CONSTRUCTION PROCESS

Rowner Research Project Phase One

March 2014

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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:

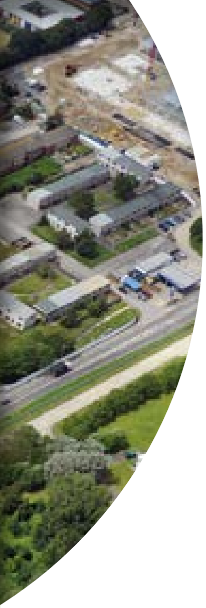
- Design and construction stage
- Post-occupancy evaluation
- And an overheating study

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

This is the third factsheet in the series, covering the construction process of the 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**



Construction at Rowner research

The construction for Block B and Block C started in 2010 and was completed by 2011. The Hub followed the project throughout its construction phase and documented different aspects. This information included :

- A photo diary documenting the progress of work on site, capturing elements that may have an impact to the performance of the buildings.
- A design and construction audit based on the documents provided to the Hub and the SAP calculations.
- Structured interviews with members of the design and construction team, as well as the residents (as part of the research into consumers attitudes).
- A walkthrough with members of key organisations involved in the construction, design and research of the project.

It has to be noted that the Hub's role in the project was that of a research facilitator. The Hub did not advise on any problems that may have been observed during this phase and it did not affect the process.

Information recorded was used to inform the As-Built SAP calculations and produce new performance predictions. These predictions were based on assumptions of various changes and were compared against the measured data during Phase 2 of the research project. The results will be published in the next series of Rowner documents.

Building fabric

Walls

External walls were constructed using Thin-Joint masonry system with full fill blown-bead insulation. The same construction system, but with mineral wool batts, was used for the sheltered walls between the flats and unheated corridors.

This construction system was new to both the project and construction teams, which led to a significant amount of learning being gained on the job. The system manufacturers were available on site to take feedback and provide guidance to the tradesmen.

The party walls in Block B (Code level 3) were partially filled edge-sealed cavity walls, corresponding with Robust Detail E-MW-15 in order to comply with the standards for achieving sound insulation in accordance with Part E of the Building Regulations. Block C (FEES) party walls were fully filled edge-sealed cavity walls corresponding with Robust Details E-MW-17 which took into account thermal bypass.

Floor

A concrete beam and Expanded Polystyrene (EPS) insulation block suspended floor system was used for both blocks, with a sound isolating membrane incorporated along the DPC. Intermediate floors were constructed using concrete planks.

Roof

The roof was insulated along the ceiling line with mineral wool between and over the joists to achieve a U-value of 0.10W/m^{2}K. The ventilated roof space was used to run the mechanical ventilation ductwork for the top floor flats.

Windows

Double glazed PVC-U windows and patio doors were installed in all the flats.

Thin-Joint block-work

Sound insulation along floor edge

Roof space

Building services

Ventilation

In order to minimise heat losses due to infiltration and maximise savings in CO_2 emissions, the flats combine an air-tight fabric, with a permeability of $4m^3/m^2.h$, with a Mechanical Ventilation with Heat Recovery (MVHR) system.

The system was specified to provide supply and extract ventilation rates to comply with the 2006 edition of Approved Document F of the Building Regulations.

While the specification document stated that these would incorporate a summer bypass feature, the installed units were only capable of having a summer mode enabled. This meant that during summer the system should operate on an 'extract only' mode and draw fresh air through openings.

Other services

All flats had a gas combi-boiler for space heating and instantaneous hot water.

Space heating was provided through radiators in all rooms controlled by TRVs, a wall thermostat and programmer. The thermostat however was located in the corridors although the recommended location for these is in a living space.

While the drawings showed the boilers and MVHR systems located in a boiler cupboard in the hall of all the flats, during the course of the project guidance in Approved Document J was revised which required all boilers to be installed on an external wall to allow for the flue to lead directly to the outside. This change was incorporated into all the flats, although it was not reflected in the drawings.

Observations

- The new construction method and technologies used on site required a level of skills and training that was not appraised prior to the start of construction. This impacted the application of the Thin-Joint masonry and the installation of the MVHR ductwork layout.
- For the use of Thin-Joint blockwork, coursing blocks were not used to achieve the required sill, lintel and floor heights.
- The construction team reported that the material of the blocks did not allow for the helical ties to be hammered in through easily and a hole was required to be drilled for the ties. An alternate approach was used on site and the ties fixed within the mortar joints as the blockwork was being laid. It is however not clear whether this was a problem with the product (which was from a mainstream manufacturer), a requirement for specialist skills, or lack of familiarity with the new system and the procurement.
- There were instances where it appeared that the cavity closers around window openings were formed by mineral wool. While this may be due to the proximity of the window to the fire stops between dwellings, this would limit the uniformity with which the blown bead insulation would fill the cavity.
- The use of flexible ductwork should have been limited in the MVHR installation. Some sharp bends and angles were observed that could have affected the MVHR system's performance.
- In order to ensure airtightness of the building fabric, the ductwork coming in and out of the MVHR unit was boxed over. However, there wasn't enough consideration for access to the control panel for maintenance and this boxing was subsequently removed.

Window opening construction

MVHR ductwork

Boxed MVHR unit

Recommendations

- Training for new technologies should be provided to site operatives and designers, as well as all personnel in supervisory roles, and should cover installation, coordination and commissioning.
- Structural details and services featured have to be integrated in the drawings provided on site, and adapted to contain the necessary information to all trades. This will ensure good interfacing and sequencing of work reducing any chances of shortfalls that can impact performance.
- Information from the design team must include commentary on the sequencing of site activities and procedures for addressing any variations that may occur on site. This will assist in addressing any difficulties that may be faced during construction.
- With an increase in the number of trades and specialist skills required on site, it is important to structure clear monitoring procedures for site works, with adequate checks at all stages to ensure the construction reflects instructions from drawings. Failure to do so may result in inaccurate construction and consequently problems that may prove difficult to be corrected if noticed at later stages.
- Changes and improvisations on site should be limited. However if changes are made, these should be communicated to the design team and, where appropriate, the SAP assessor.

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