REPORT

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Measurement of sound reduction index of walls in the laboratory according to ISO 10140-2

(3 appendices)

The meaning of this test is to investigate the impact of a special screw on a wall construction. The screws were used to fasten the gypsum boards on each side of 95 mm wooden studs. The wall with the special screws were compared with ordinary gypsum board screwing.

Client

Innovation Skåne AB

Test objects

A wall of wood studs 45x95 at c/c 450, 95 mineral wool and one layer of 12,5 mm gypsum boards on each side.

The wall was tested with ordinary screwing of the gypsum boards and with special screws supplied by Acoustos AB

Pictures of the walls and their details can be seen in the report.

Arrival of test objects

Just before the test

Date of measurement

2019-02-20 and

Results

A summary of the test results is given in table 1. Complete results are shown in the appendices.

A direct comparison between the special screws and ordinary screwing is given in table 2 and enclosure 3.

The results are valid for the tested objects only.

Accred. No. 1002
Testing
ISO/IEC 17025

Table 1

Stud wall:	R_w (dB)	$C_{50\text{-}3150}$ (dB)	Enclosure
Ordinary gypsum board screws	38	-3	1
The special screws	47	-7	2

Table 2 – Results of the special screws compared with ordinary screws, both in wooden studs. Positive numbers means better sound insulation with the special screws.

ΔR_w (dB)	$\Delta C_{50\text{-}3150}$ (dB)	$\Delta R_w + C_{50\text{-}3150}$ (dB)
9	-4	5

Measurement method

The measurements have been carried out according to the international standard ISO 10140-2 which corresponds to former ISO 140-3:1995. SP is accredited for the method.

The sound reduction index R has been determined according to:

$$R = L_1 - L_2 + 10\lg\left(\frac{S}{A}\right)$$

where L_1 is the average sound pressure level in the source room (dB), L_2 is the average sound pressure level in the receiving room (dB), S is the area of the test specimen (m^2) and A is the equivalent absorption area of the receiving room (m^2).

The average sound pressure levels have been determined by using a rotating microphone boom (radius >1,1 m) and a digital frequency analyser. A continuously moving loudspeaker has been used in the source room. During the measurement time of 128 s, the loudspeaker has moved up and down along a line across the room.

Evaluation

The results have been evaluated regarding weighted sound reduction index in the laboratory R_W according to Swedish and international standard SS-EN ISO 717-1:2013. In the enclosures R_w, (C;C_{tr}), ($C_{50\text{-}3150}$;$C_{tr\ 50\text{-}3150}$) och ($C_{50\text{-}5000}$;$C_{tr\ 50\text{-}5000}$) are given. These spectrum adaptation terms are defined in SS-EN ISO 717-1:96. The spectrum adaptation terms can be added to R_w to obtain adaptation to different noise spectra. C refers to adaptation of R to spectrum with character of traffic noise in high speed (i.e. a larger share of high frequency noise than urban traffic noise). C_{tr} refers to adaptation to urban traffic noise according to NT ACOU 061 and SS-EN ISO 717-1:96. (C;C_{tr}) are calculated for the frequency range 100-3150 Hz, ($C_{50\text{-}3150}$;$C_{tr\ 50\text{-}3150}$) for the frequency range 50-3150 Hz and ($C_{50\text{-}5000}$;$C_{tr\ 50\text{-}5000}$) for the frequency range 50-5000 Hz. The average reduction index R_{mean} is the arithmetic average value of R for the 16 third-octaves 100-3150 Hz.

Measurement uncertainty

Measurement U, according to ISO 12999-1:2014, with respect to the reproducibility are given in table 2. The table shows the uncertainty with the coverage factor k=2 (corresponding to 95% confidence level).

Table 2

1/3-octave band (Hz)	Measurement uncertainty, U (dB)
50	11,7
63	6,7
80	5,9
100	5,0
125	5,0
160	3,8
200	3,3
250	3,3
315	3,3
400	3,3
500	3,3
630	3,3
800	3,3
1000	3,3
1250	3,4
1600	3,4
2000	3,4
2500	3,5
3150	3,6
4000	4,0
5000	4,7
R_W	2,0

In table 3 the chosen highest measured sound reduction indices (R'_{max}) of the laboratory are given for a mounting in the receiving room (one room mounting) and over the joint to the sending room (two room mounting). Measured values within 15 dB of the highest measured values may be affected by the limits of the laboratory and are thus of the type "≥". The closer the test object values are to the limits of the laboratory the more they may be affected.

Table 4

Frequency (Hz)	R'_{max} (dB) Walls placed in the receiving room only (one room mounting)	R'_{max} (dB) Wall structures placed on each side of the laboratory joint (two room mounting)
50	31,5	39,0
63	23,7	37,8
80	32,6	47,7
100	38,3	45,8
125	43,1	52,2
160	46,6	57,5
200	48,7	60,0
250	53,4	64,9
315	55,8	67,0
400	57,7	68,8
500	57,6	72,5
630	58,7	74,8
800	62,7	79,3
1000	66,0	84,1
1250	67,6	88,6
1600	68,4	92,4
2000	70,0	90,1
2500	66,0	86,3
3150	67,2	87,2
4000	68,5	90,4
5000	70,1	88,1
R'_W	62	73

Test room

The airborne sound reduction laboratory for walls, where the volumes of the source and receiving rooms are 107 m^3 and 129 m^3 respectively, was used as test room. The dimensions of the test opening between the measurement rooms are 2,59 x 4,21 m.

Mounting

The mounting was carried out by a subcontractor to RISE in consensus with the client.

Pictures of the test objects

Picture 1 – The wall during mounting.

Picture 2 – The wall.

Picture 3 – Details of the wall. U-channel and studs.

Picture 4 – The special screw in the measurement in enclosure 2.

Equipment

Microphones	Brüel & Kjær	4166	1011610	(source room)
		4166	1072010	(receiving room)
Microphone preamplifiers	Brüel & Kjær	2619	726822	(source room)
		2619	726782	(receiving room)
Microphone power supplies	Brüel & Kjær	2801	618956	(source room)
		2804	815268	(receiving room)
Microphone booms	Brüel & Kjær	3923	761969	(source room)
		3923	912304	(receiving room)
Sound analyzer	Norsonic	830	10765	
Calibrator	Brüel & Kjaer	4230	1410946	
Measurement programme	Acoustic	2.0.8		

RISE Research Institutes of Sweden AB
Building Technology - Sound and vibration

Performed by

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Appendices

Appendix 1

Determination of sound insulation in a laboratory according to EN ISO 10140-2

Client: Innovation Skåne AB Date of test: 2019-02-20

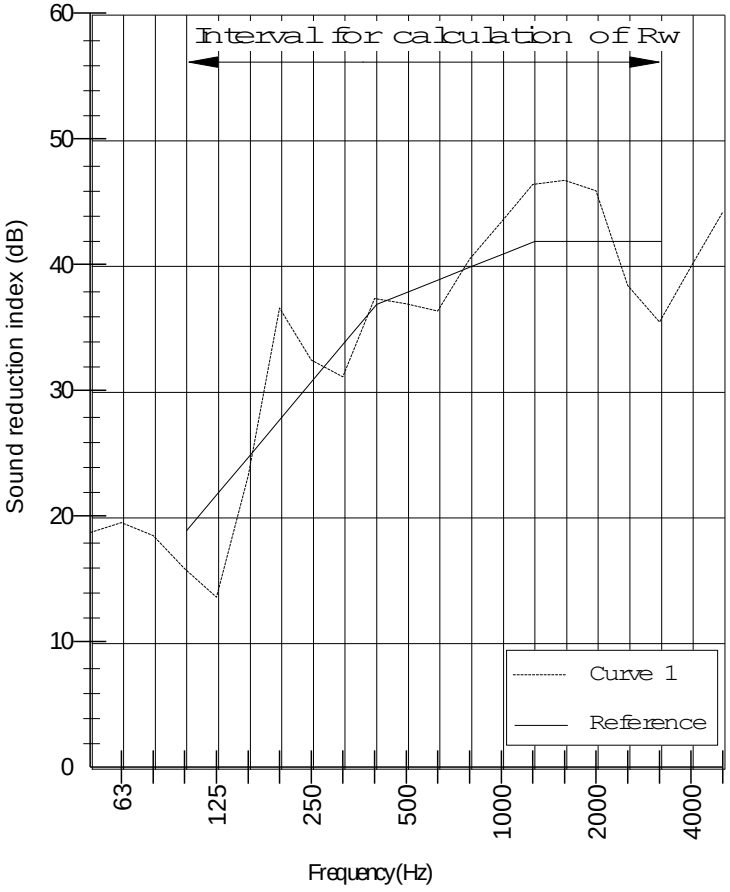
Test object: Wall of wood studs 45x95 at c/c 450, 95 mineral wool and one layer of 12,5 mm gypsum boards on each side. Testing with ordinary gypsum screws.

Screwing: c/c 200 along board edges and c/c 300 in the middle of boards.

Boards: Gyproc GNE 13

Area of the test opening: 10,96 m^2, one room mounting.

Result: Curve 1 – Test object
Curve 2 - Reference curve



Frecuency (Hz)	Curve 1 (dB)
50	18,6
63	19,5
80	18,4
100	15,8
125	13,5
160	23,2
200	36,5
250	32,4
315	31,1
400	37,3
500	36,9
630	36,3
800	40,4
1000	43,4
1250	46,4
1600	46,7
2000	45,9
2500	38,3
3150	35,4
4000	39,8
5000	44,2

Rw	38
(C; Ctr)	(-3;-8)
50-3150	(-3;-9)
50-5000	(-2;-9)
Rmean	35
Sum. Dev.	30,5
Max. Dev.	8,5
Frequency	125

Appendix 2

Determination of sound insulation in a laboratory according to ISO 10140-2

Client: Innovation Skåne AB Date of test: 2019-02-21

Test object: Wall of wood studs 45x95 at c/c 450, 95 mineral wool and one layer of 12,5 mm gypsum boards on each side. **Testing with special screws**.

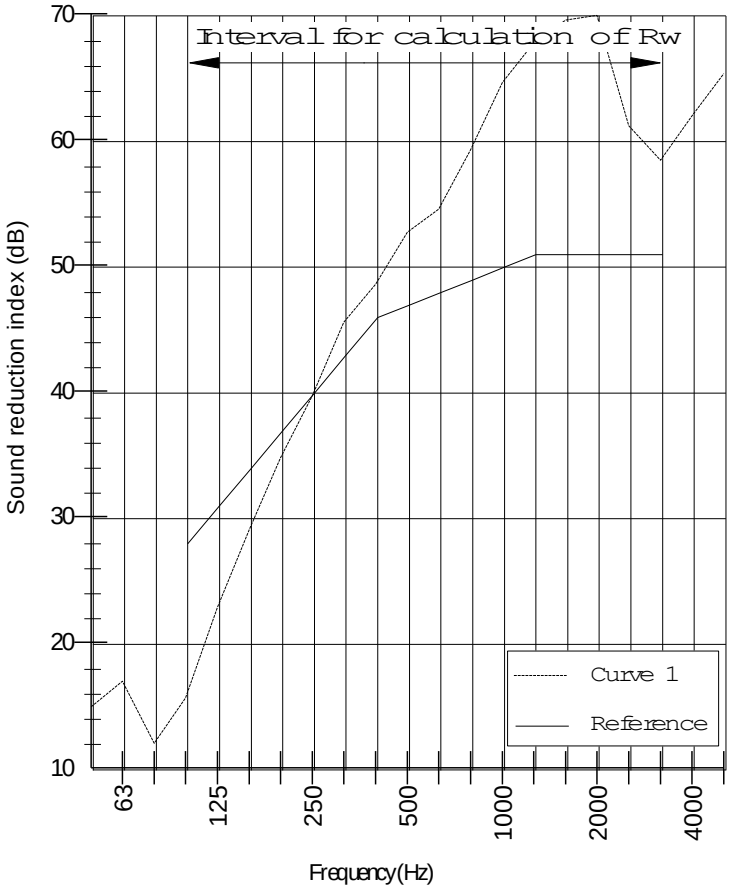
Screwing: c/c 300 along board edges and c/c 500 in the middle of boards.

Boards: Gyproc GNE 13

Area of the test opening: 10,96 m^2, one room mounting.

Result: Curve 1 – Test object

Curve 2 - Reference curve



Frecuency (Hz)	Curve 1 (dB)
50	14,8
63	16,9
80	11,9
100	15,5
125	22,8
160	28,9
200	34,7
250	39,6
315	45,5
400	48,5
500	52,6
630	54,5
800	59,2
1000	64,5
1250	67,7
1600	69,5
2000	69,9
2500	61,1
3150	58,3
4000	61,9
5000	65,2

Rw	47
(C; Ctr)	(-5;-13)
50-3150	(-7;-17)
50-5000	(-6;-17)
Rmean	49,5
Sum. Dev.	28,5
Max. Dev.	12,5
Frequency	100

Appendix 3

Determination of sound insulation in a laboratory according to ISO 10140-2

Client: Innovation Skåne AB Mätdatum: 2019-02-20

Test object: Wall of wood studs 45x95 at c/c 450, 95 mineral wool and 13 mm gypsum boards.

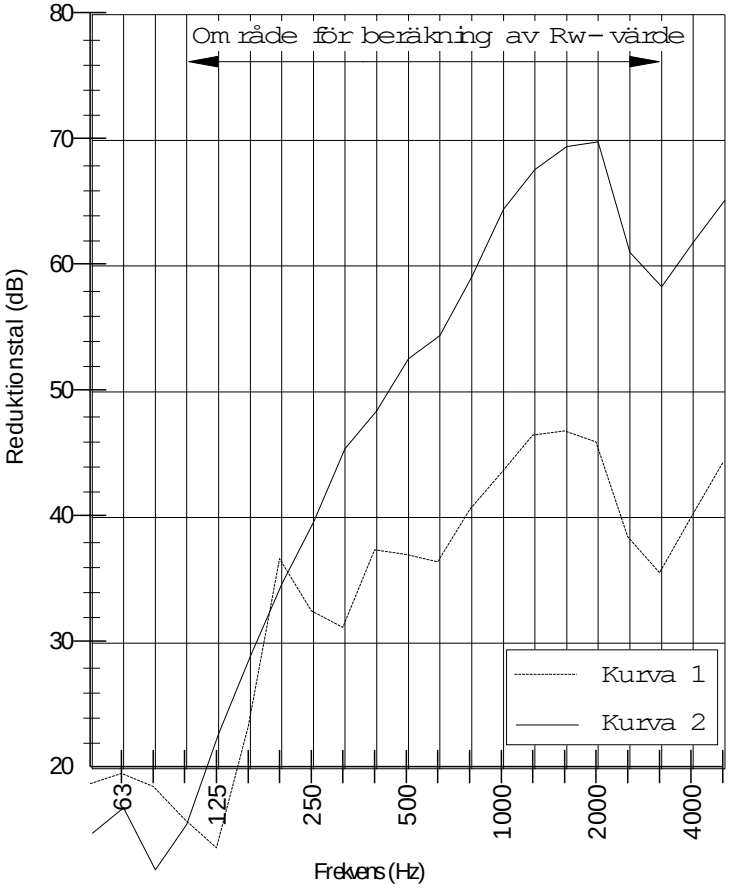
Boards: Gyproc GNE 13

The special screws compared with ordinary screwing.

1: Ordinary screwed.
2: With special acoustical screws.

Area of the test opening: 10,96 m^2, one room mounting.

Results: Kurva 1 – Ordinary screwing
Kurva 2 – The special screws



Frequency (Hz)	Kurva 1 (dB)	Kurva 2 (dB)
50	18,6	14,8
63	19,5	16,9
80	18,4	11,9
100	15,8	15,5
125	13,5	22,8
160	23,2	28,9
200	36,5	34,7
250	32,4	39,6
315	31,1	45,5
400	37,3	48,5
500	36,9	52,6
630	36,3	54,5
800	40,4	59,2
1000	43,4	64,5
1250	46,4	67,7
1600	46,7	69,5
2000	45,9	69,9
2500	38,3	61,1
3150	35,4	58,3
4000	39,8	61,9
5000	44,2	65,2

Rw	38	47
(C; Ctr)	(-3;-8)	(-5;-13)
50-3150	(-3;-9)	(-7;-17)
50-5000	(-2;-9)	(-6;-17)
Rmedel	35	49,5
Sum. Avv.	30,5	28,5
Max. Avv.	8,5	12,5
Frequency	125	100