Victorian Stucco

Editor: Miles Lewis
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Cover images: From left (back cover) to right

Photographs by Donald Ellsmore:
Detail of weathered stucco on St Patrick’s Hall, Ballarat
Detail of incised decoration on house Gore Street, Fitzroy
Detail on facade of Smith Street, Fitzroy
# Contents

| Introduction | 1 |
| Origins of Stucco: Miles Lewis | 3 |
| Sources and precedents | 3 |
| The Renaissance | 3 |
| Modern stucco | 6 |
| Natural cement | 7 |
| Artificial cement | 8 |
| Conclusion | 11 |
| Stucco: Materials And Finishes: Donald Ellsmore | 13 |
| Abstract | 13 |
| Introduction | 14 |
| The nature of Victorian stucco | 15 |
| Lime and the natural cements | 16 |
| Artificial cements | 17 |
| External plasters in early Australian building practice | 18 |
| Stucco revival | 19 |
| Stucco materials and application | 20 |
| Paints and other applied surface finishes | 25 |
| Regional and periodic colour variations | 26 |
| Conclusion | 27 |
| Australian Stucco: Miles Lewis | 29 |
| Definitions | 29 |
| Materials and imports | 30 |
| Rock lime | 31 |
| Roman cement | 33 |
| Magnesian lime | 34 |
| Artificial cement | 35 |
| Local stucco | 37 |
| Practice | 40 |
| Finishes | 40 |
| Moulding and casting | 44 |
| Twentieth century painting | 48 |
| Conclusion | 49 |
| Materials and Techniques of External Stucco: Barrie Cooper | 51 |
| Abstract | 51 |
| Introduction | 51 |
| Materials | 51 |
| Setting out | 52 |
| Mouldings | 53 |
| Features and enrichments | 54 |
| Creating an original mould | 55 |
| Conclusion | 58 |
| External Renders: Materials, Properties and Conservation Issues: David Young | 61 |
| Introduction | 61 |
| Limes | 61 |
| Cements | 64 |
| Comparison of lime, hydraulic lime and cement binders | 64 |
| Aggregate—sand | 65 |
| Conservation issues | 67 |
| Conclusion | 68 |
| Testing of stucco: David West | 69 |
| Visual inspection | 69 |
| Tap testing for drumminess | 70 |
| Infra-red thermography | 70 |
| Sampling | 70 |
| Opening up | 70 |
| Finishes | 71 |
| Visual testing in the laboratory | 71 |
| Chemical testing | 71 |
| Physico-chemical testing | 71 |
| Physical properties | 72 |
| Samples | 72 |
| Validating reproductions | 72 |
| The Analysis and Conservation of Stucco surface Finishes: Jenny Dickens with a contribution by David Tilbrooke | 73 |
| Introduction | 73 |
| Materials | 74 |
| Materials identification | 78 |
| Methods of examination | 79 |
| Technical analysis (with contributions by David Tilbrooke) | 81 |
| Philosophy of analysis and intervention | 83 |
| Conclusion | 87 |
| Case study: ‘Benvenuta’ | 88 |
| Cleaning and Re-coating Victorian Stucco: Donald Ellsmore | 91 |
| Abstract | 91 |
| Introduction | 91 |
| The natural appearance of stucco | 92 |
| Paints and applied finishes | 93 |
| Colour variations | 96 |
| Problems with heavy paint layering | 97 |
| Benefits and risks of cleaning and paint removal | 99 |
| Today’s options for finishing stucco | 101 |
| Conclusion | 104 |
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However, it has been compiled two to three years afterwards, and does not purport to be a literal record of the event. Some speakers produced no written papers, and are not included here, or produced papers subsequently. All have been given the opportunity to revise their material, and some have done this extensively, and some completely new material has been introduced in an attempt to make the document a more comprehensive and useful reference. The resulting papers provide important insights into Victorian stucco: this publication should provide a highly useful and practical reference for anyone interested in the topic.

An attempt has also been made to rationalise terminology, and a glossary is included. But the most contentious word has been ‘stucco’ itself. It is used to mean so many things that no complete agreement can be reached, and this can be a source of great confusion. The word is sometimes used, as in the title of this seminar, as a generic term to cover the whole range of plaster, lime and cement finishing. In reality, however, it has not generally been used in the last two centuries for internal plasterwork, although that was its primary meaning in Renaissance Italy. It has been used loosely in the twentieth century for various ornamental or textured finishes, but this is unhelpful, and is not recommended. In nineteenth century Australia, it was in general use for plaster, lime and hydraulic cement exterior finishes, but not usually for artificial or Portland cement, and not for castings. In the twentieth century most writers have referred to ‘cement’, ‘cementing’, ‘cement render’, ‘composition’, ‘compo’; a few refer to ‘Portland cement stucco’ or ‘cement stucco’; but very few describe a Portland cement finish simply as ‘stucco’.

We therefore recommend that any external finish be described by its material if possible, as in ‘hydraulic lime stucco’, ‘Hamelin’s mastic stucco’, ‘Roman cement stucco’. But as this information is commonly unknown for earlier work, where the word ‘stucco’ alone is used, it should be taken to mean external plastering in a material other than Portland cement. Portland cement finishes are better not called ‘stucco’ at all, but rather, ‘cement’ or ‘composition’, or possibly (where they are applied by trowel), ‘cement render’. As the matter is so controversial, we include at the end of this publication a series of brief extracts from British and Australian texts, which illustrate the use of the various terms.

The Heritage Council of Victoria has kindly taken on the funding and production of this publication.
Underground basilica of the Porta Maggiore, Rome 1st century CE: plaster decoration of the vault.

Miles Lewis
Origins of Stucco
Miles Lewis

Sources and precedents

Plastering is the secret craft. Until the 1890s, there was no solid textbook on the subject. Aspects like scagliola, though widely understood in general terms, were conducted according to the secret recipes and procedures of each practitioner. In terms of external rendering, I have never found any clear published description of the method of creating incised decoration before that of Barrie Cooper in this volume. It is unsurprising, therefore, that the greatest confusion has surrounded the use of the word ‘stucco’.

Many writers refer to the use of stucco in Egypt, Mycenae, classical Greece and Rome,1 and the Roman writer Vitruvius has likewise been translated as referring to stucco.2 But there is no Latin or other ancient word corresponding to ‘stucco’, and the most that can be inferred is that they are referring to some sort of plastering. The most relevant is what Vitruvius called albarium opus, a pure white lime coat to the surface of which crushed marble was added to give a marble-like external finish,3 used especially in the Achaean temples of southern Italy. Pliny also speaks of a mixture of refined lime with saffron, hard enough to be used even in floors and pavements.4 Later medieval and other recipes involve the use of carbonate of lime—generally burnt limestone or chalk—mixed with materials such as fig juice, eggs, blood, elm bark, hot barley water, and malt wort.5

There is plenty of evidence of ancient plastering: including many examples in Egypt and some in Mesopotamia. The albarium opus of the Achaean Greek temples has disappeared. In fact there is virtually no surviving plaster from the classical Greek period, but there is a great deal of Roman plasterwork surviving—varying from the delicate relief work of the underground basilica at the Porta Maggiore, Rome, to the crude interior finish of some of the tombs at Palmyra. There is then an interregnum, and very little survives in Europe until the Romanesque period, after about 1000 CE.

The Renaissance

The word ‘stucco’ appears only after the Italian Renaissance, principally in reference to a material for internal modelling, and Papworth gives stuccatura as an Italian word embracing all sorts of interior ornament imitating carved stone.6 Bankart devotes a chapter to ‘The Stucco-Duro of the Italian Renaissance’, and this is also about decorative relief work, almost all of it internal.

1 Bankart, Art of the Plasterer, pp 4–5 ff.
5 Bankart, Art of the Plasterer, p 7.
6 Papworth, Dictionary of Architecture, sv Stucco.
(the exception being the Palazzo Podesta, Genoa, of 1563).\(^7\) Vasari refers to a stucco resembling that of Vitruvius, with a surface finished in marble dust.\(^8\) Various recipes survive from the Renaissance. One, used by the sculptor Jacopo de Monte San Savino, is described as ‘Admirable stucco for making and modelling figures for colouring and resisting water’:

Take of finely powdered travertine 5 lb., and if you would have it fine and more delicate, take fine marble instead of travertine, and 2 lb. of slaked lime, and stir and beat them well together like a fine paste.\(^9\)

The stucco known as marmorino was, similarly, given a marble effect by the addition of powdered seashells and travertine marble dust, and was pressed with a hot iron after being applied.\(^10\) It was also common in rural buildings in Italy to use intonaco or plaster stucco ruled in imitation of ashlar masonry, and this was done by Palladio in all of his country villas, the fabric of which is brick. Palladio’s walls were incised to suggest the joints of masonry, though these lines are much less perceptible today.\(^11\)

Vasari credits Primaticcio with executing the first stucchi in France,\(^12\) but he is referring to the artist’s elaborate

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\(^7\) Bankart, Art of the Plasterer, pp 22–36.

\(^8\) Vasari, On Technique, pp 170–2.


\(^10\) This was used at Palladio’s villa ‘La Malcontenta’: Rybczynski, The Perfect House, pp 93–4.

\(^11\) Rybczynski, The Perfect House, pp 4, 60, 94.

\(^12\) Vasari, On Technique, pp 171, 183. This is a translation, but Millar, Plastering Plain and Decorative, p 107, quotes him as using the word stucchi.
interior plaster modelling at Fontainebleau, which is of no relevance to the present topic. Bankart refers to stucco as being introduced to England at Nonsuch Palace in about 1538, and this work was external relief modelling and sculpture, though not the sort of broad surface work now evoked by the term.13 It was carried out by Italians, including the brothers Luca and Bartolomeo Penni, summoned for the purpose by Henry VII.14 In 1666 Hugh May wrote of stucco still in the classical sense of a render surfaced in marble dust, or at least a good imitation of it:

If there be use of stucco, I have great hopes, from some experience already had, that there are English materials to be brought by sea at an easy rate, that will afford as good plaster as is any where to be found in the world; and that with a mixture of cheaper ingredients than marble-meal, which was the old, is now the modern way of Italy.15

Both Wren and Kent used plaster with marble dust added for internal carved decoration.16

Richard Neve, author of the first dictionary of building terms in English, or perhaps in any language,17 gives no definition of stucco, but he makes a reference to its use for sculptural work:

For figures, the last coat is made of plaster stone managed as marble or alabaster. Stuc ornaments are made of a composition neither too hard nor too soft, and then a prepared mould is pressed or struck upon it, and when removed, is cleaned by hand. — The moderns consider that plaster of lime and sand does not dry so soon as stuc for painting on, and being greyish is more proper than so white a ground for colours.18

Soon stucco, in something more like the modern sense, was to reach Britain. The Palladian revival of the eighteenth century gave rise to an interest in Palladio’s stucco surfaces, sometimes finished in colours such as ochre. At Colen Campbell’s ‘Mereworth Castle’, Kent, of 1753, both the house and the later pavilions were finished in ochre-coloured stucco in what was seen as the Italian manner.

It is this type of Palladian stucco, covering broad surfaces, ruled to imitate masonry, and sometimes coloured with ochre or other pigment, which is the source of Australian practice. But it is ignored by British writers on plastering, who are more concerned with elaborately modelled work.

Thus, Millar and Verrall credit Robert Adam with introducing to England the use of ‘stucco externally to give brick houses the appearance of stone’.19 But Adam was later than Campbell, and I am not aware that he faced complete buildings in this way, though he certainly created frontispieces, plasters and other elements in cement. He used some stucco in Hanover Square in about 1776 (Summerson suggests based upon Liardet’s cement). Wyatt used Higgins’s cement for stucco in 1779 as indicated above, and Nash used some sort of stucco in 1783.20 But the more extensive adoption of stucco in Britain follows the discovery of Parker’s and other hydraulic cements, and their use by architects such as John Nash and James Wyatt. Nash adopted Parker’s cement as soon as it was introduced in 1796, and used it until about 1820, when he changed to either Hamelin’s or Diehl’s mastic.21

There was also a lively vernacular tradition in Britain. Lime plaster was used externally in London in the reign of King John, and plastering or daubing over wattling and other
infill materials was essential in half timbered buildings, which were the predominant type until the seventeenth century. Verrall reported that all those he had examined were three-coat work in lime plaster containing either chopped straw or, in better quality work, ox or horse hair. The surface was whitewashed, or occasionally painted.22 Such a material, based upon non-hydraulic components, depends heavily on the maintenance of a painted surface to protect it, and cannot simulate natural stone in the same way as the hydraulic limes and cements of better class work. But in Australia, as we shall see, that distinction is not so clear.

As the aim in the finishing of stucco is to simulate ashlar masonry, it was commonly ruled (either with a groove or with a line in crayon or pencil). William Atkinson had recommended as a dash coat a mixture of quicklime and sharp sand, coloured to imitate stone, which if properly done would not require new colouring but “improve daily with the mosses and weather stains”.23 His recommended colouring materials were yellow ochre and lamp black or ivory black, or even better “blue black”, prepared from charcoal (probably meaning the latter for the ruling of the ashlar joints).24 Apart from this he advocated a stucco made of slaked lime and clean sharp sand, which “if laid on with an uneven surface to give it the appearance of undressed stone, will produce all the desired effect, and look better than rough-cast”.25 The use of lime in these ways seems optimistic, especially in the English climate, though the mosses and weather stains should certainly have been achievable.

Modern stucco

In England, which must be taken as largely relevant to Australia, “stucco” was described in the eighteenth and the nineteenth centuries as “now a species of plastering, occasionally worked to resemble marble. One sort is made of lime, the other of plaster.”26 By the end of the century, it was said to be “a somewhat indefinite term, used loosely for various plastic mixtures in whose composition lime, plaster, or cements enter”. However, the four types which Millar described as being used in the south of England (common, rough, bastard and trowelled) were all based more or less on hydraulic lime, washed sand and/or grey lime putty.27 He distinguishes Portland cement work as something different from stucco, which had come into use in the mid-nineteenth century,28 though the examples he gives are earlier, including the Athenaeum Club, Travellers Club, and United Services Club.29

Verrall, however, uses the term “Portland Cement Stucco” and devotes a brief chapter to it.30 By Portland cement stucco is meant something different from, and superior to, an ordinary mixture of cement and sand. The aim is to produce a material which will set with moderate rapidity, dry hard and give good protection, but which will be more plastic than ordinary cement mortar, and possessing reasonable retardation properties in setting, can be manipulated over a sufficiently long period to give freedom in obtaining decorative effects without interfering with ultimate or definite setting.31

An American text of the 1920s, Lowndes and Boyd, distinguishes three types of external stucco: lime, Portland cement and magnesite, though the boundaries were blurred, as the lime stucco might have a small amount of Portland cement, and the Portland cement stucco might contain a proportion of lime.32 Magnesite could not be mixed with either, and as it is not known to have been used in Australia (except as flooring) will not be further considered here.
Natural cement

Major changes had taken place with the introduction of hydraulic ‘Roman’ cement, and then Portland cement. In the late eighteenth century a number of so-called cements, actually limes with pozzolanic additives, were developed in Europe. In both Britain and Australia there were some rock limes which by reason of their composition, particularly if the stone contained a proportion of clay, produced a material with some hydraulic properties. A true hydraulic lime cannot be slaked, will set even under water, and when used as stucco on the outside of a building will be able resist the weather. In Britain the best known type was the blue lias lime found in the west of England.33

The engineer John Smeaton used blue lias lime in the 1750s in the construction of the Eddystone Light, but added terra puzzulano, which was available, more or less fortuitously, from a Plymouth merchant.34 The addition of pozzolano and other materials to lime is a traditional practice, quite distinct from the manufacture of artificial cement. Such mixtures were developed to a high degree by Bryan Higgins, who published his results in 1780,35 and may conceivably have been influential in Australia. Higgins patented one recipe36 and licensed it to be used by the builder Samuel Wyatt, and the architect James Wyatt,37 only shortly before the latter was to form his partnership with James Parker in the development of natural cement. Wyatt covered a façade at 9 Conduit St, London, in Higgins’s cement in 1779.38

In 1774 Antoine-Joseph Loriot published his cement in the Mémoire sur une Découverte dans l’Art de Bâtir.39 This was followed immediately by an English edition that sold out: a success attributed by Eileen Harris to the facts that the invention was fully explained in the book but not protected by patent, and that the publication coincided with the London Building Act, 1774.40 Loriot’s ‘cement’ was in fact no more than a mixture of sand, brick dust and either quicklime or old slaked lime (according to his two recipes),41 and Higgins dismissed it entirely, apart from acknowledging that lime was at least a better ingredient than whiting.42 Higgins was promoting his own cement, which was at least the result of a process of experimental development, but it, in its turn, could not compete with the natural or ‘Roman’ cement discovered a few years later.

33 Wood, Cottages of the Labourer, p 7.
34 Smiles, Lives of the Engineers, II, p 57.
35 Higgins, Experiments on Calcareous Cement, passim, especially pp 182 ff.
36 British patent no 1207, to Bryan Higgins, 23 April 1779, reproduced in Davis, A Hundred Years of Portland Cement, pp 227-231.
37 Higgins, Experiments o Calcareous Cements (London 1780), passim, especially pp 182 ff.
38 Summerson, Georgian London, p 111.
40 Harris, British Architectural Books and Writers, p 301.
41 Papworth, Dictionary of Architecture, sv ‘(Antoine Joseph) Loriot’. Harris interprets it as a single recipe using both quick and slaked lime.
Roman cement was the invention, or more precisely the discovery, of James Parker of Northfleet in Kent, who found that septaria nodules found on the Island of Sheppey, or by extension other naturally occurring combinations of clay and limestone, would produce a hydraulic cement. Parker’s patent of 1796 provided essentially that this material should be burnt to a high temperature and ground to produce a stronger cement than any hitherto available, and one which could resist weathering and even had some capacity to set under water. It was manufactured and marketed by Parker in partnership with the architect James Wyatt. In France, comparable nodules were found at Boulogne, and a clay beneath this stratum was the only identified natural cement in the form of a soft deposit. Many other types followed. The principal British brands, according to Hurst, were Harwich, or Frost’s; Francis & Grellier’s, made at Millwall; Atkinson’s or Mulgrave, from Whitby in Yorkshire; Calderwood, from Glasgow; and Medina, from Hampshire and the Isle of Wight. But of these Frost’s at least is better described as an artificial cement, and is discussed in that context below.

Roman cement is in many ways the key to the Regency style. It was much used by Wyatt himself, and by his principal rival John Nash, as a way to conceal brick or other material and give it the appearance of stone, though ironically it was a failed exercise of this sort that bankrupted Nash at the outset of his career. It lent itself to the curves of bow windows and the pilasters, Greek frets and other adornments of the Regency. And it was the very material against which Pugin was to fulminate when he argued for a more ethical style:

Timbered fronts of curious and ingenious design are swept away before the resistless torrent of Roman-cement men, who buy their ornaments by the yard, and their capitals by the ton. Every linen-draper’s shop apes to be something after the palace of the Caesars ...

Artificial cement

The success of natural or so-called ‘Roman’ cement naturally led to experiments aimed at artificially matching or improving upon the naturally occurring proportions of clay and lime. In Britain Edgar Dobbs obtained a patent in 1810 for mixing chalk or limestone with clay, burning it, and grinding the clinker, which if done correctly in terms of proportions and temperature, could have produced an artificial or Portland cement. However, Dobbs specifically avoided vitrification.
In France L J Vicat had already succeeded in creating: a factitious Roman cement by making bricks with a pasty mixture of 4 parts of chalk, and 1 part of dry clay, drying, burning and grinding them ... its efficiency is somewhat doubtful; though this was in itself sufficient to encourage others to experiment with artificial cements. Skempton may or may not be right, but certainly N E Pelouze, writing in 1829, proposed the creation of an artificial cement to reproduce the qualities of the Roman cement made by Parker. He clearly distinguished hydraulic lime [chaux hydraulique] as a different substance, and acknowledged Vicat as the pioneer in the field.

Vicat published his Recherches Expérimentales in 1818, followed by Résumé des Connaissance Positives Actuelles sur les Qualités, &c, in 1825. The London builder James Frost went to France to study Vicat’s cement, which was now in production at Meudon, then took out a patent in 1822 for his ‘British cement’, which was largely inspired by Vicat. In 1825 Frost established a factory at Northfleet (Swanscombe) to manufacture it, then in about 1830, by increasing the clay content from 15% to 30%, succeeded in producing what Skempton calls an artificial Roman cement. However, A C Davis was later to claim that Frost had produced what we now understand by the term ‘Portland cement’. These differences are impossible to resolve, given that contemporary records are limited and that Portland cement had yet to reach its canonical form. In 1833 Frost retired to the United States, and sold the factory to Francis, White & Francis, who in turn transferred it over the next four years to the control of White & Son. Later still the company became J Bazley White & Sons, then by 1853 John Bazley White & Brothers, whose cement was specified for Parliament House, Ottawa, in 1859, and exhibited at Sydney in 1879, both in its own right and in the form of W H Lascelles’s prefabricated cottage.

Portland cement is more generally regarded as the invention of Joseph Aspdin, who is claimed to have made an hydraulic cement for the first time in 1813, by lightly calcining a mixture of clay and limestone, substantially the same as Vicat’s, but significantly different from, and inferior to, what was later called Portland cement. A C Davis was to refer to this as being ‘ground hydraulic lime’, but Aspdin called it ‘Portland’ cement, from a supposed resemblance to the appearance of Portland stone. He patented it under that name in 1824, and established a factory in 1825, subsequently run by his elder son, James. In 1828 Marc Brunel used Aspdin’s cement, for the first time on a major scale, in the construction of the Thames Tunnel.

The systematic experiments of Major-General C W Pasley at the Chatham Naval Dockyard, from 1826 onwards, grew largely from the experiences of Vicat and Frost, and advanced the understanding of cement out of all measure. Most of Pasley’s experiments were conducted using White’s cement, the successor of Frost’s, which
at this stage was made of mixed Harwich and Sheppey nodules, and would not qualify as Portland cement. An artificial cement was potentially much better than a natural one because the optimum proportions of clay and limestone could be selected, but its development was retarded by the fact that early experimenters, instead of calcining it to the point of incipient vitrification, tended to assume that this was undesirable, and even to sort and remove any vitrified lumps. The first certain evidence of the material being burnt to near vitrification, and thus being effectively Portland cement in the modern sense, is at White’s factory some time after 1840. It may have been as late as 1845, for it has also been claimed that at that date Isaac C Johnson, works manager of J B White & Sons, first burnt the materials at a high enough temperature to produce what was later understood by the term ‘Portland cement’, and in particular realised the importance of grinding and using the clinker rather than discarding it.

By the 1840s, when Aspdin’s patent had expired, a number of ‘Portland’ cements were on sale, one of which, ‘Pulham’s Portland Stone Cement or Artificial Stone’ was claimed to have been first used in about 1821, and likewise to have been named from its close resemblance to Portland stone in colour, hardness and durability. Gwilt dates the appearance of true Portland cement to 1843, and refers to it as being made from the mud of the Medway mixed with chalk, and the ashes of former makeings, and calcined at a high temperature almost to vitrification. This seems to be a reference either to the cement now produced by Maude & Co, or to the development work undertaken by Pasley. Late in 1843 Maude & Co announced that they had made arrangements with Joseph Aspdin’s younger son, William, to manufacture an improved version of Aspdin’s cement at Rotherhithe. It was explained that Aspdin’s original cement, though generally regarded as superior, had been used only to a limited extent in London because of the cost of transport. William Aspdin entered the partnership of Maude, Jones & Aspdin at Rotherhithe, and a remark in 1845 that ‘Maude’s’ cement had not been in use long enough to assess it serves to confirm that they were now producing a different material. William Aspdin was later a member of Robins, Aspdin & Co, but whether this company was the legal successor of Maude, Jones & Aspdin is unclear. By 1855 William Aspdin’s Patent Portland Cement was being made by Aspdin, Ord & Co.

Other makers had entered the market as well, and by 1852 there were six in all:

- Joseph Aspdin, Wakefield
- J B White & Sons, Swanscombe
- Robins & Co, Northfleet
- Charles Hilton, Faversham
- I C Johnson, Rochester
- Aspdin & Son, Gateshead

By 1853 they included also Thomas Freen & Co of Wouldham-on-the-Medway; R Greaves, near the Avon, who sold through Charles Richardson of London; and James Weston of Millwall, Poplar. The first Portland cement manufactory was established in France in 1840 and the first in Germany in 1853 at Zülichow near Stettin, by the brothers Bleiptrene, coming into full production in 1855. Others soon followed, and although they initially modelled their works upon British ones, the Germans then introduced great
improvements, and by the 1880s their cements were 50% stronger than the British cements. Frost established himself in New York, and by 1841 succeeded in making on a commercial scale a fine greyish-white cement, which he had been able to achieve only experimentally in England, and which he claimed was three to six times as hard as marble. This venture seems nevertheless to have died, for it is reported that production did not begin in the United States until the 1870s, and even then the majority of the market was supplied by imports from Britain and Germany. The first of the next generation manufacturers was David O Saylor at Coplay, Pennsylvania, from 1871. It was more than another decade before manufacture began in Australia.

The most substantial guide to cement rendering practice is William Millar’s *Plastering Plain and Decorative*, of 1897, and particularly his section of ‘Methods of Working Portland Cement Façades’, which deals with mixtures, application and modelling. Verrall recommended the choice of a fine grained, slow setting Portland cement, mixed with no more than 20% hydrated lime, and the desired amount of washed sand and any coarse aggregate (one part of cement to three of aggregate being a typical ratio). Lowndes and Boyd accept ordinary Portland cement except where a white stucco is required, when one of the white cements available on the market is used in conjunction with white sand or marble dust.

**Conclusion**

This is a field in which there are few sharp distinctions and few clear definitions. But one can say that a change took place at different times in different places. The traditional exterior finish was a predominantly sheer surface render based on hydraulic lime or natural cement. It was commonly ruled and often tinted, but the use of marble dust or similar material had largely ceased by the nineteenth century. If there was modelling of any complexity it was in some other material, such as Coade stone (a terra cotta), one of the various artificial stones, or Portland cement.

The new treatment, beginning in about 1840, used Portland or artificial cement. It was a stronger, harsher material, sometimes quite dark in colour and therefore less readily tinted. It was durable and could be modelled *in situ* or in precast elements, which could be incorporated homogeneously. If the older tradition is called ‘stucco’, then it is better to distinguish the newer one as ‘cement’, even though many writers are not so clear.

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Former Clunes Free Library, 1878. The front of the disused library retains very fine stucco from which deteriorated modern paint was carefully removed in 1986. At that time the building was also stabilized structurally and damaged areas of stucco were repaired.

Donald Ellsmore
Abstract

During the nineteenth century and early part of the twentieth century, brick and stone buildings were often finished at least in part with external decorative plastering, sometimes referred to as stucco. This form of decoration on the facades of prestigious buildings achieved a high level of sophistication during the boom period in the colony of Victoria. Various forms of lime and cement-based plasters provided the means of decorating entire facades or selected parts of buildings with elaborate detailing that replicated the appearance of finely worked stone. Several different materials were employed to achieve the subtle colouring of stone, and there are some regional variations.

Surviving examples of Victorian stucco include some that have retained their original appearance, although these are usually somewhat altered by the effects of weathering. Others have been painted many times over, and some have been smeared over with sand and cement coatings—thus concealing the fine detailing and subtle colouring of the original stucco finishes. This introduction to the materials and finishes of Victorian stucco, reviews documented trade practices and discusses the types of materials and finishes, as a prelude to the more detailed discussions that follow. It includes some observations about the surviving evidence of past practices to stimulate discussion and encourage further research on this important subject—even though they are yet to be fully analysed and understood.
Introduction

As has been discussed elsewhere, the historical record is not clear or consistent in the matter of the term ‘stucco’. The term appears to have many meanings, or sometimes little meaning at all—it has been applied to a range of different materials and techniques over time. It is Italian in origin, and originally described fine quality plaster executed in lime putty and hand modelled in situ to produce low relief decorations on walls and ceilings. Strictly speaking therefore, the term stucco should apply only to the very fine surface finishes of multi-layered interior plaster work, but in English usage and in common Australian usage it is also used in relation to exterior plasterwork.

There is evidence that the term stucco was used to describe both exterior plasterwork in general, and the final layer in a three-coat external plastering system, as early as 1836 in Australia. The term generally applied to any or all forms of exterior plastering, irrespective of the nature of the final finish or the number and composition of the layers beneath it.

William Millar, in 1897 gave a detailed account of nineteenth century British plastering practices in his comprehensive Plastering, Plain and Decorative (still considered by most traditional plasterers to be the plastering bible). He described four types of stucco in common use in London and the south of England, and stated that the only difference between the stucco and traditional three-coat internal plasters was the setting coat—the first-coating and the floating being the same for all. Millar defined stucco as applying loosely to ‘various plastic mixtures in whose composition lime, plaster or cements enter’, thus embracing all the materials used in plastering. What is very clear, from Millar and from others, is that the final appearance of the stucco was usually intended to resemble stone.

The 1929 twelfth edition of George Mitchell’s Building Construction, states that external plastering is usually known as stucco. James Nangle’s Australian Building Practice states that external plastering “… resolves itself into either the covering of the wall or exterior of the building with the rendering of cement mortar, called stucco, or else the dressing of all base courses, sills, mouldings etc.” His diagrams label the former as ‘cement stucco’.

In England, various forms of lime and cement stuccoes were applied to masonry and to selected parts of buildings, even timber buildings, from the nineteenth century until quite recently. In Australia the most sophisticated examples of stucco are found on Victorian Italianate and Boom style buildings and on some of the grand country villas and mansions—especially those constructed on pastoral runs, and in the goldfields towns of Victoria. These examples were described in contemporary reports as ‘cemented’, ‘cement fronted’, ‘plaster fronted’ and even ‘plasterers’ Corinthian’. The term stucco did not appear to suit the aspirations of the era that witnessed the proliferation of Portland cement-fronted buildings although it was the more common term in use before the widespread use of Portland cement and it is still the term that is preferred by some.

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86 AONSW. Schedule of Government Contracts in the Colony of New South Wales, 1836; this uses the expressions ‘render, float and stucco on brick’ and ‘lath, plaster, float, and stucco’. The AONSW. Schedule of Government Contracts in the Colony of New South Wales, 1864 required that ‘The whole of the plastering and stucco to be made up with sharp pit or fresh water sand or road drift and the stucco be not less than ¾ inch thick’.

87 Sydney Morning Herald, 18 February 1850, p 2, ‘the back wall of the King Street Court House [is being] stuccoed about half way up’.

88 Millar, Plastering, Plain and Decorative, p 103

89 Millar, Plastering, Plain and Decorative, p 101

90 Mitchell, Building Construction, p 75.

91 Nangle, Australian Building Practice [1944], p 390.

92 Dixon & Mulheasus, Victorian Architecture, p 16.

93 Morris-Nunn, Rich and Chaste, p45.
In his chapter on stucco in *Good and Proper Materials – the Fabric of London Since the Great Fire*, Frank Kelsall volunteered that:

> stucco can be defined as some sort of composition which can be applied to the whole or part of a housefront and can be used equally for a plain covering or for running mouldings and forming ornament.94

Stucco was used increasingly in speculative brick-built structures in England, although it was not universally admired, and was not so commonly adopted where there were good reserves of building stone and the skilled labour to work it. Where stucco was extensively used, as in London, it began to lose favour with many builders and their clients by the 1860s. However, this was not so in Australia, in Melbourne and the goldfields towns in particular, where stucco provided the means of achieving aesthetically sophisticated architectural finishes despite the general shortage and high cost of labour. It provided the means of finishing brick buildings with beautifully executed finishes when stonework was difficult to obtain. The fashion for stucco diminished in the early twentieth century as interest in applied exterior decoration of all forms waned.

### The nature of Victorian stucco

Stucco had several intrinsic advantages, including the ability to improve the appearance of inferior brick and stonemasonry, and some even attributed to it superior thermal and waterproofing qualities.95 However, it was not considered to be superior to well-made brick or stone surfaces in the Australian context. During the boom period of the second half of the nineteenth century, stucco afforded the ability to achieve high quality building finishes within the constraints of limited trade skills and building stone resources.

95 Downing, *Architecture of Country Houses*, p. 63. Downing considered stucco to be a cheaper, warmer and drier material than ordinary masonry.
In the early years of the twentieth century, stucco provided the means of achieving the sinuous lines and eclectic motifs of the Art Nouveau and Federation styles in exterior relief decorations. It even provided a means to decorate early forms of reinforced concrete construction, which were otherwise plain and utilitarian in their appearance. A simple definition of stucco that would appear to suit these later forms of exterior plasterwork in the Australian context is ‘an exterior plaster finish composed of Portland cement, lime, and sand, mixed with water, used for decorative work or mouldings’. However Burden who penned this definition in 2003, went on to refer to it as being ‘usually textured’ (which is a misconception). Other references to stucco refer only to mixes of sand and Portland cement, usually in the proportions of 3:1 containing no lime whatsoever, whilst some references to external plasters make no reference to the term stucco at all.

In the matter of Portland cement and Victorian stucco, the papers that follow make two important points and they are worth repeating here to remind readers about the true nature of the material known as ordinary Portland cement, or OPC. First, modern Portland cements are much harder and more uniformly grey in colour than earlier forms of Portland cements (which were available in a range of subtly different colours and were sometimes specified with care to attain contrasting colours on the elements of building facades). Second, the early and varied forms of Portland cement were less hard and more compromising than modern forms, which are more refined in their manufacture. The concept of stucco mixes composed of Portland cement and sand today is challenging because of the growing awareness of the deleterious effects of Portland cement-based plasters on weak masonry surfaces, especially in the presence of moisture and salts.

In recognising the widespread use of Portland cement following its successful introduction in the mid 1850s, Millar advised that:

Portland cement is unquestionably the best plaster material for resisting vermin, damp and fire. In fact, of all the mortars or cements that have been used for plastering the exterior wall surfaces of buildings, Portland cement is unquestionably the best plaster material for this purpose produced in this century or any other.

Nangle was of the same opinion—that Portland cement and sand together produced the best mix for external plastering, and that even the addition of lime water, to make it work fat, was to be condemned.

Notwithstanding these opinions, there have been many instances of use of materials other than, or in addition to, sand and cement in stucco. It is therefore useful to return to earlier examples and references to understand how stucco evolved as a material, and how practices were applied in Australia.

Lime and the natural cements

Before Portland cement became accessible in the second half of the nineteenth century, lime was the most common binder used in mortars. It is still used extensively in mortars and plasters, and is recommended for many building conservation applications. Lime-based mortars are now widely acknowledged as generally superior to cement-based mortars and plasters in repairing heritage places, mainly because they are more compatible with aged, weakened, fragile or porous building fabric, including sedimentary building stones, traditional brickwork and soft bedding mortars.

Common limes harden by the process of carbonation, which occurs when the calcium hydroxide of fresh lime combines with carbon dioxide in the atmosphere in the presence of water to form calcium carbonate. The process produces porous mortars and plasters that are suitable for many types of conservation works and repairs, although their setting is relatively slow, which can be a disadvantage in external plastering.

96 Burden, Illustrated Dictionary of Architectural Preservation, p 247. The full definition is ‘an exterior fine plaster finish composed of Portland cement, lime, and sand, mixed with water, used for decorative work or mouldings, and usually textured’.

97 Millar, Plastering, Plain and Decorative, p 183.

98 Nangle, Australian Building Practice [1944], p 366.
Hydraulic limes found a use in traditional forms of external plastering because they enabled plasters to set more rapidly without any need for contact with the air. Even more importantly, in external work, they could resist erosion by water, to an extent which common limes could not (and natural cements were even better in this respect). Natural hydraulic limes were produced by burning argillaceous or siliceous limestones and are composed of calcium silicates and aluminates, together with calcium hydroxide.

Roman cement was a natural cement discovered and patented in 1796, more than 20 years before Portland cement. Its development arose from a search for materials to use in finishing London buildings in ‘stucco or composition resembling stone, more durable than the common sort’. 99 It was produced from marls or septaria (limestones containing more than 25% clay) and was fast setting, brown in colour, and hard when set. The derivation of the name, Roman cement, was an attempt by its inventor to draw a link between the new material and those of proven quality from the ancient world.

Roman cement was used in England in Regency and early Victorian stucco either as the principal binding agent or mixed with lime and sand, although the proportion of sand in such mixtures was of necessity small because Roman cement had a poor affinity with it. This characteristic made it more suitable for casting decorative elements than for flat floated and trowelled surfaces. Roman cement was imported in kegs to Australia and began to appear in construction in the 1830s. However, it was superseded by Portland cement when that material was found to have superior qualities in many situations, although some places appear to exhibit examples of both materials being used together. 100 The use of Roman cement in Australia was relatively short-lived.

Artificial cements

Early attempts to reproduce natural hydraulic properties by artificial means led to the development of hard, fast-curing cements, which had obvious benefits in the production of decorative external plastering, and in the production of ornate mouldings in particular. Portland cement was developed in Britain where an early form of it was patented in 1824. Its name derives from its similarity in appearance to Portland stone. The original Portland cement differed from natural hydraulic lime in only minor ways, had similarities to Roman cement, and was used only to a limited extent. Portland cement only came into favour after the 1840s when it was worked at higher temperatures and marketed as ‘Patented Portland Cement’.

Some of the early forms of Portland cement were greenish and brownish with tints of grey, and not as strong as the modern forms. Portland cement today has a distinctive, uniform light blue grey colour and very high strength when used in combination with suitable aggregates. Today this modern form of Portland cement is fired at very high temperatures and is used almost universally in the building industry in all forms of concrete, mortars and common external renders.

Portland cement hardens and sets relatively quickly in most environmental conditions, by a chemical process of gel crystal formation — thus making it a very useful material for external plastering. However, the setting process involves the loss of water and shrinkage, which can be a hindrance in fine work and in repairs to heritage building fabric. In addition, it is now understood to be incompatible with many forms of masonry under some conditions. Portland cement plasters are harder, less porous and less permeable than lime-based plasters, and they can be a source of sulphates, which may contribute to the salt decay of traditional brick and stone masonry.

100 Roman cement was imported in casks in the 1830s by James Bowman for use in finishing his villa ‘Lynnhurst’ on the shores of Sydney Harbour. The villa was built in the Regency style and finished with external stucco, decorated with architraves and cornices run in Roman cement. The Docker house ‘Bontharambo’ near Wangaratta, built in the early 1850s with mainly imported materials, appears to have both Roman and Portland cement elements.
External plasters in early Australian building practice

When Australia was settled by Europeans there were—at least near Sydney—very few readily accessible sources of limestone for manufacturing limes or cements, so colonial builders resorted to using clay as a binder in their mortars and plasters. Clay was readily obtainable, as were sands of various types. Aboriginal shell middens and live oyster shells were abundant near the early port settlements, and were found to be suitable for calcining to produce building lime—although the early settlers rapidly depleted the resource. Clay, sand and primitive forms of lime (or combinations of these materials with other binders) were employed in vernacular buildings and in more refined colonial buildings. Early records refer to various natural and artificial binders used to improve the properties of mortars and plasters and to counter clay shrinkage such as animal manure, blood, various natural forms of reinforcement and fish and shell products. The early settlers found suitable materials for the limited production of building limes further afield, in the form of deposits of shells and natural limestone. They could burn and slake these to produce both common and hydraulic building limes—materials that were used in both sophisticated and primitive structures in most parts of Australia until the late nineteenth century, when the Australian production of Portland cement commenced.

Considering the limited availability of imported materials in the Australian colonies in the first half of the nineteenth century, it is not surprising that the materials used in external plasters differed from those used in Britain at the time. Nevertheless, Roman cement and early forms of Portland cement were used here during that period. We also know that J C Loudon's Encyclopaedia of Cottage, Farm and Villa Architecture had some currency in the colonies, and that it would have guided colonial builders in a wide range of building matters. Loudon was of the opinion that in general, wherever good fresh lime and clean sharp sand could be had, an excellent cement might be formed. He wrote (in 1833, prior to the general availability of Portland cement) that:

> The Cements for Stuccoing are chiefly the Roman cement, of which there are two kinds common in Britain, Parker’s and Mulgrave’s; the Puzzolano; the tarras; the gypsum; the mastic; Frost’s cement; the metallic cement; and Bailey’s composition… A very hard and durable cement may be formed of stone lime recently burned, and, immediately after being slacked, mixed with clean sharp sand. This about London is called Bailey’s composition… The usual proportions are three of sand to one of lime.102

101 In the early 1980s, the plasters and mortars used in the construction of the two end wings of the Rum Hospital in Sydney were examined closely during conservation works. They comprised mainly clay and sand, with small quantities of shell lime and small quantities of both cow hair and chopped grasses to provide some tensile strength and to overcome the shrinkage of the clay during drying. The internal plasters were applied in layers up to 35 mm thick.

102 Loudon, Cottage, Farm and Villa Architecture, pp 259–60 (§ 527).
He also reported that the main purpose for stuccoing the fronts of buildings, or, as he described it, ‘covering the outside walls of cottages with cement’, was generally to imitate stone.\(^{103}\) The need to imitate the natural colour of stone would have been met in the colonial era by the application of some form of natural colouring to either or both the stucco and its surface.

It is well documented, and clearly illustrated in surviving works, that Portland cement began to overtake all other forms of cement for high-grade work after it was imported from the middle of the nineteenth century, and locally manufactured material from the end of the century. However, in Ireland and also to some (unquantified) extent in Australia, lime and Roman cement maintained their value in external plastering until about the 1870s. The English architect and writer, Joseph Gwilt, noted the Irish use of lime:

> Stucco work, as it is called, and as executed daily in Ireland for outside work, consists of their roche lime, slaked for 3 to 4 months, mixed with sand and worked with trowels... stands the weather as perfectly as Roman cement.\(^{104}\)

Lime was often used in conjunction with Portland cement, which gave accelerated setting times and reduced working times. Although soon overtaken by Portland cement, lime continued to be used in many applications, no doubt because of the higher cost of imported cements, but also because its inclusion in plaster mixes made them more workable. The combination of lime with Portland cement and sand in Ireland went by the name ‘bastard stucco’. But curiously, in the south of England, according to Millar, bastard stucco was a final coat of 2½ parts of washed sand and 2 parts of chalk lime putty which was normally trowelled off and brushed to give it a stone look, and was better in quality than ordinary setting.\(^{105}\)

Millar also noted the acceptance and success in England of Portland cement, supplanting stuccos. He observed that, by the end of the nineteenth century, there were miles of streets in the West End of London where nearly the whole of the facades were plastered with either Roman or Portland cement.\(^{106}\) Roman cement had been in general use from the 1790s for plastered fronts but, according to several commentators, after a few years of exposure some showed signs of decay, allowing other, more durable forms of cement to overtake it. Upon the introduction of Portland cement, plastered fronts again became fashionable in England, and their popularity in Australian cities and towns grew substantially during the last decades of the nineteenth century.

Mitchell wrote in 1936:

> Lime is now almost superseded by Portland cement [because of its superior strength, uniformity and speed of application]. The general proportion for both rendering and setting coats is 1:3 Portland cement to clean gritty sand.\(^{107}\)

The ratio of 1:3 cement to sand quoted by Mitchell derives from the volumetric equation of 1 part of voids in every 4 parts of clean dry plastering sand. The role of sand in solid bulk plasters is to overcome shrinkage—therefore the aim with mixes of 1 part cement to 3 parts sand is to replace the voids completely to achieve a homogeneous mix that would set as a solid mass with minimal unfilled voids. Of course, tradesmen, were aware that the properties of sand varied from place to place, and they adjusted their mixes accordingly to obtain the best finishes. Even so, specifications of 3 parts sand to 1 part cement are still most usually specified.

### Stucco revival

A factor in the brief, mid-century English popular revival of stucco was the construction by Queen Victoria and Prince Albert of a large villa on the Isle of Wight (‘Osborne’).\(^{108}\) The building of this fully Portland cement-faced unpainted Italianate villa inspired a wider use of stucco, especially in rows of terrace houses in London. Once it was chosen by their queen and her consort, stucco suited the aspirations

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103 Loudon, Cottage, Farm and Villa Architecture, p 527
104 Gwilt, The Encyclopaedia of Architecture [1912], p 709
105 Millar, Plastering Plain and Decorative, p 104.
106 Millar, Plastering Plain and Decorative, p 181.
107 Mitchell, Building Construction, p 76
108 The house, ‘Osborne’, was built between 1845 and 1851 for Queen Victoria and Prince Albert by the builder Thomas Cubitt, whose company also built the main façade of Buckingham Palace and many London terraces. Prince Albert was the designer. The architecture is based on palaces of the Italian Renaissance and has two campanile-like towers. The brick building was faced with Portland cement and its interiors were richly plastered. The house was always the favourite of Victoria, who spent many summer months there.
of the emerging middle classes. The impact of the construction of Osborne can be seen in the construction of stucco fronted Italianate villas and town houses throughout the British Empire.

The stuccoed Italianate style of Osborne and other British examples was transferred to Australia, and to Victoria in particular where gold and pastoral production brought wealth and a desire by the nouveau riche to build and decorate in the fashionable London style. We therefore can find very fine examples of high quality stucco in all the major Australian cities and regional towns, and on wealthier rural estates. A high proportion of the stucco work of the era is commonly believed to have been executed in Portland cement, although recent research and a growing awareness of natural and hydraulic limes is causing a re-evaluation of the range and extent of materials used.

Stucco layering

The historical record throws up some inconsistencies in the methods of application of stucco. For example, when we examine some places where stucco has failed and delaminated we can see that it was applied in layers in accordance with Millar’s recommendations—sometimes in three or more coats. However, some other applications appear to be homogeneous—possibly single applications. Furthermore, some of the sound stucco is so hard that it resists sampling of the material for analysis. It is clear that the traditional three-coat plastering system referred to as ‘render, float and set’, or ‘render, float and stucco’, did not always apply to external plastering. The use of Portland cement in particular overcame the need to build up in layers as in the traditional method. Sometimes, Portland cement and sand mixes are sometimes incompatible in colour, texture and strength and they have a tendency to shrink and craze as well as to promote the movement of moisture and the concentration of soluble salts that can damage masonry. This does not mean that the past use of such mixes was wrong, but it may mean that it would be wrong to re-use them today. The sand and Portland cement mixes of the past were in various ways different from those in use today. In addition, it also seems that the aging process causes the fabric of stuccoed buildings to change over time in subtle ways, which make it unlikely that modern Portland cement and sand mixes would blend satisfactorily with the original finishes.
Cement plasters were recommended to be applied in two coats, or occasionally only one. Modern cement renders are commonly applied in one application, facilitated by the use of additives to reduce shrinkage during setting.

In the traditional three-coat method, the purpose of the first rendering coat was to deal with unevenness in the form and porosity (known as suction) of the substrate, and to provide a uniform surface to receive the floating coat. The floating coat on flat surfaces brought the plaster to the state of being smooth and even, and was finished with a wooden float. The final coat was then worked on top of the even surface to create the desired quality, colour and texture of the finished stucco.

The number of coats appears to some extent to have been a function of the nature and condition of the substrate, and also to some extent determined by the required final finish. Rough masonry surfaces with uneven suction could not be successfully stuccoed without building up the layers to overcome this unevenness. Finer finishes also required more layers to achieve a high quality result—whereas modern machine made bricks and cement mortars provide a uniform surface suitable for rendering in a single application, usually of sand and cement.

Nangle recommended two coats, or sometimes only one, and that the thickness should be no less than ¾ inch (19 mm). Others acknowledged that two-coat work was common but considered three-coat work better. The first coat should be the strongest, and he recommended that each coat should be allowed ample drying and shrinkage time before the next was applied, and that the render coat should be scratched to provide a key for the following floating coat. This was sometimes called the ‘scratch coat’. There were various recommendations for scratching surfaces, and a four or five pronged set of cut and sharpened laths was sometimes illustrated for this purpose. However, Millar argued persuasively that a single lath should be used to produce the best keying for the following floating coat, and that this did not require any...
scratching in preparation for the final setting coat of stucco.\textsuperscript{109}

**Surface textures and finishes**

Nangle recommended that the final coat should be finished with a steel trowel, but others advocated either a wooden float or a felt-covered float to achieve a finish as near as possible to the texture of stone. For example, Mitchell advised that textured finishes to represent stone surfaces were worked best with a felt-covered hand float.\textsuperscript{110} This is largely consistent with Millar, who described the four different types of finishes used in London. It is clear that the choice of finish was based on the location, desired appearance, amount of worked decoration and the nature of the stone being emulated. He acknowledged that some of the terms used to describe these different types of stucco were only used by workmen, and the use of these stuccoes by 1897 was to a great extent superseded by Portland cement for exterior work, and Parian and other white cements for interior work.\textsuperscript{111}

According to Millar, ‘common stucco’ was preferred for exterior work, comprising 3 parts of coarse sand to 1 of hydraulic lime, to which a small portion of hair was added. It was laid in a similar way to ordinary rendering in one coat, and the surface finished with a hand float. ‘Rough stucco’ was used for plastering churches, corridors, and entrance halls—to imitate stone. The work was floated with ordinary coarse stuff, and then set with stuff composed of 3 parts of washed sharp sand and 2 of grey lime, not chalk. When it was to represent ashlar masonry, the surface was set out with lines to imitate ashlar stonework. The staining of the stucco to represent the colour of stone was achieved by diluting sulphuric acid (oil of vitriol) with water, and mixing with it liquid ochres and other colours to the required tints. The setting stuff of rough stucco could also be mixed with the ochres before application.\textsuperscript{112}

Millar considered the ‘bastard stucco’ he described to be somewhat better in quality than ordinary setting. The final coat of bastard stucco was composed of 2½ parts of washed sand and 2 parts of chalk lime putty, all trowelled off and brushed to achieve the desired finish.\textsuperscript{113} ‘Trowelled stucco’ was generally used for work that has to be subsequently painted. The stuff for the finishing coat was composed of from 2½ to 3 parts of washed sharp sand to 2 parts of chalk lime putty. The sand was not as fine as that used for ordinary setting, being washed through a sieve having about 12 mesh to the inch, and the finish was worked to a near gloss with the trowel. When dry, the gloss apparently went off, leaving a fine surface ready for painting.\textsuperscript{114}

Millar also described what he termed ‘coloured stucco’, which was used in Italy to execute lime stuccos in colours, by mixing various oxides in the lime. These were the same colours that were used for internal coloured setting coats; suitable also for sgraffito and concrete.\textsuperscript{115}

It seems likely that all the finishes described by Millar were used in Australia, and that some further focussed research would identify examples of these. However, given the diversity of the Australian workforce in the period, it is unlikely that there would be a high degree of parity between the finishes described by Millar and those used here.

In conservation work today, when Portland cement mixes are used in repairs adjoining aged finishes, they are rarely visually compatible. When modern sand and cement mixes are finished with a wooden float, there is often an undesirable visual incompatibility between materials—either because the original finish might have been another type, or because superimposed layers of paint finishes have severely distorted the appearance of the original surfaces. Ways of overcoming this problem (such as removal of all paint layers prior to repairing the stucco) are rarely simple. The incompatibility that can be observed in repair works often leads to the application of paint finishes that are not

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\textsuperscript{109} Millar, *Plastering Plain and Decorative*, p 91.

\textsuperscript{110} Mitchell, *Building Construction*, p 75.

\textsuperscript{111} Millar, *Plastering Plain and Decorative*, p 103.

\textsuperscript{112} Millar, *Plastering Plain and Decorative*, p 104.

\textsuperscript{113} Millar, *Plastering Plain and Decorative*, p 104.

\textsuperscript{114} Millar, *Plastering Plain and Decorative*, p 104.

\textsuperscript{115} Millar, *Plastering Plain and Decorative*, p 104.
necessary for any reason other than to conceal the repairs. The application of impervious paint finishes usually has long-term conservation implications.

**Stucco materials**

On some aspects of stucco all the main authorities seem to agree whereas physical evidence reveals a somewhat different truth. For example, all agree that sand should be clean, sharp and well graded, yet close inspection of weathered external plastered surfaces sometimes reveals surprising inclusions in the plaster mixes, including shell, unslaked lime particles, cinder and very large sand particles (or fine gravel). All of these inclusions appear to be contrary to best practice, yet the evidence is that they have lasted very well. No doubt, some of these inclusions impart positive qualities to the base layers and assist in overcoming problems such as shrinkage. However, the top layer was usually made with fine sand and pure lime or cement to achieve the desired uniformity of appearance and weatherproofing properties.

The fine material in stucco surface layers has a major influence on the workability, appearance and strength of the finished work. The fine aggregate should be always clean and free from silt and clay because the presence of these would increase the water demand of the wet plaster and reduce its dry strength and durability. Fine aggregates consisting of round (non-sharp) particles produce weaker mixes than those containing angular particles, since angularity allows the particles to lock against each other.116 Lime putty—the form of lime used in traditional stucco mixes—was produced by slaking rock lime with water and leaving it to stand for a long period. The length of time needed to be sufficient for the lime to fully form calcium hydroxide, without any unslaked portions of calcium oxide (which could later cause weaknesses and disruptions in the surface finish). In the past, it was commonly thought that well aged lime putty was superior, although some authorities considered fresh slaked lime to be better. Recent research indicates that freshly slaked lime is no better than lime putty which has aged,117 and that there is no benefit in leaving the lime to slake for months and years as was sometimes done in the past.

There is little information on how changes in the use of Portland cement have influenced stucco, but at the time it was introduced it was generally conceded that ordinary Portland cement had an unattractive colour, which could be rendered pleasing by the addition of pigments or by employing sands of various tints.118 The amount of pigment should be no greater than 5% in any mix.

White Portland cement—sometimes specified today in conservation work to avoid the unpleasant grey look of ordinary Portland cement—differs physically from the grey form only in its colour, although its manufacture is significantly different from the grey product. Apart from its purer colour, it does not appear to have any benefits.

**Natural and applied colour**

Lime tended to allow the natural colours of the sand to show in the cured stucco, as noted by Loudon:

> Where the cement used… is lime and sand, it will resemble stone with little or no colouring matter added; but where Roman cement, or Puzzolano, or tarras, is used, the colour, after being laid on, will be dark, and the cement must therefore be brought to a stone colour by washing it over with washes, composed in proportions of five ounces of copperas to every gallon of water, and as much fresh lime and cement (to which some add tallow), as will produce the colour required. The copperas, or sulphate of iron, oxidises with the atmosphere, and produces a reddish tinge.119

Copperas, was mentioned by many as a suitable colouring agent for stuccoes and also for fixing other mineral pigments in stucco mixes. It was by far and away the most commonly recommended colouring agent throughout the entire period covered in this discussion.

In the following paper, Lewis examines various methods that were used to impart colour to stucco, including the addition of pigment to mixes to offset their inherent

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118 Mitchell, Building Construction, p 76.
119 Loudon, Cottage, Farm & Villa Architecture, § 528, p 260.
greyness, careful selection of the types of sand and cement, and the application of colouring to the surface either during or after the finishing process. Since Portland cement derived its name from its similarity to Portland stone, it is obvious that natural Portland cement stucco would not suit the purposes of imitating different sorts of Australian building stones without adjustment. Portland stone was never a suitable model for Australian buildings, although it was used very carefully and deliberately to achieve the desired look in some situations. Nevertheless, Portland cement, like earlier types, sometimes was considered quite suitable to be left in its natural colour, provided the selection of sand and cement was carefully specified. This is borne out in field research where the warmer colours of some nineteenth century stuccos exhibit the presence of coloured sands.

Millar summarised the means he encountered to colour Portland cement facades, including the modulation of those facades by adjusting the colours of the different cement parts:

Elements were varied in colour alternatively by using a rich yellow pit sand from Gilmerton for some, and a grey river sand for other. Red sand and brick-dust is used for a similar purpose, also for colouring cast concrete. Bullocks’ blood mixed with cement has been used to obtain a resemblance to red brick. Earthy stains are not as durable as mineral oxides; they also tend to weaken the cement, whereas mineral oxides have a reverse tendency. Manganese, or manganite, is also of a suitable nature.

The warm colour of the popular Caen building stone from the north of France could be achieved by mixing

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120 Lewis, ‘Australian Stucco’.
121 Millar, Plastering Plain and Decorative, p 190.
yellow oxide and red oxide in the Portland cement plaster mix. Dark red colours and buff stone colours could be achieved by varying the proportions of the same mineral pigments. Millar concluded that coloured cement or stucco would last as long as the work, whereas if Portland cement finishes were coloured on the surface only, the colour would soon wear off.122

Paints and other applied surface finishes

Millar’s predictions are born out in the Australian context where a careful examination of the apparently unpainted surfaces of stucco-finished heritage places usually reveals that those places were, at some early time in their history, coated with coloured washes. Other finishes were common but it is not easy to determine whether they were painted early in the life of the buildings, or later; or whether colour washes were present before other coatings were applied. Even when an oil paint was applied as the first finish, in accordance with some recommended practice, the paint could not have been applied until the stucco was fully dry. The drying out process could take months or, sometimes, years.

Oil paint is not a logical finish for external stucco when it is intended to have a stone look. Oil paint has a natural gloss, which cannot be readily suppressed without impairing the properties of the paint. Furthermore, the application of oil paint is arduous, and three-coat work (the minimum that would suffice on stucco) would be costly and time consuming. Nevertheless, the description by Millar of ‘trowelled stucco’ for work which would be subsequently painted, indicates clearly that some stuccoes were intended to be painted with conventional oil-based house paints, or perhaps with one of the newly developed washable distempers, very soon after the plastering work was completed.

Colour washes, by contrast, could be applied immediately to fresh render in a single coat, in various weather conditions, and they imparted what many considered to be a more convincing stone look. However, as Millar and others noted, colour washes were not very impervious or durable.

Copperas, or iron sulphate, appears not only as a colouring agent and mordant in colour washes but also as a type of treatment, in its own right for the surface of cementitious material. One source in the 1960s advised:

It isn’t hard to give concrete that effective ‘stone’ look that relieves the monotony of plain surfaces. A solution of Copperas (ferro-sulphate) will do the job. Dissolve ¼ lb of Copperas in water and sprinkle or spray it on the trowelled surface while damp and before it sets.123

Copperas either when incorporated into the stucco mix or when applied as a wash on stucco, made the lime plaster harder and more durable. It imparted a golden to reddish brown finish and therefore could be used as a substitute for ochres, with better performance over the longer term. There were also various proprietary washes for use on stucco. Some contained cement, with or without size, and others were based upon materials such as plaster of Paris or lime. Those based on cement were termed cement washes.

Oil paint, mixed according to the traditional method by combining white lead carbonate with linseed oil, provided the most durable exterior paint. It is therefore not surprising that oil painting was recommended as a durable finish, and specified by government agencies in high quality work.124 Nor is it surprising to find multiple layers of hard oil paint on surviving examples of Victorian stucco despite the practical difficulties and relatively high cost of applying it. Oil paint, also known as lead paint, was a common finish for stuccoed building elements up to the time that lead was phased out of paint in the 1970s for environmental health reasons. The replacement material in most common usage today is so-called ‘plastic’ paint, normally in the readily available form of the acrylic emulsion paints which have become the industry standard for all forms of internal and external painting, irrespective of substrate or colour or finish.

Washable distempers and mineral silicate paints were eminently suited to stucco but it is not clear to what extent they were used in Australia. Mineral silicate paints have been available since the late nineteenth century in Europe, where Keim Mineral Paints were first manufactured in
Bavaria. These paints were marketed as the nineteenth century equivalent of traditional fresco paint. Silicate paint was specified on the cement stuccoed parts of some brick railway buildings in New South Wales in the early twentieth century, but it is not known whether it was the Keim type or a washable distemper produced by the Silicate Paint Co. The so-called washable distempers were water-based paints that incorporated either or both mineral silicates and emulsified oils that imparted some of the qualities of durable oil paint in the finish. One pigment, called Chariton White—a combination of zinc oxide and barytes invented by J B Orr of London and patented in 1874—was used by the Silicate Paint Co. to make a product called Duresco, which was used in Sydney and probably also more widely afield. The New South Wales Government Architect stated in his 1890 annual report to Parliament that it was in use on all government buildings. This paint was marketed in a dry powder form and recommended to be mixed with clean water and applied hot.

Regional and periodic colour variations

A large number of rendered buildings in around Melbourne of the late nineteenth century were finished originally with cream and light earth toned colour washes, whereas in the Sydney area warm pink, salmon and terra cotta hues appear to have been more common. This might be explained in part by a desire by Sydneysiders to emulate the warm hues of aged Sydney yellow block sandstone, the principal building stone in the colony. In the Victorian goldfields towns and cities, a high number of mid-brown finishes can be found. It has been suggested that these were obtained with washes that were pigmented with tailings from mining, but no research has yet been able to confirm this. One outstanding example of the mid-brown finishes can be seen on the civic group of buildings in Bendigo’s Pall Mall.

In a more general sense, stucco colours were made with earth pigments. The range of colours included the earth colours from nature and more particularly the colours of the natural building stones. The painting of stuccoed buildings with conventional house-paints, as opposed to the colouring of the original stucco finishes, followed the same pattern as other painted masonry and timber structures. Over time, the tonal values of the earth colours used to make the traditional house paint colours for the walls of buildings grew darker, culminating in the use of the darkest tones from 1920 to 1940 when they were superseded by the fashion colours of the Modern movement. The brief appearance of Venetian red and other red oxide hues was inspired by the brief fashion for red brick architecture in the Queen Anne and Federation styles. A large number of stuccoed buildings were painted in pseudo brick colours in the 1890s but most of them reverted to lighter earth tones in the following period.

After World War II, Australians enthusiastically embraced modernism, including the use of pastel paint colours, which soon replaced the earth tones on all types of external surfaces. White untinted house paints soon followed those. Post-war changes in the manufacturing and marketing of paint, together with the rise of the home ‘handyman’, resulted in a more liberal use of paint, and this gave rise to the excessive layering of paint coatings commonly found on stuccoed surfaces today.

Stucco enjoyed a revival of sorts in the 1930s when various forms of applied cement decoration appeared on masonry and asbestos cement sheet clad timber-framed buildings. These so-called textured stuccoes were obtained with Portland cement and sand mortars applied by trowel or cast from a spatter device to create Spanish, Italian, English Cottage, Californian and Modern American textures, which could be suitably coloured with Portland cement based paints of almost any hue. Regrettably, these so-called stuccoes have left an inaccurate understanding about the origins of stucco and caused confusion about the term in current usage. For many today, the term ‘stucco’ denotes only a rough-textured wall finish.

125 Keim History, retrieved 9 April 2007, http://www.keimsystems.com/history.html In 1878 A W Keim was granted a royal patent for his liquid silicate paint combining a potassium silicate binder with inorganic fillers and natural earth oxide color pigments, and it has been used successfully since then.
126 Great Britain, patent no 517 to J B Orr, 10 February 1874, for a white pigment of barium sulphide and zinc sulphide.
128 The Bendigo Post Office and Law Courts group at 51-71 Pall Mall was built between 1883 and 1896. It is finished with cement which has been coloured with a mid brown wash.
Conclusion

As a result of the research initiated by the Victorian Stucco symposium which was held in April 2007, there is a growing awareness of the value of stucco as a material and a heightened awareness of the traditional methods that were employed to obtain the outstanding finishes and subtle colouring of the material in high class buildings. Many fine examples of Victorian stucco survive intact. Some retain their original appearance unaltered except for the changes wrought over time by weathering. These examples represent a valuable heritage resource, providing priceless evidence of the sophisticated trade practices used to create them. Conservation practitioners are now keener to understand and reproduce the traditional methods in the repair and conservation of the material. It may be too late to recover the authentic finishes of some, but with greater knowledge of traditional trade practices and by sharing the accumulated knowledge of Victorian stucco materials and finishes it should be possible in the future to achieve higher standards in the conservation of all surviving forms of Victorian stucco.

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Shell lime used in the mortar of a basement wall of an inn at 31–33 North Street Windsor, 1840s.  Donald Ellsmore
Australian Stucco
Miles Lewis

> definitions
> materials and imports
> rock lime
> Roman cement
> magnesian lime
> artificial cement
> local stucco
> practice
> finishes
> moulding and casting
> twentieth century painting
> conclusion

Definitions

I will take ‘stucco’ in the Australian context to mean an external rendered surface, which is in practice nearly always—implicitly or explicitly—an imitation of stone. But it is important to remember that the term has also been used in other ways, and it is therefore unwise to assume that historical references to the manufacture, application, surfacing or preservation of ‘stucco’ are useful or relevant to the material as found in Australia.

England, however, is largely relevant, and there ‘stucco’ was described in the eighteenth and the nineteenth centuries as ‘now a species of plastering, occasionally worked to resemble marble. One sort is made of lime, the other of plaster.’¹²⁹ It was in much the same sense that Haddon still used the word in Australia:

In preparing internal surfaces for painting or decorating, the final coat may be in ‘lime stucco’, half sand, half lime, worked up with a felt float. This brings up a scum, which scum before it is dry is trowelled back into the work with a steel trowel. This when finished gives a hard, glass-like surface.¹³⁰

But in practice Australian stucco ranges from this sophisticated form down to the cruder plastering of wattle-and-daub huts. It was not just a question of plaster or common lime stucco. In Australia, as in Britain, there were some rock limes which by reason of the clay in their composition, produced a material with some hydraulic properties. This was essential for a durable stucco finish, for a common lime stucco would quickly wash away unless it was sealed very carefully. Roman cement, which was better still, was hardly produced in Australia at all, but it was quite extensively imported.

¹²⁹ Neve, quoted in Papworth, Dictionary of Architecture, sv Stucco; I have been unable to locate the reference in Neve
¹³⁰ Haddon, Australian Architecture, p 489.
A change comes with the transition to Portland cement, which resulted in a surface of a very different character, though still usually emulating ashlar masonry. Robert Haddon sensibly explained in 1908:

The term ‘stucco’ is sometimes applied to cemented surfaces, but it is not of altogether general application, ordinary cement and sand work being generally referred to as ‘cementing’.131

James Nangle was not quite so careful, for he referred to ‘cement stucco’, but in Australia, as elsewhere, the word ‘stucco’ used alone almost always refers to a material used upon lime or natural cement, not upon Portland cement. Here we will consider both types.

Materials and imports

Neither limestone nor chalk was to be found in the vicinity of Sydney Cove,132 and shells were burnt for lime in the first months of settlement, as they had been in other colonies in North America133 and South Africa.134 Governor Phillip is said to have brought a little lime from England to the settlement, but he had to try to obtain more locally even for his own house. ‘The Governor’, wrote John White, ‘notwithstanding that he had collected together all the shells which could be found, for the purpose of obtaining from them the lime necessary to the construction of a house for his own residence, did not procure even a fourth part of the quantity which was wanted.’135 Such lime as could be obtained from sea shells at Sydney was in great demand for stuccoing and plastering over the other inferior building materials, and therefore not much was used for mortar or other structural purposes.

Loam was also used for plastering. The only surviving Victorian example of external loam stucco, according to Hanut Dodd, is that of ‘Ercildoune’ near Ballarat, of 1859.136 Loam was used more commonly for internal work, as at Robert Hoddle’s house in Melbourne of 1838,137 and a surviving example is the ceiling of St Andrew’s Manse, Port Fairy, of 1856.138

As a general rule shells (see photograph on p. 28) can be easily seen in the mortar of older buildings in coastal and riverine New South Wales. Shell lime was burnt from the piles of oyster shells found in Aboriginal middens all along the coast, and when these were exhausted the bays and inlets were dredged for live oysters.139 In the 1850s and 1860s the activities of the shell diggers had become a problem in the Sydney region, and were resulting in the depletion of oyster supplies, a problem overcome only when the establishment of railway connections in the 1870s enabled rock lime to be brought from inland.140

At Coal River [Newcastle] the lime was made from oyster shells which, according to W C Wentworth, were found close to the banks of the river ‘in beds of amazing size and depth’, which some surmised were the results of the perennial feasts of the Aborigines. Wentworth himself thought it more probable that they were natural beds left aside by some shift in the course of the river. The lime was sold at Sydney for a shilling a bushel,141 and the commandant, Major Morisset, was also expected to maintain a stock of 1,200 bushels in the lime store. In 1816 Captain Wallis established the Limeburner’s Bay settlement north of Stockton, on the Hunter River. When this was abandoned for Port Macquarie in 1823, the manufacture was continued by free settlers who sold the lime to nearby squatters, and shell boats traded on the

131 Haddon, Australian Architecture, p. 491.
132 Philip, The Voyage of Governor Phillip, p 145.
137 Cannon, Historical Records of Victoria, III, p 271.
139 Gemmell, And So We Graft from Six to Six, p 5.
140 Wentworth, Statistical Description of New South Wales, p 56.
river until at least 1838.\textsuperscript{142} At Twofold Bay a large heap of ‘mud-oyster’ shells which were burnt for lime in the 1840s was reported to have been brought ‘from distant shores’, but it is easier to believe that they were gathered in the immediate vicinity.\textsuperscript{143} On the Clarence River the only lime available was that manufactured from oyster and cockle shells, and it was in use at least until 1866.\textsuperscript{144}

At Corinella in Victoria shell lime was burnt in 1826, and shell lime was burnt by John Allee in early Melbourne for a short time until sources of limestone were discovered. From December 1837 until at least October 1838 government gangs were collecting and burning shells in the vicinity of Melbourne, though limestone was also being used from August onwards.\textsuperscript{145} Similarly at Moreton Bay [Brisbane] shells were burnt for lime until Captain Logan travelled up the Bremer and found limestone. A specimen of this was sent to Sydney in April, and within a few months a kiln was built at what was then known as Limestone Hills [Ipswich].\textsuperscript{146} Shell lime was also being produced at Port Arthur, Tasmania,\textsuperscript{147} and in New Zealand, where in 1840 the best spot for collecting shells was reported near the site of Auckland.\textsuperscript{148}

Coral was an alternative raw material in the more northerly parts of Australia. In 1846 Andrew Petrie is thought to have burnt both shells and coral at Cleveland for use in the building of ‘Newstead House’, Brisbane,\textsuperscript{149} and both materials were burnt in the kiln established on St Helena island in 1869.\textsuperscript{150} Even in the 1880s both shells and coral were used at Palmerston [Darwin].\textsuperscript{151}

**Rock lime**

At Norfolk Island there was found limestone suitable as a building material in its own right, as well as for burning, and this enabled the construction of durable buildings even in the very first years. By 1793 sacks of lime were being sent to Sydney in the Kitty.\textsuperscript{152} Limestone was burnt successfully at Collins’s Sorrento settlement in Port Phillip Bay, of 1803–04, but not used after the settlement was abandoned. In Van Diemen’s Land Lieutenant-Governor Paterson on his first arrival at Port Dalrymple in 1804 reported the discovery of limestone, though it proved unsuitable for burning, and within a few weeks a better lime was being made from shells.\textsuperscript{153} Limestone was also found near Hobart.\textsuperscript{154} By 1816 a limestone quarry had been opened near Hobart, ‘the Mortar from which is extremely good for Masons’ Work, but not as good as Shell-Lime (which is to be had in the greatest abundance) for the Plasterer’s use’. Limestone had also been burnt at Gunning’s estate on the Coal River, and deposits had been discovered in other parts of the island.\textsuperscript{155}

Only in the 1820s were deposits of limestone and marble found in inland New South Wales,\textsuperscript{156} for example at McArthur’s property at Cowpastures, where limestone was burnt in 1821, allegedly for ‘cement’,\textsuperscript{157} and north of the Mount Horrible Road near Bathurst, from 1822.\textsuperscript{158} Lime was nevertheless in short supply in most inland parts of the colony, and as late as 1826 James Atkinson suggests that the settler’s stone chimney should be built with loam as mortar.\textsuperscript{159} The same loam, mixed with some coarse grass, would serve as a first coat in plastering.

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143 Wellings, Benjamin Boyd, p 14.
144 Intercolonial Exhibition, Official Record, p 61.
145 Cannon, Historical Records of Victoria, III, pp 270–279.
146 Steel, Brisbane Town in Convict Days, pp 54, 73.
147 Intercolonial Exhibition, Official Record, p 74.
149 Lack, Newstead House, p 5.
151 Australasian Builder & Contractor’s News, 8 September 1897, p 358. See also Daly, Digging, Squatting, and Pioneering Life, p 110.
152 Collins, The English Colony in New South Wales, p 177.
153 Robertson, Early Buildings of Southern Tasmania, I, p 15.
154 Charles Jeffreys, Van Diemen’s Land (London 1820), quoted in Stone & Tyson, Old Hobart Town, p 58.
155 Hobart Town Gazette, I, 3 (15 June 1816), p 2.
156 Irving, ‘The First Australian Architecture’, p 149, citing Herman, p 134; Freeland, p 68; Bigge Enquiry C.O. 201/122, p 58. Irving claims the same for Van Diemen’s Land, but this is contradicted by the Hobart Town Gazette report, supra.
157 Herman, The Early Australian Architects, p 98, quoting Henry Kitchen to Commissioner Bigge, 1821, Bigge Appendix, box 27, 6449.
159 Atkinson, Agriculture and Grazing in New South W., p 31.
then there should be a second coat containing ‘a portion of lime’, and the whole should be whitewashed. The lime from Bathurst had no impact in Sydney because of the difficulty and expense of transporting it over the Blue Mountains, but lime from Picton and Argyle was being sold in Sydney in the 1840s. After the railway was put through, Marrulan lime became the favoured type for bricklayers, and by the 1870s limes burnt from the Marrulan and Manning River stones were standard items on the Sydney market. However, lime was also brought from Victoria, and by 1880 shell lime had been completely superseded.

In Van Diemen’s Land rock lime was found in various new locations, but the distribution of stuccoed buildings, which were common in the north and rare in the south, was determined more by the lack of good freestone in the north than by the distribution of limestone. In the 1830s several kilns were operated by the government near New Norfolk. In Western Australia limestone was available at both Albany and Fremantle, but at Albany shells were burnt in preference to stone in 1826–7. Lime was used in the construction of the Round House at Fremantle in 1831, and according to Pearson it would have been burnt either in shallow pits or in small masonry kilns. At Rottnest Island, as at Albany, though limestone was quarried for building purposes, shells were burnt to get lime for mortar and stucco. Near Perth, limestone could be got from Mount Eliza, but none had been found in the vicinity of York, and in the 1860s the government offered a reward of £40 for its discovery.

It was not long after the settlement of Melbourne that John Pascoe Fawkner remembered the rock lime that had been used in 1803–04 at the abortive settlement of Sorrento, where he had been as a child, and from 1839 an extensive trade developed in lime from Point Nepean, some of it for export to Sydney. Other sources of limestone had been found at Geelong and elsewhere which would produce a slightly hydraulic lime, and it was this that at last made external stucco reasonably durable. Thus it was that Melbourne, in contrast to Sydney, developed a stuccoed architecture of a sort now outmoded in Britain itself. ‘I am sorry to say that the demon of Roman cement has doubled the Cape, and begun to revel in all the luxuries of the Regent-street school of architecture’ wrote a visitor in 1845, though most of the stucco which conveyed this impression would not in fact have been made with imported Roman cement, but with locally burnt rock lime.

In 1821 the Sydney architect Henry Kitchen told Commissioner Bigge that limestone had been burnt to produce cement at MacArthur’s property at Camden, but this can at best have been only a mildly hydraulic lime, or much more would have been heard of it. In practice, all hydraulic materials were imported to Sydney for some time to come. Parker’s cement was available at least by 1826, and was being advertised in 1835 by G S Tucker. Other more or less adequate hydraulic limes were brought from Port Phillip and elsewhere. In Adelaide, after the failure of the Torrens Weir, T B Strangways was insistent that North Adelaide lime should on no account be used in public works exposed to water, but only the best hydraulic lime. In Adelaide that would have meant an imported product, but in Victoria a number of roche or rock limes with hydraulic properties were discovered from the 1850s onwards.

160 Atkinson, Agriculture and Grazing in New South Wales, p 97.
161 Gemmell, And So We Graft, p 5.
162 Mayes, Australian Builders’ Price-Book (1877), p 44.
163 Gemmell, And So We Graft, p 5.
164 Burn, Picture of Van Diemen’s Land, p 89.
165 Report by Major Lockyer, Historical Records of Australia, 3/6, pp 481, 485, 489, quoted in Coutts, Corinella, p 146.
166 Pearson, ‘The lime industry in Western Australia’, p 94.
167 Ferguson, Rottnest Island, p 21.
168 Millett, An Australian Parsonage, p 71.
171 Australian, 5 April 1826, quoted in Oyster, Servant and Master, p 105.
A Victorian specification of 1890 calls for ‘approved Geelong, Waratah [Gippsland] or Lilydale roche lime’, while another specification in that year names these three together with Coimadai lime. Coimadai or Pyrete Creek, near Bacchus Marsh, was a source of common lime from the 1850s onwards. By 1886 three lime claims were in the hands of the Alkemade Hydraulic Lime and Cement Company, a partnership of Petrus Alkemade, builder, and Matthew Egan. Nearby George Dibley also established a Hydraulic Lime & Cement Co. Lime from these sources was in high demand during the building boom of the 1880s, and J C Newbery, chemist at the Victorian Museum, claimed that it was equal to the best imported English hydraulic lime. Dibley’s works ceased production in 1892, doubtless as a result of the depression, but Alkemade’s continued well into the twentieth century.

**Roman cement**

As local production of lime was improved in the latter half of the century, the importation of hydraulic lime from Britain and elsewhere (which had been substantial) was reduced considerably. What did not reduce was the importation of cement. Roman cement was probably imported to Australia fairly extensively and used for special purposes. Major Mitchell’s memoranda of about 1828 note the desirability of lining a cesspool with Roman cement, but these are probably notes transcribed from English sources, and it does not follow that anything of the sort was being done in Australia. It was essential, according to James Thompson, that brick or stone walls on the south or weather side should be stuccoed ‘for, if this is not done, the rain penetrates the bricks or stone, and makes the walls always wet.’ For such purposes ‘Roman’ cement was imported. T H James reported amongst the abandoned detritus at Port Adelaide in 1836 ‘blocks of Roman cement’, now as hard as stone, wanting nothing but the staves and hoops. In 1856 barrels of Roman cement were listed amongst the contents of ‘Barwon Grange’, Geelong. All this is consistent with what is found at the house ‘Lulote’ at Inverleigh, west of Geelong, thought to date from the early 1850s. The west or weather wall only is rendered, and the (distinctly odd) verandah columns are of brick rendered in a material which is partly exposed, and is probably Roman cement.

Portland Cement was also imported by the Australian colonies, and of course attempts were made to emulate...
both types locally. The first attempts in Australia at producing a hydraulic cement seem to have been those of Charles Mayes in 1853. It does not appear that any system of patents was operating in Victoria at the time (the first patents were issued in the following year, the second being to Mayes himself for his improved pisé). However, Mayes claimed to have invented ‘an incombustible building material’, and on the strength of this sought from Lieutenant-Governor La Trobe a licence to search for and remove ‘certain rocks or cement stones for the manufacture of calcareous, hydraulic and other cements’ required to make his material, as well as to construct kilns and do other things ancillary to the enterprise. As there was no patent specification, we do not know what he had invented. Nor did he gain his licence. The file is annotated by ‘JF’ [J F L Foster, Colonial Secretary], ‘I do not feel at liberty to grant all his applications give the sanguine gentleman a proper answer.’

The only significant local manufacturer of Roman cement was the Patent Septaria Cement Company at Mornington, Victoria, which constructed its kilns in 1862 and struggled on until 1865. It was to be more than 20 years before local makers were able to produce Portland cement successfully. Much later William Shearing, of G & W Shearing, South Australian brick and pottery makers, discovered a cement stone within reach of Adelaide, and in 1889 the cement was reported to be available in any quantity.

**Magnesian lime**

In Victoria there were abortive experiments with magnesian limestone cements, which probably reflect earlier developments in India. A British colonist in India, Dr Macleod, had discovered the hydraulic properties of magnesian limestone and brought them to the attention of the Madras government. Tests were conducted by A T Cotton of the Madras Engineers, who found magnesian cement to be equal to Parker’s. Its cost was about the same, but within 15 years it dropped to a tenth due to the discovery of major magnesium deposits at Salem and Trichinopoly. The new material came into wide use in India, where it was also tested by J T Smith. Next, during the 1830s, Pasley tested magnesian limestones from the north of England, but was not optimistic about their usefulness. In France, Chatoney and Rivot asserted that magnesian limestone produced a superior cement for hydraulic works, but a commission report took the reverse view, and actually recommended that magnesian cements be barred from use. In the United States Q A Gillmore challenged the stance of the French commission and pointed out that the most reliable local limes, under the various Rosendale brands, were from magnesian stone.

Specimens of newly discovered limestones were tested by J G Knight in a small kiln set up for the purpose in 1859, and produced a hydraulic cement. Amongst these, it seems, were the ‘shelly or magnesian’ limestones used in combination with ironstone to produce a cement according to a patent taken out by T P Edwards in 1862. Edwards seems to have referred to two different stones, a shelly limestone from the coast near Geelong and elsewhere, and a magnesian limestone or dolomite discovered in the excavation of the Reilly Street drain at Collingwood. Although the latter was reported in the *Australian Builder* as a likely source of ‘good artificial cement’, it seems to have contained such a mixture of ingredients as to be almost a natural cement stone, and was clearly inspired by the success of magnesian cement in India. Edwards was followed by W H Hughan, who made two patent applications, of which one was granted, for a cement using clay and quartz tailings. The other, for ‘Hughan’s Portland Cement’, was refused in 1861.
probably because it used magnesian clay and was similar to Edwards’s patent.188 It would seem that it should not be regarded as a Portland cement, but it is not clear whether Hughan was a local resident or an overseas applicant.189

Artificial cement

Portland cement was generally available in the Australian colonies by the middle of the nineteenth century,190 and was imported in increasing quantities for the next 40 years. It was first listed in Melbourne in 1857,191 but the Co-Operative Society of Plasterers had in the previous year recommended it as the best material for external use192—doubtless meaning render or stucco. In March 1857 Charles Laing specified it for the stucco of buildings at Brighton,193 and it was also used at ‘Glass Terrace’, Fitzroy, built in stages during the 1850s, where it survives.194

In 1862 Dyer’s Lime & Cement Stores, of Melbourne, advertised four British brands: Wouldham’s; Knight, Bevan & Sturges’s; White’s; and Hilton’s.195 In 1863 the Sydney importer Richard Wynne negotiated with another manufacturer, Booth & Co of Borstal, on the Medway near Rochester, in Kent. He was concerned with issues of quality, price, freight rates and quality of barrels,196 but there is no positive evidence that anything came of this, for there is no report of the use of Booth’s cement in Australia. In 1871–72 Portland cement was used at the Alfred Graving Dock in Williamstown, though the fact that contemporary reports mention only ‘hydraulic cement’197 suggests that a common terminology had not gained currency. In Darwin Portland cement was used by J G Knight for concrete flooring and for the foundations of government buildings, as mentioned above, notwithstanding the fact that shell lime could be obtained locally and was used in other parts of the same buildings.

In 1881 the current prices listed in the Australian Engineering and Building News named three British brands, Knight Bevan’s, White’s, and Gostling’s,198 and the current price list in the Australasian Builder & Contractor’s News in 1888 named ‘British Lion’, ‘Tunnel’, Hilton’s and Francis & Co’s ‘Nine Elms’.199 But this gives no idea of the range available. Nearly 50 imported brands, mostly British but some German, were either advertised locally or shown at trade exhibitions in Australia by 1888. There are in fact only a handful of British brands which are not recorded in Australia, amongst them: Ashton & Green’s ‘Castle’ brand;200 that of Coles, Shadbolt & Co;201 ‘Earle’s’, by Thomas & George Earle of Hull,202 and the Rugby Portland Cement Co’s ‘Rugby’ brand.203

These imported cements continued to be used quite routinely well into the twentieth century—Knight Bevan Sturge’s, for example, was specified for additions to a Melbourne shop in 1907,204 and was used again in Australia’s most remarkable reinforced concrete structure, the Dennys Lascelles Austin Wool Store at Geelong, of 1911.205 It is presumably the ‘K.B.’ cement still being advertised by James Moore & Sons in 1913, along with a previously unrecorded ‘Black Eagle’ brand.206

189 Hughan was later to obtain a British patent for the use of Portland, Roman and other cements in deodorizing works: Great Britain, patent no 2893 to W H Hughan, 19 September 1868. Also related patents, no 67, 8 January 1879; no 3060, 30 November 1871; no 2700, 20 August 1873; and no 1959, 5 June 1874.
190 For example at Adelaide in 1851: Colonial Architecture in South Australia, p 107.
195 Mayes, Australian Builders’ Price-Book (1862), p viii.
196 Information from Irene Wynne, 7 September 2004.
198 Australian Engineering and Building News, 1 May 1881, p 216.
199 Australasian Builder & Contractor’s News, 22 December 1888, p 582.
200 Ashton & Green, Limited, p 20.
201 Said to have been established in 1850: Building News, 20 April 1888, p xxvi.
203 Building News, 20 April 1888, p xxvi.
204 Flannagan, ‘Shop Additions in Heidelberg Road, Ivanhoe’, p 18.
205 Stone, Reinforced Concrete in Australia, p 11.
The prominence of German brands reflects the position in Britain itself, where A C Davis complained of the fact that ‘our Continental neighbours’ were now making a first class cement at a price low enough for it to be shipped ‘not only to this country [Britain] but to the very centres of the export and colonial trade which English manufacturers once thoroughly relied upon as their own market.’207 The importation of German cement to Australia was worth £20,000 prior to World War I, but then decreased to zero, whereas imports from Denmark rose from £261 in 1914–15 to £20,502 in 1915. This gave rise to the not unnatural suspicion that the German product had simply been rerouted. However, the Danish Consulate pointed out that there were large cement works in Denmark, and that the establishment of a direct steamship service had enabled the product to be brought onto the market. There was no possibility that any was of German origin.

There seem to have been substantial differences between the brands, not merely in terms of their engineering properties, which were rarely critical before the advent of reinforced concrete, but also their appearance. A major function of Portland cement in the 1870s and 1880s was the surfacing of buildings and the casting of architectural ornaments. The specification for a South Australian bank in 1878 directs:

Every care must be taken in putting on the last coat to keep it of a uniform tint. “Goslings” [sic] or “Johnstons” [sic] brand is to be used in the setting coat, and in the event of this not proving satisfactory to the Architects the work must be neatly distempered of an uniform approved tint.208

It is impossible to define the point at which a true artificial cement was manufactured in Australia, still less one that can reasonably be described as ‘Portland’. Hughan’s patent of 1861 had in fact used the word, and was an artificial mixture. The Schnapper Point company’s cement was certainly an artificial mixture. In 1871 the word ‘Portland’ again appeared in the patent of W H Malyon,209 but whether this was of local origin is unclear. In 1873 J M Robertson, who had previously patented a way of manufacturing hydraulic cement, received a further patent for improvements in the manufacture of hydraulic or ‘so-called Portland cement’. Infusorial limestone from Waurn Ponds, Moorabool or elsewhere was ground with basalt in a ratio between 2:1 and 4:1, mixed with water, formed into bricks, calcined, and ground again into powder.210 The first sustained attempt at artificial cement manufacture seems to have been made in South Australia. William Lewis, a limeburner, is said to have experimented for some years with mixtures of limestone and clay, and at last produced a material which was claimed to be ‘but little inferior to Portland cement’.211 On 12 December 1882 Lewis’s Marino Cement Works were opened on the 39 hectare site at Brighton. The new venture struggled financially, unable to compete with imported cements, and closed down in the following year, but new works were to be built on the same site in 1892. These used the same raw materials, and more than a million tonnes of Portland Cement were produced there in the ensuing 60 years.212 The Cullen Bullen Company claimed to have made Portland Cement in New South Wales in 1884, though they did not achieve commercial production for some years.213 The more or less enduring enterprises were: in Victoria, the Australian Portland Cement Co set up in 1889, and the Victorian Cement Works in 1890; in South Australia, Shearing’s Portland Cement Co in 1892 (which immediately became the South Australian Portland Cement Co); and in New South Wales, the Cullen Bullen Lime and Cement Company (later Commonwealth Portland Cement) in 1889 and Goodlet & Smith, who began production in 1893.216

207 Davis, Portland Cement, p 1.
209 Victorian patent no 1548 to William Henry Malyon, 29 August 1871.
210 Victorian patent no 1725, 1725A to James Moeller Robertson, 29 January 1873.
212 Penn, How Firm the Foundation, passim.
214 The company was apparently established at Portland in Western Victoria, but leased land at Fyansford near Geelong, with limestone available not far away at Batesford. It did not come into production until well into 1890, Australasian Builder & Contractor’s News, 7 December 1889, p 192.
216 Goodlet & Smith commenced production at their Granville works in 1893 under the ‘Rock’ brand. The cement was burnt from limestone brought by rail from Mudgee, where the company owned large deposits, using patent kilns and, from 1901, rotary furnaces. Johnson, ‘Goodlet and Smith’, pp 2, 6.
Local stucco

The British tradition of plastering materials such as wattle and daub was naturally transmitted to Australia. But the distinction between the vernacular and the high style was not maintained, for Australian vernacular examples might be ruled in imitation of masonry just as in more pretentious buildings. Most of this work was the result of habit and tradition in the truest vernacular sense, and we have very little documentation of it, but a certain amount can be learnt from inspection.

Peter Cunningham advised an external plaster for slab houses consisting of ‘alluvial soil, mixed with a portion of cow-dung to prevent it from cracking, and with chopped straw to enable it to adhere.’217 ‘Hawthorn Bank’, Port Albert, Victoria, is a wattle and daub building possibly dating from the 1840s, and a close examination of the daubed or rendered surface shows that it contained animal hair and probably a significant proportion of lime. Although few have been closely investigated, many examples seem to be similar, amongst them Leschenault House, Western Australia (since clad over in weatherboard).

A now demolished pair of houses in Vine Street, Ashfield, Sydney, was built by a German in the 1850s and presented a very convincing face of stucco ruled as ashlar, though underneath it was a building of fachwerk and lehmwickel. Around Wattle Flat, Hill End and Gulgong is a strong school of pole and pug construction, which, as indicated in the Holtermann photographs of 1872, was sometimes daubed very crudely, but in other cases ruled perfectly as ashlar.

217 Cunningham, Two Years in New South Wales, II, p 162.
A composition, or ‘compo’ as it was known, of sand and hydraulic lime or cement was the common material for facing brickwork. There were in theory ways of producing a reasonably durable stucco from a good common lime, and there is some evidence of this in Australia. The Settler’s Hand Book, of 1861, advised:

Take 56 lbs. [25.4 kg] of pure coarse sand, 42 lbs. [19 kg] of pure fine sand, mix them together, and moisten them thoroughly with lime-water; to the wetted sand add 14 lbs. [6.4 kg] of pure fresh burnt lime, and while beating them up together, add in successive portions, 14 lbs. of bone ash; the quicker and more perfectly, these materials are beaten together, and the sooner they are used the better, as they harden rapidly.218

Higgins’s cement was also claimed to be suitable, but if it was used in Australia at all it must have been quickly overtaken by Parker and Wyatt’s ‘Roman Cement’. The advantage of Parker’s cement, of Mulgrave’s Roman cement, and indeed of gypsum plaster, was that they set rapidly. Frost’s ‘cement’ (actually a hydraulic lime, though Frost did later produce a cement), was slower, especially as it was sometimes mixed with common lime. So was Bailey’s composition, a stone lime slaked immediately after burning and mixed with three parts of clean sharp sand.219 By the mid-nineteenth century the usual options for an external compo or stucco in Britain were Roman, Portland, Bailey’s, John’s, Brown’s or Robinson’s cement, and London builders often used the same materials for internal plastering, running cornices and casting ornaments.220

In external work the aim was always to imitate the appearance of stone, and a typical English specification for an exterior stucco surface the early nineteenth century was “to lath, lay, set, and colour stone colour ...”221 The addition of materials other than pigments is not recorded in Australia, despite the rich history of such mixtures.
overseas. The second government house at Parramatta, built by Hunter in 1799, had a stucco finish grooved to imitate stone, as will be mentioned below, and it would be of some interest to know what lime was used for it, or whether some of the new Roman cement was imported for the purpose. The locally burnt lime was of course not sufficiently waterproof to make a durable external stucco, and as soon as good bricks could be made they were adopted as the main material for important public buildings. This is characteristic of the work of our first important architect, Francis Greenway. It is by no means clear how a durable stucco was achieved in most early buildings, but it is notable that for two good quality terrace houses in Melbourne a specification of 1854 called for a stucco of Sullivan's artificial stone.222

These earlier buildings tend to be mainly flush-faced, but where mouldings were required, they could be formed in rough brick or stonework, just as for internal plastering, and then built up to the required profile. A good example of this is the Wesleyan Chapel in Paterson Street, Launceston, designed by Samuel Jackson in 1835. The front is a strange and vaguely Tudor Regency design with panelled pilasters. The side flank shows the same pilasters set out in brickwork for a render coat, which never eventuated. On the main surfaces a resemblance to ashlar masonry was commonly attempted by ruling the stucco in an ashlar pattern divided by shallow grooves, pencil or crayon lines, or both, and by colouring the surface, as will be discussed below.

Portland cement was to acquire its name in England because of its resemblance to Portland stone when used as a stucco. This was undoubtedly its major use in the Australian colonies as well, especially on important public buildings, such as the St Kilda Town Hall, Melbourne, in 1859.223 Cement might be used for the dressings only, but with the same objective of evoking the appearance of stone. Hornabrook's shops in Adelaide were completed in 1887 with a brick front and cement bands, dressings, cornices and pilasters, all coloured in imitation of stone.224 Most late nineteenth century buildings of any architectural elaboration depended upon Portland cement, either because they included castings and mouldings that required it, or because they were fully coated in it, as was the case with 'Mandeville Hall', Melbourne, in 1877.225 Indeed by this date Mayes could say that, for external work, stucco or lime plaster had been entirely superseded by Portland cement ‘compo’ in Melbourne and Sydney. Nevertheless, specimens of stucco 20 years old were to be found in Sydney, still in good condition, and in country districts where limestone was available, lime might still be the best material to use. If it were properly coated, and treated with chunam, it would be just as durable as cement compo.226 The word ‘chunam’ had a meaning other than its original Indian one—a fine plaster of shell lime, jaghery water [sugar water], egg white and ghee [clarified butter] in various proportions.227 Mayes meant a mixture of one bushel [0.36 m3] of lime to two gallons [9 l] of best ‘thin black oil’.228

Portland cement render, unlike earlier types, was commonly left in its natural colour, which itself depended very much upon the brand of cement used and the choice of the sand. In one instance, ‘Bvenveruta’ in Melbourne, the work was formed using Knight, Bevan & Sturge’s, the leading British cement, but finished in the German ‘Stern’ or star brand, with different sands in the two mixes, and with the finished surface ruled as blockwork:

The whole of the outside cement work to be
Worked in Knight Bevan’s and finished in Star brand,
composed of three parts of washed Sandridge sand
with one of cement for the first coat and two parts
of washed Caulfield sand with one of cement for the
fining. To cement in two coats as above described,
the whole of the external brickwork (excepting back
calls of the main building above conservatory roof
and to outbuildings) also inside walls of Conservatory
and face of retaining wall to same also insides and
tops of parapets and shafts of chimneys. The whole
finished to an even thickness of ½" and to a uniform

References:
221 Loudon, Cottage, Farm, and Villa Architecture, § 830, p 421.
223 Australian Builder, 24 December 1859, p 409, quoting the St Kilda Chronicle.
224 Australasian Builder & Contractor’s News, 3 September 1887, p 267.
226 Mayes, Australian Builders’ Price-Book (1877), p 85.
227 Smith’s note in Vicat, Calcareous Mortars and Cements, p 136.
228 Mayes, Australian Builders’ Price-Book (1877), p 97.
colour, all to be block lined (with the exception of the insides of parapets) including cross joints to all mouldings and arches. The whole of the face mouldings to be run clean and sharp and all work to be of an even colour and well watered at the various stages of progress.229

**Practice**

For Australia, the first detailed account is that of Robert Haddon:

Outside cement work of all kinds is best done in damp weather, freedom from actual rain or frost on the one hand, and from excessive dryness on the other, being advisable.

Cement work should always be kept damp. The surfaces upon which it is laid should be wetted, and if practicable, rough to form a good key, and the work should be kept moist for at least seven days after completion.

... In all cement work the nature and character of the Portland cement used should be ascertained, as the strength and time of setting varies greatly in this article. Coarse sand is best for first coating, and fine washed sand for finishing.

The following is a workable recipe: - First coat (‘floating’). — Four parts of sand, one part of Portland cement, gauged clean and used fresh and laid evenly on to the walling in a ¾-in. [19 mm] thick first coat.

After first coat has set, second coat (‘finishing’), with a ¼-in [6 mm] thick finish, compounded of 2½ parts fine sand to one of cement.

The finish may be brought to hardiness by the steel trowel or to a granulated (sand) surface by wood float.230

Nangle differs from Haddon in minor respects. He recommends sand-cement ratio of 3:1, or 2:1 for arrises and exposed portions, or in first class work 2:1 throughout. The rendering is usually put on in a single ¾ in [19 mm] layer, but sometimes a ¼ in [6 mm] outer coat is used.231

**Finishes**

As in Britain, ashlar ruling was common, for example, in John Lee Archer’s work in Van Diemen’s Land. Specifications rarely give any details of this ruling process, but say something like ‘well hand floated trowelled rubbed up and lined off as may be directed by the Architects.’232

To further improve the effect, an appropriately coloured sand could be used in the mix, a pigment could be added, or a wash applied to the surface, to create an effect even more like that of freestone, more especially the Portland or the Bath stone favoured in Britain.

At Old Government House, Parramatta, the rear extension of the building built in 1815 fortuitously preserved some of the wall surface of 1799, which is ruled as ashlar and mottled or daubed with an ochre tint in a rather crude way, though it may have looked well enough at a distance. At ‘Pontville’, Doncaster, Melbourne, of the 1840s, a section of the external stucco was preserved above a false ceiling built into a verandah, and the surface is similarly ruled but uniformly coloured with a warmish brown tint. No doubt there is some change and deterioration in such finishes, as in all others, but enough examples survive (more usually exposed by peeling paint), to suggest that this was fairly standard. I would cite ‘Mountford’, northern Tasmania, 1830s onward; the upper window architraves of the original portion ‘Glass Terrace’, Fitzroy, about 1853; and the former Volunteer Arms Hotel, Port Fairy, of 1868. At the original hospital, New Norfolk, Tasmania, a large area of ashlar ruled stucco remains, though it probably dates from the 1850s rather than from Archer’s original building. Beneath the verandah, the joints are picked out in white, while above they are reported to be simply ruled (unless this reflects erosion of the exposed areas). Blind windows are painted in trompe l’oeil effect, a practice that was probably fairly common in Australia, though few survive.

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229 Law, ‘Specifications ... for Mrs. L. Abrahams’, p 44.
230 Haddon, Australian Architecture, pp 490-1.
231 Nangle, Australian Building Practice, p 397.
Old Government House, Parramatta, NSW: part of the rear wall of 1799, covered over in 1815. Mary Lewis

Pontville’, Doncaster, Victoria: 1840s: detail of original stucco. Miles Lewis

Stucco surface exposed by peeling paint at the former Volunteer Arms Hotel, Port Fairy, of 1868. Miles Lewis

‘Mountford’, Tasmania, c 1830s: detail of original stucco exposed by peeling paint. Miles Lewis
In Australia the Settler’s Hand Book of 1861 proposed colouring stucco with a distemper made of skimmed milk, quicklime, linseed oil, and a colouring agent such as whiting or ochre.\(^{234}\) A better guide to general practice is ‘Altyre’, a stuccoed house in Melbourne, which was specified in 1889 to be refinshed with ‘best weatherproof colour set with tallow + copperas [iron sulphate] or other approved ingredients’.\(^{235}\) Twenty years later Robert Haddon described as typical ‘a mixture of lime, colouring matter, and a fixer such as copperas or salt.’\(^{236}\) Various proprietary washes were marketed in England for use on stucco, to enhance its resemblance to the more fashionable building stones, some of them actually

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235 Beswicke & Hutchins, ‘Painting “Altyre”’.  
236 Haddon, Australian Architecture, p 498.
containing cement, with or without size, and others based upon materials such as plaster of Paris or lime. To what extent they were used in Australia is uncertain, but the best-known brand, John's Patent Stucco Wash, was marketed in Melbourne by Dickson, Williams & Co.

As more sophisticated cements became available they were sometimes combined to create a colour scheme in their own right, just as was done with hard plasters internally. The specification for ‘Bvenenuta’, quoted above, is an example of this. Even where the surface remains exposed it is rarely possible to read such a scheme today, though I know of one example where it is more or less discernible, doubtless preserved by the clean country air: ‘Noorilim’ at Goulburn, by James Gall, of 1878–79. John Sulman referred in 1887 to shops in Bond Street, Sydney, where ‘the mouldings and their ornaments are run in a white cement in contrast with the plain grey of the body of the walling, and the effect is by no means unsatisfactory’.

But, while some buildings were left with their original cement coatings, tinted or otherwise, there were those who felt that paint was essential, though this would not be done for the first few years. When the ‘exterior cement plaster’ of the Royal Mint at Melbourne began to crack within 10 years of its application, this was attributed to the lack of painting. The Public Works Department asserted that ‘plaster facings’ should receive at least five coats of paint after three years, and after that a coat every two years. The paints were generally designed to evoke the colour of freestone, and one should not forget that they were sometimes sanded to give them a greater verisimilitude. In the United States A J Downing said ‘Stuccoed or cemented buildings should be marked off in courses, and tinted to resemble some mellow stone; Bath, Portland stone, or any other of the light free-stone shades, are generally most agreeable.’ He even went so far as to illustrate such tints, probably for the first time in published form.

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237 Hasluck, Cassell’s House Decoration, pp 159–60.
238 Builder [UK], XI, 539 (4 June 1853), p 367: it came in a stone colour, but could be tinted to different colours, and was recommended as an improvement over common lime wash or water colour.
239 Mayes, Victorian Contractors’ Price-Book (1859).
241 Argus, 10 February 1882, p 1.
Moulding and casting

The whole system of enrichment used in the boom style was dependent upon the introduction of reliable cements. Earlier and simpler stuccoed buildings might have been enriched with a cornice, a row of dentils, a name plate and modest scrolls or modillions. We know in some cases, and can reasonably assume in all, that these were done in a higher quality lime or cement, usually distinct from the material used in the body of the work. But with the widespread use of Portland cement any part of the building could be enriched, and often was.

External cornices were run in much the same way as internal ones, the rough shape being first formed in the brickwork of the structure. If this was done in rough stone rather than brick three coats might be required, but according to Haddon two were the norm, ‘the stuff being gauged not too rich, otherwise fine cracks may occur’.242

A good example of brickwork prepared for the purpose, with projecting courses roughly hacked to shape, can be seen in the Greek Orthodox Church, Victoria Parade, East Melbourne, by Walter Butler.

As indicated above, incised decoration, in which a decorative pattern of linework is recessed into the face of the render, is an enigma so far as documentary sources go. There is a traditional type called ‘impressed plaster work’, but unfortunately, though Millar’s chapter on Portland cement facades promises a discussion of this in the contents, it does not actually appear.243 However, craftspeople can still do it, and Barrie Cooper explains elsewhere that the pattern is pounced onto the surface, and the design cut out with an implement while the render is stiff but not yet hard.

In 1864 the Corinthian capitals, urns and modillions of the Launceston Town Hall were cast in Portland cement. They were first modelled in a very fine pipeclay from Cataract Hill, then a plaster cast was made, and this then used to create the cement versions. It was reported, somewhat over-optimistically, that this novel material would be denser and more indestructible than freestone ‘as the elements which wreak such certain decay on every species of freestone seem to have no effect on the manufactured Portland cement.’244

In the 1880s ‘Patent Victoria Hydraulic Freestone’ was marketed in Melbourne by a company of that name, and this also seems to have been based upon Portland cement.245 It was used especially by the Melbourne architects Crouch & Wilson, for water tables.

242 Haddon, Australian Architecture, p 491.
243 Millar, Plastering Plain and Decorative, p 187. Millar does refer on p 25 to the impressed plaster of the 12th–13th centuries, but it appears to be literally impressed, rather than incised, presumably with moulded forms rather than sharp edges.
244 Cornwall Chronicle, 22 October 1864, p 4.
245 The material seems to be unconnected with the ‘Victoria Stone’ patented in England in 1868, which was made of granite chippings and Portland cement cast in moulds, then steeped in ‘a solution of silica’: Papworth, Dictionary of Architecture, sv Victoria Stone.
and other details of their many churches. The material was first exposed to public examination in 1881 at the Artificial Stoneworks at the corner of St Andrew and Church Streets, Middle Brighton. It was reported to be manufactured according to R H Stone’s patent. The architect Michael Egan appears to have been an active partner, and Charles Webb and Evander McIver are referred to as well.246 The works were moved two years later to Sandridge [Port Melbourne], where they were officially opened on 1 October 1883.247 The patentee was apparently a local man, R Holden Stone, for he wrote to the Argus to state that no chemicals were used in the process, and that therefore, unlike other artificial stones, no soluble salts were produced.248

The scientific community was enthusiastic. J Cosmo Newbery found that the stone:

contains no soluble constituents which would cause disintegration, or exfoliation, and that the more it is exposed to moist atmosphere the harder it becomes; in fact the stone has hydraulic properties.


246 Argus, 5 August 1881, p 3.
247 Argus, 2 October 1883, p 9.
248 Argus, 3 October 1883.
249 To Architects, Contractors, &c.
R W E McIvor also found that it seemed to harden during exposure, rather than to deteriorate, that it performed well under other tests, and that it was ‘admirably suited for building purposes’.

The first reported use of the Victoria stone was in the new premises of David Munro at 154 Queen Street, corner of Little Lonsdale Street, in 1882. It was used in 1884 for Terry & Oakden’s E S & A Bank, Brighton, and for Evander McIver’s Presbyterian Church, Brunswick. Also in 1884 T J Crouch mounted an appeal against the Melbourne City Council’s refusal to allow the use of the material in a city building façade, and surprisingly enough he was successful: the referees determined the material was a stone within the meaning of the Melbourne Building Act. The most extensive use of the material was in the Presbyterian Church in Alma Road, West St Kilda, built 1885–86 to the design of Wilson & Beswicke. The body is of bluestone, but the dressings, water tables, enrichments, mouldings, tracery and pinnacles, and the whole of the prominent spire, are of Victoria stone.

A material based upon Portland cement, like the Victoria Hydraulic Freestone, seems a natural enough extension of the earlier ‘artificial stones’ based upon lime or natural cement. Indeed, by the 1880s one hears little of specific patents, though the amount of ornamental cement casting increases exponentially, using the extensive range of Portland cements now available on the Australian market. Nor do we hear much of the specialist casters and modellers involved, though a fountain at 11 Redmond Street, Kew, probably contemporary with the house, of 1887–89, is branded:

L MURPHY C[...] D[...]

Haddon gave an account of the manufacture of enrichments and ornaments in what he called ‘pressed cement’:

The work is first modelled in clay and cast in plaster of Paris piece moulds, which are well coated with shellac. “Stuff” of Portland cement and sand gauged two or three to one is then mixed and pressed into the molds with ramming tools. When slightly set the molds are removed piece by piece, and the work laid out upon drying boards, trimmed, and afterwards kept moist by watering for several days until hard.

In gauging the cement and sand care should be taken to thoroughly mix the two, and to wet so that the mortar may be damp without being sloppy.

Pressed cement work may be attached to stuccoed surfaces with cement mortar, and strengthened with galvanized iron hooks, nails or clips.

The architect Norman Hitchcock, of Melbourne and then Fremantle, was one of the few whose ornaments are so characteristic that it seems certain that he owned not only the designs but also the actual moulds. His buildings in the inner suburbs of Melbourne are immediately recognisable by the combination of standard types of mask, vermiculation and swags, but most of all by the lush parapet scrolls with radially placed perforations and projecting spikes (which survive in rare cases). These scrolls are quite unknown in the work of other designers. A terrace of houses by Hitchcock in King Street, Fremantle, uses these scrolls and is almost identical to ‘Walkham House’, 902 Swanston Street, Carlton. A rather more specialised element used by Hitchcock is a cupid acting as an atlante, which appears in the former Buckley and Nunn building at 198–204 Faraday Street Carlton, of about 1886. It reappears more than 20 years later in George Street Fremantle, made almost unrecognisable by the change of context. Whereas the Carlton building was...
a lush Renaissance/Baroque confection entirely executed in cement, in Fremantle we are looking at a terrace of gabled, almost Gothic, red brick houses, in which cement is used only in the dressings. It is only the fact that Hitchcock signed the building that makes us confident that it is the work of the same man.

The most revealing document in this context is the specification for the Melbourne mansion ‘Benvenuta’, of 1891. It has particularly fine classical figures standing on the parapet, and the oral tradition that they were imported from Italy by the owners is more believable than in most cases, given that they were specified as being supplied by the ‘proprietress’, Leah Abrahams. A number of other details are specified, including the cornices with ‘modillions (face leaf planted on)’256 However all the other ‘enrichments’ of the exterior were provided by the local modeller Otto Waschatz—egg and dart mouldings and scrolls on the chimneys; large scrolls and a ‘loft’ on the tower; egg and dart and running leaf moulds on the tower cornice and architrave; an ornamental head, corners and festoons, also on the tower; balusters in the parapet; figure modelling in the pediments (partly detached); ‘small flower and leaf on plate’ in the pedestals; modillions with leaves planted on in the upper and lower cornices, distorted to suit the curve of the central pediment, with mitre leaves and acorn drops at the corners of the modillion course; further friezes, architraves, archivolts, spandrel sprays at the arch springings; corinthian capitals; enriched panels in the window spandrels; deep foliage and shell panels in canopies over doors and windows; an enriched impost course; festoons; and foliated keystones. There were also four stock vases to be provided by the principal contractor, not by Waschatz, with holes in the bottom to receive 3/4 inch [19 mm] galvanized iron pipe fixings.257 Truly, Portland cement must be seen as the main generator of the Boom Style.

Cement casting did not end with the Boom Style, but in the twentieth century the imperative was to achieve a better verisimilitude of real stone, quite distinct from the stucco tradition, and this was done by the use of colouring agents and crushed rock finishes. One such was the Architectural Pre-Cast Stone produced in Victoria and Tasmania by Picton Hopkins & Son, who stressed that the facing was cast integrally with the body of the block.258 Here, then, stucco facing and cement casting practice have entirely diverged, for simulating stone in the wall surface was now seen as a dishonest technique. The underlying concept of stucco had simply ceased to be relevant.

256 Law, ‘Residence for Mrs. L. Abrahams’, p 46.
258 Ware & Richardson, Ramsay’s Catalogue [1949], § 5/1; Ware & Richardson, Ramsay’s Catalogue [1954], § 5/1.