A Summary Guide for Specifiers

The Acoustic Performance of Timber Doors

The following table summarises typical levels of sound insulation that can be expected from timber doors.

*It is important to note that all acoustic door assemblies require good perimeter sealing between the leaf and the frame, around all edges (and between the frame and the surrounding construction). That can affect opening forces and full closing of the door. Specifiers accordingly also need to take into account ease of access, and fire door requirements for fire resistance and smoke control.

Sound reduction index R_w measured values	Notes for Specifiers	Guidance
"Standard Doors" Typically up to 29 dB	E.g. Lightweight doors without perimeter sealing. Mass expressed as kg/sqm can be an indicator of higher performances.	Approved Document E for residential uses recommends minimum mass criterion 25 kg/sqm, or R_w 29dB.
Acoustic Doors Typically 30 to 36 dB	A relatively small change in R_w represents a significant change in door performance and door construction. Mass is a factor, but not necessarily sufficient in itself. Door assemblies around 35 dB to 36 dB should be regarded as enhanced acoustic designs, requiring some special considerations in leaf construction.	NHS guidance for corridor doors capable of 30 dB to 35dB. BB93 for schools requires a) minimum 35 dB for doors between adjacent classrooms; b) 30 dB between circulating areas and teaching rooms; c) 35 dB between circulation areas and rooms with communication special needs, music and drama.
Special Acoustic Doors Typically +36 to 45 dB. Top-of-the range, usually individual solutions (not "off-the-shelf").	Usually special acoustic developments, using different materials, thicknesses and proprietary feature. Several factors are significant as well as mass, e.g. including reflection, stiffness, coupling, frequency and resonance effects. Usually require special developments.	As a broad guide, at R_w40 dB, loud speech likely to be faint, and not fully understood; at 45 dB, loud speech and shouting audible (music still relatively easily heard, especially at lower frequencies).
High Level Insulation + 45 dB to 55 dB	Increasingly unlikely with individual door designs. Option for higher R_w levels is to combine two acoustic doors in tandem, in a special acoustic lobby with absorbing walls between the doors.	BS 8233 (Table 3) advises that a weighted difference of 55 dB or more on site between rooms ($D_{nT,w}$) is difficult to achieve (and such levels should be avoided).

Reference: BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings.* Table E.1A and Table E.2 provide example values of R_w and $D_{nT,w}$ for common types of wall and partition constructions.

*Door manufacturers should be consulted as early as possible in the specification process, and provided with as much detail as possible concerning the complete door specification and relevant factors on site (such as the floor level and floor covering), to minimise unforeseen problems subsequently arising on-site or in use.

Opening and closing forces

1. The use of edge seals for acoustic, smoke control and fire resistance reasons, and other considerations (such as door weight), can all affect door opening forces, which can potentially affect ease of access for some users. Fire doors need to fully close to be effective against smoke and fire. A combined specification is therefore likely to require careful selection of components, especially including the door closer.

2. Specifiers should note that the installer is often - and likely to be - completely independent of the door manufacturer. Installation needs to be given a separate focus. And the manufacturer should not be held responsible for issues arising on installation, or during service arising from installation workmanship. The threshold seal can be an important detail, for both acoustic and smoke control. But the floor level and floor covering is likely to be unknown to the door manufacturer, and typically outside their control.

Weighted sound reduction measured indices, (R_W)

3. R_W values should only be accepted when determined by a UKAS-accredited laboratory (or European equivalent). Under laboratory conditions flanking transmission around the test panel can be suppressed and controlled; and installation workmanship can be ensured. [US, ASTM, STC values are not equivalent to R_w.]

Sound levels on site

4. A weighted sound reduction value on site ($D_{nT,w}$) cannot be directly compared with R_W indices because on-site measurements are influenced by factors which are controlled for R_W measurements under laboratory conditions (or do not apply). Factors such as the area of separating walls, the volumes and sound absorption properties of source and receiving spaces, installation and various transmission paths through the structure (e.g. ducts, doors, glazing and other openings and service channels) can all affect on-site measurements.

The importance of installation

5. The quality of workmanship in assembly and installation is especially important in achieving specified acoustic performance. Attention to the seals around door leaf edges is essential. That includes the seal between the door-frame and surrounding structure, and the threshold seal, the floor finish or covering.

6. All components should be as specified, including glazing (type, area and glazing system) and grilles or other elements that could affect acoustic performance. Installation should follow manufacturer's instructions. Even a small gap can cause sound leakage out of all proportion to the size of the gap.

Sound characteristics

7. The log scale required for comparing sound pressures and intensities in decibels (dB), because of the wide frequency range of the human ear and its non-linear response, means that comparing changes in dB is not immediately straightforward. 1 dB is about the smallest change the human ear can detect. Sound effects are subjective, and influenced by background noise levels (including outside noise and internal services), sensitivity to noise and privacy requirements. The following provides a qualitative indication of the typical effects of relative changes in dB sound levels:

Change in Sound Level dB	Relative Change in Sound Energy (Power) Decrease	Increase	Change in apparent loudness (For mid frequency range)
3	1/2	x 2	Just perceptible
5	1/3	x 3	Clearly noticeable
10	1/10	x 10	Half or twice as loud
20	1/100	x 100	Much quieter, or louder

(From "Fundamentals of Acoustics", Prof Colin Hansen, Dept of Mechanical Engineering, University of Adelaide)