



PLASTFOIL®
polymeric waterproofing

Waterproofing of tunnels,
substructures and
subsurface structures

QUALITY EVERY DAY

PREFACE

In 2008 company PENOPLEX SPb Limited was the first in Russia who kick-starts production of polymeric waterproofing materials under trade mark PLASTFOIL®.

At present time PENOPLEX SPb Limited produce the widest range of waterproofing materials: for regions with tropic climate, for regions with moderate climate and for regions with arctic climate; materials for underground structures: tunnels, foundations, materials for artificial water bodies: swimming pools, ponds etc.

All goods that produced on manufactory pass high quality control, which is confirmed with the national certificates of the leading technical universities and organizations. Moreover, products under trade mark PLASTFOIL® are the first and unique plastic waterproofing materials produced in Russian Federation, which obtained the European quality certificate of the world leading university company SGS. This certificate confirms, that choosing PLASTFOIL® you get guarantee protection of the building, that is confirmed by the strongest tests in European laboratories.



INTRODUCTION

The most important stage constructing of any building or structure is a professional protection from water and moisture in certain places by means of corresponding waterproofing materials. Unfortunately, this protection is sometimes neglected and not all factors are taken into account in the course of designing.

Very often the economic advantage of high quality waterproofing for ensuring operational life of the object is underestimated. And consequently, in future the customer shall have to bear expenses related to provision of the complex waterproofing system, its missing elements in particular. In addition, waterproofing of buildings and structures in general requires only a small part of the total expenses for building construction.

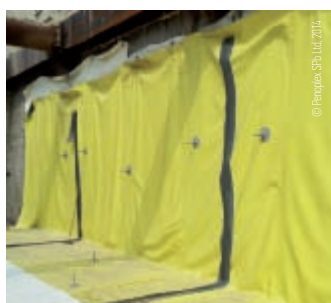
Application of waterproofing systems with polymeric membrane PLASTFOIL® allows ensuring reliable protection from moisture as it provides for a number of important advantages, such as long life, almost zero moisture absorption, more reliable quality check of the works performed and efficient repairs to damaged parts in the course of construction as well as in the process of operation.

ABOUT MATERIAL

Polymeric membrane PLASTFOIL® GEO — polymeric waterproofing membrane, unreinforced. It is produced with a yellow signal layer, which allows quick detection of damage to the waterproof membrane at the stage of installation (and sometimes at the stage of operation). Polymeric membrane PLASTFOIL® GEO has optimum flexibility and elasticity, making installation more convenient and minimizing the risks of waterproofing layer breakage related to possible movement and deformation of structure and ground.

The results of tests performed in K.D. Pamfilov Academy of Public Services LLC showed that the polymeric membrane PLASTFOIL® GEO is absolutely bio resistant and is not culture media for fungus and microorganisms.

Under GOST 9.048-91 Methods of Laboratory Testing of Resistance to Mold Fungus - 0 points for the whole testing period. Results of the analysis, documents and technical materials relating to research of PLASTFOIL® GEO operational life conducted by the Research Institute of Structural Physics of the Russian Academy of Architecture and Construction Sciences show that the potential service life of the membrane makes up to 100 years.



TECHNICAL PARAMETERS

Thickness, mm	Width, mm	Length in roll, mm	Reinforcement type	Dimensional measurement when heated, %, up to	Radius of curvature with the radius of rounding 5 mm, at temperature °C
1,5 / 2,0	2 000	20 000	No reinforcement	1,5	-45
Tensile strength, method B longwise/ transversal (EN 12311-2(B)), Mpa	Elongation at brake, %, up to longwise/ transversal (EN 12311-2)	Water resistance	Water absorption, %, up to	Reaction to fire (EN 13501-1)	UV exposure (1000h), (EN 1297)
17 / 17	300/300	waterproof	0,2	Class E	pass

PACKING

Weight of 1 roll, kg	Q-ty on pallet, pcs.	Pallet size, m	Weight of pallet, kg
81,6 / 108,8	17 / 14	1,25×2,0×0,9	1478 / 1601

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TYPES OF WATERPROOF SYSTEMS

All methods of constructing foundations, tunnels and other buried structures can be divided into two groups: construction from surface and underground construction.

The method of construction from surface includes the track-type and “slurry wall”.

Track type provides for opening of a ditch, in which underground structure is erected in the usual way. Upon completion of construction, the ditch is covered with ground. This method provides for possible arrangement of external waterproofing and more favourable conditions of placing concrete.

The disadvantage of this method is the need to reserve considerable areas around the ditch to arrange walls with stable slopes, this method limits the depths up to 5-7 m.

The distinguishing feature of the “slurry wall” method is that the fence walls of underground structure are created in the narrow opening along the structure outline and the ground is removed from the structure internal area under protection of the erected walls. In water-bearing ground the walls are usually buried up to waterproof layer, which provides for no waterway in the course of the earthwork. If no water confining layer can be reached, underwater works can be performed.

Closed construction method, as a rule, is used for driving deep-level tunnels.

This method can also be used for shallow tunnels, if the tunnel has to be driven through hard formation. In this case, one should not use track type, because it is cheaper and easier to use the formation itself as supporting construction for the foot, walls and crown of the tunnel.

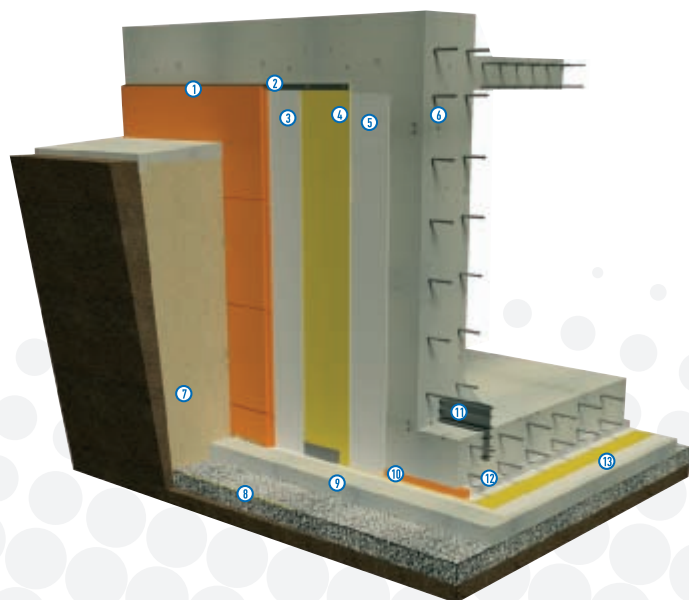
There are various methods of closed construction of the tunnel, but they have one common feature — train tunnel is formed from inside and consequently tunnel waterproofing should be arranged from inside.

At present company PENOPLEX SPb Limited has developed unique efficient systems for damp-proofing of foundations, transport tunnels, subway, collectors and other underground and buried rooms arranged using various construction methods. Use of the most advanced materials and technologies will guarantee protection of underground structures from the influence of moisture, fungi and microorganisms, soil gases, root penetration etc. All the materials used correspond to the highest requirements of Russian and European standards.

1. «HYDROSTOP» SYSTEM

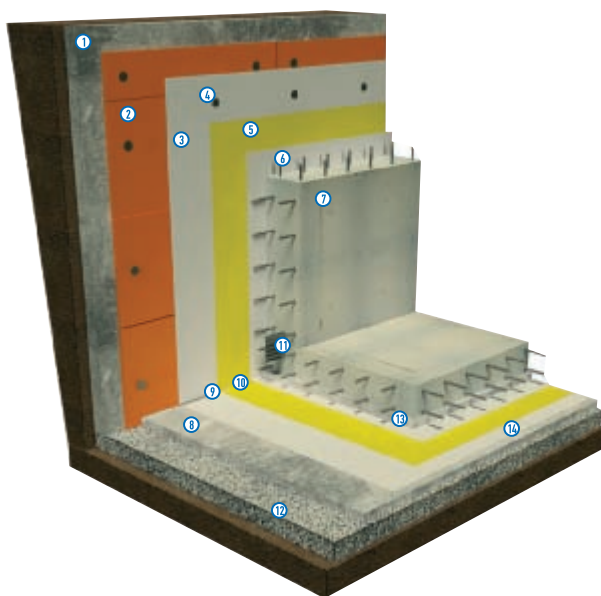
«HydroStop» system creates a waterproofing line of substructure on the outside for protection from the influence of moisture. «HydroStop» system uses membranes 1.5 or 2 mm thick. The choice depends directly upon the level of influence of underground waters and structure depth. Polymeric membrane is positioned between two layers of geotextile, which ensures reliable protection of waterproofing layer from possible damage resulting from structure movement and base roughness.

1.1. OPEN METHOD (FOUNDATION)



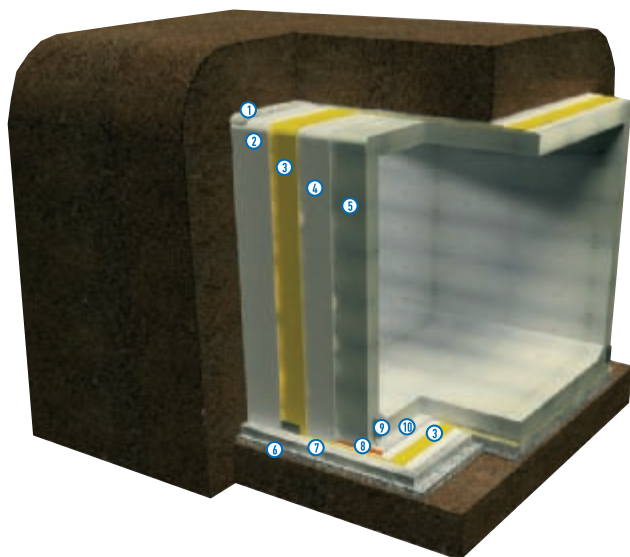
1. Extruded polystyrene foam, e.g. PENOPLEX®
2. Edge board
3. Geotextile, not less than 500 g/sq.m
4. Polymeric membrane PLASTFOIL® GEO
5. Geotextile, not less than 300 g/sq.m
6. Waterproof structure
7. Backfill soil
8. Chip bedding
9. Concrete bedding
10. Compensator of extruded polystyrene foam, e.g. PENOPLEX® 50x50 mm
11. Waterstop
12. Sand cement screed 50 mm
13. Geotextile, not less than 500 g/sq.m

1.2. «SLURRY WALL» METHOD



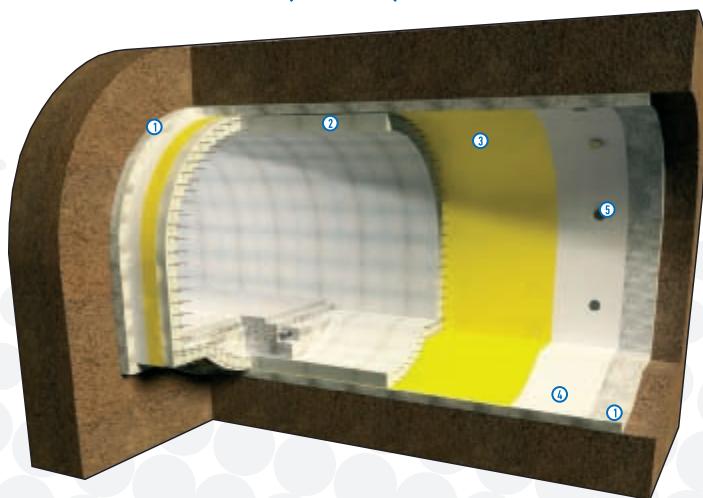
1. Slurry wall
2. Extruded polystyrene foam, e.g. PENOPLEX®
3. Geotextile, not less than 500 g/sq.m
4. PVC rondel
5. Polymeric membrane PLASTFOIL® GEO
6. Geotextile, not less than 300 g/sq.m
7. Waterproof structure
8. Concrete bedding
9. Compensator of polyethylene foam
10. Angle strengthening with plastic foil PLASTFOIL® GEO
11. Waterstop
12. Chip bedding
13. Sand cement screed 50 mm
14. Geotextile, not less than 500 g/sq.m

1.3. OPEN METHOD (TUNNEL)



1. Sand cement screed 50 mm
2. Geotextile, not less than 500 g/sq.m
3. Polymeric membrane PLASTFOIL® GEO
4. Geotextile, not less than 300 g/sq.m
5. Waterproof tunnel
6. Chip bedding
7. Concrete bedding
8. Compensator of extruded polystyrene foam, e.g. PENOPLEX® 50x50 mm
9. Waterstop
10. Sand cement screed 50 mm

1.4. CLOSED METHOD (TUNNEL)



1. Primary sprayed concrete
2. Tunnel main supporting part
3. Polymeric membrane PLASTFOIL® GEO
4. Geotextile, not less than 500 g/sq.m
5. PVC rondel

SCOPE OF THE SYSTEM

«HydroStop» system is designed for waterproofing of buildings and structures from the influence of capillary water and soil waters. It is used for arrangement of foundations of residential and industrial buildings, shopping malls and parking areas, tunnels, collectors using “the open method” (ditch) as well as “the closed method”, it is the most widely-used system due to its economic and high performance properties.

ADVANTAGES OF THE SYSTEM

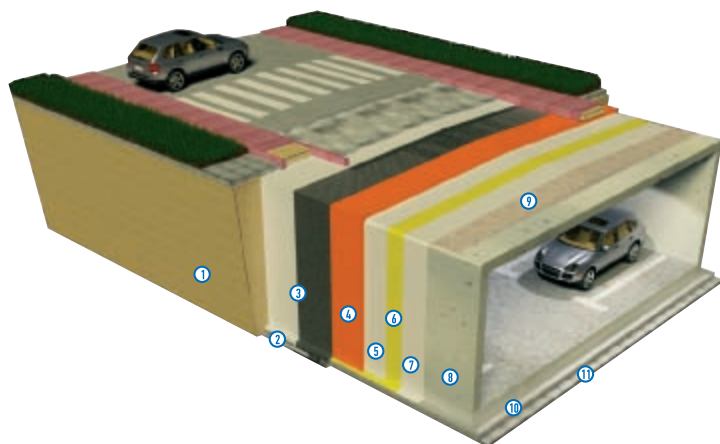
Advantage of this system is free laying of membrane, which allows compensating any movement of the structure and single layer considerably increases the rate of erection. Plastic foil, in contrast with bituminous waterproofing materials, is less demanding to the base (smoothness, dustlessness, dampness etc.).

Yellow signal layer and double weld seams allow immediate detection of defects in plates and welding points. The undeniable advantages also include cold mounting method, possible laying at negative temperatures and in wet conditions.

2. «DRAINAGE» SYSTEM

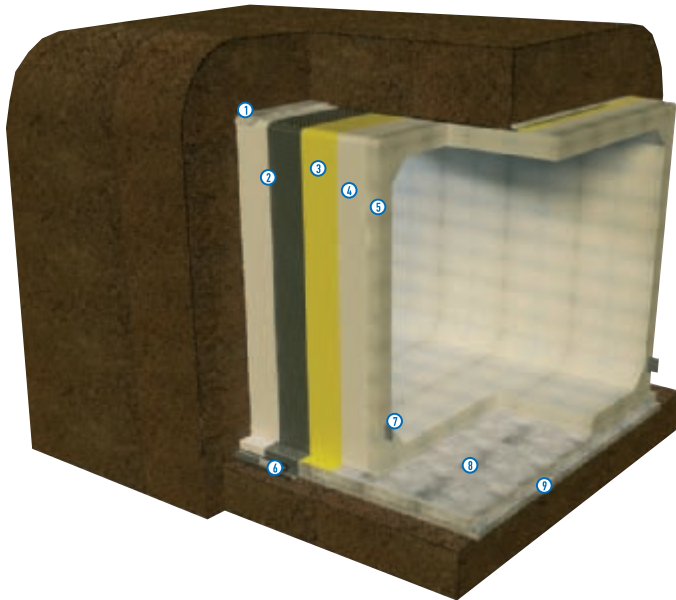
The «Drainage» system is used for waterproofing from capillary and infiltration water, it presents a combination of polymeric membrane PLASTFOIL® GEO and drainage layer with the complex of water removing. It is used with and without waterstops and control injection connection fitting. In case of direct contact with finished concrete structure a protective layer of geotextile or drainage layer shall be installed to avoid damage to waterproofing layer when operating the structure.

2.1. OPEN METHOD (PARKING AREA)



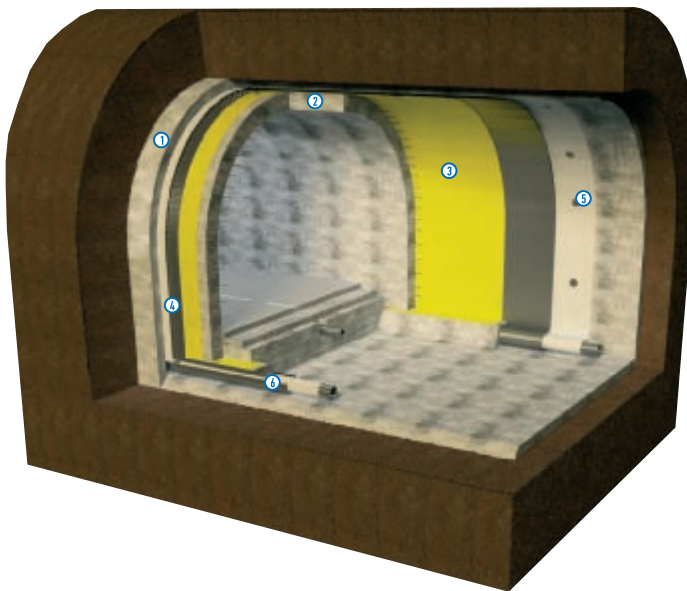
1. Backfill soil
2. Weep hole
3. Profiled membrane with drainage layer of geotextile
4. Extruded polystyrene foam, e.g. PENOPLEX®
5. Geotextile, not less than 500 g/sq.m
6. Polymeric membrane PLASTFOIL® GEO
7. Geotextile, not less than 300 g/sq.m
8. Waterproof parking area
9. Sloping layer of lightweight concrete
10. Concrete bedding
11. Chip bedding

2.2. OPEN METHOD (TUNNEL)



1. Sand cement screed 50 mm
2. Profiled membrane with drainage layer of geotextile
3. Polymeric membrane PLASTFOIL® GEO
4. Geotextile, not less than 300 g/sq.m
5. Waterproof tunnel
6. Weep hole
7. Waterstop
8. Concrete bedding
9. Chip bedding

2.3. CLOSED METHOD (TUNNEL)



1. Primary sprayed concrete
2. Tunnel main supporting part
3. Polymeric membrane PLASTFOIL® GEO
4. Profiled membrane with drainage layer of geotextile
5. PVC rondel
6. Weep hole

SCOPE OF THE SYSTEM

It is used for waterproofing of foundations and structures not affected by soil waters. Possible use of waterproofing system when constructing the tunnels, collectors, underground parking areas considerably increases the life of the structure.

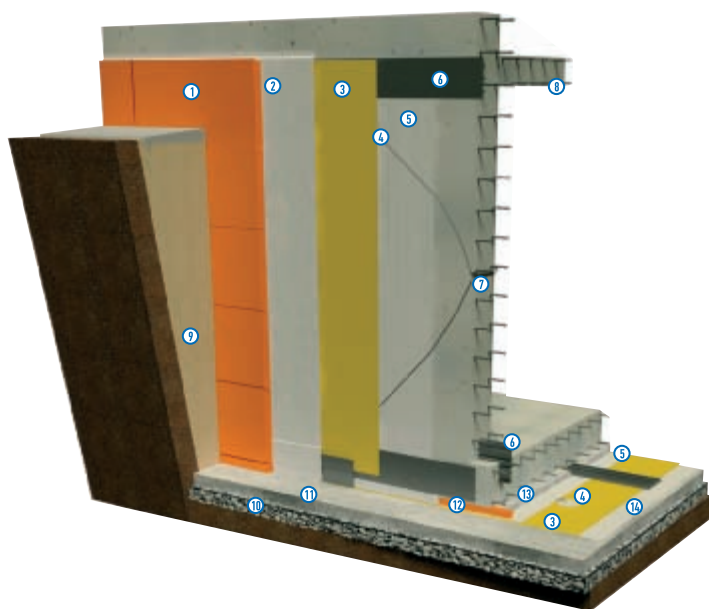
ADVANTAGES OF THE SYSTEM

Advantage of this system is the use of waterproofing membrane only on vertical parts of the foundation and on flooring, waterproofing of the foundation plate is not required. Due to organized disposal of capillary and infiltration water from the structure with the help of geotextile or various profiled membranes with filter layer.

3. «AQUACONTROL» SYSTEM

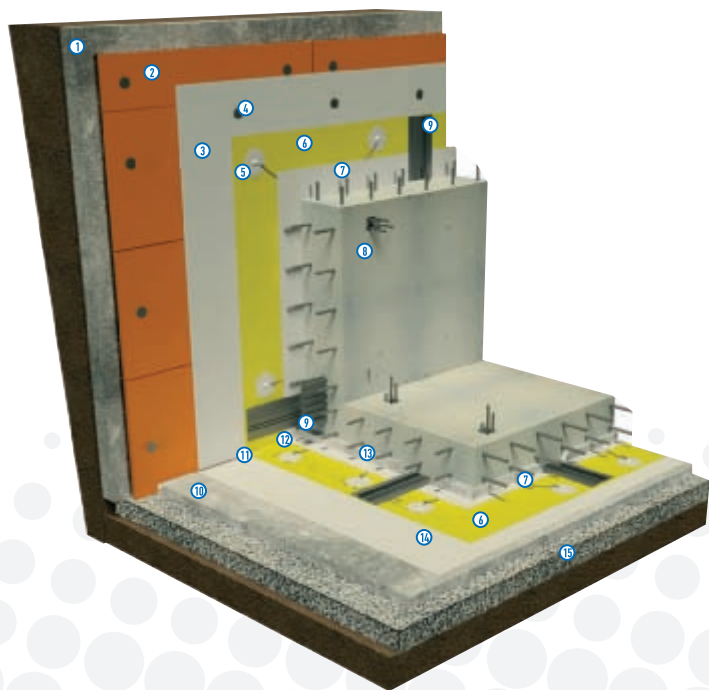
Waterproofing system «AquaControl» with division into sections with the help of waterstops and installation of control injection connection fitting for monitoring and elimination of possible leakage. In case of damaged part, the system allows restricting water spreading between the waterproof surface and the membrane by means of division into sections (charts) by waterstops. Free method of membrane laying allows completing waterproofing works in the shortest possible time and double weld seam with test channel allows monitoring the work of installation company.

3.1. OPEN METHOD (FOUNDATION)



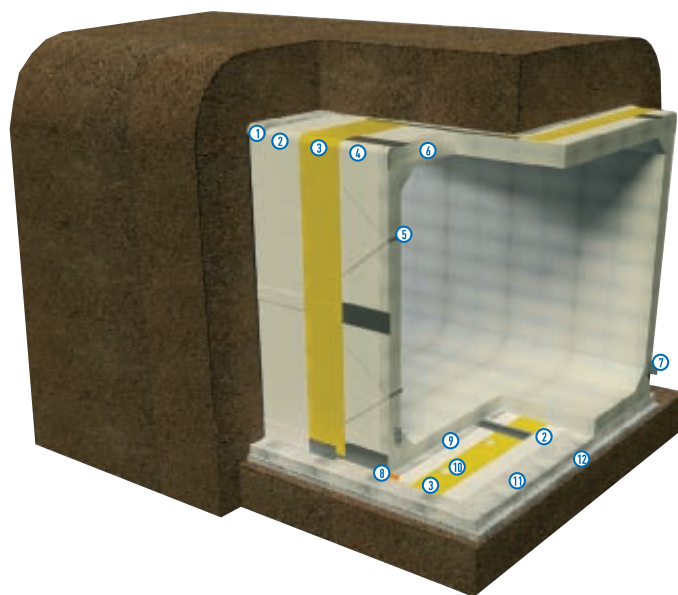
1. Extruded polystyrene foam, e.g. PENOPLEX®
2. Geotextile, not less than 110 g/sq.m
3. Polymeric membrane PLASTFOIL® GEO
4. Angle injection connection fitting
5. Geotextile, not less than 300 g/sq.m
6. Waterstop
7. Metal case
8. Waterproof structure
9. Backfill soil
10. Chip bedding
11. Concrete bedding
12. Compensator of extruded polystyrene foam, e.g. PENOPLEX® 50x50 mm
13. Sand cement screed 50 mm
14. Geotextile, not less than 500 g/sq.m

3.2. «SLURRY WALL» METHOD



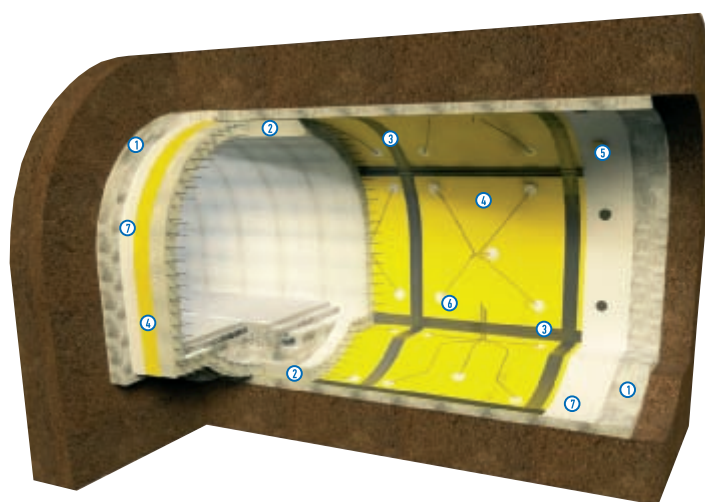
1. Slurry wall
2. Extruded polystyrene foam, e.g. PENOPLEX®
3. Geotextile, not less than 110 g/sq.m
4. PVC rondel
5. Angle injection connection fitting
6. Polymeric membrane PLASTFOIL® GEO
7. Geotextile, not less than 300 g/sq.m
8. Waterproof structure
9. Waterstop
10. Concrete bedding
11. Compensator of polyethylene foam
12. Angle strengthening with polymeric membrane PLASTFOIL® GEO
13. Sand cement screed 50 mm
14. Geotextile, not less than 500 g/sq.m
15. Chip bedding

3.3. OPEN METHOD (TUNNEL)



1. Sand cement screed 50 mm
2. Geotextile, not less than 500 g/sq.m
3. Polymeric membrane PLASTFOIL® GEO
4. Geotextile, not less than 350 g/sq.m]
5. Metal case
6. Waterproof tunnel
7. Waterstop
8. Compensator of extruded polystyrene foam, e.g. PENOPLEX® 50x50 mm
9. Sand cement screed 50 mm
10. Angle injection connection fitting
11. Concrete bedding
12. Chip bedding

3.4. CLOSED METHOD (TUNNEL)



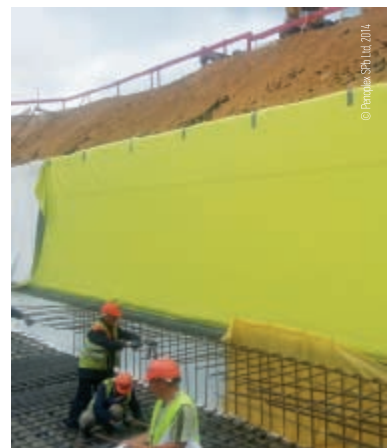
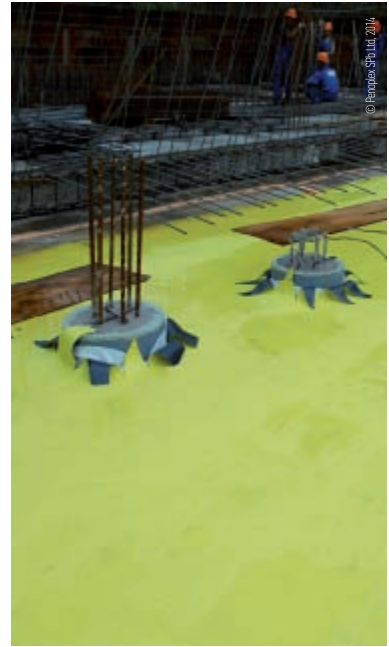
1. Primary sprayed concrete
2. Tunnel main supporting part
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SCOPE OF THE SYSTEM

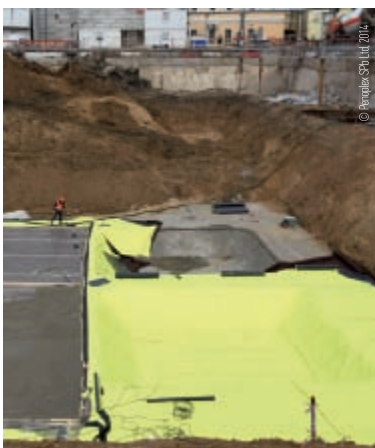
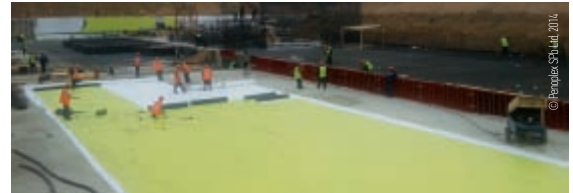
«AquaControl» system is designed for waterproofing of foundations of buildings and structures, tunnels, collectors, subway and underground parking areas from outside from the influence of high level of soil waters. Possible use in closed and open construction methods makes the system unique in its own way.

ADVANTAGES OF THE SYSTEM

Advantage of «AquaControl» system is the possibility of dividing the isolated surface into sections, the so-called “charts” with the help of waterstops and polymeric membrane. Waterstops sinking in concrete structure create a barrier for transfer and spreading of water between the structure and damp-proof plate. And installed injection connection fitting allows prompt detection of damage to waterproofing and further repair by filling the charts with the repair compound.



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Prompt detection of leakage

– the water starts leaking through control injection connection fittings numbered in accordance with the sequence number of certain local area ("chart"). Thus, in the shortest possible time it is clear, in what part the integrity is damaged and waterproofing is required.



High repair capability

– leakage-blocking compound is introduced through injector under pressure to the area of detected damage. Further this compound hardens, thus reliably damp-proofing the certain damaged area ("chart").



Leakage monitoring in the course of installation

– installation is performed with the special equipment forming the weld seam with special test channel. This technology allows immediate monitoring of leakage and reliability of the welded waterproofing flooring.



High rate of installation

– welding is performed with automated equipment
– reels 2 m wide are convenient for installation (minimum number of joints, seams)
– high reliability of welded joints, homogenous weld seam increases tear strength of the plate itself



Universal technology

– possible waterproofing of buried structures with high hydrostatic pressure of soil waters on the buried structure.



Anti-radon protection

– the laboratory of radiation-proof construction (Research Institute of Structural Physics of the Russian Academy of Architecture and Construction Sciences) conducted an integrated study of radon-permeable material of reeled waterproofing polymeric PLASTFOIL®.

In terms of radon permeability resistance index the polymeric membrane PLASTFOIL® GEO is recommended for use for the purpose of anti-radon protection of buildings and structures.



Biostability

The results of tests performed in K.D. Pamfilov Academy of Public Services LLC showed that: Plastic foil PLASTFOIL® is absolutely bioresistant and is not culture media for fungus and microorganisms. Under GOST 9.048-91 Methods of Laboratory Testing of Resistance to Mold Fungus – 0 points for the whole testing period.

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