VALIDATION REPORT No. 380294

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Customer

AERCEL MATERIALI ESPANSI CELLULARI S.p.A.

Via Gaetano Giordani, 2 - 40054 BUDRIO (BO) - Italy

Item*

gypsum fibreboard cladding on a plasterboard partition wall

Activity

comparative measurement of the sound insulation of a plasterboard partition in accordance with the requirements of Annex C of standard UNI EN ISO 140-4:2000

Results

	Sound insulation index "R_w" [dB]	Improvement "ΔR_w" [dB]
Partition without cladding	40	4
Partition with cladding installed	44	

(*) according to that stated by the customer.

Bellaria-Igea Marina - Italy, 25 February 2021

Chief Executive Officer

Order:
87267

Activity date:
11 September 2008

Activity site:
Farm building - Via Montefiorino, 17 - Località Vergiano - 47900 Rimini (RN) - Italy

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Purpose of measurement

The measurements aim to assess the effects on sound insulation obtained by fitting gypsum fibreboard cladding to a plasterboard partition wall.

Description of item

Starting from the side exposed to noise, the plasterboard structure is formed by:

- 2 layers of plasterboard, thickness 12,5 mm per layer;
- framework created with steel channels, depth 50 mm, filled with mineral wool blanket, thickness 50 mm and density 50 kg/m³;
- layer of plasterboard, thickness 12,5 mm.

The cladding is subsequently attached directly to the framework using self tapping screws and consists of "GIPS FASER H" gypsum fibreboard, thickness 12 mm, supplied by Global Building S.r.l., on the internal surface of which a studded blanket is applied called "FONOSPHERA SF51", maximum thickness 7 mm and minimum thickness 2 mm, this consisting of a studded layer of closed-cell cross-linked polyethylene, density 30 kg/m³, and a layer of polymer mass and mineral fillers, thickness 1 mm.

The measurement was performed in two steps:

- vibration velocity measurements for evaluation of the sound reduction index of the partition without cladding;
- vibration velocity measurements for evaluation of the sound reduction index of the partition with cladding installed.

Photo of partition during installation of cladding

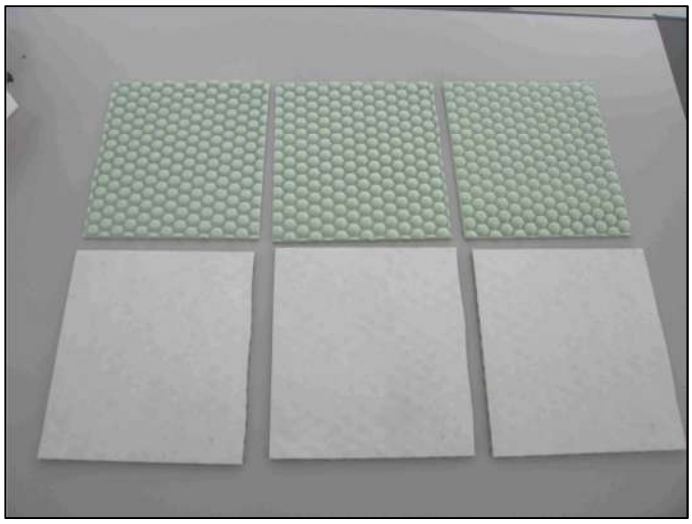
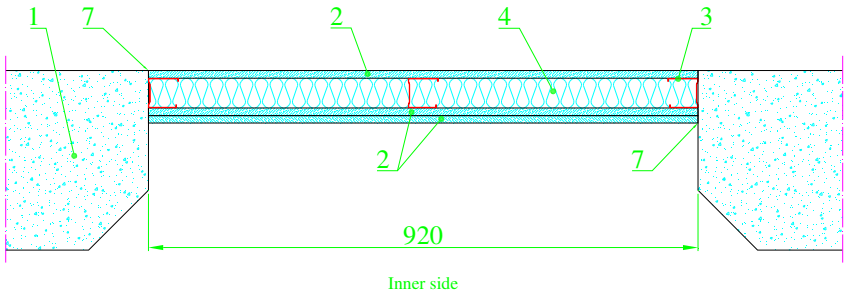


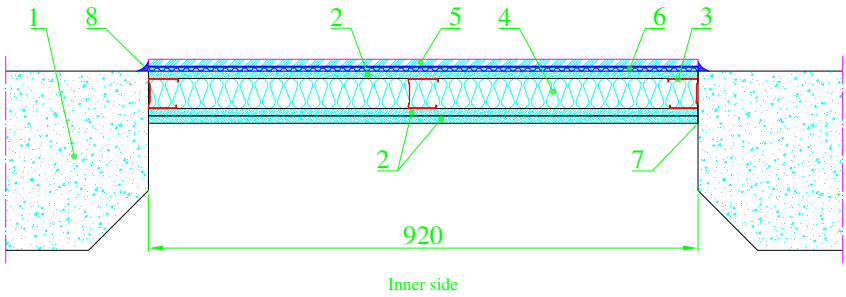
Photo of items of the "FONOSPHERA SF51" insulation blanket

CROSS SECTION OF THE PARTITION
BEFORE AND AFTER INSTALLATION OF THE CLADDING

Partition without cladding



Partition with cladding installed



Key

Symbol	Description
1	Masonry wall, thickness 300 mm
2	Plasterboard, thickness 12,5 mm;
3	Load-bearing framework: steel channel, depth 50 mm
4	Mineral wool blanket, thickness 50 mm and density 50 kg/m³
5	"GIPS FASER H" gypsum fibreboard, thickness 12 mm, supplied by Global Building S.r.l.
6	"FONOSPHERA SF51" studded insulation blanket, maximum thickness 7 mm and minimum thickness 2 mm, consisting of a studded layer of closed-cell cross-linked polyethylene, density 30 kg/m³, and a layer of polymer mass and mineral fillers, thickness 1 mm
7	Gypsum plaster finish
8	Low modulus silicone sealant

Normative references

Standard	Title
UNI EN ISO 140-4:2000 *	Acoustics - Measurement of sound insulation in buildings and of building elements - Field measurements of airborne sound insulation between rooms
UNI EN ISO 717-1:2007	Acoustics. Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation

(*) annex C "Measurement of flanking transmission".

Apparatus

Description
Sinus Messtecnik "Soundbook Quadro 974301.6" four-channel real-time analyser, serial number 6114
Look Line "DL 301" dodecahedral speaker
Look Line "D 301" power amplifier
DJB Instruments "A/120/V" accelerometer, serial number 3037
APT "AT01" accelerometer calibrator, serial number 2229
Complementary accessories

Method

The source room has an opening designed to house a French door leading onto a large external terrace and this opening has been filled with the partition to be measured.

After positioning the sound source inside the room, the sound pressure level was measured at various frequencies within the range 100 Hz to 5000 Hz along with the surface velocity level of the sample at various points of the outward-facing surface, using an accelerometer well attached with beeswax.

The sound reduction index of a partition is generally given by the equation:

$$R = 10\,\mathrm{Log}\left(\frac{W_1}{W_{sample}}\right)$$

where: R = sound reduction index in dB;
W_1 = sound power incident on the entire partition, in W;
W_{sample} = sound power transmitted by sample, in W.

The sound power "W_1" incident on the sample is given by:

$$W_1 = \left[\frac{S_{TOT}\left\langle P_1^{\,2}\right\rangle}{4\cdot\rho\cdot c}\right]$$

where: W_1 = sound power incident on the entire partition, in W;
S_{TOT} = overall area of the entire partition = 10,14 m²;
$\left\langle P_1\right\rangle$ = spatial average of the sound pressure in the source room squared, in Pa;
$\rho \cdot c$ = characteristic impedance of air, in kg/m²·s.

The sound power transmitted by the sample "W_{sample}" is related to the vibration velocity of its emitting surface by the following equation:

$$W_{sample} = S_{sample}\cdot\rho\cdot c\cdot V^2\cdot\sigma_k$$

where: W_{sample} = sound power transmitted by sample, in W;
S_{sample} = sample surface area = 2,19 m²;
σ_k = radiation efficiency, a figure of about 1 above the critical frequency;
V = sample surface velocity, in m/s;
$\rho \cdot c$ = characteristic impedance of air, in kg/m²·s.

The sound reduction index "R" is therefore provided by the following equation:

$$R = 10\,\mathrm{Log}\left[\frac{S_{TOT}\left\langle P_1^{\,2}\right\rangle}{S_{sample}\cdot 4\cdot\rho^2\cdot c^2\cdot V^2\cdot\sigma_k}\right]$$

The single-number quantity "R_w" of the sound reduction index "R" is equal to the value in dB of the reference curve at 500 Hz in accordance with the method specified by standard UNI EN ISO 717-1:2007.

Environmental conditions

Average temperature	30 °C
Average relative humidity	60 %

Test room characteristics

Source room volume	40,2 m³
Surface area of item (0,93 × 2,35 m)	2,19 m²
Generation of sound field	White noise
Microphone positions in source room	6 microphone positions
Accelerometer positions on sample surface	6 evenly distributed positions

Results

PARTITION WITHOUT CLADDING

Frequency [Hz]	Source level [dB]	Source pressure [Pa]	V [m/s]	ρ · c [kg/m²·s]	σ_k	R [dB]
100	82,6	0,3	$9{,}03559 \cdot 10^{-5}$	415,03	1	17,8
125	89,8	0,6	$9{,}64693 \cdot 10^{-5}$	415,03	1	24,4
160	88,2	0,5	$5{,}65539 \cdot 10^{-5}$	415,03	1	27,4
200	91,6	0,8	$6{,}64477 \cdot 10^{-5}$	415,03	1	29,4
250	89,5	0,6	$5{,}0433 \cdot 10^{-5}$	415,03	1	29,7
315	91,0	0,7	$4{,}04894 \cdot 10^{-5}$	415,03	1	33,2
400	89,7	0,6	$3{,}77529 \cdot 10^{-5}$	415,03	1	32,4
500	89,4	0,6	$2{,}24763 \cdot 10^{-5}$	415,03	1	36,6
630	90,4	0,7	$2{,}09997 \cdot 10^{-5}$	415,03	1	38,2
800	89,9	0,6	$1{,}50903 \cdot 10^{-5}$	415,03	1	40,6
1000	89,7	0,6	$1{,}11247 \cdot 10^{-5}$	415,03	1	43,0
1250	91,4	0,7	$9{,}93213 \cdot 10^{-6}$	415,03	1	45,7
1600	85,9	0,4	$4{,}23328 \cdot 10^{-6}$	415,03	1	47,7
2000	86,7	0,4	$4{,}26909 \cdot 10^{-6}$	415,03	1	48,4
2500	90,9	0,7	$6{,}94575 \cdot 10^{-6}$	415,03	1	48,4
3150	90,9	0,7	$5{,}45937 \cdot 10^{-6}$	415,03	1	50,5
4000	89,8	0,6	$2{,}67343 \cdot 10^{-6}$	415,03	1	55,5
5000	90,0	0,6	$1{,}3164 \cdot 10^{-6}$	415,03	1	61,8

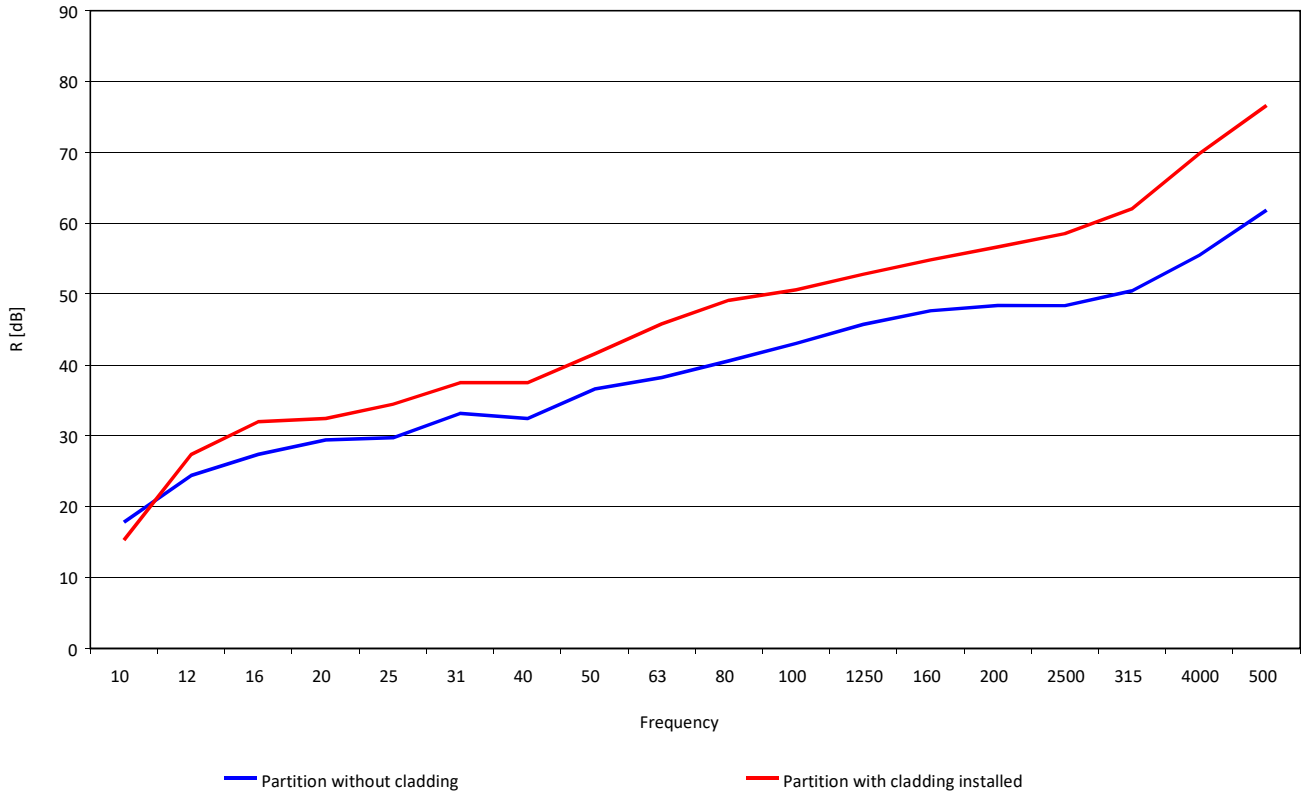
Sound reduction index "R_w"	**40 dB**

PARTITION WITH CLADDING INSTALLED

Frequency [Hz]	**Source level** [dB]	**Source pressure** [Pa]	**V** [m/s]	**ρ · c** [kg/m²·s]	**σ_k**	**R** [dB]
100	82,6	0,3	0,000120334	415,03	1	15,3
125	89,8	0,6	$6{,}8526 \cdot 10^{-5}$	415,03	1	27,4
160	88,2	0,5	$3{,}32556 \cdot 10^{-5}$	415,03	1	32,0
200	91,6	0,8	$4{,}68549 \cdot 10^{-5}$	415,03	1	32,5
250	89,5	0,6	$2{,}93327 \cdot 10^{-5}$	415,03	1	34,4
315	91,0	0,7	$2{,}4548 \cdot 10^{-5}$	415,03	1	37,5
400	89,7	0,6	$2{,}0998 \cdot 10^{-5}$	415,03	1	37,5
500	89,4	0,6	$1{,}27263 \cdot 10^{-5}$	415,03	1	41,5
630	90,4	0,7	$8{,}76626 \cdot 10^{-6}$	415,03	1	45,8
800	89,9	0,6	$5{,}62777 \cdot 10^{-6}$	415,03	1	49,1
1000	89,7	0,6	$4{,}64393 \cdot 10^{-6}$	415,03	1	50,6
1250	91,4	0,7	$4{,}38782 \cdot 10^{-6}$	415,03	1	52,8
1600	85,9	0,4	$1{,}85107 \cdot 10^{-6}$	415,03	1	54,8
2000	86,7	0,4	$1{,}65052 \cdot 10^{-6}$	415,03	1	56,7
2500	90,9	0,7	$2{,}15196 \cdot 10^{-6}$	415,03	1	58,6
3150	90,9	0,7	$1{,}43708 \cdot 10^{-6}$	415,03	1	62,1
4000	89,8	0,6	$5{,}12679 \cdot 10^{-7}$	415,03	1	69,8
5000	90,0	0,6	$2{,}40256 \cdot 10^{-7}$	415,03	1	76,6

Sound reduction index "R_w"	**44 dB**

The following graph and table compare the sound reduction index values obtained for the partition with and without the cladding fitted with “FONOSPHERA SF51” insulation blanket.



Comparative graph of results

	Sound insulation index “R_w” [dB]	**Improvement “ΔR_w”** [dB]
Partition without cladding	40	4
Partition with cladding installed	44	