Influence of hydrophobation and deliberate thermal bridge on hygrothermal conditions of internally insulated historic solid masonry walls with built-in wood

A large share of the Danish building stock contains historic multi-storey buildings. A considerable energy saving potential exists, achievable through thermal insulation of the façades. Previous research has elucidated problems regarding poor hygrothermal conditions when interior thermal insulation is applied to the façade, but examples exist with positive results.

Eight 1×2m solid masonry test walls with wooden members were installed in an insulated container. The hygrothermal implication of applying 100mm AAC as interior thermal insulation system was investigated with variations including use of hydrophobation and substitution of insulating material with a deliberate thermal bridge.

Relative humidity and temperature were monitored in the walls over 2 years in 10 measurement points. The amount of wind driven rain was monitored with rain gauges and calculated from climate station data. The indoor excess of humidity by volume corresponded to the highest indoor climate class for dwellings.

Damage models indicated risk of mould growth in the insulation/masonry interface, and risk of wooden decay in the wall plate for the reference and insulated case. Hydrophobation of the exterior surface in tempered cold climate reduced the overall relative humidity, although it increased during winter due to a reduced dry-out potential towards the outside.

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