

ENERGY-EFFICIENT EXTENSIONS

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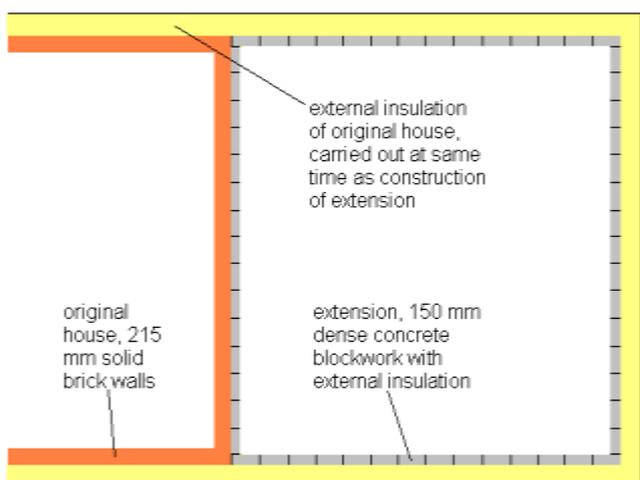
Introduction

Some of you may have in mind to build an energy-efficient extension, rather than a brand new house. In this article, I explain a few pitfalls to avoid if you want the resulting home to have minimum heating costs. You should also be able to reduce the heating costs of your existing home at the same time, since the new building probably loses less heat than the gable end wall or the other wall which it covers up.

I concentrate here on adding an extension to an existing solid-walled house. Some of you, however, may be adding an extension to a cavity-walled house. If so, try to follow the same basic principles; they will serve you well.

Figure 1 shows a way to add an extension, using solid masonry walls with external insulation - one of my favoured construction methods, see earlier articles. With the existing house also having solid walls, the logic of the situation is to insulate the walls of the whole building.

Figure 1. External Insulation of Existing Solid-Walled House Combined with Solid-Walled Extension - Best Way to Reduce Heat Loss.



The walls shown have 250-300 mm insulation and a U-value in the range 0.10-0.15 W/m²K, typical of a project aiming at the Passivhaus or AECB Gold Standard. The walls of the existing house go from a U-value of 2.1 to 0.15 W/m²K, which is a drop of 93%.

In case you think such notions are fanciful, this sort of insulation is widely underway on German houses, especially those built between 1900 and 1980. Government policy there is to retrofit all dwellings to a very low-energy standard by 2025 - a standard well beyond the UK's 2006 Building Regulations for *new* construction.

The Passivhaus Institut in Darmstadt, Germany www.passiv.de is promoting external insulation to these levels where possible; i.e., for buildings which are not historically important and are unlisted. On listed buildings, it is recognised that there are difficulties in achieving such standards. Other methods, such as internal solid wall insulation are being widely used, although they have disadvantages:

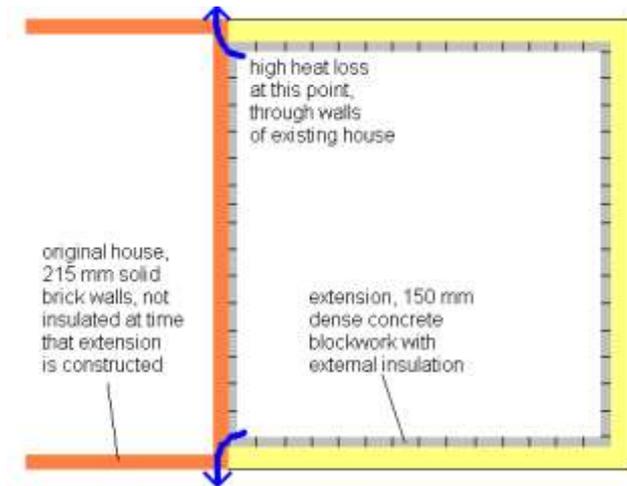
1. internal solid walls usually cause enough thermal bridges to reduce its effectiveness significantly;
2. it takes up floorspace;
3. external insulation reduces the risks of internal condensation but internal insulation can make the risks worse.

If your house is free-standing, unlisted and outside conservation areas or listed building cartilages, this work does not need planning permission. In other circumstances, the concept of external insulation may yield resistance from planners. But there are many areas in the west and others where render dominates or is at least acceptable as an alternative to brick.

Problems

Figure 2 shows a problem which arises if you build a highly-insulated extension and don't insulate the existing house. Although the newly-constructed house is highly-insulated and airtight, its junction with the house forms a thermal bridge. Heat flows in the direction of the blue arrows, detracting from the thermal benefits of the extension.

Figure 2. Solid-Walled Extension to an Existing Solid-Walled House, Showing Areas of Excess Heat Loss.



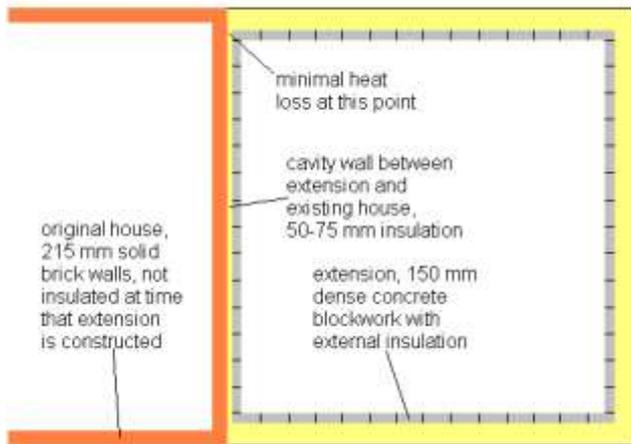
On an extension in Ackworth, Yorkshire the owners wish in hindsight that they had insulated their 1960s semi-detached house to the same standard when building an extension. This does overcome the problem that the more comfortable a new building is the more critical one becomes of buildings which are cold and draughty!

Their extension is built of externally-insulated 215 mm dense concrete block with 150 mm of expanded polystyrene insulation and is strikingly comfortable. To heat the 70 m² of floorspace needs only a 1 kilowatt radiator, fed from the existing condensing boiler!

If Not Insulating the Existing House

If you are extending a house, but for some reason you are unable to insulate the walls of the existing house at the same time, Figure 3 shows one way to proceed. Use a small amount of insulation between the extension and the existing house, creating a cavity wall.

Figure 3. Solid-Walled Extension to An Existing Solid-Walled House - One Way to Reduce Heat Loss.



This avoids forming a severe thermal bridge. It ensures that in a fuel-scarce future - we are probably close to “ peak oil” , after when energy prices will rise sharply - the new house provides a haven of warmth even if you cannot afford to heat the old, uninsulated house.

Conclusions

With that, I sign off and take a break from these monthly articles. I shall write occasional articles in future on self-build projects which were designed to be very energy-efficient and at some point I may return to doing a regular column. Meanwhile, thank you for reading these articles and I hope that they have been of some help.