



earth-sheltered houses



Earth-sheltered houses at Keldur in Iceland.

what are they?

A building can be called earth-sheltered when it has a thermally significant amount of soil or substrate in contact with its external envelope. That dry definition includes having earth against its walls, on its roof, or being underground.

Earth-sheltering has a long history. Earth-sheltered houses at Keldur in Iceland are amongst the country's oldest buildings, and houses of turf and earth have an ancient history in many parts of the world. A web search reveals the existence of ancient earth-sheltered dwellings in India, China, Africa and Turkey; and if we include caves, earth-sheltering can be considered one of humanity's oldest types of dwelling.

Technically speaking, there are 3 kinds of earth-sheltered building: earth bermed; in-hill / earth-covered; and underground or fully recessed.

The earth berm or bund consists of earth banked against the walls. This might be one wall (polar facing) or all walls. Traditionally, stones were used too, and/or turf; modern construction calls for insulation and waterproof membranes.

In-hill, or earth-covered construction covers the roof as well. Buildings are set into a slope and normally oriented towards the equator (or with the slope of the hill to take drainage into account - see Mike Oehler's Basic Design, in resources).

Underground earth-sheltered buildings can also be called atrium-style because of the common use of an atrium or courtyard to ensure adequate light and ventilation. Some of the most famous subterranean houses are to be found in Coober Pedy, Australia, where underground living is a response to an extremely hot climate.

There are low-tech and high tech approaches to this technique. There's a world of difference between concrete and steel earth-sheltered houses which whilst they can be energy efficient in use, have high embodied energy and can cost £1000 per square metre, and hand-dug earth-shelters with timber posts and shed-style roofs.

what are the benefits?

Mike Oehler has a list of advantages of his style of earth-sheltering: no foundation; less building material; less labour; aesthetically pleasing; lower tax; warm in winter; cool in summer; better view; built-in greenhouse; ecologically sound; increased yard space; fallout shelter; cuts atmospheric radiation; defensible; concealment; closer to source of water; relatively fireproof; pipes never freeze; superior flooring; can be built by anyone; weatherproof; less maintenance; soundproof.

Many builders might not see 'defensible' as an advantage, although to those with an appreciation of how the 21st Century might go on, it's not necessarily the last thing on our minds. On that note, earth-sheltering may be a solution to an unpredictable climate. High winds and extreme temperatures are good reasons to consider earth-sheltering, and whilst you probably don't want to live in an earth-shelter on the flat in a time of flood, and a lot of earth-sheltered house designs struggle with drainage problems, that can be dealt with by having a roof that goes with rather than against the slope of the land, and building on the flat isn't necessarily recommended.

Earth-sheltered buildings have thermal mass and are often built for maximum solar gain, heating up naturally in the winter, but the high summer sun doesn't reach deep into the cool interior. Privacy and soundproofing are also benefits, as is 'landscape fit' - a sensitively built earth-shelter can disappear into the natural lie of the land.



Frame for earth-sheltered house and finished house; cost, £3000; pic: Simon Dale.



what can I do?

Earth-sheltering is a technically challenging undertaking in some ways, but as with all building, a great deal comes down to design choices. It's quite possible to earth-shelter an existing building. Perhaps the most commonly seen approach these days is to put a green roof on a house, but in a similar fashion, walls can be bermed. We might imagine our own homes, or even whole towns and cities disappearing into a rolling landscape of earth-sheltering coming to look like meadows, providing bee forage, cooling and oxygenating.

In terms of self-building, earth-sheltering would seem to offer an ideal solution for those in search of good energy efficiency and landscape fit. The crucial question is whether ecological self-builders can manage to get their designs past a system of building regulation intended to fit an industry focused on creating lines of toxic boxes instead of homes for the future of people and planet.

Of course all self-build or renovation projects are expensive, but at least some of the approaches to earth-sheltering can be done with modest resources, and the payback in energy savings should make the hard work involved worthwhile.

Almost any kind of ground work or construction in the UK requires planning permission, but one interesting idea might be to dig a pond for the sake of wildlife, water storage or aquaculture, and then to use the pile of earth generated to do a bit of earth-sheltering on whatever you're living in. See what the planners say. This will also inevitably involve building regulations, but the main problem may be lack of official guidance. Pioneers will help shape the policy. Lots of inspiring examples of earth-sheltering do already exist: Phil Reddy's house gives an idea of a high-specification build with costs at the time of around £1200 a square metre. The Hockerton Housing Project is a well-known example of earth-sheltered housing in a community setting, and its website offers all sorts of advice and inspiration both for new builders and retro-fitters. The HHP was built for £485 a square metre, completed in 1998.

Considered the father of the modern earth-sheltered movement, Malcom Wells has left a huge body of work to base our projects on. Pioneers like Wells imagined a world in which the majority of buildings would one day be effectively underground. Of all the approaches though,



Hockerton Housing Project: earth-sheltered homes in Nottinghamshire, courses & open days.

perhaps the most accessible is that of Mike Oehler. He's inspired many an ecological self-build pioneer, and instead of concrete and steel he advocates PSP - posts, shoring and polyethylene sheeting; Oehler's vision encompasses an affordable technique within everyone's reach.

The best low-impact building makes use of resources available on-site; it minimises the energy consumption in construction and use of the building; it creates structures that are healthy and pleasant to live in; it does no harm to the wider landscape and possibly improves it, offering new and enriched habitats for plants and animals. Also, climate change will challenge all of our buildings, and what we build must take into account a much altered world. Earth-sheltered architecture can address these questions, and can be included in the list of empowering and accessible self-build techniques that can be learned and applied by people whatever their experience. Having just read Mike Oehler's book, I now want to go and start digging a hole; the thing to remember though is that good design goes before a good project.

resources

- lowimpact.org/earth-sheltered-houses for info, courses, links, books, inc.
- Mike Oehler, *The \$50 and Up Underground House Book*
- Boyer & Grondzik, *Earth Shelter Technology*
- Rob Roy, *Earth-sheltered Houses*
- hockertonhousingproject.org.uk - Hockerton HP
- lowcarbon.co.uk - Brighton Earthship
- malcolmwells.com - Malcolm Wells
- undergroundhousing.com - Mike Oehler

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