

# INSULATION



High rise flats, refurbished with external wall insulation, in Greenock, Inverclyde District Council.

## WORKING FROM OUTSIDE

**I** Dr Rodger Canning looks at the technical aspects of external insulation systems.

External wall insulation is today recognised as a proven and cost-effective method of refurbishment of buildings to improve thermal characteristics and appearance.

An increasing demand for such systems is evident in new commercial and industrial buildings. Furthermore the introduction of the new Building Regulations will make the use of external insulation systems designed as an integral part of the structure an interesting option for architects, specifiers and builders.

External wall insulation is normally a

composite system employing three basic elements: (a) the insulation, (b) the fixings and accessories and (c) the cladding/decorative - and - protective finish. A cross section of a typical system is shown in Fig 1.

The use of external wall insulation systems for refurbishment overcomes many of the problems associated with ageing buildings.

### Thermal Properties

A substantial part of the total heat in buildings can be lost through the outer walls. With insulation, savings of between 60% and 80% can be achieved in losses through the walls, providing a saving of fuel bills of approximately 25%.

The typical U-values of various con-

struction types with differing thickness of external insulation are given in Table 1.

### Condensation Control

One of the major problems that has increased in recent years has been that of condensation occurring to the detriment of the building fabric, its internal finishes and hence its appearance generally. This has been exacerbated by the increased use of water-vapour

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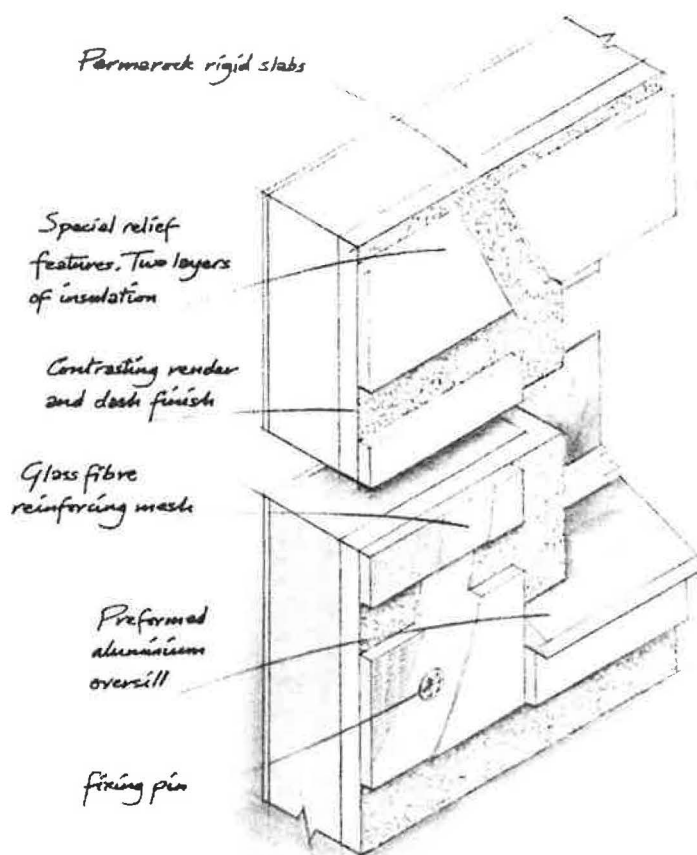


Figure 1: Cross section view of a typical external wall insulation system.

systems has given rise to many problems resulting from poor weather-proofing and thermal performance.

Poor workmanship and the difficulties of detailing to deal adequately with water penetration at door and window openings have been contributory factors.

External insulation provides an external, completely waterproof barrier that circumvents these common building defects, and the system includes effective means of preventing water penetration through those weak points in the building.

## Cold Bridging Avoided

This is a problem not confined to framed construction or solid masonry. Penetration of cavity walls by constructional elements and at door or window openings are common causes of cold bridging where conventional detailing is used. This can give rise to inadequate thermal performance and also encourages condensation. The insulation system can be applied to all elements of the external wall envelope where cold bridging occurs and is a complete answer to this vexing problem.

## Deterioration Arrested

The external insulation system provides an aesthetically pleasing and uniform treatment which arrests degradation resulting from the ageing process, such as the progressive deterioration of masonry, mortar joints or external rendering and the effects of pattern staining, atmospheric pollution, freeze/thaw cycles and decay generally. Both the building fabric and the owner's investment are protected.

## Development

Leading companies in the industry have made substantial investment in research and development of improved materials, fixing methods and techniques, together with "on site" application standards and methods.

Development programmes have included the thermal laboratory testing of insulation panels and mortars over a wide range of temperatures, accelerated thermal change testing and the use of infra-red ovens to investigate the effects of thermal shock.

Particularly important is quality control within the factory. Adhesives, mortars and renders must be subjected to a continual programme of testing to ensure compliance with the close toler-

producing appliances, intermittent heating cycles, inadequate natural ventilation and modern lifestyles resulting from the desire to conserve energy.

External wall insulation places the insulation in the best (and the technically correct) location to minimise the effects of these factors, and to create an improved internal environment. The benefit of the thermal storage capacity conferred by solid wall constructions is enhanced.

The risk of interstitial condensation is minimised by the use of external insulation. Typical temperature and

relative humidity gradients through wall sections with and without insulation are shown in Fig 2.

## Water Penetration Overcome

A further problem that can be eliminated by the application of external insulation is that of water penetration through the structure. The reliance placed on cavity wall construction has not always been justified in practice, and the use of solid masonry in older properties, or of prefabricated building

Table 1 — Typical U-values for construction types

Wall Construction	Brick/Cavity/Brick	Brick/Cavity/Block	No fines
Uninsulated	1.47	0.99	1.64
50mm insulation	0.45	0.40	0.47
75mm insulation	0.34	0.31	0.35
100mm insulation	0.27	0.25	0.28

Note: The above figures assume a 16mm internal plaster finish and are based on thermal data from BS 5250.

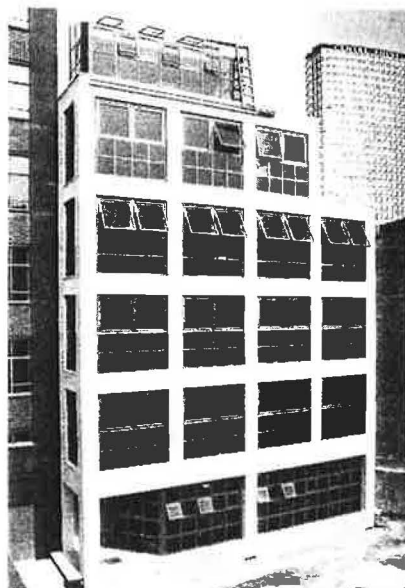
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ances required in terms of chemical formulation.

Included in the test procedures are colour fastness of materials and the accurate checking of material colours to ensure full compliance with the specification concerned.

## On-site Inspection

On-site technical inspection during the application process is vital and must be backed with a fast laboratory test facility to ensure that overall installation quality meets the highest standards.



External wall insulation applied to a concrete frame office building in London.

## Wind Load Resistance

Systems should be tested to ensure adequate wind load resistance. The Building Research Establishment has developed a test rig on which systems can be subjected to suction loads representing some 50 years' exposure. Test panels can be subjected to shock loads of up to 9kPa.

## Fire

All systems recognised by the External Wall Insulation Association satisfy the requirements of BS 476: Parts 6 & 7 and provide a surface of Class O as defined in Approved Document B2/3/4 of the 1985 Building Regulations (England and Wales), or Regulation E17(1) of the Building Standards (Scotland) and Regulation

Graduate chemist Rose Aigbogu conducting colour testing in Permarock's laboratories.

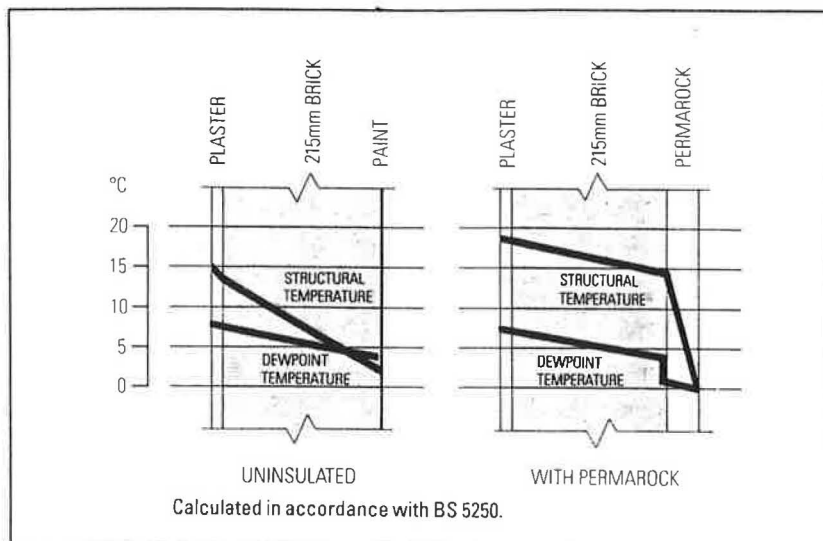


Figure 2: Temperature and Relative Humidity gradients through wall sections with (right) and without (left) insulation.

E15(1) of the Building Regulations (Northern Ireland).

## Certification

Many external wall insulation systems now hold British Board of Agrément certification which recognises experience, test procedures and quality levels.

## Developing Markets

In addition to development in a technical performance sense, external wall insulation systems offer the architect and specifier a wide range of possibilities for building improvement in terms of colour and texture and for unifying the appearance of groups of disparate buildings, particularly in terrace development where the effects of age, building condition or of external main-

tenance have led to patchy or unsightly effects.

Ranges of textures and finishes available are now extensive and the use of insulation to add decorative features as a means of improving bland exterior walls is rapidly growing.

Increased attention is being given to the use of external wall insulation technology in new construction for commercial and industrial buildings and for use on solid wall structures as commonly seen in continental construction practice.

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