



PLANNING GUIDE

System Solutions for Intensive Green Roofs

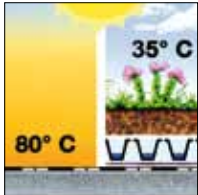
Life on Roofs



Green Oases for Our Cityscapes

The environmental, urban development and engineering advantages of green roofs:

Protection of the Roof Membrane



- Protects the roof membrane from UV radiation, heat, cold and hail

New Habitat



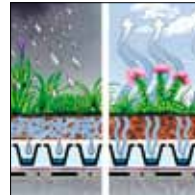
- Avoids sealing and creates new habitat for plants and animals

Utilized Roof Areas



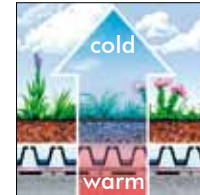
- Additional space for improved quality of life

Rainwater Retention



- Reduces run-off

Reduction of Energy Costs



- Thermal protection and reduction in heating and cooling costs

Noise Protection



- Enhances sound insulation

Features

Unlike extensive green roofs, intensive green roofs offer almost endless possibilities of design. However depending on the kind of vegetation intensive green roofs require more maintenance.

The features at a glance:

- **Maintenance:**
 - Medium to high level of maintenance
 - Periodic to regular irrigation
- **Plant communities:**
 - Herbs, grasses, perennials, lawn, shrubs, bushes and trees
- **Loads and build-up heights:**
 - Build-up height from 150 to 800 mm
 - Weight from 160 to 1200 kg/m²
- **Costs:**
 - Higher costs

Principles

At ZinCo, intensive green roofs are installed in accordance with standards and with system.

Our six principles at a glance:

- The System Build-up is tailored to suit each roof.
- The System Build-up ensures permanent drainage, even under load.
- The System Build-up provides for a good water/air balance.
- The System Build-up is adapted to suit the required type of vegetation.
- The System Build-up keeps maintenance and upkeep to a minimum.
- The System Build-up provides for a long green roof life.



More Options with ZinCo



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System Build-up "Roof Garden"



The "Roof Garden" green roof system is a multifunctional green roof build-up with high water storage. It is suitable for lawns, perennials, and with deeper system substrate, for shrubs and trees. Integration with hard landscapes, for example, walkways, terraces, driveways or play areas, etc. is also possible.

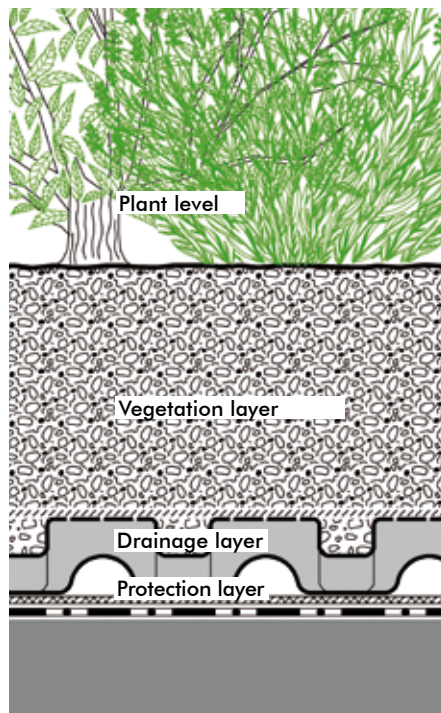
Floradrain® FD 60 elements, the heart of this system build-up, can also be used as a shuttering for concrete to create foundations for supporting structures without penetrating the roof membrane or impeding water drainage. The drainage capacity is tested according to EN ISO 12598.

On zero degree roofs, a roof dam irrigation system can be installed which stores up to 40 mm of water. This makes for lush plant growth on relatively thin substrate layers. The "Roof Garden" build-up allows for the realisation of a variety of design concepts, even waterfeatures.





Weight kg/m ²		Height mm
dry	water- saturated	
from 200	from 300	from 200
32	42	70
232	342	



Lawn, perennial plants, and with deeper substrate, also shrubs and small trees

System Substrate "Roof Garden"
or System Substrate "Lawn"

Filter Sheet SF
Floradrain® FD 60 filled with Zincolit® Plus

Protection Mat ISM 50
Root Barrier WSB 100-PO,
if waterproofing is not root-resistant

Build-up height: from 270 mm
Weight, saturated: from 340 kg/m²
Water retention capacity: from 110 l/m²

System Build-up "Summer Plains"

Up to now, light-weight solutions were only possible in the field of extensive green roofs. However, with the System Build-up "Summer Plains" the balancing act between "light-weight" and "intensive" can easily be mastered. It allows for visually appealing prestigious designs even on roofs with a low load bearing capacity.

The drainage element Aquatec® AT 45 and the Wicking Mat DV 40 are the heart of this build-up. The basic principle involves the distribution and storage of water in the element cells which is then drawn upwards when required, through the wicks in the mat to the substrate layer. The water is fed through special dripper-lines and the amount is controlled by the specially-developed electronic Irrigation Manager BM 4.

Water consumption is significantly lower with this type of irrigation than is the case with irrigation from above, as the water is available directly in the root area and there is considerably less evaporation. Due to this sophisticated kind of irrigation substrate depths can



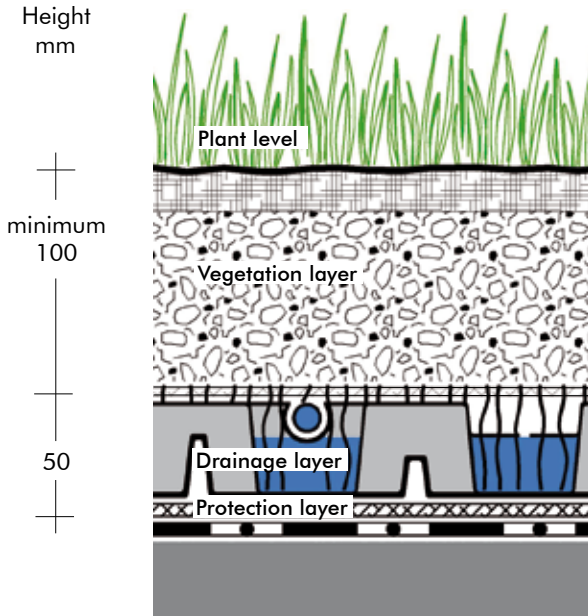
be reduced up to 50 % in comparison to other intensive build-ups which results in a lower system weight. Furthermore the Aquatec® elements do not require an infill as some other build-ups which also contributes to reduction in material requirements, installation costs and weight.

One greening variation is the herb-turf roll, for example, which was specially developed for this build-up. Depending on cutting frequency, it can be used either as a lawn for access or as a herb meadow.





Weight kg/m ²		Height mm
dry	water-saturated	
95	140	minimum 100
4	25	50
99	165	



Vegetation

System Substrate "Lawn"

Wicking Mat DV 40
Aquatec® AT 45 with Dripperline 100-L1

Filter Sheet PV
Root Barrier WSB 100-PO,
if waterproofing is not root-resistant

Build-up height: from 150 mm
Weight, saturated: from 165 kg/m²
Water retention capacity: from 65 l/m²



Slotting the dripperlines into place. The lines are then connected to the control system.



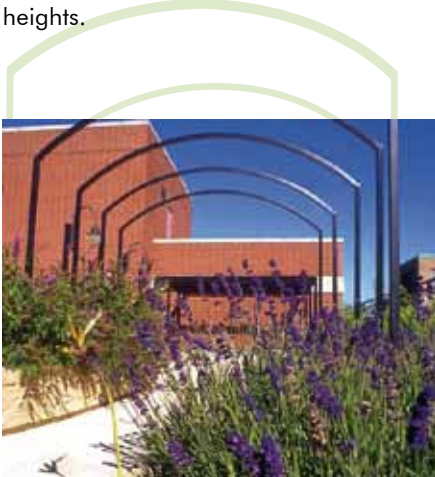
When installed, the wicks in the Wicking Mat dip into the cells and carry the water to the substrate.



Perfectly implemented technology allows for lots of variety with an intensive green roof.

System Build-up “Heather with Lavender”

The semi-intensive system build-up “Heather with Lavender” allows for sophisticated planting design. Nevertheless, compared to intensive green roof build-ups, it manages with relatively low maintenance and relatively low build-up heights.

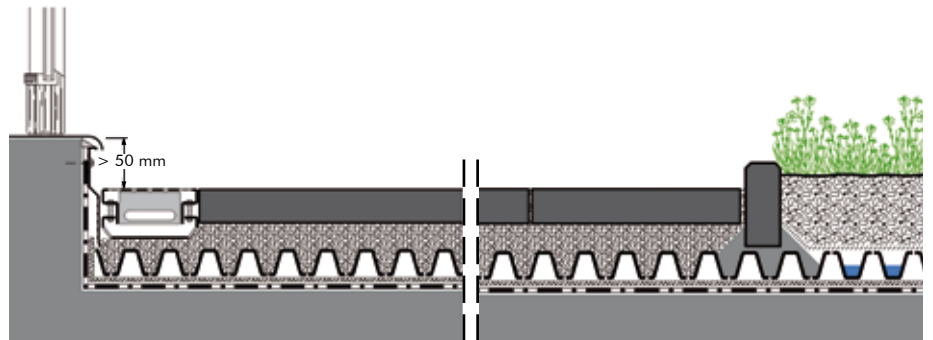


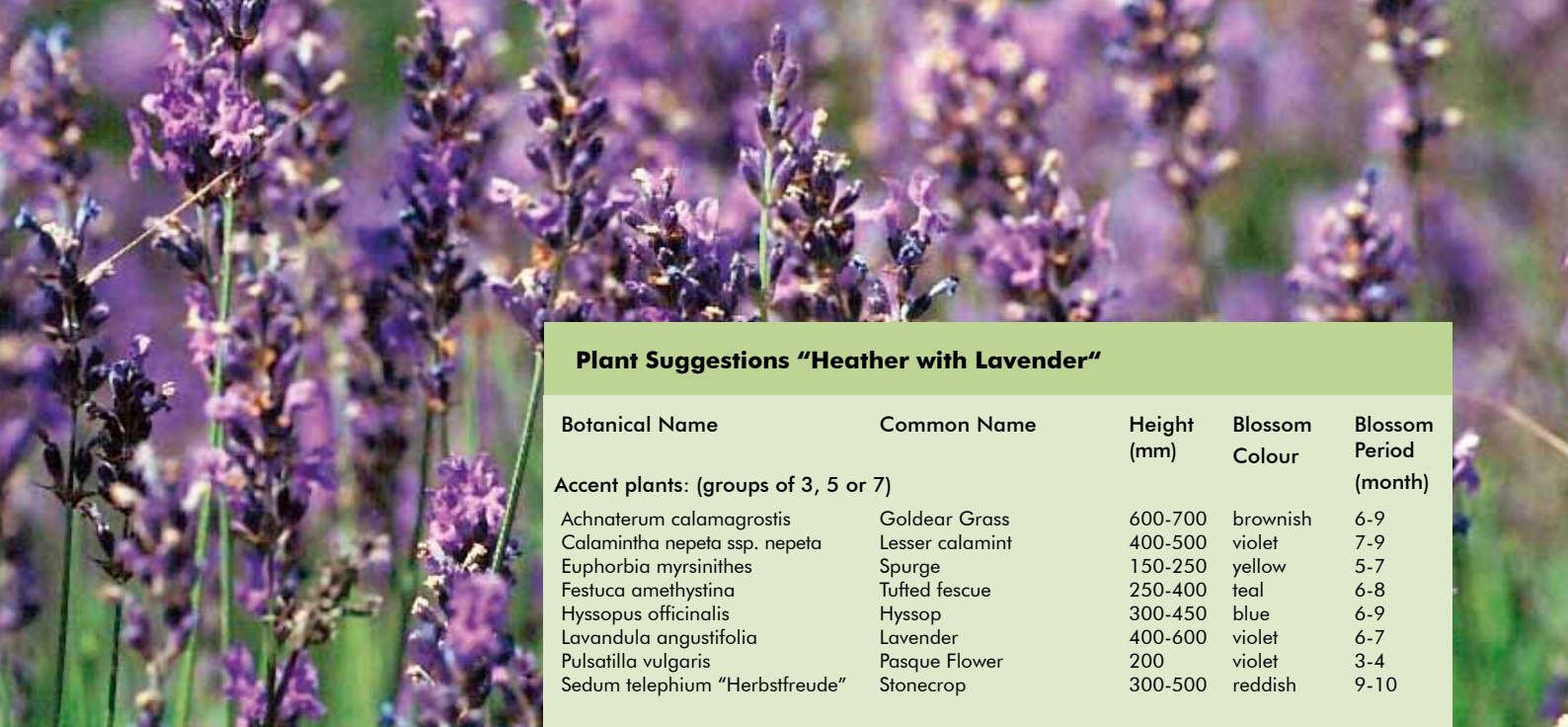
The plant community can be chosen amongst a wide variety of draught resistant perennials, grasses and low shrubs, for example thyme, organum or lavender.

The relevant “Heather with Lavender” system substrate, which has been specifically designed for the plant community “Heather with Lavender”, in combination with the water retention and drainage element type Floradrain® FD 40-E creates the necessary habitat conditions so that the “Heather with Lavender” – once rooted – requires little maintenance.

Floradrain® FD 40-E is ideal as a sub-structure for green roofs, but it can be applied just as well under concrete slabs or paved surfaces. Moreover, borders between different areas can be founded in a stable and secure manner. Kerbs can be set directly in concrete or mortar onto the Floradrain® without impeding the water run off.

Floradrain® also safely drains the excess water out of the channels or grills, which are often installed to safeguard door sills. In this case, the required upstand height which is normally 150 mm, according to the German “Flat Roof Principles”, can be reduced to 50 mm above the finished surface. Under concrete slabs, which should have a fall of at least 1 %, the troughs of the Floradrain® elements must be filled with stone chippings. Also, the Floradrain® elements are to be laid “upside down” with the openings facing the protection mat.





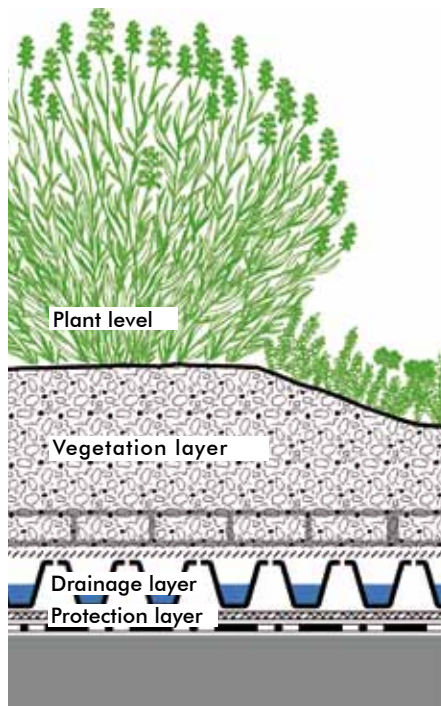
Plant Suggestions "Heather with Lavender"

Botanical Name	Common Name	Height (mm)	Blossom Colour	Blossom Period (month)
Accent plants: (groups of 3, 5 or 7)				
<i>Achnatherum calamagrostis</i>	Goldear Grass	600-700	brownish	6-9
<i>Calamintha nepeta</i> ssp. <i>nepeta</i>	Lesser calamint	400-500	violet	7-9
<i>Euphorbia myrsinites</i>	Spurge	150-250	yellow	5-7
<i>Festuca amethystina</i>	Tufted fescue	250-400	teal	6-8
<i>Hyssopus officinalis</i>	Hyssop	300-450	blue	6-9
<i>Lavandula angustifolia</i>	Lavender	400-600	violet	6-7
<i>Pulsatilla vulgaris</i>	Pasque Flower	200	violet	3-4
<i>Sedum telephium</i> "Herbstfreude"	Stonecrop	300-500	reddish	9-10

Ground covering plants:

<i>Anaphalis triplinervis</i> "Sommerschnee"	Pearly everlasting	200-250	white	7-9
<i>Armeria maritima</i> i.S.	Sea thrift	150-250	rosa	5-6
<i>Chamaemelum nobile</i> "Plena"	Double Flowering Chamomile	200-250	white	6-8
<i>Fragaria vesca</i> var. <i>vesca</i>	Crinita woods-strawberry	200-250	white	4-6
<i>Hypericum polyphyllum</i>	St. Johnswort	100-150	yellow	6-7
<i>Matricaria caucasica</i>	Caucasian Chamomile	150	yellow; white	5-7
<i>Nepeta x faassenii</i>	Faasen's catmint	250-300	violet	6-9
<i>Oenothera missouriensis</i>	Ozark sundrops	200-250	light yellow	6-9
<i>Origanum vulgare</i> "Compactum"	Compact marjoram	150	light rosa	7-9
<i>Teucrium chamaedrys</i>	Germander	200-250	rosa	7-8

Weight kg/m ²		Height mm
dry	water-saturated	
100	150	100
-	-	150
150	225	
3	11	40
103	161	
-	-	
153	236	



Plant level "Heather with Lavender",
16 pcs/m²

System Substrate "Heather with
Lavender", from 100 mm

Fallnet®
Filter Sheet SF
Floradrain® FD 40-E
Protection Mat SSM 85
Root Barrier WSF 40,
if waterproofing is not root-resistant

Build-up height: ca. 160 mm
Weight, saturated: ca. 195 kg/m²
Water retention capacity: ca. 70 l/m²

System Build-up “Green Underground Car Park Deck”



Due to the accessibility of underground car park decks and their normally generous structural load reserves, they provide a good opportunity for using a build-up where the substrate can be applied using a wheel loader.

In the System Build-up “Green Underground Car Park Deck”, the Protectodrain® or Elastodrain® studded sheets that cover the entire area, protect the roof membrane from all types of dynamic forces, even during the building phase. Covered with the stable filter sheet TG or PV, they also allow for excess water to safely drain off.

Together with Zincolit® Plus and the system substrates, the build-up offers the widest possible range of solutions for planting and design. Frequently, green areas are installed on underground car park decks in conjunc-

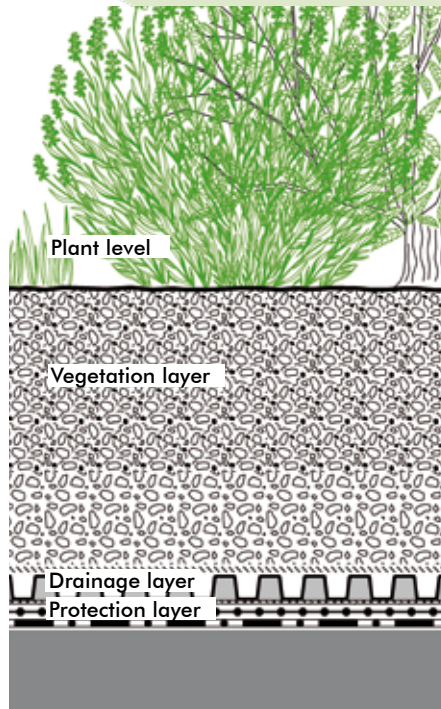


tion with different types of pathways or vehicle surfaces. Whether it's a car space or a fire station entrance, grass pavers, block paving or concrete slabs – there are many options. For further details,

please see our ZinCo Planning Guide “Walkways and Driveways”. Simply request our catalogue or download it from www.zinco-greenroof.com



Weight kg/m ²		Height mm
dry	water- saturated	
from 200	from 300	from 200
depending on total substrate depth		
5	5	30
205	305	



Lawn, perennials and with deeper substrate layers also shrubs and small trees

System Substrate "Roof Garden" or "Lawn"

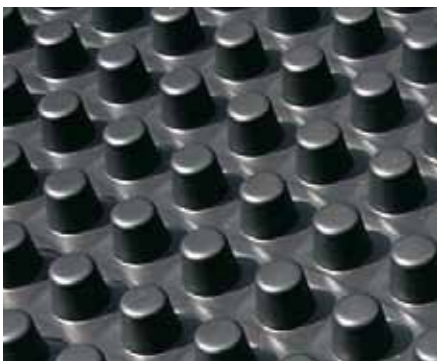
Zincolit® Plus, in case of substrate depths ≥ 350 mm

Filter Sheet TG

Protectodrain® PD 250

TGF 20

Root Barrier WSB 100-PO,
if waterproofing is not root-resistant



Protectodrain® PD 250



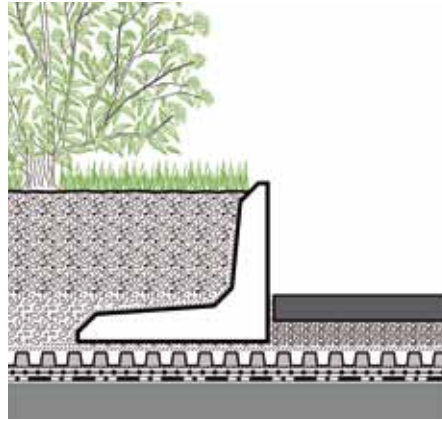
Elastodrain® EL 202

Protectodrain® PD 250 and particularly Elastodrain® EL 202 with its dense stud-
ding are ideal sub-structures for all types
of pathway and vehicle surface.

Perfect Solutions down to the Last Detail

Planting Bushes and Trees

In order to establish trees and bushes permanently on roof areas, it is often necessary to create more space for the roots by forming special planting areas with higher substrate level, such as planters or mounds. Anchor fixings are often used for securing bushes and trees against wind damage and can be attached to the borders of planters. If there is no possibility to do so, the plants can also be tied for example, to galvanized reinforcing mats, which are laid into the substrate layer or fastened to perforated paving slabs. Within a System Build-up, not only "mounds", but also borders for areas of deeper and varied substrates are possible, for example, if bushes were to be planted around a roof garden for more privacy. An attractive possibility to create such borders are the ZinCo Concrete Kerbs.



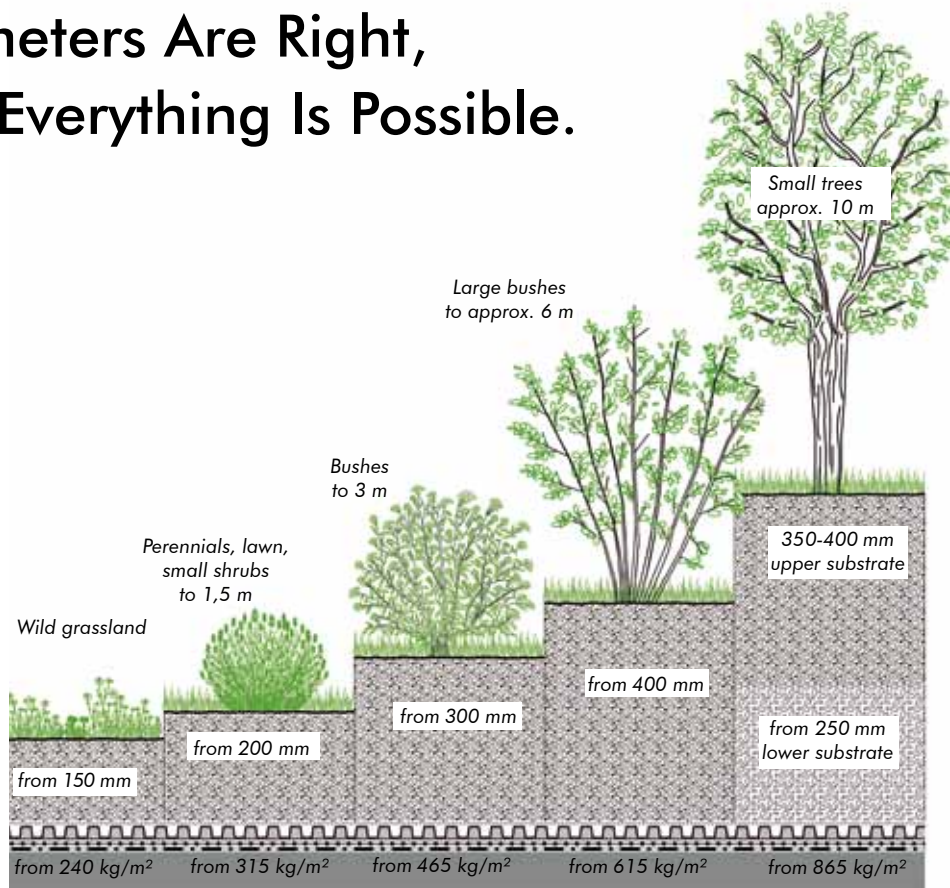
Even Bamboo can be applied on a roof but requires special safety measures.



If Parameters Are Right, Almost Everything Is Possible.

Substrate Depth Depends on Type of Plants

Plant growth is especially affected by the type and depth of applied substrate. On a substrate height of approx. 150 mm, near-natural wild grasslands are possible. For sophisticated perennial plantings, as well as for bushes and trees, higher substrate levels are required. The potential for horizontal extension of the roots of trees and bushes must be ensured. ZinCo offers a range of substrates with which every green roof request can be fulfilled.



Ponds and Pools

With the correct design, ponds and pools can be installed on roof decks. They should generally be placed above the drainage layer and lined separately with a special plastic membrane; should the pool ever leak, the water will flow to the regular roof drainage. It is recommended to have at least 300 mm depth of water to compensate for the higher evaporation rate on high and exposed buildings.



Expertise in Water Management and Restrictive Building Conditions

Roof Dam Irrigation

In roof gardens it is useful to conserve as much rainwater as possible to reduce the need for additional watering. The spacious channels forming the underside of the Floradrain® FD 60 allow for water storage of 40 mm in depth. The water is stored across the roof area and reaches the plants by capillary action and evaporation. Water storage is easily achieved by installing roof dam elements above the roof outlets. A roof laid at 0° fall is required to include this system, along with a suitable membrane for such use.

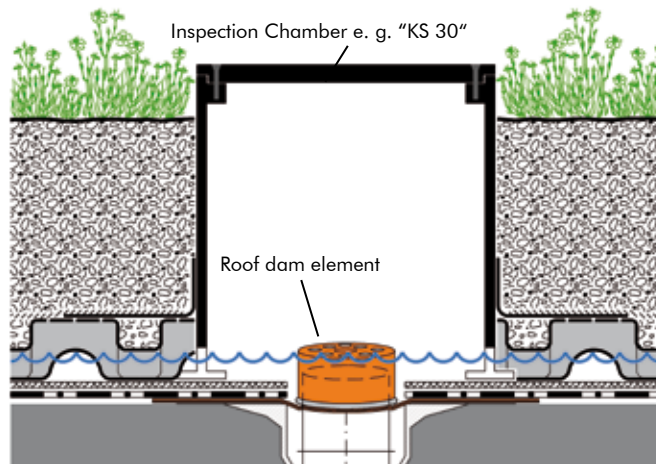
Inspection chambers make it possible to examine and maintain the roof dam elements at any time. With automatic irrigation machines, for example the float-controlled "B 32" or the larger "B 52", a minimum water storage can be maintained even in periods of drought. Drinking water, as well as "recycled" grey water, can be used for irrigation.



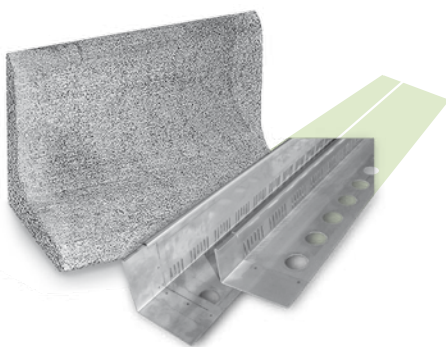
An inspection chamber incorporated into the system build-up



Roof dam element for long-term irrigation

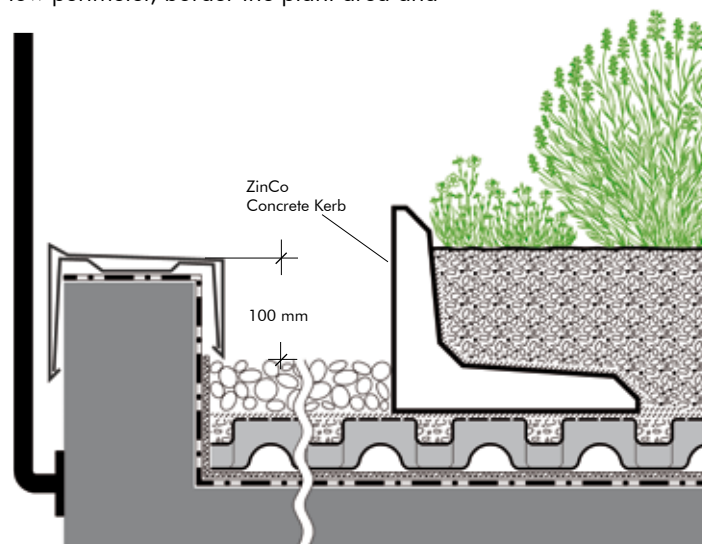


Intensive Greening on Roofs with Low Edging



Even with low perimeter upstands, intensive green roofs with higher build-ups can be installed. Concrete L-kerbs or stainless steel profiles, set in from the low perimeter, border the plant area and

allow for a greater depth of substrate. Thus, they ensure continuous and effective drainage beneath the plant beds and the roof edge.



Top Priority for Roof Gardens: Solutions without Roof Penetration



Guardrails

Roofs that are intended for access require a surrounding guardrail for safety purposes.

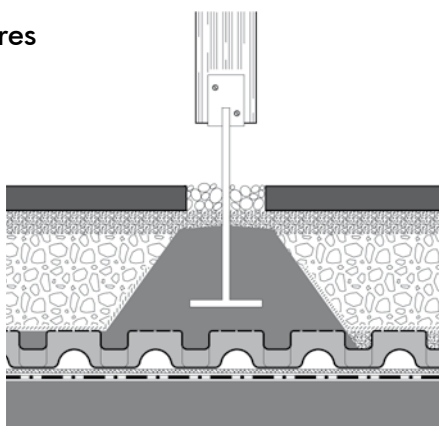
The ZinCo Guardrail Base GB provides the perfect solution without penetrating the roof membrane. It is suitable for both a ZinCo Guardrail and a proprietary handrail adapted to suit the architecture of the building. The guardrail can be fitted without special tools.

The Guardrail Base GB is placed either beneath the green roof, a gravel strip or suitable paving slabs which in each case provide the required load.

Foundations for Supporting Structures

Floradrain® FD 60 can also be used locally as a formwork enabling foundations for various furnishings without penetration of the roof membrane. The channel system on the underside of the elements ensures the unimpeded drainage of excess water.

As protection from sintering, carbonate release should be prevented by means of the type and surface treatment of the concrete and through the choice of suitable aggregate materials.



Creating Space – with System!

This Planning Guide aims to give you a general overview of the technology involved in the various intensive green roof options.

Our technical experts will be pleased to advise you on specific solutions for your own individual building projects: from the planning phase right through to creating your specification texts.

Challenge us!



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