

TECHNICAL OFFER 0388 / 09.09.2014 г.

CLIENT

Diane Rowles

PROJECT

Dog Shelter in Elhovets village, Rudozem

NOTES

Prepared by: eng. Tsvetan Nedkov

Verified by: eng. Aleksandar Kirechev

1. Problem to solve:

In the neighborhood of dog shelter are situated residential houses at nearest distance of 124 meters.

The sound pressure level generated by dogs exceed the Bulgarian Noise Standard “Наредба N 6 от 2006 за показателите на шум в околната среда” and there is a need for sound attenuating measures.

The maximum sound pressure level, measured at 1 meter of the façade of residential building must be as follow:

- For day period – 55 dB/A;
- For evening period – 50 dB/A;
- For night period – **45 dB/A**;

As the night period has lowest numerical value it is taken into account for acoustical calculations.

For the calculation of outdoor sound propagation is applied EN ISO 9613-2:2005 [1].

2. Initial parameters and measured noise level:

2.1. Situation: fore distances and altitude is used Google Earth;



2.2.Measurement of sound pressure level according A curve:

Point 1: Leq = 74.6 dB/A

Measurement Report

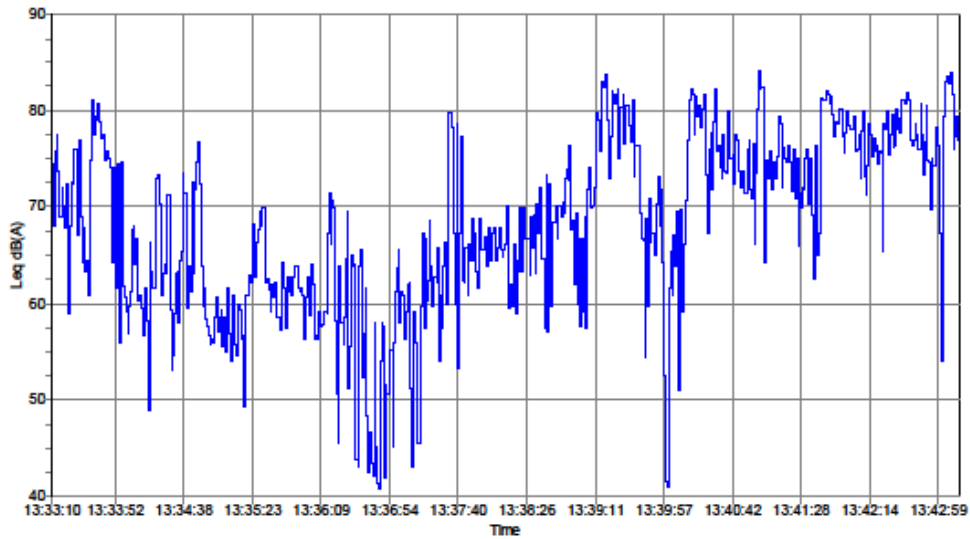
Measurement Details

Date and Time: 06.9.2014 г. 13:33
Sound Level Meter: Pulsar PM:95 B22508
Recalibration Due: 30.4.2014 г.
Run Duration: 00:09:59 hh:mm:ss

Location: Point 1 in dog shelter

Data

Leq	74,6 dBA	L1,0	83,8 dBA
Lepd	57,8 dBA	L10,0	79,3 dBA
LAE	102,2 dBA	L50,0	65,9 dBA
LAFmax	88,7 dBA	L90,0	53,1 dBA
Peak	101,8 dBC	L95,0	47,2 dBA
		Lmin	39,8 dBA



Чувам ли ме?

Point 2: Background noise without sound source $Leq = 50.5$ dB/A

Measurement Report

Page 1

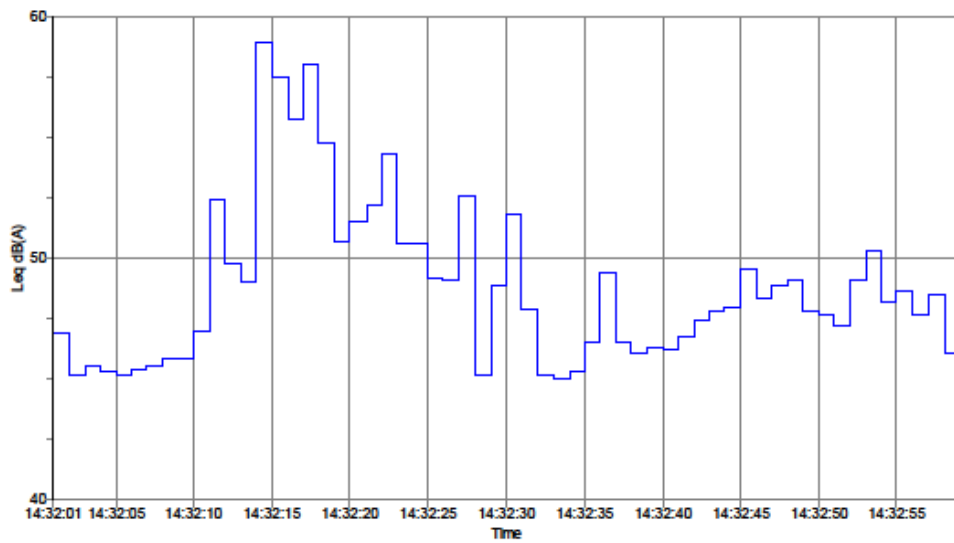
Measurement Details

Date and Time: 06.9.2014 г. 14:32
 Sound Level Meter: Pulsar PM:96 B225D8
 Recalibration Due: 30.4.2014 г.
 Run Duration: 00:00:59 hh:mm:ss

Location: Point 2 - Background noise

Data

Leq	50,5 dBA	L1,0	57,3 dBA
Lepd	23,6 dBA	L10,0	51,9 dBA
LAE	68,1 dBA	L50,0	47,2 dBA
LAFmax	62,2 dBA	L90,0	45,3 dBA
Peak	77,0 dBC	L95,0	45,1 dBA
		Lmin	44,5 dBA



Pulsar Analyzer Measurement Report. Printed on 09.9.2014 г. at 15:22:20.

Point 2: With enabled sound source Leq = 60.1 dB/A

Measurement Report

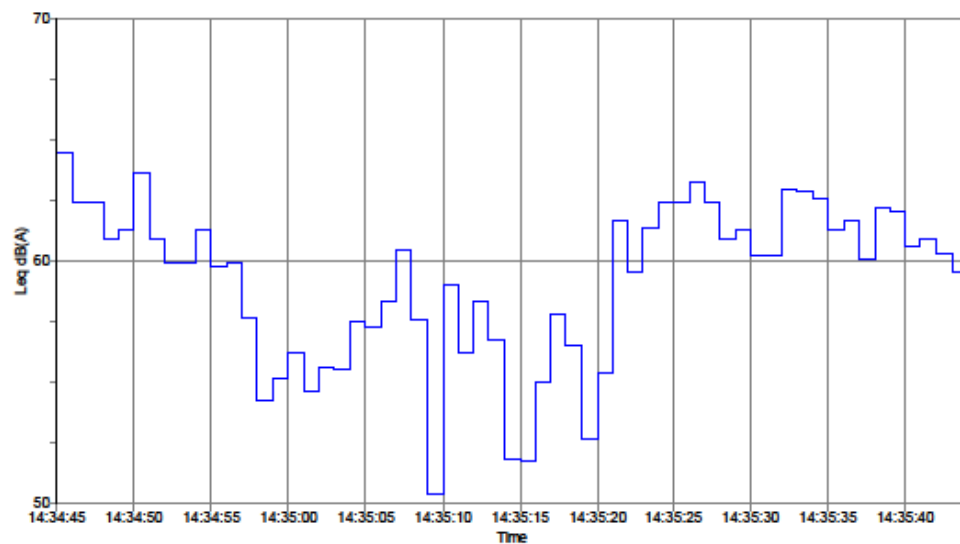
Measurement Details

Date and Time: 06.9.2014 r. 14:34
Sound Level Meter: Pulsar PM:96 B22508
Recalibration Due: 30.4.2014 r.
Run Duration: 00:00:59 hh:mm:ss

Location: Point 2 with enabled sound source

Data

Leq	60,1 dBA	L1,0	65,6 dBA
Lepd	33,3 dBA	L10,0	63,3 dBA
LAE	77,8 dBA	L50,0	59,3 dBA
LAFmax	69,7 dBA	L90,0	51,3 dBA
Peak	92,8 dBC	L95,0	48,7 dBA
		Lmin	42,2 dBA



Чуваш ли ме?

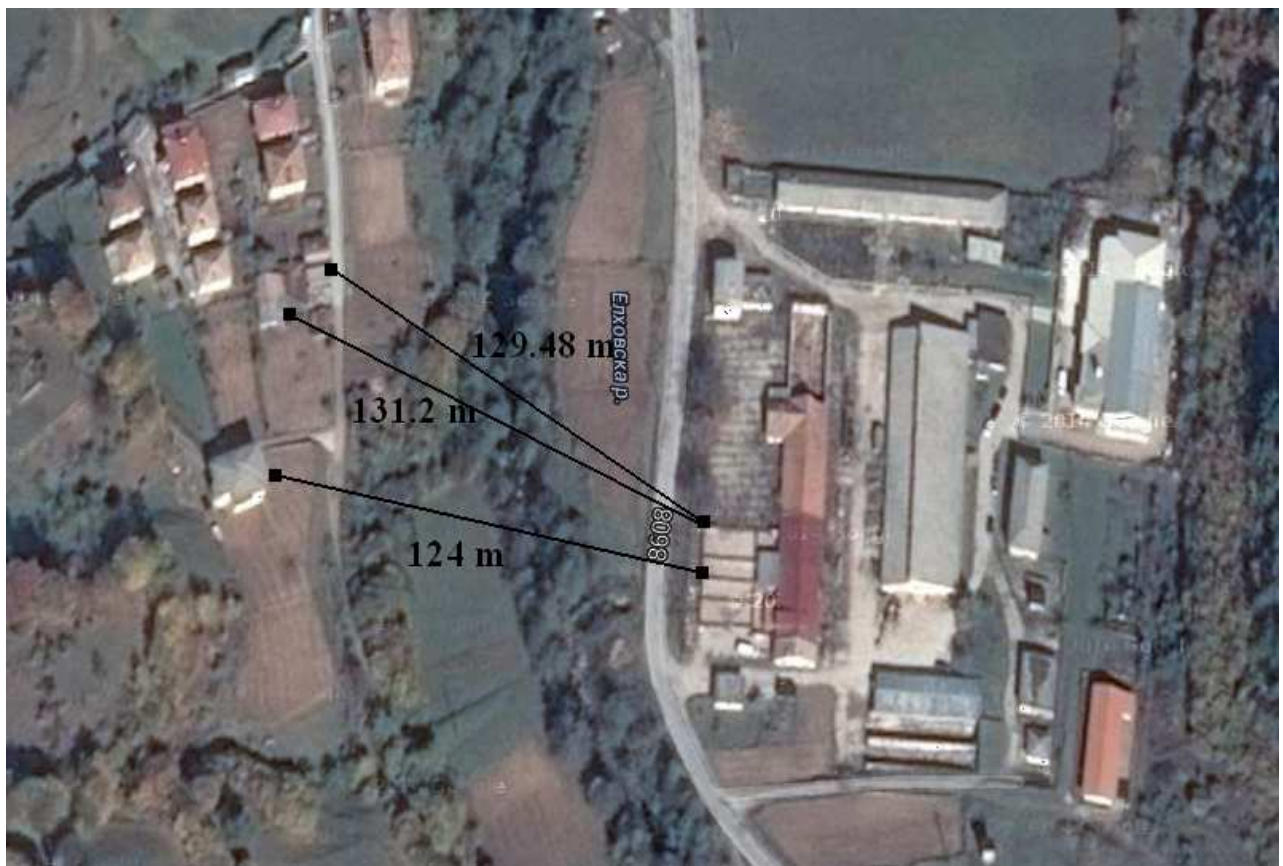
2.3. Analysis of the measured sound pressure level (SPL):

The SPL measured in front of the façade of Point 2 (Residential building) is with 15.1 dB more than numerical value for night period. This mean that the sound attenuation measures must be with efficiency at least 16 dB at the point of measurement.

3. Solutions:

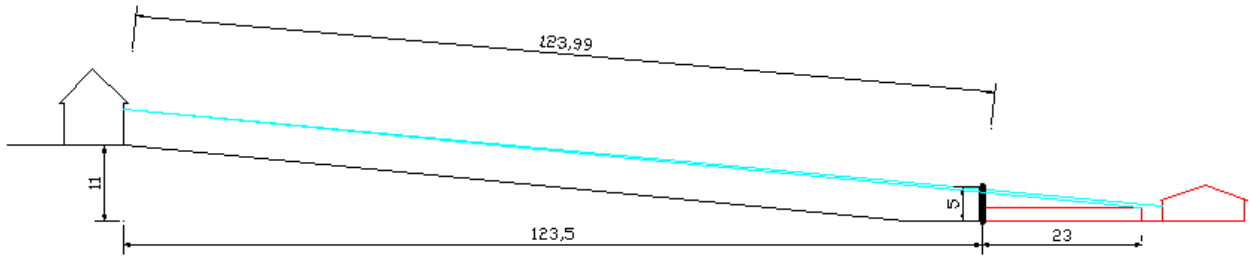
3.1. Variant 1 – Sound attenuation barrier:

The nearest residential building is situated at 124 m and level difference of altitude 11 m.



Чувам ли ме?

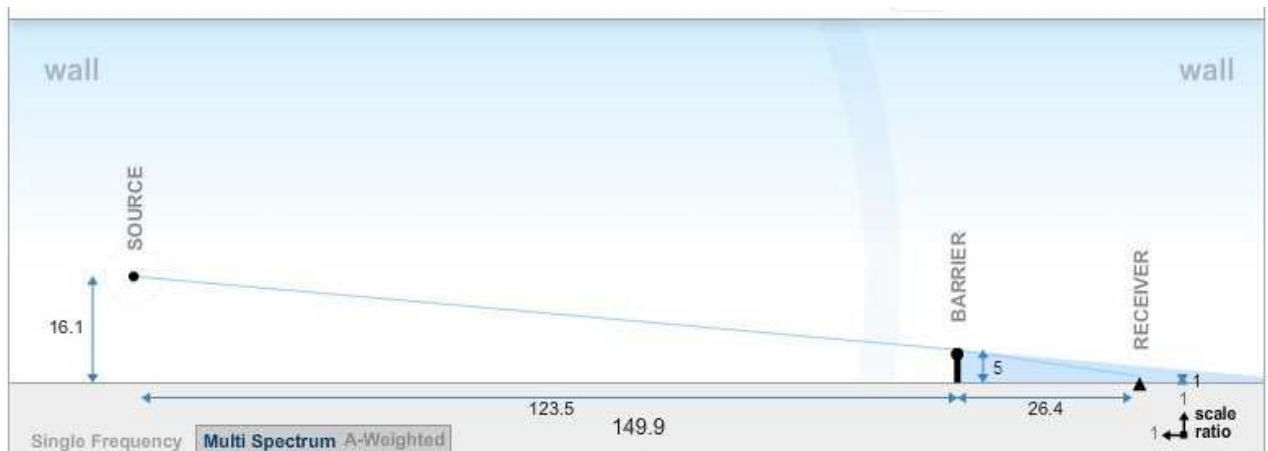
Section of the terrain gives a geometrical ray trace of the sound vector:



To be efficient the minimum high of the sound barrier must be 5.00 meters. Plan of the barrier is given on the picture:



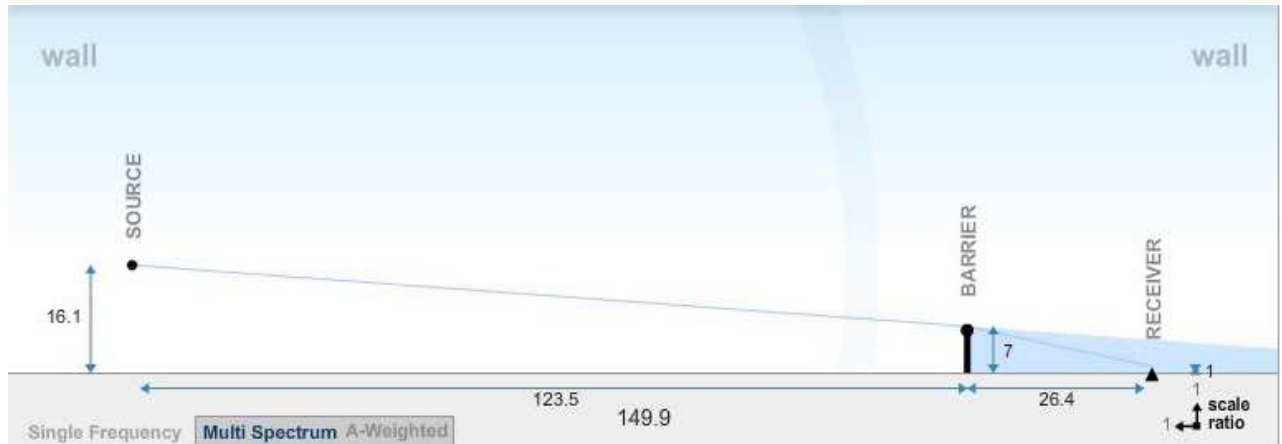
Acoustic calculation of sound attenuation from 5 m barrier:



Чувам ли ме?

The sound power level in the receiver Point 2 will be 15.8 dB, converted to sound pressure level will be **4.81 dB << 16 dB – Sound barrier with high of 5 m is ineffective.**

If the high of barrier is changed to 7 m the calculations shows that the sound power level at Point 2 will be 23.6 dB, converted to sound power level will be 12.5 dB < 16 dB - **Sound barrier with high of 5 m is ineffective**



If the high of barrier is changed to 8 m the calculations shows that the sound power level at Point 2 will be 26.1 dB, converted to sound power level will be 15 dB ~ 16 dB - **Sound barrier with high of 8 m can be accepted as effective.**



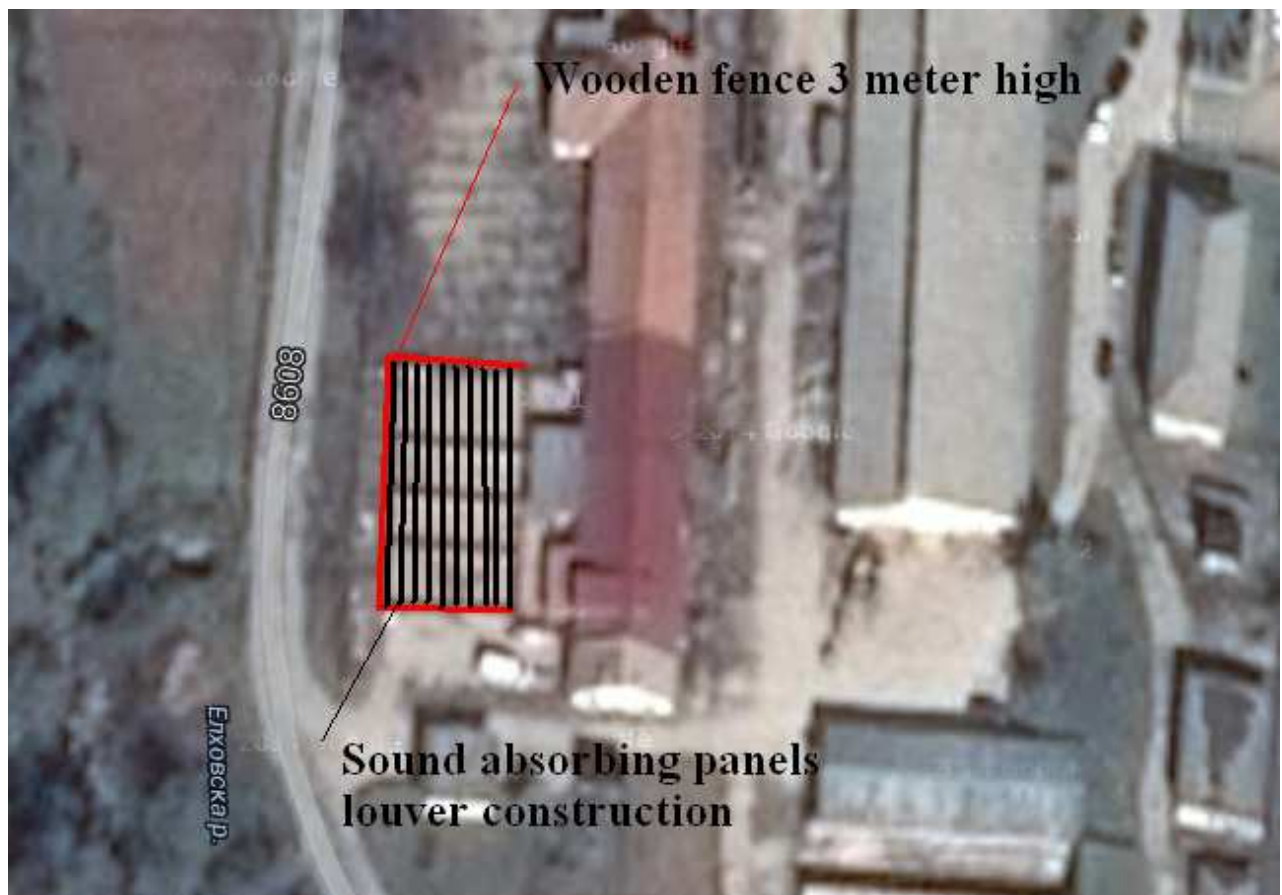
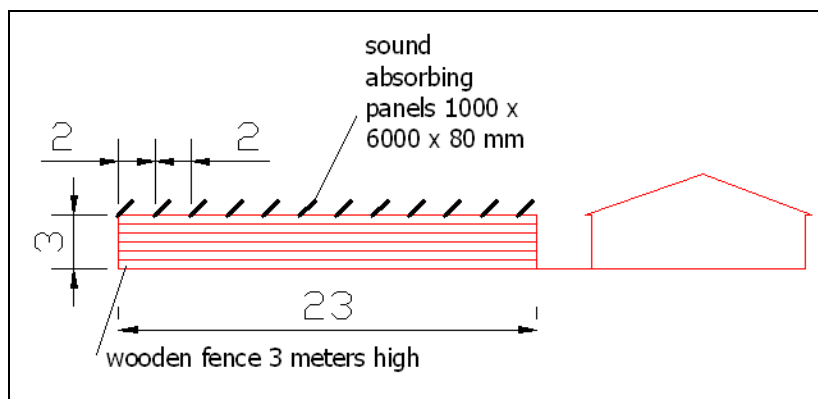
Price – quantity offer for 62 meters long and 8 meter high sound attenuating barrier.

No	Type of work/material	Unit	Quantity	Price per unit	Total
1	Ground trench works	m3	85,00	50,00 lv.	4 250,00 lv.
2	Steel Reinforced concrete fundaments	m3	118,00	225,00 lv.	26 550,00 lv.
3	Metal frame columns 8000 mm	pcs	26,00	2 250,00 lv.	58 500,00 lv.
4	Perforated absorbing panels 1000x8000x50 mm	m ²	496,00	43,00 lv.	21 328,00 lv.
5	Accessories	kit	1,00	1 250,00 lv.	1 250,00 lv.
6	Constructive project	pcs	1,00	1 500,00 lv.	1 500,00 lv.
Total price without V.A.T.					113 378,00 lv.
Total price with included V.A.T.					136 053,60 lv.

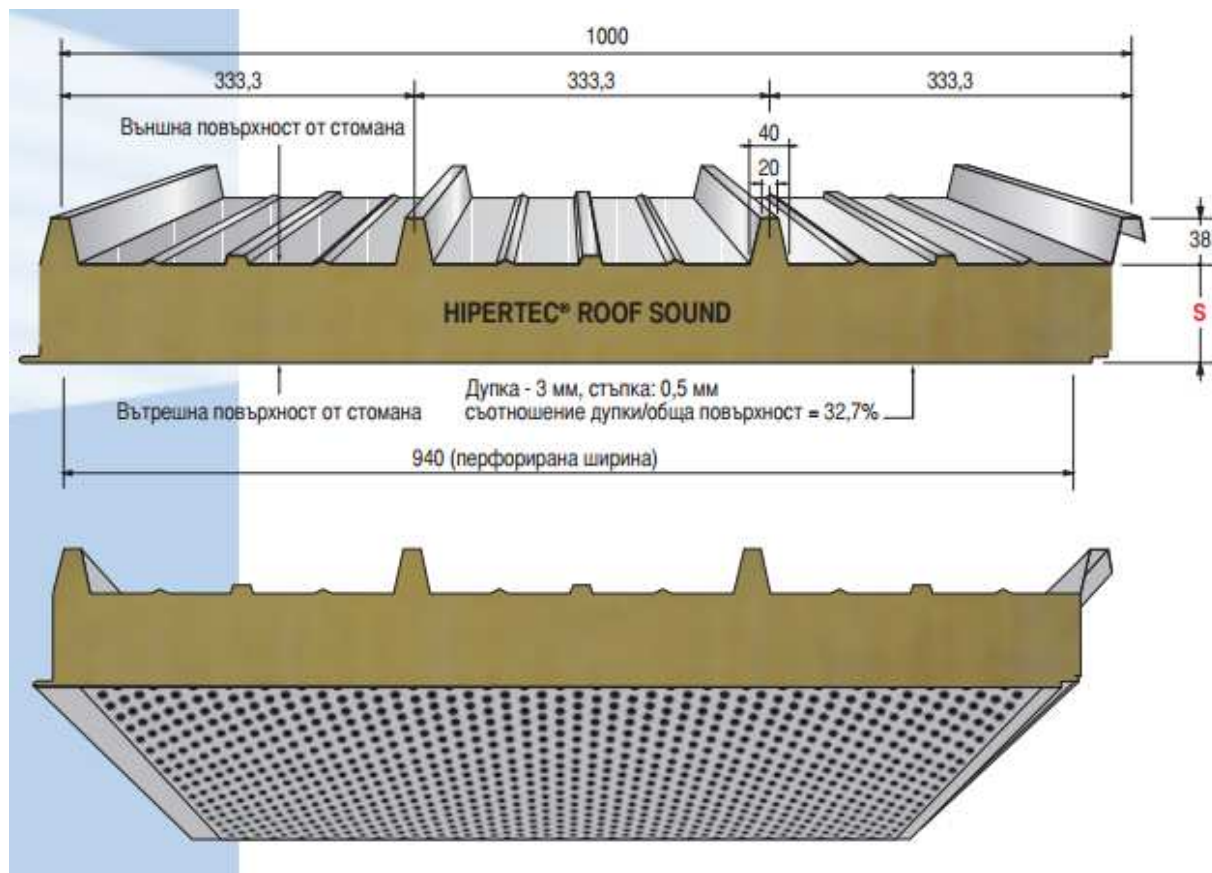
Чуваш ли ме?

3.2.Variant 2 – Sound attenuation roof louvers:

The main concept is to construct acoustic louvers on the roof of every separated yard and to achieve effective sound shadow in direction of residential houses. The wing of every louver is 6 meters long perforated sandwich panel from two face sheets from laminated steel and stone wool core. The inner metal sheet is perforated for good absorption. The maximum distance of wings is 2 meters and the angle of rotation is 45 °. Calculated sound attenuation in Point 2 will be **20.5 dB**. The problem here is the same as Variant 1 – heavy fundamentals and steel construction in reason of high wind load and a big bridge distance – 6 meters.



Section of the roof panel



Price – quantity offer for 62 meters long and 8 meter high sound attenuating barrier.

No	Type of work/material	Unit	Quantity	Price per unit	Total
1	Wooden fence with length 88 m and high 3 meters	m2	264,00	52,00 lv.	13 728,00 lv.
2	Steel construction with concrete steps for roof wings for louver system	pcs.	48,00	1 140,00 lv.	54 720,00 lv.
4	Perforated absorbing panels 1000x800x50 mm	m ²	288,00	43,00 lv.	12 384,00 lv.
5	Accessories	kit	1,00	950,00 лв.	950,00 lv.
6	Constructive project	pcs	1,00	1 500,00 lv.	1 500,00 lv.
Total price without V.A.T.					83 282,00 lv.
Total price with included V.A.T.					99 938,40 lv.

3.3.Variant 3 – To install a second hand of metal hall:

On Bulgarian market there is a option for a second hand demountable metal hall. Sound insulation provided by this type of constructions is at least **26 dB**, so it will be the most effective and most cheaper variant.

We attach a example for this type of construction with dimensions: 30 meters length, 12 meters wide and 6 meters high. – 350 square meters with price 16 000 lv. with included V.A.T.:

<http://www.alo.bg/1796737?highlight=метално+хале>

**Price – quantity offer for 62 meters long and 8 meter high sound attenuating barrier:**

№	Type of work/material	Unit	Quantity	Price per unit	Total
1	Second hand metal hall with dimensions 30 x 12 x 6 meters - 350 m2	pcs	1,00	13 333,00 lv.	13 333,00 lv.
2	Transportation of the metal hall from city of Elhovo	pcs.	1,00	1 250,00 lv.	1 250,00 lv.
4	Mounting and demounting of the metal hall	pcs.	1,00	4 500,00 lv.	4 500,00 lv.
Total price without V.A.T.					19 083,00 lv.
Total price with included V.A.T.					22 899,60 lv.

Чувам ли ме?

Conclusions:

- 1. First step of a sound attenuating measure is to close all openings (doors , windows) of a shelter because they give a free path for noise propagation.**
- 2. If there is a option to move the yards on the back side of the building the sound attenuation will be more satisfactory and the sound attenuations measures will be with reduced price.**
- 3. The position of the residential buildings is the main problem, including the altitude difference in levels – 11 meters.**
- 4. From acoustic point of view the position of shelter is unfavorable.**
- 5. If there is a possibility to change the place of the shelter or to use some of the neighborhood buildings for training yard.**