

## SOUND REDUCTION INDEX OF FOUR WALL CONSTRUCTIONS WITH EWES SOUND FASTENER

### SUMMARY

The sound reduction index of four wall types has been measured according to SS-EN ISO 10140-2:2021 and evaluated according to SS-EN ISO 717-1:2020. The measurements were performed with the screw Sound Fastener from EWES.

A summary of the results is presented in the table 1 below.





Measurement protocol	Test object	Wall thickness (mm)	$R_w$ (dB)
M1		12,5 mm plasterboard 11 mm OSB board 70 mm Wooden studs with 70 mm Insulation 11 mm OSB board 12,5 mm plasterboard	117 54
M2		12,5 mm plasterboard 70 mm Wooden studs with 70 mm Insulation 12,5 mm plasterboard	95 45
M3		12,5 mm plasterboard 70 mm Wooden studs 12,5 mm plasterboard	95 35
M4		2x 12,5 mm plasterboard 70 mm Wooden studs 2x 12,5 mm plasterboard	120 45

Table 1: Summary of the tested wall types with weighted sound reduction  $R_w$  according to ISO 717-1.

### 1 CLIENT

EWES AB, Lundavägen 53, SE-333 71, Bredaryd, Sweden  
Contact: David Gaulier, david.gaulier@ewes.se, +46 (0)370 867 31

### 2 ASSIGNMENT

To measure and evaluate the sound reduction for a number of wall types.

### 3 TEST OBJECTS

The test objects were mounted between test room 2 (sending room) and test room 1 (receiving room) in Akustikverkstan's laboratory in Skulptorp, Skövde. All test objects were mounted on the sending room side of the acoustic split in the laboratory.

All frames were built with 70 x 45 mm wooden studs with 450 mm centre-to-centre distance between. The plasterboard was a standard type (Knauf danogips A 13) with the weight 8.6 kg/m<sup>2</sup>. All wall types had the innermost layer connected to the studs with EWES Sound Fastener, see figure 1.



Figure 1: EWES Sound Fastener

Wall types in M1 and M2 had insulation (Paroc extra 70 mm) with the density of 28 – 30 kg/m<sup>3</sup>. The wall type in M1 had 11 mm OSB board with the weight of 6.7 kg/m<sup>2</sup>.

The second layer of plasterboard in M1 and M4 was screwed with regular screws that did not connect to the studs. For M1 and M4 each layer was placed in an overlapping pattern for the walls with two layers of gypsum board on each side of the frame.

The interface between the test opening and the plaster board of the wall was sealed with latex sealant and clay.



Figure 2: A (M1) wall seen from the sending room side.

More images are available in *Appendix 4 Photos*.

#### **4 MEASUREMENT PROCEDURE**

The measurements were performed according to SS-EN ISO 10140-2:2021 with two speaker positions in the sending room and with the microphone placed on a rotating boom in each measurement room. Each measurement period was 60 seconds. The reverberation time of the receiving room was measured with two speaker positions and four microphone positions.

The measurements were performed in the Akustikverkstan laboratory in Skultorp 2023-06-14 by Staffan Andersson. More information about the laboratory can be found in appendix 1. The measurement equipment is described in appendix 2. Akustikverkstan is accredited for the ISO 10140 and ISO 717 standards.

#### **5 RESULTS**

The measurements have been evaluated according to SS-EN ISO 717-1:2020. The weighted sound reduction indices,  $R_w$ , for the test objects are presented in table 3 together with the adaptation terms  $C$ ,  $C_{tr}$  and  $C_{50-3150}$ . Detailed results for the measurements are available as measurement protocols 3078-M1 to M4. The results are valid only for the tested specimens. The measurement accuracy is described in appendix 3.





Measurement protocol	Test object	$R_w$ (dB)	C	$C_{tr}$	$C_{50-3150}$
M1	 12,5 mm plasterboard 11 mm OSB board 70 mm Wooden studs with 70 mm Insulation 11 mm OSB board 12,5 mm plasterboard	54	-4	-10	-7
M2	 12,5 mm plasterboard 70 mm Wooden studs with 70 mm Insulation 12,5 mm plasterboard	45	-4	-11	-5
M3	 12,5 mm plasterboard 70 mm Wooden studs 12,5 mm plasterboard	35	-2	-6	-2
M4	 2x 12,5 mm plasterboard 70 mm Wooden studs 2x 12,5 mm plasterboard	45	-1	-7	-2

Table 3: Sound reduction index for the tested objects.

This report should always be used in its complete context, even though the measurement protocols may be used independently.

Staffan Andersson

Reviewed by Carl Nyqvist, 2023-06-20



## APPENDIX 1: INFORMATION ABOUT THE TEST FACILITY

Test room 2 on the 1<sup>st</sup> floor is rectangular with the dimensions of  $L \times W \times H = 5.0 \times 6.25 \times 3.93$  m. The volume of the room is  $123 \text{ m}^3$  and the total surface area of walls, ceiling and floor is  $151 \text{ m}^2$ . This room is used as the sending room during the measurements of the sound reduction indices of the walls.

Test room 1 (reverberation room) on the 1<sup>st</sup> floor has a rectangular form with the dimensions of  $L \times W \times H = 4.65 \times 5.85 \times 7.35$  m. The volume of room is  $200 \text{ m}^3$  and the total surface area of walls, ceiling and floor is  $209 \text{ m}^2$ . This room is used as the receiving room during the measurements of the sound reduction indices of the walls.

A section of the two rooms together with the location of the tested wall are shown in figure A1.1. The test opening is  $10 \text{ m}^2$  ( $3.65 \times 2.74$  m).

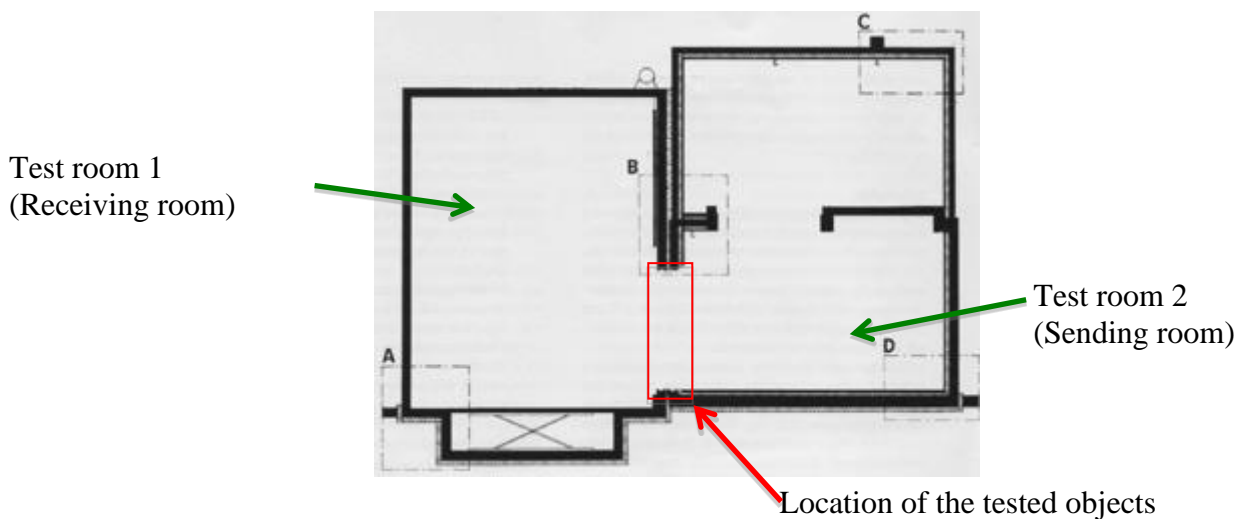


Figure A1.1: Section of the laboratory with the sending room (1<sup>st</sup> floor) and the reverberation room (1<sup>st</sup> floor) together with the location of the test specimens.

The walls of Test room 1 are made from 20 cm concrete with a density of 2300-2400 kg/m<sup>3</sup>. The walls in Test room 2 room are made from bricks (25 cm) with two layers of gypsum board and one layer of wooden fibreboard with 100 mm mineral wool behind. The test opening is acoustically separated in the split line between the rooms.

The laboratory address is Vallmovägen 11, 541 55 Skövde.

The measured  $R'_{\max}$  for wall elements in the laboratory are stated in figure A1.2 below.

Frequency (Hz)	Sound reduction (dB)	
	Heavy-weight	Light-weight
50		33.8
63		36.2
80		38.7
100	50	46.8
125	53	49.2
160	53	51.5
200	55	57
250	59	62
315	62.5	65
400	68	68
500	76	73
630	81	77.9
800	83	82
1 000	85	85
1 250	88	85
1 600	92	87.2
2 000	95	94.9
2 500	98	95.2
3 150	98	97
4 000		98.7
5 000		101.7

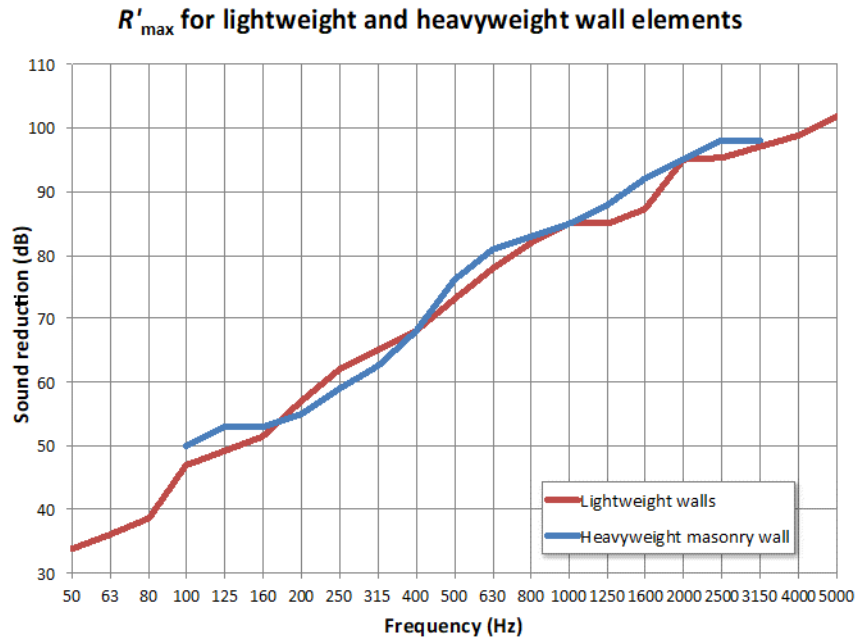


Figure A1.2: Measured  $R'_{max}$  for lightweight and heavyweight wall elements.

## APPENDIX 2: MEASUREMENT EQUIPMENT

The equipment used during the measurements is presented in Table A2.1. The equipment fulfils class 1 according to IEC 61672-1, 60942 and 61260. Last calibration date is kept in the Akustikverkstan calibration log. A function control using a microphone calibrator is made immediately prior to and after the measurements.

Equipment	Brand and type	Serial number
Analyser	Norsonic 140	1404198
Analyser	Norsonic 140	1404881
Omnidirectional loudspeaker	IMA Kub 1	8, 9, 10
Microphone cartridges	Norsonic 1225	149475, 215330
Microphone preamplifier	Norsonic 1209	13604, 14567
Microphone calibrator	Norsonic 1256	31964
Equalizer	Monacor MEQ-2152	-
Amplifier	Denon POA-2200	-

Table A2.1: Used measurement equipment.

### APPENDIX 3: MEASUREMENT ACCURACY

The measurement accuracy of the weighted sound reduction index,  $R_w$ , is typically within 1.2 dB compared to other testing facilities.

The measurement accuracy of the sound reduction index is frequency dependent and background noise dependent. The measurement uncertainty for single one-third octave bands is shown in Table A3.1. The value represents one standard deviation of the measurement reproducibility.

<b>50 Hz</b>	<b>63 Hz</b>	<b>80 Hz</b>	<b>100 Hz</b>	<b>125 Hz</b>	<b>160 Hz</b>	<b>200 Hz</b>
± 6.8 dB	± 4.6 dB	± 3.8 dB	± 3.0 dB	± 2.7 dB	± 2.4 dB	± 2.1 dB
<b>250 Hz</b>	<b>315 Hz</b>	<b>400 Hz</b>	<b>500 Hz</b>	<b>630 Hz</b>	<b>800 Hz</b>	<b>1 kHz</b>
± 1.8 dB	± 1.8 dB	± 1.8 dB	± 1.8 dB	± 1.8 dB	± 1.8 dB	± 1.8 dB
<b>1.25 kHz</b>	<b>1.6 kHz</b>	<b>2.0 kHz</b>	<b>2.5 kHz</b>	<b>3.15 kHz</b>	<b>4.0 kHz</b>	<b>5.0 kHz</b>
± 1.8 dB	± 1.8 dB	± 1.8 dB	± 1.9 dB	± 2.0 dB	± 2.4 dB	± 2.8 dB

Table A3.1: Measurement accuracy for sound reduction index, without background noise.

In case of too high background noise levels, the sound reduction index is at least the presented value, giving a one-sided positive uncertainty from background noise.

The measurement accuracy of other parameters is found in table A3.2.

Parameter	Uncertainty
$R_w$	± 1.2 dB
Temperature	± 0.5° C
Humidity	± 3% units
Static pressure	± 0.5 kPa

Table A3.2: Measurement uncertainties.

## APPENDIX 4: PHOTOS



Figure A4.1: Test wall M1 seen from the receiving room.



Figure A4.2 Test wall M1 during construction.



Figure A4.3: Test wall M1 during construction.

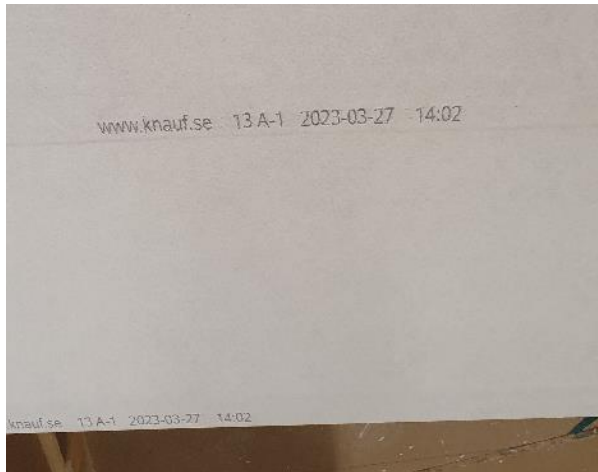
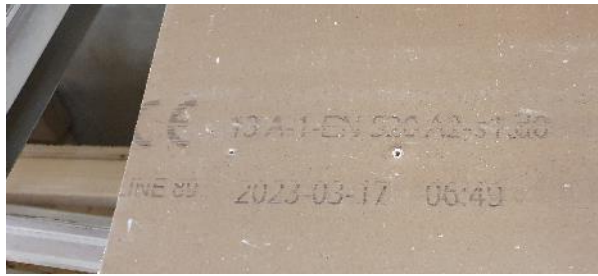


Figure A4.4: Plasterboard used for the measurement.



Figure A4.5: M2 seen from sender room.





Figure A4.6: M2 and M3 from receiving room.



Figure A4.7: M2 during construction.



Figure A4.8: M3 and M4 during construction.



Figure A4.8: M3 from sender room.



Figure A4.9: M4 during construction.





Figure A4.10: M4 seen from sender room.



Figure A4.11: M4 seen from receiving room.

## Sound reduction index according to ISO 10140-2

No. of test report: 3078-M1  
Date of report: 2023-06-21  
Date of test: 2023-06-14  
Name: Staffan Andersson

Laboratory measurements of airborne sound insulation of building elements

Client: EWES  
Manufacturer: EWES, PAROC, Knauf  
Test specimen mounted by: Akustikverkstan, EWES

### Test room identification:

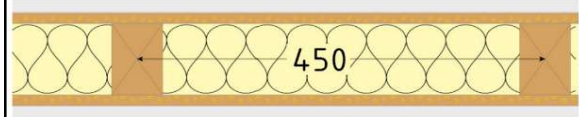
test room 2 (sending room) to test room 1 (receiving room)

### Product identification:

Wooden studs, OSB board, Knauf danogips A 13, PAROC eXtra 70 mm, EWES Sound Fastener

### Description of the specimen:

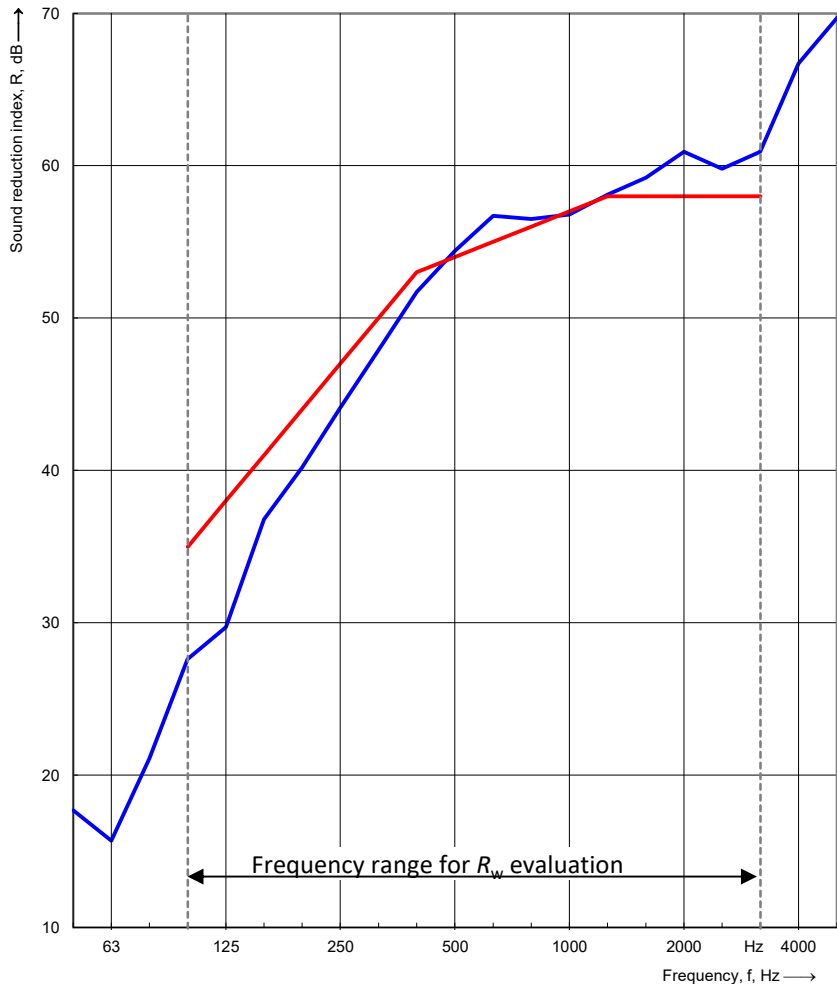
12.5 mm plasterboard  
11 mm OSB board  
70 mm wooden studs, c.t.c. 450 mm, with 70 mm insulation  
11 mm OSB board  
12.5 mm plasterboard  
OSB board have been mounted to wooden studs with Sound Fastener.



Barometric pressure: 100.1 kPa  
Size of test opening: 10.00 m<sup>2</sup>  
Mass per unit area: 38 kg/m<sup>2</sup>  
Temperature: 19.0 °C  
Air humidity: 48 %  
Source room volume: 123 m<sup>3</sup>  
Receiving room volume: 200.0 m<sup>3</sup>

— Measured sound reduction index, R  
— Shifted curve of reference values (ISO 717-1)

Frequency f [Hz]	R 1/3 octave [dB]
50	17.7
63	15.7
80	21.1
100	27.6
125	29.7
160	≥ 36.8
200	40.2
250	44.1
315	47.9
400	51.7
500	54.4
630	56.7
800	56.5
1000	56.8
1250	58.1
1600	59.2
2000	60.9
2500	59.8
3150	60.9
4000	66.7
5000	69.7



≥ indicates R-value within 15 dB from R'max

Rating according to ISO 717-1

$$R_w(C;C_{tr}) = 54 \text{ ( -4 ; -10 ) dB}$$

$$C_{50-3150} = -7 \text{ dB} \quad C_{50-5000} = -6 \text{ dB} \quad C_{100-5000} = -3 \text{ dB}$$

$$C_{tr,50-3150} = -19 \text{ dB} \quad C_{tr,50-5000} = -19 \text{ dB} \quad C_{tr,100-5000} = -10 \text{ dB}$$

$$\text{Sum of unfavourable deviations: } 30.2 \text{ dB}$$

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

**Sound reduction index according to ISO 10140-2**

Laboratory measurements of airborne sound insulation of building elements

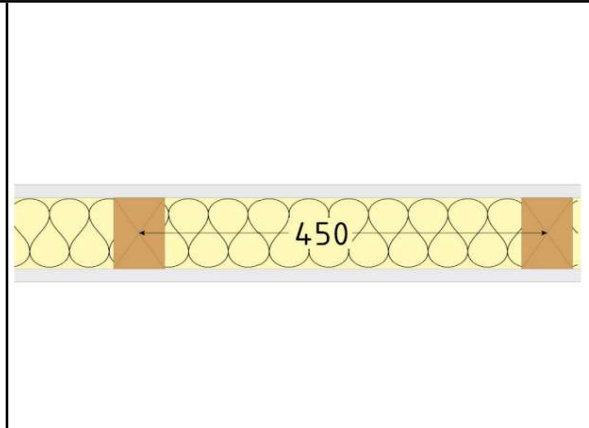
No. of test report: 3078-M2  
Date of report: 2023-06-21  
Date of test: 2023-06-14  
Name: Staffan Andersson

Client: EWES  
Manufacturer: EWES, PAROC, Knauf  
Test specimen mounted by: Akustikverkstan, EWES

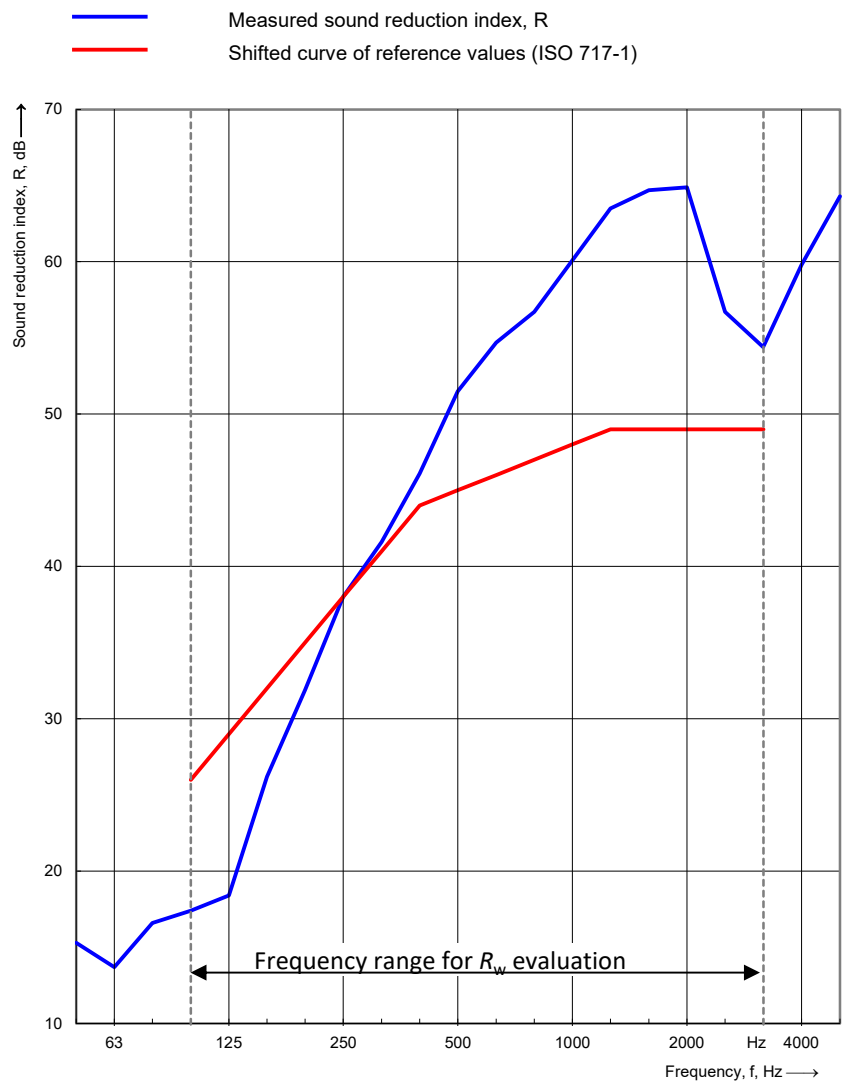
**Test room identification:**  
test room 2 (sending room) to test room 1 (receiving room)

**Product identification:**  
Wooden studs, Knauf danopigs A 13, PAROC eXtra 70 mm, EWES Sound Fastener

**Description of the specimen:**  
12.5 mm plasterboard  
70 mm wooden studs, c.t.c. 450 mm, with 70 mm insulation  
12.5 mm plasterboard  
Plasterboard have been mounted to wooden studs with Sound Fastener.



Barometric pressure: 100.1 kPa  
Size of test opening: 10.00 m<sup>2</sup>  
Mass per unit area: 25 kg/m<sup>2</sup>  
Temperature: 19.0 °C  
Air humidity: 49 %  
Source room volume: 123 m<sup>3</sup>  
Receiving room volume: 200 m<sup>3</sup>



Frequency f [Hz]	R 1/3 octave [dB]
50	15.3
63	13.7
80	16.6
100	17.4
125	18.4
160	26.2
200	31.9
250	38.0
315	41.6
400	46.1
500	51.5
630	54.7
800	56.7
1000	60.1
1250	63.5
1600	64.7
2000	64.9
2500	56.7
3150	54.4
4000	59.8
5000	64.3

Rating according to ISO 717-1  
 $R_w(C;C_{tr}) = 45$  ( -4 ; -11 ) dB

$C_{50-3150} = -5$  dB    $C_{50-5000} = -4$  dB    $C_{100-5000} = -3$  dB  
 $C_{tr,50-3150} = -14$  dB    $C_{tr,50-5000} = -14$  dB    $C_{tr,100-5000} = -11$  dB  
 Sum of unfavourable deviations: 28.1 dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

## Sound reduction index according to ISO 10140-2

No. of test report: 3078-M3  
Date of report: 2023-06-21  
Date of test: 2023-06-14  
Name: Staffan Andersson

Laboratory measurements of airborne sound insulation of building elements

Client: EWES  
Manufacturer: EWES, Knauf  
Test specimen mounted by: Akustikverkstan, EWES

**Test room identification:**  
test room 2 (sending room) to test room 1 (receiving room)

**Product identification:**  
Wooden studs, Knauf danogips A 13, EWES Sound Fastener

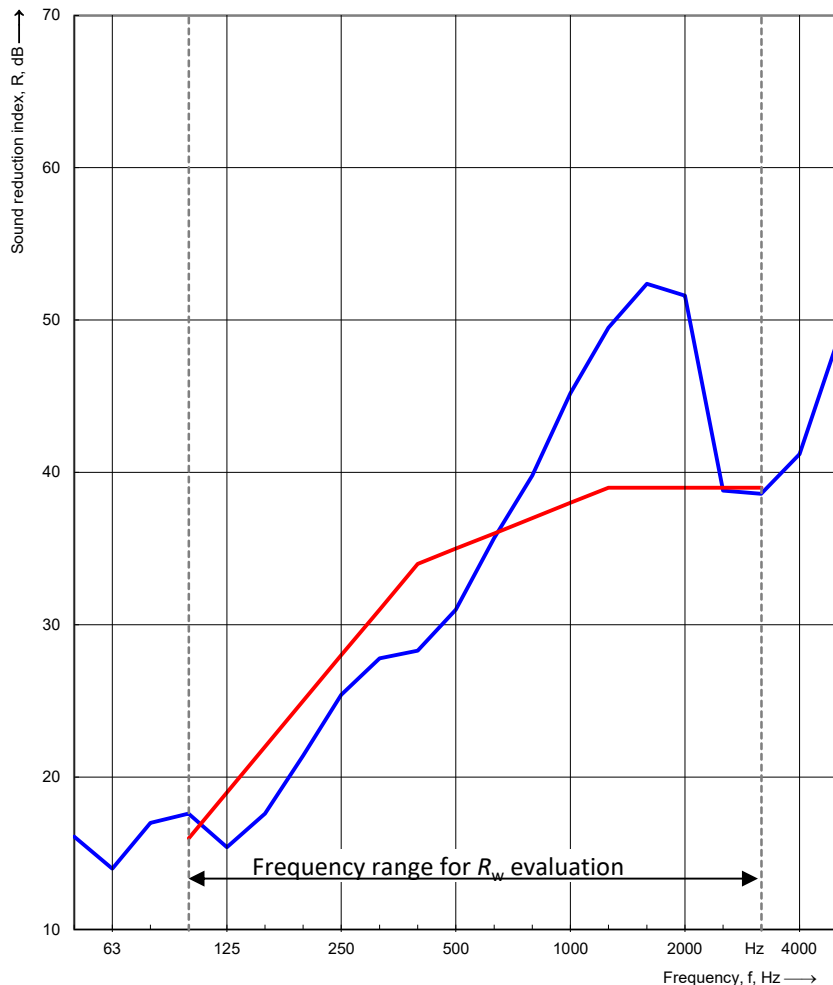
**Description of the specimen:**  
12.5 mm plasterboard  
70 mm wooden studs, c.t.c. 450 mm  
12.5 mm plasterboard  
Plasterboard have been mounted to wooden studs with Sound Fastener.



Barometric pressure: 100.1 kPa  
Size of test opening: 10.00 m<sup>2</sup>  
Mass per unit area: 23 kg/m<sup>2</sup>  
Temperature: 19.0 °C  
Air humidity: 50 %  
Source room volume: 123 m<sup>3</sup>  
Receiving room volume: 200.0 m<sup>3</sup>

— Measured sound reduction index, R  
— Shifted curve of reference values (ISO 717-1)

Frequency f [Hz]	R 1/3 octave [dB]
50	16.1
63	14.0
80	17.0
100	17.6
125	15.4
160	17.6
200	21.4
250	25.4
315	27.8
400	28.3
500	31.0
630	35.7
800	39.8
1000	45.2
1250	49.5
1600	52.4
2000	51.6
2500	38.8
3150	38.6
4000	41.2
5000	48.7



Rating according to ISO 717-1

$$R_w(C;C_{tr}) = 35 \text{ ( } -2 \text{ ; } -6 \text{ ) dB}$$

$$C_{50-3150} = -2 \text{ dB } C_{50-5000} = -1 \text{ dB } C_{100-5000} = -1 \text{ dB}$$

$$C_{tr,50-3150} = -7 \text{ dB } C_{tr,50-5000} = -7 \text{ dB } C_{tr,100-5000} = -6 \text{ dB}$$

$$\text{Sum of unfavourable deviations: } 28 \text{ dB}$$

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

## Sound reduction index according to ISO 10140-2

No. of test report: 3078-M4  
Date of report: 2023-06-21  
Date of test: 2023-06-14  
Name: Staffan Andersson

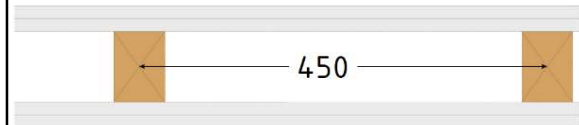
Laboratory measurements of airborne sound insulation of building elements

Client: EWES  
Manufacturer: EWES, Knauf  
Test specimen mounted by: Akustikverkstan, EWES

**Test room identification:**  
test room 2 (sending room) to test room 1 (receiving room)

**Product identification:**  
Wooden studs, Knauf danogips A 13, EWES Sound Fastener

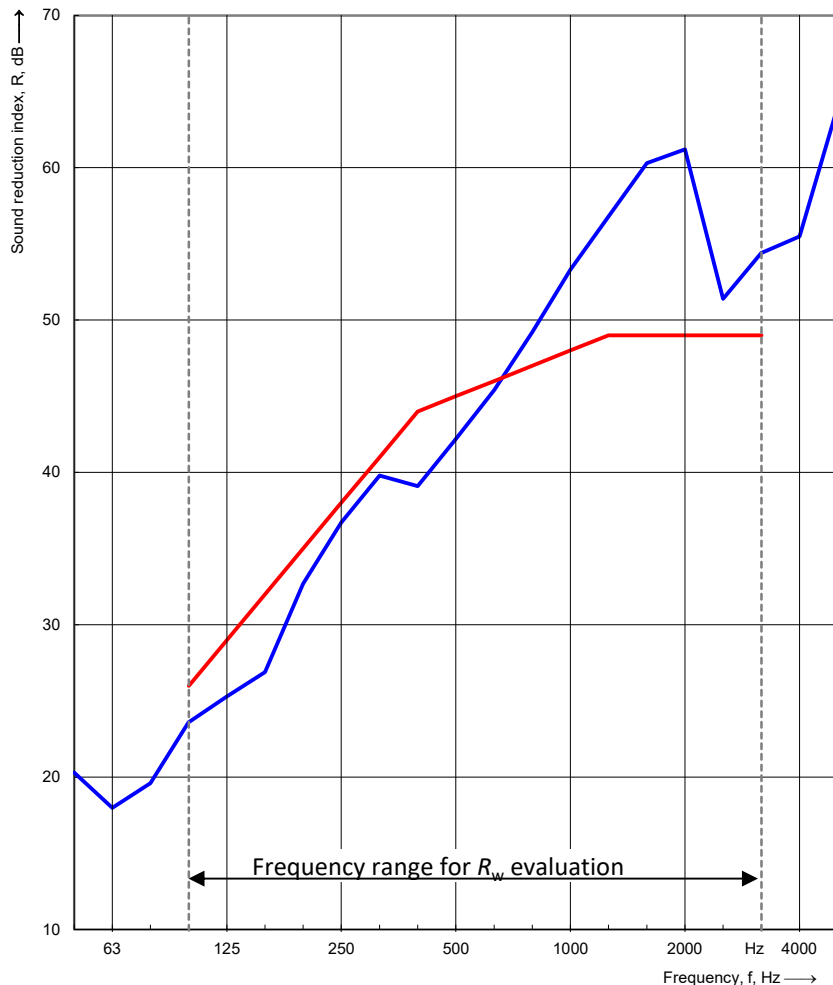
**Description of the specimen:**  
12.5 mm plasterboard  
12.5 mm plasterboard  
70 mm wooden studs, c.t.c. 450 mm  
12.5 mm plasterboard  
12.5 mm plasterboard  
Innermost layer have been mounted to wooden studs with Sound Fastener.



Barometric pressure: 100.1 kPa  
Size of test opening: 10.00 m<sup>2</sup>  
Mass per unit area: 41 kg/m<sup>2</sup>  
Temperature: 19.0 °C  
Air humidity: 50 %  
Source room volume: 123 m<sup>3</sup>  
Receiving room volume: 200.0 m<sup>3</sup>

— Measured sound reduction index, R  
— Shifted curve of reference values (ISO 717-1)

Frequency f [Hz]	R 1/3 octave [dB]
50	≥ 20.3
63	18.0
80	19.6
100	23.6
125	25.3
160	26.9
200	32.7
250	36.7
315	39.8
400	39.1
500	42.2
630	45.4
800	49.2
1000	53.3
1250	56.8
1600	60.3
2000	61.2
2500	51.4
3150	54.4
4000	55.5
5000	64.1



≥ indicates R-value within 15 dB from R'max

Rating according to ISO 717-1

$$R_w(C;C_{tr}) = 45 \text{ ( -1 ; -7 ) dB}$$

$$C_{50-3150} = -2 \text{ dB } C_{50-5000} = -1 \text{ dB } C_{100-5000} = 0 \text{ dB}$$

$$C_{tr,50-3150} = -10 \text{ dB } C_{tr,50-5000} = -10 \text{ dB } C_{tr,100-5000} = -7 \text{ dB}$$

$$\text{Sum of unfavourable deviations: } 24.3 \text{ dB}$$

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.