

Outline Specification

Barbrook PassivHaus Retrofit

7 and 8 Barbrook, Lynton, North Devon



Proposal 1 (Full external and internal refurbishment)

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General Information

The outline specification here is intended to address No 7 and No 8 Barbrook Rd, Lynton. These semi detached properties are Universal system built houses dating from circa 1930 and are of fundamentally identical construction with the exception of a few minor modifications and differences in secondary heating and hot water systems.

The refurbishment of the properties will follow PassivHaus design principles in terms of the insulation values, airtightness requirement, ventilation and services. The aim is to meet the PassivHaus supplementary heat requirement of 15kWh/m²a or come as close to this level as is practically and economically feasible, whilst also achieving a Primary Energy target of less than 115kWh/m²a. These targets will necessitate factor 10 reductions in the current space heating demand coupled with extensive measures to drive down lighting, appliances, hot water and cooking demand.

A number of wider sustainability criteria will also be implemented on this project including the provision of external cycle stores, and the use of low flow water fittings. Low embodied energy and carbon storing materials will be used wherever possible and priority will be given to local sourcing. At least 80% of the assessed materials used in the project will be responsibly sourced in accordance with the guidelines set out in the Code for Sustainable Homes (CSH) Category 3: Materials (Mat2) Responsible Sourcing of Materials. 100% of all timber will be legally and responsibly sourced in accordance with the CSH guidance.

Note: the information provided here is intended to form an outline specification only; construction detailing and a final specification will be provided by the Architect and Environmental Design Consultant during the detailed design and documentation phases.

General approach

- The entrances to both dwellings and the position of all window openings will remain as existing
- All glazing and doors will be replaced with highly efficient triple glazed units
- The main walls are to be over clad with external insulation and a rain screen
- The roofline will be raised slightly and the eaves extended out slightly to accommodate additional insulation, the roof will be stripped back and re-clad using the existing roof tiles where possible
- The existing internal floor will be removed and excavated to allow for insulation beneath the new
- Internal walls to the ground floor will be removed and rebuilt
- An external biomass boiler room will be constructed at the side of the properties to house a single biomass boiler shared between both properties. An external drying space will be incorporated as part of the boiler room extension.
- An area for pellet storage capable of holding approx. 6 months of pellets will be located adjacent to the biomass boiler
- 2 small cycle stores (1 for each dwelling) will be constructed at the gable ends of each property
- A continuous airtight barrier will be created on the inner side of the external insulation layer in order to achieve an airtightness as close to $1\text{m}^3/\text{m}^2.\text{hr}$ @ q50 as possible. All service penetrations and junctions will be taped and mechanically sealed
- Vertical slab insulation to a depth of approx 800mm will be placed around three sides of the perimeter of the building
- Whole house mechanical heat exchange systems with a rated efficiency of not less than 90% will be installed in both dwellings
- 3m^2 of evacuated tube solar collectors (or the maximum useable area) will be installed on the South facing hip roof and linked to a single thermal store located in the loft over no.8
- LPG gas will be installed for cooking
- Low energy LED lighting or hybrid solar lighting will be installed throughout each dwelling with movement sensors located in bathroom and communal areas
- Smart energy metering will be installed and output displays located in the ground floor living areas
- Low flush WC systems will be installed along with low flow water fittings

Demolitions

A pre-demolition audit of the site should be undertaken in order to write a best practice Site Waste Management Plan (SWMP). Guidance on the preparation of a SWMP can be found at <http://www.smartwaste.co.uk/>. The key objective of the SWMP is to divert as much material away from landfill disposal as possible, in accordance with the waste hierarchy.

- Remove concrete paving to a width of 1m around the perimeter of the building (see Ground works, section a)
- Remove external side entrance porch to South elevation of No 8
- Remove existing chimneys entirely to ground floor level (salvage bricks for re-use in accordance with SWMP)
- Strip back roof covering (set aside existing tiles for re-use)
- Remove existing insulation from between rafters and ceiling joists (set aside for re-use/ recycle)
- Remove existing night storage heaters, extract fans, hot water cylinders and control systems (recycle in accordance with SWMP)
- Remove internal walls to ground floor and under-stairs cupboard
- Remove staircase (and set aside) to allow full access for new ground floor
- Remove all windows and doors (recycle in accordance with SWMP)
- Remove internal drylining and battens
- Remove kitchen units and cupboards (set aside for reuse)
- Remove bathroom units and cupboards (set aside for reuse)
- Remove existing soil and grey water pipes, rainwater pipes and guttering (set aside for re-use where feasible)
- Remove etc external lights, and TV reception devices
- Remove existing sockets ceiling roses and all wiring

Ground Works

Prior to carrying out the ground works the depth of the bedrock will need to be investigated at a number of locations around the perimeter of the property in order to establish the feasibility of the proposal below.

Remove concrete paving to a width of approx 1m around the perimeter of the properties to allow excavation of a trench of approximately 800mm depth around the West, North and South elevations of the property

First Fix

Roofs

The existing hipped roof profile will remain, but the roof structure and cladding will be removed. A specialist designed truss system will replace the existing and the saved tiles will be replaced. Internally the first floor ceiling and joists will be removed. The new insulation will be incorporated within the new structure i.e. following the roof pitch. The structural calculations to confirm the structural design of the new roof will be provided by the specialist, at detailed design stage.

- Remove existing roof tiles and ridge saddles (and set aside for re-use)
- Remove existing roof structure
- Remove existing chimney stack to ground level (set aside bricks for salvage or internal wall re-use)
- **Create new warm roof structure** Tape all joints in PE barrier with proprietary air tight sealing tape. Air tight grommets to be used to seal all lighting wiring penetrations and gaskets to be used to seal any ductwork penetrations in PE membrane
 1. Insulate between rafters with blown cellulose fibres (Warmcell)
 2. Breathable roofing membrane (e.g. Tyvek Supro Plus or similar) turned down over fascia and soffits and taped to external wall junction
 3. 25mm x 38mm counter battens (treated FSC)
 4. 25mm x 38mm roofing battens (treated FSC)
 5. Fix Roofing tiles to battens (majority re-used existing)
 6. Cedar [locally sourced FSC] for Fascia etc
 7. New guttering and rainwater goods to be Lindab galv metal

External walls

The existing windows will be removed but openings will remain as existing due to the environmental hazards associated with cutting back the existing asbestos shuttering. The ground work and perimeter insulation trench should be excavated prior to over cladding the external walls.

- Carry out ground works and perimeter insulation trenching as described above
- Remove all existing windows and doors and dispose of for recycling in accordance with SWMP
- Remove all pipework, vents, flues, rainwater goods, external lean-to's fences and other structures in preparation for:
- **Create new externally insulated over-clad wall structure:**
 1. Dub out existing wall face with cement & sand to provide a level and firm surface. Butter up rear of 18mm OSB sheeting and fix with plugs and screws [NB existing surface contains asbestos, so full protection must be used by all persons in the vicinity whilst fixing work on the walls is in progress], and a pattern of adhesive [as Gripfill] and finish to a level 150mm above mean ground level. (All joints to be taped with air tight tape)
 2. Fix boxing around window openings and timber frame spaced off existing walls and secured with modified Teplowties to allow 350mm thick void for Warmcell insulation, and connect to roof structure at eaves. All joints air tight taped
 3. Connect any service runs through new frame structure and tape and grommet seal all joints through the timber frame and concrete walls

4. Line outer face of the timber frame with 52mm Steico Universal wood fibre board and breathable wind/rain barrier membrane (tape all joints using proprietary air tight tape and clamp down joints with treated battens, as below)
 5. Batten outside with 50x25mm treated FSC timber battens at approx 600mm cts (according to cladding width specified below)
 6. FSC/PEFC locally sustainably sourced Western Red Cedar 18-22mm thick x 100 -125mm shiplap pattern, treated for fire resistance with HR Prof fire retardant
 7. Internal plasterboard and battens to be removed and all internal surfaces of external walls to be plastered with bonding plaster and skimmed to provide an air tight barrier. Full attention must be paid to sealing all aspects of the external walls, including the first floor zone. So any new services [i.e. back boxes, switches, pipe and ductwork] will wherever possible be located in the partitions. Otherwise they will be sealed and pipe and ductwork penetrations to be grommet, foam or silicon sealed.
- **Create new external perimeter insulation**
 1. Dig perimeter trench to depth of existing stone foundations [approx. 800mm below grade]; provide new concrete foundation and 100mm dense concrete block wall to contain the 250mm sub grade insulation and support the new external timber frame
 2. Tape seal connection between insulation and new timber frame wall structure
 3. Use geo-textile membrane and/or recycled plastic sheeting to protect insulation from damage below ground
 4. back fill trench with loose pea gravel to create French drain

Ground Floor slab

Internal ground floor partition walls, kitchen units and stairs etc to be removed in accordance with the schedule outlined in Demolitions section above. The existing ground floor slab is to be removed and disposed of in accordance with the SWMP. A total depth of 590mm (below the existing finished floor level) will need to be excavated in order to create the new ground floor structure

- **Create new insulated ground floor slab:**
 1. Remove internal floor coverings and excavate existing slab, to create a level ground surface at 590mm below the existing finished floor level
 2. Apply 150mm sand blinded well compacted hard core; radon proof DPM dressed up to form air tight junction with external wall (using plastering lathe to fix), 125mm concrete slab [reinforced under the central partition and using 50% PFA cement replacement mix with recycled aggregate. Allow floor to fully cure and test residual RH levels before proceeding] , 250mm Polyfoam Plus insulation and topped with a reinforced 65mm cement and sand screed)

Windows

- Replacement windows to be installed in existing openings and meet combined U values (frame and glazing) of $\leq 0.8 \text{ W/m}^2\text{K}$. This will require triple glazed units with soft low-e coatings and argon fill. Frames to be FSC timber thermally broken

Doors

- External doors to be replaced with triple glazed thermally insulated timber units of the same dimensions as existing and thermal specification identical to the glazing ($U_T \leq 0.8 \text{ W/m}^2\text{K}$)
- Doors and windows to be installed using prefabricated plywood window and door frame boxes in order to locate the windows and doors within the insulated plane, and reduce thermal bridging. Window and door air tight foils to be taped to internal OSB layer to create an airtight seal. A second layer of external taping to the window box is also advised.

Second Fix

Internal Partition Walls, ceilings, stairs, kitchen and bathroom units:

The existing internal partition walls are to be removed and rebuilt to the architect's specification to accommodate improved room floor plan arrangements and better internal daylight distribution. Internal partitions will be designed to accommodate MVHR ductwork runs and acoustic insulation:

- Internal partition walls to be rebuilt to accommodate MVHR *rectangular ducts* and extract and supply valves (1 per room)
- FSC timber stud wall construction 38x89 CLS @ max 600 c/c with 50mm sound insulation and 13mm plasterboard and skim
- New kitchen units to be reinstated once works to ground floor and walls have been completed [NDH supply item]
- Replacement Bathroom units incl. New low flow sensor controlled taps; Dual flush toilet)
- Bathroom and kitchen tiling and floor and wall finishes to be reinstated
- Floor finishes [carpet and sheet material] to be by tenants
- New flight of stairs [same arrangement as existing] to be instated once ground floor works have been completed