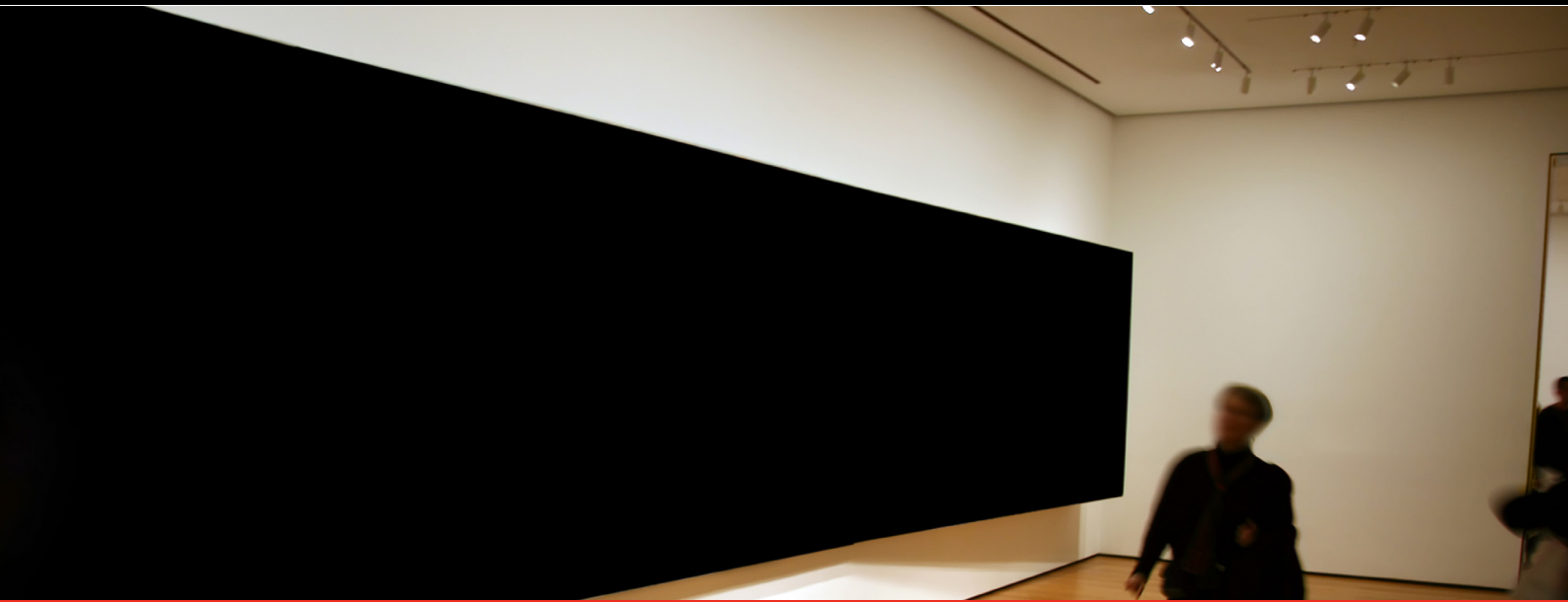


Learning Interrupted: How Excess Noise Affects Concentration

Understanding Challenges and Control of Noise in Educational Facilities




Pyrotek®

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Introduction: addressing noise in educational environments

When it comes to concentration, silence is indeed golden. However, educational institutions and cultural centres operate at ambient noise levels that far exceed the standard for optimal learning¹.

The result is poor memory and cognitive function, the inability to comprehend speech correctly, and suffering test scores². These learning impediments have long-term consequences, particularly for young children in their formative schooling years.

 Uncontrolled noise impairs the human brain's ability to learn at optimal function – an issue that affects people's mental development every day.

The impact of noise in schools

Compared to adults, children are less able to filter out non-essential sounds. In teaching environments that operate at a volume where comprehension becomes difficult, the consequence is a noticeable reduction in reading and writing skills, worsening social behaviour and short-term memory problems.

For best learning outcomes, ambient noise in classrooms should be 28dB – roughly the volume of a whisper. Noise levels above 41dB have been shown to impact student test results³.

Many educational institutions, including libraries, museums and cultural centres, are ill-equipped to deal with the barrage of noise from students, teachers and visitors, the drone of HVAC systems, external road and rail noise and particularly in our intensive multimedia learning culture.

The aim of this white paper is to examine the causes and impact of noise disruption on learning, concentration and ambience. In addition, we will explore effective solutions for creating peaceful environments where learning conditions are optimised.



However, classroom volume is more often closer to 60dB; the equivalent of two people having a nearby conversation⁴. Not only does this impede student concentration and learning outcomes, it is the cause of increasing numbers of sick days for teachers suffering from voice strain⁵.

While facilities constructed with concrete or brick walls will have some defence against noise transfer, the trend toward economically-priced lightweight building materials has exacerbated modern noise issues in learning spaces.

Testing volume levels

Testing the decay of sound in a room – that is, the length of time a sound reverberates within a space – indicates the scale of the noise issue.

A 0.4 to 0.9 second decay time is considered satisfactory. However, classrooms, gymnasiums, music rooms, libraries and museums – areas with hard surfaces or high ceilings that lack adequate absorptive materials – may experience reverberation of more than 2 seconds, which creates a confused and inarticulate 'noise' within the room. This increases overall volume and can impact concentration and comprehension ability.

The challenge of merging silence and sound

Many modern educational and cultural facilities are now mixed-use zones that need to accommodate multiple uses. The quiet and reflective atmosphere of libraries, museums and art galleries must live alongside the buzz of tour groups, collaboration zones and audio-visual presentations.

Cavernous spaces, such as those commonly found in museums, are particularly susceptible to echo – a phenomenon that drives visitors and tour guides to raise their speaking level further⁶.

The subsequent din causes patrons to leave earlier, with a reduced restorative and fulfilling experience⁷. This in turn has ramifications on the income and reputation of the institute.

Solutions to noise issues

Fortunately, while noise issues are an ongoing problem in educational facilities, there are a variety of proactive solutions for all surfaces. These modifications are not only readily available, they're also cost-effective, customisable, and easily fitted to existing or new buildings.

The aim is to reduce the reverberation time in a room by increasing the amount of sound-absorbing materials. In addition, noise transfer can be targeted through soundproofing barriers and window double-glazing.

Best results are achieved by addressing several surfaces throughout the room simultaneously, rather than concentrating on a single wall, the ceiling or floor only.

Pyrotek®, a global leader in soundproofing technology, provides a wide range of acoustic solutions that specifically address the noise issues faced by educational facilities and cultural centres.

Resolving wall and ceiling reverberation

Echohush® high-performance sound absorbing panels effectively combat reverberation and echo without compromising on aesthetics.

Made from thermally bonded recyclable polyester fibres, **Echohush**® Panels are lightweight and impact resistant, and can be fully customised to suit the practical needs of classrooms and library rooms, as well as the visual appeal of modern museums and exhibition centres.



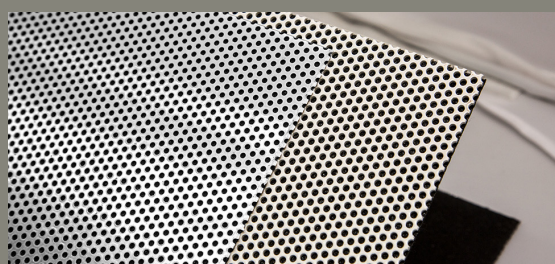
Retrofitting vs Aesthetics

Soundproofing initiatives can be integrated during the design and build process; for existing buildings, solutions can be retro-fitted to target problem areas.

Luckily, that doesn't mean losing the architectural individuality of the space. This is particularly important in cultural buildings such as museums and art galleries, where the interior is often an element of art in itself.

Pyrotek's range of sound-absorbing solutions can be tailored to meet the aesthetic needs of the space, including:

- Ceiling panels in a range of materials
- Digitally printed panels including corporate branding
- High performance acoustic treatment materials
- Custom trimmed acoustic textiles, various colours
- Powder-coated metal panels, microperforated absorbers
- Proven commercial solutions certified to fire codes



Minimise floor noise

Footsteps, sliding chairs and desks, and impact noise from floors can be significantly reduced using Pyrotek's high-density bonded foam underlay, **Silentstep**®.

Quality underlay also cushions floor noise from adjoining rooms, including those located on the floors below.

While **Silentstep**® supports a range of carpet applications, the new-generation underlay is also highly effective when placed under hard timber, tile or parquet flooring, which are particularly prone to impact noise.

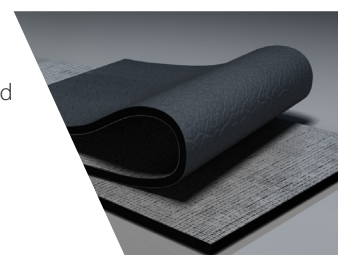


Noise transfer solutions

Facilities divided via partition walls or into small rooms, such as museum exhibitions or library small-group spaces, can reduce noise transfer between sections with **Wavebar**®, Pyrotek's high performance flexible vinyl barrier.

Mass-loaded to achieve maximum acoustic transmission loss, **Wavebar**® can be integrated inside walls, floors and ceilings to block noise transfer in and out. The weight of the vinyl barrier is customised to specifically target problem frequencies.

Wavebar® can also be adhered to partitions, such as those found between exhibitions, classrooms or as temporarily dividers, to improve acoustic insulation.



Outdoor and high resistance soundproofing

Sorberscreen Micro™ is a unique and decorative sound absorber for use in walls and ceilings, and is weather resistant for outdoor applications.

Made from micro-perforated metal with a 1mm aluminium finish, **Sorberscreen Micro**™ can be supplied in several varieties and its unique look complements architecturally distinctive buildings.

Sorberscreen Micro™ can also be shaped to suit equipment with high volume and heat output, such as server racks.

Pyrotek® Acoustic Solutions

With over 40 years experience, Pyrotek® is a global leader in advanced noise control technology. Pyrotek® acoustic insulation solutions are continually evolving to anticipate the changing needs of a broad range of industries, without compromising on visual appeal and aesthetic.

For more information, visit www.pyroteknc.com

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About Pyrotek®

Pyrotek® provides innovative noise control products and tailored acoustic insulation solutions to the Australian building and architecture market.

With an inhouse engineering team, Pyrotek® can create highly specialised products to designed specifications and performance requirements.

To find out more about Wavebar®, Sorberscreen, Echohush, Silentstep or other acoustic solutions, visit www.pyroteknc.com

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