



**BUDAN**  
**h500**

**Manual  
for  
contractor**

PW "BUD-MASZ" MACIEJ STACHLEWSKI,

*ensures the high quality of its products - BUDAN anti-noise acoustic panels and guarantees that the panels will maintain the stability of acoustic and anti-corrosion parameters if they are properly installed and the appropriate rules of transport, storage, use and maintenance are applied.*

***All works related to the assembly and maintenance of BUDAN panels should be carried out by persons with appropriate qualifications to perform specific works as well as knowledge and skills in the field of assembly and operation of aluminum products.***

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## BUDAN PANELS

Bud-Masz has been continuously producing noise-reducing aluminum acoustic panels since 1998, which are fillings for noise barriers and anti-noise enclosures.

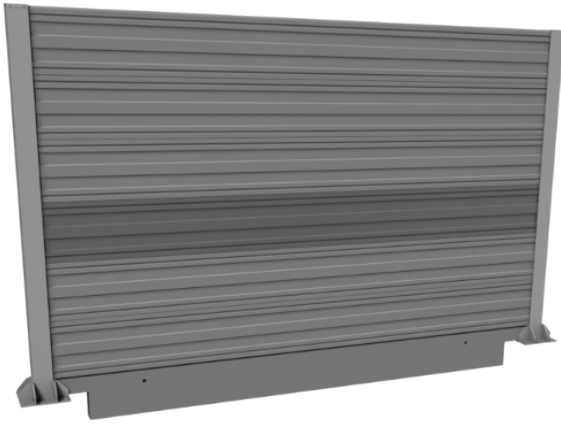


Figure 1  
Assembled span of a noise barrier with BUDAN panels

BUDAN panels are characterized by:

- low construction costs,
- the highest acoustic parameters <sup>1</sup>,
- high aesthetics
- any color matching the surroundings,
- possible anti-graffiti coating - high resistance to vandalism,
- service life of at least 30 years,
- extended warranty up to 10 years
- constant monitoring of the quality and parameters of panels,
- resistance to weather conditions and corrosion,
- resistance to fire - non-combustible materials,
- environmental protection - all materials used in production are recyclable,
- lightweight and modular design for quick assembly.

### GENERAL REMARKS

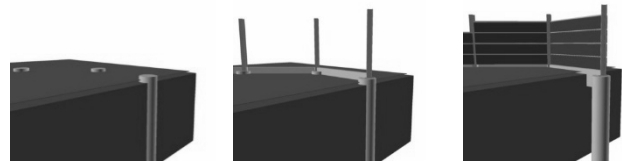
The dimensions of the noise barriers and their location in relation to noise sources and in relation to noise-protected zones should be specified in the individual acoustic design taking into account the properties of BUDAN panels. When selecting panels during the design process, attention should be paid to

their acoustic properties <sup>2</sup>.

The noise barrier made of panels, as a lightweight structure, can be placed on foundation piles. Depending on the type of investment, it is proposed to make drilled foundations (e.g. using the CFA method) or to drive prefabricated foundations. Both the length and diameter of the pile should be selected for a specific implementation, taking into account the ground conditions, the height and the location of the noise barrier construction.

When designing the foundation spacing, the maximum length of the panel should not be forgotten.<sup>3</sup>

The most common construction for mounting panels are I-section load-bearing columns.



Depending on the method of foundation, the column structure can be equipped with a mounting base <sup>4</sup> or it can be poured directly into the foundation pile.

In order to maintain the acoustic properties of the assembled noise barrier, the space between the panel and the ground should be filled. ground beams are most often used. The shape of the beam should be matched to the dimensions of the panel and structure, and should also take into account the terrain.

The acoustic noise barrier made of BUDAN panels may also contain other elements, individually designed by the designer. Among them, the following can be distinguished:

- additional finishing of the upper part of the noise barrier with processing,
- additional elements of the load-bearing structure pole protecting the panels against theft,
- transparent modules <sup>5</sup> - can be combined with transparent noise

<sup>1</sup>Complies with the harmonized standard EN 14388:2005; -EN 14388:2005/AC:2008., classes A4, B3 - the highest sound absorption and insulation

<sup>2</sup>The basic acoustic parameters are given by classes A (absorption) and B (insulation)

<sup>3</sup>For a typical panel  $L_{max} = 5000mm$

<sup>4</sup>Base to be screwed onto the pile anchors

<sup>5</sup>Components from other manufacturers must be compatible with BUDAN panels

barriers,

- additional safety elements such as emergency exits, fire protection culverts,
- without additional elements, the noise barrier can be planted with climbing plants, as in the case of "green wall" noise barriers <sup>6</sup>.

## DIMENSIONS OF BUDAN PANELS

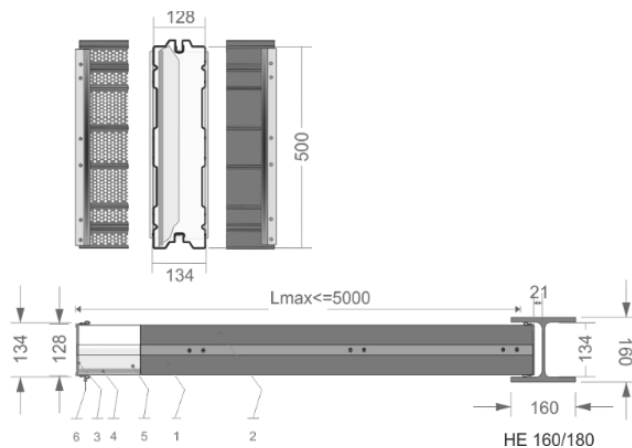


Figure 2

Panel BUDAN h500 Standard

BUDAN panels have standard dimensions:  
 modular height 500mm (except for non-standard solutions) <sup>7</sup>,  
 width 128mm + anti-vibration gaskets = from 134mm to 152mm <sup>8</sup>,  
 any length of the panels from 500mm to 5000mm <sup>9</sup>,  
 the length of the installed panels should be less than the installation clearance. <sup>10</sup>

Due to the cassette structure of the panels, the dimensional tolerance of the panel length is  $\pm 5$ mm.

## PACKING

BUDAN panels are packed on returnable wooden pallets. Basic parameters of pallets with BUDAN panels:

Parameter	Value maximal	iu
Pallet height	2.40	[m]
Pallet width	1.23	[m]
Pallet length	6.00	[m]

<sup>6</sup>Common name for panels made of galvanized frames and steel bars filled with mineral wool

<sup>7</sup>Does not apply to cut panels

<sup>8</sup>The type of gasket attached to the panel is suitable for installation on wide-leg I-beam poles: - HEB160/HEA160 (internal width 134mm) or on special order - HEB180/HEA180 and C160).

<sup>9</sup>6000mm length is possible for customized solutions

<sup>10</sup>For example, a span length of 5000 mm (axle spacing of columns), a panel with a total length of  $4955 \pm 5$  mm should be installed.)

Pallet weight	2000	[kg]
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Figure 3

Parameters of transport pallets

stretch foil at the customer's request .

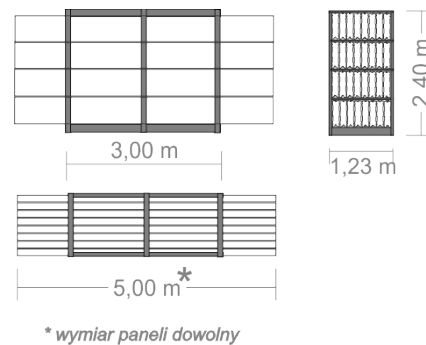
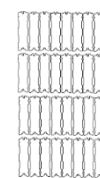


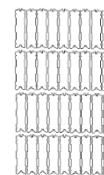
Figure 4

Dimensions of pallets with panels

Due to the different dimensions of the panels, the length of the pallet may vary. In the case of shorter panels, they are connected in rows on a pallet.



HEB160 -36 pcs



HEB180 -32 pcs

Figure 5

Number of panels on a pallet

The number of panels on a pallet may vary depending on the order and depending on the length of the panels. The panels are arranged in 4 rows and in 8 or 9 columns, depending on the type of anti-vibration gasket included with the panel, adapted to the cross-section of the load-bearing structure column.

## TRANSPORT

Only the following vehicles may be used to transport BUDAN acoustic panels:

- technically efficient,
- covered,
- with a load box that allows loading from above and from the side.

Loading spaces must be clean. The planes of the walls and the ground must not have protruding nails or other sharp elements. Protruding elements must be properly secured so as not to damage the panels.

The length of the truck (load box) must be such that the pallets rest along the entire length of the means of transport. It is not allowed to put the pallet outside the loading box of the means of transport.

If, after loading, the total length of the tractor with the semi-trailer and panel packages exceeds 16.5 m or the total length of the articulated vehicle (car + trailer) with panel packages exceeds 18.5 m, the carrier must obtain a special transport permit.

Taking into account the condition of public roads, drivers transporting acoustic panels are obliged to periodically <sup>11</sup>check the effectiveness of fastening the cargo (pallets) and, if necessary, improve the fastening and securing of the cargo.

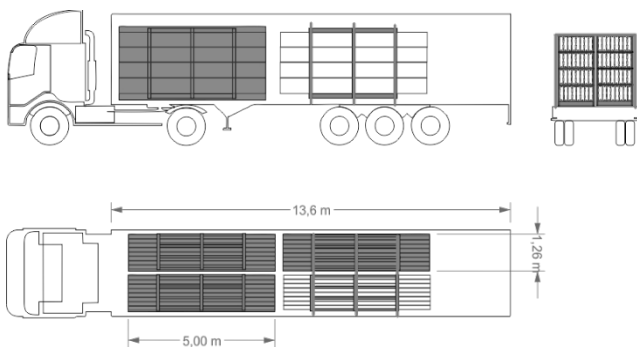


Figure 6

Fastening the transport belts

The recommended width of the loading area is 2500mm, the required height of the loading area in covered vehicles is at least 2600mm, and the maximum speed of transporting panels is 70km/h.

The truck collecting the panels must be equipped

with lashing straps <sup>12</sup>to secure the load on the load box. The number of strips depends on the length of the panels; lane spacing 3 lanes per stack of 2 pallets side by side, 6 to 9 lanes in total.

It is recommended that the vehicle carrying the load should be equipped with 2 sets of flat slings with lugs, approx. 6 m long and with a lifting capacity of 30 kN for unloading.

Depending on the type and length of the panels, 4 or 6 standard pallets can be packed per truck with a semi-trailer with a length of 13.6 m. This corresponds to an amount of 280m<sup>2</sup> to 400m<sup>2</sup>.

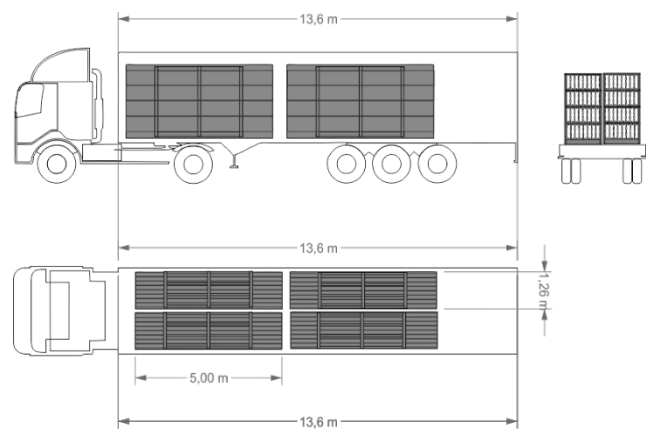


Figure 7

Loading of 5 m long panels

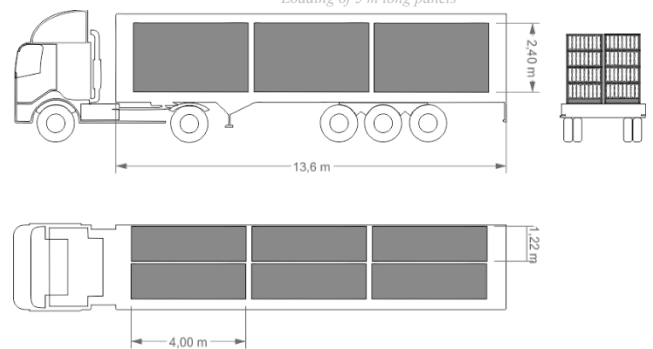


Figure 8

Loading of pallets with 4m long panels

<sup>11</sup>First 5km, next 100km and each subsequent 100km

<sup>12</sup>Belt width min. 50mm

## UNLOADING

Before unloading the BUDAN panels, check the technical condition of the packaging by visual inspection.

Before unloading, unfasten the securing straps on the truck.

***Unloading the originally packed panels from the car should be done using a forklift or manually. It is unacceptable to unload with a crane, except for pallets with a reinforced structure. These pallets are specially marked and made to order .***

***In the case of installation of panels at a high height, please inform us in advance (during the order) in order to strengthen the pallets transported by a crane.***

During unloading, the buyer is obliged to make a qualitative and quantitative acceptance of the products in terms of obvious defects, confirmed by the acceptance report or confirmation of the entry on the WZ document <sup>13</sup>.

***If panels with obvious defects are installed, the product is not covered by the warranty.***

Qualitative and quantitative defects are considered to be:

- dimensional discrepancies,
- color discrepancies,
- any mechanical damage,
- scratches and cracks in paint coatings,
- quantitative discrepancies of the assortment.

Depending on the length of the panels, pallets can be unloaded:

- manually,
- by forklift,
- using a crane <sup>14</sup>, using a beam traverse and 4-rope loop slings with flat slings and eyelets approx. 6m long.

***Pallets must not be stacked during unloading.***

Pallets should be unloaded in places not exposed to mechanical damage, away from chemical substances, on a level and paved area.

Pallets and panels after unloading should not be

submerged in water, have direct contact with other liquids and loose substances, in particular with the ground.

***If you notice damage to the goods before or during unloading, note it in the waybill (WZ). If possible, take photo documentation.***

***Do not install damaged panels!***

***BUD-MASZ does not bear the cost of replacing installed, damaged panels.***

### MANUAL UNLOADING

The weight of the panel varies depending on the type and length and ranges from 10kg/m to 15kg/m.

It is possible to manually lift and move the panel by 2 people.



Figure 9  
Manual handling 2 people

### UNLOADING WITH A FORKLIFT

When unloading with a forklift, pay particular attention to the lifting capacity of the forklift.

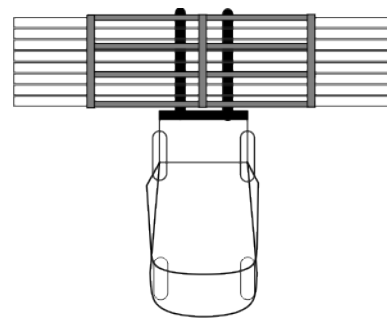


Figure 10  
Pallet support area

The forklift should be able to lift a pallet weighing 2.5 tons and the fork spacing should be adapted to the pallet width of 1.23 m.

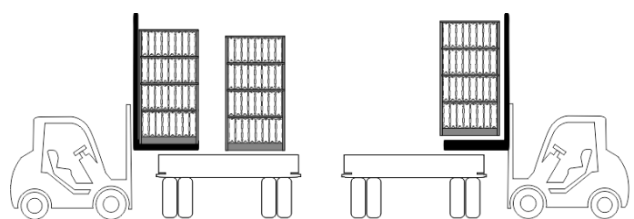


Figure 11  
Side unloading on both sides of the truck

<sup>13</sup>Material issue document from the warehouse

<sup>14</sup>With reservations for reinforced pallets

**Each time the pallet should be removed from the truck using a forklift truck, it should be performed by a person trained and authorized to operate a forklift truck.**

The pallet should be lifted centrally, the forks should be placed symmetrically between the middle vertical board and the middle board of the pallet base.

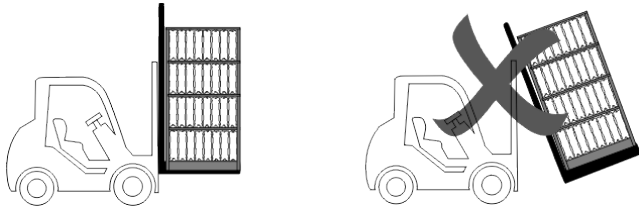


Figure 12

*Placing the pallet and transporting it with a forklift*

When unloading, pallets should be removed one at a time from each side of the truck or from the top if pallets are lifted by crane.

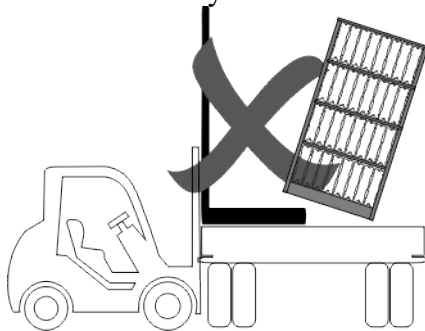


Figure 13

*Improper unloading with mismatched forks can damage the pallet*

## UNLOADING BY CRANE

**Unloading by crane may only be carried out for pallets with a reinforced structure .**

Reinforced pallets are specially marked and made to order.

**Pallets must be lifted one at a time.**

Pallets should be lifted using a beam traverse and 2- or 4-rope loop slings.

## REMOVAL OF PANELS FROM PALLETS

After unloading the pallets of the truck, in order to remove the panels, the side and top wooden elements of the pallet must be detached <sup>15</sup>.

After dismantling, all wooden elements should be stored in a place not exposed to direct contact with dirt or water.

All wooden elements of transport pallets are returnable elements.

Removing panels from pallets should be done manually.

## STORAGE AND INTERNAL TRANSPORT AT THE CONSTRUCTION SITE

Panels stored outdoors should be thoroughly cleaned of plastic transport protection ( stretch foil ).

Pallets and panels should be stored on even and hardened surfaces.

It is absolutely necessary to avoid placing pallets and panels directly in places:

- with water accumulation,
- with high dust levels,
- exposed to mechanical damage,
- exposed to strong chemical compounds,
- with a particularly aggressive alkaline environment,
- with a particularly aggressive acidic environment,
- with direct long-term contact with: salt, its solutions and derivatives,
- with direct long-term contact with smoke, tar, oil and its derivatives,
- with direct long-term contact with animal feces,
- with direct long-term contact with other chemical compounds that may permanently damage the paint coating or contribute to aluminum corrosion.

Failure to comply with the storage rules may damage the panel coatings in the long term.

***If the panels are stored and installed later than 30 days from the date of production, the foil protecting the panels during transport must be removed.***

***It is not allowed to stack pallets with panels in the storage place.***

<sup>15</sup>In the case of pallets screwed using a screwdriver with a suitable tip, in the case of pallets nailed with a hammer



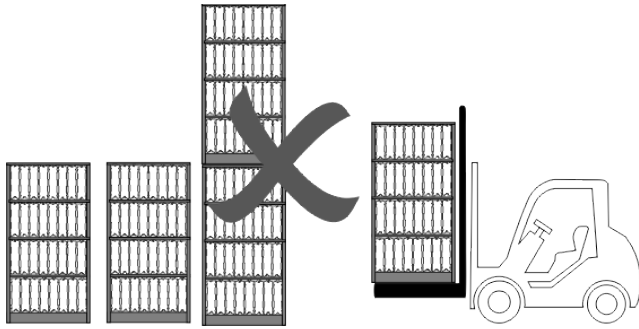


Figure 14  
Pallets cannot be stacked

Internal transport at the construction site should be carried out using a forklift - in the case of moving entire pallets or manually - in the case of moving individual panels.

It is unacceptable to move or push the pallets without lifting them.

All wooden elements of the pallet are reusable and are a returnable element for which the manufacturer may charge a deposit.

## PREPARATION FOR ASSEMBLY

Before starting the installation of acoustic panels, the supporting structure should be checked for accuracy and compliance with the design <sup>16</sup>.

Particular attention should be paid to:  
whether the spacing of columns and their cross-section correspond to the design,



Figure 15  
The noise barrier alignment is correct

whether the pole is set correctly vertically,  
whether the linearity of the columns in the line of the noise barrier is maintained,  
ground beams or other elements included in the design that may affect the assembly of panels <sup>17</sup>.

***In the event of errors or inconsistencies, the Site Manager and the supplier of panels or the Manufacturer should be informed .***

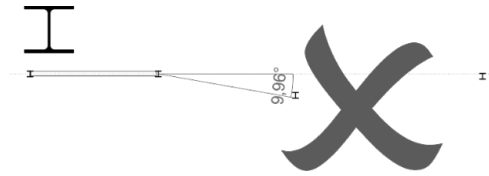


Figure 16  
The noise barrier linearity is incorrect

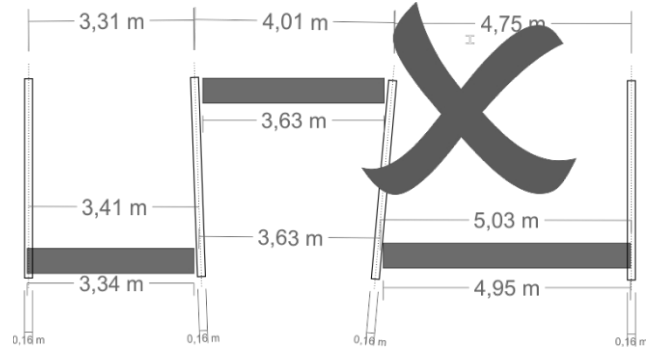


Figure 17  
Incorrect vertical positioning of the structure

Proper preparation of the structure will ensure trouble-free installation of panels prepared for a specific project.

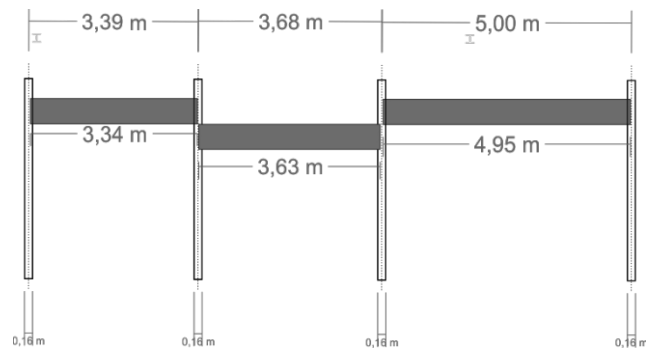


Figure 18  
Correct vertical alignment of the structure

***It is forbidden to carry out any welding or painting works in the vicinity of the panels, as it may cause permanent damage to the paint coatings .***

## PROTECTIVE FILM

Acoustic panels can be protected against dirt and damage with a protective film. Already after a short time, due to the influence of atmospheric factors, the film may vulcanize, crack and there may be difficulties with its removal.

The Buyer undertakes to remove the protective film from the acoustic panel cladding within 60 days from the production date or delivery date specified in the WZ document, but not later than before starting the installation.

***In the event that a panel defect is revealed after removing the foil, the Buyer undertakes to stop***

<sup>16</sup>Any differences must be removed before installation  
<sup>17</sup>If they were designed

*installing subsequent panels and immediately report defects to the supplier or Manufacturer, i.e. no later than before installing subsequent panels.*

*The Supplier and the Manufacturer shall not be liable for the damage suffered by the Buyer as a result of installing defective Goods, in particular for the costs of disassembly and reassembly of acoustic panels.*

## INSTALLATION

*The installation of the panels must be carried out in accordance with the applicable instructions, approvals, Polish standards and building practice.*

Installation of panels should take place no later than 180 days from the date of their production. Before installation, it is necessary to remove the foil protecting the panels during transport. It is unacceptable to install the panels together with the protective foil.

When installing the panels, do not use tools that may damage the paint coating.

The following activities are strictly forbidden:

- hitting panels,
- lowering panels from a height in the structural column profile,
- panel cutting,
- panel drilling,
- unscrewing the panels,
- panel riveting,
- any other mechanical intervention

During assembly, the panels should be gently inserted between the shelves of structural columns.

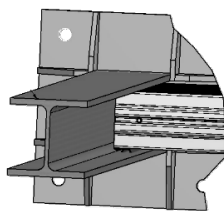


Figure 19

*Inserting the panels into the pole*

The panels are installed horizontally.

BUDAN acoustic panels are installed with the perforated side facing the noise source.

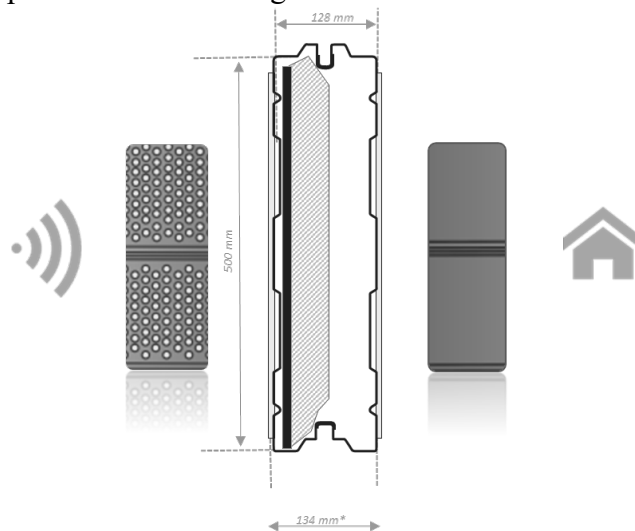


Figure 20

*Assembly BUDAN h500 Standard*

The BUDAN panels have been equipped with their own stabilizing gaskets, thanks to which the assembly takes place only by inserting the cassette into the previously prepared structure. The low weight of the elements assembled in the traditional way enables assembly without the use of a crane.

Before starting the assembly, check the structure for accuracy and compliance with the design.

In the case of assembly of spans over 20 m<sup>2</sup> made of BUDAN panels, it is necessary to use transoms in the structure that transfer vertical loads.

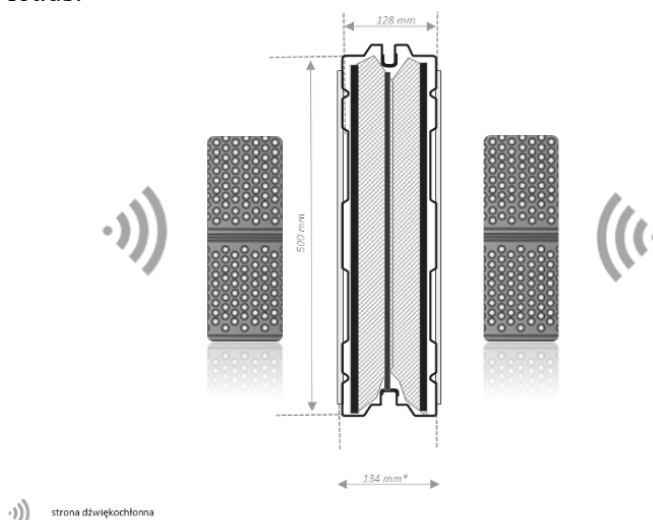


Figure 21

*Installation of the BUDAN h500 PA panel*

Do not install the panels when the wind speed exceeds 10 m/s, as well as during precipitation and lightning or in dense fog. For panels in dark

colors, it is recommended to carry out installation at temperatures from 10 °C to 25 °C. The manufacturer is not liable for damage caused by the use of inappropriate installation and assembly materials, such as:

- silicones,
- glues,
- varnishes and solvents,
- other materials that may react chemically with the elements of the product.

The manufacturer is not liable for product defects resulting from their combination with other items that are not the manufacturer's products or products not recommended by the manufacturer or mounted directly to the panels without the consent of the manufacturer, including in particular:

- all kinds of gratings,
- rope,
- security elements,
- other elements not related to the product and attached to the panels.

As a standard, BUDAN panels are installed in wide-leg columns by sliding them from the top between the shelves of I-beams.

***There is no need to screw the panels to the supporting structure.***

It is allowed to use structures made of other profiles if they have been designed by a person with appropriate design qualifications.

***It is unacceptable to install panels in structural columns that do not match the thickness of the panel***<sup>18</sup>.

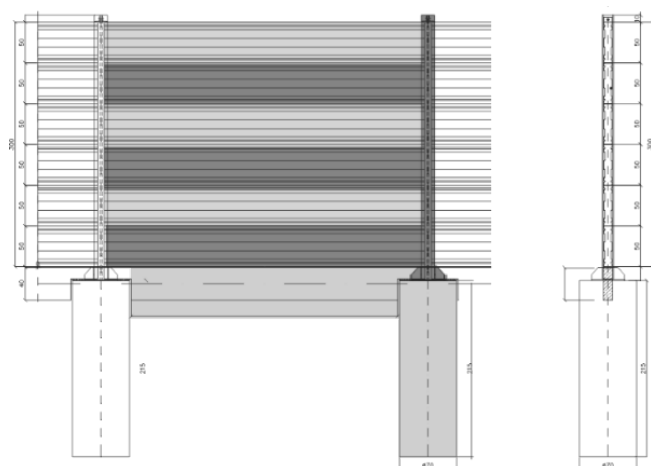


Figure 22  
Acoustic noise barrier - general view

<sup>18</sup>Panel with the anti-vibration gasket included in the set

The span of the anti-noise noise barrier (enclosure) with BUDAN panels should consist of load-bearing structure pillars embedded in the foundation or attached to another structure.

The posts of the load-bearing structure are galvanized steel posts (optionally painted) with I-section or C-sections.

h	HEA160 HEB160 HEM160 Standard gasket
	HEA180 HEB180 HEM180
c	C160 C160E

The selection of the structure should be made at the design stage.

Optionally, the panels can be laid on a prefabricated reinforced concrete ground beam. The filling of the acoustic screen or anti-noise enclosure is made up of BUDAN acoustic panels.

Depending on the type, BUDAN panels have the ability to absorb sound on one or both sides and, depending on this, they have 1 or 2 perforated linings (sides). We always lay the panels with the perforated side facing<sup>19</sup> the source of noise.

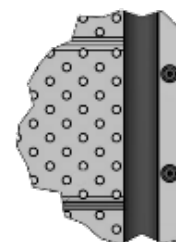


Figure 23  
Perforation holes

When installing acoustic panels up to a height of <sup>20</sup>1.5 m in the supporting structure, the most practical method is manual assembly. The weight of the panel varies depending on the type and length, but should not exceed 15 kg/m. It is possible to move the panel manually by 2 people.

Inserting panels over 1.5 m high requires the use of a lift, scaffolding or assembly platform. It is also possible to lay the panels using a special

<sup>19</sup>with holes  
<sup>20</sup>3 modules of 500mm stacked on top of each other

gripper.

Each panel is inserted from the top of the load-bearing structure, keeping a distance of 22.5 mm  $\pm$  2.5 mm from the axis of the posts on each side.

The panel is correctly mounted in the column when it is placed centrally and the anti-vibration gasket does not extend beyond the structure.

Each successively laid panel should be placed on top of the previous one, overlapping the profiled groove in the lower part of the panel in the shape of a double wave on the tongue of the panel below.

In order to ensure proper acoustic tightness of the joined panels forming the anti-noise noise barrier, it is necessary to check whether the tongue-and-groove locks are properly adjacent to each other.

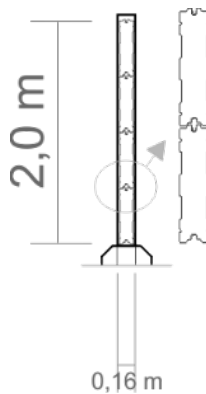


Figure 24  
Arrangement of panels in the column

For aesthetics, it is important to maintain the linearity of the horizontal joints.

The panel has gaskets attached to the side covers and matched to the recommended mounting profile - C or H.



Figure 25  
Gaskets included with the panel

**The panels are not screwed to the supporting structure in any way.**

Panels installed in the structure incorrectly, not inserted centrally or with lengths not adjusted to the axial spacing of the columns may undergo thermal deformation. In particular, this applies to panels in dark colors.

When exposed to direct sunlight, the aluminum panels heat up.

In the case of darker colors, there is a possibility that thermal stresses may arise as a result of a large temperature difference between the panel facings, affecting the operation of the panel embedded in the structure.

This stress can cause the panel surface to bulge. The bulge may be temporary (transient), i.e. appear only under certain conditions, e.g. very high insolation.

All such effects do not adversely affect the acoustic parameters and load-carrying capacity of the panel, but they affect the aesthetics.

Depending on the color, the temperature at which the panels will be installed should be taken into account. Installation of panels in dark colors at low temperatures increases the heating effect of the panels in the summer.

It is therefore recommended that the installation of these panels be carried out at a temperature greater than 10°C.

## CONSTRUCTION

The BUDAN panels have been equipped with their own stabilizing gaskets, thanks to which the assembly takes place only by inserting the cassette into the previously prepared structure.

The length of the installed panels should be less than the assembly clearance <sup>21</sup>from the axial spacing of the posts.

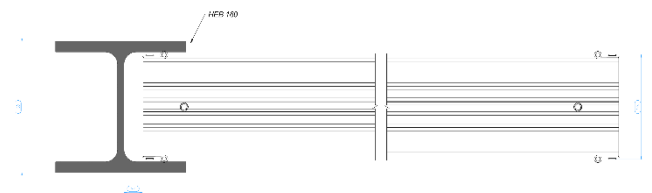


Figure 26  
Installation in HEB160

<sup>21</sup> The assembly clearance is 40mm-50mm from the axial spacing of HEB / HEA columns; e.g. span length 5000mm (centre spacing of columns), a panel with a total length of 4960mm (4950mm) should be installed.

The type of gasket attached to the panel is matched to the post in which the panel will be mounted. The standard design is H160. Gaskets for other profiles should be specified at the stage of ordering.

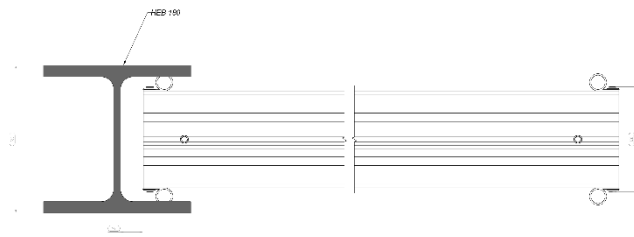


Figure 27  
Installation in HEB 180

**Structural columns are not in the commercial offer.**  
**BUD-MASZ is not responsible for the steel structure .**

#### ATMOSPHERIC CONDITIONS

The correct installation of acoustic panels is significantly affected by weather conditions: wind speed, precipitation and visibility.

Due to the relatively low weight of the panels and their large surface, the wind speed during assembly should not exceed 10m/s. Do not install the panels during precipitation <sup>22</sup>or lightning.

During thick fog or if visibility deteriorates due to dusk and there is no artificial lighting, the installation of panels should be stopped.

It is recommended to carry out assembly works at temperatures of 5°C to 20°C. At an ambient temperature below 4°C, the seals may harden, which makes it difficult to insert the load-bearing structure between the supports.

Due to the possibility of heating up dark surfaces <sup>23</sup>, it is recommended to carry out installation at temperatures from 5 °C to 25 °C.

#### HEALTH AND SAFETY

All works performed during the assembly of acoustic panels must be carried out in accordance with the generally applicable health and safety regulations for assembly works and

under the supervision of authorized persons.

During the assembly of acoustic panels at heights, safety devices in the form of ropes and safety belts of the fitter type should be used.

Workers assembling the panels should be equipped with protective gloves, as there is a risk of peeling the epidermis by aluminum elements.

#### CULVERTS IN PANELS

The cutouts in the noise protection elements are made before the panels are installed, as this weakens the cross-section and therefore the places of the cutouts should be properly stiffened.

If you have to carry out the installation through an acoustic enclosure or make a technological opening, remember about the basic rules:

- the dimensions of the hole diameter in one panel should not exceed 300mm,
- the hole should be located centrally in the vertical axis of the panel,
- the opening should have a minimum distance of 100mm to all side edges,
- the opening should be finished with a reinforcing flashing .

If it is necessary to make holes with large diameters , the <sup>24</sup>proposed solution is to use an additional steel structure in the size of the desired hole.

***The manufacturer bears no responsibility for panels modified outside the manufacturer's production facility or without the express written consent of the manufacturer.***

***All non-standard elements that can be produced should be made by the Manufacturer***

#### MAINTENANCE, CHECKING THE TECHNICAL CONDITION AND OPERATION

BUDAN panels have been designed in such a way that, apart from fulfilling their basic function, which is protecting the natural

<sup>22</sup>Rain, hail or snow

<sup>23</sup>Especially for panels in dark colors

<sup>24</sup>Openings over 300mm

environment against noise, they also meet aesthetic requirements .

In order for the panels to serve as long as possible, the rules described below must be followed.

Aluminum panels should be inspected annually for technical condition.

In the event of slight damage to the paint coatings caused during installation or operation, they must be repaired immediately.

in the case of small paint defects below 10mm <sup>2</sup>	cleaning the surface of any bubbles under the paint coating and washing with biodegradable mild detergents.
in the case of larger paint losses above 10mm <sup>2</sup> and not exceeding 7% of the total surface of the paint coating	cleaning the surface of any bubbles under the paint coating, washing with detergents, making the necessary touch-ups using the primer and varnish for aluminum recommended by the manufacturer

Coating damage causes environmental contaminants to come into direct contact with the aluminum. In extreme cases, this may lead to pitting corrosion. If a larger surface of the coating has been damaged, the panel should be cleaned of varnish residues or a renovation painting should be carried out.

In the event of spot changes in the paint coating as a result of normal operation, these places should be protected.

In order to maintain the aesthetic appearance, it is recommended to wash and clean the panels every 12 months using mild and biodegradable detergents <sup>25</sup>.

***Do not use alkaline detergents. Washing should be done with soft brushes, sponges or under low pressure.***

After each washing, it is necessary to thoroughly rinse the detergent with clean water. The pressure of clean water used for flushing must

not exceed 5 MPa <sup>26</sup>at a distance of 30 cm to 40 cm from the panel. Rinsing should be done very thoroughly, starting from the top of the acoustic noise barrier, so that all the cleaning agent is rinsed away.

The water temperature should not be higher than 30°C. An exception is when rinsing with water to remove grease, when the water temperature can be temporarily increased to 50°C. Grease can be removed with a soft cloth. Surfaces cleaned in this way must be rinsed immediately with clean water.

***The use of organic solvents or abrasive cleaners must be strictly avoided. Do not steam clean or rinse with water at ambient temperatures below 1°C.***

It is necessary to wash the panels after the winter season when:

- chemicals were used near the panels.
- there is persistent contamination that may damage the coatings by sanding, rubbing or vibration.

Washing should take place when the air temperature constantly rises above 10°C.<sup>27</sup>

It is recommended to use technical solutions limiting the possibility of adverse phenomena, e.g.:

- continuous immersion of panels,
- exposure to chemical vapors and highly alkaline or acidic liquids.

During the implementation of individual stages of construction, it is very important to follow the recommendations regarding transport, unloading, and storage as well as installation of acoustic panels.

At the design stage, appropriate infrastructure elements should be foreseen and designed at the same time, depending on the installation site, e.g.:

- energy-absorbing road barriers,
- ground beams , etc.

<sup>25</sup>For example, a solution of water with a car shampoo type liquid pH values in the range of 4-9.

<sup>26</sup>50 bars  
<sup>27</sup>Mostly March-April.

## SNOW REMOVAL

During mechanical snow removal in the vicinity of acoustic panels, the speed parameters of the plowing vehicle should be observed depending on the distance to the noise barrier.

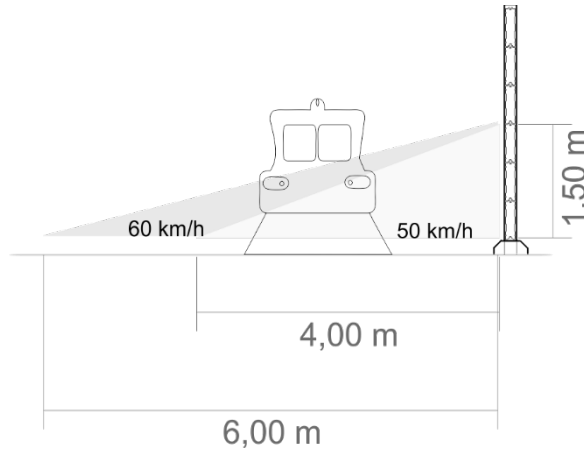


Figure 28  
Snow removal

The suggested plowing speed for noise barriers located 1m to 4m from the plowing vehicle is 50km/h, FOR distances above 4m UP to 60km/h.

## GRAFFITI REMOVAL

The panels can have an "anti-graffiti" coating, a specially selected varnish applied directly at the aluminum production stage.

Depending on the type of graffiti, removing it involves the use of appropriate cleaning methods, ranging from wiping with a cloth <sup>28</sup> to the use of biodegradable graffiti removers.

In the case of anti-graffiti coatings, graffiti is removed using appropriate means adapted to the type of graffiti.

TYPE	Cleaner <sup>29</sup>
Spray paint	A, C, D
Marker diluted with water	O
Permanent marker	A, B, C, D, E
Lipstick	O
Shoe polish	O

Removing graffiti is possible with soft cloths,

<sup>28</sup>In the case of simple impurities

<sup>29</sup>Legend:

- A 90% alcohol (denatured alcohol)
- B 1:1 mixture of denatured alcohol and detergent
- C Acetone
- D Trichlorethylene
- E Tetrachloroethane
- O Wipe with fabric

varnish polisher or with the use of graffiti removal agents. Removal of graffiti should take place no later than 30 days from the date of its creation.

Before removing graffiti, the panel should be thoroughly cleaned with mild and biodegradable detergents.

In cases of drawings difficult to remove, it is recommended to use professional graffiti removers <sup>30</sup>.

Grffiti should be removed as soon as it appears. The graffiti removal process can be completed using clean water under pressure up to 5 MPa . The paint will return to its natural color after a few hours.

The optimal temperature of the environment and the surface to be cleaned should be between 10° and 32°C.

***When using all washing, cleaning or graffiti removal agents, it is absolutely necessary to follow the instructions for use provided by the manufacturer of these agents.***

In the case of using all washing, cleaning or graffiti removal agents, neutralize the cleaned surface with water after using them.

***In the case of using all washing, cleaning or graffiti removal agents, it is essential to carry out a graffiti removal test on a small area before starting work***

## CLIMBERS ON BUDAN PANELS

BUDAN panels should be planted with vines that do not require additional supports, gratings, ropes, scaffolding, etc.

As evidenced by over 20 years of observations, noise barriers made of BUDAN panels are very good supports for vines.

Climbing plants efficiently grow over the panels, which is due to both the structure and the materials used.

The diversified surface allows plants to effectively cling to the support (noise barrier) over the entire surface.

<sup>30</sup>For example, AGS 5 SR - Anti Graffiti System, manufactured by Trion Tensid AB (Sweden)

On the perforated surface of the noise barrier, tentacle-climbing vines will efficiently climb <sup>31</sup>. Both surfaces, including those without perforations, can successfully cover adventitious <sup>32</sup>and root -attaching vines <sup>33</sup>.

Stucco aluminum and mineral wool protected against moisture with a glass veil are plant-friendly materials. The rebates and adhesive roots stick to the panels without difficulty.

***For each project, plants should be selected by local horticulture experts***

Individually for each noise barrier, a selection of plants should be developed in terms of:

- growth size,
- care method (pruning, weeding, leaves, weight),
- the possibility of ignition,
- danger of falling debris,
- planting method and density,
- type of substrate for plants (soil),
- way of hydration.

The choice of plants should be made taking into account the analysis of the costs of maintaining a planted noise barrier.

The choice of plants must also be made depending on the location of the root <sup>34</sup>.

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<sup>31</sup>Eg grapevines, and Virginia creeper

<sup>32</sup>E.g. grapevine

<sup>33</sup>E.g. common ivy

<sup>34</sup>Shade, partial shade, sunshine





Since 1998, BUD-MASZ has been producing BUDAN aluminium acoustic panels. These panels are among the most commonly used noise reduction elements

BUDAN panels are characterized by:

- the highest acoustic parameters,
- high aesthetics with high resistance to vandalism,
- environmental protection as all materials used for production are recyclable,
- long-term use in difficult conditions.

*The information presented above is consistent with the current state of our knowledge as at the date of publication. BUD-MASZ strives to provide the most accurate information regarding its products, but does not bear any responsibility for errors, decisions or direct, indirect or consequential damages resulting from the incorrect use of information contained in this publication.*

*BUD-MASZ reserves the right to make changes at any time. Current information about changes can be obtained directly from the Manufacturer.*

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