Insulation Solutions in Cornwall

Part L1 (2002) in existing dwellings

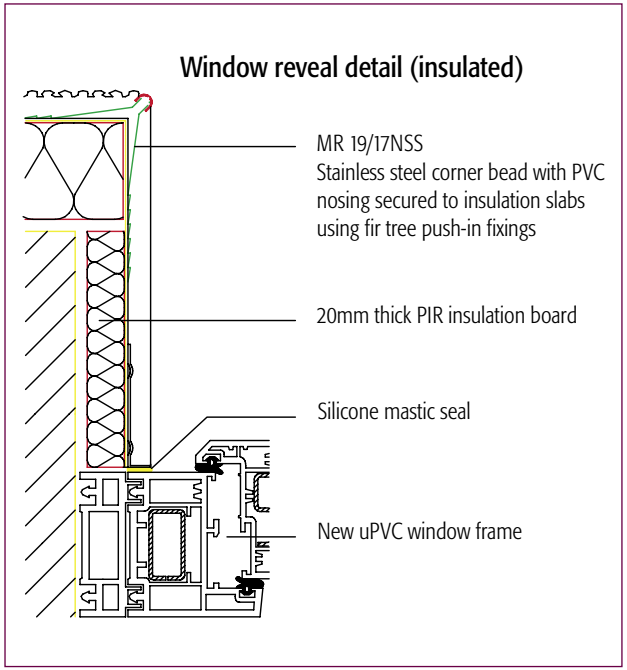
Cornwall case study

Introduction

Penwith Housing Association (PHA) in South West Cornwall, and before them Penwith District Council, have been using external insulation on their properties for 20 years. Most of the social housing in the area was built in the 1940s from ten-inch concrete hollow blocks. The properties suffered from mould and damp problems and were very hard to heat, leading to a high risk of fuel poverty in this area. The Council originally used 25mm glass fibre insulation but insulation standards have increased over the years as insulation products have evolved.

One of the most recent refurbishments by the PHA was the Penalverne Estate in central Penzance. These houses were originally all social housing, but with the 'right to buy' scheme some of them are now privately owned. All of the PHA properties were refurbished in 2001-2 and the paler properties in the photographs are the refurbished houses.

▲ Penalverne houses



Insulation details

Most of the Penalverne Estate properties are clad in the 'Swisslab' cladding system by M.R. Polymer Cement Products Ltd. (now Alumasc Exterior Building Products Ltd.). This system was chosen at the time because it was the only system known to the design team that held an Accreditation Certificate. There are now several other similar accredited systems available and some of the properties were clad using the Envirowall 'Enclad' system. The 'Swisslab' system uses 40 mm phenolic insulation slabs and the specification for the stages of work required is given in the table 1.

Particular attention needs to be taken to avoid cold bridging at windows and doors and an example of the detailing developed for the windows is shown in the diagram. The thickness of external insulation that can be used is dependent on factors such as the rain water systems, as replacement of all these systems would add another significant cost. In any case, waste pipes and any balanced flue outlets and airbricks do require extension. Thicker insulation can also impinge on path widths and access to the properties.

Table 1

Specification	Average Wall Areas
Wire brushing or power washing	End Terrace House 90.1 m^2
Fungicidal wash	Mid Terrace House 46.2 m^2
Stabilising solution/bonding agent	
MRS3 polymer scratch coat and dubbing render	
40 mm MR phenolic insulation slabs	
Glassfibre reinforcing scrim and MR tile adhesive	
MRS7 polymer cement render and chippings	
Stainless steel beads with plastic nosings	
Preformed aluminium oversills	

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Insulation effectiveness

The effectiveness of the insulation is detailed in table 2. Although the 40mm phenolic board does not bring the wall U-values quite down to new-build standards (U = 0.35 W/m²K), the value of 0.42 W/m²K represents a six-fold improvement and allows the houses to exceed the National Housing Federation Target for affordable warmth of NHER 8.0. The PHA design team considered that this option provided the optimum balance of insulation level against thickness for these properties.

From the point of view of eco-friendliness and sustainability, the BRE 'Green Guide to Housing Specification' rates this system as 'A' grade.

Infrared thermograms[1] (right) show that the insulated properties are clearly cooler on the outside (pink and blue colours) than their uninsulated neighbours (orange and yellow colours). The only weak point in the insulated properties is at ground level where the insulation has to be curtailed above the damp-proof course.

A survey of tenants by the Association for the Conservation of Energy showed that there is a fairly high degree of satisfaction in terms of comfort and 'cosiness' in general sense.

Table 2 The effect of Energy Efficiency Improvements to a Penwith Housing Association Property in Penzance Cornwall

	NHER	SAP	Carbon Index	CO^2/ Tonnes/yr (SAP)	Total Running Cost £/yr	External Wall 'U' value (W/m²k)
End of Terrace solid walled house in Penzance. Before Improvement (gas room heater)	2.4	18	1.1	7.2	737	2.61
As above with double glazing and gas fired heating (condensing boiler system)	5.5	51	3.4	4.0	492	2.61
As improvement above and with 40mm phenolic board external insulation	8.7	81	6.2	2.0	355	0.42
Note: The National Housing Federation Target for Affordable Warmth is NHER 8.0						

[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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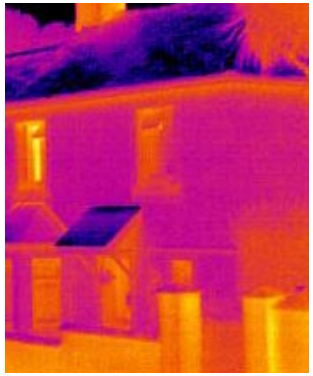
Boilers and controls

PHA have found that if they can only do one refurbishment job on a property, then installing a condensing boiler is the most effective option and they have used condensing boilers as their standard installation for some years. Although there were some reliability problems in the early stages, PHA have found the Gloworm boilers they currently use are very reliable and the prices have plummeted as a result of the Green Boiler scheme to £600 - £700.

They use a high-recovery cylinder and a hot-water priority system to ensure that the boiler operates in condensing mode for as much of the time as possible. They have found that the high-recovery cylinder reduces the time that the radiators are off when the water is being heated from 30 minutes to 10-12 minutes.

PHA installs thermostatic radiator valves (TRVs) on all radiators except the room with the room thermostat in it. Tenants are visited by an energy advisor a few months after the installation of the system to help them to understand the use of the controls.



Costs and benefits

Indicative costs of the external insulation system are given in table 3. The costs are relatively higher in Cornwall because of the distance that materials need to be transported, so these can be viewed as a maximum estimate for a 'bulk' job; one-off property prices would be significantly higher. These prices are not cost-effective on a simple pay-back system as the estimated savings are about £140 per annum, assuming that all the savings are accrued in monetary terms and not as greater thermal comfort.

However, there are many added benefits in terms of reduced maintenance costs, tenant satisfaction, and achieving targets for 'decent homes' that make this level of expenditure justified. The improvements also increase the notional value of the housing association stock, so that the costs are a smaller proportion of the value of the property after the improvements.

Advantages

- Thermal mass of the building is on the inside so that any heat is retained
- Helps to reduce fuel poverty
- Eliminates damp and mould
- Reduces structural disintegration
- Improves value and appearance of property
- Do not need to decant residents during works
- Increases residents' feelings of worth

Disadvantages

- Relatively expensive, especially for one-off jobs
- Have to remove and re-fit waste and electrical services

Table 3 Indicative costs of the external insulation system

	Average Cost per Dwelling	
	2 Bedroom Mid Terrace House	3 Bedroom End Terrace House
Operation		
Preparation of Walls	£204.02	£397.90
Work to Cables and Pipes	£485.49	£946.82
Work to Plinths & dpc	£249.50	£486.60
External Insulation and Render System	£3,502.31	£6,830.25
Beads, Flashings, Sills & Joints	£1,248.75	£2,435.35
Preliminaries	£438.18	£854.53
	£6,128.26	**£11,951.44**

Basis of Prices Costs based on a £600,000 contract carried out in 1998 and 1999 and updated for inflation to 1st quarter 2003 tender level. All costs exclude VAT