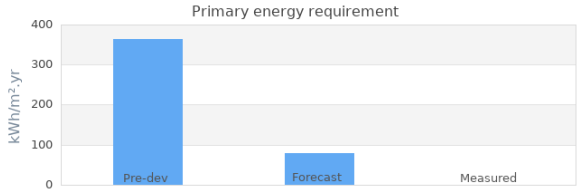
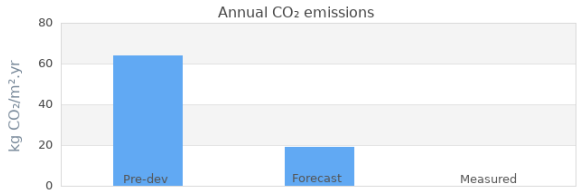
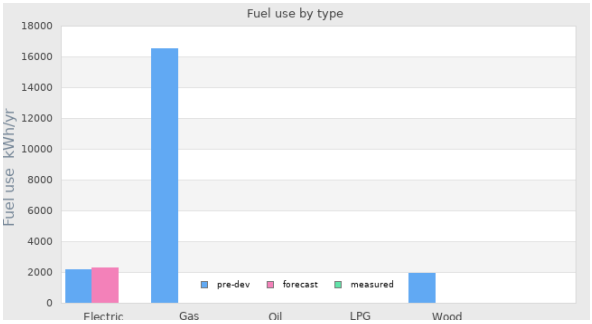
https://www.lowenergybuildings.org.uk/

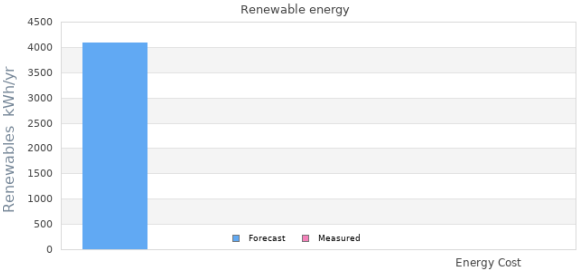
**Project name** 1970s Lancaster retrofit

**Project summary** Retrofit of 1970s semi-detached house using IWI. Designed, built and certified to the AECB Retrofit Standard - Level 2.




## Project Description

| | |
|---|---|
| Projected build start date | 01 Jun 2019 |
| Projected date of occupation | 01 May 2021 |
| Project stage | Occupied |
| Project location | Lancaster, Lancashire, England |
| Energy target | other |
| Build type | Refurbishment |
| Building sector | Private Residential |
| Property type | Semi-Detached |
| Existing external wall construction | Masonry Cavity |
| Existing external wall additional information | 60mm cavity with existing EPS beads |
| Existing party wall construction | |
| Floor area | 73.5 m² |

| | |
|---|---|
| Floor area calculation method | PHPP |

## Project team

| | |
|---|---|
| Organisation | ColdProof / Haus Martins |
| Project lead | Eric Fewster |
| Client | Wendy Pattinson |
| Architect | n/a |
| Mechanical & electrical consultant(s) | Adam Dadeby (MVHR), Chris Wilde (heating/DHW) |
| Energy consultant(s) | Eric Fewster (ColdProof) |
| Structural engineer | |
| Quantity surveyor | |
| Other consultant | |
| Contractor | Gideon & Saul Martin (Haus Martins) |

## Design strategies

| | |
|---|---|
| Planned occupancy | 2 people - occupancy selected as automatic in PHPP |
| Space heating strategy | Air source heat pump with underfloor heating |
| Water heating strategy | Air source heat pump |
| Fuel strategy | Electricity |
| Renewable energy generation strategy | Existing 19 solar PV panels generating 4,084 kWh/a |
| Passive solar strategy | |
| Space cooling strategy | Using openable windows in summer |
| Daylighting strategy | |
| Ventilation strategy | MVHR |
| Airtightness strategy | Airtight membrane for ceilings and in front of wood fibre IWI. Plaster layer in front of Spacetherm and for partition walls. Screed for floor. Relevant tapes used for junctions (plasterable, non-plasterable). |
| Strategy for minimising thermal bridges | Thermal bridge modelling done for all relevant junctions, with heat loss reduced where this was possible to be mitigated. Certain junctions (e.g. party/partition wall to external wall, and partition wall to ground) remain as thermal bridges, with relevant ps values entered in PHPP. |
| Modelling strategy | Baseline and post-retrofit modelling done in PHPP. |

| | |
|---|---|
| Insulation strategy | Existing 60mm cavity wall filled with EPS beads, with 100mm wood fibre IWI on most walls, but some (e.g. stairwell, bathroom) having thinner Spacetherm boards (20mm aerogel on plasterboard). Average u-value walls: 0.23 W/m2K.Suspended floor removed, replaced with 200mm EPS with screed/UFH, OSB and floorboards over. U value floors: 0.17 W/m2K.Loft insulation topped up to 390mm of mineral wool. Roof u-value: 0.103 W/m2K. |
| 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** | 2199 | 2310 | |
| **Gas** | 16521 | | |
| **Oil** | | | |
| **LPG** | | | |
| **Wood** | 1955 | | |
| | | | |

Primary energy requirement & CO2 emissions

| | previous | forecast | measured |
|---|---|---|---|
| **Annual CO2 emissions** (kg CO2/m².yr) | 64 | 19 | - |
| **Primary energy requirement** (kWh/m².yr) | 363 | 79 | - |

Renewable energy (kWh/yr)

| Renewables technology | forecast | measured |
|---|---|---|
| **-** | 4084 | |
| **-** | | |
| **Energy consumed by generation** | | |

Airtightness ( m³/m².hr @ 50 Pascals )

| | **Date of test** | **Test result** |
|---|---|---|
| Pre-development airtightness | - | - |
| Final airtightness | 04 May 2021 | 1.36 |

Annual space heat demand ( kWh/m².yr )

| | Pre-development | forecast | measured |
|---|---|---|---|
| **Space heat demand** | 189 | 44 | - |

| | |
|---|---|
| Whole house energy calculation method | PHPP |
| Other energy calculation method | |
| Predicted heating load | 22.8 W/m² (demand) |
| Other energy target(s) | AECB Retrofit Standard - Level 2 |

## Building services

| | |
|---|---|
| Occupancy | 2 people - occupancy selected as automatic in PHPP |
| Space heating | Air source heat pump with underfloor heating |
| Hot water | Air source heat pump |
| Ventilation | MVHR - Brink Renovent Sky 150, installed efficiency stated in PHPP of 74.9% |
| Controls | 4 speeds available via digital controller for MVHR |
| Cooking | Electricity |
| Lighting | Mostly low energy bulbs |
| Appliances | Dishwasher, washing machine, condensation dryer, 1 x freezer, 1 x fridge-freezer |
| Renewables | 19 solar PV panels generating 4084 kWh/a |
| Strategy for minimising thermal bridges | Thermal bridge modelling done for all relevant junctions, with heat loss reduced where this was possible to be mitigated. Certain junctions (e.g. party/partition wall to external wall, and partition wall to ground) remain as thermal bridges, with relevant psi-values entered in PHPP. |

## Building construction

| | |
|---|---|
| Storeys | 2 |
| Volume | 182m³ |
| Thermal fabric area | 246m² |
| Roof description | Loft insulation topped up to 390mm of mineral wool. |
| Roof U-value | 0.10W/m² K |
| Walls description | Existing 60mm cavity wall filled with EPS beads, with 100mm wood fibre IWI on most walls, but some (e.g. stairwell, bathroom) having thinner Spacetherm boards (20mm aerogel on plasterboard). |
| Walls U-value | 0.23W/m² K |

| | |
|---|---|
| Party walls description | Plastered 100mm concrete block either side of 80mm unfilled cavity |
| Party walls U-value | 1.32W/m² K |
| Floor description | Suspended floor removed, replaced with 200mm EPS with screed/UFH, OSB and floorboards over. |
| Floor U-value | 0.17W/m² K |
| Glazed doors description | Existing PVC |
| Glazed doors U-value | 1.56W/m² K installed |
| Opaque doors description | Green Building Store Performance |
| Opaque doors U-value | 1.10W/m² K uninstalled |
| Windows description | Existing PVC |
| Windows U-value | 1.60W/m² K installed |
| Windows energy transmittance (G-value) | 0.48% |
| Windows light transmittance | |
| Rooflights description | |
| Rooflights light transmittance | |
| Rooflights U-value | |

## Project images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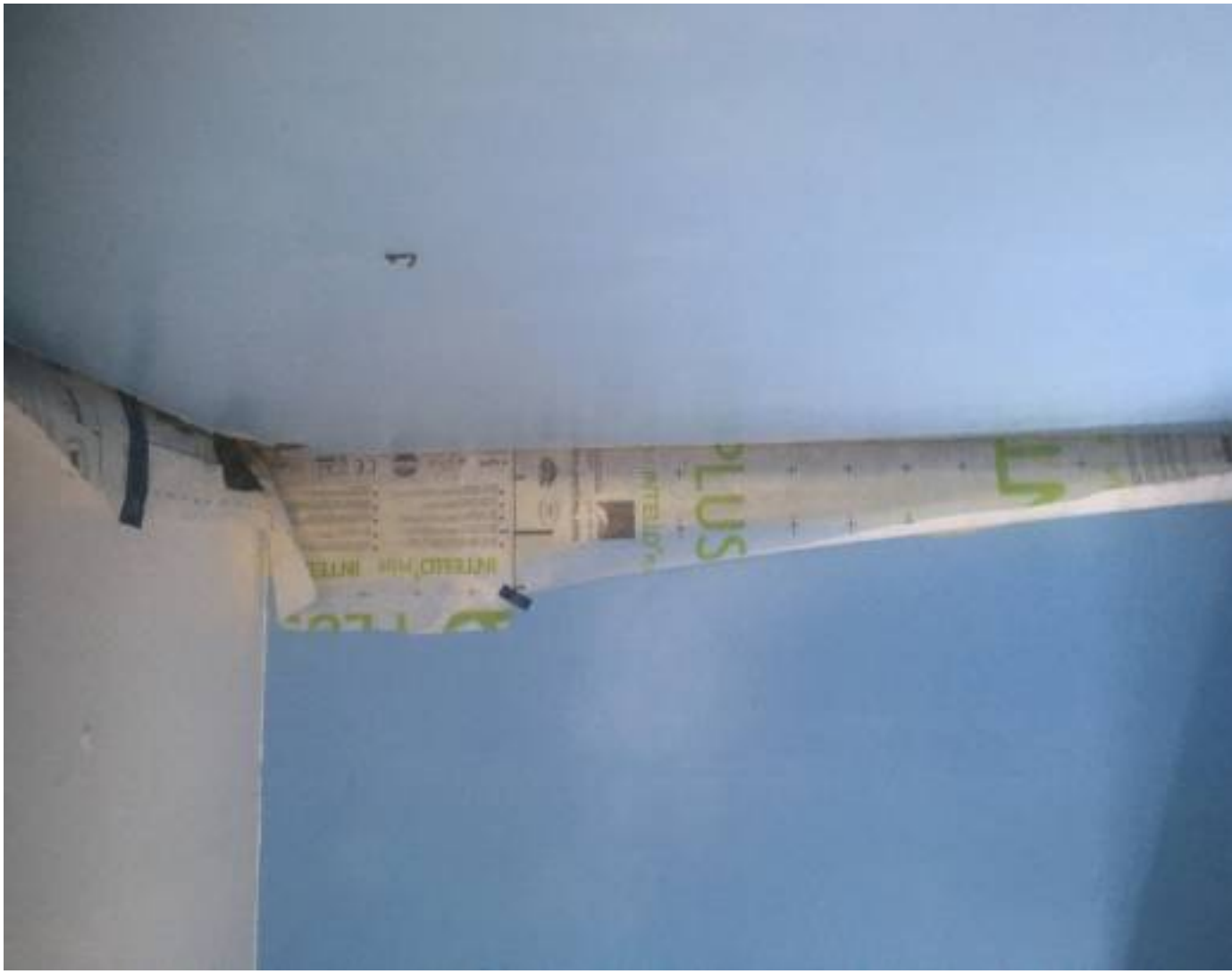


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