



*Newhouse, Ashreigny, North Devon: a cob and thatch farmstead.*

## Introduction

It is estimated that around one third of the world's population lives in houses constructed of unbaked earth. Earth buildings are found throughout Europe, from Finland and Russia down to the Mediterranean. This tradition is predominantly represented in Britain by cob, the West Country name for a building method in which sub-soil is mixed with straw and water, brought to suitable consistency and then placed in horizontal layers to form a mass wall. The practice of cob building is strongest in western areas, in particular the south-west region from East Cornwall through to Hampshire and Wiltshire. There is an equally strong cob building tradition, with some striking similarities to that of Devon, in western France, from the Cherbourg peninsula down to the Vendée region, south of Nantes.

In cases where the walls of cob buildings have been left unrendered they may give the impression of having grown out of the landscape (which, in a sense, they have). Their subtle earth colours, complementing perfectly those of the fields that surround them, can add greatly to the charm and diversity of the Devon countryside. Moreover, cob buildings, especially those with thatched roofs, represent the survival of a method of building based upon the energy

efficient use of locally available renewable and re-cyclable materials. They have thermal insulation qualities equal to, or better than, most conventional houses being built today but produced at a fraction of the energy cost.

Devon contains more earth buildings than any other county in Britain. The earth building tradition is rooted in antiquity and there are buildings in the county known to date from the 15th century or even earlier, a testimony to the durability of this humble and much misunderstood material. At a conservative estimate there are in Devon at least 20,000 houses constructed wholly or partly of cob and an equal number of barns and other out-buildings as well as numerous boundary walls. Only a small proportion of these structures is protected by conservation law and even those that are may be at risk through redundancy or neglect or because they are not being correctly repaired and maintained. The number of cob buildings lost annually in Devon is difficult to assess but is thought to have been several hundred over the last ten years. It is in response to increased concern over the continued loss of these buildings and to a revival of interest in this and other traditional building methods that this leaflet has been produced.



*Cob cottages in the village centre at Inner Hope, South Devon.*

Cob buildings are found throughout Devon but tend to be more numerous in the east and north of the county, Mid-Devon and Teignbridge districts probably containing the greatest numbers. Cob buildings are by no means confined to rural areas but may also be found in many town and village centres. The material continued in use for building well into the late Victorian period until eventually rising labour costs, the availability of cheap bricks and concrete blocks, and the introduction of building byelaws led to its almost complete disappearance.

### The Raw Material

A glance at the geological map of Devon will show that a large area in the middle and north of the county (some 40% of the total land area) overlies a rock formation known as the Culm Measures. In the east, centred on the Exe Valley, is a formation known as the Permian sandstones and breccias, which covers some 15% of the county and is easily identified by its characteristic "red Devon" soils. Although the rocks in these areas have been quite extensively used for building they are generally of poor quality and difficult to work. The soils, on the other hand, provide a serviceable and easily obtained building material, which is one reason why cob buildings are so numerous in these parts of Devon.

The soils of Devon are thought to be among the best in Britain for earth construction. There are two reasons for this. Firstly, most soils contain a proportion of volumetrically stable clay – that is to say, clays which are fairly coarse and therefore do not expand and contract excessively – and which provide adequate cohesion. Secondly, the soils are usually found to be well graded or, in other words, contain a well distributed range of aggregates from coarse gravel through to fine sands and silts. Clay is a vital element in cob building because without it little or no cohesion can be achieved other than that obtained through compaction which, in traditional cob building tends to be fairly limited.

In clay soils cohesion is achieved by the forces of molecular attraction which bind together the contact surfaces of the clay particles so that the clay, provided it is well distributed throughout the soil, forms a coating around the silts, sands and gravels, effectively bonding them together. A typical serviceable cob mix would

contain clay and aggregates in the following proportions; stones and gravel (over 5 mm diameter) 30–40%; fine and coarse sands 25–30%; silt 10–20% and clay 10–25%.

Examination of any old cob wall will reveal the presence of straw, which is an essential ingredient. During the construction process it has the effect of binding the soil together into workable lumps, thus facilitating its placement on the wall. As the wall dries out shrinkage takes place (the first three to four weeks are the most critical) and the straw has the beneficial effect of distributing shrinkage cracks throughout the wall, which prevents the formation of large fissures thereby reducing the risk of subsequent structural failure. The tensile strength of cob is very low but the presence of a sufficient quantity of straw has the effect of reinforcing the material, increasing its resistance to shear failure. Both wheat and barley straw were used in the past, together with hay, twigs and other organic material including animal dung. There is little evidence to support the view that animal dung was an essential ingredient in cob. However, since the mix was often trodden by animals, usually cows or oxen, it was inevitable that a certain amount of dung would find its way into the material.

A good, well graded clayey sub-soil containing plenty of straw requires no other additives. Given the right conditions a well constructed cob wall will set almost as hard as rock, so the addition of lime or cement is quite unnecessary. It is claimed that lime was added to cob, presumably in order to achieve a faster set, from the 1850s onwards, though there is no record of it having been used in earlier times.



*Large 18th century cob warehouse at Shaldon, converted into seaside villas around 1830.*

### Building Methods

Clearly, finding the right sub-soil was of prime importance because soils can show considerable variation locally and not all are equally suitable for building. In earlier times builders probably used whatever material was to hand and it is likely that only those built of the best material have survived. By the beginning of the 19th century the state of the art had advanced to the point where builders had sufficient confidence in the material to construct large town houses with basements and attics. The cob walls of such houses are 20 feet (6 metres) or more in height and often only 2 feet (600 mm) thick.



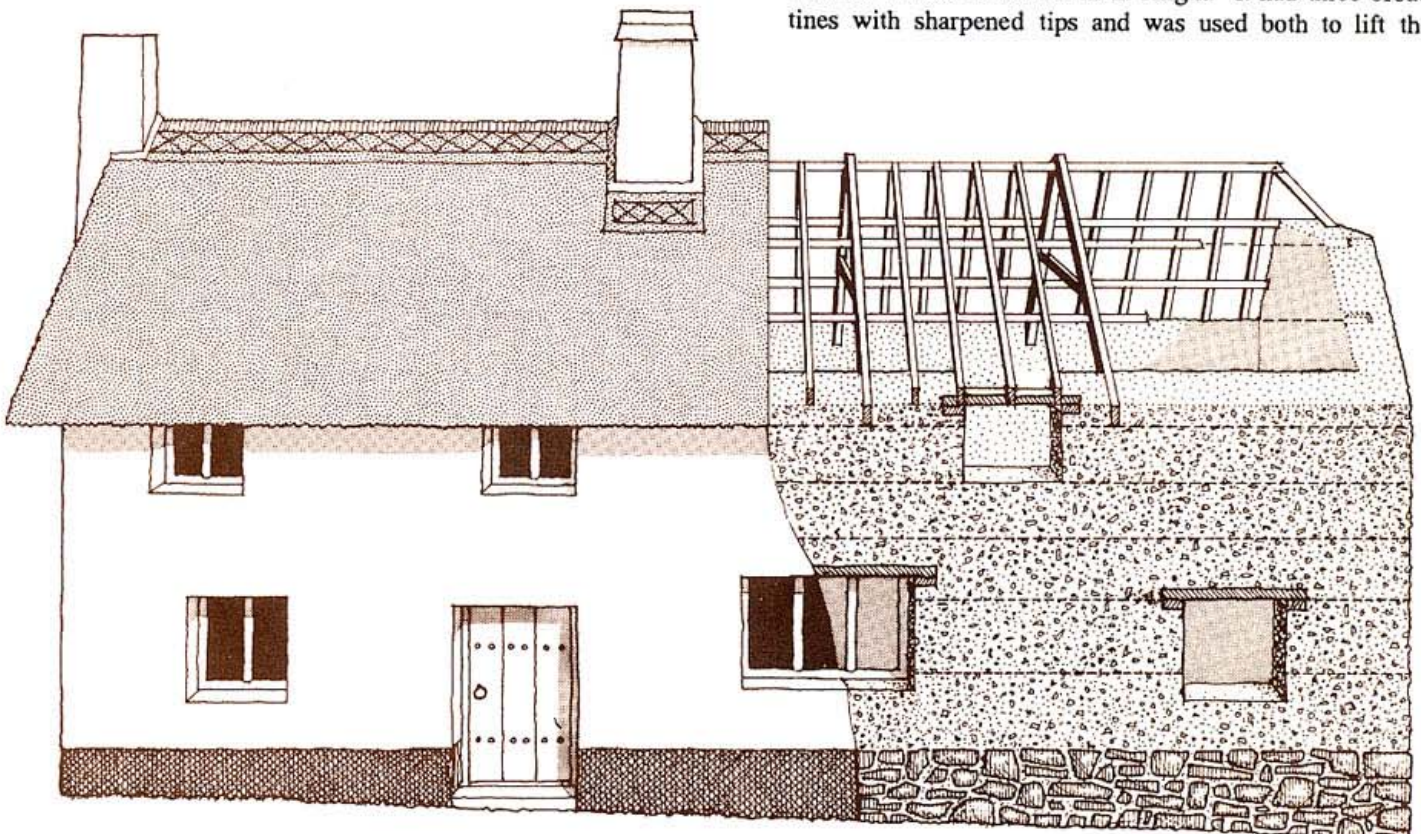
*Traditional method of cob construction showing mixing, placing material on the wall, compaction by treading and paring back the wall face.*

Probably the last major cob building to be constructed in Devon was a house called Coxen at Budleigh Salterton, designed by the Arts and Crafts architect Ernest Gimson and completed, using local labour, in 1912. From the end of the First World War through until the mid-1970s there is thought to have been very little new building in cob. There has, therefore, been a sixty year break in the continuity of the earth building tradition in Devon, during which time many of the old skills were lost and are now having to be re-learned. As a result any new building projects tend to be of an experimental nature. The man to

whom credit must be given for reviving the cob tradition in Devon is Mr Alfred Howard of Down St Mary near Coplestone, whose bus shelter, constructed in his home village in 1978, was the first new cob building to have been completed in Devon since the end of World War II.

Cob walls are normally built off a stone plinth, which can vary in height from around 450 mm above ground level up to first floor joist level in some domestic buildings. Correct mixing of the material is as important as the actual construction process. The soil is first broken down to a fairly fine tilth, all large stones greater than about 50 mm dia. being removed in the process. It is then spread out in a bed some 100 mm in depth on a hard, pre-wetted surface on top of a thin layer of straw. Water is then added and a second, thicker layer of straw is spread evenly on top (about 25 kg of straw per cubic metre of soil – 1.5 to 2.0 % by weight – is considered adequate). The straw is then trodden into the soil which is turned several times, more water being added as required. Thorough treading of the mix (traditionally by either men or animals) is vital because it ensures even distribution of the clay and renders the material to a consistency and state of cohesion suitable for building. The quantity of water used will vary according to soil type but is usually in the range of 10 to 12% by weight. If too little water is added the necessary blending, in other words efficient distribution of the clay fraction throughout the soil, will be difficult to achieve; the material will also be difficult to compact when it is placed on the wall. On the other hand, excessive amounts of water reduce the soil to a soft, plastic state, making building virtually impossible. In this case the material may need to be left for several days to dry out before using.

In the South West the tool most usually employed in cob construction was a small fork with a slightly curved wooden handle about 1.2 m in length. It had three broad tines with sharpened tips and was used both to lift the



*A typical 17th century cob house showing some constructional details. The wall is built off a stone plinth in several layers, or lifts, and lintels and roof timbers are supported on the cob, using timber pads or cross pieces where necessary.*

clods of earth onto the wall and then to beat and shape the material to the required form. Actually, much of the necessary compaction was achieved by the workman's boot, the material being placed in diagonal layers, well heeled in, and then thoroughly trodden between each lift. The height of a lift or 'raise' would vary according to soil type and consistency from 300 up to 900 mm. The material always overlapped the face of the stone plinth by at least 75 to 100 mm, the surplus being pared off after a few days, usually before commencing the next lift, with a special flat, sharp edged spade, known as a 'paring iron', or with a small mattock. The best cob walls are comprised of well-graded, moderately clayey soils containing plenty of small stones and straw, and have been well compacted. Such walls, if kept dry by means of a stone plinth and a roof with a good overhang at the eaves (ideally around 450 mm), will last for centuries.

An alternative construction technique, in use from about 1820 onwards – possibly to achieve a degree of symmetry in the walls of town houses and terraced cottages, involved the use of timber shuttering. When this method was employed it is likely that the soil was placed between the shuttering, which would be from 600 to 900 mm in height, in shallow layers no more than 100 to 150 mm deep. To this layer straw would be added and well trodden in, the process being repeated with successive layers until the shuttering was filled. This technique was in use in the Dunsford area before World War I and is known to have been used to rebuild a cob wall at Holsworthy Beacon in 1939. In both cases lime is said to have been added to the soil and it seems likely that this method was one in common use during the late 19th century.



*Cob shelter at Starcross built by Teignbridge District Council in 1989.*

External cob walls, especially those of barns and the rear (usually north and east facing) walls of farmhouses and cottages, were often left unrendered. Alternatively they could be coated with limewash which would, with repeated applications over the years, form a protective layer up to 3–5 mm thick. Where a render coat was applied it would usually be made up of lime and river sand with animal hair added to strengthen the material and act as a binder. Rough-cast renders were applied to many rural buildings during the late 19th century but are thought not to be a traditional finish for cob walls. Internal plasters, which needed to be less durable, would often be comprised of sieved earth mixed with hay and/or animal hair, either lime washed or a given a finishing coat of fine lime plaster.

## Other Uses of Earth in Traditional Buildings

Although this leaflet is concerned primarily with external load-bearing cob walls, it must be emphasised that earth was also widely used in the construction of internal walls and ceilings and, in early town houses, for infill panels in timber framing. Internal walls constructed of earth and timber were in common use up to the 18th century. Wattle and daub was the earliest form, though several variants are found including a method where cob was placed within a timber frame and then covered with riven laths to which a mud/hair plaster was applied. Internal plasters made up of sieved earth and hay or animal hair remained in use, even in very grand houses, right up to the 1850s. Where these forms of construction survive they should always be preserved and if repairs are needed specialist advice should be sought. As with cob walls, there is now a developing knowledge of these traditional techniques which will enable historically correct, non-disruptive repairs or reconstruction to be carried out.

## Conclusion

The object of this leaflet is to promote a greater understanding of the nature of cob, of the number of cob buildings that survive in Devon and the need to ensure their preservation. All buildings, if not properly maintained, are subject to structural failure. The occasional sudden collapse of cob buildings has given rise to a largely undeserved reputation for being unsound, unpredictable and generally inferior. However, it is a fact that the majority of failures in cob walls can be attributed to either neglect, inappropriate maintenance and repair or to misguided alterations.

A second leaflet will deal with the causes of decay and structural failure in cob buildings and will provide guidance on their maintenance and repair using appropriate methods and materials. Cob building is enjoying a modest revival in Devon, with several projects recently completed or in progress, so that it is now possible to obtain advice on repair and maintenance as well as new building.

Anyone requiring further information, or seeking advice on the repair and maintenance of cob buildings, should contact their District Council Planning Department and ask to speak to the Conservation or Historic Buildings Officer. Specialist advice is also available from the following:

Countryside and Heritage Division  
County Engineering and Planning Department  
County Hall  
Exeter EX2 4QW

The Society for the Protection of Ancient Buildings  
37 Spital Square  
London E1 6DY

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