

Acoustic Comfort

Healthy

Credit: 12

Points: 2

Outcome

The building provides acoustic comfort for building occupants.

Criteria

Minimum Expectation	Nil	<ul style="list-style-type: none"> An Acoustic Comfort Strategy is prepared to describe how the building and acoustic design aims to deliver acoustic comfort to the building occupants.
Credit Achievement	2 points	<p>In addition to the <i>Minimum Expectation</i>, a combination of the following subject to building type:</p> <ul style="list-style-type: none"> The building achieves maximum internal noise levels. and/or The building achieves minimum internal noise levels. and/or The building provides acoustic separation. and/or The building minimises impact noise transfer. and/or The building is designed with reverberation control.

Additional information

Stage implementation

Strategy	Brief	Concept	Design	Tender	Construction	Handover	Use
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Synergies with other credits

- Amenity and Thermal Comfort
- Verification and Handover

Sustainable Development Goals

- Goal 3 (Good Health and Wellbeing)

Relevant reporting initiatives

- None

Regularly occupied areas

This credit applies to all regularly occupied areas in the building – those continuously occupied or occupied for more than two hours (previously known as ‘primary’ and ‘secondary’ spaces) including living and sleeping areas. Areas that are either transient or accessed intermittently such as corridors, storage, back of house or plant rooms can be excluded. Spaces can also be excluded if the use of the space (for example, a laboratory) justifies specific ventilation conditions – a Technical Question must be submitted to the NZGBC for confirmation. A space can be excluded if the applicable Standard recommends that specialist advice be sought, such as in a theatre.

Requirements

Minimum Expectation

The project must comply with the following criteria:

- Acoustic Comfort Strategy

Acoustic Comfort Strategy

An Acoustic Comfort Strategy must be prepared describing how the building design will deliver acoustic comfort to the building occupants.

The following requirements are to be addressed:

- Quiet enjoyment of space
- Functional use of space
- Control of intrusive or high levels of noise
- Privacy
- Noise transfer
- Speech intelligibility

The Acoustic Comfort Strategy is to include:

- A summary of the Standards, legislation, guidelines, and other requirements that apply to the project
- The proposed performance metrics for each of the Acoustic Comfort criteria relevant to the different uses within the building and whether this exceeds minimum legislative or best practice guidelines
- Description of how the design solution is intended to achieve the proposed performance metrics

The strategy must be prepared by a qualified acoustic consultant during the design stage and the design solutions described in the strategy must be incorporated into the Contract Documents.

Credit Achievement

In addition to the *Minimum Expectation*, the following are the applicable acoustic criteria assessable under this credit:

- Maximum Internal Noise Levels
- Minimum Internal Noise Levels
- Acoustic Separation
- Impact Noise Transfer

- Reverberation Control (non-residential spaces only)

Depending upon the project type, the project must comply with some, or all, of the above criteria, as shown in the table below:

Project Type	Maximum Internal Noise Levels	Minimum Internal Noise Levels	Acoustic Separation	Impact Noise Transfer	Reverberation Control	Requirement for 2 points
Residential (including healthcare buildings)	•		•	•		2/3
Healthcare	•		•	•	•*	3/4
Schools	•	•	•	•	•	3/5
Fit-out (commercial)	•	•	•	•	•	4/5
Fit-out (retail)	•		•	•	•	3/4
Base build (commercial)	•		•			2/2
Base build (retail)	•		•			2/2
Sport and Leisure	•		•	•	•	3/4
Industrial	•		•			2/2

*Wards are excluded

Maximum Internal Noise Levels

Internal ambient noise levels in the regularly occupied areas must be no greater than the upper range value relevant to the activity type in each space as recommended in the current AS/NZS 2107:2016.

For buildings with sleeping areas

In buildings with sleeping areas noise levels must not exceed recommended Sleep Disturbance criteria as defined in the NSW EPA Road Noise Policy 2011:

- Up to two noise events per night: maximum internal noise levels below 70 dB LAmax
- All other events: maximum internal noise levels below 55 dB LAmax

The internal ambient noise levels can exclude those services under the direct control of the occupant such as split system air-conditioning units and switchable exhaust fans (e.g., toilet, kitchen hoods and laundries).

Minimum Internal Noise Levels

Internal ambient noise levels in the regularly occupied areas must be no less than 5 dB below the lower range value relevant to the activity type in each space as recommended in the current AS/NZS 2107:2016.

Measuring noise levels

Noise measurements and documentation must be provided by a qualified acoustic consultant and in accordance with the current AS/NZS 2107:2016.

Noise measurements must account for all internal and external noise including noise arising from building services equipment, noise from outdoor sources such as traffic, speech masking, and (where known) noise from industrial process. Occupancy noise is excluded.

For open plan spaces compliance must be demonstrated by doing 1 measurement per 100 m². Every floor of the building is to be tested. For enclosed rooms, 10% of the enclosed rooms are to be tested. These need to be representative of the spaces within the building and reflect the range of external noise impacts on the building.

The selection of representative spaces must be justified and must consider how the spaces are considered to be the most conservative with respect to both internal and external noise sources. The acoustic compliance report must include mark-up plans of where the tests were conducted.

Naturally ventilated buildings

Where the minimum internal noise level criteria is targeted, for naturally ventilated buildings the internal noise requirements must be achieved with all windows/openings closed. Where the maximum internal noise level criteria is targeted, for naturally ventilated buildings the internal noise requirements must be achieved with all windows/openings open."

Acoustic Separation

The project must address noise transmission between enclosed spaces within the regularly occupied area. Compliance can be demonstrated via either:

- Privacy
- Sound insulation

Where full-height intertenancy walls are being delivered by the Head Contractor to Cold Shell spaces, these walls must comply with the credit requirements and cannot be excluded.

Privacy

For hotels, student accommodation and serviced apartments

- All walls and floors (excluding riser walls) separating accommodation units must achieve sound transmission class of no less than 55

For all other spaces:

The sound insulation between internal spaces complies with: $D_w + L_{AeqT} > X$.

Where:

D_w = Weighted sound level difference measured between two spaces

L_{AeqT} = Indoor ambient noise level in the space adjacent to the enclosed space

X = 75 except for:

- X = 60 for any partition with a door,
- X = 80 for walls/partitions separating areas with elevated privacy requirements (e.g., meeting rooms, classrooms, wards, etc.)

The sounds tests, which D_w is derived from, must be measured in accordance with ISO 16283-1.

See *Guidance* for more information on the above pathways.

Sound insulation

The partition between the spaces should be constructed to achieve a weighted sound reduction index (dB R_w) of:

- At least 45 for all partitions separating enclosed spaces which are:
 - Fixed without a door
 - Glazed partitions without a door* (refer to Guidance section)
- At least 40 for all partitions fronting a room (from an open plan area)
- At least 35 (in composite with door and partition) for all partition types that contain a door, with the door itself meeting at least 30
- At least 50 through floors between occupied spaces

Impact Noise Transfer

This criterion applies to:

- All floors located above regularly occupied areas
- Adjacent spaces belonging to different tenancies which share a floor

The impact insulation class of floors shall be no less than:

- 55 for floors above accommodation units in hotels, student accommodation and serviced apartments
- 50 for all other spaces

Reverberation Control

Reverberation time in the regularly occupied area must be below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016. This requirement does not apply to hotels, student accommodation and serviced apartments.

For open office areas and where note 3 of Table 1 AS/NZ 2107:2016 applies and requires that reverberation times be minimised as far as practical, acoustic absorption should be installed in the noise sensitive space. Acoustic absorption should be applied in locations appropriate to the function of the space and located to maximise the acoustic performance of materials selected.

Compliance can be demonstrated by either:

- Installed acoustic absorption, irrespective of quantity or location installed, must result in a reverberation time equivalent to or lower than the reverberation time predicted for treating at least 50% of the combined floor and ceiling area with a material having a noise reduction coefficient (NRC) of at least 0.5.
- Treating 50% of the combined floor and ceiling area with a material having an NRC of at least 0.5. Dedicated teaching space must have reverberation times in the lower half of the range specified in Table 1 of AS/NZS 2107:2016.

Measurements must be conducted in at least 10% of the spaces in the regularly occupied area.

The range of measurement locations shall be representative of all spaces available within the regularly occupied areas. All relevant buildings systems must be in operation at the time of measurement. Projects less than 500m² Gross Floor Area (GFA) must account for measurements conducted in at least 95% of spaces within the regularly occupied area.

Guidance to be provided to future tenants regarding the effect of materials on reverberation.

Submission content

Submissions for this credit must contain:

- **Submission form**
- **Evidence** to support claims made in the submission

Recommended evidence:

- Acoustic Comfort strategy.
- Detailed Drawings detailing the acoustic design features relevant to this credit.
- Report by a qualified acoustics consultant confirming credit compliance.
- Extracts from the commissioning report detailing relevant measured noise levels and target noise levels.

Alternate documentation can also be used by project teams to demonstrate compliance.

The recommended evidence listed above is applicable to the as built submission. See the Design Assessment section in the Introduction for more information on submitting evidence for the Design assessment.

The key requirement is that evidence is provided to support each claim made within the Submission form.

Guidance

Qualified acoustic consultants

A Member of the Acoustical Society of New Zealand (MASNZ) or qualified staff member within an Association of Australasian Acoustical Consultants (AAAC) member firm.

Alternative options can be considered through a Technical Question.

Performance metrics

The proposed performance metrics may include the following parameters which are typically used to design acoustically comfortable spaces inside buildings. Each parameter may contribute to more than one of the Acoustic Comfort Issues:

- Control of external noise intrusion
- Control of internal noise sources
- Background noise masking
- Acoustic separation of spaces
- Control of reverberation
- External noise emissions

Referenced standards

The following Standards and Guidelines are examples of those expected to be referenced in the Acoustic Comfort Strategy report. The acoustic consultant will identify which apply to this project based on building type, location, and client requirements.

- AS/NZS 2107:2016
- Association of Australasian Acoustical Consultants (AAAC) Guidelines (www.aaac.org.au)
- Relevant Government or Local City Council Guidelines and Legislation
- Client's acoustic requirements (if applicable)

Acoustic absorption

Where note 1 of Table 1 AS/NZ 2107:2016 applies and requires that reverberation times be minimised for noise control, acoustic absorption should be installed in the noise sensitive space. Acoustic absorption should be applied in locations appropriate to the function of the space and located to maximise the acoustic performance of materials selected. The resulting performance of the installed acoustic absorption, irrespective of quantity or location installed, must result in a reverberation time equivalent to or lower than the reverberation time predicted for treating at least 50% of the combined floor and ceiling area with a material having a noise reduction coefficient (NRC) of at least 0.5.

Alternatively, compliance may be demonstrated by treating 50% of the combined floor and ceiling area with a material having an NRC of at least 0.5.

Sound insulation

The Acoustic Consultant can use their discretion to determine whether an R_w of 35 or 45 is more applicable when using glazed partitions. The selected Weighted Sound Reduction index must be justified in terms of adjoining space use, required levels of noise sensitivity between spaces and any other aspects which would help to achieve acoustic separation.

Measurements must be carried out within finished rooms, accounting for any carpets and acoustically absorbent ceilings specified. The measurements can be conducted in either furnished or unfurnished spaces.

Internal noise

Internal noise measurements shall be undertaken in accordance with AS/NZS 2107:2016 with the building services systems operating under "normal conditions" for the space, in combination with any external steady-state or quasi-steady-state sounds. For living spaces, commercial spaces and other occupational spaces, measurements should be taken between 7am – 7pm at traffic peak time and for sleeping areas (hospital wards, bedrooms, and the like), measurements should be conducted between 10pm – 7am.

Acoustic criteria by building typology table

- Impact noise is not compulsory as not all buildings are more than one storey
- Maximum and minimum noise levels have been shown separately to allow for flexibility and allow it to be made not applicable for project where appropriate.

Acoustic separation

Compliance with the Acoustics Separation criteria can either be demonstrated via achieving the privacy rating (requires site testing for confirmation) or design & construction documentation review (does not require testing)

Reverberation

Reverberation refers to the persistent prolonged reflections of sound in a space. A technical definition is provided in AS/NZS 2107:2016.

Definitions

Reverberation

Reverberation time refers to the time taken for reverberantly decaying sound pressure level to decrease by 60 decibels in a room.

Enclosed space

Enclosed space is defined as meeting rooms, private offices, classrooms, sleeping areas, and any other similar space where it is expected that noise should not carry over from one space to the next.

Supporting information

The following resources support this credit:

- New Zealand Building Code
- AS/NZS 2107:2016
- NSW EPA Road Noise Policy 2011
- ISO 16283-1
- ISO 16283-2