

## SECTION 18

### ACOUSTICS

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## 18 Acoustics

Acoustic separation and appropriate room acoustics are important for teaching and office environments.

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These types of intrusive noise can be classified as either:

Steady or pseudo-steady (e.g noise from continuously operating plant or the like) that can be quantified as as the equivalent continuous level :  $L_{Aeq}$ .

Transient (e.g. aircraft fly over) that is measured as the level exceeded for 1 percent of the time:  $L_{A01}$ .

### 18.4.2 Building Services

Building services noise includes noise sources such as fans, air-conditioning, motors and pumps etc. The noise can be transferred to internal useable spaces by two mechanisms:

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For **Table 18.1**, the following notes apply:

For areas not listed in **Table 18.1**, consult satisfactory levels AS/NZS 2107.

For musical performance spaces, video production, animal houses speech pathology and audiology areas, recommended levels require specific advice from an acoustical consultant.

Criteria apply over any one hour period during applicable hours (typically 8am to 9pm).

Where buildings are affected by continuous transportation noise and the building is air-conditioned, the design of the building shall be such that there is an equal contribution between intruding noise and air-conditioning noise. (e.g. 37dBA of intruding noise and 37dBA of air-conditioning noise to give 40 dBA total).

In a situation where there is no significant intruding noise, then the values in **Table 18.1** can be made up entirely of noise from building services.

Building services must generate noise levels no less than 5 dB below the criteria. In buildings where silent air-conditioning technologies such as chilled beams are used, Sound conditioning using a speaker array to elevate the background noise level must be installed in all spaces to maintain privacy. The sound conditioning system using a fully adjustable proprietary engineered system adjusted to the satisfaction of JCU.

### 18.5 Rain Noise

Rain noise within noise-sensitive spaces should not exceed the criterion level in **Table 18.1** by more than 5 dBA. Predicted rain noise levels should be based upon rainfall intensity levels of 30 mm/hour for areas of tropical Queensland. In areas other than tropical Queensland, rainfall rates used in design should be stated in reporting.

### 18.6 Building Noise Emissions

Noise emissions can arise from building services or the functional activities of the space. This category includes noise generated by associated activities (e.g. delivery vehicles to a loading dock). Noise of this type may impact on other buildings on or off campus depending on their function.

The acoustic characteristics of potentially affected adjoining buildings should be taken into account to determine acceptable noise emissions from the proposed new building and the associated noise source(s).

### Internal Affected Spaces

Refer to **Table 18.1** for internal criteria within campus buildings affected by noise from other new buildings.



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In the absence of an Australia Standard for the manufacture of polyester insulation, any partition cavities shall be glass wool to achieve the necessary sound transmission loss between spaces.

All walls separating sensitive spaces from toilets and areas with frequently used joinery and benches attached to walls are required to be resilient to impact noise. Allowance should be made using twin-track, staggered stud or use of resilient mounts depending on the type of impact noise being created and wall construction.

Where noise from building services and noise intrusion is expected to be lower than the noise levels in **Table 18.1**, and sound conditioning not viable, the partition  $D_{nT,w}$  ratings should be increased proportionally to compensate for the lower background noise levels.

All lecture theatres greater than 200 person shall have sound lock entries unless confirmed by JCU as not required.

Partition details are important to achieve the required  $D_{nT,w}$  ratings, particularly for high ratings. The following details should be considered and provided by the acoustical consultant:

- Plasterboard at partition junctions and "T" junctions.
- Recesses above and below services ducts and at wall angles.
- Blinds and blind boxes.
- Mullions.

### 18.8 Acoustic Qualities of a Space

There are a number of acoustical parameters used to define and describe the acoustical qualities of a space. The most common is the measurement of reverberation time: RT60, which is the time in seconds required for a sound to reduce by 60 decibels after the sound is stopped.

The reverberation time should be quoted in terms of the mid-frequency reverberation time, which is the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands, or the arithmetic average of the reverberation times in the one-third octave bands from 400 Hz to 2.5 kHz.

The RT60 for various spaces are defined in **Table 18.4**:

**Table 18.4 Recommended Reverberation Times**

Room Type	RT60 (s)
Standard individual office, or shared office	0.6
Senior staff (individual) office	0.6
Administrative/clerical office (open space), post graduate student areas	0.6
Counselling Office	0.6
Teaching Room	0.5 to 0.8
Lecture Theatre	0.6 to 1.0*
Library	0.6**
Video-conferencing Room	0.3 to 0.7
Corridors, Lobbies	0.6 to 0.8 **

\* Based on room volumes and recommended Reverberation Times in [AS/NZS 2107](#).

\*\* Longer times are acceptable in larger volumes as recommended by an acoustical consultant.



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For any other spaces not listed in **Table 18.4**, [AS/NZS 2107](#) should be used or specific advice from the project acoustical consultant sought

For a quality acoustical environment with good speech intelligibility the following adverse impacts must be avoided:

- Rear wall echoes in lecture theatres.

- Standing wave or room modes in recording or practice studios.

- Flutter echo in performance spaces.

These acoustical issues must be evaluated and addressed on a project specific basis using a specialist acoustic consultant.

### 18.9 Vibration



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options (e.g. extra basements extend the excavation period and the likely duration of noise impacts). As a minimum, compliance with [AS 2436 2010](#) is required.

