

Product Development Showcase

Project title: CarbonLite Passivhaus refurbishment project, Hereford
Customer: PermaRock Products Ltd
Architects: Simmonds Mills
EJOT product: ejothem® STR U

Grove Cottage is on the east side of Portfield Street in Hereford, sitting amongst a mixture of Victorian homes. Built in 1869 for a railway inspector, the detached building is sited close to the rail route from Hereford to South Wales and in summer 2007, Simmonds Mills Architects began design work that considered the extension and refurbishment of the 90 square meter two bedroom property.



Utility bills showed that to heat and power the house required 128,000kWh/yr from natural gas and 113,800kWh/yr of electricity. That's 5.5 tonnes of gas, and 7.5 tonnes of electricity, emitting a combined 13 tonnes of carbon dioxide per year.

Government targets

The UK government itself has set a 60% reduction of carbon dioxide emissions target on 2000 levels by 2050. This commitment will require carbon reductions to be made by all industries including the housing sector which presently accounts for 27% of carbon dioxide emissions. The house building industry is the subject of numerous government policies and legislation, but none are as demanding as the Code of Sustainable Homes, which set a 'world-beating' target for all new homes to be zero carbon by 2016.

With this proviso, the architects decided that the Grove Cottage project could throw the issue of renovation

versus new-build into focus by seeking to reduce carbon dioxide emissions for heat and power by approximately 80 - 85% using average measured performance of a typical modern UK house of the same size. Simmonds Mills began on a design that applied low-energy, lowcarbon 'design rules of thumb'.

As the Association for Environment Conscious Building's (AECB) executive officer Andy Simmonds had been part of the CarbonLite Programme and was well placed to develop designs up to a planning application.

AECB CarbonLite Programme

The CarbonLite programme is aimed at everyone involved in the design, construction and use of low-energy, low-CO₂ emissions buildings. As an essential resource in the building sector's drive towards low-carbon living, the initiative provides a unique combination of research materials, technical data, training programmes, forums links and contacts.



Simmonds
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AECB

The energy performance target was AECB CarbonLite Step 2 plus further guidance on how to ensure that CO₂ emissions are minimised. It was felt that a result somewhere within the range of performances reported by the Passivhaus Institut for continental Passivhaus refurbishments should be achievable and that a demand of no more than 22 kWh/m²yr would be possible.

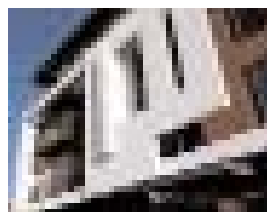
This set extremely challenging targets for improving the thermal performance of the building fabric through high levels of insulation.

Given the likely extent of heat loss from both hard to deal-with thermal bridges associated with the property and difficulty with incorporating high levels of insulation in existing floors it was thought that much lower U-values for walls and roofs would be able to compensate. A new extension to the refurbished house also meant a deviation from the classic Passivhaus building form which was also dictated by planning related restrictions. Therefore walls and roofs were drawn 'thick' to ensure that realistic construction depths and overall roof heights and increases to wall thicknesses avoided problems later on that might have compromised insulation thicknesses.

External Thermal Insulating Composite Systems (ETICS)

The majority of the existing brickwork walls and all the new concrete blockwork walls of the extension to the property were externally insulated using the PermaRock EPS-Platinum insulated render system, adhesively bonded and mechanically fixed to masonry.

PermaRock Products Ltd, an eaga company, is a leading designer and manufacturer of external wall insulation and specialist render systems. The EPS-Platinum system



utilises a high performance expanded polystyrene and the insulation is then directly coated with a self coloured proprietary render. Several fixing options were considered for the PermaRock system as heat loss from mechanical fixings can be very significant.

The approach adopted at Grove Cottage uses a full coverage adhesive bonding of the insulation boards, rather than the more common 'ribbon' of adhesive, eliminating any risk of air movement behind the insulation boards. Mechanical fixings are needed to provide additional support for the thick insulation boards whilst the adhesive cures. Potentially fixings can be removed after the adhesive has fully cured, however the existing walls had been painted with masonry paint which might have compromised the adhesive bond between the insulation and the wall.

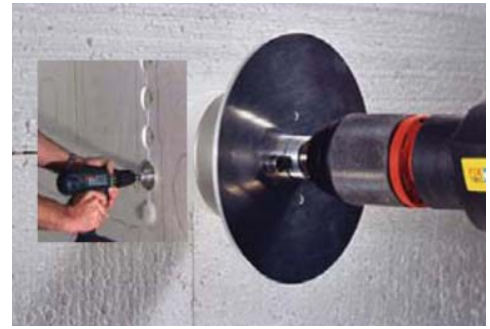
Results through partnerships

PermaRock's remit was seen by EJOT UK as an opportunity to reinforce the companies positioning as an innovative solutions provider. Collaboration with leading players across the construction industry has led to numerous modifications to existing fastening systems and increasingly complete bespoke solutions. Given the objectives of the refurbishment project, EJOT UK supplied PermaRock with ejothem STR U 295 anchors complete with EPS rondelles, thus enabling a significant reduction thermal conductivity. Ejothem® STR U is EJOT's self-countersinking anchor system which has been developed specifically for the fast and secure mechanical fixing of ETICS systems. Suitable for any masonry substrate it comes with European Technical Approval ABCD and E and seemed particularly appropriate to complement PermaRock's system.

Ejotherr® STR U is a product developed specifically as a result of EJOT's commitment to forward thinking development programmes. It is unique because the anchor is recessed into the insulation in a one-step process, so that the washer face is 25mm below the surface of the insulation, minimising thermal loss from the outset. A 25mm thick disk of polystyrene insulation, or rondelle, is placed over the fixing head so that any cold spots due to thermal conductivity through the anchor are eliminated.

The PermaRock / EJOT UK contribution to the project is one piece in a remarkable challenge which the architects have set themselves but it is hoped that the project will become a unique and valuable case study for:

- the AECB CarbonLite Programme
- the European Passive House Network Project
- the New Home Super Home Project
- two Leeds Metropolitan University projects working
- in conjunction with the AECB
- the Passivhaus Institut



Further information about the Grove Cottage Project can be found at:
www.simmondsmills.com
www.greenbuildingmagazine.co.uk

Further information on the AECB CarbonLite Programme can be found at:
www.carbonlite.org.uk

Further information on PermaRock Product Ltd can be found at:
www.perमारock.com