Cappotto REDArt su supporto in legno timber frame Rw=66,5 dB sp. 382 mm
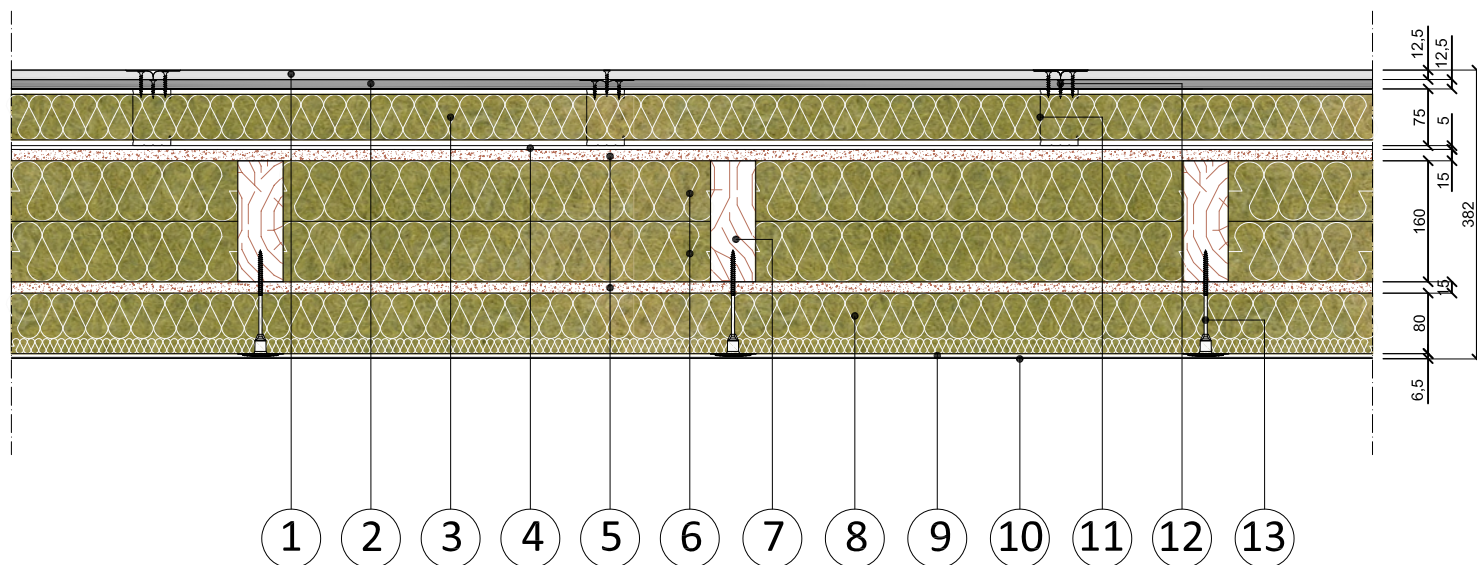
R_w (C,C$_{tr}$) = 66,5 (-5,-12) dB

N.	Descrizione	Description
1	Lastra in gesso rivestito BA13, sp. 12,5 mm	Plasterboard layer BA13, th. 12,5 mm
2	Lastra in gessofibra FERMACELL BA13, sp. 12,5 mm	Fermacell gypsum plasterboard BA13, th. 12,5 mm
3	Lana di roccia ROCKWOOL Acoustic 225 Plus, sp. 60 mm	ROCKWOOL Acoustic 225 Plus stonewool panel, th. 60 mm
4	Intercapedine d'aria, sp. 5 mm	Air gap, th. 5 mm
5	Pannelli in OSB, sp. 15 mm	OSB panel, th. 15 mm
6	Pannelli in lana di roccia ROCKWOOL Timberock, sp. 80 mm	ROCKWOOL Timberrock stonewool panel, th. 80 mm
7	Montanti in legno d'abete, dim. 160 x 80 mm	Timber studs, 160x80 mm
8	Pannelli ROCKWOOL Frontrock Max Plus, sp. 80 mm	ROCKWOOL Frontrock Max Plus stonewool panel, th. 80 mm
9	Rasante ROCKWOOL REDArt armato con rete, sp. 5 mm	ROCKWOOL REDArt base coat with reinforcing mesh, th. 5mm
10	Finitura Siliconica ROCKWOOL REDArt, sp. 1,5 mm	ROCKWOOL REDArt Silicone Top coat, th. 1,5 mm
11	Montante a C in acciaio zincato 50x75x0,6 mm	Galvanized steel C studs 50x70x0,6 mm
12	Viti fosfatate autofilettanti	Self tapping screws
13	Tassello REDArt per legno STR H per fissaggio isolante	REDArt screw fasteners STR H for wooden support

REPORT N. 118-2016-IAP

UNI EN ISO 10140-2:2010
LABORATORY MEASUREMENT OF SOUND INSULATION OF BUILDING ELEMENTS
MEASUREMENT OF AIRBORNE SOUND INSULATION

Issue place and date: Cerea (VR), 09/13/2016

Committee: Rockwool Italia S.p.A.

Committee address: via Londonio, 2 - 20154 Milano - Italy

Sample delivery date: 07/18/2016

Sample provenance: Rockwool Italia S.p.A.

Sample installation date: 07/28/2016

Sample installed in laboratory by: TL (sampling made by the committee)

Test date: 07/29/2016

Test location: Z Lab S.r.l. – Via Pisa, 5/7 – 37053 Cerea (VR) – Italia

Sample denomination: ”ROCKWOOL REDArt ETICS ON TIMBERFRAME SUPPORT”
”CAPPOTTO ROCKWOOL REDArt SU TELAIO IN LEGNO CON CONTROPARETE”

LAB N° 1416

PREPARED	VERIFIED	APPROVED
Antonio Scofano	Antonio Scofano	Antonio Scofano

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Sample description

Timberframe panel, ETICS system and lining with ROCKWOOL stonewool insulation.

Il campione sottoposto a prova è costituito da un sistema di isolamento a cappotto formato da pannelli in lana di roccia a doppia densità e controparete realizzata con struttura metallica e lastre di gesso rivestito e gessofibra, spazio tra i montanti delle orditure metalliche e del telaio in legno riempito con pannelli in lana di roccia.

Sample dimensions are:

Height* *Altezza totale*	2980 mm
Length* *Larghezza totale*	3600 mm
Thickness* *Spessore totale*	302 mm
Acoustic usable surface *Superficie acustica utile*	10.7 m^2

Test specimen is made of:
Il campione è costituito da:
- plasterboard layer BA13, with the following specifications :
  lastre in gesso rivestito BA13, aventi le seguenti caratteristiche dimensionali:
  - nominal length = 1200 mm;
    lunghezza nominale
  - nominal width = 3000 mm;
    altezza nominale
  - nominal thickness = 12.5 mm;
    spessore nominale
  - nominal density = 720 kg/m^3;
    densità nominale
- single layer of Fermacell gypsum fibreboard. The gypsum fibre board, classified as A2,s1-d0 in terms of fire reaction, consists of 80% gypsum and 20% paper fibre. Specifications:
  Singolo strato di lastre in gessofibra Fermacell. I pannelli, in classe di reazione al fuoco A2,s1-d0, sono composti all' 80% da gesso e al 20% da cellulosa e hanno le seguenti caratteristiche dimensionali:
  - nominal length = 1250 mm
    lunghezza nominale
  - nominal width = 3000 mm
    altezza nominale
  - nominal thickness = 12.5 mm
    spessore nominale
  - density = 1150±50 kg/m^3 (15 kg/m^2)
    densità nominale
- metal frame composed by:
  struttura metallica formata da:
  - n. 2 metal tracks, head and floor, U-shaped, size 40x75 mm, thickness 0.6 mm;
    n. 2 guide, inferiore e superiore, realizzate con profili in acciaio zincato a forma di "U", dimensioni sezione 40x75 mm e spessore 0.6 mm;
  - n. 7 metal studs C-shaped, thickness 0,6 mm, installed spaced by 600 mm;
    n. 7 montanti realizzati con profilati sagomati a forma di "C" in acciaio zincato, spessore 0,6 mm, disposti con un interasse di 600 mm;
- insulation layer composed by stonewool panels called ROCKWOOL Acoustic 225 Plus 60 mm thickness, with the following properties:
  strato di materiale isolante, spessore nominale 60 mm, realizzato mediante pannelli in lana di roccia denominati ROCKWOOL Acoustic 225 Plus ed aventi le seguenti caratteristiche:
  - length = 1200 mm
    lunghezza nominale
  - width = 600 mm
    altezza nominale
  - thickness = 60 mm
    spessore nominale

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-     ○ density   =   70 kg/m^3
          densità nominale
- 5 mm air gap
  intercapedine d'aria, spessore 5 mm
- Oriented strand board (OSB) wood panels with the following specifications:
  Pannelli OSB a base di legno aventi le seguenti caratteristiche dimensionali:
  - ○ nominal length   =   1250 mm
    lunghezza nominale
  - ○ nominal width   =   3000 mm
    altezza nominale
  - ○ nominal thickness   =   15 mm
    spessore nominale
  - ○ density   =   550 kg/m^3
    densità nominale
- Timberframe structure realized by TECNOWOOD S.R.L consisting of timber elements, section 160 x 60 mm:
  Struttura a telaio prodotta da TECNOWOOD S.R.L realizzata tramite elementi in legno d'abete di sezione rettangolare 160x60 mm:
  - ○ density   =   500 kg/m^3
    densità nominale degli elementi in legno
- Insulation layer composed by stonewool panels called ROCKWOOL Timberock instaleld in double layer, thickness 80+80 mm, with the following properties:
  Strato di materiale isolante formato dall'accostamento di pannelli in lana di roccia ROCKWOOL Timberock posati in doppio strato, spessore 80+80 mm:
  - ○ length   =   1200 mm
    lunghezza nominale
  - ○ width   =   565 mm
    altezza nominale
  - ○ thickness   =   80 mm
    spessore nominale
  - ○ density   =   70 kg/m^3
    densità nominale
- Oriented strand board (OSB) wood panels with the following specifications:
  Pannelli OSB a base di legno aventi le seguenti caratteristiche dimensionali:
  - ○ nominal length   =   1250 mm
    lunghezza nominale
  - ○ nominal width   =   3000 mm
    altezza nominale
  - ○ nominal thickness   =   15 mm
    spessore nominale
  - ○ density   =   550 kg/m^3
    densità nominale
- Insulation layer composed of dual density stonewool slabs "ROCKWOOL Frontrock Max Plus" , with the following characteristics:
  Strato di materiale isolante formato dall'accostamento di pannelli in lana di roccia ROCKWOOL Frontrock Max Plus a doppia densità dello spessore di 80 mm
  - ○ length   =   1200 mm
    lunghezza nominale
  - ○ width   =   600 mm;
    altezza nominale
  - ○ thickness   =   80 mm
    spessore nominale
  - ○ nominal density = dual density =   120/70 kg/m^3
    densità nominale del solo pannello in lana di roccia = doppia densità
- Panels are fixed using "ROCKWOOL REDArt Tassello per legno" fixings, length 120 mm, 4 hole fixing per panel;
  I pannelli sono fissati tramite tasselli a vite della lunghezza di 120 mm denominati ROCKWOOL REDArt Tassello per legno quantità n. 4 tasselli a pannello
- Base coat with a finished thickness of 5 mm, composed of "ROCKWOOL REDArt Base Coat" and a reinforcing mesh;
  Rasatura armata dello spessore di 5 mm, realizzata mediante malta

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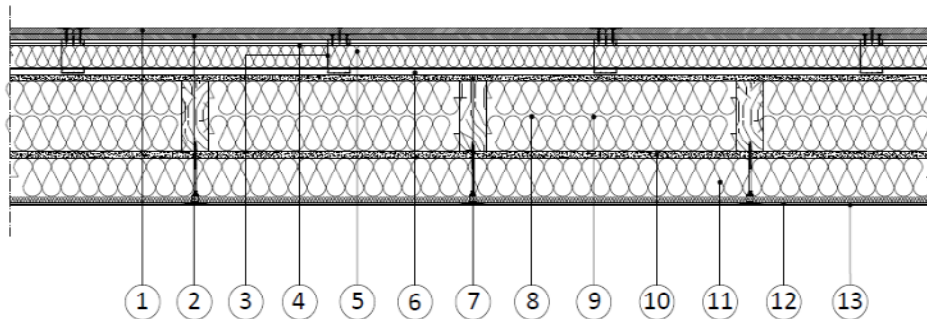
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cementizia denominata ROCKWOOL REDArt Rasante con interposta rete di armatura in fibra di vetro antialcalina denominata ROCKWOOL REDArt rete standard.
- "ROCKWOOL REDArt Silicone Primer" priming coat and "ROCKWOOL REDArt Silicone Top coat" top coat, thickness 1.5 mm
Finitura realizzata con strato denominato ROCKWOOL REDArt Finitura Siliconica dello spessore di 1,5 mm steso su strato fissativo denominato ROCKWOOL REDArt Fissativo per Finitura Siliconica

Simbolo	Descrizione
1	lastra in gesso rivestito BA 13, spessore 12,5 mm
2	lastra in gessofibra fermacell, spessore 12,5 mm
3	montante verticale in acciaio zincato 50x75x0,6 mm
4	guida orizzontale in acciaio zincato 40x75x0,6 mm
5	pannello in lana di roccia ROCKWOOL Acoustic 225 Plus sp. 60 mm
6	aria 5 mm
7	pannello in OSB - spessore 15 mm
8	pannello in lana di roccia ROCKWOOL Timberock sp. 80 mm
9	montante in legno d'abete - sezione 160 x 80 mm
10	pannello in OSB - spessore 15 mm
11	pannello in lana di roccia ROCKWOOL Frontrock Max Plus sp. 80 mm
12	ROCKWOOL REDArt Rasante con rete di armatura in fibra di vetro antialcalina
13	ROCKWOOL REDArt Finitura Siliconica su strato REDArt Fissativo per Finitura Siliconica

Symbol	Description
1	plasterboard, 12,5 mm th.
2	Fermacell gypsum fibreboard, 12,5 mm th.
3	metallic stud - 50x75x0,6 mm
4	metallic track - 40x75x0,6 mm
5	ROCKWOOL Acoustic 225 Plus stonewool panel, 60 mm th.
6	air gap 5 mm
7	OSB panel - 15 mm th.
8	ROCKWOOL Timberock stonewool panel, 80 mm th.
9	Timber studs - 160 x 80 mm
10	OSB panel - 15 mm th.
11	ROCKWOOL Frontrock Max Plus stonewool panel, 80 mm th.
12	ROCKWOOL REDArt Base Coat with reinforcing mesh
13	ROCKWOOL REDArt Silicone Top coat with REDArt Silicone Top coat

(*) nominal data provided by the sample manufacturer
(**) data measured by test element sampling

Standards references

UNI EN ISO 10140-2:2010	*Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation.*
UNI EN ISO 717-1:2013	*Acoustics – Acoustic insulation verification in buildings and in building elements Part 1: Airborne sound insulation.*

Test environment description

The test environment structure is made of reinforced concrete, wholly insulated from the laboratory through anti-vibration supports. In particular, this environment consists of a source room and a receiving room, both characterized by an irregularly-shaped volume, free of any parallel partition. The rooms are separated by a 100 cm thick test frame.

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The dimensional data are listed below:

Average source room dimensions (L x W x H)	700 X 500 X 330 cm
Average receiving room dimensions (L x W x H)	770 X 560 X 370 cm

Test equipment and instruments

Instrument	Model	Serial number
Sound Level Meter	LARSON DAVIS L&D 2900B	1080
Microphone	GRAS 40AQ	204027
Preamplifier	LARSON DAVIS L&D PRM900C	1267
Calibrator	LARSON DAVIS L&D CAL200	3852
Omnidirectional source	LOOKLINE D301	DO900159
Termohygrometer	DELTA OHM HD2301.0	09020599
Temperature and humidity sensor	DELTA OHM HP472AC R	09028736
Tape	STANLEY POWERLOCK 33-442	13/946
Microclimate with pressure gauge	DELTA OHM HD 32.1	MSP430F4618

Environmental data during the test

	Source room	Receiving room
Volume	113.1 m^3	163.8 m^3
Average temperature	27,2 ± 1.0 °C	28.0 ± 1.0 °C
Average relative humidity	55.4 ± 2.0 %	53.0 ± 2.0 %
Atmospheric pressure	101.1 kPa ± 1 hPa	
Sample area	10.7 m^2	

Measurement method

The airborne sound insulation test between two rooms is based on the difference between the average sound pressure level in the source room (L_1) and the one detected in the receiving room (L_2). The acoustic source (which produces pink noise) has been operated within the source room in 3 different positions, while the microphone is located in 5 different positions, both in the source room and in the receiving room. A measurement for each source-microphone combination has been performed, for a total of 15 measurements in the source room and 15 in the receiving room. The integration time, for each measure, has been at least 15 s.

Having detected the average level of sound pressure in the receiving environment, the source is switched off, in order to allow the background noise level measurement, L_b. The spectrum corrections, L_2, which need to be calculated for each spectrum frequency component, are equal to:

$$L_2 = L_2 - 1,3 \text{ [dB]} \quad \text{if} \quad L_2 - L_b \leq 6 \text{ dB}$$

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$$L_2 = 10 \cdot \log(10^{(L_2/10)} - 10^{(L_b/10)}) \text{ [dB]} \quad \text{if} \quad 6 < L_2 - L_b < 10 \text{ dB}$$

The reverberation time calculation, T allows to determinate the sound reduction index, R or the sound insulation for small elements $D_{n,e}$. These parameters result from the application of the following formulas:

$$R = L_1 - L_2 + 10 \cdot \log(S/A) \text{ [dB]}$$

$$D_{n,e} = L_1 - L_2 + 10 \cdot \log(A_0/A) \text{ [dB]}$$

where:
S: is the free test area opening in which the test element is installed, expressed in m^2;
A_0: reference equivalent sound absorption area, equal to 10 m^2;
A: equivalent sound absorption area in the receiving room, calculated by the Sabine equation:

$$A = 0{,}16 \cdot (V/T) \quad [m^2]$$

where V is the volume of the receiving environment, in m^3.

Basing on the values calculated for each one-third octave frequency band from 100 Hz to 3150 Hz, the experimental curve has been evaluated and compared with the reference one, which is provided within the standard UNI EN ISO 717-1.
Then, the curves comparison method is applied, up to the point where the sum of the unfavorable differences between relative curves values is on the reference curve less than or equal to 32 dB. The value corresponding to the 500 Hz frequency has subsequently been evaluated: this value is the index of evaluation of the apparent sound reduction index R_w (or the normalized acoustic index for small elements $D_{n,e,w}$).

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Measured values

f [Hz]	L₁ [dB]	L₂ [dB]	Lᵦ [dB]	T [s]	R [dB]
Frequency	*Source room level*	*Receiving room level*	*Background noise*	*Reverberation time*	*Sound reduction index*
50	81.4	68.7	17.4	3.77	14.6
63	81.6	52.6	18.5	4.06	31.2
80	80.0	50.5	15.3	3.97	31.6
100	88.7	53.6	17.5	3.14	36.3
125	91.9	53.9	18.4	2.71	38.5
160	91.5	47.0	14.8	2.57	44.7
200	88.8	32.3	10.0	2.45	56.5
250	90.0	24.4	6.8	2.42	65.5
315	90.1	16.7	4.6	2.23	73.3
400	90.8	14.5	6.0	2.13	76.4
500	91.5	14.1	2.1	2.11	77.0
630	92.6	15.2	1.5	2.19	77.2
800	93.2	15.9	0.7	2.09	76.6
1000	92.9	14.1	1.8	2.03	78.3
1250	92.0	12.9	1.7	2.03	78.7
1600	94.0	14.3	2.1	2.15	79.4
2000	96.6	15.9	2.8	2.11	80.3
2500	95.3	15.7	3.5	2.00	79.0
3150	93.1	16.8	4.1	1.92	75.5
4000	96.7	18.7	4.8	1.77	76.8
5000	92.9	20.4	5.3	1.60	70.7

(**)*Applied correction for background noise according to UNI EN ISO 10140-4:2010. §4.3.*
(***) *Uncertainty is calculated with a covering factor k = 1.96. corresponding to a 95% trust level.*

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zetalab ITALIA

Sound reduction index. R. according to UNI EN ISO 10140-2:2010

Sample description:
"ROCKWOOL REDArt ETICS ON TIMBERFRAME SUPPORT"
"CAPPOTTO ROCKWOOL REDArt SU TELAIO IN LEGNO CON CONTROPARETE"
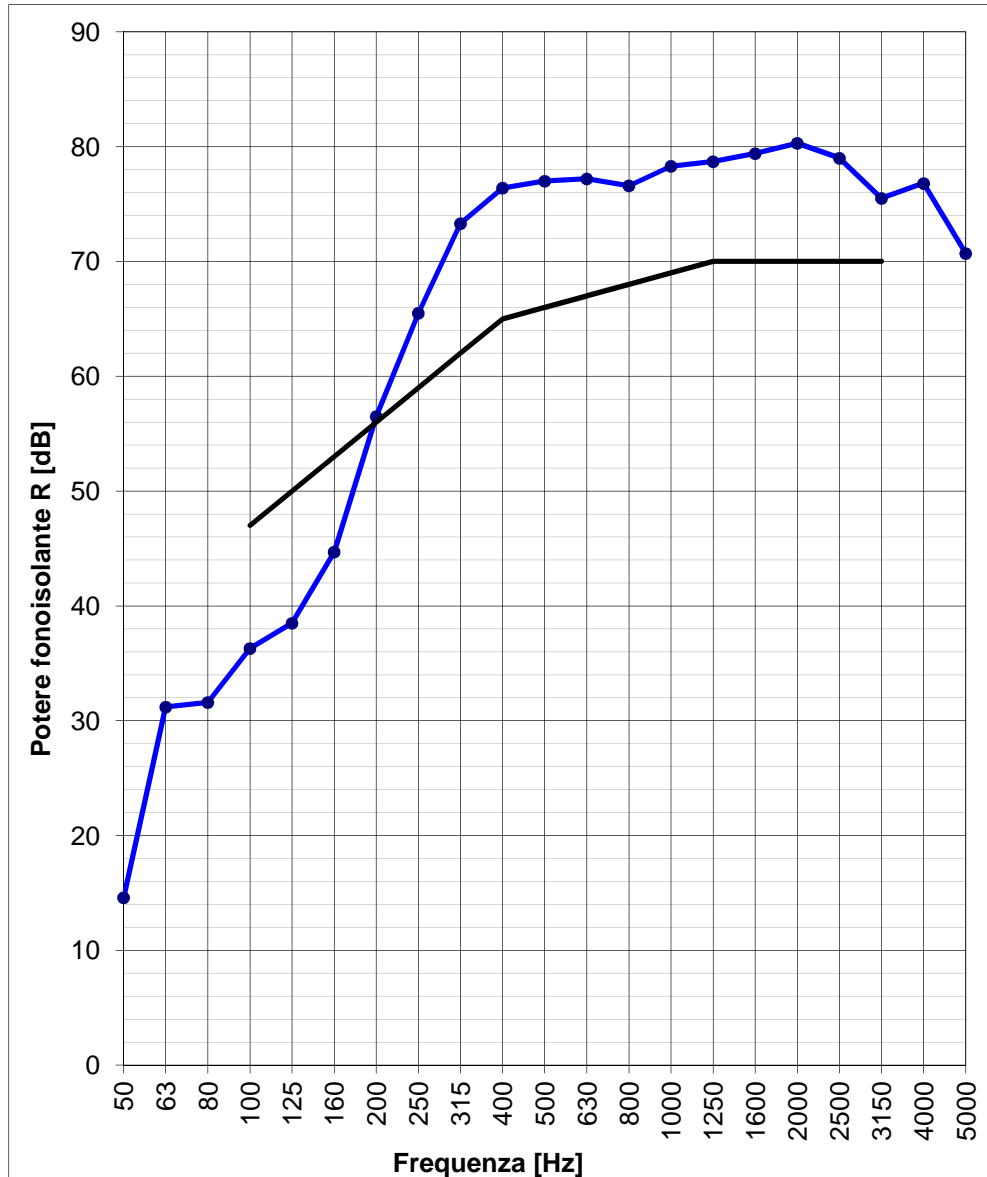
Specimen area: 10.7 m²
Rooms volume: Emitting   113.1 m³   Receiving   163.8 m³

f [Hz]	R [dB]
50	14.6
63	31.2
80	31.6
100	36.3
125	38.5
160	44.7
200	56.5
250	65.5
315	73.3
400	76.4
500	77.0
630	77.2
800	76.6
1000	78.3
1250	78.7
1600	79.4
2000	80.3
2500	79.0
3150	75.5
4000	76.8
5000	70.7

Evaluation of conformity according to ISO 717-1

R_w (C;C_{tr}) = 66.5 (-5 ; -12) dB $C_{50-3150}$ = -13 dB; $C_{50-5000}$ = -12 dB; $C_{100-5000}$ = -4 dB

Evaluation based on laboratory measurement results by means of a technical method.

$C_{tr.50-3150}$ = -27 dB; $C_{tr.50-5000}$ = -27 dB; $C_{tr.100-5000}$ = -12 dB

Laboratory Manager Ing. Antonio Scofano

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