Technical Note No 39

Sound transmission through building envelopes

This Technical Note is one of four on building envelope acoustics. The series comprises:

TN 37 Introduction to building envelope acoustics
TN 38 Acoustic performance of windows
TN 39 Sound transmission through building envelopes
TN40 Sound environment behind a building envelope

Introduction

This Technical Note deals with sound transmission through building envelopes including different forms of predominantly lightweight wall construction. It gives guidance on how walls comprising a number of separate elements can be assessed.

Sound transmission from outside to inside is covered. Although many aspects are common to sound transmission from inside to outside the reader should also see BS EN 12354-4:2000 if they are concerned with containment of sound within a building.

Performance of windows in heavy walls is covered in TN 38 'Acoustic performance of windows'.

Principles

The performance of a wall or roof has to be considered in terms of the internal spaces. The aim is to provide a building envelope that gives the required sound pressure levels within a room or other internal space.

The noise level within a room will depend on the amount of sound energy transmitted through the wall and interreflection of sound inside the room. The room effect is usually determined by the amount of sound absorbing material in the room.

Sound transmission of an assembly of components can be calculated provided the wall can be analysed as discrete areas, for each of which the Sound Reduction Index is known.

This applies to windows in walls and collections of windows but note that sound transmission through interface components such a joining mullions between windows may not be known.

Direct sound transmission

Sound transmission through a whole wall is established by calculating an apparent sound reduction index (SRI) for the wall. This is used to determine the difference in sound between the outside and inside.

The procedure is to calculate the sound power reduction for each element of the wall. The total sound power reduction can then be calculated and converted to an apparent sound reduction index.

When sound of intensity 1W/m^2 falls on a wall, the sound power (in watts) transmitted by an element is given by:

$$w_i = S_i 10^{\frac{-R_i}{10}}$$

where

S_i is the area of an element (m^2)
R_i is the Sound Reduction Index of that element (dB)

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