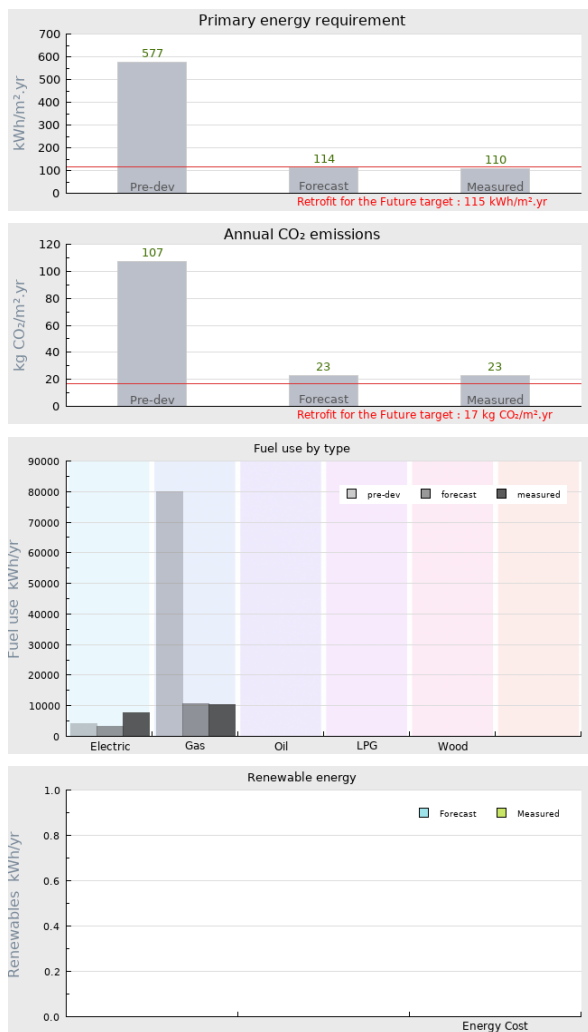


Project name Whole house retrofit of a typical Victorian solid wall detached property in Brighton

Project summary The aim is for a realistic, replicable and robust whole house solution to retrofitting solid wall Victorian housing to dramatically reduce carbon loads through space and water heating, and electrical consumption. The project will use established technologies that when combined offer the best carbon return per spent and when used together are more than the sum of their parts. The project will focus on upgrading the thermal envelope of all the external elements walls / floors / roof / glazing to achieve the optimum balance of u-values and air tightness in the context of existing building. Energy efficient services for space and water heating and appliances are the other elements of our whole house.



Project Description

Projected build start date	01 Mar 2010
Projected date of occupation	30 Sep 2010
Project stage	Under construction
Project location	Brighton, East Sussex, England
Energy target	Retrofit for the Future
Build type	Refurbishment

Building sector	Public Residential
Property type	Detached
Existing external wall construction	Solid Brick
Existing external wall additional information	215mm brick
Existing party wall construction	
Floor area	177 m ²
Floor area calculation method	PHPP

Project team

Organisation	Earthwise Construction Ltd
Project lead	Earthwise Construction Ltd
Client	Two Piers Housing Co-Operative
Architect	BBM Sustainable Design Ltd
Mechanical & electrical consultant(s)	Robinson Associates
Energy consultant(s)	
Structural engineer	
Quantity surveyor	
Other consultant	NBT Consult, Roger Case Design & Management, University of Brighton
Contractor	Earthwise Construction Ltd

Design strategies

Planned occupancy	Six bedrooms, some work at home during the week.
Space heating strategy	Heating from mains gas condensing boiler feeding radiators; Heat recovered from exhaust air using very efficient MHVR system.
Water heating strategy	Solar hot water from evacuated tube system; Gas condensing boiler back up.
Fuel strategy	Mains Gas; Mains electricity.
Renewable energy generation strategy	N/a
Passive solar strategy	
Space cooling strategy	Natural ventilation for most of the cooling season; Daytime use of MVHR with night purging during heat waves.
Daylighting strategy	All kitchens achieve a minimum average daylight factor of at least 2%; All living rooms, dining rooms and studies achieve average daylight factor of at least 1.5%.
Ventilation strategy	Comfort ventilation with heat recovery (winter); Openable windows (summer); MVHR and window opening will be monitored.

Airtightness strategy	External masonry to have parge coat to provide continuous air barrier with membrane all apertures taped to ensure airtightness at critical junctions; Roof structure sealed to inside face of external masonry wall to create continuous layer; Airtight layer to be sealed to insulation layer in loft; Solid concrete ground floor slab to be taped at junctions.
Strategy for minimising thermal bridges	Continuous insulation maintained throughout where possible; Returns of 1m insulation where internal/external insulation of front elevation occurs; Geometric thermal bridges minimised; Thermal bridging analysis undertaken for all primary junction interfaces, in order to assist with value engineering and where possible design out / reduce mechanical fixing and where necessary low-thermal conductive fixings used; Junctions assessed include: ground floor junction, external corner, eaves, verge, window jamb, head and sill, door jamb, head and threshold.
Modelling strategy	Whole house modeling was undertaken in SAP and PHPP.
Insulation strategy	Application of external insulation to solid brick walls on north, south, and east elevations (to achieve U-value of 0.15 W/m ² K); Application of internal render on street facing west elevation (to achieve U value of 0.15 W/m ² K); Insulated floating floor over existing solid cement ground slab (to achieve U-value of 0.14 W/m ² K); Removal of existing mineral fibre loft insulation to create service zone, joists over boarded with insulation boards and insulation boards at rafter line (to achieve U value of 0.10 W/m ² K).
Other relevant retrofit strategies	We are planning to carry out our package of retrofit measures with tenants remaining in the dwelling during the proposed works; We intend to demonstrate our approach can be undertaken with minimal disruption to the tenants and with no associated temporary re-housing costs.

Other information (constraints or opportunities influencing project design or outcomes)

Energy band F - current SAP energy rating of 33; Large, but compact building form with simple external architectural detailing; Few and limited external openings, bay windows on front elevation; HMO - no hierarchy of internal spaces, bedrooms on ground and first floor; Six bedrooms, several bathrooms and a large open plan kitchen and living room, with doubling up of appliances; Existing boiler system is 'heavy', unresponsive, poorly maintained and is over 25 years old; Co-operative ownership & management by residents who are RSL; Currently has high levels of multiple occupancy with vastly differing lifestyles and requires flexibility in operation; High levels of occupancy with high electrical and water requirement issues.

Energy use

Fuel use by type (kWh/yr)

Fuel	previous	forecast	measured
Electric	4061	3162	3915
Gas	80054	10647	8407
Oil			
LPG			
Wood			

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m ² .yr)	107	23	23
Primary energy requirement (kWh/m ² .yr)	577	114	110

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	-	9.76
Final airtightness	-	3

Annual space heat demand (kWh/m².yr)

	Pre-development	forecast	measured
Space heat demand	-	40	-

Whole house energy calculation method	SAP Extension for Whole House
Other energy calculation method	
Predicted heating load	7850 W/m ² (demand)
Other energy target(s)	

Building services

Occupancy	NULL
Space heating	NULL
Hot water	NULL
Ventilation	NULL
Controls	NULL
Cooking	NULL
Lighting	NULL
Appliances	NULL
Renewables	NULL
Strategy for minimising thermal bridges	NULL

Building construction

Storeys	
Volume	
Thermal fabric area	
Roof description	NULL
Roof U-value	0.00W/m ² K
Walls description	NULL
Walls U-value	0.00W/m ² K
Party walls description	NULL
Party walls U-value	0.00W/m ² K
Floor description	NULL
Floor U-value	0.00W/m ² K
Glazed doors description	NULL
Glazed doors U-value	0.00W/m ² K
Opaque doors description	NULL
Opaque doors U-value	0.00W/m ² K
Windows description	NULL
Windows U-value	0.00W/m ² K

Windows energy transmittance
(G-value)

Windows light transmittance

Rooflights description NULL

Rooflights light transmittance

Rooflights U-value 0.00W/m² K

Project images









