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Instructions for installing the GRAF Rain Bloc compact 300

GRAF Rain Bloc compact 300
Order no. 360050

The points described in these instructions must be observed in all cases. Failure to do so shall invalidate the warranty. For any additional items purchased through GRAF, you will receive separate installation instructions in the transport packaging.

The components must be checked for any damage before the system is transferred to the trench. Damaged components must not be used.

You can download any missing instructions from www.graf.info or request them from GRAF directly.

Contents

1. General information

1.1 General

Infiltration systems are usually subject to official approval processes. This should be investigated in the planning phase. The statutory specifications and the requirements in the relevant literature, such as German and European standards and work sheets / data sheets of the DWA, always apply.

Only authorised and qualified personnel should install and inspect the infiltration system. The following safety and installation instructions should also be noted.

The infiltration system is usually sized in accordance with work sheet DWA A-138. You can request free sizing on request. In particular the permeability of the surrounding soil is of great significance to the function of the system. Misjudgements may result in problems with and damage to the infiltration ditches.

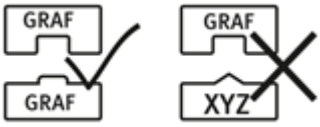
1.2 Safety

All work should be undertaken in compliance with the relevant accident prevention regulations according to BGV C22.

Furthermore, relevant specifications and standards, such as DIN 18300 “Earthworks” and DIN 4124 “Excavation pits and trenches”, must be observed during installation, assembly and repairs.

The entire system must always be switched off and secured against unauthorised restarting during any work on the system or system components.

There is an increased risk of slipping on the system in frosty and wet conditions.



GRAF provides an extensive range of accessories, which are all coordinated and can be combined to form complete systems. Using accessory parts not approved by GRAF will render the warranty/guarantee null and void.

1.3 Transport and storage

GRAF infiltration ditch elements Rain Bloc compact 300 are stored and transported in packaging units of 12 modules or 14 modules. The basic dimensions of the packaging units are always 1.2 m x 0.6 m.

They can be transported to the installation location with a fork lift truck or similar equipment. At the installation location, the infiltration ditch elements can be moved manually or with light-duty equipment.

A suitable surface (level and solid) should be used for intermediate storage. Please ensure correct storage. This means away from negative influences such as fuel, lubricants, chemicals and acids. Storage outdoors should not be for any longer than one year. What is more, the impact sensitivity of the elements increases as the temperature falls. Especially in the event of frost, impact may therefore cause damage to the elements.

Before installation, the infiltration ditch elements should be checked for damage. Damaged or defective parts must not be installed. If in any doubt, contact GRAF.

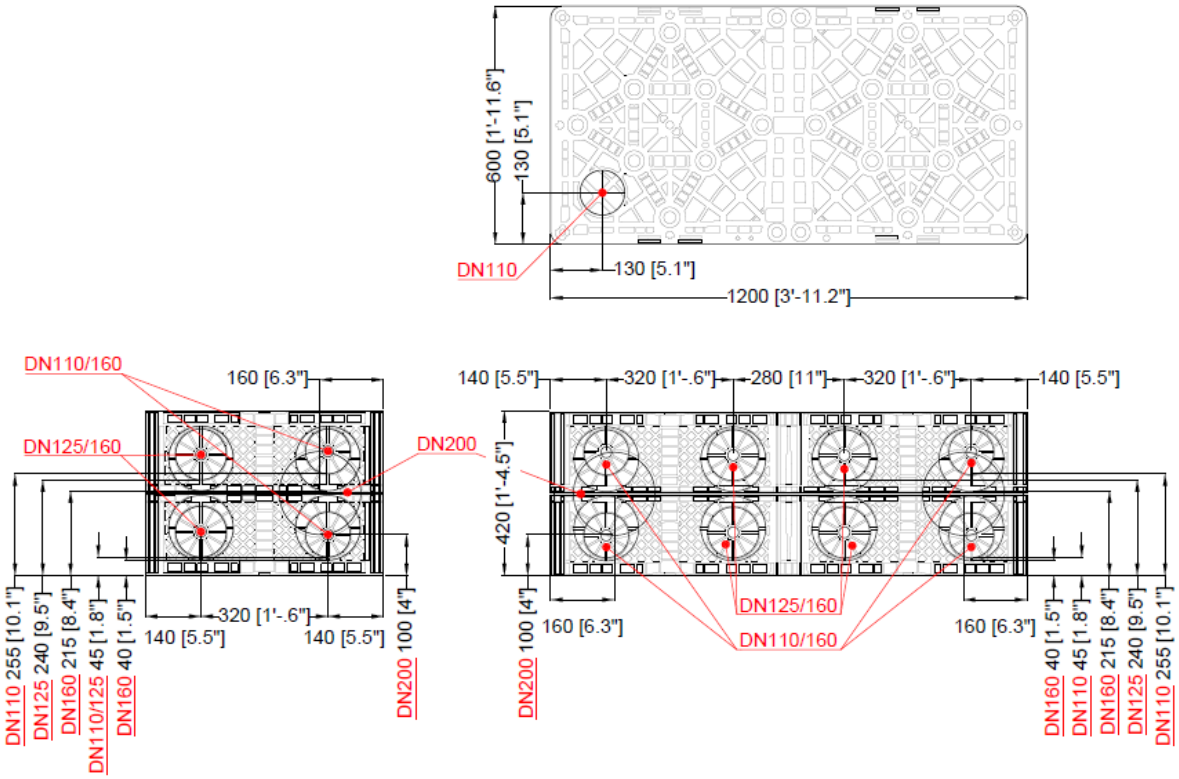
2. Technical data

2.1 Technical data to Rain Bloc compact 300

	Rain Bloc compact 300
Volume (gross/net)	300 litres /285 litres
Dimensions (LxWxH)	1200 x 600 x 420 mm
Connections	13 x DN 100, 12 x DN 120, 24 x DN150, 6 x DN 200
Weight	17 kg
Material	100 % polypropylene (PP), recycled material
Loading capacity Short term Long term	 130 kN/m² 65 kN/m²
Max. / min. earth covering	see Table 3

Table1 - Technical data Rain Bloc compact 300

2.2 Dimensional drawing Rain Bloc compact 300



3. Selecting the location

3.1 Location

3.1.1 Distance to buildings

A total of four different scenarios can be distinguished with regard to the distance to buildings and fixed installations.
Firstly, it is necessary to check whether the system is for infiltration or retention. Whilst possible damage caused by escaping water must be taken into account for an infiltration system, this can be ignored for a retention system.
Secondly, the installation situation must be checked. If the infiltration or retention system or even the upstream filter is deeper than the foundations of neighbouring buildings, the load transfer from surrounding buildings or foundations or public roads must also be considered. **Under no circumstances should the infiltration ditch modules and external filters be within the load transfer range. This also applies to any upstream filters.**

	Infiltration	**Retention**
Foundation deeper than infiltration ditch module	*Description:* Avoidance of damage caused by escaping water *Figure:* Figure 1 *Minimum distance:* 1.5 x FT	-
Infiltration ditch module deeper than foundation	*Description:* Taking account of the load transfer range + Avoidance of damage or undercutting by escaping water *Figure:* Figure 2 *Minimum distance:* Maximum value of 1.5 x diff. or 1.5 x FT; but at least 3 m	*Description:* Taking account of the load transfer range *Figure:* Figure 2 *Minimum distance:* 1.5 x diff.

Table 2 - Distance to buildings

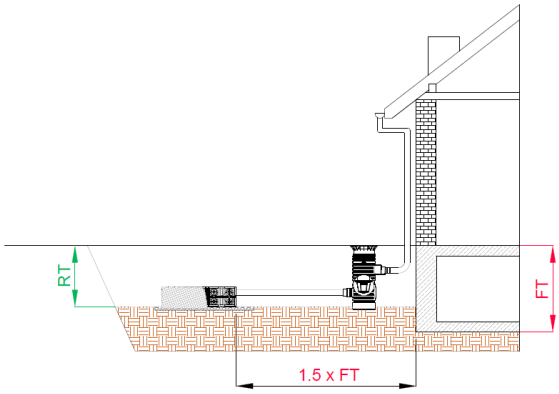


Figure 1: Installation situation: Foundation deeper than infiltration ditch module

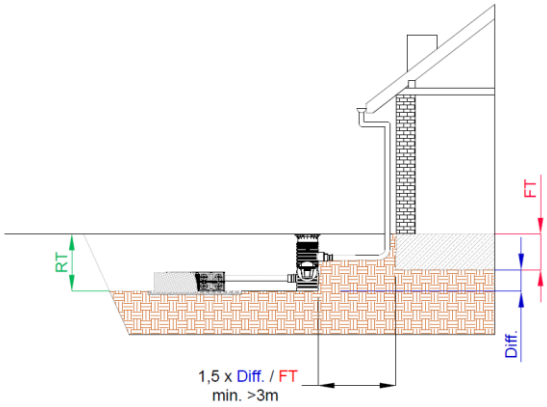


Figure 2: Installation situation: Infiltration ditch module deeper than the foundation

Note: If no external filter is planned, the distance between foundation and infiltration ditch applies.

3.1.2 Distance to groundwater/stratum water

The thickness of the ground between the trench bed of the infiltration system and the average highest groundwater level expected must not fall below 1 m according to work sheet DWA A-138. If this distance does fall below one metre, it must be agreed with the relevant authorities.

3.1.3 Distance to trees

The location of the infiltration system must also take into consideration any existing and planned trees. To avoid damage by the root system, the distance (A') between the infiltration ditch modules and trees should correspond to the expected maximum crown diameter (A). If this is not possible, a root protection film should be fitted to protect the system from root penetration.

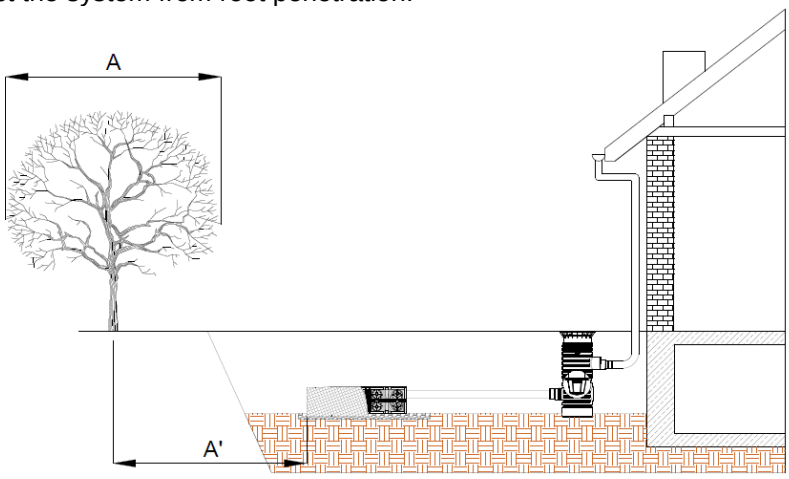


Figure 3: Installation situation: Distance to trees

3.1.4 Distance to neighbouring property

A sufficient distance should be maintained from plot boundaries to avoid damage or interference to neighbouring properties.

3.1.5 Installation under traffic areas and distance to public traffic areas

GRAF infiltration ditch modules are approved for installation under parking areas and private roads. However, separate conditions apply here.
The various load categories and the associated minimum earth coverages according to section 4 must be observed!

Examples of suitable traffic areas are:

- Car parking spaces
- Accesses for parking areas
- Private roads
- Access routes

According to RStO12 these areas belong to load category Bk0.3. This means a number of 300,000 equivalent 10-tonne axle crossings, spread over a lifetime of 50 years.

Installation in the vicinity of the following traffic areas is not permitted:

- Public roads or traffic areas
- Traffic areas with speeds >30 km/h
- Traffic areas without load limits regulated by marking
- Traffic areas without constructional restrictions
- Areas with a regular volume of ≥8 trucks (with a total weight of ≥30 tonnes) per day
- Traffic areas in the vicinity of air, rail, port operations or other land use of special vehicles

GRAF can be contacted in the event of a different installation situation or ambiguous traffic areas, such as a crossing or installing a heavy-duty crane.

Public roads are subject to substantially greater static loads so a sufficient distance must be maintained from them. The distance (A) should be selected such that the forces arising (static and dynamic) from the public roads do not impact on the system.

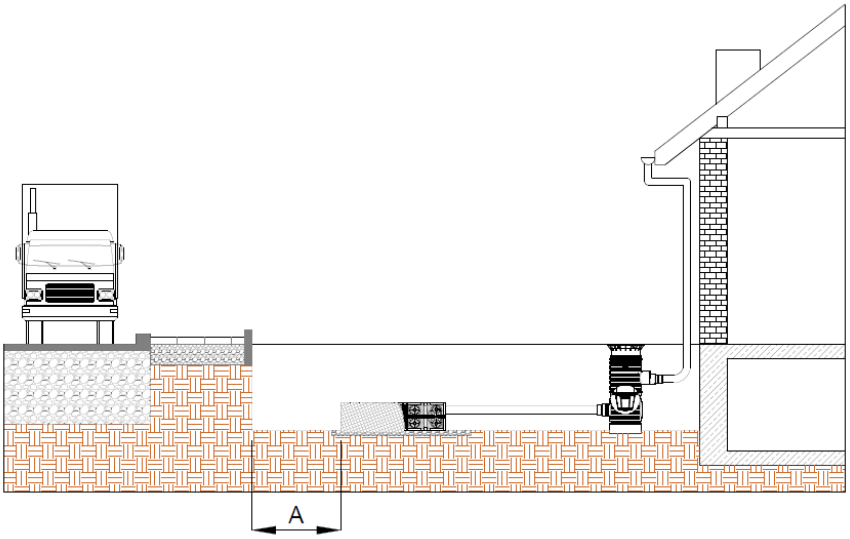


Figure 4: Installation situation: Distance to public traffic areas

3.1.6 Distance to an upstream underground tank

If the infiltration elements are installed behind a rainwater harvesting system, a sedimentation tank or a small wastewater treatment system, it must be ensured that no seepage water enters the excavation pit of the underground tank. The distance A to be maintained is the difference between the installation depth of the underground tank and the infiltration system, multiplied by 1.5. However, the minimum distance between the underground tank and infiltration system must not be less than 2 m.

$$A = 1.5 \times (T_{\text{Underground tank}} - T_{\text{Infiltration}}) \geq 2 \text{ m}$$

With:

A	Distance between infiltration system and underground tank
$T_{\text{Underground tank}}$:	Installation depth of the underground tank
$T_{\text{Infiltration}}$:	Installation depth of the infiltration system

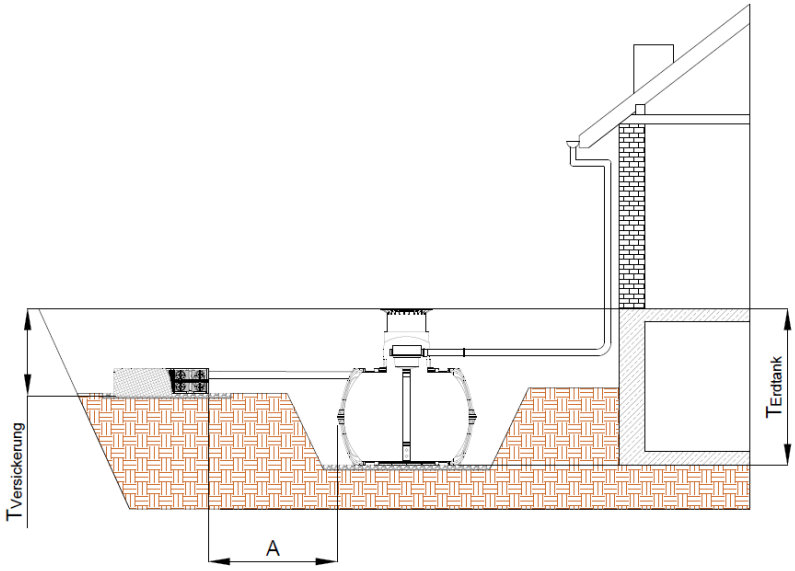


Figure 5: Installation situation: Distance to an upstream underground tank

3.1.7 Slope

If a system is installed at a distance of less than 5 m to a slope, mound or embankment with an incline of more than 5°, a statically calculated supporting wall must be constructed to bear the pressure of the soil. The wall must extend beyond the system by at least 0.5 m in all directions and must be at least 1 m away from the system.

3.1.8 Frost-proof limit

In accordance with DIN 1986-100, the drainage pipes, which also includes pipes from connecting surfaces such as yards and roof areas, should usually be installed in an area free of frost. However, due to minimum distances from groundwater/stratum water, there may be limited installation options. Checks should be undertaken on a case-by-case basis to establish whether a flatter installation would be sensible or, in the case of a swale infiltration ditch, is indispensable.

3.2 Pre-treatment

The rainwater which is supplied to the infiltration system always requires a treatment stage. This may be settling basins, filter shafts or simple filters that clean the incoming water of dirt particles. The ingress of dirt should be avoided because the infiltration performance decreases if the system is clogged with fine particles and, in extreme cases, results in a blockage.

In special cases, multi-stage filter systems with coarse and fine filters are used to purify the rainwater accordingly. The exposure and size of the collection surface can be used to determine whether a multi-stage system is necessary and which dimensions a corresponding filter should have. We would be pleased to assist you with the selection of a suitable filter/filter shaft. GRAF offers an extensive product range for this purpose.

GRAF Rain Bloc compact 300 modules are not suitable for inspection and / or cleaning. The selection of a suitable external pre-filter therefore greatly influences the long-term infiltration performance of the whole system.

3.3 Trench dimensions

The infiltration ditch is sized according to work sheet DWA A-138. Please contact us for free sizing.

The company GRAF recommends a circumferential working space of 1 m in order to carry out tasks like:

- connecting pipes and vent lines (see section 5.4)
- wrapping in geotextile (see section 5.3)
- wrapping in plastic liner (see section 6)

without any problems.

The trench height depends on the product selection, traffic loading and planned connection heights / shafts.

The trench must also be designed in accordance with DIN 4124 "Excavation pits and trenches". In particular, this includes the slope angle. With installation depths ≥ 1.25 m, this must be selected according to the type of soil.

4. Load categories

4.1 Installation under surfaces suitable for pedestrian loading

When installing under surfaces suitable for pedestrian loading, vehicles of any kind must be prevented from driving over the surface through structural measures or cordoning off. The structure of layers in green spaces above the infiltration system is different from surfaces with traffic loading, see section 4.2. The possible installation depths and max. earth coverings are stated in Table 3 and Table 4.

4.2 Green spaces above the infiltration system

If a lawn is planted above the infiltration elements, the system should be covered with a water-impermeable film or a layer of clay roughly 100 mm thick because otherwise this lawn area may dry out more quickly than the rest of the lawn.

4.3 Installation under surfaces suitable for vehicle loading

The minimum and maximum earth coverings differ depending on the various load categories: car, truck 12, HGV 30, HGV 40 and HGV 60. Table 3 shows the min. and max. earth coverings for the various load categories. Deviating installation situations should always be discussed with Otto GRAF GmbH.

Fillers (reused excavated material and/or gravel) with a maximum density of 20 kN/m³ are needed.

Note:
During and after installation, ensure that only load categories approved for the construction project drive over or park on the infiltration ditch modules. Fences, barrier tape or warning signs can prevent unapproved vehicles from accessing sensitive areas.

The following table shows the minimum and maximum earth coverage.

Category	Suitable for pedestrian loading	Car	Truck 12	HGV30	HGV40	HGV60
Earth covering (min.) [m]	0.25*	0.25*	0.50*	0.50*	0.50**	0.50**
Earth covering (max.) [m]	3.00	3.00	3.00	2.75	2.5	2.25

Table 3 - min. and max. earth coverings depending on the load and friction angle

* Friction angle φ ≥ 35° and backfill with a specific weight ≤ 20 kN/m³
** Friction angle φ ≥ 40° and backfill with a specific weight ≤ 18 kN/m³ If a road construction according to RStO 12 is required, the minimum earth covering may increase.

4. Load categories

The installation depth also depends on the load categories and the friction angle of the backfill used.

Category	Suitable for pedestrian loading	Car	Truck 12	HGV30	HGV40	HGV60
Installation depth (max.) [m], φ = 25°	5.50	5.50	5.25	5.00	5.00	4.50
Installation depth (max.) [m], φ = 30°	6.75	6.75	6.50	6.25	6.00	5.75
Installation depth (max.) [m], φ = 35°	7.50	7.50	7.50	7.50	7.50	7.50

Table 4 - min. and max. installation depths depending on the load and friction angle

For an installation with ≥ 8 layers we recommend an additional check of the max. acceptable deformation.

For additional information on the installation of infiltration ditch elements under traffic areas up to HGV60, please refer to the sections 7 and 8.

5. Installation

5.1 Preparing the trench

The sizes of the trench depend on the dimensions of the infiltration ditch, leaving a working space all the way round (see section 3.3).

Figure 6: Digging the trench

The trench bed must always be prepared as a level, flat pit with load-bearing capacity. Sharp objects, larger stones or similar foreign objects should be removed.
A blinding layer, with a thickness of approx. 80 mm, made from gravel (grain of 8/16 mm) is then placed on top of the bed. This is then drawn out flat and serves as a base for the next stages.

Figure 7: Preparation of the levelled ground

5.2 Covering with geotextile

Geotextile forms the protective layer for the infiltration ditch elements and prevents dirt from entering the ditch. Damage to the geotextile should be avoided.

The geotextile is placed lengthwise on the blinding layer. Ensure sufficient overlap (300 mm) at the joints.

Since the entire infiltration system will be wrapped with the geotextile later on, sufficient coverage should be ensured at this stage.

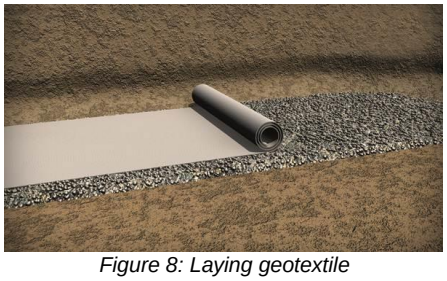


Figure 8: Laying geotextile

5.3 Positioning the infiltration ditch elements

The infiltration ditch elements are placed on the geotextile sheets (lying, never upright) and connected to each other with EcoBloc connectors (shown in yellow in Figure 11). Two EcoBloc connectors (shown in yellow in Figure 11) are required for the transverse and longitudinal connection.

Figure 9: Positioning the infiltration ditch elements

5. Installation

In a system consisting of several layers, the individual layers can be placed lengthwise and crosswise to each other to achieve a connection.

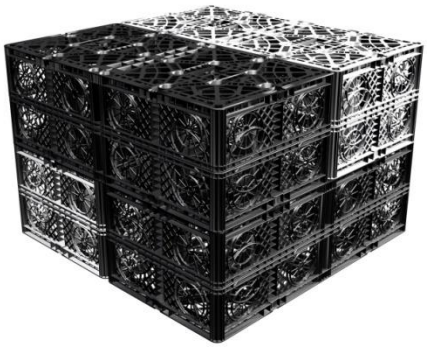


Figure 10: Multi-layer construction

The individual layers are connected in vertical direction by the centring pins (shown in green in Figure 11), which are already inserted in the individual packing units of the blocks. The horizontal connection is achieved using EcoBloc connectors.

Figure 11: Vertical connection - centring pins & horizontal connection - EcoBloc connectors

Alternatively, the individual layers can also be connected vertically using the EcoBloc connectors (shown in yellow in Figure 12). These protrude slightly for this purpose and thus enable centring.

Figure 12: Vertical connection - EcoBloc connectors

Once all the blocks are positioned, the system is fully wrapped in geotextile. This prevents the ingress of dirt particles into the infiltration system through the backfill.

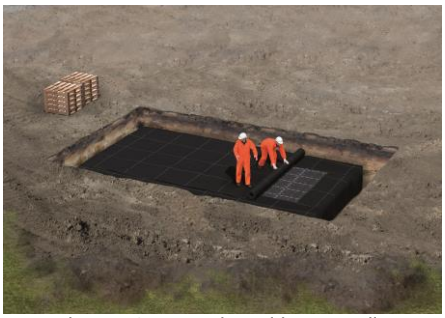


Figure 13: Wrapping with geotextile

Please note:
There is an increased risk of slipping on the system in frosty and wet conditions.

5.4 Fitting the inlet and vent

Inlets can be installed at the front or side of the block in DN 110, DN 125, DN 160 or DN 200. A rotary cutter, keyhole saw or similar tools are suitable for cutting out the connections.

On the inlet surface, an X is cut into the geotextile. The inlet pipe is slid in around 150 mm and the rest of the X cut glued or welded to the pipe.

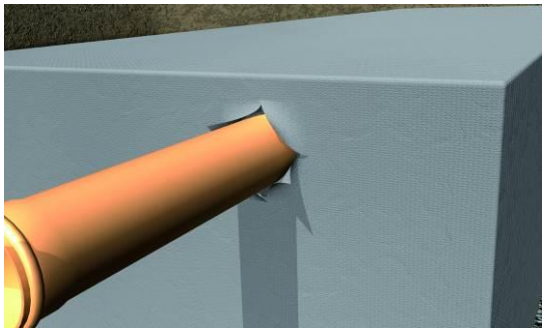


Figure 14: Fitting the inlet

The vents needed are produced in the same way. The vertically aligned vents can be produced on the horizontal drill surface using a 90° KG bend.
The Rain Bloc compact 300 also has a DN 110 connection on the upper side of the block.

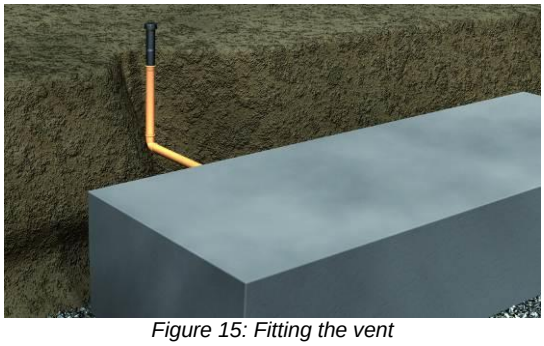


Figure 15: Fitting the vent

The required number as well as the size of the vents depend on the diameter of the inlet pipe and the number of inlets.

	Number of vents		
Inlet pipe*	DN 110	DN 160	DN 200
DN 110	1		
DN 160	1		
DN 200	2		
DN 315	3	2	1

* If more than one inlet pipe is used, the number of vents increases correspondingly**.**

Table 5 - Number and size of vents depending on the inlet pipe

5.5 Inspection

The Rain Bloc compact 300 modules themselves cannot be inspected. In order to enable an inspection nevertheless, what are known as partial drainage pipes can be used. These are laid around the perimeter of the infiltration ditch and connected to the ditch via shafts (see Figure 16). Alternatively, the infiltration layer can be subdivided and the partial drainage pipes can be integrated centrally (see Figure *17*)

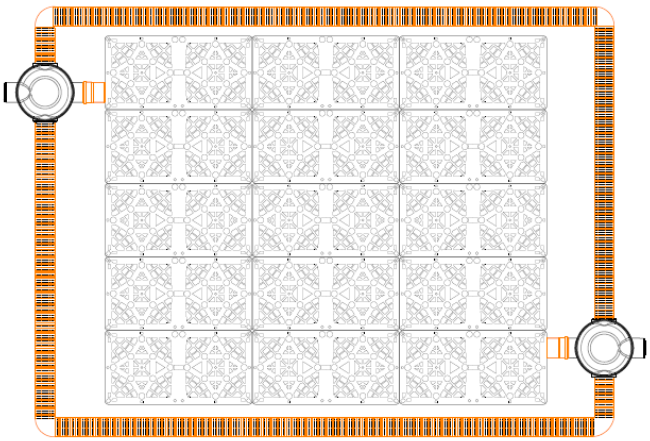


Figure 16: Partial drainage pipes circumferential

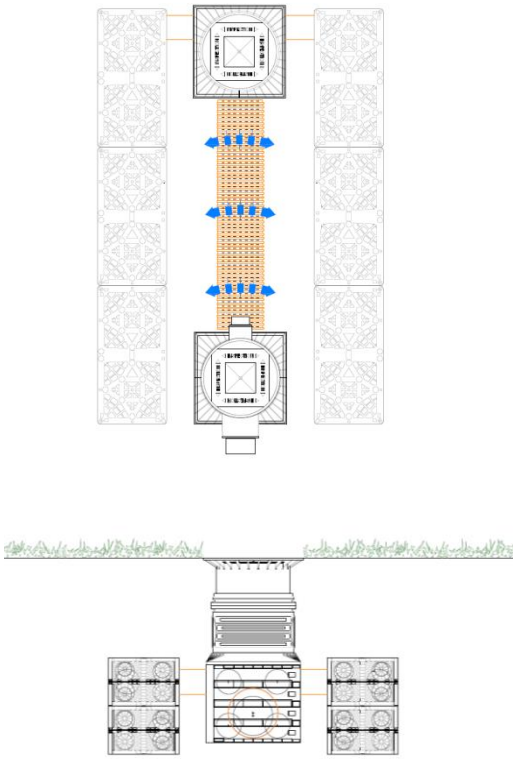


Figure 17: Partial drainage pipes central

5.6 Backfilling the infiltration system

Before backfilling the trench, all inlets, vents and shafts must be connected. Ensure that the geotextile is not pulled apart. Overlaps must remain in place when backfilling.

When the trench is being backfilled, the installation conditions described in section 4.3 must be observed and adhered to. Provided that the installation situation does not require special backfilling materials, the packed drainage system is backfilled with coarse-grained, compactible loose ground (gravel, crushed stone, sand etc.) at least up to the top edge of the drainage system. Above the top edge of the drainage system, any excavated earth or similar can then be used for backfilling the trench if necessary. Sharp objects, larger stones or similar foreign objects should be removed.

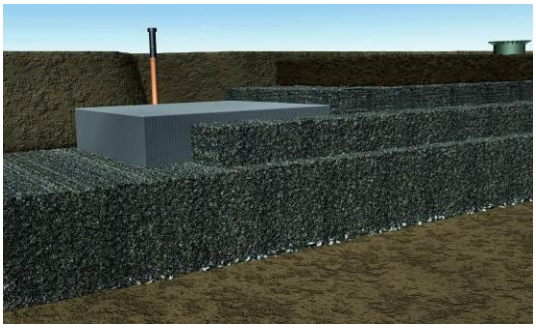


Figure 18: Backfilling the infiltration system

Please note:
The blocks must not be driven over directly with construction machinery.

6. Structure as retention volume / retention tank

6.1 Structure of retention volume

The preparation of the trench and the laying of the first geotextile layer is described in sections 5.1 and 5.2.

6.2 Laying geotextile, film and geotextile

Further steps follow laying the first layer of geotextile.

The water-impermeable film is placed on the first layer of geotextile, followed by another layer of geotextile. This three-layered surround provides protection and a water-tight shell.

GRAF and your local trading partner remain at your service for any further information or advice concerning waterproof film.

Figure 19: 3-ply layer structure

6.3 Structure as retention volume / retention tank

For use as a retention tank, a flow controller or a drainage throttle should be installed in a separate shaft.

GRAF and your local trading partner remain at your service for any further information or advice.

<u>Please note:</u>

When setting up a retention tank, it is essential to consider the groundwater level. An accumulation of groundwater may cause uplift, resulting in damage to the system and its surroundings.
If you intend to install the system in groundwater, please consult with GRAF beforehand. Please provide GRAF with the necessary information about the construction project (soil cover, groundwater level, loading etc.) and consult on this.

Depending on the soil type, heavy rainfall may cause local rises in stratum water, particularly in the material used to backfill the trench. When installing the retention system, check again that no compaction of the subsoil or silting-up has taken place during the construction phase.
It may be necessary to install extra drainage. GRAF will be happy to provide advice on this.

7. Installation under traffic areas up to HGV60

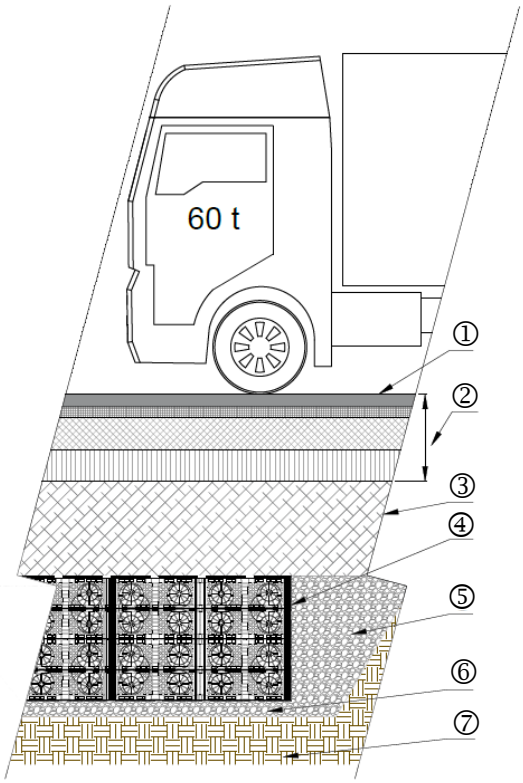


Figure 20: Installation under traffic areas up to HGV60

Please note:

- The infiltration ditch modules are installed and connected in accordance with section 5. Ventilation heads should be installed in green spaces.
- The backfill materials of the different soil layers may have a maximum specific weight of 20 kN/m³ [124.86 lbs/ft³].
- The soil layers must be evenly distributed all round and compacted in layers of max. 300 mm using light or medium compaction equipment. A degree of compaction Dpr of ≥ 97% should be achieved.
- The use of compaction equipment with vibration switched on is not permitted.
- Sudden backfilling with large earth masses is not permitted.

	Description	Height	Properties
1	Traffic area	———	
2	Pavement according to valid guidelines e.g. RStO 12	According to valid guidelines	• Observe local conditions with regard to frost-free installation depth
3	Top levelling course	Min. 400 mm	• Macadam road base • Free from foreign objects • E_{V2} ≥ 45 MN/m²
2+3		Min. 800 mm Max. 2250 mm	
4	Geotextile/plastic geomembrane	———	• Infiltration application: completely wrapped in geotextile to prevent dirt ingress from the surrounding soil • Retention application: 3-ply layer structure (geotextile-sealing sheet-geotextile) to protect the sealing sheet and make the tank watertight
5	Side backfilling	To top edge Blocks	• Gravel 8/16 mm [0.31/0.63"] • free from foreign objects (e.g. roots, shatter, waste or organic material) • The permeability of the side backfill should at least correspond to that of the existing soil.
6	Blinding layer	800 – 100 mm	• Gravel 8/16 mm [0.31/0.63"] • Level layer, without sharp objects, large stones or similar foreign bodies • E_{V2} ≥ 45 MN/m²
7	Trench bed	———	• Level, flat and load-bearing base consisting of subsoil that allows infiltration

8. Use of construction machinery in the installation phase

Various construction devices may be used to fill the trenches. Given the additional dynamic loads they cause, compaction equipment must not be driven directly over the infiltration ditch elements and compaction equipment with activated vibration motors must not be taken over the area.

By way of example, Table 6 shows the earth covering needed for various compaction equipment when using a split with a **friction angle of φ ≥ 35°**.

Earth covering in [m]	Properties	Max. approvals
min. 0.1	*Lightweight walk-behind roller*	
	Total weight:	approx. 700 kg
	Distributed:	evenly, over 2 rollers
	Dimension:	0.9 x 0.7 m
min. 0.2	*Lightweight earthwork roller*	
	Total weight:	approx. 2.5 t
	Distributed:	evenly, over 2 rollers
	Dimension:	1.2 x 3.2 m
min. 0.5	*Roller compact, excavator*	
	Total weight:	approx. 12 t
	Distributed:	evenly, over 2 rollers
	Dimension:	5.9 x 2.3 m

Table 6 – Accessibility of construction machinery Rain Bloc compact 300

Please contact GRAF in the event of deviation from the materials and equipment stated here.

9. Other applications

This documentation relates solely to the use of the GRAF Rain Bloc compact 300 infiltration ditch modules for retaining, storing or infiltrating rainwater. Any other use of the infiltration ditch modules must be agreed with Otto GRAF GmbH with regard to technical, material and/or static considerations.

Should special requirements apply, we would also recommend contacting architects or planners with knowledge of hydrology and geology.