

Evidence of Best Practice:

1.0 Towards Carbon Zero

Radian is an award-winning housing and support provider, managing 18,000 affordable homes across the south of England. Whilst the majority of housing stock is general needs housing, it also includes a significant portfolio of sheltered and supported housing, together with key worker accommodation, shared ownership, market rent and private sale properties.

Radian's **Towards Carbon Zero** Project was established in 2008. The scheme aims to deliver nearly 40 low to zero carbon homes on four sites over the next two years and is an integral part of a number of Radian strategies.

The homes are to be built using various modern methods of construction. A range of renewable energy solutions and procurement methods will also be employed. This will enable us to test and evaluate their success in delivering affordable, sustainable, comfortable and welcoming homes for Radian's residents, which achieve the government's stated goal of Carbon Zero housing by 2016. Residents moved into the first set of completed houses in March 2011 and this has become the first major milestone in the delivery of the goals and aspirations of the project.

"Radian, a housing association leading the way in retrofitting hard-to-treat homes and building eco homes that far exceed the current minimum standards for energy efficiency; nearly 44,000 people are reaping the benefits in lower fuel bills and cosier homes."

The Ashden Awards Judging Panel, 2011

The projects within the Towards Zero Carbon Programme are as follows:

- Lovejoy lane Windsor: (9 Homes) Completed March 2011
- Stoneham Green, Southampton (11 homes) Completed March 2012
- Copnor Bridge, Portsmouth (14 homes)completion due Jan 2013
- Ecostation, Whitehill Bordon Ecotown. (3 homes) completion 2014

For case study see link below:

http://www.radian.co.uk/images/stories/sustainability/towardszerocarbonproject_awards%20brochure_aw.pdf

2.0 Case Study 1. Stoneham Green:

http://www.radian.co.uk/images/stories/Dev_and_New_Business/StonehamGreencasestudy.pdf

Stoneham Green is the first Code for Sustainable Homes Level 6 development in Southampton. The eleven family homes is one of the few schemes to reach zero carbon standards in the south of England. All the homes are designed to reduce the impact on the environment and maximise the use of renewable energy sources, with each home fitted with a fully interactive Energy Dashboard to help residents get the most from the technologies installed. By doing so, Radian hopes the homes will significantly lower energy bills and generate more disposable income for the residents.

Project background

One of Radian's key objectives is to build on its success and environmental sustainability credentials by investing and completing the building of this Code 6 scheme. Having won the Ashden Gold Award for its track record and commitment to promoting sustainable development nationally, Radian is continuing its promise to develop eco homes and provide affordable, sustainable housing for families across the South of England.

Consultation

The site was previously derelict, having formerly housed a series of unused allotments and a community centre, which had been demolished. Due to the proposed site being overgrown with vegetation, slow worms and grass snakes were present on site. These had to be sensitively rehoused to a suitable habitat nearby over a period of months.

As with all Radian developments, extensive consultation was held with local residents and community members about issues such as overlooking, access, and materials. Their views and comments were taken into account and incorporated within the proposals and the final design. There was broad consensus that Radian's proposals reflected the need for quality family homes in the area. Most people who attended the consultation felt that the scheme was well designed and made good use of the derelict site.

Radian has also provided each of these homes with an allotment garden, which they will be encouraged to maintain. In order to inspire residents to produce their own vegetables and fruit, Radian are hosting a number of gardening workshops to give advice and teach residents how to get the best from their allotment.

Key Features and technologies

Radian was determined to create a scheme that would achieve the highest levels of sustainability through use of renewable energy and a well sealed building fabric using passivhaus principles to reduce energy consumption. **These included:**

- **Timber frame construction with high performance insulation**
- **A communal biomass boiler burning wood pellets to provide all homes with heating and hot water**
- **Use of low flow rate taps and shower**
- **High performance triple glazing**

- **Fully integrated PV installation**
- **All homes designed to Lifetime Homes standards**
- **Whole house mechanical ventilation.**
- **A high performance building fabric providing significantly reduced U values and improved air tightness**
- **An advanced Building Energy Management System (BEMS) with interactive energy dashboard.**

The water efficiency technologies in place also ensure that the new residents will use no more than 80 litres of water per person per day. This figure far exceeds the current average usage of 150 litres per person per day and the Building Regulations requirement of 120 litres per person per day. However, in order to realise Radian's ambitions of lowering utility bills to combat fuel poverty, these technologies must be utilised properly.

Energy Dashboard

The Energy Dashboard enables residents to see all energy and water consumption around their home in real time allowing them to actively seek to control their energy costs. By being able to understand what device is consuming energy, residents have the ability to react quickly and reduce their energy consumption with a mind to saving money.

It is estimated that each home, especially if maximum use is made of the photovoltaic's, will have annual fuel bills of less than £500.00 per year. This compares to an average of £1000.00 for the same home meeting Building Regulations. Providing online house manuals, composting guides and refuse collection times provides essential information to each resident. The content of each manual can be edited centrally and helps to alleviate resident's frustrations and costly technical calls. This improved approach has seen consistently high resident satisfaction scores.

At Stoneham Green, the heating and hot water provided by the communal wood pellet Biomass Boiler is billed on a monthly basis. These bills are updated continually as the month progresses on the Energy Dashboard meaning residents feel more in control of their energy spend as they can monitor and make decisions about their usage and this has proved popular as residents can use the Energy Dashboard to manage their monthly finances. . The upward rise in fuel prices has, in general, caused energy bills to increase. However this is not the case on this project with residents experiencing lower energy bills by using our system to stay actively informed of their energy costs. Some residents have reduced their heating bills considerably through this method with some receiving heating bills of just 41p for the calendar month.

The Energy Dashboard monitors all aspects of the homes performance and not just energy use. One household has reduced their water consumption to 5 cubic meters per month by active monitoring of their use. The residents were keen to stick to a monthly budget and the live energy monitoring allowed them to achieve this.

Another household, through the real-time monitoring and monthly billing, were able to quickly realise that they were spending too much on 'heating' and managed to quickly adjust their lifestyle and save £60 a month.

Open House

An open house was made available from April to May 2012. This allowed for any interested parties to study the technologies in place and discover more about the practicalities of building to this ultimate standard of sustainability. To date we have been able to accommodate nearly 250 people on these training sessions.

The Open House sessions offer a unique opportunity to hear presentations from key members of the project team, including builders, architects and local apprentices, and to review the lessons learnt during the build.

Post Occupancy Evaluation:

Radian has commissioned a post occupancy evaluation survey of each house in Stoneham Green 6 months after occupancy and this will be followed up after 12 months and 2 years. The survey seeks to get feedback on how people are finding the houses to live in and also to report on energy and water consumption.

As part of the energy dashboard set up, we were able to install a number of data loggers in the homes recording heating, hot water, and electricity use as well as temperature and air quality. The initial reports will be made available to Residents in early January 2013 with additional details available to be shared more widely with the stakeholders and the industry. A copy of the initial report of the outcomes is attached in the Appendix.

- Heating: All houses are using significantly less energy for heating than expected.
- Hot water : Again significantly less hot water use than envisaged at design stage
- Electricity Use: Average electrical use below design levels for most properties (significantly less for larger 3 bed properties than 2 bed properties)
- Average Energy saving per dwelling approx £80/month (representing average 48% saving compared to previous dwelling)

3.0 Case Study 2. Copnor Green:

Copnor Green is a 'cutting edge' development designed by Radian as a flagship scheme for Portsmouth City Council. These new 'low carbon' homes provide a variety of accommodation and are designed to reduce environmental impact and running costs for residents. Excellently located within easy reach of local transport, this attractive development provides a calm oasis in the heart of this vibrant City and is ideal for promoting low carbon development to a wider audience.

From 1908 the site was the home of Copnor Bridge Bowling Green until the City Council was obliged to relocate it to enable urgent repairs to be undertaken to the adjacent railway bridge. Following the bridge repairs, the Council determined to dispose of the site by inviting formal tenders. Radian considered that this was an opportunity on a strategic site in the heart of Portsmouth for a low carbon development. Being in an established community mainly composed of Edwardian terraced housing and representative of much of Portsmouth's housing stock, it was an ideal location to showcase and promote low carbon development to a wider audience.

Radian submitted a bid for the site with a proposal to provide a housing development that the City could be proud of. It would demonstrate low carbon development and would be a partnership with the Council to share the experience and knowledge the stakeholders and others wanting to understand the design principles involved. The new homes will be monitored with data collecting equipment to see how the actual performance of the homes matches the design aspirations and compares to other modern housing. This will be shared with the City Council as a means to promote further low carbon development in the City. Despite not being the lowest bid, Radian was awarded the site by the Council who embraced the concept and aspirations of the project.

Design and Challenges

Bounded by two roads, a bridge and the main Portsmouth to London railway line, this was not the easiest of sites to design and develop. Radian's contractor, PMC Construction and Development Services Limited has embraced the challenge and interpreted the dynamic design for the development by MH Architects.

The brief for the project was to design a flagship scheme in partnership with the City Council to demonstrate that a low carbon and attractive scheme could be delivered on a highly restricted inner city site. By providing homes meeting Code Levels 3, 4 and 5, the scheme would practically demonstrate how the advancements in sustainable building could be met. If that wasn't enough, the homes had to be simple to live in and not be reliant on an understanding of complex technologies by the residents. It was considered by the design team that utilising "Passive Haus" principles of high insulation, a high degree of airtightness, good thermal storage, and controlled solar gain would provide an excellent basis for providing a comfortable living environment. These 'all electric' homes are heated by small electric wall mounted panel heaters with water heating via appropriately sized immersion heaters in highly insulated storage cylinders. Although not normally considered for high Code Level homes, the high thermal performance of these buildings enable the use of these simple to use appliances. The highest Code Level homes have photo voltaic panels installed to offset the electricity cost.

Key Features and Technologies

The homes have been designed to meet the requirements of Code Levels 3, 4 and 5 of the Code for Sustainable Homes to demonstrate the increasing standards needed to meet the improvement in Sustainable building. The Building fabric is the same for all of the properties which are designed to PassiveHaus standards. This requires the homes to be very well insulated with high levels of airtightness to reduce the energy demand for heating. Key features are:

- **High performance triple glazed windows to minimise heat loss and maximise natural light**
- **High insulation standards to minimise heat loss**
- **Low energy internal and external lighting**
- **Low polluting insulation materials**
- **Low environmental impact materials**
- **Mechanical heat exchange and ventilation system**
- **Photo voltaic panels to higher Code properties to provide electricity**
- **Enhanced sound insulation**
- **Water efficient fixtures and fittings**
- **Homes configured to gain maximum benefit from solar gain to minimise heating demand during winter months and shading during summer**
- **External wall insulation to maximise thermal store capacity of clay/concrete block external walls**

Open House

As with Stoneham Green, one of the Code Level 5 houses will be made available for a month as an open house (Feb. 2013). This will allow visitors to see the details of the construction of the homes and the technologies used. It is hoped that this will be a useful resource to local schools, colleges, council officers, councillors and the wider community. We have already witnessed great interest by local school children and council officers researching low carbon practice. The new homes have had performance monitoring equipment installed in them that will be used for the first two years of occupation. This will enable the actual performance of these homes to be compared with the designed performance to provide useful knowledge for future developments.

4.0 Scheme Outcomes:

The Towards Zero carbon Programme is leading to the development of a number of new initiatives by radian and its stakeholders in understanding and developing new ways of working, types of construction, procurement methods and public engagement aimed at delivering sustainable local developments. We are committed to sharing the outcomes and best practice which has included the following:

- Evidence of high levels of resident satisfaction with the new homes (see Appendix A)
- Development and adoption of a fabric first approach to development using simple, tried and tested technology which has resulted in the development of Radian Building Performance standard which is available to all on our website:
http://www.radian.co.uk/images/stories/sustainability/radianbuildingperformancestandards_finalversion_jan2012.pdf
- Houses outperforming design criteria largely as a result of resident engagement with the new homes through the energy dashboard which has transformed people's lives and embodied a lifestyle change. <http://stoneham-radian.kaldien.com/>
- Reduced demand for water use (without the need to resort to rainwater harvesting) and this has helped to influence Portsmouth City council in its draft sustainable SPD (see following link
http://www.portsmouth.gov.uk/media/DRAFT_sustainable_design_and_construction_SPD.pdf)

Evidence of best Practice undertaken for Radian

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Appendix A: Resident Post Occupancy Evaluation; Stoneham Green