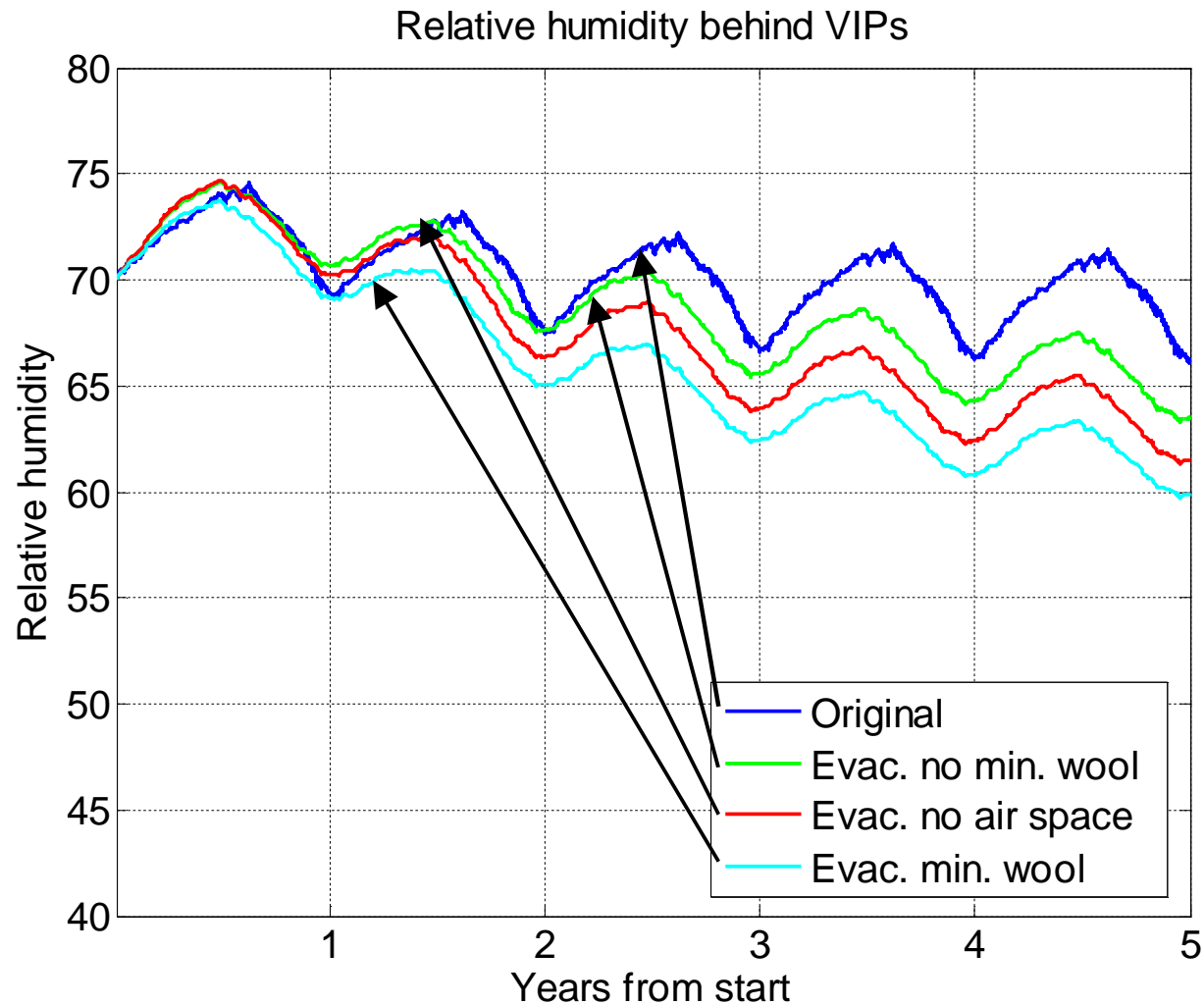
Mold growth potential

- Hukka, A. & Viitanen, H.A., 1999
- Model based on observed mold growth on wood

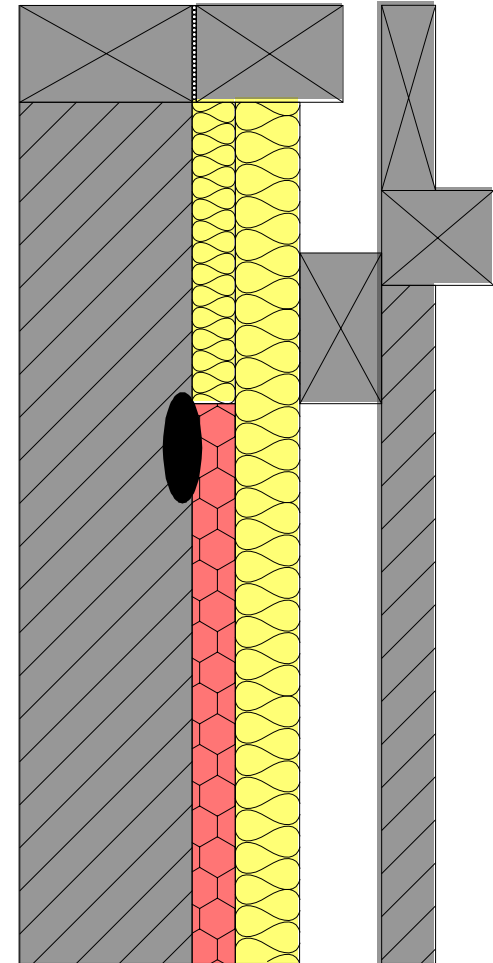
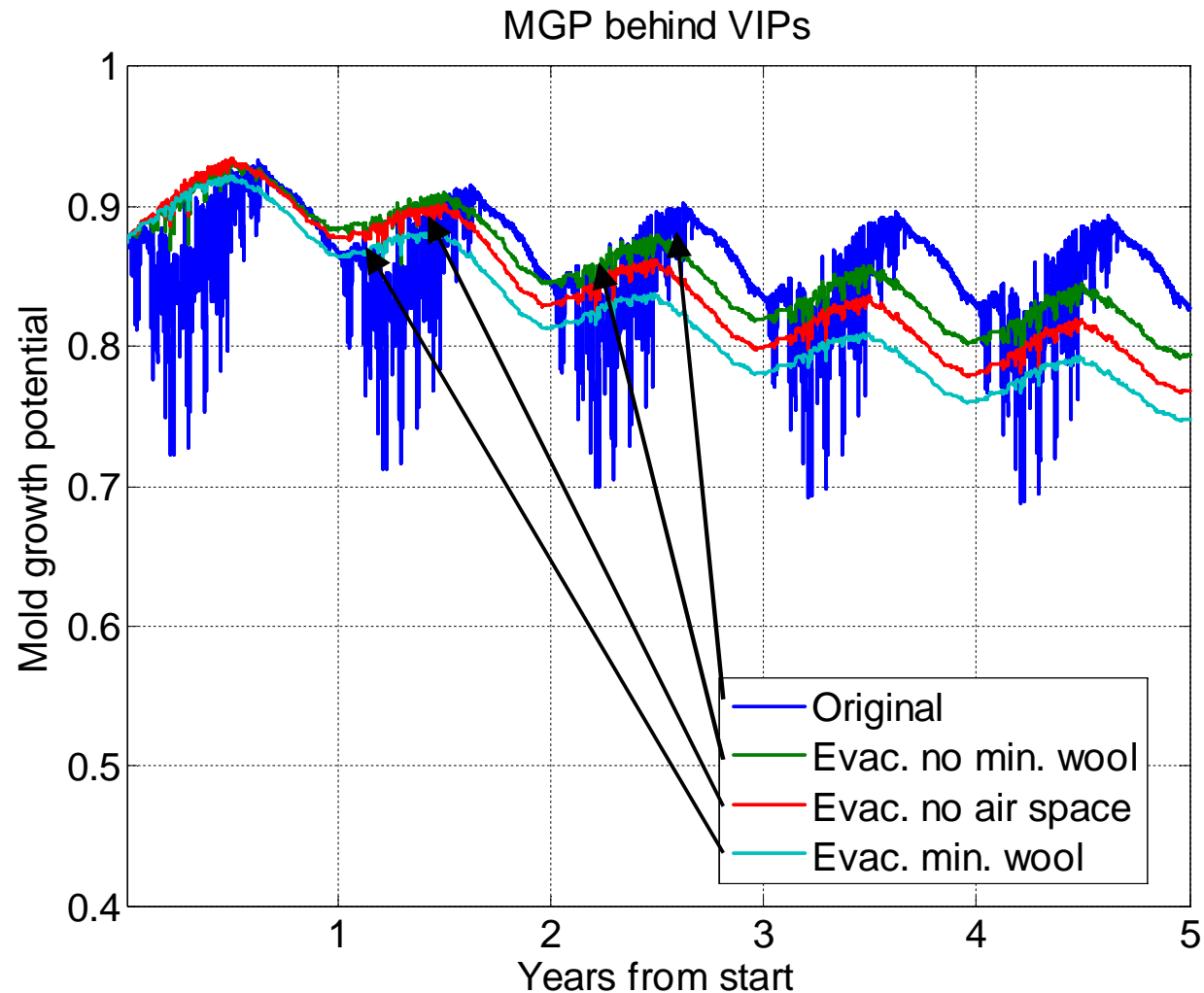
$$m = \frac{RH}{RH_{crit}}$$



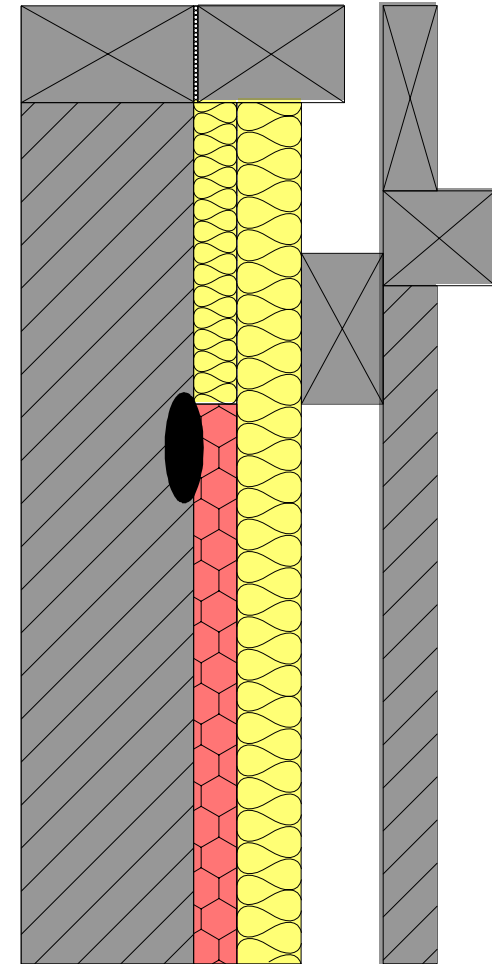
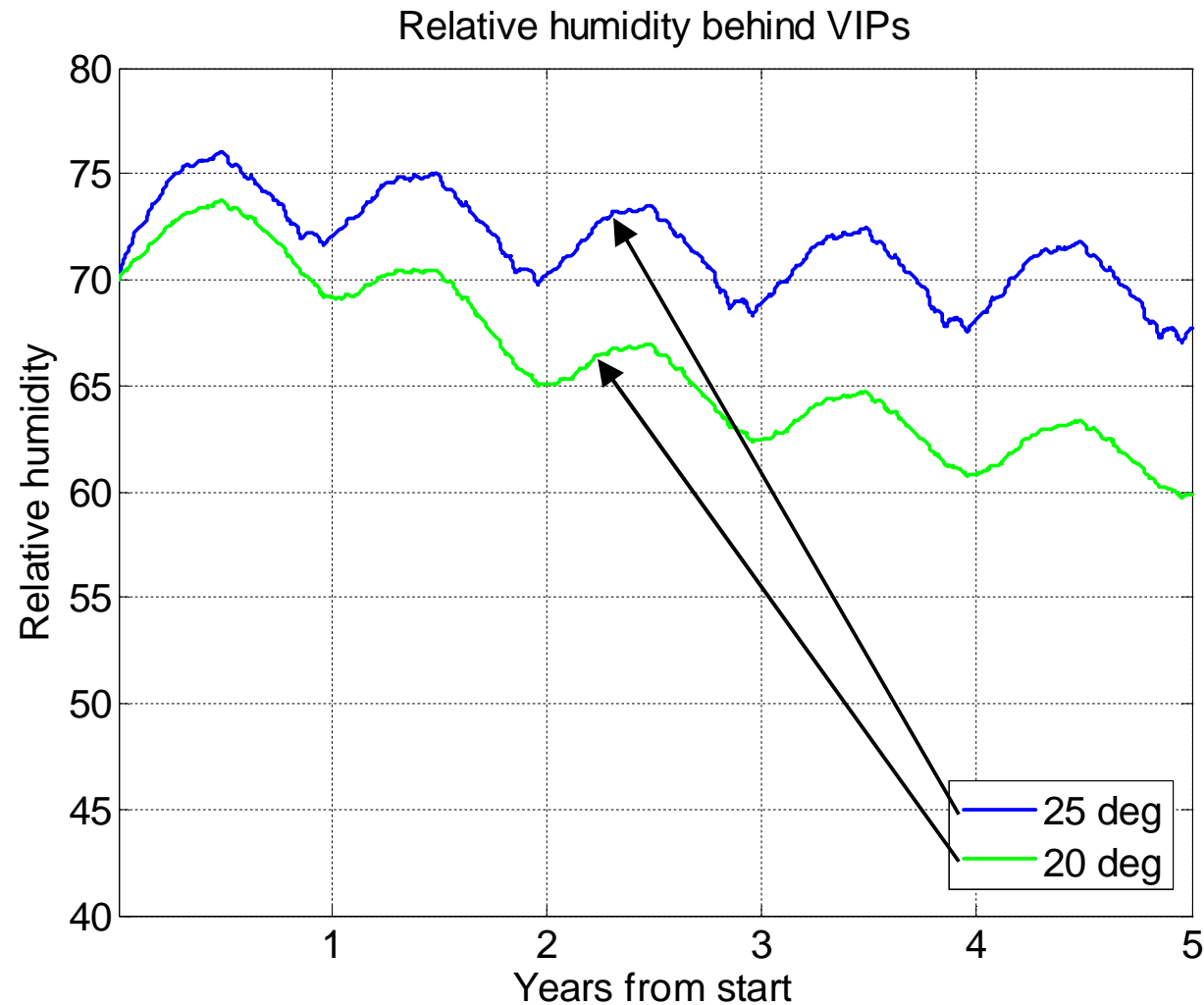
5 years of Gothenburg climate



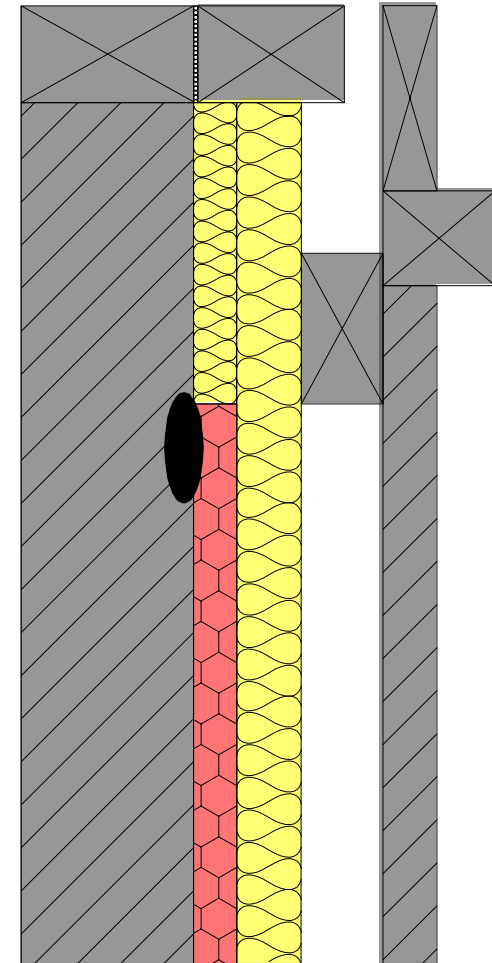
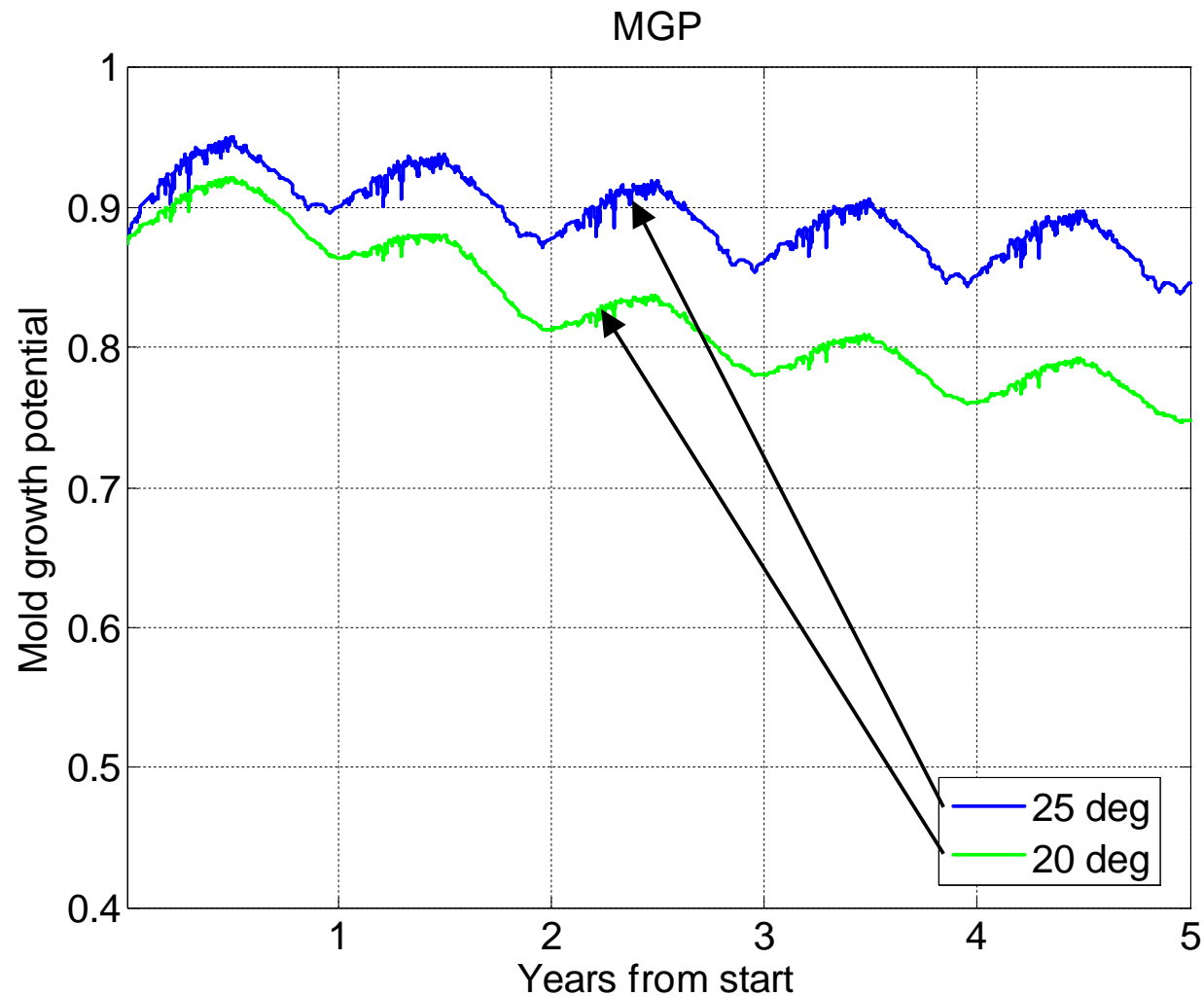
5 years of Gothenburg climate



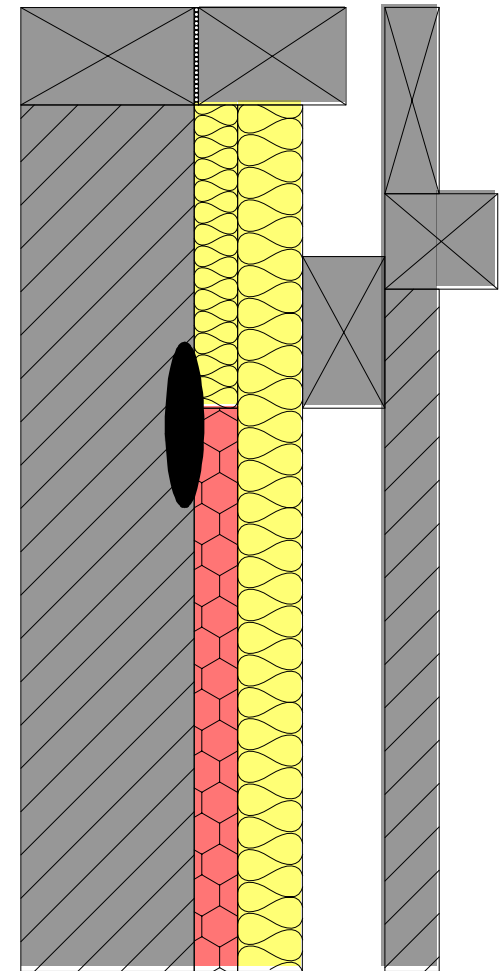
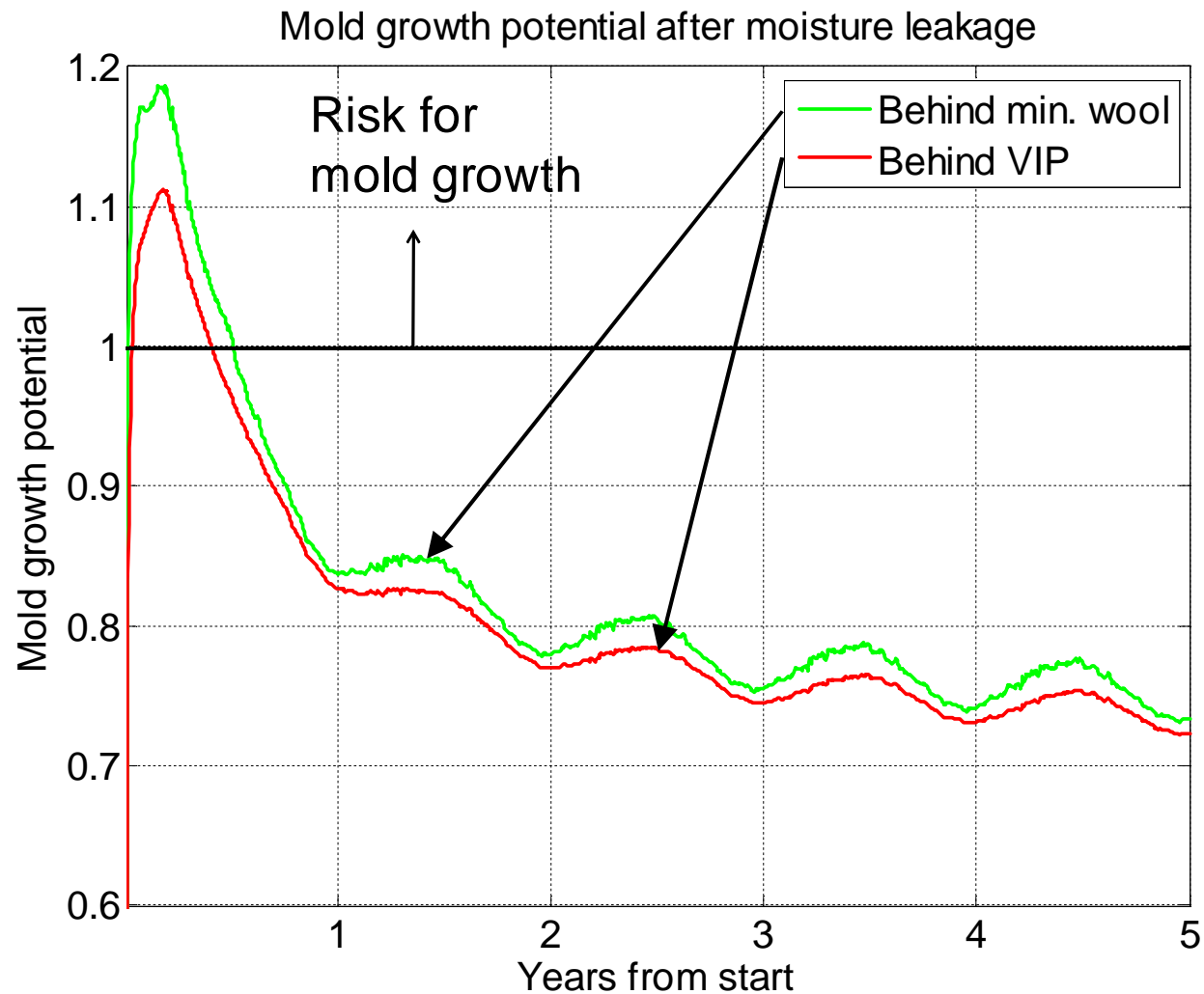
Higher indoor temperature



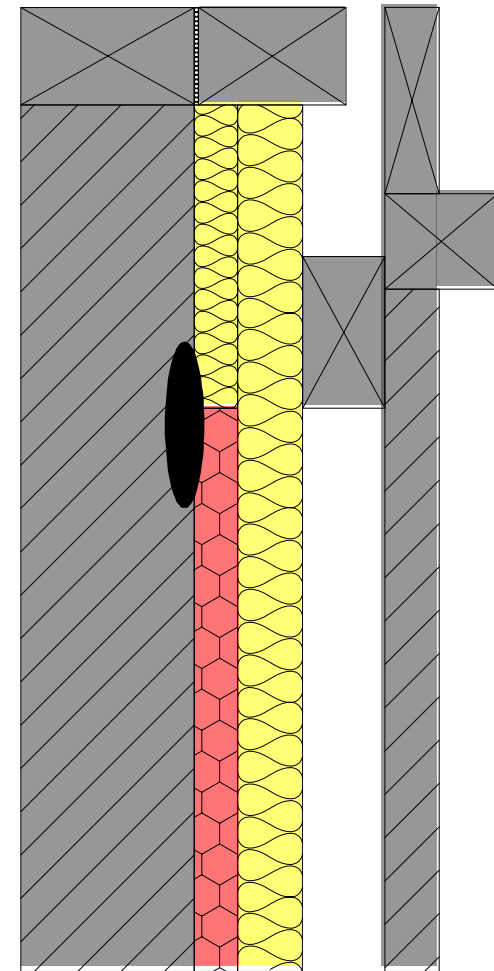
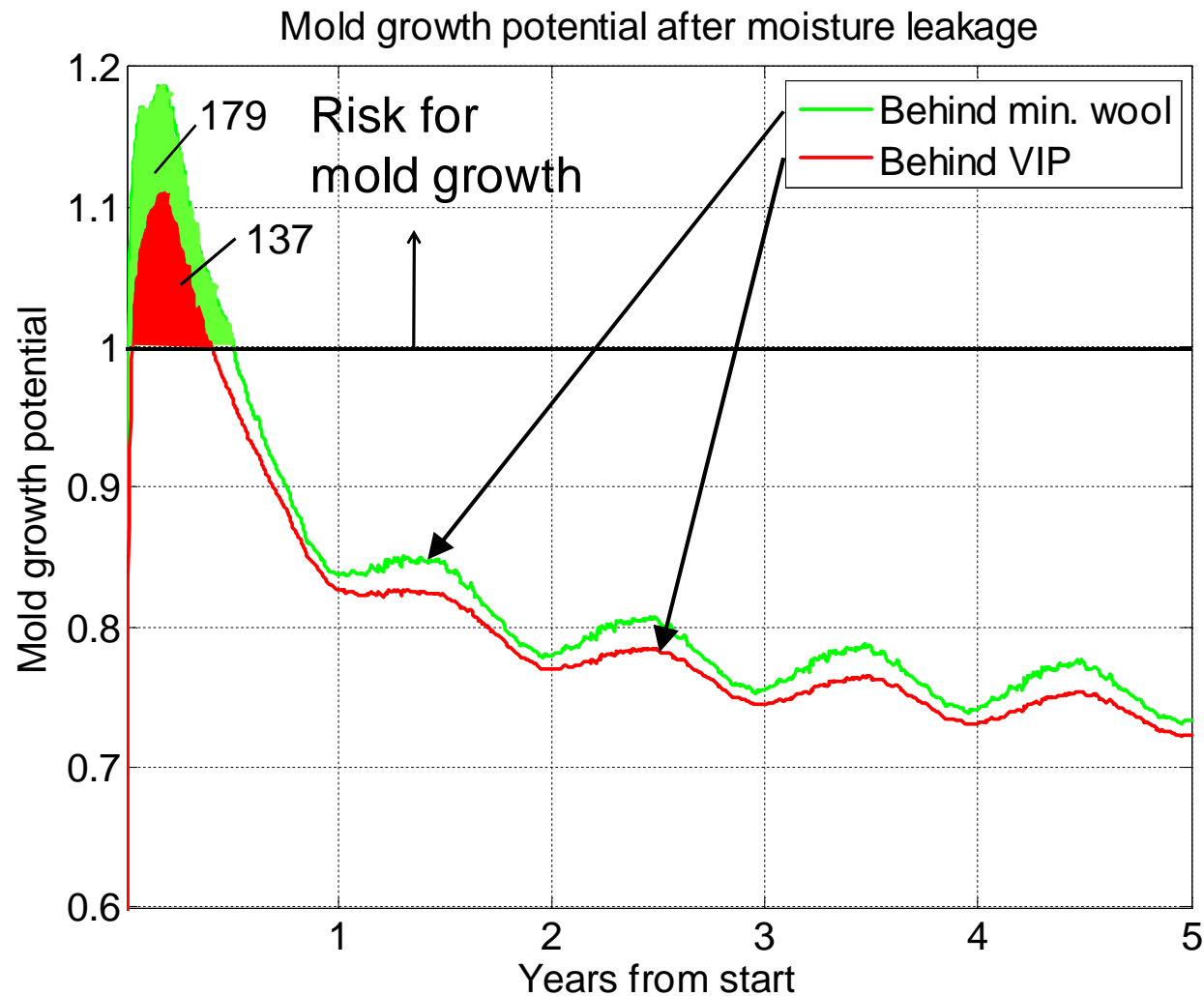
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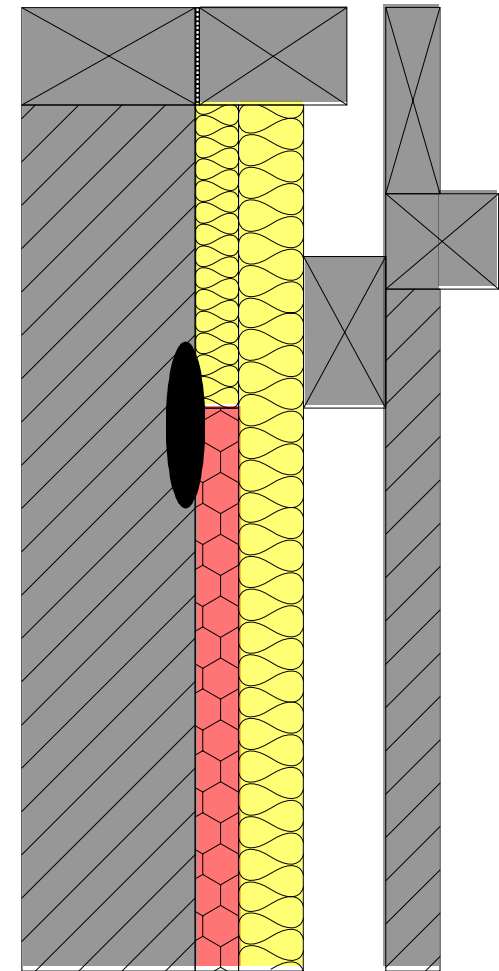
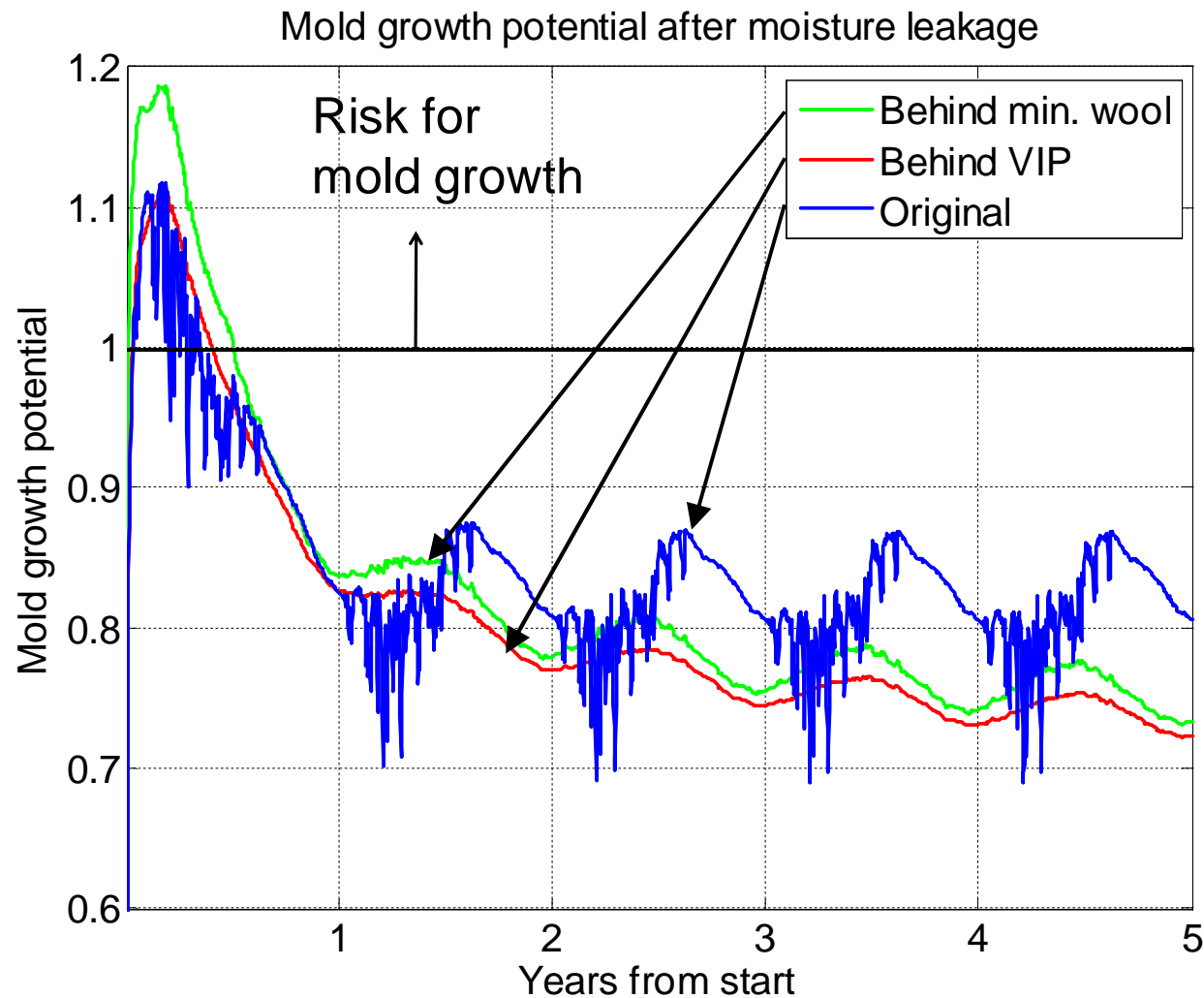
Built in moisture



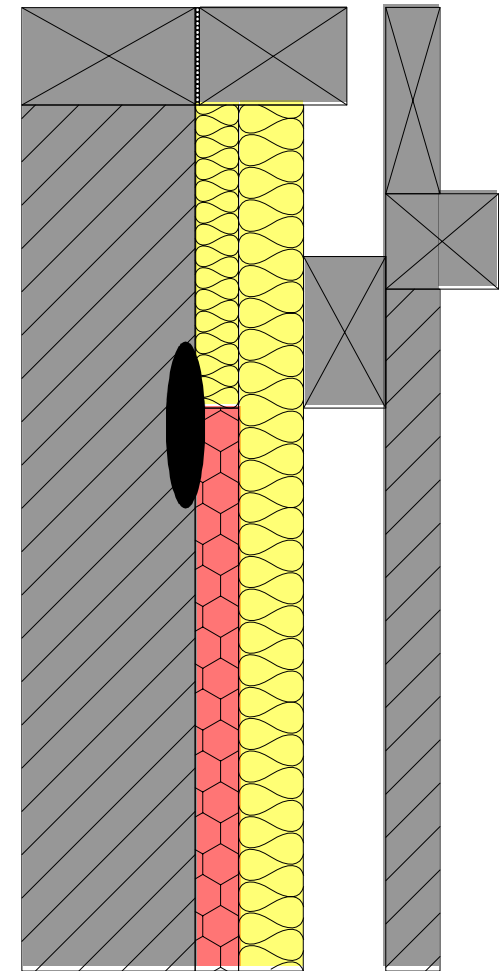
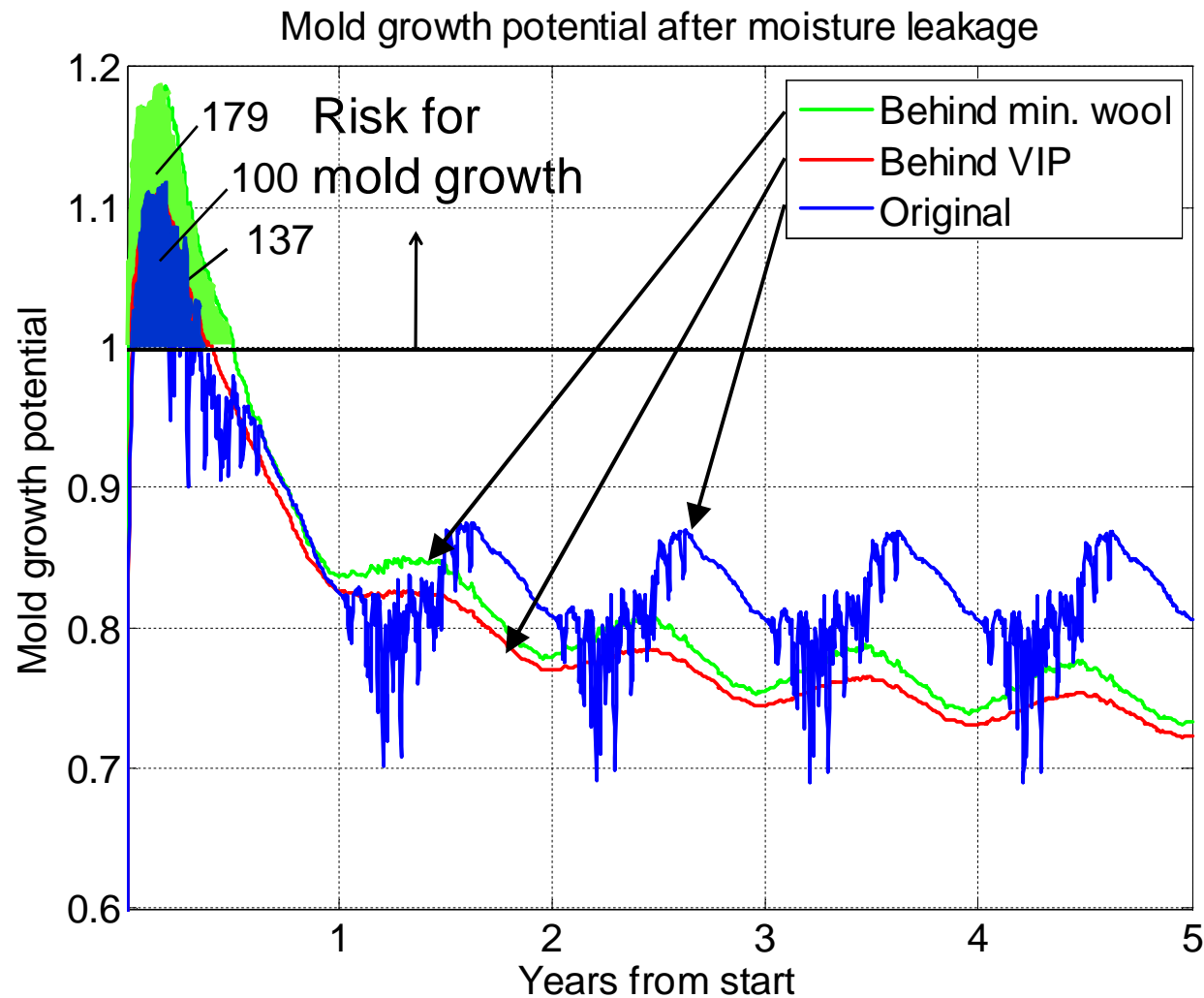
Built in moisture



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Built in moisture



Conclusions

- 5 year simulations with Gothenburg climate showed that the mold growth potential in the wall will decrease compared to the original case
- All the tested designs showed decreased moisture content
- Built in moisture is allowed to dry out through the wall
- Drying time is increased with the added vapour barrier and VIP
- No large change in the hygrothermal state if a panel is punctured