Timber-framed barn in the north of France

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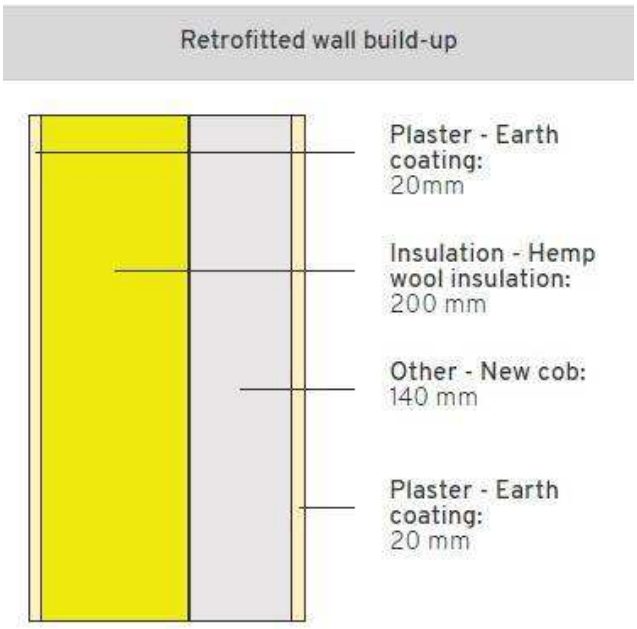
Hemp Wool

Walls

What is the solution?

This solution consists in insulating a timber-framed wall with 20 cm of hemp wool on wood frame. It was then rendered with earth on chestnut laths. No airtightness membrane was installed because the render is naturally airtight when well dosed and executed. A vapour control layer can be installed if the render is not sufficiently air-tight. Other bio-based insulation could have been possible (cellulose wadding, wood fibre insulation, sheep wool, etc.) The exterior façades were rendered with a lime and clay plaster. Between the wooden frame and the render, the plaster is being processed at 45° to the outside. This allows the wind-driven rain to be evacuated away from the wooden frame. All renders were executed in Spring, in order to let them dry long enough.

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



Cross section for a retrofitted wall insulated with hemp wool

Chestnut laths as a support for the earth render

Rendered inner walls

The internal insulated timber-framed barn (Cerema)

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

Hemp wool is a bio-based insulation that is well adapted to the hygrothermal behaviour of heritage buildings, especially those with cob. Like cob, this insulation system (hemp wool and interior earth render) is indeed vapour-permeable, so moisture can migrate from the inside of the building to the outside through it. However, moisture has to be manage with a vapour control layer when the insulation system is too vapour-permeable, because internal condensation could occur if it is the case. As it is crucial when retrofitting for several reasons to have an airtight building envelope, this kind of internal insulation technique has to come with an airtightness barrier. This is here the role of the interior earth render. It is also crucial to limit at minimum thermal losses. That is why a large thickness of insulation is required. Besides, the frame between which the insulation is placed has to be in wood and not in metal in order to avoid thermal bridges. The internal insulation technique is well adapted to timber-framed buildings with no interior decoration, as an exterior insulation technique could hide the frames that have often a strong heritage value.

Description of the context:

This timber-framed building is located in Saint-Samson-la-Poterie in the Oise region (northern France), over Paris, and especially in the natural region called "Pays de Bray". It was the barn of a landlord housing of the 17th century and it has recently been retrofitted and restored by the owner himself. A careful work on the materials and on the execution was made.

Pros and cons of the solution:

The pros for this solution are a hygrothermal behavior adapted to heritage buildings. A good airtightness when installed with an airtight barrier. A good thermal performance when installed in a sufficient thickness and with wood frame instead of metal one. A technique adapted when the exterior has a strong heritage value. The cons for this solution are the need to be sure that the insulating system is not too vapor-permeable, because internal condensation could occur if it is the case. A hygrothermal simulation can be necessary. The need to be sure that the insulating system is enough airtight. And when there is a vapour control layer and/or an airtightness barrier, that it is well installed, as moisture and air could pass from the interior to the wall without control.

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

This solution is well-known and documented for new buildings.

Link to best practice example (Hiberatlas):

https://www.hiberatlas.com/en/timber-framed-barn-in-the-north-of-france--2-182.html