

case study

Balehaus

Developing and testing straw bale panels for housing construction

Project Summary

To develop and test prefabricated straw bale building panels for use in housing construction, by developing the Modcell system which has only previously been used as cladding in low rise buildings. Featured on Grand Designs Live, the new BaleHaus system is targeted for wider scale uptake in the UK domestic housing market.

Partnership

- University of Bath, BRE Centre for Innovative Construction Materials.
- White Design – Low environmental impact architect
- Integral Structural Design – Sustainable structural engineering consultancy
- Agrifibre Technologies Ltd. – specialist in industrial use of agricultural crop fibres
- Eurban Construction - specialist in the installation of solid timber building structures

Aims

The Modcell construction technique, a non-load-bearing cladding for bespoke, medium rise framed buildings has not been used as a load-bearing wall system. The enhanced BaleHaus system will be tested to conform to domestic building standards, including load bearing, and stands out as the leading renewable, carbon neutral building product.

Innovation

Though straw bale construction has historically been used, to varying extents, the modern development of a wholly prefabricated load-bearing panelised housing system using straw bales is highly innovative.

The innovation lies in developing panel design, details for fixings between panels and adjoining features (base, floors, roof, openings, and services), testing and understanding performance, and developing the system for commercial exploitation in the UK through partnerships with commercial housing developers.

The panels must be sufficiently robust to meet modern construction demands, such as load-bearing capacity, fire resistance, thermal transmittance and acoustic performance.

Further innovation lies in the fact that the panels are readily manufactured off-site close to the final construction site, using local flying factories, and are delivered fully finished and ready for installation.

Development

A 2m x 2m BaleHaus panel weighs 750kg, comprised of straw bales (280kg), cross-laminated timber frame (100kg), steel reinforcing, screw fixings (10kg), lime render (360kg) and timber pegs.

The net embodied carbon per panel equates to 14 kg. CO₂ or 3.5 kg.CO₂/m² in contrast to conventional walls of 100 kg.CO₂/m², giving a saving of around 96.5 kg.CO₂/m². For a typical house with 150-200 m² of wall, this gives a potential saving of over 19 tonnes of CO₂ per house.

Due to high levels of thermal insulation, a new straw bale building will save 2-4 tonnes CO₂ per house per annum on heating. Over 60 years this comprises a total saving of 120-240 tonnes of CO₂. A construction market share of just 0.1% by 2012 will deliver around 50,000 tonnes CO₂ savings. (approx. 200 BaleHaus developments)

The partners have considerable industry experience underpinning knowledge transfer throughout the construction industry, particularly housing, which will benefit from delivery of low carbon housing built in compliance with demands of the Code for Sustainable Homes.

Carbon Connections is HEIF-funded investment project utilising £3 million for carbon reduction activities. Based at the UEA, Carbon Connections supports innovative projects in carbon reduction using a partnership model. The aim is to facilitate knowledge transfer between universities and research laboratories and the business community to speed commercial development of carbon-saving projects, whether technological or behavioural in focus.

