TFI Report 21-000620-01

Impact Sound Insulation
Walking Noise

Customer

CFL Flooring International Limited
16C3 TML Tower 3 Hoi Shing Road Tsuen Wan
NT 999077 Hongkong
CHINA

Product

laminate floor covering

SPC+Acoustic Layer and Slab

This report includes 3 pages and 2 annexes

Responsible at TFI

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Aachen, 08.06.2021

Dr.-Ing. Andreas Zoëga
- Head of the testing laboratory -

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1 Transaction

Test order	impact sound insulation according to EN ISO 10140 laboratory measurement of walking noise according to EN 16205
Order date	30.04.2021
Your reference	Vera Wu
Sampling performed by	Customer
Product designation	SPC+Acoustic Layer and Slab
TFI sample number	2100909

2 Product Specification

Use surface	PVC
Construction	heterogeneous
Structure	embossed
Pattern	tonal effect without pattern
Colour of the use surface	brown, light brown
View	
Thickness [mm]	6.5 + 1 mm backing*
Area density [g/m²]	12750*
Type of delivery	modules
	*customer information

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3 Results

Impact sound insulation	ΔL_w = 21 dB	
A-weighted walking noise level	$L_{n,walk,A}$ = 83 dB(A)	(83.2 dB(A) ± 0.5 dB(A))
Reflected Walking Sound	RWS = 57.9 sone	

The measurement results are evaluated without consideration of the measurement uncertainty with reference to compliance with limit values, unless otherwise specified by the test standard.

4 Annexes

Impact sound insulation	TS 21-000620-01[a]
Walking noise	GS 21-000620-01[a]

The annexes marked [a] are based on tests accredited in accordance with EN ISO/IEC 17025.

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Annex TS - Impact Sound Insulation

1 Test Method / Requirements

EN ISO 10140-1:2016	Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products
EN ISO 10140-3:2010 + A1:2015	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation
EN ISO 10140-4:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 4: Measurement procedures and requirements
EN ISO 10140-5:2010 + A1:2014	Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment
EN ISO 717-2:2013	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation
ISO 12999-1:2020	Acoustics - Determination and application of measurement uncertainties in building acoustics - Part 1: Sound insulation

2 Laboratories

Test rooms:	TFI Aachen GmbH, Charlottenburger Allee 41, 52068 Aachen
Sending room (BAL1):	Room volume V = 5,96 m x 3,85 m x 2,24 m = 51,40 m³ (cuboid room with with absorbent cladding)
Receiving room (BAL2):	Room volume V = 6,11 m x 4,01 m x 2,55 m = 62,48 m³ (cuboid room)
Reference floor:	S = 5,96 m x 3,85 m = 22,95 m² 16 cm concrete slab floor with an area-related mass of m‘ ≈ 384 kg/m² Elastically mounted to suppress flank transmission.
Flanking walls:	Walls in the sending room with acoustic facing shell to suppress flank transmission.

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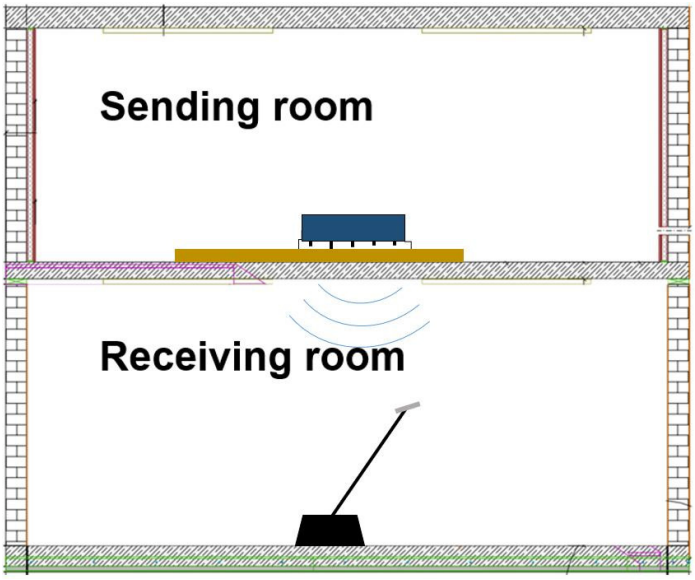
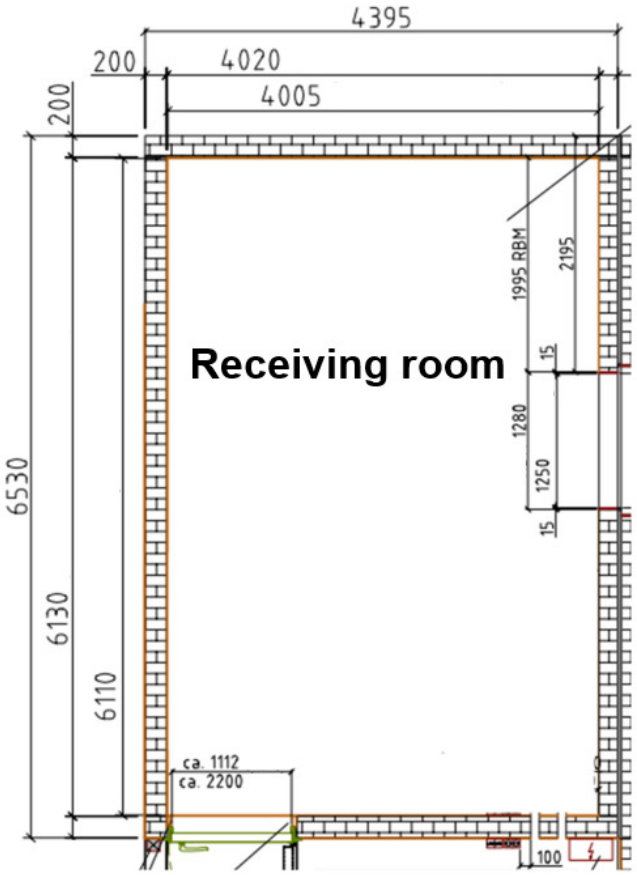
Profile:



Plan view receiving room:



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3 Measuring Devices

Real-time analyzer:	1 Norsonic Nor140
Microphone:	2 Norsonic Type1209
Loudspeaker:	1 Norsonic Nor229
Tapping machine:	1 Norsonic Nor277 (standard tapping machine with 3 feet and 5 hammers according to ISO 10140)

4 Measuring Operation

Impact sound pressure level: 4 microphone positions with 2 tapping machine positions each

5 Evaluation

The impact sound pressure level generated by the standard tapping machine is measured in the receiving room under a bare heavy floor with and without a floor covering. The impact sound reduction is determined on the basis of the measured values as follows::

$$\Delta L = L_{n,0} - L_n \text{ [dB]}$$

$L_{n,0}$ Impact sound pressure level without a floor covering [dB]

L_n Impact sound pressure level with a floor covering [dB]

For the evaluation of the weighted reduction in impact sound pressure level ΔL_W, the relevant reference curve is shifted in increments of 1 dB towards the measured curve until the sum of unfavourable deviations is as large as possible, but not more than 32 dB.

The linear impact sound level ΔL_{lin} is determined according to the following equation:

$$\Delta L_{lin} = L_{n,r,0,w} + C_{l,r,0} - (L_{n,r,w} + C_{l,r}) = \Delta L_w + C_{l,\Delta}$$

$L_{n,r,w}$	the calculated weighted normalized impact sound pressure level of the reference floor with the floor covering under test
$L_{n,r,0,w}$	78 dB, calculated from $L_{n,r,0}$ according to section 4.3.1 of DIN EN ISO 717-2:2013-06
$C_{l,r}$	Spectrum adaptation term for the reference floor with the floor covering to be tested
$C_{l,r,0}$	-11 dB, spectrum adaptation term for the reference floor with $L_{n,r,0}$ determined according to A.2.1 DIN 717-2:2013-06

6 Note

The results are based on measurements performed under laboratory conditions with artificial excitation (standard procedure). The test results are applicable in due consideration of the national provisions and the local circumstances and/or constructions.

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Impact sound insulation according ISO 10140-3 TS 21-000620-01

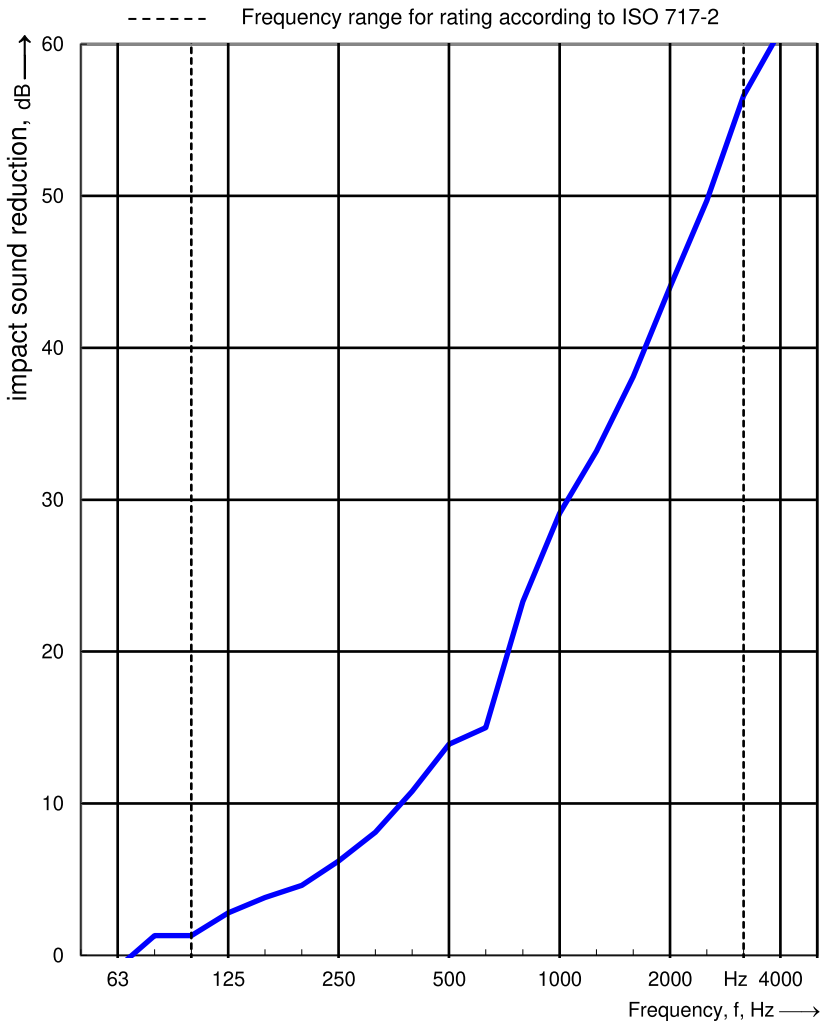
Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight reference floor

TFI sample number:	2100909	Testing period:	27.05.2021
Product designation:	SPC+Acoustic Layer and Slab	Installation:	27.05.2021
Installed by:	TFI Aachen GmbH		
Size of test area:	10,21 m²		
Connection with the floor:	loosely laid		
Category:	II		
Construction: (from top to bottom)			

Receiving room:		Sending room:	
Volume:	62,5 m³	Volume:	51,4 m³
Air temperature:	18,7 °C	Air temperature:	19,0 °C
Relative air humidity:	63,8 %	Relative air humidity:	54,8 %
Air pressure:	99,8 kPa	Type of reference floor:	Heavyweight

Frequency f [Hz]	$L_{n,0}$ 1/3 oct. [dB]	ΔL 1/3 oct. [dB]
50	52,5	-0,9
63	58,1	-0,8
80	58,4	1,3
100	56,5	1,3
125	62,4	2,8
160	72,1	3,8
200	69,2	4,6
250	69,2	6,2
315	69,7	8,1
400	70,1	10,8
500	70,7	13,9
630	69,2	15,0
800	70,6	23,3
1000	70,7	29,1
1250	71,2	33,2
1600	71,5	38,1
2000	71,9	44,0
2500	71,4	49,7
3150	71,2	56,6 [1]
4000	70,1	60,9 [1]
5000	68,1	63,0 [1]

[1] Zu hoch



Evaluation according to ISO 717-2

ΔL_w = 21 dB ΔL_{lin} = 10 dB $C_{I,\Delta}$ = -11 dB $C_{I,r}$ = 0 dB

The results are based on measurements, which were performed under laboratory conditions with artificial excitation (standard procedure).
Measurments in one-third octaves.

Impact sound insulation according ISO 10140-3 TS 21-000620-01

Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight reference floor

Evaluation according to ISO 717-2

ΔL_w = 21 dB $C_{I,\Delta}$ = -11 dB $C_{I,r}$ = 0 dB

The results are based on measurements, which were performed under laboratory conditions with artificial excitation (standard procedure).
Measurments in one-third octaves.

Weighted normalized impact sound pressure level $L_{n,0,w}$ = 78 dB

Weighted normalized impact sound pressure level $L_{n,w}$ = 56 dB

Frequency [Hz]	ΔL [dB]	$L_{n,0}$ [dB]	L_n [dB]
50	-0,9	52,5	53,4
63	-0,8	58,1	58,9
80	1,3	58,4	57,1
100	1,3	56,5	55,2
125	2,8	62,4	59,6
160	3,8	72,1	68,3
200	4,6	69,2	64,6
250	6,2	69,2	63,0
315	8,1	69,7	61,6
400	10,8	70,1	59,3
500	13,9	70,7	56,8
630	15,0	69,2	54,2
800	23,3	70,6	47,3
1000	29,1	70,7	41,6
1250	33,2	71,2	38,0
1600	38,1	71,5	33,4
2000	44,0	71,9	27,9
2500	49,7	71,4	21,7
3150	56,6	71,2	14,6
4000	60,9	70,1	9,2
5000	63,0	68,1	5,1

Receiving room:

Volume: 62,5 m³

Air temperature: 18,7 °C

Relative air humidity: 63,8 %

Air pressure: 99,8 kPa

Sending room:

Volume: 51,4 m³

Air temperature: 19,0 °C

Relative air humidity: 54,8 %

Type of reference floor: Heavyweight

Remarks:

TFI sample number: 2100909

Annex GS – Laboratory measurement of walking noise on floors

1 Test Method / Requirements

EN 16205:2020	Laboratory measurement of walking noise on floors
EN ISO 10140-1:2016	Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products
EN ISO 10140-2:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation
EN ISO 10140-3:2010 + A1:2015	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation
EN ISO 10140-4:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 4: Measurement procedures and requirements
EN ISO 10140-5:2010 + A1:2014	Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment
EN ISO 717-2:2013	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation

2 Laboratories

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Receiving room (BAL2):	Room volume V = 6,11 m x 4,01 m x 2,55 m = 62,48 m³ (cuboid room)
Reference floor:	S = 5,96 m x 3,85 m = 22,95 m² 16 cm concrete slab floor with an area-related mass of m‘ ≈ 384 kg/m² Elastically mounted to suppress flank transmission.
Flanking walls:	Walls in the sending room with acoustic facing shell to suppress flank transmission.

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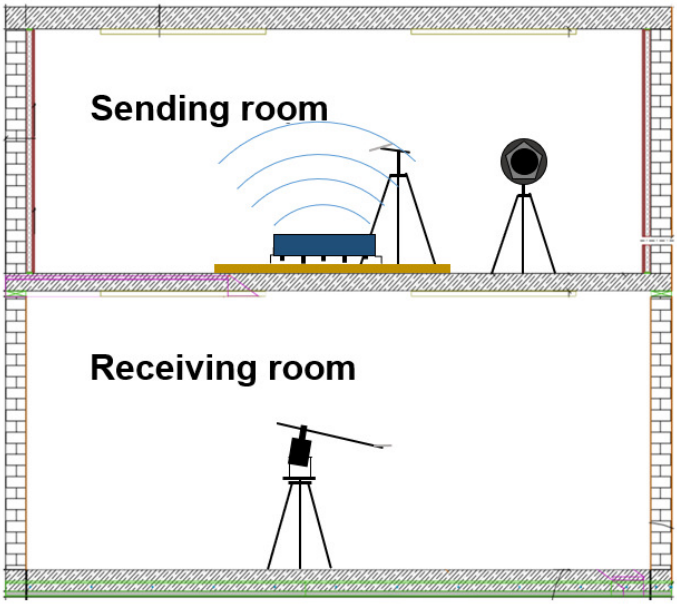
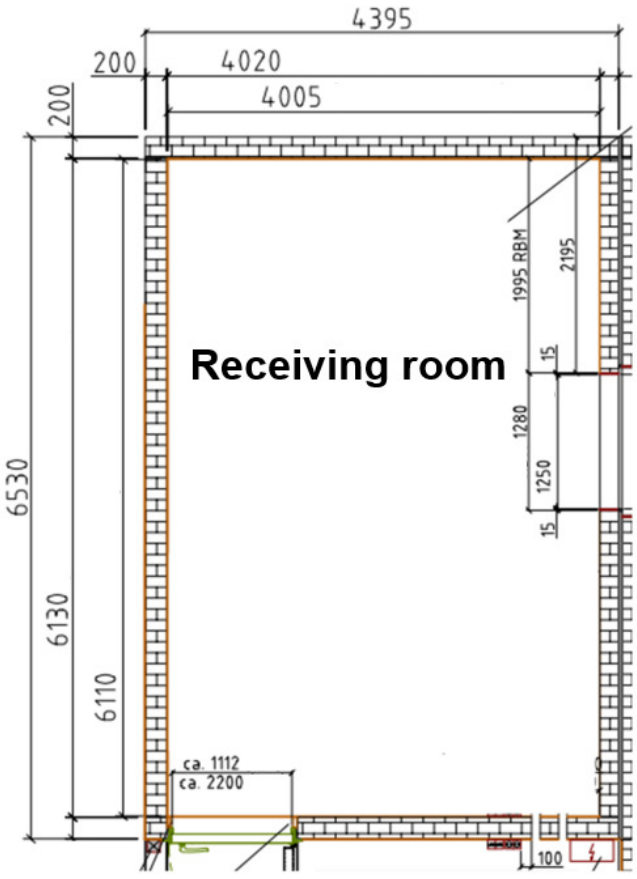


Plan view receiving room:



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4 Measuring Operation

The measurement of the walking sound is performed in an impact sound test laboratory according to EN ISO 10140. The laboratory consists of two rooms above each other, which are separated by a standard homogeneous concrete floor. A standard tapping machine (EN ISO 10140-5 Annex E) is used as a walking noise source.

The test is performed on the standard concrete floor in three installation-conditions:

1. standard concrete floor uncovered (bare reference floor)
2. standard concrete floor covered with five segments (each approx. 4 cm x 4 cm) of the test object
3. standard concrete floor covered with a sufficiently large sample (approx. 10 m²) of the test object.

For each of these three installation-conditions, eight measurements of the average sound pressure level in one-third octave bands are carried out with the standard tapping machine. For installation-conditions 2 and 3, the reverberation times are measured in the sending room.

The walking sound level is calculated according to equation 1 of DIN EN 16205. The A-weighted walking sound pressure level is calculated from the measured average sound pressure levels.

The noise spectrum and the perceived loudness of the reflected walking sound are calculated according to Annex E of DIN EN 16205.

5 Note

The results are based on measurements performed under laboratory conditions with artificial excitation (standard procedure). The test results are applicable in due consideration of the national provisions and the local circumstances and/or constructions.

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Walking Noise according EN 16205

GS 21-000620-01

Laboratory measurement of walking noise on floors

Annex GS - Laboratory measurement of walking noise on floors

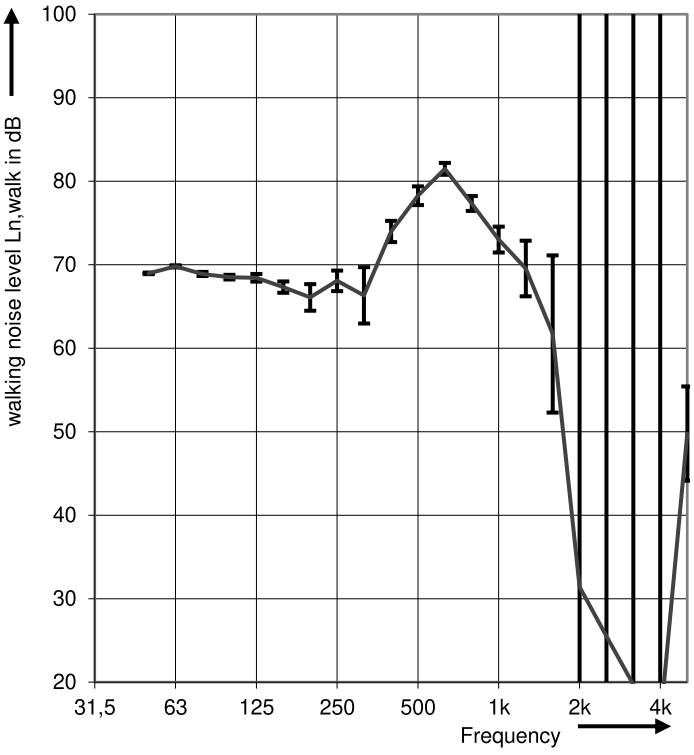
TFI sample number:	2100909	Testing period:	27.05.2021
Product designation:	SPC+Acoustic Layer and Slab	Installation:	27.05.2021
Installed by:	TFI Aachen GmbH		
Object set-up: (if multi-parted; from top to bottom)	-		

Upper room:		Lower room:		Size of test area:	10,21 m²
Volume:	51,4 m³	Volume:	62,5 m³	Connection with floor:	loosely laid
Temperature:	19,0 °C	Temperature:	18,7 °C	Remarks:	tested with a load of approx. 22 kg/m²
Relative humidity:	54,8 %	Relative humidity:	63,8 %		
Barometric pressure:	99,8 kPa	Type of reference floor:	Heavyweight		

Table with sound pressure level and mesurement uncertainty

f	$L_{i\text{-}Fl,b}$	$L_{i\text{-}Fl,c}$	$L_{i\text{-}with}$	$L_{i\text{-}pads}$	$L_{i,ref,b}$	$L_{n,walk,i}$	$u_{walk,i}$
[Hz]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
50	52,5	55,8	58,8	57,3	65,5	69,0	0,1
63	58,1	61,6	61,2	58,6	66,0	69,8	0,1
80	58,4	59,4	65,1	59,4	66,5	68,9	0,2
100	56,5	56,4	65,6	59,7	67,0	68,5	0,3
125	62,4	59,9	68,5	62,2	67,5	68,4	0,5
160	72,1	67,8	69,5	66,0	68,0	67,3	0,7
200	69,2	65,7	71,6	71,4	68,5	66,1	1,6
250	69,2	65,6	73,3	72,2	69,0	68,1	1,2
315	69,7	63,4	75,1	74,3	69,5	66,3	3,4
400	70,1	61,6	78,8	75,1	70,0	74,0	1,3
500	70,7	59,0	82,3	78,0	70,5	78,3	1,1
630	69,2	55,8	83,3	73,2	71,0	81,5	0,7
800	70,6	48,7	79,8	74,1	71,5	77,3	0,9
1000	70,7	43,7	77,8	75,1	72,0	73,0	1,5
1250	71,2	40,1	77,1	76,2	72,0	69,5	3,3
1600	71,5	35,8	73,6	73,4	72,0	61,7	9,4
2000	71,9	31,3	70,8	71,2	72,0	31,4	####
2500	71,4	24,9	67,5	68,1	72,0	25,5	####
3150	71,2	18,9	65,0	65,8	72,0	19,7	####
4000	70,1	13,1	61,8	63,0	72,0	15,0	####
5000	68,1	7,5	60,1	59,3	72,0	49,8	5,6

walking noise level with uncertainty bar



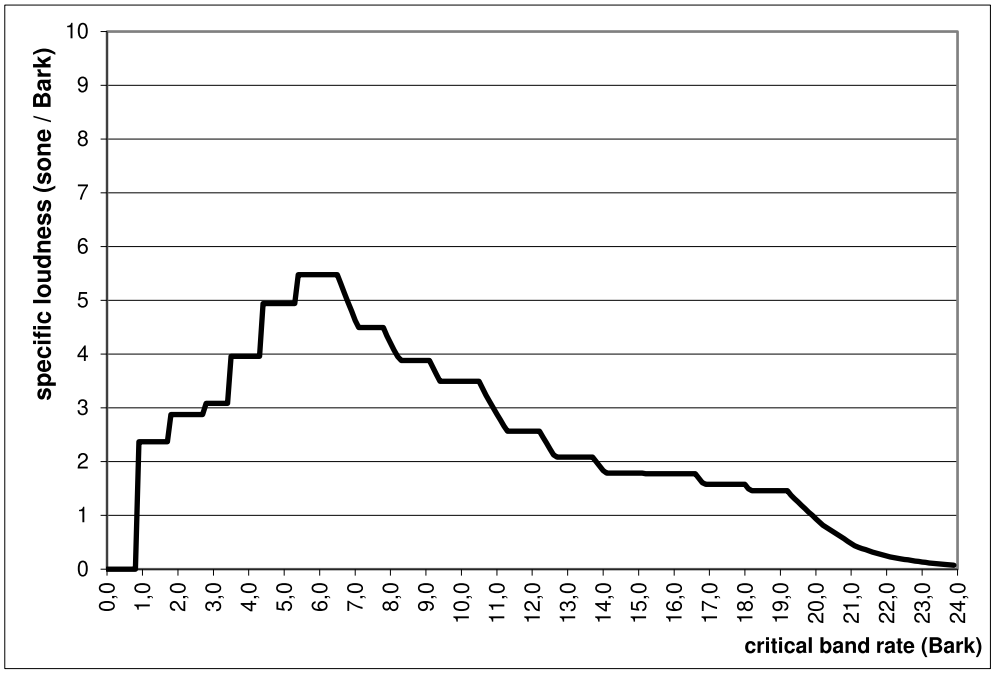
A-weighted walking noise level according EN 16205:2020

$L_{n,walk,a}$ = 83 dB(A) (83,2 dB(A) +/- 0,5 dB(A))

Evaluation according to Annex E

Calculation of the loudness RWS

f	$L_{i,loud}$
[Hz]	[dB]
100	64,8
125	66,9
160	67,2
200	68,8
250	70,0
315	72,3
400	76,5
500	80,4
630	81,9
800	78,6
1000	76,3
1250	75,7
1600	72,1
2000	68,9
2500	65,2
3150	62,7
4000	59,5
5000	58,0



Calculation of reflected walking sound according to Annex E of EN 16205:2020
(with room correction, based on an equivalent sound absorption area of 10 m²)

loudness RWS: 57,9 sone

Calculation of reflected walking sound according to Annex E of EN 16205:2013+A1:2018 (informative)

loudness RWS: 64,7 sone