

7.10 Asbestos Cement

asbestos

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asbestos

Asbestos was to be used for a range building products, of which asbestos cement was one of the last, but was to become far the most prominent. From the time of Charlemagne the material had been woven into a fireproof cloth, made from the finest type, amianthus, which was found in the Pyrenees, the Alps, and other parts of Europe, as well as the Urals, North America and even New South Wales. The more splintery common asbestos was found in various parts of Great Britain; other varieties were called 'mountain leather' and 'mountain cork' because of the resemblance to those materials, the latter being found in Lanarkshire; and 'mountain wood' was found in the Tyrol, the Dauphinois and parts of Scotland. The material was used for fireproof roofing, flooring and lagging for steam pipes, but by the mid-nineteenth century there seemed little prospect of it being used more extensively in building.¹ However in 1877 important mines were opened at Thetford and Coleraine in Canada, and this marks the beginning of serious commercial exploitation of the mineral. Other mines soon followed in Italy, Cyprus, Russia and elsewhere, but by the mid-twentieth century Canada was responsible for about 80% of production.²

The H W Johns Manufacturing Company, of the United States, claimed to have been mainly responsible for developing the practical applications of asbestos. They had been making roof compositions and preservative materials from 1858 and, after a period of experimentation, began using asbestos in their products in 1868. In 1874 they began to manufacture paints, and though they made a range of paint products it was asbestos paints by which they became known.³ In the 1880s Johns described their roofing as 'strong canvas, combined with an asbestos-coated felt, and a manilla lining, or "backing," water-proofed and compressed into a compact, flexible sheet, resembling leather'. They advertised a large range of other asbestos-based products, including an 'Asbestos Stove and Furnace Cement'.⁴ By 1890 Johns were advertising asbestos and other paints; asbestos roof coating (of ground asbestos and silica in coal tar); asbestos roofing; asbestos felt; asbestos building felts; asbestos lining felt; asbestos sheathing; asbestos lagging; 'Asbesto-Sponge Cement Felting'; asbestos wire cloth; asbestos fire sheets; asbestos

1 'Asbestos', *Encyclopædia Britannica* (9th ed, 25 vols, Edinburgh 1875-1889), II, pp 675-6.

2 William Kinniburgh, *Dictionary of Building Materials* (London 1966), pp 30-31.

3 H W Johns Manufacturing Co, *Descriptive Price List, H.W. Johns' Asbestos Materials* (Boston 1890), p 2.

4 H W Johns Manufacturing Co, *Modern House Painting* (New York, no date [c 1886]), *passim*.

millboard; and 'asbestos concrete coating'.⁵ This coating was applied by trowel but, like the furnace cement, must be in some degree a predecessor of asbestos cement. An asbestos millboard was quite extensively used in the late nineteenth century as a partition lining, in situations where sound attenuation or fireproofing were important considerations.⁶

Asbestos mining had been at least contemplated in Australia since 1881, when a prospectus was issued for the Floraston Freehold Gold and Asbestos Mining Co. (Ltd.) of North Gundagai, New South Wales.⁷ By 1887 it seems to have been established that the locally available asbestos was coarse, and too brittle to be spun, and asbestos continued to be imported. However, the Australasian Asbestos Manufacturing Co Ltd of Melbourne produced asbestos lagging for boilers,⁸ and this might have been of local origin. Although it was found in many other countries, Canada and Italy were the main sources of supply at this stage.⁹ Immediately prior to World War II all the asbestos used in Australia, 15,000 tonnes per year, was imported from Canada and South Africa.

The Colonial Sugar Refining Company [CSR] investigated deposits and mined short-fibred white asbestos in Tasmania for a time, but deposits were small and production ceased at the end of the war.¹⁰ In 1943 CSR bought a crocidolite (blue asbestos) mine in the Wittenoom Gorge, Western Australia, from the discoverers L G Hancock and E A Wright.¹¹ The mine was operated through a separate company, Australian Blue Asbestos Ltd, and a mining town was established by the West Australian and Commonwealth governments. However, the blue fibre was more expensive than imported asbestos and CSR was unable to sell it, though it was used in the company's own 'Fibro' sheeting, and in its vinyl floor tiles.¹² CSR applied to the Tariff Board in 1954 for a 40% tariff on imported asbestos, but Hardies, who would have been most affected, successfully opposed it, and then were able in 1966 to sign an agreement to purchase CSR's asbestos at a reduced price.¹³

Hardies and Wunderlichs had entered upon a further marriage of convenience late in 1944 and jointly established Asbestos Mines Pty Ltd to extract white (chrysolite) asbestos at Baryulgil on the Clarence River, New South Wales, which for more than twenty years, though production was never large, Hardies buying out Wunderlichs' half share in 1953.¹⁴ In the immediate post-war period there was a worldwide shortage of asbestos. James Hardie & Co gained access to supplies of amosite or brown asbestos, a very long fibred iron silicate, from the Transvaal, and relied upon this in the decade 1946-56 until Canadian white asbestos became again available in quantity.¹⁵ At the end of 1948 the company also acquired in the Cape Asbestos Coy Ltd, which mined extensive amosite and crocidolite

5 Johns, *Descriptive Price List*, *passim*.

6 Joseph Gwilt [ed Wyatt Papworth], *An Encyclopædia of Architecture* (London 1899 [1842]), §2247 p 706.

7 *Argus*, 29 September 1881, p 11.

8 Centennial International Exhibition 1888-1889, *Official Record* (Melbourne 1890), p 833.

9 *Australasian Builder & Contractor's News*, 25 June 1887, p 106.

10 Clive Turnbull, 'Widening the Field', in A G Lowndes, *South Pacific Enterprise* (Sydney 1956), pp 213-4.

11 *Story of James Hardie*, p 35.

12 Turnbull, 'Widening the Field', pp 217-8.

13 *Story of James Hardie*, pp 34, 35.

14 *Story of James Hardie*, pp 26, 34, 35. The name is presumably an anagram of 'Yulgilbar', Edward Ogilvie's original property in the area.

15 *Story of James Hardie*, p 21.

(blue asbestos) deposits in South Africa. Asbestos was then bought from CSR, under the agreement referred to, from 1956 until the Wittenoom mine closed in 1966.¹⁶

asbestos cement

Asbestos cement was a totally new material introduced at the turn of the century, but as we have seen the H W Johns Company had long mixed asbestos with cement. In about 1892 one A Huhlwein developed a crude process of mixing asbestos fibre, Portland cement and water, and filter pressing it to the required shape and density. In 1896 a Russian company used asbestos from the Urals and, again by means of a filter process, produced what was called 'Uralite', the first such material in commercial production.¹⁷ Meanwhile the Austrian brewer and textile manufacturer Ludwig Hatschek had been experimenting in an old cardboard factory with making boards of various types using short asbestos fibres and various bonding materials, and (allegedly at some time between in 1889 and 1893) hit upon the combination of the fibre with Portland cement, running the mixture as a slurry over normal rotating sieve cardboard machinery. He now produced the first asbestos cement sheets, which he patented in 1900.¹⁸ These used 15% asbestos and 85% cement, and by 1910 they were being manufactured in ten countries.¹⁹

Hatschek manufactured his material in the form of slates, of a size and shape resembling the local cement tiles manufactured by Adolph Kroher,²⁰ and it was this form of square shingle laid on the diagonal that was commonly used in early asbestos cement roofing in Australia. Belgian-made 'Eternit' tiles were amongst the first of this type but certainly not available in Britain from about 1893 as indicated by A D King.²¹ Bungalows built with 'Uralite Kent Board' - presumably a version of the Russian product - were shown at the Cheap Cottages Exhibition, Letchworth, in 1905.²² According to King, asbestos cement was introduced in Britain only in about 1904,²³ and it was made there after the Belgian patents expired in 1910.

Now, or at least before 1918, the material was manufactured in Britain by three or possibly four companies. Turner Brothers had been boilermakers since 1871 and had made use of asbestos for lagging; Bell's United Asbestos Co had dealt in asbestos products since 1888 and now owned an asbestos mine in Québec; and the British Uralite Company was presumably connected with the original Russian venture. A fourth company, the British Fibro-Cement Co, has not been researched, and may or may not have been a

16 *Story of James Hardie*, p 29, 35, 58.

17 *The Story of James Hardie & Coy. Pty. Limited 1888 to 1966* (Sydney, no date [1966]), appendix G.

18 Marian Bowley, *Innovations in Building Materials* (London 1960), p 119; Pedro Guedes, *The Macmillan Encyclopedia of Architecture and Technological Change* (London 1979), p 263

19 Guedes, *Architecture and Technological Change*, p 263.

20 Charles Dobson, *The History of the Concrete Roofing Tile* (London 1959), p 17.

21 A D King, *The Bungalow* (London 1984), p 121: nor is the company 'S A Eternit' a person, as King believes.

22 *Architectural Review*, 18 (1905), pp 151-7, quoted in King, *The Bungalow*, p 123.

23 King, *The Bungalow*, pp 121, 164, citing M Bowley, *Innovations in Building Materials* (Cambridge 1960), pp 118-120.

manufacturer.²⁴ This is unfortunate, as the name suggests that it was the company to which James Hardie & Co of Australia was linked. The nature of the Belgian patents which had expired is unclear, but Hatschek's own patents are said to have continued until 1924²⁵ (which seems quite inconsistent with normal British provisions), and only then could the asbestos cement industry develop without constraint.

importation

Australia was not far behind Britain. James Hardie, a Scottish-born merchant dealing in tanners' supplies in Melbourne, was in London in 1903 when his agents gave him samples of a 'new type of roofing and lining slate' made in France and known as 'fibro-ciment'. Hardie and his Sydney partner, Andrew Reid, took on the agency,²⁶ and during that year arrangements were made to import the material from Poissy in France.²⁷ The company later claimed quite without foundation that it had begun marketing the material in 1902,²⁸ but it is true that by 1904 they were selling 'fibro-ciment' even in Perth, though it never achieved any great prominence there.²⁹

William Spriggs has been claimed as 'the first to import fibro cement sheets into this country from Italy', and in the town of Thirroul, New South Wales, where Spriggs lived, a house in Bear Street is said to be the first to have been clad in the material.³⁰ This may well be the type branded 'Reinforced Fibrocement Gallia' which has a $\frac{3}{4}$ inch [19 mm] mesh through it. Dr Bruce Mitchell, who has found it in a house in New South Wales, believes it to date from about 1900,³¹ though it could not possibly be as early as this.

By 1906 the name was being anglicised to 'Fibro-Cement', and the ever-enterprising E G Stone had used it to build a silo on his farm at Werrington, New South Wales. He reported that it should be used when unpacked from the cases and still unmaturing, for though it was very brittle and difficult to handle in this state, it could be nailed close to the edge without fracture. On exposure to the atmosphere it would harden. The sheets were sold by James Hardie & Co at Sydney for 2 s 6 d a square yard.³² It was still not a major line for Hardies, and in fact the company was making losses in the trade, partly due to the high rate of breakage, and in 1908 considered closing down this part of their business.³³

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- 24 Bowley, *Innovations in Building Materials*, pp 119-120. In 1889 Bell's was advertising to the colonial market 'dagger packing', 'non-conducting composition', expansion sheeting, yarn and other asbestos products, including lubricants: A J R Trendell [ed], *The Colonial Year Book for the Year 1890* (London 1890), p xliii.
- 25 Bowley, *Innovations in Building Materials*, p 295.
- 26 Brian Carroll, *A Very Good Business* (Sydney 1988), p 10.
- 27 *Story of James Hardie*, p 8.
- 28 'Fibrolite Asbestos Cement Sheets', *Cumming & Campbell's (Ltd.) Monthly Magazine*, IV, 13 (1928), p 27.
- 29 Ian Kelly, 'The Development of Housing in Perth (1890-1915)' (MArch, University of Western Australia, 1991), p 210, quoting the *West Australian Mining, Building and Engineering Journal*, 16 January 1904, p 23.
- 30 *Parramatta & Hills News*, 9 July 1982, quoted in Robert Irving, 'Mostly About Walls', in Irving [ed], *The History and Design of the Australian House* (Melbourne 1985), p 210.
- 31 Bruce Mitchell by letter of 25 February 1986.
- 32 E G Stone, 'Fibro-Cement Silo', *Agricultural Gazette of New South Wales*, XVII, 10 (2 October 1906) pp 997-8.
- 33 *Story of James Hardie*, p 8.

In 1907 Hardies were selling patent asbestos cement slates for roofing, in a variety of sizes, thicknesses and colours - blue, red, purple and grey³⁴ - and in the following year (when they were still calling it Fibro-Ciment) they claimed it was 'The Most Largely Used Building Material of the Day'.³⁵ Mayes's price book of 1908 reports the material to be available from 'John Hardie & Co' of Sydney in sheets, still at 2 s 6 d a yard, and in slates measuring 16 x 16 x 1/8 inches [406 x 406 x 3.2 mm], which could be laid in a diamond pattern, at £23 a thousand.³⁶

These patent slates (asbestos and cement) are made in purple, blue, red and grey, of various sizes and thicknesses, with mouldings, ridge and hip pieces, coverings, and special shaped tiles for ornamentation, of the same composition.

Meanwhile French-made 'Titanic' asbestos cement slates were advertised locally in 1907,³⁷ and in 1908 Noyes Bros of Melbourne and Sydney were selling them as "'Titanic" Asbesto [sic] Cement Slates and Sheets'.³⁸ However, in 1914 Noyes's Sydney branch was advertising 'Poilite' asbestos cement sheets and tiles,³⁹ whereas John Sanderson & Co of Melbourne, who had been selling Poilite in 1908,⁴⁰ by 1913 were advertising 'Eternit' brand sheets at their Melbourne and Sydney branches.⁴¹ William Barrie & Co of Melbourne were agents in Victoria and Tasmania for Calmon's asbestos walling, ceiling and roofing tiles (claimed to be the original and the largest manufacturer).⁴² This brand was also sold in New Zealand by A C Ross & Co of Christchurch.⁴³

An early use of the material was in a house at 606 Forest Road, Carlton, New South Wales, said to have been built in 1907,⁴⁴ but more prominent was the exterior cladding of

34 Walter Jeffries, *The Australian Building Estimator* (Sydney 1907), p 201.

35 *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 97; see also the advertisement in Robert Haddon, *Australian Architecture* (Melbourne, no date [1908]), advertisements p xxxvi.

36 C E Mayes, *The Australian Builders & Contractors' Price Book* (7th ed, Sydney 1908), p 106.

37 Hugh Fraser, *The Federation House* (Sydney, 1986), p 42, citing *Art and Architecture*, 1907.

38 Haddon, *Australian Architecture*, advertisements p xxxviii.

39 C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), pp 27-9, advertisements p 43. Poilite was also allegedly sold in New Zealand from 1913, and Jeremy Ashford reproduces, but regrettably does not source or date, an advertisement by John Chambers & Son Ltd, sole agent for the country. Jeremy Ashford, *The Bungalow in New Zealand* (Auckland 1990), pp 45, 46.

40 Haddon, *Australian Architecture*, advertisements p ix, where it is reported to be available not only in the form of wall sheeting and roofing slates, but also 'Rounded Sections for Hospital Walls'.

41 *The Architectural Students Annual* (Melbourne 1913), p viii: their representative was Joseph V Cormack, and the product was described as 'Sanderson's Asbestos Cement Sheets', with the actual brand name in inconspicuously small type. By 1914 the brand is not mentioned at all: Mayes, *Australian Builders Price Book* (1914), advertisements p 39. In New Zealand Eternit seems to have been available from about 1908: Ashford, *The Bungalow in New Zealand*, p 46.

42 *Cazaly's Contract Reporter*, XXIV, 25 (23 June 1908), p 97; see also Haddon, *Australian Architecture*, advertisements p xxii.

43 G W Phillips, *Designs for New Zealand Houses & Residences* (Christchurch [New Zealand] no date [c 1910]), inside back cover.

44 A photo of the house under construction, and another as it was in 1955, are amongst a set of illustrations of early examples (all the others being from 1912 onwards) supplied by Hardies to a Senate committee in 1955. Kindly supplied by Robert Staas, from: James Hardie & Co, Evidence

Spencer Street Station, Melbourne, in the following year.⁴⁵ In 1908 a bungalow using both sheets and 'slates' of fibro-cement was reported in the outer Melbourne suburb of Bayswater.⁴⁶ The material came to Queensland as early as elsewhere, for though Robert Riddell dates the arrival of asbestos cement shingles to 1915, and wall sheeting only slightly earlier,⁴⁷ Stephen Murray has reported asbestos cement slates of 1908 surviving in Brisbane. These slates are beneath the later roof covering of the old Dixon Shoe Factory in Montague Road, West End, of 1908, designed by the architect Richard Gailey.⁴⁸ 'Slabestos', a brand on sale in New Zealand in 1916,⁴⁹ has not been reported in Australia.

W C Torode, the Adelaide builder whose pioneering concrete houses have been discussed above, had also used asbestos cement in the ceiling of Kinderman's Cafe in Rundle Street in 1907. The house which Torode built in 1909 at Bellevue Place, Unley Park had both the ceilings and the walls lined in asbestos cement sheets which he claimed to have imported from Belgium.⁵⁰ The asbestos cement roofs of cottages built in 1909 at Cape de Couedie, Kangaroo Island, are also said to be Belgian.⁵¹ By 1914 corrugated asbestos cement roof sheeting was available, and so were various decorative friezes, dadoes and ceilings for internal use. Mayes speaks of 'uralite' as another term for asbestos cement, though there is no evidence that Uralite itself was marketed in Australia. He names the brands 'Fibro-cement', 'Poilite', 'Eternite' [*sic*] and 'Titanic',⁵² though Hardies insisted that their 'Fibro-Cement' (now said to be British-made) was 'entirely different from fibrous cement'.⁵³

Apart from the examples of roofing in Brisbane and on Kangaroo Island, the oldest surviving asbestos cement identified in Australia is the cladding of two houses at 5 and 3 Margaret Street, Roseville, Sydney, thought to date from about 1913 and 1914 respectively.⁵⁴ They appear to be standard models manufactured by George Hudson & Son Ltd, a company which by this time was offering asbestos cement cladding as an alternative to weatherboards in its precut houses.⁵⁵ Another asbestos cement clad house of 1914 stood until 1997 at 340 Pacific Highway, Hornsby.⁵⁶

local manufacture

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- on Asbestos Cement Homes submitted to the Senate Committee on National Capital Planning - Canberra August 1955 (Mitchell Library uncatalogued manuscripts).
- 45 *Building*, I, 3 (November 1907), p 25.
- 46 *Building*, 15 October 1908, p 71. The bungalow belonged to a Professor Wilson.
- 47 Robert Riddell, 'Sheeted in Iron. Queensland', in Trevor Howells [ed], *Towards the Dawn* (Sydney 1989), p 180.
- 48 Information from Stephen Murray, 1901 & 1904.
- 49 James Christie, *New Zealand Houses* (Auckland, no date [c 1916]), p [30].
- 50 John Schenk, 'The concrete houses of Walter Charles Torode', *Architecture Australia*, LXX, 4 (June 1988), pp 65, 67.
- 51 Information from Peter Bell, 1991.
- 52 Mayes, 1914, op cit, p 29.
- 53 Mayes, 1914, op cit, advertisements, p 9.
- 54 Information from Mark Arbuz, Sydney, 2000.
- 55 Hudson, Cottage Homes (), designs 10A, 9A, and .
- 56 Information, 2000, from Robert Staas, of Noel Bell, Ridley Smith & Partners, who has kindly supplied a copy of a measured drawing.

There was a boom in the demand for asbestos cement in 1913-14,⁵⁷ but the effect of the war was of course to throttle the importation of such materials. The Wunderlich company, which had bought up asbestos mines in New South Wales and Victoria, was spurred to establish a factory at Cabarita in Sydney and from 1917 produced what was called 'Durabestos'.⁵⁸ In the same period Andrew Reid of James Hardie & Co went to Manchester in 1915 and arranged to buy Swiss-made machinery and to bring out a Swiss engineer, Ernest Witzig, to initiate production. A site was purchased at Camellia in Sydney in 1916, and in May 1917 production of flat sheets and tiles began under the registered name 'Fibrolite'.⁵⁹ Geoff Ashley has identified at Willandra homestead in western New South Wales specimens of asbestos cement which the Hardies believe to be 'Fibrolite' as manufactured by them within their first year of production.⁶⁰ However, as the modern staff are almost certainly quite unaware of the range of imported types available at the time, this may well be a rather rash presumption.

The difficulty of obtaining supplies of asbestos caused Hardies to open a small mine and crushing plant at Woodsreef, Barraba, in northern New South Wales, which began production in 1919 but closed down four years later as normal overseas supplies resumed, having produced only a few hundred tonnes of asbestos in all.⁶¹ Corrugated sheets were first produced by Hardies in 1919, when the company was still paying royalties on all its asbestos cement products to the Manchester company Felber Jucker & Co,⁶² an arrangement which was finally terminated with a lump sum payment in 1921.⁶³ In March 1920 land was bought at Rivervale, Perth, and the factory which opened in the following year produced corrugated sheets to supply not only the local but the Melbourne market.⁶⁴ In 1922 Andrew Reid, of Hardies, saw asbestos cement pipes in Italy and was impressed by them, so the company began experimenting with their manufacture in 1923. In May 1925 G R Sutton (who had originally joined the staff as a bookkeeper) devised the process which was finally adopted, and the first pipes were produced at Camellia in 1926.⁶⁵

new products

Durabestos came in sizes up to 10 by 4 feet [3 x 1.2 m], as did another brand, 'Endurite', as opposed to the 10 x 3 foot [3 x 0.9 m] maximum for Fibrolite. Corrugated Fibrolite sheeting came in a width of 2 ft 7¹/₂ in [0.81 m] by a maximum of 10 feet [3 m].⁶⁶ In 1926

57 'Fibrolite Asbestos Cement Sheets', *Cumming & Campbell's (Ltd.) Monthly Magazine*, IV, 13 (1928), p 27.

58 Wunderlich Ltd, *Forty Years of Wunderlich Industry* (Sydney 1927), p 95; Susan Bures, *The House of Wunderlich* (Sydney 1987), p 103.

59 *Story of James Hardie*, p 9.

60 Geoff Ashley, 'Two Centuries of the Western NSW Dwelling', *The Australian Dwelling: A Conference* (Hay, NSW, 1990), p 9.

61 *Story of James Hardie*, p 11.

62 *Story of James Hardie*, p 9.

63 *Story of James Hardie*, p 12.

64 *Story of James Hardie*, p 11.

65 *Story of James Hardie*, pp 12, 13. Production began at Brooklyn in 1927 and Rivervale in 1929: *ibid*, p 15.

66 *Architectural and Building Journal of Queensland*, 10 July 1926, p 83.

another Durabestos factory was set up in the Melbourne suburb of Sunshine,⁶⁷ followed by another at Gaythorne in Brisbane in 1936.⁶⁸

Hardies bought land at Brooklyn, Melbourne, in 1926, the same year as Wunderlichs at Sunshine and not far away, and at that time began to produce 'Super Six' corrugated sheet at Camellia. The first major roof covered with it was the Roxy Cinema at Parramatta.⁶⁹ 'Super six' and other large profiles were introduced in Britain,⁷⁰ doubtless before Australia, and such wider pitch corrugated roof sheets came into favour because they were less easily confused with corrugated iron. In 1935 Wunderlichs introduced, in addition to the standard three inch [75 mm] pitch corrugations resembling corrugated iron, their 5³/₄ inch [146 mm] 'Wunderlich Deep Corrugated Durabestos' roofing and siding sheets, which were used that year for two contracts at Luna Park, North Sydney.⁷¹ There were seven corrugations to a sheet of 3 ft 5¹/₄ in [1.05 m] width, with a depth of three inches [75 mm].⁷² Other prominent examples by 1938 were the Manufacturers Pavilion at the Sydney Showgrounds, and the Melbourne Cricket Ground. Subsequently - probably in 1938 - Wunderlichs introduced "'Tropical' Roofing Tiles' of exactly these dimensions but only 2 ft 6 in [0.75 m] long, and in 'Russet shades on a pink-impregnated Asbestos-Cement base'.⁷³ No doubt the company felt that the inhabitants of tropical north would be unable to distinguish a corrugated sheet from a tile, so long as it was coloured red.

Whilst Wunderlich and Hardie dominated the market, they were not alone. In 1919 Sprigg's Asbestolite Company of Sydney was advertising 'Asbestolite' sheets and 'roofing slates'⁷⁴ (this is presumably the company of William Spriggs of Thirroul, above). In 1922 the Brisbane dealer Charles L Sadgrove was able to display at the Brisbane Show a sample of rock from the asbestos mines at Barraba, the crushed stone with the fibre removed, a scale model of a bungalow with Fibrolite wall sheets and roof slates, and other products including Fiberlic Board and Fibro C. Cold Water Paint.⁷⁵ (Fiberlic Board was not an asbestos cement product but a US-made fibre laminated wallboard⁷⁶). In 1929 James

67 *Forty Years*, op cit, p 96

68 Eddie Butler-Bowdon & Charles Pickett, 'The Fibro Frontier' (typescript paper kindly made available to me in 1994), p 14. If this date is correct, then the Powerhouse Museum must be wrong in assigning a date of 1934 to a Wunderlich brochure advertising Durabestos sheeting manufactured at Gaythorne: Wunderlich Limited, *Seaside Cottages* [brochure] (no date, ?1934), Wunderlich Collection, Powerhouse Museum, Sydney, A7437-9/136, p 12.

69 *Story of James Hardie*, p 13.

70 In 1936 C R Speaker & Co made both five and seven inch corrugated sheets, and the Universal Asbestos Mfg Co Ltd made 'Super Six' and 'Twin Twelve' sheets. J E Sears & J E Sears [eds], *The Architects' Compendium and Annual Catalogue* (London 1936), p 91.

71 Wunderlich Limited, *Wunderlich Deep Corrugated Durabestos Roofing, &c* [brochure] (1935), Wunderlich Collection, Powerhouse Museum, Sydney, A7437-9/118, *passim*.

72 Wunderlich Limited, *Wunderlich Deep Corrugated Durabestos* (Sydney 1938), *passim*; Mayes, *Australian Builders' Price Book* (1938), pp 16-17. Mayes gives eight corrugations to a sheet, which must be a mistake, and states that the material is available in colour, whereas the Wunderlich booklet specifically states, p 17, that the 'natural colour is a pleasing grey white', and mentions no alternative.

73 Wunderlich Limited, *Wunderlich "Tropical" Roofing Tiles* [brochure] (1938), Wunderlich Collection, Powerhouse Museum, Sydney, A7437-9/139.

74 *Building*, XXIV, 145 (12 September 1919), p 40.

75 *Architectural and Building Journal of Queensland*, I, 3 (7 September 1922), p 35.

76 F E Drury et al [eds], *Architects', Builders' and Civil Engineers' Technical Catalogue* (London 1946), p 145; Evelyn Drury et al [eds], *Architects', Builders' and Civil Engineers' Reference Book* (London 1950), p 225.

Hardie & Co formed a Brisbane company to take over what the company history refers to as Sadgrove's 'branch agency' there, and Sadgrove joined the Brisbane Board.

But it may not have been quite so simple, for while Sadgrove was doubtless their agent in relation to 'Fibrolite', the company histories do not acknowledge Fiberlic or Fibro C as being Hardie products. So it seems that Sadgrove's business may have been more than just an agency for Hardies. Under the new arrangements in Brisbane a local factory for Hardies was begun at Newstead in 1934.⁷⁷ By 1929 Australian Cement Ltd of Geelong appears to have been manufacturing flat asbestos cement sheets under the 'Arc' brand, and by 1938 Asbestos Products Ltd of Alexandria, Sydney, manufactured, and would contract to lay, 'Correbestos' roofing, which was produced in both the standard three inch [76 mm] and a large 5³/₄ inch [146 mm] pitch.⁷⁸ They may then have changed the name, for in the following year they claimed to be making 'Fibrobestos',⁷⁹ which was also advertised in Melbourne by T S Nettlefold.⁸⁰

Australia was barely affected by the remarkably named 'Konka Board' of New Zealand, and was not blessed with the 'Kosy Konka Homes' which were built in their hundreds by Bassett & Co of Wanganui.⁸¹ However records of the architectural practice of W H Pender, of Maitland, mention a 'stud and Konka' cottage at Cessnock in 1925,⁸² and this suggests that the material must have been marketed in this country. It does not appear to have been conventional asbestos cement, as Ashford describes it as being made of cement, fibre (of an unspecified type), and pumice. It was patented in 1915 by R M Maunder of Palmerston North,⁸³ and Barretts described themselves as 'Dominion controllers under patent rights'. The company's own booklet is somewhat guarded about the nature of the material, which it describes as a 'patented concrete sheet', but given that it was supplied 'green' in a semi-hardened condition, and achieved hardness only after some months,⁸⁴ it must have been a form of asbestos cement manufactured in sheets three feet by two feet by ³/₈ths of an inch [900 x 600 x 9.5 mm] to use as a base material for cement stucco.

The first Konka buildings were put up in Wanganui in about 1915, and one was broken open in 1921 to demonstrate its excellent condition.⁸⁵ The material was assessed by a Sydney architect, J E Justelius, of Justelius & Son, on behalf of an Australian syndicate who were at first concerned about its porosity. This however was a virtue, because it was used mainly as a base for roughcast, with which it bonded well.⁸⁶ The board was supplied in sheets 3 ft x 2 ft 6 in x ⁵/₈ inches thick [900 x 750 x 16 mm].⁸⁷ Its rival in New Zealand was Walasco cement board, first used in Auckland in about 1922, and also used mainly as

77 *Story of James Hardie*, p 16.

78 Mayes, *Australian Builders' Price Book* (1938), advertisement p 3.

79 *The Eastern Suburbs Builders Handbook and Diary 1939* (Sydney 1939), p 17.

80 R V F Eldridge, *Concrete and Cement Work* (Melbourne, no date [1937]), p 24.

81 Bassett & Co Ltd, *Cosy "Konka" Homes of New Zealand* (Wanganui [New Zealand], no date), passim. See also Peter Shaw, *New Zealand Architecture* (Auckland 1991), p 98.

82 Barry Maitland, *The Pender Index* (Newcastle [New South Wales] 1999), sv.

83 Bassetts claimed that 75% of houses in Wanganui were built of it, and by the 1930s it was being advertised nationally.

84 Bassett & Co, *Cosy "Konka" Homes*, p 4.

85 Bassett & Co, *Cosy "Konka" Homes*, p 6.

86 Bassett & Co, *Cosy "Konka" Homes*, p 18.

87 Bassett & Co, *Cosy "Konka" Homes*, p 4 - contrary to the dimensions cited in Ashford, *The Bungalow in New Zealand*, p 46.

a base for stucco. It carried a grid of small square projections, doubtless to assist in bonding. It was sold by the eponymous H V Wallace & Co of Auckland, and seems to have been locally manufactured.⁸⁸

In 1929 Hardies introduced 'Tilux' decorated board, made at the Camellia factory using machinery and know-how purchased from the French Eternit company.⁸⁹ This was a glazed imitation tile sheet called 'Tilux' for use in wet areas, in red mottled, grey mottled, blue mottled, dappled green, pearl grey and 'St Anne' finishes. Tilux was rivalled by a similar material, 'Duratile', made by Wunderlichs in imitation of a tile pattern,⁹⁰ though Cuffley speaks of a Wunderlich product of this sort called 'Duradec'.⁹¹ Although this had the tile pattern it does not appear to have had the mottled finish, which Wunderlichs introduced only subsequently (no later than 1935) and for smooth sheets. They were marketed as 'Durachrome' in various mottled colours, including 'golden buff' and green.⁹² Another product, called 'Duraveneer', consisted of asbestos cement sheets veneered with Queensland walnut or maple, and was designed to combine fire resistance with the ornamental qualities of timber.⁹³ It was pitched at the commercial and public building market, but there is no evidence to suggest that it achieved any degree of acceptance.

By 1938 there was also an alleged 'new departure', in which flat asbestos cement cladding sheets were placed horizontally rather than vertically, and 'drip moulds' - apparently the horizontal cover straps - were made in various profiles designed to withstand the weather as well as to 'introduce a pleasing decorative feature'. This seems to have been another initiative by Wunderlichs.⁹⁴

A small number of schools in Victoria, such as those at Oxley Flats, of 1936-7, and Maiden Gully, gazetted in January 1938 (the latter demolished) were made of sandwich panels of fibreboard between asbestos cement sheets. The panels were about four feet [1.2 m wide] and at Maiden Gully were one inch [25 mm] thick set, and they were set within a structural frame of steel, in the one case, and of timber in the other.⁹⁵ These panels broadly conform to the description of Wunderlich's 'Insulabestos', which was available by 1938. It consisted of two sheets of $\frac{5}{32}$ inch [4 mm] Durabestos with a core of 'efficient insulating fibre', and though it was made only to order, the standard widths were three and four feet [0.9 and 1.2

88 *Building Progress*, III, 3 (Wellington edition, March 1938), p 16.

89 *Story of James Hardie*, p 15.

90 *Ramsay's Architectural Catalogue* (1st ed, Melbourne 1931), p 176; Wunderlich Limited, *Duradec* [brochure] (1934), Wunderlich Collection, Powerhouse Museum, A7437-9/116; *Architectural and Building Journal of Queensland*, April 1936, p 33; Mayes, *Australian Builders' Price Book* (1938), advertisements p 1 & p 15.

91 Peter Cuffley, *Australian Houses of the Forties and Fifties* (Knoxfield [Victoria] 1993), p 82.

92 Wunderlich Limited, *Wunderlich Durachrome* [brochure] (1935), Wunderlich Collection, Powerhouse Museum, A7437-9/121/1.

93 Mayes, *Australian Builders' Price Book* (1938), p 321.

94 Mayes, *Australian Builders' Price Book* (1938), p 13.

95 Richard Peterson, *Historic Government Schools a Comparative Survey* (Melbourne, no date [c 1993]), pp 47-8; copy of contract drawing for Oxley Flats kindly supplied by Richard Peterson; and Peterson to the author, 30 August 1994. Laurence Burchell identifies twelve schools of this model, the other ten being Bolinda, Upper Black Dog Creek, Wonwondah North, Lower Cape Bridgewater, Swan Hill West, Goschen, Neilborough, Nar Nar Goon South, Jil Jil, Wabba. He reproduces as his category 42 the drawing for Bolinda, which has the same gazettal date as Oxley Flats, December 1936: L E Burchell, *Survey of One-Room State Schools 1900-1949* (no place, 1989), passim.

m] and the thickness $\frac{3}{4}$ inch [19 mm],⁹⁶ which is less than at Maiden Gully. It is possible that the filling was Solomit strawboard, the patent for which (as discussed above) envisaged a sandwich panel of this character. However, the date seems a little too early, and more probably Insulabestos was a response to, or a pre-emptive strike against Solomit. After World War II Victoria & Interstate Airways Limited (VIA) developed a system of structural panels for prefabrication purposes which consisted basically of a hardwood frame bonded with phenolic resin adhesive to an asbestos cement sheet on either side.

In 1940 Hardies began to consider establishing a plant in South Australia, because of wartime difficulties in transporting their goods to the Adelaide market, and ultimately they joined their main rivals, Wunderlichs, in establishing a factory operated by a new local company, Asbestolite Pty Ltd. It is difficult to see how such an accommodation could ever have been entertained in other than wartime conditions. Under the joint agreement the name Fibrolite could not be used, and it was only in 1966 that Asbestolite became Fibrolite in South Australia.⁹⁷

post-war developments

A fourth manufacturer had now entered the Australian market. In 1941 Goliath Cement had considered establishing an asbestos cement plant at its works in Railton, Tasmania, but decided against it. In 1945 it was decided to proceed, using machinery supplied by Hume Steel and expertise from a New Zealand asbestos cement manufacturer, and presumably relying upon local white asbestos deposits. In October 1947 Goliath was able to bring 'Tasbestos' flat sheets onto the market. However there were continual difficulties in securing supplies of asbestos, and this led the company to join Hume Pipes Ltd in what proved to be the rather unsatisfactory purchase in 1951 of a Southern Rhodesian asbestos fibre mill.⁹⁸

It was the Second World War, and the materials shortage which followed, which made this a boom industry. Asbestos cement manufacturers were better able than most to switch from war to peacetime production, and were able to promote their products by such means as the 'Asbestos Cement Homes Exhibition' which travelled Australia in 1949.⁹⁹ The war itself had boosted the consumption of asbestos cement from eight to fourteen million square metres, and this rose to twenty-three in the following decade.¹⁰⁰ During this post-war decade 28% of all the houses built in Australia were clad in asbestos cement, and as many as 51% in New South Wales.¹⁰¹

But competition was now more intense. Hardies' 'New Contour' corrugated sheets were advertised in the mid-1950s.¹⁰² In April 1957 they introduced 'Asbestolux Insulation

96 Mayes, *Australian Builders' Price Book* (1938), advertisement p 1 & p 16.

97 *Story of James Hardie*, p 24.

98 Philip McKay, *History of the Cement Industry 1939 to 1977* (typescript report [Melbourne] no date), pp 35, 83-4. Despite difficult times, the asbestos cement plant was still operating at the time McKay wrote.

99 *Story of James Hardie*, p 29.

100 Hutchinson in *200 Years*, p 119, quoting Commonwealth Bureau of Statistics, *Production Bulletin*, 1938-9 to 1948-9, and *Secondary Industries*, 1948-50 to 1962-3.

101 *Seventy Years of Wunderlich Industry* (Sydney 1957), p 35.

102 *Story of James Hardie*, p 40; Cuffley, *Houses of the Forties and Fifties*, p 82.

Board', and 'Striated Sheet' for interior and exterior use, but technical problems with Asbestolux caused its withdrawal after a year, and it was reintroduced only in 1961.¹⁰³ Asbestolux had been put on the market in Britain six years earlier by Cape Building Products Ltd, a subsidiary of Cape Asbestos Co. It was made from amosite fibre, with a high grade silicate as a binder, rather than cement.¹⁰⁴

In October 1958 Hardies introduced 'Shadowline' for exterior walls,¹⁰⁵ and a new moulded panel called 'Coverline' in Queensland (and elsewhere in 1960).¹⁰⁶ In 1959 they launched a new autoclaved Fibrolite sheet, said to have much greater strength, flexibility and stability and yet to cost no more, and made using a high pressure steam curing process claimed to have been pioneered in Australia.¹⁰⁷ In 1958 the company replaced its original 'Tilux' range with four new colours, but in January 1960 it introduced a totally new version of Tilux, using new machinery installed at the Camellia works, and this came in six 'marbletone' colours. This proved far more successful than the old product, and in 1960 a sheet produced by the same method but in single plain colours was introduced, as 'Colorboard'.¹⁰⁸ This was overdue, given that Australian investigators in 1949 had reported upon the introduction of integral colouring for asbestos cement in the United States.¹⁰⁹ It is not possible to take the story further here except to say that the flood of new products continued - fluted sheet, 'K-Lite' insulation, asbestos cement weatherboards, 'Log Cabin' building board, 'Ranchline' building board, and the cellulose building board 'Hardiflex'.

Wunderlich, once Hardies' main rival, slid from the scheme. The decline began in 1960 when the company entered into a notably unsuccessful joint venture with Humes, Wunderlich Humes Asbestos Pipes Ltd. The intention was to challenge the Hardie monopoly in this area, but it backfired: the enterprise lost money for three years and the plant was closed down, and then sold to Hardies in 1964 at less than half price.¹¹⁰ The final crunch came with a battle for control of the Wunderlichs in 1969, won finally by CSR. The Wunderlich interests were variously dismembered and wound down, and, ironically enough, the Durabestos factories were ultimately sold in 1977 to James Hardie & Co, giving that company a virtual monopoly on fibre cement manufacture in Australia - poisoned chalice though it proved to be.¹¹¹

103 *Story of James Hardie*, pp 38, 47.

104 Bowley, *Innovations in Building Materials*, pp 328, 353

105 *Story of James Hardie*, p 40.

106 *Story of James Hardie*, p 44.

107 *Architecture Today*, I, 12 (October 1959), p 39.

108 *Story of James Hardie*, pp 39, 42. The 1958 colours were camellia pink, cloud blue, old ivory and meadow green.

109 D V Isaacs & J W Drysdale, *Building Technique and Building Research* (Sydney 1949), p 39.

110 Bures, *House of Wunderlich*, p 149; Brian Carroll, 'A Very Good Business' (Sydney 1988), p 127.

111 Bures, *House of Wunderlich*, p 152; Carroll, 'A Very Good Business', pp 11, 201.