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# *individual* Homes

SELF-BUILDS, RENOVATIONS AND EXTENSIONS





# THE SOLAR HOUSE

MICHAEL HOLMES VISITED MICHAEL WINTER AND ELIZABETH MONK WHOSE INNOVATIVE, LOW-ENERGY, TIMBER-FRAME HOME HAS WON THEM THIS YEAR'S DAILY TELEGRAPH/INDIVIDUAL HOMES HOMEBUILDERS OF THE YEAR AWARD. PICTURES BY JOHN EDWARD LINDEN.

AS YOU MIGHT EXPECT from the home of a talented young architect, The Boundary House is radically different from the average self-build project, but it nonetheless presents some useful lessons for anyone planning to build their own energy-conscious home. Michael Winter and his partner Elizabeth Monk took the brave decision to invest all their worldly assets — and a good chunk of their bank's — into building their dream: an experimental, low-energy, low environmental-impact house. Despite two years of frustration and the stress of an overstretched budget, the result is a great success.

**Finding the Site:** "The most frustrating part of the project was in searching for a suitable, affordable site in the home counties, within good commuting distance of central London," explains Elizabeth, who works as a chartered accountant for a big London accountancy firm. "We even considered converting a barn at one stage and made a number of unsuccessful bids." When success in finding a



site eventually came with the discovery of a wooded half-acre plot, positioned alongside a branch line near the centre of Tunbridge Wells, it was short lived: once again their bid was unsuccessful.

Six months after the auction however, their luck changed when the vendors contacted them to ask if they were still interested in buying the site. Access problems due to a 'ransom strip' had forced the original buyers to pull out. The vendors had spent the last few months solving the legal side of the problem at their own expense and were prepared to sell the plot at the reduced price of £65,000, which included the additional cost of the small strip of land preventing access to the site, for which its owner managed to ransom £16,250, one quarter of the plot value.

The long, narrow, largely wooded plot had not been an obvious choice for their planned project, but Michael felt the site had potential and managed to convince an initially rather dubious Elizabeth that they should go for it. Existing full planning consent was for a Victorian style house, but Michael was confident after discussing details with the planners that



*"Our home doesn't even need central heating!"*

they would be able to get consent for something contemporary which reflected the local ecology of the site.

### Low-Impact Design:


A member of the Ecological Design Association (EDA) and the Association of Environmental Conscious Builders (AECB), Michael Winter was particularly keen to create a house which caused minimum damage to the both the local and global environment, whilst remaining within a sensible budget. This meant using 'green' building materials and construction techniques wherever possible as well as a design that minimised the energy requirements of the finished structure.

To limit the damage to the wooded site, the house was designed to fit within an existing clearing, snaking in between the tree trunks and requiring the removal of only two trees. Timber-frame construction was chosen as it is currently considered to be the most eco-friendly. To minimise impact on the site and to protect the tree roots, the timber frame is raised off the ground by glulam timber columns, resting upon individual concrete pads from 1-2m deep.

Sandwiched between a railway line and public footpath to the north, and a picturesque Kent county cricket ground to the south, the house has been designed with its service rooms to the north and bedrooms and main living areas to the south. Glazing was kept to a minimum on the north elevation, minimising heat-loss, creating privacy from the footpath and reducing the noise of passing trains. The south elevation incorporates a

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 *The house is built from 'green' materials wherever possible. The roof is covered in copper and the walls are clad in timber protected with eco-friendly stains.*





*The largely open-plan first floor comprises living, dining, kitchen and breakfast areas.*

large proportion of glazing, maximising passive solar gain and making the most of the views of the pretty cricket ground.

Given the height of the surrounding trees, it made sense for the main living areas to occupy the raised first storey and for the bedrooms to make use of the more secluded privacy of the ground floor. The upside down layout also reflects the natural process of heat rising, allowing the living spaces to be slightly warmer than the bedrooms.

The house contains four bedrooms, three bathrooms and a utility room on the ground floor. The largely open-plan first floor comprises of living, dining, kitchen and breakfast areas. There is also a separate large studio for Michael, a study for Elizabeth and a large, raised, east facing deck. (see floorplan)



*The hall and stairwell has a vaulted ceiling and is bridged on the first floor by a flying landing.*



**Low-Energy Features:** The Boundary House incorporates the latest thinking in low-energy design, making maximum use of passive solar gain whilst incorporating very high levels of insulation. Even with the UK's climate, the system works to the extent that there is no requirement for a conventional central heating system. Instead, a heat-pump attached to the mechanical ventilation system, together with a heat exchanger, recycles the

solar energy and heat from household activities such as cooking, washing and bathing (there are electric towel radiators in the three bathrooms), and turns it into sensible heat, blown back into the house. In the darkest coldest days of winter, this system is backed up using a traditional wood-burning stove, positioned in the centre of the living area. Heat pumps, powered by electricity, work the same way as a normal domestic condensing fridge or freezer except in this case, the process of reversed and heat is extracted from the outgoing air. The idea is that they recycle considerably more energy than they use.



Hot water is heated by Thermomax solar panels with electric immersion heating as a backup on cloudy days. With the exception of drinking water, all water requirements are met from rainwater collected from the roof into a large tank positioned below the garage. Despite all its energy-efficient features, Boundary House scored only 69 on the SAP energy-efficiency test and a rating of 7.2 on the NHER scheme because of the inability of the energy rating schemes to fully take into account the passive solar technology used in The Boundary House.

**The Frame:** As well as designing the house himself, Michael Winter also developed the unique timber-frame building system used in the project. This is effectively an adaptation of the traditional post and beam building system used for centuries in the UK, only replacing the oak with laminated timber beams called glulams, and the mortise and tenon joints with stainless steel bolts.

The huge strength of glulams and the large spans that are made possible by laminating layers of wood, open up some exciting new open-plan design possibilities. Boundary House comprises sixteen huge vertical glulam beams around eight metres long, supported on concrete pad foundations, with several more glulams bolted across them to form the two floors and roof structure. The glulam structure incorporates steel rods to tie the framework together, which like the steel bolts have been used as a feature of the house.

The spaces in the walls and floors between the glulam skeleton are made up using 'I' profile beams positioned at 600mm centres. Manufactured in Canada by Truss Joist Macmillan from laminated plywood sections, 'I' beams have the strength of solid studs of the same dimensions, but contain far less timber, prevent any possible cold bridging of heat from inside to outside and are less prone to warping: they are therefore both cost-effective and ecological.

The exterior of house is clad in Swedish timber boards, stained black using organic stains. The walls use the breathing-wall system developed at Findhorn in Scotland and supplied by Warmcel. This system



**Michael** has designed a spacious work area to allow him to practise from home. **Elizabeth** has a study, located off the living area.

uses cellulose fibre (recycled newspaper) treated with borax for fire and vermin protection, blown into the cavity in the walls, between bitumen impregnated fibreboard on the outside and a vapour control barrier/plasterboard on the inside. The vapour control layer provides a check on the amount of moisture passing through the construction avoiding potential rot. The walls and floors contain 250mm of this cellulose insulation, the south roof 400mm and the north roof 450mm. To bring down the energy lost through the windows, they are triple glazed with low-E glass and the voids filled with Argon gas.

The copper covered roof is designed in two sections with the northern raised slightly above the southern, allowing a small clerestory which introduces more sunlight. The system was developed with the help of TRADA but a structural engineer helped to handle all the calculations.

**The Build:** Michael and Elizabeth quickly calculated that it would make better financial sense for them to work overtime than for them get involved in the actual building work. They opted to sub-contract the build, with Michael managing the team and Elizabeth handling the financial side of the project.


After a number of initial enquiries and discussions with various contractors, a local carpenter, Chris Arnold was found to put up



The unique timber-frame system developed by Michael Winter allows the creation of large open spaces. The wood-burning stove is only used to back up the passive solar heating during the winter months.

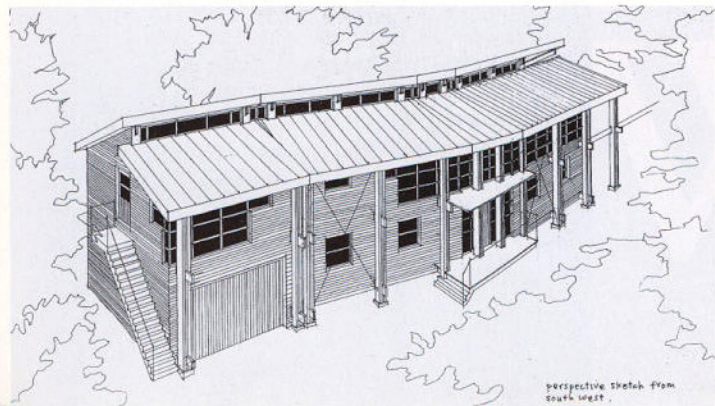




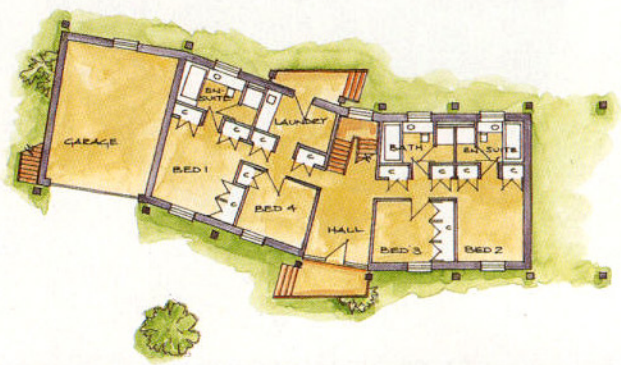
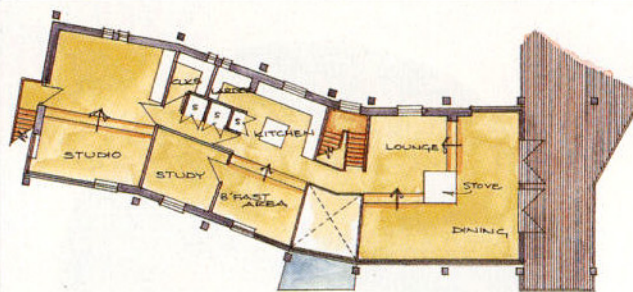
 Hot water is supplied by Thermomax solar panels, backed up by a gas condensing boiler.

the unusual frame and complete the majority of the timber works on the house. During the build Michael was able to obtain NHBC membership as a registered builder so that even by employing many different subcontractors the house would still receive a ten year NHBC warranty.

Building work began in July 1995 and was completed eight months later by March 1996 when the couple moved in. At £235,000, the project cost Michael and Elizabeth more than they had anticipated, but then there were several exceptional costs, not least developing a new timber-frame building system. The couple also had to bring service connections over a considerable distance to the site and spent large chunks of cash on single items, like the rainwater collection tank which cost around £10,000 alone. They have also used expensive windows, reclaimed flooring and a luxury kitchen. The project need not have cost so much, but on visiting the house, one can certainly appreciate where the money has been spent. The finishes and detailing are of an extremely high standard. ■



perspective sketch from south west



## CONTACTS

### ARCHITECT:

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### CARPENTER:

Chris Arnold  
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### TRUSS JOIST MACMILLAN (I-BEAMS)

☎ 01527 854853

### THE SWEDISH WINDOW COMPANY

☎ 01787 223931

### OSTERMAN & SCHEIWE UK LTD (ORGANIC STAINS)

☎ 01895 234899

### THERMOMAX (SOLAR PANELS)

☎ 01344 874747

### GENVEX INT LTD (MECHANICAL VENTILATION)

☎ 01926 407131

### COTSWOLD METAL ROOFING LTD

☎ 01865 883787

### TRADA

☎ 01494 563091

### ECOLOGICAL DESIGN ASSOCIATION

☎ 01453 765575

### ASSOCIATION OF ENVIRONMENTAL CONSCIOUS BUILDERS

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Four bedrooms, three bathrooms and a laundry are located on the ground floor, all shielded from the noise of passing trains by an embankment and natural screening. Access is via the main double-height entrance lobby in which the stairs to the first floor are also situated. Designed to allow Michael to work from home, the first floor includes a separate open-plan office/studio area whilst Elizabeth has her own study. The breakfast area, stairwell void and main living/dining area all have views of the cricket ground through the largely glazed south wall. There is also a spacious covered deck area to the east. The first floor is covered in hardwood floorboards reclaimed from an old school. Even for someone planning to build a smaller, more conventional home, it is worth taking note of the way Boundary House has been designed and orientated to make the most of its site and of the free heat of the sun.

NAME: Michael Winter & Elizabeth Monk  
PROFESSIONS: Architect & Accountant  
REGION: Kent  
DESIGNER: Selves  
HOUSE TYPE: Four bedroom detached  
HOUSE SIZE: 3250 sq. ft. (inc. garage)  
WARRANTY: NHBC  
BUILD ROUTE: Subcontractors & DIY  
BUILD TIME: Eight months  
LAND COST: £65,000  
BUILD COST: £235,000  
CURRENT VALUE: £320,000  
COST PER SQ. FT.: £72



**FACT FILE**