

Info Sheet

Green Roof Drainage

Some facts about green roof drainage

Green roofs retain a considerable amount of stormwater which is why funding is often provided for them or they are often required (relieve the sewage system, reduce sealing level etc.). However, green roofs

also have more or less surplus water, depending on the season, which also has to be able to drain off so that neither the roof nor the vegetation will be damaged. In Europe, roof drainage is regulated by the

European standard DIN EN 12056-3 "Gravity drainage systems inside buildings". National guidelines also apply. Please see also the FLL Green Roofing Guidelines for additional, useful information.

Ascertaining the stormwater run-off

Stormwater run-off from a roof can be established as follows:

$$Q = r_{(D,T)} \cdot C \cdot A \cdot \frac{1}{10000}$$

- Q Stormwater run-off in l/s
- r Rain calculated in l/[s · ha]
- D Rain duration in min
- T Annuality in a
- C Run-off coefficient (dimensionless)
- A Effective precipitation area in m²

Run-off coefficients for green roofs are, e.g. listed in the FLL Green Roofing Guidelines. They are between 1 (100 % volume flow rate) and 0 (0 % volume flow rate). The annuality of the rain calculated for roof area drainage must be at least once in 5 years – a duration of 5 minutes should be applied. (r(5,5)). Together with emergency drainage, at the very least the system must manage to drain a 100-year event r(5,100) at this location. Rain can be calculated with the help of data provided by the national meteorological office.

Test plant for the determination of run-off coefficients of green roof systems according to the "FLL-Green Roofing Guideline" 2008.

Guide values for run-off coefficients depending on the thickness of the substrate layer and the pitch of the roof as per the FLL "Green Roofing Guidelines" (2008):

Green roof area			Roof pitch	
			≤ 5°	> 5°
- at	> 500 mm	Build-up height	C = 0.1	-
- at	250–500 mm	Build-up height	C = 0.2	-
- at	150–250 mm	Build-up height	C = 0.3	-
- at	100–150 mm	Build-up height	C = 0.4	C = 0.5
- at	60–100 mm	Build-up height	C = 0.5	C = 0.6
- at	40–60 mm	Build-up height	C = 0.6	C = 0.7
- at	> 20–40 mm	Build-up height	C = 0.7	C = 0.8

The above values are based on a 15-minute calculated rain of 300 l/[s·ha]. The run-off coefficients for some of the ZinCo systems were established metrologically. For further information, please contact us with details of your own project building.



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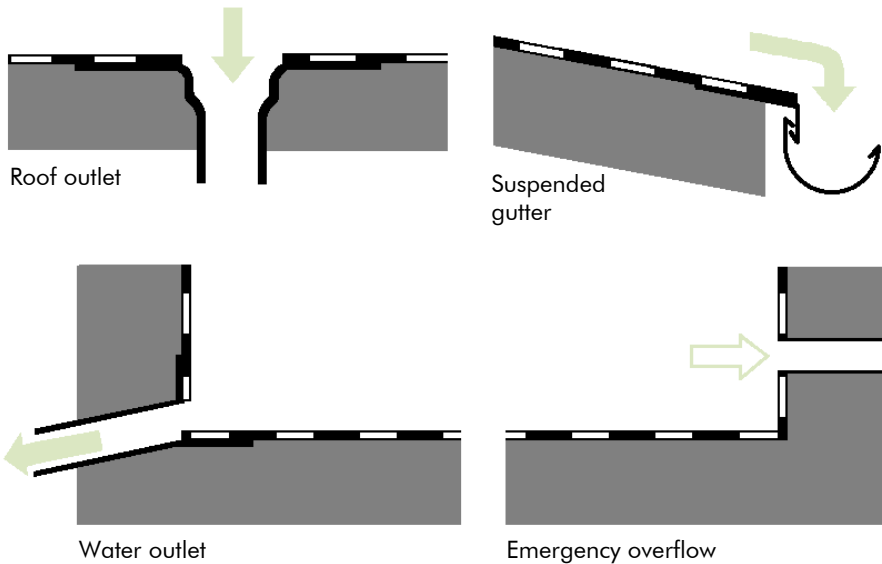
Drainage elements

Green roofs can be drained using:

- Roof outlets (gully)
- Inner drainage channels
- Roof gutter on facade
- Water spouts

For safety reasons and regardless of the size of the area or other factors, roof surfaces with inner drainage elements have to have at least two run-offs or one outlet and one emergency overflow. A professional planner should be consulted

to measure the roof and emergency outlets. Drainage installations must be capable of absorbing both excess water from the drainage layer and surface water from the substrate layer or from slab surfaces. Roof outlets must be kept free from vegetation and from gravel and must be accessible at all times. For this reason an inspection chamber with surrounding gravel strip must be placed above roof outlets in vegetation areas; and in slab areas, a suitable terrace grill that is flush with the patio covering can be installed. Drainage elements should normally be situated at the lowest points of the roof area; in the case of green roofs with pounding water, however, special dam-up elements can be integrated via the roof gullies. Green roofs can also be drained with roof drainage systems that are normally operated when filled (pressure flow). It is important to remember in this case that areas with differing run-off coefficients are connected to different pipes (e.g. extensive/intensive green roofs).



Inspection chamber in extensive green roof.



Removable terrace grill with paving slabs.