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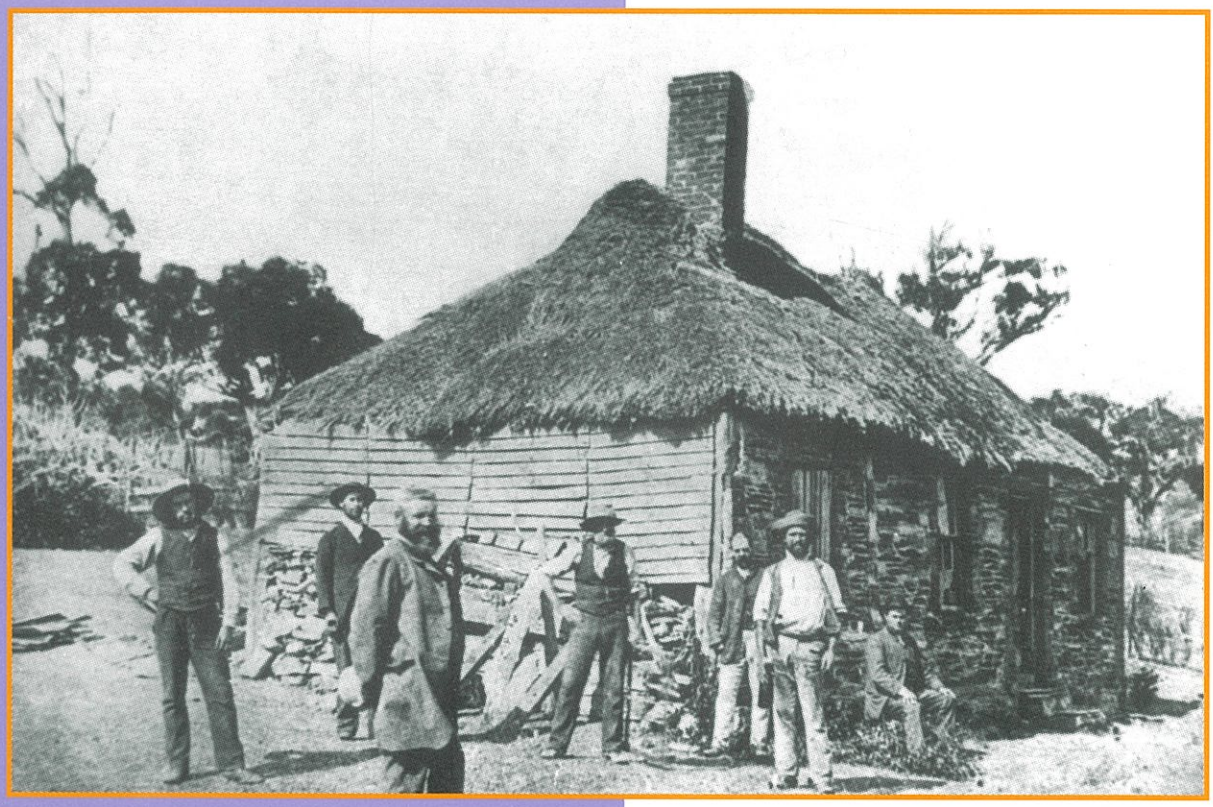

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EARLY ROOFING AND ROOF MATERIALS IN SOUTH AUSTRALIA

City of Adelaide

Heritage South Australia
Government of South Australia

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FOREWORD

We are delighted to introduce *Early Roofing and Roof Materials in South Australia*, another in the series of Heritage Conservation Publications produced jointly by the City of Adelaide and Heritage South Australia.

As the roof is one of the most important parts of a building, being the main protective element that keeps out the weather, its proper function is vital to the long term conservation of a building. It is also a major component in the external appearance of a building and, like many building features, is subject to changes in fashion and taste.

The conservation of our built heritage relies very much on the interest, commitment and goodwill of heritage building owners; as well as the skills and knowledge of the architects, builders and tradespeople who are involved in their maintenance.

This publication not only provides a fascinating history of early roof types and construction methods in South Australia, but also very useful and practical advice on how to maintain the historic appearance of a roof, and how to undertake repairs sympathetic to its age and character.

We trust you will find this publication as informative and interesting as we do.

Dr Jane Lomax Smith
Lord Mayor
City of Adelaide

Hon Dorothy Kotz MP
Minister for Environment and Heritage

1. INTRODUCTION

Overview

The roof is one of the most important parts of a building, being the main protective element which keeps out the weather. The roof provides physical shelter and a psychological sense of personal security and well-being.

The design of buildings and their roofs reflects the culture of the time and place. In terms of our built environment this has meant adapting a generally European tradition to the resources and climate at hand. When South Australia was first established, this meant coping in a relatively primitive manner. While the wealthy few could afford to import roofing materials such as slates or zinc panels (or even prefabricated buildings) from Britain, most early settlers had to make do with timber shingle roofs or anything else to keep the water out. For many this often meant bark or thatch.

As the colony grew, timber shingles gave way to corrugated galvanised iron and a wider use of roofing slate. Terracotta Marseilles tiles then became popular in the early Twentieth Century. Asbestos roofing was introduced circa 1909 and long-length metal roofing and the ubiquitous concrete tile after WW2.

Evolution in roofing technology has resulted in some curious roofing solutions over the years. For most people however roofing has always been a matter of finding a practical and cost effective solution. Today there is a wide range of roofing materials available. Sheet roofing materials predominate because of their economy and utility. Concrete tiles, the successor to the Marseilles tile, also remain very popular.

Fashion has also played an important part in the history of roofing, both in terms of roof design and roofing materials. The widespread use of Marseilles tiles at the turn of the century and in later years is a good example. These tiles, originally imported from France and then made locally, became very popular in Australia. Their present day successor, the concrete roofing tile, remains one of the country's most popular roofing materials.

Architecturally, roofs are important visual elements because they are usually major components in the external appearance of a building. The complex roof forms of Federation buildings and the elegant or even dominating 'flat roof' forms of many 1950-1960 'Post War International' buildings were key visual elements of those buildings. Conversely many 'Modern' buildings from the 1930's -1940's period often had hidden roofs, i.e. flat or low pitched roofs, screened from view by parapet walls.

What is evident is that the roof and its design are often key architectural elements which help determine the form and visual character of most buildings.

Today older buildings are more highly sought after and many owners seek to maintain and restore them in a way which retains or re-instates their historical integrity. Looking after the roofs of such buildings is usually the starting point of this process. Only when this is attended to can the rest of the building be considered with some certainty.

This Technical Note aims to provide a basic understanding of older roofs and how to maintain and repair them. It deals with roof cladding and associated external features and broadly covers the period from the start of the colony in 1836 through to the Second World War. As the extent of dilapidation and causes of decay vary greatly, this note can only represent an introduction to conserving roofs. It does not attempt to address all aspects of roofing dilapidation or deal with any considerations of internal roof structure. Expert advice should always be obtained for this. While emphasis is given to heritage-listed buildings, the principles set out in this booklet constitute good general maintenance and repair practice for most older buildings.

Conservation Principles

When considering the maintenance and repair of older roofs, it is useful to keep basic conservation principles in mind so that any work which is carried out can be done in a way which maintains the historic character of the original building and is consistent with the technology of its time. Such principles include:

Understand the Original Design

The starting point for any work on an older roof is to understand the original design, ie what sort of roof type is it; which elements make this up; how it has changed, if at all; what parts could be removed, what needs to be done now. Once this is obtained it becomes easier to understand the cause of any problems and to identify what work is needed to rectify them or restore the roof.

If it is difficult to understand the original design of a roof because of later changes, look at neighbouring or nearby buildings of a similar age and design. These often retain the original design and will help understand the roof concerned.

Identify the Original Fabric

It is always very useful to understand which parts of the roof fabric form part of the original roof and which parts are later repairs or additions. Knowing this will assist in deciding how any repair or restoration work should be done.

Maintain the Original Roof Design

Where possible the original roof design should be maintained and restored. This ensures that the integrity of the original building design is maintained and that its historic character is not compromised. Inadequate original roof practices should be identified and if necessary put right in a way which maintains the building's historic character.

Repair Original Fabric Where Possible

The original roof fabric on older buildings should be retained and repaired wherever possible. This will retain the roof's patina of age and maintain its historic character.

For example, this is particularly important with verandah roofs where the original single length corrugated sheeting may be dented or out of alignment but is other-wise in reasonable condition. Depending upon the severity of the denting, the cladding may be just left as it is, taken off and re-rolled or replaced with new or secondhand corrugated steel. Another seemingly attractive possibility would be to re-roof the entire verandah with new custom-orb. While there may be occasions where this is the best option, owners should be aware that the Australian Building Code may require additional roof structure if the entire verandah is to be re-clad, whereas this possibility will not arise if only a few existing sheets need to be repaired or replaced with new. This is required for two reasons, ie present day corrugated steel is different to the old corrugated iron, and current building standards are higher than last century. Additional structural support may require a whole new rafter and batten system where none existed before.

A certain amount of wear and tear is quite acceptable and can significantly add to a building's historic character.

Re-roof with the Same Materials

If a roof needs to be entirely re-clad, then use the same material and details as the original. If this is not possible, consider using a compatible material which maintains the historic character of the house. In many cases natural galvanised corrugated steel will be appropriate for roofs and verandahs. Corrugated iron and corrugated steel has been used widely for roofing in South Australia since the 1850's. It 'dulls off' with age and develops an attractive rough texture which collectively give the roof an attractive patina and feeling of age.

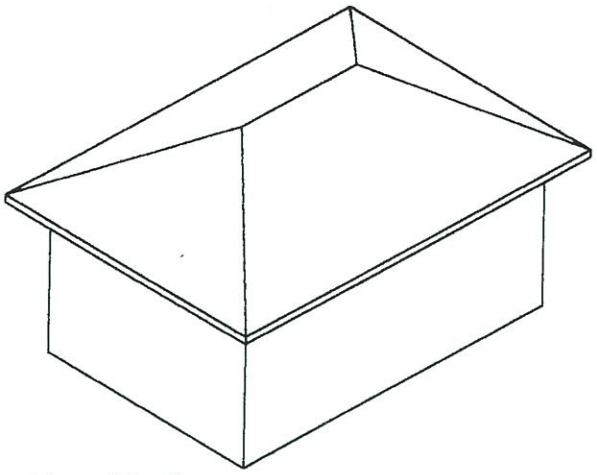
Image courtesy of State Library of South Australia Ref: B12373

This early photograph dates from 1890 and shows the first "Bush Inn" in the High Street at Willunga in 1839. It has a thatch roof, slate front wall and stone-timber side walls. This eclectic mix of materials is typical of many very early buildings in South Australia and indicative of the primitive nature of many of the very first buildings erected, few of which survive today. Its thatch roof reflects the choice of building materials available locally.

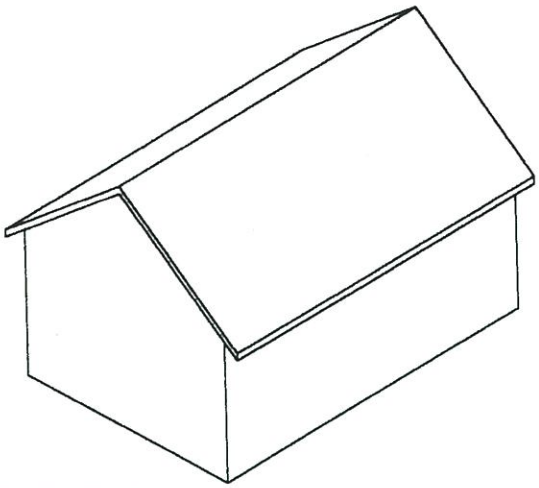
Common Roof Types

While roofs come in all shapes and forms, most common roofs are derived from one or a combination of a small number of roof types which have existed for centuries or longer. The gable roof, hipped roof and lean-to roof (or skillion) are three of the most enduring. These roof types and other common roof types are illustrated on the next two pages. Less commonly used roof types such as Mansard or butterfly roofs are not shown.

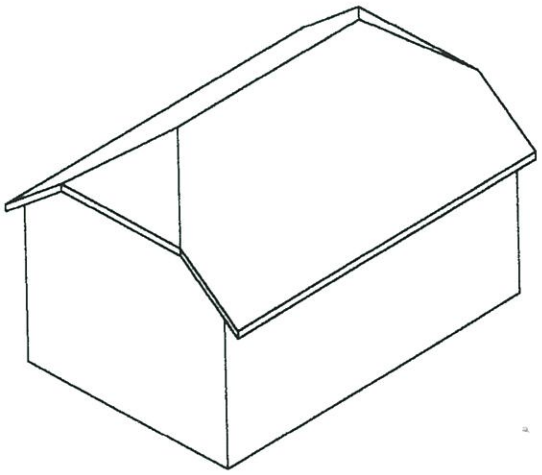
Common Roof Types



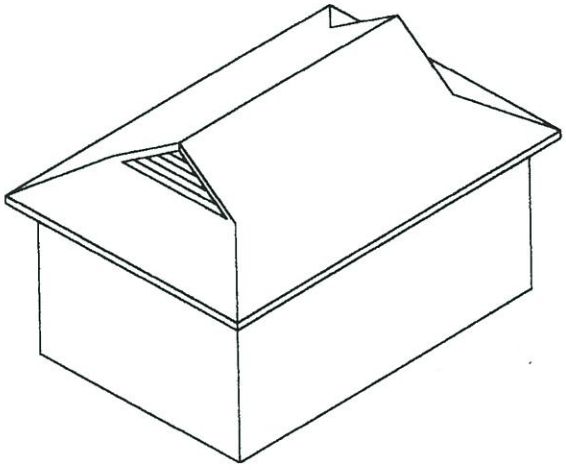
Hipped Roof



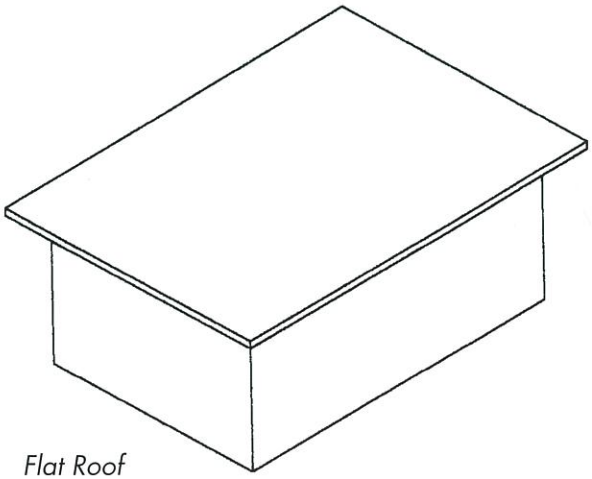
Gabled Roof



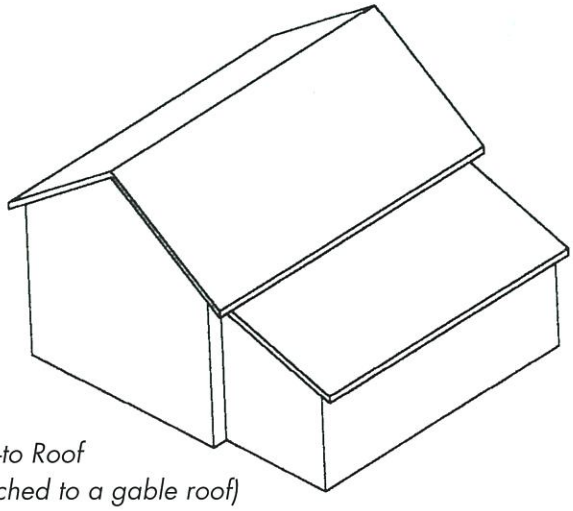
Dutch Gabled Roof



Louvred Hipped Roof
(also called a gambrell roof)

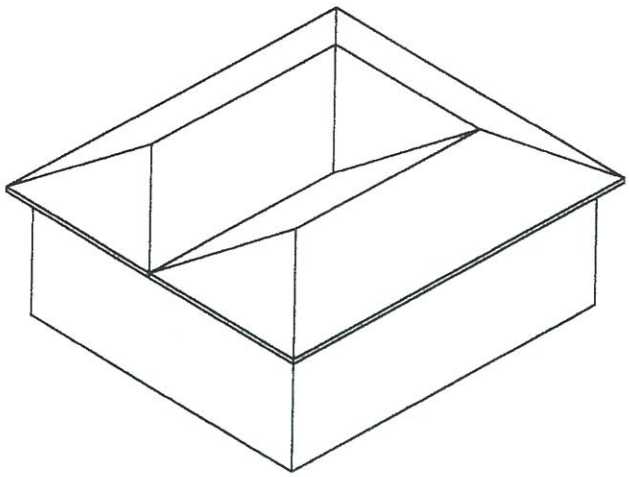


Flat Roof
(with broad overhangs)

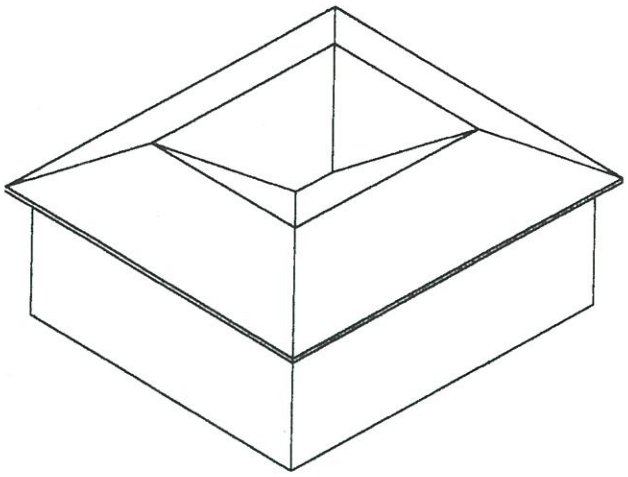


Lean-to Roof
(attached to a gable roof)

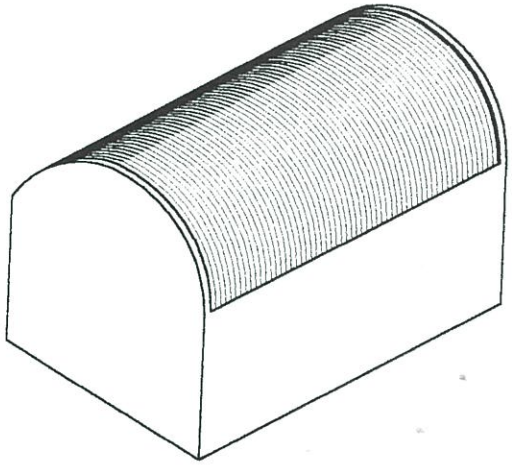
Common Roof Types



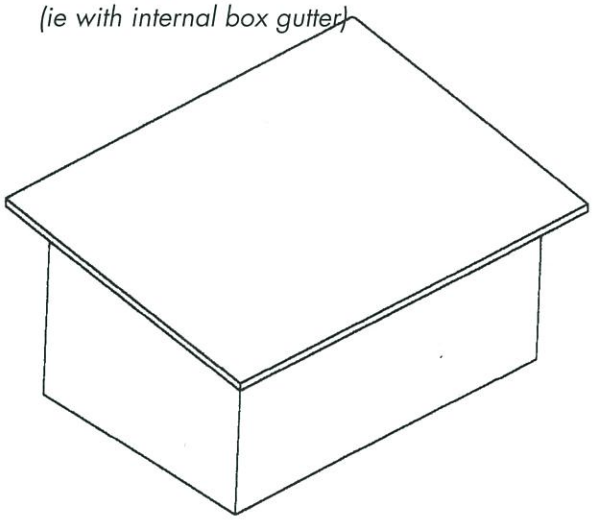
Double Hipped Roof
(also called an "M" roof)



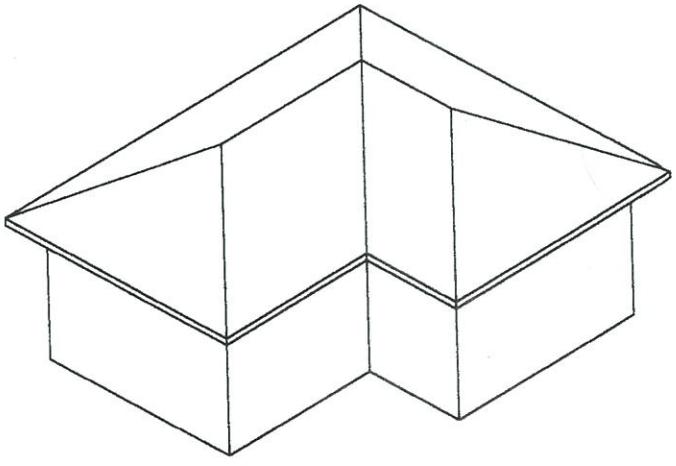
"Well" Hipped Roof
(ie with internal box gutter)



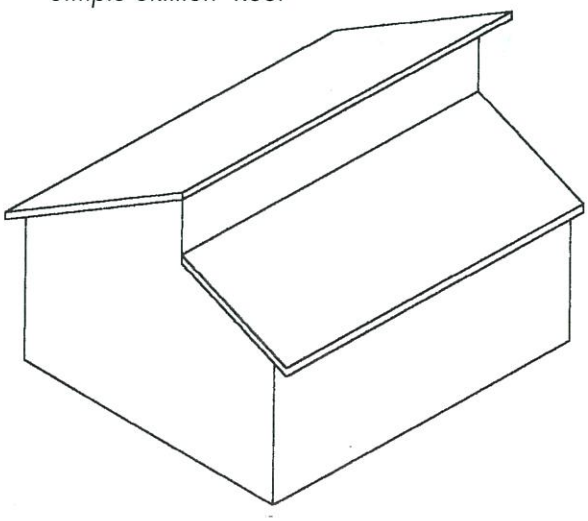
Barrel Vaulted Roof



Simple Skillion Roof



Multiple Hipped Roof



Asymmetrical Skillion Roof
(with clerestory window)

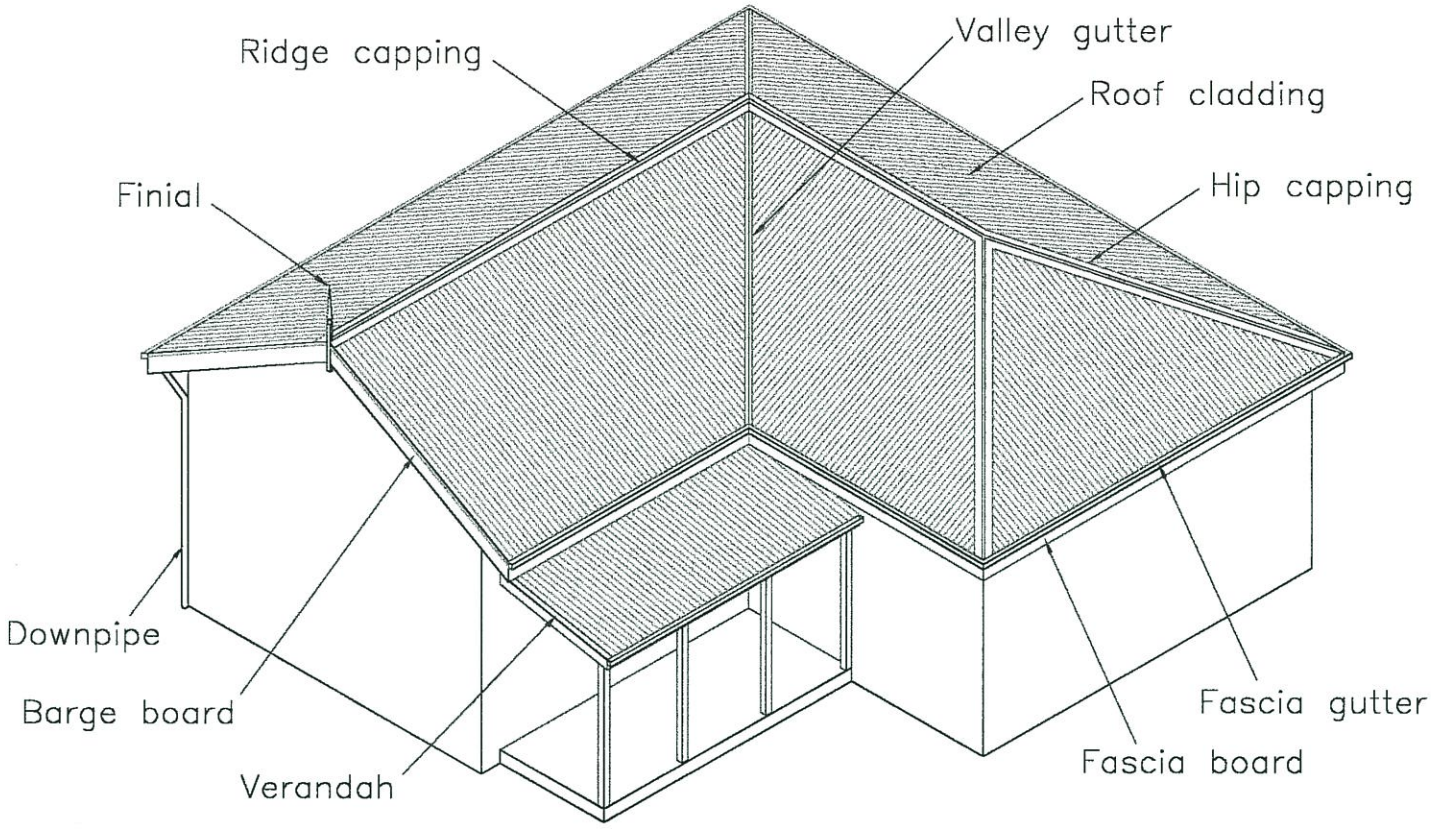
Examples of Local Roof Types

Gable roofed cottage in Willunga

Hipped roof shop in Alberton

Gambrel roofed house in Pennington

Roof Elements



This shows the main parts of a roof

Glossary of common roofing terms

Acroteria:	Decorative element on the ends of gutters. Usually cut to a profile from sheet galvanised steel.
Apron Flashing:	Horizontal flashing installed at the top of a roof slope where it meets a parapet wall or chimney.
Barge Board:	Projecting board closing off the edge or end of a gable roof, ie overhanging the end of a gable. Sometimes decorated.
Barge Capping:	Material used to close off and weatherproof the end of a gable. A long piece of timber or metal is usually used, fixed to a barge board.
Box Gutter:	Internal gutter usually located between two sections of sloping roof.
Capping:	The material used to close off and weatherproof the junction where two elements of a roof meet, eg a ridge, barge or hip capping.
Downpipe:	A pipe used to carry water from a gutter down to a stormwater drain.
Eaves:	Underside of a roof overhanging a wall, usually enclosed.
Fall:	Pitch or slope of the roof or gutter.
Fascia Board:	Horizontal timber board at bottom of rafters supporting the gutter. Used to close off gaps between rafters when directly abutting a wall.
Finial:	A vertical decorative element used at the tops of pinnacles and gables. Usually made from timber but stone and metal also used.
Flashing:	Sheet material used to waterproof a junction between two inter-secting surfaces, eg a roof abutting a wall or vent pipe or chimney.
Gable:	A triangular end or element of a wall, following the line or shape of the roof from the eaves to the ridge.
Gutter:	A channel used to collect stormwater and direct it to downpipes.
Gutter Boards:	Boards located under internal gutters eg valley gutters or box gutters to give support and ensure proper long term falls.
Gutter Brackets:	Metal brackets used to locate and support gutters.
Hip:	A sloping ridge formed where two inclined roof surfaces meet.
Pop or dropper:	A short length of tapered downpipe fixed to a gutter at the point where water is discharged from the gutter into a downpipe.
Overhang:	The distance a roof projects out beyond a wall.
Parapet:	A low wall located on the perimeter of a building, projecting above the line of the eaves . Usually an extension of an outside wall.
Pitch:	Slope or fall of a roof. Usually expressed as an angle or ratio.
Rainwater Head:	A box shaped receptacle used to collect stormwater from gutters and direct it into downpipes.
Roof Cladding:	Material used to clad the roof.
Ridge:	The highest part of a roof, usually at the apex of a truss or where the main rafters meet.
Ridge Capping:	The material used to close off and weatherproof the top junction of where two inclined planes of a roof meet.
Scotia:	A concave timber moulding used under gutters to locate, establish correct falls and give some support to gutters.
Soaker:	A flashing used to create a small gutter on the upper side of elements which penetrate the roof, eg the high side of chimneys .
Stop End:	The closed end of a gutter.
Spreader:	A horizontal section of downpipe, usually with holes in it, attached to the bottom of a vertical downpipe and used to distribute and spread out storm water from above onto a lower roof.
Valley Gutter:	Gutter at intersection of two internally sloping roof planes
Eaves gutter:	Gutters attached to the fascia or barge.
Vents:	Openings in roofs to allow the passage of air, eg a small gable dormer on older buildings or vertical pipes on more recent buildings.
Verge:	Extreme edge of a roof, eg where tiles protrude over a wall below.

2. ROOF MATERIALS IN SOUTH AUSTRALIA

Introduction

When South Australia was first settled by Europeans the early pioneers had to build their houses and other buildings as best they could. The choice of roofing materials was limited. The wealthy used roofing slate, zinc tiles and lead shipped out from England. The less wealthy used thatch, timber shingles or even bark, i.e. whatever was at hand was used. Many first arrivals simply used tents.

Timber Shingles

The most widely used roofing material in the early years of the colony was the timber shingle. This was the common name given to both machine-sawn timber shingles and hand-split timber shingles. These were cut from local timber and can still be seen on many older cottages, particularly under corrugated iron applied over shingles as a later 'improvement'.

Shingles were made in various sizes. Two common sizes used in South Australia were 460mm long by 200mm wide and 750mm by 170mm. Shingles were usually cut from local Eucalyptus. Stringybark and Casuarina were widely used in the eastern States. Shingles could last up to twenty or thirty years, depending upon exposure, roof pitch and local weather conditions .

Kensington and Norwood Council Historic Photo Collection

Cottage with timber shingle roof

Roofs constructed from shingles were usually simple hipped or gable roofs without gutters. The shingles were laid in alternating layers in much the same way as slates and terracotta tiles were laid, building up a two or three ply thickness. No finish was applied, so the shingles weathered to a silver-grey colour. Ridges were formed in several ways, ie by inter-weaving shingles, by using timber boards to make up a 'capping', and by using imported or local galvanised iron ridge capping. Lead cappings were also used occasionally on very early roofs, dressed over a traditional timber ridge roll.

Using shingles lasted into the 1890's, particularly in rural areas. However in the city their use ceased in 1858 when the City of Adelaide banned the use of such flammable roofing materials.

Thatch

Thatch was also widely used in the early years of the colony, with straw, reeds and native grasses being commonly used. Necessity, economy, its natural insulating qualities and the ready availability of thatching materials in some localities made it popular in rural areas of South Australia. Thatching methods and practices usually reflected those from the settlers homelands, often British regional areas or parts of Europe.

Thatch was inferior to shingles and decreased in popularity once more economical roofing became available. It was also highly flammable and attracted rodents. Like timber shingles, its use in metropolitan Adelaide ceased in 1858 when the Adelaide City Council banned such materials for use in buildings.

Thatch continued to be used in country areas however on secondary buildings and structures such as barns and shelters, mainly for reasons of economy and habit, well into the Twentieth Century. Thatch can occasionally still be seen today on older farm buildings in South Australia.

Slate

Slate was discovered in South Australia at Willunga in 1840. This resulted in a good supply of roofing slate for Adelaide and surrounding areas very early in the life of the colony. Slate quickly became a popular roofing material in those areas near suitable quarries. As it was a common roofing material in Britain and Europe, there was a ready supply of tradespeople among arriving settlers to lay slate roofing. While more expensive than timber shingles, slate came to be used widely throughout South Australia.

Roofing slate suited the aesthetic ethos of the Victorian period which was pre-occupied with detail and decoration. It could be used in a variety of patterns and incorporate contrasting patterns or bands of different coloured tiles. Slate roofing became very popular and was widely used up to the turn of the century and beyond, on all types of buildings.

Roofing slate came in a range of sizes, colours and quality. All the usual traditional English sizes were available, e.g. Countess, Duchess, Viscountess, Ladies etc. A common slate size in South Australia was 550x 300mm. Slates were fixed with galvanised, zinc or copper slating clouts via either centre nailing (one hole) or head nailing (two holes).

Ridges and hips were typically capped with a strip of lead formed over a timber roll (on top of the ridge/hip beam) and uppermost slates. Galvanised iron ridge cappings were also used where economy was required. Terra cotta ridge capping was occasionally used with decorative finials. Chimneys and parapets were flashed with stepped lead flashings fixed into brick joints. Lead was considered superior and the preferred capping.

The slate quarries at Willunga on the Fleurieu Peninsula were the main source of roofing slate in South Australia. An attractive mid-grey colour, Willunga slate was used on many Adelaide buildings, including Bonython Hall and St. Peter's Cathedral. Slate was also imported from Britain, coming mainly from quarries in Wales and England, including Bugail and Penrhyn.

Imitation roofing slate was introduced in the late 1920's. These have been available ever since in a range of sizes and in varying forms, manufactured first from Asbestos and then fibre-cement. James Hardie still make a fibre-cement 'heritage shingle' today, coloured slate grey and 630 x 235 x 6mm in size. Several artificial slate products are available, such as Eternit's 'Stonit' and 'Eterna'. Real slate is rarely used today because of its high cost.

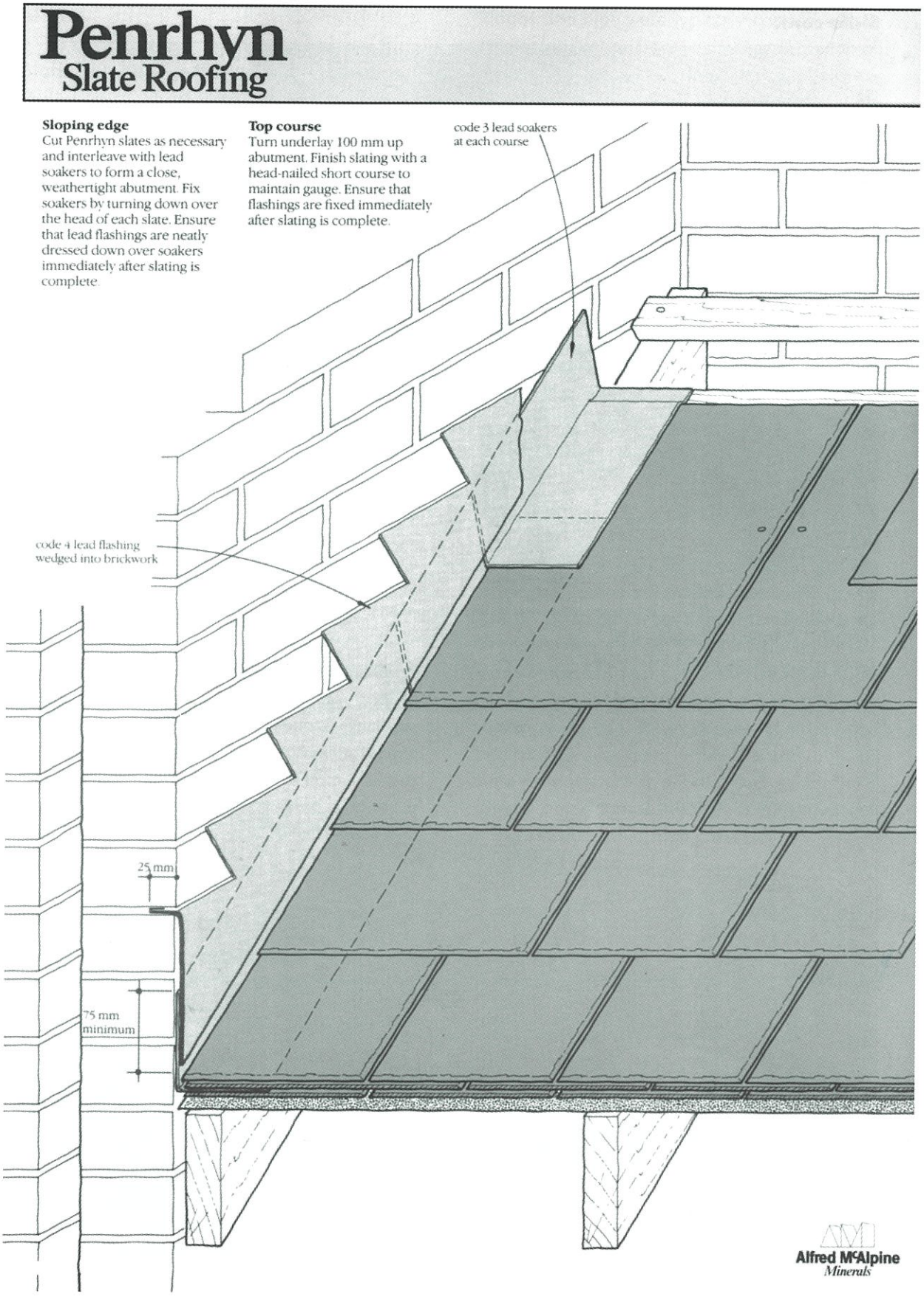
Courtesy: Ruth Baxendale

Cottage with slate roof

Slate cont.

Detail of a slate roof gable end
Note verge detail and loose slates

Detail of patterning of roofing slate
Note use of three different slates



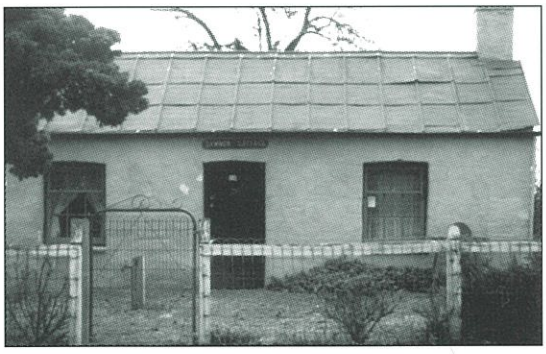
Detail of a slate roof parapet wall flashing
Taken from Penrhyn Slate Roofing Notes

Metal Tiles

Zinc roofing products were available in South Australia from the very first days of the colony. They were imported from Britain and came in two forms, rolled sheet and patented metal tiles. The former appears to have been little used in South Australia, while the latter was used here but was quickly supplanted by corrugated galvanised iron in the 1850's.

The metal tiles were a large 'pan' with a rolled long edge, typically laid on boards with vertical timber rolls on both sides and fixed with metal clouts. The finished roof had quite a strong visual texture, as can be seen in the cottage below. Such tiles were often used to upgrade earlier shingle roofs. One widely available brand was the Morewood and Rogers Patent Tile which came in two sizes, 900 x 450 and 900 x 600mm wide. Local copies fabricated from galvanised iron and zinc sheet also appear to have been made.

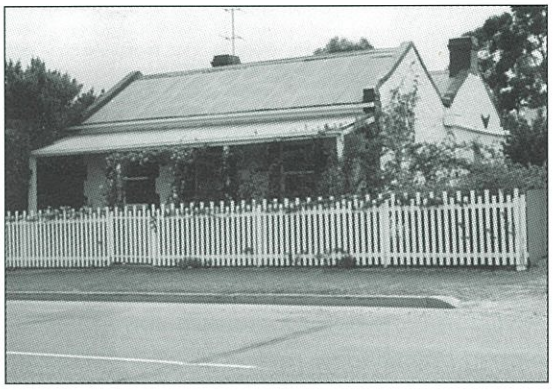
The Baptist church in Flinders Street in the City of Adelaide was originally roofed in metal tiles. This roof was restored in the mid-1980's when Wunderlich briefly re-introduced zinc tiles. These were high quality replicas of the original tiles.



Cottage in Penola with metal tile roof

Galvanised Iron

Rolled galvanised iron was first imported into South Australia from Britain in about 1850. This was sheet or corrugated iron coated with zinc. It quickly became popular because of its economy, its relatively large size (ie fewer joints), its versatility, simple use and ease of transport. Roofs clad in corrugated iron were quick to build, worked well and did not readily catch fire. It was also ideal for laying over earlier shingle roofs*.



Early cottage with corrugated iron roof

The early galvanised iron came in standard lengths (typically 2'6"x6'0"), was relatively thick and had slightly larger corrugations than present day profiles. This gave it great durability, although it was susceptible to rusting at laps. These characteristics made it a slightly different product to today's nearest equivalent.

Its ability to span relatively large distances made it popular with farmers and industry, where it was widely used to build large barrel-vaulted roofs for ancillary buildings such as stables and sheds. This was achieved by riveting sheets together to form a large almost self supporting curved roof. Minimal structural support was needed, making such roofs popular in remote areas where timber was scarce.

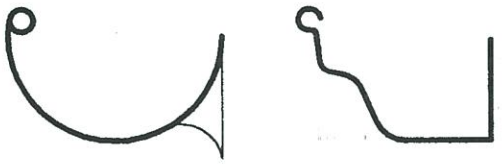
** It is not unusual today to find timber shingles under an old corrugated iron roof. Many a shingle roof has been preserved in this manner.*

A villa in Norwood roofed with corrugated steel. Note bull-nosed roof on verandah and decorated hipped bay window roof.

Church hall roofed with original 6'0" long sheets of corrugated iron. Note the pattern or texture the small sheets make.

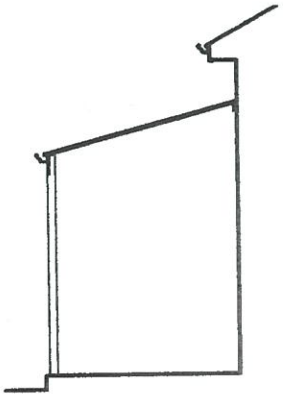
Galvanised Iron Cont.

A limited range of ancillary products made from sheet galvanised iron was introduced at the same time, including flashings, gutters and down-pipes. Ridge and hip cappings were also available. Galvanised iron ridge and hip flashings were fabricated with a centre roll and were fixed down with galvanised clouts. Lead was also initially used for cappings and continued to be used for hips on curved verandahs. Half round gutters and Ogee gutters were widely used as eaves gutters and came in several sizes. These were used with round galvanised downpipes and folded rainwater heads.

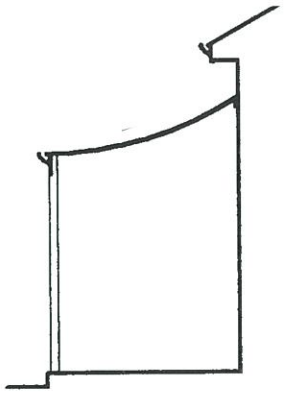


Half round gutter; Ogee gutter

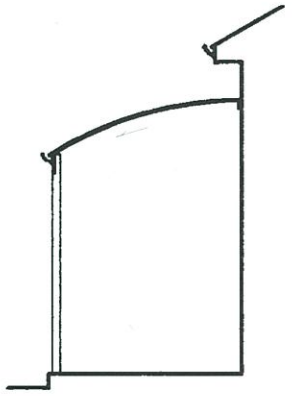
Corrugated iron could also be curved easily. This led to the evolution of the curved verandah roof, expressed in a number of profiles such as the convex, the concave, the bullnose and the Ogee. It could also be used at a relatively low pitch which made it ideal for lean-to roofs. A not uncommon sight in the early years of the colony were buildings with shingle roofs for the main roof and corrugated iron verandahs and lean-to additions.



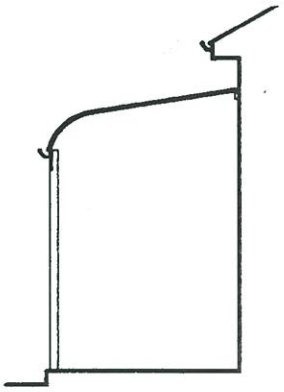
Straight verandah profile



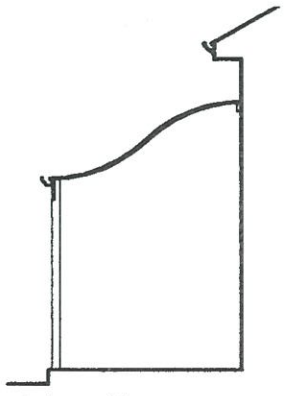
Concave (or 'eyelash') verandah profile



Convex verandah profile



Bullnose verandah profile



Ogee verandah profile

Galvanised Iron Cont.

An early fashion with curved verandahs was to stripe the verandah roof, ie alternative sheets would be painted in different colours. This is thought to have evolved from the use of striped canvas awnings on shop fronts which preceded galvanised iron verandahs.

Attractive verandah in Willunga

Galvanised corrugated iron established itself as a popular building material in the early Victorian period in South Australia. Many Adelaide villas still have their original roofing iron from the 1880's-90's.

Sheet galvanised iron was also widely used. Decorative elements such as acroteria were often cut out and fixed to the corners of gutters on the main roof on houses, particularly in the 1870's-90's. Rainwater heads were fabricated in a wide range of sizes and styles. Cast iron decorative sections were sometimes used on the ridges of important buildings.

Galvanised iron with smaller corrugations was also produced. This was used and is still used extensively for external wall cladding, internal wall lining, ceilings, joinery and verandah soffits and other innovative uses.

Steel replaced iron early this century and 'galvanised iron' became 'galvanised steel' in the same physical form. Quality changed however as thinner steel and thinner galvanised coatings were used.

Properly looked after, galvanised iron or steel will last for many decades. Its main problem has been rusting. Until the 1960's, corrugated steel came in relatively short standard lengths. This required extensive horizontal overlapping of sheets which often lead to rusting. Today's long lengths, ie a single length cut to suit the roof in question, do not have this problem.

Old galvanised steel, either corrugated or flat sheet, is often still quite usable today, even if it is quite badly rusted. Provided it is not holed and the profiles match, rust can be cleaned off and the iron sealed. Such iron or steel can last for decades, particularly if it is also painted. In Malden, Australia's first heritage town near Bendigo, corrugated and sheet iron from last century and early this century is routinely recycled even though it may be heavily rusted. Recycled corrugated steel retains a most attractive patina of age.

A new corrugated metal roof cladding called 'Zincalume' was introduced by Lysaghts in 1975. This was an aluminium alloy coating on steel. A coloured or painted version of this called 'Colorbond' was introduced at about the same time. An improved version called 'Zincalume' was later introduced in 1993. These new materials transformed the roofing market.

Corrugated galvanised steel roof cladding is made of a different material today. The nearest equivalent to the old 'corrugated iron' is the natural galvanised corrugated steel from Fielders, BHP Building Product and others. This varies in thickness, eg Fielders 'Double-Smelted Galvanised' corrugated steel is similar to the original heavy gauge iron. BHP make 'Custom-Orb' and 'Custom Blue-Orb'. Blue-orb is softer than Custom-Orb and is suitable for curving. It is widely used today for bull-nosed verandahs, tanks and downpipes.

Corrugated steel is still very popular. It is seen as being very 'Australian' and is currently very fashionable, being modern and contemporary yet possessing strong historical links to early 'corrugated iron'.

Zincalume Steel and Colorbond Steel

Zincalume steel is a zinc-aluminium alloy coated steel material; Colorbond steel is a coloured version of this, i.e. it is finished with a silicon modified polyester coating. Natural galvanised steel, on the other hand, is just that. Each of these come in a range of zinc coatings and thicknesses. The profile of present day custom-orb is slightly smaller than the original and cannot be lapped in conjunction with older corrugated iron or steel roofs because of this difference. While proprietary brand names, both Zincalume and Colorbond steel have become somewhat generic terms in today's building industry.

While Zincalume steel is a good modern building material, it is not generally recommended in its natural state for visible restoration work on heritage-listed buildings. Corrugated 'Zincalume' steel is superficially similar to corrugated galvanised steel but is made from a different material and has different physical and aesthetic properties. It has a very smooth shiny finish which changes very little with age, ie it does not 'dull off' or develop a rough texture or patina of age as natural galvanised iron does. This gives it a different colour and texture to aged corrugated galvanised steel. As a result it does not match the physical appearance or texture of old galvanised steel, ie a roughened and matt mid-grey colour that looks noticeably 'old'.

Zincalume steel is not recommended for repairing existing corrugated galvanised steel roofs. Zincalume is incompatible with copper or lead. Zincalume cannot be soldered. Run-off from Zincalume into galvanised steel or lead gutters can result in inert catchment. Acid rain draining into galvanised gutters can cause corrosion. Given these difficulties, it is considered unsuitable for use on heritage buildings.

If Zincalume steel cladding is used on a heritage building it should preferably be painted to match it in visually with the older character of the building concerned. Zincalume is best used on new buildings.

Terracotta Tiles

The Marseilles pattern terracotta tile was introduced to South Australia in the 1890's and quickly became very popular. These unglazed tiles originally came from France where they were supplied by tileries near Marseilles. Tiles were used extensively on Federation and Queen Anne style houses early this century and then later on Californian bungalows. The French tiles were relatively thin and brittle however and were eventually replaced by more robust locally-produced tiles. The original importer, Wunderlich Ltd., began to make their own Marseilles-type tiles in 1922 at Edwardstown and quickly became a major Australian supplier.

Tiled roof ot Norwood Oval.

Tiled roof on Tudor Bungalow

Terracotta Tiles Cont.

Marseilles tiles were complemented by a range of ridge and hip tiles. Decorative finial and ridge tiles were also available and can be seen on Federation houses in Toorak Gardens or Glenunga.

Decorative ridge tiles in North Adelaide

The Marseilles-type tile remained very popular up to the 1970's and is still available today. Concrete roofing tiles were introduced in the 1950's and effectively supplanted the terracotta Marseilles type tile in the popular market.

Flat plain unglazed terracotta roofing tiles were also available at the turn of the century. These tiles were relatively expensive and tended to be used on costly homes such as Carrick Hill at Springfield or for small areas of feature roofing or cladding*, eg on sun-screen roofs or small bay windows, often located at ground level where they would be readily seen. This can be seen on Roche House, 46 Palmer Place, North Adelaide. Such tiles were typically 254x152x10mm thick. Their use was not widespread.

Concrete Tiles

These were first introduced in South Australia in the 1950's and became very popular in the 1970's and more recent decades. They were originally bought in as a cheaper and stronger replacement for the terracotta Marseilles-type tile. The range of concrete tile types and profiles has expanded significantly since the 1970's. They have now become one of the most popular roofing materials in the mass housing market.

Fibre Cement

Compressed fibrous cement products including roofing 'slates' were introduced into Australia early this century. These were first imported from France in 1903 and consisted of corrugated and flat sheet products, moulded cappings and accessories. It quickly became popular and was used extensively in the 1920's for roofing, cladding, lining and other uses. Entire houses were built from what became known as asbestos-cement.

Local production commenced in Sydney in 1917 when Wunderlich Ltd. introduced its Durabestos range of products. This included 'roofing slates' and corrugated sheets of 'asbestos-cement'. The latter came in two profile sizes, a standard size and a larger size. The smaller size was similar to corrugated iron, while the larger was bolder and more distinctive. James Hardie also began making asbestos products. Their 'New Contour' corrugated roofing was another larger profile size.

Compressed fibrous-cement roofing tiles were also introduced at this time. These came in a range of sizes and colours and both copied shingles and slates and also introduced new sizes (eg 400x400mm). This size gave a most attractive patina or texture to a roof when laid diagonally. These tiles became popular during the Federation period and can be seen on some Federation villas in the eastern suburbs and the Woodville / Cheltenham area. They were imported from Europe eg Eternit tiles from Belgium and also made locally eg Hardies Fibrolite tiles.

Diagonal roofing tiles

** Flat terracotta tiles were also used for feature wall cladding on Federation style houses, as seen in Toorak Gardens etc.*

Fibre Cement Cont.

The name 'asbestos-cement' evolved because of the blue asbestos used in it's manufacture. This additive has not been used now for several decades however.

James Hardie introduced an updated version of their imitation roofing 'slates' in the 1960's-70's with bevelled corners. While used occasionally to replace real roofing slates, they were never popular.

The use of compressed fibre cement for domestic and commercial roofing peaked in the 1960's. Increasing consciousness about the health effects of asbestos began to effect sales in the early 1970's. Although asbestos was removed from the manufacturing process, the use of compressed fibre-cement roofing for domestic purposes declined sharply. Today compressed fibre-cement is little used for roofing and is primarily used for cladding or wall lining. The only roof cladding available now is 'Super Six', used mainly for industrial roofing.

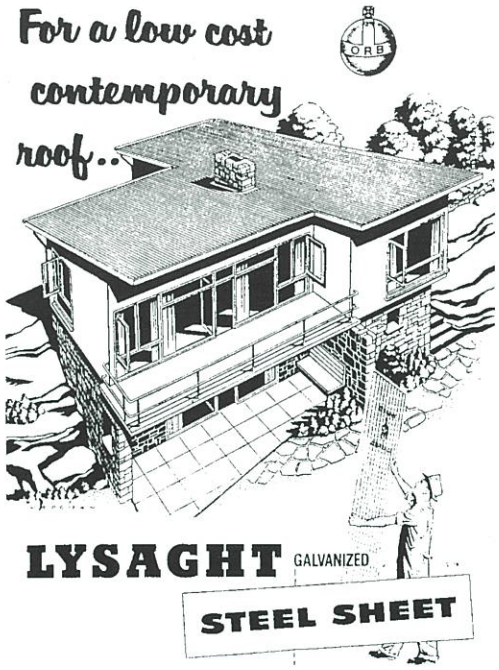
Flat Roofs

In Victorian times the term 'flat roof' in Britain referred to a roof pitch of less than seven degrees, usually clad with a sheet metal such as zinc, copper or lead*. In South Australia such roofing was rare but was sometimes used on Government or institutional buildings. However it was little used on residential buildings.

In terms of popular usage, flat roofs and flat roofing systems were first seen in Australia in the 1920's when impregnated bituminous felt was used on the roofs of office blocks. This consisted of laying multiple coats of bitumen over a base of felt placed on a sub-base of concrete. Proprietary products such as Malthoid and Jutex were used in a similar manner. Such roofing however was rarely used domestically in South Australia.

** For lead sheetwork refer Bibliography for publications of Lead Sheet Association & Lead Development Association.*

Flat roofs in housing appeared more widely in the late 1950's following World War 2 when steel roof decking became available. This 'decking' or cladding evolved out of the manufacture of corrugated galvanised iron and reflected advances in technology made during and immediately after World War Two. Known initially as 'Galvanised Steel Sheet' roofing, it could be used at pitches of one to two degrees to the horizontal, which allowed roofs to appear 'flat'.



A 1960's advertisement for Lysaght's

The term 'flat roof' in the 1960's-1970's was associated with low-pitched roofs (ie 1-4 degrees pitch) and referred to buildings using metal decking or roof cladding. It became available in a number of different profiles, with 'Klip-Lock' being a popular style in the 1960's. It was typically used for flat roofs on buildings with parapet walls or significant eaves overhangs. Aluminium sheeting also became available in the 1960's.

Today flat roof cladding comes in a wide range of profiles to cater for a broad range of uses and situations.

3. TRADITIONAL ROOF DETAILING

Cappings and Flashings

Cappings are strips of material used to seal roof junctions where different roof components meet, ie ridge cappings, hip cappings, parapet cappings and barge cappings (also called verge cappings). Flashings are strips of material used to seal roof penetrations, such as a vent, or where roof cladding abuts a vertical face, such as a wall or a chimney. Most roofing systems have dedicated 'cappings' or 'flashings' to seal such junctions.

The first material to be widely used for this in South Australia was rolled lead. This represented the technology of the day and was imported from Britain. Lead was available from the start of the colony and used extensively on early slate roofs and metal roofs. It came in rolled strips in standard sizes and was used on ridges, hips, valleys, barges and junctions with walls and chimneys. It was readily cut and shaped and used as both cappings and flashings. Cappings were usually fixed with clouts to the ridge beam or hip rafter and then tamped into the profile of the iron or slates. Lead flashings to vents were fixed with clouts while flashings to vertical wall faces were normally fixed into raked out horizontal brick joints and lapped and sealed. Some early slate roofs did not use lead cappings and instead interwove slates to form a special ridge and hip course to seal the junction.

Verges to gable walls on slate roofs usually used a timber barge-board with timber capping. However when timber was not available or on lesser buildings, verges were often formed by extending slates 50-70mm over the edge. Similarly, mortar fillets or parging were occasionally used to 'seal' slate roofs and corrugated iron roofs to adjacent masonry parapet walls. This was very much an economy detail and prone to cracking and leaking.

Lead was heavy however and expanded in the hot Australian summer. It needed good support and careful fixing if it was not to move, slip or split.

Lead hip capping on a verandah

Zinc flashings were also available from the start of the colony for use with zinc sheet and tiles. Like lead it was used to seal roofing junctions. However it was superseded by galvanised iron in the early 1850's and did not achieve the widespread usage of lead. The Baptist Church in Flinders Street was originally roofed and flashed with zinc.

The advent of galvanised iron introduced a cheaper form of roofing to Australia. The first galvanised iron capping to be available was a copy of the traditional lead capping, complete with central roll. This was used for ridges and hips and was usually cut or 'scribed' into the flutes of the corrugated iron. Both lead and galvanised iron cappings were initially used on corrugated iron roofs. However galvanised iron predominated, except on verandah hips where the malleability of lead was better suited to being formed into curved verandah profiles. Galvanised sheet was also used widely for other minor waterproofing needs.

Galvanised iron ridge capping

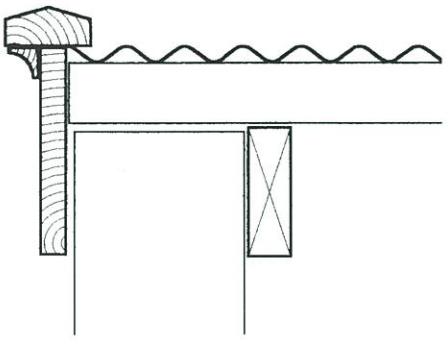
Cappings and Flashings Cont.

The first barge cappings for corrugated iron roofs were made from timber. These consisted of a weathered 'cricket bat' piece of timber, typically 140 x 45mm, fixed to the top of the barge board and supported on the outside by a timber scotia. The corrugated roofing slipped in under this on the roof side and was thus effectively 'flashed'. These were used for many years, well into the Twentieth Century. The problem with timber however was that it had a limited life and generally deteriorated within a few decades, depending upon the timber used and the degree of exposure.

Like slate, early corrugated iron was usually sealed to vertical wall surfaces with lead flashings. This was used in short lengths and fixed into raked-out horizontal brick courses. It would lap over the next section of flashing and have a stepped appearance.

Also like slate, mortar was used at times to seal corrugated iron roof cladding to vertical wall surfaces. This was done by either parging or rendering the rear of the parapet wall and continuing this down onto the roofing or by using a band of render which followed the line of the roof. These mortar seals were prone to cracking and water entry however and were not considered as good as lead.

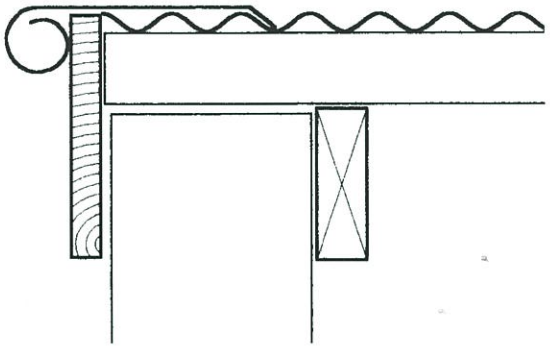
The first manufactured galvanised steel barge capping to be widely used was the rolled barge capping in which a 50-70mm rolled end section was combined with a flat section to fit neatly over a barge board and thus provide a considerable degree of weather protection. This came into wide spread use in the early Twentieth Century and quickly superseded timber barge cappings. It became the new industry standard and is still available.



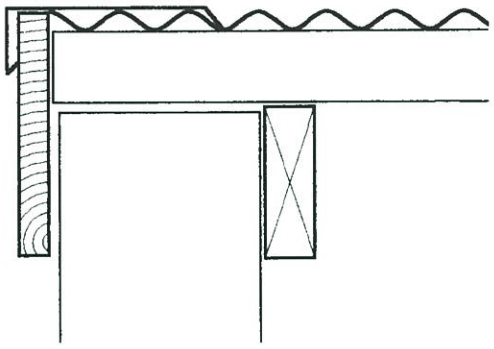
Timber barge capping detail

Timber barge capping. Note weathered profile. Also note scribing of galvanised iron capping into flutes.

Rolled barge capping on lean-to



Rolled barge capping detail



Folded barge capping

An enterprising answer to sealing barge junctions with corrugated iron on more primitive buildings in rural areas was to simply bend the corrugated iron down over the edge of the roof, thus forming an effective flashing of the wall/roof junction.

After the Second World War, the rolled galvanised steel capping evolved into the folded galvanised steel capping. This and its subsequent Colourbond and Zincalume steel derivatives have since become the mainstays of today's metal roof industry.

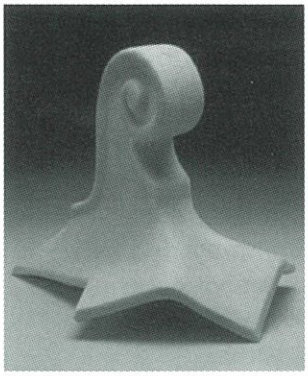
Cappings and Flashings Cont.

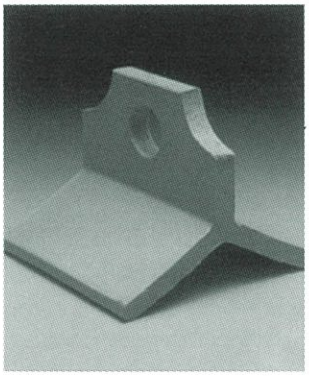
Terracotta tile roofs were originally capped by the use of a standard ridge or hip tile. Verges were usually finished with a simple overhang, i.e. the edge of the tile would overhang the wall or barge board by 20-50mm. Feature gables often used timber barge cappings. Lead flashings and cappings were sometimes used on more complex roofs for wall junctions, parapet walls and hips to smaller elements like sunshades or bay windows. In time lead was replaced by galvanised steel flashing. This in turn was replaced by Colorbond steel flashing.

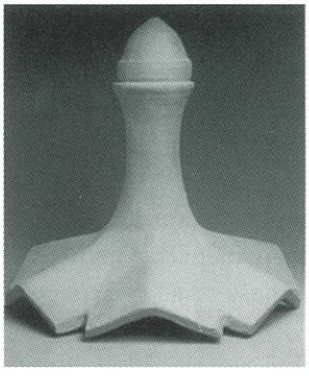
Terracotta tile roofs today are still capped by the use of a standard ridge or hip tile. Verges are now finished in several ways, with a special verge or barge tile being the most common.

Concrete tiles used the same or very similar flashing details. Concrete tiles today have a very wide range of custom concrete barge and ridge tiles and galvanised or Colorbond flashings.

Asbestos and fibre cement roof products also introduced moulded flashings and cappings. Only a limited range of barge and ridge cappings is available today.







Contemporary decorative tiles
Taken from Bristile Clay Tiles brochure

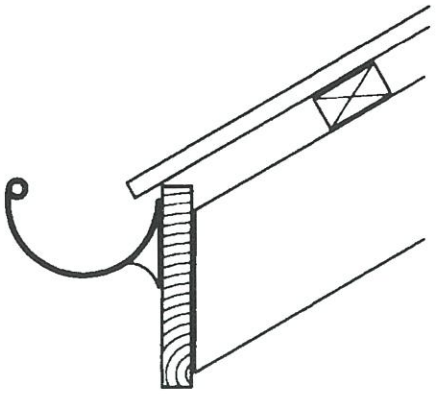
Gutters and Downpipes

Many early buildings did not have metal gutters as they were expensive and difficult to obtain in the early years of the colony. Given the difficulties of establishing the colony, only important government or private buildings could afford gutters. When used they followed traditional British building practice and were either box gutters or eaves gutters, fabricated from materials imported from Britain. Box gutters and valley gutters were usually made from lead while eaves gutters were cast iron. Those settlers who could not afford metal gutters usually used nothing, although hollowed-out tree trunks were occasionally used.

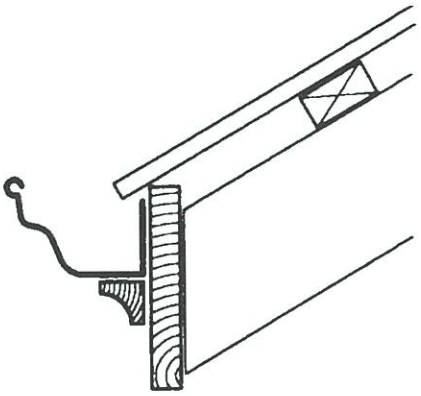
The increased use of galvanised iron in the 1850's included eaves gutters folded from sheet galvanised iron. These copied the older cast iron gutters from Britain and provided the colonists with an economic range of guttering and down-pipes. They proved popular and became the first to be widely manufactured and used in South Australia. They came in traditional profiles, i.e. Half-Round, Ogee and Ovolo, in standard lengths of six feet. Lengths of gutters and downpipes were joined together by riveting and soldering. Rain water heads were also manufactured from flat galvanised iron. These components enabled economic gutter systems to be readily assembled.

Timber scotias were used to align gutters and help support them. Scotias came in several sizes, depending upon the need.

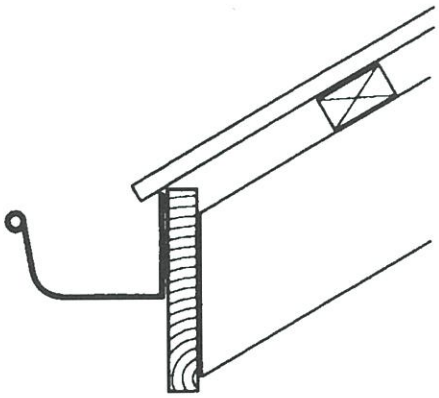
These first gutters were used with both round and square galvanised downpipes, rolled or folded from galvanised sheet. While square downpipes were used on more important buildings and in formal situations, the bulk of every-day use was accommodated with round downpipes. These came in a range of standard sizes, i.e. 2 inch, 21/2 inch and 3 inch diameter. The standard length was six feet. Down-pipes were fixed to walls with metal straps cut from galvanised sheet and could be quite decorative.



Half Round gutter



Ogee gutter



Quadrant or D gutter

Gutters on government and institutional buildings in the Victorian period were usually a combination of traditional lead lined box or valley gutters and Half-Round or Ogee eaves gutters on the less important sides. Such buildings often had parapet walls at the front and sides and used square downpipes and rainwater heads on those sides, ie on the formal part of the building. The rear usually had a more informal character and used eaves gutters and round down pipes.

Gutters and Downpipes Cont.

Larger more affluent houses also reflected British building practice and similarly used box gutters, eaves gutters and both square downpipes and round downpipes. Most private residences however usually only utilised eaves gutters and round galvanised downpipes.

On better quality buildings downpipes typically discharged into red brick surface drains or rendered brick sumps and then into underground pipes. However in most domestic situations the downpipes usually discharged onto the ground directly alongside the external walls.

In the late 1930's a simplified version of the Ogee gutter was introduced, called the Quadrant. This became very popular and spawned a number of derivatives such as the longtail quadrant and bull nosed quadrant. The basic quadrant gutter, also known as a D gutter, is still widely used today.

After the Second World War the choice of gutters increased significantly with new profiles and materials being introduced. Larger volume and squarer profile gutters such as the Squareline were introduced, along with aluminium and PVC gutter and downpipe systems. Square shaped gutters such as Lysaght's Novaline are typical of today's popular guttering.

Roof Vents

Ventilation of interiors became important in the Victorian era as healthy living and healthy buildings became widespread priorities. This led to the incorporation of measures which included sophisticated ventilation systems in roof spaces of public buildings and institutions. Some Government buildings used gas-powered forced ventilation systems, however most buildings used air convection systems. These usually consisted of galvanised iron ducts or large lighting boxes which connected ceiling ventilators in the rooms below to external roof vents.

Such vents were typically small gable roofed structures made from galvanised sheet. Such vents were incorporated into the overall design of the building and became attractive and important visual elements in their own right.

Roof vents in corrugated steel roofing. Note pattern created by roof cladding.

Gablette vents in slate roof

Decoration

The decoration of roofs has varied over the years in line with public taste and the availability of materials. Slate roofs were decorated by varying the pattern, shape and colour of slate. Corrugated iron/steel roofs were decorated with cast iron ridges, finials and ornate barge or fascia boards. Gutters were decorated with acroteria.

The most common form of decoration was painting. While many roofs were left in their natural state, galvanised iron roofs on Victorian buildings were often painted, reflecting the Victorian obsession with decoration. While the roof cladding was usually painted only one colour, it formed a key part of often complex overall colour schemes which picked out different roof elements such as gablets, barge boards, finials, ridges, eaves etc.

Where cost was a concern, the main roof was usually left unpainted, ie as natural galvanised iron. Decoration by painting was then only taken up to the gutter. The use of colour was thus concentrated at a level where it was most seen. This was the case particularly in rural areas.

While the main roof on Victorian buildings was usually monochrome, verandahs were often brightly striped with alternative sheets painted in different colours.

Roof Fixings

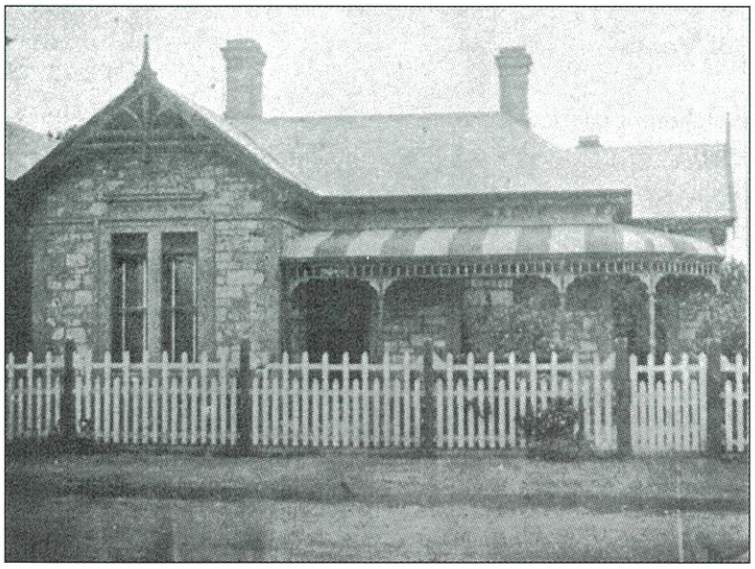
Shingles
Timber shingles were usually fixed down with square cut roofing nails as used last century. These are available again from specialist woodwork centres.

Slate Roofs
Slates were nailed down to battens with metal slating clouts, placed through holes drilled or punched through the slate. Clouts were usually galvanised iron, although copper clouts were occasionally used on better quality projects. There were two methods of nailing, head nailing and centre nailing.

Corrugated Iron and Steel
Corrugated iron and flat galvanised sheet and their later steel equivalents were usually fixed down with 'roofing nails' (ie spring head nails) which incorporated a flat galvanised circular 'skirt' to cover the hole made by the nail.

Terracotta Tiles
Terracotta tiles were traditionally fixed down by locating the tile on battens via lugs on the underside and then securing the tile with copper wire.

Photo of striped verandah roof



F W Dancker, 1904 *Modern Dwellings*

4. MAINTENANCE OF ROOFS

All roofs should be inspected annually. At the very least roofs should be checked for integrity of cladding, leaks and correct operation of gutters.

Timber Shingles

Today there are few if any functioning shingle roofs left in South Australia. The future for those remaining depends not so much on maintenance as restoration. When this is contemplated, the best approach is to aim to maintain or re-instate the original roof design, using only those remaining original shingles in good condition and supplementing them as necessary with matching shingles, either salvaged from similar buildings in the area or made up to match the original. Given the rarity of such work, specialist advice from relevant conservation agencies such as Heritage South Australia should be sought.

Early timber shingle roofs are often found under old corrugated iron roofs. Such shingles should be retained wherever possible, being an important historical record (and valuable insulation).

Slate

Roofing slates typically have a life of forty to seventy years, depending upon the quality of the slate. They deteriorate in a number of ways, including delaminating on the underside and weathering around their fixing holes. What may appear to be a slate roof in good condition externally may in fact be significantly deteriorated when inspected on the underside.

Slate roofs should be inspected at regular intervals by professional roof slaters for leaks, loose or slipped slates. Matching or very similar slates should be used for any repair work, although this may not always be possible.

Slate roofs can only be maintained so far before consideration will need to be given to replacing all the slates. This will need careful assessment as there are two major problems involved. The first is that a new slate roof will cost four to eight times the cost of re-roofing in corrugated iron, depending upon the quality of the slates used. The second is that there are very few trained slaters in South Australia. People thinking of re-slating a roof are advised to contact the State Heritage Branch.

On major heritage buildings this cost may not be a significant problem, but on many privately owned domestic heritage buildings the cost of these materials and the specialist labour required may be prohibitive. In these situations, it is acceptable to replace an unserviceable slate roof with a new natural galvanised corrugated iron roof. This is usually compatible with the age of the building and may be more practicable and achievable for owners. Note that natural galvanised iron should be used.

Cappings and flashings on slate roofs are usually lead. Like the slates, these will require maintenance and will need to be replaced from time to time, depending upon their condition. This is usually done by roof slaters as part of the overall work.

The clouts fixing down the individual slates can sometimes deteriorate before the slate does. A common repair to a slate roof is to remove and then re-nail all the existing slates, replacing defective slates with new at the same time. This amounts to a re-roofing of the building.

Today there is a wide range of literature available on recommended slating practice, coming mainly from Britain and North America. Major suppliers such as Penrhyn provide detailed guidelines and 'good practice' notes on how to slate roofs. British Standards BS5534, BS680 and related standards set the present benchmark for professional slating practice in the English speaking world.

Galvanised Iron and Steel

Galvanised iron and steel roofing is generally very durable but like all materials needs maintenance. Its most common problem is rust which will develop where water is trapped. This typically occurs at the laps, i.e. where one sheet overlaps the next. This can be a significant problem on roofs clad with short length sheets, such as the original six foot long sheets. It can also occur in gutters where water may 'pond' and eventually rust through. A corrugated steel roof may look in good condition from outside yet can often be found to have significant rusting when viewed internally. Minor rusting can be repaired by cleaning off rust, neutralising and priming the steel, and then repainting.

Older corrugated iron or steel is quite thick and strong and will last a long time, even if rusted. Small areas of rust can be dealt with as described above. A few areas of rust do not mean a roof has to be re-clad but rather that it needs maintenance. The original iron or steel should be kept on as long as practical as the patina and sheet layout contribute significantly to the historic character of a building.

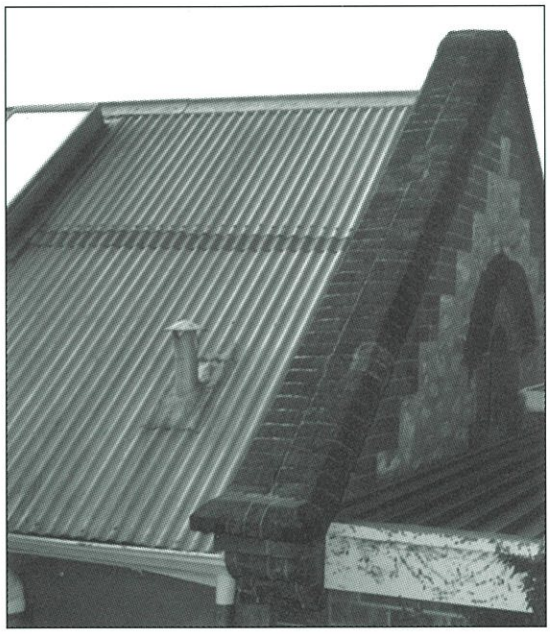
Roofing

Rusted overlaps can be alleviated to a degree by slipping, ie slipping in a new section of corrugated steel at the bottom of each sheet. While this will not stop rusting, it will extend useful roof life.

When old corrugated steel roof cladding needs to be replaced, new natural galvanised steel custom-orb should be used. It is important to confirm with the roofer that natural galvanised steel roofing is to be used and not Zincalume steel, as the industry standard today is Zincalume. Natural galvanised is still available, at a similar cost to Zincalume. It is rolled on demand and will need to be ordered in. Natural galvanised steel is better for heritage buildings because it 'dulls off' with age and more likely to be compatible with an existing older storm-water system in terms of electrolytic deterioration.

While natural Zincalume steel is a perfectly good material in its own right, it does not weather in the same way as natural galvanised steel, making it less suited to matching the weathered textured surfaces of historic buildings. If painted over however, it is quite acceptable.

Second hand corrugated steel can also be used to repair or re-roof older roofs. If used for repairs, check to make sure that the flutes are the same size.



Slipped roof repairs. Note slip sheet.

The question of whether to use the same size roofing sheets as the original or modern long lengths cut to fit will depend on the importance of the building and the owner's wishes. While the smaller sheet size gives an attractive pattern to a roof, a longer length will give better water proofing and a longer life. In most situations long lengths will be quite acceptable. Roof sheets which match the original size need only be considered on buildings of special heritage significance.

Galvanised Iron and Steel Cont.

Colorbond

Another choice for roof re-cladding is Colorbond pre-painted steel custom-orb. This can be used to replace an old painted galvanised steel roof and will be appropriate in many situations. Where historical authenticity is required however, natural galvanised steel custom-orb should be used and either left natural or painted. Colorbond has a polyester baked coating which gives it a different patina to weathered oil paint. It comes in a limited range of standard colours of which only Heritage Red, Homestead, Slate Grey, Wheat and Armour Grey are suitable for heritage buildings. Like paint, Colorbond colours may fade over time and may also change colour slightly. Painted custom-orb will weather naturally and present a more historic patina than Colorbond. The choice involved depends on the owner's wishes and the building involved.

Gutters

Galvanised steel gutters are prone to ponding and rusting. Ponding is caused when the fall of older gutters, which were often laid to very low falls, change due to settlement of walls and stop the gutter draining properly. When this happens the gutter must be refixed to drain correctly.

Water that sits in a gutter with no fall will cause rusting. Like roofing, small spots of rust can be plugged with a proprietary filler and repaired. However metal gutters will only have a life of 20-30 years and will eventually need replacing. When this occurs the new gutter should be selected to match the original gutter. As the gutter being replaced may not be the original, care should be taken to consider the situation and find out what the original gutter profile was. Old photographs and on-site evidence can be useful. If the original gutter profile cannot be identified, then a profile should be selected which is appropriate to the age of the building.

Half round gutters have been used on buildings since the start of the colony and are still available in a modern form.

Ogee gutters have also been used since the start of the colony and were widely used up to the late 1930's. Two sizes were available, the larger being used for general roofing and the smaller for verandahs and bay windows. Ogee gutters are still available today, although modern versions have a wider 'pan' and a less sharply defined profile. When selecting Ogee gutters today, be aware that the historical authenticity of the profile varies from brand to brand. Ogee gutters were fabricated last century by folding galvanised sheet metal and had sharp arrissed corners. Today they are extruded and have curved corners. They cannot be used in conjunction with older gutters.

It is not uncommon in Adelaide to see the render at the base of a stuccoed gable wall moulded into an Ogee shape at the sides to reflect the shape of either the adjacent gutter or the gutter behind.

D gutters came in during the 1930's and are still used. They are a simplification of the Ogee profile. D gutters and later types of eaves gutters are not appropriate for use on Victorian or earlier buildings.

Box gutters

Older box gutters are a frequent cause of leakage problems, blocking up easily with refuse and leaves. These problems are due largely to the way older box gutters were made, ie they were small, made in short lengths and often laid to a very low fall. Modern box gutters do not have these problems because they come in long lengths, are bigger in cross section, are better flashed and laid to greater falls.

When replacing an older box gutter, the new size should be properly calculated. A larger size should always be used even if roof battens have to be moved. Particular attention should be given to supporting the gutter board so that ponding is not caused in the future. Over-flow pops should be installed to provide secondary over-flows. The new box gutter should be rolled as one length and its sides turned up under the roofing so that the sarking can be dressed down into it.

Galvanised Iron and Steel Cont.

Downpipes

Downpipes will also rust out and need to be replaced. When this occurs take care to replace them with new pipes selected to match the original. These were usually round galvanised steel downpipes. Care should be taken to find out if the downpipe being replaced is the original or not. Avoid using rectangular downpipes in domestic situations or PVC downpipes, as these do not match older downpipes or give an authentic historic appearance. Make sure that the holding down straps match the design of the original straps.

Cappings and Flashings

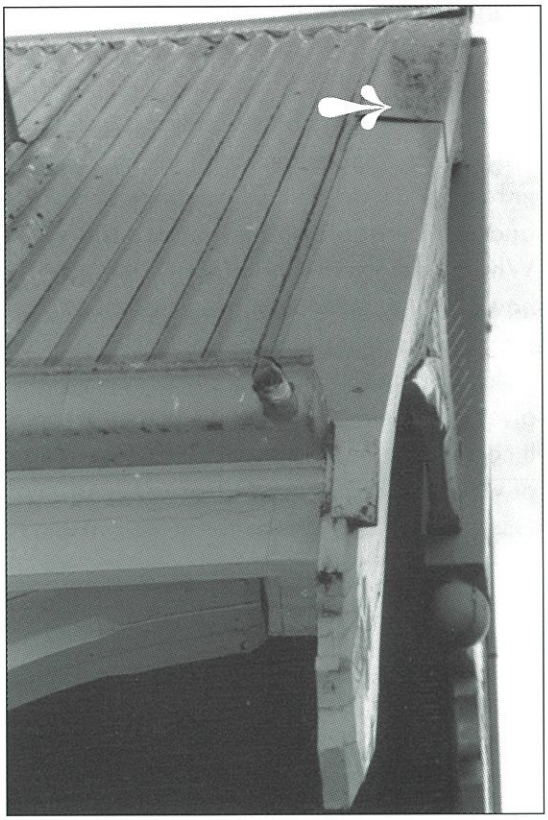
Roof cappings and flashings also need to be replaced from time to time and like roofing and gutters should always match the original. Flashings should not be cut into masonry but rather fixed into the existing brick joints. Always ensure that ridge and hip cappings are cut or scribed to fit into the flutes of the roof cladding. Be aware that there are two ridge/hip capping profiles available now, 'three-break' capping and 'rolled' capping. The latter is the more historically authentic.

Roof Vents and Other Decoration

Original roof vents and decoration such as acroteria should always be retained, repaired and replaced. These are important elements in the presentation of older buildings. The biggest threat to these items comes when a roof is reclad.

Roof Fixing

Corrugated steel roofs were historically fixed down with roofing nails. Where an authentic restoration of a galvanised steel roof is required, roofing nails should be used, ie hot dipped galvanised nails supplied with a neoprene washer. If an authentic restoration is not required, standard hex screw fixings can be used. The current Australian Standard for fixing metal roofing specifies either nail or screw fixings.



Historic gable design compromised by replacing original timber capping with new folded metal capping

Verandah Roofs

The maintenance of a verandah roof is different to that for the main roof. While superficially similar, its materials, structure fixings etc are usually different. Verandah roof cladding is thicker, there is usually no intermediate supporting structure and the roof cladding is riveted together to form a continuous structural membrane. Verandah roofs are also often used for access to the main roof and its gutters.

The verandah roof cladding may rust and require attention or even replacement. If practical the original cladding should be kept for as long as possible. This will maintain the original design and the roof's patina of age. Any rust spots should be removed and the cladding sealed, primed and repainted, if previously painted. If not, paint the affected area with zinc. If a sheet is too rusted to repair, replace it with new, preferably using salvaged iron or steel cut and rolled to match the original.

Galvanised Iron and Steel Cont.

Reconstructing a Verandah Roof

If an entire verandah is to be restored or reconstructed, archival research and on-site evidence will be vital to the success of such work. The original profile of the verandah roof can sometimes be seen as a painted outline on the wall. Old photographs may show the original verandah and its design. Such evidence will help resolve essential construction details. Persons planning a verandah reconstruction are advised to obtain professional help.

When the time comes for a verandah roof to be entirely re-clad, use natural galvanised steel Custom Blue-Orb, either painted or left natural. Custom Blue Orb steel is the thickest roofing currently available and being more malleable can be readily curved. New roofing sheets should be curved to match the original roof profile and joined together with tank rivets, like the original roof was. The actual curving is usually arranged by the supplier. (see also pages 11, 20).

Historically verandah roof cladding was butted up to the wall of the main building and tucked under a protruding brick string-course usually provided at high level. The overhang of the string-course acted as a 'flashing'. Metal flashings were not used. As a result there was a small gap between the cladding and the wall. This gap is more noticeable on the return curved section of a hipped verandah roof where the roof curves or angles down to the gutter, allowing daylight to be seen usually through the gap. This is quite normal.

When re-cladding a verandah roof, do not use a standard modern metal flashing to seal the roof to the main building. These are too large and can significantly change the appearance of a building. If there is no traditional brick string course, try to locate a small minimum size zinc or lead flashing into a horizontal brick joint. If this is not possible, pin the vertical part of the flashing to the wall face and seal it to the wall using a band of render. Try to avoid cutting into the stonework. The hips of curved hipped verandahs should ideally be sealed with a rolled lead capping as they were traditionally, not with a modern folded galvanised steel capping.

Verandah roof with rendered flashing

Galvanised Iron and Steel Cont.

Structural support

If a verandah roof is to be entirely re-clad, the Australian Building Code may require additional structural support for the roof, even though the original steel cladding may have had none. This will depend upon the span of the verandah roof. It is required today because steel roof cladding is not as strong as last century. The current Australian Building Code also has higher structural requirements than at the time when the verandah was first built.

This requirement can be achieved in a number of ways. Flat steel reinforcing bars can be used to connect the verandah fascia and posts back to the wall, thus stiffening the whole structure. This is usually done at each verandah post. Either a flat upright bar or a t-section can be used, depending upon the need. These will need to be curved to match the original curve of the roof. Additional timber battens can be located between these stiffeners if needed. Any additional structure should be painted out to match the underside of the verandah roof so that only one colour is presented visually, as it was historically.

Matching the original profile

It is important to precisely match the profile of the original verandah when re-roofing an older verandah in order to maintain historical authenticity. Modern verandah profiles rarely match historical profiles because building methods and structural requirements have changed.

Modern 'bull-nosed' verandahs erected in the last decade or so have a different shape to older 'bull-nose' verandahs. They are more bulbous and prominent at the front than authentic Victorian bullnose verandahs. This is because there is a now a specific way to build bullnose verandahs which utilises a quarter circle profile structurally at the front in order to achieve a greater clear span. The original bull nose profile utilised more of an arc at the front, not a full quarter-circle.

Terracotta Tiles

Terracotta roofs are very durable. Being kiln fired vitrified products, terracotta tiles can last for many decades. However tiles do become more brittle with age and do not cope well with movement or point loads. Inadequate structural support can lead to movement and cracking of tiles. People walking on roofs will often crack tiles. If you must walk on a tiled roof, tread where one tile overlaps the next, as this is the strongest part.

The most common maintenance needs are repairing cracked and slipped tiles. Cracked tiles should be replaced with new to match the original, if these can be obtained. If these are not available, the original tiles can be repaired by gluing the two parts together with a suitable silicone product. Alternatively, original tiles may need to be sourced from less important areas of the original roof. Slipped tiles should be re-positioned and re-fixed.

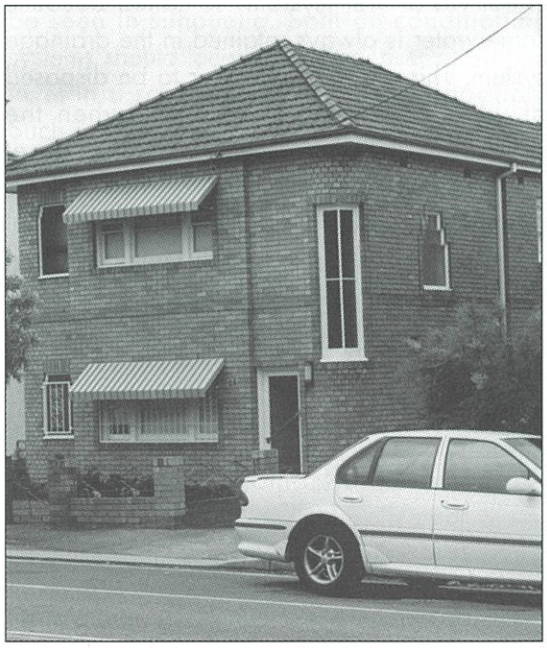
Cracking can also occur in the bedding mortar of ridge and hip tiles. Small cracks can be repaired by filling the cracks from inside the roof with silicone. These are easier to locate from within. This also avoids any external movement over the tiles. Major leaking through the ridge or hips may necessitate the removal and re-bedding of those tiles in new mortar. Always use experienced tradespeople who specialise in repairing tiled roofs.

Another more serious problem with tiled roofs is sagging of the timber framework which structurally supports the tiles. This is a visual and functional problem caused by a number of factors, including inadequate structural support by battens and rafters, purlins not supported properly off internal walls, old age, and inadvertent structural weakening of rafters or battens. One common cause is the use of roof framing systems originally designed for metal roofs being converted to support tile roofs without being given adequate supplementary support.

Terracotta Tiles Cont.

Sagging is a question of degree, as the weight of tiled roofs will often cause some deflection over time. Very minor sagging is usually not a problem. More noticable sagging becomes unsightly and creates small gaps between individual tiles which can admit wind-blown water. Repairing a sagged roof usually requires the tiles to be removed, the rafter and battens to be upgraded and the roof re-tiled. Such work should only be done after a careful structural assessment has been made and professional advice obtained. The work is best carried out by tradespeople specialising in tiled roofs.

Terracotta tile roofs are susceptible to lichen growth. Depending upon personal tastes, this can be seen as a good or bad thing. Such growths can be cleaned off but this should only be attempted by professional cleaners experienced in cleaning tile roofs. Incorrect cleaning can cause irreparable damage to tiles.



Terracotta tiled roof house

Pressed metal 'roofing tiles' are very different from terracotta tiles and are not recommended for heritage buildings.

There are two types of terracotta tiles, glazed and unglazed. It is important to note that unglazed tiles may have been finished with a stain (a 'slipstain') to colour their exterior. Unglazed tiles are hard to clean as most cleaning actions remove some of the protective surface skin. If unglazed or slipstained tiles must be cleaned, it is best to only partially clean them, i.e. to clean off easily removed material and accept a certain degree of soiling. The least harmful method is to spray the tiles with hot water and neutral pH soap.

Glazed tiles are best cleaned by washing with water and using a plastic scourer. A water-rinsable neutral pH liquid soap can also be used. When cleaning avoid:

- Mechanical methods, eg grit blasting, abrasive discs, metal bristle brushes;
- High pressure water or other liquids;
- Acid cleaning, i.e. hydrofluoric acid;
- Alkaline cleaners e.g. caustic soda.

There are strict regulations concerning the type of cleaner selected and the disposal of cleaning runoff. Any rainwater tanks should be disconnected until after the first subsequent rain has truly rinsed the roof. Some cleaners can also corrode gutters. There is always the danger of cracking or breaking tiles.

There are various treatments available to 'freshen up' tiled roofs which may appear 'tired' or 'tatty' with age. While these may be suitable for concrete tiles, they should generally be avoided for clay or terracotta tile roofs. Clay tiles were intended to be used naturally and were selected for their attractive natural terra-cotta appearance, which with age develops an attractive patina. Painting or 'enhancing' a clay tiled roof will only detract from the historic appearance of the original roof and create an ongoing maintenance problem. There is also a high risk of tile breakage during painting. 'Wet look' treatments are particularly out of keeping with the original character of older buildings. Painting a tiled terracotta roof to 'freshen it up'should be avoided.

Common Roofs

If a roof forms part of a row of terrace houses or a larger building, it is important that any repairs that may be needed fit in with the original design of the overall roof. If the building concerned is sub-divided into several ownerships, consideration should be given to arranging the collaboration of all owners. A dilapidation survey carried out by a professional experienced in heritage work will be useful in these circumstances. This will provide the necessary framework for individual owners to maintain their sections of roof and ensure that all work is carried out in a co-ordinated manner, thus maintaining visual consistency.

Separation of Incompatible Materials

Direct contact between incompatible metals should be avoided to ensure against corrosion. Lead and iron in particular should not come into contact with aluminium, aluminium alloys (eg Zincalume steel) or aluminium-zinc-coated steel. Water should not be allowed to run off lead onto any of the above aluminium materials. Green hardwood and chemically treated timber should also be separated from aluminium materials.

Stormwater Drainage

The stormwater disposal system should be carefully considered when re-guttering a roof. This should include resolving the way gutters fall, the location and number of down-pipes required, and how water will be disposed of once brought down to ground level. Attention should be given to meeting today's standards rather than the original. A common improvement today is to increase the size, number and location of downpipes and the method of disposal so that water can be disposed of more quickly and more efficiently. AS 2180 Metal Rainwater Goods - Selection and Installation, is a good guide for sizing gutters/downpipes and for understanding contact between dissimilar metals.

The runoff from a roof, ie the stormwater, should be taken well away from a building, out to the street, sump or other approved disposal point. It should not be allowed to discharge alongside a building as this localises soil movement (i.e. soil heave) adjacent to and under the footings as the soil becomes moist and then dries out again. This in turn may exacerbate movement in the building and thus accentuate the cracking of the walls.

Downpipes should preferably discharge into an underground stormwater system made of modern PVC pipes. These leak far less than old terracotta pipes. Such a system usually drains to the street water-table via a 'dry' drainage system, ie the overall system conveys all runoff water to the street. This is dependent upon the levels of the building and site allowing the water to readily drain out to the street.

This cannot always be achieved however because of incompatible levels. In some situations stormwater can be drained out to the street via a 'wet' system, so-called because some water is always retained in the drainage system. This allows stormwater to be disposed of when falls are not ideal, ie when the discharge point is lower than the street watertable. Such a system has to be permanently sealed and will require careful construction to allow for soil movement and wear and tear. Where a wet system is not practical an electric pump may be required to push water out to the street.

The actual connection of vertical metal downpipe to horizontal underground PVC stormwater pipe is usually made via a short section of upright PVC pipe, ie the metal pipe fits into a slightly wider PVC pipe. A sump or inspection point may also be incorporated at this junction. The upright PVC pipe can be quite intrusive visually if left in its natural state and should ideally be cut down to about 50-100mm above the lowest ground level and painted the same colour as the downpipe or another unobtrusive colour.

5. MODERN REQUIREMENTS

Airconditioning, Roof Lights, Vents

Modern living standards place greater demands on roofs than when they were first built. Solar panels, air-conditioning, roof-lights, service grilles, exhaust fans, satellite receivers, television antennae and plumbing vents all impact on the visual appearance and function of today's roofs. The key to dealing with these is to implement them so they are unobtrusive and not readily seen.

Consideration should always be given to locating new elements in positions which do not form part of an important view of the building. For example, roof mounted air-conditioning units should be located at the rear of buildings or, if it is an old villa with double hipped roof and central box gutter, in the middle of the roof. They should not be mounted on the front of the house where they will be readily seen or above the roof where they may be seen in silhouette. Split air-conditioning systems should locate the condenser at ground level in a screened or unobtrusive position. Such installations should always have regard for the original design of the building and how it is viewed publicly.

Every effort should be made to maintain the original appearance of the building. When change is implemented, it should complement the original character of the building and not compromise the original design. Changes should occur within the architectural character of the building and in the spirit of the time it was built.

Where no choice exists but to make such change in a very exposed position, the visual impact of that change can often be lessened by painting the changes out to match their background so that the degree of contrast is lessened. Painting an item a dark matt colour to make them a negative element within the overall environment will work in other situations.

Service Pipes

Where service pipes or conduits must be exposed on a roof, always try to:

- minimise the number of service runs;
- minimise their length;
- locate them unobtrusively;
- paint them to match the background.

Visually intrusive air-conditioning unit

6. ROOFWORK TODAY

Availability of Tradespeople

The first problem to be addressed in considering the repair of an older roof is finding tradespeople who are skilled and experienced in carrying out the necessary work. This will obviously depend upon the type of roof in question.

Thatching

Thatching has ceased to be practised even though there are still a considerable number of thatched buildings, mainly agricultural structures, surviving in rural areas in South Australia.

Timber Shingles

Roofing with timber shingles is rarely carried out today in South Australia, although from time to time a building is still roofed in this way. These buildings tend to be one-off projects, usually of a civic or public nature. In these cases the shingles are usually purpose made and fixed by tradespeople or others who are well intended but rarely experienced in this craft.

Slates

There are still a few trained and experienced roof slaters in South Australia, typically British immigrants who have come out after the Second World War. There are also a number of local tradespeople who have picked up the trade by working with one of these trained slaters. Persons considering repairing or re-roofing a slate roofed building should consult Heritage South Australia for up-to-date advice on the availability of roof slaters.

Corrugated Steel

While working with galvanised steel is a diminishing practice, there are still experienced tradespeople in South Australia who can competently repair and re-roof in galvanised steel. These tend to be older tradesmen who were trained in the 1950's and 1960's. Finding these people is a matter of asking around and speaking to local plumbing businesses and older roofing contractors.

Terracotta Tiles

Like galvanised iron, there are still good experienced tradespeople available but they have to be sought out. They too are typically older tradesmen trained in the 1950-60's. Some roofing firms specialise in restoring old tiled roofs and have experienced tradespeople in house, while other firms will know who to go to and will arrange the job for you. A good strategy is to approach several firms and choose the one which can best demonstrate experience and competence in working with terracotta tiles.

Bituminous Felt

There are still experienced tradespeople available who can lay and repair bituminous impregnated felt roofs and balcony flooring. Such work is probably best arranged through a roofing company or builder who has the appropriate trade contacts. Some roofing companies specialise in repairing or restoring older roofs and will be able to provide the appropriate tradespeople.

Availability of Materials

Another problem can be obtaining suitable supplies of roofing materials.

Roofing Slate

The supply of roofing slate in South Australia is usually arranged through roof slaters. While there are agents in New South Wales for Penrhyn slate*, local roof slaters usually have their own contacts here and abroad for purchasing new or second hand roofing slate. This is often only brought in on a job by job basis. While the best roofing slate usually comes from Wales, slate is available from a wide range of sources. Local second hand roofing slates can be used, but particular care should be given to its selection and purchase to ensure sound slates are acquired. This is best left to professional slaters. The programming, purchase and delivery of slates should also be allowed for as it may take months for the slate to actually arrive on site.

**The Slate People, 5 Foundry Road, Seven Hills NSW 2147 02 9624 7377*

Availability of Materials Cont.

Corrugated Galvanised Steel
Galvanised steel in corrugated form (ie Custom-orb, Custom Blue Orb), flat sheet and small-fluted form is still available from several manufacturers like BHP Building Products. It is roughly the same price as Zincalume and is rolled on demand.

Owners should be aware that one of the quirks of the roofing industry is that natural Zincalume steel custom-orb will usually be used when natural corrugated steel is requested, rather than natural galvanised custom-orb. This is because many roofing firms assume that customers who ask for galvanised iron are talking in a generic sense and will be happy with Zincalume. As Zincalume cladding is not generally recommended for visible work on heritage buildings (refer Section 2), it is important to confirm with the roofer or supplier that galvanised steel is required.

Some suppliers may also say that galvanised steel is no longer made or is more expensive. This is incorrect and can be checked directly with BHP. Being only rolled on demand does mean that orders will need to be placed in advance. Good programming is therefore advised.

Second hand galvanised steel is available from salvage yards and demolition sites. While this needs to be selected with care for condition and matching profiles, it is often quite satisfactory for repairs and re-roofing heritage buildings. Its use depends upon the situation and owner's wishes.

Terracotta Tiles
It is always difficult if not impossible to get supplies of roof tiles to match older tiles. Demolition sites and local salvage yards are the best places to find second hand tiles. If matching tiles cannot be found, the only other practical options are to use the closest possible match from whatever is available and accept a degree of visual mismatch; or to remove tiles from a less important section of the original roof and use these for repairs, and then use near-matching tiles on less important areas.

Mistakes to Avoid

Modern roofing practices are often different from those of Victorian times or before World War Two. This should be kept in mind when arranging repairs to an older roof. Inappropriate materials and details can inadvertently be used if proper attention is not given to all aspects of the work. Attention should always be given to using 'good roofing practice' and making good any previous examples of 'bad roofing practice'. Some of the traps to avoid are:

- Inadvertent loss of original roof fabric when re-roofing, such as vents, gablets, timber cappings, acroteria;
- Use of Zincalume steel custom-orb roof cladding rather than galvanised steel custom-orb;
- Use of an inappropriate material, eg PVC downpipes, rather than rolled galvanised downpipes;
- Use of the wrong gutter size or profile, ie D rather than Ogee;
- Use of rectangular downpipes for domestic work rather than round;
- Discharging high level gutters into lower level gutters when this may over load these gutters;
- Not scribing new ridge or hip capping into corrugated metal roofing;
- Using a large modern flashing to seal the top of a verandah roof to a wall;
- Use of a folded barge capping rather than a timber or rolled capping;
- Use of the wrong material which may result in electrolytic corrosion;
- Discharging water off a Zincalume steel roof into galvanised steel gutters;
- Forgetting to replace or reinstate timber scotias under eaves gutters;
- Cutting flashings into masonry walls rather than fixing into existing joints;
- Use of three-break galvanised ridge capping rather than roll-top capping;
- Use of short length gutters;
- Abuttal of dissimilar metal materials;
- Not painting or minimising the section of PVC pipe which joins the bottom of downpipes to the stormwater system.

Take Advantage of the Opportunity

When undertaking roof repairs take the opportunity to remove any unused or non-original vents, cables and conduits. This will clean up the appearance of the roof, make it more weather-proof and usually improve the building's value.

Also give consideration to reinstating any original elements which have been removed in the past, ie timber finials, timber cappings (often overlaid with flat galvanised sheet steel folded to match the timber profile), acroteria, roof vents, roof gablets, profiled fascia boards. This will improve the appearance of the building.

The conservation of chimneys and parapet walls should also be considered when roof repairs are contemplated. It may be necessary or appropriate to repair these first, minimising potential for damage of the roof in the future.

It may also be useful to consider future service needs such as air-conditioning condenser locations, television antennae or satellite dish locations, solar hot water panel locations etc, for an anticipatory and integrated longer term result.

Possible Funding Support

Funding assistance is available for some properties in South Australia. Buildings listed in the State Heritage Register are eligible for financial assistance from the State Heritage Fund. Buildings listed as local heritage places, and places listed in the State Heritage Register are eligible for financial assistance from the Commonwealth Government's Tax Incentive for Heritage Conservation Programme. Interested owners should contact Heritage South Australia Register, Dept. for Environment, Heritage and Aboriginal Affairs, GPO Box 1047 Adelaide SA 5000 telephone 08 8204 9262, for information on both.

Designated Local Heritage Places in the City Of Adelaide can apply for financial assistance from the City of Adelaide Heritage Incentive Scheme.

General Guidelines for Conserving Older Roofs

The following guidelines should be kept in mind when carrying out repair work or conservation work on older roofs:

- Always retain and preserve the original roof design;
- Always retain as much of the original roof fabric as possible;
- Always retain and preserve all original roof features including chimneys, vents, gablets, decoration, turrets etc;
- Ameliorate previous mistakes and un-informed work wherever possible;
- Avoid the use of inappropriate materials (see Traps to Avoid on previous page);
- Locate non-original roof elements such as roof-lights, air-conditioning condensers, new vents, conduits, solar collectors, TV antennae, satellite dishes etc. in unobtrusive positions not visible from the street or public places;
- Avoid introducing any new roof features which might effect the integrity of the original roof design or damage any of the original architectural features of the roof;
- Maintain the roof regularly. Keep all gutters unblocked and attend to any leaks or repairs as soon as practical;
- Ensure all stormwater discharge is taken well clear of the building and that downpipes do not discharge alongside the building.
- Use colours appropriate to the age of the building, ie use Colorbond or paint the roof, gutters and downpipes in historic colours in order to maintain the historical integrity of the building.

7. CASE STUDY

Overview
In 1996 the roof at Roche House, a State heritage listed place at 46 Palmer Place North Adelaide was surveyed and a priority work schedule prepared. This became the basis for carrying out maintenance repairs later in the year, assisted by the Adelaide City Council Heritage Incentive Scheme.

Site Inspection
The roof and its various elements were carefully inspected from a scaffold and all dilapidations noted. The roof was a 1905 terracotta tiled roof of Marseilles tiles imported from France. It was in good condition for its age, although a number of minor repairs were evident, including:

- Verge tiles nailed to barge boards. The tiles had cracked as a result;
- Slipped tiles;
- Valley gutters badly rusted;
- Missing timber finials;
- Sections of rotten timber in the barge boards;
- Timber cappings covered over with painted galvanised tin;
- Downpipes discharging alongside the building;
- Original Ogee gutters replaced with 1950 D gutters;
- Flat terracotta bay window roofing tiles had been painted over;
- The timber trim, ie fascias, barge boards, eaves, soffits needed painting;
- Modern PVC vents installed through the roof.

Locating Materials
A source of matching roofing tiles was located at a salvage yard (in this case the Adelaide Red Brick Co.)

Original Ogee gutter replaced by D gutter

Priority Maintenance Work
A schedule of priority work was resolved based on carrying out essential repairs and restoring the original roof design wherever possible. This included:

- Replacing sections of rotten timber;
- Fixing all loose and cracked tiles;
- Replacing rusted box gutters;
- Installing an underground stormwater disposal system;
- Painting the building in an appropriate period colour scheme, resolved from on-site inspection and paint scrapes.
- Reinstating the missing timber finials;
- Cleaning off paint from the flat tiles;
- Painting out the PVC vents to match the building;

Future Work
Work deemed as desirable but not essential at the present was programmed for the future, ie replacing the D gutters with Ogee gutters when the former had worn out.

Opportunity Work
Other work carried out at the same time because access was available and the opportunity presented itself included repointing sections of the chimneys and repairing the stucco infill panels in the feature gables.

Summary
By understanding the overall roof and its various needs, a comprehensive and balanced maintenance programme was able to be resolved and implemented which addressed both basic repairs and the restoration of much of the missing historical character of the building.

Note cracked tile, slipped tile and lichen

8. FURTHER READING

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