

RAINWATER FLOW RATE CALCULATION

COVER PAGE

Project Name:	CROWN STREET PH2
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There are three separate areas that require surface water drainage:

- The tower roof
- Roof garden area at level two
- Balconies at level two

The main roof area is a siphonic system. All other systems are traditional gravity systems.

All systems are designed in accordance with BS EN 12056-3.

Revision Summary		
Description	Revision	Date
Stage 4 Design (Not uploaded to Asite)	P01	12/11/2019
Design updated to include level 01 services	P02	14/01/2020
MWA Comments incorporated. Additional redundancy provided to vertical overhang calculation.	P03	15/09/2021
Construction Issue	C01	27/05/2022

Vertical overhang calculations:

Flow Rate (Q) = Rainfall Intensity x (Effective Area x Co-efficient)

Calculating Rain Fall Intensity

Extract from BSEN12056-3 NB2.2

27/05/2022

(a) Using Figure NB.6, estimate the depth of rainfall falling in 2 min storm event with a return period of once in 5 years (2 min M5), in mm

3.8mm

(b) Using Table NB.1, obtain the M5 rainfall depth corresponding to the chosen duration (D min M5), in mm.

1.0 - co-efficient for 2min storm duration

(c) Using Figure NB.7 and the D min M5 to calculate the depth of rainfall falling over duration, D min, for the required return period (D min MT), in mm.

1.6 - Co-efficient for 75 year return period (50 years * 1.5 co-efficient)

(d) Calculate the rainfall intensity, r , in l/s per m² using equation NB.2

$$r = \frac{(D \text{ min } MT)}{D \times 60} \quad \dots\dots \text{(NB.2)}$$

where

- r is the rainfall intensity, in l/s per m²;
- (D min MT) is the depth of rainfall falling in a storm event with return period T years and duration D min, in mm;
- D is the duration of the storm event, in min.

Plugging in the above values in bold into equation NB. BSEN12056-3 Rainfall Intensity =

0.051 l/s/m²

Definitions:

Return Period (calculation step C)

The return period, T (in years), of a storm event can be defined approximately by the chance, $1/T$, that the event will be exceeded in any given year. It should be noted that $1/T$ does not exactly represent the chance of exceeding the chosen rate of rainfall in a given year but is a good approximation if T is more than 5 years. Since it may be the contents of the buildings that are at risk, this chance per year can be related to the consequences of damage to the contents.

See page 52 of BSEN12056-2, for different co-efficient multipliers when applying return year data.

Vertical overhang calculationCalculating Effective Area

Effective Area = The area of the vertical surface that will effect the rainfall run-off into the area in question. The area of the vertical surface is limited to 10m*, because anything above that will naturally dissipate before reaching the area in question.
Effective Area = Perimeter of surface (m) * vertical height (limited to 10m) (m) * co-efficient

*** NOTE = A VALUE OF 37m WILL BE USED TO ASSESS THE RAINWATER RUN-OFF FROM THE VERTICAL OVERHANG, RATHER THAN THE BS VALUE OF 10m. THIS IS DUE TO THE DEVELOPERS PAST EXPERIENCE OF THESE SYSTEMS NOT DRAINING ADEQUATELY.**

Co-efficient = 0.5 (Constant)

Perimeter Values:

C4 Level 02 roof top garden perimeter =	24 m
C5 Level 02 roof top garden perimeter =	22 m
C4 Level 01 balconies wall perimeter =	40 m

Effective Area

C4 Level 02 roof top garden perimeter =	420 m ²
C5 Level 02 roof top garden perimeter =	385 m ²
C4 Level 01 balconies wall perimeter =	400 m ²

Flow Rate

C4 Level 02 roof top garden perimeter =	21.28 l/s
C5 Level 02 roof top garden perimeter =	19.51 l/s
C4 Level 01 balconies wall perimeter =	20.27 l/s

Flat roof surface water flow rate Calculation

Flow Rate (Q) = Run-off (l/s) * Area of roof (m2)

Note - The siphonic system on the tower roof, is designed and calculated by Polypipe (the calculations have been checked and approved by MEP design). The polypipe calculations are attached to the end of this document.

Run-off = 0.055 l/s/m2

The run-off value calculated by Polypipe is the value used for all flat roofs on project. See Polypipe calculation for justification.

Plan Area

C4 Level 02 roof top garden perimeter =	605 m2
C5 Level 02 roof top garden perimeter =	513 m2
C4 Level 01 balconies wall perimeter =	34 m2

Flow Rate

C4 Level 02 roof top garden perimeter =	33.3 l/s
C5 Level 02 roof top garden perimeter =	28.2 l/s
C4 Level 01 balconies wall perimeter =	1.9 l/s

TOTAL FLOW RATE

Total Flow Rate is a summation of the flow rate from the vertical overhang and the plan area water volumes.

Flow Rate

C4 Level 02 roof top garden perimeter =	54.6 l/s
C5 Level 02 roof top garden perimeter =	47.7 l/s
C4 Level 02 balconies wall perimeter =	22.1 l/s