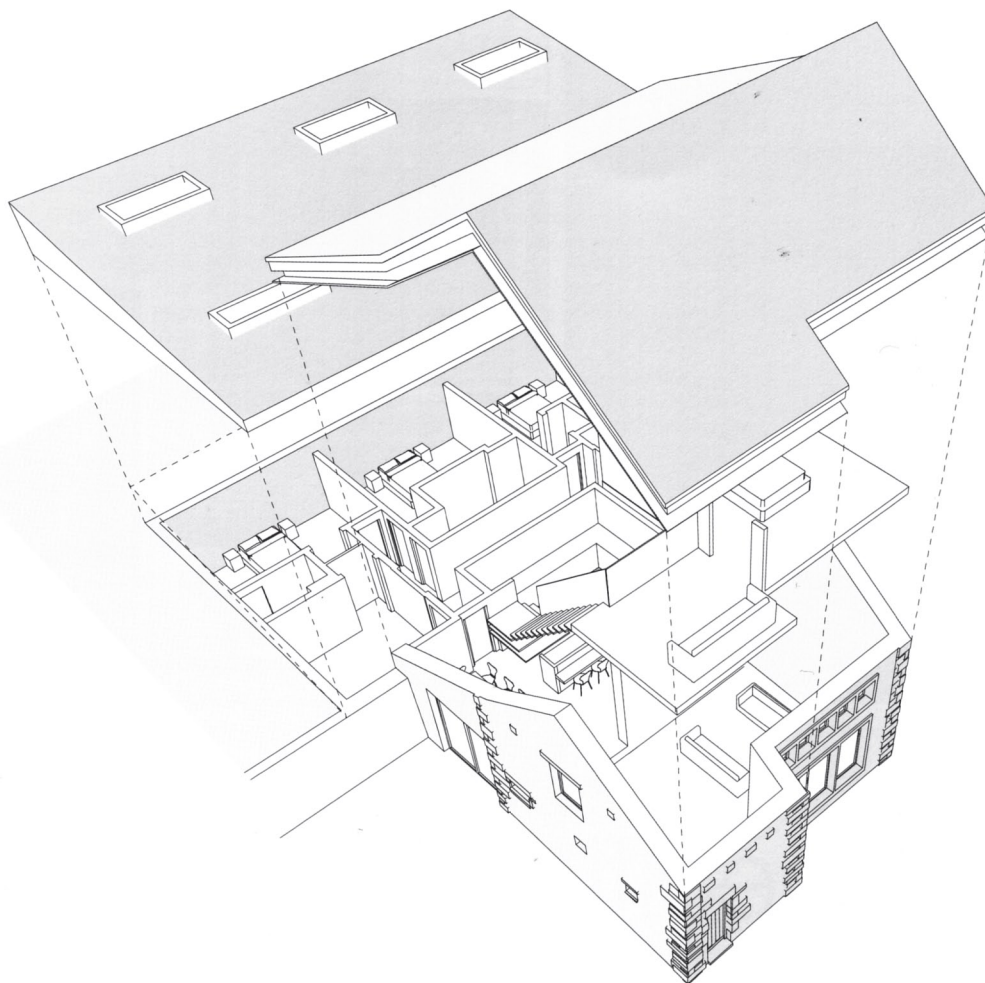


## Clough Bottom Cottage, Lancashire

Architecture.m has designed an underground extension to a historic stone cottage. Susan Dawson describes the innovative system of construction.

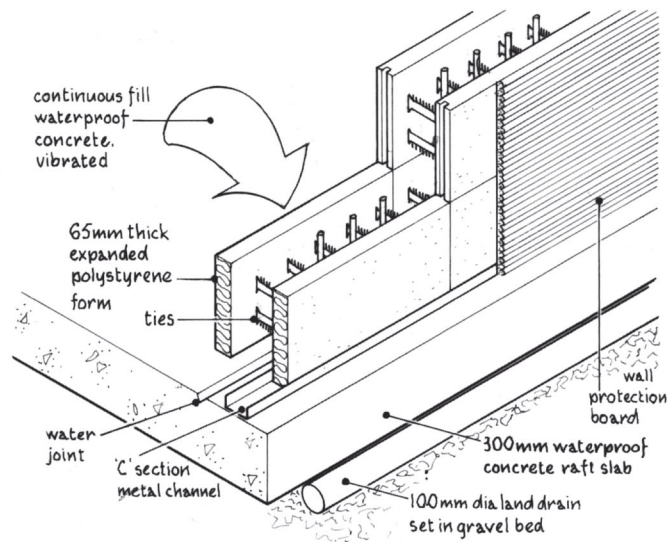


Clough Bottom Cottage began life as a 17th century small-holding, became an agricultural store and is now being developed into a new family home by architecture.m. Its location, within half a mile of the Peak District National Park, meant that any above-ground developments that would intrude on the beauty of the countryside were discouraged by the planning authority. Fortunately the cottage lay well within the curtilage of a mature estate; in addition it lay on a steep hillside and had been partly built into it; this suggested to the architect that new accommodation could be added under the conveniently adjacent slope. This would reduce its impact on the local context - the only clue to its location being the series of toughened glass sky lights found above the main spaces - while achieving thermally efficient Passivhaus standards.

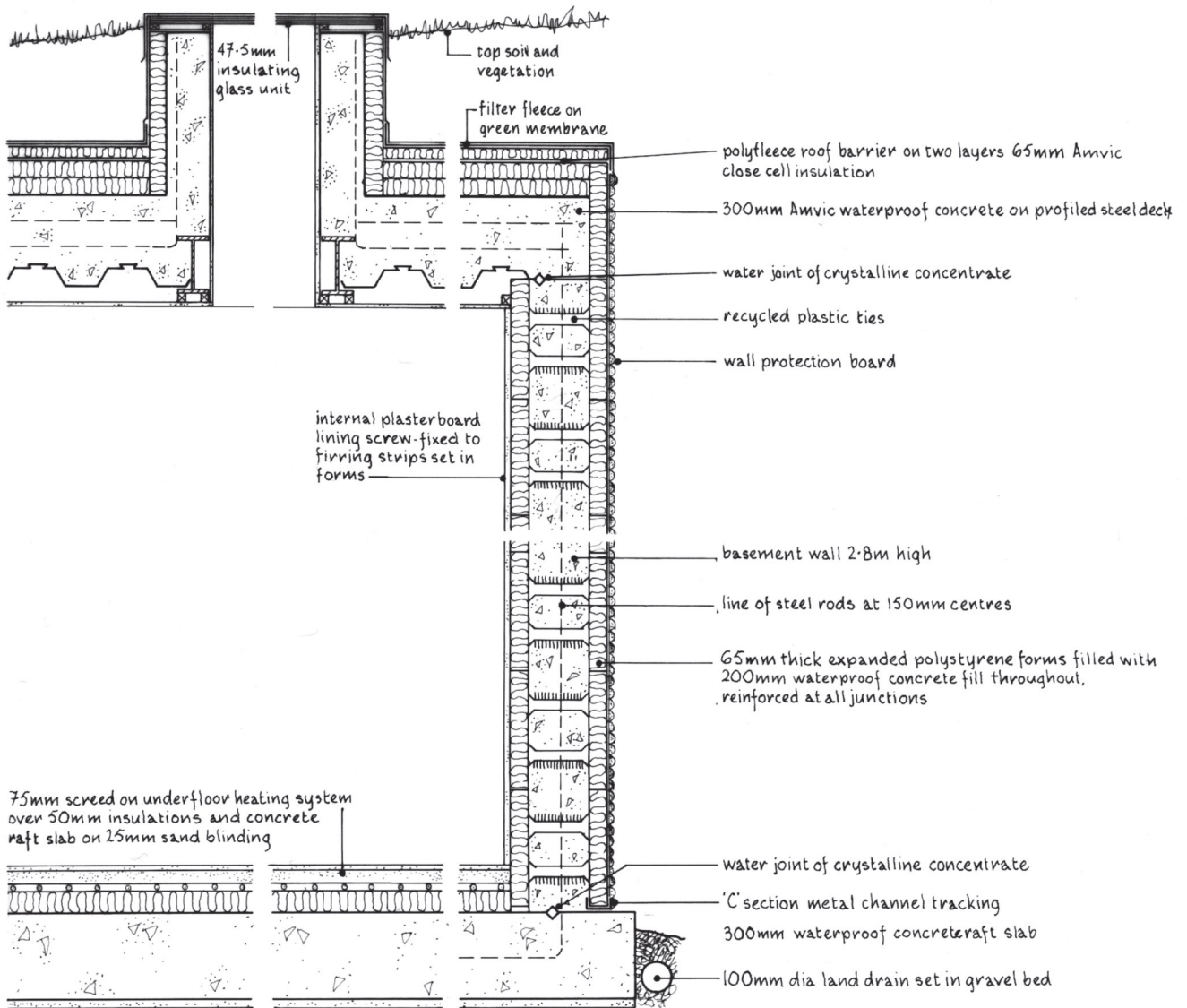
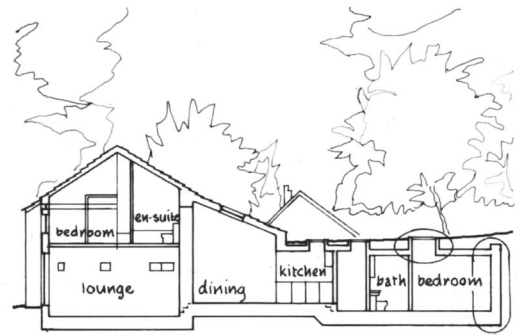
The two phases of the scheme, the development of the original cottage and the underground new-build section, provide an unusual family home capable of achieving highly efficient thermal, acoustic and sustainable standards.

Architecture.m specified an insulated concrete framework system (ICF) for the walls and roof of the underground extension. This particular system, AMVIC, provides its own installation service. In principle, the ICF wall system was erected as follows:

- a 300mm deep structural slab of concrete with waterproofing crystalline admixture was laid and a drain, backfilled with gravel, was set around the perimeter. Rows of vertical steel bars and a C-channel were fixed to the slab to set the precise position of the formwork. A water barrier joint of crystalline admixture was positioned at the base of the wall.
- a series of 200mm wide hollow expanded polystyrene forms were laid, slotted together and stacked up to become permanent shuttering for the walls, with additional structural steel reinforcement. The 65mm thick inner and outer layer of each form are held together by recycled plastic ties.
- Concrete was poured into the forms and vibrated with great care. At Clough Bottom the walls of the underground structure, 2.8m high, were produced in one continuous pour; the lack of joints prevents air leakage. Steel fibres were added to the mix to increase its structural strength.
- A water barrier joint of crystalline admixture was fitted at the wall head and a profiled metal deck roof was laid; it was reinforced and poured with concrete (with waterproofing crystalline admixture and steel fibres) to create a composite roof structure. As a final 'belt and braces', walls and roof were lined with wall protection board before being covered with topsoil and vegetation.



Cut-away Diagram of Wall Construction



Detail of Wall Construction

**Architects** Architecture:m  
**Structural Engineer** CSR Design, Harrogate  
**Main Contractor** Oldfield Construction, Saddleworth  
**Specialist Contractor** Amvic Wall Systems Ltd.  
**Skylights** Sunsquare