



This beautiful straw bale building was constructed in 2006 and now provides an inspirational base for education and other groups visiting St Catherine's near Windermere in the Lake District National Park. It is the first straw bale building in the Lake District and it is the first one built or owned by the National Trust. It is innovative in other ways too; particularly through its design, its materials and the mix of traditional and new construction techniques and the approach that was taken to getting it built.

The design is such that the energy needs of the building are low and many materials used for construction are from sustainable, renewable resources, or are recycled. To cut down on transport these were as locally sourced as possible. At the end of the building's life many of them will naturally biodegrade or can be recycled, meaning the Footprint will leave a very small ecological footprint.

During construction, opportunities were taken to include people in the process and engage them with its progress. Some of the building work was undertaken by volunteers, either on courses learning new skills or on work parties. Alongside, site visits, open events and talks were arranged for visitors and community groups and a local schools art project began.

The Design

The Footprint consists of a single open room of about 105m² with a small store and tea making area at the back. Outside there is a covered activity area and a timber walkway around the building. It is a simple but unusual shape, almost elliptical at one end with gently curved walls. There is quite a large roof overhang that curves around the building on all sides both for protection from rain and also to screen direct sunlight in the summer. The total size of the building is around 220m².



The south facing side is glazed panes and windows, allowing the use of natural light in the inside, maximising solar gain and ventilation. This also gives the feeling of the building being part of the outdoors and not shut off from it. There is one door and the sense of being part of the site is further enhanced with steps to the meadow.

The northern side is one long wall with a single window, which extends to provide a sheltered wall to the covered activity area.

On the eastern end there is a straight glazed wall with another door leading out to the covered area.

The western end is beautifully curved, with four small windows.



Material Facts

- 360 standard wheat straw bales were used for the walls in the Footprint. The straw came from Yorkshire where it grew on flat land which makes the bales dense and consistent in texture. To build with straw it has to be kept dry; no moisture must penetrate. When the walls were going up on 4 weeks of training courses, a canopy was erected to keep off moisture. We were extremely fortunate with the weather in 2006; the straw walls saw



mostly hot and dry conditions during their construction and settlement period, although nothing was left to chance and they were carefully covered at the end of each day. After a lot of trimming, the render was applied in August; 3 coats of lime plaster externally and 2 coats of clay plaster inside.

- Green oak has been used for the frame of the building and the interior floor and skirting boards are beech. The exterior walkway, steps and flooring and the bridge from the car park area are larch. The balustrade on the walkway is oak. Three dozen trees from sustainable National Trust woodlands in the Lake District were used for these aspects of the building; the beech and larch mostly from felling; the oak from trees that came down near Coniston in the gales of January 2005. The careful



choice of timber has reduced the need for chemical preservatives.

- The roof is of triple lap oak shakes, with a breathable felt membrane. The 12,000 shakes are from sustainable sources in the south west.



Even though it requires further transportation, SW oak generally has a stronger, straighter, grain than local oak which doesn't produce the same neat split, and meant that fewer trees were needed for supply. Other timbers include UK softwoods for the roof structure, and the two

portals that allow us to keep the interior space open, are laminated small strips of timber glued together to give a curve, known as Glulam.

- Internally, a curved cob wall separates the main room from the small kitchen and store. Three types of cob were used; initially the cob was a straightforward mix of clay, straw and soil cleared from the site. When the wall got too high for further safe work, emphasis moved to the production of



bricks on site by hand using purpose made forms, and air drying the bricks on racks. Even though over 1500 bricks were made by work parties, we ended up buying 600 bricks in. The supplier was down in Devon and these bricks are very red compared to our Cumbrian

brown earth. National Trust masons finished the wall, and in volume we have 22.5 m³ of cob!

- The floor voids are insulated using local sheep's wool, with locally produced Thermafleece in the roof voids.

- Pilkington K Glass is used for the windows and doors.
- The 41 foundation pillars for the suspended floor in the Footprint are of recycled tyres, infilled with a rammed mix of reused subsoil, quarry waste and clay. Their construction was very labour intensive and was undertaken as part of the first training course. Over 120 car tyres and a tractor tyre were reused this way; the cob wall itself sits on a curve of 17 rammed earth tyre pillars.



Construction Facts

- The Footprint was built through a Partnership arrangement under a negotiated tender with Lambert-Gill from Carlisle as the Principal Contractor, and Amazon Nails from Todmorden as the Training Enterprise who led most of the green building aspects of construction as hands-on courses.
- The building was designed by Paul Crosby Architects in Kendal who produced the original sketch design, then developed and detailed in house by the National Trust's Building Department in Grasmere.

- The site was cleared at the end of March 2006 and the contractors finished most of their work at the end of October. It was first used in February 2007.

- The tyre foundations, the straw walls, most of the lime and the entire clay plastering were built by people on training courses. Over 140 participants and staff on National Trust training places lent a hand and learnt these new skills. 325 labour days got work done on training events.



- Over 120 different people from youth groups, families, friends, National Park and National Trust staff and other volunteers contributed to the construction of the cob wall alone. A further 60 or so volunteers helped with painting, roofing or other practical work, or with administration, education work, catering, filming, photography, website creation and the production of resources. This put in around 125 days hands-on on construction and 230 or so days on other aspects of the Project.

- In total, trainees and volunteers on the building put in over 450 labour days.
- During construction there were 7 open evenings for members of the public; 15 special interest group visits and staff gave talks offsite to a range of groups.

- Radio Cumbria, the local BBC station, provided sound recording equipment and a radio blog by the Community Education Officer was broadcast every few weeks.

- A digital time-lapse camera kept a record of building progress. Fixed in a window of the existing office, it took a photograph every 5 minutes. Over 43,000 images were taken, we now have "movies" of construction! Additionally, 2600 digital photos were snapped throughout, and the project has its own website www.strawfootprint.org.

- A local schools art and sustainability project is running involving 4 schools and 127 pupils on activities.

- The Footprint Project was made possible by a bequest from the estate of Enid Rowell, grant aid from the Lake District National Park Sustainable Development Fund, income from courses and a number of small donations.