UWE Estates and Facilities Design Guide

Chapter 11: Acoustic Standards

UWE Bristol | University of the West of England

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11.1 Change Control

Version Number	Date of Issue	Chapter Ref	Brief Description of Change(s)
None	NOV2019		Issued as Appendix 1
2021	JAN2021		Appendix amended to Chapter 11
2022	JAN2022	11.2	ADDED: Reference should also be made to the UWE Health and Safety Standard on The Control of Noise at Work.
2023	JAN2023		No Change from 2022.

11.2 Introduction

Reference should also be made to the UWE Health and Safety Standard on The Control of Noise at Work which can be found here:
https://intranet.uwe.ac.uk/tasks-guides/Policy/control-of-noise-at-work

Many acoustic standards are derived from those contained in the DfES publication BB93 Acoustic Design of Schools. The standards described in that publication are from the Building Regulations, mandatory for new and refurbished school buildings. For universities they are not mandatory. While they form a useful starting point, some spaces within a university fall outside the requirements of most schools, and in some cases higher acoustic standards may be justified even when rooms are being put to similar uses.

11.3 Sound Insulation between Rooms - Airborne Sound between Rooms

The table below lists various types of room according to their function, along with the required level of airborne sound insulation.

Where a wall separates two rooms with different functions, the standard of sound insulation to be applied will be the higher of the two.

The quantity used to specify sound insulation here is DnT(Tmfmax),w as defined in BB93. This is the standardized level difference between the two rooms, measured according to the requirements of ISO 140 part 4 and standardised to the highest recommended mid frequency reverberation time in either of the two rooms. It is then frequency weighted as described in ISO 717 part 2. It is not the same as the weighted sound reduction index, abbreviated to Rw and commonly used by suppliers of building materials to characterise their products.

Type(s) of Room	**Min Value of DnT(Tmfmax),w**
Academic staff and admin offices, meeting rooms	45dB
Cafeterias, coffee bars etc.	45dB
Class rooms, lecture rooms, seminar rooms and tutorial rooms. Audio Visual and video conference rooms and language laboratories	45dB
Drama studios, music practice rooms.	55dB
Halls and rooms for music drama and other live performances	55dB
Large lecture theatres and flagship conference rooms	50dB
Lecture theatres up to 100 seats	45dB
Library circulation and media storage areas	40dB
Library study areas	45dB
Recording studios	60dB*
Rooms intended for clinical examination and treatment, Confidential interviews, psychotherapy, speech therapy etc.	50dB*
Science laboratories, art and design studios, graphics workshops	40dB
Sports halls and gymnasia	50dB
Swimming pools	45dB
Workshops	45dB*

* Denotes that requirements can vary considerably and specialist design input may be required.

11.4 Airborne Sound Insulation between Rooms and Circulation Spaces

It is difficult to measure sound insulation values between a room and an odd shaped space such as a corridor. As a result it is normal to specify minimum values of the weighted sound reduction index R_w required of partition systems and doors separating a room from a circulation space. Two levels of sound insulation are specified here for these situations.

Structure	Minimum value of R_w
Partition separating a teaching space or office from a circulation area	40dB
Door within the above partition, rated as a complete door set	30dB
Partition separating a teaching space for specialised purposes (such as music or drama) from a circulation area	45dB
Door within the above partition, rated as a complete door set	35dB

Specialist acoustic design input will be required if a teaching room or other noise sensitive room opens into a busy atrium or through corridor, or in the case of large lecture theatres and conference rooms with a waiting/ social area immediately outside their doors.

11.5 Impact and Air Borne Sound Insulation of Floors

Impact sound insulation deals with the transmission of noise to the rooms below from noise sources in contact with the floor. Typical noise sources include footsteps, moving furniture and machinery. Because the internal layout of a building may be changed many times during its lifetime, a single set of standards is applied here for the airborne and impact sound insulation of floors. In the case of airborne sound insulation, the quantity specified is, as before, DnT(Tmfmax),w. For impact sound insulation the quantity specified is L'nT,w, as defined in ISO 140 part 7 and ISO 717 part 2.

Minimum value of DnT(Tmfmax),w	55 dB
Maximum value of L'nT,w	55 B

11.6 Noise from Outside

The maximum sound pressure levels due to external noise intrusion are listed in the table below. These values include noise contributions from transport – including road and rail traffic and civil aviation – from the weather, and from industrial and human activity both on and off University's premises. Building and civil engineering work are not included since they are temporary in nature.

The values listed should be considered in conjunction with the specification for building services noise which appears later. Control of external noise involves consideration of the ambient noise levels at the specific site involved, the sound insulation properties of the building shell (including the roof structure in the case of aircraft noise) and the impact on sound insulation of any ventilation requirements such as the need for opening windows.

Type(s) of room	Maximum value of $L_{Aeq,30\ minutes}$
Academic staff and admin offices	40dB
Cafeterias, coffee bars etc.	45dB

Type(s) of room	Maximum value of $L_{Aeq,30\ minutes}$
Class rooms, lecture rooms, seminar rooms and tutorial Rooms Audio visual and video conference rooms Language laboratories	35dB
Drama studios, music practice rooms	30dB
Entrance halls, corridors, stairwells, atria and circulation spaces	45dB
Halls and rooms for music drama & other live performances	30dB
Large lecture theatres and flagship conference rooms	30dB
Lecture theatres up to 100 seats	35dB
Library circulation and media storage areas	40dB
Library study areas	35dB
Recording studios	25dB
Rooms intended for clinical examination and treatment, confidential interviews, psychotherapy, speech therapy etc.	35dB
Science laboratories, art & design studios, graphics workshops	35dB
Sports halls and gymnasia	40dB
Swimming pools	50dB
Workshops	40dB

Rain falling on lightweight roofs can cause disturbing noise inside the building, for example in a sports hall used for examinations. This subject is still developing and there is as yet no standard for measuring noise from rain within buildings. The variability of the weather is an added difficulty when setting standards for this since very exceptional rainfalls will occur occasionally. Building designers are expected to supply information about expected rain noise levels in the light of up to date knowledge and experience on other similar projects.

11.7 Room Acoustics

Control of reverberation within buildings is important in creating good learning and working conditions within the building. The quantity listed in the table below is the mid frequency reverberation time, Tmf, as defined in BB93 (and based on measurements made according to ISO 3382:2000. This is obtained by calculating the arithmetic average of the reverberation times in the octave bands centred on 500 Hz, 1,000 Hz and 2,000 Hz. As well as being important in its own right, the reverberation time enters into the calculation of standardised sound insulation parameters.

Type(s) of room	Max. value of T_{mf}
Academic staff and admin offices	1.0 s
Cafeterias, coffee bars etc.	1.0 s
Class rooms, lecture rooms, seminar rooms and tutorial Rooms Audio visual and video conference rooms Language laboratories	0.8 s
Drama studios, music practice rooms	1.2 s
Entrance halls, corridors, stairwells, atria and circulation spaces	1.0 s
Halls and rooms for music drama and other live performances	1.2 s

Type(s) of room	Max. value of T_{mf}
Large lecture theatres and flagship conference rooms	1.0 s
Lecture theatres up to 100 seats	0.8 s
Library circulation and media storage areas	1.0 s
Library study areas	0.8 s
Recording studios	0.6 s
Rooms intended for clinical examination and treatment, confidential interviews, psychotherapy and speech therapy	0.6 s
Science laboratories, art and design studios, graphics workshops	0.8 s
Sports halls and gymnasia	1.5 s
Swimming pools	2.0 s
Workshops	1.0 s

The reverberation time at lower frequencies tends to be greater than at the midrange frequencies dealt with in the above table. Reverberation times at 250 Hz and 125 Hz should not exceed the above figures by more than 30%.

Reverberation times in awkward shaped spaces such as corridors and stair wells are difficult to predict and measure. In these spaces, complying with the guidance in Approved Document E should result in satisfactory reverberation conditions.

11.8 Noise from Building Services

Noise from building services should not exceed the noise rating (NR) values listed below. This includes noise from the normal operation of heating, ventilation and air conditioning plant. Higher levels may be permissible during purge ventilation. When planning ventilation duct runs, they should as far as possible avoid crossing partition walls, and where this is inevitable a crosstalk silencer must be incorporated so that the sound insulation requirements listed earlier are met.

Type (s) of room	Maximum value of Tmf
Academic staff and admin offices	NR 35
Cafeterias, coffee bars etc.	NR 40
Class rooms, lecture rooms, seminar rooms and tutorial Rooms Audio visual and video conference rooms Language laboratories	NR 30
Drama studios, music practice rooms	NR 30
Entrance halls, corridors, stairwells, atria and circulation spaces	NR 40
Halls and rooms for music drama and other live performances	NR 30
Large lecture theatres and flagship conference rooms	NR 30
Lecture theatres up to 100 seats	NR 30
Library circulation and media storage areas	NR 35
Library study areas and Recording studios	NR 30
Rooms intended for clinical examination and treatment,	NR 35

confidential interviews, psychotherapy, speech therapy etc.	
Science laboratories, art and design studios, graphics workshops	NR 30
Sports halls and gymnasia	NR 35
Swimming pools	NR 50
Workshops	NR 35

11.9 Acoustic Design of Residential Accommodation

The Building Regulations Approved Document E – Resistance to the passage of sound, provides guidance and sets the requirements for the acoustic design of residential accommodation