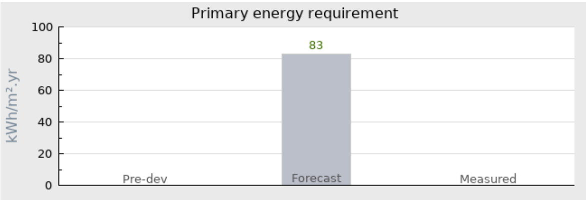
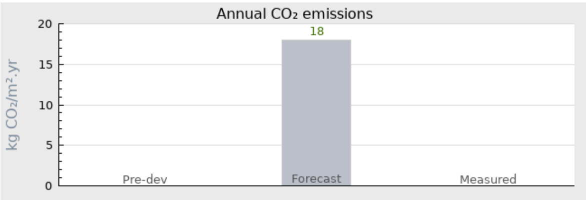
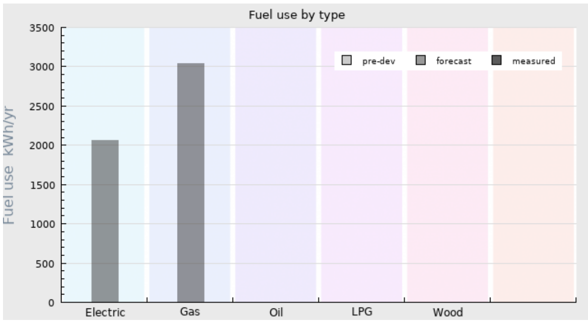
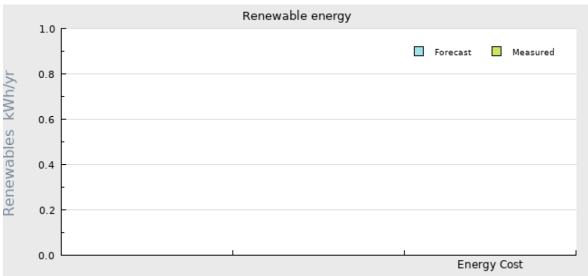
Project name Denby Dale

Project summary The Denby Dale Passivhaus has pioneered the combination of low energy Passivhaus methodology with standard British cavity wall construction and building materials and is the UKs first cavity wall Passivhaus. Built for private clients as a home for their retirement to a tight budget of 141k, the project was designed and built by Green Building Company - the construction division of Green Building Store. To get cavity wall to perform to Passivhaus standards the building team had to develop unique design details. For more information on the Denby Dale Passivhaus and to register for a free 40 page pdf technical briefing, go to:www.greenbuildingstore.co.uk/denbydalehouse









Project Description

Projected build start date	15 May 2009
Projected date of occupation	06 Jun 2010
Project stage	Occupied
Project location	Denby Dale, West Yorkshire,
Energy target	
Build type	New build
Building sector	Private Residential

Property type	Detached
Existing external wall construction	Masonry Cavity
Existing external wall additional information	300mm cavity
Existing party wall construction	
Floor area	104 m²
Floor area calculation method	PHPP
Building certification	Passivhaus certified

Project team

Organisation	Green Building Store
Project lead	Bill Butcher & Chris Herring, Green Building Store
Client	Geoff & Kate Tunstall
Architect	Derrie O'Sullivan
Mechanical & electrical consultant(s)	
Energy consultant(s)	Pete Warm, WARM low energy building practice
Structural engineer	
Quantity surveyor	
Other consultant	
Contractor	Green Building Company

Design strategies

Planned occupancy	
Space heating strategy	Heating from mains gas fired boiler. Space heating need was calculated as 1.18 kW (at 10 degrees celcius) .Total heating need (including water heating) was 3kW but the smallest gas boiler we could find was 4.8 kW. To create adequate capacity for the boiler (in terms of water volume etc) we installed 1 radiator, 2 towel rails and a duct heater for MVHR system.
Water heating strategy	Heating from mains gas fired condensing boiler. Grant-funded solar thermal panels added later by clients.
Fuel strategy	Mains gas, Mains electricity
Renewable energy generation strategy	None in original build and budget - preferring to concentrate funds on the Passivhaus measures and building fabric itself.However, the clients have subsequently installed grant-assisted solar thermal and solar PV panels on their roof.

Passive solar strategy	South elevation. Window proportions optimised using PHPP. Clients wanted a large solar space - as part of the house which was modelled in PHPP to avoid over heating.
Space cooling strategy	Daytime use of MVHR with night purging during heat waves.Measures to provide summer shading include:Large roof overhang, external venetian blinds, proposed deciduous vine on a pergola.
Daylighting strategy	
Ventilation strategy	Comfort ventilation with heat recovery (winter)Openable windows (summer)
Airtightness strategy	Wet plaster coating to interior walls.Concrete floor slab is carried across the top of the blockwork of the inner leaf of the wall to minimize shrinkage cracking between the wall and the floorAttention to airtightness detail around window and door openings and junctions between floors, walls and roofs, including use of airtightness membranes and tapes. To improve airtightness around the window opening, a plywood box was set into the wall. An adhesive-backed airtightness tape was then attached to the plywood with a fleece wrapped into the wet plaster, making the junction between the plywood and plaster airtight. Another airtightness tape was used to seal the gap between the window and the plywood box.Various details at first floor junction to avoid penetration of the inner leaf blockwork including: use of timber wall plate; parging of the blockwork behind the wall plate; use of-anchored stainless steel threaded bar to carry the 302mm timber I beam structure. Use of I-B...
Strategy for minimising thermal bridges	Use of 300mm insulation in the cavity going right down to the strip foundation, so that any heat lost from the concrete floor slab will have a longer thermal transfer path. Use of lightweight aerated block below ground level, which does not transfer heat as readily as standard concrete block.Use of basalt and resin cavity wall ties (instead of the usual steel ties).Positioning of windows and doors at the centre line of the insulation layer.
Modelling strategy	Whole house modelling was undertaken in PHPP.

Insulation strategy	Walls: 300mm fibreglass batts Under groundfloor: 225mm polyfoam insulationRoof void: 500mm fibreglass quiltWindows and doors: triple glazing with insulated thermal break in frame.
Other relevant retrofit strategies	
Other information (constraints or opportunities influencing project design or outcomes)	

Energy use

Fuel use by type (kWh/yr)

Fuel	previous	forecast	measured
Electric		2058	
Gas		3034	
Oil			
LPG			
Wood			

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m².yr)	-	18	-
Primary energy requirement (kWh/m².yr)	-	83	-

Renewable energy (kWh/yr)

Renewables technology	forecast	measured
-		
-		
Energy consumed by generation		

Airtightness (m³/m².hr @ 50 Pascals)

	Date of test	**Test result**
Pre-development airtightness	14 Jan 2010	0.41
Final airtightness	11 Mar 2010	0.34

Annual space heat demand (kWh/m².yr)

	Pre-development	forecast	measured
Space heat demand	-	15	-

Whole house energy calculation method	PHPP
Other energy calculation method	

Predicted heating load	10 W/m² (demand)
Other energy target(s)	

Building services

Occupancy	
Space heating	Vaillant Eco-Tec 612 (4.8kW)
Hot water	
Ventilation	PAUL Thermos 200 MVHR unit. SAPQ and Passivhaus Instiut certified.92% efficiency.
Controls	
Cooking	Gas with recirculating cooker hood.
Lighting	Low energy LED lighting system in most areas.
Appliances	
Renewables	
Strategy for minimising thermal bridges	Psi values have been calculated for internal and external values. External psi-value have been entered into PHPP.

Building construction

Storeys	2
Volume	
Thermal fabric area	
Roof description	PlasterboardMineral wool
Roof U-value	0.10W/m² K
Walls description	Gypsum plasterDense concrete blockCavity fill mineral woolSandstone
Walls U-value	0.11W/m² K
Party walls description	
Party walls U-value	
Floor description	ScreedKnauf polyfoam
Floor U-value	0.10W/m² K
Glazed doors description	Ecopassiv triple glazed FSC 100% timber windows
Glazed doors U-value	0.80W/m² K installed
Opaque doors description	
Opaque doors U-value	
Windows description	Ecopassiv triple glazed FSC 100% timber windows
Windows U-value	0.80W/m² K installed
Windows energy transmittance (G-value)	52.9%
Windows light transmittance	70.9%
Rooflights description	

Rooflights light transmittance
Rooflights U-value

Project images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