Understanding how any traditional building was designed to work rather than just reaching for the retrofit is essential if we want to ensure or improve its energy efficiency, writes **John Edwards**

Back to basics

Energy efficiency in any building depends on its design, the materials from which it is made, its location, condition and the way it is used. If we are to make a building more energy efficient, then we need to understand all of these factors, taking an holistic approach. Understanding the difference between older and newer buildings is also essential. The former are normally vapour-permeable, in that moisture is let in and then evaporates, whereas the latter rely on vapour barriers and air gaps to keep moisture out.

First principles

Although solid masonry walls are common in older buildings, there are also many variations between one property and the next. Recognising a building type is also very important: by understanding its design, how it is constructed and the materials from which it is made, we can assess both how it performs and what affects that performance.

The basic steps to take to ensure energy efficiency are as follows.

- **Lifestyle changes:** the energy hierarchy lists those simple things that building occupants can do to improve energy performance, such as using a shower rather than a bath or a washing line rather than a tumble dryer.

- **Maintaining buildings properly:** a poorly maintained building is less likely to be energy efficient.
- **Condition survey:** a detailed analysis will involve building pathology and understanding the materials and methods of construction.
- **Maintaining or reinstating vapour permeability characteristics.**

While these provide a very good starting point, it is normal for a recognised means of assessing energy performance to be adopted as well, such as the Reduced Standard Assessment Procedure (RdSAP), which is used for all existing buildings. This assessment method involves many standard assumptions that are integrated into the software, and it produces an energy performance certificate (EPC) that categorises a property into a band according to SAP points, with band A being the most energy efficient and G the least.

RdSAP also generates a recommendation of the works required to improve energy efficiency, and indicates what band could be achieved if these were undertaken. However, research has indicated that RdSAP is inaccurate, especially where older buildings are concerned, as it normally underestimates their energy efficiency; neither does it take into account the condition of the building. The recommendations generated by RdSAP should therefore be treated with caution.

Moisture is the biggest problem in an older building and, as indicated in BS 7913: 2013: Guide to the Conservation of Historic Buildings, building fabric that is damp could be 30% less energy efficient than dry building fabric. The control of moisture is therefore key to both energy efficiency and sustainability. This is where using building pathology is essential.

Getting an older building into good repair in a way that maintains or reinstates vapour permeability should be prioritised over energy efficiency measures, and it is important to understand that installing elements and materials that are impermeable could have a devastating effect on an older building.

Guidance and its limitations

When it comes to deciding what measures to install, it is important to continue thinking about vapour permeability and its overall effect on the hygrothermal performance of the building. Installing one measure could have consequences for many other different elements and aspects of an older building.

One useful tool is the retrofit guidance wheel, which is freely available online (*www.stbauk.org*). This points towards measures that are most likely to work and carry least risk, and away from riskier, less practical options. Most importantly though, it highlights how different measures affect each other. Again, a condition survey should be carried out first.

Bear in mind that it takes someone with building expertise to use the wheel, otherwise the answers to the questions that it poses may not be correct. This online tool is probably the best presently available but it is not perfect, and there are some measures, especially relating to work on existing building fabric, that are not included.

Another thing that neither the wheel nor most other guidance does is refer to BS 7913: 2013. This standard contains lots of excellent guidance, including the need for heritage impact assessments. When implementing any retrofit measure, a heritage impact assessment should be carried out.

The thermal coherence of the external envelope is particularly important, and thermal bridging should be reduced as much as possible, so insulation should be carefully designed. In some places this will be very difficult: for example, at floor–wall junctions, timber joists bedded into the walls will form a thermal bridge and therefore be susceptible to interstitial condensation. This can be managed, however, provided that the building fabric around the timber joists is vapour-permeable and thus allows such moisture to escape.

However, if there is cement mortar pointing or cement render on the exterior then this will inhibit evaporation and possibly put the ends of the joists at risk of becoming rotten. Another risk worth mentioning is that, if internal wall insulation is not carried through into the voids between ceilings and floors, then the whole horizontal strip could act as a thermal bridge and enable moisture to persist, with obvious consequences.

The location of the building is another critical factor. There is a huge difference between UK weather exposure zones 1 and 4, with zone 4 representing the most severe conditions. Risks of persistent, heavy, wind-driven rain have to be appreciated, especially when considering the merits of internal wall insulation, the orientation of the building, the degree of sheltering, the thickness of walls and their construction, the materials from which they are made, and their condition.

Part L 1b of the Building Regulations in England and Wales, or Technical Handbook 6 in Scotland and F1 in Northern Ireland, calls for consequential improvements when a proportion of work is undertaken to the thermal envelope. However, such works have to be technically, functionally and economically feasible.

While there are exemptions for listed buildings and those in conservation areas, no such exemption exists for more than 90% of traditional buildings, though a "special consideration" may be sought in England and Wales if the work is not feasible, adducing BS 7913: 2013 in support. Similar provision may exist in Scotland and Northern Ireland, but is less emphatic.

Many different types of insulation materials and products are available, and all have different installation methods. Careful selection is needed, especially when only slender sections can be installed – for example around window reveals – to provide thermal cohesion as much as possible, so materials may have to provide much better thermal performance for their thickness than those in other areas where greater thicknesses are possible.

Conclusion

While a great deal of expert effort can and should go into planning and specifying work that will make an older building more energy efficient, this can all be severely compromised if it is not implemented properly. Adherence to BS 7913: 2013 on project management and supervision provides a robust approach, based on managing the risks of specification non-compliance.

Taking an holistic approach to improving the energy efficiency of older buildings need not be complex. It is initially about going back to basics and providing a building with its original performance characteristics so far as possible. It becomes complex and risky when retrofitting, and here again using vapour-permeable materials is key. However, it will not be without its risks, and by following BS 7913: 2013 management of these will be more straightforward.

John Edwards FRICS is Director of Edwards Hart Consultants and lead author of BS 7913: 2013
john@edwardshart.co.uk

Image © iStock