Folehaven

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PUR-foam with channels of capillary-active material – solution B

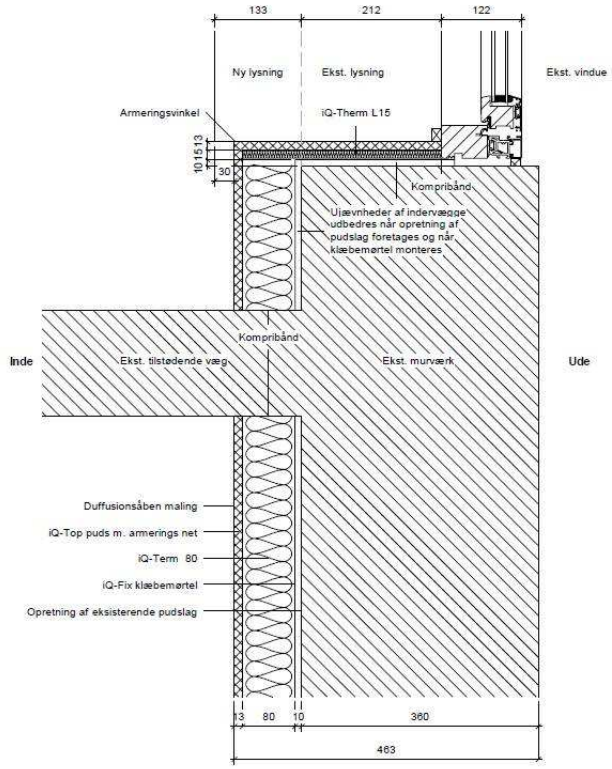
Walls

What is the solution?

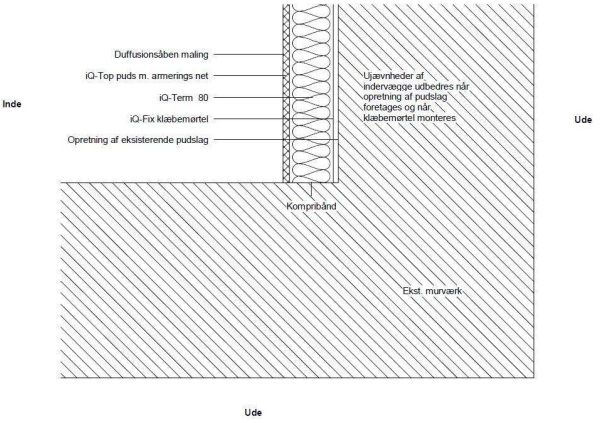
Internal insulation of 360 mm solid gable walls made of brick and lightweight concrete (110-230 mm outer layer of brick with holes, layer of concrete, and 10 mm interior plaster) using 80 mm PUR-foam (lambda 0,031 W/(m K)) with thin calcium silicate channels every 40 x 40 mm, making the insulation capillary-active to some extent. Any irregularities in the original inner surface (render) are levelled by means of plaster and glue mortar before applying the insulation blocks. The average U-value of the wall is reduced from 1,05 W/(m2 K) to 0,65 W/(m2 K) (calculated values).

Cross section of the wall build-up, available pictures of the solution:

Drill core of the wall structure. © AAU

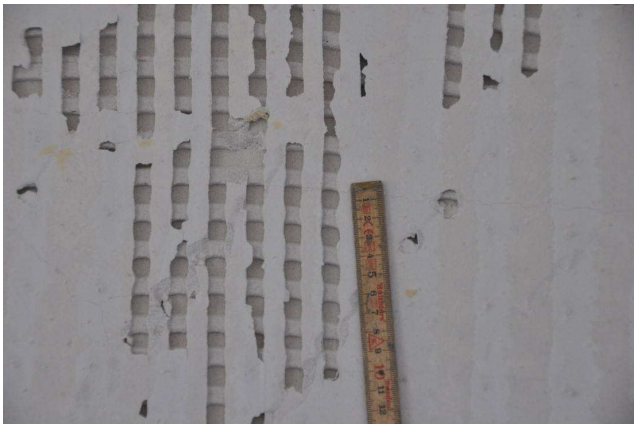


Internally insulated gable wall, 80 mm of insulation (PUR-foam with thin calcium-silicate channels). Horizontal cross-section between external wall (insulated) and internal wall, including details at window (window sill insulated). © AAU



Internally insulated gable wall, 80 mm of insulation (PUR-foam with thin calcium-silicate channels). Corner between gable wall (insulated, at right) and facade (not insulated, at bottom), horizontal cross-section. © AAU

View of gable wall after removing the internal insulation, to look for mould growth two years after installation. No mould growth was identified, however the view shows that the insulation system did not fully bond to the existing wall. © AAU



Close up of the wall showing the size of the areas with no bonding. According to the producer, opening of max 4x4 cm are accepted © AAU

Installation of internal insulation © AAU

Installation of internal insulation © AAU

Why does the solution work in terms of compatibility with conservation, moisture safety and energy improvement?

There was no sign of moisture-related damage after three winters, though these were mild winters compared to normal Danish winters. Energy saving was around 20 %. Insulation can be removed as it is added as an extra layer to the existing construction. However, the existing wall may have to be repaired afterwards. The solution was chosen based on energy efficiency, not conservation compatibility.

Description of the context:

Internal insulation was used as part of the Copenhagen municipality policy to reduce energy use in buildings by 20 % by 2025, while keeping the appearance of dwellings unchanged and improving the indoor climate and comfort. Existing interior surface (rendering) was cleaned for any organic material before

applying the insulation system to remove any remains of organic material before its installation. Wooden laths were applied at the inner surface to give the inhabitants the possibility to hang paintings or other things on the walls without damaging the insulation. In some of the test apartments, the insulation was removed again after two years to see whether there was any mould growth at the interface between the insulation and the original wall.

Pros and cons of the solution:

So far, the solutions have worked for three (mild) winters (2015-2018). Long term behaviour remains to be seen. However, based on the experience from the test apartments, the municipality wants to apply internal insulation in the whole development, consisting of 932 apartments (not decided yet). As the system is glued directly to the existing wall it is not easily removable and inspection of conditions behind the insulation is only possible by means of sensors installed together with the insulation.

Type of data available (level of information, simulation):

Hourly based measurements (RH, temperature) from test apartments since autumn 2015.

Is there any related publication? If yes, please provide any available link or document for further reading

https://www.hiberatlas.com/smartedit/projects/203/Renovation with Internal Insulation and Heat Recovery in Real Lif.pdf
Paper - Renovation with Internal Insulation and Heat Recovery in Real Life–Energy Savings and Risk of Mold Growth
https://www.hiberatlas.com/smartedit/projects/203/Energy savings and risk of mold growth in apartments renovated with internal insulation.pdf
Paper - Energy savings and risk of mold growth in apartments renovated with internal insulation