

Impact Sound Transmission ($L_{n,w} + C_i$, $L'_{nT,w} + C_i$)

Impact Sound

Typical impact sound sources on floors are footsteps, jumping, and dropped objects. Examples on walls are cupboard doors and furniture knocks. When a surface is struck it vibrates. The vibration travels via structural connections to other parts of the assembly where it is radiated into the air.

Background

The $L_{n,w}$ and $L'_{nT,w}$ based acoustic measures originated in Europe, and are used in the Building Code of Australia effective from 1 May 2004. Their particular focus with the spectrum adaptation term C_i , is to emphasise low frequency sounds affecting occupant satisfaction such as footsteps.

Impact Rating Definitions

$L_{n,w} + C_i$

A **laboratory** rating that only applies to assemblies that have been constructed in a purpose-made acoustic laboratory and tested according to standard ISO 140-6. It applies to impact transmission from a standard taping machine. The lab is designed so sound is essentially only measured vertically, with sound from other paths (flanking) such as walls being suppressed.

- (i) $L_{n,w}$ is the “weighted normalised impact sound pressure level”. It is a single number rating. In general, a lower number means better overall impact performance (the sound pressure level is lower). The rating is derived from data that has been adjusted (normalised) to receiving room absorption of $10m^2$ to account for the influence a receiving room has on sound pressure level.
- (ii) C_i is a spectrum adaptation term. It effectively adjusts $L_{n,w}$ to account for typical footstep noise. The subscript is “I” for impact. See standard ISO 717-2 for more.

By way of an example, an $L_{n,w}$ of 56 and C_i of 3, may be reported as $L_{n,w} + C_i = 59$ dB, or sometimes as $L_{n,w}(C_i) = 56(3)$ dB.

$L'_{nT,w} + C_i$

A **field** rating that only applies to assemblies that have been tested on site according to ISO 140-7. It can apply to impact transmission from a standard tapping machine in vertical, horizontal, and diagonal directions. Performance can be affected by other sound paths (flanking) e.g. through walls.

- (i) $L'_{nT,w}$ is the “weighted standardized impact sound pressure level”. The rating is derived from data that has been adjusted (standardized) to a receiving room reverberation time of 0.5 seconds to account for the influence a receiving room has on sound pressure level.
- (ii) C_i is a spectrum adaptation term. It effectively adjusts $L_{n,w}$ to account for typical footstep noise. The subscript is “I” for impact. For more information see standard ISO 717-2.

Test Method

Although these two ratings are different, the underlying test method is essentially the same. A standard tapping machine impacts the source room floor. A microphone measures the sound level in the receiving room. As sound insulation changes with frequency, the receiving room sound level is measured at 16 one-third-octave band centre frequencies. The frequencies range from 100Hz to 3150Hz. The measurement data is adjusted to take into account the characteristics of the receiving room, and is then plotted resulting in a measurement curve. A standard reference curve is then fitted to the measurement curve. Rules are followed to fit the reference curve to the measurement curve to obtain the single number rating. The rules are described in ISO 717-2.

Notes:

- (i) There is no relationship between IIC and $L_{n,w} + C_i$, or $L'_{nT,w} + C_i$. These measures use different frequency ranges along with different curves and curve fitting rules.
- (ii) The AAAC (Association of Australian Acoustical Consultants) has a draft noise control star rating system, which uses a different measure – namely $L_{n,w}$.
- (iii) This document is intended as a guide only and does not replace the need to consult on matters of building law and customer satisfaction.