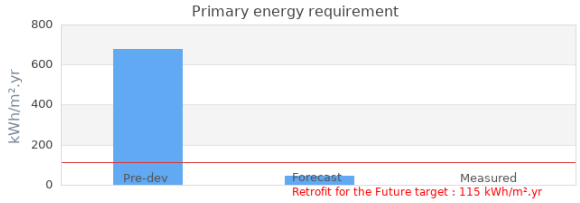
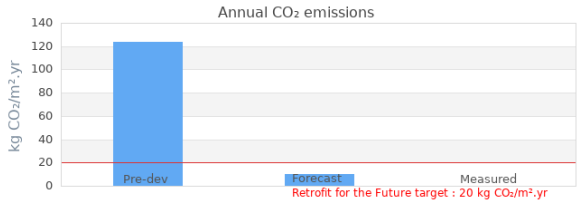
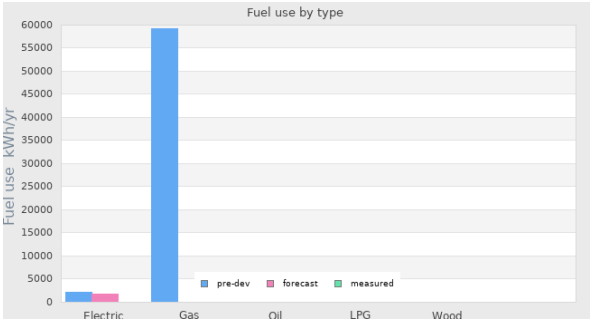
https://www.lowenergybuildings.org.uk/

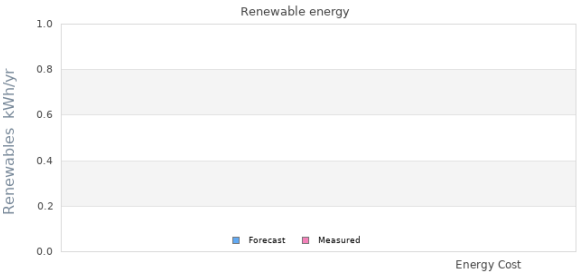
Project name LB Greenwich - How low can we go?

Project summary Our project has sought to produce a retrofit solution which is practical to build, easy to run and maintain, is cost effective and highly replicable to other similar properties. Achieving these aims will help enable social landlords like LB Greenwich, to roll out the solution across large numbers of existing dwellings. Our solution is based on applying Passivhaus standards of insulation and airtightness to the building envelope, with additional measures to further reduce energy demand, therefore limiting additional bolt-on technologies to provide that reduced energy demand. The 2bed extension required by LBG gives opportunities for improving performance and a model for other landlords with overcrowding of existing housing stock.









Project Description

Projected build start date	19 Apr 2010
Projected date of occupation	30 Sep 2010
Project stage	Under construction
Project location	Charlton, London, London, England
Energy target	Retrofit for the Future
Build type	Refurbishment
Building sector	Public Residential

Property type	Semi-Detached
Existing external wall construction	Solid Brick
Existing external wall additional information	215mm brick with external pebbledash render and brick plinth
Existing party wall construction	215mm solid brick
Floor area	108.4 m²
Floor area calculation method	PHPP

Project team

Organisation	Greenwich Council
Project lead	London Borough of Greenwich
Client	London Borough of Greenwich
Architect	Levitt Bernstein
Mechanical & electrical consultant(s)	Thames Renewables Ltd /Sustainia Ltd
Energy consultant(s)	The Healthy Home
Structural engineer	LB Greenwich
Quantity surveyor	LB Greenwich
Other consultant	UEL
Contractor	Apollo

Design strategies

Planned occupancy	Seven people, only half of which will be out at work or school on weekdays
Space heating strategy	Air source heat pump and MHVR with additional electric radiant heater in bathroom operated by movement sensor. Heat recovered from kitchen and bathrooms. Incoming air will be taken at highest point of roof to avoid lower temperaures near ground level.
Water heating strategy	Water heated by air source heat pump - combined heating and hot water system. Top-up provided by 5.3m2 of solar thermal panels on south facing extension roof.
Fuel strategy	Mains electricity will be used to power the heat pump. An economy 10 tariff will be used in order to benefit from cheaper off peak electricity to heat the calorifier. The economy 10 tariff will allow a top up of heat in the afternoon if required

Renewable energy generation strategy	The Carbon Factor attached to photovoltaic generated electricity appeared to negate the suitability of PV. Micro wind was ruled out on the basis of local planning constraints and technical feasibility. 5.3m2 evacuated tube solar thermal to roof.
Passive solar strategy	Glazed window and door openings are maximised to the west and south aspects, taking advantage of the extension to provide some limited south facing wall.
Space cooling strategy	Natural ventilation for the majority of the cooling season. Additional low power fan allows for reversal of Genvex system in summer to provide responsive night time cooling when required.
Daylighting strategy	Windows to the west and south have been maximised in size. Where a room has become deeper and in another a window has reduced in size a sunpipe has been dropped into the back of each room to maximise natural daylight.
Ventilation strategy	Mechanical ventilation with heat recovery in colder months. Natural cross-ventilation during warmer months.
Airtightness strategy	New ground floor concrete slab provides air tight junction with existing walls. High perfrmance windows and doors to be installed, including triple glazed to north and east. Roof to be insulated at rafter level with appopriate airtight membrane. New enclosed porch to front door to reduce heat loss through door.
Strategy for minimising thermal bridges	External insulation of walls and chimneys, perimeter insulation to new ground floor slab and overlap with external wall insulation, insulated reveal details to window and doors, new enclosed porch to minimise problems with front door frame/wall return. External insulation will continue down to footings, a depth of 0.5 to 1.0 metre below ground level
Modelling strategy	Modelling has been carried out using PHPP to provide whole house energy consumption data. SAP has been used as required by the competition guidelines for comparative purposes. The existing building was also modelled in PHPP to provide CO2 saving analysis and current fuel consumption data.

Insulation strategy	Below slab insulation to new ground floor to achieve 0.13 W/m2K U-value. External rendered wall insulation to achieve 0.1W/m2K Chimneys to be insulated and rendered externally. Roof insulation between and below rafters to give warm roof space to 0.1W/m2K U-value
Other relevant retrofit strategies	Measures should be easy to run and maintain. The passive strategy reduces the reliance on technology and will be easier to understand and operate to optimum performance by tenants.
Other information (constraints or opportunities influencing project design or outcomes)	The house was included as part of the council extension program after its selection for the Retrofit competition and identified for 2 additional bedrooms. This has provided some opportunities, for example to provide some limited south facing windows, and maximise west facing glazing, but also has meant a more difficult analysis of costings for example.

Energy use

Fuel use by type (kWh/yr)

Fuel	previous	forecast	measured
Electric	2155	1843	
Gas	59250		
Oil			
LPG			
Wood			

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m².yr)	124	10	-
Primary energy requirement (kWh/m².yr)	678	43	-

Renewable energy (kWh/yr)

Renewables technology	forecast	measured
-		
-		
Energy consumed by generation		

Airtightness ($m^3/m^2.hr$ @ 50 Pascals)

	Date of test	Test result
Pre-development airtightness	-	7.73
Final airtightness	-	0.57

Annual space heat demand (kWh/m^2.yr)

	Pre-development	forecast	measured
Space heat demand	-	20	-

Whole house energy calculation method	PHPP
Other energy calculation method	
Predicted heating load	11.7 W/m^2 (demand)
Other energy target(s)	

Building services

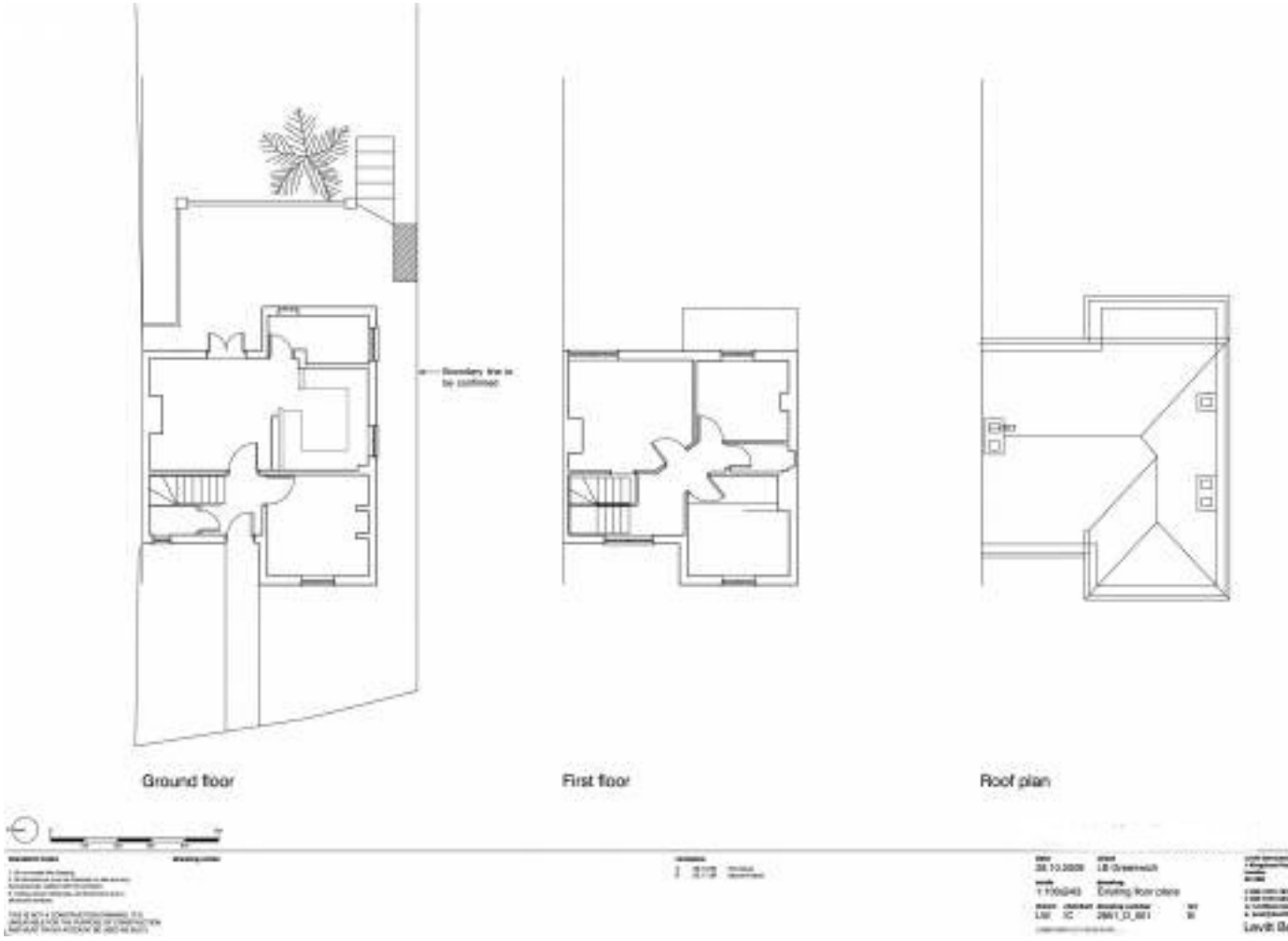
Occupancy	NULL
Space heating	NULL
Hot water	NULL
Ventilation	NULL
Controls	NULL
Cooking	NULL
Lighting	NULL
Appliances	NULL
Renewables	NULL
Strategy for minimising thermal bridges	NULL

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/m² K
Opaque doors description	NULL
Opaque doors U-value	0.00W/m² K
Windows description	NULL
Windows U-value	0.00W/m² K
Windows energy transmittance (G-value)	
Windows light transmittance	
Rooflights description	NULL
Rooflights light transmittance	
Rooflights U-value	0.00W/m² K

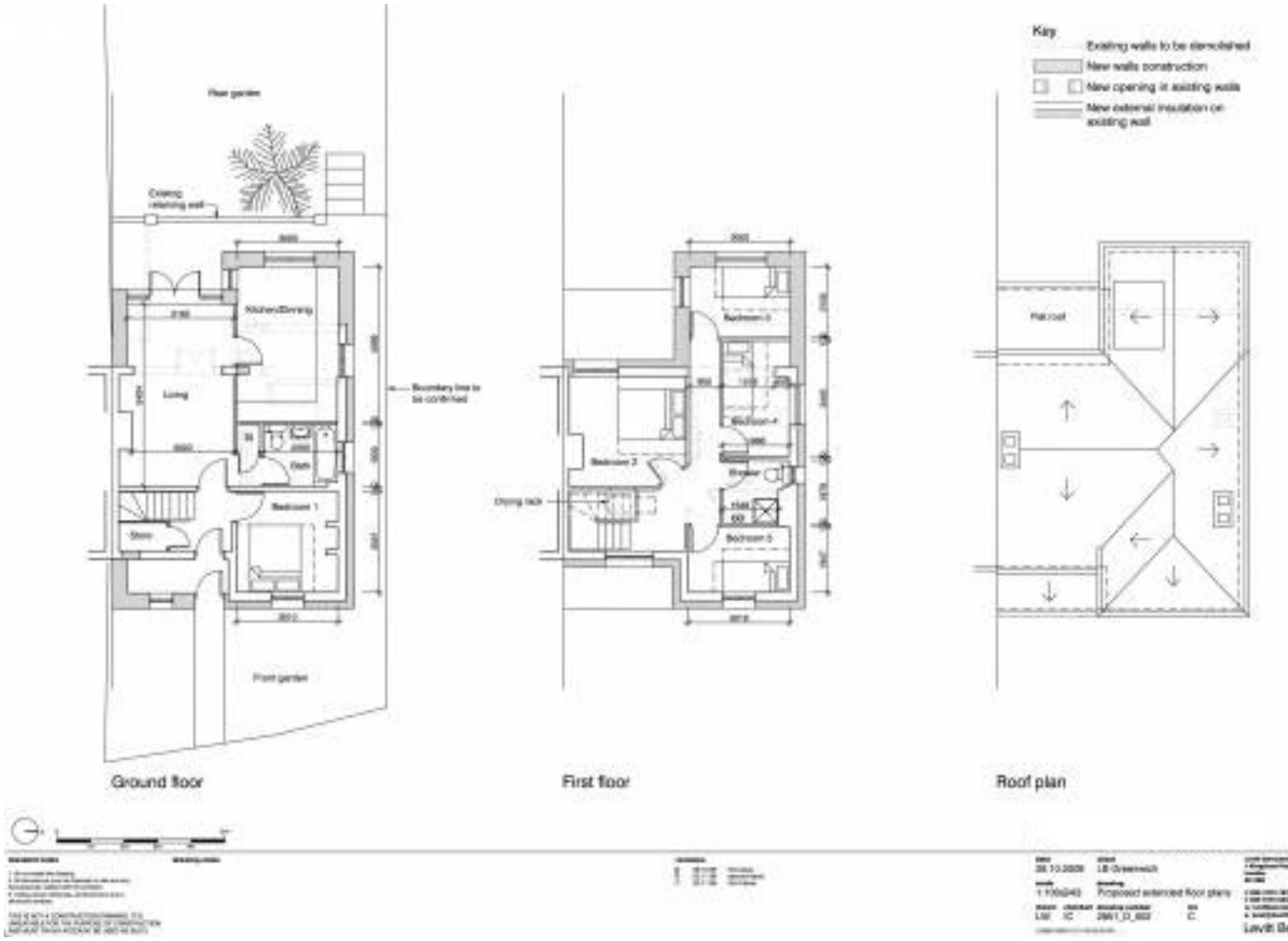
Project images



Rear, west elevation

Side, north elevation

Front, east elevation


Key
Existing walls to be demolished
New walls construction
New opening in existing walls
New external insulation on existing wall
Rear garden
Existing retaining wall
Kitchen/Dining
Living
Bath
Bedroom 1
Store
Front garden
Boundary line to be confirmed
Bedroom 3
Bedroom 4
Bedroom 2
Shower
Bedroom 5
Drying rack
Flat roof
Ground floor
First floor
Roof plan