Diagram showing environmental details

Insulated ventilation panels

Ventilating lightwell
Case Study: Retrofit for Living

Key Facts

Project name: Retrofit for Living
Location: 61 Warwall, London E6 6WQ
Classification: Refurb Domestic Building
Type: Terraced house
Size: (GFA, NLA, project footprint): 99m2 after retrofit
Total Capital Cost: £82,220 (building works £72,570 / energy and environmental monitoring £9,650)
Client: East Thames Group (funding and brief by Technology Strategy Board)

Project team

Architect: Penoyre & Prasad LLP
Structural Engineer: Osborne Edwards
Services, Energy & Environment Engineer: XC02 Energy
Main Contractor: Lakehouse Contracts

Project Summary

Retrofit for Living is one of 87 demonstrator projects in the Retrofit for the Future programme, sponsored by the government’s Technology Strategy Board. The programme is targeted at low-rise houses drawn from the UK’s social housing stock and seeks innovative whole-house solutions to achieve an 80% reduction in CO₂ emissions, compared with 1990 emissions.

61 Warwall is a mid-terrace, two-storey, three-bedroomed house on the Winsor Park estate in London Docklands. It was built in 1992, with masonry cavity walls, double-glazing and pitched roofs with a small amount of loft insulation.

Transformational changes have been made to the house to not only bring about highly efficient energy use, but also an improved quality of living for residents. These qualitative improvements are rooted in an understanding of the real concerns, habits and aspirations for tenants in social housing, elicited from a survey and evaluation of occupancy prior to design.
Environmental Impacts

Energy efficiency
The presence of a long-term tenant enabled us to investigate current living habits and energy use before making any changes. An innovative energy and space conditions monitoring suite has been installed which feeds live data back to a repository. This will be reviewed against predicted targets and can be adjusted to further reduce wasted energy. This monitoring can provide a detailed breakdown of renewable energy generated, delivered and wasted allowing for a full analysis. The predicted CO₂ emissions after retrofit are 16kg/m²/yr – a reduction of 79% from the 1990 baseline for average UK social housing.

Alterations to the external appearance have been carefully controlled to limit the visual impact of the retrofit on the rest of the terrace and wider neighbourhood. Insulation has been installed to the internal face of the front wall, keeping the existing brickwork and features intact. Solar panels have been restricted to the upper part of the roof only.

Materials
An innovative ‘breathing’ roof has been devised as a future-proof means of dissipating moisture and avoiding condensation, should the provision for natural ventilation not be used by tenants. Natural insulation products of wood fibre slab and hemp fibre quilt are used, which have excellent moisture permeability, good thermal mass and low embodied CO₂. An ‘intelligent’ vapour control membrane provides improved inter-seasonal moisture control.

The solid base of the ground floor has been overlaid with vacuum insulation panels manufactured in the UK. These give ultra high thermal performance for only minimal (25mm) rise in floor level, and avoid the disruption of removing floor screed. The installation includes thin sheets of steel and cellular foam for puncture protection.

New triple-glazed windows incorporate openable ventilation panels with security louvers - this fully integrated solution is a new product developed from collaboration between Penoyre & Prasad and Nordan, the window manufacturer. A triple glazed openable rooflight provides natural ventilation through passive stack effect. This operates automatically according to temperature and humidity and closes automatically when it rains. A manual over-ride is also provided.

Indoor environmental quality
Without extending the house, the internal environment has been transformed by the creation of a ventilating lightwell within the existing loft space. This brings natural light to the previously dark centre of the house, and provides an easy to use, natural ventilation strategy and space for drying clothes, instead of energy-intensive tumble-drying.

Stale air is exhausted by stack effect through an opening rooflight and fresh air is admitted through insulated ventilating panels beside new triple glazed windows; security louvers in front of the panels allow the residents to leave them open for daytime ventilation when the house is unoccupied.

The lightwell also contains a space-saving stairs with mezzanine giving easy access to the solar thermal store and new storage spaces in the loft. The easily accessible and temperate storage spaces in the loft have been very well received, freeing up vital space in the main house.

Operations and maintenance
The design team produced an illustrated user guide explaining the principles and operation of all the energy saving features and equipment. This was explained at an induction to all the features and equipment given to the residents once works were complete. The project is currently undergoing a 2-year period of energy and environmental monitoring. A series of four post occupancy evaluations will be carried out over this period by a specialist monitoring consultant, Dr Rajat Gupta of Oxford Brookes University.

Waste reduction
The works were designed to result in minimal demolition or removal of waste from site. The ground floor was insulated to a very high level whilst retaining the existing floor construction, and the roof was insulated by keeping the main truss members and re-using the existing concrete roof tiles.
Overarching sustainability achievements

East Thames, a registered provider of over 14,000 homes, are ‘delighted’ with the innovative retro-fit solutions. The client was committed to this project, not only because this housing type is very typical of a large proportion of its existing stock, but because of the urgent need to develop and implement innovative solutions to energy and carbon reduction which will reduce the risk to residents of fuel poverty.

The project has been an exemplar of effective collaborative working between the designer, contractor and client, and the sensitive and consultative approach to continued occupancy also avoided the additional costs of temporary re-housing.

The final scheme has demonstrated how energy efficiency measures can also ‘add value’ to existing homes, a key factor when deciding on housing options.

What lessons were learned and what conclusions can be drawn from this project?

A key challenge for successful delivery of the project has been the continued occupancy of the residents throughout, which has required careful programming of the works and provision for decant and storage.

The main lessons drawn for the benefit of future retrofit projects are:

— Limit the scope of works to the most cost-effective measures.
— Give site-based inductions and workshops to construction personnel and sub-contractors explaining the new technologies and methods required.
— Careful co-ordination of sub-contractors is needed.
— Carry out careful and detailed planning of works around residents remaining insitu.
— At least 6 weeks lead-in time needed prior to start on site, to plan works and procure materials.
— Retrofit at scale to reduce costs.

Awards won for the project

Three Rs Award, Housing ‘Small’ Award: Retrofit for Living – November 2011

Project comments/press/quotes:

The residents remained in the house over a long, disrupted winter of building works, but have emerged delighted with their transformed house. As the project developed, they reported immediate improvements in their thermal comfort, and found that one hour’s heating - in comparison to heating all day previously - was sufficient for their needs.

“I love my upstairs area. The roof windows let in so much light and they open up automatically when its gets too hot. I feel proud to have a home in which all the members of my family can feel warm and cosy.”

— Tracey Hillyard, Resident