

## **CIVIL CALCULATIONS**

Job No:	P17799	Designer:	DA
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Site Address:	147 Marion Road, Richmond SA 5033		

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## Roof Areas and Rainfall Intensities

### Roof Areas

Type	Area (m <sup>2</sup> )
Roof Area 1	165
Roof Area 2	146
Roof Area 3	61

### Rainfall Intensities

Below are the intensities in mm/hour for the corresponding storm duration and ARI event.

Duration	1 Year	2 years	5 years	10 years	20 years	50 years	100 years
<b>5Mins</b>	43.3	58.4	81.3	98.2	121	156	186
<b>6Mins</b>	40.3	54.4	75.5	91.1	112	144	173
<b>10Mins</b>	32.5	43.8	60.4	72.6	89.3	114	136
<b>20Mins</b>	23.1	31	42.4	50.7	62	79.1	93.8
<b>30Mins</b>	18.4	24.7	33.6	40	48.8	62	73.4
<b>1Hr</b>	12.2	16.2	21.9	25.9	31.4	39.7	46.8
<b>2Hrs</b>	7.9	10.5	14	16.5	19.9	24.9	29.3
<b>3Hrs</b>	6.11	8.09	10.7	12.6	15.2	19	22.2
<b>6Hrs</b>	3.93	5.19	6.82	7.96	9.55	11.9	13.8
<b>12Hrs</b>	2.5	3.29	4.28	4.97	5.93	7.31	8.49
<b>24Hrs</b>	1.55	2.03	2.6	3	3.55	4.35	5.01
<b>48Hrs</b>	0.917	1.19	1.51	1.72	2.01	2.44	2.8
<b>72Hrs</b>	0.661	0.851	1.07	1.21	1.41	1.7	1.94

## Roof Gutter Design

The gutters are to consist of an eaves gutters. The calculations are shown in Appendix A to C.

### Roof Area 1

**Box Gutter** size: 300 mm (w) x 170 mm (d)

Length of Rainhead ( $l_r$ ) = 230 mm

$l_{oc} = 45$  mm

Overflow channel: 200 mm (w) x 110 mm (d)

$h_t = 105$  mm

Downpipe size: 125 mm diameter

### Roof Area 2

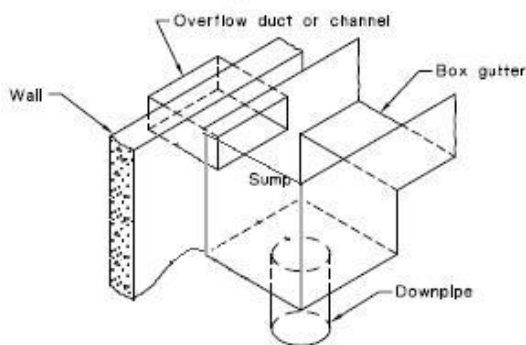
**Eaves Gutter** size: 15,600 mm<sup>2</sup> Effective Cross Sectional Area.

Downpipe size: 150 mm diameter

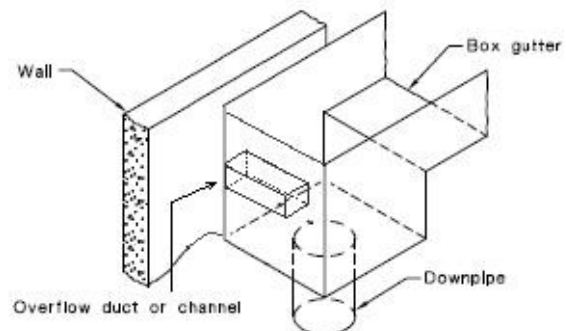
### Roof Area 3

**Eaves Gutter** size: 13,900 mm<sup>2</sup> Effective Cross Sectional Area.

Downpipe size: 150 mm diameter



Option A: Overflow Channel on side.



Option B: Overflow Channel on the end

## **Appendix A – Roof Area 1 Stormwater Calculations – Box Gutter**

Select Event Flow for Design of Gutter & Downpipe	8.5 L/s
Number of Gutters	1
Number of Downpipes per Gutter	1
$Q_{\text{DESIGN}}$	8.5 L/s

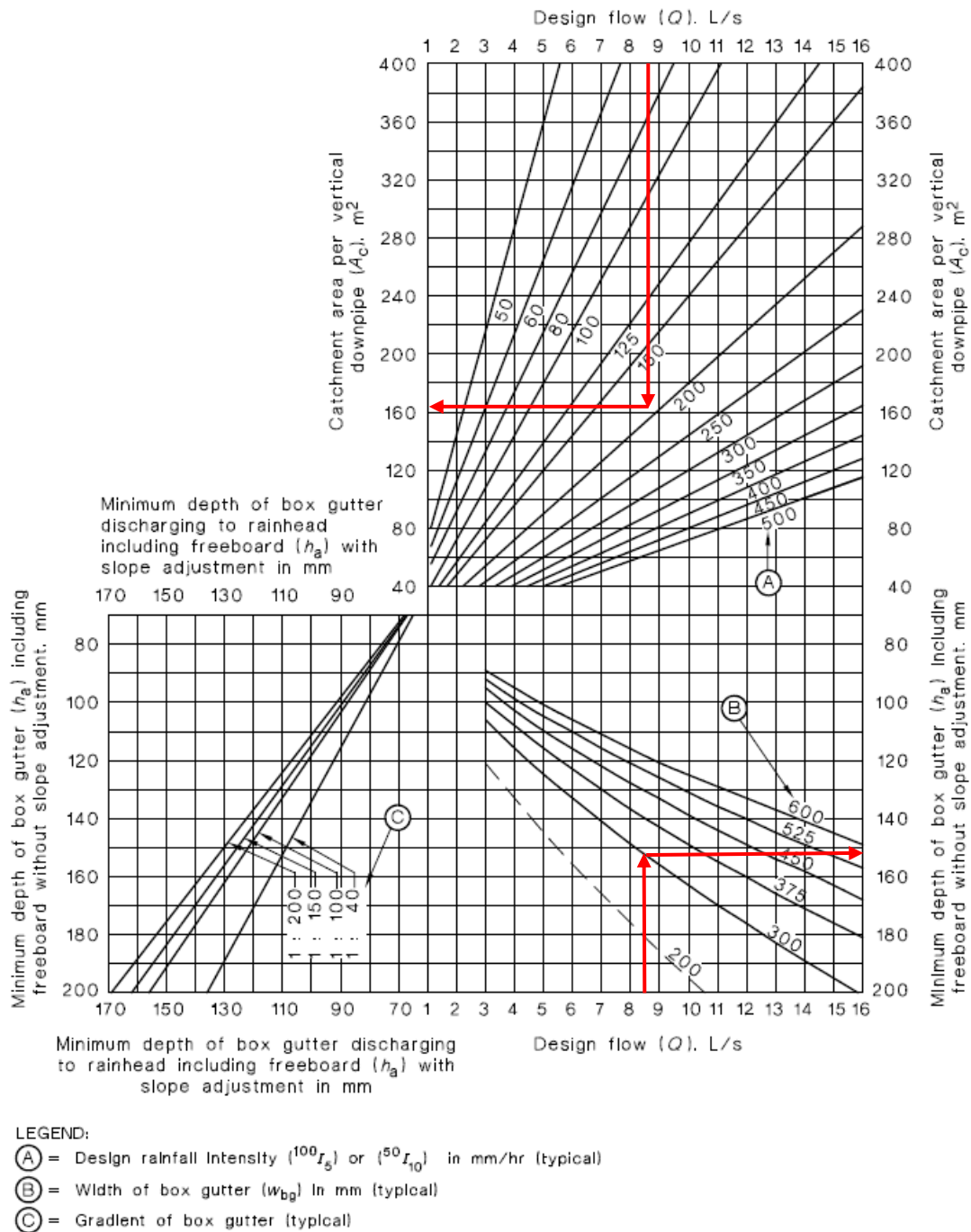
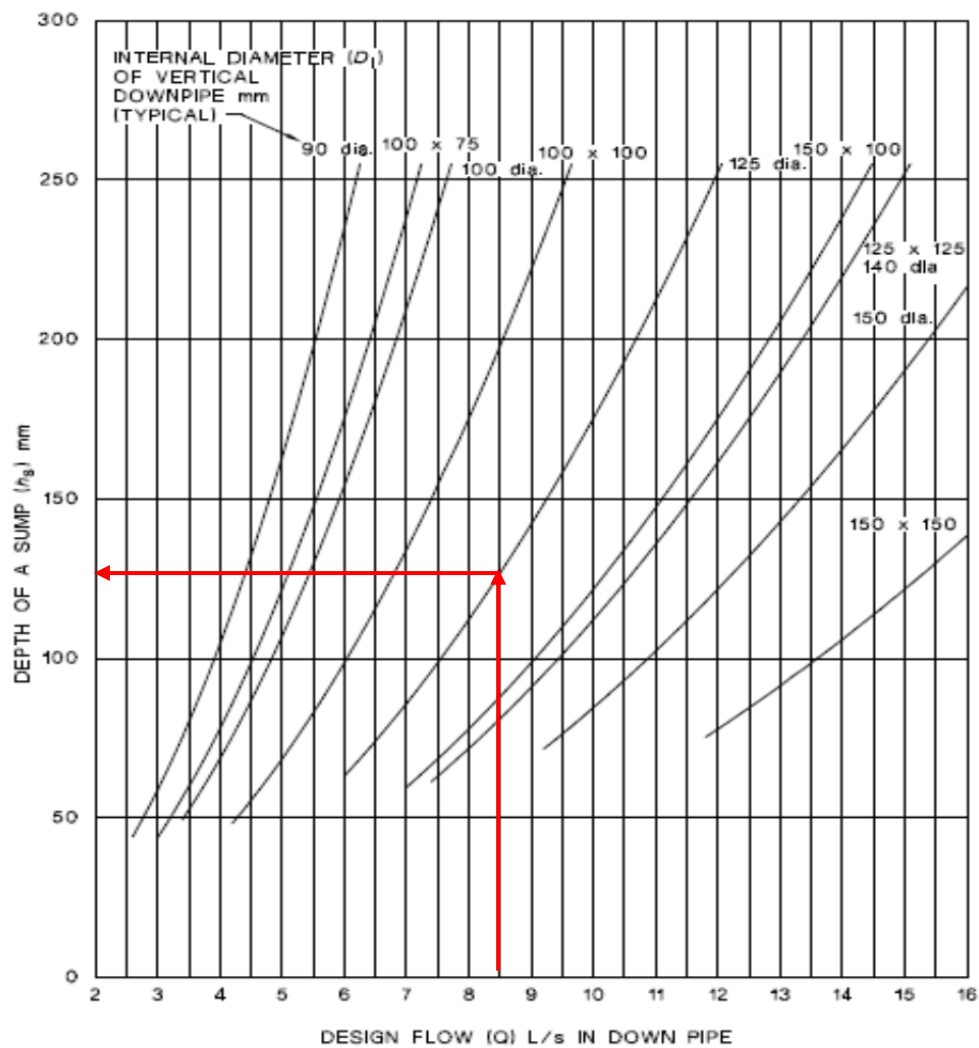


FIGURE 11 DESIGN GRAPH FOR A FREELY DISCHARGING BOX GUTTER



**Depth of Sump**

Downpipe	$h_s$ (mm)
125mm dia.	125

$$h_a = 155 \text{ mm}; h_r = 1.67 \times 155 = 260 \text{ mm}$$

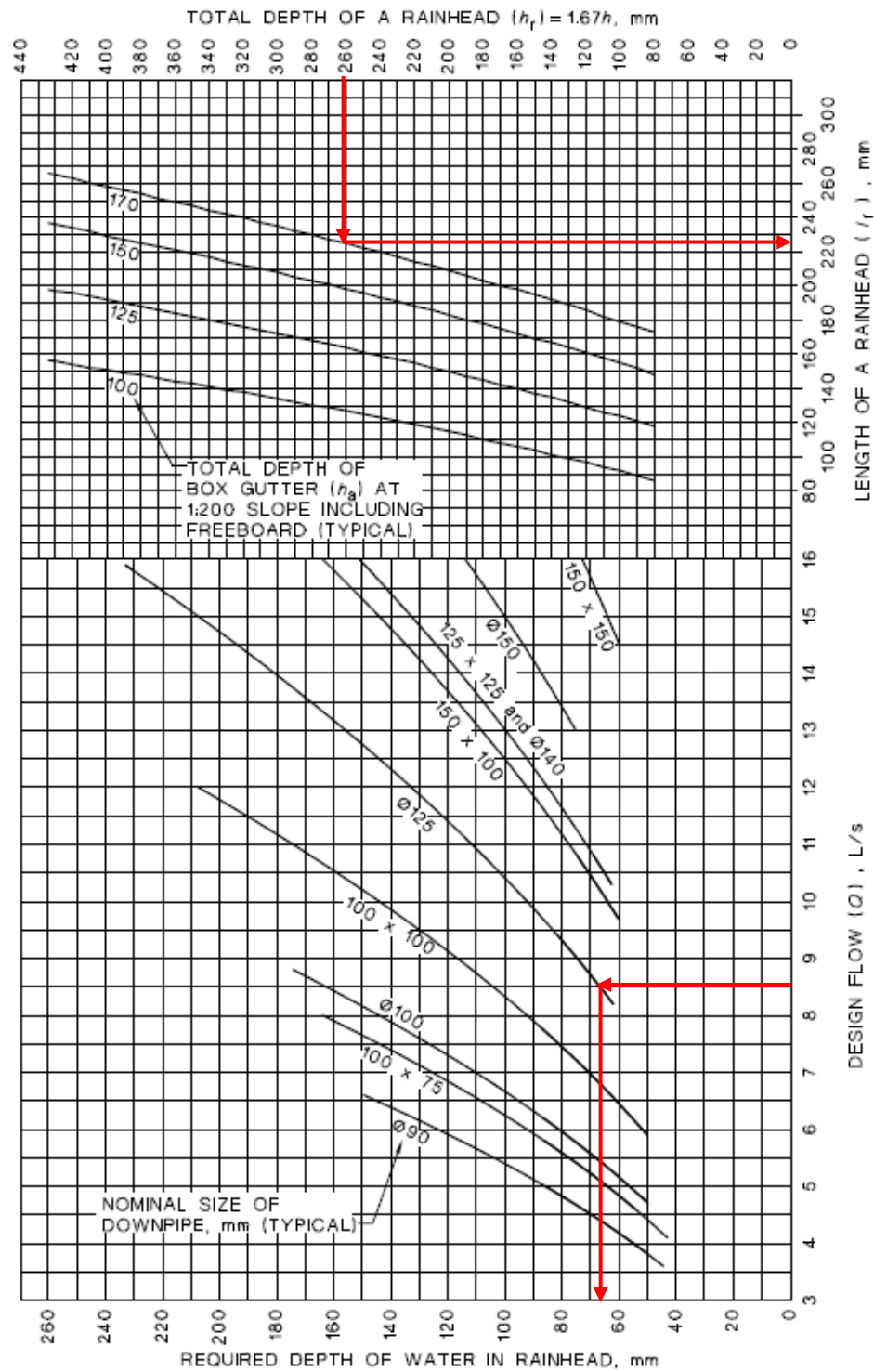
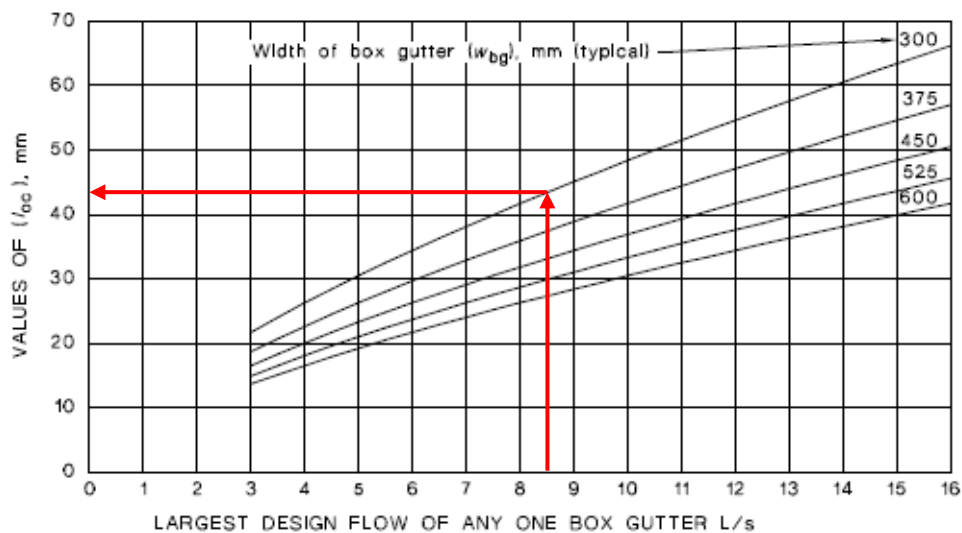


FIGURE 13 DESIGN GRAPH FOR RAINHEAD

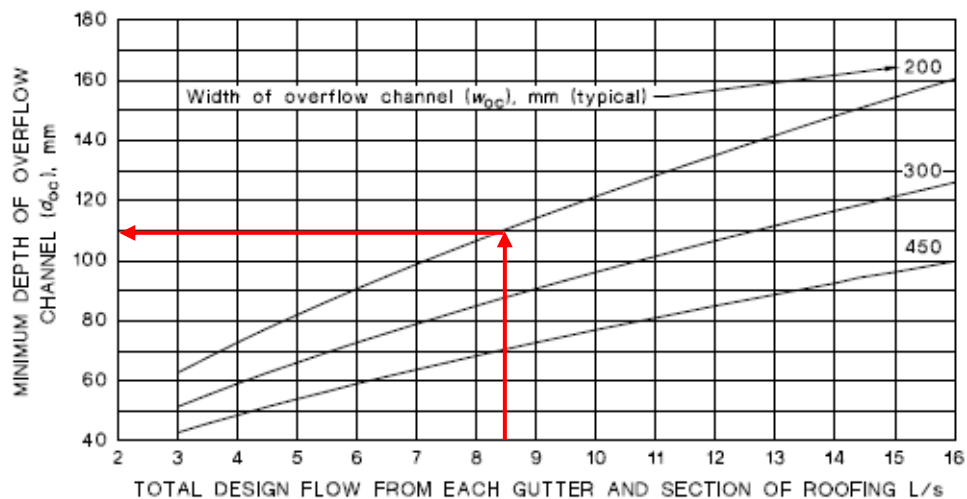
Depth of gutter = 170 mm (total with slope); Length of Rainhead ( $l_r$ ) = 230 mm

**Required Depth of Water in Rainhead**

Downpipe	Rainhead Depth of Water (mm)
125mm dia.	65



(a) Determination of values for  $l_{oc}$



(b) Determination of values for  $d_{oc}$

NOTE: Graph (a) applies to both sump/side overflow device, and sump/high-capacity overflow device.

**FIGURE I6 DESIGN GRAPH FOR SUMP/SIDE OVERFLOW DEVICE**

Width of box gutter = 300 mm;  $l_{oc}$  = 45 mm

Overflow Channel:

Width = 200 mm; Depth = 110 mm



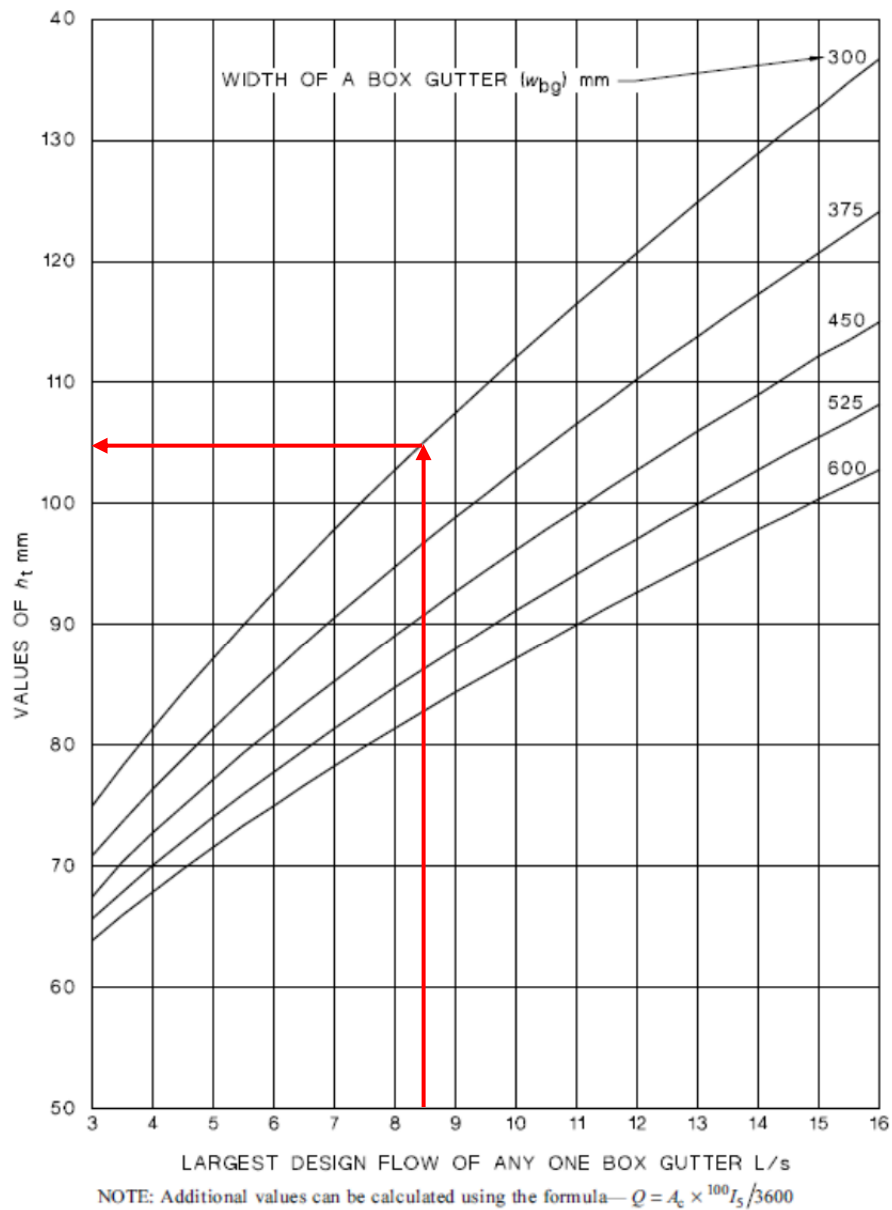


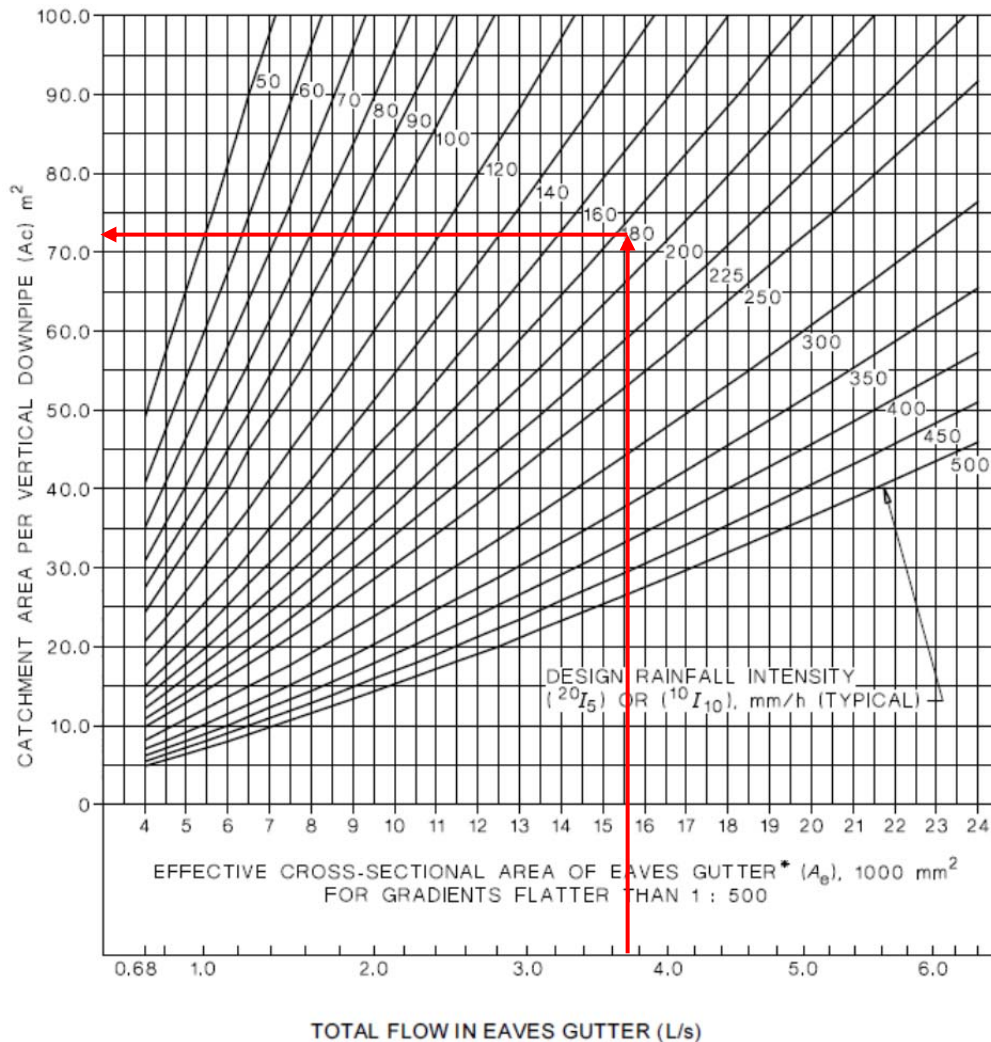
FIGURE I8 DESIGN GRAPH FOR SUMP/HIGH-CAPACITY OVERFLOW DEVICE

Width of box gutter = 300 mm;  $h_t$  = 105 mm

## Appendix B – Roof Area 2 Stormwater Calculations for Eave Gutter

### Eaves Gutter Catchment

Select Event Flow for Design of Gutter & Downpipe	7.5 L/s
Number of Gutters	1
Number of Downpipes per gutter	2
$Q_{\text{DESIGN}}$	3.75 L/s



73  $\text{m}^2$  Catchment per downpipe, therefore 2 downpipes is ok. (max area 146  $\text{m}^2$ )

15,600  $\text{mm}^2$  Effective Cross Sectional Area of Eave Gutter Required.

**TABLE 3.3**

**EAVES GUTTER—REQUIRED SIZE OF VERTICAL DOWNPIPE**

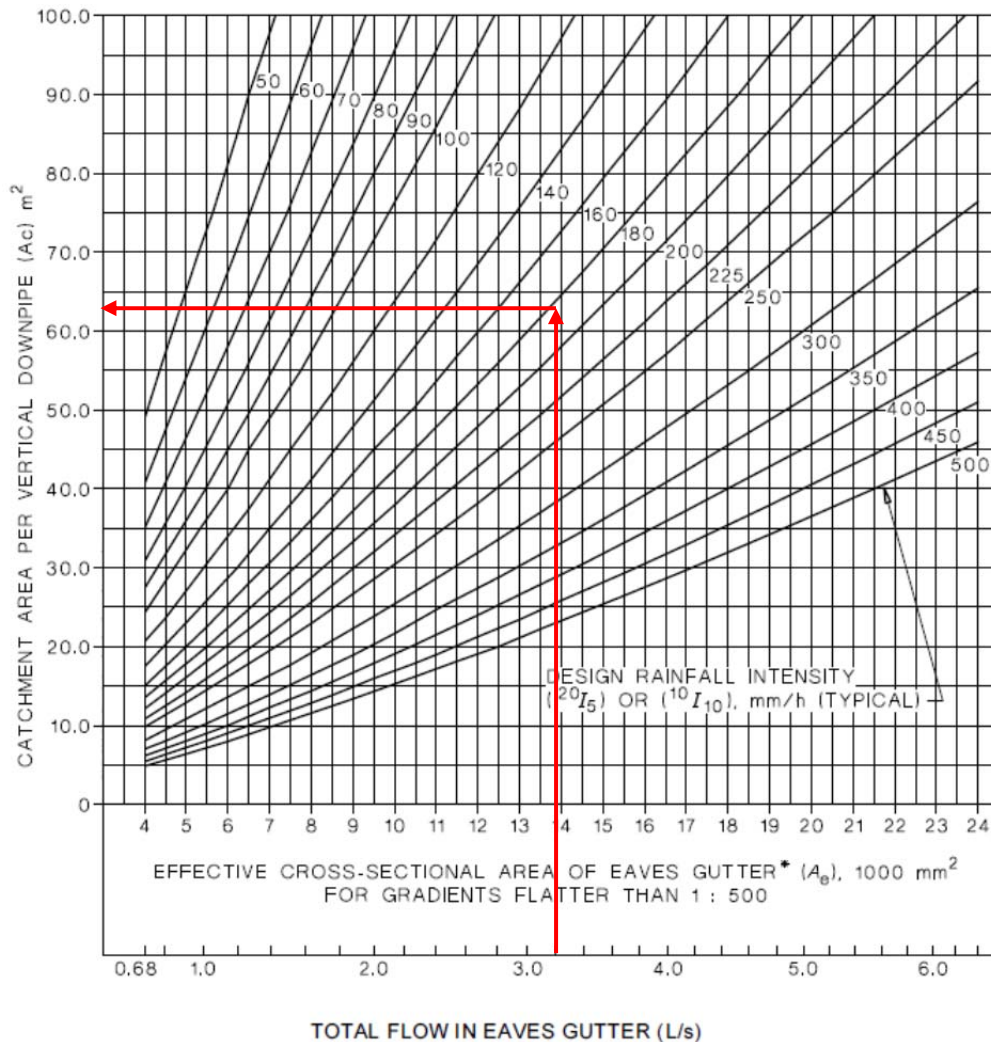
Maximum effective cross-sectional area of an eaves gutter ( $A_e$ ), see AS/NZS 2179.1. (Required effective cross-sectional area is obtained from Figure 3.5) Nearest 100 mm <sup>2</sup>		Internal size of vertical downpipe mm	
Gradient		Cross-section	
1:500 and steeper	Flatter than 1:500	Circular	Rectangular or square
3 500	4 700	65	65 × 50
4 200	5 600	75	65 × 50
4 600	6 200	75	75 × 50
4 800	6 400	80	75 × 50
5 200	7 000	80	100 × 50
5 900	7 900	85	100 × 50
6 400	8 600	90	100 × 50
6 600	8 900	90	75 × 70
6 700	9 000	100	75 × 70
8 200	11 000	100	100 × 75
9 600	12 900	125	100 × 75
12 800	17 100	125	100 × 100
12 800	17 200	150	100 × 100
16 000	21 500	150	125 × 100
18 400	24 700	150	150 × 100
19 200	25 800	—	150 × 100
20 000	26 800	—	125 × 125

Required Downpipe: 150 mm diameter, assuming 1:500 and steeper gutter gradient.

## Appendix C – Roof Area 3 Stormwater Calculations for Eave Gutter

### Eaves Gutter Catchment

Select Event Flow for Design of Gutter & Downpipe	3.2 L/s
Number of Gutters	1
Number of Downpipes per gutter	1
$Q_{\text{DESIGN}}$	3.2 L/s



63  $\text{m}^2$  Catchment per downpipe, therefore 2 downpipes is ok. (max area 126  $\text{m}^2$ )

13,900  $\text{mm}^2$  Effective Cross Sectional Area of Eave Gutter Required.

**TABLE 3.3**

**EAVES GUTTER—REQUIRED SIZE OF VERTICAL DOWNPIPE**

Maximum effective cross-sectional area of an eaves gutter ( $A_e$ ), see AS/NZS 2179.1. (Required effective cross-sectional area is obtained from Figure 3.5) Nearest 100 mm <sup>2</sup>		Internal size of vertical downpipe mm	
Gradient		Cross-section	
1:500 and steeper	Flatter than 1:500	Circular	Rectangular or square
3 500	4 700	65	65 × 50
4 200	5 600	75	65 × 50
4 600	6 200	75	75 × 50
4 800	6 400	80	75 × 50
5 200	7 000	80	100 × 50
5 900	7 900	85	100 × 50
6 400	8 600	90	100 × 50
6 600	8 900	90	75 × 70
6 700	9 000	100	75 × 70
8 200	11 000	100	100 × 75
9 600	12 900	125	100 × 75
12 800	17 100	125	100 × 100
12 800	17 200	150	100 × 100
16 000	21 500	150	125 × 100
18 400	24 700	150	150 × 100
19 200	25 800	—	150 × 100
20 000	26 800	—	125 × 125

Required Downpipe: 150 mm diameter, assuming 1:500 and steeper gutter gradient.