

Insulation and retrofit: Finding the sweet spot

The retrofit challenge

The UK's 29m homes are among the least energy-efficient in Europe with approximately two-thirds in need of better insulation levels ¹. This includes 8.5 million difficult to treat 'solid wall' homes with over 90% of these currently uninsulated ². Improving the energy efficiency of our housing stock is vital if we are to meet our net zero commitments.

Building Regulations throughout the UK provide flexibility on target U-values in existing buildings. For example, Part L ³ of the Building Regulations for England (p26) offers some flexibility when retrofitting existing walls, roofs and floors.

An improved U-value of 0.30 W/(m²·K) is the target but a 'threshold' level of up to 0.70 W/(m²·K) is sufficient for walls, as long as the approach can achieve a simple payback not exceeding 15 years and is 'technically and functionally feasible'.

This lesser standard for the thermal element (U-value) is acceptable where retrofit measures seek to balance the requirements of Part C of the Building Regulations (England) to protect from the harmful effects of interstitial and surface condensation, which can lead to mould growth.

English Housing Survey data ⁴ published in July 2023 found that damp and mould affect 177,000 social homes. The effects of exposure to mould can be life-threatening, most recently amplified in the tragic case of Awaab Ishak ⁵.

Natural fibre insulation

This “allowable zone” of between 0.30-0.70 W/(m²·K) takes focus away from low thermal conductivity materials (e.g. PIR) and allows us to consider a wider range of retrofit solutions to be utilised, such as natural fibre insulation (NFI).

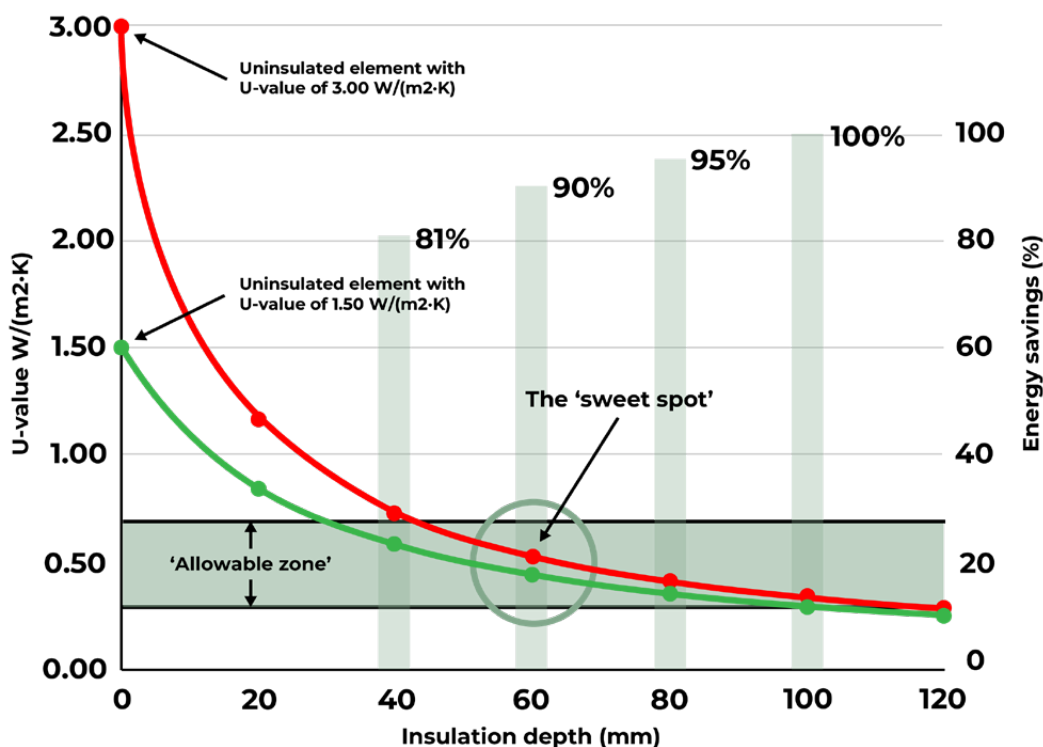
Whilst Building Regulations largely focusses on thermal performance (U-value), this distracts us from other equally important issues such as moisture regulation, that natural fibre insulations are best suited to manage due to their true ‘breathability’.

Breathability is a critical function in helping maintain a healthy moisture balance within many types of construction, particularly solid walls which naturally allow moisture to evaporate out of the fabric and dissipate in the environment. True breathability requires a combination of vapour openness and sorptivity (i.e. the ability of a material to adsorb and desorb water vapour).

Further benefits of NFI include an ability to lock up (sequester) carbon, and lower VOCs (off-gassing), which in combination with enhanced humidity control create healthier indoor environments for occupants.

Energy savings

If installing internal wall insulation on a solid wall, even a relatively thin layer of natural fibre insulation (40mm) can meet the allowable U-value of 0.70 W/(m²·K) and provide significant energy savings of c.81% against the target improved value.



Installing 60mm of insulation provides thermal performance right in the middle of the allowable zone and provides c.90% energy savings against the target improved value.

Using 100-120mm of insulation allows us to meet the lower threshold of 0.30 W/(m²·K) but a lot more insulation is required and energy savings returns start to diminish.

Explainer – Energy loss and energy savings

A U-value (W/m² K) is a much-used metric in insulation. It tells us the ‘energy loss’ per square metre for every degree of temperature difference. When we compare U-values for one insulated element with another we are only comparing the energy loss of each. The main purpose of insulation upgrades is to save energy, so it is logical to also compare ‘energy savings’ rather than energy loss.

To calculate energy savings, the uninsulated existing element (e.g. solid wall) provides a reference point. The energy savings are then the difference between the U-value of the uninsulated element (existing solid wall without insulation) less the U-value of the insulated element (existing solid wall with proposed insulation installed).

Conclusion

The industry’s focus on U-values (energy loss) for retrofit rather than energy savings has resulted in many existing properties being over-insulated, increasing condensation risks or more often, not being insulated at all because of the prohibitively high levels of insulation perceived necessary. In addition, this focus has encouraged the specification of synthetic insulation materials which are less suitable for solid wall buildings and can cause moisture issues.

By focussing on energy savings rather than just U-values and finding the ‘sweet spot’ for internal wall insulation depth, we can meet the requirements of the Building Regulations, achieve significant energy savings, retain more internal floor area, and get a faster payback on our initial investment.

What’s more, by utilising ‘breathable’ natural materials we can lock up carbon, and reduce condensation risks, helping to secure the long-term health of the building fabric and improve occupant comfort.

Find out more about natural fibre insulation at asbp.org.uk/nfi.

References

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