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Bearbeiter: Dipl.-Ing. Gräf/Cramer 12

Product Examination

*Examination in view sound absorption of an one-sided highly absorbent noise protection wall consisting of aluminium sheet metal and comparison of sound insulation degrees with ZTV Lsw 88, DIN EN 1793-2 and RLE 800.2001
Type A3-e*

Client: Bongard GmbH & Co. KG
Heilberscheider Str. 12

56412 Nentershausen

Project-Nr.: **A2321 – II**

1. Description of System of Material Tested

The noise protection wall consists of perforated aluminium sheet metal cassettes ($d = 1,25$). The front sides of the examined panels were provided with coverings ($d = 1,5$ mm) (see encl. 3).

Construction Assembly:

Side exposed to noise: perforated aluminium plate with longitudinal profiles,
 $d = 1,25$ mm
hole diameter: 5 mm
hole distance: 8 mm
percentage of holes: 31 %, related to complete
surface = 27 %

Hollow: - approx. 30 mm air space
- approx. 60 mm mineral fibre, $RG = 120 \text{ kg/m}^3$
- approx. 30 mm air space

Back side: closed aluminium sheet metal. $d = 1,25$ mm

Total panel weight: approx. $17,6 \text{ kg/m}^2$

Total panel thickness: $d = 123$ mm

Dimension of panel: 2000 mm x 500 mm x 123 mm

2. Examination of Sound Absorption

The tested material and/or the tested panels (supplied by client as being representative for the panels produced) were being tested in the sound room

according to the ZTV Lsw 88 and/or RLE 800.2001

lying on the floor with integrated double T-beams and lateral planks.

Procedure of testing: measurement of sound absorption in sound room according the DIN EN 20354 of July 1993

Test conditions: The noise panels were being tested according to paragraph 4 of the ZTV- Lsw 88 and/or RLW 800.2001, incl. 3, photo 2, lying on the floor of the sound room.
Determination of the value $\nabla L_{A,\alpha,Str.}$ for the sound absorption results from the individual values A_i for the dimensions with the frequencies 100 Hz up to 5000 according to table 8 of the ZTV Lsw 88.
Determination according to RLE is according to RLE 800.2001, incl.3, item 2 (3).

Tested surface: 2,43 m x 4,80 m = 11,7 m²

3. Test Results

3.1 Absorption Degrees

The absorption degrees are shown in incl. 1, the reverberation values in the sound room with and without material can be seen from incl. 2.

3.2 Sound absorption according to ZTV Lsw 88, RLE 800.2001 and DIN EN 1793-1

sound absorption according to ZTV Lsw 88							
Terzmitten-Frequenzen Hz	Faktor K_i	α_i *)	$K_i \cdot \alpha_i$				
100	1	0,40	0,40				
125	2	0,59	1,18				
160	3	0,72	2,16				
200	4	0,86	3,44				
250	5	1,01	5,05				
315	7	0,97	6,79				
400	9	0,97	8,73				
500	11	0,96	10,56				
630	15	0,98	14,70				
800	21	0,98	20,58				
1000	29	0,99	28,71				
1250	32	0,94	30,08				
1600	26	0,95	24,70				
2000	20	0,93	18,60				
2500	15	0,84	12,60				
3150	10	0,81	8,10				
4000	5	0,82	4,10				
5000	3	0,78	2,34				
$\Sigma K_i =$	217	$\Sigma \alpha_i =$	202,82				
<table border="1" style="margin: auto;"> <tr> <td>$\Delta L_{A, \alpha, Str} =$</td> <td>10 dB</td> </tr> <tr> <td>assessment:</td> <td>highly absorbent</td> </tr> </table>				$\Delta L_{A, \alpha, Str} =$	10 dB	assessment:	highly absorbent
$\Delta L_{A, \alpha, Str} =$	10 dB						
assessment:	highly absorbent						

absorption degrees α_i according to "RLE der Bahn AG"									
Frequenz	100	125	250	500	1000	2000	4000	Hz	assessment
requirements	0,2	0,3	0,5	0,8	0,9	0,9	0,8	dB	material complies with requirements
tested material	0,40	0,57	0,95	0,97	0,97	0,91	0,80	dB	

Sound absorption DL_A according to DIN EN 1793-1		
Frequenz [Hz]	L_i [dB]	α_{Si}
100	-20	0,40
125	-20	0,59
160	-18	0,72
200	-16	0,86
250	-15	1,01
315	-14	0,97
400	-13	0,97
500	-12	0,96
630	-11	0,98
800	-9	0,98
1000	-8	0,99
1250	-9	0,94
1600	-10	0,95
2000	-11	0,93
2500	-13	0,84
3150	-15	0,81
4000	-16	0,82
5000	-18	0,78

$$DL_A = -10 \lg \left[1 - \frac{\sum_{i=1}^{18} \alpha_{Si} * 10^{0,1L_i}}{\sum_{i=1}^{18} 10^{0,1L_i}} \right] = 12 \text{ dB}$$

groups of sound absorption	
group	DL_A
A 0	no examination
A 1	< 4
A 2	4 bis 7
A 3	8 bis 11
A 4	> 11

system belongs to sound absorption group

A4

3.2 Assessment according to ZTV Lsw 88

The system can be declared as **highly absorbent** on account of its value of

$$\Delta L_{A,\alpha,Str.} = 10 \text{ dB}$$

3.3 Assessment according to DIN EN 1793-1

The system belongs to sound absorption group

A4

3.4 Assessment according to RLE 800.2001 of Deutsche Bahn AG

The tested material complies with the requirements according to RLE 800.2001.

3.5 Absorption Degrees

Procedure of absorption values is shown in diagram of enclosure 1.



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