

# Acoustic Comfort

Excessive indoor noise is a major problem in the community. Unwanted noise can:

- cause stress and affect human wellbeing
- impair productivity in the workplace and the classroom, and
- affect patient outcomes in hospitals and aged care facilities.

A range of factors contribute to the increased level of concern about acoustic privacy and these include<sup>1</sup>:

- open plan offices and homes
- a large increase in the number of people living in town houses and apartments
- inadequacy of existing sound insulation regulations.

Carpet can significantly improve the functionality of indoor spaces by reducing unwanted noise.

## Carpet Reduces Impact Noise

Carpet virtually eliminates floor impact sounds such as noise produced by footfalls, chairs scrapped across the floor, and objects dropped onto the floor.

According to acoustical consultants, Graeme E Harding and Associates<sup>2</sup> (GEHA):

“The installation of carpet or similar types of floor covering is the only method available for eliminating excessive noise generated by floor impacts. Carpeted floors can result in a reduction in noise of over 20 decibels<sup>3</sup>.” This is particularly important in schools, busy offices, health care facilities and in the home with children, where floor impact sounds can contribute greatly to ambient noise levels.

## Carpet Absorbs Sound

The pile structure of carpet can effectively absorb sound and help to control sound reverberation<sup>4</sup>. For a typical broadloom carpet the noise reduction is 35%<sup>5</sup>. If the carpet is installed with an underlay this will *almost double*.

**Table 1 Noise Reduction Coefficients (NCR)**

Material	Approximate Noise Reduction Coefficient
Carpet with underlay	0.65
Acoustic ceiling tile	0.63
Carpet	0.35

The noise attenuation of carpet is directly proportional to the thickness of the floor covering, and this is true for the full spectrum of sound frequencies<sup>6</sup>.

## Building Code of Australia Acoustic Performance Criteria

The BCA incorporates a performance requirement for impact sound insulation for walls and floors separating sole occupancy units. The requirement applies to Class 2 and 3 buildings, which are typically town houses and apartments.

“Carpeted floors can result in a reduction in noise of over 20 decibels.”

For peace of mind buy ACCS graded carpet



In June 2006 the Carpet Institute commissioned CSIRO acoustical laboratories to test a range of carpets for impact noise generation in accordance with the BCA requirements. All carpets were found to easily meet the BCA criterion for impact sound insulation.

**Table 2 Impact Sound Reduction Values and BCA Requirements**

Product	Impact sound reduction ( $L_{n,w} + C_l$ )	Performance
Requirements for Class 2 & 3 buildings	62 or less	
Carpets (with underlay) on concrete	30	Excellent impact sound insulation
Carpets (without underlay) on concrete	42	Good impact sound insulation
Concrete floor	68	Inadequate impact sound insulation

Carpet is the most practical and cost effective option to protect residents of multi-tenanted and multi-storey buildings from noise passing into the indoor environment from occupancies above.

### AS/NZS 2107:2000: Recommended Design Sound Levels and Reverberation Times for Building Interiors

**Table 3 Recommended reverberation times**

Type of occupancy	Recommended reverberation time ( $T_{60}$ ) <sup>4</sup>
General office areas	0.4 to 0.6 seconds
Private offices	0.6 to 0.8 seconds
Primary school classrooms	0.4 to 0.5 seconds

While AS/NZS 2107:2000 does not include recommendations for dwellings, GEHA considers that a reverberation time greater than 0.8 seconds is unsuitable for domestic living areas. Using CSIRO data, GEHA calculated reverberation times for spaces with and without carpet. In all cases, installation of carpet and underlay is predicted to bring excessively long reverberation times down to acceptable levels.

Unlike hard flooring, carpet can significantly reduce indoor noise by absorbing airborne sound and reducing the transmission of impact sound.

*Noise attenuation is yet another reason why carpet is the best floor covering choice where functionality and fashion are important.*

### About the Carpet Institute of Australia

The Carpet Institute of Australia Limited (CIAL) is the lead industry association for Australia's \$1.6 billion carpet industry. CIAL represents carpet manufacturers accounting for 95% of Australian carpet production, as well as retailers and suppliers of goods and services to the industry.

#### Footnotes

1. Australian Building Codes Board (ABCB), Regulatory Impact Statement February 2002, Proposal to Change the Sound Insulation Provisions of the Building Code of Australia.
2. Graeme E Harding and Associates, Review of the Acoustical Properties of Carpet, August 2006 commissioned by the Carpet Institute to interpret the CSIRO acoustical test results.
3. A decibel is the smallest audible increment of sound pressure that can be determined by the human ear. (1 decibel is just audible to humans). The decibel scale is logarithmic so that an increase of 10,000 fold in sound pressure provides a decibel level of 40, while 100,000 pressure differential gives a decibel level of 50.
4. Reverberation is the persistence of sound in a space after a sound source has been stopped. Reverberation is quantified by measuring the time it takes for sound reflected off multiple surfaces of a room to reduce in level by 60 decibels. This is reverberation time ( $T_{60}$ ) and is measured in seconds.
5. The Noise Reduction Coefficient (NRC), a scalar representation of the amount of sound energy absorbed upon striking a particular surface, is 0.35 in this case. A NCR of 0 indicates perfect reflection; an NCR of 1 indicates perfect absorption.
6. P.G.Bakker "Acoustic Properties of Carpets - International Wool Secretariat paper V.4, no. 76 (1979)

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