

**Local Value-Add Case Study**  
**Dandara**

*Establishing a local supply chain for  
Passivhaus builders in Scotland*

Project: **Dandara/Robert Gordon University Passivhaus research project**  
Contract value: **circa £347,000**

## Building a Scottish supply chain

### Researching the possibility of a Scottish Passivhaus standard

In January 2016 housebuilder Dandara was awarded a grant from Construction Scotland Innovation Centre (CSIC) to fund research into whether volume housebuilders could design and build to Passivhaus standard from a Scottish supply chain. With Robert Gordon University in Aberdeen, Dandara aimed to develop a new product: the Scottish Passivhaus model.



## THE BACKGROUND

In 2015, when this project began, the Scottish Government had set targets of reducing carbon emissions by 42% by 2020, which was having a significant impact on how the construction industry was thinking about and approaching current and future works.

In the UK's domestic housebuilding sector, for example, volume-build housing accounted at the time for around 90 per cent of new dwellings built. Properties were being produced to low-carbon standards, but not to the coordinated design and quality assurance standard of Passivhaus or equivalent.

Scottish companies has been slow in comparison to equivalents to pursue the benefits offered by developing components and systems for the low energy sector. The Dandara/RGU project aimed to create a deeper understanding and market adoption of an 'affordable Passivhaus' standard based on establishing, as far as possible, a Scottish-based supply chain.

Two homes would be built as part of the project: one to approved and certified Passivhaus standards and one that would replicate the process using locally-sourced components and materials wherever they were available.

As well as assessing effectiveness and affordability, the project would seek to maximise employment of local companies along the supply chain and help them gain Passivhaus certification for their products. It would also examine the benefits of the Passivhaus build for occupants, not only in terms of reduced energy bills but also as they relate to comfort and health.

*Passivhaus standards can be applied to provide high-quality housing at a competitive cost level, utilising the local Scottish supply chain and taken to mass market.*

### Project hypothesis

## PROJECT PARAMETERS FOR SETTING SCOTTISH STANDARDS

The project would focus on Dandara's Hazelwood development in Aberdeen. The 'Rowan' home type was selected for adaptation as a representative of a standard home in terms of specification, buildability, build cost, energy efficiency, running cost and open market value.



One would be built to to Passivhaus standard, using certified Passivhaus products and processes, and one created to the 'Scottish Passivhaus' standard.

As well as establishing whether a Scottish supply chain could be created, this would identify technical and project management modifications needed to achieve compliance, and allow Dandara effectively to cost future builds created to emerging regulatory standards.

## CREATING THE LOCAL SUPPLY CHAIN

Dandara's Scottish base at the time the project took place was in Aberdeen, which meant they were excellently placed for working with RGU and local suppliers, a key element in reducing embodied carbon during the build as well as meeting the overall objective. Both the Dandara and RGU teams were involved in generating the design of the home to be created under the project.

Scottish timber frame specialists Scotframe, with a base in Aberdeenshire, had previous experience of Passivhaus builds and the knowledge required to meet the performance standards of the design. They were engaged in the early stages of the process to provide the closed panel timber frame walls and roofs with insulation on the inside face. A specialist local labour team was also appointed early on to carry out the build.

Aberdeenshire low-energy home builder Cairnrowan Custom Homes were brought on board by Scotframe to erect the timber frame up to the airtight stage, and then to ensure air and wind tightness after service installation. That created a single point of contact for airtightness works and testing from a local firm with experience in building to Passivhaus standards. Air and wind tightness membranes and tapes were provided by Perthshire firm A Proctor Group.

At the time the project was carried out, there were some gaps in the supply chain – windows were sourced from Ireland, for example, partly to ensure the design of both experimental homes was identical and partly because at the time there were no Scottish-made products in windows and insulation barriers that could fulfil the project's needs.

*This project enabled a deeper understanding of PH design and the market adoption of the 'affordable Passivhaus' in the Scottish context. It looked to maximise the employment of local companies along the supply chain and to help them gain Passivhaus certification for their products.*

Similarly, there were no Scottish suppliers at that time for internal rigid wall and floor insulation of MVHR heating systems, and these had to be sourced outside of Scotland.

Dandara had trained their own staff in Passivhaus building methods, and some additional training relating to the installation of taping and insulation barriers was delivered on site.

By the end of the project Dandara had a full in-house team with specialist knowledge and understanding of low-carbon technologies, on-site logistics and sequencing and financial implications of the Passivhaus model.



## FINDING A WAY FORWARD FOR A LOCAL APPROACH

Both the homes selected for the study were successfully built to Passivhaus standard. Both utilised a timber frame designed and manufactured in Scotland, and erected by a locally-based timber frame installer. That showed that both design and construction skills were available in Scotland, and created a viable template for other volume housebuilders to follow.

It also identified some key opportunities for development, like the manufacture and installation of Passivhaus standard window systems and internal insulation products, as well as low-carbon heating and ventilation systems like MVHR.

It addressed issues and concerns like costs and skills shortages by demonstrating that volume housebuilders could meet and overcome those challenges without significantly negative impact on business and profitability. And the final report documented the entire process of achieving Passivhaus standards, giving other volume builders a clear set of guidelines to follow.

*"Throughout this project, we continued our mission to design and build innovative homes while actively pursuing solutions which contribute to the global movement tackling climate and environmental challenges.*

*"Its achievements will continue to inform how we build homes across the UK, with learnings finding their way into future developments as we seek to deliver the very best in new home design and construction. Passivhaus now forms part of our future business strategy."*

**Dandara Homes**

## PASSIVHAUS BENEFITS AT A GLANCE

- **Improved indoor air quality** via MVHR filtration and continual adaptation to internal and external conditions
- Potential to use up to **90% less energy** than standard build home, meaning reduced CO2, reduced bills and reduced fuel poverty
- No **draughts** or **cold spots**
- **Perfectly-regulated temperature** all year round
- **Sustainable** construction methods

*This case study was prepared by Construction Scotland Innovation Centre on behalf of the Scottish Construction Leadership Forum – March 2021.*

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