

## Noise barrier system

The Liapor noise barriers are proven in many places around the world. The barriers have been proving to be the effective anti-noise system at busy traffic areas, noisy operations of industrial plants and other similar situations for over 30 years. The Liapor noise barrier system not only allows high acoustic efficiency, but due to its structural design and easy installation it requires a minimal maintenance and it has a wide selection of architectural designs.

### Description of the Liapor noise barrier system



The Liapor noise barrier system offers highly effective protection against the harmful effects of noise from the ever increasing traffic load. In terms of airborne sound insulation the noise components fall into the category **B3** ( $DL_R > 24$  dB), in terms of sound absorption in the category **A3** ( $DL_\alpha > 8$  dB) or A4 ( $DL_\alpha > 11$  dB)

## Prefabricated acoustic panel (wall panel)

Double-layered concrete panels consist of sound-proof plate, which also performs the structural functions and the absorption layer of the profiled, lightweight Liapor-concrete aggregate. Both layers are connected at the factory using the “fresh to fresh” method and form a monolithic unit.

### Concrete plate

- Thickness: 110-130 mm (may be thicker)
- Basis weight: 275-350 kg/m<sup>2</sup>
- Concrete: C 30/37 – XF4

### Absorption layer

- Consists of a flawed lightweight concrete made of the Liapor MLB 2 aggregate (750 kg/m<sup>3</sup>)

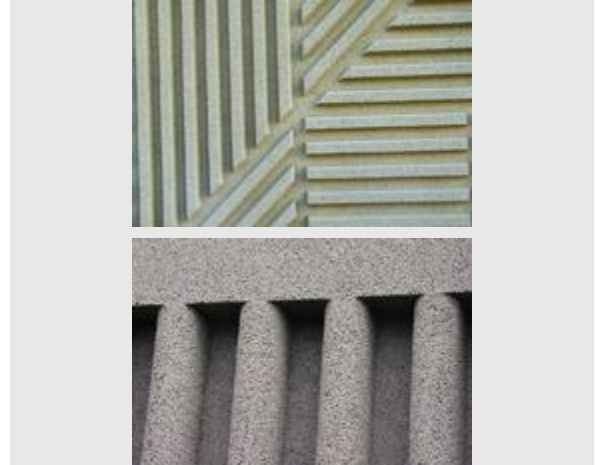
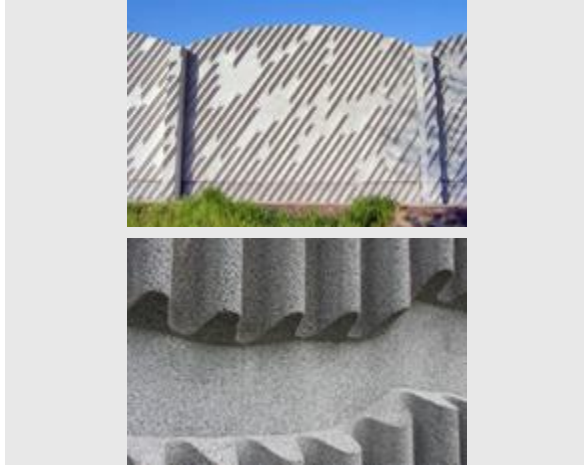
### Maximum size of sections:

- Maximum length of 6 m (can save up to one third of the cost of columns and ground work)
- Maximum height 3,5 m
- Dimensions of the sections can be flexibly adjusted according to the investor’s specifications and the project documentation.

In terms of transportation the most suitable are the panels measuring up to the height of 2,6 m. The higher panels require a special transport.

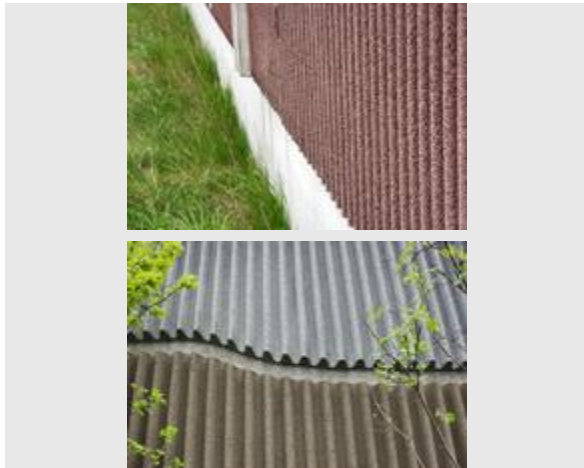
## Shape of surfaces

- The surface of absorption layers is made in the rubber or wooden molds, which allows for a wide selection of shapes.
- Rear side of sections - the surface of the carrier plate can be also modified according to customer requirements. It can be provided with the lamella, or "brushed" or "raked" structure.



## Selection of colors

- **The concrete mixture is colored already during the production:** Sections can be colored in full thickness of both layers, or only from the outer side. The selection of colors is wide, but the most frequently used colors are natural grey, yellow, red or brown.
- **Additional spray:** The sections can be provided with additional spray consisting of Metaenamel paints in any RAL color shades, manufactured by Metalcrom, which do not reduce the sound-absorbent ability of the walls.



## Columns

The supporting columns are made of rolled steel sections HEA (BBB) 160 - HEA (BBB) 220, or we use the precast reinforced concrete columns in the shape of letter "H".

## Precast concrete columns



- **Concrete: C 30/37 – XF4.**
- **Length: 200–600 cm.**
- **Surface finish: the surface can be painted.**
- The column length depends on the project documentation; the maximum length is 6 m.

## Steel columns



- **Type HEA, HEB 160 - 220**
  - The lower portion of the column is fitted into the cup at the base. This part of the column is not surface-treated. Surface protection of the column begins 100 mm below the surface level of the base.
  - The actual surface protection is specified by the investor's and designer's requirements.
  - When the columns have been installed and the panels have been assembled, it is necessary to check whether there has been no damage to the surface protection and any damage should be repaired.
- Their shape is constant for all heights of noise barriers.
  - The possibility of supplying corner columns for the break walls at angles - 15°, 30°, 45°, 60°, 75° and 90°
  - Surface of columns and colors are variable.
  - Saturation of colors on the columns is achieved by spray paint or by coloring the concrete.
  - Finishing of the concrete columns surface is made with special plates inserted into the mold during the casting of columns.
  - Method of column reinforcement varies depending on its length and the installation area.
  - The opening for manipulation is located at the top of the column.
  - For railway transportation the columns are also accompanied by threaded containers designed to connect the conductive segments and subsequent movement of noise barriers.
  - **Surface protection:**
    - Blast to Sa 2,5 dle ISO 8501
    - Hot dip galvanization - 80 µm
    - 2k-DB EG - 100 µm
    - 2K-DC lack - 80 µm
  - Dimension of the column and its type is specified in the project documentation and it depends on the choice of wall panels and the height of noise barriers.
  - The columns are installed in an upright position. The handling of the column is made through a hole in its upper part, through which the crane hinge is passing.

# Foundations of the Liapor noise barriers

The Liapor noise barriers are usually installed by three methods: through the establishment of bored pillars, anchors drilled into the concrete structure, or with the precast concrete footings.

## Prefabricated footings



Installation of columns in the concrete footings is used primarily in the areas with soil characteristics unsuitable for drilling, inaccessible for the drilling rig

## Reinforced concrete piles (base drilled into the ground)



Borehole diameter and its depth depends on the height of noise barriers, the type of the columns and soil characteristics. This provides a structural analysis for noise barriers.

Steel cage is inserted into the hole and the body of the pillar is filled with concrete (minimum C 25/30) up to the level of the working joint approximately 700

## Anchoring of columns into concrete structures



and places with a frequent occurrence of engineering networks (usually near railroad tracks).

Minimum height of the footing is 80 cm. The footings can be prefabricated or monolithic. Columns are usually fitted into the cup with the depth of 550 mm. In exceptional situations they are installed before the casting. Dimensions of footings, reinforcement and the type of concrete are specified in the project documentation. The footings are usually wrapped in a net only at the bottom surface.

The type of concrete used: C 30/37 – XF4

mm below the final top of the face pillar (the pile header), where the center of the column is determined, the hole is drilled and the pin assembly is mounted. This is followed by the column installation, alignment of its verticality and the concreting of the column (C 30/37 - XF4) into its final position.

The borehole is usually reinforced by the steel cage made of  $\varnothing 8$  mm thick spiral wire, reinforced with  $\varnothing 20$  mm longitudinal rods. The spiral pitch is typically 300 mm, which at the top of the borehole, in the last 80 cm, thickens to 150 mm. Profiles of the bars are approximate. The exact design of reinforcement is determined by structural analysis and design documentation.

The concrete structure (the pillar, a concrete strip, bridge ledge, retaining wall) is drilled up to the length of 300 m and subsequently the steel column is attached to the anchor through the base plate.

# Benefits of the Liapor walls

**Compared to other acoustic systems, the Liapor noise barriers have a number of advantages:**



## Long life span

- According to studies, the life span of the Liapor walls is up to 50 years. This is more than three times the lifetime of plastic or wooden noise barriers.
- Durability of concrete noise barriers is not affected by high temperatures or UV radiation, as is the case with plastic noise barriers.
- In addition, the concrete layer is not subject to moisture absorption and mildew, such as the mineral wool used as an absorber in the plastic, aluminum and wood systems.

## Saving one third of the cost of columns and ground work

According to structural calculations individual wall panels up to 6 m and with a minimum deflection can be used in strong winds also. At the length of 6 m we can save on a number of columns and the cost of ground works up to one third of the cost. Other

noise barrier systems usually allow for the maximum field length of 4 m.



## Possibility of recycling

The Liapor noise barrier system is environmentally friendly. The wall panels can be recycled. Recycling is usually not possible due to the preservatives used in the wood systems.

## High level of sound insulation

- $DL_R > 45$  dB
- Sound insulation with other materials is also lower due to their lower base weight.

## Optional level of sound absorption

The degree of sound absorption is dependent on the thickness of absorbing layer and the waveform. The achieved values place the noise barrier components in the category A2, A3 and A4.



## Heat resistance of concrete sections

Compared to plastic and other acoustic systems, the Liapor walls are resistant to high temperatures and fire.

## Wide selection of architectural designs



The molding technology we use enables the creation of virtually any shapes of the sections (trapezoidal, triangular and curved). Plastic and aluminum systems are in this respect limited.

### **Color variety**

Coloring of the sections already in the production or spraying on the site can achieve a variety of color shades.



The ideal surface for climbing plants

### **The ideal surface for climbing plants**

The rough surface of sections is a good precondition for easy growing of climbing plants and greenery. To grow greenery, most other systems require a support structure.

### **Maintenance-free operation**

Due to the characteristics and structure of the absorption layer made of the Liapor aggregates, the harmful effects of humidity and exposure to chemical de-icing substances are not visible on the Liapor walls. At the same time the free moisture penetration into the spaces between the grains allows for the self-cleaning effect on the surface of the absorption layer. For this reason, the Liapor

noise barrier system does not have to be covered on the top and it is therefore completely maintenance-free.



Noise absorption on both sides

### **Easy installation**

Installation of the walls is carried out without the use of fasteners (screws, nails, etc.) - the two plates are connected already at the factory, thus eliminating their connecting and the threat of loosening of fasteners and the risk of falling plates.

### **Noise absorption on both sides**

The system offers two-sided absorbing walls, again in different surface versions.

### **Other advantages over other systems**

- No risk of bird collisions such as with the walls made of transparent plastic or glass.
- No risk the walls can be stolen, such as with the walls made of aluminum.

### **The Liapor noise barriers can reduce exhaust emissions**

The Liapor noise barriers reduce both the noise pollution caused by the road traffic, but they can also significantly contribute to the reduction of environmental pollution. Population of the significant part of the Czech Republic is exposed to high noise pollution and air pollution especially in big cities and near main roads, caused by the road traffic and exhaust emissions of the nitrogen oxide NO<sub>x</sub>.

A completely new and technologically interesting solution on how to reduce emissions of air pollution is the Liapor system using the TX Active technology. It uses the natural process of photo catalysis, the action of light which leads to degradation of many substances, including airborne pollutants. Since under natural conditions the process of photo catalysis is slow, the reaction rate can be accelerated by using a photo catalyst, which is titanium dioxide  $TiO_2$ . That is activated by the UV-A radiation and can break down the gaseous nitrogen oxides  $NO_x$ .

Ideal places for applying this technology are the concrete noise barriers, which not only reduce the noise in the area, but also significantly improve the quality of air.