

Stage 1 Design

11.08.2022

Location: Reading

Stage 1 Permavoid Design, 145-148 Friar Street/1-13 Queen Victoria Street

We have reviewed the information for the 145-148 Friar Street/1-13 Queen Victoria Street, Reading Project and would offer the following comments.

- EPG has undertaken calculations based on using the Permavoid system as manufactured by Polypipe Civils Ltd. The calculations will be based on the Critical Duration Storm Event of 100-year storm event with 40% allowance for climate change.
- The FEH calculation methodology has been used for rainfall modelling.
- We have taken the catchment areas as outlined in Table 1; these figures have been obtained from the information provided by the client. 80% of the provided lower figure has been taken as the available attenuation space, this conservative estimate will account for gravel surround, access vents and other areas where Permavoid may not be positioned. The contributing area has been taken from the larger area denoted Blue/Brown roof + on the client's drawing. This will be refined at the next design stage.

Table 1: Catchment Areas

Brown/Blue Roof Ref	Contributing Area (m2)	Roof Area (m2)	Attenuation Area (80% of roof area)	Permavoid Depth (mm)
A	61.7	56	44.8	150
B	11.5	Sheds to Roof D		
C	160.7	Sheds to Roof D		
D	295.7 (inclusive of roofs B + C)	111.9	89.52	235
E	31.3	24	19.2	150
F	73.1	57.2	45.76	150
G	37.8	29.3	23.44	150
H	28.8	22.2	17.76	150

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- The design rate set by the client is 'as low as practicable'. Therefore, the minimum orifice outlet of 20mm will be applied. Where this is not sufficient (i.e., Roof D) the outlet size will be increased. The resulting attenuation volumes are set out in Table 2.

Table 2: Attenuation Volumes & Design Rates

Brown/Blue Roof Ref	Contributing Area (m2)	Permavoid Area (m2)	Permavoid Depth (mm)	Permavoid Volume (m3)	Orifice Size Ø (mm)	Run-off Rate (l/s)
A	61.7	44.8	150	6.38	20	0.2
D	295.7	89.52	235	19.98	28	0.8
E	31.3	19.2	150	2.73	20	0.2
F	73.1	45.76	150	6.52	20	0.3
G	37.8	23.44	150	3.34	20	0.2
H	28.8	17.76	150	2.53	20	0.2

- The above results in a total outfall rate of **1.9 l/s**.
- The Permavoid attenuation system is a specialist system with dedicated components that have all been designed to work holistically as a structural attenuation system in conjunction with proposed waterproofing and surface finishes of roofs and podiums. The Permavoid blue roof element is made up of 85mm and 150mm interlocking geocellular units that can be combined to produce deeper attenuation systems (85mm, 150mm, 235mm, 300mm, 450mm, etc.). The Permavoid incorporates high compressive strength and bending resistance within joints to create a horizontal structural 'raft' that is ideal for shallow attenuation of rainwater, particularly within loaded and trafficked areas. The modules have a very high void ratio (95%) to achieve highly efficient water storage capacity. The Permavoid components have been specifically designed to work with the blue roof system and includes, Outlets inspection chambers, Overflow inspection chambers, RWP diffuser catchpit chambers, treatment channels and gullies to name but a few.
- Calculations have been based on flat roof with no fall. EPG does not recommend to design green/blue roofs or podiums to a fall as it significantly compromises the storage and results in increased flow rates.
- The key principle of the Permavoid attenuation system is the SuDS treatment train. The Treatment train as set out in the SuDS Manual (co-authored by EPG Director Steve Wilson) states that silts and other contamination should be managed at source. Using the RWP catchpits, the outlet and inlet chambers/diffuser units capture silt and treat water at source. This minimises the risk of blockage and by extension the risk of surface flooding.

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- It is noted that the proposals are for a brown roof design, we would recommend green roofs to gain the benefits of biodiversity, cooling/insulation as well as rainwater uptake and evapotranspiration.
- For both brown and green roofs, passive irrigation can be facilitated using geotextile wicking wrap. In a brown roof system, the primary benefit is the cooling effect of evaporation, mitigating the urban heat island effect, which is of particular importance as we continue to witness high temperatures in increasing frequency, caused by the ongoing climate crisis.
- It is noted the intention of using the roofs for PV panels. We would recommend that photovoltaic panels are accompanied by green/blue roofs to create a BioSOLAR system. Evapotranspiration via a vegetated roof creates a microclimate that has a cooling effect which increases the efficiency of solar power generation.
- The Permavoid system has undergone full hydraulic and structural testing, to allow the project engineer and architect(s) to develop the attenuation system and landscape finishes with confidence.

Trust this is of assistance.

HLP Jones

Heather Palmer-Jones

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