

Replacing corrugated iron roofs

Many heritage places in Brisbane have corrugated steel roofs, like the traditional *timber and tin* houses.

It is essential to maintain or replace corrugated iron roofing where required for the long-term care of heritage buildings. New roof sheeting should match the original as closely as possible to maintain the cultural significance of these buildings.



Machinery for making sheet metal: Atlas Foundry, corner Russell and Merivale Streets, South Brisbane, State Library of Queensland, circa 1915

Traditional metal roofs

The term galvanised iron, or GI, originated with the use of wrought iron sheets as the base metal in the earlier part of the 1800s.

Mild steel sheeting rapidly replaced wrought iron as the base metal following improved steel making and processing methods later in the 19th century. The first Australian galvanising works appear to have been set up in Sydney in 1863.

The old hand-dipping process provided the metal sheets with excellent weather protection. Sheets of 0.6mm thickness (24 gauge steel) could be curved for bull-nose verandah roofs. Thicker sheets of 0.8mm (22 gauge steel) were also used for roofing although they were less common.

Materials used for hot dip galvanising have not changed. However, early dipping processes tended to make the galvanising layering more uneven with thinly-coated areas more prone to weathering and rusting. On the other hand the coating could be in places very thick (as much as 800 gms/m²).

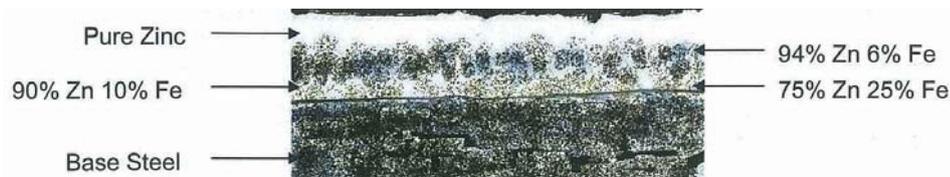




Production processes: E. Sahcs & Co Galvanising Works, Warren Street, Fortitude Valley, Brisbane, State Library of Queensland, no date

New metal roofs

With technological advances, the galvanised coating is now thinner and more evenly distributed across the surface area.



Cross section of galvanised steel coating

A thin protective coating of zinc is bonded to the steel base by a series of iron-zinc alloy layers. The durability of the galvanising coating is dependant on the amount of zinc applied to the steel surface.

Heavy galvanising provides a thorough coating of zinc for long-term sheet protection. Good GI sheeting is provided in 6mm thick (24 gauge) steel sheets with a coating of 600gm of iron-zinc alloy layers/m².

Current standard GI sheeting

Coatings of roof sheeting

- z600 (600gm per sq m – 300gm on each side)
- z450 (450gm per sq m of coating – 225gm on each side)

Thicknesses of steel sheeting for GI roof sheets

- 24 gauge steel – 0.60mm thick
- 26 gauge steel – 0.42mm thick

Zinc metal spraying (spray galvanising)

- this method has the advantage of being able to be applied on site
- a stream of molten zinc is blown on to the steel surface and it usually needs a sealing coat after application
- as the adhesion is mechanical it is prone to failing and the coating adheres more successfully to rough steel surfaces

Types of sheet profiles

Traditionally, steel sheets were made in several profiles. These varied in depth (vertical distance from top to bottom of corrugation) and pitch (horizontal distance from top of one corrugation to top of next).

The greater the corrugation depth the more the sheets could span wider distances without supports.

Traditional corrugations and coating are still available from some suppliers and a number of builders/tradespeople work with the traditional corrugated galvanised steel.

Available profiles



House with short sheet roof

Much longer sheets (30m lengths) are readily available and may be an option when the roof is not visually prominent. Long sheets cover most roofs without the need for overlapping joints reducing the risk of corrosion.

Other roofing components

Fastenings

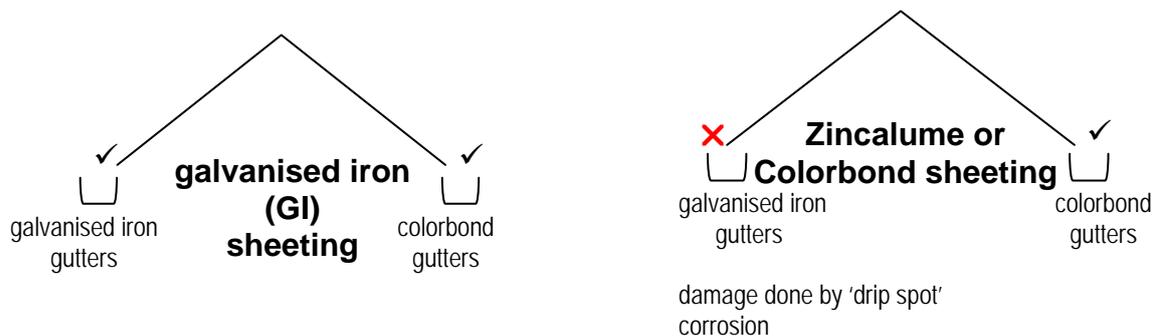
- use traditional slot-headed galvanised roofing screws or nails and washers particularly when the roof is highly visible
- fixing with hexagonal nut-headed galvanised screws is acceptable if the roof is not visible or prominent

Flashing and Cappings

- use GI flashings and capping, shaped to match the roof profile or lead flashing (but not in a very harsh environment), with GI roof cladding

Gutters

- ensure gutters and their fixings match the roof material, have external spikes/brackets and soldered joints/corners
- use silicone instead of soldering with lead to avoid contamination in rain water tanks
- use Colorbond gutters if the original roof cladding has been replaced earlier with Colorbond or Zinalume

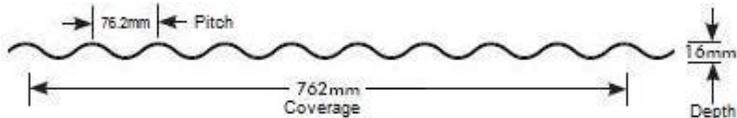


Gutter profiles

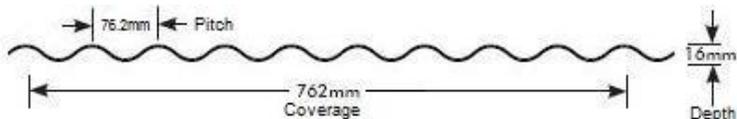
- ensure gutters have a high back to facilitate overflow and no slots at the front
- match original profiles – generally variations on the **Ogee** profile for 19th century and some early 20th century buildings and mostly **Quad** for later buildings



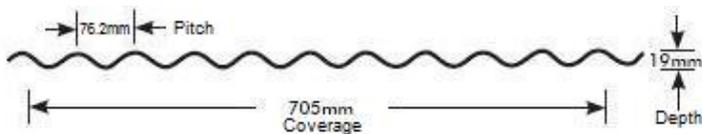
- **Custom Blue Orb** (for straight spans only) – 16mm depth, 76.2mm pitch, made of 0.42mm thick (26 gauge) steel can be 0.45mm or 0.48mm, depending on the thickness of the galvanising coating



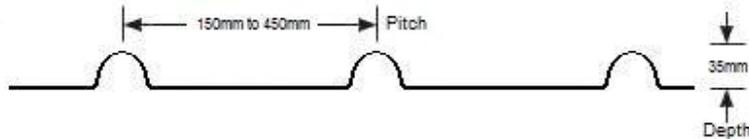
- **Custom Orb** (also used for bullnose and curved roofs) – 16mm depth, 76.2mm pitch, 0.6mm thick (24 gauge) steel



- **Heritage Barrel press** (an early profile also used for bullnose and curved roofs) – 19mm depth, 76.2mm pitch in 0.42mm thick steel (for straight spans only) and in 0.6mm thick steel



- **Gospel Oak** –named after the original English manufacturer – (primarily used in religious and other public buildings)– 35mm depth with pitches ranging from 150mm to 450mm



Gospel Oak and Heritage Barrel press (no longer standard production lines) can be custom made to match the original profile

Sheet lengths

Corrugated galvanised steel sheets traditionally came in short lengths (1160mm to 3000mm). Short sheets are now usually customised to match the original sheeting as they are not available in standard lengths.

Overlapping joints are more prone to corrosion. However, when only a few sheets need replacing, the best option is to use short lengths of sheets to match the original size. This is also preferable when the roof is visually prominent as the horizontal lines formed by the joints give it a distinctive traditional appearance.

Shorter sheets are not usually covered by warranty from suppliers.



Ogee gutters with ornamental Acroterion detailing above corners

Downpipes

- ensure downpipes are metal with a round or rectangular form to match original profile and they match the gutter material and any decorative elements
- use galvanised iron brackets to fix galvanised iron gutters and downpipes
- carry out a paint analysis of the building to identify the original colour scheme before painting gutters and downpipes



Gutters and square downpipes with rainwater head



Section of square downpipe with ornamental bracket

Durability of roof sheeting

Prolonged durability results from:

- quick run-off of dirt and water from steeply pitched roofs, such as in old roofing
- galvanising, as the zinc present in the coating acts as a sacrificial material to protect the steel substrate by corroding to produce a relatively non porous and stable surface



19th century cottage with steep pyramid roof

Causes of rapid deterioration

- 'drip spot' corrosion when galvanised iron gutters and downpipes are used in conjunction with Zinalume or Colorbond roof sheeting



Gutter deterioration due to 'drip spot' corrosion

- debris on the roof



Accelerated gutter deterioration due to lack of maintenance

- loose fixings which allow wind-blown rain to penetrate under the sheeting
- rust at the overlapping joints of corrugated sheeting which tends to trap water by capillary action
- increase in acid rain and pollution particularly in some inner-city areas

Suppliers and warranties

Some manufacturers and suppliers stock galvanised iron sheeting and provide warranties.

Some suppliers in Brisbane use flat metal sheets and do their own corrugation and hot-dip galvanising.

They supply warranties for their corrugating and galvanising processes. Warranties range from 5 to 25 years depending on the galvanizing thickness (z450mm or z600mm) and the location. The closer the roofing is located to the ocean the more rapidly it will deteriorate because of the high levels of salinity in the atmosphere.

Further reading

- Heritage Victoria, 'Corrugated roofing', 2001
<http://www.heritage.vic.gov.au/admin/file/content2/c7/Roofing.pdf>
- Heritage Victoria, *Why any old galvanised iron won't do*, 2000
http://www.heritage.vic.gov.au/admin/file/content2/c7/Why_any_old_galvanised_iron.doc
- Heritage Victoria, *Metalwork*, 2001,
<http://www.heritage.vic.gov.au/admin/file/content2/c7/Metalwork.pdf>

For more information contact Council's Heritage Unit.

