Impact sound parameters

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UKAS TESTING 4051

ATTMA

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- Acoustic classification system
- Akulite programme
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What's the problem?


BS EN ISO 16283-2:2015
ISO 16283-2:2015(E)

Standardised impact sound pressure levels, $L'_{n,0}$ according to ISO 16283-2

Field measurements of impact sound insulation of floors using the tapping machine

Client:

Date of test:

Description and identification of the building construction and test arrangement, etc.:

Receiving room volume: m³

Frequency f Hz	$L'_{n,0}$ one-third octave dB
50	
63	
80	
100	
125	
160	
200	
250	
315	
400	
500	
630	
800	
1 000	
1 250	
1 600	
2 000	
2 500	
3 150	
4 000	
5 000	

Frequency range according to the current of reference values ISO 717-2

Rating in accordance with ISO 717-2:

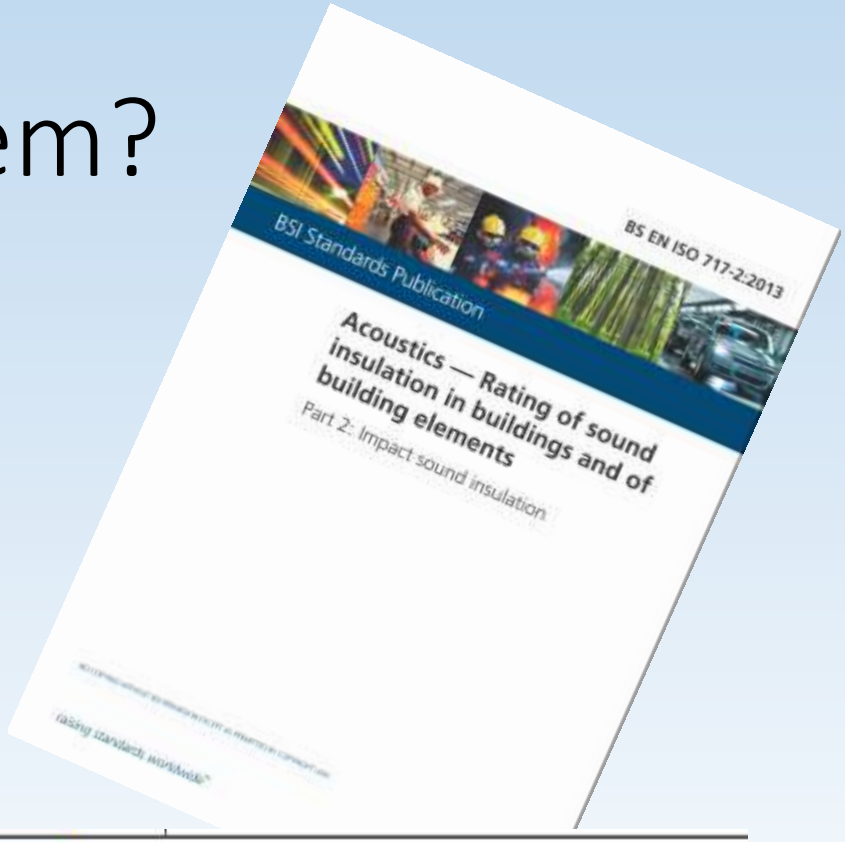
$L'_{nT,w}(C_I)$ = () dB; $C_{I,50-2500}$ = dB

Evaluation based on field measurement results obtained by an engineering method

No. of test report: Name of test institute:

Date: Signature:

Figure C.1 — Example of a form for the expression of results using the tapping machine



Spectrum adaptation terms

$$L_{\text{sum}} = 10 \lg \sum_{i=1}^{k} 10^{L_i/10} \text{ dB}$$

$$C_{\text{I}} = \left(L'_{\text{n}T,\text{sum}} - 15 - L'_{\text{n}T,\text{w}} \right) \text{dB}$$

COST Action TU 0901

- 32 countries collaborated
- Acoustic classification scheme for dwellings
- ISO/ NP 19488
- Impact sound parameters:
- $L'_{nT,w}$ and
- $L'_{nT,w} + C_{i50-2500} = L'_{nT,50}$

COST TU0901, download here

Class values and interpretation

Type of space	Class A $L'_{nT,50}$ (dB)	Class B $L'_{nT,50}$ (dB)	Class C $L'_{nT,50}$ (dB)	Class D $L'_{nT,50}$ (dB)	Class E $L'_{nT,50}$ (dB)	Class F $L'_{nT,50}$ (dB)
In dwellings from other dwellings	≤ 44	≤ 48	≤ 52	≤ 56	≤ 60	≤ 64

Class	General	Sound insulation judged poor
A	A quiet atmosphere with a high level of protection against sound	less than 5%
B	Under normal circumstances a good protection without too much restriction to the behaviour of the occupants	around 5%
C	Protection against unbearable disturbance under normal behaviour of the occupants, bearing in mind their neighbours	around 10%
D	Regularly disturbance by noise, even in case of comparable behaviour of occupants, adjusted to neighbours	around 20%
E	Hardly any protection is offered against intruding sounds	around 35%
F	No protection is offered against intruding sounds	50% or more

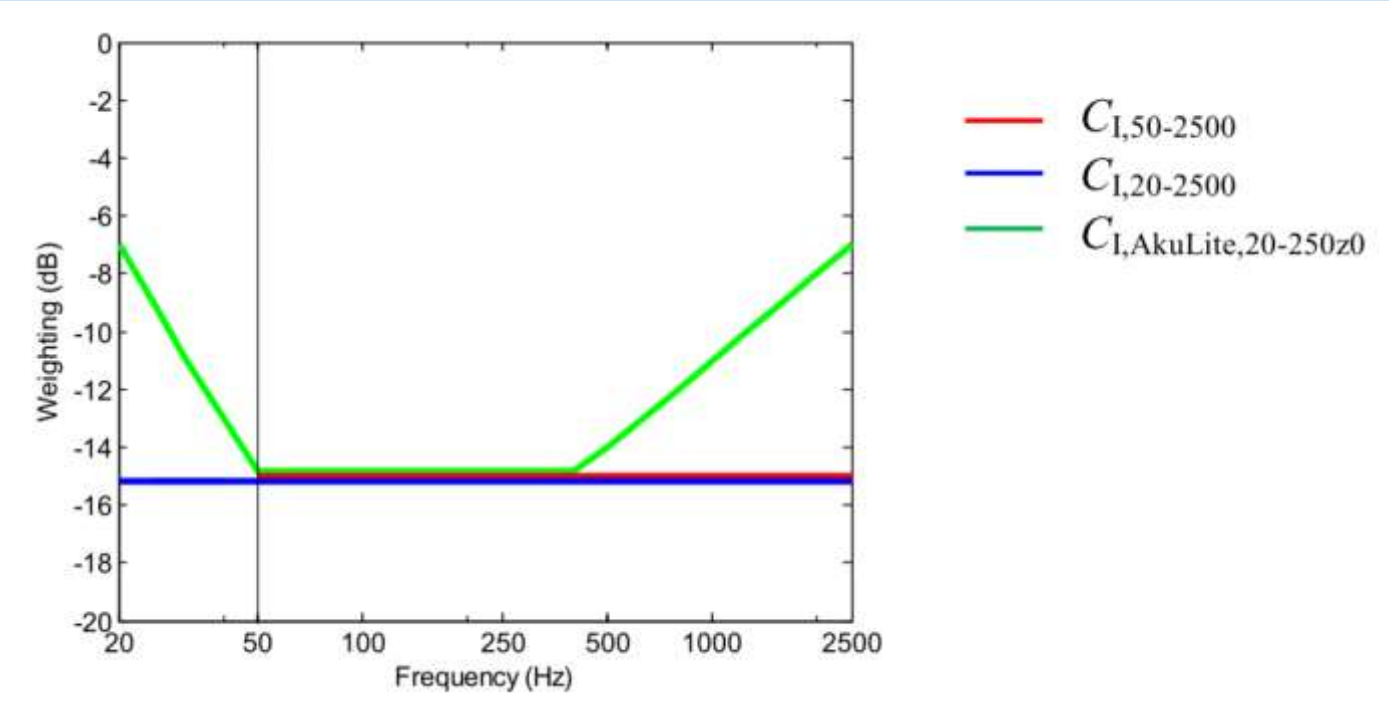
COST TU0901, download here

AkuLite and AkuWood

- 10 buildings investigated
- Questionnaires and measurements
- 50 – 2,500 Hz: $L'_{nT,\,50}$ $R^2 = 32\ \%$
- 20 – 50 Hz : Energy sum $R^2 = 78\ \%$
- 20 – 2,500 Hz: $L'_{nT,\,Akulite}$ $R^2 = 85\ \%$

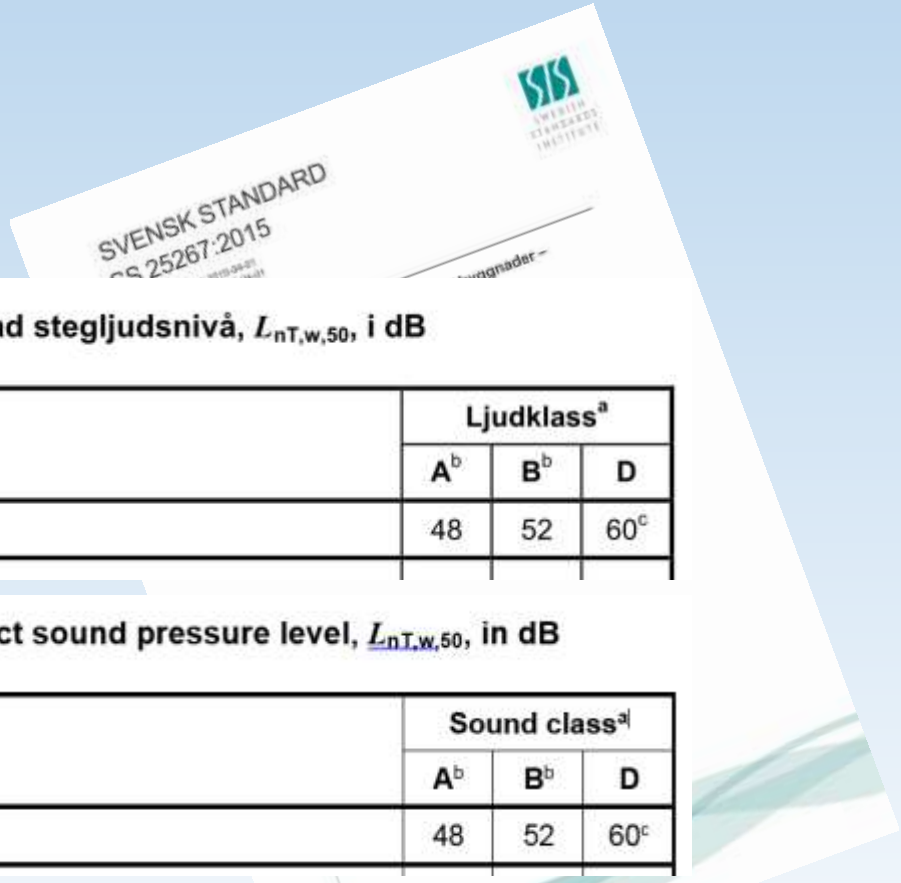
K Hagberg, D Bard; Low frequency sound transmission in multifamily wooden houses, Proc. Internoise 2014, Melbourne, Australia, download here

Akulite programme



F Ljunggren, C Simmons, K Hagberg, Correlation between sound insulation and occupants' perception – Proposal of alternative single number rating of impact sound, Applied Acoustics Vol 85, Nov 2014, pp 57–68

SS 25267: 2015


SVENSK STANDARD
SS 25267:2015

Tabell 2 – Högsta vägda standardiserad stegljudsnivå, $L_{nT,w,50}$, i dB

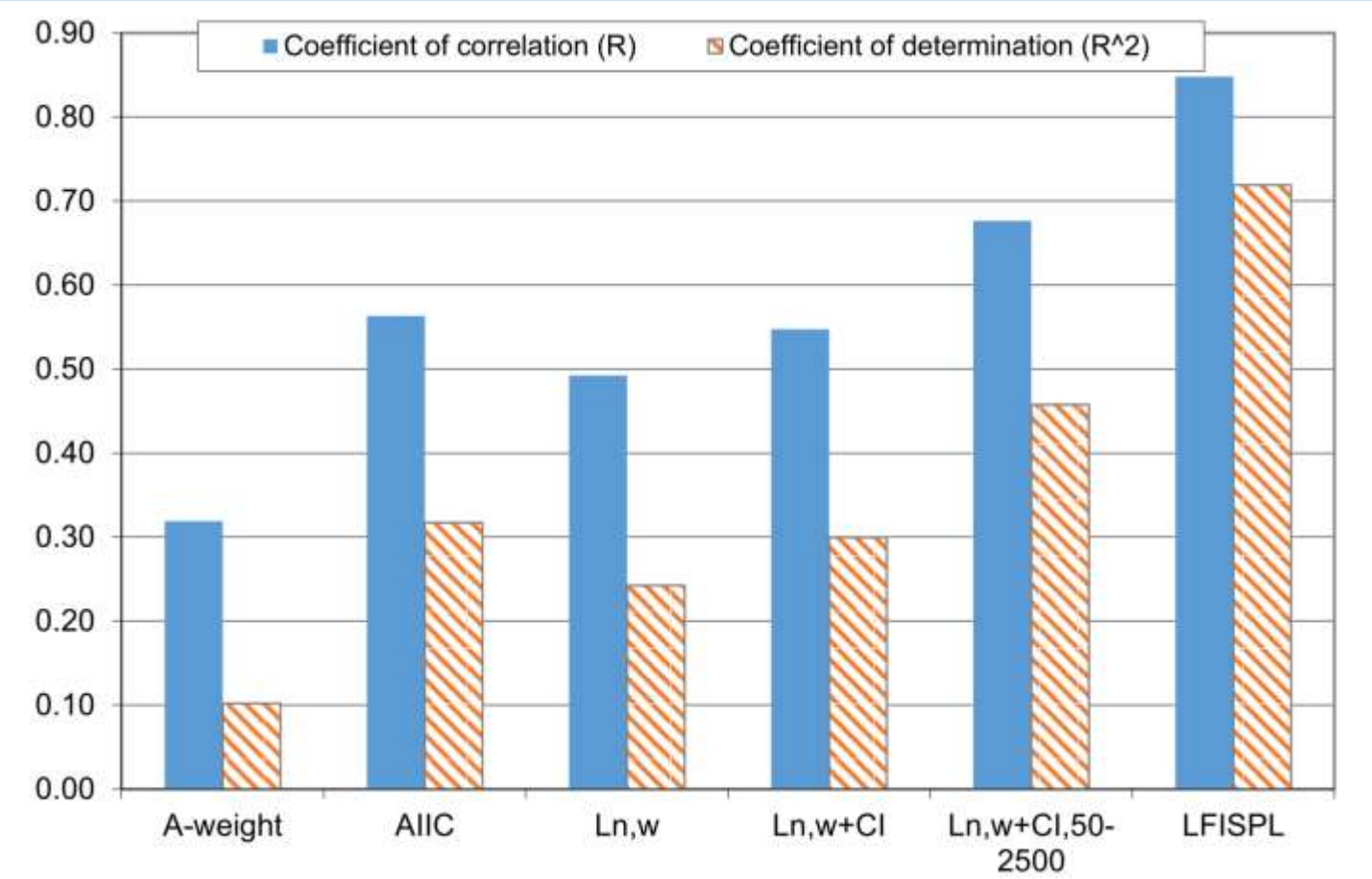
Typ av utrymme	Ljudklass[a]		
	A[b]	B[b]	D
Från utrymme utanför bostad till utrymme i bostad	48	52	60[c]

Table 2 – Highest weighted standardised impact sound pressure level, $L_{nT,w,50}$, in dB

Type of area	Sound class[a]		
	A[b]	B[b]	D
From space outside dwelling to space inside dwelling	48	52	60[c]

Note b:
To avoid disturbing low-frequency impact sound at frequencies below 50 Hz, weighted standardised impact sound pressure level requirements can be applied with and without spectrum adaptation term 20 Hz – 2500 Hz, $L_{nT,w,20}$, according to Annex A

LoVerde & Dong, USA



J. LoVerde; W Dong, A new metric to quantify and evaluate low frequency impact noise, Proc. Internoise 2014, Melbourne, Australia

LoVerde & Dong

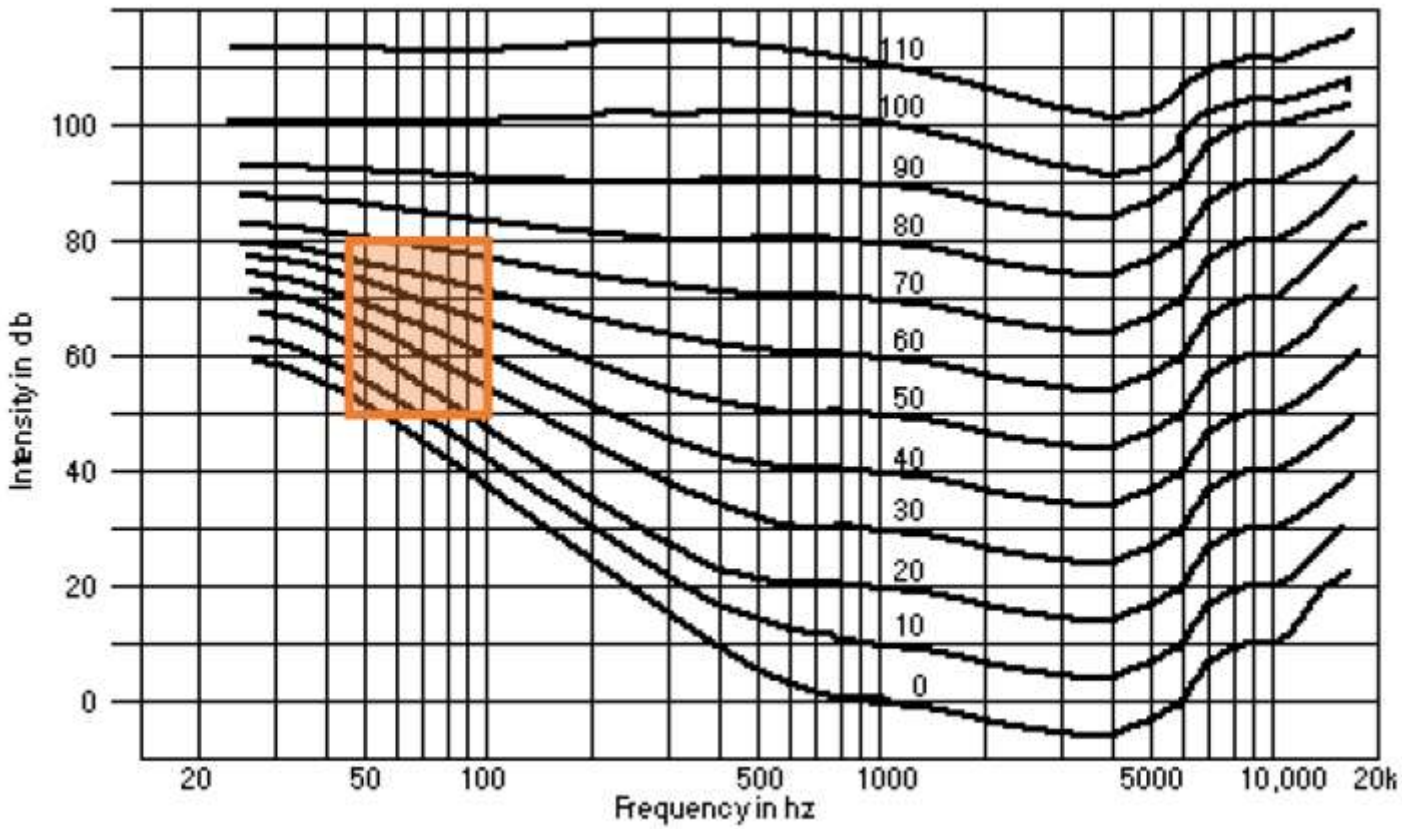


Figure 3 – Equal loudness contours with the region of interest highlighted.

J. LoVerde; W Dong, A new metric to quantify and evaluate low frequency impact noise, Proc. Internoise 2014, Melbourne, Australia

LoVerde & Dong

- 63 Hz octave band level
- > 70 dB large percentage of complaints
- < 60 dB almost universally acceptable

John J. LoVerde and Wayland Dong, Development of a low-frequency impact noise metric, J. Acoust. Soc. Am. 134 4083. 2013

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Soft heavy ball drop

- Described in ISO 10140-3 & ISO 16283-2
- Classification schemes for $L_{AF,max}$
- May be unnecessary

H Sato, J Yoshimura, Classification scheme of floor impact sounds with the standard rubber ball in dwellings, Proc Internoise 2014, Melbourne, Australia

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Conclusions

- Current metrics above 50 Hz inadequate
- $L'_{nT,50}$ may be insufficient
- Different methods proposed
- Swedish SS 25267 most sophisticated
- *It is proved that the low frequencies have to be part of the evaluation procedure or the entire wooden building industry will have no success at all for the future!* – Klas Hagberg

K Hagberg, New research create basis for future competitive wooden structures, 21st ICSV Beijing, China, 2014

Thank you for listening

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