Sound Solutions for Schools

A Practical Guide to Designing Acoustically Balanced Learning Spaces

Introduction

Effective acoustic design is essential in educational settings, shaping environments that enhance student concentration, improve communication, and support overall academic performance. Poor acoustics can amplify noise, disrupt speech clarity, and elevate stress levels for both students and educators, making sound design not just beneficial but critical for well-being and productivity.

Navigating Australia's varied acoustic regulations can be challenging, as guidelines differ across States and Territories, each with specific standards for background noise, reverberation times, and sound insulation. This quick guide offers a streamlined path through these complexities, providing architects and designers with a simple and tangible way to meet their acoustic requirements in a variety of learning spaces.


YAMAHA

Evolution of educational design

Educational design has transitioned from fully open-plan “modern learning environments” toward a more balanced approach that combines traditional enclosed classrooms with flexible, collaborative spaces. Initially, open-plan classroom designs aimed to encourage flexibility and group learning, yet the drawbacks—such as high noise levels and poor speech perception—have prompted a re-evaluation.

In recent years, the emergence of vertical schools—multi-storey buildings designed to address space limitations in urban areas—has introduced unique challenges in acoustic design. Unlike traditional single-level schools, vertical schools require careful consideration of noise transmission across floors, as sounds from one level can easily disrupt others. This setting has intensified the need for integrated acoustic strategies, from specialised ceiling and wall materials to floor isolation techniques, all aimed at controlling and distributing sound within and between levels.

A hybrid approach has emerged today as the preferred model, incorporating enclosed classrooms, nooks, and operable walls that allow schools to adjust spaces as needed, depending on group size, learning style and activity. This configuration balances open-plan spaces for collaborative work with quieter, private spaces that support language development and communication, creating an adaptable learning environment that aligns with modern educational goals.

Optimising acoustics through design

Optimising acoustics through thoughtful design begins with careful floor planning to reduce sound disturbance between spaces. Strategic layering of spaces within a building, such as positioning noisier spaces like assembly halls or sports halls away from quieter learning environments, can significantly reduce noise transfer.

Additionally, incorporating breakout spaces or corridors as buffers between noisy and quiet zones provides a further layer of sound management. In the architectural model below, minimal parallel wall surfaces exist between classroom spaces, which are acoustically zoned with partitions.

The strategic use of partitions, ceilings, and walls is also crucial in controlling noise levels. Partitions between rooms can help limit sound transfer, while specific ceiling designs, such as direct-fix or suspended baffles, are effective for noise absorption as well as creating visual interest. Walls with sound-absorbing materials, such as acoustic pinboards or specialised insulation, can further enhance noise control, contributing to a more comfortable and productive learning environment.

See **Table 3** for an overview of selected acoustic treatments from Autex that are suitable for education facilities.


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Acoustic regulations by state

Architects and designers involved in educational facility projects must navigate various regulations and guidelines to ensure acoustic environments are optimised for learning. Each state and territory has local regulations that provide specific performance requirements for each space, most of which are derived from AS/NZS 2107:2016.

Acoustic requirements for educational facilities across Australia have similar objectives but vary slightly across States and Territories. See **Table 1** for a quick reference guide.

The acoustic objectives of Australian educational facilities are aligned with internationally recognised standards that help ensure that the acoustic objectives required for our teaching spaces are aligned with best practice globally. Key documents include:

- New Zealand Ministry of Education's "Designing Quality Learning Spaces - Acoustics";[1]
- UK's Building Bulletin 93, "Acoustic design of schools: performance standards";[2]
- Germany's DIN 18041 standard for acoustic quality in rooms; and
- the American ANSI/ASA S12.60-2010 standards for acoustical performance in schools.

Table 1. Acoustic requirements across Australia

Please refer to each document for detailed performance requirements.

Jurisdiction	Document	Overview
VIC	Victorian Department of Education and Training, "Building Quality Standards Handbook" *https://content.sdp.education.vic.gov.au/media/building-quality-standards-handbook-1068*	**5.5 Acoustic engineering:** Classrooms and core learning spaces must be designed to allow clear verbal communication between teachers and students while minimising noise disturbance. **5.5.3 Internal noise levels:** Spaces must be designed to achieve the design sound level from AS/NZS 2107 for their use type. **5.5.4 Reverberation:** Spaces must be designed to achieve the sound reverberation time below the maximum stated in the 'recommended reverberation time' from AS/NZS 2107, based on the most relevant space type.
NSW	NSW Department of Education, "Education Facilities Standards and Guidelines" *https://education.nsw.gov.au/about-us/efsg*	The acoustic design of rooms and spaces should address internal noise levels; room acoustics (principally reverberation time); noise emission (to the environment), and room-to- room noise control. An internal noise level assessment is required for all new buildings to ensure comfortable acoustic conditions in occupied spaces. Additionally, room acoustics must meet the sound reverberation time standards outlined in both the performance guidelines and AS/NZS 2107:2016, adhering to the more stringent of the two.
SA	South Australian Department of Education, "Design standards for education facilities" *https://www.education.sa.gov.au/docs/infrastructure/property-services/education-facilities-design-standards.pdf*	**Acoustics** Educational facility design must consider acoustic issues such as reverberation, acoustic separation, and internal noise from mechanical services, and, in specific cases, address additional factors like noise from traffic, rain, and external areas, with an acoustic engineer required for complex situations: p. 24. Reverberation requirements have been developed based on the Australian Standard and the AAAC Guidelines for Educational Facilities Acoustics: pp. 26-27. Recommended noise levels are set out in pp. 31-32 of the document.
QLD	Queensland Department of Education, "Design Standards for DETE Facilities" *https://qed.qld.gov.au/our-publications/standards/Documents/design/design-standards-facilities.pdf*	**14 Acoustic engineering** Designs must provide an acoustic environment in which clear communication between teachers and students is achieved while disturbance from other activities is minimised. Acoustic designs are to be in accordance with the higher requirement of this standard, or AS2107 and the Association of Australasian Acoustical Consultants Guideline for Educational Facilities
TAS	Tasmania, Department of Education, "Built Environment Guide" *https://publicdocumentcentre.education.tas.gov.au/library/Shared%20Documents/Built-Environment-Guide.pdf*	**Amenity** Acoustic performance to suit the intended use that considers distraction, intelligibility of speech, hearing, and noise levels and allows adjoining spaces to be effectively used when connected (opened) and when separated (closed).
NT	Northern Territory Government, "Minimum Design Standard – Architectural Design" *https://dipl.nt.gov.au/__data/assets/pdf_file/0007/1233439/minimum-design-standard-docid420v202312.pdf*	**3.1 Objectives** Physical Environment, Health & Wellbeing - effective design that positively enhances the health and wellbeing of staff such as: natural light and air, colours and materials, spaces and acoustics. Professional advice is essential to ensure designs meet compliance, and it is the designer's responsibility to follow legislation, codes, and best practices, including the NCC, Australian Standards, DDA, WHS Act, and specific agency requirements.
ACT	Australian Capital Territory Government, "Volume 2 Output Specification Part A: Functional Brief" *https://www.education.act.gov.au/__data/assets/pdf_file/0006/1349574/EDU_2019_008_Documents.pdf*	**15 Acoustic Engineering** The acoustic performance of the Facilities must: • control sound transfer between spaces; • control room reverberation (echoing) within spaces; and • control ambient noise levels arising from mechanical plants, hydraulic fixtures, equipment or external noise (transportation).

Where your state or territory is not listed guidance from the local authority, or an acoustic consultant should be obtained.

Strategic layering of spaces within a building, such as positioning noisier spaces like assembly halls or sports halls away from quieter learning environments, can significantly reduce noise transfer.

A quick guide to tailoring sound for every learning space

Background noise levels and reverberation times are critical considerations in designing learning environments, as they directly affect communication and functionality. This guide provides architects and designers with a tool for understanding how to meet the acoustic requirements of various spaces during the design phase.

Table 2. Acoustic requirements and treatments by room function

The below table provides guidance on how to meet the essential acoustic requirements when designing a variety of learning spaces, as well as our recommended treatment.

The Noise Reduction Coefficient (NRC) measures the sound absorption ability of an acoustic product, with values ranging from 0 (no sound absorption) to 1 (total sound absorption).

Room Function	Design Reverberation time (seconds)	Control- Acoustic Absorption	
		Ceilings	Walls
Large general learning spaces >300	Refer to ASNZS 2107-2016 Fig A1	NRC 0.80 100% or NRC ≥0.9 min 80 %	Multipurpose acoustic display linings ≥ NRC 0.4 on at least two perpendicular sides of the room. Total wall treatment to min 30% of the ceiling area
Small learning spaces < 300 m3, Focussed learning areas and libraries	Primary 0.4 - 0.5 Others 0.6		
Technology spaces and Laboratories	0.5 - 0.8		
Circulation	≤ 0.8	NRC 0.7 100% NRC ≥0.80 min 80 % NRC ≥0.90 min 80 %	Multipurpose acoustic display linings ≥ NRC 0.4 As required and ideally opposite reflective surfaces, i.e. glazed partitions and doors
Breakout spaces and Collaboration areas	≥0.6	NRC 0.85 100% NRC ≥0.90 min 80 %	≥ NRC 0.7 on at least two perpendicular sides of the room. Total wall treatment to min 35% of the ceiling area
Private offices and meeting rooms	0.6	NRC 0.7 100%	≥ NRC 0.7 on at least two perpendicular sides of the room. Total wall treatment to min 20% of the ceiling area
Music teaching rooms Music practice rooms Multimedia rooms Recording rooms Multipurpose halls Drama studios Auditoria	Specialist design required		

Assumptions

Proposed solutions to be used as guidance only but are expected to provide the required performance levels in most scenarios, larger spaces, spaces where the activities are expected to create higher noise levels and building with high level of exposed mass including hard flooring may require additional or higher performing materials. An acoustic consultant is typically required to approve all designs and is recommended.

Acoustic lining are required to comply with the relevant sections of the building code including, fire ratings structural and durability ratings and environmental requirements.

Autex Acoustics Product Guide

Application	**RT60 (Ave 500 hz-1khz-2khz)**	**Control- Acoustic Absorption**			
		Minimum Treatment		**Recommended Treatment**	
		Ceilings	**Walls**	**Ceilings**	**Walls**
Areas for conferencing, collaboration and general learning.	≤ 0.6 - 0.8 For large learning spaces. Refer to fig 1 (Mid frequency reverberation time versus Room Volume: AS/NZS2107-2016)	Quietspace® 25mm Panel 75% ceiling area.	12-18mm Composition, or ≥12mm Cube on at least 35% of two walls.	50mm Quietspace® Panels fitted to 80% ceiling area.	18mm Composition, or 25mm QS Panels, or 24mm Cube. Fitted to ≥35% of two perpendicular walls.
Areas for concentration and focused learning.	≤ 0.4 - 0.6	Quietspace® 25mm Panel fitted to 80% ceiling area.	12mm -18mm Composition, or ≥12mm Cube on at least 35% of two walls.	25-50mm Quietspace® Panel fitted to 85% ceiling area.	18mm Composition, or 24mm Cube, or 25mm Quietspace® Panel fitted to ≥50% of two perpendicular walls.
Smaller spaces for formal meetings and video conferencing.	≤ 0.4 (For Video specialist conferencing rooms 0.2)	18mm Composition, or 25mm Quietspace® Panel on at least 75% available ceiling areas.	18mm Composition or 25mm Quietspace® Panel or 24mm Cube to nominally 50% of two walls.	50mm Quietspace® Panel fitted to 90% of ceiling area.	18mm Composition, or 25mm Quietspace® Panel , or 24mm Cube, or Lanes fitted to ≥50% of two perpendicular walls.
Music, Drama Rehearsal Spaces.	0.7 -2.00 Room Volume Dependent	Ideally use irregular shaped rooms with some diffusion. For absorption recommend 50mm-100mm Quietspace® Panel 12-24mm Cube with nominal 50mm airgaps (Broad Band Absorbers) Ideally not more than combined 30-50% total surface area.			
Performing arts and Theatre spaces.	Specialist design advice required.				


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Acoustic solutions for every space

In learning environments such as classrooms, breakout spaces, and music rooms, acoustic treatments help meet the specified acoustic guidelines and ensure that students and teachers can communicate clearly. Autex are constantly seeking new and innovative ways to expand their acoustic treatments to suit all types of learning environments. Previously their Composition® product had an NRC rating of 0.4 but after seeing a need for a thicker design solution for architects they increased it to 18mm thickness with an NRC rating of 0.55.

Beyond their functional purpose, it is essential to consider the **aesthetic impact** of acoustic solutions in educational settings. Acoustic panels and linings must blend seamlessly into the overall design of the space, maintaining visual harmony without compromising on performance. Modern acoustic solutions are available in a variety of colours, textures, and finishes, allowing architects to incorporate them into the design without detracting from the aesthetic appeal.

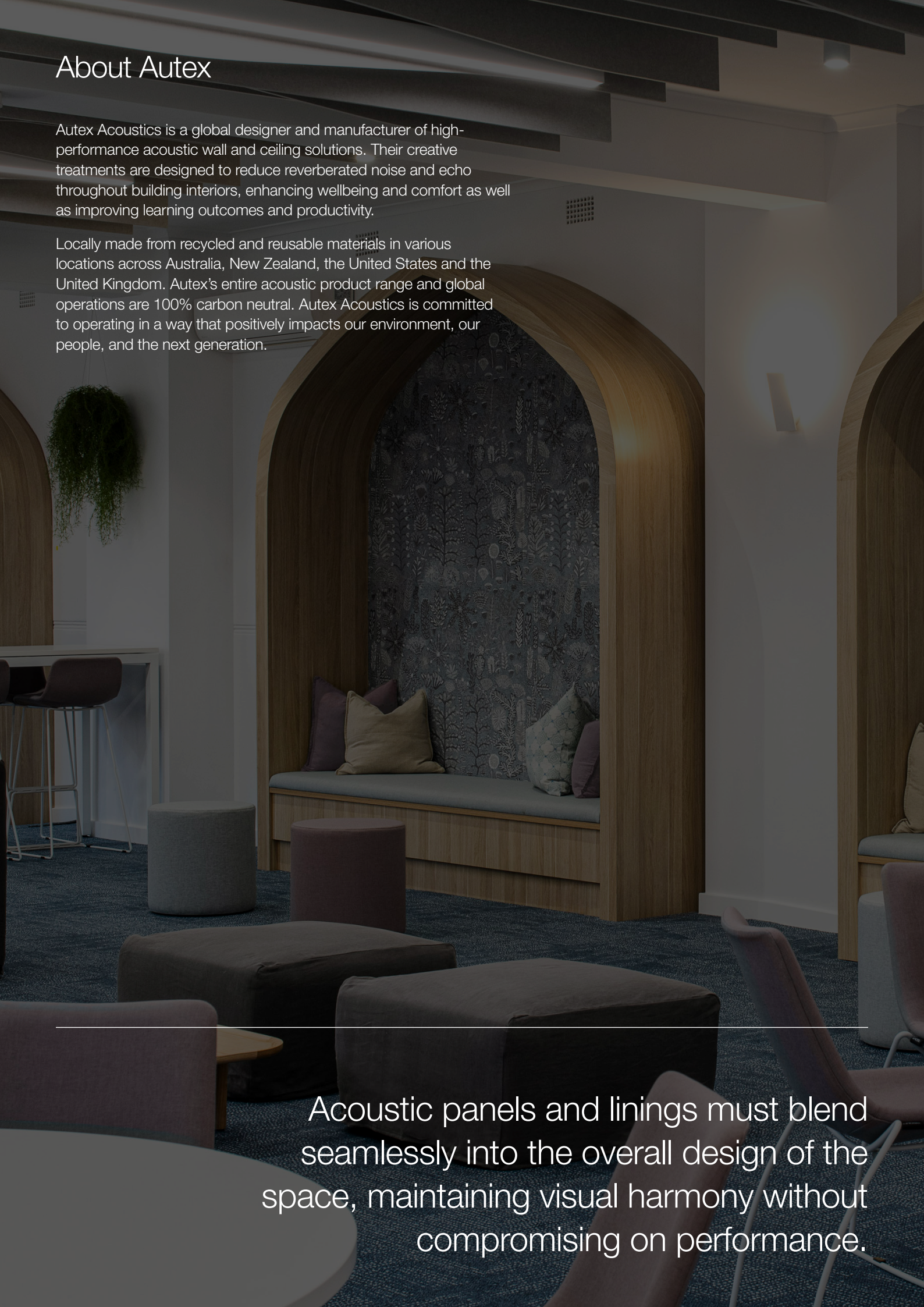
Table 3. Autex's treatment options for learning environments

Product type	Name	Features and benefits	Technical specifications
Wall covering	**Composition®**	• Pinnable, hook and loop receptive surface • An alternative finish to paint • Durable and easily maintained • Floor to ceiling solution with no vertical joins • Easy installation around windows and openings • Carbon neutral • Made locally	Form: Roll NRC: 0.40–0.55 Composition: 100% polyester fibre (PET) with a minimum 80% recycled content. Thickness: 10 mm - 18 mm Fire rating: AS5637.1, AS ISO9705-2003. Group 1, (SMOGRArc): <100m2/s2. Application: Wall
Acoustic baffle system	**Frontier™** **Horizon™**	• A wide variety of modular colour options • Available in nine styles • Mount fins or rafts flush to the ceiling to 'blend in', fix them to rails or suspend them using extension rods • Create a more comfortable and personalised experience by tuning the acoustic effect. Simply move the fins or rafts closer together or further apart. • Easy installation • Carbon neutral • Made locally	Form: Fins | Raft NRC fins: 0.70 | 0.75 | 0.85 | 0.90 | 1.00 | 1.05 NRC raft: 0.75 | 0.80 | 0.90 | 0.95 Thickness: 12mm | 24mm Content: 100% polyester fibre (PET) with a minimum 80% recycled content. NRC Horizon: 0.8 Fire rating: AS5637.1, AS ISO9705-2003. Group 1, (SMOGRArc): <100m2/s2. Application: Wall | Ceiling
Acoustic panel	**Quietspace® Panel**	• Delivers excellent acoustic performance • Reduces reverberation and echo in spaces with high noise levels • Easy to install around lighting and other fixtures • Available in standard black, white, or grey • Carbon neutral • Made locally	Form: Panel NRC: 0.85–1.00 Composition: 100% polyester fibre (PET) with a minimum 80% recycled content. Thickness: 25 mm | 50 mm | 75 mm | 100 mm Fire rating: ISO 9705 - Group 1-S Application: Wall | Ceiling
Acoustic panel	**Cube**	• Lightweight, semi-rigid panel that delivers excellent acoustic performance • Solid colour and smooth finish, with no edging or capping required • Highly durable, providing long-term stability and performance • A versatile medium that is highly customisable • Simple installation • Carbon neutral • Made locally	Form: Panel NRC: 0.45–0.80 Composition: 100% polyester fibre (PET) Thickness: 12 mm | 24 mm Fire rating: AS5637.1, AS ISO9705-2003. Group 1, (SMOGRArc): <100m2/s2. Application: Wall | Ceiling

About Autex

Autex Acoustics is a global designer and manufacturer of high-performance acoustic wall and ceiling solutions. Their creative treatments are designed to reduce reverberated noise and echo throughout building interiors, enhancing wellbeing and comfort as well as improving learning outcomes and productivity.

Locally made from recycled and reusable materials in various locations across Australia, New Zealand, the United States and the United Kingdom. Autex's entire acoustic product range and global operations are 100% carbon neutral. Autex Acoustics is committed to operating in a way that positively impacts our environment, our people, and the next generation.



Acoustic panels and linings must blend seamlessly into the overall design of the space, maintaining visual harmony without compromising on performance.

CARBON NEUTRAL

In everything we do

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References

1 Ministry of Education. "Designing Quality Learning Spaces - Acoustics". MoE. https://assets.education.govt.nz/public/Documents/Primary-Secondary/Property/Design/Flexible-learning-spaces/DQLS-Acoustics-v-3.1-31-May-2024-Final-1.pdf (accessed 1 December 2024).

2 Department of Education UK. "Building Bulletin 93 - Acoustic design of schools: performance standards". DoE. https://assets.publishing.service.gov.uk/media/5a8170d3e5274a2e8ab54012/BB93_February_2015.pdf (accessed 1 December 2024).

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All information provided correct as of January 2025