INTERNAL GUTTER DESIGN

Internal or 'within roof area' gutters (also described as box gutters) are seen as an easy solution to the collection and disposal of roof water. However, significant inconvenience, damage and health issues may occur if one overflows.

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In an ideal world, internal gutters should be avoided, but it is not always possible to do so. Three New Zealand Building Code clauses must be applied to their design – B2 *Durability*, E1 *Surface water* and E2 *External moisture*.

Under Clause B2 a gutter must remain durable with normal maintenance for at least 15 years. Clause E1 states buildings and site works should be constructed in a way that protects people and other property from the adverse affects of surface water, and Clause E.2.3.1 states that roofs must shed precipitated moisture. In locations subject to snowfall, roofs must also shed melted snow.

Designing internal gutters

When considering the design of an internal gutter, the first references to consult are E1/AS1 and E2/AS1. E1/AS1 gives design rainfall intensities so that designers can determine the amount of water that has to be dealt with. E2/AS1 states that gutters should be sized to comply with 8.1.6.1 *Internal, valley and hidden gutters*, and 8.1.6.3 *Internal gutters*.

In summary, the key design requirements from E2/AS1 for designing internal gutters (see Figure 1) are:

- Each gutter must be designed to carry a rainfall intensity capacity that is twice the minimum required for an external gutter.
- A minimum width of 300 mm and a minimum depth of 70 mm (with an allowance of at least 20 mm freeboard) to give a minimum cross sectional area of 21,000 mm^2. A greater cross sectional area may be required after a gutter sizing calculation using E1/AS1 Figure 16 and 5.1.3. →

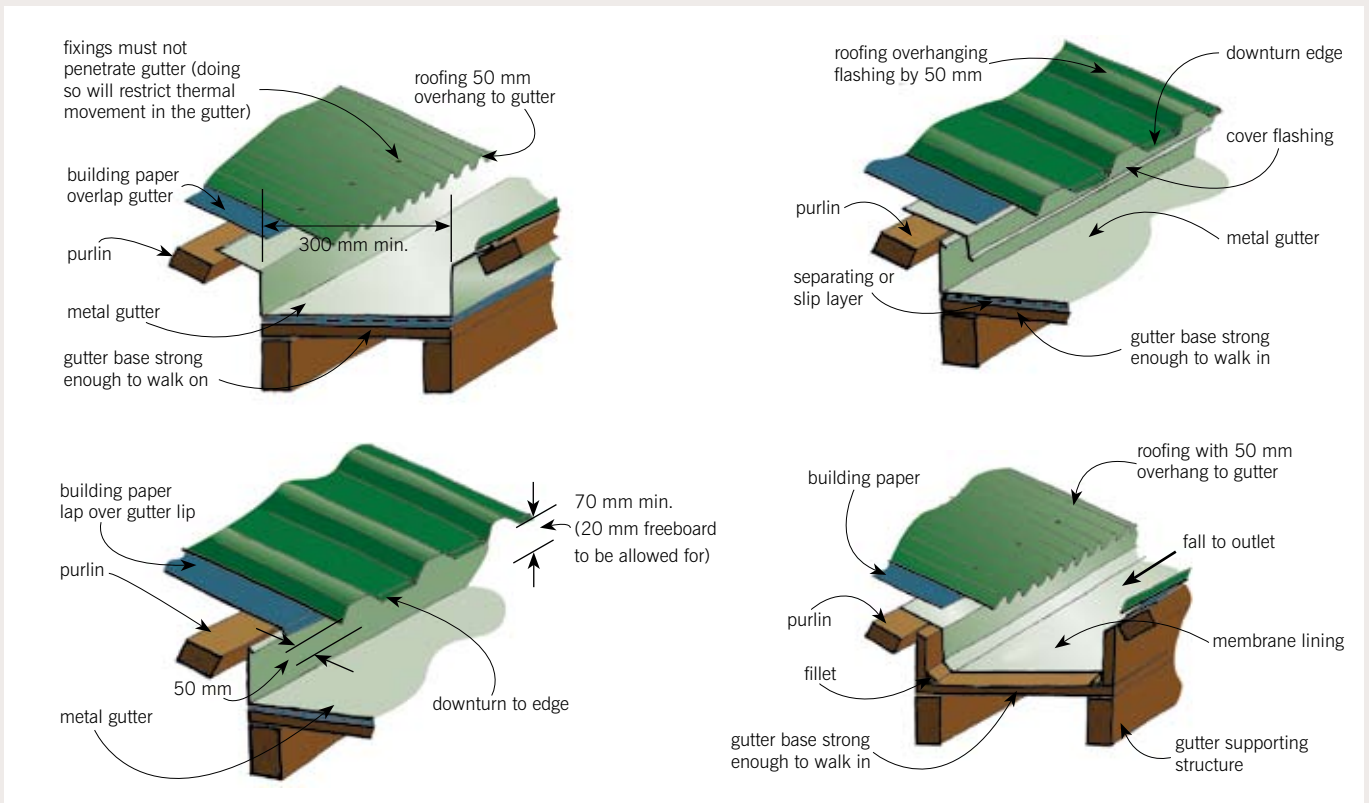

Figure 1: Internal gutter design/construction options.

- In snow prone areas, snow guards or snow boards should be used so the gutter will remain free to drain melted water. Also consider a leaf guard.
- A weir outlet and discharge into a rainhead that has an overflow with the bottom below the sole of the gutter should be considered.
- An allowance should be made for an expansion at the high end (see Figure 2).
- Continuous support should be provided to the base – for butyl rubber gutters, sheet plywood support is required.
- All joints should be lapped and sealed.
- The gutter must not receive direct discharge from downpipes and/or spreaders.
- Metals must be separated from any timber treated with a copper-based treatment solution.
- Gutters should be formed from the same material as the roofing (except for a tile roof, where the gutter should not be formed from tiles) or from the list of materials given in 8.1.6.1. Where the slope of the gutter is less than 3° only the materials listed in 8.1.6.1 can be used. AZ150 or Z275 coated steel cannot be used unless it has a factory applied finish.

Other features recommended

To ensure that internal gutters will always work, it is recommended that designers also:

- if possible, provide two outlets per gutter run
- provide overflows, equal in size and number to the outlets, located in an obvious position (such as over a doorway) to give the earliest possible warning of a problem
- have a minimum fall of 1:300 (1:100 is recommended to allow for any sag between supports and to ensure there is always positive drainage to the outlet)
- locate downpipes at not more than 12 m intervals
- create a base of sufficient strength to accommodate foot traffic during maintenance and/or roof access (particularly if there are steeply pitched roofs draining into it)
- use wider, rather than narrower, gutters which are easier to keep clean or repair
- incorporate details which allow the gutter to be readily replaced (without replacing the roofing) at the end of its serviceable life.

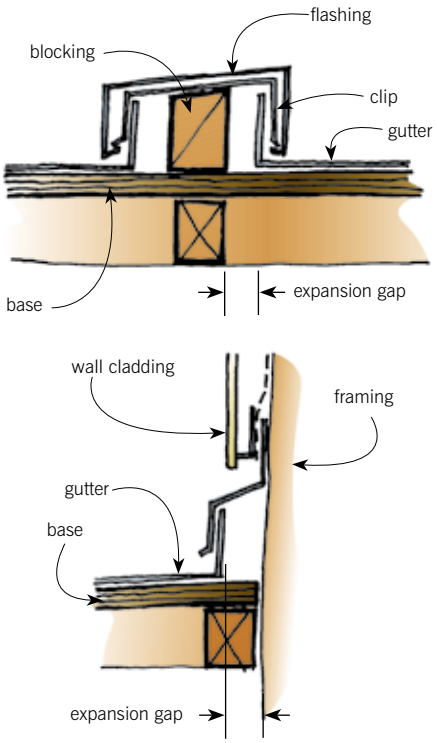

Figure 2: Allowing for movement.

SNOW

Figure 15.1 of NZS 3604: 1999 *Timber framed buildings* gives a map of snow zones across New Zealand which relates to a site's altitude above sea level. This can give an indication of likely sites that will be subject to snow and will need to cater for the removal of melting snow as part of an internal gutter design. However, it does not indicate the quantity of snow.