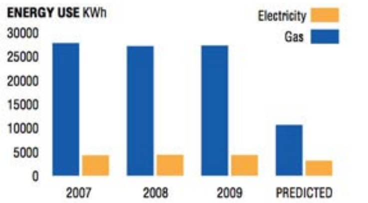
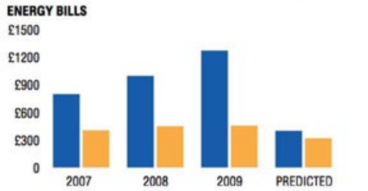
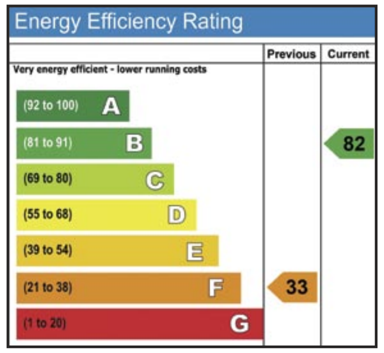
KEY PROJECT DETAILS

| | |
|---|---|
| Project: | The Nook, Lover's Walk, Brighton; House in Multiple Occupation, Eco-Retrofit |
| Construction Time: | Seven Months |
| Completion Date: | February 2011 |
| Gross Floor Area: | 177m2 |
| Budget: | £142,000 or £802/m2 |
| 'U'Values: | Roof - 0.10W/m2K<br>Walls - 0.15W/m2K<br>Floors - 0.13W/m2K |
| Clients: | Two Piers Housing Co-Operative Ltd.<br>The Technology Strategy Board |
| Architect: | BBM Sustainable Design Ltd |
| Main Contractor: | Earthwise Construction |
| Project Manager: | Mischa Hewitt |


prepared by Earthwise Construction




top left: Internal insulation being applied to a front bay window.
top right: External insulation being applied to a parapet and window reveal.
below left: Floor insulation being applied to the depth of the 1st stair riser.
below right: To avoid replacing the ceilings, a vapour control membrane was applied to the attic floor joists prior to fitting insulation.
top: Energy Use and Energy Bill graphs produced by Mischa Hewitt of Earthwise Construction showing profiles for pre and post retrofit works.
above: The SAP rating of the house improved from 33 to 82 points or a band F property becoming band B.

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## THE BUILT ENVIRONMENT'S CARBON REDUCTION CHALLENGE

The United Kingdom is signed up to a legally binding international agreement to cut carbon emissions by 80 per cent by 2050. Government experts have equated that this means the average metre squared area of building in the UK will be limited to around 17kg of carbon emission per annum. Currently this is thought to be in the region of 90kgCO2/m²/annum. There are many questionmarks facing government and industry alike as to whether or not this is technically achievable or in deed affordable. Historical conservation issues may have a bearing too or the density of accommodation simply will not allow enough solar energy to be utilised per unit area of accommodation. Perhaps most concerning of all is the question of how to apply retrofit measures onto old buildings without giving rise to unhealthy living conditions or creating building defects.

## WHY THE NOOK RETROFIT STUDY IS IMPORTANT

Whole house retrofit projects such as the Nook are vitally important for a number of reasons. Firstly, they help develop technologies which can achieve the carbon reduction challenge of our hard to treat existing building stock and in ways which are ultimately affordable for a 'roll out programme'. Secondly, with a two year monitoring programme to record how the retrofit measures perform, they will provide feedback to the industry about the effectiveness of the measures and most importantly provide building designers with a better understanding of how super insulation standards effect buildings not originally intended to perform in this way. Finally, for the landlord the project provides an invaluable insight into the management and financial obstacles associated with these kinds of works being carried out on actively occupied housing stock and affords an opportunity to develop arrangements to mitigate disruption to tenants.

## LOWER ENERGY BILLS

Here in the UK, we all face higher energy costs as global demand is set to outstrip supply. Fuel poverty could well become an issue for a much greater proportion of society which will raise further questions of how we achieve affordable warmth across the community. The retrofit measures effected at the Nook will hopefully show massive reductions in fuel costs for the tenants. Projected costs developed from the energy modelling have been set against the previous running costs.

**Prior to the works being carried out, the occupants were paying about £1450.00 per annum in energy costs. It is hoped that this will be reduced to about £750.00 per annum.**

What the Monitoring will help to Record:

- map retrofit cost versus environmental benefit;
- map occupant behaviour in using the building's energy systems;
- monitor indoor thermal comfort through the year;
- monitor indoor air quality through the year;
- monitor overall heating costs;
- monitor overall electrical demands;
- monitor overall water demands


# PROJECT PROFILE

## THE NOOK

eco-retrofit of a victorian house in multiple occupation

eco open houses

Technology Strategy Board
Driving Innovation

Two Piers Housing Co-operative

earthwise construction

BBM SUSTAINABLE DESIGN

for more information:
web: www.bbm-architects.co.uk
email: info@bbm-architects.co.uk
tel: 01273 480533

## INTRODUCTION

How do you take an energy guzzling solid brick Victorian detached villa in multiple occupation and reduce its energy demand by 80%? This was the brief for the Nook, a large period house in Brighton owned by Two Piers Housing Co-Operative. The project came about as a call for proposals from the Technology Strategy Board who were looking to award grants to around ninety properties of all shapes and sizes in the social housing sector up and down the country and monitor the results for two years to determine whether or not each project had achieved an average carbon footprint of around 17kg of CO2/m²/annum. The project lead was taken up by Earthwise Construction, who were behind the Brighton Earthship, and appointed BBM Sustainable Design to provide specialist architectural input.

## SELECTING THE RIGHT STRATEGY

The retrofit was particularly challenging for a number of reasons:

- the house was in a conservation area and the front elevation's appearance had to be retained
- it is not terraced so there is proportionally a large amount of exposed surface area to insulate
- the external walls are solid brick (no cavity)
- the ground floor was a difficult to insulate solid concrete slab

In preparing the original proposal to the Technology Strategy Board, the design team's principle aim was to arrive at a realistic, replicable and robust solution to retrofitting solid wall Victorian housing.

**Recognising the drivers that the housing co-operative would face when posed with a retrofit strategy such as tackling fuel poverty, reducing maintenance requirements, temporary housing, shortening the length of void periods and maintaining asset value, our approach was to utilize technologies that are simple and reliable that will require minimal attention in terms of control by the occupier or maintenance by the landlord; taking the view that if the technologies and strategies can exist in the background, then such measures are likely to be more successful than relying on social change and on complicated systems management.**

## ABOUT BBM SUSTAINABLE DESIGN

BBM have been a leading exponent of low energy design and eco-retrofit since the mid 1990's. Early on, the practice was vocal in promoting the need to act responsibly with the environment through energy and resource concious design. At the start of the millennium the team had produced a number of influential building projects demonstrating that low energy ideas could result in award winning design and dramatically reduced running costs. Their campaign to utilise locally sourced materials has brought about a rediscovery of architectural language which pertains to place. For more information on the work of BBM Sustainable Design visit: www.bbm-architects.co.uk

## TECHNICAL PROJECT SUMMARY

Roof - Achieves a U-Value of 0.10W/m²K.
At the Nook we insulated the attic floor but to avoid the expense and disruption of taking down and replacing the old ceiling, we had to first form a vapour control membrane below the new insulation. No easy task as this had to be draped over every joist and taped at the edges to stop any warm moist air from inside condensing within the new insulation zone.

Walls - Achieves a U-Value of 0.15W/m²K.
Being in a conservation area, the Planners required the appearance of the house's front elevation to be retained and thus ruled out the use of an external insulation solution (more robust technically) so the back and sides of the house are insulated externally and insulated from the inside on the front elevation.

Ground Floor Achieves a U-Value of 0.13W/m²K.
The ground floor is a solid concrete slab. Breaking out the slab and forming a new insulated build-up was not an option from a cost or disruption point of view. The final solution selected was to make use of the high ceilings and simply insulate to the depth of the entire first step of the staircase. This involved repositioning the bottom step and newel post and raising doors on the ground floor.

Windows & Doors
New treble glazed windows were used around the non-street elevations but the conservation officer insisted on using sliding sash windows for the front elevation. To satisfy these requirements, the team sourced a high performance double glazed sliding sash unit.

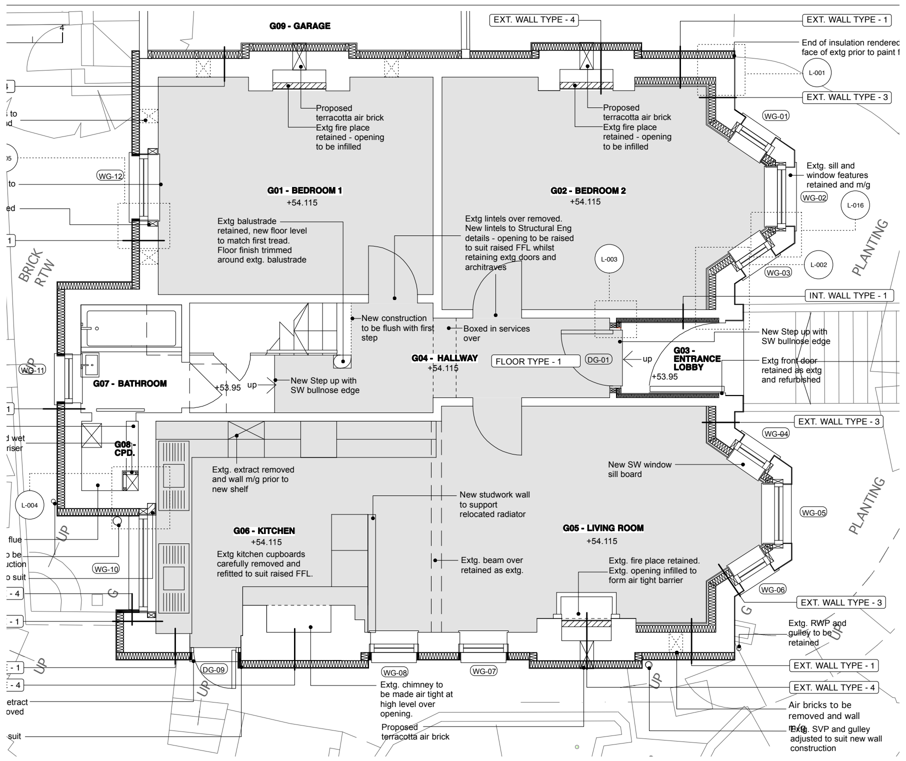
Heating
The new retrofit measures greatly reduce the need for fossil fuel heating. The house has been given a new high efficiency gas condensing boiler but it is hoped that through much of the year the heating demands can be met by the solar thermal panels mounted on the roof. It made sense to reuse the existing radiator system in the house.

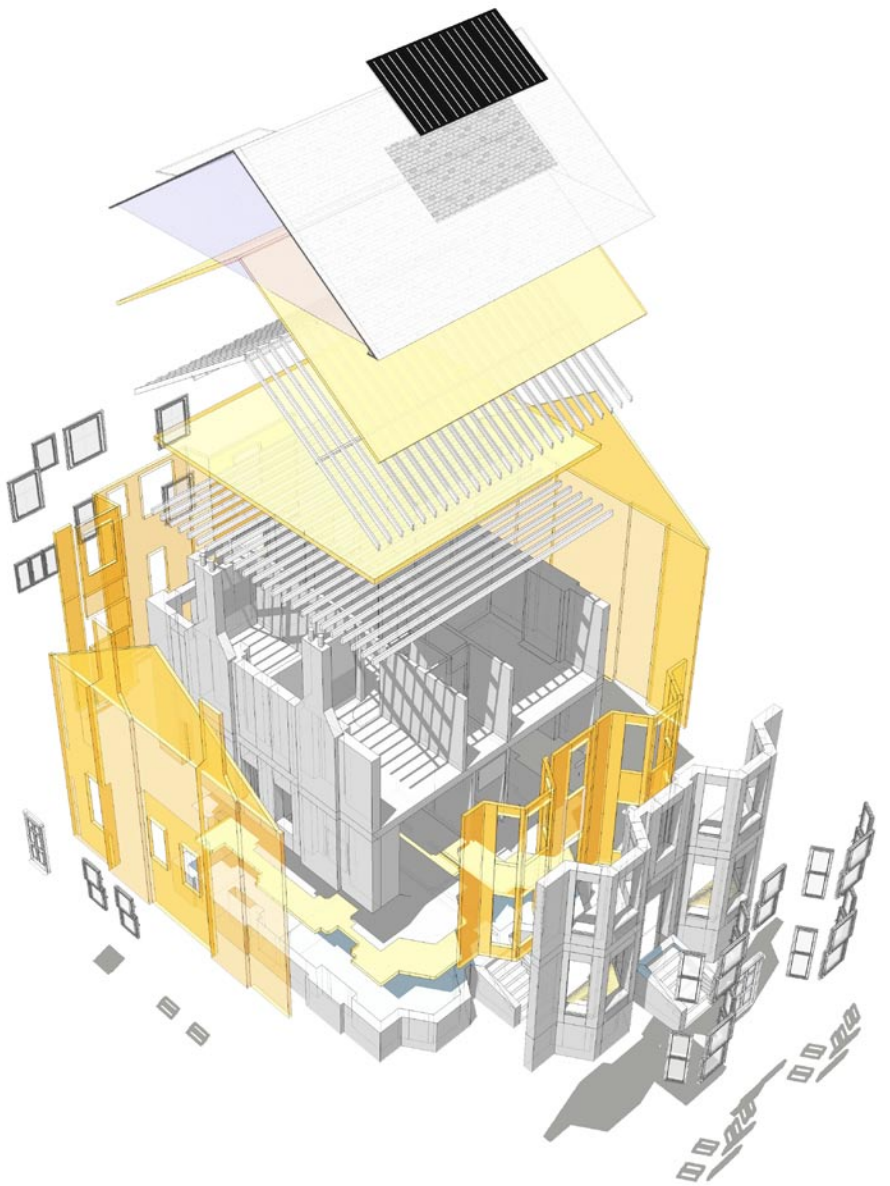
Ventilation
During the heating season, the house works with a mechanical ventilation system which includes a heat recovery feature (MVHR). To work effectively the house had to be sealed to achieve a very high level of air tightness. In operation, the occupants also need to re-learn how to live with the system and refrain from opening windows while the unit is in operation.

Lighting
Whilst LED lights are the most energy efficient form of lighting the cost of doing this could not be justified against simply replacing all the bulbs with compact fluorescents.

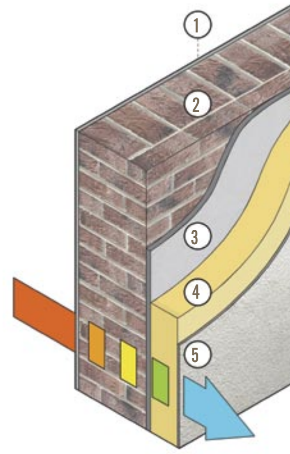
Appliances
The carbon calculations have to include all energy use, and the upgrade measures included swapping the domestic appliances for A+ and A++ rated white goods.

Energy Performance Certificate
The measures adopted on the house increased the building's SAP rating from 33 to 82 points.

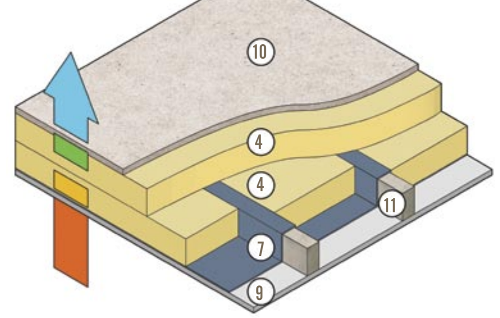


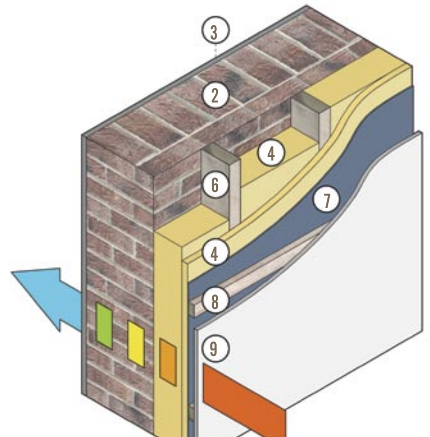
## EXTERNALLY INSULATED WALL



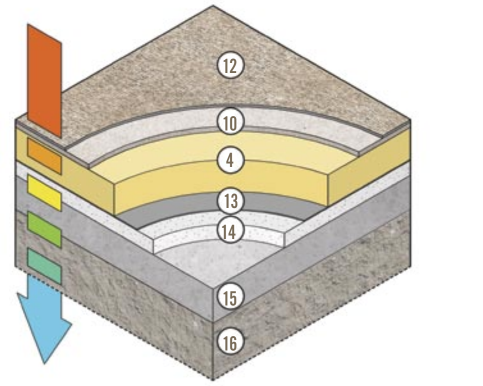

## ATTIC FLOOR INSULATION



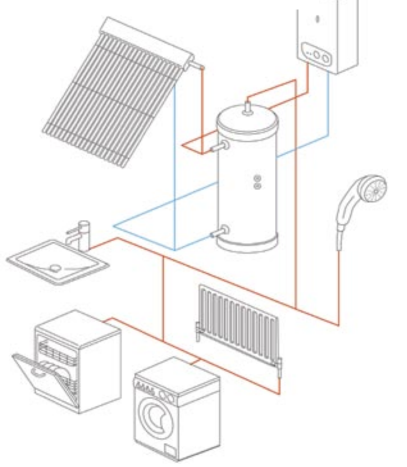

## INTERNALLY INSULATED WALL



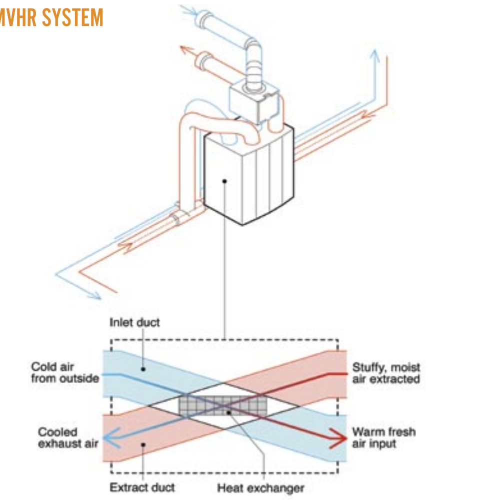

## GROUND FLOOR INSULATION




## SOLAR THERMAL SYSTEM



## MVHR SYSTEM




top left: Ground floor plan showing general layout and how the two wall types overlap towards the front of the house. The grey area denotes where the floor insulation was added.
below left: Exploded axonometric view of the insulating jacket applied to the house. Note the internal insulation lining to the front elevation and external insulation on the sides and rear of the property.
middle top: Wall insulation as applied to the outside of the existing walls.
middle centre: Wall insulation as applied to the inside of the existing walls.
bottom centre: Schematic of the heating system.
bottom right: Schematic of the MVHR ventilation system.
right top: Attic floor insulation.
left centre: Ground floor insulation.

KEY:
1. internal plaster / 2. original solid brick wall / 3. original render finish / 4. new PUR insulation / 5. new external render finish / 6. new timber battens / 7. vapour control membrane 8. new timber batten forming service zone / 9. new plasterboard internal lining / 10. flooring grade chipboard / 11. original attic floor joist / 12. new floor finish / 13. polythene sheet / 14. original sand:cement screed / 15. original concrete slab / 16. subsoil