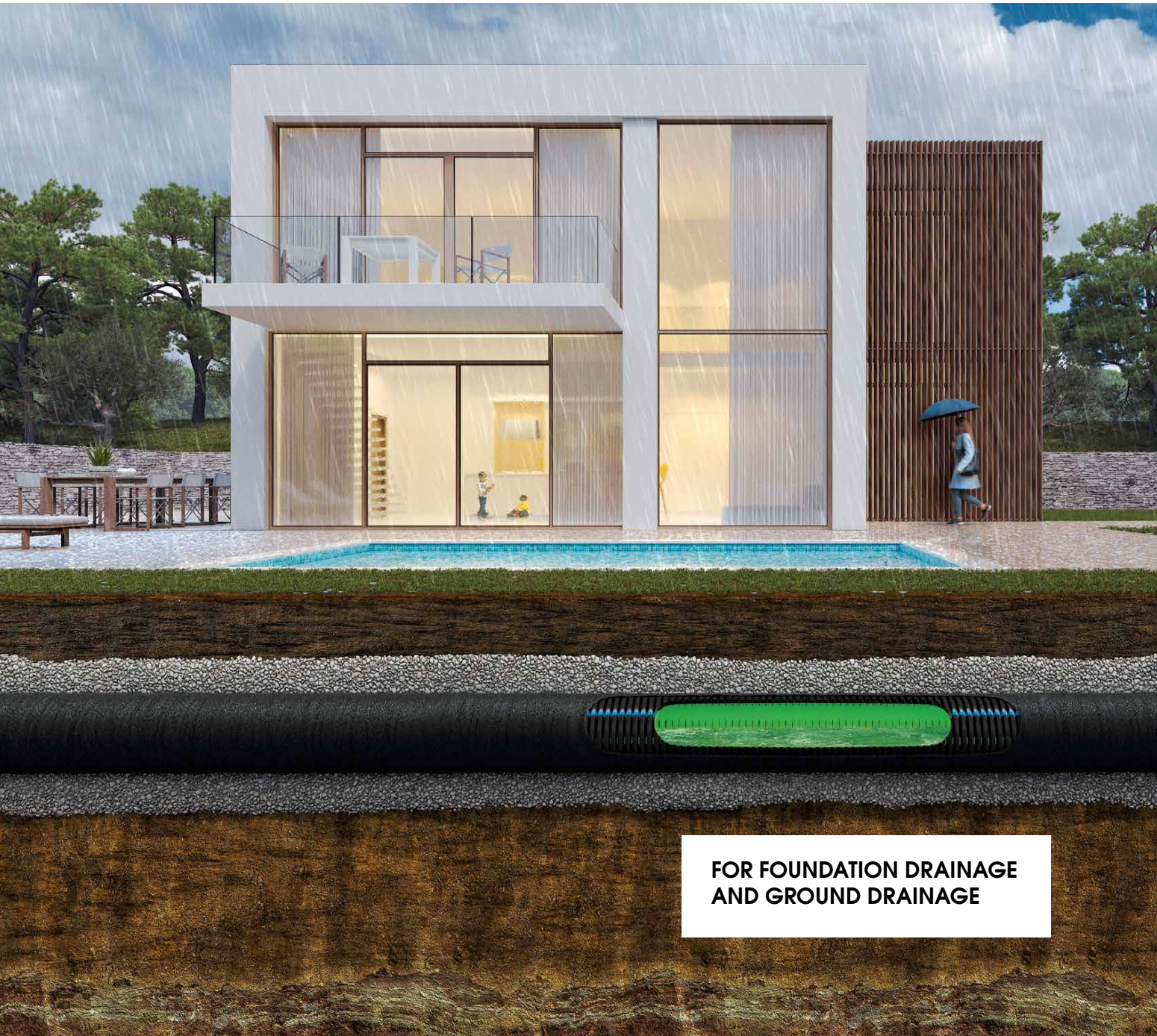
KOUVIDIS®
forever safe

GEODRAIN® PLUS

4-layer perforated double-structured wall conduits
with built-in geotextile

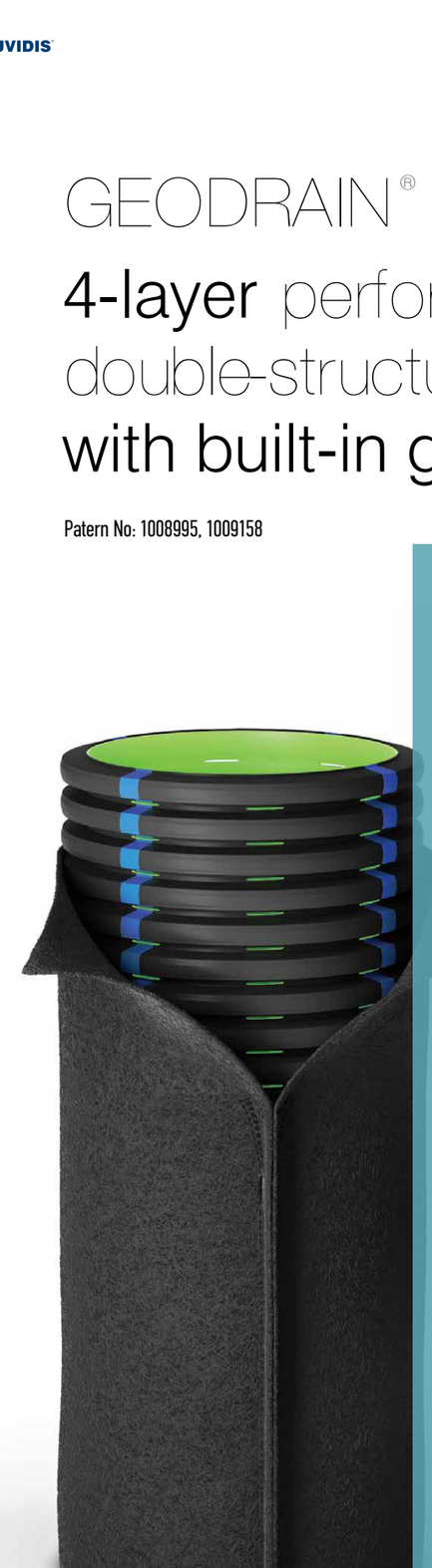


FOR FOUNDATION DRAINAGE AND GROUND DRAINAGE

GEODRAIN® PLUS

4-layer perforated double-structured wall conduit with built-in geotextile

Patern No: 1008995, 1009158

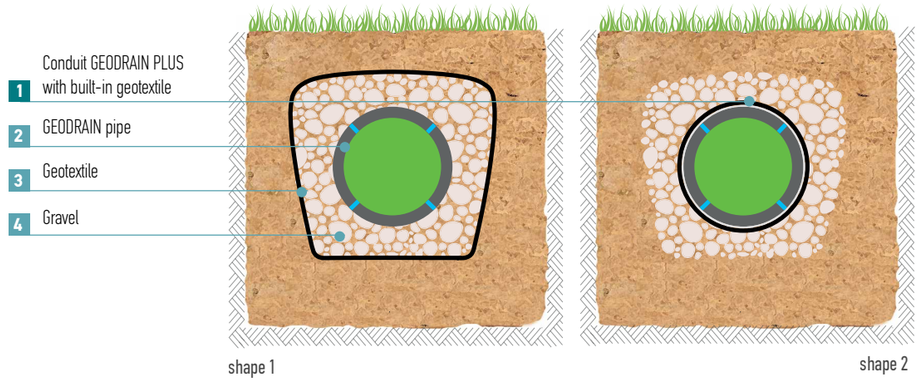


up to **50%**

fewer man-hours
for the installation of the geotextile

up to **50%**

fewer metres of geotextile,
since it is built into the drainage pipe



benefits

The new GEODRAIN® PLUS drainage pipes with built-in geotextile create a more rational drainage system. By changing the filtering device to gravel, geotextile, drainage pipe (figure 2), rainwater is collected in the drainage pipe in a smoother flow, gradually passing through the filtration layers.

Time savings

When a drainage system is being installed, at least 50% of the required man-hours are dedicated to cutting, spreading and positioning the geotextile. Using the GEODRAIN® PLUS drainage pipe with the built-in geotextile, the installer saves valuable time during the installation process.

Cost savings

If the geotextile is installed before the gravel (figure 1), the required geotextile quantity is 200% greater. GEODRAIN® PLUS pipes enable a more prudent use of geotextile, thus ensuring lower installation costs. At the same time, using a smaller quantity of geotextile contributes to the reduction of the environmental footprint.

GEODRAIN® PLUS

4-layer perforated double-structured wall conduit
with built-in geotextile

drainage
why is it necessary?

What is subsoil drainage?

Drainage of the subsoil is the safe collection and removal of water.

Where is it due to?

Water concentration on the surface of the soil may be due to various factors such as heavy rainfall, poor irrigation, moisture resulting from the rise of the groundwater table and possible leakage of the drainage network.

Where is it necessary?

Building foundations: Water penetration into the mass of a structural element (foundation) can gradually cause chemical alterations which can lead to mechanical damage. (subsidence).

Crops: Excess water makes soil plowing ineffective while at the same time accelerate the degradation of its structure with negative effects on plants. In extreme cases it can lead to salinisation of the soil making it unsuitable for agricultural use.

Why is it necessary?

The purpose of drainage of the subsoil is to maintain moisture (waters) at normal levels by means of a suitable drainage pipe system.

The benefits of drainage

Maintaining the level of humidity at normal levels has multiple benefits for structural elements as well as for crops, as it keeps the soil 'healthy'. That is: it allows its proper venting, does not erode it, does not affect its degree of heat, does not prevent the proper development of root systems by proper absorption of its nutrients.

How does it work?

1 **The gravel** forms the underlay on which the drainage pipes are to be based. In fact, they are another kind of "filter" as they are guiding the water to the drainage pipes while preventing the fine grains of the soil area from entering the filter.

The grading of the material and its permeability is the subject of a technical study.

2 **The geotextile** is the final “filter” towards the drainage pipe. Its role is to prevent the soil particles carried away by the water from entering the drainage pipe, thus protecting its slots from clogging, while also contributing to the seamless flow of water.

There are various types of geotextiles and their selection is the subject of a specific study. Following research and empirical studies, the use of a non-woven, UV-resistant polypropylene geotextile is recommended for Greek environments (see more on p.10).

3 **Drainage pipes** are perforated with perimeter holes to collect the water and safely remove it to the collection/discharge point. They are plastic, with double structured wall, rigid or flexible, corrugated externally, so that they can be installed more easily following the soil morphology, and smooth inside to facilitate the flow of water. The GEODRAIN® PLUS pliable pipe range is offered with pre-installed non-woven, needle-punched geotextile

They are placed with a slope of at least 0.5% from the highest to the lowest point.

Read installation guide (page 17)

drainage pipes characteristics GEODRAIN® PLUS

GEODRAIN® drainage pipes are made of high density polyethylene (HDPE), they have two walls, a corrugated exterior and a smooth interior, structured together and symmetrically perforated at specific degrees, 360^0 or 220^0.

The GEODRAIN® PLUS pliable pipe range is offered with pre-installed non-woven, needle-punched geotextile.

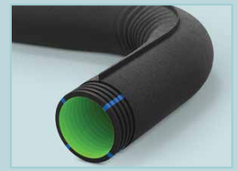
Produced in coils and straight bars, they are easily loaded and transported due to their reduced weight, and are quickly cut using simple professional cutting tools.

application fields

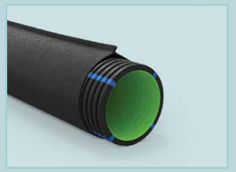
They are suitable for subsoil drainage in all types of residential buildings, stadiums and surrounding areas, industrial and commercial applications, photovoltaic parks, agricultural applications, landfills, uncontrolled landfills and road networks.

GEODRAIN® PLUS is the first double-wall drainage pipe with built-in geotextile manufactured by a 100% Greek company.

Pipes characteristics

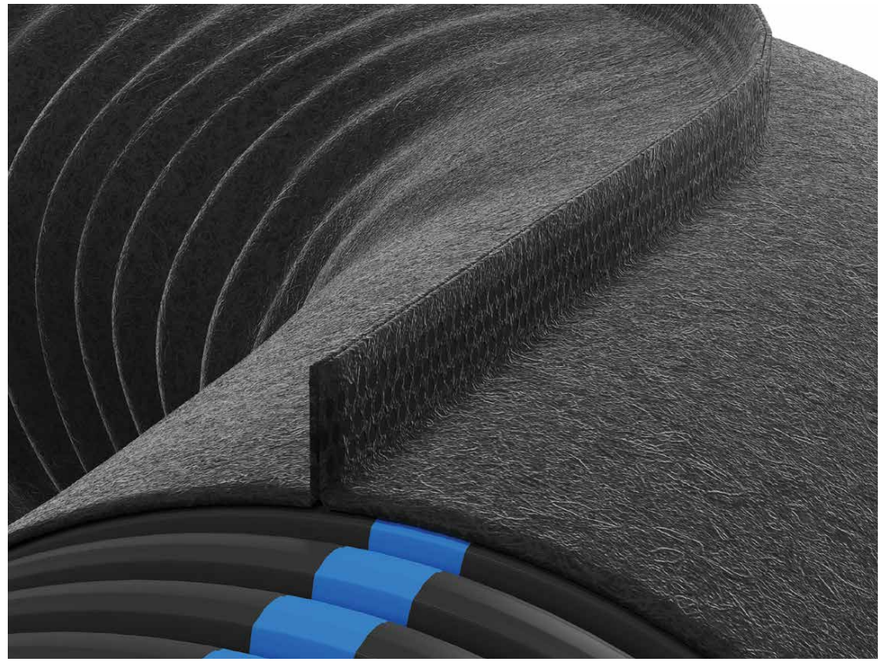


GEODRAIN® PLUS
Pliable pipe with Geotextile



GEODRAIN® PLUS
Rigid pipe with Geotextile

Pipe category	Type R2 (DIN 4262-1)	
Ring Stiffness (acc. to ISO 9969 standard)	SN 4 KN/m² (450Nt) SN 8 KN/m² (>750Nt)	
Degrees of perforation (acc. to DIN 4262-1 standard)	360^0 - TP (totally perforated) Perimetric and symmetric perforation	220^0 ±10 (locally perforated) Along pipe symmetric perforation
Perforation area (acc. to DIN 4262-1 standard)	>50 cm²/m	
First raw material	High density polyethylene (HDPE)	
Chemical resistance (acc. to ISO 10358)	Yes	
Ageing resistance	Resistant to UV radiation (5 years)	
Green product	Halogen and heavy metals free	
Color	Geotextile: Black RAL 9004, Longitudinal lines : Blue RAL 5015 External layer: Black RAL 9004, Internal layer: Green RAL 6038	
Color marking (acc. to NF P 98-332)	With blue longitudinal lines	
Harmonized Legislation	RoHS Directive, REACH Regulation	
Outer diameters (OD)	Ø63, Ø90, Ø110, Ø125, Ø160, Ø200	Ø110, Ø125, Ø160, Ø200
Pipes length	Coils 50 m: OD63, OD90, OD110, OD125 25 m: OD160, OD200	Bars 6 m



geotextile characteristics of GEODRAIN® PLUS drainage pipes

The geotextile used in GEODRAIN® PLUS drainage pipes is non-woven, needle-punched and UV-resistant. It bears a legal CE marking and is accompanied by a Declaration of Performance in accordance with Regulation (EU) No 305/2011 on the construction products regulation. At the production stage, it is placed around the drainage pipes using one of the most modern connection methods, in order to ensure its stability and its equal distribution before and after installation.

The size of its pores is designed to retain filtered soil particles, while also ensuring adequate permeability and preventing internal barriers inside the drainage pipe. It has a lifetime of up to 100 years from the time of installation in soil temperatures ≤25°C and is particularly resistant to acid and alkaline environments. Its design meets 90% of the soil characteristics found in the Greek territory.

Geotextile characteristics

Ageing resistance	Resistant to UV radiation (5 years)
Mass/Surface (acc.to EN ISO 9864)	150gr/m²
Thickness (2kPa) (acc. to EN ISO 9863-1)	1,3 mm
Resistance to Static Puncture (CBR) (acc. to ISO 12236(N))	2000N
Dynamic Perforation Resistance (acc. to ISO 13433(mm)	28mm
Tensile strength (acc. to EN ISO 10319)	8.0κN/8.0%
Characteristic Opening Size (acc. to ISO 12956(mm))	90 μm
Water permeability (VIH50) (acc. to EN ISO 11058)	110 mm/sec
Water flow capacity (acc.to EN ISO 11058)	110 l/m²/sec

indicative applications

Drainage of subsoil in surrounding areas

Drainage of swimming pool floor

Perimeter drainage of foundations

Drainage of retaining walls

pipes & fittings characteristics

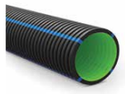
DN/OD

LP
Perforation
DIN 4262-1

GEODRAIN® PLUS

13.6m

DN/OD mm	ID mm	Packaging Bar (m)	Truck (m)	SN 4 Part No	SN 8 Part No
110	91	6	4800	1012110	1013110
125	105	6	3072	1012125	1013125
160	134	6	2520	1012160	1013160
200	169	6	1800	1012200	1013200



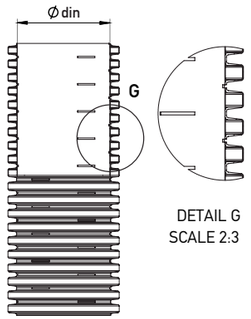
DN/OD

LP
Perforation
DIN 4262-1

GEODRAIN®

13.6m

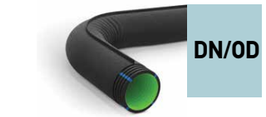
DN/OD mm	ID mm	Packaging Bar (m)	Truck (m)	SN 4 Part No	SN 8 Part No
110	91	6	4800	1014110	1016110
125	105	6	3072	1014125	1016125
160	134	6	2520	1014160	1016160
200	169	6	1800	1014200	1016200



DETAIL G
SCALE 2:3

Perforations characteristics

Nominal diameters	110	125	160	200
Perforation slot number	5	5	5	5
Perforation length (mm)	20	22	20	22
Perforation width (mm)	1,5	1,5	1,6	1,6
Perforation number per meter	185	191	267	220
Perforation area (cm²/m)	≥50	≥50	≥50	≥50



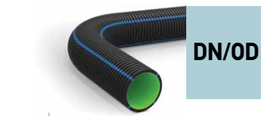
DN/OD

TP
Perforation
DIN 4262-1

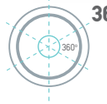
GEODRAIN® PLUS

13.6m

DN/OD mm	ID mm	Bending radius	Packaging coil (m)	Truck (m)	SN 4 Part No
63	47	0.25	50	14000	2028063
90	74	0.36	50	7000	2028090
110	91	0.44	50	4500	2028110
125	105	0.50	50	3500	2028125
160	135	0.64	25	1900	2028160
200	170	0.80	25	1225	2028200



DN/OD



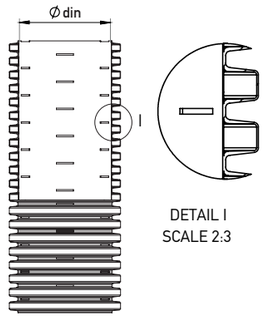
TP
Perforation
DIN 4262-1

GEODRAIN®

13.6m

DN/OD mm	ID mm	Bending radius	Packaging coil (m)	Truck (m)	SN 4 Part No
63	47	0.25	50	14000	2031063
90	74	0.36	50	7000	2031090
110	91	0.44	50	4500	2031110
125	105	0.50	50	3500	2031125
160	135	0.64	25	1900	2031160
200	170	0.80	25	1225	2031200

NOTE 1: GEODRAIN and GEODRAIN PLUS pliable pipes come with protection caps at each edge of the pipe.
NOTE 2: GEODRAIN and GEODRAIN PLUS rigid pipes come with a protection cap at the one edge and a connection coupler at the other. GEODRAIN and GEODRAIN PLUS have a minimum order quantity policy.
NOTE 3: For the correct installation of the GEODRAIN and GEODRAIN PLUS rigid pipes in the trench, make sure that they are placed from the non-perforated side.



DETAIL I
SCALE 2:3

Perforations characteristics

Nominal diameters	63	90	110	125	160	200
Perforation slot number	6	6	6	6	6	6
Perforation length (mm)	11	13	17	18	19	22
Perforation width (mm)	1,5	1,5	1,5	1,5	1,6	1,6
Perforation number per meter	312	287	255	223	403	268
Perforation area (cm²/m)	≥50	≥50	≥50	≥50	≥100	≥90

Connection couplers with hooks

DN/OD mm	Packaging pc/box	Part No
63	15	6101063
90	10	6101090
110	5	6101110
125	5	6101125
160	2	6101160
200	3	6101200

End caps

DN/OD mm	Packaging pc/box	Part No
63	30	6100063
90	15	6100090
110	8	6100110
125	8	6100125
160	6	6100160
200	6	6100200

KOUVIDIS adhesive & sealant

Packaging	Part No
6x310 ml	6001004

KOUVIDIS

installation guide

Installation of pipes in underground networks requires a series of works that need to be carried out as specified in the design so as to ensure the safety of the works and the installation itself.

Basic information on trenches

When digging a trench for conduit installation care must be taken in order to ensure a smooth, even underlying surface. It is best that trenching is performed as late as possible before the laying of the conduits and for backfilling to take place as soon as possible after their laying.
Some basic accuracy checking criteria for the trench works are:

- Slope and level of the bottom of the trench in accordance with the differences in height provided
- For Dimensions of the excavated sections.
- Pipe diameters and mechanical strengths
- Evenness of the trench surfaces, bottom and walls
- Removal of surface and ground water
- Selection, reuse and temporary storage of the excavated materials and removal of those which are unsuitable

Reception and transportation to the installation point

The pipes and their fittings must be inspected upon delivery, to see that they bear the correct labels and markings and meet all the necessary specifications laid down in the design. Prior to installation they must be carefully checked for any signs of damage.

Storage

The conduits must be stored in such a way as to ensure that they remain incorruptible. They must not be placed next to open trenches and their storage area must be clean and free from any foreign bodies such as sharp stones that could cause damage. The use of specially customized forks or special polyester straps is indispensable.

Laying

Place the pipes in such way ensuring that their surface, alongside their length, lies completely on the bottom of the trench. In the case of interruption of the installation process, or due to a temporary break in the works, or in view of connection at a later date, the ends of the pipes must be sealed with protective caps. The caps must not be removed before the connection process. The area of the pipe that will come into contact with the connection fitting (coupler) must be clean and show no signs of damage.

Connection

During the connection process (coupler, well, etc.) it must be ensured that no foreign bodies can get inside the pipes. In order to achieve this, particular care must be taken when cutting and assembling the conduit.Guidelines for the correct use of KOUVIDIS Sealant and KOUVIDIS Lubricant, during the assembling of GEODRAIN pipes with the relevant coupler, can be found at www.kouvidis.com.

Inspection

During the installation, in addition to visual checks, the following checks must also be performed: checks for any deformation of the pipes, change in degree of compaction and the adequacy and effectiveness of the laying. The surface on which the conduits are laid must be thoroughly inspected and meet the requirements of the design regarding its degree of slope and evenness.

Drainage system

The drainage system must be designed and installed in such a way that it functions as a permanent filter, where the water is safely drained and transferred, using gravity, to the collection or discharge points.

Before designing a drainage system, it is necessary to assess specific factors that drastically affect its form. Specifically, the following must be determined:

- the characteristics of the drainage basin (surface area, terrain, slopes, cavities, location of the building etc.),
- soil type
- soil permeability
- the chemical composition of the groundwater
- the point of discharge of the drainage water
- the level of the aquifer

DIN 4095

Figure 1 shows a typical example of a drainage system for perimeter protection of a building's foundations and underground masonry, in accordance with the German Standard DIN 4095 (Planning, design and installation of drainage systems protecting structures against water in the ground). It consists of the perforated plastic pipe, the geotextile, the plastic drainage membrane and the aggregates used for the backfilling of the drainage trench. The geotextile acts as a "filter" of the perforated drainage pipe, preventing the clogging of its slots and interior.

If GEODRAIN pipes are used, the geotextile "envelopes" all trench materials along with the aggregates used, while if GEODRAIN PLUS pipes are used, the geotextile surrounds the drainage pipe.

Drainage network

To facilitate network design, the DIN 4095 standard describes a set of "standard conditions" as follows:

Morphology of the plot soil: flat to slightly inclined,

Soil permeability: low

Foundation depth: up to 3m

Building height: 15m

Length of the drainage pipe network from the highest to the lowest elevation point: 60m

If the above conditions are met, the network should be as shown in figure 2. Specifically, the network consists of a perforated pipe of an internal diameter DN100 or larger (corresponds to a pipe of external diameter DN/OD125) with a 0.5% slope from the highest to the lowest elevation point. For monitoring purposes, a cylindrical chamber of a nominal diameter DN300 may be installed at the points of direction changes, while the network may terminate at a chamber of nominal diameter DN1000.

Drainage pipe selection

Drainage pipe selection The DIN 4095 standard proposes the chart shown in figure 3, from which we can select the appropriate tube pipe for a given slope and flow rate (l/s). The vertical axis shows the slope of the drainage system, while the horizontal axis shows the flow rate per pipe diameter (the nominal diameters shown in the diagram match the pipe's inner diameter). For example, a pipe with an internal diameter of DN100 and a slope of 0.6% corresponds to a flow rate of 3 l/s.

CAUTION: The above information is an informative guide for safe trenching and pipe installation and should not in any way be confused with the specifications defined in the study. For more information, please consult the European Standard EN 1610 (Construction and testing of drains and sewers). and the German Standard DIN 4095 (Planning, design and installation of drainage systems protecting structures against water in the ground).

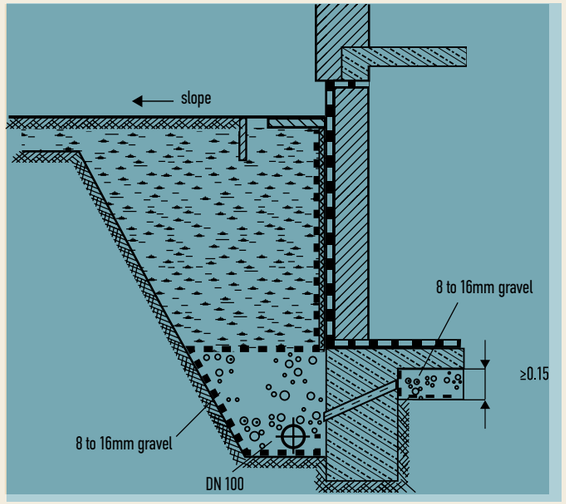


Figure 1

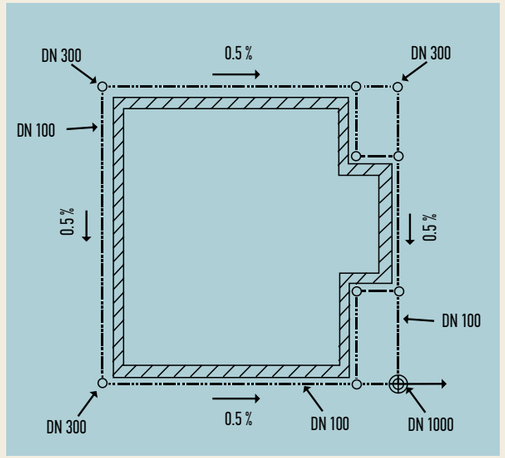


Figure 2

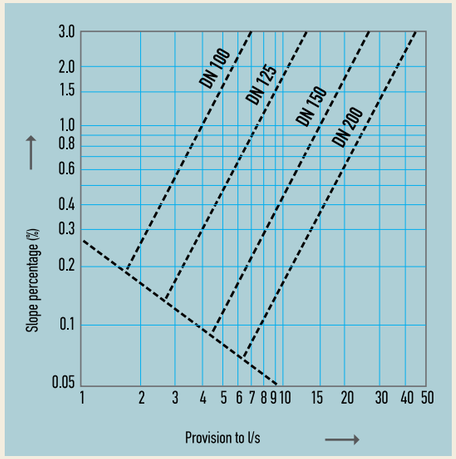


Figure 3

CAUTION: The above information is an informative guide for safe trenching and pipe installation and should not in any way be confusedwith the specifications defined in the study. For more information, please consult the European Standard EN 1610 (Construction and testing of drains and sewers). and the German Standard DIN 4095 (Planning, design and installation of drainage systems protecting structures against water in the ground).

practical guide

1 Water collection / discharge point

Selection of the point where collection and removal of drainage water will take place. This point should be at a lower level than the height of the drainage pipe network. This point may be a natural recipient or a sewage or rainwater drainage system. Alternatively, it may be a collecting well from which the water, with the help of a pump, can be led to appropriate locations.

2 Creation of a trench

The trench should have the corresponding width according to the diameter of the drainage pipes to be placed inside it and the corresponding depth according to the space that we want to drain. For example, in the case of perimeter drainage of buildings, drainage pipes must be located close to the base of the structure's foundations and under the water collection systems located on the ground surface (if any).

3 Formation of a gravel layer

The drainage pipe must always be placed on a layer of gravel and the first backfill layer, which will cover the drainage pipe, must also consist of gravel. The gravel layers are essentially another type of "filter", as they serve to guide the water towards the drainage pipes, while at the same time preventing the fine grains of the soil area from entering the filter. The thickness of this "filter" must not be less than 0.3m, while the grading of the material and its permeability is the subject of a technical study.

4 Installation of drainage pipes with built-in geotextile

The drainage pipes are perforated with perimeter holes to collect water and safely remove it to the collection/discharge point. Their built-in geotextile acts as a filter, allowing the water to flow seamlessly into the drainage pipe, while preventing the penetration of soil material inside the pipes as well as protecting the clogging of their slots. The pipes are placed at a minimum slope of 0.5% from the highest to the lowest point. The selection of the correct diameter must be determined following a relevant study, as it is influenced by a number of factors, such as soil permeability and morphology, installation depth, slope, as well as the type of substrates of the trench.

5 Installation of chambers

At the points of direction change, a cylindrical chamber with a nominal diameter of at least DN300 may be installed, for the purposes of supervision or cleaning. The distance between the chambers must not exceed 50m, while the network may be terminated in a chamber with a nominal diameter of at least DN1000 (see figure 2).

6 Backfilling

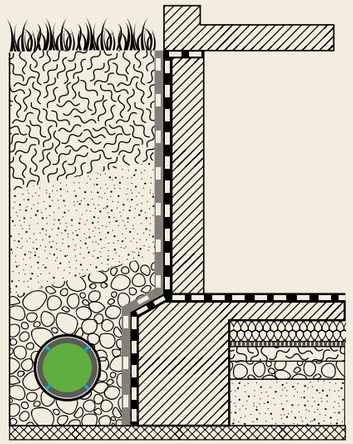
Initially, drainage pipes are coated with a layer of gravel, the grading of which is determined by the study. The trench is then backfilled using sandy gravel and, finally, with the inert materials removed during the excavation operations.

7 Inspection

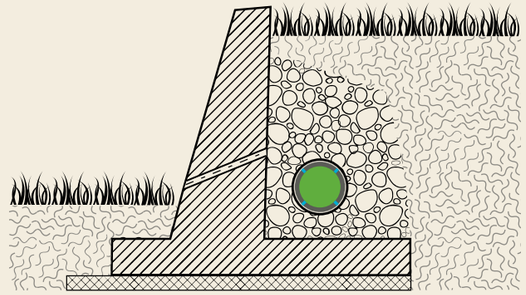
The drainage system must be protected from damage, congestion or ground displacement. After backfilling, the proper operation of the network should be checked (using visual means) and any results should be noted.

CAUTION: Although the basic principles of filtering (gravel, geotextile, drainage pipe) apply to most soils, experience has shown that there are some rare cases of soils where it is difficult to create a filtration zone. These are, indicatively, non-coherent soils such as yellow calcareous mud or scattered clay. These types of soils are called "internally unstable" as they contain a significant amount of incoherent particles which can easily penetrate the filters created by the gravel and the geotextile. In these cases, the design engineer must take serious account of the soil composition in order to properly design the filtration zones around the drainage pipe.

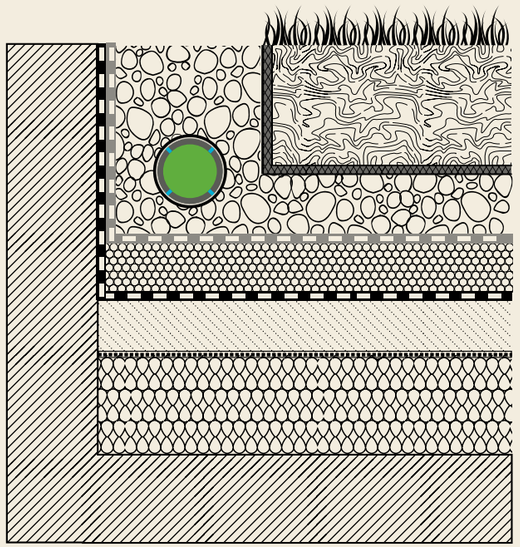
Drainage examples



Drainage along the perimeter of the foundation, for the collection of rainwater and for protection against the rise of the aquifer level.



Drainage in reinforced concrete walls



Drainage in structures with a planted roof

Legend

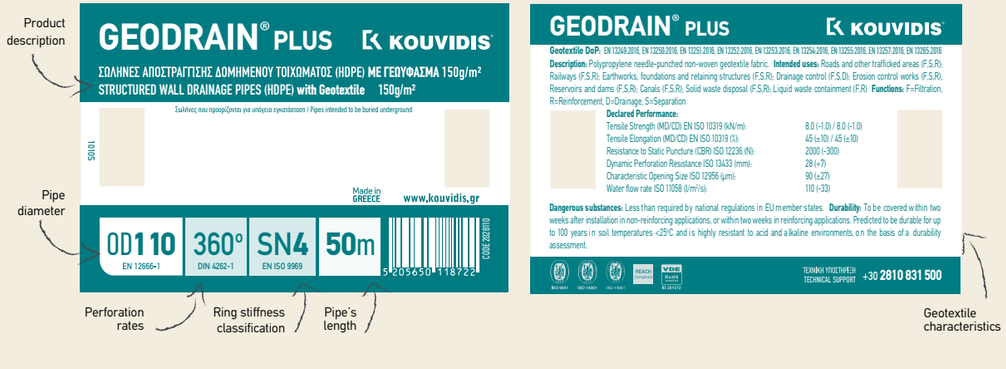
- Sand gravel
- Planting
- Soil
- Planting soil for extensive planting
- Conduit with Geotextile GEODRAIN® PLUS
- Filtration sheet
- Gravel drainage zone
- Root barrier membrane
- Thermal insulation slab
- Sealing membrane
- Water flow barrier
- Separating layer
- Insulation
- Reinforced concrete
- Cleaning concrete
- Transverse drainage

CAUTION: The above information is an informative guide for safe trenching and pipe installation and should not in any way be confused with the specifications defined in the study. For more information, please contact Kouvidis technical support.

technical appendix

Explanation of GEODRAIN® PLUS label

In every GEODRAIN® PLUS pipe there is a label that facilitates the identification of the product and the explanation of its specific properties.



PRODUCT TYPE

	DIN 4262-1
Circular pipes with pliable inner and outer surface.	R1
Circular pipes with smooth inner and pliable outer surface.	R2
Circular pipes with a one-material wall, homogeneous wall structure, smooth inner and outer surface.	R3

TYPE OF PERFORATION

	DIN 4262-1
Totally perforated pipes 360⁰	TP
Locally perforated pipes 220⁰±10⁰	LP
Multi-purpose pipe ≤120⁰ /	MP
Unperforated pipes	UP

Ring Stiffness (EN ISO 9969)

Nominal Diameter (DN)	Nominal Diameter (SN) [kN/m²]
DN ≤ 500mm	SN 4, SN 8, SN 16
DN ≥ 500mm	SN 2, SN 4, SN 8, SN 16

SN: Nominal Stiffness

CAUTION

Although the basic principles of filtering (gravel, geotextile, drainage pipe) apply to most soils, experience has shown that there are some rare cases of soils where it is difficult to create a filtration zone. These are, indicatively, non-coherent soils such as yellow calcareous mud or scattered clay. These types of soils are called "internally unstable" as they contain a significant amount of incoherent particles which can easily penetrate the filters created by the gravel and the geotextile. In these cases, the design engineer must take serious account of the soil composition in order to properly design the filtration zones around the drainage pipe.

LEGEND

220⁰ Partial perforation 220⁰

LP Perforation DIN 4262-1 — Partial pipe perforation based on the standard DIN 4262-1

360⁰ Full perforation 360⁰

TP Perforation DIN 4262-1 — Full pipe perforation based on the standard DIN 4262-1

ISO 9001 — Certification body of Quality Management System EN ISO 9001

ISO 14001 — Certification body of Environmental Management System EN ISO 14001

ISO 45001 — Certification body of Occupational Health and Safety Management System ISO 45001

VDE RoHS compliant ID 201572 — The product does not contain hazardous substances acc. to 2011/65/EE RoHS Directive. Certification body VDE

REACH Compliant — Compliance with REACH Regulation EC/1907/2006 about chemicals

GREEN PRODUCT KOUVIDIS — Environmentally friendly product. Halogen free, heavy metals free (RoHS), low smoke, SVHC-free (REACH) with 100% eco-friendly packaging

1st version 09. 2022

MANUFACTURING EXCELLENCE AWARDS 2021
Τα βραβεία της Ελληνικής Βιομηχανίας

WINNER

ISO 9001 ISO 14001 ISO 45001 VDE RoHS compliant ID 201572 REACH Compliant

KOUVIDIS was founded 40 years ago when Emmanuel Kouvidis, an electrician-installer, decided to quit his job and set up a business of his own in order to produce high quality conduits which would not break and which would ensure the safety of electricians- installers.

His vision came true and KOUVIDIS evolved to one of the largest Greek plastic pipe manufactures characterized by continuous development and innovation. Keeping its people at the heart of all its actions and aiming to the sustainable development and the cycling economy, KOUVIDIS will continue to provide value added products and services and to constantly improve the installer's work.

Learn more about our
40+ years journey

www.kouvidis.com

KOUVIDIS®

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