

3. EARTH AND STONE

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Earth building is perhaps the oldest and widest spread building tradition in the world, with a specific technique suited to almost any soil, and to most climates. Because of this it translates to Australia remarkably well. The earths available in Australia fairly comprehensively reflect those overseas, and so to a large degree does the range of climate. There are - on the broad scale - no necessary changes brought about by the nature of the materials, as is the case with construction using Australian hardwoods or bark, so that variations in technique are essentially cultural ones. This is in part true also of stone, a material which demands only limited attention here due to its relatively minor role in Australia, especially in vernacular construction. What is specific to earth building is the lack of documentary detail, for contemporary writers are rarely able to distinguish one construction from another, few examples survive intact, and those that do cannot be understood without probing. At the Australind settlement in Western Australia, for example, there were twenty-five dwellings made of earth in one form or another,¹ but it would be a brave person who claimed to know how they were all built.

Since I dealt with the topic in *Victorian Primitive* it has become possible to give a much better assessment of the nature of earth construction as between one colony and another, it is also possible to set it far better into the international context. While little further can be said about the background of pisé - some critics felt that I had already said rather too much in *Victorian Primitive* - more can certainly be said here about adobe, and especially about sods. The sources for the use of these materials are confusing. Many writers do not know the differences between them, so that it is hard to tell what they are talking about. Others, even if they know the difference, regard the terms as more or less interchangeable. The ever-influential J C Loudon does not devote much space to earth construction, but he does illustrate one extraordinary cottage design with thick earth walls, which are lined with brick on the inner face only. The body of the walls is at first described as 'compressed earth', but he subsequently states that 'mud, or turf, or rustic work, rough stones of any kind, or straw, heath, or reeds' may be used, and

¹ Ian Molyneux and Associates, 'Leschenault Homestead' Conservation Plan (2 vols, Fremantle [Western Australia] 1996), p 141.

later suggests 'turf, rammed earth, rubble work or whatever may be most economical.'²

One of the few special opportunities offered by the materials in Australia is that of 'ant-bed' or crushed ant hills, used for all types of earth construction in those areas where it was available in western Queensland, the Northern Territory, and Western Australia. The first Australian reference is in the *Settler's Hand-Book* of 1861 which, interestingly, seems to refer to examples already built in New South Wales, but using antbed only as an addition to mortar in conventional masonry walling.³

There is no suggestion that the idea was derived from anywhere else, but it is interesting that in South Africa the Hottentots used pulverised anthills as a material for 'a smooth durable floor which becomes as hard as a brick',⁴ and the Raik Dinka likewise used the material of low ant hills to produce a hard bluish cement, which was said to be virtually waterproof, and used this for flooring.⁵ European settlers took up the idea, and a dwelling in Natal in the 1830s had floors of 'antheap' pounded hard.⁶ In Durban in 1850 either ant-heap or clay was used for the daub of wattle-and-daub.⁷ In the early twentieth century a Rhodesian mining company put up buildings of a sort of pisé made of antheap or ordinary dagga, which was not to be too sandy, mixed with three parts of ashes or clinker, which had been sieved free of fine dust.⁸ In Ceylon huts were plastered over with the earth from white ant hills, because it was impervious to moisture.⁹

In Western Australia antbed was used for adobe, and in Queensland for adobe, cob, pisé, earthen flooring and, in due course, for the surfacing of tennis courts. In at least one case, at Mooraberrie homestead in 1906, it as used to make baked bricks:¹⁰

The walls of the house, some two feet in thickness and twelve in height, are of pisé brick (ant-bed clay), built by the owners ... with the aid of black labour.

The clay was carted in from the run by drays and dumped into a prepared hollow near the building-site. Water was poured upon the clay

² J C Loudon, *Encyclopædia of Cottage, Farm and Villa Architecture* (London 1846 [1833]), pp 192, 194-5; § 386.

³ *Australian Settler's Handbook: being Practical Hints for the Unexperienced on the most simple and profitable method of cultivating their land: being the result of many years experience in the Colony* (James W Waugh, Sydney 1861), pp 8-9.

⁴ John Fitchen, *Building Construction before Mechanisation* (Cambridge [Massachusetts] 1986), p 214, ref Nicholas Pike, 'The Hottentots of Southern Africa', *Scientific American Supplement* (July-December 1893), pp 14,772--3.

⁵ Susan Denyer, *South African Traditional Architecture* (London 1978), p 94.

⁶ Brian Kearney, *Architecture in Natal* (Cape Town 1973), p 3.

⁷ Kearney, *Architecture in Natal*, p 13.

⁸ Clough Williams-Ellis, *Cottage Building in Cob, Pisé, Chalk & Clay* (London 1919), p 81.

⁹ T A Britton, *Dry Rot in Timber* (London 1875), p 241.

¹⁰ A M Duncan-Kemp, *Our Sandhill Country* (Sydney 1934), pp 20-21.

to render it soft and pliable. It was then 'puddled,' trodden by the blacks, until it was the consistency of modelling clay; straw or [grass] was then mixed with it.

The ant-hills used were mostly of the conical kind, rich red clay with a wonderful polishing surface. The clay made excellent bricks, tennis-courts, and floors when carefully laid down.

The blacks readily lent a hand, as they were extremely fond of white ants roasted or in their natural state. Forty blacks, gins and boys, would set out bright and early, following the drays and knocking over the mounds as they passed. It was strenuous work, as ant citadels were built to last, withstand wind and weather, and did not yield easily to blows of pick and shovel.

Specially prepared moulds made of board and shaped like oblong boxes were filled with the pugged mixture, turned out on to a smooth, cleared space of ground and left to dry in the sun. Some moulds were made with a handle at each end and would hold two to three bricks at a time. When a pile of five to six thousand bricks were dry they were gathered into a mud brick kiln or wall, firewood was laid in cleared spaces within, a fire lighted, the kiln sealed with mud and kept sealed for ten days or a fortnight until the outside wall felt warm. The bricks when opened up were "fired" to a smooth shiny red, and, if the work were carefully carried out, beautifully even.

In the 1920s a Townsville writer, seemingly unaware of its extensive use already in the west of the state, suggested that antbed should be crushed and used in pisé construction. The *Architectural and Building Journal of Queensland* queried whether its superiority was sufficient to justify the expense, and rightly pointed out that it could in any case be worked up into a paste by puddling it with water, so that crushing was unnecessary.¹¹ Kenneth McConnel, writing in New South Wales in 1947, wrote once again almost as if the material were a new discovery, reporting that antbed was impregnated by the ants with an adhesive waterproof substance, and when crushed, mixed with water to a paste, and cast in a mould, it produced a cement-like mass. He recommended its use for pisé construction.¹²

We are now enormously well informed about surviving earth buildings of all sorts in New South Wales through a monumental thesis by Annette Green, but unfortunately there is no remotely comparable survey of any other state. This is not a serious problem in relation to Queensland, Tasmania or the Northern Territory, where the number of such buildings was and is minuscule, but it is so in relation to other states, especially Western Australia. Green

¹¹ *Architectural & Building Journal of Queensland*, VIII, 83 (10 September 1929), p 32.

¹² Kenneth McConnel, *Planning the Australian Homestead* (Sydney 1947), p 114.

quotes the census figures from 1911 to 1947, ¹³ and the following extract is telling:

%ages	NSW	VIC	SA	WA	ACT	AUS
1911	1.10	0.83	0.81	2.28	7.24	0.90
1947	0.36	0.35	0.21	1.60	0.51	0.37

It is reasonable to surmise that very few new earth buildings were constructed over this period, and that the declining percentages represent both the destruction of existing buildings and, more importantly, the construction of new ones in other materials. This is confirmed by the figures for the Australian Capital Territory, where the proportion of new construction was greatest of all, and hence the relative prominence of earth buildings declined most dramatically.

The 1950s saw a revival in earth building, but it is not easily sorted into the traditional categories. Often the soil was stabilised with cement, and whilst it might be placed in formwork, like pisé, it was not necessarily rammed, and can be seen as a form of cob in shuttering. In New Zealand P J Allen, a lecturer in civil engineering at Canterbury University College, promoted soil-cement construction, and under his influence John Anker and his brothers founded the Terracrete company and successfully tendered to build state housing in the Wellington suburb of Wainuimata.¹⁴ Inspired by experiments in Sweden, stabilised soil was even proposed for road construction in Tasmania, as an alternative to macadam or concrete. Sodium silicate and calcium chloride would be added to a suitable soil, and the traffic left to compact it.¹⁵

¹³ 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 29.

¹⁴ M L D Allen, 'A Renaissance of Earth as a Building Material in New Zealand' (MArch, University of Auckland, 1991), p 16.

¹⁵ *Cross-Section*, no 19 (1 May 1954), p 2.