Dundon Passivhaus

Small Projects

Passivhaus Trust Awards 2015

Prewett Bizley Architects

UK PASSIVHAUS AWARDS 2015

07 July – Residence of the Austrian Ambassador

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PROJECT OVERVIEW

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Location: Somerset, UK

Building Type: Detached family house

TFA: 204 sq m

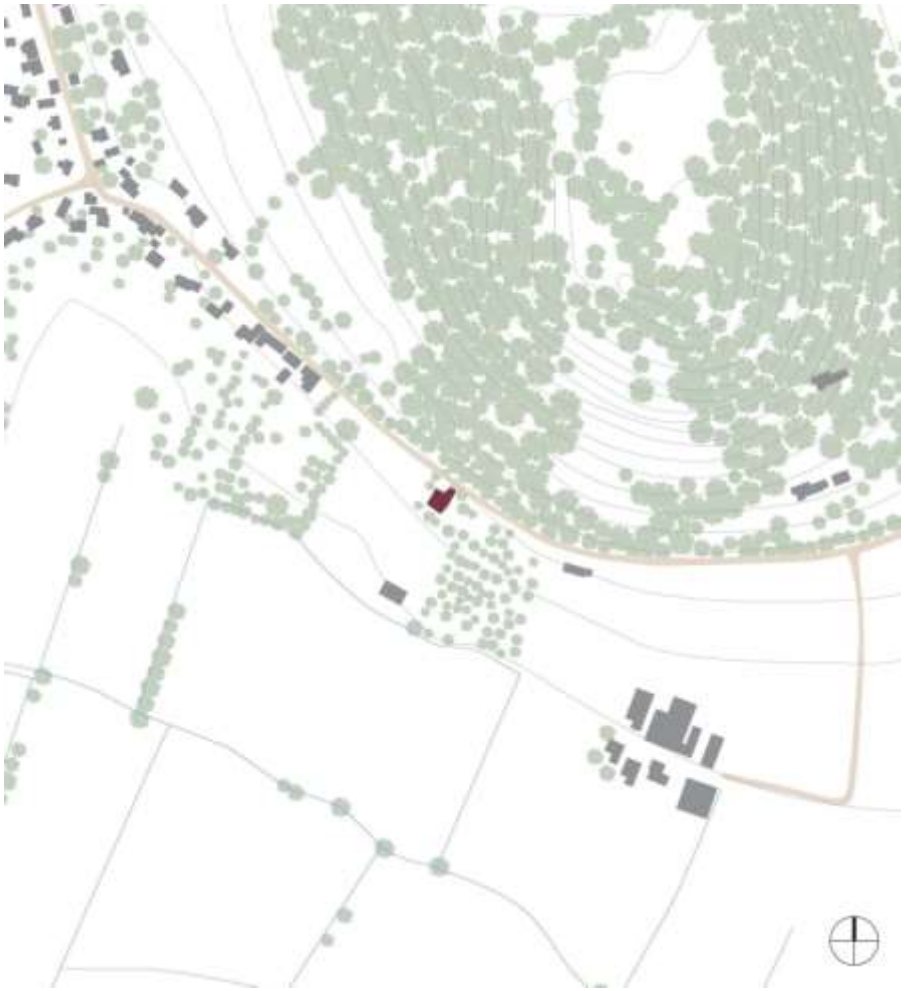
Construction: Softwood timber frame with green oak outrigger structure

Completion date: March 2015

Occupancy: Occupied since November 2012

Build cost: £485,000

Cost / sq m: £2377 TFA (£1695 GEA)



Key Team:

Owner: Emily & Graham Bizley

Architect: Graham Bizley

Structural Engineer: Structural Solutions

Passivhaus designer: Graham Bizley

Main Contractor: Graham & Emily Bizley (self-build)

Timber frame: Allwood

Window supplier & installer: JPW construction

MVHR design, supply & commissioning: Green Building Store

DESIGN PHILOSOPHY

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- Achieving Passivhaus standard should not on its own be remarkable. All buildings should be built to this standard.

- How to build in a bold but sensitive way in a rural landscape?

- How far can we push the possibilities of Passivhaus?

- Architecture doesn't have to be sacrificed for excellent energy performance.

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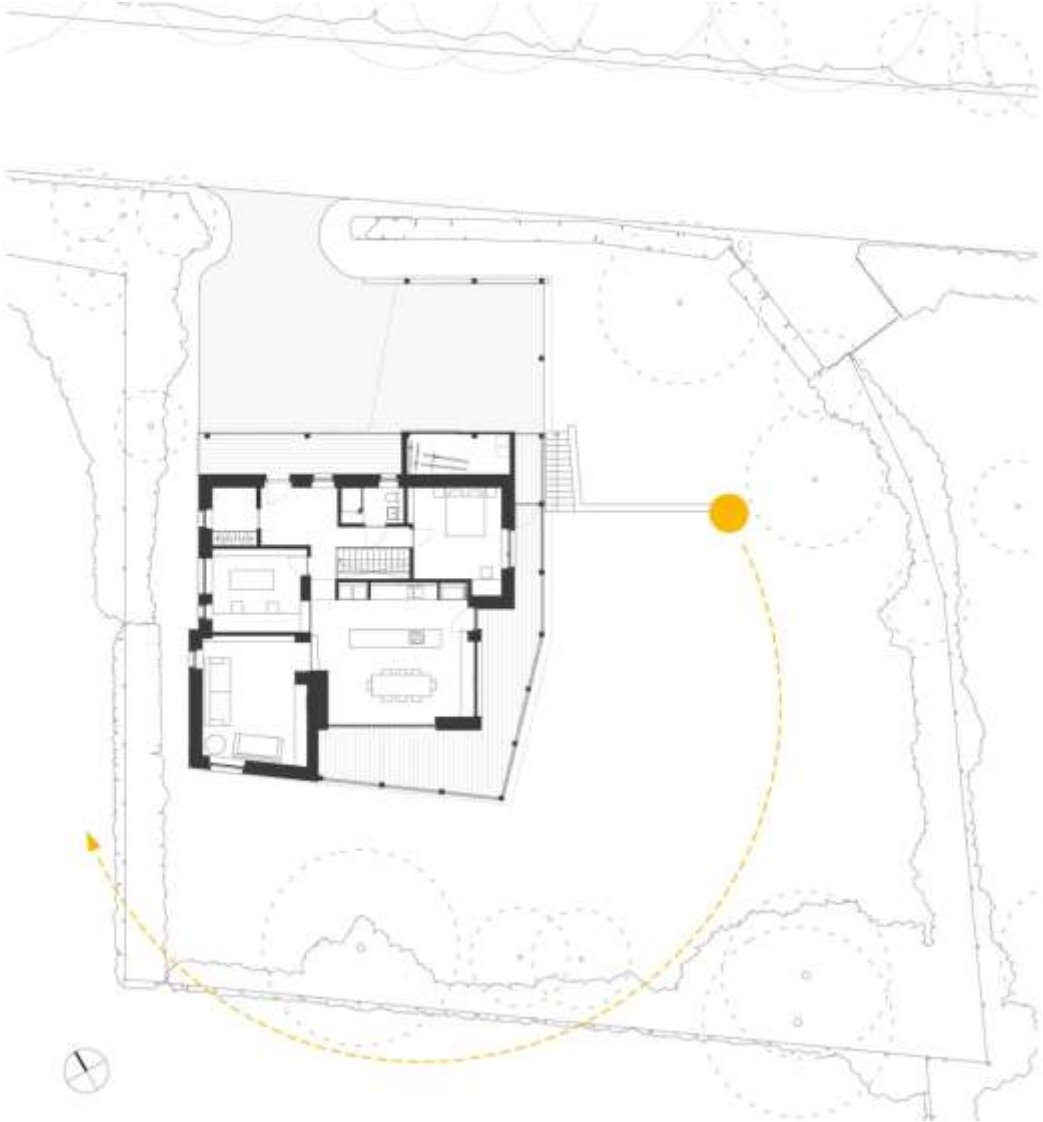

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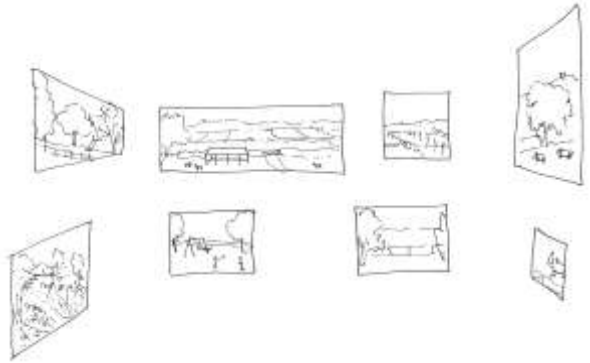

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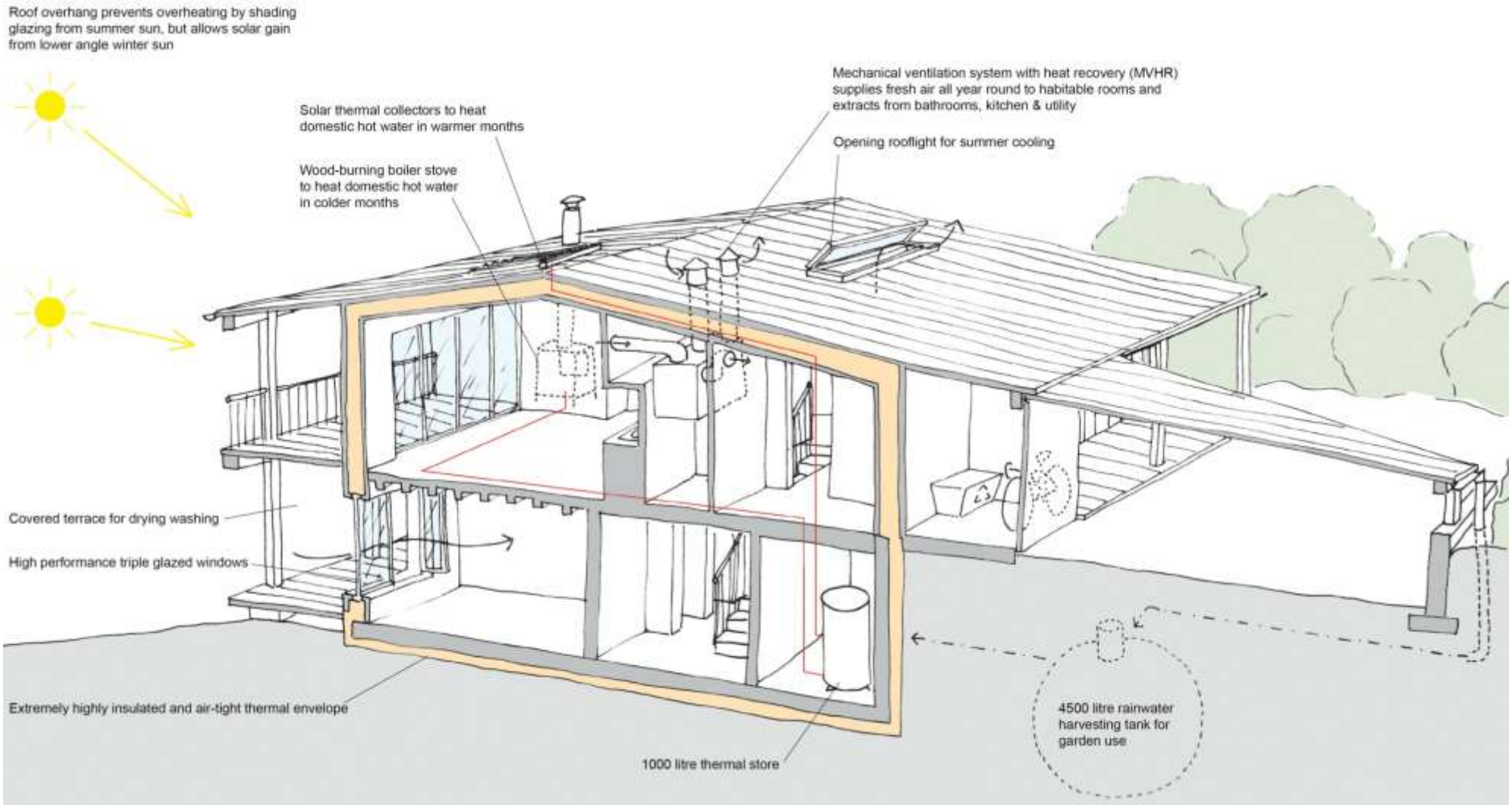

AESTHETICS

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- Rich variety of spaces, serene atmosphere, connection to its place.
- Qualities people admire in traditional buildings: material richness, texture, craft, intimacy

AESTHETICS

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ENERGY PERFORMANCE

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PRIMARY ENERGY DEMAND	SPACE HEATING DEMAND
= 120 kWh/m2/year	= 14 KWH/M2/YEAR
AIR TIGHTNESS	**HEATING LOAD**
=0.57 AC / H	= 10 W/M2

Actual primary energy demand is 85 kWh/m^2. CO2 emissions: 22.2 kg/m^{2}a

Electricity: Good Energy (100% renewable @ £0.1429/kWh). Planning permission for PV.
Use for 1 year: 26.6 kWh/m^2 (**£776**), 25% higher than predicted (21.4 kWh/m^2) because building work has been on-going, using power tools daily (60kWh/a), both of us work from home (computers: 584kWh/a) and Emily bakes bread twice a week (oven: 300 kWh/a).

Space heating: In PHPP demand assumes 90% electricity, 10% wood.
Actual figures are 86% electricity, 14% wood (although so far no electric heater installed)

DHW: In PHPP, DHW requires 15.2 kWh/m^{2}a from wood.
Energy from wood = 513kWh/m^3, so require 6m^3 solid wood = 15.1 m^3 loose @ £78/ m^3 = £1178/a.
DHW demand in PHPP assumes 33% solar, 60% electricity, 7% wood burning
Actual figures are 41% solar, 1% electricity, 58% wood burning.
DHW calculated on occupancy of 5.8, using 145 l/day. Actual occupancy 2 + 2 children + guests using average 75 l/day, so DHW used is only 7.5 kWh/m^{2}a , not 15.2 kWh/m^{2}a .

Wood: Actual use over 2.83 winters = 15 m^3 = 5.3 m^3/a = 2.12 m^3 solid equivalent.
Energy from wood = 513 kWh/m^3 (burned at 80% efficiency) = 5.33 kWh/m^{2}a from wood burner.
Actual cost of wood @ £78/m^3 = **£413/a**. >50% is from our trees & offcuts so actual cost = **£200**.
Actual running cost = £989/year = £4.85/m^2
(Reduces to £2.03/m^2 if PV installed and all wood bought in)

USER FEEDBACK

"WE LOVE THE AIR QUALITY AND EVEN HUMIDITY."

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Base internal temperature with no heating is 15 °C after several cloudy days.

On sunny days winter temperature upstairs is 18 - 20 °C on sunny days or if wood burner has been on every evening for 2 hours.

Downstairs there is little heat from wood burner or occupation during the day so temperature stays at about 16-17 °C.
We have now installed a 2.1kW duct heater to use sparingly next winter as allowed for in PHPP.

Summer temperature is often up to 25 °C inside on sunny days but no higher.
- Doors & windows open most of the summer.
- Rooflight provides good night time cooling.
- Shading from roof & balconies works well.

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CONSTRUCTION APPROACH

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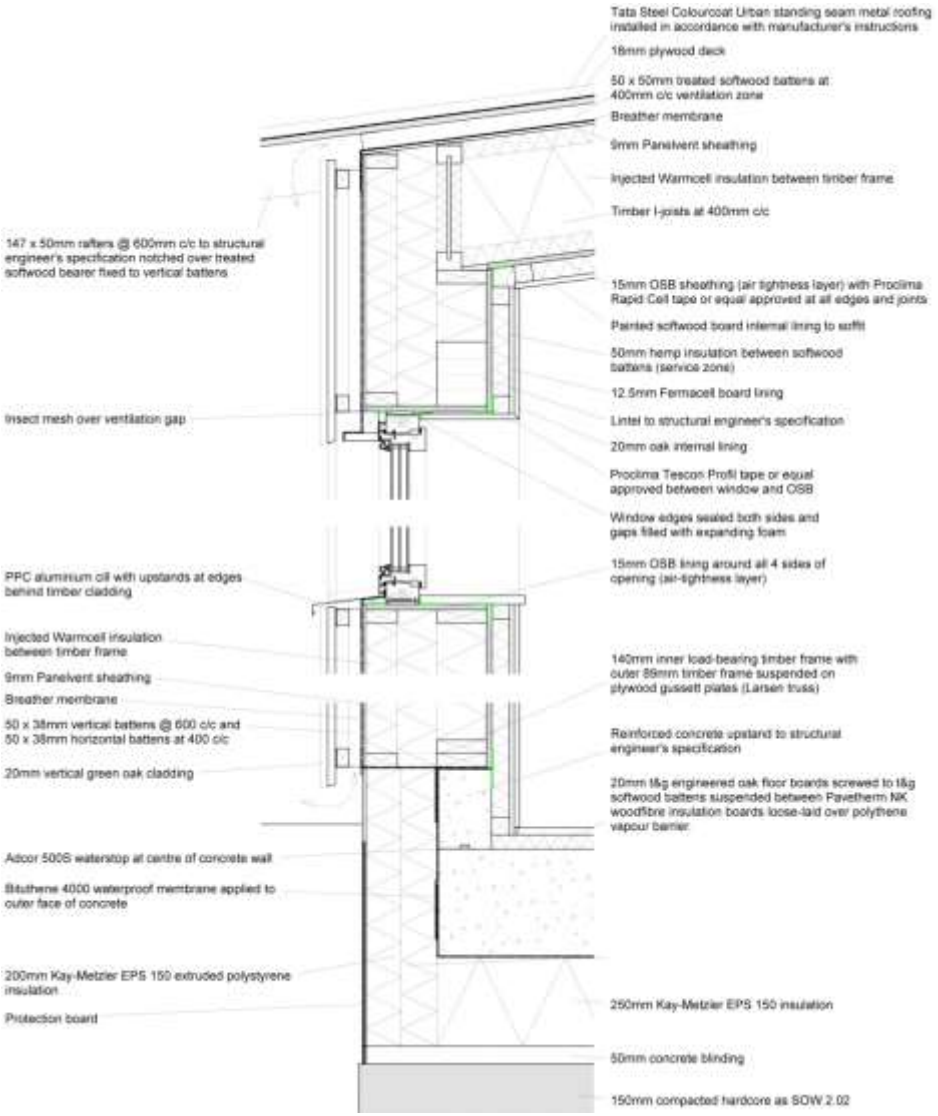

CLEVER COSTS SAVINGS

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Prefabricated timber frame
- time saving & easily adaptable on site and in future
- accurate
- less weather dependent than masonry

Very low level of site waste: NO SKIPS
- Most waste is timber → Wood burner

Whole life costs:
- Green oak external cladding – v low maintenance
- Locally sourced firewood for water & space heating
- Potential for 100% on-site energy generation with PV
- Superstructure all made from recyclable materials (timber, steel roof, glass)

Total Costs:

£2377 / sqm TFA

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