



Hemp concrete

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Walls

What is the solution?

The solution is to replace the original filler material (bricks or cob) in the void of the half-timbered walls. After this first step a lime plaster could be applied on both faces of the wall. The wood structure can optionally remain visible. Depending of the region and the type of building, tradition have been to recover the wood structure or to leave it visible. The façade highly subject to driving rain must be protected with a full plaster and or roof overhang.

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



Hemp concrete in place from inside
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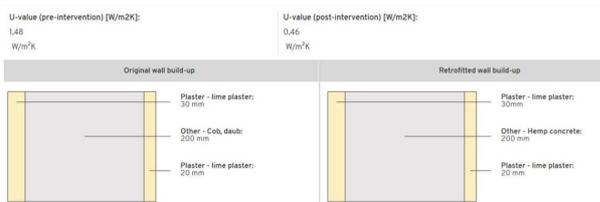


Application of the hemp concrete from outside copyright : Cerema



Before application of the lime plaster
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Cross section copyright : Cerema



Half timbered house with hemp concrete
infill, retrofitting (left part) and new
construction (right part) in Troyes, tourism
offices © Cerema

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

This solution works in terms of conserving the historical values due to the unchanged appearance of the façade and preserving the proportions of the building as no additional insulation layers are applied. Considering moisture safety, the hemp concrete is vapour open and "capillary active". A correct plaster is needed on the outside part to manage the rain penetration. This plaster needs to be vapour open and lime is advised with no cement addition. For the air permeability, special care is needed at the interface between wood and hemp concrete. For the energy improvement, the U-value with cob is 3 times higher than the U-value with hemp concrete (original U-value 1,48 W/(m²K), retrofitted U-value 0,46 W/(m²K)). The thermal result of the refurbishment is not as high as "classic insulation materials" as hemp concrete has a thermal conductivity around 0,1 W/(mK).

Description of the context:

This solution could be used alone to improve the U-value of the wall but it could also be used in combination with another insulation solution for a better thermal resistance of the wall if necessary. Half-timbered houses usually present strong heritage interest and exterior insulation or exterior changes are not welcome. This sort of construction represents 6% of all the French buildings built before 1945 that is around 500 000 buildings. The cob or bricks infill materials are sometimes in bad shape and their withdrawal is the opportunity to improve the thermal performance. This solution has also been applied in new construction in historical area (Tourism offices in Troyes, East of France for instance)

Pros and cons of the solution:

Hemp concrete has several advantages. The required internal finish plaster ensures good air tightness. A further advantage are the diffusion-open, moisture-storing and capillary-active properties of hemp concrete. Hemp concrete is a bio-based material with a very good life cycle analysis (35 kg of stored CO₂ per square meter of wall, to compare with an average of 8 kg of CO₂ release per square meter of wall insulated with R = 2,5 (m²K)/W of mineral wool). The main disadvantages are the lower thermal resistance (its thermal conductivity is about 0,1 W/(mK)) compared to other insulation materials. The drying duration is also rather high: in good temperature conditions, 30 days are reasonable to insure the dryness of the whole thickness.

Additional Information:

This solution could be combined with additional insulation with hemp concrete or other solutions from the inside part of the walls.