

DENBY DALE PASSIVHAUS



Design

A CASE STUDY



Design Case Study

Denby Dale Passivhaus was built for a private client who wanted a three bedroom detached house, built to a strict budget of £141,000 on an area of 118m³.

The aim of building this property was to provide the construction industry with an easy to use template to build a low energy Passivhaus using techniques and materials that are familiar to the British workforce.

It uses 90% less energy for space heating than the UK average house and is 20 times more airtight than a standard build. It optimises heat from the sun and Mechanical Ventilation with Heat Recovery (MVHR) provides constant fresh air and helps retain the heat inside the house. It has super insulation and triple glazing on windows and doors combined with insulated timber frame all help to retain heat. Airtight measures include weathertight plaster barrier applied inside the walls, minimising shrinkage between wall and floor and use of airtightness tapes and membranes. Using a cavity wall offers 'thermal mass' to stabilising temperatures which helps to allow the house to retain heat in winter and be cool in summer.

Heating the house is expected to cost as little as £75 per year as the heat from the sun, occupants' body heat and daily household activities is usually all that is needed to heat the house.

The design team preferred to put resources into Passivhaus energy efficiency measures rather than micro-renewables. However, the client did receive a grant to install solar thermal panels for hot water.

Key features:

- Mechanical Ventilation with heat recovery (MVHR) system
- Minimised thermal bridging – use of 300mm insulation in the cavity going right down to the strip foundation; use of lightweight aerated block below ground level; use of basalt resin cavity wall ties; positioning windows and doors at the centre of the insulation layer.
- Maximised airtightness – wet plaster coating to interior walls; attention to airtightness detailing around window and door openings and junctions between floors, walls and roofs, including use of airtightness membranes and tapes.
- Super insulation – 300mm fibreglass batts for the walls; 225mm polyfoam insulation under the ground floor; 500mm fibreglass quilt in the room void; triple glazing with insulated thermal break in frame for windows and doors.
- Minimised thermal bypass – windtightness and careful installation of insulation to reduce air movement through or around insulation.

Key facts:

- 118m³ three bedroom detached house
- £141,000 build costs (including motorized external sun shading, decorating, garage, external works and incoming services)
- Airtightness = 0.33ach@50Pa
- Space heating needs – under 15kW/m²/annum
- Peak heating load = 10W/m² (when outside temperature = -10 degrees Celsius)
- Total heat demand = 1.18kW (equivalent to one bar of an electric fire)
- Condensing boiler heat output = 4.kW
- MVHR unit with a heat recovery efficiency of 92%