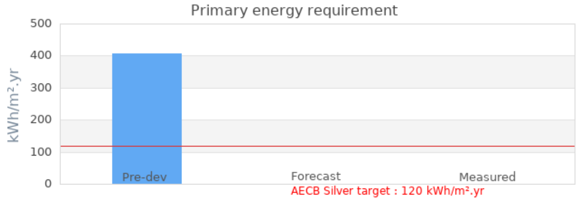
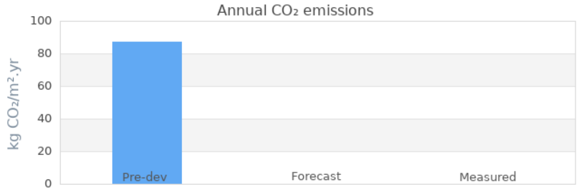
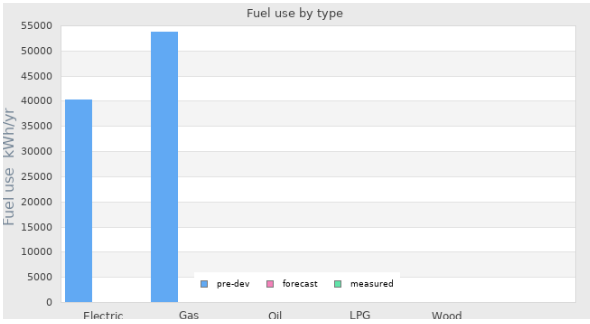
https://www.lowenergybuildings.org.uk/

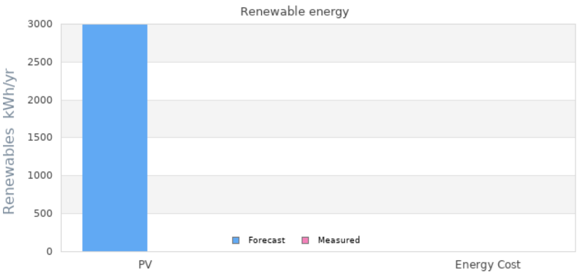
Project name RetroPHit 02 Medical Surgery, Hereford

Project summary A 400m2 GP Practice in Hereford City, built 1978.









Project Description

Projected build start date	
Projected date of occupation	
Project stage	Conception
Project location	Hereford, Herefordshire,
Energy target	AECB Silver
Build type	Refurbishment
Building sector	Public
Property type	Detached
Existing external wall construction	Masonry Cavity
Existing external wall additional information	Lightweight block inner skin, 50-70mm cavity, 100 facing brick
Existing party wall construction	
Floor area	398 m²

Floor area calculation method	APPROX

Project team

Organisation	RetroPHit
Project lead	RetroPHit
Client	Cantalupe Surgery
Architect	Simmonds.Mills Architects
Mechanical & electrical consultant(s)	RetroPHit
Energy consultant(s)	RetroPHit
Structural engineer	RetroPHit
Quantity surveyor	RetroPHit
Other consultant	
Contractor	chosen from RetroPHit business list

Design strategies

Planned occupancy	Medical centre housing GP Practice. Maximum occupancy: 9 Admin Staff, 9 GPs/Clinical Staff , 4 District Nurses and 21 Patients.
Space heating strategy	Existing: heating is via 3 no. mains gas fired boilers feeding radiators + individual electric room heaters. In combination with extensive insulation measures: type, size and number of boilers to be assessed at detail design stage. Radiators can be run with greater efficiency and safety at a lower water temperature. Radiator layout and controls e.g., thermostatic valves (TRVs) to be assessed for required maintenance / replacement. Individual electric heaters to be replaced with additional radiators + TRVs if required.

Water heating strategy	Existing: water heating via same 3 gas boilers (extent of hot water provision via boilers TBC) + electric point-of-use under sink heaters for hot taps. Pipe insulation to DHW pipework to be considered to improve speed of delivery of hot water to taps, potentially reduce use of expensive carbon intensive electrically heated hot water and to reduce summertime overheating from pipework in offices. Water use is recorded as typically 209 cu.m/yr, with a relatively low hot water use reported (TBC). South West facing roof space is occupied by PV panel array, with a smaller unshaded roof area still available to the South East. Mainly due to low hot water use solar thermal panels are not currently proposed, however an insulated and 'future proofed' hot water store will be investigated for both space and water heating purposes.
Fuel strategy	Existing: natural gas via mains supply. To be retained as space (and water heating - see above) fuel. Existing mains electricity use is reduced by a recent PV installation. Strategy is to reduce whole building heat and power consumption through energy efficiency measures, whilst moving the proportion of fuel used away from electricity to natural gas as far as possible in order to reduce the Practice's overall carbon intensity.
Renewable energy generation strategy	Existing: roof mounted PV system. No further PV proposed. Sub metering of PV output to be made more accessible/visible and to be reported / displayed separately to whole building electricity consumption. The role of other onsite heat and power technology will be assessed carefully at detailed design stage.
Passive solar strategy	The main street elevation faces South West and this combined with the number of large windows relative to office size + the lack of shading leads to localised and general overheating from excessive (low angle) afternoon solar gain. The South East elevation is more shaded and has less glazing. Therefore the options for increasing useful solar gain appear limited and the issue of overheating should be tackled.

Space cooling strategy	An older air conditioning system is in use during the summer period to provide cooled air to a number of rooms. The energy consumption of this unit may be relatively high and there should be room for some potential improvement, however it needs to be assessed as part of the overall ventilation and passive solar control strategy (see ventilation strategy). Lack of significant/any insulation in the roofspaces also adds to overheating on the top floor from solar gain via the roofspace. Overall, increased wall and roof insulation will reduce the amount of heat during hot weather reaching the inside of the building. It is proposed to replace existing windows with 2+1 insulated frame windows with inetgral venetian blinds as an effective method of shading the westerly windows whilst reducing noise and heat loss. Improved cross building natural ventilation can be created via air vents (fire protected) though internal walls/doors to connect to rooms with openable windows on the North.
Daylighting strategy	Daylighting could be improved through redecoration of certain areas with higher reflectance colour schemes. If the 2+1 windows are used, the integral blinds offer an ability to control solar gain/privacy levels with good daylighting control. Electrical lighting retrofit, including daylight sensitive lighting controls + upgrading existing luminaires with lowest energy types available offers an extremely cost effective way to reduce running costs and reduce emissions.

Ventilation strategy	Option 1: full mechanical ventilation with heat recovery (natural ventilation backup). Benefits include comfortable temperature, consistently high quality air - potential use of finer, pollen grade filters if required. Heat recovery reduces heating costs and can be used at night during hot weather to slightly cool the concrete floor slabs / building structure ready for the next day. For significant nighttime cooling natural cross ventilation is required through windows open in 'hopper' position. Security issues can usually be addressed. Higher capital and installation cost, ductwork could fit above suspended ceilings. Building may require more than one unit. Option 2: whole building mechanical extraction only (natural ventilation backup). Individual 'passive' air inlets (dampened against external noise) set through walls behind radiators to 'preheat' air drawn into rooms. Loft mounted unit extracting continuously with low power fan from wet rooms. Lower capital, installation cost.
Airtightness strategy	Air leaks (draughts) from outside will be: through light fittings in the 2nd floor ceiling, and other service penetrations in this ceiling or walls generally: via window and doors - poor or missing seals: via the ventilated masonry wall cavity and through the blockwork where not plastered: The concrete intermediate floors may be solid (in situ) or precast solid concrete plank or hollow core concrete plank. The drawings indicate that they are built into, and bear onto the inner skin of blockwork which, unless potentially compromised by being hollow core planks, is an intrinsically airtight detail. However the airtightness of the wall relies on the plaster and to maintain this continuity the plaster should be taken up to the concrete ceiling and down to the floor slab. This is unlikely to be the case, so some air leakiness should be assumed as the blockwork is NOT airtight in itself. Therefore an airtight hi-performance injected cavity fill insulation is proposed for the walls.

Strategy for minimising thermal bridges	Installation of cavity wall insulation can suffer from poor workmanship leaving unfilled areas. Using a highy quality installation company is proposed, combined with thermal imaging to assess final work. Linking the injected cavity wall insulation continuously with the proposed loft insulation is important for air tightness and to reduce thermal bridging losses. Thermal bridges will remain between window frames and cavity wall insulation however the detail will anticipate any future addition of external wall insulation in order to close to any replacement window frames further reducing thermal bridging and heat loss whilst improving comfort conditions close to windows. Thermal bridging generally will be improved.
Modelling strategy	The next stage in the RetroPHit process - detailed design, drawing and specification - uses the Passivhaus Planning Package to effectively model energy use, comfort and co2 emissions. Post retrofit whole building energy forecasts and running costs can be assessed more accurately during this next stage.
Insulation strategy	Given the role of the masonry cavity allowing uncontrolled air leakage into the building it is proposed to inject the cavity with a hi-performance polyurethane injected cavity insulation. The cavity appears to be 70mm wide. We have no concerns in principle with insulation filling the cavity using a closed cell foam of this type, which will not transfer moisture across the cavity to the inner blockwork during severe weather. It is not proposed to insulate wall internally nor the ground floor due to disruption and cost. External wall insulation may be added at a later date. It is proposed to use a thin layer of hi-performance spray foam from eaves (where the cavity wall insulation is accessible), across the attic floor structure to the oppposite eaves. Above this a cheaper mineral or natural fibre insulation maye be fitted to a greater depth.

Other relevant retrofit strategies	We are planning to carry out the package of retrofit measures with occupants remaining in the dwelling during the proposed works. Peripheral switch off plug on office equipment. It is proposed to explore affordable monitoring of different electrical circuits to understand and aid management of electricity use for three key distinct areas: lighting; plug in equipment; hardwired building services (ventilation,cooling,pumps,fans). In addition the use of individual wall mounted power monitors adjacent to each room entrance is proposed. Energy monitors in certain rooms to inform and influence occupant behaviour.
Other information (constraints or opportunities influencing project design or outcomes)	The building is in a conservation area. It took 6 months to gain permission for the recent installation of PV panels. All but one option for the energy efficiency measures proposed will be unseen on the public face of the building. The option to replace the westerly windows should not in our opinion pose an issue with planning. This can be explored with the LA at the next stage.

Energy use

Fuel use by type (kWh/yr)

Fuel	previous	forecast	measured
Electric	40210		
Gas	53687		
Oil			
LPG			
Wood			

Primary energy requirement & CO2 emissions

	previous	forecast	measured
Annual CO2 emissions (kg CO2/m².yr)	87	-	-
Primary energy requirement (kWh/m².yr)	408	-	-

Renewable energy (kWh/yr)

Renewables technology	forecast	measured
PV	2999	
-		
Energy consumed by generation		

Airtightness (m³/m².hr @ 50 Pascals)

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

Annual space heat demand (kWh/m².yr)

	Pre-development	forecast	measured
Space heat demand	-	40	-

Whole house energy calculation method	PHPP
Other energy calculation method	
Predicted annual heating load	-
Other energy target(s)	We propose a phased retrofit plan aiming for a whole building energy performance target aiming to achieve a minimum of AECB Silver and a maximum of the Passivhaus EnerPHit. Aspirational fuel use forecasts for gas and electricity are based here on Silver.

Building services

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

Building construction

Storeys	
Volume	
Thermal fabric area	
Roof description	
Roof U-value	
Walls description	
Walls U-value	
Party walls description	
Party walls U-value	

Floor description	
Floor U-value	
Glazed doors description	
Glazed doors U-value	
Opaque doors description	
Opaque doors U-value	
Windows description	
Windows U-value	
Windows energy transmittance (G-value)	
Windows light transmittance	
Rooflights description	
Rooflights light transmittance	
Rooflights U-value	

Project images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