



DQLS – Acoustics Amendment

Standard:	Designing Quality Learning Spaces (DQLS) – Acoustics
Version:	V3.1, 2020
Section:	Section 1 (Reverberation Time (1.1), Sound Transmission and Impact Insulation (1.2) and Indoor Noise Levels (1.3))
Effective From:	May 2024 for all projects (including projects currently in design)

Amended Section 1 Mandatory Requirements for Acoustics

This section sets out NZSPA’s mandatory requirements and approved solutions for acoustic performance in schools. All new buildings and major refurbishments must be designed to achieve these mandatory requirements. Compliance checks are done using the verification methods in **Section 3** of [DQLS - Acoustics](#).

Tables 3 to 6 provide approved solutions for controlling **reverberation time (RT)**, **sound absorption**, **sound insulation** and **impact insulation**. Alongside the approved solutions are performance requirements that alternative designs (i.e., different from the approved solutions) must comply with.

This guidance addresses typical learning and ancillary spaces arrangements, but it cannot cover all design options. If a particular space is not listed, designers are to apply the limits for the space that is most relevant in terms of size and function.

Amended Section 1.1 Internal Acoustic Treatment - Reverberation time (RT)

Sound absorption is required to prevent excessive **reverberation**. The ceiling area allows for most of the absorption treatment, but wall treatment is also needed to prevent sound reflecting between parallel walls.

The approved solutions use the following general terms to describe the acoustic materials that shall be used:

- **NRC** is the average whole-ceiling performance. Each ceiling tile or ceiling panel has its own **NRC** value, but the total coverage of the product must be considered.
 - For example, if an **NRC** 1.0 tile covers the whole ceiling, the average whole-ceiling value will be **NRC** 1.0. But if the same tile only covers 70% of the ceiling (with the remainder being a hard material like plasterboard), the whole-ceiling value will be **NRC** 0.7.
 - Note that ceilings also have a **CAC** requirement – see **Table 5** and **Section 1.3.3** below.
- Thin wall treatment: 10-15mm acoustic absorption aka acoustic pinboard – minimum **NRC** 0.4
- Thick wall treatment: 50mm+ acoustic panels – minimum **NRC** 0.9

If a design doesn't adopt the approved solution for a room, compliance with the RT performance requirements shall be confirmed by an acoustic engineer.

Wall **absorption** should be well distributed around the room, but prioritise:

- treatment opposite hard surfaces like glass and plasterboard, to control horizontal reflections
- treatment at occupant ear height – both standing and seated (generally between 1.2 m and 1.8 m above floor level or lower in primary school rooms where pupils sit on the floor).

Table 3 sets out the approved solutions and maximum **RT** performance requirement for different spaces.

There may be some situations where an approved solution cannot achieve the maximum **RT** performance requirement. Rooms will likely be fit for purpose, but an acoustic engineer should be engaged to address any concerns during design or after commissioning.

Note that the **RT** performance requirement for larger spaces with volumes greater than 300 m³ will depend on their volume – refer to **Figure 4**.

NZSPA expects that all floors will be carpeted, except for toilets and changing rooms, maker spaces, wet areas within learning spaces and staff rooms, technology spaces, laboratories, assembly halls and gyms.

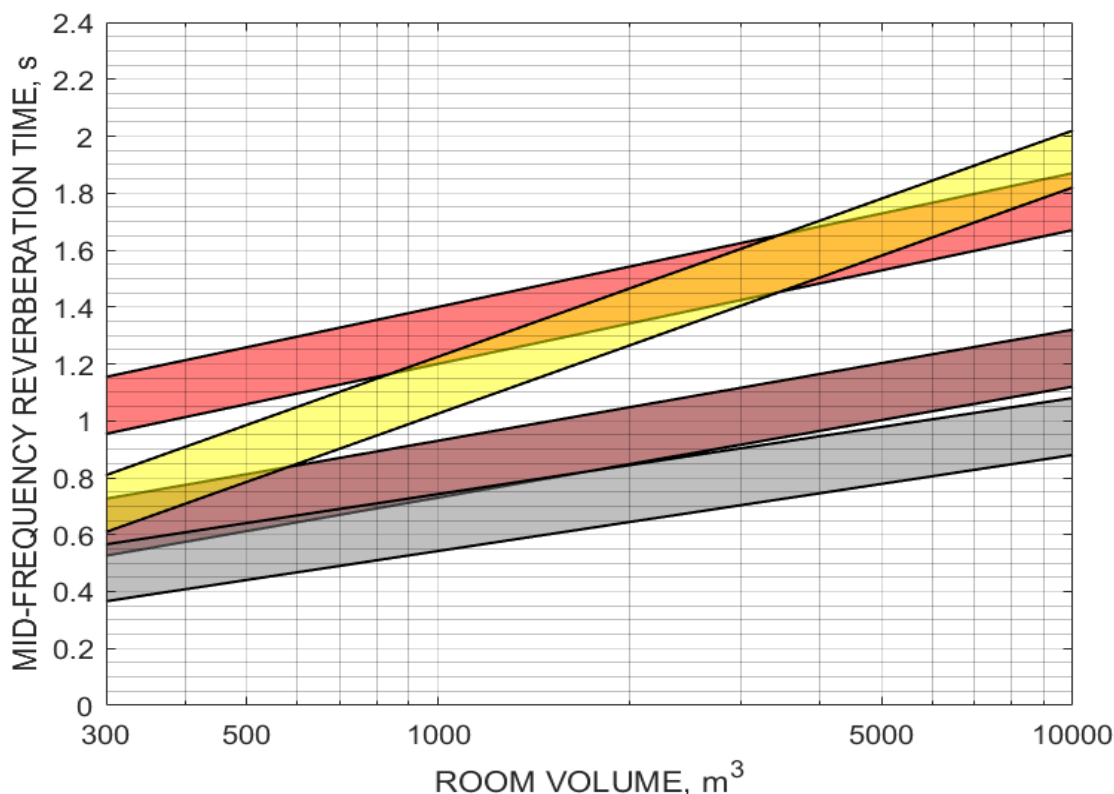
Table 3: Approved solutions for reverberation control

Space	Approved solution	Performance Requirement (s)
Assembly halls Gyms	• NRC 0.7 ceiling • NRC 0.7 wall treatment on at least two perpendicular sides of the room, centred at occupant ear height. Total wall treatment to min. • 30% of the ceiling area	See Figure 4
Large learning spaces > 300 m ³	• NRC 0.85 ceiling • Thin wall treatment on a at least two perpendicular sides of the room. Total wall treatment to min 30% of the ceiling area	See Figure 4
Small learning spaces < 300 m ³ Staff rooms Whare Libraries	• NRC 0.85 ceiling • Thin wall treatment on at least two perpendicular sides of the room. Total wall treatment to min • 30% of the ceiling area	Primary school learning spaces – 0.5 All other spaces – 0.6
Technology spaces Laboratories Circulation	• NRC 0.85 ceiling • Thin wall treatment on at least two perpendicular sides of the room. Total wall treatment to min. of 30% of the ceiling area • NRC 0.7 ceiling for circulation spaces (no wall treatment)	0.8
Breakout spaces	• NRC 0.85 ceiling • Thickwall treatment on at least two perpendicular sides of the room. Total wall treatment to min 30% of the ceiling area	0.5
Offices Meeting rooms	• NRC 0.7 ceiling • Thick wall treatment on one wall. The total area of wall treatment should be a minimum of 20% of the ceiling area.	0.6
Music teaching rooms Music practice rooms Multimedia rooms Recording rooms	• Specialist design required	Music rooms – 0.6 Other rooms – 0.4
Multipurpose halls Drama studios Auditoria	• Specialist design required	See Figure 4

The **RT** performance requirements in **Table 3** and **Figure 4** are for unoccupied rooms and are **mid-frequency RTs** (the average of the 500Hz and 1 kHz octave bands). They generally follow guidance in the [AS/NZS 2107:2016 Standard](#). For rooms with more than one purpose, the lowest relevant **RT** value applies.

Rooms should have a balanced **reverberation spectrum** with similar **RTs** at low, medium and high frequencies. The **RT** should not exceed the **Table 3** value by more than 30% at 250Hz and 2kHz, and by 50% at 125Hz. In rooms where live music is played (i.e., assembly halls, auditoria, music rooms and performance spaces) a **bass rise** is allowed – refer to **Section 2.2** in [DQLS - Acoustics](#).

Figure 1: Mandatory reverberation time ranges for large spaces



Key			
Auditoria	Gymnasias	Assembly Halls	Large learning spaces

Amended Section 1.2 Sound Transmission and Impact Insulation

Table 4 sets out the approved solutions for **sound insulation** and **impact insulation** of internal walls and floors.

Each approved solution is considered to be a cost-efficient way of achieving the STC or **IIC** performance requirements. Alternative designs may be accepted, provided they are confirmed to meet performance requirements by an [acoustic engineer](#).

Doors and other openings have a big effect on a partition's acoustic performance, and these are addressed in **Section 1.2.2** below.

1.2.1 Connected spaces

In a learning setting, it is important to identify whether two spaces are connected or not, because it influences the acoustic design. Sound travels more easily between connected spaces, but this is acceptable if the activities are acoustically compatible i.e., all quiet or all noisy at the same time, or there is an ability for coordination of activities between space users.

Two spaces are connected if they are:

- both spaces where learning activities occur
and
- physically connected to each other by a door, corridor or opening (i.e., one can walk between them without going outside),
and
- their use is under the control of the same kaiako/teacher(s) so learning activities can be coordinated.

Walls between connected spaces are permitted to have lower **STC** ratings – refer to **Table 4**.

Notes on connected spaces

- The most common connected space types are learning, breakout, maker space and low-noise tech.
- Spaces either side of a sliding door must be connected because sliding door **STC** ratings aren't high enough to permit independent use of the two spaces.
- Walls with **STC** ratings higher than 50 cannot practicably be achieved with a single stud wall system and may require specialist input. Where ratings higher than **STC** 50 are required, rearranging the room layout should be considered in the first instance to avoid this high rating and a high **STC** rated wall should only be used where a rearrangement of rooms is not practicable.
- Connected learning spaces should be clearly grouped and labelled in design drawings.

1.2.2 Approved solutions for walls and floors

Tables 4 and 5 show the approved solutions for each type of space, and the corresponding **STC** and **IIC** performance requirements. If two adjacent spaces have different **STC** or **IIC** requirements, use the higher-rated approved solution.

Table 6 show the approved solutions for walls with openings (doors and windows) in them. An opening reduces the overall **STC** of a partition so if it is sufficiently large, the **STC** of the wall component can be relaxed.

Project Teams can use alternative solutions to meet NZSPA's approved solution, provided an acoustic engineer has confirmed that it is acoustically equivalent and will meet our performance requirements.

Notes on Tables 4 – 6

The following spaces are not learning spaces, so are less noise-sensitive.

- Kaiako/teacher workspaces
- Meeting rooms
- Staff rooms
- Offices

These rooms have no **STC** requirement and standard interior wall constructions will generally be acceptable. But, if any high-noise or noise sensitive activities (listed below) are directly adjacent (e.g., plantrooms, moderate and high-noise tech spaces, music rooms), the **Table 5** values apply.

STC 40 is suitable for all corridor/circulation walls, unless the adjoining room is one of the following noise sensitive spaces, in which case the **Table 5 and 6** performance requirement applies:

- Auditorium
- Music teaching room
- Music practice room
- Recording room
- Multimedia room
- High-noise tech spaces
- Rooms where speech privacy is required

Toilets have no **STC** requirements, and placing toilets, plumbing components, and electric hand dryers on walls shared with learning spaces must be avoided. If this is unavoidable, you must incorporate acoustic treatments to the shared wall (unless this space is a gym, storage, resource or service area) to achieve an **STC** rating of 43. Refer to NZSPA's [*Toilet and Changing Space Design Standards \(V3.0, 2024\)*](#) for more information.

The approved solutions are for walls with 90 mm timber framing. 140 mm timber and 92 mm steel framing perform slightly better in single stud arrangements and can be substituted. All walls must have perimeter acoustic sealant, as per approved industry practice.

Stud spacings for single stud walls must be 600 mm. Smaller spacings will result in lower **STC** performance. Where smaller stud spaces are required for structural purposes, an acoustic engineer should confirm the **STC** rating achieved by the wall build-up.

Acoustically, steel framed walls perform better than timber framed walls (especially with directly fixed wall linings), but timber stud walls are generally more sustainable.

Examples of different technology spaces are:

Low noise tech	Art, DVC rooms and primary school maker spaces, where student activity is the primary noise source.
Moderate-noise tech	Food, textiles, and secondary school maker spaces (with robotics, 3D printers, CNC machines etc.), where equipment can produce moderate noise levels.
High-noise tech	Automotive, trades, metalwork, and woodwork, where equipment can be very noisy.

The performance requirements in Table 4 and 5 below allows a threshold within 2 **STC** points as being equivalent.

Table 4: Approved solutions for walls between connected spaces

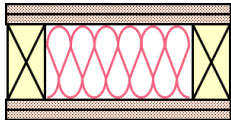
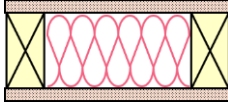
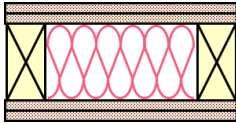
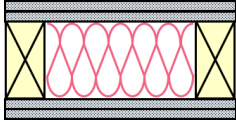
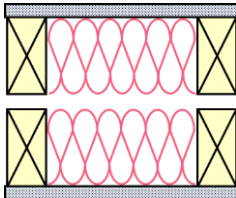
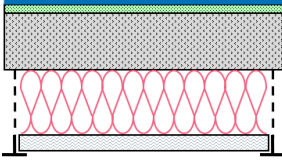
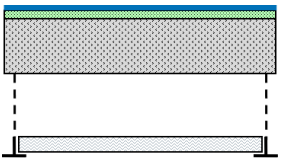
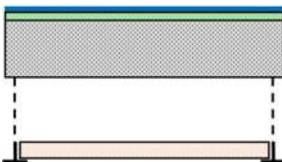
Space	Approved solution		Performance Requirement (allow within 2 STC)
Connected Learning Breakout Low-noise tech Laboratories Moderate-to moderate, and high-to-high noise tech spaces that are connected for learning purposes	• 2x10mm standard plasterboard • Minimum 90mm wall framing with insulation • 2x10mm standard plasterboard		STC 45

Table 5: Approved solutions for walls and floors between non-connected spaces

Space	Approved solution(s)		Performance Requirement (allow within 2STC)
Walls			
Corridors	• 1x13mm standard plasterboard • Minimum 90mm wall framing with insulation • 1x13mm standard plasterboard		STC 40
Libraries	• 2x10mm standard plasterboard • Minimum 90mm wall framing with insulation • 2x10mm standard plasterboard		STC 45
Non-connected Learning Breakout Low-noise tech Where Moderate-noise tech Laboratories Multimedia rooms Rooms where speech privacy is required. Corridor walls to high noise generating or sensitive spaces.	• 2x13mm high-density plasterboard • Minimum 90mm wall framing with insulation • 2x13mm high-density plasterboard		STC 50
Gyms Assembly halls Auditoria High-noise tech spaces Music teaching rooms Music practice rooms Recording rooms Plantrooms	• 1x13mm high-density plasterboard • Minimum 2x90mm double wall framing (minimum 25 mm gap between frames) with double insulation • 1x13mm high-density plasterboard		STC 60

Space	Approved solution(s)	Performance Requirement (allow within 2STC)
Suspended floors		
Rooms with high noise activities (e.g., music, high-noise tech)	- Selected floor covering over acoustic underlay (min. ΔL_w 15 dB) - Concrete floor with min. surface mass 280kg/m² e.g., 120mm solid concrete - Insulation to cavity - Suspended ceiling with min. CAC 30	 STC 60 IIC 55
Rooms with hard floors (e.g., technology spaces, laboratories)	- Selected floor covering over acoustic underlay (min. ΔL_w 15 dB) - Concrete floor with min. surface mass 280kg/m² e.g., 120mm solid concrete - Suspended Ceiling with min. CAC 30	 STC 50 IIC 55
All other suspended floors	- Selected floor covering over acoustic underlay (min. ΔL_w 15 dB) - Concrete floor with min. surface mass 280kg/m² e.g., 120mm solid concrete - Direct fix or suspended ceiling with min. CAC 20	 STC 50 IIC 50

Note - If a hard floor area is less than 10% of the ceiling area of the space below, IIC 50 is acceptable.

Table 6: STC ratings for walls with openings

Space	Fixed window		Hinged door		Sliding door	
	Wall STC	Window STC	Wall STC	Door STC	Wall STC	Door STC
Corridor	40	35	40	30	N/A	N/A
Connected Learning Breakout Low-noise tech Libraries Offices Laboratory-to-laboratory Moderate-to-moderate noise tech, and high-to-high noise tech spaces that are connected for learning purposes	45	38	40	30	N/A	25
Non--connected Learning Breakout Low-noise tech Whare Laboratories Moderate-noise tech Rooms where speech privacy is required	50	45 (double glazed)	45	35	Spaces either side of a sliding door are always connected (see Section 1.2.1)	
Gyms Assembly halls Auditoria High-noise tech spaces Music teaching rooms Music practice rooms Recording room	60	Window not recommended. 50 (Double window)	60	Doors not recommended in walls between these spaces. Rearrange them with a corridor or lobby in between. STC 50 for corridor walls		

Refer to [DQLS – Acoustics Section 3](#) for the verification requirements for on-site acoustic performance.

Figures 2, 3 and 4 below shows some STC mark-ups of typical classroom layouts.

Figure 2: Example STC plan wall mark-up of a typical learning hub

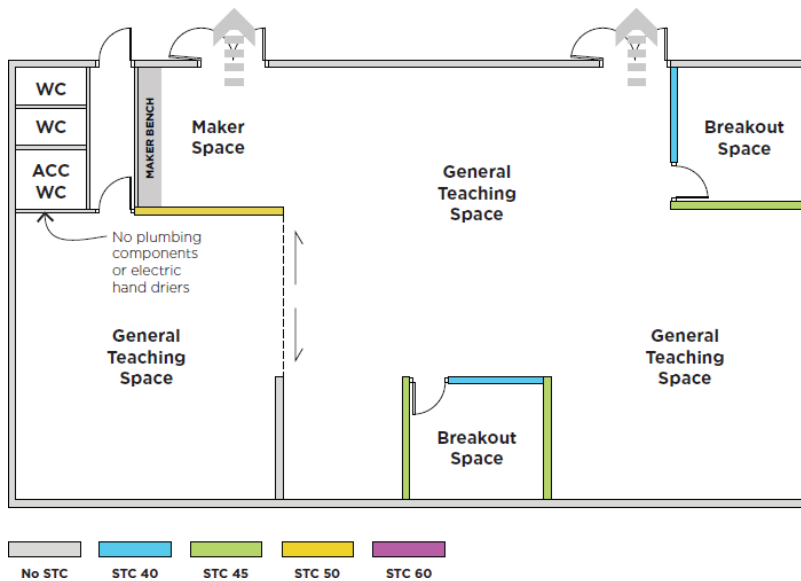
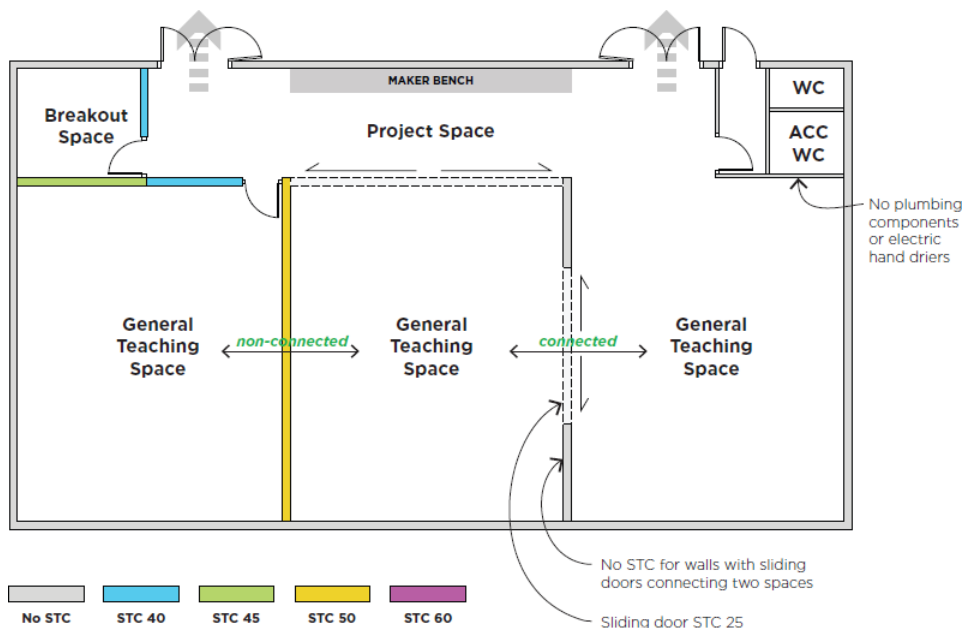


Figure 3: Example STC plan wall mark-up of a typical learning hub



Amended Section 1.3 Indoor Noise Levels

1.3.1 Indoor ambient noise

Indoor [ambient noise](#) must not exceed the relevant levels in [Table 7](#) below. These levels apply when the room is unoccupied, but ready for occupancy. This means that if the room is naturally ventilated, compliance must be achieved with ventilating windows open.

Rain noise does not need to comply with these levels – it is managed separately. Refer to [Section 1.3.3](#).

1.3.2 HVAC noise

Heating Ventilation and Air Conditioning (HVAC) systems (including in-ceiling plant, down-duct and duct break-out, and outdoor plant) must not exceed the relevant noise levels in [Table 7](#). The values apply when all systems are operating as they would for normal occupancy.

The requirement for split-system heat pumps (high wall and cassette units) depends on whether each unit is user-controlled, or automated by a Building Management System (BMS):

- High wall or cassette units must not be specified in spaces with [ambient noise](#) limits of 35 dB or less (i.e., auditoria, multimedia and recording rooms).
- BMS-controlled indoor units must comply with the HVAC noise levels outlined in [Table 7](#) when operating at their design speed.
- Each user-controlled heat pump indoor unit can be turned on and off by the occupant, so can be limited in operation and thus less intrusive to learning activities. These units must comply with the ‘user-controlled’ noise levels outlined in [Table 7](#).

The design speed is the speed setting (low, medium, high etc.) the unit must be on to maintain the required room temperature. Refer to [DQLS Indoor Air Quality & Thermal Comfort](#).

Specialist extract systems such as fume cupboards, kitchen rangehoods, dust extract systems, automotive extract etc., are not required to comply with [Table 7](#) noise levels for the spaces they service. However, they must comply with [Table 7](#) noise levels in adjacent spaces.

Table 7: Maximum indoor noise levels

Space	Maximum Indoor Noise Level (LAeq)		
	Ambient	HVAC	User-controlled indoor units
Gyms	50 dB	45 dB	50 dB
Learning spaces Technology Spaces Laboratories Libraries Kaiako/teacher workspaces Staff rooms Meeting rooms Offices	40 dB	40 dB	40 dB
Breakout spaces Music teaching rooms Music practice rooms Whare Assembly Halls	40 dB	35 dB	40 dB
Auditoria	35 dB	30 dB	35 dB

Space	Maximum Indoor Noise Level (LAeq)		
	Ambient	HVAC	User-controlled indoor units
Multimedia rooms Recording rooms	30 dB	25 dB	30 dB

1.3.3 Rain noise

Rain noise only occurs intermittently – although some areas of NZ have higher rainfall rates than others.

Typical roof systems provide a reasonable control of rain noise and are acceptable. NZSPA considers a typical roof system to be:

- A profiled steel warm roof system and a CAC 30 ceiling system
- A profiled steel warm roof system and a mass layer, and a CAC 20 ceiling system
- A profiled steel cold roof with fibrous insulation in the cavity and 13 mm standard plasterboard ceiling or a CAC 40 ceiling system

Notes:

- The ceiling is also important for reverberation control, so it needs to be specified accordingly. For example, ceiling tiles will need a high NRC rating and a standard plasterboard ceiling will need direct fixed or cloud panel absorbers to achieve the RT requirement.
- Please refer to other relevant NZSPA standards to ensure any cold roof design for schools will perform to the intent of the Building Code.
- Where more light-weight systems are proposed, or where a school can justify a particular concern about rain noise, an [acoustic engineer](#) should be engaged for advice.

Additions to Glossary

Description	Definition
Absorption blanket	Lofted insulation blanket or panels (typically polyester, glasswool or mineral wool) with a minimum density of 10kg/m ³ . Products with ‘noise control’ or other acoustic ratings not required.
High-density plasterboard	Plasterboard with density greater than 920 kg/m ³ (see also: standard plasterboard)
Thin wall treatment	10-15mm acoustic panel (aka acoustic pinboard) – minimum NRC 0.4
Thick wall treatment	50mm+ acoustic panel – minimum NRC 0.9

Description	Definition
Standard plasterboard	Plasterboard with density between 630 kg/m ³ and 920 kg/m ³ (see also: high-density plasterboard)

*All amendments above supersede pages 12 to 17 of [DQLS – Acoustics, V3.0 \(2020\)](#)

*This amendment will be incorporated into the forthcoming update and renaming of the DQLS suite.