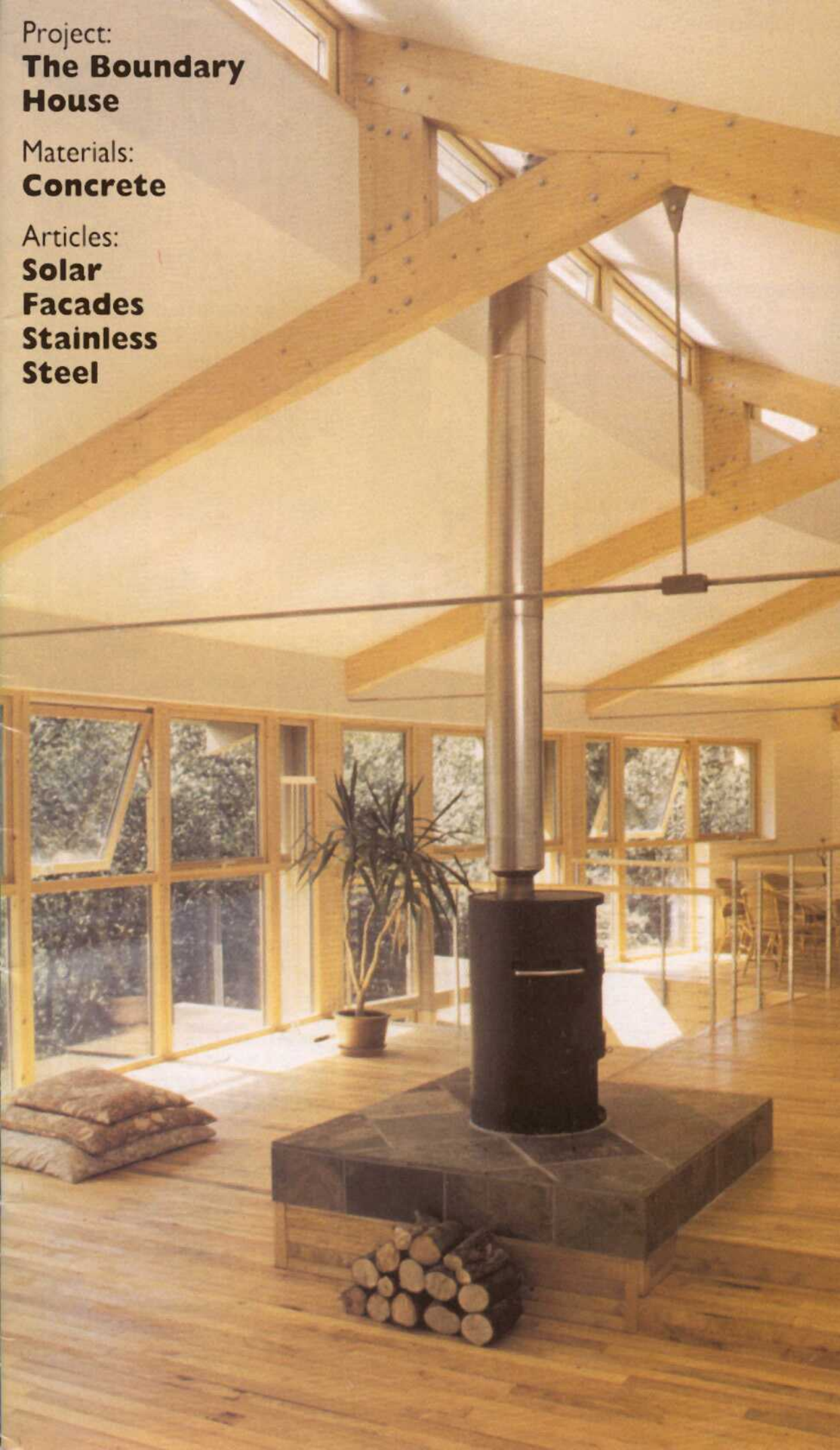


Project:
**The Boundary
House**

Materials:
Concrete

Articles:
**Solar
Facades
Stainless
Steel**



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SUSTAINABLE ARCHITECTURE, CONSTRUCTION & DESIGN

NOVEMBER 1997



ABOVE: THE BOUNDARY HOUSE ENJOYS A WOODED SETTING BY TUNBRIDGE WELLS' NEVILL CRICKET GROUND, WITH THE REAR OF THE SITE BORDERING THE MAIN LONDON TO KENT COAST RAILWAY LINE.

Distinguished of Tunbridge Wells

Recent winner of an RIBA Downland Design Award, The Boundary House was designed for himself by chartered architect, Michael Winter. This innovative low-energy timber-framed house has an unlikely setting in the centre of Tunbridge Wells. ECO went down to the woods to investigate.

Three years ago Michael Winter and his partner (now wife) Elizabeth Monk purchased a half acre site at Upper Cumberland Walk, Tunbridge Wells following an exhaustive search of the home counties for a suitable setting for an eco home. At first sight, the location does not look promising. It is a narrow, wooded site, bordered on one side by the renowned Nevill Cricket Ground, which hosts Kent CC every year, and to the rear by the main railway line. Perhaps it needed an architect's vision to see the potential, but certainly the low asking price of £65,000 reflected the limitations of the site.

Elizabeth, a Chartered Accountant, organised the financial side of the project, while Michael was responsible for design and managing the building contractors. His response to the site was an articulated timber frame which used an existing clearing. Not surprisingly as a member of both the Ecological Design Association and the Association of Environmental Conscious Builders, Michael wanted to produce an environmentally-sensitive, low energy house. However, he was also mindful of eventual resale of the house and so, while the building has many innovative features, it is primarily a comfortable family home, with four-bedrooms and a partially self-contained studio. At 3,250 sq feet it is a large property, with four bedrooms (two with en-suite bathrooms) and a spacious family bathroom. Michael chose a timber frame, using a combination of glulam structural elements and timber-composite I joists.

The house is orientated to maximise solar gain and natural light. It faces south, and the south elevation features large Low-E, triple-glazed, argon filled, windows. These have a K value of 1.4W/m²K. In

summer, the trees to the south provide natural solar shading while in winter, when the sun is lower in the sky, the sun's rays are able to penetrate through the bare branches.

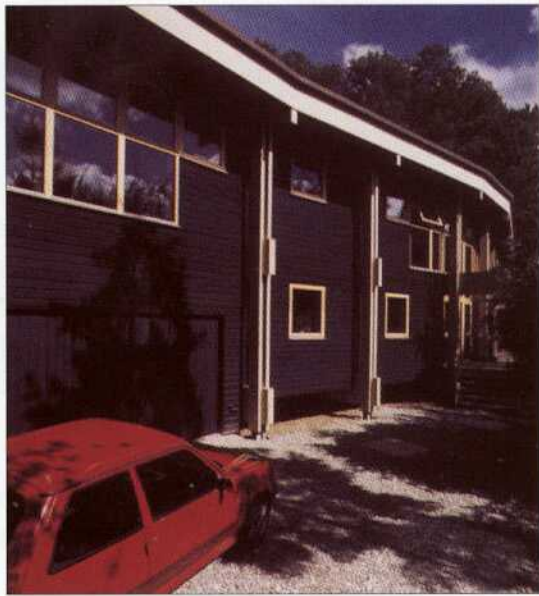
The rear elevation, which faces the railway line, is of solid construction, with few windows. This reduces the sound impact of the passing trains, and ensures privacy from those using the footpath over the track.

Internally, the house has an upside down plan, with the open plan kitchen, dining area and living room, and the studio, on the first floor with the bedrooms and bathrooms on the ground floor. This allows the natural rise of warm air to be used to maximum effect, especially in the full length glazed entrance void which rises to an open balcony in the living space. These rooms are planned to minimise heating requirements, with the bedrooms on the south side and service rooms such as bathrooms, the laundry and vented walk-in larder to the north. In order to minimise sound penetration of the lightweight internal walls, storage cupboards are sited between rooms.

Michael's determination to minimise the house's environmental impact on the site determined the structural detailing. Instead of conventional foundations, which would have inevitably resulted in the felling of many of the surrounding trees, he chose to elevate the timber frame and support it on deep pad foundations. The combination of this technique and the snaking plan which took into account the position of existing trees, meant that only three trees had to be removed to make room for the house. The concrete pads were positioned between the remaining trees' roots. To date, this appears to have been successful, with the oaks having survived the first season with no apparent damage.



THE REAR ELEVATION IS ARTICULATED AROUND EXISTING TREES, PREDOMINANTLY OAK



THE FRONT ELEVATION FEATURES BLACK-STAINED TIMBER CLADDING AND ENERGY SAVING TRIPLE GLAZED WINDOWS

Michael's planned the house as a hi-tech timber box, with visible glulam beams set against black-stained timber cladding. The timber-frame structure was developed with the aid of TRADA. It is based on a traditional post and beam system, but using glulam beams and steel bolts. Sixteen vertical glulam beams run vertically from the concrete pads, with horizontal glulam beams forming the floor and roof structure. Timber composite I joists at 600mm centres are supported by the glulam beams. These lightweight elements offer both great strength and sufficient depth to allow high levels of thermal insulation to be incorporated. The glulam structure incorporates steel rods to tie the framework together which, like the steel bolts, have been used as a design feature.

The exterior of the house is clad in softwood, stained black using natural stains. To ensure excellent levels of thermal insulation, which means that central heating is not required, the walls use the breathing wall system. This comprises bitumen-impregnated fibreboard externally and a vapour-control barrier and plasterboard on the internal face, with Warmcel cellulose fibre blown into the cavity. The insulation levels vary - 250mm in the walls, 400mm in the south roof and 450mm in the north roof. The walls achieve a K value of 0.139W/m²K, the south roof 0.087W/m²K and the north roof 0.078W/m²K.

The house has a mechanical ventilation system and four basic methods of heating. The most visible of these is a solid fuel stove in the open plan living room. This features a stainless steel flue, largely for aesthetics but also to ensure a good draw. While a cast iron flue would be preferable from a thermal performance, this is one instance where the design of the house took preference over pure green issues. The bathrooms feature electric towel radiators with thermostatic controls and time switches. The mechanical ventilation system, powered by two 75W electric fans, is connected to a heat exchanger and heat pump. This recycles the heat generated from solar gain and household activities such as cooking, washing and bathing, and turns it into sensible heat that is blown back into the room.

The final heat source is solar panels on the roof which provide hot water, backed up by electric immersion heaters. There are two separate hot water tanks, controlled so that when number one reaches its target temperature, the heating load is automatically switched to the second.

In retrospect, Michael would probably opt for a larger stove, so that it could hold sufficient logs to keep

burning overnight, and underfloor heating on the ground floor since, in the height of winter, the bedrooms require ancillary heating in the form of Calor gas fires since the internal temperature drops below 12°C for approximately two weeks. He also feel that the heat pump, which promised up to 4kW output, in fact only achieves around 1 to 2kW. The actual performance will become clearer when the School of Architecture at the University of East London completes its two year monitoring project.

One of the building's most innovative features is the copper roof which is designed in two sections with the 22.5° north pitch elevated above the 17.5° south in order to accommodate a 600mm band of clerestory windows to enhance daylight levels. The roof's deep overhanging eaves help minimise solar gain in summer, and visually reduce the impact of the thick structure required to incorporate such high levels of thermal insulation.

All the lighting, with the exception of the uplighters, is low voltage. The uplighters feature 200W halogen lamps, which Michael likes for their colour purity.

The roof is used to collect rainwater which is stored in a large tank beneath the garage. Copper rainwater pipes channel the water to the garage. A simple metal mesh screen covers the gutters to keep out leaves. Natural settlement helps keep the water clean, but it is then passed through a gauze screen to remove finer particles and then a UV treatment tube to eradicate any bacterial infection. Currently the stored water is used for washing and irrigation, and has, not surprisingly, a metallic taste. This should diminish as the patination develops. The tank has four floats. One is a cut off should the tank run dry. Two trigger and then shut off the mains should the level fall below a critical point (this has not happened to date), while the final float prevents flooding should the level rise too high. Two submerged pumps circulate the water into the house. A pressure vessel, installed to stop the pumps activating every time a tap is turned on, is probably under-specified. Michael now believes that a 200ltr capacity, rather than 100ltr, is probably required.

In keeping with the eco-friendly principles, the living area features a timber plank floor reclaimed from a school in Dartford. Downstairs the choice of flooring shows the more pragmatic side of the building, with Indian slate chosen for its aesthetic appeal.

One of the building's most attractive features is the extensive covered timber decking to the east. This is accessed from the main open plan living area and affords

COST ANALYSIS

January to August 1997

Electricity
Economy 7
 1770.3 units @ 2.7p
£47.80
Standard tariff
 3958.5 units @ 7.3p
£288.97

Gas
 5.92 units @ 44p
£2.60

Water
 4.936 units
 @ 84.03p water
 @ 80.3p waste
Total: £4.15 water
£3.96 waste

Overall Total £347.48 or
£43.43 per month or
0.16p/sq ft/pa

Installation Costs
Woodburning stove
from Scan - £900

Infrastructure costs -
drains and fences
£35,000

UV water treatment
plant - £300

Water pump - £1,000

19,000 gallon water
storage tank - £7,000

Swedish Triple-Glazed
Windows - £15,000

Solar panels - £2,500

FACT FILE

The Boundary House
Tunbridge Wells

Costings

Site £65,000
Construction £235,000
Floor area 3,250 sq feet
Living area £72/sq ft

Architect

Michael Winter
01892 539709

Framework - Joinery

Chris Arnold
01892 525434

Consultants

TRADA 01494 563091
EDA 01453 765575
AECB 01559 370908

I Beams

Trus Joist MacMillan
01527 854853

Windows

The Swedish Window Co
01787 223931

Organic Paints

Ostermann & Scheiwe
01895 234899

Solar Panels

Thermomax
01344 874747

Copper Roof

Cotswold Metal Roofing
01865 883787

Glulam Beams

Moelven
01703 695566

Sheathing

Panel Agency
01474 872578

Insulation

Excel Industries
01495 350655

OSB

Norboard
01272 290297

Photography

Peter Cook

TOP RIGHT: ERECTING THE
GLULAM AND I JOIST FRAME

TOP LEFT: THE LIVING SPACE
VIEWED FROM THE KITCHEN
DINING AREA

MAIN: THE COVERED DECK
VIEWED FROM THE WOOD



good views over the Nevill Cricket Ground or, if you a so inclined, the railway line to the north. Organically projecting into the surrounding wood, it is reminiscent of some of Frank Lloyd Wright's private houses. This main deck is echoed in the decking which leads to the main entrance and by a further small deck to the rear of the building.

As a working architect who currently divides his week between Fitzroy Robinson (the pioneering Barclaycard building was one of Michael's recent projects) and private work, a good studio was a natural prerequisite of any home. The Boundary House provided such an opportunity with a split-level open space created above the garage, which has its own access stairs. Full height glazing to the south is continued around the west elevation, providing an abundance of natural light.

As well as the RIBA Downland Design Award, The

Boundary House was also winner of the Daily Telegraph and Individual Homes Builder of the Year and Best Modern House Award. The judges reported that the "Boundary House not only represents an excellent example of contemporary design but its creators had also bravely extended the frontiers of ecological design and timber-frame technology."

The Boundary House is certainly a brave and ambitious project. Michael Winter has steered a careful path between ecological idealism and practicality. At £70/ft sq, this is not a cheap exercise, but the running costs are be low. However, the ten year payback initially projected may well prove optimistic. Still, Michael and his wife will have a very pleasant environment while they wait to find out. And, in the meantime, there is little doubt that many clients will have benefited from the lessons learnt on the project. ☺