

10.06 Damp Proofing

- a asphalt and coal tar
- b asphalt paving
- c solid barrier damp-proof courses
- d asphalt and composition damp courses

a. asphalt and coal tar

Many damp proofing measures up to the mid nineteenth century were based upon asphalt or coal tar, but then various new chemicals began to be introduced. Coal tar was itself a recent development, but asphalt had been used in the Middle East from neolithic times. Up until the early nineteenth century most of the asphalt in commercial use was gathered on the shores of the Dead Sea, and it was sometimes referred to as Jewish asphalt.¹ New deposits of asphalt were discovered in Trinidad by Sir Walter Raleigh in 1595, and then in the eighteenth century rock asphalt was found in Switzerland, Germany and France,² notably at Val de Travers in the Swiss canton of Neuchâtel [Neuchâtel], where it was identified by one d'Eryns, of Berne, in 1716.³ Although the term 'bitumen' embraces both materials, coal tar and asphalt, so little coal tar pitch was used in Britain that the word bitumen alone came to signify asphalt. In 1681, however, two Englishmen had discovered how to make pitch and tar from pit coal, and in 1690 deposits of coal tar were discovered in Norway. But it was only when the gas industry was established, with coal tar as a by-product, that the material became significant, and it was the development of road-making that first created a substantial demand for both products.⁴

The rise of asphalt was a sudden phenomenon in Europe.⁵ Natural deposits were opened up in France, and asphalt footpaths were introduced in Paris by the 1830s. According to Ure, asphalt was found in its natural state in France at Obsann (Bas-Rhin), the Parc (l'Ain) and the Puy-de-la-Poix (Puy-de-Dôme), but it could also be made artificially. Subsequently very large quantities of natural asphalt were found at Bastenne in the south of France, to the north of Orthez.⁶ According to Loudon the French had generally

¹ Andrew Ure, *A Dictionary of Arts, Manufactures and Mines* (London 1839), p 122.

² James McCawley, *Roofing* (New York 1938), pp 12-14.

³ Wyatt Papworth [ed], the *Dictionary of Architecture* (London, 1853-1892), sv Bituminous Cements.

⁴ James McCawley, *Roofing* (New York 1938), pp 14-15.

⁵ I Huguenet, *Asphaltes: Considérations Générales sur l'Origine et la Formation des Asphaltes et de leur Emploi comment Ciment Naturel Appliqué aux Travaux d'Utilité Publiques et Privés* (Paris 1847), passim.

⁶ Ure, *Dictionary*, p 122. See also Great Exhibition of the Works of Industry of all Nations, *Official Descriptive and Illustrated Catalogue* (3 vols, Spicer Brothers, London 1851), III, p 1201, where the same three locations are named.

neglected it until the revolution of 1830, but since that time it had come into wide use for pavements, flat roofs, and the lining of cisterns, and in England some use had been made of it for similar purposes.⁷ In 1834 'Cassell's patent asphalte or bitumen' was patented in Britain.⁸ Richard Tappin Claridge obtained a further patent in 1837, and laid one of the first asphalt pavements in Whitehall, and by the end of 1838 at least two other companies, Robinson's and the Bastenne company, were in production.⁹ During 1838 there was said to be an asphalt mania on the London stock market, with some companies claiming exclusive rights to the only genuine asphalt 'mines' in France, others that German asphalt was just as pure, and yet others asserting that perfectly good asphalt could be found in England.¹⁰

It was reported in 1838 that thirty-two French patents had been granted for different types of asphalt and bitumen, and as many applied for in Britain but refused, because they so much resembled each other.¹¹ Claridge's was the type most used in the 1840s and 50s, and was made of the natural calcareous bitumen obtained at Pymont, Seyssel, in the French Department of Ain. This contained nine parts of limestone to one of bitumen, and under Claridge's patent it was improved by the addition of pitch or tar. Another readily available type was the Val de Travers asphalt from Neuchâtel, which contained one fifth bitumen, and there was also a 'colonial asphalte' made from coal tar, which could be laid at 30% the price of the imported types, but was unsuited to Victoria's climate because it melted at 46°C as opposed to 77°C for natural asphalt.¹²

Limmer asphalt, which seems to appear a little later, was produced by one Henning, of Limmer, near Hanover. In 1851 he exhibited raw asphalt stone, melted asphalt cakes, and asphalt as prepared for use in covering roofs and pavements.¹³ Trinidad asphalt had proved unprofitable to the lessees of the asphalt lake, who included the Earl of Dundonald, but the industry was transformed when the various leases were acquired and united by the Americans A L Barber and E B Warren, who proceeded to market the

⁷ J C Loudon, *Encyclopaedia of Cottage, Farm and Villa Architecture* (1846 [1833]), §2446, p 1249.

⁸ E E Cassell and Co of the Patent Asphalte and Bitumen Works, London, also advertised a 'Patent Impervious Wood and Compressed Cork Flooring ... requiring no rafters, impervious to wet or damp, not liable to rot, and for durability and cleanliness well adapted to kitchens, cottages, warehouses, barns ...': *Builder*, III, 126 (5 July 1845), p 324.

⁹ *Mechanic's Magazine*, XXIX, 789 (22 September 1838), p 448.

¹⁰ *Mechanic's Magazine*, XXIX, 767 (27 April 1838), p 48.

¹¹ *Mechanic's Magazine*, XXIX, 777 (30 June 1838), p 224.

¹² Mayes, *Australian Builders' Price-Book* (1862), p 74. Mayes erroneously refers to Neuchâtel as being in Normandy.

¹³ Great Exhibition of the Works of Industry of all Nations, *Official Descriptive and Illustrated Catalogue* (3 vols, Spicer Brothers, London 1851), III, p 1133.

material worldwide.¹⁴ Some asphalt was also produced within the Papua States, by D R Pasquall.¹⁵

b. asphalt paving

For paving floors Loudon recommended an artificial mix using three parts of mineral pitch and three of resin, boiled for time in a pot, to which were added ten parts of sand, five of small gravel, and one of slaked lime. This was to be shovelled onto a foundation which had been levelled up with small stones, and then spread about 50 mm thick.¹⁶ By the middle of the century asphalt was widely used in flooring barns and outbuildings, as well as for pavements and roofs, and regarded by C B Allen as suitable for cottage floors. A layer of gravel or small stones was placed first, and onto this was spread about 50 mm of boiling asphalt, much as advocated by Loudon. This was carefully pressed down and smoothed, and very small stones were sifted over and pressed into it.¹⁷

At the Sydney Mint in 1853-4 asphalt was used for both flooring and roofing, though it appears that iron plates were laid over the flooring in the more heavily trafficked areas. 253¹/₂ blocks of Seyssel asphalt, as well as a quantity of tar, were imported from F McNeill & Co (the English roofing felt manufacturers).¹⁸ A rock asphalt floor was laid in a store and dwelling near Market Wharf in about 1857, but a quantity of the material was reshipped from Sydney to Mauritius because nobody was interested in risking their capital on it. Twenty years later, however, the floor was reported to be in its original condition.¹⁹ Asphalt was also one of the materials used for damp proof courses, and in 1873 Farmer's 'Victoria House' store at Sydney was given an 18 mm layer of asphalt through all the walls at ground level.²⁰

The use of asphalt in building was a novelty in Melbourne in 1856, when the *Australian Builder* made a point of reporting that Cairns & Co of the Carron Yards had laid an asphalt floor in a store which Walter Powell had recently bought, in Flinders Lane East,

the workmen were engaged in laying down first, broken metal, to form a foundation, and afterwards running on this the liquid asphalt. A portable furnace was used for keeping the pitch or tar in a state of ebullition, and into this was poured dry sand, both being well stirred

¹⁴ McCawley, *Roofing*, p 14.

¹⁵ Great Exhibition of the Works of Industry of all Nations, *Official Descriptive and Illustrated Catalogue* (3 vols, Spicer Brothers, London 1851), III, p 1285.

¹⁶ Loudon, *Cottage, Farm and Villa Architecture*, §2446, p 1249.

¹⁷ C B Allen, *Rudimentary Treatise on Cottage Building* (2nd ed, London 1854 [1853]), pp 40-41.

¹⁸ Invoice of F McNeill & Co to the Master of Her Majesty's Mint, 30 November 1853, Archives Office of New South Wales 2/763, quoted in Fiona Starr et al, (), pp 40-41.

¹⁹ *Town and Country Journal*, 3 March 1877, p 348.

²⁰ H M Franklyn, *A Glance at Australia* (Melbourne 1881), p 348.

together. It was not laid in slabs, but the whole mass was evenly spread and compressed by a trowel, and well rubbed and reduced to a uniform close surface. Lastly, a fine sand was sprinkled over the asphalt, and worked in with a trowel.²¹

By July Cairns was publicly advertising that he would take contracts for asphalt work.²² In 1859 Milne & Co of Collins Street west were also advertising, offering to lay Seyssel, German or other asphalt,²³ and in 1861 William Moss of Bignell's Lane was manufacturing asphalt locally.²⁴ A Melbourne house advertised in 1861 had a stable with an asphalt floor, presumably dating from the time of construction in 1859.²⁵

Despite the fact that asphalt had been introduced mainly for paving purposes and laid by Claridge in 1837, it is said that the first sizeable application in Britain was as late as 1869 in Threadneedle Street, London.²⁶ If so, then Australia was not far behind, for James Shepherd is said to have invented and patented the type of asphalt paving used in Melbourne,²⁷ and in 1871 the Patent Composition Paving Company of Melbourne laid a trial section of pavement for the Geelong Council at the intersection of Myers and Yarra Streets.²⁸ Shepherd's Patent Composition [asphalt] Pavement was listed as a standard item in Mayes's *Price-Book*. from 1877,²⁹ and in 1878 it was laid in the basement of Briscoe & Co's building in Collins Street, Melbourne.³⁰

The Patent Asphaltum Company of New South Wales showed its patent blocks, facing tiles, paving and roofing at the Sydney Scientific and Mechanical Exhibition in 1886. Several large buildings being completed in Sydney were to have the patent blocks as paving in front.³¹ In the same year asphalt blocks were laid on a trial basis at a number of Sydney street intersections by the company,³² and in the following year it was reported that they had performed admirably. The asphalt paving of the Greta Court house, New South Wales, is presumed to date from the construction of the building in 1885-97, and probably consists of these blocks. Within the colonnade on three sides the floor is finished with what have been described as 'hexagonal asphaltine unit pavers of 120 mm side length and 43 mm thickness.'³³

²¹ *Australian Builder*, 16 (19 June 1856), p 129.

²² *Australian Builder*, 18 (3 July 1856), p 148.

²³ C B Mayes, *The Victorian Contractor's and Builder's Price-Book* (Melbourne 1859), p ii.

²⁴ Intercolonial Exhibition of Australasia, 1866-7, *Official Record* (Melbourne 1867), p 200.

²⁵ *Argus*, 28 September 1861, p 2.

²⁶ McCawley, *Roofing*, p 85.

²⁷ Isaac Selby, *The Old Pioneers Memorial History of Melbourne* (Melbourne 1924), p 150.

²⁸ W R Brownhill, *The History of Geelong and Corio Bay* (Melbourne 1955), p 90.

²⁹ Charles Mayes, *The Australian Builders' Price-Book* (3rd ed, Melbourne 1877), p 45.

³⁰ *Argus*, 8 July 1878, p 6.

³¹ *Australasian Ironmonger*, 1 October 1886, p 163.

³² *Australasian Builder & Contractor's News*, 25 September 1887, p 285.

³³ Ken Phelan of Cessnock City Council, email on the Engineering Heritage web site, 23 August 2004.

This company now began to expand its operations in every direction. In 1887 the Patent Asphaltum Co of Sydney supplied the floor for a stable and coach house at Summer Hill,³⁴ and asphalt floors were laid in the basement and on the terraces of the Adelaide Jubilee Exhibition Building.³⁵ In 1889 an asphalt floor was laid at the St James's Park Skating Rink, in the Melbourne suburb of Hawthorn, under the supervision of Augustus Wolskel, Victorian representative of the Patent Asphaltum Company. The material consisted of Trinidad asphalt mixed with an exceptionally hard limestone from the Myall Lakes, New South Wales, and it was laid on felt over the original timber floor.³⁶ When the company held its half-yearly meeting in Sydney it was reported that the Melbourne branch was prospering so well that a branch in Brisbane was under consideration.³⁷ In Sydney itself Wertheim's Building, at the corner of Bridge Street and Queens Place, had a basement floor of another product, MacIntosh's Asphaltine, which was also continued vertically up the basement walls.³⁸ By 1908 the Patent Asphaltum Co of New South Wales was advertising 'Trinidad Asphaltum Atco Refined', and it was soon manufacturing damp courses and other products which will be mentioned below. The company also had a depot on the Yarra Bank in South Melbourne, though it is not clear whether it manufactured at that address.³⁹

At the Centennial Exhibition the Patent Asphaltum Company obtained a first order of merit, as did Jones & Son Ltd of Collingwood, and the French suppliers of Seyssel asphalt. The Deutsche Asphalt Actien Gessellschaft of Hanover, James Forbes of Melbourne, and the Tar Paving Co of Melbourne were all awarded the second order of merit.⁴⁰ It was Forbes, nonetheless, who came to dominate the Melbourne architectural market. Already in 1879 the Metropolitan Meat Market had been specified to have paving in the stalls, cellars and yards of asphalt in combination with bluemetal, with Forbes & Co nominated as the suppliers.⁴¹ In the same year Forbes's Patent Asphalt, laid in a one inch [25 mm] thickness, was specified for the basement floor of one of FW Prell's buildings in Queen Street.⁴² In a building of 1889 a damp proof course of 'Forbes's patent composition' was specified to be applied hot to all basement walls and piers.⁴³ By 1908 Jas Forbes & Co, at Munro and Brady Streets, South Melbourne (near the Patent Asphaltum Co), were asphalters and tar distillers, producing their own asphalt, bitumen paint, varnish, creosote and other products. They also imported the main brands of asphalt: Trinidad, Seyssel, Val de Travers and Limmer.⁴⁴

³⁴ *Australasian Builder & Contractor's News*, 25 June 1887, p 125.

³⁵ *Australasian Builder & Contractor's News*, 16 July 1887, p 158.

³⁶ *Australasian Builder & Contractor's News*, 10 August 1889, p 138.

³⁷ *Australasian Builder & Contractor's News*, 17 August 1889, p 148.

³⁸ *Australasian Builder & Contractor's News*, 14 December 1889, p 579.

³⁹ *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 97.

⁴⁰ Centennial International Exhibition 1888-1889, *Official Record* (Melbourne 1890), p 899.

⁴¹ G R Johnson, 'Bill of Quantities. Metropolitan Meat Market. Bank, Hotel, and Two Shops, &c.' (Melbourne 1879), pp 6-79.

⁴² F W Wilson, 'General Conditions and Prices', p 6.

⁴³ Hyndman & Bates, 'Specification, &c, Warehouse & Offices / Flinders Street West / E L Yencken Esq / Flinders Street E.' (Melbourne 1889), p 28.

⁴⁴ *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 98.

The rise of the tennis court in the later nineteenth century created another market for tar-based materials. In 1911 William Guilfoyle gave directions and cost estimates for the tennis court at 'Turkeith', Victoria. the costs were (in £):

20 yds coarse screenings	2
10 yds fine topping	1
Tar 24 galls at 5d (heated once)	5

in addition to freight, labour and railway fares. The directions were:

Foundation prepared as above + well rolled - Coat of coarse screenings almost 1¹/₂ inches deep spread carefully over-rolled + well sprinkled with tar + rolled - better left then for a day - a coat of about 1" of fine toppings ready mixed is then spread on top + rolled + a coating of blue stone dust (3 or 4 barrow loads) is dusted over + rough stuff carefully swept off - when the tar comes through with the heat more bluestone dust on + brush over with an old hair broom. Fit for play in 14 days. 40-50 pc tar to mix with fine topping, 25 pc coarse screening, 15 pc for metal. Gas Coy's "once distilled tar"⁴⁵

In 1934 Pabco's 'Malthoid Basement Waterproofing' was available, as well as 'Anderson's Pure Bitumen'.⁴⁶ By the mid-twentieth century the Shell Company was producing Flintkote Industrial Bituminous Emulsion, which was described as being 'composed of bitumen, but ... superior to the normal material in very many respects'. It could be applied cold, and if necessary to damp surfaces, was odourless, and would not creep. It was recommended for sealing deteriorated concrete factory floors, for use in refrigeration chambers as a vapour seal on the warm face, for waterproof reservoirs, tanks, gutters and old corrugated iron roofs; and for other adhesive and protective purposes.⁴⁷

c. solid barrier damp-proof courses

There were a number of materials in use for damp proof courses, and an anonymous British text of 1878 stated that slate, coal tar and sheet lead were the common types.⁴⁸ These were not necessarily alternatives, for in the 1860s Eyland and Burn recommended that slate or lead be bedded in either

⁴⁵ From the 'Turkeith' farm diary, as advised by Marika Kocsis, 1999.

⁴⁶ W L Richardson, *Ramsay's Architectural and Engineering Specifications [Volume 1]* (Ramsay Standard Catalogue Service, Melbourne, no date [1934]), .

⁴⁷ F W Ware & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (3rd ed, Melbourne 1954), § 11/10.

⁴⁸ *Cottages: how to Arrange and Build Them, by a Sanitary Reformer* (2nd ed, London 1878), p 71.

tar and sand, or hydraulic cement. As an alternative they suggested 'Taylor's foundation bricks', the terra cotta product described below. In a stone house the foundation walls should be laid in hydraulic mortar, and should rest on a bed of concrete.⁴⁹ But even in England damp proof courses were the exception rather than the rule as late as the 1880s.⁵⁰

Slate was particularly recommended in the *Australian Settler's Hand Book*, published in Sydney in 1861, for use as a damp course in brick walls.⁵¹ Tar and slate was used in South Australia as early as the 1850s,⁵² and by the 1870s, according to Paul Stark, glass, basalt, slate and even timber were used in the colony, an instance of the latter being a jarrah dampcourse at 136 Wright Street, Adelaide.⁵³ A local specification in 1878 called for

at level of underside of floor plates, a damp proof course of slates. Each slate to be the full thickness of foundation walls, lapped over side, bedded and flushed with cement.⁵⁴

Charles Mayes, in an ostensibly Australia-wide text, but writing from Melbourne, described the usual type in 1883 as consisting of one or two courses of slate embedded in Portland cement. He doubted that they would last twenty years without decaying, but in fact they are the commonest found in surviving buildings, and have generally remained effective wherever they have survived intact and unbridged. In 1887 it was reported that slate in cement was unsuitable for Sydney, mainly because the cement used locally was too porous.⁵⁵ In Melbourne, however, in 1891 W S Law was still specifying two layers of slate with the joints well broken, seemingly set not in cement but in the same lime mortar as the rest of the masonry.⁵⁶ Percy Oakden, in 1885, referred to slate and cement, asphalt, and patent bituminous felt, but he now specially recommended the glazed terra cotta dampcourse which has been described above.⁵⁷

⁴⁹ E S Eyland, Francis Lightbody & R S Burn, *Working Drawings & Designs Architecture and Building* (Edinburgh, no date [c 1863]), essay 3, p 26; R S Burn, *Modern Building and Architecture* (London, no date [c 1870]), p 26.

⁵⁰ S D Adshead, *Modern Methods of Building* [published version of a lecture to the RIBA, 1936] (London 1937), p 1.

⁵¹ *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* (Sydney 1861), p 10.

⁵² Verco diary c 1856, South Australian Archives, cited in Bruce Harry, 'Historic Building Method and its Relevance in Conservation Today', in Peter Freeman et al [eds], *Building Conservation in Australia* (Red Hill [ACT] 1985), p 50.

⁵³ Information from Paul Stark, 1991.

⁵⁴ Reed & Barnes, 'Specification of Work to be done and Materials to be used in the Erection of Banking Premises at "Kooringa S.A." for the Bank of Australasia' (Melbourne 1878), p 9.

⁵⁵ *Australasian Builder & Contractor's News*, 21 May 1887, p 35.

⁵⁶ W S Law, 'Specifications of Residence Drummond St. Carlton for Mrs. L. Abrahams' (Melbourne 1891), p 9.

⁵⁷ Terry & Oakden, *What to Build and How to Build It* (Melbourne 1885), p 12.

Taylor's dpc>: ? International Exhibitoin 1862.

A local patent was granted to the Melbourne architects A L Smith and Thomas Watts for the use of slabs of glazed or vitrified stoneware as a damp-proof course for walls.⁵⁸ This appears to be identical with the patent damp-proof course shown by John Taylor of London at the International Exhibition of 1862, which consisted of extruded slabs with holes running through them, claimed to combine the effects of a damp-proof course, air bricks, and bond reinforcement.⁵⁹ The Smith & Watts version seems to have been manufactured by Luke Nolan of the Gillbrook Pottery, Brunswick, by 1870, when Nolan described it as:

Stoneware patent damp proof course, for preventing damp rising up the wall and for ventilating under the floor. 9-inch course, 6 d. each; 14-inch course, 9 d. each. This is a stoneware tile or flag, 21/2 inches [65 mm] thick perforated along its length, for laying along the top of the foundations of a building, prior to the bricks being commenced; the perforation prevents the damp rising and secures ventilation; the two sizes are for walls 9 inches and 14 inches thick.⁶⁰

It does not appear to have found much acceptance, and Charles Mayes stated in 1883 that 'glazed hollow tiles' for damp proof courses had been offered for sale in Melbourne and Sydney for many years, but very rarely used.⁶¹ Percy Oakden, in 1885, advocated it as the most effective form of damp proof course,⁶² but no examples have been reported except for a debased version, possibly of fairly modern date. In the 1920s Doultons were marketing a product of this sort, an extruded slab with voids in the form of slots, and with tongued and grooved edges.⁶³ Even later there was another British type, also extruded, but in section like a series of overlapping circles - rather thin and seemingly delicate.⁶⁴

In 1906 Henry Brooks & Co advertised as Australian agents for A Siebel's patent asphalted sheet lead damp course.⁶⁵ In 1908 the Patent Asphaltum

⁵⁸ No 946 to Alfred Louis Smith & Thomas Watts, 22 August 1866.

⁵⁹ International Exhibition, 1862, *Illustrated Catalogue of the Industrial Department* (2 vols, London 1862), p 56; 'International Exhibition of 1862' in Eyland, *Working Drawings & Designs*, p 2; Burn, *Modern Building and Architecture*, p 184. See also *Notes on Building Construction; Part III; Materials* (London 1879), p 135, for damp-proof courses of stoneware and fireclay by Doulton and Jennings.

⁶⁰ *The Industrial Progress of New South Wales* (Sydney 1871), p 82. Nolan also showed his patent damp-proof course 'for floor ventilation' at the Philadelphia Exhibition of 1876: Victoria, *Official Catalogue &c* [Philadelphia Centennial Exhibition, 1876] (Melbourne 1876), p 97.

⁶¹ Charles Mayes, *The Australian Builders' Price-Book* (4th ed, Melbourne 1883), p 144.

⁶² Terry and Oakden, *What to Build and How to Build It* (Melbourne 1885), p 12.

⁶³ Doulton & Co. Ltd., *Drainage and Sewerage Appliances, &c* (Lambeth [London] 1926), pp 26-30.

⁶⁴ Percy Thomas, *Modern Building Practice* (Melbourne 1885), p 12.

⁶⁵ *The Australasian Handbook Shippers, Importers and Professional Directory & Business Guide for 1906* (Gordon & Gotch, London 1906), p 4.

Co of Sydney advertised, amongst other products, something very similar: the 'Acme' damp course, of sheet lead coated on either side in bitumen-saturated felt.⁶⁶ It was still on sale in 1922,⁶⁷ and must be the same as the 'A.C.A. Bitu Lead Damp Course', which the company claimed, in 1927, to have manufactured for over thirty years.⁶⁸ This must also have been equivalent to the 'Ledkore' and 'Ledbit' dampcourses. The former was sold in Britain by George M Callender & Co of Westminster, and said to consist of 'successive layers of densely compressed bitumenized material built around a core of lead.'⁶⁹ The latter was made by Anderson & Co, and was available in Victoria in 1934 through William Crosby Limited.⁷⁰ By the 1950s an aluminium damp proof course, 'Alcor', was being marketed by Baker & Watson Pty Ltd, of Fairfield, New South Wales,⁷¹ and the 'Austral' copper strip dampcourse by Austral Bronze.⁷²

Although it is far from being a solid barrier, it is convenient to mention here the Knapen system, in which hollow terra cotta tubes are inserted into the wall to allow moisture to evaporate. This was in use in Britain by the mid-twentieth century, but it is unclear when it reached Australia.⁷³

d. asphalt and composition damp courses

'Lakeside' at Robe, South Australia, a house probably of the 1880s, has what appears to be an original damp course of some sort of bituminous character, especially in the stables (seen by the writer), while a house in North Adelaide of the 1890s has a mixture of sand and tar, or perhaps asphalt.⁷⁴ Of course one can tell more from specifications than from observation. A Melbourne house of 1889 was to have 'tar, pitch and sand, ½" inch thick, to be laid on hot',⁷⁵ and similarly the the Metropolitan Meat Market in Melbourne, already mentioned, was to have a damp proof course of coal tar and sand half an inch thick,⁷⁶ while at 'Boisdale', Victoria, the specification called for a damp

⁶⁶ C E Mayes, *The Australian Builders and Contractors' Price-Book* (7th ed, Sydney 1908), advertisements p 5.

⁶⁷ *Building*, 12 October 1922, p 33.

⁶⁸ *Australian Homes* (Melbourne 1927), p 126.

⁶⁹ C H Reilly, *The Liverpool Architectural Sketch Book*, III (Architectural Review, London 1913), p v.

⁷⁰ W L Richardson, *Ramsay's Architectural and Engineering Specifications [Volume 1]* (Ramsay Standard Catalogue Service, Melbourne, no date [1934]), p 52.

⁷¹ *Ramsay's Catalogue* [1954], § 11/13.

⁷² *Building Lighting Engineering*, 24 October 1952, p 15; E J A Weller, *Official Queensland Architecture and Building Year Book* (Architecture Building Engineering, Brisbane 1953), p 20.

⁷³ Evelyn Drury et al [eds], *Architects', Builders' and Civil Engineers' Reference Book* (London 1950), p 156: it is referred to as the Knapen Patent Atmospheric System, marketed by British Knapen Ltd of Middlesex.

⁷⁴ Information from Paul Stark, 1991.

⁷⁵ L J Flannagan, 'Mrs. C. Jones. Alterations + Additions to house Lygon St Carlton Specifications' (Flannagan, Melbourne 1889) [StateLibrary of Victoria WD HOU 174].

⁷⁶ Johnson, 'Metropolitan Meat Market', pp 6-79.

proof course of tar and sand, without further elaboration.⁷⁷ In Australia the only references to asphalt damp courses are in urban situations. In 1890 the Commercial Bank of Australia headquarters in Melbourne was specified to have a damp course of half inch [13 mm] 'Patent Trinidad Asphaltum',⁷⁸ and the National Mutual Life Association building had a three quarter inch [19 mm] layer of Claridge's patent Seyssel Asphalte across the whole structure, in addition to a half inch [13 mm] layer applied to the basement and area walls.⁷⁹

The other options were tar mixed with ashes, or Callender & Sons' pure bitumen damp course. This latter, which was supplied in rolls, had been widely used in Britain and America, and, as reported in 1883, recently introduced in Sydney,⁸⁰ where it was sold through the agents Findlay & Baynes.⁸¹ By 1887 it already promised to supersede all other damp proof courses, being cheaper than most or all of them.⁸² In 1888 the *Australasian Builder & Contractor's News* gave the product a blatant editorial plug, reporting that gas tar, felt, pitch and slate had all been found wanting as damp-proof courses. The solution was Callender's Pure Bitumen Damp-Course, for which R B Baynes & Co (as the firm had become) were agents. It was elastic and very strong, and was already used 'in all Government offices' in Victoria and in a number of prominent buildings which were enumerated, in both Melbourne and Sydney.⁸³ In 1888-9 Callender's bitumen, damp-resisting solution, and other products were shown at the Centennial Exhibition.⁸⁴ George M Callender's 'Ledcore', mentioned above, seems to have been a later product, and by 1913, when it was being sold, the traditional pure bitumen dampcourse was being marketed in Britain as 'Callendrite'.⁸⁵

In 1908 the Patent Asphaltum Co of Sydney advertised no less than five different damp proof courses: the canvas covered, consisting of bitumen and powdered limestone about 3.5 mm thick, covered in canvas on both sides; the 'Trinidad', of two layers of saturated felt with a fine layer of bitumen between; the 'Perfectus', a thicker material consisting of canvas coated with bitumen on both sides; the 'Acme' (mentioned above); and the 'Rubber', of

⁷⁷ Guyon Purchas, 'Estimate for New Residence and Stabling Boisdale Estate near Maffra Gippsland for A.M. Foster Esqre' (Melbourne 1892), p 2.

⁷⁸ G W Blackburn, 'The Commercial Bank of Australia Limited, New Premises, &c' [bill of quantities] (Melbourne 1890), p 61.

⁷⁹ Wright, Reed & Beaver, 'Specification for Erection of Premises for the National Mutual Life Association of Australasia. Corner of Collins & Queen Streets Melbourne' (Melbourne 1890), p 4.

⁸⁰ Charles Mayes, *The Australian Builders' Price-Book* (4th ed, Melbourne 1883), p 144.

⁸¹ Charles Mayes, *The Australian Builders' Price-Book* (5th ed, Melbourne 1886), advertisements, no page.

⁸² *Australasian Builder & Contractor's News*, 21 May 1887, p 357.

⁸³ *Australasian Builder & Contractor's News*, 15 December 1888, p 553.

⁸⁴ Centennial Exhibition 1888-9, *Official Record*, p 449.

⁸⁵ C H Reilly, *The Liverpool Architectural Sketch Book*, III (Architectural Review, London 1913), p v.

very thick felt saturated with pure bitumen.⁸⁶ In 1914 the Patent Asphaltum Co still supplied the Acme, Rubber and Perfectus damp courses.⁸⁷ By 1922 they claimed that their 'certified' Trinidad National Asphalt Dampcourse had proved itself over thirty years. They still advertised the 'Acme', but it is not apparent whether the others still existed.⁸⁸

In 1908 John Sanderson & Co advertised the 'Congo Never Leak Roofing & Damp Course', alleged to be more elastic, plastic and durable than any similar product.⁸⁹ In 1913 the Genasco dampcourse, which came in rolls, was available:⁹⁰ it was probably an asphalt impregnated felt, like the Genasco Roofing. In 1914 Mayes listed slates and cement, glazed earthenware, Leadite, Ruberoid, Maltha, Malthoid and Vulcanite dampcourses.⁹¹ Maltha and Leadite were made by William Fimmel & Co of Sydney.⁹² The situation was somewhat different in Britain where H A Welch claimed in 1936 that bitumen felt was rarely used, and that slate in cement was the commonest damp proof course.⁹³

In 1938 tarred sand was still an option in Australia, as were earthenware, and slate set in cement, but the range of roll and sheet material now included Adamax, Anderson's Rok Bitumen, Crane Brand, Danks pure lead, Maltha, Ormco, Ormonoid Sentinel, P & B Asbestos, Rexilite (2 and 3-ply) and Trinidad Asphaltum. For damp-proofing floors and other large areas Malthoid and Ruberoid were used. By the 1940s two pound bituminous-coated lead (perhaps the same as Acme or Leadite) was the material accepted by most authorities in Australia, and Malthoid and other bitumenised products were in wide use.⁹⁴ The N.S.W. Asphalte Co advertised rock asphalte,⁹⁵ and W & H Pitman advertised powders and paints for addition to cement-based mortars⁹⁶ - the equivalent of the tarred sand of earlier days. Neuchatel Asphalt was still advertised by the Neuchatel Asphalte Company (Nairn) Pty Ltd, of Sydney,⁹⁷ and in 1954 by the Neuchatel Asphalte Company (A'asia) Pty Ltd⁹⁸

⁸⁶ C E Mayes, *The Australian Builders and Contractors' Price-Book* (7th ed, Sydney 1908), advertisements p 5.

⁸⁷ Mayes, *Australian Builders Price-Book* [1914], advertisements p 5.

⁸⁸ *Building*, 12 October 1922, p 33.

⁸⁹ *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 97.

⁹⁰ James Moore & Sons Pty. Ltd., *Price List 96 August 1913* (James Moore, Melbourne 1913), p 2.

⁹¹ C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), p 32.

⁹² Mayes, *Australian Builders Price-Book* [1914], advertisements p 15.

⁹³ H A Welch, *The Construction of the Modern House* [published version of a lecture to the RIBA, 1936] (London 1937), p 18.

⁹⁴ *You Can Build Your Own Home!* (2nd ed, Sydney 1948 [1946]), p 45.

⁹⁵ *Ramsay's Catalogue* [1949], § 11/3.

⁹⁶ *Ramsay's Catalogue* [1949], § 11/5; also *Ramsay's Catalogue* [1954], § 11/11.

⁹⁷ F W Ware & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* [Melbourne 1949], § 11/8.

⁹⁸ F W Ware & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* ([3rd ed] Ramsay's Standard Catalogue Service Pty Ltd, Melbourne 1954), § 26/3.