



TENAPORS PLATES FOR FORMATION OF SLOPES

foam polystyrene elements for formation of slopes in flat roofs

INSTALLATION MANUAL

2018

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1. General guidance

1.1. TENAPORS plates for formation of slopes

TENAPORS PLATES FOR FORMATION OF SLOPES most often are used to create slopes for flat roofs to ensure correct inclination for drainage, ventilation shafts, parapets and other cases. Plates can also be used for leveling the other walls, for making inclinations on balconies and floors and also in other application where it is necessary to create inclination on flat surface or to correct undesirable slopes of surfaces. It is possible to use wide warranty of EPS materials to obtain not only necessary inclinations but also provide needed thermal and mechanical properties.

With this technology it is possible to provide necessary inclination and thermal properties by using only EPS material. We provide wide variety of technical solutions that can be used on almost all types of constructions. Insulation thickness, mechanical properties and technical solution should be implemented in design stage according to customer needs and legislation. Minimal plate thickness is 20mm, plates are available with different inclinations starting from 1% and bigger. TENAPORS plates for formation of slopes main properties:

- 1. Wide range of technical solutions that can be applied according to design of the building;
- Low weight of material it will not additional weight to roof and building bearing structure, and no heavy machinery is needed in construction process;
- Assembly works can be carried out easy and in short period of time labor costs are reduced;
- 4. Low water absorption material will maintain it's excellent thermal and mechanical properties even in situations when waterproofing fails;
- 5. It is possible to store materials temporarily in construction site without any protection;
- 6. Chemically resistant to weak acid, alkali and saline liquids;
- 7. Material is self-extinguishing;
- 8. Cost-effective solution roof insulation and inclinations are made with the same material.

In picture No. 1 it is possible to see typical solutions for formation of slopes for flat roofs – it is possible to manufacture different solutions depending on customers request. Standard sizes of plates can be found in table No. 2.

Picture No. 1. Solutions for flat roof inclinations.



Explanation:

- roof bearing structure
- the main thermal insulation layer
- plates for formation of slopes
- * Other tecnical solutions are also available on request

Table No. 1. TENAPORS PLATES FOR	R FORMAION OF SLOPES – standard sizes
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Width, mm	Length, mm	Thickness, mm	Inclination	EPS type
Standard – 1000	Standard – 1000	Minimal – 20	Minimal 1%	Standard – EPS 100*
Maximum – 1200	Maximum - 4000	Maximal - 300		

* On request other EPS types are available

Slopes usually are formed in with 3 types of systems:

- Plates with inclination on one plane plates for formation of slopes "S";
- Plates with inclination on two slopes plates for formation of slopes "PS";
- Formation of slopes with system VK drawings have been attached.

Depending on clients request it is possible to form slopes according to individual technical solution that is integrated in roof design.

1.2. Installation guidelines

In these guidelines have been gathered main rules of installation of TENAPORS PLATES FOR FORMATION OF SLOPES. In construction or renovation of building it is advised to implement technical solution in building design – in this case most optimal solution will be accomplished. If desired solution is implemented during construction, it is necessary to consult with design author paying undivided attention to materials thermal properties and requirements of fire safety.

1.3. Detailing

Technical drawings have been attached to these installation guidelines. I these drawings standard technical solutions have been shown and they are integral part of this document. Designs that are given are only informative and before usage of any given solution it is necessary to consult with certified professional for more detailed information.

2. System building physics

2.1. Thermal conductivity

TENAPORS PLATES FOR FORMATION OF SLOPES most commonly are made from EPS 100 material, which has thermal conductivity of λ =0,036 W/mK. Depending on clients' needs it is possible to produce plates from wide variety of EPS and NEO EPS with thermal conductivity from 0,031 W/mK to 0,040 W/mK. By changing material, it is possible to accomplish excellent thermal properties in almost all cases. Unlike conventional methods, where slopes usually are constructed from concrete, our provided technology is much easier to construct and provides additional thermal layer, that as a result win different economical benefits during construction and in building service life.

Expanded polystyrenes long term water absorption will not exceed 5% and this property will ensure excellent long thermal properties. This material property is especially essential for roof insulation, because in case of failure of waterproofing layer a large amount of water can infiltrate in to insulation layer. Other insulation materials that are also used in this application which have high water absorption in this case can be damaged severally. Changing insulation layer can be costly and problematic process.

2.2. Load bearing capacity

Depending on request expanded polystyrene can be with density from 12 kg/m³ to 31 kg/m³. Other analogue materials that are used in this application can have density in range of 30 kg/m³ to 200 kg/m³. This indicator can be very important in case of renovation of old buildings, because their bearing structures may not be intended for additional weight. By using EPS material, it is possible to decrees load by up to 30-80% compared to other materials that are used in this application.

In other cases, decrees of weight of insulation material can be enough for other roof application such as green roofs and other. Although TENAPORS PLATES FOR FORMATION OF SLOPES are low weight they can hold considerable load that will be enough for such application. Green roofs can provide not only esthetic benefits, but also improve buildings thermal performance, but also increase buildings long term value. When calculating bearing loads that can occur in roof application it necessary to use materials long term performance indicators – in this case it would be long term compressive strength at 2% deformation after 50 years. Technical data have been gathered in table No. 2.

Table No. 2	2. TENAPORS EPS	material	technical	data
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TENAPORS EPS type	Compressive strength at 10% deformation	Long term compressive strength (2 % deformation, 50 years)	Thermal conductivity EPS λ , W/mK	Thermal conductivity NEO EPS λ , W/mK
EPS 70 / NEO EPS 70	70 kPa or 7,0 t/m ²	21 kPa or 2,1 t/m ²	0,039	0,032
EPS 80 / NEO EPS	80 kPa or 8,0 t/m ²	24 kPa or 2,4 t/m ²	0,038	0,031
EPS 100 / NEO EPS 100	100 kPa or 10,0 t/m ²	30 kPa or 3,0 t/m ²	0,036	0,031
EPS 150 / NEO EPS 150	150 kPa or 15,0 t/m ²	45 kPa or 4,5 t/m ²	0,034	0,031
EPS 200	200 kPa or 20,0 t/m ²	60 kPa or 6,0 t/m ²	0,034	-

3. Preparations

3.1. Storage

TENAPORS L EPS should be stored in well-ventilated rooms or under shelters on rigid, smooth, clean and dry surface with a height of not more than 2 m. Elements should be protected from precipitation, direct sunlight and mechanical damage. The storage must be equipped in accordance with fire safety regulations.

3.2. Devices and tools

For installation of TENAPORS PLATES FOR FORMATION OF SLOPEs such tools are required:

- Level;
- Pencil or marker;
- Hand saw or knife;

For cutting TENAPORS PLATES FOR FORMATION OF SLOPES to the required size, use either a sharp knife or a saw, before cutting carefully measure and mark it with marker. To provide required structural stability during roof operation so that it will not be affected by load that will be created by wind, rain and snow it is necessary to fasten materials to load bearing structure, vapor barrier and insulation layers to each other. In these cases, usually mounting foam such as Penosil Premium Polystyrol FixFoam 877 or similar is used. In other cases, also nail plastic nails, nail plates and other assembly methods can be used.

4. Installation

4.1. Preparatory work

Before TENAPORS PLATES FOR FORMATION OF SLOPES are laid on the surface it is necessary to make sure that surface is straight. In there is unevenness concrete smoothing layer should be applied. Sand, soil particles and other sediment can be found on roof surfaces – to provide high quality of work it is crucial to clean surface from such unwanted particles. When surface is cleaned and smoothened vapor barrier as the first layer of construction should be laid. This protective layer will protect insulation from unwanted water vapor and ensure long term performance. To provide tightness of vapor barrier it should be laid with at least 200 mm vide overlapping's so that no gaps would appear.

4.2. Setting up

It is crucial that during construction and in time of maintenance no gaps appear between insulation plates. Gaps are not wanted because non-controllable air circulation can occur and gaps in time could absorb moisture. Both situations will lead to increased heat losses true constructions. Heat losses will be bigger in places where gaps go true all insulation layer. To avoid such defect, it is necessary to have 2 layers of insulation where upper layer should be shifted to the side. Insulation plate layout has been shown in picture No. 2.

TPicture No. 2. Heat insulation layout.



Explanation:



- roof bearing structure
- the main thermal insulation layer
- plates for formation of slopes

In time of use it is possible that because of wind, rain and snow TENAPORS PLATES FOR FORMATION OF SLOPES can start to move. To avoid such situations, it is necessary to design solutions for fastening insulation and vapor barrier to each other and bearing structure. For such purposes standard solution is usage of mounting foam, which needs to be used according to manufacturer's guidelines. As additional fixing units nail plates and plastic nails can be used. Nails will provide additional strength in cases when plates could be lifted up and plates will hold gaps in places. Needed amount of units can be seen in table No. 3, but fixings are displayed in picture No. 3. However, picture No. 4 shows us construction that is usually used in these applications.

Table No. 3. Amount of mechanical fixings.

Location of fixing	Type of fixing	Usage	Amount, pcs
Floor insulation fixing to L EPS element	Plastic nail	To ensure insulation	8 pcs/m ²
and lower insulation layers		material liftoff	
Floor insulation sheet fixing to each	Nail plate	To ensure tight seems	2 pcs/ 1m of
other and L EPS element			seem

Picture No. 3. Mechanical fixings.



Picture No. 4. Flat roof construction.



4.3. Waterproofing

For flat roof waterproofing usually 3 different kind of application methods – there can be waterproofing that has to be mechanically fixed, glued or hot melted. Before starting installation of waterproofing it is crucial to consult with manufacturer about more detailed description how material should be fixed properly. Depending on the application methods also heat insulation material layout can change.

Mechanically fixed and glued waterproofing can be directly applied on TENAPORS PLATES FOR FORMATION OF SLOPES and no additional separating layer has to be used. Hot melt technology requires that additional layer from non-burning heat insulation of at least 20mm should be added – for example mineral wool or different. This layer is needed because expanded polystyrene maximum temperature is only +80 °C and by exceeding this temperature it is possible to damage material. Both used installation techniques have been shown in drawings attached.

In places where flat roof construction joins parapet cracks in waterproofing can appear. To avoid this situation roof transition edging should be fixed. This solution decreases curvature of waterproofing and ensures long service life without leaks. Transition edging usually is 150x150x2000mm big and is made from the same material as TENAPORS PLATES FOR FORMATION OF SLOPES. Drawing of this solution can be seen in picture No. 5.



Picture No. 5. Installation of transition edging.

5. Drawings







requirements and other legislation. ** Before choosing a solution, consult with a certified specialist regarding it's compliance with fire safety informaion is informative only - the actual values may vary depending on technical solution that has been chosen.



LJ-2018-9-2-ENG	Drawing number	SIA "TENAPORS" Spodribas street 1, Dobele, LV-3701, Latvia Tel.:+37163707051 Faks: +37163724371
Roof	Type of Product	^{Name} Formation of baced on n concrete panel glued
1:10	Scale	inclinatior nonolithic s. Mechau waterproo
September 2018	Date	n on flat roof reinforced nically fixed or ofing.



September 2018





Ņ 1. Tenapors EPS 70/100 Nr. Tenapors material Plates for formation of slopes TENAPORS EPS100 Picture

requirements and other legislation.



September 2018	1:10	Roof	LJ-2018-9-5-ENG
Date	Scale	Type of Product	Drawing number
lġ.	terproofin	wa	Tel.:+37163707051 Faks: +37163724371
ot melted	panels. Ho	concrete p	Spodribas street 1, Dobele, LV-3701, Latvia
reinforced	nonolithic	baced on m	
ר on flat roof	inclinatior	Formation of	SIA "TENAPORS"



Facade plaster

Tenapors EPS70 facade thermal insulation

Hot melted roller waterproofing

Formation of inclination on flat roof baced on steel roof bearing structure.

Hot melted waterproofing.







* Charact

requirements and other legislation. ** Before choosing a solution, consult with a certified specialist regarding it's compliance with fire safety informaion is informative only - the actual values may vary depending on technical solution that has been chosen. * Characteristics such as thickness of the thermal insulation layer and bearing structure, and otherare technical



LJ-2018-9-7-ENG	Drawing number	Spodribas street 1, Dobele, LV-3701, Latvia Tel.:+37163707051 Faks: +37163724371	SIA "TENAPORS"
Roof	Type of Product	Flat roof drair	Name
1:10	Scale	nage funn	
September 2018	Date	el assembly.	











TENA®	SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvia Tel.:+37163707051 Faks: +37163724371	Name Formation of sl Sy	opes for ta stem VK-	apered roofs - 3
PORS	Drawing number	Type of product	^{Scale}	Date
	VK-2018-8-3-ENG	Roof	1:50	August 2018

Formation of slopes for tapered roofs - system VK-4





TENA®	SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvia Tel.:+37163707051 Faks: +37163724371	Name Formation of sl Sy	lopes for t /stem VK-	apered roofs - 4
PORS	Drawing number	Type of product	Scale	Date
	VK-2018-8-4-ENG	Roof	1:50	August 2018







	SIA "TENAPORS"	Name		
TENA®	Spodrības street 1, Dobele, LV-3701, Latvia Tel.:+37163707051 Faks: +37163724371	Formation of sl sy	opes for ta stem VK-	apered roofs - 5
PORS	Drawing number	Type of product	Scale	Date
	VK-2018-8-5-ENG	Roof	1:50	August 2018

Formation of slopes for tapered roofs - system VK-5