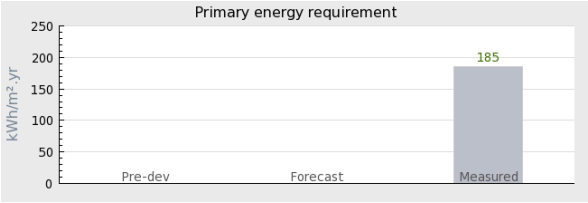
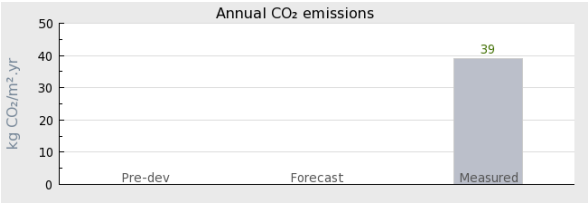
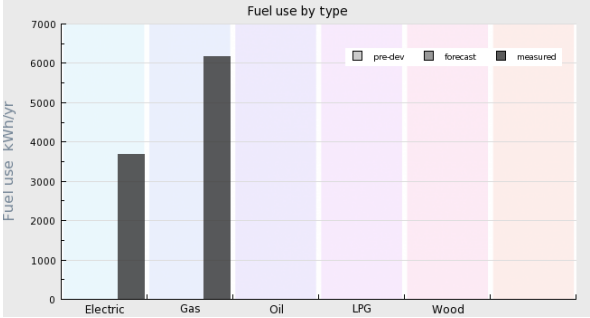
http://lowenergybuildings.org.uk

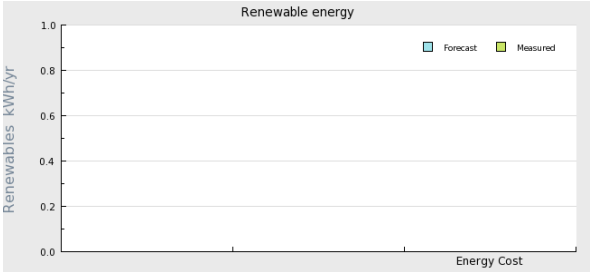
Project name Dartmouth Avenue

Project summary The first of three schemes undertaken by Greenoak Housing Association and architect Jon Broome. The aim was to develop a replicable model to reduce emissions and other environmental impacts in mainstream housing by incorporating cost effective and trouble free measures. The emphasis is on reducing energy demand by creating a well insulated and airtight envelope. The properties in this development range in size from 80m2 2 bed dwellings to 108m2 4 bed dwellings. The average floor area and energy use per dwelling has been used in this entry.









Project Description

Projected build start date	
Projected date of occupation	31 Jan 2005
Project stage	Occupied
Project location	Woking, Surrey, England
Energy target	other
Build type	New build
Building sector	Public Residential
Property type	Semi-Detached
Existing external wall construction	Softwood frame

Existing external wall additional information	
Existing party wall construction	
Floor area	88 m²
Floor area calculation method	SAP

Project team

Organisation	
Project lead	
Client	Green Oak Housing Association
Architect	Jon Broome
Mechanical & electrical consultant(s)	
Energy consultant(s)	
Structural engineer	
Quantity surveyor	
Other consultant	
Contractor	

Design strategies

Planned occupancy	Mix of 2-4 bed dwellings.
Space heating strategy	Low NOx, gas combi boilers were used and fed a conventional radiator heating system in each house.
Water heating strategy	Gas combi boilers supply the hot water.
Fuel strategy	Mains gas and electricity.
Renewable energy generation strategy	
Passive solar strategy	
Space cooling strategy	
Daylighting strategy	The improved comfort from triple glazing meant that large windows could be installed for daylight.
Ventilation strategy	Mechanical extract ventilation (MEV) with continuous extract from bathroom and kitchen, with humidity controlled wall inlets. The bathroom extract grilles include PIR detectors to boost extract when rooms are occupied, and there is a boost switch to increase air flow when cooking.
Airtightness strategy	Large, pre-fabricated timber frame panels (to minimise the number of joins) with internal airtightness membranes.

Strategy for minimising thermal bridges	The timber frame panels designed with insulation zones abutting at corners and eaves. The large panels mean there is less doubling up of structure at panel joints than typical pre-fabricated timber frame designs. The design also includes cross battening of the 50mm battens which increase the insulation from the standard 140mm frame depth.
Modelling strategy	SAP/NHER
Insulation strategy	
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			3684
Gas			6162
Oil			
LPG			
Wood			

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m².yr)	-	-	39
Primary energy requirement (kWh/m².yr)	-	-	185

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	-	-
Final airtightness	-	3

Annual space heat demand (kWh/m².yr)

	Pre-development	forecast	measured
Space heat demand	-	-	-

Whole house energy calculation method	
Other energy calculation method	
Predicted annual heating load	-
Other energy target(s)	

Building services

Occupancy	Varies from 2 bed to 4 bed dwellings. Average 20m2/person
Space heating	Conventional radiator heating is used, with a low NOx condensing combi gas boiler in each house.
Hot water	A condensing combi gas boiler in each house provides hot water.
Ventilation	Mechanical extract ventilation (MEV) by Aerco Ventilation Ltd. This was continuous extract from bathroom and kitchen, with humidity controlled wall inlets. The bathroom extract grilles include PIR detectors to boost extract when rooms are occupied, and there is a boost switch to increase air flow when cooking.
Controls	
Cooking	Gas
Lighting	Low energy compact fluorescent lighting was used throughout.
Appliances	
Renewables	
Strategy for minimising thermal bridges	

Building construction

Storeys	2
Volume	
Thermal fabric area	

Roof description	The roof insulation is cellulose between 300mm timber I beam rafters, topped with bitumen impregnated fibreboard. Internally plasterboard is fixed directly to the I beams with a vapour control layer forming the air barrier. A service void is not required as all pipes, wires and ducts are run through the open web joists of the first floor construction and wall lights only are used on the upper floor. A warm mezzanine was formed over the upper floor, providing storage space to the bedrooms.
Roof U-value	0.14W/m² K
Walls description	The walls are timber frame, 140mm x 50mm studs with 50x50 counter battens to the inside, fully filled with cellulose insulation behind a lining of oriented strand board (OSB) sheets. External finish is a 15mm bitumen fibreboard, breather membrane, 25mm battened cavity and lime render on stainless steel mesh. Some areas use natural finish timber cladding instead of render. Internally the OSB layer is sealed with a vapour control membrane also forming the air barrier. After installation a cross-battened 25mm service void is formed behind the plasterboard. This development was built from large pre fabricated panels.
Walls U-value	0.19W/m² K
Party walls description	
Party walls U-value	
Floor description	The floor is suspended timber inprefabricated panels. The construction uses LVL (laminated veneer lumber) beams to span the pile caps, with the floor made of 300mm composite timber I-beams at 600 centres, filled with cellulose insulation enclosed by bitumen fibreboard below and OSB above. A gas-proof membrane between OSB and ply flooring provides the airbarrier.
Floor U-value	0.12W/m² K
Glazed doors description	
Glazed doors U-value	
Opaque doors description	
Opaque doors U-value	
Windows description	Triple glazed windows are used, with wooden frames seen internally but clad with aluminium externally to minimise maintenance.
Windows U-value	1.30W/m² K uninstalled
Windows energy transmittance (G-value)	
Windows light transmittance	
Rooflights description	
Rooflights light transmittance	
Rooflights U-value	

Project images