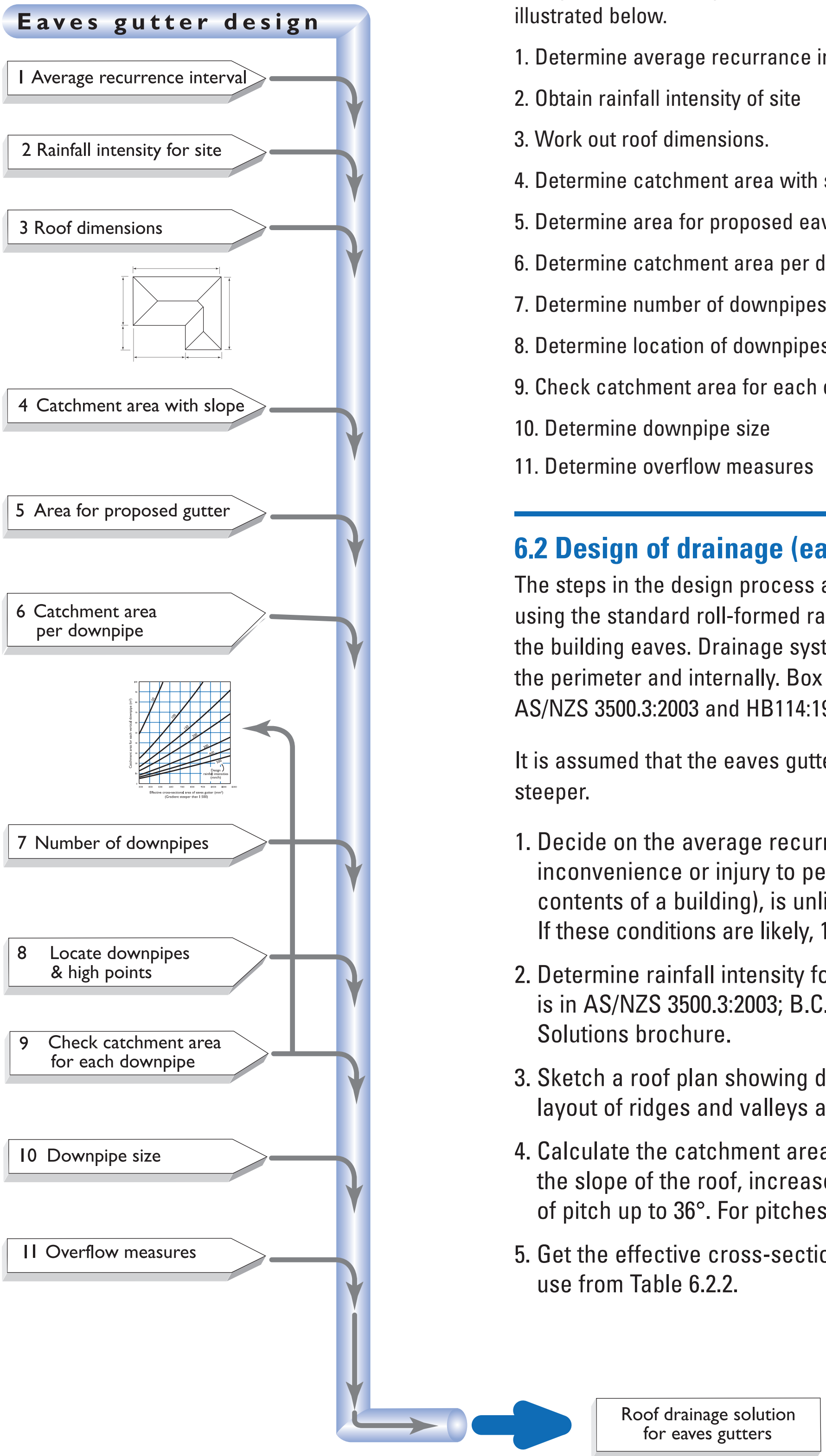
6

Roof drainage



6.1 Introduction

Roof drainage systems can be affected by a number of variables and must be designed and detailed by a suitable qualified trade or professional. The design of roof drainage aims to protect people, property and the building. The designed drainage system must be installed under the supervision of a qualified trade or professional. The steps of the design process are illustrated below.

1. Determine average recurrance interval (ARI)
2. Obtain rainfall intensity of site
3. Work out roof dimensions.
4. Determine catchment area with slope
5. Determine area for proposed eaves gutter.
6. Determine catchment area per downpipe
7. Determine number of downpipes required
8. Determine location of downpipes and high points
9. Check catchment area for each downpipe.
10. Determine downpipe size
11. Determine overflow measures

6.2 Design of drainage (eaves-gutter system)

The steps in the design process are for a perimeter drainage system using the standard roll-formed rainwater products (gutters) installed at the building eaves. Drainage systems for larger roofs use box gutters at the perimeter and internally. Box gutter systems are thoroughly treated in AS/NZS 3500.3:2003 and HB114:1998.

It is assumed that the eaves gutters will have a gradient of 1:500 or steeper.

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, a minimum ARI can be 20 years. If these conditions are likely, 100 years is recommended.
2. Determine rainfall intensity for the site from Table 6.2.1. More data is in AS/NZS 3500.3:2003; B.C.A. or in our local regional Rainwater Solutions brochure.
3. Sketch a roof plan showing dimensions in plan view, pitch of roof, layout of ridges and valleys and large roof penetrations.
4. 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 36°. For pitches over 36° refer to AS/NZS 3500.3:2003.
5. Get the effective cross-sectional area of the gutter you intend to use from Table 6.2.2.

6. Using the cross-sectional area of the gutter on the graph in Figure 6.2.2, determine the catchment area per downpipe.
7. Calculate (as a first test) the minimum number of downpipes required for the selected gutter using the equation:

$$\left.\begin{array}{r}\text{Number of}\\ \text{downpipes (min.)}\end{array}\right\} = \frac{\text{Total catchment area of the roof}}{\text{Catchment area (determined in 6)}}$$

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

8. 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.

   When selecting the location of high points and downpipes, consideration should also be given to proximity to high concentrations of water flow (e.g. valley gutters, diversions around large roof penetrations, dormers, etc.) More guidance is given in AS/NZS 3500.3:2003, HB114:1998 and BCA.

   Calculate the area of each catchment for each downpipe.

9. With the area of your eaves gutter, check that the catchment area for each downpipe, calculated in Step 8, 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 and size 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 6.

10. Decide on the downpipe size. Recommendations in AS/NZS 3500.3:2003 on downpipe sizes. As an approximate guide, 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).
11. Consider measures to counter overflow of gutters into the building. Consideration of overflow at high concentrations of water flow may need to be given. Guidance on this matter is given in NSW Dept of Fair Trading bulletin FTB40 (January 2009).

Install gutters with a suitable fall to avoid ponding and to allow water to easily flow away. Steeper falls are preferred for prolonged life of the gutter. More information can be found in our publication, 'Water Overflow & Residential Gutters'. Refer to the BCA and the Australian Standards for more guidance.

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

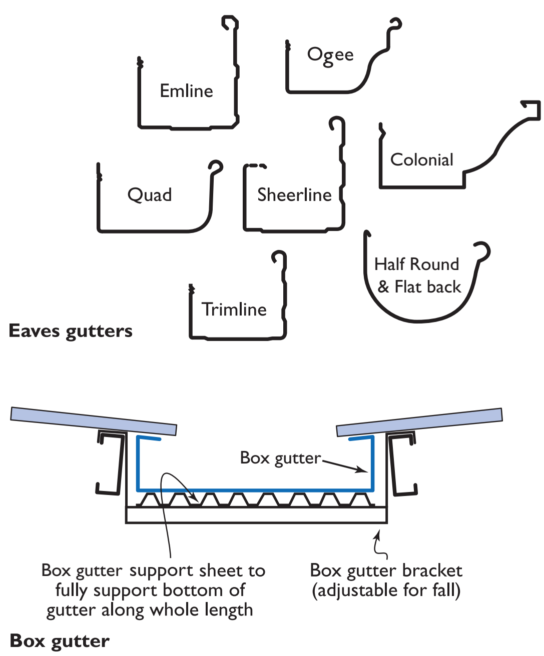
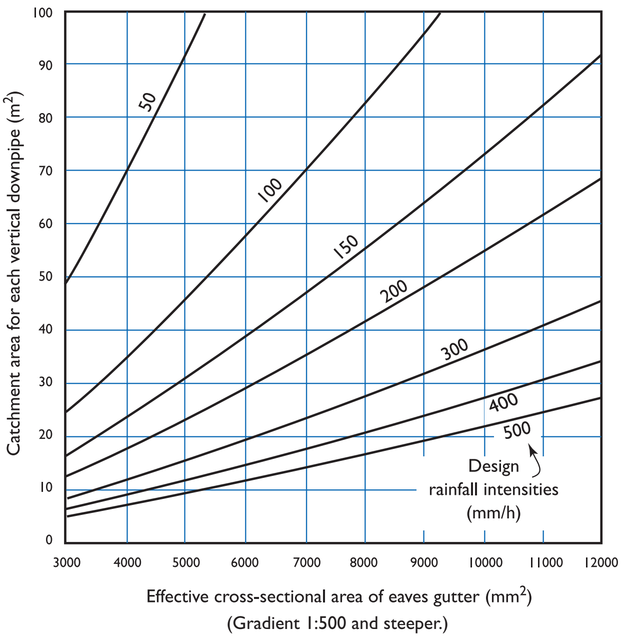


Figure 6.1.1
Typical gutters

Figure 6.2.2

Cross-sectional area of eaves gutters required for various roof catchment areas (where gradient of gutter is 1:500 and steeper). (Adapted from AS 3500.3:2003)



Gutter, downpipe and accessoriy availability and details may vary locally. Reference should be made to the local LYSAGHT Rainwater Solutions brochure for your area.

Example

Find the minimum catchment area for each downpipe on a house in Forbes using Quad Hi-front gutter.

METHOD

Using the gutter cross sectional area taken from Table 6.2.2 (shown across the bottom of the graph) draw a line upwards until it intersects with the Design rainfall intensity (Table 6.2.1). Draw a line at 90° to determine the catchment area for each downpipe.

DATA

Design rainfall intensity = 151 (B.C.A.)

Gutter area = 5804 (Table 6.2.2)

SOLUTION (from Table 6.2.2)

Catchment area for each downpipe = 37 m²

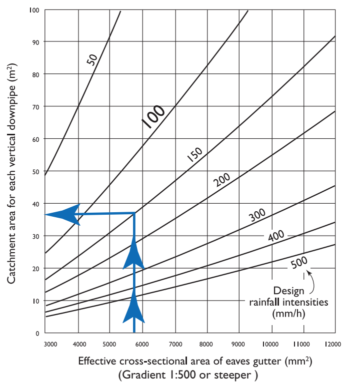


Table 6.2.2

LYSAGHT gutter areas and downpipes

	Slotted	Effective# cross-section	Minimum standard downpipe sizes to suit gutters (gradient ≥ 1:500) Round (diameter)	Rectangular or square
	yes/no	mm²	mm	mm
COLONIAL	no	4465	n/a	45 x 95
EMLINE	yes	6723	100	100 x 75
EMLINE	no	9540	125	100 x 75
FITFAST	yes	6723	90	100 x 75
FITFAST	no	7209	90	100 x 75
FLAT BACK 150	yes	5220	90	100 x 75
FLAT BACK 150	no	6447	90	100 x 75
HALF ROUND 150	yes	4775	90	100 x 75
HALF ROUND 150	no	6995	90	100 x 75
OGEE	no	5242	-	100 x 50
QUAD 115 Hi-front	yes	5225	90	75 x 75
QUAD 115 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
QUAD 115 Low-front	no	6165	90	100 x 50
QUAD 150	no	8910	100	100 x 75
QUAD 175	no	14672	100	100 x 75
Square Bead Quad	no	5420	n/a	45 x 95
Quarter Round	no	5970	n/a	45 x 95
RANCELINE	no	5657	75	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

Values calculated in accordance with AS/NZS 2179.1:1994

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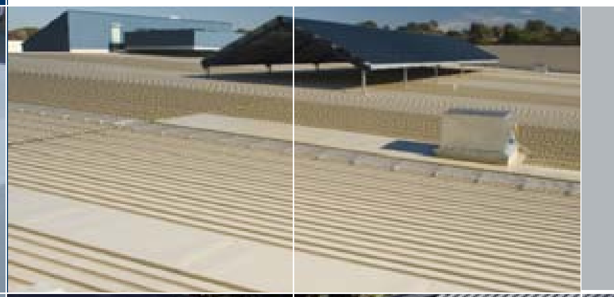

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