Roof plumbing – roof drainage systems

For new buildings or renovations requiring development approval (including complying development) the *Environmental Planning and Assessment Act 1979* requires compliance with the Building Code of Australia (BCA). The BCA is the framework for assessing the installation of residential roof plumbing, including guttering, as 'residential building work' under the *Home Building Act 1989*. The BCA specifically provides standards for the design and construction of downpipes and gutters and calls up the *AS/NZS 3500.3: Plumbing and drainage Part 3: Stormwater drainage*.

Builders, plumbers, and roof plumbers installing roof drainage systems should be fully aware of all the factors for consideration, requirements, and options available in the BCA and Australian Standards. This guide is a brief summary of some relevant issues. Installers should not rely on this guide.

Roof drainage systems—design AS/NZS 3500.3

1. Catchment areas

- Vertical walls abutting a roof must be included in the catchment area. For hipped roofs with eaves gutters a simplified formula can be used to calculate catchment area, but the slope of the roof must be known. Refer to *AS/NZS 3500.3*.
- The catchment area of a roof and any vertical walls is greatly influenced by the direction of wind driven rain, therefore the combined catchment area must be used for sizing purposes.

2. Rainfall intensity

- Rainfall intensities are given in Appendix E, *AS/NZS 3500.3*. The appendix gives five minute duration rainfall intensities. There is also reference to an Average Recurrence Interval (ARI) of 20 and 100 years.
- The ARI is used in accordance with Table 3.1, *AS/NZS 3500.3* where the risk of property damage, inconvenience or injury to people is taken into account.

  For example:
  – external gutters eaves gutters 20 years ARI
  – Internal gutters, box gutters 100 years ARI
- Table E1 in *AS/NZS 3500.3* lists latitude and longitude of selected places, some of which are marked on the maps. If there is any doubt regarding the rainfall intensity for a particular area, refer to the relevant council / shire for accurate rainfall intensity figures.

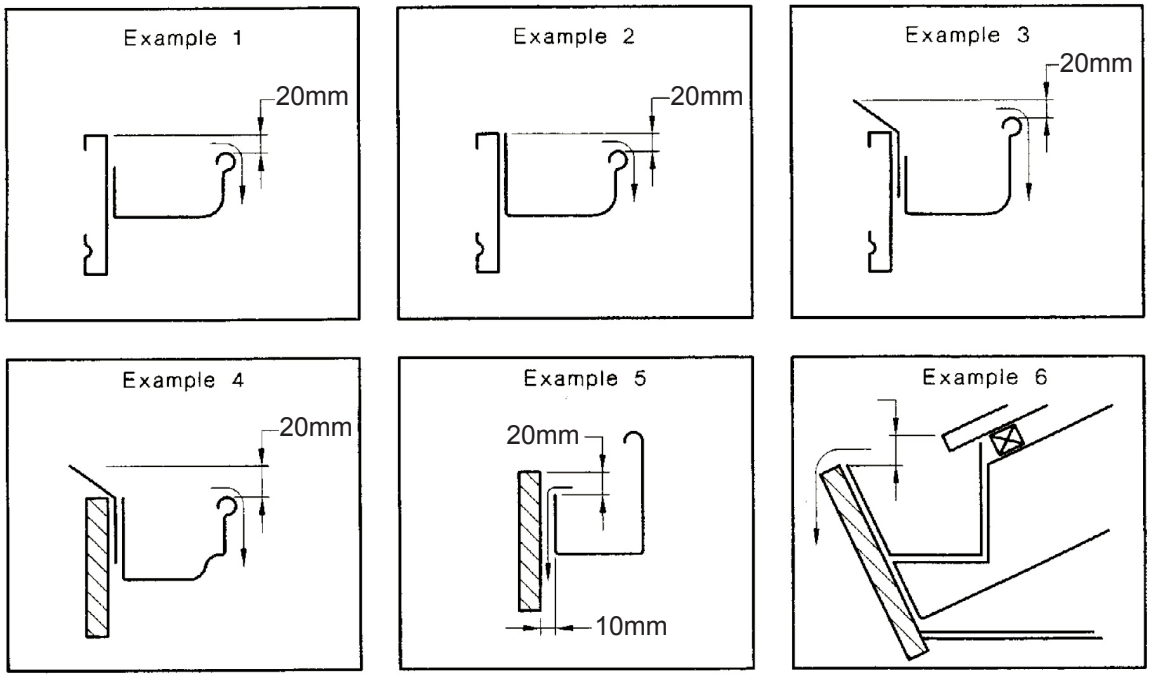
3. Overflow measures for eaves gutters

- Always consider what will happen if the gutter overflows. If water cannot flow back into the building, e.g. gutter fixed to rafters without eaves linings, no overflow measures are required. If water can flow back into the building; e.g. through eaves linings, then overflow methods must be provided.

  Examples of acceptable overflow measures for eaves gutters can be found in Appendix G of *AS/NZS 3500.3*.

  Simplified ways of providing for overflow of external eaves gutters can be found on page 12 of *HB 144*. A figure of 20mm is adopted for convenience in the examples shown in *Figure 1*.

Figure 1: Providing for overflow of external eaves and gutters (20mm)



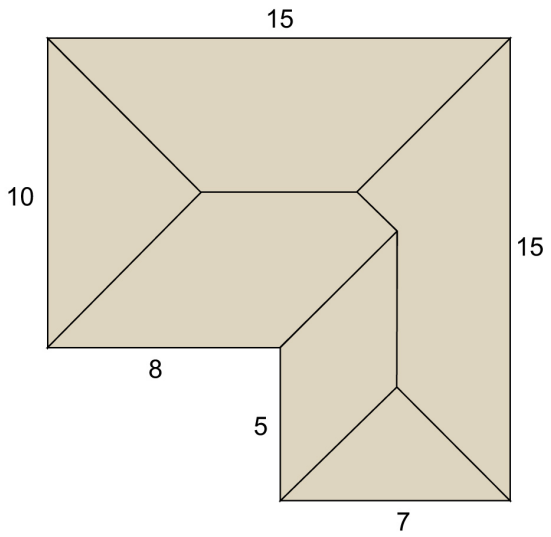
Source: HB 114:2003 Figure 1

Design Example

The following example is shown to illustrate the procedure adopted by *HB 114* to design eaves gutters and downpipes.

A hypothetical house is to be constructed in an area that has an ARI of 130mm/hour. The plan is shown in *Figure 2*. The roof pitch is 23°. Gutter overflow could cause significant damage, therefore overflow measures are required.

Figure 2: Design example of house plan



Step 1: Determine the 5min/20 year ARI for the locality

From *AS/NZS 3500.* the ARI for this hypothetical house and area is 130mm/hour.

Step 2: Select eaves gutter and gutter slope

The eaves gutter selected is quad spouting with an effective cross sectional area of 6125mm^2 installed with a slope of 1:500.

Step 3: Determine downpipe size

From Table 3.3 in *AS/NZS 3500.3*, the minimum size downpipes compatible with spouting of 6125mm^2 cross sectional area (installed at a 1:500 gradient) are 90mm diameter round or 100 x 50 rectangular.

Note that a minimum gradient of 1:500 is preferred.

Step 4: Select 100 x 50 rectangular downpipe

From Figure 3.5 (A) in *AS/NZS 3500.3*, the maximum catchment per downpipe is 47m^2.

Step 5: Determine minimum number of downpipes

To calculate the minimum number of downpipes, divide the roof catchment area by the allowable maximum catchment per downpipe.

$$\textbf{Min number of downpipes} = \frac{\text{roof catchment area}}{\text{allowable maximum catchment per downpipe}}$$

$$= \frac{223.8}{47}$$

$$= \textbf{4.76m}^2$$

= Five downpipes are required
(round up to the next whole number)

Step 6: Determine the average catchment area per downpipe

To calculate the average catchment per downpipe, divide the roof catchment area by the number of downpipes.

$$\textbf{Average catchment per downpipe} = \frac{\text{roof catchment area}}{\text{No. of downpipes}}$$

$$= \frac{223.8}{5}$$

$$= \textbf{44.76m}^2$$

Step 7: Divide the roof into approximately equal catchment areas and determine downpipe positions

Divide the roof into five catchments and nominate the high points between downpipes (see *Figure 3*).

Step 8: Select an overflow method if required

The example building requires overflow measures.

AS/NZS 3500.3 provides various methods depending on the type of gutter used. For this job select example 1 from Figure 1 in *HB 114* where the gutter is installed with the top of the front bead a minimum of 20mm below the top of the fascia (see *Figure 4*).

Installers must be aware of design requirements, and apply them on the job.

Figure 3: Roof divided into five catchments

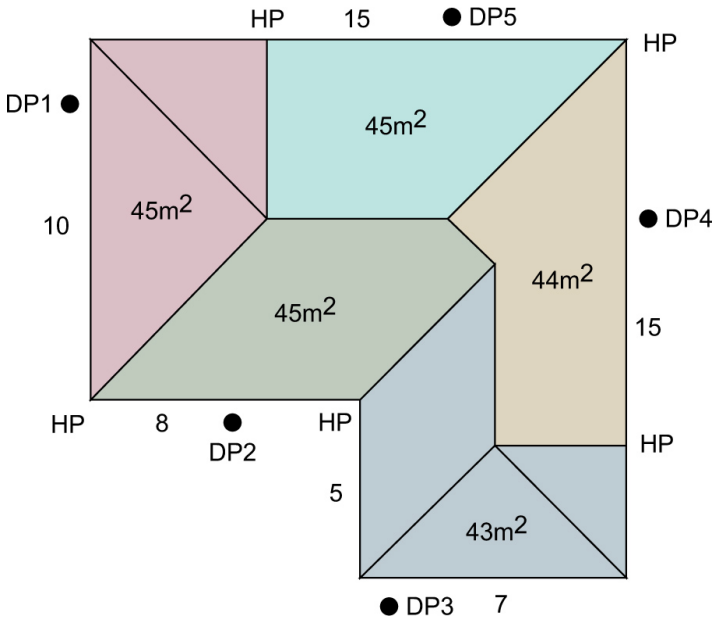
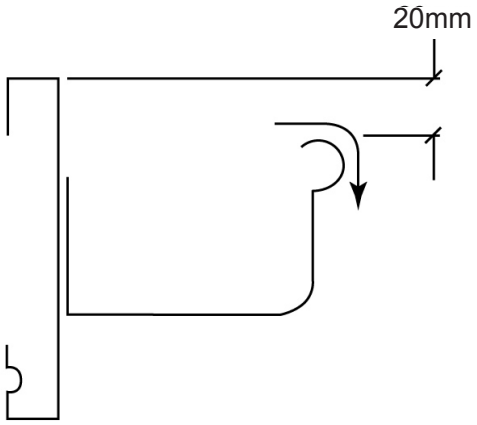


Figure 4: Example of overflow method



Source: AS/NZS 3500.3:2003 Figure G1(a) modified

Note

- There are many possibilities for downpipe positions. In some cases, depending on roof shape or building layout, extra downpipes may be needed as it is not always possible to achieve approximately equal catchment areas.
- Valley gutters should be at high points to allow drainage away from internal angles.
- The sub catchment areas may not add exactly due to rounding off during calculations.
- In this particular example, as per step 5, no catchment area should exceed the allowable 47m^2.

Acknowledgement

This guide is based on the Victorian Plumbing Industry Commission's *Roof Plumbing Technical Solution Sheet 0.04*. NSW Fair Trading thanks the Victorian Building Commission and Plumbing Industry Commission for permission to adapt their document.

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