PLANNING GUIDE

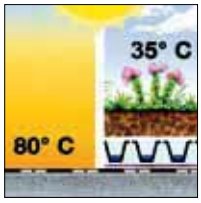
System Solutions for Extensive Green Roofs

Life on Roofs

Green Oases for Our Cityscapes

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

Protection of the Roof Membrane

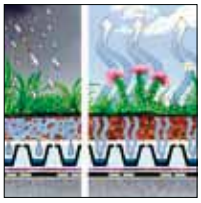


- Protects the roof membrane from UV radiation, heat, cold and hail

New Habitat

- Avoids sealing and creates new habitat for plants and animals

Rainwater Retention

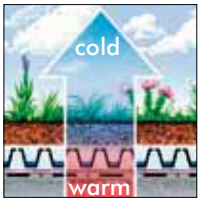


- Reduces run-off

Dust Binding

- Enhances the micro-climate by filtering out dust and smog particles

Reduction of Energy Costs



- Thermal protection and reduction in heating and cooling costs

Noise Protection

- Enhances sound insulation

Features

Unlike intensive green roofs, extensive green roofs require little upkeep or maintenance.

The features at a glance:

- **Minimum maintenance:**
  - Inspection and maintenance once or twice per year
  - Water and nutrient supply mostly by natural means
- **Plant communities close to nature:**
  - Undemanding
  - Extensive
  - Self-regenerating
- **Low loads and build-up heights:**
  - Mainly substrates with layer depths of up to about 120 mm
  - Loads about 50-150 kg/m²
- **Low-cost:**
  - For set-up and maintenance

Principles

ZinCo extensive green roofs are installed in accordance with current 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 and with a low pitch.
- 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.

All the information regarding vegetation technology is related to moderate continental climate and needs to be adapted in case of any other climate.

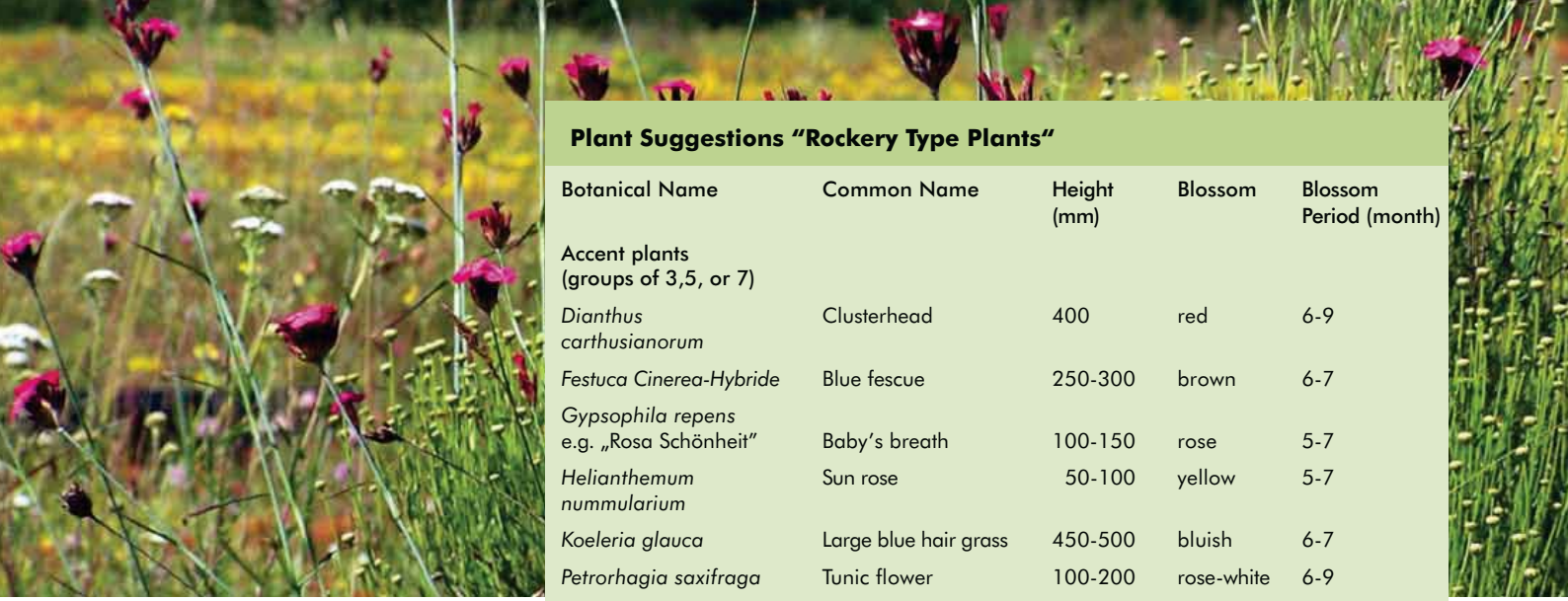
More Options with ZinCo

→ Please see our Planning Guide ***“Systems for Pitched Green Roofs”*** for information on pitched and steep pitched green roofs.

System Build-up “Rockery Type Plants“

“Rockery Type Plants“ allows for an extensive green roof with sophisticated design and individual character. The “Rockery Type Plants“ substrate is applied with a minimum of 70 mm in depth. “Rockery Type Plants“ vegetation consists of a wide variety of species which results in a long blooming period and allows for different accents throughout the vegetation period. Sedum species and other perennials are primarily used as a ground cover. Drought resistant perennials add flowering accents and height to the design,

Dianthus carthusianorum for example reaches up to 400 mm of height. The build-up is realized by manually planting plug plants. Thus the desired result can be predetermined. Furthermore the colour spectrum is significantly more differentiated in comparison to “Sedum Carpet“.

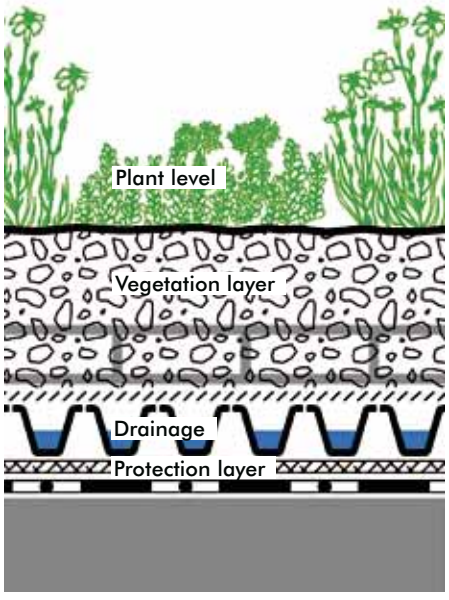


Plant Suggestions "Rockery Type Plants"

Botanical Name	Common Name	Height (mm)	Blossom	Blossom Period (month)
Accent plants (groups of 3,5, or 7)				
Dianthus carthusianorum	Clusterhead	400	red	6-9
Festuca Cinerea-Hybride	Blue fescue	250-300	brown	6-7
Gypsophila repens e.g. „Rosa Schönheit"	Baby's breath	100-150	rose	5-7
Helianthemum nummularium	Sun rose	50-100	yellow	5-7
Koeleria glauca	Large blue hair grass	450-500	bluish	6-7
Petrorhagia saxifraga	Tunic flower	100-200	rose-white	6-9
Saponaria ocymoides	Rock soapwort	150-200	rose	5-7
Satureja montana ssp. illyrica	Winter savory	100-150	violet	8-9
Saxifraga paniculata	Livelong saxifrage	200-250	white	6-7
Sempervivum-Hybriden	Houseleek hybrids	100-200	red/rose	7-8
Filler Plants (minimum of four different Sedum varieties)				
Cerastium arvense "Compactum"	Field chickweed	50-100	white	5-6
Hieracium pilosella	Mouseear hawkweed	150-200	yellow	5-7
Potentilla neumanniana	Alpine cinquefoil	100-150	yellow	3-4
Prunella grandiflora	Large self-heat	200	violet	6-8
Thymus doerfleri "Bressingham Seedling"	Bressingham thyme	60-80	rose	5-7
Thymus serpyllum	Wild thyme	50	violet	5-9

Additional Sedum varieties from the plant community "Sedum Carpet" on page 9.

Weight kg/m²		Height mm
dry	water-saturated	
70	98	70
2	10	30
72	108	



Plant level as per plant suggestions "Rockery Type Plants"

System Substrate "Rockery Type Plants"

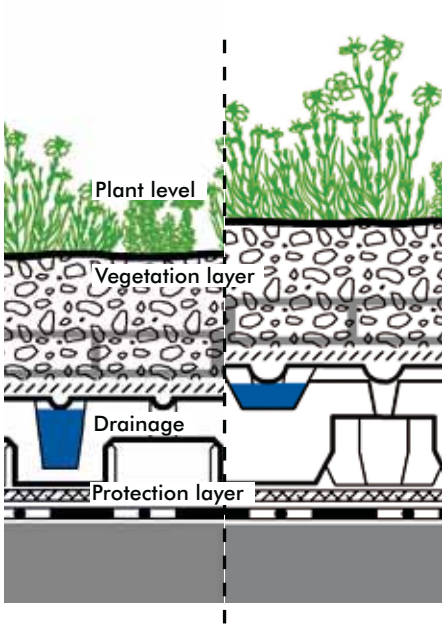
Safety Device "Fallnet®", if required (attention to load requirements)
Filter Sheet SF
Floradrain® FD 25-E
Protection Mat SSM 45
Root Barrier WSF 40, if waterproofing is not root-resistant

Build-up height:	ca. 100 mm
Weight, saturated:	ca. 110 kg/m²
Water retention capacity:	ca. 36 l/m²

System Build-up “Rockery Type Plants“ on 0°-Roofs

On 0°-roofs where deeper puddles might remain, the standard System Build-up “Rockery Type Plants“ is to be modified.
By installing higher Floraset® elements (50 or 75 mm) the necessary distance to the water level is ensured. The green roof build-up will be somewhat higher but not heavier as these elements are made of extruded polystyrene hard foam and therefore have a negligible weight. The Protection Mat TSM 32 with its lower retention capacity is sufficient, as water from the puddles is made available to the plants.

Weight kg/m²		Height mm FS 50	Height mm FS 75
FS 50/FS 75			
dry	water-saturated		
70	98	70	70
2	7	50	80
72	105		



Plant level “Rockery Type Plants”

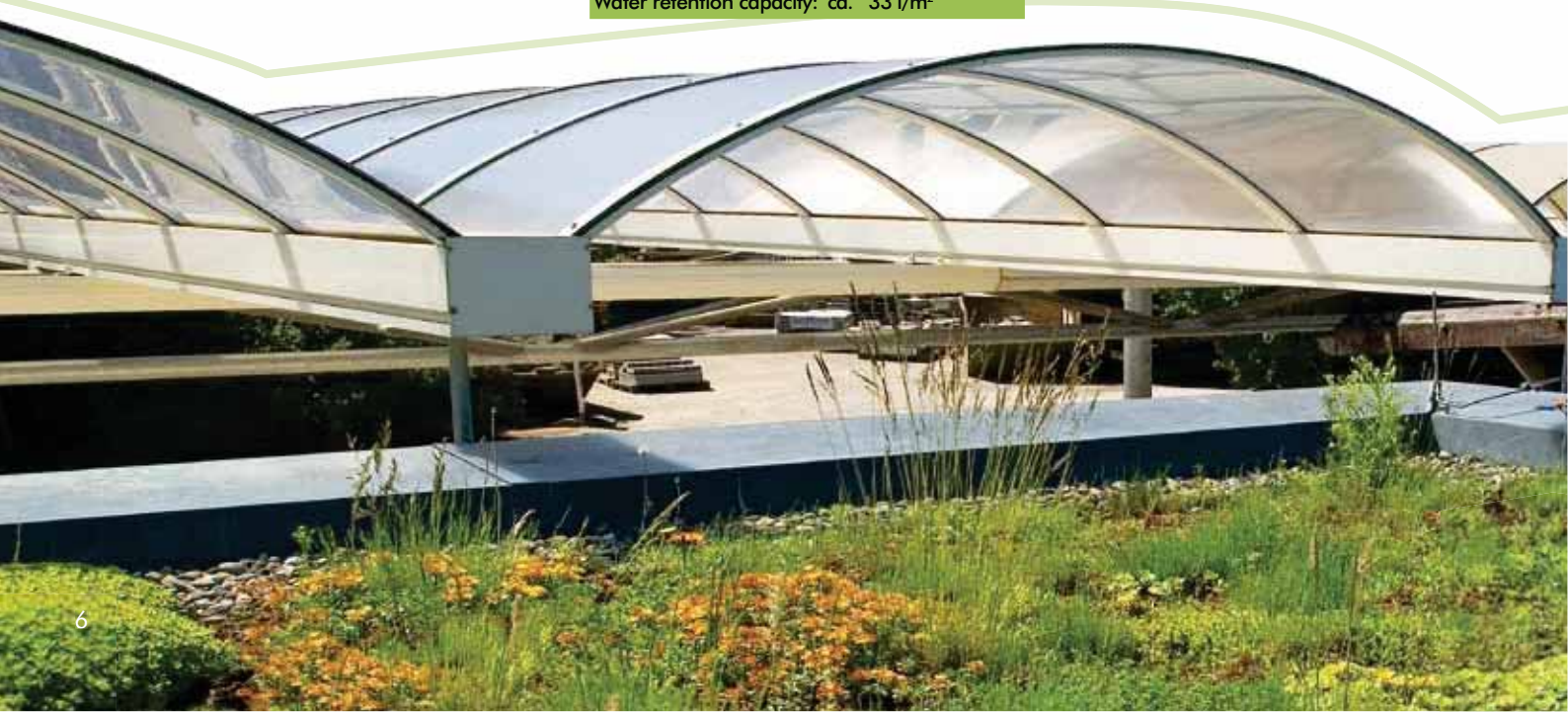
System Substrate “Rockery Type Plants”

Safety Device “Fallnet®”, if required (attention to load requirements)
Filter Sheet SF

Floraset® FS 50 or FS 75

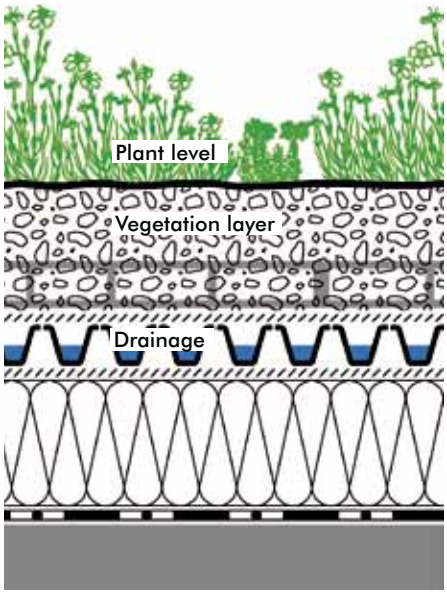
Protection Mat TSM 32
Root Barrier WSF 40,
if waterproofing is not root-resistant (beneath the thermal insulation layer).

Build-up height:	ca. 120 resp.150 mm
Weight, saturated:	ca. 105 kg/m²
Water retention capacity:	ca. 33 l/m²



System Build-up “Rockery Type Plants“ on Inverted Roofs

Weight kg/m²		Height mm
dry	water-saturated	
80	112	80
2	6	30
82	118	



Plant level “Rockery Type Plants”

System Substrate “Rockery Type Plants”

Safety Device “Fallnet®”, if required (attention to load requirements)
Filter Sheet SF
Floradrain® FD 25-E
Separation Membrane TGV 21
Roof construction with XPS thermal insulation

Root Barrier WSF 40,
if waterproofing is not root-resistant (beneath the thermal insulation layer).

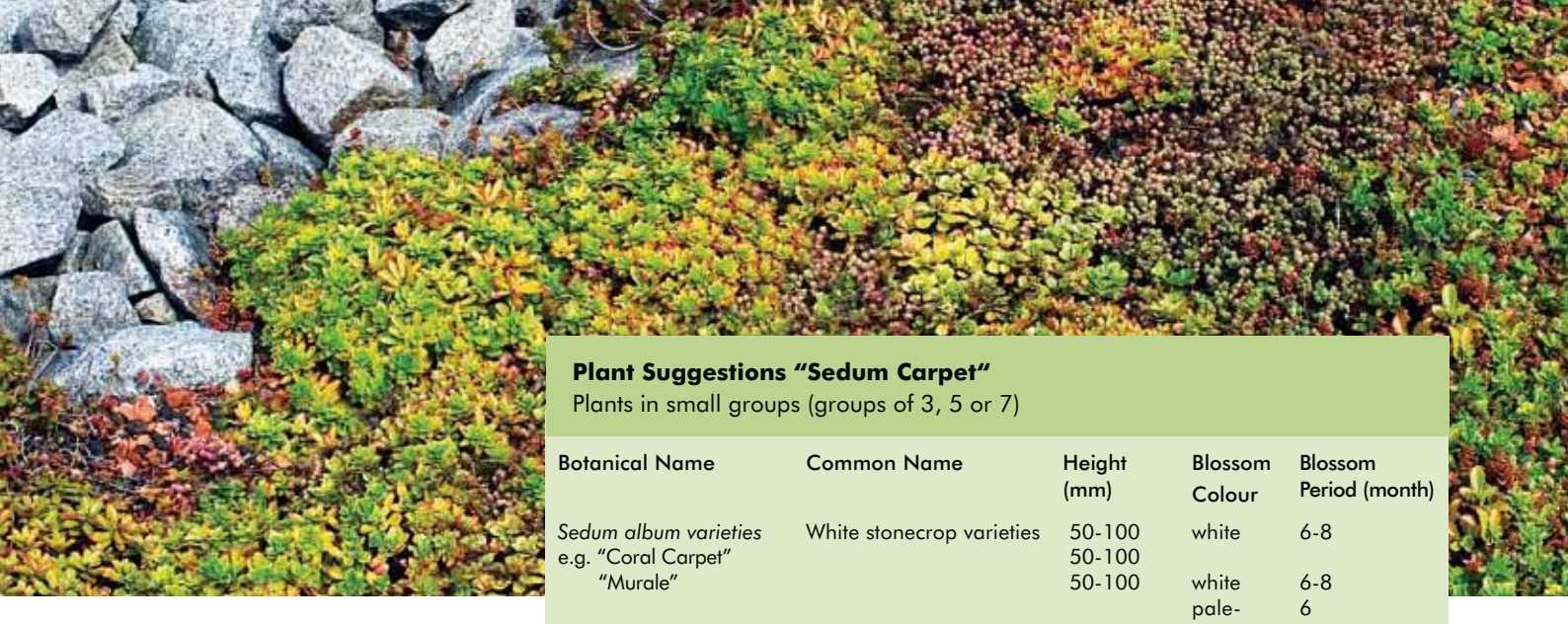
Build-up height:	ca. 110 mm
Weight, saturated:	ca. 120 kg/m²
Water retention capacity:	ca. 36 l/m²

With inverted roofs, layers that prevent the diffusion of damp must not be installed above the XPS thermal insulation boards. Therefore, the water retaining protection mat must be replaced by the diffusion permitting Separation Membrane TGV 21. In the case, that root barriers are necessary they have to be placed below the insulation boards directly onto the waterproofing. A deeper substrate layer compensates for the water retention capacity of the protection mat.

System Build-up “Sedum Carpet”

“Sedum Carpet“ is a shallow, ground-covering extensive green roof type. In moderate climates, it gets along with approx. 60 mm of “Sedum Carpet“ System Substrate.
“Sedum Carpet“ is applied, especially if both, the load often bearing capacity of the roof and the expenses for maintenance, are restrictive.

Proven sedum species, in combination with the appropriate system build-up, guarantee a long-lasting low maintenance green roof. The plant community “Sedum Carpet“ contains various low-growing sedum species. The main blooming time is in early summer, with yellow or red and white flowers dominating at different times. Throughout the year, “Sedum Carpet“ is represented in various shades of green. Red shades, particulary in autumn, are a pleasant change in the visual appearance. “Sedum Carpet“ is installed either by sedum cuttings or plug plants.

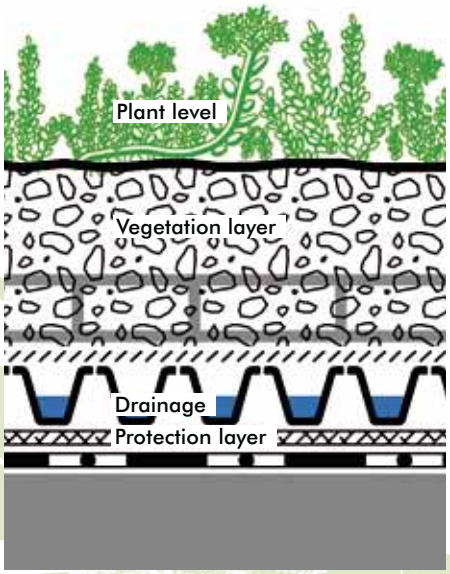


Plant Suggestions "Sedum Carpet"
Plants in small groups (groups of 3, 5 or 7)

Botanical Name	Common Name	Height (mm)	Blossom Colour	Blossom Period (month)
Sedum album varieties	White stonecrop varieties	50-100	white	6-8
e.g. "Coral Carpet"		50-100		
"Murale"		50-100	white	6-8
			pale-rose	6
Sedum cauticolum	Nettle-leaved goosefoot	100-150	rose	8-9
Sedum floriferum "Weihenstep. Gold"	Gold sedum	100-150	yellow	6-7
Sedum hybridum "Immergrünchen"	Hybrid stonecrop	100-150	yellow	7-8
Sedum reflexum	Crooked yellow stonecrop	200-250	yellow	6-7
Sedum sexangulare	Tasteless yellow stonecrop	50-100	yellow	6-7
Sedum spurium in varieties.	Dragon`s blood			
e.g. "Album Superbum"		100-150	white**	7-8
"Fuldaglut"		100-150		7-8
"Roseum Superbum"		100-150		7-8
"Splendens"		100-150		7-8
"Variegatum"		100-150		7-8

** infrequent blooming

Weight kg/m²		Height mm
dry	water-saturated	
67	84	60
2	10	30
69	94	



Mixture of Sedum Cuttings according to plant suggestions "Sedum Carpet"

System Substrate "Sedum Carpet"

Safety Device "Fallnet®", if required (attention to load requirements)

Filter Sheet SF

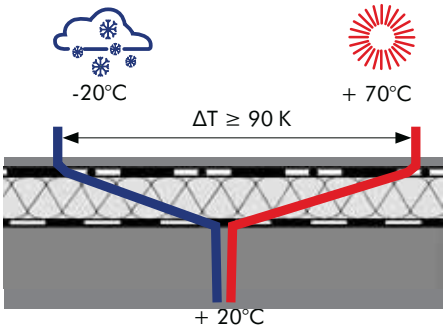
Floradrain® FD 25-E

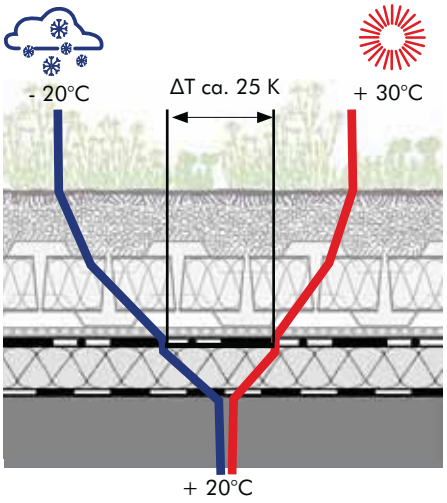
Protection Mat SSM 45

Root Barrier WSF 40,
if waterproofing is not root-resistant

Build-up height:	ca. 90 mm
Weight, saturated:	ca. 95 kg/m²
Water retention capacity:	ca. 25 l/m²

System Build-up "Climate Roof" as a Thermal Insulating Green Roof



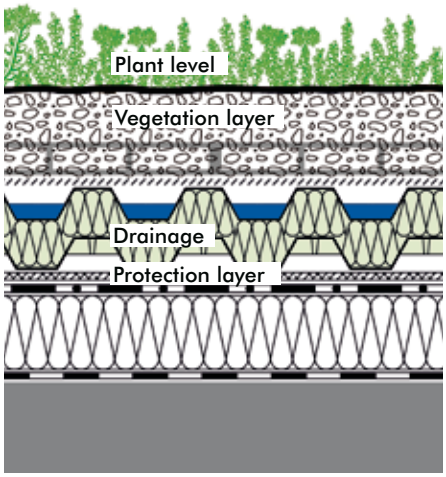


Thickness of the basic thermal insulation	U-value of the roof build-up no green roof	Floratherm® WD 65-H added	Floratherm® WD 120-H added
60 mm	0.57	0.36	0.24
80 mm	0.44	0.31	0.21
100 mm	0.36	0.27	0.19
120 mm	0.31	0.23	0.18
150 mm	0.25	0.20	0.16
180 mm	0.21	0.23	0.14

The U-value (formerly k-value) of the roof build-up is determined essentially by the basic thermal insulation and the Floratherm® element. The table above is based on basic thermal insulation with a thermal conductivity of 0.04 W/m²K and an approx. 200 mm thick concrete slab.

If you apply the officially aproved Floratherm® drainage elements as a substructure, the green roof build-up takes on the function of an additional thermal insulation layer.
Theses elements save costs for heating and cooling and contribute to meeting the requirements of energy saving regulations in cases of refurbishment.

Weight kg/m²		Height mm
dry	water-saturated	
67	84	60
3	11	70/120
70	95	



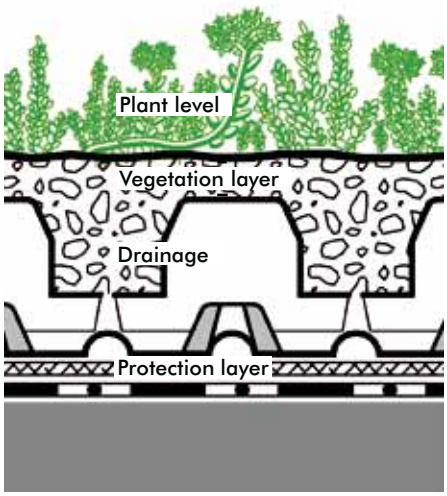
Plug Plants FB 50 "Sedum Carpet"
System Substrate "Sedum Carpet"
Safety Device "Fallnet®", if required (attention to load requirements)
Filter Sheet SF
Floratherm® WD, (type in accordance with required thermal resistance values)
Protection Mat SSM 45
Roof build-up with basic thermal insulation and waterproofing membrane

Build-up height:	ca. 130 resp. 180 mm
Weight, saturated:	ca. 95 kg/m²
Water retention capacity:	ca. 25 l/m²

System Build-up “Extreme Light Weight” up to a Roof Pitch of 5°

For some roof areas, even the Standard Build-up “Sedum Carpet“ is too heavy. The solution is a system build-up with Floraset® FS 75. Less substrate is required as it is not applied equally but mainly fills the gaps between the high studs of the element. Although they start growing mainly in those “planting pots“ the Sedum plants still form a dense ground cover which is supported by mosses over the course of time. The build-up weight is approx. 60 kg/m². In areas with little annual precipitation and also on pitched roofs either additional substrate which effects weight and build-up height is required or irrigation is to be provided.

Weight kg/m²		Height mm
dry	water-saturated	
37	55	65
2	5	30
39	60	



Plug Plants FB 50 “Sedum Carpet”

System Substrate
“Rockery Type Plants Light“

Floraset® FS 75

Protection Mat TSM 32
Root Barrier WSF 40,
if waterproofing is not root-resistant

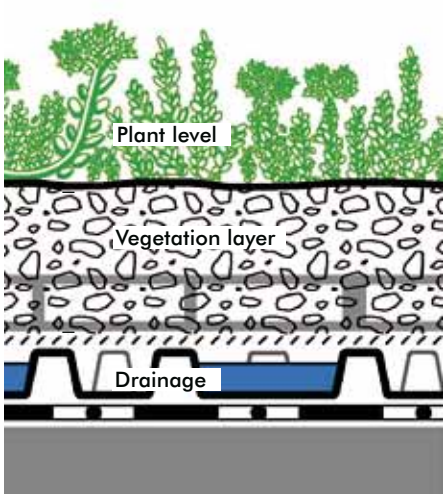
Build-up height:	ca. 100 mm
Weight, saturated:	ca. 60 kg/m²
Water retention capacity:	ca. 21 l/m²

System Build-up “Industrial Green Roofs”

The bigger the roof area, the higher the costs. You can avoid this by omitting certain layers. However, this could be dangerous as certain functions that are important for the long-term proper performance of the green roof are no longer available.

ZinCo, therefore, has combined a number of functional layers in one product. Fixodrain® XD 20 can be installed without an additional protection layer, due to its extremely large contact surface and bonding over a large area. The filter sheet is laminated directly onto it and it is installed in one pass. The elements are attached to each other by means of studs down the long side and the filter sheet overlaps along both the long and the top sides.

Weight kg/m²		Height mm
dry	water-saturated	
67	84	60
1	4	20
68	88	



Hydroseeding or Sedum Cuttings
as per “Sedum Carpet” plant suggestions

System Substrate “Sedum Carpet”

Safety Device “Fallnet®”, if required
(attention to load requirements)
Fixodrain® XD 20

Root Barrier WSF 40 and Filter Sheet PV,
if waterproofing is not root-resistant

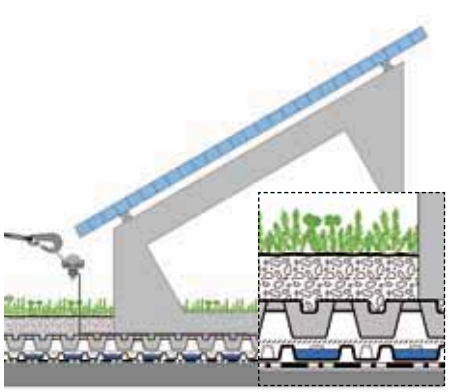
Build-up height:	ca. 80 mm
Weight, saturated:	ca. 90 kg/m²
Water retention capacity:	ca. 20 l/m²

System Build-up "SolarVert®"

Solar energy or green roof?
A thing of the past! With our System Build-up "SolarVert®" (Fixodrain® XD 20, ZinCo Solar Base SB 200 and Base Frame SGR) solar panels can be combined with a green roof easily, which makes them even more effective. And, there is no need for roof penetration, as the load required to ensure a permanent, secure system is provided by the green roof build-up. The Solar Bases can be positioned on the Fixodrain® level as required.

By developing the Solar Base, ZinCo has added another aspect to the benefits of a green roof: the integration of solar energy into a green roof build-up. The efficiency of the green roof as an ecological compensation area is improved thanks to the ZinCo Solarbasis® integrated into the SolarVert® system build-up.

For further information, please see our planning guide "Solar Energy and Green Roofs".



Solar panel

Solar Base Frame SGR 35/90

Plug Plants FB 50 "Sedum Carpet" or Sedum Cuttings
System Substrate, substrate depth as per the required load
ZinCo Solar Base® SB 200
Fixodrain® XD 20
Root Barrier WSF 40,
if waterproofing is not root-resistant

When working on flat roofs, including maintenance of solar energy systems, devices to prevent persons from falling are required. Single attachment points are usually not a viable solution, as solar systems are usually built up close to the roof edge. Fallnet SB 200-Rail provides the perfect solution for such situations. It was developed especially for the use in combination with the Solar Base SB 200. Here the existing periphery of the solar system is used to attach the anchorage device. Only the rail itself, the rail supports and object specific accessory is added as required. This allows for a fast and cost-effective realization of fall protection, perfectly integrated into the roof landscape.

Accessories and Details Programmes

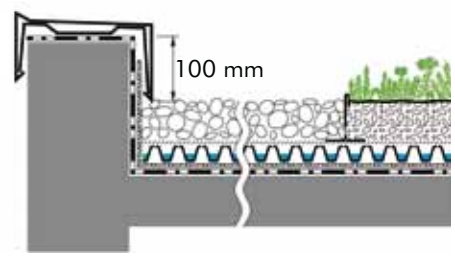
Perimeters

In line with the "German Guidelines for Roofs with Waterproofing", an upstand height of at least 100 mm above the surface covering is required at the roof perimeter. The parapet should have a covering that slopes towards the roof. The protection mat and, where required the root barrier, are drawn upwards and secured.

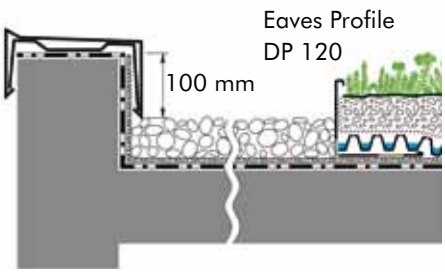
Increased loads must be applied to loosely laid roof waterproofing sheets around the roof perimeter and corner areas where there is high wind suction (high building, exposed location …). This is very often provided by means of sufficiently wide and heavy edge strips consisting of concrete slabs or grass pavers.

If in projects with high wind loads the perimeter and corner areas of the roof are to be part of the green roof, the vegetation cover must be closed immediately. EcoSedum® is ideal here. These pre-greened grid elements are securely fixed to each other by an interlocking plug connection system. They are sufficiently permeable when greened so that wind suction forces cannot find purchase.

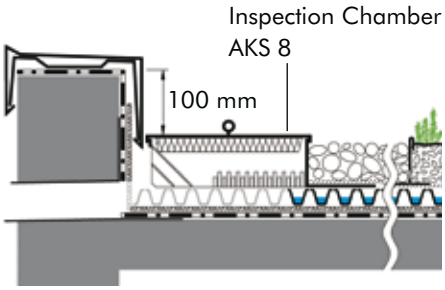
Pre-cultivated EcoSedum® elements can be used both in combination with concrete slabs (loosely laid waterproofing) and on their own (adhered or mechanically fixed waterproofing layer).



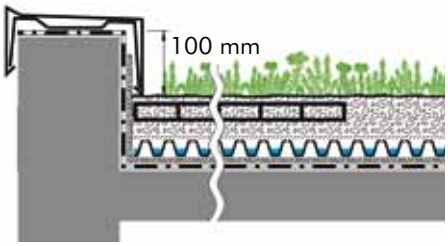
Standard perimeter solution



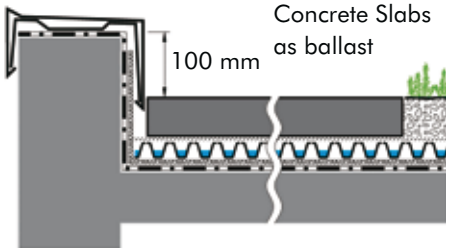
Solution for low perimeters



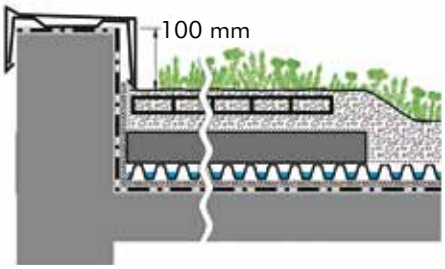
Draining flat roofs by means of water spouts integrated into the parapet



Perimeter solution for high wind loads with EcoSedum® (fixed waterproofing)

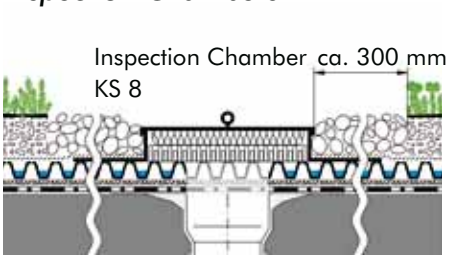


Perimeter solution for high wind loads (loose waterproofing)



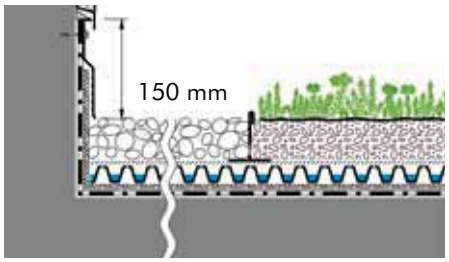
Perimeter solution for high wind loads with pavers and EcoSedum® (loose waterproofing)

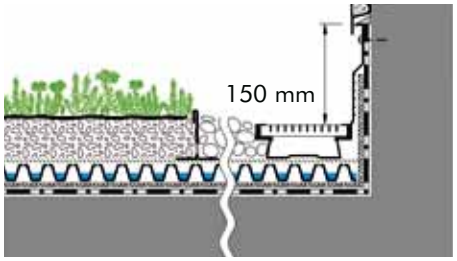
Roof Drains and Inspection Chambers



Usually, the drainage of flat roofs is achieved through roof drains. Their quantity as well as their dimensioning is to be determined in accordance with European and German Standard DIN EN 12056-3 and DIN 1986. Inspection chambers make sure the roof drains remain accessible and therefore can be cleaned easily, if necessary.

Wall Connection

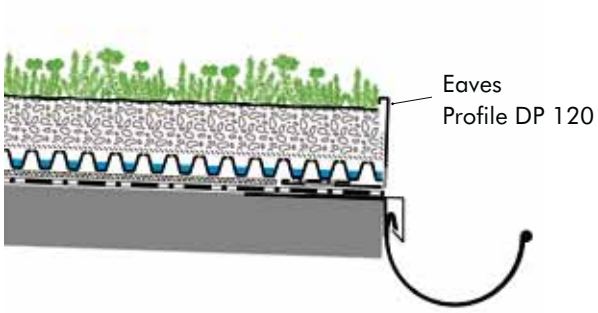




The connection to walls needs to be waterproof. Therefore the protection mat, the waterproofing and the root barrier are taken up at least 150 mm above the finished surface of the green roof build-up and fixed with a protection profile. In front of facades the installation of additional drainage channels is recommanded in order to lead rainwater directly into the drainage layer. If only little water is expected, a simple gravel strip is sufficient.

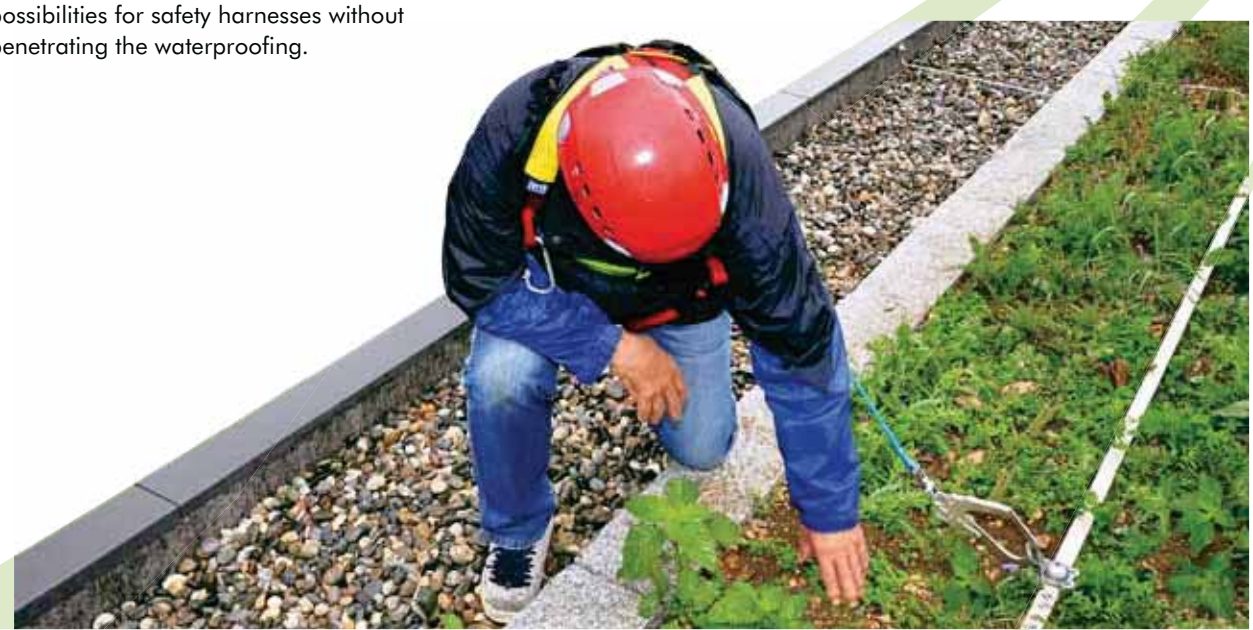
Drainage Via an External Eaves gutter

If the drainage of a green roof is to be ensured by an external gutter, the green roof build-up can be bordered by an eaves profile, which is attached to the waterproofing. Eaves profiles border the build-up but allow for unhindered runoff due to their drainage slots.



Fall Protection

National regulations as well as directives brought out by insurance associations prescribe the use of fall protection systems for works at height. The "Fallnet®" which can be integrated into ZinCo Green Roof System Build-ups offer fixing possibilities for safety harnesses without penetrating the waterproofing.

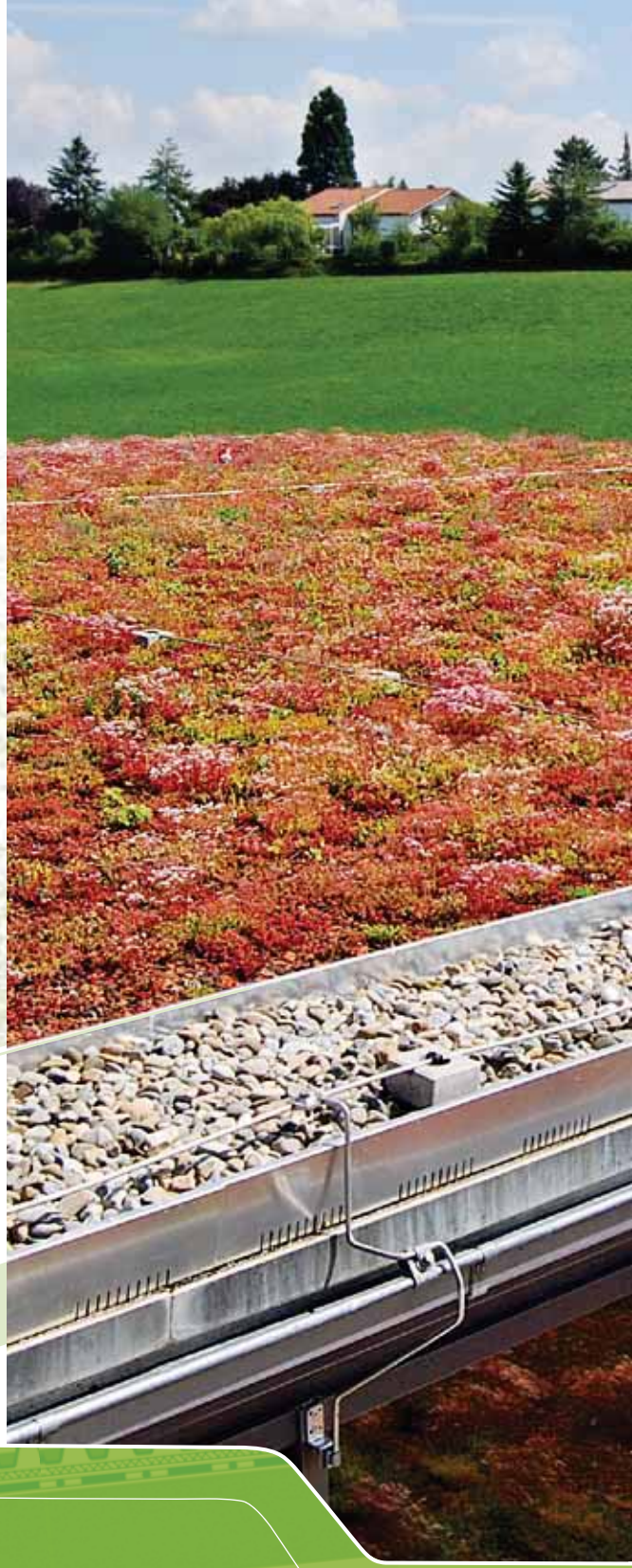


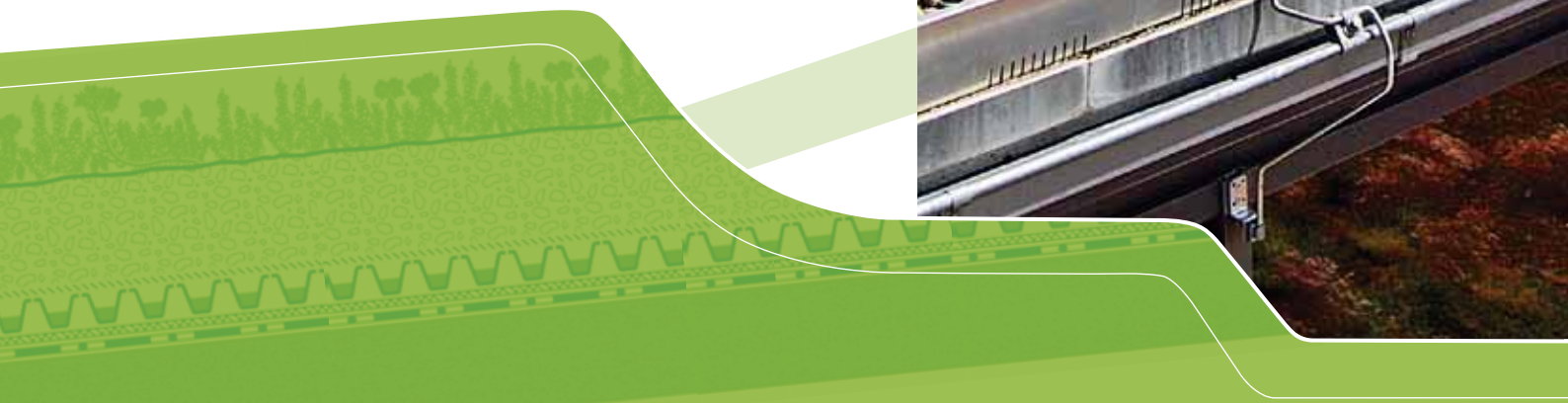
Ecological Protection Layers with System!

This Planning Guide aims to give you a general overview of the technology involved in the various extensive 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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