ZERO CARBON HUB

CONCEPT

Rowner Research Project Phase One

March 2014

The Rowner research project was undertaken in Gosport and spanned from 2009 - 2013.

The Project was funded by the Technology Strategy Board (TSB) as part of the Building Performance Evaluation programme (BPE), together with support from First Wessex, NHBC Foundation, LABC, Saint-Gobain, HCA and Taylor Wimpey.

The research project at Rowner investigated the design and delivery of 24 apartments, split equally over two blocks. The developments were part of Phase I of a multi-phased project, the Rowner Renewal project.

The first Block (B) was built to comply with the Code for Sustainable Homes (CSH) level 3 energy requirements, and Block C was built to achieve the Fabric Energy Efficiency Standard (FEES).[1]

This project provided the Hub with the opportunity to investigate the implementation of the FEES in built flats.

The two blocks had different tenancy agreements, with Block B being offered as shared ownership and Block C as simple tenancy.

1. The Fabric Energy Efficiency Standard (FEES) is the proposed maximum space heating and cooling energy demand for zero carbon homes from 2016.

The research project had three phases:

- Design and construction stage
- Post-occupancy evaluation
- An overheating study

This series of five factsheets cover aspects of the first phase of the project.

This is the first factsheet in the series, covering the concept behind the Rowner research project.

Subsequent factsheets covering the other two phases of the project, and a case study report including all phases, will be produced by the Zero Carbon Hub in due course.

The factsheets can also be found online at: **www.zerocarbonhub.org**

Rowner development project

The Rowner Renewal is a £145 million regeneration project near Portsmouth, Hampshire, facilitated by the coming together of five key partners; First Wessex, Gosport Borough Council, Hampshire County Council, Home and Communities Agency (HCA) and Taylor Wimpey. The Zero Carbon Hub developed the research project at Rowner Renewal in collaboration with the following project partners:

First Wessex, the Housing Association who are the clients for the construction of the development and the ongoing support of the affordable housing on the development.

Home and Communities Agency, who have provided funding support to the project and worked with the Zero Carbon Hub to develop the energy standards for the dwellings that are the focus of the research project.

Taylor Wimpey group, who are the main developers of the site and led the design, delivery and construction processes.

Saint-Gobain, the organisation that supported the development of some of the innovative construction materials and systems used on this project.

LABC, who provided the warranty of the homes and the verification processes for the purpose of Building Regulations Compliance.

Rowner research project

Phase 1

The first phase of the research, the design and construction stage, spanned September 2010 to September 2011, and included:

- Evaluation of design intent and site practices – by a detailed analysis of design and specification information provided, interviews with key design and construction team members, walk-throughs of buildings being assessed, and a detailed evaluation of photographic evidence taken during the construction process.
- Building fabric, testing and analysis including testing air-permeability, a whole-house heat loss test (co-heating test), in situ U-value measurements, and investigation by thermography.
- Evaluation of handover and occupant engagement – review of guidance material to occupants, information packs, and personal handover process including interviews of occupants and a structured survey evaluating occupant satisfaction.

Phase 2

The second phase of the research, post-occupancy evaluation, spanned September 2011 to July 2013, and included:

- Analysis of operational efficiency of fixed building services – by metering and monitoring the energy consumption of the heating and ventilation systems, incoming and outgoing water, and air temperatures in two sample flats to get an understanding of operational efficiencies.
- Analysis of post-occupancy fuel and resource consumption – metering of gas, electricity and water consumption in all 24 flats for two years, and detailed sub-metered unregulated energy consumption analysis in two flats which facilitated analysis of energy use and a comparison with predicted values/available relevant benchmarks between the two research blocks built.
- Evaluation of internal environment and comfort – by monitoring internal temperature and humidity levels.

Phase 3

The third phase of the research, the overheating study, spanned September 2012 to September 2013, and included:

- A follow-on, in-depth assessment of any potential over-heating in 11 flats (4 located in block B and 7 located in block C) by measuring internal temperature humidity, window opening patterns via sensors and occupant interviews.

All phases of the research project had to comply with mandatory TSB requirements and for the three phases, three final reports were compiled and submitted to the Technology Strategy Board. These reports are not publicly accessible but the summary report that the Hub will produce in 2014 will contain all relevant findings from the project.

In addition to the TSB requirements, the Hub complemented the project with extra testing and monitoring (photo diary of construction, extra airtightness tests during various phases of construction, correction of thermal bridging values, window sensors analysis and further investigation of the MVHR unit performance).

Research project principles

Comfort

A fabric first approach (well insulated structure) was chosen, as it was considered a pragmatic and cost effective way to increase the energy efficiency of the homes.

A high performing fabric would ensure indoor thermal comfort and low running costs.

A Mechanical Ventilation with Heat Recovery system (MVHR) would ensure adequate levels of ventilation are achieved and provide fresh air which has been pre-warmed through the heat exchanger.

Gas boilers and thermostats were considered to be technologies that the occupants would feel familiar with and have a better control over, since most of the occupants had such systems installed in their previous homes.

Innovation

Wall construction used Thin-Joint masonry, a method considered as a modern method of construction (MMC). The advantages of this technique to the fabric design were the low thermal conductivity of the blocks and a smaller proportion of mortar (reduced linear thermal bridges).

Blown-bead insulation was used in the cavity of the external walls. This insulation type would allow for the entire width of the cavity to be filled to maximise thermal efficiency.

Mechanical Ventilation with Heat Recovery (MVHR) units were installed in all flats. This technology is intended to ensure adequate levels of ventilation are achieved and, at the same time, that the amount of energy required for heating would dramatically reduce.

The dwellings

The two blocks have been orientated to maximise solar gains in the winter and minimise heating loads, with the predominantly glazed façades facing south. During summer the use of windows would ensure the proper cooling of the properties.

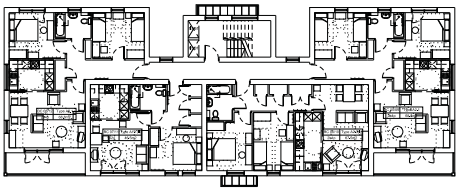
Each floor had two triple-aspect corner and two mid-plan single aspect flats arranged around a stair core. The walls were cavity masonry, made of Thin-Joint blockwork with full fill expanded polystyrene (EPS) blown bead insulation.

The two blocks were identical in layout and orientation, only mirrored.

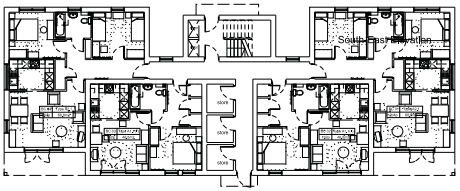
The flats were arranged around a central unheated circulation core and access was provided via a staircase. There were three flat types in the blocks;

- A corner two-bed flat with three exposed walls
- A one-bed single aspect facing South-West
- A two-bed single aspect unit which also faced South-West

The design of the blocks was not from the design portfolio that the developer usually used but was specifically created for this particular research project.



First and Second Floor Plan



Ground Floor Plan

North-East Elevation

South-West Elevation

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