

William Stanwix and Alex Sparrow

The Hempcrete Book

Designing and building with hemp-lime

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PART ONE

Principles of building with hempcrete

The hempcrete wall: an overview

There are several ways of using hempcrete within the structure of a building, but its 'standard' use, which is probably the most familiar to those who have seen or worked with the material, is the construction of solid (monolithic) walls to form the thermal envelope.

This chapter describes the principles of construction and the typical construction method for a cast-in-situ hempcrete wall. There are other ways of using the material in walling, depending on the specific application and the specifications of the architect or building designer, but the basic principles are the same.

Later chapters in this part of the book provide an expanded discussion of the methods used and skills involved at each stage of wall construction. Other than the information given in this chapter on services, all topics relating to the wall build-up are covered more thoroughly in the rest of Part 2, so that detail is not reproduced here. Instead, this chapter provides a broad overview of the entire walling system.

Hempcrete wall construction principles

A hempcrete wall is built with natural materials and provides a very high level of thermal and acoustic insulation. It is also vapour permeable ('breathable'), so provides moisture buffering – passive regulation of humidity, which is beneficial both for human health, because it improves the quality of the indoor air, and for the fabric of the building. Different levels of insulation can be achieved by casting different thicknesses of hempcrete, but a standard thickness in new build would typically be 300mm or 350mm. The thermal performance achieved varies according to the exact materials used.

As a monolithic cast-in-situ walling system, hempcrete effectively minimizes the chance of thermal bridging, by forming a continuous sheet of insulation material all around the building. The wall build-up, in its simplest form, uses only two or three different materials (lime, hemp, timber), which adhere closely to one another,



Glulam roof structure in a large hempcrete building.

and it contains no cavity, thus minimizing the risk of interstitial condensation.

More information about the benefits of using natural insulation materials and the thermal, moisture management and other properties of hempcrete can be found in Chapters 4 and 7.

Hempcrete walls are cast around a structural timber frame, as they are not strong enough to be load-bearing. Although they have some strength in compression, this is not enough in itself to support the weight of the roof and upper floors. The set hempcrete though, does provide a good strength in tension, which provides

racking strength to the timber frame, meaning that the use of timber can be minimized in a well-designed frame.

It is perfectly possible to construct large buildings, including those with structural frames of engineered steel or glulam to accommodate several storeys or cross large spans, using cast hempcrete. However, these are more likely to involve complicated frame designs, and in the case of very large buildings it is likely to be quicker and more cost-effective to use prefabricated hempcrete panels or blocks or sprayed cast-in-situ hempcrete than to place the hempcrete by hand.

Focus on self-build 1: Agan Chy

Inheriting a field with a dilapidated concrete barn on it gave Bob and Tally Moores an opportunity to fulfil what was, for a Bob at least, a long-held dream of building his own house. Planning permission had been refused on the barn once, but after some detective work Bob and Tally found an old map which convinced the council that, contrary to previous opinion, the barn sat within the village boundary, and permission was eventually granted for demolition of the barn and construction of a house.

Bob is a carpenter, used to timber framing, so his house was always going to be based around a green oak frame, and having worked for a supplier of traditional and environmentally friendly building products, he was familiar with lime and other natural materials. He was doing an MSc in Sustainable Architecture at the Centre for Alternative Technology, from which he says he learnt a lot, but couldn't understand why everyone was talking about easy-build bolt-together timber-frame houses with lightweight insulation, which needed to be sealed up tight to keep the heat in and then ventilated using mechanical systems to maintain indoor air quality. Bob says, "Up to the point when we built the house, I had lived mainly in vernacular buildings, built from local, natural materials that had stood the test of time. I wanted the same feeling of permanence from the house I was going to build myself. . . to know that, as well as being a high-thermal-performance eco-house, it would stand a chance of being there for centuries to come, and I didn't think I would get that from a lightweight insulated timber-frame house." The more Bob thought about it, the more it seemed to him that thermal

mass was the key to passively storing heat, whether created by heating systems or from the sun, and slowly releasing this energy to maintain a constant comfortable temperature inside.

The final design included a green oak structural frame, with a softwood studwork frame built off this to take the hempcrete. The principles of passive solar design were followed: highly efficient glazing on the south-facing elevation and a minimum of windows on the north side, together with a good overhang so that the windows are shaded in summer but allow solar energy in during the winter, when the sun is lower in the sky. All the external walls are 300mm hempcrete, with additional thermal mass provided by a deeper-than-usual concrete floor slab and slate floor covering in the open-plan living area. The roof is insulated using wood-fibre insulation panels. Being in an exposed location close to the Atlantic coast in north Cornwall, Bob and Tally have sensibly used a larch rain-screen cladding over the hempcrete on the exposed walls (most of the house); on the south side, they used a breathable render. Bob's motto for the build was 'Low-tech – high performance', and this comes out in the solidity and strength of the materials that surround us as we stand in the kitchen: oak posts and beams, solid black slate flooring, black slate windowsills, lime plasters and thick hempcrete walls. The house, on a scorching July day, feels reassuringly cool and comfortable, despite the fact that we are sitting next to the large south-facing windows and the external doors are open, allowing a direct connection with the heat outside.

In the winter, heating is provided by a wood burner in the living room, the flue of which passes



1. Curved window reveals accentuate the natural feel.

2. Lime plaster and windows on three sides give this bedroom a light, soft atmosphere.

3. The wood burner is the only heating Bob and Tally need most of the time.

4. The stove pipe passes through the bedroom, making use of the flue itself for additional heating.

5. Traditional, natural materials are used to create a building with a contemporary feel at Agan Chy.

6. Bob outside his hempcrete home.





Whether you're working on a new build or planning a renovation, *The Hempcrete Book* will tell you everything you need to get started with hempcrete.

A detailed practical manual for professionals and self-builders, this book explains the many benefits of building with hempcrete and other hemp products. It describes how to source and mix hempcrete materials, and provides a full explanation of construction techniques, highlighting potential pitfalls and how to avoid them. The book includes a comprehensive resources section, examples of completed builds, and fully illustrated design notes.

Hempcrete is a natural building material with excellent qualities: it's breathable, creating healthier buildings; it provides excellent acoustic and thermal insulation, with the advantage of good thermal mass; it's lightweight, reducing construction costs – and it's environmentally friendly.

The Hempcrete Book is a powerful tool for any eco-builder.

The authors



William Stanwix and **Alex Sparrow** are among the foremost experts on building and renovating with hempcrete. With over ten years' experience in the construction sector, including as a building surveyor, Will is the founder of one of the UK's first construction companies to build exclusively with hempcrete and complementary natural materials. His business partner Alex specializes in the use of hempcrete in historic buildings and is also a freelance writer on natural building. In addition to construction services, they also offer consultancy, technical design and training for people interested in using hempcrete.



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