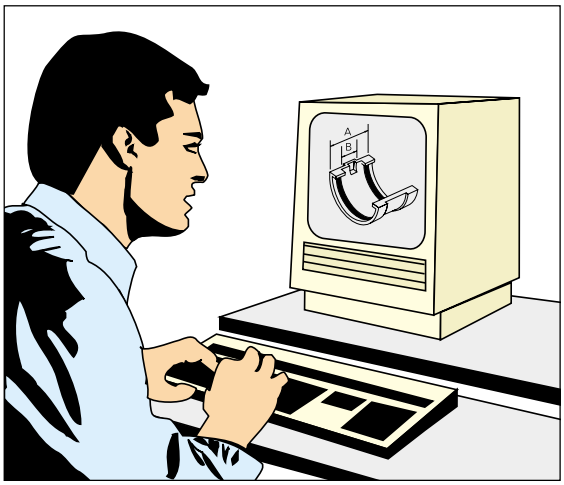
2.00 DESIGN GUIDE

Hunter Rainwater Systems



2.00 APPLICATION CRITERIA
Effective maximum roof area
Calculation of area to be drained
Selecting the system
Design notes
COSHH
Site precautions
Hunter and CDM

Table 1: Gutter Profile/Flow Capacity
(Adjustment for angles in gutter when calculating effective roof areas)
Worked example

Gutter profile selection and rainwater outlet siting
Compatibility Table

2.00 Design Guide

APPLICATION CRITERIA

In order to design an effective and efficient system and to select the Hunter rainwater system suitable for the application, the specifier should follow the following procedures:

1. Determine the rainwater outlet positions with regard to the underground drainage system.

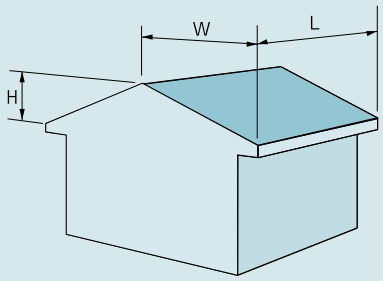
2. Calculate the effective maximum roof area (see below) to be drained.

3. Note the distance of any gutter angle from the nearest outlet.

EFFECTIVE MAX ROOF AREA (ALLOWANCE FOR WIND)

This can be calculated by using the following formula (see diagram below):

$(W + \frac{H}{2}) \times L$ (length of roof) = area in m^2



W = Horizontal span of slope

H = Height of roof pitch

L = Length of roof

The above formula is in accordance with BS EN 12056-3:2000

Note:

For flat roofs, the roof area should be regarded as the total plan area.

If the pitched roof is complex, ie has different pitches or spans, then each part should be calculated separately.

An alternative acceptable method is described in the Building Regulations, Approved Document H, which is reproduced in the table below:

CALCULATION OF AREA TO BE DRAINED

Type of surface	Design area (m^2)
1. flat roof	plan area of relevant portion
2. pitched roof at 30°	plan area of portion x 1.29
pitched roof at 45°	plan area of portion x 1.50
pitched roof at 60°	plan area of portion x 1.87
3. pitched roof over 70° or any wall	elevational area x 0.5

Note:

To calculate flow in litres/second for 75mm/hour intensity, multiply effective roof area m^2 by 0.0208.

SELECTING THE SYSTEM

Once the following facts have been determined,

a) The effective roof area (or areas)

b) The number and position of outlets

c) The angles and their distances from outlets,

The selection of a gutter system can now be approached.

To select a guttering system to suit the design criteria refer to drainage data in Table 1.

DESIGN NOTES

As can be seen from Table 1 on page 11, the gutter flow capacity and the area of roof which can be drained with a given number of outlets will increase if the gutter is laid to a fall. This is also the case if the downpipe is positioned centrally to the gutter. If it is possible therefore to incorporate these features in the layout, they will lead to a more economical system.

The recommended maximum fall is 1:350. This will considerably reduce the chance of silting and blocking of outlets by debris, leaves, etc. (Plastic gutters can be laid level).

For pitched roofs without eaves, the Hunter rise and fall brackets may be used, which have threaded adjustable stems to provide a fall in the gutter (see installation details at the end of this brochure).

NOTE:

It is important that all products in this brochure are correctly installed in accordance with BS EN 12056-3 'Code of Practice for drainage of roofs and paved areas'. Reference to BS EN 752-1996 drain and sewer systems outside buildings are also recommended.

HEALTH AND SAFETY

COSHH

The Control of Substances Hazardous to Health Regulations should be referred to where applicable. Information on pertinent COSHH Regulations is available from the Commercial Department on request.

SITE PRECAUTIONS

The relevant regulations detailed in the Health and Safety at Work Act 1974 must be adhered to on site.

When using a ladder, make sure it is securely fixed at the top and that the bottom is on level ground. If the ground is smooth or slippery, place a bag filled with sand or soil at the foot of the ladder and take care not to over reach. Take special care when removing old cast iron systems, as they can be extremely heavy and therefore dangerous.

HUNTER AND CDM

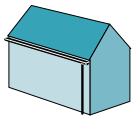
Specifiers have an obligation under the Construction (Design and Management) Regulations to identify and evaluate the health and safety implications of the products and systems their designs require. Hunter products can be specified on the basis that they do not present a risk to users at any stage of the construction process.

2.00 Design Guide

PROFILE-BASED SELECTION: Table 1 - GUTTER PROFILE/FLOW CAPACITY

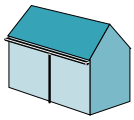
Check the performance of the chosen gutter system against your design criteria for roof area and flow rates, using the table below.

DOWNPIPE AT ONE END



		GUTTER FIXED LEVEL		GUTTER FIXED AT 1:350 FALL	
		GUTTER FLOW (Litres/sec)	ROOF AREA (m^2)	GUTTER FLOW (Litres/sec)	ROOF AREA (m^2)
HALF ROUND	76mm	0.5	24	0.6	29
	112mm	0.9	43	1.3	62
SQUAREFLO		1.6	77	2.0	96
125	68mm downpipe	2.1	101	2.4	115
	82mm downpipe	2.2	106	2.5	120
REGENCY		2.1	101	2.3	110
OGEE		1.1	53	1.5	72
HIGHFLO		2.8	136	2.9	137
STORMFLO	110mm downpipe	5.9	282	5.9	284
	160mm downpipe	6.6	318	6.7	320

DOWNPIPE AT CENTRE



		GUTTER FIXED LEVEL		GUTTER FIXED AT 1:350 FALL	
		GUTTER FLOW (Litres/sec)	ROOF AREA (m^2)	GUTTER FLOW (Litres/sec)	ROOF AREA (m^2)
HALF ROUND	76mm	0.7	34	0.8	38
	112mm	1.8	86	2.6	125
SQUAREFLO		3.2	154	3.8	182
125	68mm downpipe	3.8	182	4.6	221
	82mm downpipe	4.0	191	4.9	232
REGENCY		4.2	202	4.7	226
OGEE		2.4	115	3.0	144
HIGHFLO		5.4	258	6.0	289
STORMFLO	110mm downpipe	11.1	534	12.4	598
	160mm downpipe	12.5	601	14.0	673

ADJUSTMENT FOR ANGLES IN GUTTER WHEN CALCULATING EFFECTIVE ROOF AREAS

The calculated effective roof area figures are affected by angles in the gutter as follows:

If a length of eaves gutter includes an angle, the flow in the gutter will be impeded and its capacity reduced by 15%.

Where an angle occurs in a length of gutter served by two outlets, the reduction factor of 0.85 should only be applied to that part of the gutter in which the angle obstructs the flow.

The figures in the table are based on the average U.K rainfall intensity of 75mm/hr, roof pitch not exceeding 50^{o} and gutters running full. Refer to BS EN 12056-3 for detailed information on roof drainage.

Note: The highlighted figures on the top table relate to the worked example as follows.

2.00 Design Guide

WORKED EXAMPLE

Figure 1 shows the roof plan of a dwelling with a 30° pitched roof.

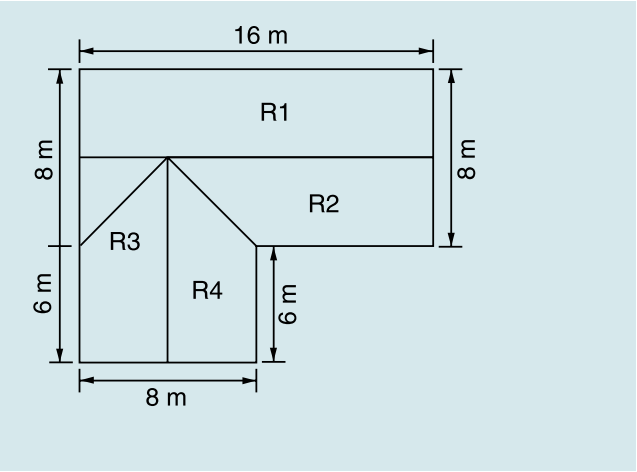
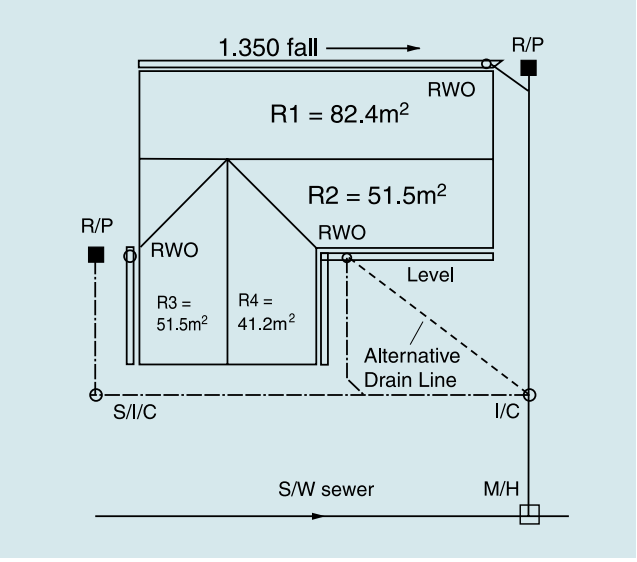


Figure 2 shows feasible outlet positions, gutter installation, roof area, and possible drainage layout.



NB. It is considered good practice to locate outlets as near to valleys as possible.

DESIGN CRITERIA

From figure 1 to the conclusion as denoted in figure 2 the following design criteria have been used.

By using the formula:

$$(W + \frac{H}{2}) \times L$$

The effective roof area can be calculated.

CALCULATION SEQUENCE

R1: $(4 + \frac{2.3}{2}) \times 16 = 82.4m^2$

R2: $(4 + \frac{2.3}{2}) \times 10 = 51.5m^2$

R3: $(4 + \frac{2.3}{2}) \times 10 = 51.5m^2$

R4: $(4 + \frac{2.3}{2}) \times 8 = 41.2m^2$

GENERAL DESIGN NOTES

1. Roofs R2, R3 and R4 are trapezoid in shape, to calculate the roof area without getting into complicated mathematics it would be apt to divide the roof into simple shaped, such as rectangles and triangles.

2. If elevations are not available but the roof pitch is known there is a simple method of finding the height of roof pitch ('H').

METHOD

Angle tangent x horizontal span of slope will give you height of roof pitch ('H'). In our worked example we have a 30° pitched roof (tangent = 0.5774).

$\therefore$ 0.5774 x 4 = 2.3m/height of roof pitch.

3. To calculate flow in litres/second in eaves gutters multiply effective roof area m^2 by a rainfall intensity of 0.0210.

EFFECT OF ANGLES

If a length of eaves gutter includes an angle, the flow in the gutter will be impeded and its capacity reduced by 15%.

Where an angle occurs in a length of gutter served by two outlets, the reduction factor of 0.85 should only be applied to that part of the gutter in which the angle obstructs the flow.

2.00 Design Guide

GUTTER PROFILE SELECTION AND RAINWATER OUTLET SITING

1. Assume that the Hunter Squareflo profile has been selected.

2. The maximum effective roof area to be drained is

R2 + R4 (51.5 + 41.2) = 92.7m^2

Consulting Table 1 it will be found that a gutter fixed level using one end outlet would give a roof area of 96m^2, but as we have a 90˚ angle at the valley we need to apply the 0.85 reduction factor, making the gutter capacity 84.15m^2. By positioning the outlet near to the valley and fixing the gutter it will drain 154m^2 x 0.85 = 130.9m^2.

3. Roof 1 has an effective roof area of 82.4m^2 to be drained, consulting Table 1 it will be found that by fixing the gutter level as for R2 and R4 we can only achieve a roof drainage area of 77m^2.

3. continued

It will therefore be necessary to fix the gutter to a fall of 1:350 which will then give us 96m^2, meeting the requirement of 82.4m^2 using one outlet.

4. Roof 3 has an effective roof area of 51.5m^2, consulting Table 1 it will be found that by fixing the gutter level and discharging to one outlet at one end the maximum roof area that can be drained will be 77m^2.

Please note that the outlet has been positioned at the valley end of the gutter.

CONCLUSION

Hunters Squareflo Rainwater System is suitable for our example design criteria but it is possible to select different gutter profiles with the adjustments to the number and positioning of outlets together with gutter falls.

PROJECT SELECTOR

	Sheds/Greenhouses	Conservatories	Domestic Housing	Commercial/Light Industrial
Half Round 76mm	✓			
Half Round 112mm		✓	✓	
Squareflo		✓	✓	
125		✓	✓	✓
Regency		✓	✓	✓
Ogee		✓	✓	
Highflo				✓
Stormflo				✓

COMPATIBILITY

Hunter Half Round, Squareflo and 125 PVCu Rainwater systems are compatible with many other manufacturers' systems and with cast iron and aluminium profiles. The table alongside indicates the most commonly found manufacturers.

For further information, please contact Hunter Technical Department.

MANUFACTURER	HALF ROUND	SQUAREFLO	125*
Hepworth	Yes	Yes	Yes
Marley	Yes	No	Yes
Osma	Yes	No	Yes
Polypipe	Yes	Yes	Yes
Geberit	No	No	No
Brett	Yes	No	Yes

*Using adaptor seal - R600