

3.03 Cob

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a. context

Cob differs from adobe and pisé in that mixed clay, straw and water is laid or pitched on course by course while still in the plastic state, as opposed to dry mud brick laid in a conventional way, or gravelly loam rammed into formwork or shuttering. The faces of the wall are pared down as the work progress, and when dry they are plastered inside and given some sort of protective coating on the outside.¹ It is a more primitive form of construction than the other main types, requires less skill, takes longer over all, and is less durable. It is also almost universal, and especially so in Europe. In France the terms *torchier*, *torchis* and *bauge* are used for mud and straw walling, and in England mud walling was once called 'torchers'.² The term 'cob' is first recorded in Cornwall in 1602, and is used in the west country, as opposed to 'clob' on Berkshire, 'clom' or 'mud' [mwd] in Wales, and 'witchert' in Buckinghamshire.³ Here it is convenient to use the normal term 'cob', as well as another word, 'pug' for a similar material when it is inserted into timber or other hybrid forms of construction.

In parts of Africa and the Near East a form of 'layered mud' construction is used in which the layers remain very distinct, each with a slanting outer face, so that the wall profile is like giant weatherboarding, while plan is often free form rather than rectangular.⁴ This is a tradition culturally distinct from cob in Europe, though an English illustration of 1797 shows walls on a free form plan and with similarly pronounced layers, though not the weatherboard profile.⁵ In the Marche region of central Italy it is believed that the mud was trodden in pits, formed into cylinders of 80-150 mm diameter and 300-400 mm long, rolled in straw, and thrown up to the waller to be placed.⁶ Some other traditions seem to have involved placing the

¹ Clough Williams-Ellis, *Cottage Building in Cob, Pisé and Stabilised Earth* (London 1919), p 59.

² Wyatt Papworth [ed], *The Dictionary of Architecture* (London 1853-1892), sv Plasterer.

³ John McCann, *Clay and Cob Buildings* (Princes Risborough [Buckinghamshire] 2004 [1983]), p 4.

⁴ For examples in Burkina and Yemen see Jean-Louis Bourgeois, *Spectacular Vernacular* (2nd ed, New York 1996 [1983]), p 37, and Enrico Guidoni, *Primitive Architecture* (New York 1978 [Milan 1975]), p 17.

⁵ An engraving of a cottage at Enfield, Middlesex, reproduced in McCann, *Clay and Cob Buildings*, p 14.

⁶ Enrico Quagliarini, 'Earth Constructions in the Marche Region (Italy): Building Techniques and Materials', in Malcolm Dunkeld et al [eds], *Proceedings of the Second International Congress on Construction History* (3 vols, Cambridge 2006), III, p 2567.

material in the form of soft lumps rather than as a homogeneous mix, though the physical evidence is usually equivocal. Walls built of marl mixed with chopped straw or rushes, or less commonly furze, were quite usual in Ireland, and in other parts furze, heath, straw or rushes were placed between layers of mud, but it is not clear whether the construction used was truly cob.⁷ There was also a form of cob used in India, with which some Australian settlers may well have been familiar. These walls were described as being of mud, placed in layers 450 to 500 mm deep and 650 to 750 mm thick at the base, and reducing by about 25% as they rose.⁸

Both France and England influenced their colonies in the use of cob. In Acadia [Nova Scotia], seventeenth and eighteenth century houses were mainly timber framed but infilled with 'tamped clay and saltmarsh hay', known in New France as *colombage bousillé*.⁹ In the Richmond area of Natal several cob houses were built in the 1860s, apparently poorly, as none has survived.¹⁰ Cob was said to be widely used in the 1850s in the poorer parts of Europe and Asia and the backwoods of America and New Zealand, though Australia is not specifically mentioned.¹¹

b. British practice

Cob walling was traditional to large areas of Britain and should have been the most likely form of mud construction to be adopted in the Australian colonies, though there is little historical evidence of it. True cob was found in Devon, Somerset, South Wiltshire, and apparently Pembrokeshire and elsewhere in Wales; a similar method using chalk and straw was used in Dorset, Hampshire and Wiltshire,¹² and other slight variants in Yorkshire and Buckinghamshire.

The implements used, according to Innocent, were a dung fork and a 'cob parer' resembling the shovel or 'peel' used by bakers to remove bread from the oven. The walls were 60 centimetres thick and each layer was trodden by the workman and left for a week or two, according to the weather, before another was placed; the corners were commonly rounded to diminish their susceptibility to cracking.¹³ In cob walling, unlike pisé, it was not possible to build in the door and window frames as the work proceeded because the mud was much damper and therefore liable to rot the wood.¹⁴ S O Addey describes a method used in the East Riding of Yorkshire, where the layers were 130 to 180 millimetres thick and a thin layer of straw with the ends pointing outwards was placed between each, the ends subsequently being cut off,¹⁵ but it is not clear whether the purpose of this was to help bind the wall or to provide a surface on which to tread or beat the wall and consolidate the mud. The drying time for each layer must have varied considerably according to the weather and the

⁷ A T Lucas, *Furze* (no place [Ireland] 1960), pp 142-3.

⁸ Thomas Williamson, *The East India Vade Mecum* (2 vols, London 1810), I, pp 488-518, quoted A D King, *The Bungalow* (London 1984), p 20.

⁹ Harold Kalman, *A History of Canadian Architecture* (2 vols, Toronto 1994), I, p 82.

¹⁰ Brian Kearney, *Architecture in Natal* (Cape Town 1973), p 14.

¹¹ *Ecclesiologist*, IX (1848), pp 217, 228; see also *Builder*, VII, 326 (5 May 1849), p 211.

¹² Papworth, *Dictionary of Architecture*, sv Cob Walling; Williams-Ellis, op cit, p 82.

¹³ Innocent, op cit, pp 136-7.

¹⁴ *Builder*, VII, 326 (5 May 1849), p 211.

¹⁵ *** S O Addey, *Evolution of the English House*, p 40.

consistency of the material itself. Christopher Powell cites the practice of John Prawle, a builder in south-west England between 1770 and 1822, who seems to have waited only one or two weeks.¹⁶

In the west of England, the mixture used was clay, small gravel and straw beaten well together, and the walls were 380 to 460 millimetres thick,¹⁷ and according to another account it was common in the west country to build the wall on a stone plinth, placing each fork-full diagonally and treading the layer firmly before leaving it to dry.¹⁸ In Dorsetshire the cob was made with ground chalk, and in the sandy and heathy district loam, gravel and sand were used with heath rather than straw as a binding material.¹⁹ In Hampshire three parts of chalk to one of clay were kneaded and mixed with straw, but in the parts where chalk was not easily obtainable it was ground and used only for the rough cast or finishing coat.²⁰

Although cob traditionally was simply piled up to make a wall, there was a variation introduced in the nineteenth century in which timber shuttering was used,²¹ said to have been found in areas where the earth was especially prone to slump.²² This in no way turns the construction into pisé - for the material is different, it is laid moist, and it is not rammed. The technique is not well documented or generally known, but there are a number of references to it. For example, a Suffolk bricklayer was to recall having seen cottages built in Essex in about 1812, which were:²³

... of clay puddled, that is, used in a very soft state, between a case of boards. They were then plastered over, and are now [1847] standing, occupied, and in apparently sound state.

A Norfolk man described a building he had seen used for fourteen years, 'with clay walls ... either in one solid piece, or else with clay lumps',²⁴ and in Sussex 'the walls' of the mud-built cottages in the New Forest were formed of clay mixed with chopped straw or stones, packed down between boards or hurdles, these latter ... being removed when the clay dried or hardened'.²⁵ In his *Cottage Building*, C B Allen

¹⁶ Christopher Powell, 'Genesis of a General Contractor: a Georgian Vernacular Builder Transformed', in Malcolm Dunkeld et al [eds], *Proceedings of the Second International Congress on Construction History* (3 vols, Cambridge 2006), III, p 2549. However Powell's calculations are unclear and he believes, almost certainly wrongly, that the wall was built in only two stages.

¹⁷ J B Papworth, *Rural Residences* (London 1832), p 15.

¹⁸ Olive Cook, *English Cottages and Farmhouses* (London 1954), plate 259.

¹⁹ C F Innocent, *The Development of English Building Construction* (Cambridge 1916), pp 136-7.

²⁰ Innocent, *Development of English Building*, pp 136-7, quoting Charles Vancouver, *General View of the Agriculture of Hampshire*, p 67.

²¹ Larry Keefe & Peter Child, 'Devon and Cornwall', in John Hurd & Ben Gourley [eds], *Terra Britannica* (London 2000), p 37.

²² McCann, *Clay and Cob Buildings* (1983), p 18, and 'Is Clay Lump a Traditional Building Material?', *Vernacular Architecture* XVIII (1987), p 1; both quoted in A L Green, 'Unfired Earth Walls. The Promotion and Use of Sod, Sun-Dried Brick, Cob and Pisé Walling in New South Wales from 1788 to 1960' (MBlEnv, University of New South Wales, 1989), p 13.

²³ A J Green in a letter to the *Builder* (London), V, 134 (31 July 1847), p 388.

²⁴ *Builder*, V, 136 (10 August 1847), p 388.

²⁵ Innocent, *Development of English Building*, p 135, quoting C E Clayton, 'Cottage Architecture', in *Memorials of Old Sussex*, p 291.

mentioned a modified cob walling used in Devonshire and the west of England which was placed in shuttering like pisé, but was made of moistened clay or loam mixed with straw, and could be raised only 30 to 45 centimetres at a time before being left to dry.²⁶ This was presumably the 'dry cob' walling in Devonshire which, according to Papworth, was preferred to ordinary cob because it was less prone to settlement.²⁷ Near Exeter in the early part of the century a form of cob was sometimes laid in formwork 'in those parts of the red land where Dunstone shillot or clay shale is not available'. The red clay was mixed with small stones or gravel, and with barley straw in the ratio of eight bundles, or one pack-horse load, to nine cartloads of clay. The clay was trodden down between the side boards, and one cartload would suffice for half a perch of wall, 500 mm wide by 200 deep.²⁸ A further variation is the Scottish 'clay and bool' wall, in which stones were set inside the shuttering, touching either face, and then tempered clay packed around them,²⁹ or else the pug was placed in alternate layers with rounded water washed stones.³⁰

In 1848 the *Ecclesiologist*, which was widely read in Australia and other colonies, published an account of the construction of a perch of walling, 5.5 x 0.3 x 0.6 metres thick:

... two loads of clay and one load of coarse shilf (broken slate in small pieces such as is used for mending roads in parts of Cornwall) mixed and wetted, and trodden together to lump just the same as clay for brick before it is put into the mould: to this is added three bundles of barley straw, well treaded into the above mixture of clay and shilf; this is built on a stone wall, about 6 ins at a time, treading every layer well down and solid; it is put on in a moist state by means of shovels, so that a course can hardly be raised more than 12 or 18 in. in height at a time without risk of bulging, and then it must be left for some time to dry and to become consolidated before a second course can be placed upon it; and when the whole wall is built up it must be pared down to make the surface true and even. The stone wall under the cob ought to be 2 ft in height from the foundation, to keep the damp off the cob. The cob wall should project over the stone wall about 1 1/2 in. If the weather is dry about 5 ft in height can be built, then it may rest about three weeks, till the wall has got dry enough to build on again, the 5 ft more on top if required.³¹

Early in the twentieth century there was something of a revival of cob in England, though it did not compare with the renaissance of pisé, and it had little or no influence in Australia. It was symptomatic of this that just before World War I Ernest Gimson built himself a cob house near Budleigh Salterton in Devonshire. This was then published in Clough Williams-Ellis's pioneering and influential book on earth building.³² In 1919-20 the Department of Scientific and Industrial Research built experimental cottages at Amesbury, in response to the post-war shortage of

²⁶ C B Allen, *Rudimentary treatise on Cottage Building* (London 1854 [1853]), p 33.

²⁷ Papworth, *Dictionary of Architecture*, sv Cob Walling.

²⁸ Clough Williams-Ellis & J & E Eastwick, *Building in Cob, Pisé and Stabilised Earth* (London 1957), p 51.

²⁹ Alexander Fenton & Bruce Walker, *The Rural Architecture of Scotland* (Edinburgh 1981), p 84.

³⁰ Walker, *Clay Buildings in North East Scotland* (1977), p 9, quoted Green, 'Unfired Earth Walls', p 13.

³¹ *Ecclesiologist*, IX (1848), pp 217, 228; see also *Builder*, VII, 326 (5 May 1849), p 211.

³² Clough Williams-Ellis, *Cottage Building in Cob, Pisé, Chalk & Clay* (London 1919), pp 35-7.

conventional building materials. One was of chalk and straw cob, one of pisé, and one of chalk and cement. Although all were showing cracking by 1927 (the pisé least of all), they survive in sound condition today.³³

c. New Zealand

Cob is better documented in New Zealand than in Australia. Even in the early 1840s Edward Beckwith, Commissioner of lands for the Auckland District, noted two 'clay' houses amongst the 150 or so dwellings in his area.³⁴ In 1843 William Powditch wrote of how he had added a 'mud' kitchen to his house, 'the most comfortable room we have ever had', and was now adding a bedroom with walls seven feet [2.1 m] high and eighteen inches [450 mm] thick. The foundations were levelled and a timber frame put up in such a way that it would be incorporated in the finished wall flush with the inside face. This was to provide the necessary fixing for skirtings and shelves, and for hanging doors. Then a course of rough stone was laid as a protection from rising damp. Now a clay free of stones was chosen, broken down to a fine texture, tempered with water to the consistency of stiff mortar, and mixed with *wi wi* grass chopped to lengths of 100-150 mm. This mixture was placed on the wall by hand or with a spade, roughly, but with a line to keep it straight, in courses of 300 to 450 mm each day, provided the weather was good. Window frames were put in as the work proceeded, but not fixed to anything else, as they must be able to drop a little as the wall itself subsided. In wet weather the top of the wall was protected with *wi wi* grass. When the wall was complete a roof was added, with generous eaves to protect it, and after it had dried for a few days it was pared true with a sharp spade, and finally plastered on both faces.³⁵

In the country districts of New Zealand cob was second only to timber in popularity, and two-thirds the cost, and it was particularly favoured in areas like the Canterbury Plains where timber was scarce. On the plains, as well as in the Banks Peninsula, there are still dozens of cob cottages including one at Allendale near Lyttelton, which was built in stages from the 1850s by Adam Bloor.³⁶ 'Avonhead' at Riccarton, near Christchurch, was built in cob in 1853 by William Bray, but demolished in 1944.³⁷ The Acheron Accommodation House, on the route between Canterbury and Nelson, was built in 1862-3 and survives today.³⁸ Surviving two storey examples are 'Broadgreen' at Nelson, and a house at Stoke, to the south, both of the 1850s, and

³³ Richard Burt, 'The Experimental Earthen Cottages at Amesbury, England: a Long Term Conditional Assessment', in Santiago Huerta [ed], *Proceedings of the First International Congress on Construction History* (3 vols, Madrid 2003), I, pp 442-452.

³⁴ *** [missing, Beckwith ref supposedly in 2.03 Slabs], p 27.

³⁵ William Powditch to Gilbert Mair, 16 April 1843, Gilbert Mair papers, ms 188, part VIII, Auckland Public Library, quoted in P R Wilson, 'The Architecture of Samuel Charles Farr 1827-1918' (MA, University of Canterbury, 1982), pp 26-7.

³⁶ S Northcote-Bade, *Colonial furniture in New Zealand* (Wellington 1971), pp 22-3.

³⁷ Paul Pascoe, 'The Study of the Early Buildings in the Canterbury Settlement, &c' (thesis, apparently Wellington 1935), copy from the General Assembly Library, Wellington), p 53; T E R Hodgson, *Fire and Decay: the Destruction of the Large New Zealand House* (Waiura [New Zealand] 1978), pp 16-17, cited in J W F Cattell, 'Domestic Architecture in Christchurch and Districts, 1850-1978' (MArch, University of Auckland, 1981), p 12.

³⁸ John Wilson, *Canterbury Historical Guide* (Christchurch, no date), p 28.

'Tiptree Cottage' near Christchurch, of the 1860s.³⁹ Broadgreen is said to have been built by William Buxton in 1853 to accommodate his wife and six daughters, and to be modelled upon a Devonshire farmhouse.⁴⁰ Lady Barker, who was settled in the vicinity, reported in 1866 that the material was 'simply wet clay with chopped tussocks stamped in.'⁴¹ We should probably discount a reference by Charlotte Godley to 'cob' houses near Canterbury in 1850 as being frames of poles filled with clay.⁴² We know from actual buildings and from documentary references that there were many true cob houses in the area, not dependent upon timber, and in any case what she describes is not cob.

John Wilson refers to many other surviving examples, including several at Blenheim, Awatere and elsewhere.⁴³ However he does not use the term very precisely, for he describes cob as being puddled clay with straw, either packed between forms or made into bricks.⁴⁴ The latter type certainly cannot be described as cob: the former may be, but one wonders where examples of pisé may not have been mistaken for cob, given that none, other than Pompallier House, is ever referred to in New Zealand. Avonhead has been referred to as 'boxed' cob.⁴⁵ Peter Shaw refers to Esk Head homestead near Canterbury, of 1863, as having cob exterior walls but wattle and daub partitions.⁴⁶ Martin Hill guardedly says that many New Zealand cob buildings look as if they are hybrids of construction methods, probably made with lumps of clay, but with a result similar to cob construction.⁴⁷ The use of lumps of soft soil is documented in Natal, South Africa, where 'clay or ant-heap, tempered with sand and cow-dung, [was] trampled into mud by Natives, and served in balls or buckets to the operator, according to the consistency required.'⁴⁸

d. early Australian examples

The first use of cob in Australia may have been the 'clay huts' used by the marines in the first few months at Sydney while the barracks were being built.⁴⁹ In 1791 Governor Phillip wrote home that

The want of limestone still obliges us to confine our buildings to a certain height, for although the clay is of a strong binding nature, we cannot with safety

³⁹ John Wilson, *AA Book of Historic New Zealand Places* (Auckland 1984), pp 142-3; Michael Fowler & Robert Van De Voort, *The New Zealand House* (Auckland 1983), pp 117, 122; and Peter Shaw, *New Zealand Architecture* (Auckland 1991), p 39.

⁴⁰ Wilson, 'Architecture of Samuel Charles Farr', p 27. However, Shaw, *New Zealand Architecture*, p 39, dates Broadgreen to 1857.

⁴¹ F N Barker, *Station Life in New Zealand* (Auckland 1973 [1883]), pp 49-50.

⁴² Charlotte Godley [ed John Godley], *Letters from New Zealand by Charlotte Godley 1850-1853* (Christchurch 1951), p 159.

⁴³ Wilson, *Historic New Zealand Places*, pp 154, 155, 156, 161-2, 164, 169, 174, 182, 216, 217, 218.

⁴⁴ John Wilson, *AA Book of Historic New Zealand Places* (Auckland 1984), p 155.

⁴⁵ *** Pascoe, 'Early Buildings in the Canterbury Settlement', p 53.

⁴⁶ Shaw, *New Zealand Architecture*, p 20.

⁴⁷ Martin Hill, *Restoring with Style* (Wellington 1985), p 8.

⁴⁸ Brian Kearney, *Architecture in Natal* (Cape Town 1973), p 64, referring to G Russell [ed], *The History of old Durban* (1899), p 91.

⁴⁹ David Collins [ed Maria Collins, James Collier], *An Account of the English Colony in New South Wales* (Christchurch 1910 [London 1798 & 1802; 1804]), p 22.

carry the walls of those buildings more than twelve feet [3.6 m] above the ground, as the rains are at times very heavy, and should they come on before the clay is thoroughly dry, the walls should be in danger from the great weight of the roof.⁵⁰

This has been interpreted as a reference to clay being used as mortar in brick buildings, but Phillip's words would make little sense in this context, and in any case bricks were still very scarce at the time. Moreover he clearly is not saying that the rain will wash the mortar out of the joints (which could scarcely be much of a problem with a properly finished façade, and with adequate eaves). He is saying that the weight of the roof - clearly a reference to thatch - will become very great in the rain, and will crush the walls if they have not fully dried out. As a landowner in Hampshire Phillip would have been very familiar with cob construction, and this explains his insight.

Some version of cob in formwork appears to have been used in about 1834 by Samuel Moore, a farmer from Ulster, in building his house 'Oakover' on the Swan River.⁵¹ The construction is referred to as 'clay rammed between boards', and it could be an erroneous description of pisé, but the reverse is generally true at later dates in Western Australia and in the other colonies, where, as we shall see, there is a persistent tendency to use the word pisé to describe of what is really cob in formwork.

Another early example of cob (without the use of formwork, so far as we know) is a church on the Upper Swan, visited by J R Wollaston in 1843, which he said was of mud, but a better building than he expected.⁵² Thomas Peel built two successive dwellings of what is described as 'pug' at his property 'Lowlands' in 1845 and 1858.⁵³ Frank Bolt illustrates a brick kiln at Dover, Tasmania, which he dates to the 1840s and believes to have been constructed by 'ramming earth into a formwork'. However, this is intrinsically improbable given that the structure is round and with walls heavily leaning inward. It is more probably of cob construction without any external shuttering, though there may well have been an inner core to support it. Cob walling is barely recorded in early Victoria, two possible exceptions being that Fawkner is said to have built a house in Bourke Street of straw and mud⁵⁴ and that Lonsdale's notes describe a building occupied by Thomas Manifold as made of mud and thatch.⁵⁵ A third exception will demand somewhat closer consideration, below.

Government House, Adelaide, was reportedly built with walls of 'red clay from the banks of the river, wetted and mixed with chopped reeds and whitened, and 2 ft

⁵⁰ Peter Bridges, *Foundations of Identity* (Sydney 1995), p 30, quoting *Historical Records of Australia*, I, 1, pp 247-8 (or conceivably p 75).

⁵¹ Barbara Chapman, *The Colonial Eye* (Perth 1979), p 84.

⁵² A Burton [ed], *Wollaston's Picton Journal* (Nedlands [WA] 1975), p 232.

⁵³ Ian Molyneux, 'Lowlands, Western Australia', in John Moore et al, *Historic Homesteads of Australia Volume Two* (Stanmore [NSW] 1976), pp 102, 106.

⁵⁴ Isaac Selby, *The Old Pioneers' Memorial History of Melbourne* (Melbourne 1923), p 237.

⁵⁵ R V Billis and A S Kenyon, *Pastures New* (Melbourne 1930), pp 38-41. Wattle and daub and sods are distinguished separately in Lonsdale's notes, and 'mud' seems more likely to be cob than either pisé or adobe. Backhouse found buildings of 'mud and plaster, with thatched roofs' at the Missionary Institution, and these may also conceivably have been cob. *Narrative of a visit to the Australian Colonies*, p 500.

thick.⁵⁶ G S Kingston wrote to G F Angas in 1837, referring to the walls of some houses in Adelaide as being of 'a mixture of limestone marl and red earth' something like houses in the vicinity of Dawlish (Devonshire) of which Angas had spoken, though built with less water, and therefore more quickly.⁵⁷ In Devonshire cob large balls of clay and pug are built up on the wall to a height of 0.6 to 0.9 metres, and allowed to set before the wall proceeds higher. Faull and Young suggest that Kingston's account is misleading,⁵⁸ in that the houses were probably of pisé and not of Devonshire cob, but it is not clear to me why the description should not be taken at face value. At Mount Torrens George Dunn built a cob cottage in the 1840s,⁵⁹ while others of his family built 'Gumbank', at Charleston, in the mid-1840s. The latter is described by Faull and Young as being of Devonshire cob, but it is unclear whether there is any basis for saying this beyond the fact the owners, the Dunn family, came from Devonshire.⁶⁰ In the Burra area Cornish miners built in a form of primitive pisé, discussed below, which is only loosely differentiated from cob. The original cottage at 'Thornbury Park', Cherry Gardens, dates possibly from the 1850s, and is described as being of 'stubble reinforced pug'. This would seem to mean cob, and it is notable that the owner, the Rev Arthur Forbes Lloyd, was another Devon man - from Instow, near Bideford.⁶¹ The term 'pug', which literally refers to tempered brick earth,⁶² is more common in Australia than 'cob', and is used in relation to number of hybrid constructional types in which earth and timber are combined.

e. Rose Hill Villa & Bear's Castle

England had one cob building in particular which seems to have had an influence in the colonies, and it was stylistically a most remarkable example of what is normally a modest and unadventurous mode of construction. Rose Hill Villa in Hampshire was a two-storey building of chalk clay on a 0.6 to 0.9 metre high brick base, and was designed in a sort of castellated Persian Gothic. The actual construction was that commonly used in Stockbridge, Winchester and other places in the neighbourhood: a fine chalk clay was dug from the surface, preferably in winter so that the frost could act on it, but the house was not built until the weather was warm and dry, when a cartload of the clay was moistened and repeatedly trodden and turned till it began to bind like a loamy clay. The walls were built up in 0.4 metre layers and in a width, for two-storey work, of 0.5 metres, and at every 1.5 to 1.8 metres the work was stopped

⁵⁶ *South Australian Register*, 2 January 1919, quoted in Noris Ioannou, *Ceramics in South Australia 1836-1986: from Folk to Studio Pottery* (Netley [South Australia]), p 67.

⁵⁷ G S Kingston to G F Angas, 25 December 1837, Mortlock Library PRG 147, transcript kindly supplied by Don Langmead. Also Donald Langmead, *Accidental Architect* (Sydney 1994), p 115, where Langmead surmises that this is pisé.

⁵⁸ Jim Faull & Gordon Young, *People Places & Buildings* (Adelaide 1986), p 105.

⁵⁹ Faull & Young, *People Places & Buildings*, p 41: the reference to this building as being of cob is in conflict with the label on the drawing itself, calling it adobe: *ibid*, p 42.

⁶⁰ Faull & Young, *People Places & Buildings*, pp 66-7; Gordon Young [ed], *Onkaparinga Heritage* (?Adelaide 1988). In the former the house is attributed to George and James Dunn, in the latter to William.

⁶¹ Paul Stark, *Meadows Heritage* (Meadows [SA] 1983), p 44.

⁶² Christopher Ketteridge & Spike Mays, *Five Miles from Bunkum* (London 1972), p 25.

and planed off approximately true with a short spade. This particular building was coated on completion with stone lime, coloured and drawn.⁶³

'Bear's Castle' at Yan Yean is a mud building which in many respects resembles Rose Hill Villa. It is likewise built on a masonry plinth, and the mud is in clearly defined horizontal layers of about 0.4 metres in height (now somewhat concealed by renewal of the surface finish). It has no vertical joints, which rules out any sort of block construction, and it has round turrets at the corners, built in the same horizontal layers - an impossible thing to do in pisé construction. This building must therefore be of cob, though the interior surfaces are finished so true that there was probably a core of formwork, and the thickness is greater than that used in Hampshire, being 53 rather than 45 centimetres. The resemblance to Rose Hill Villa is more than structural, for Bear's Castle has pointed Gothic arches to most of the apertures - formed somewhat crudely around forked tree trunks - and the turrets are supposed to have been originally castellated. It dates from within a few years of the published description of Rose Hill Villa, and its builder may well have been a Hampshire man who was familiar with the prototype.

The building at Yan Yean is about 6.5 metres square to the outside of the turrets, and 3.8 metres square internally. One of the turrets is wholly of rough masonry and brick, and acts as chimney for a sizeable fireplace at one corner of the lower floor, while another turret contains a spiral staircase with rough stone steps only about 45 centimetres wide. The upper floor is no longer intact, but the supporting members were four sugar gum trunks about 15 centimetres in diameter, which still remain, while the roof structure is of slightly smaller members. Shingles have been placed on the roof in fairly recent years, but it is said originally to have been thatched, and the battlements, which must have been on the turrets only and are said to have been capped in sheet lead, have also disappeared.⁶⁴ Yan Yean was the estate of Thomas Bear, and the building, which now overlooks the Yan Yean Reservoir, is said to have been built by Bear's overseer, 'mistaking his instructions', and to have been subsequently used as shepherd's quarters.⁶⁵ It is one of the only known pure cob structures in Victoria, and it dates from about 1847, but at that time there may have been others in the area, for Charles Mayes wrote in 1859 that he had seen at Yan Yean 'common pise houses about twelve years old, and the conspicuous pise tower known as Bear's Castle'.⁶⁶

⁶³ *Builder*, I, 22 (8 July 1843), p 262: letter of James Flitcroft. C J Richardson, *The Englishman's House from a Cottage to a Mansion* (London 1870), pp 82-6, calls the material 'chalk concrete' and quotes at length from Flitcroft. He also states that the building was occupied by Fothergill Cooke, inventor of the electric telegraph [later Sir Fothergill Cooke] and at the time of writing [c 1869] by Sir Augustus Webster, Bart.

⁶⁴ In recent times the building has been reshingled and the exterior of the walls resurfaced.

⁶⁵ *Sun*, 5 November 1932; the account is largely repeated by M J Harkins, 'Bear's Castle at Yan Yean' in the *Melbourne Walker*, XVI (1945), p 59, but Bear's initial is given as J - presumably for John Pinney Bear.

⁶⁶ C B Mayes, 'Essay on the Manufactures more immediately required for the Economical Development of the Resources of the Colony', in *Victorian Government Prize Essays 1860* (Melbourne 1861), p 349.

f. the later nineteenth century

In the Shire of Evans, near Bathurst, there seem to be a number of cob buildings which are normally spoken of, quite incorrectly, as pisé. Two examples at O'Connell are the O'Connell Hotel of 1865, and a barn at 'Lindlegreen' on the junction of the Bathurst and Oberon Roads.⁶⁷ In both cases the mixture appears to have been laid damp, and contains a large proportion of grass or straw, which shows that is not pisé. The barn wall is only about 450 mm thick, and this slender proportion makes it likely enough that the cob was constructed in moulds, as was done in some English versions. At York, in Western Australia, Mrs E Millett described her house as being of 'pug', which was well-pounded mud,⁶⁸ again suggesting the use of moulds. At Clinch's property, 'Berkshire Valley', mud and straw placed in moulds - and, as usual, incorrectly described as pisé - was used in various structures, such as the stables already referred to above, built on stone foundations to a height of 1.8 metres, and continued above this in adobe.⁶⁹

As one would expect, most cob was made without shuttering. A settlers' guide published in Melbourne in 1855 described what was in reality a cob building:

The MUD HUT is made with well-tempered clay, mixed with chopped straw, worked in with a small quantity of water, and then laid on the wall, by hand, in small quantities at a time, so that the work may set quite hard in each course before the succeeding layer is placed upon it. The surface of the wall is then smoothed off with a spade or trowel ... A good coating of lime and sand when the former can be procured, vastly increases the durability of these structures, which otherwise require a verandah, or other means of protection from the effects of rain. In many cases, by giving a sufficient projection to the eaves, this difficulty may be overcome.⁷⁰

Cob continued in general use, but only occasionally is it documented. In 1870 the *Sydney Morning Herald* discussed various forms of earth construction, but mentioned cob only very briefly, as a material made from loam or clay mixed with straw - for which old sugar bags would serve well - and moistened with water.⁷¹ But in 1873 the *Town and Country Journal*, normally an adherent of pisé, gave a detailed account of cob building, before turning more briefly to clay lump and pisé.⁷² Thomas Parkinson recalled building his house near Uralla, New South Wales in 1877, when he used a horse to temper the earth, and then mixed it with straw.⁷³ Green identifies the only

⁶⁷ It was not possible to inspect the house at 'Lindlegreen', but it is said to be of the same construction.

⁶⁸ [Janet] 'Mrs E' Millett, *An Australian Parsonage* (London 1872), pp 55-65.

⁶⁹ Ray Oldham, 'Berkshire Valley, Western Australia', in J McClemens et al, *Historic Homesteads of Australia* (North Melbourne 1969), p 169.

⁷⁰ 'Rusticus' [W S Chauncy], *How to Settle in Victoria* (Melbourne 1855), p 20.

⁷¹ *Sydney Morning Herald*, 8 April 1870, quoted Green, 'Unfired Earth Walls', p 192.

⁷² *Town and Country Journal*, 3 May 1873, p 518: the references to pisé and clay lump are in the sequel of 10 May 1873, p 10. The final article contains a design for a farmhouse and is headed 'Cottage, Farm and Villa Architecture' though it bears no apparent relationship to Loudon's *Encyclopædia*.

⁷³ A L Green, 'Unfired Earth Walls. The Promotion and Use of Sod, Sun-Dried Brick, Cob and Pisé Walling in New South Wales from 1788 to 1960' (MBltEnv, University of New South

known nineteenth century cob house in New South Wales as 'Wardell' at Perthville, near Bathurst, which of course is untrue. However the building has been investigated by Ted Howard, and the family tradition of the owner, Mr Hamer, is that the builder puddled the earth and straw with his feet, shovelled it onto the walls, and trimmed off the surface, also with a shovel.⁷⁴ So far as this construction can be seen, it resembles that of the O'Connell Hotel and the barn at 'Lindlegreen' referred to above. There seems to be reasonable evidence that it was built in 1870.⁷⁵

A surviving cottage in central New South Wales presents a problem in that the walls appear to be only about 125 mm thick, set within a timber frame and with chicken wire mesh incorporated in both faces. This is much too thin for either cob or pisé construction, and it is difficult to believe that the chicken wire would give sufficient support during construction, without itself bulging or sagging. If there is not in fact a daubed palisade or other core within the wall, one can only surmise that the two layers of chicken wire were clipped or tied together to keep them vertical.⁷⁶ Green has identified an early twentieth century building at Castlereagh, New South Wales, which she believes to be of the clay and bool type.⁷⁷ There are twentieth century cob buildings in the Bathurst-Orange region, including some small examples in the Cudal area, one of which is in a state of collapse, and reveals strap iron reinforcement and built-in fixing blocks.⁷⁸ There is also the house 'Quandong', of 1946-7, designed by the architect Hedley Carr and built by W (Billy) Maker and his son. A brownish clay was mixed with fine ironstone gravel, and tempered by walking on it in a trench while it was wetted.⁷⁹

At Killalpaninna, in the Stony desert, two houses, apparently built by the Lutheran missionaries after 1877, and joined into one in 1890, are described as having walls of sandy clay mixed with reeds.⁸⁰ In Western Queensland many squatters were said to have lived for years in houses made of stiff clay, with grass for binding, and Edward Sorenson spoke in 1911 of examples west of Windorah built of earth and tallow. 'Currawilla' was one of these, with 2.4 metre walls which, because of their composition, were waterproof and scour-resistant, and survived the flooding of Farrar's Creek.⁸¹ Somewhat similarly Bertie Rayment, a pioneer of the Windorah area, wrote:

A fairly solid foundation is prepared. The mud, as near red clay as possible, must be thoroughly mixed, but no straw is required. Layers of one foot [0.3 m] are placed all around the building and wet bagging is used to keep it from drying too quickly until another layer can be put on. Wood is used only in the

Wales, 1989), p 104, quoting the *Agricultural Gazette of New South Wales*, VIII, pt 6 (June 1897), p 434.

⁷⁴ Green, 'Unfired Earth Walls', p 107, 220, quoting letter from E Howard, Eltham, Victoria, 22 June 1987.

⁷⁵ Inspected 2002. Clive Hamer, *Hope of the Vale* (Perth [Western Australia] 1985), p 41, illustrates the slab shed formerly on the site, and states that Ellis Hamer built the house in 1870.

⁷⁶ Information 2005 from Graham and Carol Edds, who do not identify the building, but say that it may be as early as the 1860s, but more probably much later.

⁷⁷ In Church Lane, Castlereagh: Green, loc cit.

⁷⁸ Green, 'Unfired Earth Walls', Appendix H, item Cabonne 02.

⁷⁹ Green, 'Unfired Earth Walls', pp 107-8, 220, quoting letter from E Howard, 2 September 1987.

⁸⁰ Howard Pearce, *Homesteads of the Stony Desert* (Adelaide 1978), p 54.

⁸¹ E S Sorenson, *Life in the Australian Backblocks* (London 1911), pp 27-8.

windows and door frames and wall plates. When the wall is up, it is levelled off and gone over with a wet rag as if for scrubbing. It is let dry for a few days, depending on the time of the year (in winter as long as a week). The next step is important. Soak boiling or near boiling fat or a paint oil as far into the mud as possible. In the back country beef fat is usually used because linseed oil has always been costly.

The best way to do this, especially in winter, is to light a fire as big as possible in each room before the roof is put on, making use of the heat of the sun, the idea being to get the fairly dry mud wall hot while the heat is in the wall. Put as much boiling oil as the wall will absorb; use a swab. If the wall penetrates three-quarters of an inch [19 mm] into the mud inside and out, the wall will be a good one.⁸²

After Bear's Castle little is heard of cob in Victoria for two or three decades. However a six-roomed house at Nunawading with eighteen inch [450 mm] clay walls was offered for sale in 1876.⁸³ A mud walled dairy, seemingly of cob, which was built in 1879 at Ravenswood. It probably derives from Welsh tradition, for it was built for a Welshman, John Lewis, and by another, Joseph Jenkins, who speaks of it in his *Diary of a Welsh Swagman*.⁸⁴ The Madresfield hop kilns at East Bairnsdale, of about 1882 (now demolished), were built by J A Taylor and named for his home village in Kent. However Kent is not especially known for cob construction, and in any case the proportion of lime used at Madresfield is almost sufficient for the product to be described as concrete. The only known twentieth century cob building in Victoria is a chicory kiln at 'Bay View', French Island, built in about 1905.⁸⁵

⁸² Peter Forrest, 'Old Buildings in Western Queensland', *Sphere* (October 1979), p 26, quoted in John Archer, *Building a Nation* (Sydney 1987), pp 131-2.

⁸³ *Argus*, 18 November 1876, p

2.

⁸⁴ Joseph Jenkins [ed William Evans], *Diary of a Welsh Swagman 1869-1894* (Melbourne 1977 [1975]), pp 85-9.

⁸⁵ Miles Lewis, *West and South Gippsland: Best Old or Renovated Farm Building* ([Melbourne] 1985), p 2.