

## Background

- The Old Apple Store is a development of 5 new family homes, with one existing unit retained and completely refurbished. The site nestles within the site of the old apple store in the picturesque village of Stawell in Somerset. The 2 x 4 bed units are nearing completion and work will shortly start on the terrace of 3 bed units: all the new homes are designed to achieve CSH level 5. Following on from their award winning development at Great Bow Yard, Ecos Homes wanted to create a specification that achieved CSH level 5 in a robust solution that provided a thermally efficient shell, could be easily replicated, with reduced build times and with the most sustainable materials on the market.



## Construction

- Roof:** Engineered I Beams fully filled with Warmcel with 100mm woodfibre with OSB top and bottom. Internally Proclima Vapour Control Layer Intello Pro to underside of OSB. Finished externally with Sarnafil Single Ply membrane. U-value: 0.12 kWh/m<sup>2</sup>k
- Ground Floor:** Concrete slab with 150mm Kingspan insulation under a 50mm sand binding with 50mm edge upstands; U-value: 0.15 kWh/m<sup>2</sup>k
- Walls:** Engineered OSB cassettes fully filled with 175mm Warmcel and insulated externally with 100mm woodfibre board and rendered with mineral lime render or clad with baked softwood: U-values 0.14 kWh/m<sup>2</sup>k
- Doors and windows:** Triple glazed FSC windows U-values 1.2 kWh/m<sup>2</sup>k. Doors U-value 1.1 kWh/m<sup>2</sup>k

## Ease and Speed of Construction

Significant resources were used to construct retaining walls to the rear of the site which delayed the build somewhat. The building inspector has been quite amenable to the design but did insist on additional structural steels, which required some redesign and additional detailing. The build itself has been quick but the design of the sloping flat roof and sloping rear walls has added complexity



## Thermal Design

OSB pre-formed cassettes manufactured offsite form the walls. These are supplied open-stud and once erected, filled with Warmcel (recycled newspaper) and insulated externally with 100mm woodfibre board and rendered. Together with triple glazed windows and with a well insulated slab and roof, the structure offers very low U-values, designed to require only minimum additional heating. With a target airtightness of 3m/h@50Pa and an overall heat loss parameter of 1.2 W/m<sup>2</sup>K, the buildings should be very efficient to operate. Top up heating is with wood pellet stoves. Passivent, Solar thermal, rainwater harvesting and PVs are also integrated into the design. All hot water pipe runs are insulated and run through a central service zone and minibore where possible to reduce the volume of water in the system. Ecos have also minimised radiators (none in living space) and located the cylinder as close to the pellet burner as possible to minimise heat loss.

## Materials

A glulam frame with infill OSB cassettes form the structure. OSB (Orientated Strand Board) was selected as the sheathing board as it is manufactured in a process which uses nearly 90% of the log, with the balance used to supply energy. Insulated with recycled newspaper – Warmcel and insulated externally with woodfibre boards (compressed wood fibre with no additional resins) and rendered with a mineral render or clad with baked softwood. Between floor insulation is UK sheep's wool.



## Process

The Houses are being built by Pippin Properties Limited, a joint venture between the landowners and Ecos Homes Limited with Ecos managing the build.

- The benefits of partial offsite construction were clear
- Thermal mass is provided by the slab
- Reports from Stamford Brook highlighted the need for simple and effective detailing and minimal service punctures
- The design with sloping roofs and walls has added considerable complexity
- Some detailing has had to be worked up on site
- Close attention was given to sealing gaps – 3 operatives for 3 weeks on the first 2 units

### Management and Supply chain

- Ecos are managing the build themselves which has allowed problems to be worked through on site
- The supply chain has been stretched but manufacturers such as Passivent have worked with Ecos to provide new solutions. Passivent have supplied the system with a roof outlet for the flat roof, which was a new product

## Post-Construction Monitoring

Ecos Homes have learnt from others, especially Kinglerlee Homes, the benefits of early air-tightness testing and intend to undertake the first test once the windows are in.

### Post Occupation Monitoring

- A whole house home energy hub supplied by Green Energy Options will allow detailed monitoring of energy, water, temperature and humidity. With a touch screen, wireless sensors and live web display, the system is designed to be attractive and engaging, especially for children and will detail how the solar panels and circuits are performing.
- Tenants post occupation studies will also evaluate consumer satisfaction and behaviour patterns

