SOUNDPROOFING

with best wood SCHNEIDER® ceiling systems

Uncomplicated, fast & reliable – the team of best wood SCHNEIDER® deals with your requests.

Sales Export

Vivienne Ramsaier

Phone +49 (0)7355 9320-245
E-mail vivienne.ramsaier@schneider-holz.com

Applications engineering

Manuel Stuhlinger

B.Eng. Woodwork and wood systems | Specialist Area Soundproofing

Phone +49 (0)7355 9320-209
E-mail manuel.stuhlinger@schneider-holz.com

Jonas Steigmiller

Graduated Engineer (UAS) Interior Construction | Specialist Area Soundproofing

Phone +49 (0)7355 9320-291
E-mail jonas.steigmiller@schneider-holz.com

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Legal notice

best wood SCHNEIDER® GmbH
Kappel 28
88436 Eberhardzell
Phone +49 (0)7355 9320-0
Fax +49 (0)7355 9320-300
E-mail info@schneider-holz.com

best wood **ENGINEERING OFFICE**

Benefit now from our professionals with regard to soundproofing, fire protection and structural planning. We are available to you with engineer services, and will produce concepts and formal certificates for your building project.

from left: **Philipp Straubinger,** Structural planning | **Manuel Stuhlinger**, Soundproofing | **Norbert Bleicher,** Head of Engineering office
Jonas Steigmiller, Soundproofing | **Andreas Niederer**, Fireproofing

Soundproofing expertise – planning and legal reliability with proof of soundproofing
Soundproofing planning made easy: We will produce the necessary building and civil law soundproofing certificates for your building, such as the documents for compliance with the minimum requirements in accordance with DIN 4109 as part of the building permit. We also support you in the production of civil law agreements concerning soundproofing in your contracts and are your competent contact person for the implementation thereof. This allows us to provide you with legal and planning reliability. When doing this, we look at noise transmission inside the building and protection from external noise. As your expert office, we have modern technical equipment, extensive knowledge and experience in the field of building acoustics and building acoustics measurement technology. The service is billed as lump sum or at cost.

Scope of services:

- Building and civil law soundproofing certificates in accordance with DIN 4109,
  LHP 1 to 7 acc. to the Free Structure for Architects and Engineers [HOAI] (2021)
- Civil law soundproofing agreements
- Advice for implementing enhanced soundproofing
- Measurements of your individual ceiling structures

SOUNDPROOFING

Jonas Steigmiller
Graduated Engineer (UAS) Interior Construction | Specialist Area Soundproofing

Phone +49 (0)7355 9320-291
Fax +49 (0)7355 9320-300
E-mail jonas.steigmiller@schneider-holz.com

Manuel Stuhlinger
B.Eng. Woodwork and wood systems | Specialist Area Soundproofing

Phone +49 (0)7355 9320-209
E-mail manuel.stuhlinger@schneider-holz.com

Terms and explanations

The evaluated standard impact sound level $L_{n,w}$ is a frequency-independent integer based on edge-free test bench measurements. Only the sound transfer by the separating component is examined without the additional sound transfer via edging components that is present in practice. The evaluated standard impact sound level $L_{n,w}$ specifies the magnitude of the sound pressure level in the space below the ceiling.

The spectrum adaptation value C_I is used to adapt the standard impact sound level that has been measured with a standard trip hammer to the actual excitation caused by a walker within a frequency range of 100 – 2500 Hz.

The spectrum adaptation value $C_{I,50\text{ - }2500}$ is used to adapt the standard impact sound level that has been measured with a standard trip hammer to the actual excitation caused by a walker within a frequency range of 50 – 2500 Hz. In addition to the normal frequency range, it takes the low frequency ranges of 50 – 80 Hz into consideration.

The evaluated sound reduction index R_w is a frequency-independent integer based on edge-free test bench measurements. Only the sound transfer by the separating component is examined without the additional sound transfer via edging components that is present in practice. The evaluated sound insulation R_w specifies the number of decibels by which the sound pressure level is reduced by the ceiling structure.

The spectrum adaptation value C takes a typical noise spectrum of living activities into consideration within a frequency range of 100 – 3150 Hz.

The spectrum adaptation value C_{tr} takes a typical noise spectrum of the road traffic into consideration within a frequency range of 100 – 3150 Hz.

Areas of application for the best wood SCHNEIDER® ceiling systems

Permissible single loads and useful loads

Area of application (AB)	Usage	Examples	Category according to DIN EN 1991-1-1/NA	Single load Q_k in kN	Surface load q_k in kN/m²
1	Living rooms and lounges	Ceilings with sufficient lateral load distribution, rooms and corridors in residential buildings, bedrooms in hospitals, hotel rooms including the associated kitchens and bathrooms	A2	1.0	1.5
		Like A2, but without sufficient lateral load distribution	A3	1.0	2.0
2	Office areas, working areas	Corridors in office buildings, working areas, doctor's practices without heavy equipment, hospital rooms, lounges including corridors, small animal stables	B1	2.0	2.0
	Sales premises	Sales premise areas up to 50 m² Footprint in residential buildings, offices and comparable buildings	D1	2.0	2.0

The permissible single load specifications only apply if the following marginal conditions are fulfilled:

- Load-bearing area at least 20 cm² (corresponds to compression die Ø = 5 cm)
- Distance between single load and wall: ≥ 20 cm
- Distance between single loads: ≥ 50 cm
- The maximum permissible ceiling load may not be exceeded by the sum total of the single loads
- Extremely heavy objects such as fish tanks, pianos etc. must be taken into consideration individually

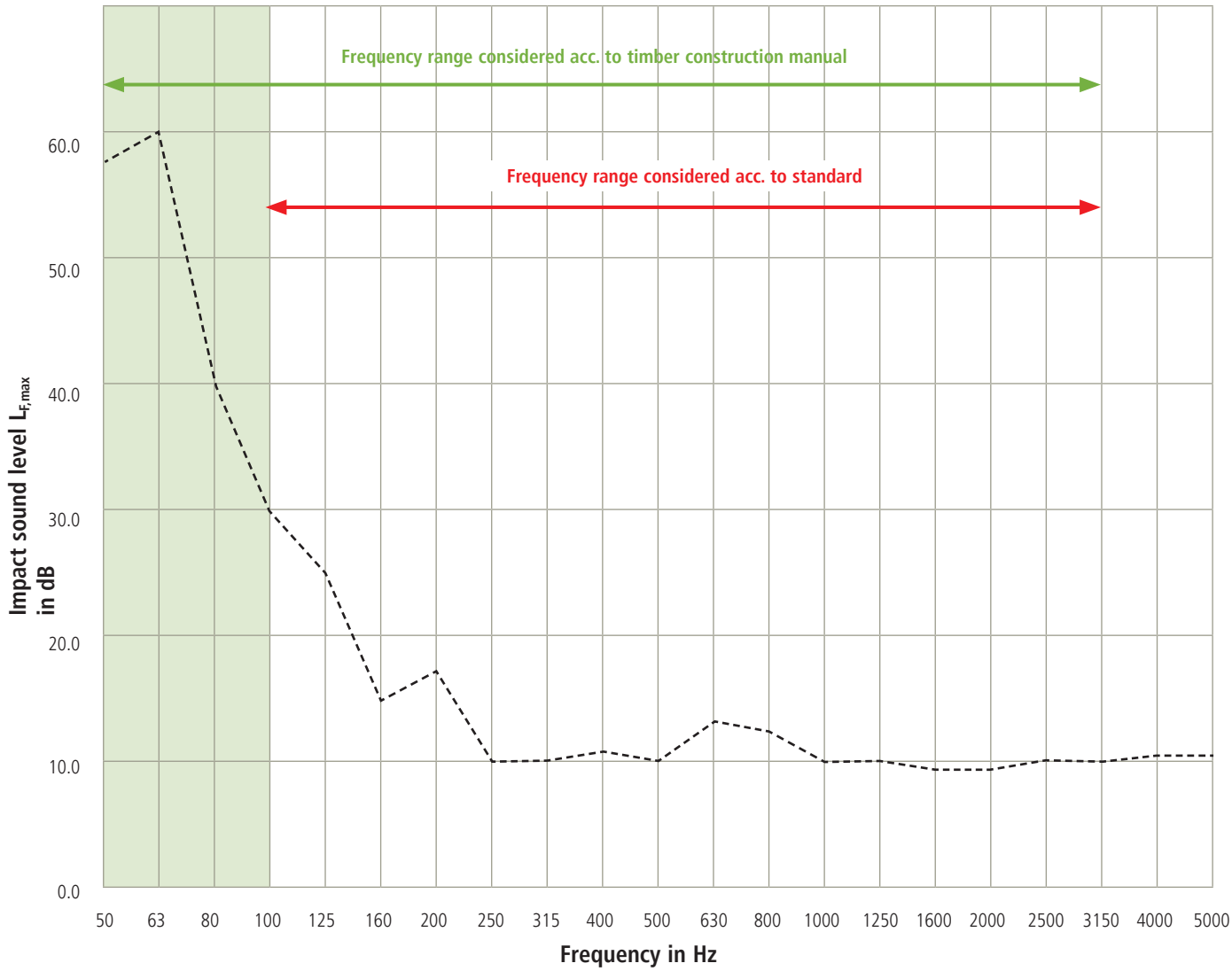
All of the necessary single and useful loads for categorizing the structures described in the following in the different areas of application have been checked internally and only apply for the respective system made from wet and dry screed and the impact sound insulation that is directly beneath it. If the materials/material thicknesses differ, they are not transferable. The floor covering has not been taken into consideration in the test.

Basics

In today's society we are surrounded by noise all day long, which is why the need for quiet within our own four walls is becoming increasingly important. Not only in public buildings and apartment blocks, but also in detached houses, it is therefore important to plan soundproofing in advance and coordinate the requirement level with the builder. The soundproofing that is required under civil law is usually always higher than the minimum soundproofing required by building law. For multi-storey wood construction (apartment blocks, office blocks), the minimum building law requirement according to DIN 4109- 1: 2018- 01 for the standard impact sound level $L'_{n,w}$ is ≤ 53 dB.

In spite of adherence to the required target values, complaints are heard time and time again with regard to the impact sound insulation of wooden ceilings. Particularly with ceilings, the noise generated by children playing or people walking on the ceiling is mainly within the range of 50 Hz to 100 Hz (Figure 1). However, since the standard only takes the frequency range from the 100Hz octave band into consideration, a ceiling can be subjectively perceived as objectionable even though the target values have been adhered to.

In order to evaluate a ceiling with regard to low-frequency sound transmission when walking, the spectrum adaptation value $C_{I,50\text{-}2500}$ is used. Since there are several spectrum adaptation values, attention must be paid to the 50 – 2500 index so that the frequency range from 50 – 80 Hz is examined during the evaluation. This spectrum adaptation value is added to the standard impact sound level $L_{n,w}$, which is measured in the laboratory.
For good soundproofing that fulfils the specifications of the standard and also satisfies the subjective perception of the user, it is expedient for an additional requirement value for $L_{n,w} + C_{I,50\text{-}2500}$ (laboratory value without edge distances but with spectrum adaptation value) to be adhered to in addition to the requirement value $L'_{n,w}$ (including edge distances) from DIN 4109.
Soundproofing levels and the associated target values for this additional requirement are defined in the "Soundproofing in Timber Construction" brochure which was published by the Wood Information Service of Holzbau Deutschland Institut e.V. In 2019 (downloadable free of charge at www.informationsdienst-holz.de) (Figure 2).



Soundproofing requirements

Table 2 | Normative requirement and recommendation for important target values

		Soundproofing level		
	1	2	3	4
	Component / transmission route:	**BASIC ≙ DIN 4109-1:2018**	**BASIC+**	**COMFORT**
1	Party wall	$R'_w \geq 53$ dB	$R'_w \geq 56$ dB	$R'_w \geq 59$ dB
2	Terraced house partition wall	$R'_w \geq 62$ dB	$R'_w \geq 62$ dB $R'_w + C_{50\text{-}5000} \geq 62$ dB [1) 5)]	$R'_w \geq 67$ dB $R'_w + C_{50\text{-}5000} \geq 65$ dB [1) 5)]
3	Apartment ceiling	$R'_w \geq 54$ dB	$R'_w \geq 57$ dB	$R'_w \geq 60$ dB
4	Apartment separation ceiling Impact sound level	$L'_{n,w} \leq 53$ dB	$L'_{n,w} \leq 53$ dB $L'_{n,w} + C_{I,50\text{-}2500} \leq 53$ dB [2)]	$L'_{n,w} \leq 46$ dB $L'_{n,w} + C_{I,50\text{-}2500} \leq 47$ dB [2)]
5	Roof terraces and loggias with living areas below them	$L'_{n,w} \leq 50$ dB	$L'_{n,w} \leq 50$ dB	$L'_{n,w} \leq 46$ dB
6	Ceilings and arcades (in all sound propagation directions)	$L'_{n,w} \leq 53$ dB	$L'_{n,w} \leq 50$ dB	$L'_{n,w} \leq 46$ dB
7	Stairs and landings	$L'_{n,w} \leq 53$ dB	$L'_{n,w} \leq 50$ dB	$L'_{n,w} \leq 46$ dB
8	External noise in accordance with the noise level range and requirements of DIN 4109			Requirement in accordance with DIN 4109 including consideration of $C_{tr50\text{-}5000}$ for the opaque component [4)]
9	Other components	in accordance with DIN 4109-1:2018	in accordance with DIN 4109-1:2018	in accordance with DIN 4109-15:2018 [4)]

[1)] Additional airborne noise requirement value, only at component without edges
[2)] Additional impact noise requirement value, only at component without edges
[3)] Special regulation for ceiling constructions which must be assigned to DIN 2109-33:2016, otherwise $L'_{n,w} \leq 50$ dB
[4)] Separate consideration for window area proportion of more than 30 %, component requirement only
[5)] Double shell wall requirement, both walls
[6)] In accordance with respective valid version or E-DIN 4109-5:2018

Figure 2 – Soundproofing level with the associated target values

This additional requirement value $L_{n,w} + C_{I,50\text{-}2500}$ is always measured during testing in accordance with ISO 10140, and can be requested from the manufacturer for any ceiling structure that has been acoustically tested in the laboratory.
We can test and optimize our ceiling systems for you on our in-house building acoustics ceiling test bench, which has been constructed in accordance with DIN EN ISO 10140-5. The results can be found in our soundproofing database at www.schneider-holz.com/deckensysteme. By continuously expanding our database, we can provide measuring data for practically any requirement level, and help our customers with their planning. The practicability of all floor constructions is also tested, and is categorized into areas of application depending on the permissible single loads and useful loads.

You will always find the right solution for your building project with our best wood ceiling systems and the tested ceiling constructions.

Soundproofing requirements

Noise load	low	moderate	high	very high
Example for emission-side room type and use	Archive room or waiting room	Living room, bedroom, open plan kitchen/living room, bathroom, toilet, office	Restaurant, crèche, gymnasium, music room	The uses categorised as "high", if these also occur during the night between 7pm and 7am
Reception room noise sensitivity	Minimum requirement L'/dB Increased requirement L'/dB			
Low Rooms for activities that are predominantly manual, e.g. workshop, laboratory, toilet	63 59	58 54	53 49	48 44
Medium Rooms for living, sleeping, intellectual work	58 54	53 49	48 44	43 39
High Room for users with a particularly urgent need for quiet, such as quiet rooms in hospitals	53 49	48 44	43 39	38 34

As a measure of the protection against impact sound transmission, the spectrally adjusted, volume-corrected, evaluated standard impact sound level $L'_{tot} = L'_{nT,w} + C_I + C_v$ is compared with the requirement values from the table above.

Whereby:

$L'_{nT,w}$ (dB) is the evaluated standard impact sound level
value calculated or measured for the installation situation, including edge distances

C_I spectrum adaptation value for the frequency range from 100 Hz to 2500 Hz
only applies for CI > 0, CI=0 applies for negative values
This spectrum adaptation value is always measured as well during testing in accordance with ISO 10140, and can be requested from the manufacturer for every ceiling structure, which has been tested acoustically in the laboratory.

C_V Volume correction

Room volume V in m^3	Volume correction C_v in dB
$V < 200$	0
$200 \leq V < 300$	2
$300 \leq V < 500$	3
$500 \leq V < 800$	4
$V \geq 800$	5

Proof is deemed to have been provided as soon as L'_{tot} falls below L' ($L'_{tot} \leq L'$).

The meaning of the impact sound protection below 100Hz is explained for the subjective perception of walking noise in the previous "Basics" section. This important part of the spectrum is described by the spectrum adaptation value $C_{I,50\text{-}2500}$. Like the German standard, SIA 181 does not contain any binding specifications regarding $C_{I,50\text{-}2500}$.

As described in the soundproofing manual from the Wood Information Service, best wood SCHNEIDER urgently recommends taking the spectrum adaptation value $C_{I,50\text{-}2500}$ into consideration in the planning and when comparing ceiling systems.

System components from best wood SCHNEIDER®

best wood **GLULAM – CEILING**

GLULAM ceiling elements made from Scandinavian spruce, local spruce or mountain larch, available in visual quality or industrial quality.

Thickness	100, 120, 140, 160, 180, 200, 220, 240, 260, 280 mm
Length	2.30 – 18.00 m
Width	500 – 1000 mm

best wood **CLT – CEILING**

CLT ceiling elements made from Scandinavian spruce, local spruce, available in visual quality or industrial quality.

Thickness	60, 80, 90, 100, 120, 140, 160 180, 200, 220, 240, 260, 280 mm
Length	2.30 – 16.00 m
Width	900 – 1200 mm

best wood **CLT – CEILING XL**

CLT ceiling elements made from local spruce, available in industrial or visual industrial quality.

Thickness	60, 80, 90, 100, 110, 120, 130, 140, 150, 160,170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 340, 360 mm
Length	2.30 – 16.00 m
Width	up to 3000 mm

best wood **CLT BOX – CEILING**

CLT ceiling elements made from Scandinavian spruce or local spruce, in visual quality or industrial quality with three glued-on ribbed beams and a cover board.

Thickness	220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480 mm
Length	2.30–16.00 m, from 440 mm 8.00–16.00 m
Width	900 – 1200 mm
Lower CLT panel	60 mm and 90 mm for increased fireproofing requirements
Upper CLT panel	60 mm

best wood **CLT BOX – CEILING FS**

CLT ceiling elements made from Scandinavian spruce or local spruce, in visual quality or industrial quality with three glued-on ribbed beams and a cover board. Wooden box element for multi-storey wood construction with soundproofing and fireproofing requirements.

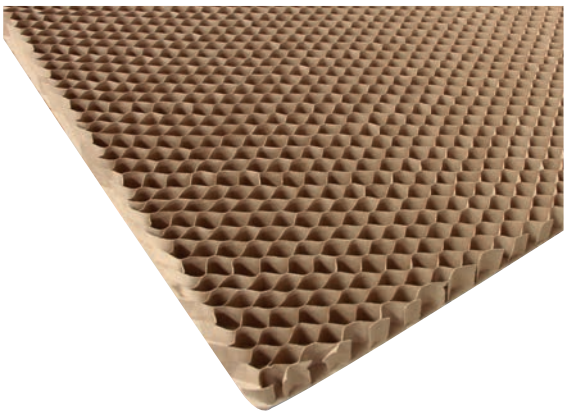
Thickness	260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480 mm
Length	2.30–16.00 m, from 440 mm 8.00–16.00 m
Width	900–1200 mm
Lower CLT panel	60 mm and 90 mm for increased fireproofing requirements
Upper CLT panel	60 mm

best wood **FLOOR 160/220**

Wood fiber insulation board for application as sub-base for floating dry screed structures as well as self levelling floor screeds and cement screeds.

Thickness	
best wood **FLOOR 140**	40, 60, 80 mm
best wood **FLOOR 220**	22, 35, 40 mm
Length	1500 mm
Width	580 mm
Density best wood **FLOOR 140/220**	140 kg/m³ / 220 kg/m³
Compressive stress at 10% compression **FLOOR 140/220**	≥ 150 kPa/180 kPa

best wood **HONEYCOMB 30/60**



best wood HONEYCOMB is a honeycomb board made from cardboard which prevents the best wood CHIPPINGS from moving or shifting.

Laying the chippings directly on the honeycomb provides a consistent layer thickness.

Filling quantity of best wood CHIPPINGS in best wood HONEYCOMB 30/60:
HONEYCOMB 30 approx. 42 kg/m²| HONEYCOMB 60 approx. 84 kg/m²

best wood **CHIPPINGS**

best wood CHIPPINGS consist of a grain made from natural calcium carbonate, which is manufactured using state-of-the-art grinding and drying systems and sieving machines.

It is used for putting into the best wood CLT BOX – CEILING FS and as ballast in best wood ceiling elements.

best wood **CHIPPINGS**	25 kg/bag, 40 bags/pallet
Delivery of best wood CHIPPINGS in Big Bags or in loose form in silo vehicle by request.	

best wood **BOUNDSPLITT**

best wood BOUNDSPLITT is a chippings binder for manufacturing a flexibly bound chippings filling for improving the soundproofing of wooden ceilings.

Boundsplitt canister	20 kg
Boundsplitt IBC container	1000 kg

Tested ceiling constructions

The achievable soundproofing level depends on the ceiling and other factors, particularly the edging walls.
Verification of the individual requirements must be provided for each individual project.

The assigned soundproofing level can basically be achieved with the respective ceiling systems, provided that the edging components are appropriately effective.

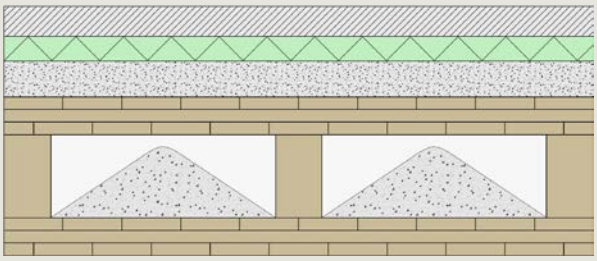
More structures can be found in the component catalogue on our web site at **www.schneider-holz.com/bauteilkatalog** or by simply using the QR code

Soundproofing level COMFORT

DE-BOX FS-15

42.0 (+1;+5) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**75.8** (-1;-6) R_w (C; C_{tr})	**F 30, REI 30** Fireproofing	**1** Field of application

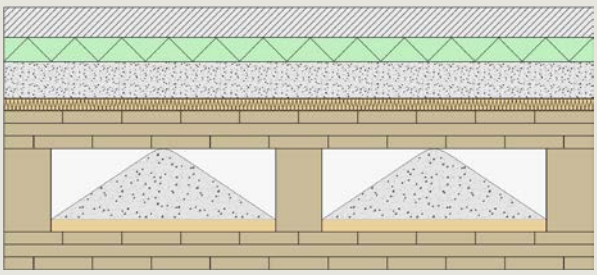
50 mm	wet screed
40 mm	Akustic ISOVER EP 1
60 mm	best wood BOUNDSPLITT
260 mm	best wood CLT BOX – CEILING FS



DE-BOX FS-23

42.4 (-1;+2) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**69.2** (-1;-4) R_w (C; C_{tr})	**F 60, REI 60** Fireproofing	**1** Field of application

50 mm	wet screed
40 mm	Akustic ISOVER EP 1
60 mm	best wood BOUNDSPLITT
20 mm	best wood MULTITHERM 140
260 mm	best wood CLT BOX – CEILING FS

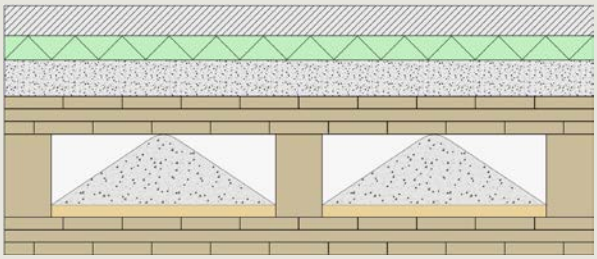


Soundproofing level **BASIC+**

DE-BOX FS-16

45.4 (-3;0) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**69.5** (-1;-4) R_w (C; C_{tr})	**F 60, REI 60** Fireproofing	**1** Field of application

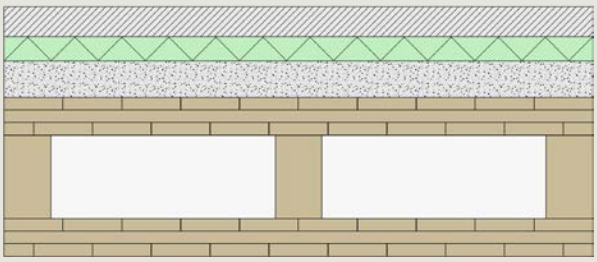
50 mm	wet screed
40 mm	Akustic ISOVER EP 1
60 mm	best wood BOUNDSPLITT
260 mm	best wood CLT BOX – CEILING FS



DE-BOX FS-17

46.2 (-2;+1) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**67.9** (0;-4) R_w (C; C_{tr})	**F 30, REI 30** Fireproofing	**1** Field of application

50 mm	wet screed
40 mm	Akustic ISOVER EP 1
60 mm	best wood BOUNDSPLITT
260 mm	best wood CLT BOX

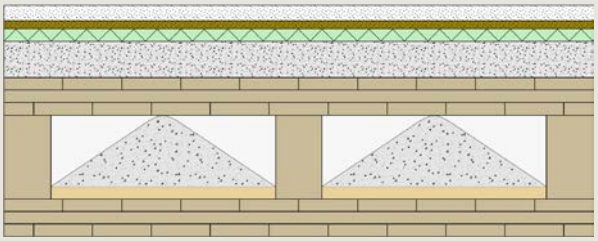


Soundproofing level **BASIC**

DE-BOX FS-07

46.6 (0;+5) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**66.1** (-3;-10) R_w (C; C_{tr})	**F 60, REI 60** Fireproofing	**1** Field of application

25 mm	Fermacell screed element
12.5 mm	PhoneStar Tri ST
20 mm	Akustic ISOVER EP 3
60 mm	best wood CHIPPINGS
260 mm	best wood CLT BOX – CEILING FS



DE-MHD-15

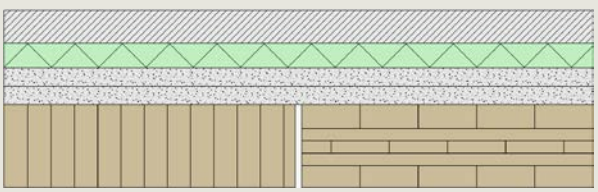
44.0 (+1;+7) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**68.0** (-2;-8) R_w (C; C_{tr})	**up to F 90** Fireproofing	**1** Field of application

15 mm	PhoneStar Tri ST
15 mm	PhoneStar Tri ST
22 mm	best wood FLOOR 220
80 mm	bound chippings
140 mm	best wood CLT – CEILING / best wood GLULAM – CEILING

DE-MHD-17

47.0 (0;+7) $L_{n,w}$ (C_i;$C_{I,50\text{-}2500}$)	**72.4** (-2;-8) R_w (C; C_{tr})	**up to F 90** Fireproofing	**1** Field of application

55 mm	wet screed
40 mm	Akustic ISOVER EP 1
30 mm	best wood CHIPPINGS
30 mm	best wood CHIPPINGS
140 mm	best wood CLT – CEILING
	best wood GLULAM – CEILING

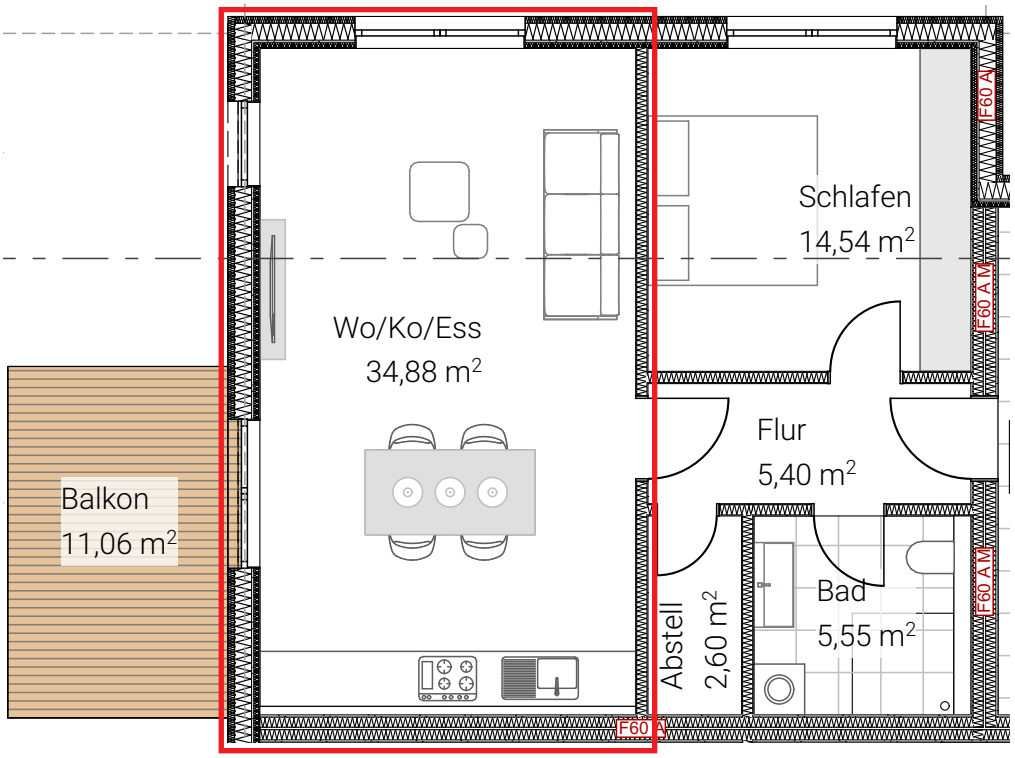


Practical example

best wood SCHNEIDER was commissioned to provide proof of soundproofing for this residential and commercial building with a total of 8 residential units.

The living/dining area of the respective apartment can be found in the north-west corner building of the ground floor and the first floor.

The layouts of the two apartments are identical in this area, i.e. the source and receiving room are directly on top of each other.



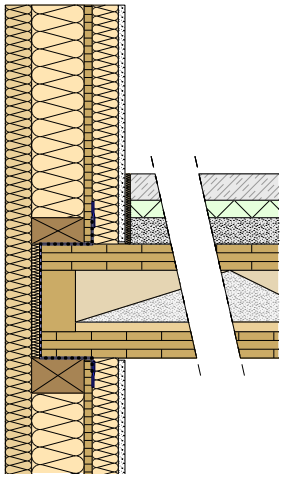
Separating component

The combination of the CLT BOX – CEILING FS and the DE-BOX FS-03 was used as the inter-storey ceiling in this construction project. The area of the separating component in this example is S = 34.9 m^2.

The sound impact level technical characteristics of this structure are:

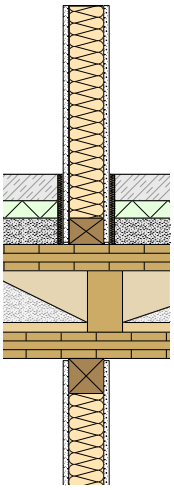
- Standard sound impact level $L_{n,w}$ = 42.1 dB (laboratory value without edges)
- Spectrum adaptation value $C_{I,50\text{-}2500}$ = 1

The value $L_{n,w} + C_{I,50\text{-}2500}$ = 43.1 dB is significantly less than the COMFORT level requirement value of $L_{n,w} + C_{I,50\text{-}2500} \leq 47$ dB.



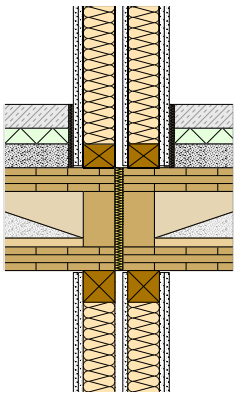
External wall edge

The length of the edging external walls on the west side is 7.7 m and 4.4 m on the north side.
The external walls have been implemented as a timber frame construction with an installation level. The CLT BOX – CEILING FS structurally interrupts the edge, and has been laid as far as the ETICS with an appropriate installation gap



Inner wall edge

The wall inside the residential unit has a length of 7.7 m. It has been implemented with the classic post and beam design, boarded with a layer of Fermacell on both sides. Apart from its function as a edge, there are no other technical soundproofing requirements for this wall.
The separating wall was attached directly to the raw ceiling at the top and bottom.



Apartment separating wall edge

The apartment separating wall with an edge length of 4.4 m consists of a double post and beam structure in accordance with the 1 HT 35 AT system from Fermacell. The boarding on both sides of the wall consists of two layers of Fermacell. There is clearance of 30 mm between the walls. The structural separation has been led through the inter-storey ceiling. The resulting gap of 20 mm has been filled with mineral fibre.

Result

Taking these edges and the room geometry into consideration, this results in a standard sound impact level of $L'_{n,w}$ = 42.8 dB. According to the normative specifications, predictive uncertainty of μ_{Prog} = 3 dB must be applied to this value.
Consequently, a value of $L'_{n,w} + \mu_{Prog}$ = 45.8 dB can be verified, which is compliant with the COMFORT level requirement value of $L'_{n,w} \leq 46$ dB. When the building was complete, the impact sound level was metrologically tested, and adherence to the COMFORT level was verified. The result of $L'_{n,w}$ = 44.1 dB meant that there was good correlation between the measurement and the calculation.

About best wood SCHNEIDER®

The Schneider company group is a regionally operating family-run company with headquarters in Eberhardzell. At the highest technical level, we produce all supporting wood components and wood fiber insulation boards for modern wood and passive house construction and pellets for ecological heating with more than 600 employees.

Good for nature, good for us all. Tested & certified.

From round wood to finished product including energy requirement, we implement everything in a closed raw material cycle in our production facilities in Southern Germany.
best wood Schneider realises energy-efficient production in accordance with DIN ISO 50001 when doing this. The wood raw material is utilised 100 % to the last chip.

We are certified by independent bodies such as natureplus and PEFC, and also tested for the sustainable building seal of quality (QNG). For the best quality with "Zero Waste", short distances, and just in time on your construction site, of course.

Headquarters Germany

best wood SCHNEIDER® GmbH
Kappel 28
D-88436 Eberhardzell
Phone +49 (0)7355 9320-0
Fax +49 (0)7355 9320-300
E-mail info@schneider-holz.com

Subsidiary Meßkirch

best wood SCHNEIDER® GmbH
Industriepark 16
D-88605 Meßkirch
Phone +49 (0)7355 9320-8000
Fax +49 (0)7355 9320-300
E-mail info@schneider-holz.com

Subsidiary Switzerland

best wood SCHNEIDER® GmbH
Weinfelderstrasse 29A
CH-8560 Märstetten
Phone +41 (0)71 918 79 79
Fax +41 (0)71 918 79 78
E-mail info@schneider-holz.com

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