

## The Waste House, Grand Parade Mews, Brighton BN2 9RS



### Introduction and approach

The Waste House was conceived by local sustainable architect, Duncan Baker Brown of BBM Sustainable Design Ltd working with founder of reuse website FREEGLE UK, Cat Fletcher. The premise was simple; 'there is no such thing as waste: just stuff in the wrong place'. For every five houses built enough material to build another is thrown away: why not try to build a house purely out of waste?

The Waste House is built on the University of Brighton's College of Arts and Humanities site. It was co-designed by Duncan's undergraduate architecture students, overseen by constructors The Mears Group and built by volunteers and apprentice construction students from City College, Brighton & Hove.

Clad in old carpet tiles with walls filled with experimental insulating mixes of old cassettes, toothbrushes and wallpaper, the building is surprisingly elegant. Thermal performance is being monitored by Brighton University's Faculty of Science & Engineering.

The house will remain an evolving project and centre promoting recycling and waste reduction.

### History

The project developed out of "The House that Kevin Built", which was a Grand Designs exercise to see if a modular, sustainable house could be built over six days, with progress televised each day. The Waste House uses much of the modular technology demonstrated, but this time showcases what can be done with 'free' waste material, routinely discarded by the building industry. Equally, it draws on the example of recycling pioneers such as Rural Studio in the US and explores how we might achieve a closed system of reusing resources.

It has been an exercise in learning for all concerned, from the University of Brighton undergraduate architects involved in the design, to trade apprentices and construction students from City College Brighton & Hove. It was a rare opportunity for young people to get practical hands-on experience of a complex build, and access to their free labour proved essential, given the labour-intensive nature of much of the work.

The University of Brighton donated the site, which is intended to be a permanent addition to its campus and an evolving work-in-progress for future students.

### OVERVIEW

Type: Detached

Age: New build (2014)

Walls: Timber frame, block outer skin, clad in tiles

Area: 120m<sup>2</sup>

### FEATURES

- + Low energy lighting
- + Mechanical ventilation with heat recovery (MVHR)
- + Reused, recycled and upcycled materials
- + Solar photovoltaics
- + Zero carbon

The build took only twelve months and came in below budget, helped by the generosity of Mears Construction in overseeing the build at no cost, and the free access to willing labour.

In recognition of this groundbreaking work, the Waste House has won a host of awards, including:

RIBA South East Regional Award 2015 – Winner

RIBA South East Regional Sustainability Award 2015 – Winner

International Green Apple Awards for the Built Environment 2015 – Winner

H&V News Awards 2015 – Shortlisted

People Environment & Achievement (PEA) Award 2014 'Best Echo Project Working with Schools' - Winner

Blueprint Awards 2015 Best Sustainable Project - Highly Commended

Blueprint Awards 2015 for Award for Architecture - Shortlisted

2degrees Champions Awards 2014 Best Waste & Resource Management – Winner

2degrees Champions Awards 2014 Best Building Project - Winner

Climate Week Awards 2014 - Finalist

Examples of how waste has been recycled/reused/upcycled:

**Foundations** – formed of concrete with a high content of ground granulated blastfurnace slag (GGBS) and ground concrete aggregate.

**Columns and beams** – made from scrap timber bolted together. Timber came from a variety of sources, including a dismantled pavilion, built as a 2012 architectural student project.

**Internal solid wall** – made from 10 tonnes of rammed chalk, excavation waste collected from a building site, compressed with a pneumatic tamper to become immediately load bearing. The wall is both a support and also acts as thermal mass.

**Thermal mass** – unsaleable clay blocks from Chandlers builders merchants were placed just below the roof to act as additional thermal mass, storing heat and stabilising internal temperatures.

**Roof** – contains a single ply membrane made from recycled tyres.

**Stairs** – internal stairs are made from compressed recycled paper by German company Lindtner.

**Floors** – surface finish is waste MDF.

**Kitchen** – an old, serviceable second hand kitchen, sourced from reuse website, Freegle.

**Window seals** – when windows were fitted into the structure, the surrounds were sealed with bicycle inner tubes rammed into the joints.

**External wall tiles** – rubber backed carpet tiles were laid in an overlapping pattern as external weather protection.

**Lights** – elegant aluminium fluorescent fittings came from Bangladesh, where they were recovered from ships being scrapped.

**Wall insulation** – experiments with different infills (see 'Insulation' section below).

**Vapour control Barriers** – PVC banners from old events, which are normally burnt or landfilled, were used as vapour barrier material.

## Energy efficiency measures

### Heating and hot water

Initially, there was some debate as to whether the building should have a heat pump, but this was ultimately deemed unnecessary. Because of high levels of insulation, the building should warm up from the large numbers of students working there and should retain heat. For that reason, there is no heating system as such, but there are electric heaters as back up.

A second hand heat recovery ventilation system has been fitted, but this has served more as a practical design exercise for architecture students rather than a necessity.

Water heating is also electric, but this is boosted in summer by using surplus generation from the PV panels, which is diverted to the immersion heater.

### Insulation

As a new building, the structure has conventional levels of wall and roof insulation. However, the first floor walls were designed as hollow plywood cavities to allow experimentation with waste as potentially free insulating material. Various infill materials were chosen, varying from disposable plastic toothbrushes from airlines to rolled scrap denim, wallpaper and even obsolete video cassettes. Using waste in this way avoids both landfill and incineration by fixing carbon into the structure whilst helping to keep it warm.

## Renewables and Low carbon technology

**Solar PV** – There is 4 kWp of solar photovoltaic panels on the south facing roof. These generate over 4000 kWh of electricity each year, which largely offsets the building's already modest electricity use, making it zero carbon.

### Carbon emissions

**Energy Use:** Electricity 3700 kWh pa, PV 4200 kWh pa.

Net CO2 emissions: virtually zero.

### Lessons learned

**Site** – When the foundations were dug, it was found that the building was on the site of an old tip, which was unstable and needed reinforcing with a lot of chalk (waste).

**Structural issues** – although recycled timber was successfully used to make beams, this was rather unconventional and posed problems for structural engineers to confirm the strength. As a result, beams had to be over-engineered to a rather 'chunky' profile to ensure safety. This made the construction process labour intensive and involved a huge numbers of bolts

**Design** – there was probably too much design in advance, rather than first investigating available material and planning accordingly. As an example, there was an over reliance on recycled ply in the original design but this material proved hard to come by and other alternatives had to be found.

## Professionals

**Architect** – Duncan Baker Brown. [bbm-architects.co.uk/](http://bbm-architects.co.uk/)

**Recycled materials** – Freegle. [ilovefreegle.org/](http://ilovefreegle.org/)

**Site Management** – Mears Construction. [mearsgroup.co.uk/](http://mearsgroup.co.uk/)

**Solar PV** – [southdownssolar.co.uk/](http://southdownssolar.co.uk/)

Eco Open Houses is an annual collaborative project between Low Carbon Trust, Brighton Permaculture Trust and Brighton & Hove City Council. Eco Open Houses 2015 is being run is part of the national Green Open Homes network established with funding from the Department of Energy and Climate Change (DECC) and is now maintained and managed by the Centre for Sustainable Energy (CSE). This years event is part funded by Brighton & Hove City Council.