Surface & Interlayer drainage

XTOP AND XFLOW FOR RAINWATER COLLECTION AND INFILTRATION

EN Edition 2022
950705 – Salesfolder XTop & XFlow

All down the line – GRAF project support

RESPONSE TIME

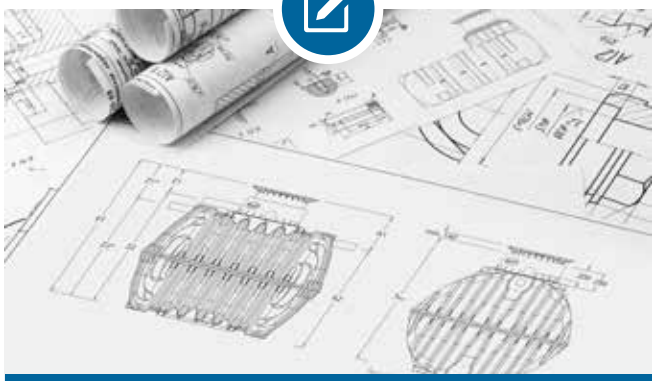
- Short response times – from the initial calculations to the quotation
- GRAF contacts are located in various time zones for better accessibility

TRAINING

- Product training at GRAF and branches worldwide
- Software training for system design and dimensioning

ADVICE

- Solutions designed for all rainwater requirements – harvesting, retention, and infiltration
- Design and specification of alternative solutions for your needs



PLANNING

- Specifications/designed in compliance with regulations
- Verification for potential flood risks
- CAD drawings provided for site plans
- Assistance with the evaluation of soil permeability

EXCELLENCE

- International know-how and exchange of knowledge
- Highest quality and customer satisfaction generate follow-up projects
- Approval certificates available immediately at **www.graf.info**

SUPPORT

- Advice on individual project solutions
- Talks with decision-makers
- Fast and friendly assistance with enquiries

www.graf.info

LOGISTIC

- Fast delivery time – 99 % of the GRAF product range is available on stock
- Area-optimised, stackable products for small on-site storage requirements and low freight costs

XTop and XFlow

The solution

Surface Drainage

Rainwater falls on permeable surfaces like green fields, sand banks, gravel beds. XTop can be used to stabilise and fix loose granular material or green fields and serve best direct permeability

green planet collection

100 % RECYCLING

XTop 50-S

- Preventing puddles
- Vehicle access on lawn areas
- Permeable ground improvement
- Fixing loose granular surfaces & erosion

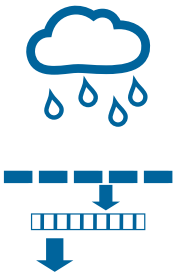
Webcode G4702

XTOP VIDEO
www.graf.info/v222

» page 8

Interlayer Drainage

Rainwater falls on semi-permeable surfaces like pavements or other and local conditions prevent fast permeability. To improve the storage capacities of wide areas, XFlow can be used next to surface from 15 – 50 cm below level.



green planet collection

100 % RECYCLING

XFlow 50-S & XFlow 50-L

- Advanced drainage in interlayer
- Supply 45 l/m² temporary stormwater storage
- Best intersectional flow-through on drainage areas
- Other applications

Webcode G4701

XFLOW VIDEO
www.graf.info/v220

» page 14

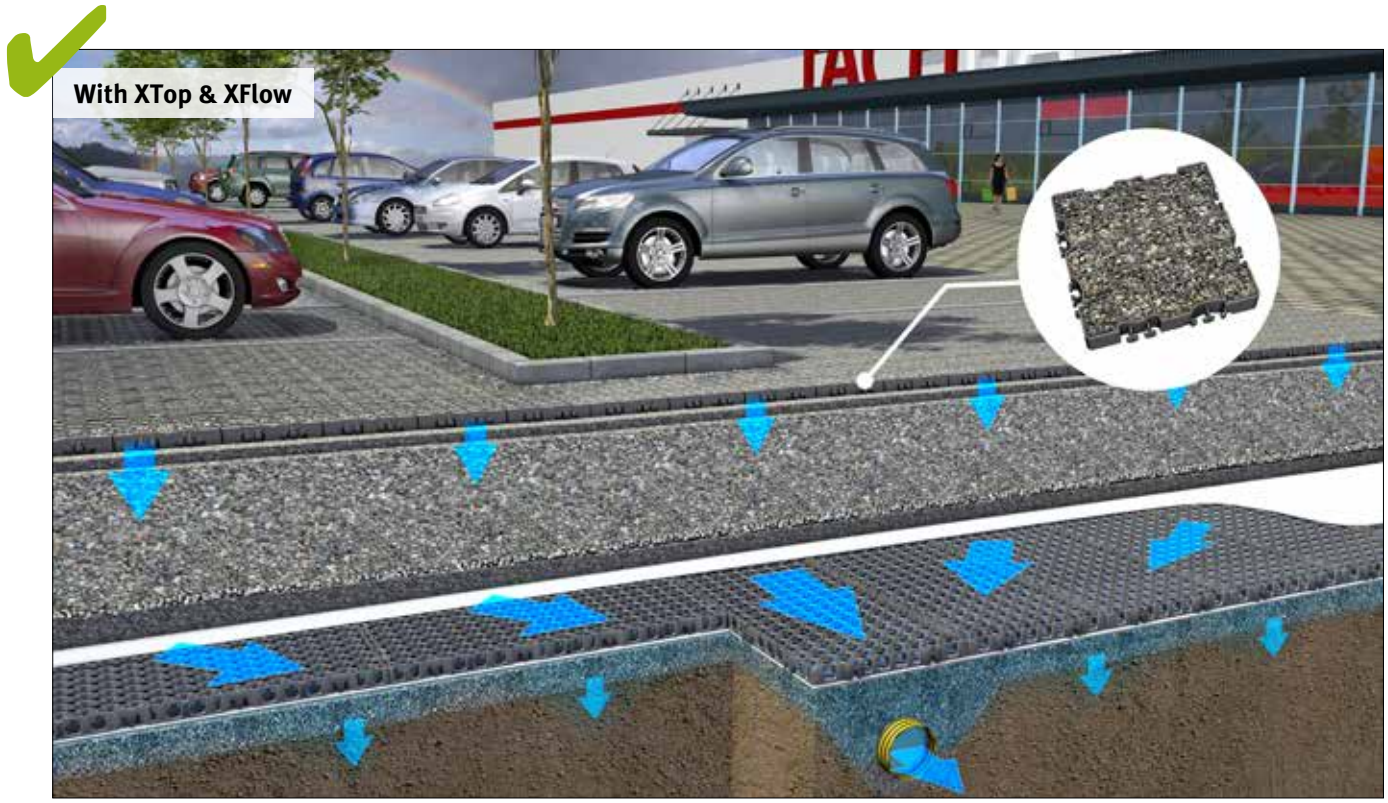
Maintenance free drainage

The increasing sealing of building areas such as parking lots for supermarkets are problematic especially in heavy rain events. Usage of permeable surfaces like paving stones with wide joints or grass pavers are important to prevent flooding.

With the help of these permeable surfaces the accumulating rainwater is quickly drained into the ground. In the layers beneath, it must either be infiltrated quickly or be temporarily stored. The combination of XTop and XFlow is optimized for the surface and interlayer drainage.

The good permeability of XTop with a max. open surface of 90 % ensures a fast drainage of the surface.

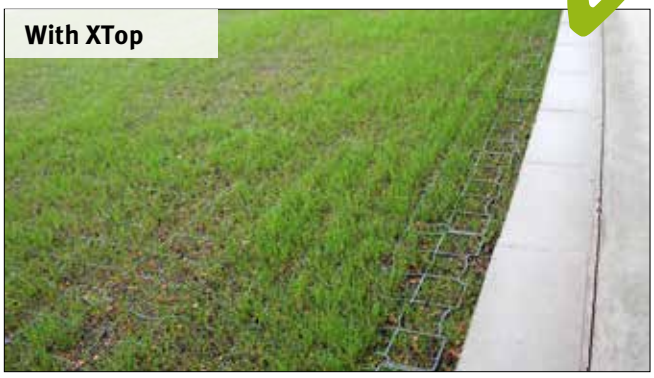
The water is then transported to the underground where the XFlow shows its strengths. XFlow significantly improves the infiltration performance thanks to its wide effective area and the good hydraulic connectivity. In addition, the high storage coefficient compared to typical installations with gravel/ crushed stone improves the characteristic for the temporary storage of rainwater in the operational area.



XTop 50-S

Benefits in operation and maintenance

- Lane grooves



- Trafficable ground reinforcement
- Natural appearance

- Puddles
- Mudd
- Potholes

- Trafficable with high punctual loadings

- Floor sealing

- Improved drainage

XFlow 50-L & XFlow 50-S

Benefits in operation and maintenance

- Local flooding through clogged storm drain

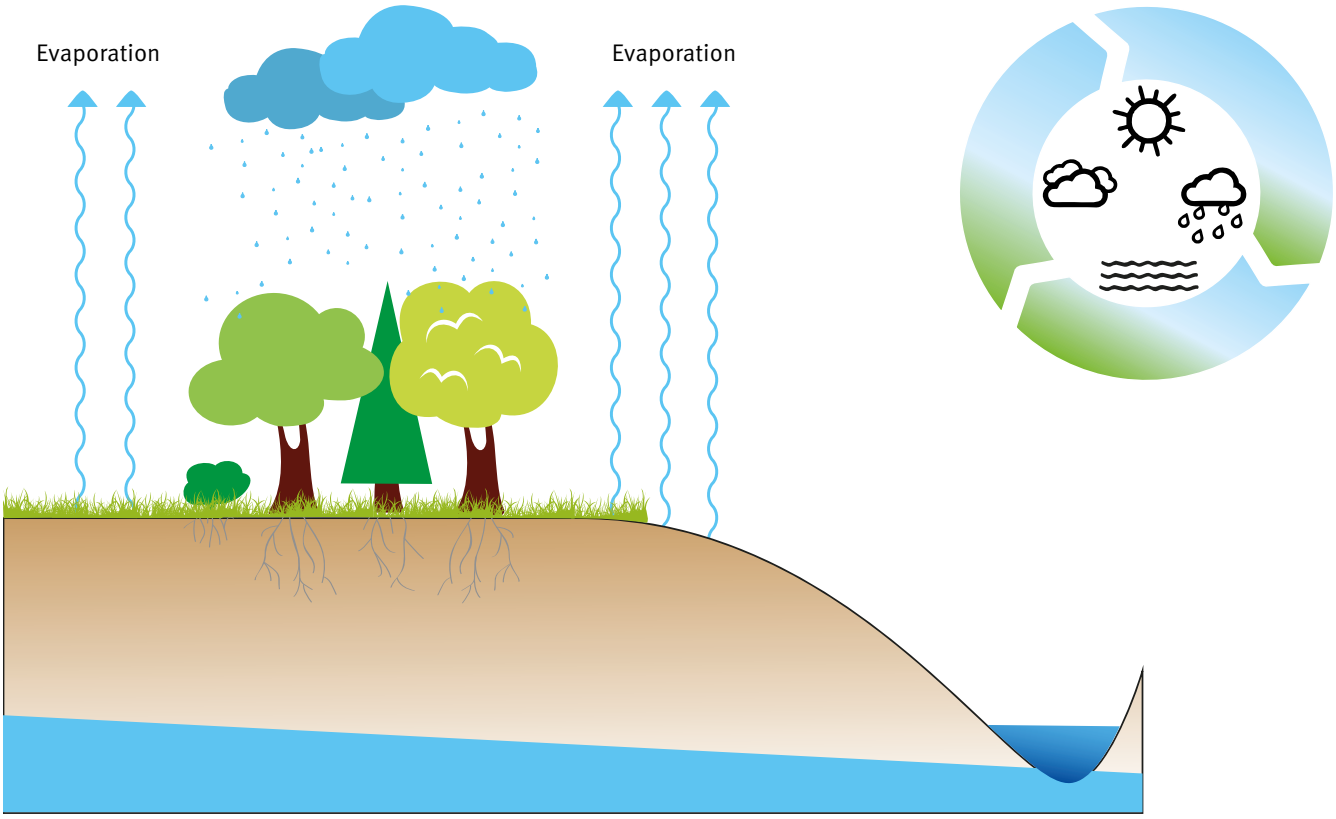
- Low-maintenance interlayer drainage

- Service vehicle required
- Bad maintenance only during heavy rain event is detectable
- Storm drain deepest point – vulnerable to dirt

- Easy maintenance of catchment area
- No labor intensive maintenance and inspection necessary
- Ideal for areas outside of the regular maintenance scope
- Only the usual cleaning work is necessary on carparks and traversable surfaces and paths
- No further underground construction products required
- Fast detection of missing service

XTop

Surface drainage and technical data



Maintaining the natural water cycle

As more and more surfaces are sealed with buildings, car parks and roads, the sewer system is having to work harder, especially in built-up areas, and the risk of flooding increases. In addition, this lowers the natural groundwater level. Grass pavers are one solution to this problem. Their open structure allows rainwater to seep away and thus maintain the natural water cycle.

Mean runoff coefficients Cm *

Asphalt, seamless concrete	Concrete block paving	Pavement areas	Compound blocks with drain joints, filtration blocks	Grass paver blocks
0.9	0.7	0.6	0.25	0.1 – 0.2

Improve your surface drainage

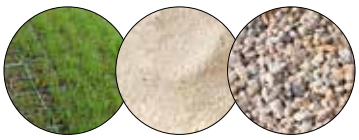
Cm = 0.9

Cm = 0.15 › 6 times improved

* according to DIN 19860-100:2016-12 & DWA-A 138-1

In contrast to full-surface sealing, where rainwater can only be drained off via an additional drainage system (integrated or adjacent), grass pavers have an open structure that ensures direct drainage. This avoids extra costs for an additional drainage system and at the same time promotes groundwater replenishment. Depending on the filling material used (gravel, lawn seed mixture, etc.), the grass paver blends seamlessly into the overall appearance and is also suitable for open spaces that are subject to heavier loads, such as vehicular access.

- ✓ **Save sewage fees**
- ✓ **Promote natural groundwater recharge**
- ✓ **Minimize floor sealing**
- ✓ **Reduce ecological impact**
- ✓ **Keep natural appearance**
- ✓ **Different types of filling possible (green, substrate and mineral)**



XTop 50-S

- 1 grid = 0.11 m² infiltration area
- Max. open surface approx. 90 %
- Interlock 24 noches per m²
- Anti-slip nub on the surface

green planet collection
100 % RECYCLING

Area	Length	Width	Height	Weight	Colour	Item no.
0.11 m² (1.18 ft²)	330 mm (13")	330 mm (13")	50 mm (2")	0.8 kg (1.76 lbs)	black	495010

Webcode G4702

XTop

Planning advice

✓ Optimized for quick installation

✓ Smooth assembly

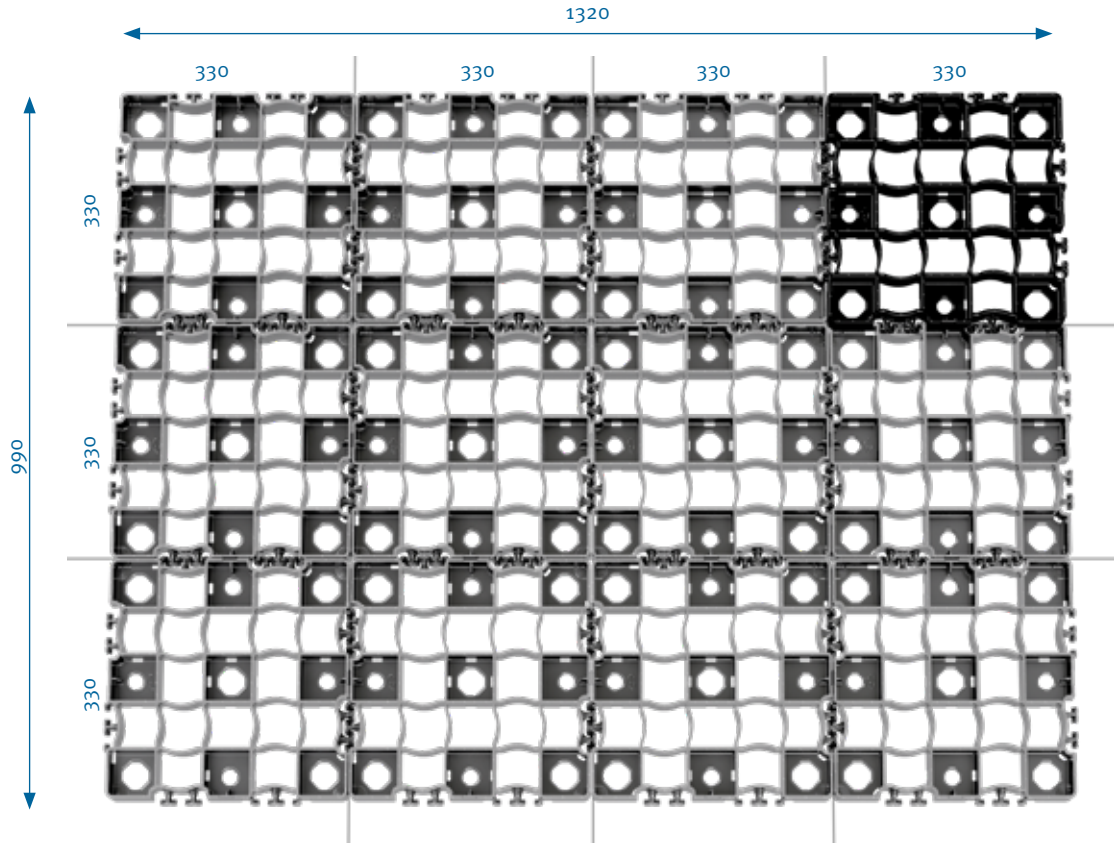
✓ Flexible adaptable

Laying

Optimized for quick installation but at the same time flexible adaptable. XTop 50-S arrives pre-assembled in a pattern of 12 pieces.

The pattern can simply be broken open so that the laying can be individually adapted.

- Area 1,31 m² (1410 ft²)
- Weight 9.6 kg (21.16 lbs)

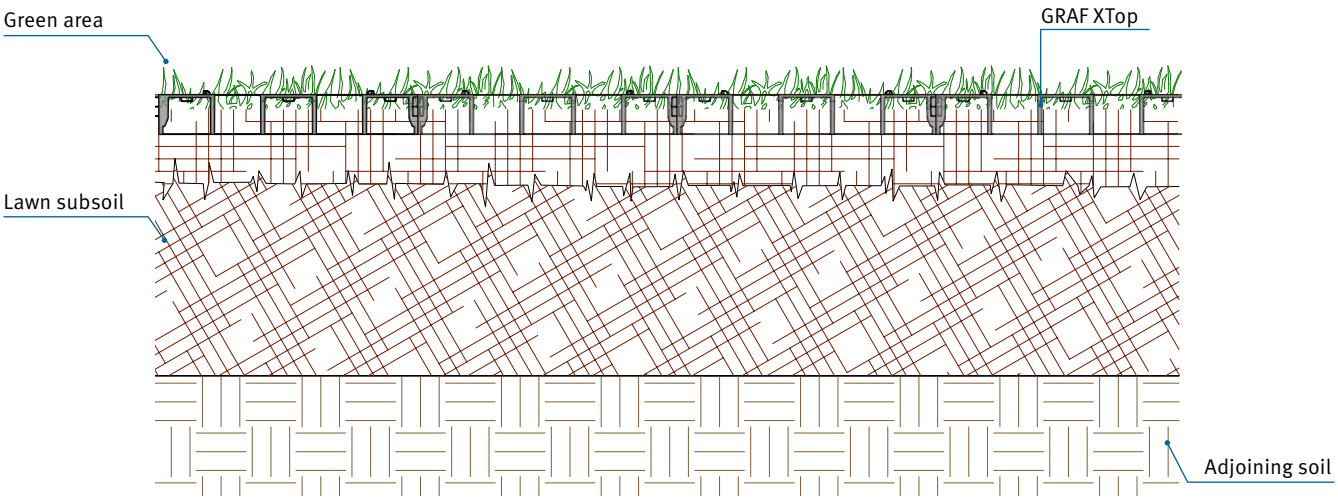


Pcs./m²	kg/m²
9.2	7.3

Wide range of potential applications

Advantages

- Easy and fast installation
- High stability
- Permeable ground improvement/ reinforcement
- No surface wetness or puddling just a short time after bad weather
- Easy to maintain



Applications

Suitable for:

- Car parks, parking spots, carports
- Side verges
- Logistic areas
- Courtyard entrances
- Golf courses

Avoiding erosions in any application!

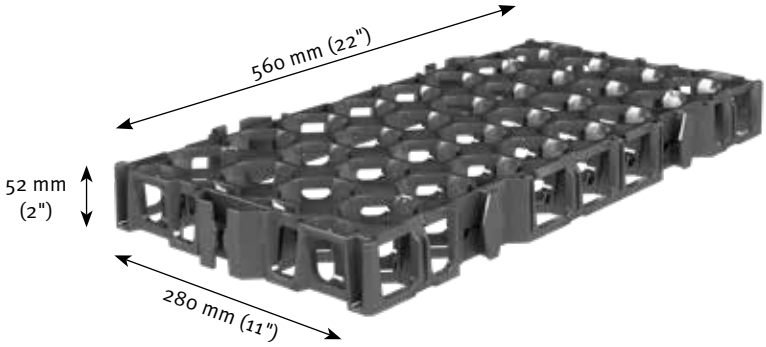
XFlow

The best of two sizes

XFlow

The best of two sizes

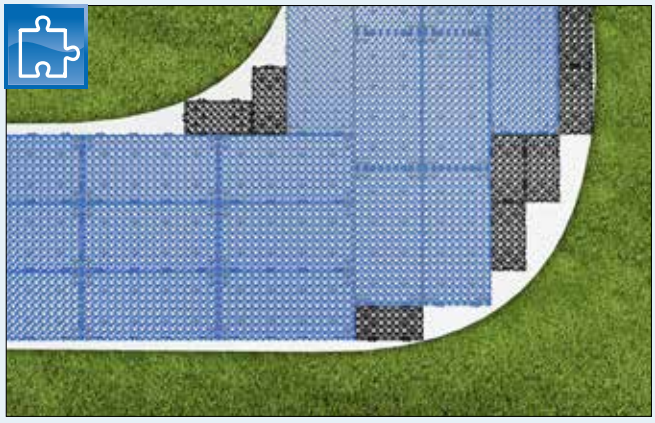
- ✓ Easy and flexible assembly
- ✓ For all combinations with XFlow 50-L & XFlow 50-S lengthwise and crosswise
- ✓ Improve your permeable areas
- ✓ High stability combined with the best hydraulic properties



Mix it to your needs

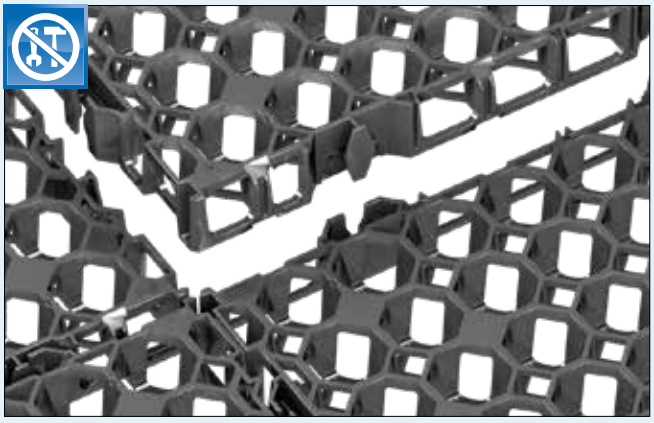
XFlow 50-S

- 1 cell = 0.16 m² (1.72 ft²) infiltration/collector area
- Storage coefficient of 85 %
- Gross/net volume: 8.2 l (2.16 US gal.) / 7.0 l (1.85 US gal.)



Flexible and fast installation

XFlow 50-L and XFlow 50-S can be combined to optimal effect, even in unusual geometries. The interaction between these two sizes serves to minimise cut waste and shorten assembly times to the same extent.

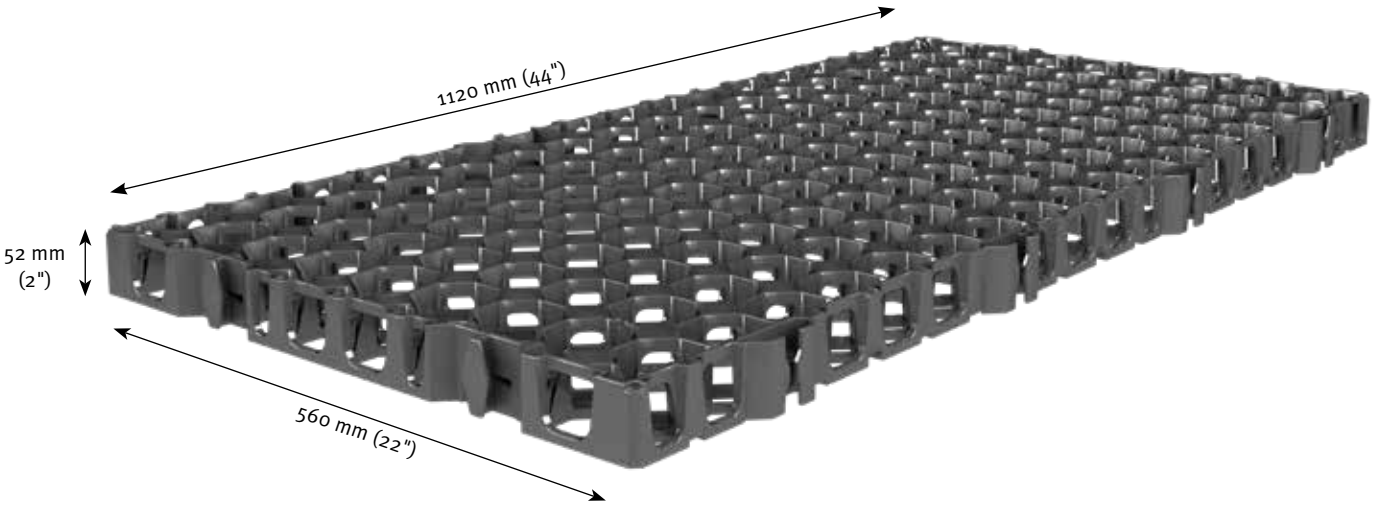


Improved handling

Fastest assembly – easy onsite handling. XFlow drainage cell features a convenient plugin system for huge time savings in installation. The various cells can be assembled in any direction.

✓ Reduction of puddles

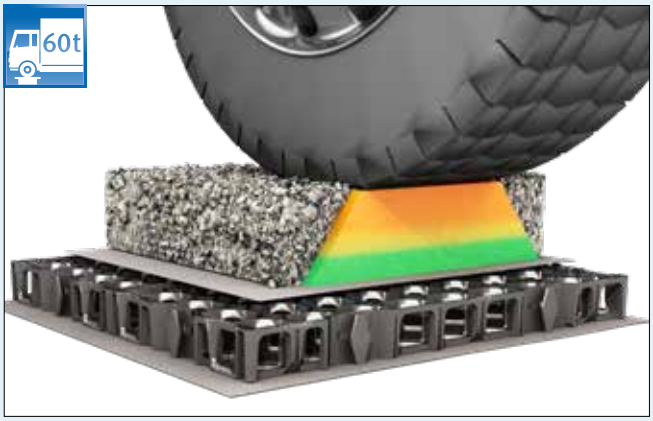
✓ Ideal for high point and traffic loads, also under special vehicles



XFlow 50-L

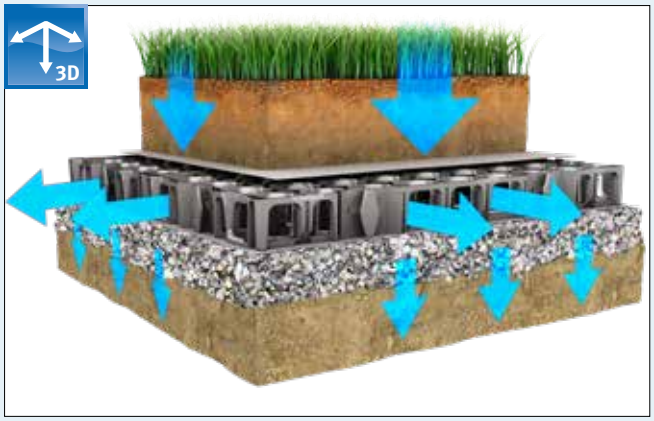
- 1 cell = 0.64 m² (6.89 ft²) infiltration/collector area
- Storage coefficient of 88 %
- Gross/net volume: 32.6 l (8.61 US gal.) / 28.7 l (7.58 US gal.)

World wide fastest installation performance



Maximised stability

XFlow drainage cell is made of high performance GRAF compounds. Just the one installation of small thickness between traversable surface and XFlow is enough to safeguard the strength and stability of the drainage cell over decades.



Hydraulic performance

XFlow provides free 3D-hydraulic flows. For infiltration applications water flows directly into the ground. Also other applications are supported by this design e. g. collecting and directing rainwater.

XFlow

System overview and components

XFlow 50-S

- 1 cell = 0.16 m² infiltration/ collector area
- Storage coefficient of 85 %
- Gross/net volume: 8.2 l (2.16 US gal.) / 7.0 l (1.85 US gal.)

XFlow 50-L

- 1 cell = 0.64 m² infiltration/ collector area
- Storage coefficient of 88 %
- Gross/net volume: 32.6 l (8.61 US gal.) / 28.7 l (7.58 US gal.)

XFlow 50-S

Drainage cell with one quarter of the area for installation over small areas or for supplementing edge areas around large installations with XFlow 50-L.

Area	Length	Width	Height	Weight	Colour	Item no.
0.16 m² (1.72 ft²)	560 mm (22")	280 mm (11")	52 mm (2")	1.2 kg (2.64 lbs)	black	495001

XFlow 50-L

Drainage cell ideal for large installations with high savings potential in installation times and work.

Area	Length	Width	Height	Weight	Colour	Item no.
0.64 m² (6.89 ft²)	1120 mm (44")	560 mm (22")	52 mm (2")	4.3 kg (9.47 lbs)	black	495000

Webcode G4701

Accessories

GRAF-Tex geotextile

For the installation of XFlow drainage cell

Sold by the metre, roll width 2.5 m (8' 2.4")

Item no. 231007

Sold by the metre, roll width 5 m (16' 4.8")

Item no. 231002

Technical data	XFlow 50-S	XFlow 50-L
Volume gross/net	8.2 l (2.16 US gal.) / 7.0 l (1.85 US gal.)	32.6 l (8.61 US gal.) / 28.7 l (7.58 US gal.)
Storage coefficient	85 %	88 %
Flow rate (@ 1% grad)	› 3.0 l/sec/m	

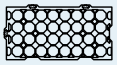
Loading class

Vehicle loading

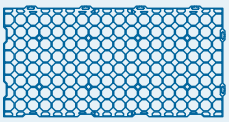
Lorry-bearing 40 t/HS-20

Lorry-bearing 60 t/HS-25

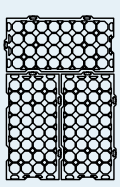
Combination options

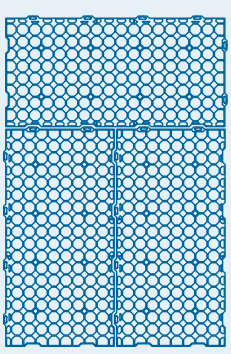


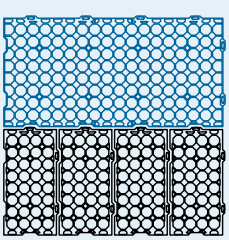
XFlow 50-S

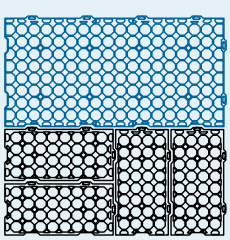


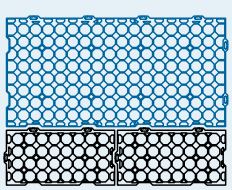
XFlow 50-L

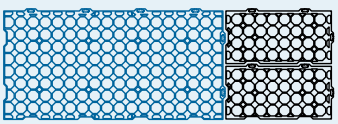


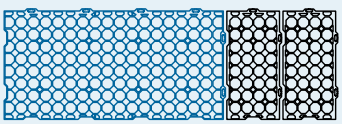












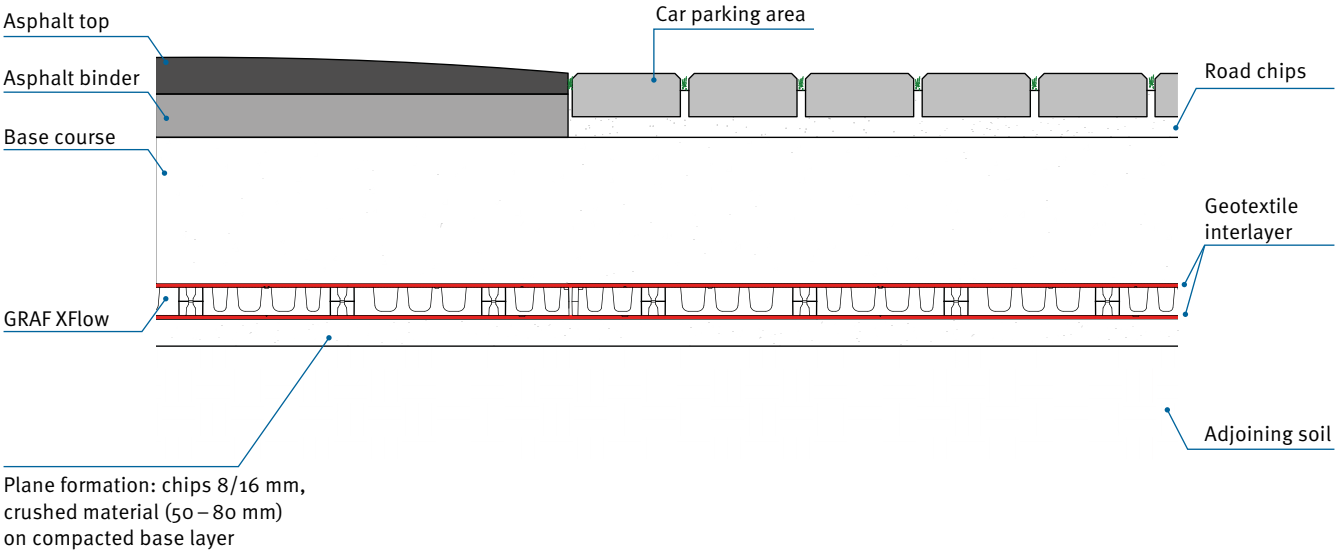
Carparks/traffic areas

Avoid wet shoes

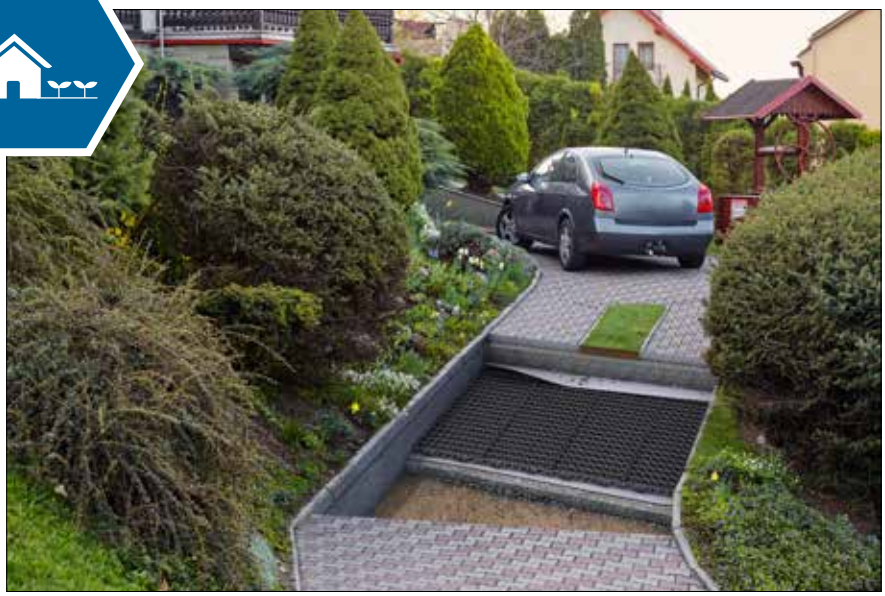
Advantages

- Paved carparks for fewer puddles
- Moving stormwater hydraulics from overground to underground
- Reduction of peak hydraulics for pipe networks

Installations with XFlow drainage cells under carparks reinstate unrestricted use of the areas just a short time after a heavy rain event. Puddling is transported under the top edge of the ground into the drainage cell. Thanks to the generous storage of up to 45 l/m², all of the accumulating water is generally stored directly underground.

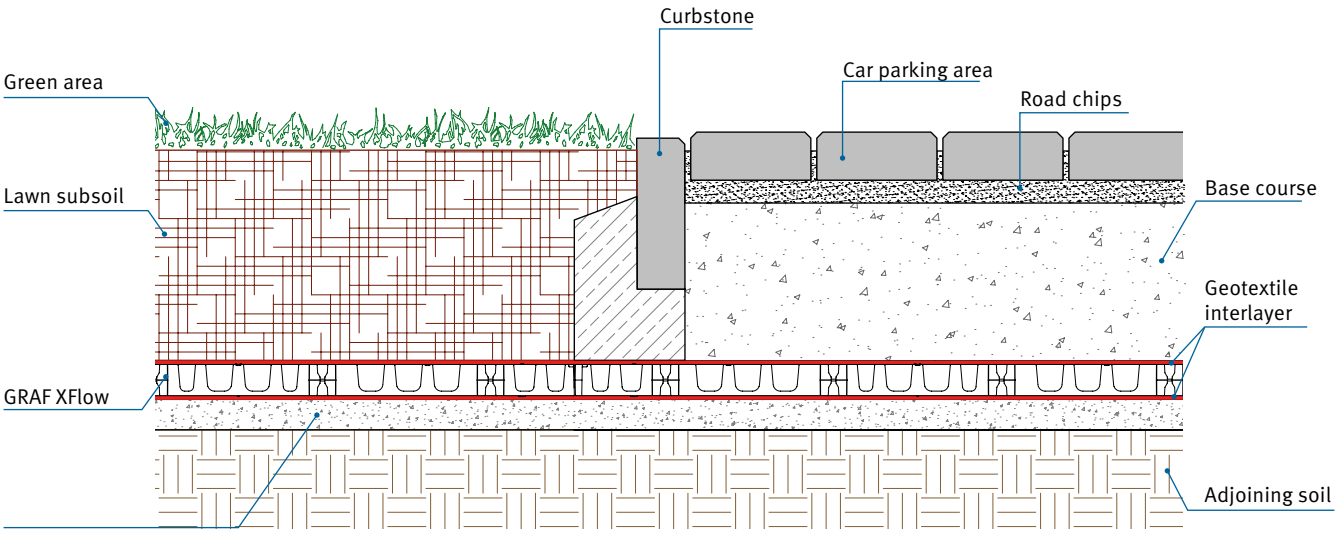


Dry feet for your customers and visitors



Advantages

- Also useful for the drainage of smaller areas
- Ideally for different land forms
- Reduction of the risk of slipping
- Visually appealing surface
- Reduced maintenance effort



Plane formation: chips 8/16 mm, crushed material (50 – 80 mm) on compacted base layer

VISIT OUR WEBSITE TO SEE OUR PERFORMANCE VIDEO
www.graf.info/v220

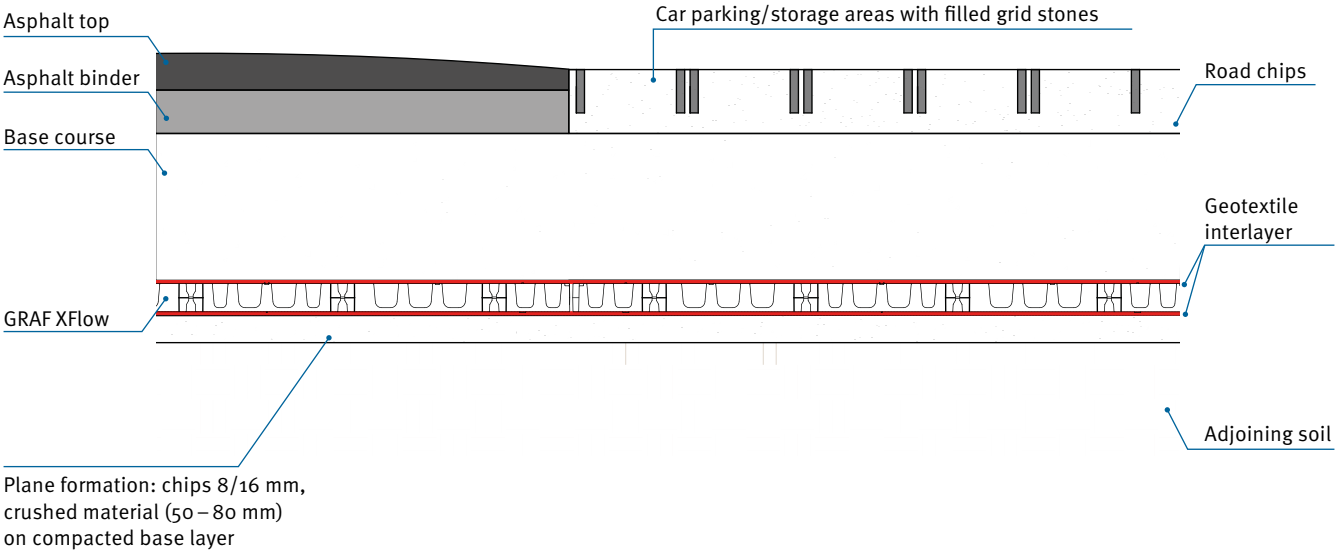
Outdoor storage areas

The best storage areas for your products

Advantages

- Any size of surface installation
- Under surfaced and unsurfaced areas (split, gravel, or other bulk materials)
- Faster availability of storage areas during and after heavy rain
- Less splashing during drives through rain!

Heavily used outdoor and split areas are prone to surface deformation, and water collects quickly in the depressions. Also heavy rainfall, cloudbursts, and similar can promote the formation of standing water on surfaces. Installed XFlow drainage cells reduce or eliminate surface standing water, so the affected areas are available at all times. In addition, the valuable goods in storage and vehicles sustain no damage or soiling from excessive splashing.



Protect your goods

Planted areas / tree tubs

Easy tending of planted islands

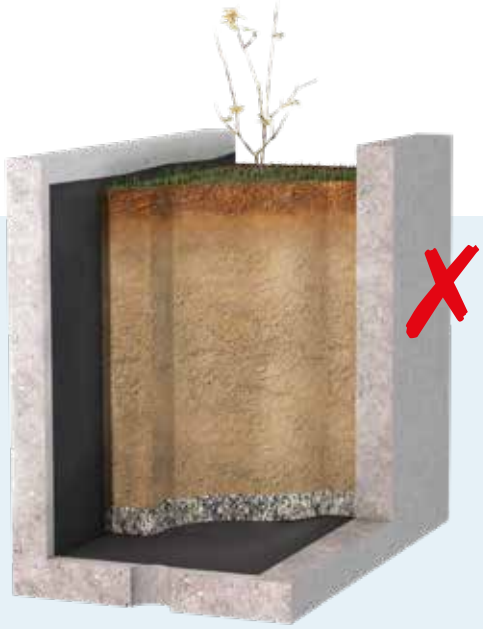
Advantages

- No standing water around sensitive roots
- Indirectly regulated water management
- No anaerobic conditions promoted by rotting in water pockets
- Temporary water storage serves to lengthen watering intervals

XFlow drainage cells are the ideal solution for improving plant and plant tub water management. The drainage cell functions here as a buffer

- After heavy rain or excessive watering, the water first collects in the XFlow drainage cells. This prevents water from collecting in the soil and reduces rotting processes
- If, on the other hand, the soil dries out and there is still water in the XFlow, the water management can regulate itself automatically via capillary forces.

Other installation options can be realised e.g. with geotextiles that permit roots to enter the drainage cells unobstructed.



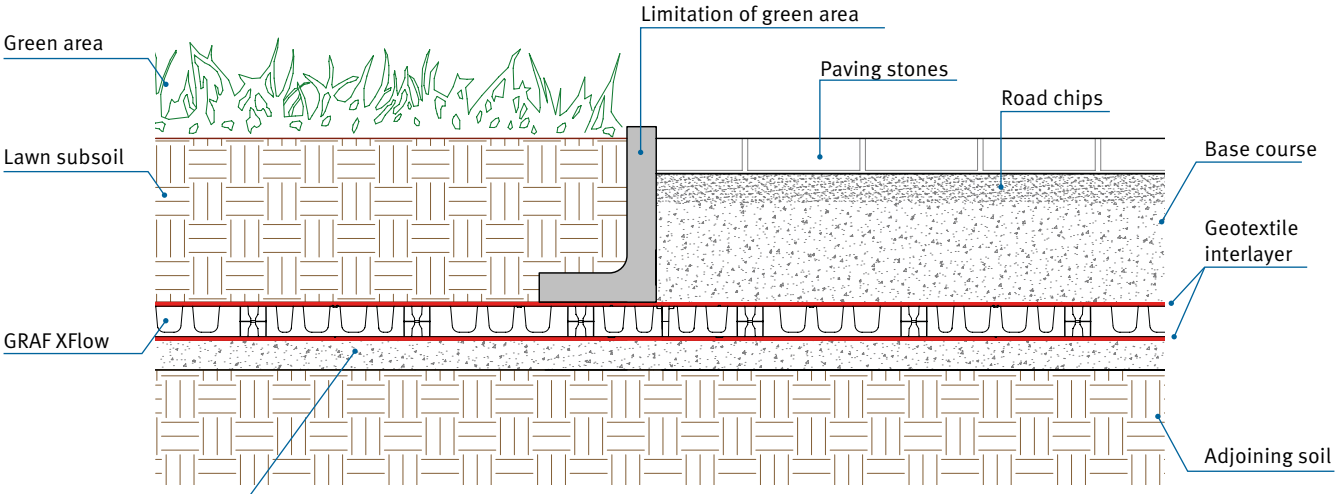
Park/Green areas

Drainage concepts for green spaces and paths

Advantages

- No surface wetness or puddling just a short time after bad weather
- Targeted removal of collecting rainwater without additional maintenance

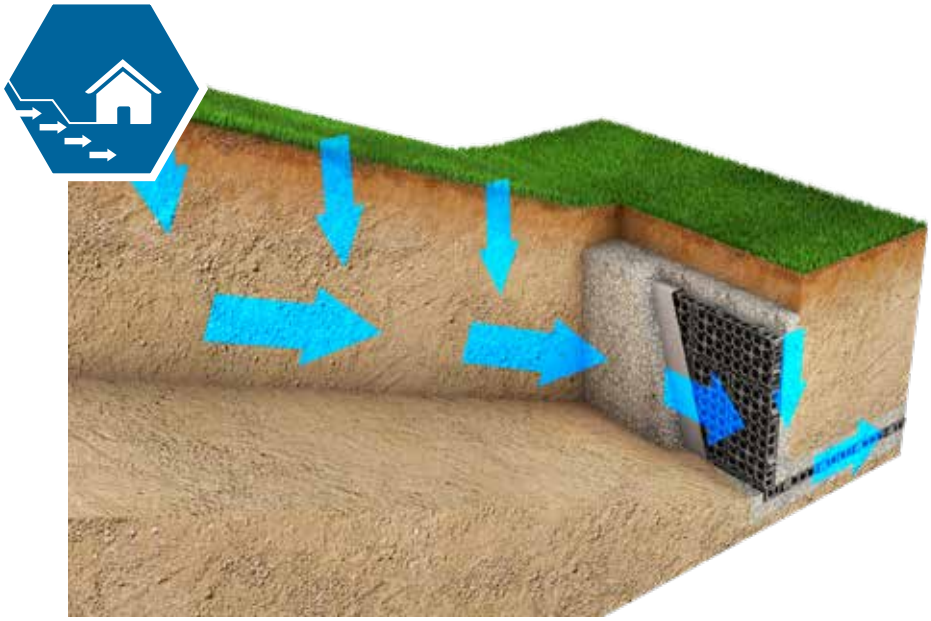
Intelligent drainage with XFlow 50-L and 50-S in green spaces and carparks safeguards the rapid removal of rainwater under heavy rain. The stratum concept behind the drainage cells can be realised under both lawn and paved areas as well as under paths. XFlow can store up to 45 litres of rainwater per square metre. In addition, the drainage cell presents an open structure for direct infiltration or for transport between adjacent cells in the system.



Protect your green area

Retaining walls / Building structure

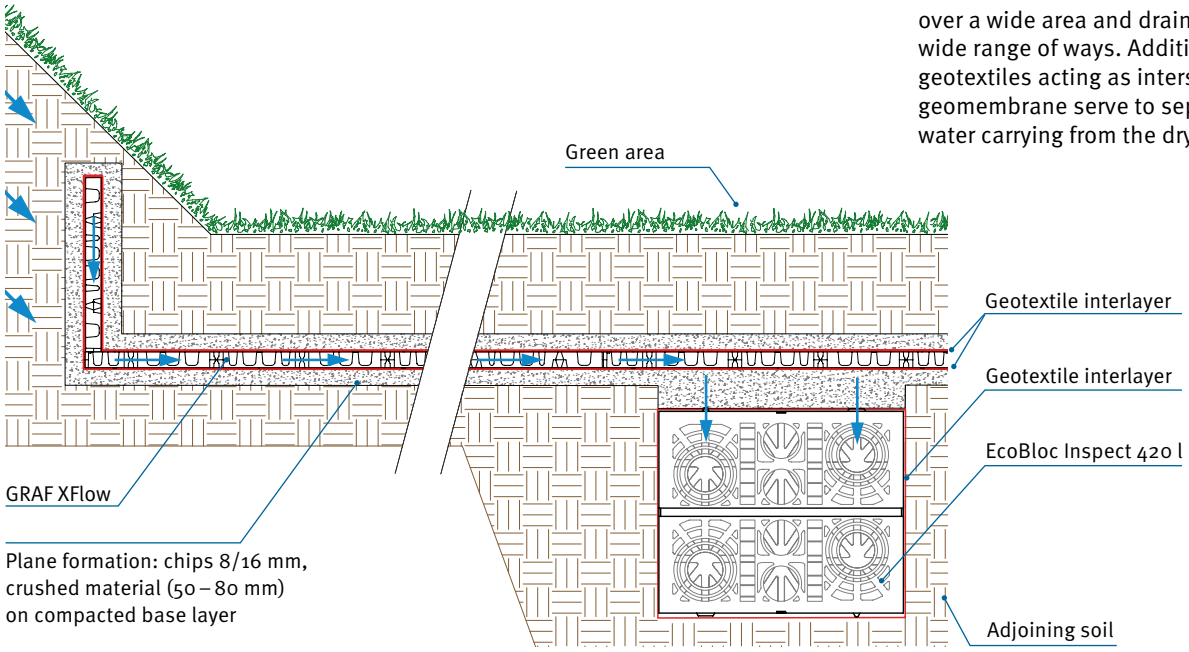
Protect underground infrastructure

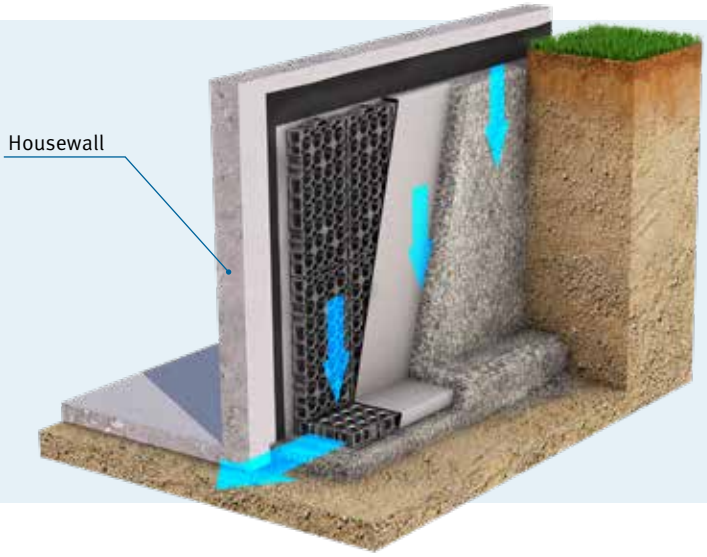


Advantages

- Fast drying of soil around all sizes of underground infrastructure
- No wetting and no additional hydraulic uncertainties in slip joints (inclines, embankments, backfills)
- Removal of slope water in terrace/ platform structures
- High hydraulic percolation performance supports all arrangements and inclinations of water carrying strata
- High stability also ideal for hillsides exposed to shearing horizontal loads

Hillside/stratum water can collect specifically in new buildings on terraces and in recently developed areas on steep hillsides. XFlow is designed for the targeted removal of collecting stratum water. The water is collected over a wide area and drained off in a wide range of ways. Additional geotextiles acting as interstratum geomembrane serve to separate the water carrying from the dry strata.





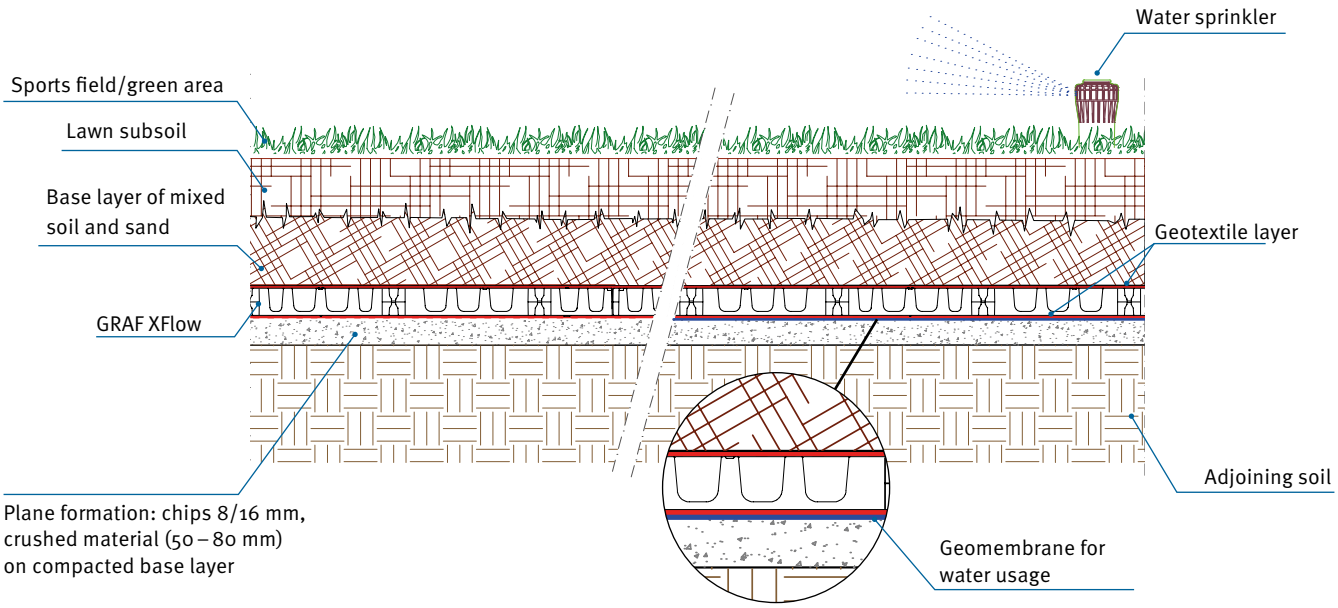
Sports areas

Wide range of potential applications

Advantages

- No surface wetness or puddling just a short time after bad weather
- Quickly playable again
- Reuse of the rainwater for irrigation of the grass field possible

For a great number of sports disciplines, the excellent quality of the lawn is of paramount importance. The availability and playability of lawns may become restricted after heavy rain or under puddling. Swamping (and therefore damage) on the lawn can be prevented when the strata features XFlow for the targeted storage, removal, or recollection of water.



No permanent wetness, specifically on lawns – more robust, and not muddy. Faster replayability!

Further sports areas

Also sports areas featuring synthetic surfaces (track and field, football pitches, etc.), loose materials (beach volleyball fields, outdoor riding facilities, golf bunkers, etc.) benefit from the targeted XFlow storage and removal of excessive rainwater. Specifically the faster availability and better playing conditions enhance the convenience for players.

Enhance surface quality

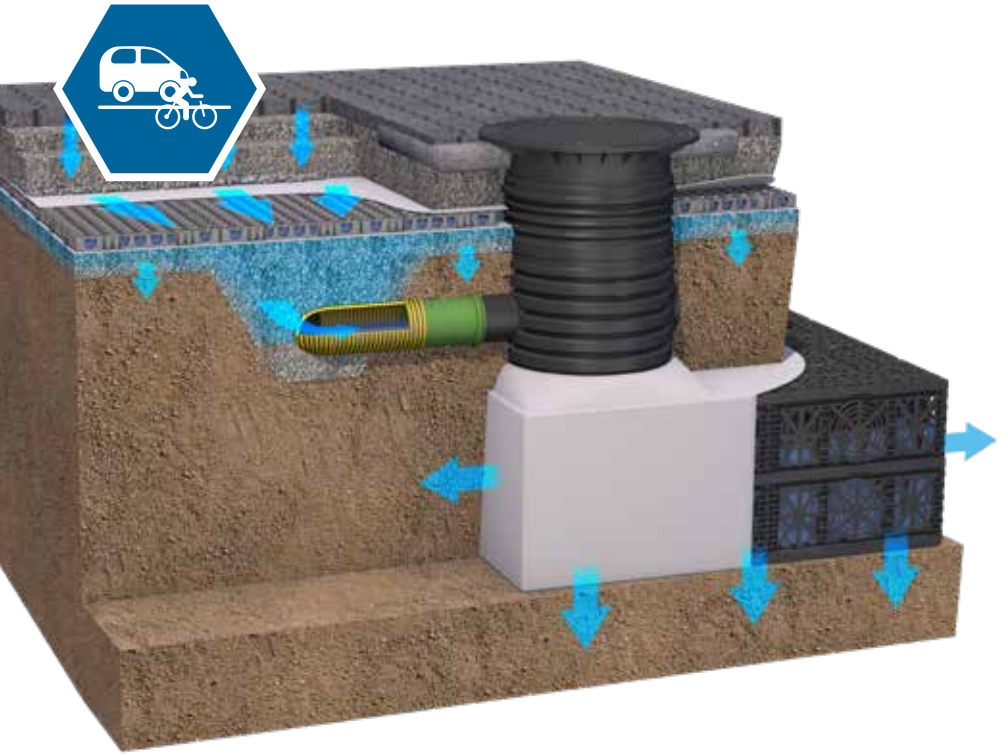
The surfaces benefit from XFlow drainage cells in particular in terms of service life, visual appeal, and availability. It is a well known fact that lawns suffer in particular when played on after the formation of standing water.
This usually and regularly involves labour intensive rework or the replacement of sods. A good drainage concept can help to lengthen considerably the intervals between replacements. Yet also synthetic turf and loose material are seriously compromised in their service life and visual appeal by wetness and standing water.

Suitable for:

- Football lawns or other lawn sports areas (rugby, polo, etc.)
- Base layers in outdoor riding facilities
- The collection and reuse of rainwater when an additional geomembrane is used in the XFlow installation
- Other facilities where XFlow can have positive effects in the strata, e.g. golf, artificial turf, bowls, etc.

Combinations

Sustainable drainage concept



Advantages

- 100 % decentralised system
- Improves groundwater recharge
- Increased protection rate against floods
- All parts heavy load accessable

XFlow drainage cells can also be combined with infiltration crates. The pavement surface is installed with a small incline, so that the rainwater is lead to the drainage pipe, which is installed under the XFlow drainage cells. The infiltration crates offer an additional temporary storage volume, which could be relevant for heavy rain events and/or bad soil conditions.

Stormwater Management
For more information about our stormwater management, ask for our catalogue.

Rainwater harvesting and XFlow

XFlow drainage cells can also be combined with a geomembrane to collect rainwater in the soil and to transport this specifically to an underground collection tank. In this process, the rainwater may already have been filtered during its passage through the various interlayers (e.g. chips, sand, or similar) and can be harvested without further filtration.

Possible applications here are, for example, under paved areas in courtyard access roads, etc., that can reharvest rainwater. Excess rainwater is then either infiltrated or transferred through the emergency overflow to the sewers or other infiltration system.

Talk to us about a potential application in your building project.

Case studies

Case Study – XTop & XFlow
Industrial

Summary

- Neuried (Germany)
- Products: XTop 50-S, XFlow 50-L & XFlow 50-S
- Application: Surface & interlayer drainage
- Specifics:
  - 15.000 m² covered surface
  - Infill XTop: gravel

Due to the high groundwater level the client was searching for a solution which guarantees a reliable drainage of the outdoor areas and the usage of these areas just short after rain occurrence.

The client decided to go for a combination of GRAF XTop and GRAF XFlow. The good permeability of the XTop grass paver ensures a fast water runoff in the layers beneath, especially the XFlow drainage cells. With its flat design, the XFlow is ideally suited for the tight installation window and the good three-dimensional hydraulic guarantees that the incoming rainwater is reliably drained away. The usage of the areas shortly after rain occurrence is therefore possible.

Case Study – XTop
Residential

Summary

- Freiburg (Germany)
- Products: XTop 50-S
- Application: Surface drainage
- Specifics:
  - 105 m² covered surface
  - Infill: grass seed & substrate
  - Loading: vehicle

The client from Freiburg, Germany was searching for a ground reinforcement for the access to his parking space.
On the one hand he wanted a drivable area and on the other hand an area to suit the appearance of the new housing.

The choice fell on the GRAF XTop grass paver. With a mix of substrate and grass seed as infill material, the area is not only drivable but also has a natural look. An additional positive effect of the new ground reinforcement is that by avoiding a complete floor sealing it is possible to save a part of the arising sewage fees.

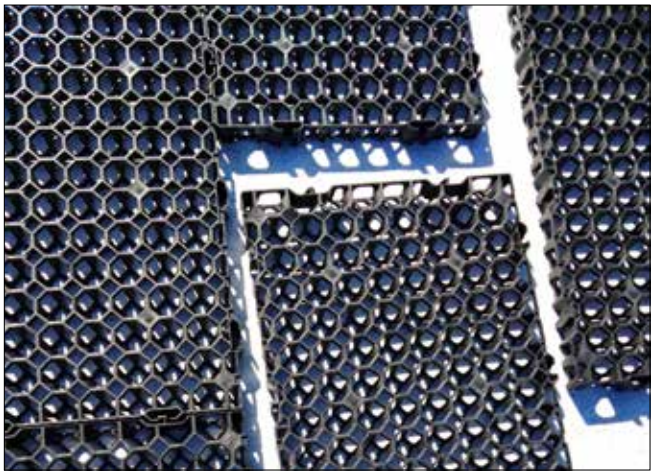
Case Study – XFlow
Commercial

Summary

- Dachstein (France)
- Products: XFlow 50-L & XFlow 50-S
- Application: Interlayer drainage
- Specifics:
  - Installation time with 5 installers:
    XFlow 50-L 2.500 – 2.700 m²/day (26.9 – 29.1 sqft)
    XFlow 50-S 1.500 – 1.700 m²/day (16.1 – 18.3 sqft)
  - 27.090 m² (291.6 sqft) covered surface

The extensive expansion of outdoor storage area in Alsace, France was the goal of this construction. An area of more than three football fields will be used to store goods, pallets and others products. The area shall be usable also in heavy rain conditions and floods/damages must be avoided. So, landowner decided to combine permeable grid on the surface with GRAF XFlow 50-L and 50-S in top layers to prevent flooding and store temporarily stormwater during stormy weather.

The rainwater will infiltrate from GRAF XFlow drainage cells directly into the soil or is lead through the cells to an overground sewer system. GRAF XFlow drainage cells ensure high-volume for stormwater and best hydraulic performance on each squaremeter of installation under permeable pavements, grid areas or similar. The two product dimensions serve fastest installations with GRAF XFlow 50-L and highest flexibility in design and landscape forms with GRAF XFlow 50-S.



for a greener planet

Climate change. Our world is currently facing huge challenges. In these times, we need role models. Inspirers who not only preach sustainability, but also put it into practice. Just as we at GRAF are already making an important contribution. After all, it‘s not just our solutions for rainwater management and other water-related applications that are sustainable through and through. The recycling plastic from which we manufacture our products is also sustainable.

For example, we turn short-lived food packaging into an EcoBloc infiltration module that lasts for generations. This is how we can make our cities a little safer against increasing heavy rainfall events. Or rainwater tanks that allow us to water our gardens with a clear conscience, even during hot spells. Quite incidentally recycling saves us about 100,000 tonnes of CO_2 every year – as much as more than 60,000 cars emit.

By the way: we recycle our products ourselves. Our raw materials competence centre makes us unique. It is our heart, which not only contains all our innovative power, but also our lifeblood. For a better world for all of us – for a greener planet.


GRAF
WINNER
GERMANY
ZIM
Zentrales Innovationsprogramm Mittelstand
1. Platz
Innovationspreis 2013
1. PLATZ
WINNER 2017
pro-K award
GreenTec Awards
TOP 10
2016
Recycling & Resources
Wirtschafts Woche

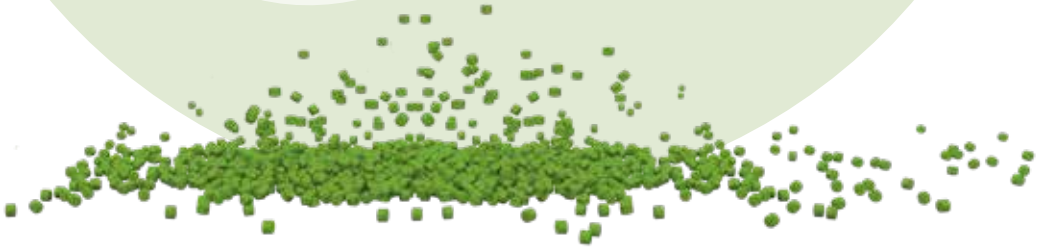
The GRAF recycling cycle

The beginning
Short-lived Packaging
and plastic waste

green planet collection

100 % GRAF
Durable, sustainable
environmental products

Pioneering recycling process
at GRAF raw materials
competence centre



Raw material made by GRAF
Recyclate at quality level
of primary plastic

This is us

The whole world is talking about sustainability. For us, it has long been a natural part of our DNA. We recognized the potential of rainwater early on: „Rainwater is free“ was one of our first campaigns back in the 1970s. Rain barrels were produced in our family business as early as 1974. The first underground tanks for rainwater harvesting followed just four years later. GRAF rain barrels have been made from recycled material since 1980. By the way, rainwater is still free of charge. But in times of climate change, drought and heavy rain, sustainable water management is much more than that: it is a valuable contribution to our future.

For this we stand

70 %
Share of recycling material

Environmental products for
SUSTAINABLE water management

100,000 TONNES CO2 savings every year
as much as more than 60,000 cars emit

LONG SERVICE LIFE
and spare parts supply

Recycling material
FREE FROM POLLUTANTS

80 % share of renewable
energies in production

Products
FULLY RECYCLABLE

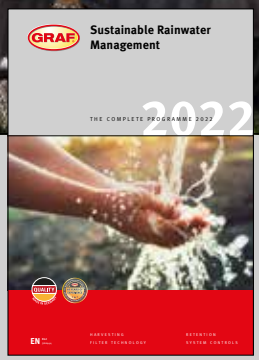
State-of-the-art production facilities
for LOW ENERGY CONSUMPTION

For further information see:
www.graf.info/sustainability

learn more

GRAF

60 YEARS OF QUALITY AND INNOVATION
60 YEARS OF EXPERIENCE



RAINWATER HARVESTING

STORMWATER MANAGEMENT

WASTEWATER TREATMENT SOLUTIONS

SEPARATORS

GARDEN PRODUCTS &
MULTI-PURPOSE CONTAINERS

Rainwater Harvesting Solutions

For more information about our Rainwater Harvesting Solutions, ask for our catalogue.

Please note:
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Pictures and photographs are approximate only.

The applicable technical documentation for the products shall control, which we will be happy to send you on request.

All offers, deliveries and services are subject to our general terms and conditions, which we will also be happy to send you.

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