Cob Construction

by Michael G. Smith

Cob and the Building Code

by John Fordice

"Broadgreen," a Victorian cob mansion built in Nelson, New Zealand, has survived two major earthquakes with no apparent damage. Quakes that occurred in the 1870's and in 1931 destroyed neighboring brick buildings. (Photo by Ianto Evans)

This four-bedroom cob and stone farmhouse, built by Kevin McCabe in 1994, marked the beginning of the cob revival in England. (Photo by Ianto Evans)

This garden studio in Northern California, built by Cob Cottage Company and the Permaculture Institute of Northern California, demonstrates cob's potential for rounded, sculptural shapes. (Photo by Michael Smith)

These 16th-century row houses with thatched roofs are typical of the approximately 2,000 cob houses that remain in use in the County of Devon, England. (Photo by Ianto Evans)

What is Cob Construction?

When I tell people I build cob houses, they often imagine structures made of corn cobs. In fact, cob is an ancient earthen building technique passed down through the millennia and known by many names in many cultures. Essentially, cob is building with mud. Clay soil, coarse sand, straw and water are thoroughly

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Ample historic precedent exists for the use of cob. Traditional buildings have been constructed of cob and successfully occupied for centuries in England, Europe, New Zealand and other parts of the world. Properly built and maintained, cob structures have proven to be safe, durable and sanitary. Cob has long provided the people of these cultures with a means of creating low cost housing out of the simplest of materials.

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combined and beaten together. This stiff mud is then built up into walls while still wet, without the use of formwork or mechanical ramming. The mixture is applied in courses, each of which is "sewn" into the one below while both are still pliable. As the bottom of the wall becomes firm and dry, more cob is added on top until the desired height is reached, with doors, windows, plumbing, electrical conduits, wooden anchors for cabinets, etc., being built in along the way. The result is a very hard, strong, monolithic earthen wall, reinforced by a continuous interwoven matrix of high tensile-strength straw fibers.

Cob buildings have proven themselves durable, comfortable and weather resistant, even in the harsh climate of coastal Britain. Due to its lack of mortar joints, cob seems to be more resistant to earthquakes than its close relative, adobe, and other kinds of unreinforced masonry. Cob walls don't burn, rot or get eaten by insects. Like other masonry materials, cob has enormous thermal storage capacity, making it ideally suited to passive solar designs. One of its most attractive attributes is the extreme fluidity of its form, making it useful in the creation of unique building shapes and decorative sculptural elements. Cob can be made with a wide range of soil types and without any heavy machinery or specialized equipment, making it highly affordable, especially for owner-builders and in less developed parts of the world. Using locally available soil and plenty of human labor brings the embodied energy and environmental impact of cob building down to a tiny fraction of conventional building practices.

One of the drawbacks of cob construction, from the standpoint of many conventional builders, is that it is time-consuming. To support the weight of new cob on top, the walls must be allowed to dry as they are built, making it impractical in most cases to add more than a foot (305 mm) or so of height per day. Another challenge, from the perspective of engineering and regulating cob buildings, is the extreme variability of applicable soil types, each of which requires a slightly different ratio of mix ingredients. Like all earthen materials, cob is susceptible to water damage. In rainy climates, it must be well protected from dampness by a good foundation and generous roof eaves, and should never be constructed in flood plains.

HISTORY

Unbaked earth may be the oldest building material known to humans. It was used to construct the first permanent human settlements 10,000 years ago. Because of its wide availability, it has been used on every continent and in every age. Even today, it is estimated that 40 percent of the world's population lives in earthen dwellings.

The most common earth-building techniques are adobe (sun-dried mud bricks), rammed earth, wattle-and-daub

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There is currently a resurgence of the popularity and use of cob in the U.S. and Canada. Present day cob builders are attracted to the beauty, economy, low environmental impact and sustainability offered by cob. There can be no question that the means, method, desire and need for cob building exist in this country. So then why is it not more common? The answer is simple—the Building Code.

In my work as an architect, instructor, builder and devotee of cob, I have spoken with many people who wish to build with cob. Time and again I have to give the same reply: "Yes, you can build with cob, but there are currently only three options open to you." Those following options are:

- to build illegally without a permit,
- to build in one of the few rural areas that allow exceptions to the normal permit process, or
- to obtain a permit via the alternate materials and methods process.

Clearly, the first two options are neither possible for, nor acceptable to, the majority of people. That leaves the third: the alternate materials and methods process.

In my opinion, this option has two serious flaws. Anyone wishing to obtain a "normal" permit for a cob building must prove to his or her local building official that cob is a safe and viable alternative. Therefore, the building official must decide into which part of the code the alternate way of building best fits—a difficult task at best, particularly if the official has limited experience with cob upon which to base such judgement. In addition, the code places the burden of proof on the potential cob builder. Such proof is something that few people are equipped to provide or able to afford. The result is that hopeful cob builders become frustrated, and the majority of plans to build with cob are stopped before they really start.

The solution to this problem is simple—change the code.

A new section of the code relating specifically to cob building needs to be written and adopted. That would provide both builder and building official guidance in and a mutual understanding of the permitting and construction of cob buildings. Once a realistic set of cob construction standards are developed, codified and adopted, securing permits for cob building will be as easy and straightforward as for any other method. Once this is accomplished, cob will be able to take its place alongside other accepted methods of building, and the growing need for the advantages of building with cob will be able to be fulfilled. Cob will be an option available to all who desire it.

Fortunately, a way of adding such a section exists in the model code process. One simply proposes the necessary changes in the code to ICBO, and if the proposal can

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(mud smeared over a lath of woven sticks), and cob. The word "cob," meaning "a lump or loaf" in Old English, refers to the mud building system common in Britain and former English colonies like Australia and New Zealand, which uses no forms, no bricks and no wooden structure. Similar techniques are indigenous throughout Northern Europe, the Ukraine, the Middle East and Arabian Peninsula, parts of East Asia, the Sahel and Equatorial Africa, and the American Southwest (where it is known as "coursed adobe").

Exactly when and how cob building first arose in England remains uncertain, but it is known that cob houses were being constructed there by the 11th Century. Cob houses became the norm in many parts of Britain by the 15th Century, particularly in Southwestern England and Wales, where the subsoil is a sandy clay and other building materials are scarce. An estimated 20,000 cob homes and as many more outbuildings remain in use in the county of Devon alone.

English cob was made of subsoil mixed with straw, water and sometimes sand or gravel. The percentage of clay in the mix ranged from three percent to 20 percent, with the average around six percent. It was mixed either by people, shoveling and stomping, or by heavy animals like oxen trampling it. The stiff mud mixture was then shoveled onto a stone foundation and trodden into place by workmen on the walls. As the walls dried, they were trimmed back substantially to leave them straight and plumb, and between 20 inches (508 mm) and 36 inches (889 mm) thick. Using this method, cob walls were built as high as 30 feet tall (9144 mm), but were usually much shorter.

The advent of industrialization and cheap transportation made fired brick available throughout England in the mid-1800's. By late last century, cob building was declining in popularity. There was virtually no new cob construction in England between World War I and the 1980's, and its traditional builders took much of their specialized knowledge with them to the grave. Fortunately, enough information survived to allow a cob building revival in the 1990's, fueled largely by historical interest and the high real estate value of ancient cob homes.

REVIVAL AND MODERNIZATION

The first construction project of the English cob revival was a bus shelter built by restorationist Alfred Howard in 1978. Since then, cob building has enjoyed an upswing in popularity in England, particularly in Devon. Kevin McCabe received a lot of favorable press in 1994 for his two-story, four-bedroom cob house, the first new cob residence to be built in England in 70 years.

Around the same time, but independently, interest in cob as an earth-friendly, inexpensive building alternative was awakening in the U.S. In 1989, Ianto Evans and Linda Smiley built their first experimental cob structure in Western Oregon. Four years later, I joined them to form

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withstand evaluation, it will be adopted. It is to the credit of the framers of the code that they had the foresight to make it open and accessible to change, but the process is costly. To write code section for cob that is able to withstand the rigors of scrutiny is a major undertaking. It will require a thorough and extensive program of laboratory-level research and testing, since the empirical data now available is neither thorough nor quantifiable enough to produce accurate and realistic code provisions for cob. Proprietary building materials industries have the capital and resources to test and develop standards for their products. Compared to these giant industrial forces, cob is a marginal church mouse. There is little money to be gained from manufacturing cob, no commercial cob association and presently too little impetus to do the work needed to bring cob into code acceptance.

What cob has to offer is not the thing that fortunes are made of. If a cob code is to become reality, a source of funding for the needed work must be found. For the gifts and benefits of cob to be returned to our world, the door to code acceptance needs to be opened. The only question remaining is how this is to be done. ■