Product Examination

Examination in view of sound insulation of an one-sided highly absorbent noise protection wall consisting of aluminium sheet metal and comparison of sound insulation 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.:   **A2383 – III**

1. Description of System of Tested Material

The noise protection wall consists of perforated aluminium sheet metal cassettes.
The front sides of the examined panels were provided with coverings of sheet metal (d
= 1,5 mm) (pls. compare schematic encl. 2).

Construction Assembly:

Side exposed to noise:	perforated aluminium plate, d = 1,25 mm percentage of perforation: 31 % hole diameter: 5 mm hole distance: 8 mm
Hollow:	- approx. 30 mm air space - approx. 60 mm mineral fibre insulating material, RG = 120 kg/ m³ - approx. 30 mm air space
Back side:	closed aluminium sheet metal, d = 1,25 mm
Total panel weight:	approx. 18,9 kg/ m²
Total panel thickness:	d = 123 mm
Dimension of panel:	2000 mm x 500 mm x 123 mm

2. Performance of Examinations

The tested material (supplied by client as being representative for the produced panels) were being installed in the installation opening of a wall test stand by means of integrated double T-beams (as requested by ZTV Lsw 88 and/or RLE 800.2001) and lateral U-profiles (according to RLE 800.2001, photo 1, encl. 3).

The dimensions of wall are as follows:

height: 2,43 m
width: 4,79 m

Date of measurement: November 12, 2002

Installation conditions: according to ZTV Lsw 88 and/or RLE 800.2001

There were not made any modifications of system during installation and adaptation of panels.

The panels being placed one above the other were positioned without sealing tapes. The vertical sealing compounds at the double-T-beams consisted of tube sealing compounds (dia = 11 mm) and were only fixed at one side of the panels. The lowest panel was being sealed against the assembly frame of the laboratory by means of an EPDM spread sealing.

Maximum depth of support of panels in

a) lateral posts: 70 mm
b) central post: 20 mm

2.1 Prescriptions Concerning Measuring and Evaluation

DIN EN ISO 140-3:

Measurement of noise insulation of construction parts in test stand

DIN EN ISO 717:

Evaluation of noise insulation in buildings and of construction parts

Random/background noise was being tested which was being filtered by means of special filters according to DIN 45652 when sending and also when receiving.

Unit of measuring noise insulation "R" is being calculated as follows:

$$R = L_1 - L_2 + 10 \log S/A$$

Explanation:

$R =$ unit of measuring noise insulation according to EN ISO 140/717

$L_1 =$ noise level in sending room

$L_2 =$ noise level in reception room

$S =$ area of test wall

$A =$ equivalent area of sound absorption of sending room, determined on the basis of measurements of reverberation time.

3. ### sound insulation according to ZTV Lsw 88, RLE 800.2001 and DIN EN 1793-2

sound insulation according to ZTV Lsw 88				
Terzmitten-Frequenz Hz	Faktor K_i	R_i dB	$10^{-0,1Ri}$	$K_i * 10^{-0,1Ri}$
100	1	14,60	0,034673685	0,034673685
125	2	11,90	0,064565423	0,129130846
160	3	15,60	0,027542287	0,082626861
200	4	16,20	0,023988329	0,095953317
250	5	18,70	0,013489629	0,067448144
315	7	22,20	0,006025596	0,042179171
400	9	24,90	0,003235937	0,029123429
500	11	29,70	0,001071519	0,011786712
630	15	30,60	0,000870964	0,013064454
800	21	34,40	0,000363078	0,007624639
1000	29	36,90	0,000204174	0,00592104
1250	32	39,70	0,000107152	0,003428862
1600	26	41,70	6,76083E-05	0,001757816
2000	20	44,90	3,23594E-05	0,000647187
2500	15	46,40	2,29087E-05	0,00034363
3150	10	46,50	2,23872E-05	0,000223872
$\Sigma K_i =$ 210		*) $\Sigma K_i * 10^{-0,1Ri} =$		0,52593

$$\Delta L_{A,R,Str.} = 10 \lg \frac{\Sigma K_i}{\Sigma K_i * 10^{-0,1Ri}}$$

$$\Delta L_{A,R,Str.} = \quad 26,0 \text{ dB}$$

sound insulation R according to "RLE der Bahn AG"								
Frequenz	100	125	250	500	1000	2000	4000	Hz	assessment
require-ments	10	12	18	24	30	35	35	dB	material complies
tested material	14,6	14,0	19,0	28,4	37,0	44,3	48,3	dB	with require-ments

sound insulation DL_R according to DIN EN 1793-2		
Frequenz [Hz]	L_i [dB]	R_i [dB]
100	-20	14,6
125	-20	11,9
160	-18	15,6
200	-16	16,2
250	-15	18,7
315	-14	22,2
400	-13	24,9
500	-12	29,7
630	-11	30,6
800	-9	34,4
1000	-8	36,9
1250	-9	39,7
1600	-10	41,7
2000	-11	44,9
2500	-13	46,4
3150	-15	46,5
4000	-16	47,3
5000	-18	51,0

$$DL_R = -10 \lg \left[\frac{\sum_{i=1}^{18} 10^{0,1 L_i} * 10^{-0,1 R_i}}{\sum_{i=1}^{18} 10^{0,1 L_i}} \right] = 25 \text{ dB}$$

groups of sound insulation	
group	DL_R
B 0	no examination
B 1	< 15
B 2	15 bis 24
B 3	> 24

system belongs to sound insulatio group

B3

3.2 Assessment

By its noise insulation result of

$$\Delta L_{A,R,Str.} = 26,0 \text{ dB}$$

The tested system complies with the requirements of paragraph 7.2.1 ZTV Lsw 88.

3.3 Assessment according to DIN EN 1793-2

The system corresponds to noise protection level

B3

3.4 Assessment according to RLE 800.2001

The tested material complies with the requirements according to paragraph 2, title (1) of the RLE 800.2001.

3.5 Assessment of laboratory measurement regarding noise insulation construction

The laboratory measurement regarding noise insulation construction (see encl. 1) is as follows:

$$R'_w = 31 \text{ dB}$$

GRANER + PARTNER
I N G E N I E U R E

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