Acoustic

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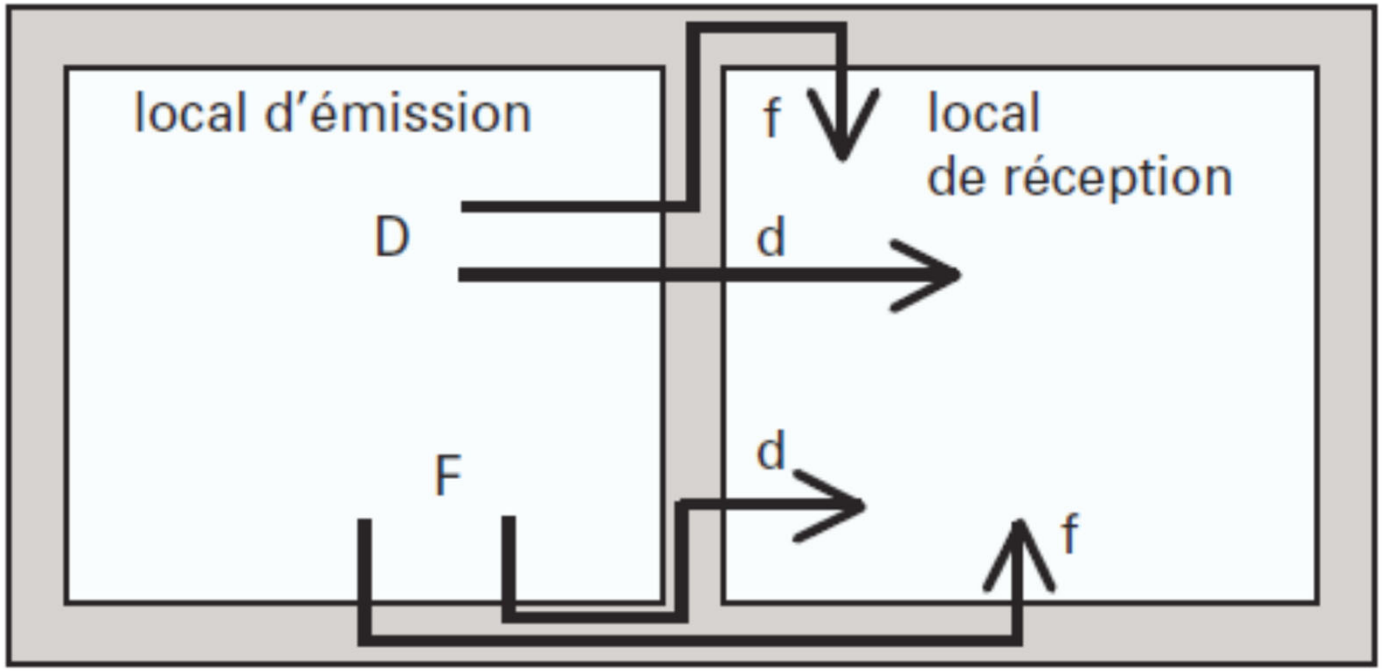
Important factors

- Costs
- Fire
- Esthetic
- Acoustic

Acoustic

- Sound transmission is very reliable
- Direct and lateral transmission

Figure 14 Chemin direct Dd et diverses voies de transmission latérales Fd, Df et Ff



SIA 181 F.2.1 Figure 14

Transmission of sound

- Aerial noise – Airborne noise

Sound propagating through the air (acoustic waves)

- Measured as sound reduction index in dB

R (mes. In laboratory), R’ (mes. In situ),

R’w (third octave band measurements in the laboratory or in situ, etc..)

Transmission of sound

- Bruit solidien

Noise transmitted by a structure, e.g. impact noise, equipment noise or vibration.

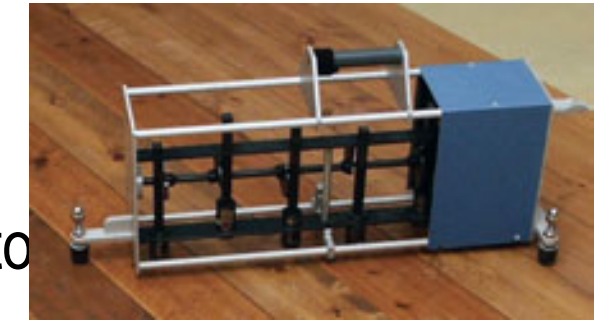
- Structure borne noise

Solid-borne noise caused by the tread or any other impulse excitation of a floor, staircase, etc., which propagates in a building and radiates in the form of airborne noise.

- Measured as standardised impact noise pressure level in dB (impact machine)

L_n (mes. In laboratory), L_n' (mes. in situ),

$L^{(')}_{n,w}$ (third octave band measurements in the laborato



Noise protection

- Minimum requirement for protection against **airborne noise**

Degré de nuisance	faible	modéré	fort *	très fort *
Exemples de genre et d'utilisation pour le local d'émission	Utilisation peu bruyante: salle de lecture ou d'attente, chambre d'hôpital, archive	Utilisation normale: séjour, chambre à coucher, cuisine, bain, WC, corridor, cage d'ascenseur, cage d'escalier, bureau, salle de conférence, laboratoire, local de vente sans sonorisation	Utilisation bruyante: local de loisirs, salle de réunion, salle de classe, crèche, jardin d'enfants, chauffage, garage souterrain, local technique, restaurant sans sonorisation, local de vente avec sonorisation et locaux annexes	Utilisation très bruyante: exploitation artisanale, atelier, salle de répéti-tion de musique, salles de gymnastique, restaurant avec sonorisation et locaux annexes
Sensibilité au bruit	Valeurs d'exigences D_i **			
faible	42 dB	47 dB	52 dB	57 dB
moyenne	47 dB	52 dB	57 dB	62 dB
élevée	52 dB	57 dB	62 dB	67 dB

+ 3 dB for new constructions

SIA 181 § 3.2.1.2 Tab. 4

Noise protection

- Minimum requirements for protection against **impact noise**

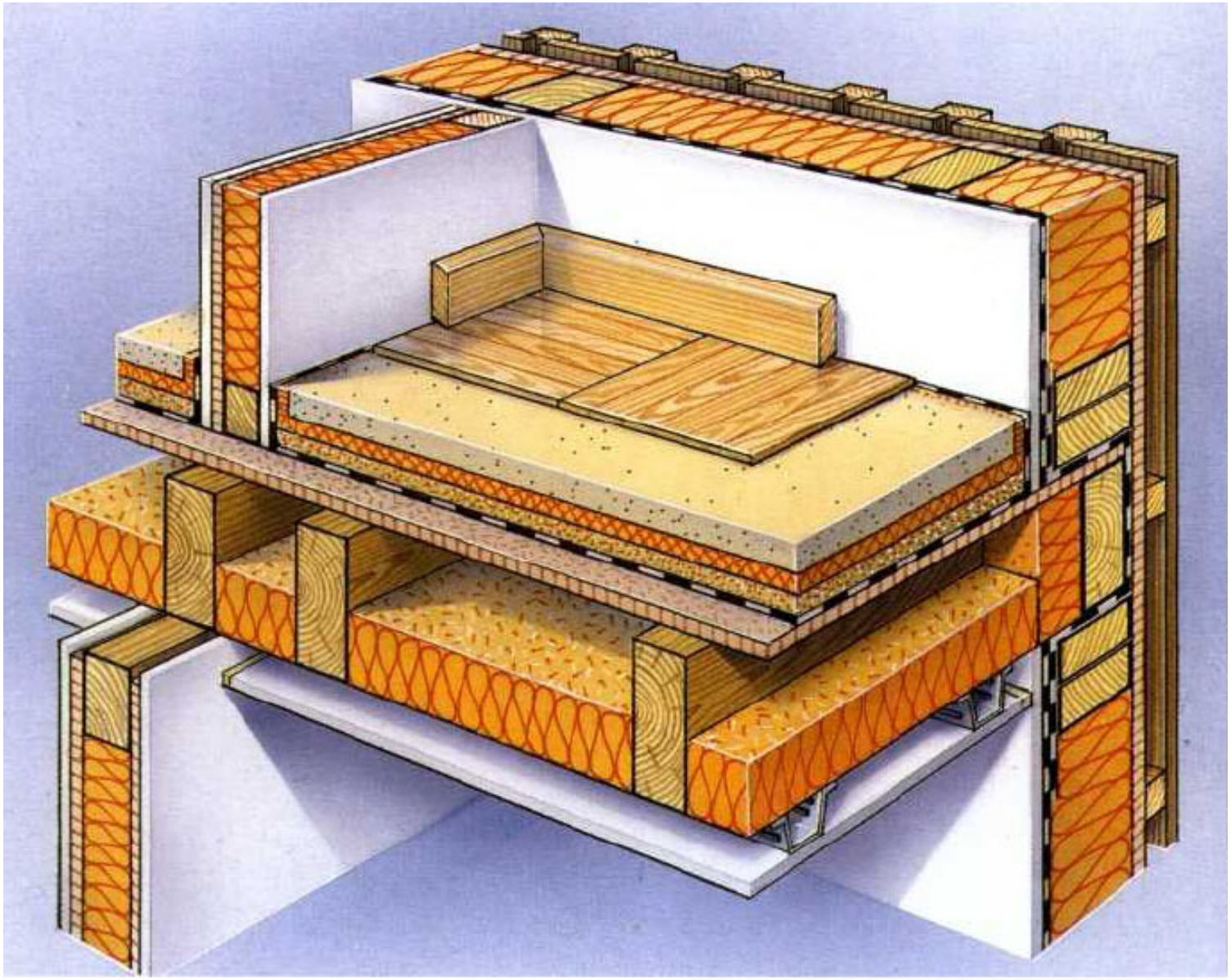
Tableau 5 Exigences minimales pour la protection contre le bruit de choc

Degré de nuisance	faible	modéré	fort	très fort
Exemples de genre et d'utilisation pour le local d'émission	Archive, salle d'attente ou de lecture	Séjour, chambre à coucher, cuisine, bain, WC, bureau, chaufferie et local de conditionnement d'air, corridor, cage d'escalier, coursive, passage, terrasse, garage souterrain	Restaurant, salle, salle de classe, crèche, jardin d'enfants, halle de gymnastique, atelier, salle de répétition de musique et locaux annexes	Les utilisations classées sous «fort», lorsqu'elles concernent également la période nocturne de 19.00 h à 07.00 h
Sensibilité au bruit	Valeurs d'exigences L'			
faible	63 dB	58 dB	53 dB	48 dB
moyenne	58 dB	53 dB	48 dB	43 dB
élevée	53 dB	48 dB	43 dB	38 dB

- 3 dB for new constructions

SIA 181 § 3.2.2.2 Tab. 5

In timber constructions



Layers

- Fermacell – Knauf pannels
- Flexible spring/battens
- Insulation with different density – flumroc - Isover - Gutex
- Mass layers = cement/anhydrite screed or concrete
- Sans - granulate
- Asphalted or resiliently bonded sand
- >>> empty <<<

- Documentation => ask your suppliers
- Lignumdata.ch

Pannels

- OSB

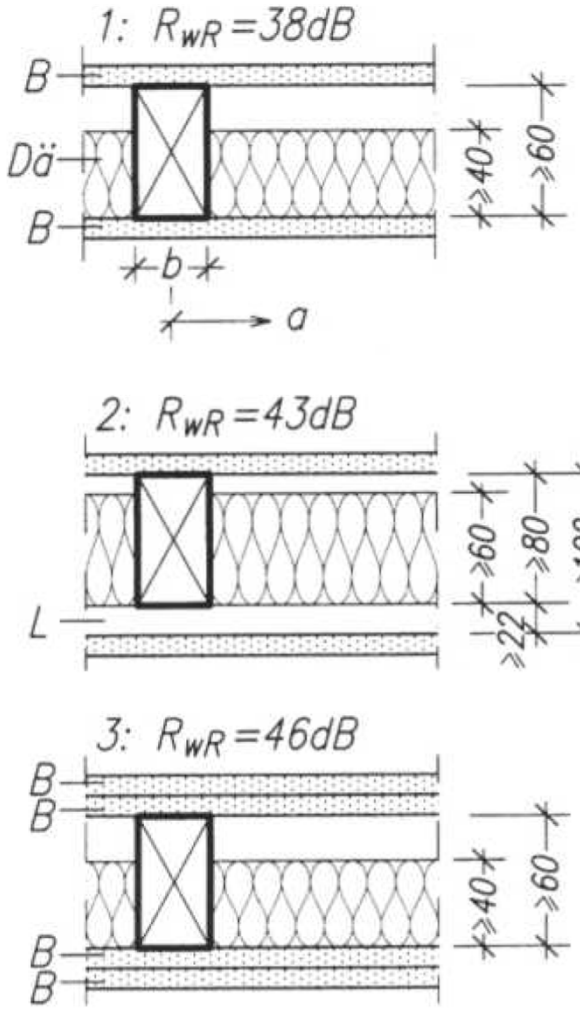
Fermacell

Gypsum-Plaster

Drywall

- Important:
  - The multiplication of layers
  - Connection details

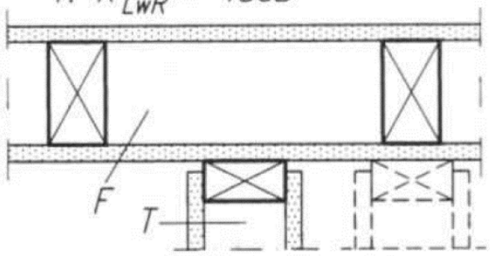
Dry wall examples



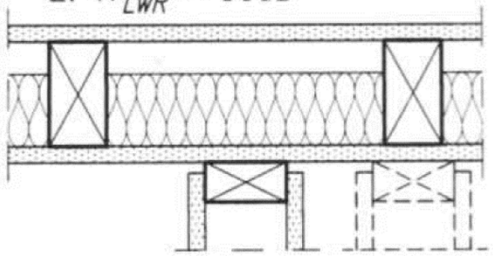
B pannel
Dä insulation

Dry wall connections

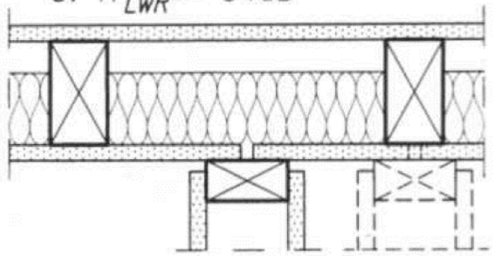
1: R_{LwR} = 48dB



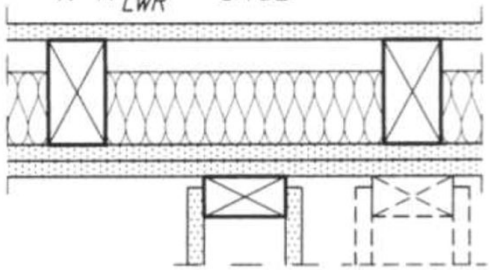
2: R_{LwR} = 50dB



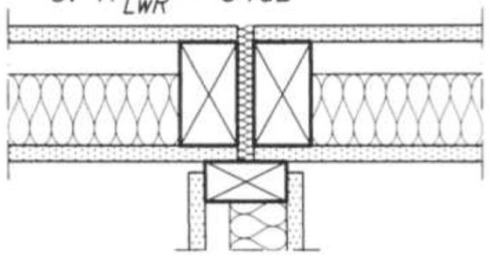
3: R_{LwR} = 54dB



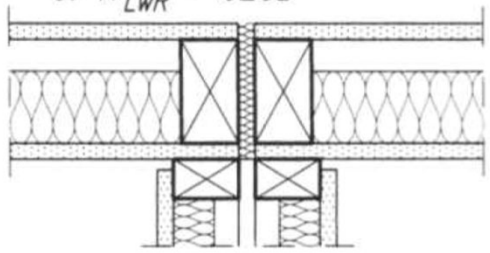
4: R_{LwR} = 54dB

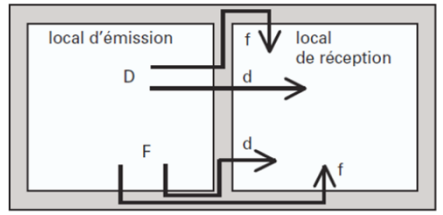


5: R_{LwR} = 54dB

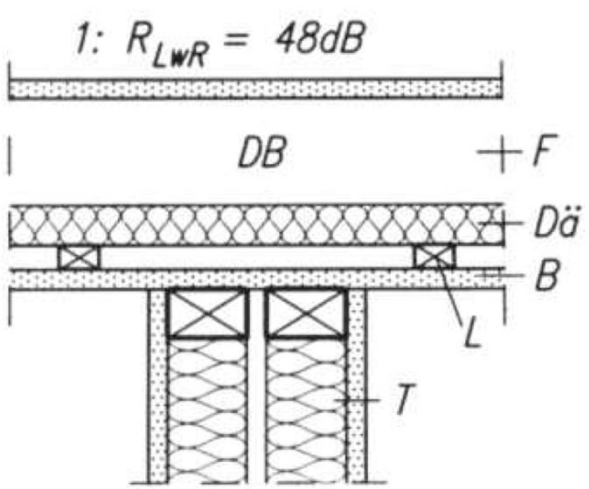


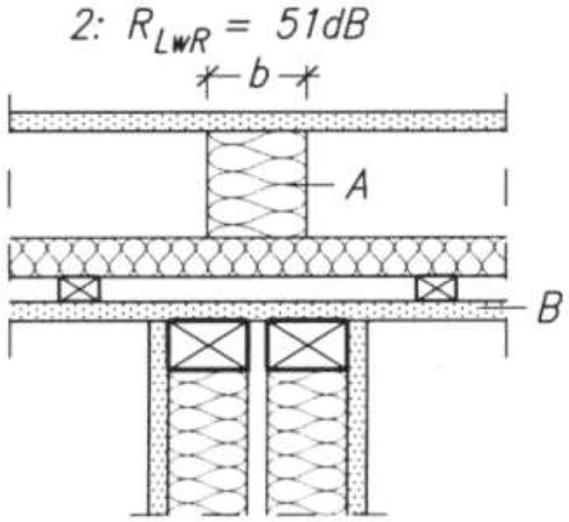
6: R_{LwR} = 62dB

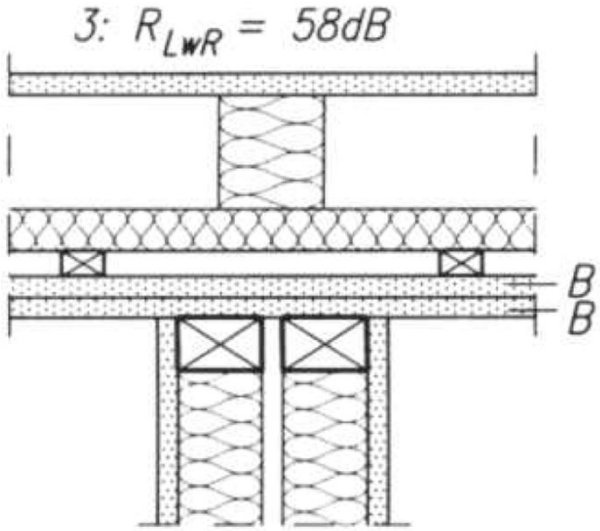


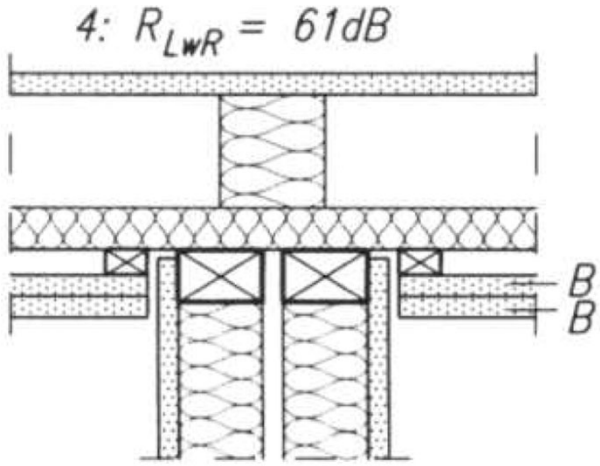


Connection to the roof

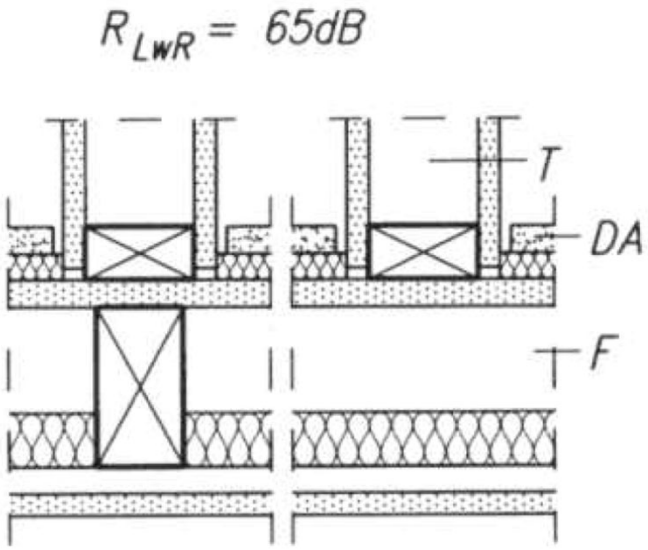


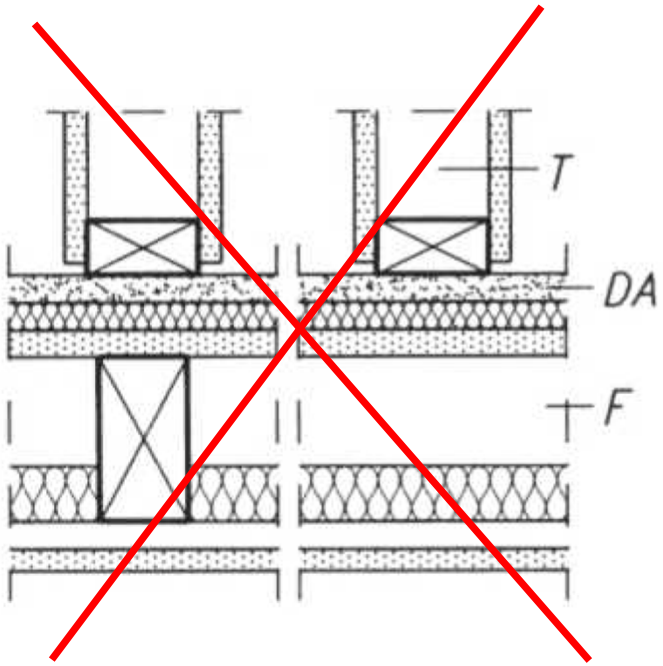


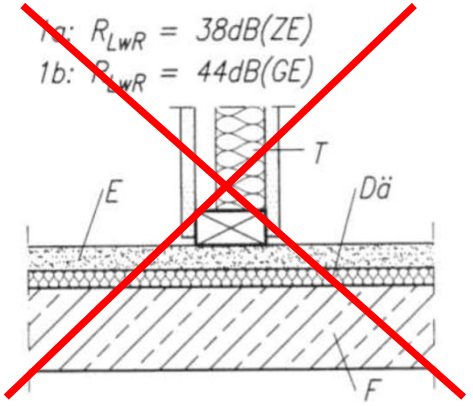


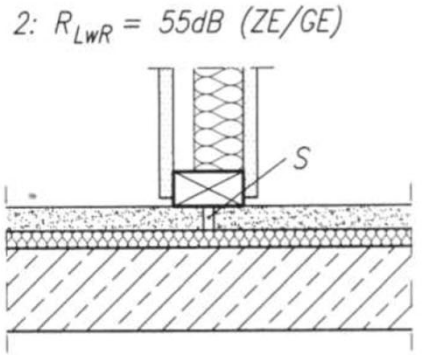


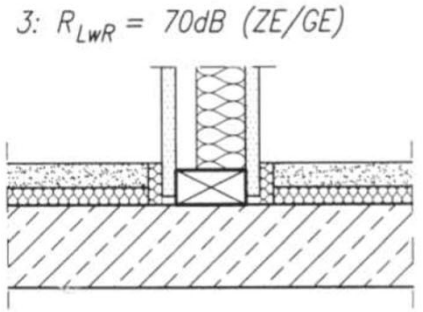
Groun connection



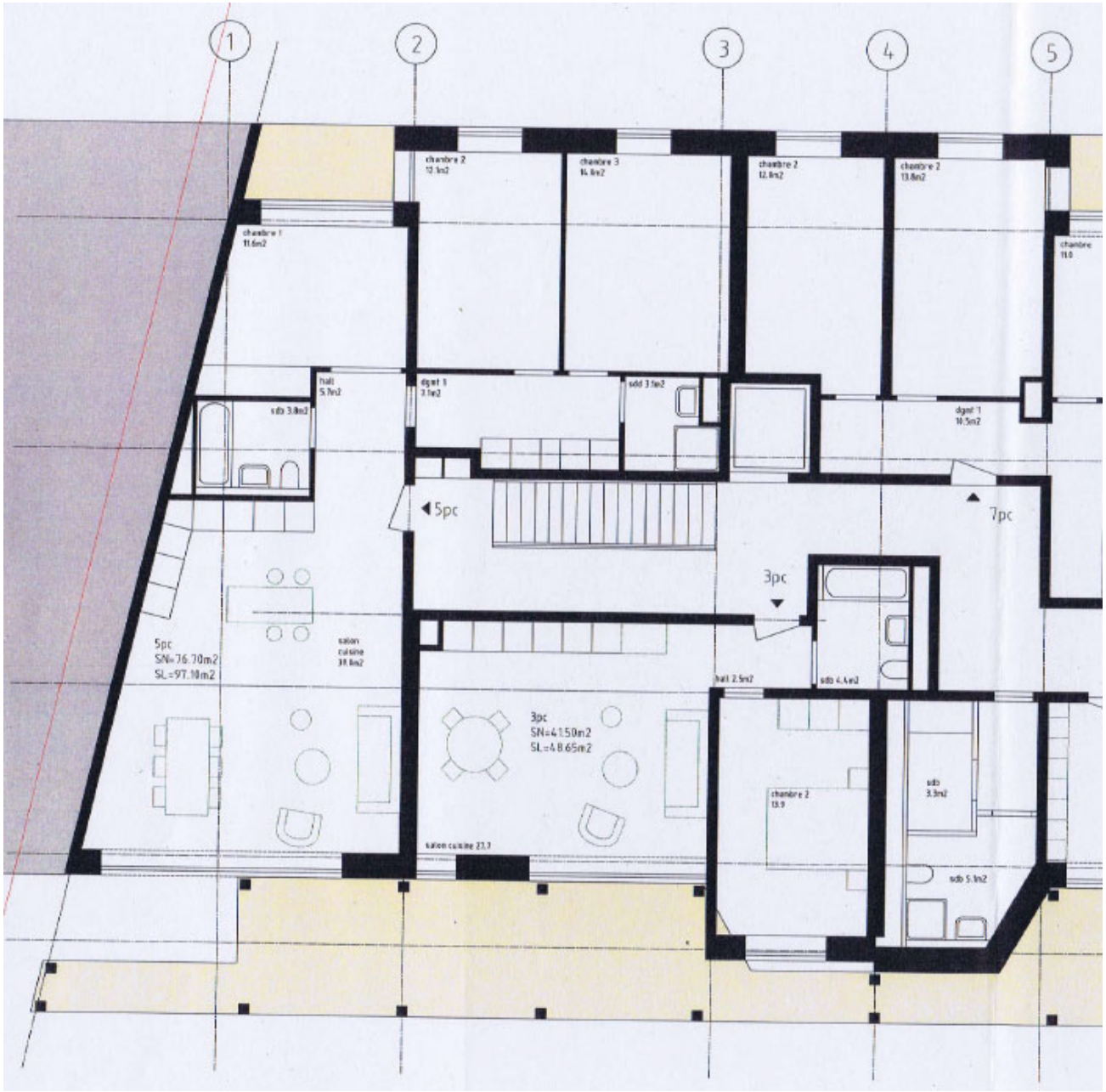




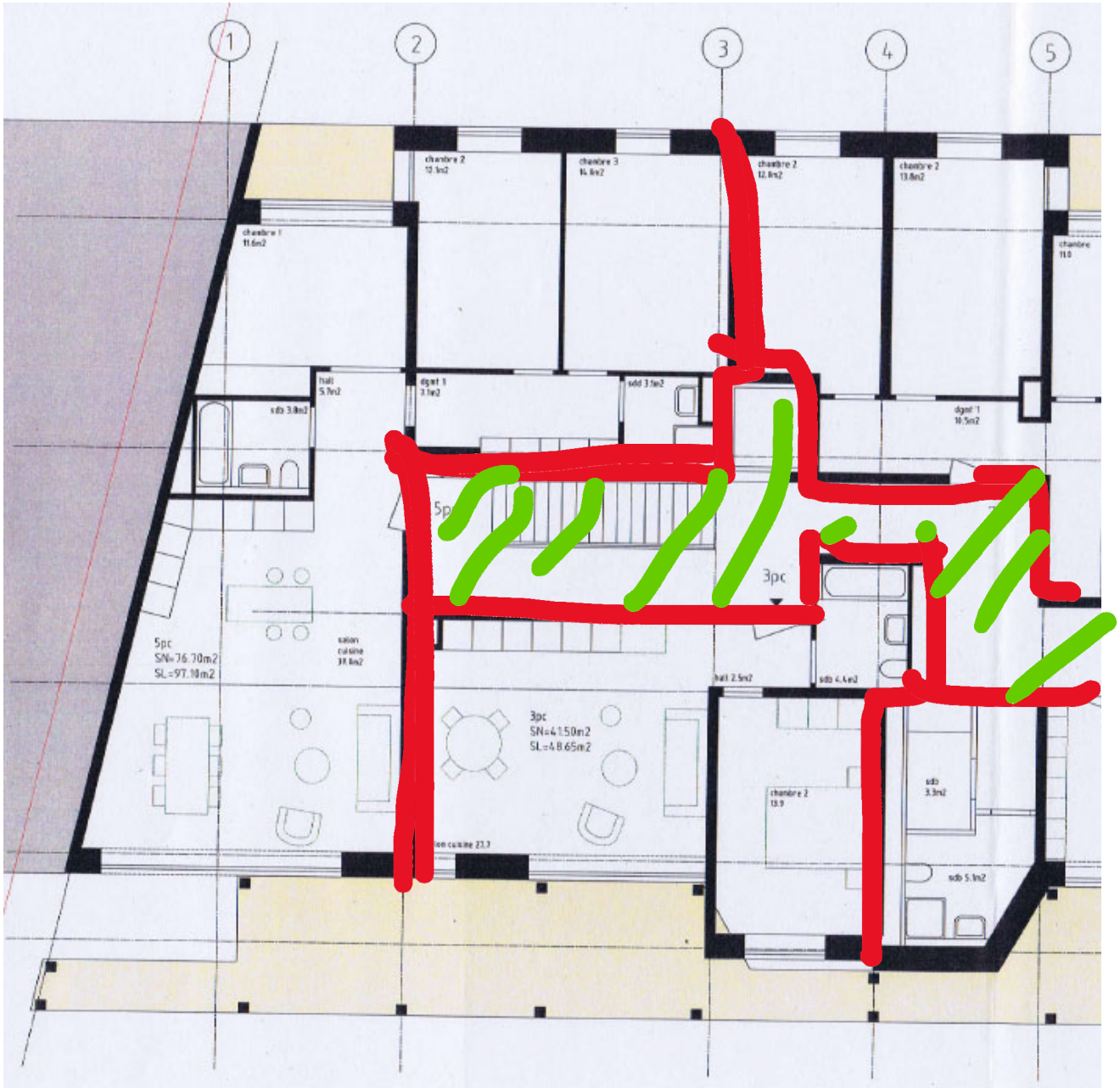




Repartition of the wals



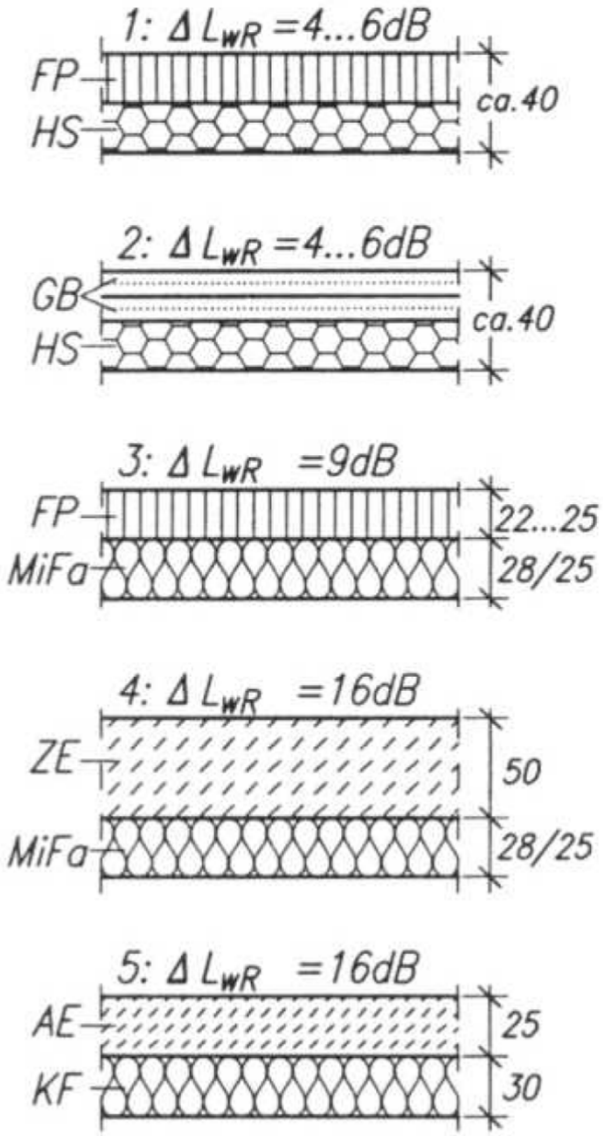
Repartition of the wals



Slabs

- Dampening impact noise is crucial
- Possibility of working with a screed (on top)
- A suspended ceiling (underneath)

Floating screed



Screeds with different attenuation levels

Attenuation indices are lower for wooden slabs than for concrete slabs (lack of weight)

FP wood particle board

HS PU foam insulation

ZE Cement screed

AE anhydrite screed

KF Koko fibre

MiF a mineral fibre

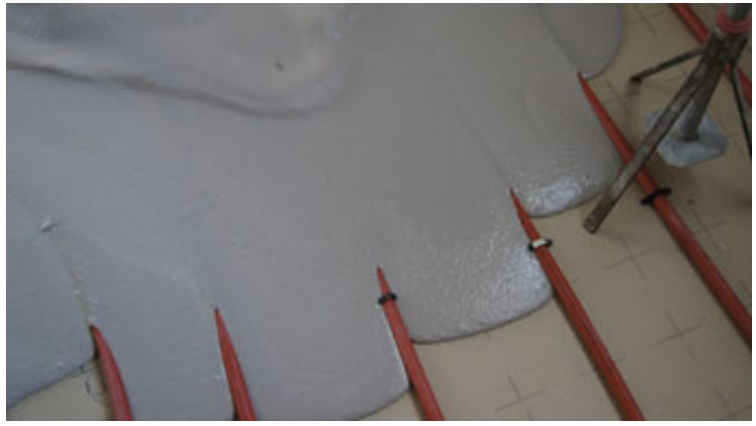
GB plasterboard

The screeds

- Cement scredd - concrete

The screeds

- The anhydrid screed

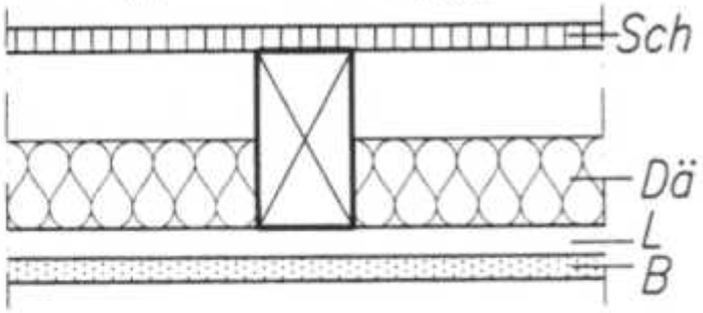


Leightweight screed

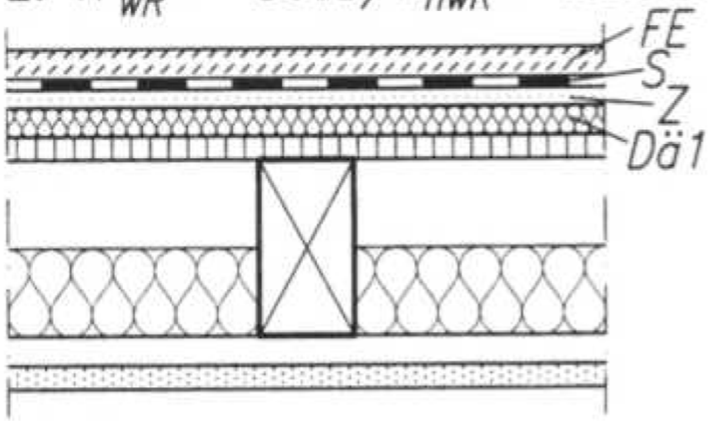
- Granulate screed - type fermacell

Slab on beams systems

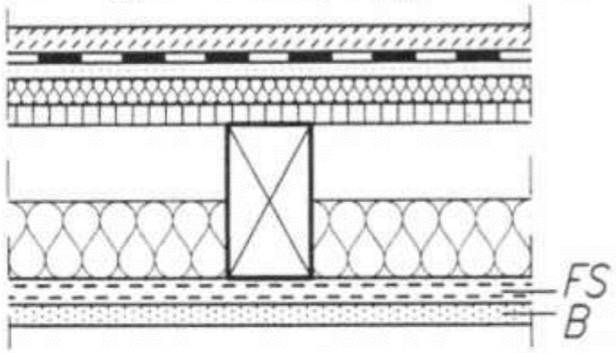
1: R'_{wR} = 41dB/L'_{nwR} = 77dB



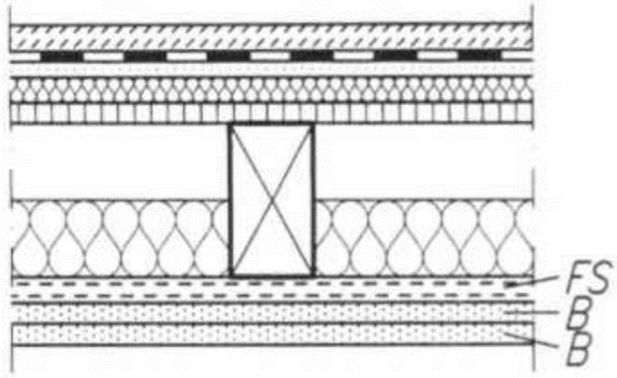
2: R'_{wR} = 56dB/L'_{nwR} = 58dB



3: R'_{wR} = 59dB/L'_{nwR} = 49dB



4: R'_{wR} = 61dB/L'_{nwR} = 47dB



Housing - ‘light’ slab with acoustic component

- Type of student accommodation – la bourdonnette
- 120mm solid wood slab
- Overlay:
  - 15mm fermacell
  - 30mm of sand
  - 30mm of acoustic insulation
  - 60mm cement screed

Housing - ‘light’ slab with acoustic component

- Raising in Lausanne
- Solid wood slab structure 24cm

Surcharge: on top:

- 30mm of acoustic insulation
- 80mm cement screed

from below:

- battens + insulation
- 2x 12.5mm plasterboard

Housing - ‘light’ slab with acoustic component

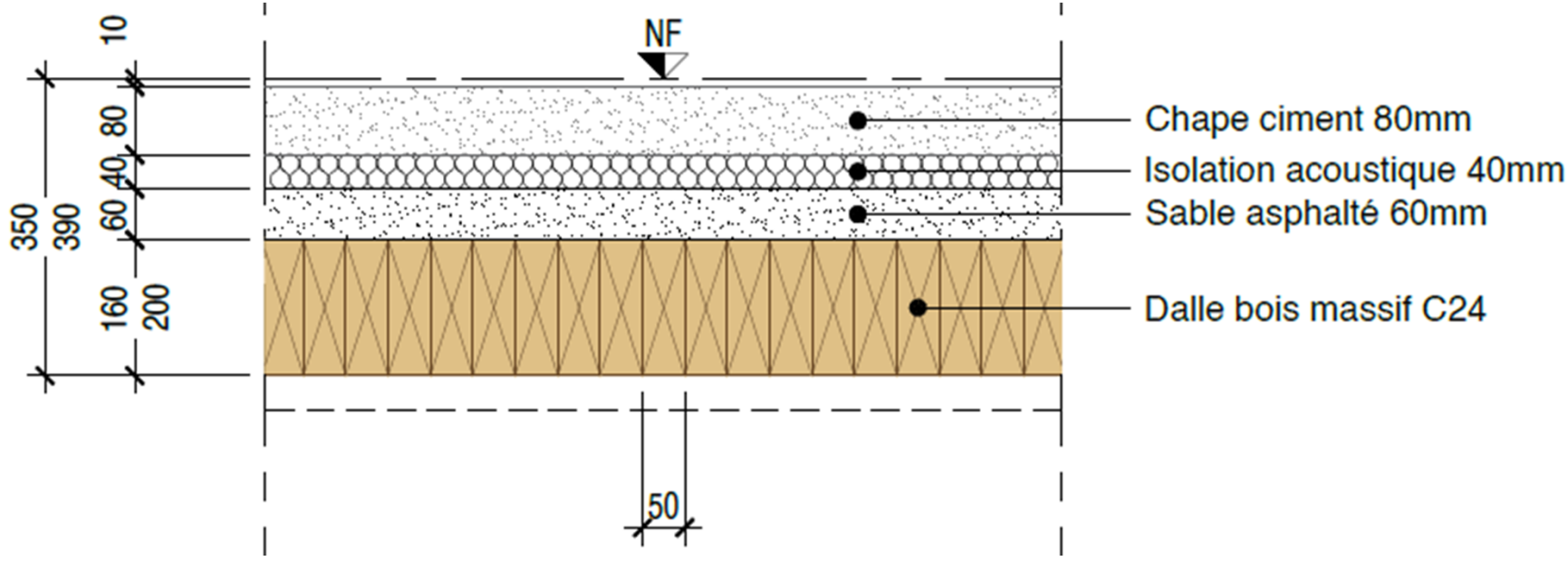
- Housing in Versoix (4.5m span at 5m)

160mm solid wood slab

Overlay: - 60 mm asphalt sand (elastic bounded sand)

- 40 mm acoustic insulation

- 80 mm cement screed

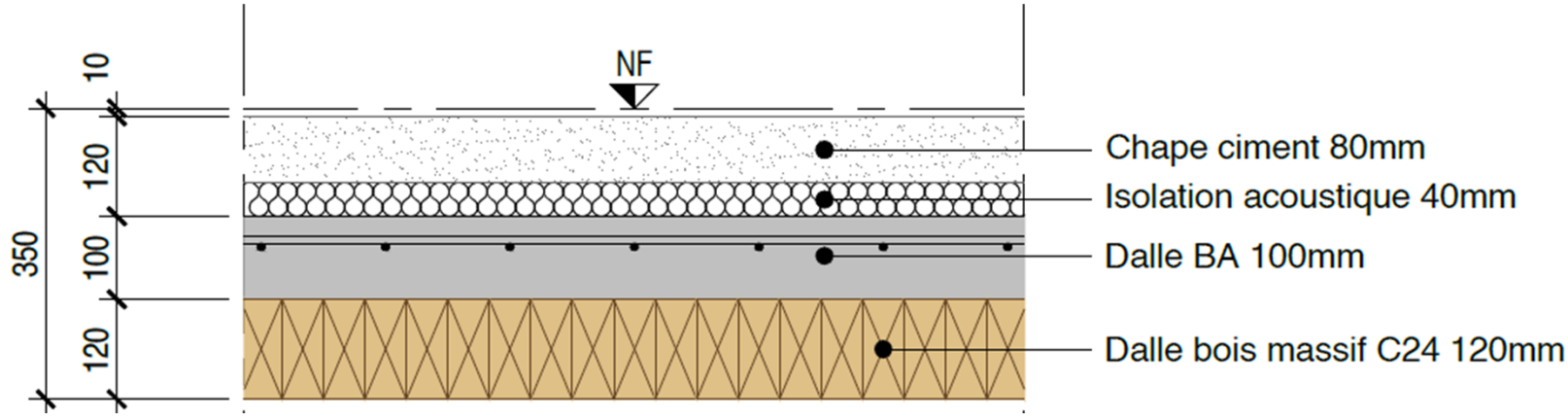


Housing
acoustic component

- Housing in Versoix (4.5m span at 5m)
- 160mm solid wood composite slab + 100mm concrete

Overlay: - 40 mm acoustic insulation

- 80 mm cement screed

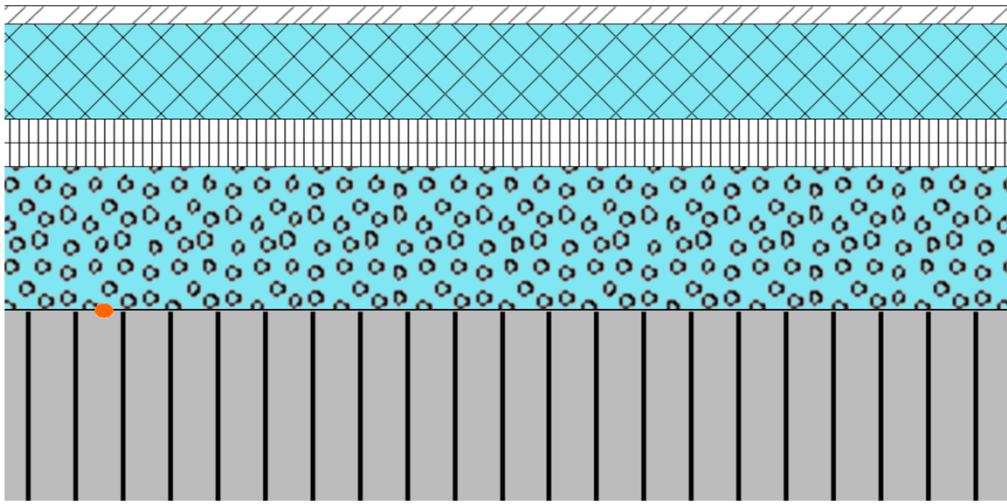


Lignum data - **Bauteil A2080**

mit Trittschalldämmung mit einer dynamischen Steifi

Luft-Schalldämmwerte		Tritt-Schalldämmwerte	
R_w	71 dB	$L_{n,w}$	44 dB
C	-3 dB	C_I	0 dB
$C_{50-3150}$	0 dB	$C_{I50-2500}$	5 dB

Grafik



Aufbau

Schicht	Produkt	Hersteller	Dicke [mm]	Gewicht
Bodenbelag	Fussbodenbelag	Generisches Produkt	15 mm	15 kg/m^2
Auflage	Zementestrich	Generisches Produkt	80 mm	176 kg/m^2
Trittschalldämmung	Holzweichfaser Trittschalldämmung	Generisches Produkt	20 mm	-
Zusatzdämmung	Glaswolle 20mm mit dynamischer Steifigkeit s' von ≤ 13.5 [MN/m³]	Isover, Sager, swisspor AG, Zisola	20 mm	1.6 kg/m^2
Beschwerung auf Tragkonstruktion	Schüttung 1376 kg/m³	Generisches Produkt	120 mm	165.1 kg/m^2
Tragschicht	Rieselschutzpapier	Generisches Produkt	0.5 mm	0.4 kg/m^2
Verbund	Ohne Verbundwirkung	-	-	-
Tragkonstruktion	Bresta Massivholzplatte	Tschopp Holzbau AG	160 mm	78.4 kg/m^2