Last month we had a look at the early exemplary housing on the Innovation Park at BRE’s Watford site. (BRE have another Innovation Park at Ebbw Vale in Wales, and a Scottish one is being developed at Ravenscraig, near Glasgow.) To complete the account, here are details of the more recently built houses on the Park at Watford.

The Green House
By Barratt, built 2008.

This was the first house built by a big housebuilder to Level 6 of the Code for Sustainable Homes. It has an attractive, somewhat Continental appearance.

Some features of the Green House:

- Raft foundation. Rafts were a popular form of foundation in the Sixties. Perhaps they will have a revival?

- External walls of thin-joint blockwork with extra-thick Celcon blocks. The walls are externally insulated and rendered with the Weber.therm XM system, incorporating 18 cm of insulation. (On the Continent rendered external insulation is common, and it’s likely to become more widespread in the UK, too, in the future. There are no conventional cavity walls on the Park.) The fairly heavyweight construction minimises summer over-heating.
• SIP roof from Smartroof with 25 cm insulation.

• U-values for the walls, roof and floor are 0.11 Watts/m².ºC, or better. Airtightness, q50 = 1 m³/h.m².

• Lots of triple glazing with a U-value of 0.88 – the generous window area equals 25% of the floor area.

• Solar thermal panels from Kingspan, coupled with a Range Tribune Duplex solar cylinder.

• Smart wiring to give digital access to most rooms.

• MVHR.

• Air Source Heat Pump, taking heat from either outdoor or indoor (exhaust) air.

• External shutters which close under computer control to reduce summer over-heating.

   But I question whether external shutters to reduce summer overheating are necessary. A fairly heavyweight shell in conjunction with a MVHR system that incorporates an automatic summer bypass is unlikely to overheat. More usefully, shutters help to reduce heat losses during the long winter nights.

The Renewable House
By the National Non-Food Crops Centre, built 2009.
(The house is now managed by the InCrops Enterprise Hub.)

Many building materials (bricks, cement, plastics, glass, etc) have high embodied carbon. (See my article about embodied carbon in the October 2011 issue.) But materials which are derived from plants contain carbon extracted from the atmosphere, and as such they lock up carbon, ie, they have negative embodied carbon. Timber is the prime example, with reed and straw (for thatching, bale walls, etc) also locking in carbon.

The promoters of the Renewable House wish to show that materials derived from plants can be used more widely in house building. So the walls of this house utilise a timber frame infilled with hempcrete blocks.

Potentially, hemp is a wonder crop that could be grown much more widely in the UK. It is extremely fast growing – second only to bamboo – and yields about 8 tonnes of dried matter per hectare per year. It also has a very wide range of uses, including the production of food, paper, textiles, plastics, drugs (legal and illegal), and building materials.

Hempcrete is a mix of lime and the woody part of hemp, and its use was pioneered in France during the Eighties. The lime petrifies the hemp – ‘turns it to stone’ – so that it cannot rot. But hempcrete blocks are not strong, so in this house they have been used in conjunction with a timber frame. The walls are lime rendered. (U-value: 0.19.)

Sheep’s wool has been used for roof insulation. (U-value: 0.16.) By the way, insulation can also be derived from hemp.
The Renewable House

This house is the only one on the Park to incorporate electric UFH. Carpets are made from DuPont’s Sorona polymer, whose raw materials include corn sugar (37% of total).

The house was built in 12 weeks. The promoters claim that it is both low carbon and low cost: excluding the cost of ground works and utilities, the build cost would be only £75,000.

The Natural House

By the Prince’s Foundation for Building Community, built 2010.
This is a pair of semis, and they stand out on the Park because of their traditional, well-proportioned, even elegant appearance. The hipped roof is uncluttered – no PV or thermal panels here. And they are the only houses on the Park that have that feature so dear to the hearts of traditionalists – a chimney. But a chimney on a modern house can be silly. (You can even purchase plastic ‘chimneys’ to put onto your roof – I hope this is one lead that readers will not follow up!) In this case, though, the chimneys have been put to a good use – for flues from wood stoves, and, more interestingly, for the vents of passive stack ventilation.

The construction methods are claimed to be traditional, but it has to be asked, whose tradition? Those of England or of Germany? The walls are made of Thermoplan blocks – more generally know by the distinctly foreign sounding name of Ziegel. The blocks have a multitude of air channels within a matrix of thin walls of fired clay. The still air contained within the blocks results in good insulation properties. And for this house, the insulation of the walls has been further enhanced by a layer of Pavatex woodfibre insulation on the outside. This has been weatherproofed with a Baumit lime render. Inside, the walls have been lime plastered.

Sheep’s wool has been used for insulation in the roof. There is a gas boiler as back-up for the wood burner.

U-values – walls: 0.20; roof: 0.11; floor: 0.11; glazing: 0.75.

Airtightness, q50 – 1.0.

There is one respect in which this house certainly has been built traditionally – it took more than a year to build. Which is in contrast to the short build times of the other houses on the Park.

**The Cub House**

By Cube Housing Solutions, built 2010.

The name of the promoters gives a hint of what this design is about – a prefabricated cuboid house.
Will the planners find it acceptable? The exterior walls are finished in shiny white plastic. There may be nothing intrinsically wrong with shiny white plastic, but it may well be too unusual as a finish for the planners. (Actually, having reflective walls and roofs is beneficial – traditional materials are often lacking in this regard. If required, though, the house can be clad in timber, or even in brick.)

Though the planners may be wary, the NHBC building inspectors should find the house acceptable – the designs have their type approval.

The pods are based on a steel frame. (U-values – walls: 0.21; glazing 1.25. Airtightness, q50 = 2.9.) Each storey has a floor area of 51 square metres.

An Exhaust Air Heat Pump is incorporated in the ventilation system. According to the promoters, the heat from the exhaust air heats not only DHW (Domestic Hot Water) but also provides space heating. (But what proportion of the space heating is supplied by the heat pump, rather than by electrical heating of the supply air?)

The manufacturers, FutureForm, say that a Cub House requires 16 days for off-site manufacture, followed by a mere seven days of onsite construction and finishing.

The developer of the Cub House is Charlie Grieg. You can read an interview with this remarkable lady, including the story behind the Cub House, in the October 2011 issue of the magazine.

What’s missing

One of the most widely publicised houses on the Park was Kingspan’s Lighthouse. Not being able to find the Lighthouse on my visit, I asked if it had been demolished. It had been ‘deconstructed’, I was told.

In an email to me, Kingspan wrote:

'Everything of which the building was constructed was re-claimed, re-used, re-cycled, down-cycled or incinerated for useful heat.'

Deconstruction was about to befall the ecoTECH Organics House, too. By definition innovation has to be new, so the lifespan of an innovative house on the Park seems to be short.

What’s to come

Two new houses are about to be built:

- The Santiago House
  This town house was the winner of the 2011 British Homes Award. Made from six steel-framed modules built by FutureForm, the house has been designed to create a flexible space that will satisfy the changing needs of its occupants.

- The Chestnut House
  A pair of Passivhaus semis designed by Bere Architects.

The Victorian Terrace

The houses on the Park show that achieving ‘zero carbon’ housing, as will be required by the building regulations in 2016, is quite doable, especially now that ‘zero carbon’ has been redefined. (The unregulated emissions due to the use of
household appliance are excluded in the new definition.) Drastically reducing the emissions for new housing is neither difficult nor costly. (The priorities are lavish insulation, minimal thermal bridging, and appropriate airtightness.)

What is a much bigger problem, one that will be much more difficult and costly to solve, is how to sufficiently upgrade the vast stock of old housing in the UK.

There used to be a Victorian stable block on the BRE site. The building has now been divided up to form three refurbished terrace houses. The Victorian Terrace is included within the Open Day exhibits, but as renovation is outside my remit, I write no more about it.

**A couple of exhibits**

In the Visitors’ Centre a couple of displays caught my attention –

**Pilkington’s Spacia glazing**

This is the world’s first vacuum glazing.

To quote Pilkington:

> ‘It offers the thermal performance of conventional double glazing in the same thickness as single glazing (6mm).’

[My comment: most window glass is 4mm thick, with 6mm only for large windows.]

Spacia glazing is composed of two thin panes of glass with a very thin vacuum between them. Tiny spacers with a diameter of only 0.25 mm keep the two panes a fixed distance apart. The spacers are placed on a grid, 2 cm apart horizontally and vertically, and they are virtually unnoticeable. The thickness of the glazing is only 6.5 mm, so it can be used where conventional double glazing would be too bulky, eg, in listed buildings.

It is too costly at present to be used in new build.

**Minus 7**

This system utilises a roof covering that extracts heat from its surroundings. The covering is composed of hollow, interlocking, aluminium ‘planks’ which are laid across the roof in place of tiles. A water/glycol mix is circulated through the planks. So far – not so very different from solar thermal panels. But for this system, the heat output (for DHW or UFH) can be boosted in temperature by a heat pump (which is only likely to be necessary in wintertime).

In the garden are buried two large water stores, one for warm/hot water and one for cold water. The system can even harvest heat during the night from the ambient air. Sunshine gives a great boost, but is not essential.

Initially, the system was called ‘Sunergy’, but ‘Minus 7’ is its new name. The ‘Minus 7’ refers to the lowest ambient temperature at which the system can extract heat.

The theory sounds good, but how well will it work in practice? BRE have been evaluating the system. Performance data for SAP’s Appendix Q is likely to be available very soon.
FURTHER INFO:

**BRE**
Follow the Innovation Park link at the bottom of their home page:
www.bre.co.uk.

**The Barratt Green House:**

**Weber**
Weber.therm external wall insulation system can be based on varying insulants – polystyrene, polyurethane, etc. (Weber is part of the Saint-Gobain building materials conglomerate.)
www.netweber.co.uk.

**Smartroof**
SIP roofs.
www.smartroof.co.uk.

**The Renewable House by the NNFCC:**

**Tradical Hemcrete**
www.limetechnology.co.uk.

**Thermafleece**
Sheep’s wool insulation.

**The Natural House by the Prince’s Foundation:**

**Natural Building Technologies**
Suppliers of ‘natural’ building materials, including Ziegel blocks, Pavatex insulation boards, and Baumit lime render. Consultants for the build of the Natural House.
www.natural-building.co.uk.

**Katzbeck**
Austrian doors and windows.
www.katzbeck.co.uk.

**The Cub Home by Cube Housing Solutions:**

**Cub Homes**

**FutureForm Building Systems**
Prefabricated modular buildings.

**Visitors’ Centre:**

**Pilkington Spacia**
Thin vacuum glazing.
Minus 7
System for collecting heat from a roof and storing it underground, with a heat pump for a temperature boost when required.
www.minus7.co.uk.

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