

Harrogate case study

Introduction

Some years ago Harrogate Borough Council carried out piecemeal refurbishments on a number of local authority owned Wimpey 'no-fines' houses in order to correct problems in specific houses as they arose. The kinds of problems which arose from time to time were complaints from occupiers about having very cold rooms or having particular rooms with a lot of condensation. (Often the condensation problems occurred on north-east facing walls). The Local Authority was frequently receiving complaints from occupiers, who at that time were often dissatisfied with the housing and complained of inadequate heating and/or high fuel bills.

In 1997/1998, the Borough Council decided to carry out a refurbishment programme on 40 of their Wimpey 'no-fines' houses, which involved applying external wall insulation. The Borough Council noted an improvement in the performance of those houses, and following that initial refurbishment programme, the Council then decided to embark upon the present much larger, refurbishment programme.

The latest refurbishment project

The present refurbishment programme involved insulation and heating system replacement of 197 existing Wimpey 'no-fines' dwellings, consisting of 69 houses and 128 two-bedroom and three-bedroom flats. The existing heating systems were replaced by condensing boilers in 2001/02 and the insulation works were carried out on houses in 2002/03.

The present refurbishment programme involved applying 95 mm of mineral fibre board (0.033 W/m²K) and render externally to the



existing 250 mm 'no-fines' walls. Additionally, plaster was applied internally. This gave a resulting wall U-value of 0.30 W/m²K. This U-value is 14% lower than the Approved Document L1 (2002) new-build value of 0.35 W/m²K, although it does not quite reach the indicative elemental standard for new-build houses in the proposed revision in 2005 of 0.27 W/m²K. In terms of sustainability, the system does receive an 'A' rating in the 'Green Guide to Housing Specification' for refurbishment of insulation.

The refurbishment programme also involved replacing nearly all of the existing gas warm air systems with a gas condensing boiler (90.6% efficiency) and radiators. The loft insulation was upgraded to 250 mm of mineral wool quilt for all roofs. The insulation to the roofs comprised 150 mm of quilt between the joists and 100 mm of quilt over the joists, giving a roof U-value of 0.16 W/m²K.



▲ The condensing boiler in one house within the scheme

The visit

BRE met with a representative of Harrogate Borough Council and visited three of the refurbished houses in order to test the performance of the insulation and gauge the level of satisfaction among occupiers.

The occupiers in the three houses visited all made it clear that they were very satisfied with the refurbishment and all of them commented that their houses were now warm and easy to heat, and that this was a massive improvement from the situation prior to the refurbishment.

One of the tenants, said that their house was now 'like an oven' and that the house retained its heat and only required the heating to be switched on for a few hours at a time. She was

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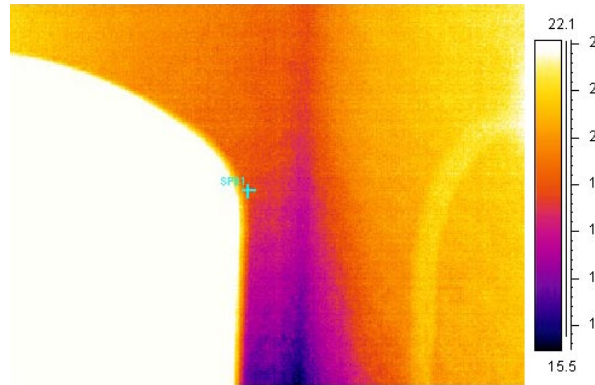
also pleasantly surprised to notice that during the hot summer of 2003 their house was cool and comfortable, as the insulation was keeping the heat out.

Infrared Thermography¹

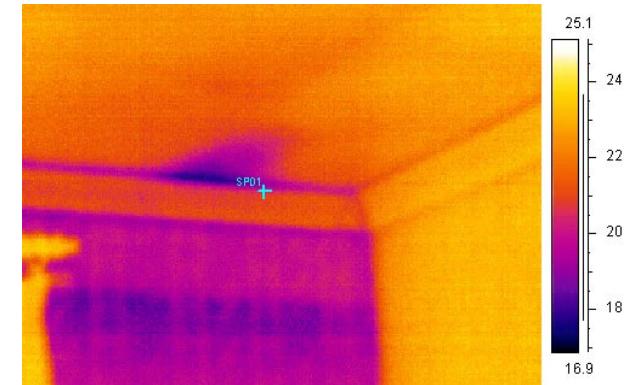
Infrared thermograms revealed that at ground floor level, the insides of the walls were at reduced temperature up to about half a metre above floor level, suggesting that there was significant thermal bridging at the wall-floor junction. Following discussion with a member of staff at the Borough Council it was found that the reason for the low wall temperatures close to ground level was that it was not practicable to run the external insulation all the way down to ground level and there was an area at the bottom of the wall which could not practicably be covered.

Thermal imaging also revealed a small number of cold areas on the walls of some of the rooms, which appeared to show remnants of the old warm air system. The thermal imagery could not establish the reasons for the dips in temperature at these points, but the cold areas observed would seem to suggest that the residual ducting could be allowing some heat to escape.

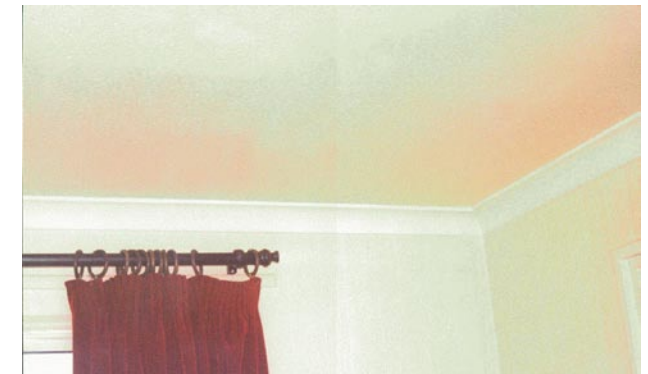
Apart from the problems mentioned above, the thermal imaging did not reveal any other significant cold areas. The temperatures of the internal surface remained relatively high at the wall-wall junctions and at lintels, indicating that any thermal bridging at these areas was not excessive.



▲ A thermal image of a wall-wall junction behind a TV set. There is a relatively slight drop in temperature at the wall-wall junction, but there is a noticeable drop in temperature at the wall-floor junction. The white area on the left side of the photograph is an image of the TV-set, while the centre of the picture shows a relatively cold area at the wall-wall junction, particularly at or close to floor level. A photograph taken from a similar position is shown below:

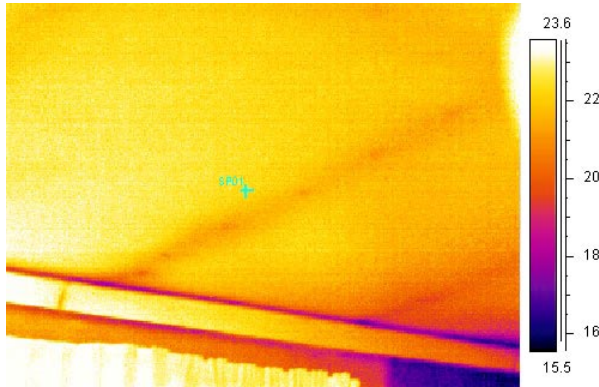


▲ There are a very small number of minor ceiling defects where the temperature is lowered, however in general this is the exception rather than the rule among the refurbished housing which was examined. The number and scale of ceiling defects suggests that the insulation on the walls and roofs is well-fitted and performing satisfactorily.



¹ Infrared thermography is a valuable tool for evaluating the thermal performance of whole buildings and for assessing the thermal performance of building components. Being a remote sensing technique, a thermographic survey can be carried out with minimal disturbance. As there is no 'natural' colour associated with infrared, all colour thermograms are reproduced using a false colour scheme. For this survey, the colour rendering is known as the "Iron" scale where the blue/black colours are cooler than the yellow/white end of the scale.

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▲ A typical thermal image of a ceiling above a window. The temperature dip due to ceiling joists is visible. There is only a relatively small temperature drop at the lintel and wall-ceiling junction



▲ A loft access hatch, showing the loft insulation after refurbishment, showing that the insulation fills the loft space and that there is no significant thermal bridging at the loft hatch



▲ An image of a gable wall, showing how it was not always practicable to extend the external wall insulation down to ground level. In this example, there is a gap of at least 300 mm between the ground level and the bottom of the external wall insulation



▲ The entrance to one of the houses, showing the external wall insulation taken almost to ground level. External insulation is also applied between the doors of the two adjacent dwellings

Advantages

- Tenants were very satisfied with the refurbishment
- Minimal internal disruption owing to the wall insulation being applied externally
- No loss to internal space for the occupiers (except for the loss of loft space for storage)
- Replication of the same works to a large number of similar houses
- High thermal inertia leads to avoidance of large temperature swings leading to high degree of thermal comfort in both summer and winter
- The refurbishment programme tended to lead to an improved appearance of the houses

Disadvantages

- Thermal bridge at wall-floor junction which is difficult to eliminate
- Small cold areas remain on some of the walls owing to remnants of the existing warm air system which could not be eliminated.