



TENAPORS L EPS

expanded polystyrene elements concrete slab foundations

INSTALLATION MANUAL

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1. General guidance

1.1. TENAPORS L EPS characterization

TENAPORS L EPS elements for concrete slab foundations are designed for construction of foundation for small residential buildings. By combining an element with insulating sheets, a mold is created in which concrete is poured and monolithic concrete slab is created. In this way, the concrete foundation does not directly touch the ground and so thermal bridges do not occur. This type of design does not only have a high resistance to ground slipping and deformation, but also has excellent thermal properties.

L EPS element must be durable, as it forms foundation to the whole house, so it is made of high strength EPS material that has a high compressive strength. Insulated foundation systems of similar design with various modifications have been widely used in the private sector in the Scandinavian countries, Germany, the United Kingdom and recently more often also in Eastern Europe. This popularity can be explained not only by the excellent thermal properties of EPS material but also by:

- 1. High compressive strength;
- 2. High durability;
- 3. Low water absorption;
- 4. Easy handling that does not require special tools or heavy equipment.

One of the most common mistakes made during construction or restoration of the building is too small or non-existent insulation of the foundation. Insufficient insulation of the foundation can increase the total heat loss of the building by about 15% -20%. Not paying enough attention to the thermal insulation of the bearing structures, can become one of the biggest problems during lifetime of house, because making changes in these structures can be problematic (or even impossible). Foundation insulation solution that we have developed is not only effecient and provides low heat loss but also:

- 1. It is easy to install and does not require special preliminary knowledge for assembly work;
- 2. Assembly works are easy to carry out labor costs are reduced;
- 3. High compressive strength and low water absorption ensure constant thermal insulation and technical properties over a period of more than 50 years;
- 4. Increased comfort of life;
- 5. The risk of thermal bridging is practically excluded;

- 6. It is possible to reduce concrete consumption by 30-60%;
- Compatible with modern warm floor solutions such as TENAPORS TERMO, TEAPORS TERMO PLUS and others.
- 8. In combination with thermal insulation of floor, it is possible to prevent unwanted heat losses, thus minimizing heating bills.

L element pluss

In order to maximize customer needs and compliance with the technical requirements of buildings TENAPORS L EPS is available in various sizes (Table No. 1). There are also 2 different types of elements (Figure No. 1):

- 1. Concrete slab foundation without warm floors L element;
- 2. Concrete slab foundation with warm floor L element plus.

Figure No. 1. TENAPORS L EPS types



Table No. 1. TENAPORS L EPS standard sizes

Length, mm	Width, mm	Height, mm	Insulation thickness, mm	L EPS types
2000	500	300 400	100	L element L element pluss

*Other sizes are available upon request

1.2. Installation guidelines

These guidelines describe the main rules that must be met while assembling TENAPORS L EPS element. To obtain desired result, it is necessary to ebbed L EPS element already in the start of project of the original building in order to ascertain the product's compliance with the technical design of the intended construction. If the technical solution is introduced during the project implementation, it is mandatory to coordinate changes with project author strictly paying attention to new solutions integration into existing project - especially for calculation of load-bearing loads.

1.3. Detailing

In the appendix to the installation guidelines, standard solution drawings have been added. Drawings specify standard assembly solutions and they are indivisible part of these guidelines. Solutions that have been drawn up are for general information only, it is imperative to consult with a certified specialist for the development of more detailed solutions

2. System building physics

2.1. Thermal insulation

Idea about TENAPORS L EPS element has been taken from Scandinavia, where it has become widely used due to its excellent thermal properties. The thermal conductivity of the foam polystyrene λ_{cl} is 0.034 W /m K. Long-term water absorber does not exceed 5%, that means that thermal properties of material will not significantly change in time, even it is installed in moist conditions. The water vapor diffusion coefficient μ is in the range of 40-100. By correctly installing the element and combining it with the thermal insulation of the floor, it is possible to achieve a heat transfer coefficient U of less than 0,10 W/(m2 x K).

2.2. Bearing load on the foundation

TENAPORS L EPS element is made of a material EPS 150, which has at 10% deformation a compressive strength of 150 kPa. Long-term compressive strength is the most important factor in building a foundation, in this case it is 45 kPa or 4.5 t/m². Elements from different grades of EPS material are also available according to customer demand, but this kind of products are used rarely.

The technology, which involves the construction of concrete foundation slab with L EPS elements, is most commonly used for the construction of wooden structures for 1-2 storey buildings in the private sector, where the long-term compressive strength that these elements provide is fully sufficient. Such foundations can also be used for the construction of private houses made of aerated concrete blocks or different building materials.

Before usage of the product, it is imperative to consult with a certified specialist about loadbearing loads to the foundation. TENAPORS L EPS element compressive strength is shown in Table No. 2.

Table No. 2. TENAPORS L EPS compressive strength

TENAPORS L EPS material grade	Compressive strength at 10% deformation	Long term compressive strength (2 % deformation, 50 years)
EPS 150	150 kPa	45 kPa
EPS 200	200 kPa	60 kPa

3. Preparatory work

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

TENAPORS L EPS assembly requires following tools:

- Level;
- Pencil or marker;
- Hammer;
- Hand saw or knife;
- TENAPORS L EPS nail plate;

To cut the TENAPORS L EPS to the required size, use either an sharp knife or a saw, before cutting carefully measure and mark it with marker. To keep the slabs together and to avoid formation of gaps between the joints during concrete poring, it is necessary to use nail plates. These fasteners can be fixed manually by hand or using a hammer.

4. Installation

4.1. Preparatory work

TENAPORS L EPS elements should be assembled on pre-leveled surface. To ensure the stability of the foundation, carefully prepare the ground first by removing the black earth layer and leveling the bearing soil. Next at least 150mm thick sand or crushed stone layer is created. This layer is carefully compacted to avoid ground deformation during buildings lifespan. It is advisable to place a geotextile layer below crushed stone layer, this also will prevent any deformation beneath foundation slab. Before installing the foundation, it is desirable to install a drainage system around the entire perimeter of the building - in this way the effect of moisture on the foundations of the building during its operation will be significantly reduced.

4.2. Setting up

In order to ensure the load bearing capacity of the slab bases throughout its lifetime and to achieve the intended thermal performance it is important that there will not form any gaps between the slabs during the concrete slip. To ensure maximum persistence between L EPS elements it is advised to use specially designed nail plates. Placement of all necessary fixings is possible to see in figure No. 3, all types of fixings have been shown in figure No. 2 and their amount can be found in table No. 3.

If seems will not be airtight during pouring concrete it is possible that concrete will get in to gaps or air gaps will be formed. Air gaps can form undesirable air circulation beneath foundation and cause additional heath loss. Thermal conductivity of concrete is much higher than it is for insulation materials and unexpected thermal bridges can appear – this will also result in higher heath losses. There are different solutions from mechanical fixing units that can prevent formation of gaps and they are:

- 1. Seems can be filled with additional polyurethane adhesive;
- 2. Additional separation layer can be fixed between concrete and insulation material by installing layer from geotextile or other material with good vapor permeability.

Ensuring that the elements are not offset, before pouring concrete around the perimeter of the foundation, the elements should be supported by leveling ground up to L EPS element upper edge. Movement of mold could result in deformation of foundation slab, which at the start can be unnoticed but in time could result in unwanted movement of construction.

In situations when floor insulation consists of more than 1 layer it should be fixed to L EPS element and layer to layer by plastic nail. This solution is used because EPS material is much more lighter material than concrete and could be lifted up during concrete pouring. In this case seems of each layer should not overlap and can additionally be fixed together with nail plates and also polyurethane adhesive. This additional fixing will prevent formation of unvented gaps between insulation plates. Amount of needed mechanical fixings can be seen in table No. 3.

Table No. 3. Amount of mechanical fixings.

Location of fixing	Type of fixing	Usage	Amount, pcs
L EPS elements upper part - between	Nail plate	To ensure tight seems	1 pcs/fixing
elements			
L EPS elements lower part – between	Nail plate	To ensure tight seems	1 pcs/fixing
elements			
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

Figure No. 2. Mechanical fixings.



Figure No. 3. Location of fixings.



5. System drawings



NOTES: Characteristics such as the diameter and amount of reinforcement, the strength of concrete, the concrete floor and the foundation thickness and required strength of the EPS are only informative. In order to clarify the actual values, it is necessary to consult to with a certified engineer.

* The thickness of the thermal insulation shown is informative in order to be able to achieve heat transfer coefficient values for residential floors (U = 0,15k). Actual values may vary depending on the characteristics of the building being designed.

** To clarify the need for a reinforcing mesh, contact a certified engineer.

A	SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	Drawing Construction scheme - insulated foundation slab.		
KS	Drawing number LE-2018-7-1-ENG	Type of product Foundation	_{Scale} 1:10	Date July 2018

1.table. Thermal insulation materials used

Product	Picture
Tenapors EPS 70/100	TT
Tenapors L EPS	
	Product Tenapors EPS 70/100 Tenapors L EPS



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A	SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	Drawing Construction scheme - insulated foundation slab. Soil with high moisture content.		
(S	Drawing number	Type of product	Scale	Date
	LE-2018-7-2-ENG	Foundation	1:10	July 2018

1.table. Thermal insulation materials used

Nr.	Product	Picture
1.	Tenapors EPS 70/100	T
2.	Tenapors L EPS	



1.table. Thermal insulation materials used

Nr.	Product	Picture
1.	Tenapors EPS 70/100	T
2.	Tenapors L EPS PLUS	
3.	Tenapors Termo PLUS	

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	SIA "TENAPORS"	Drawing		
A	Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	Construction scheme - insulated foundation slab with heated floors.		 insulated eated floors.
	Drawing number	Type of product	Scale	Date
	LE-2018-7-3-ENG	Foundation	1:10	July 2018



1.table. Thermal insulation materials used

Nr.	Product	Picture
1.	Tenapors EPS 70/100	T
2.	Tenapors L EPS PLUS	
3.	Tenapors Termo PLUS	

NOTES: Characteristics such as the diameter and amount of reinforcement, the strength of concrete, the concrete floor and the foundation thickness and required strength of the EPS are only informative. In order to clarify the actual values, it is necessary to consult to with a certified engineer.

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SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	Drawing Construction scheme - insulated foundation slab with heated floors. Soil with high moisture content.		
Drawing number LE-2018-7-4-ENG	Type of product Foundation	_{Scale} 1:10	Date July 2018
	SIA TENAPORS Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371 rawing number LE-2018-7-4-ENG	SIA TENAPORS Construction Spodrības street 1, Dobele, LV-3701, Latvija foundation sl Tel.:+37163707051 Faks: +37163724371 Soil with hig rawing number Type of product LE-2018-7-4-ENG Foundation	SIA TENAPORS Construction scheme Spodrības street 1, Dobele, LV-3701, Latvija foundation slab with he Tel.:+37163707051 Faks: +37163724371 Soil with high moistur rawing number Type of product LE-2018-7-4-ENG Foundation



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	SIA "TENAPORS"	Drawing		
TENA®	Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	The partition wall construction scheme - insulated foundation slab.		
PORS	Drawing number	Type of product	Scale	Date
	LE-2018-7-5-ENG	Foundation	1:10	July 2018

1.table. Thermal insulation materials used

____ Nr. Product 1. Tenapors EPS 100/150/200

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NOTES: Characteristics such as the diameter and amount of reinforcement, the strength of concrete, the concrete floor and the foundation thickness and required strength of the EPS are only informative. In order to clarify the actual values, it is necessary to consult to with a certified engineer.

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** To clarify the need for a reinforcing mesh, contact a certified engineer.

SIA "TENAPORS" Spodrības street 1, Dobele, LV-3701, Latvija Tel.:+37163707051 Faks: +37163724371	Drawing The partition wall construction scheme - insulated foundation slab with heated floor.		
Drawing number	Type of product	Scale	Date
LE-2018-7-6-ENG	Foundation	1:10	July 2018

1.table. Thermal insulation materials used

Nr.	Product	Picture
1.	Tenapors EPS 100/150/200	T
2.	Tenapors Termo Plus	