Plumbing Practice Note RP-06: Sizing a roof catchment drainage system

This Practice Note specifies the requirements for roof sizing and calculations for a complete roof drainage system.

The figures and contents below provide guidance for:

- The steps required when sizing a roof catchment drainage system
- Design example of a roof catchment drainage system
- Typical types of roof catchment installations
- How to calculate roof sizing

For guidance on regulatory frameworks, please refer to Practice Note: Roof Plumbing- RP01: Regulatory Framework.

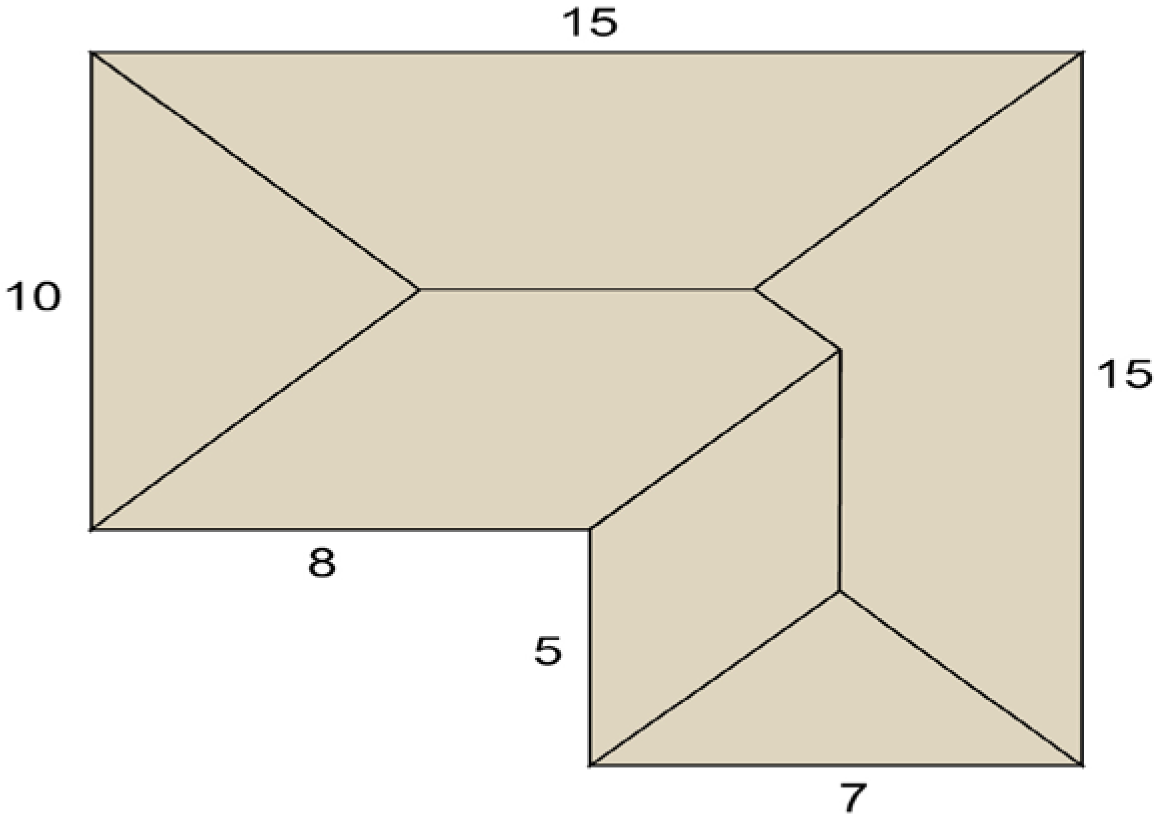
What are the steps required when sizing a roof catchment drainage system?

The following steps are applicable for domestic houses with eaves gutters:

1. Determine the Average Exceedance Probability (AEP) 5% formerly known as ARI 20 years
2. Calculate the total roof catchment area
3. Select the eaves gutter design and the slope
4. Determine the downpipe size
5. Determine the maximum catchment area per downpipe
6. Determine the minimum number of downpipes required
7. Determine the catchment area per downpipe
8. Determine the most advantageous downpipe positions
9. Select an overflow provision
10. Apply to the roof catchment drainage system to the building plan

Design example of a roof catchment drainage system?

The following example is a typical single storey dwelling built in Melbourne CBD with a roof pitch of 23°.



Design example method for sizing a roof catchment (Eaves gutters)

Step 1: Determine the Rainfall Intensity for the location and Average Recurrence Interval (ARI) [AEP 5%] for 20 years and a duration of 5 minutes

As per the requirements of AS/NZS 3500.3 Table E1 the 5min/20-year ARI for Melbourne city is 132 mm/h

Step 2: Calculate roof area from the plan. To calculate the total roof area, refer to AS/NZS 3500.3 Table 3.4.3.2: Catchment Slope Factor Area Multiplier.

Scenario: The roof dimensions are (15m x 10m) + (5m x 7m) 150m^2 +35m^2 = 185m^2.

- The roof has a 23° pitch.
- The slope factor (F) = 1.21
- F x roof plan area = 1.21m^2 x 185m^2
- The **total** roof catchment area= 223.85m^2

TABLE 3.4.3.2

CATCHMENT AREA MULTIPLIER (*F*) FOR VARIOUS ROOF SLOPES (FOR EAVES GUTTERS ONLY)

Roof slope degrees	Multiplier (*F*)	Roof slope degrees	Multiplier (*F*)	Roof slope degrees	Multiplier (*F*)
0	1.00	22	1.20	44	1.48
1	1.01	23	1.21	45	1.50
2	1.02	24	1.22	46	1.52
3	1.03	25	1.23	47	1.54
4	1.03	26	1.24	48	1.56
5	1.04	27	1.25	49	1.58
6	1.05	28	1.27	50	1.60
7	1.06	29	1.28	51	1.62
8	1.07	30	1.29	52	1.64
9	1.08	31	1.30	53	1.66
10	1.09	32	1.31	54	1.69
11	1.10	33	1.32	55	1.71
12	1.11	34	1.34	56	1.74
13	1.12	35	1.35	57	1.77
14	1.12	36	1.36	58	1.80
15	1.13	37	1.38	59	1.83
16	1.14	38	1.39	60	1.87
17	1.15	39	1.40	61	1.90
18	1.16	40	1.42	62	1.94
19	1.17	41	1.43	63	1.98
20	1.18	42	1.45	64	2.03
21	1.19	43	1.47	65	2.07

Table 1: Catchment area multipler *(F)* for various roof slopes, *referenced from HB 39 Table 3.5.2*

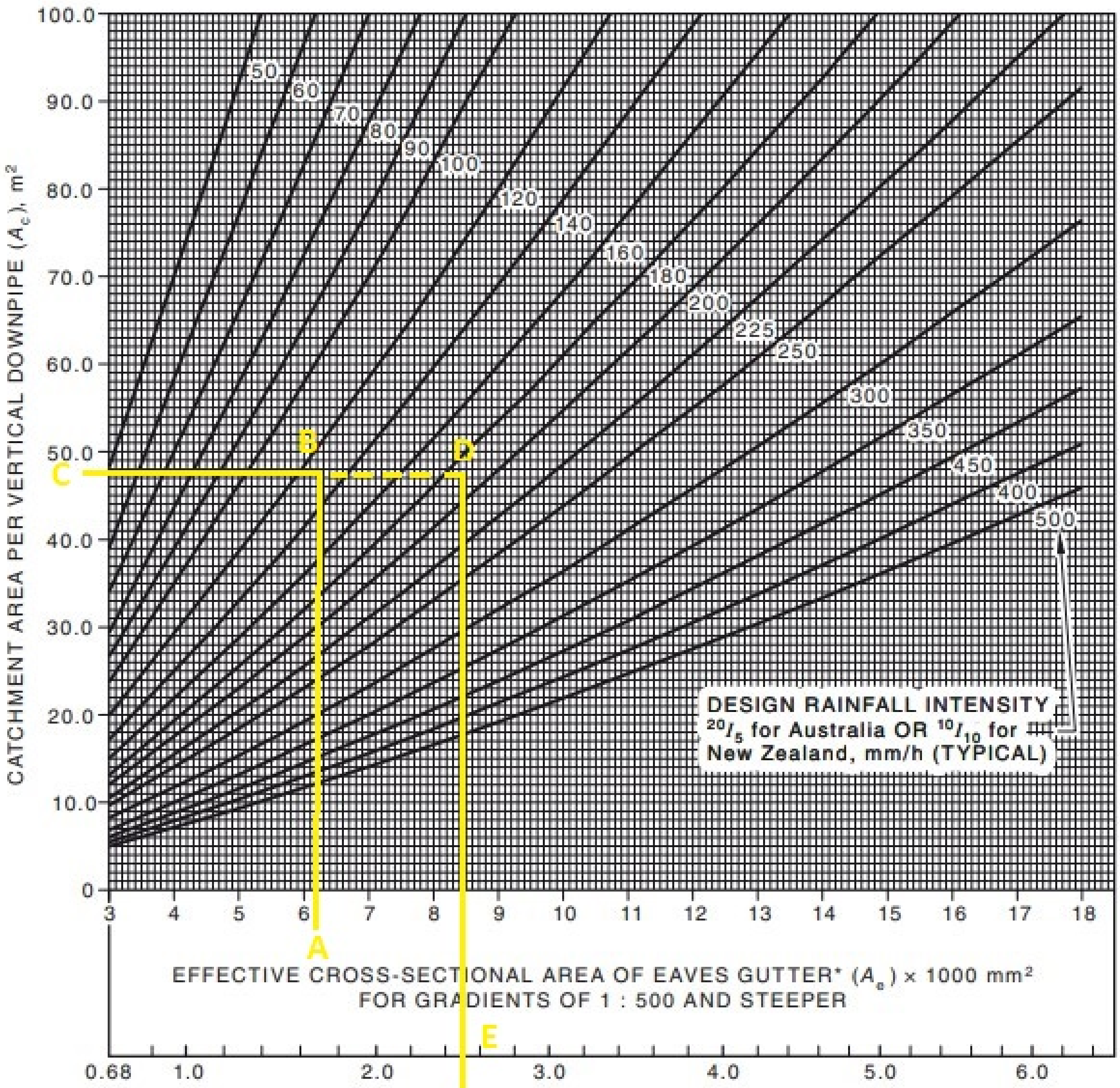
Step 3: Select eaves gutters and slope. Refer to the manufacturer's guidelines for the effective cross-sectional area of the eaves gutter.

Scenario: The gutter selected has a cross-sectional area of 6125 mm^2 and will be installed with a slope of 1 in 500

Step 4: Determine downpipe size. To determine the downpipe size, refer to AS/NZS 3500.3 Table 3.5.2.

- Round up the cross-sectional area to 6400mm^2, as per Table 3.5.2.
- The minimum size of the downpipes is 100mm x 50mm or 90mm round

Step 5: Determine the maximum roof catchment area per downpipe



Graph Interpretation:

A. A cross-section of gutter = 6125mm²
B. Average Rainfall Intensity (ARI) = 132 mm/h (20 year/5 mins)
C. Catchment area per downpipe = 47m²
D. Eaves overflow Average Rainfall Intensity (ARI) = 187mm/h (100 year/5mins)
E. Litres per second per metre = 2.5 L/s

= Maximum roof area per downpipe is 47m²

Step 6: Determine the minimum number of downpipes

To determine the minimum number of downpipes required, refer to AS/NZS 3500.3 Table 3.5.4(a)

The minimum number of downpipes is equal to the roof catchment area divided by allowable maximum catchment per downpipe=

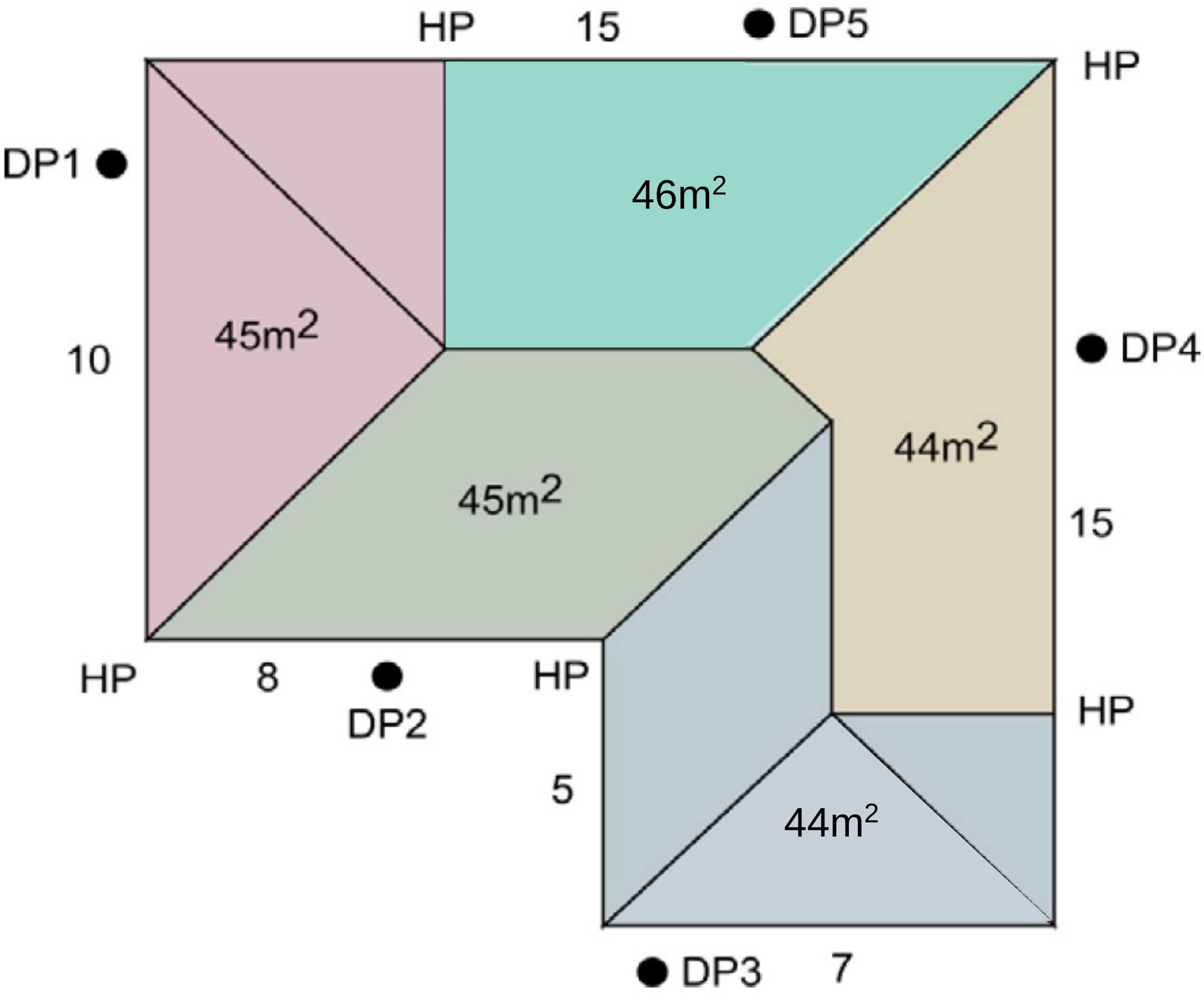
Calculation = 224 ÷ 47= 4.75
Round up to 5 downpipes

Step 7: Determine the average catchment per downpipe

Calculation: 224 ÷ 5 = 44m^2

Step 8: Divide the roof up evenly to locate downpipe positions

Note: all catchment areas are less than the maximum area per downpipe of 47m^2.



Legend
HP = High Point
DP = Downpipe

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 may be at high points to allow drainage away from internal angles.
- The sub catchment areas may not add up exactly due to rounding off during calculations.
- In this example, as per Step 5, no catchment area should exceed the allowable 47m².

Step 9: Provide an overflow.
Note* If a gutter can overflow into the building, an overflow provision must be installed.

There are different methods that can be used to provide overflow provision.

Overflow measures for eaves need to be sized to allow for a rainfall intensity for an ARI of 100 years for a 5-minute duration

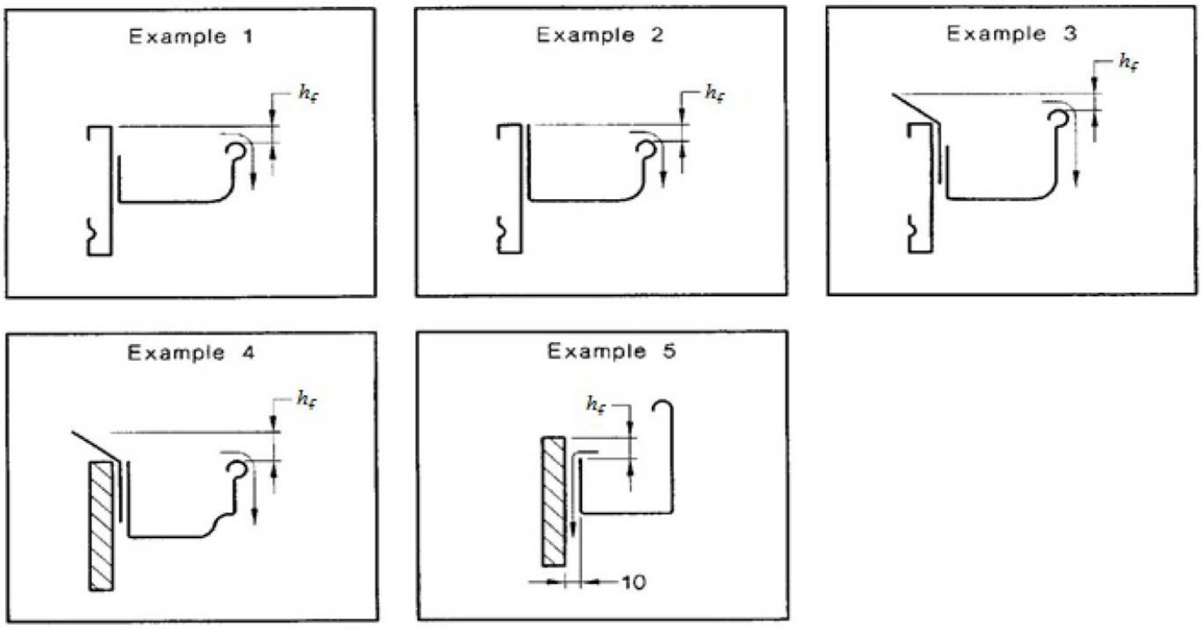


Figure 1: Overflow measures, *referenced from AS/NZS 3500.3 Appendix G*

To calculate H_f, please refer to AS/NZS 3500.3 Table 3.5.4(a) Point E

- Point E provides a L/s for the eaves gutter

Scenario: the eaves gutter has a cross sectional area of 6125mm^2 (approximately 2.5 L/s)

Calculation: Divide 2.5 by the length of the gutter. A 10m length of 2.5 divided by 10m = 0.25 L/s per metre of gutter. Refer to Table G1 for a sloping gutter with 0.25 L/s/m the H_f is 14mm

Table G1, *referenced from AS/NZS 3500: Part3, Appendix G*
Minimum h_f Values

Gutter slope	Average inflow per metre of gutter L/s/m				
	0.2	0.4	0.6	0.8	1.0
Level gutter	18	20	22	23	25
Sloping gutter	**12**	14	16	17	19
Minimum h_f mm					

Table 2: Average inflow per metre of gutter, *referenced from AS/NZS 3500: Part 3: Minimum hf Values*

The performance requirements of the PCA can also be met by a performance solution. Refer to the PCA on the requirements to develop a performance solution.

Referenced Technical Documents

- National Construction Code, Volume 3, Plumbing Code of Australia (PCA) 2019: F- Stormwater drainage systems
- AS/NZS 3500.3 Stormwater Drainage
- HB 114 Guidelines for the design of eaves and box gutters

Related Documentation

- Practice Note RP-01: Regulatory Framework for Roof Plumbing
- Practice Note RP-02: Box Gutters
- Practice Note RP-03: Eaves Gutters
- Practice Note RP-04: Downpipes
- Practice Note RP-05: Flashings

Contact Us

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