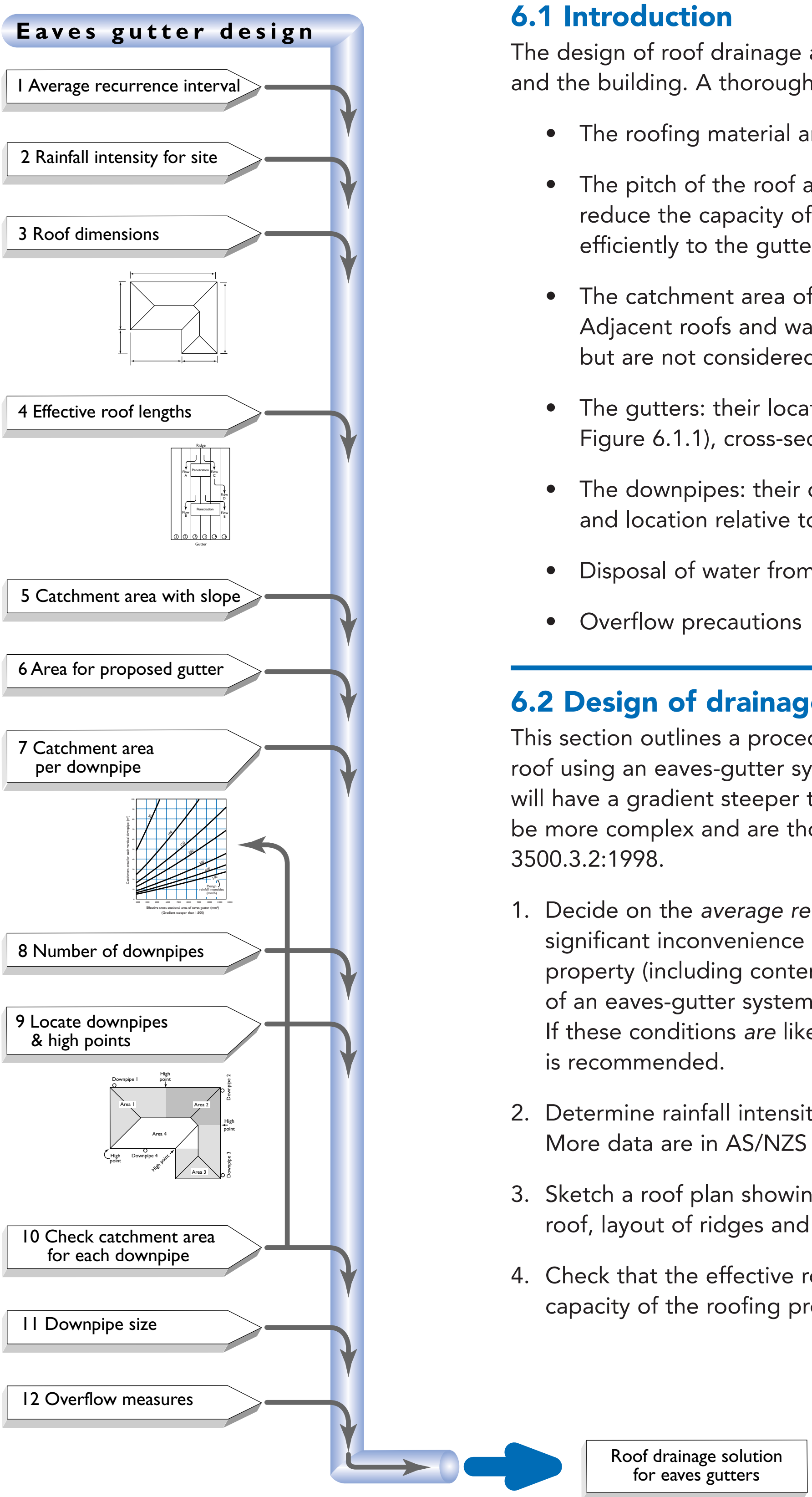
6

Roof drainage



6.1 Introduction

The design of roof drainage aims to protect people, property and the building. A thorough design includes:

- The roofing material and its profile
- The pitch of the roof and any penetrations that reduce the capacity of the profile to carry rain efficiently to the gutters
- The catchment area of the roof, including gutters. Adjacent roofs and walls can affect the catchment, but are not considered in this book.
- The gutters: their location (at eaves or elsewhere: Figure 6.1.1), cross-sectional area, and gradient
- The downpipes: their cross-sectional area, quantity and location relative to the gradient
- Disposal of water from the downpipes
- Overflow precautions

6.2 Design of drainage (eaves-gutter system)

This section outlines a procedure for designing the drainage of a roof using an eaves-gutter system. It is assumed that the gutters will have a gradient steeper than 1:500. Box gutter systems can be more complex and are thoroughly treated in AS/NZS 3500.3.2:1998.

1. Decide on the *average recurrence interval* (ARI). Where significant inconvenience or injury to people, or damage to property (including contents of a building), is unlikely (typical of an eaves-gutter system) a minimum ARI can be 20 years. If these conditions *are* likely (typical of box gutters) 100 years is recommended.
2. Determine rainfall intensity for the site from Table 6.2.1. More data are in AS/NZS 3500.3.2:1998.
3. Sketch a roof plan showing dimensions in plan view, pitch of roof, layout of ridges and valleys.
4. Check that the effective roof lengths don't exceed the capacity of the roofing profile (Section 2.4).

5. Calculate the catchment area of the roof from the plan. To allow for the slope of the roof, increase the plan area by 1% for every degree of pitch up to 40°. For pitches over 40° refer to AS 3500.3.2:1998.

6. Get the effective cross-sectional area of the gutter you intend to use from Table 6.2.2.

7. Using the cross-sectional area of the gutter on the graph in Figure 6.2.2, determine the catchment area per downpipe.

8. Calculate (as a first test) the minimum number of downpipes required for the selected gutter using the equation:

$$\left.\begin{array}{r}\text{Number of}\\ \text{downpipes (min.)}\end{array}\right\} = \frac{\text{Total catchment area of the roof}}{\text{Catchment area determined in (7)}}$$

Round the number of downpipes up to the next whole number.

9. On the plan, select locations for the downpipes and the high points in the gutters. Where practical, the catchments for each downpipe should be about equal in area; and a high point should be located at the bottom of any valleys (Figure 6.2.3).

   Calculate the area of each catchment for each downpipe.

10. Returning to the graph in Figure 6.2.2, with the area of your eaves gutter, check that the catchment area for each downpipe, calculated in Step 9, is equal to or less than the catchment area shown by the graph.

If a catchment area is too big then you can:

- increase the number of downpipes;
- reposition the downpipes and/or the high points;
- choose a gutter with bigger effective cross-sectional area, then repeat the above from Step 7.

11. Decide on the downpipe size. Recommendations in AS/NZS 3500.3.2:1998 suggest that the area of round pipes should be equal to the area of the gutter, whilst the area of square or rectangular pipes may be 20% smaller (Table 6.2.2).

12. Consider measures to counter overflow of gutters into the building.

6.3 Gutter fall

Install gutters with a generous fall to avoid ponding (which reduces gutter life), but the fall should not be so steep as to be obvious to the casual observer. Typical fall on house guttering is often about 1:250 (12 mm in 3000 mm), though a steeper fall of 1:100 should give the gutter a longer life.

Table 6.2.1
Design rainfall intensities

	For overflow of eaves gutters once in 20 years mm/hour	For overflow of internal box gutters once in 100 years mm/hour
A.C.T.		
Canberra	137	194
New South Wales		
Broken Hill	130	181
Bathurst	143	197
Sydney	214	273
Newcastle	181	233
Victoria		
Mildura	125	174
Melbourne	127	186
Ballarat	127	184
Queensland		
Brisbane	251	333
Rockhampton	248	336
Mackay	273	363
Mt. Isa	169	223
Townsville	260	346
Cairns	282	368
South Australia		
Mount Gambier	108	168
Adelaide	123	186
Western Australia		
Geraldton	132	173
Perth	146	214
Tasmania		
Hobart	99	155
Northern Territory		
Alice Springs	139	204
Darwin	285	366

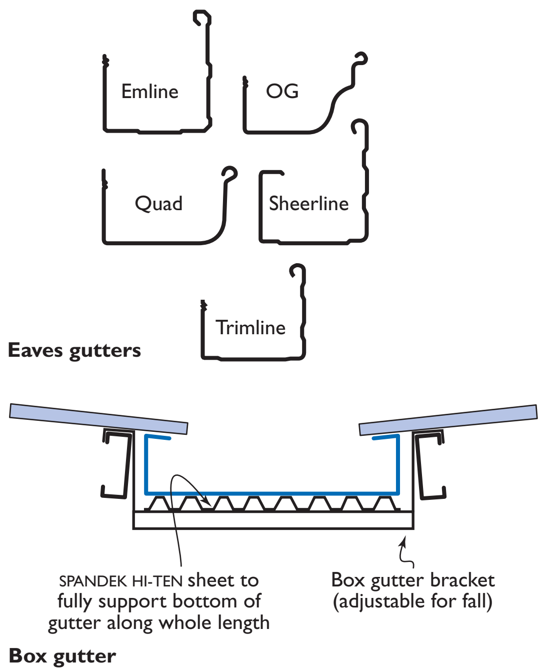
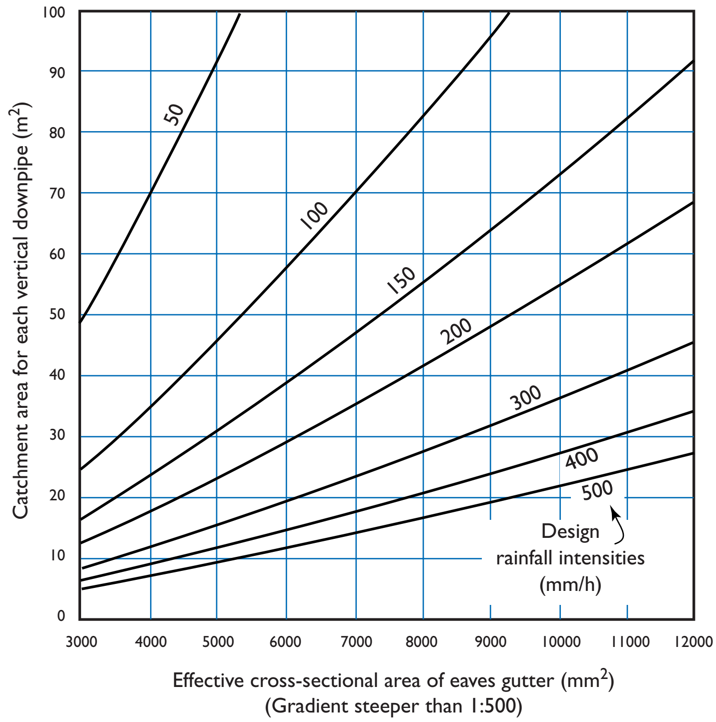


Figure 6.1.1
Typical gutters



Example
Find the maximum catchment area for each downpipe on a house in Hobart using Trimline gutter.

DATA
Design rainfall intensity = 99 (Table 6.2.1)
Gutter area = 7800 (Table 6.2.2)

SOLUTION (from Figure 6.2.2)
Catchment area for each downpipe = 81 m^2

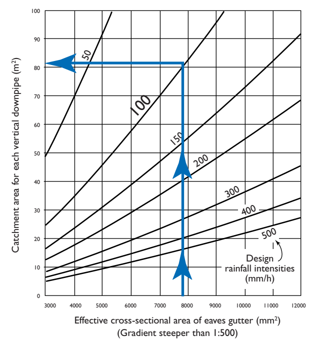


Figure 6.2.2
Cross-sectional area of eaves gutters required for various roof catchment areas (where gradient of gutter is flatter than 1:500).
(Adapted from AS 3500.3.2:1998)

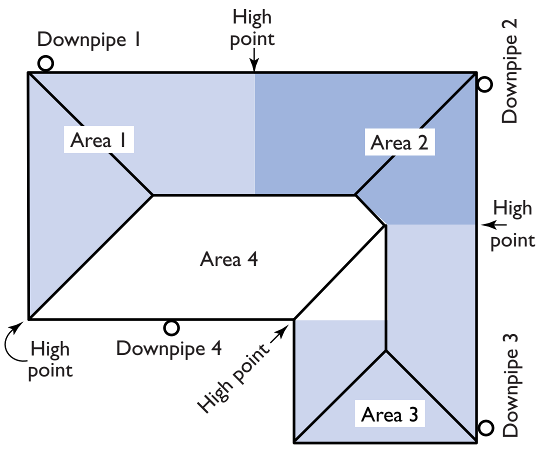


Figure 6.2.3
Locating high points and downpipes

Table 6.2.2
Gutter areas and downpipes

	Slotted	Effective cross-section	Minimum standard downpipe sizes to suit gutters (gutter steeper than 1:500) Round (diameter)	Rectangular or square
	yes/no	mm^2	mm	mm
EMLINE	yes	6723	100	100 x 75
EMLINE	no	9540	125	100 x 75
OG	no	5242	-	100 x 50
QUAD 115				
Hi-front	yes	5225	90	75 x 75
Hi-front	no	5809	90	100 x 50
Hi-front fluted Qld.	yes	5285	90	75 x 75
Hi-front fluted Qld.	no	5809	90	100 x 50
Low-front	yes	3600	90	75 x 50
Low-front	no	6165	90	100 x 50
QUAD 125 S.A.	no	7890	100	100 x 75
QUAD 125 N.S.W.	no	6370	90	100 x 50
QUAD 150	no	8910	100	100 x 75
SHEERLINE	yes	7600	100	100 x 75
SHEERLINE	no	8370	100	100 x 75
TRIMLINE	yes	6244	100	100 x 75
TRIMLINE	no	7800	100	100 x 75