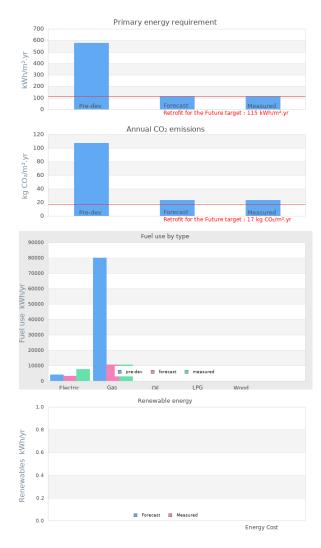


in Brighton

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

**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 that 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 m²             |
| 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/m2K); Application of internal render on street facing west elevation (to achieve U value of 0.15 W/m2K); Insulated floating floor over existing solid cement ground slab (to achieve U-value of 0.14 W/m2K); 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/m2K).                                      |
| 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 |
| Electri<br>c | 4061     | 3162     | 3915     |
| Gas          | 80054    | 10647    | 8407     |
| Oil          |          |          |          |
| LPG          |          |          |          |
| Wood         |          |          |          |
|              |          |          |          |

#### Primary energy requirement & CO2 emissions

|  | previous | forecast | measured |
|--|----------|----------|----------|
| Annual CO2 emissions<br>(kg CO2/m².yr)       | 107      | 23       | 23       |
| Primary energy<br>requirement<br>(kWh/m².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<br>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 <sup>2</sup> (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/m² K |
| Walls description        | NULL       |
| Walls U-value            | 0.00W/m² K |
| Party walls description  | NULL       |
| Party walls U-value      | 0.00W/m² K |
| Floor description        | NULL       |
| Floor U-value            | 0.00W/m² 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**

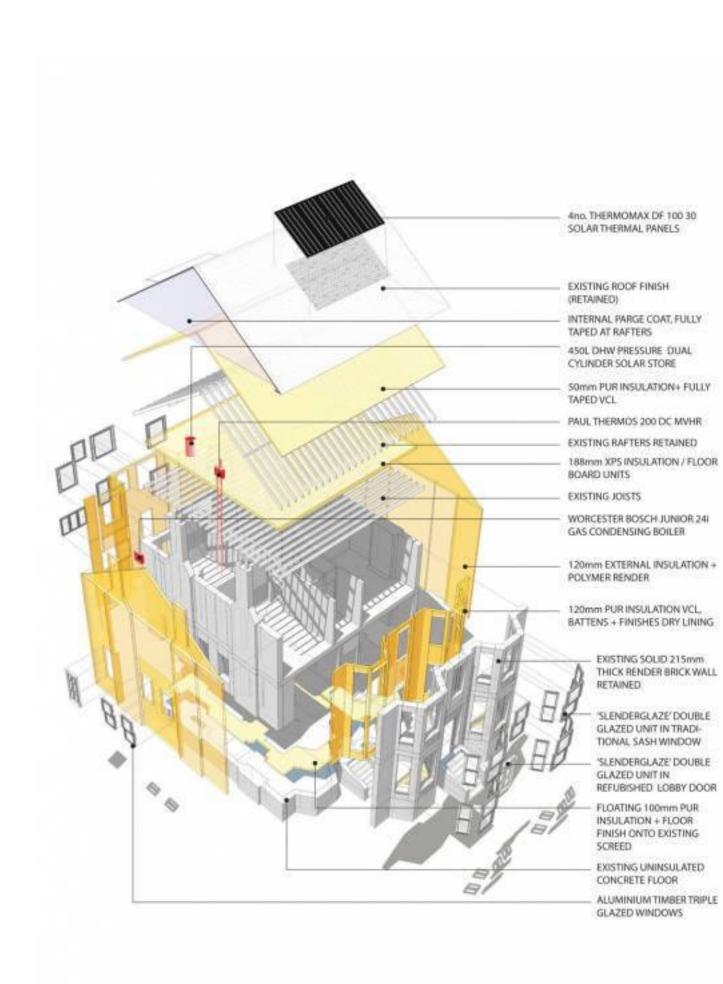


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