



# Improving Room Acoustics for Healthcare Spaces

Wall & Ceiling Design Strategies

## INTRODUCTION

Hospitals and healthcare facilities in New Zealand operate amidst a constant backdrop of sound—alarms, medical devices, HVAC systems, rolling carts, and conversations—all essential for day-to-day operations. However, excessive or poorly managed noise can create discomfort or even harm, particularly for patients who may already be vulnerable due to factors such as age, hearing impairments, and the effects of medication and illness. Addressing these challenges requires a targeted, strategic approach to acoustic design.

The role of acoustics in healthcare design has become increasingly significant, with modern guidelines emphasising the importance of sound management as a cornerstone of patient-centred care. The design and construction of walls and ceilings are fundamental to this objective because they shape how sound travels, is absorbed, or is blocked within a space.

This whitepaper explores the unique acoustic demands of healthcare environments. It highlights design considerations and strategies for optimising walls and ceilings using advanced materials and systems, such as sound-absorbing tiles, perforated panels, and noise-dampening insulation.









## IMPACT OF ACOUSTICS ON HEALTH OUTCOMES

Acoustic levels in hospitals have risen significantly over recent decades. Research by Busch-Vishniac et al. revealed a steady annual increase in sound pressure levels—0.38 dB during the day and 0.42 dB at night on average—since 1960.<sup>1</sup> Elevated noise levels have far-reaching implications for both patients and healthcare staff, directly influencing health outcomes and operational efficiency.

For patients, excessive noise can act as a health hazard, particularly for those recovering from illness or surgery. Studies consistently demonstrate that high noise levels negatively affect patients during their hospital stays, disrupting sleep, increasing stress, and slowing recovery. Conversely, environments with well-managed acoustics are shown to enhance health outcomes, supporting patients in their healing and treatment.<sup>2</sup>

Acoustic privacy also plays a critical role in patient health and quality of care. Inadequate sound insulation can lead to frequent disturbances and feelings of intrusion, hindering recovery. Furthermore, patients may withhold sensitive or vital information during consultations if they feel their conversations lack confidentiality.<sup>3</sup>

For healthcare staff, internal noise levels present significant challenges. Elevated noise can contribute to stress, fatigue, and decreased job performance.<sup>3</sup> Prolonged exposure to high noise levels may even lead to hearing loss and increased rates of job burnout.<sup>4</sup> Speech intelligibility is another critical factor, as poor acoustics can make it difficult for staff to interpret alarms, medical equipment alerts, and conversations, leading to delays or errors in patient care.<sup>5</sup>

## REGULATIONS AND GUIDELINES

In New Zealand, the design of healthcare facilities is guided by a range of standards and guidelines aimed at ensuring interiors provide a healthy, comfortable, and productive environment for patients, staff, and visitors.

One foundational standard is **AS/NZS 2107:2016 “Acoustics—Recommended Design Sound Levels and Reverberation Times for Building Interiors”**, which offers detailed acoustic recommendations across various building types. For healthcare environments, this includes specific guidance on acceptable sound levels and reverberation times for different spaces. For instance, clinical areas such as consultation rooms

and patient wards require lower sound levels to ensure privacy and support communication, while public areas like waiting rooms must balance sound attenuation with a welcoming atmosphere.

New Zealand practitioners often look to the **Australian Health Facility Guidelines (AusHFG)** for additional direction. The Association of Australasian Acoustical Consultants (AAAC) **Guideline for Healthcare Facilities** is another valuable resource. Version 2.0 of this guideline addresses the full spectrum of acoustic design considerations, from sound insulation and speech privacy to managing noise from medical equipment and building systems.

# ACOUSTIC PLANNING FOR HEALTHCARE

## 1. Engage an acoustic specialist

Effective acoustic design in healthcare facilities requires a holistic approach that integrates seamlessly with other key building considerations, such as lighting, hygiene, temperature control, and fire protection. The complexity of these environments demands early and ongoing collaboration with acoustic engineers. From the initial planning stages to post-construction assessments, regular consultation is essential to address factors such as mechanical system noise, equipment specifications, and the results of acoustical testing.

Another critical consideration is the relationship between acoustics and infection control. Healthcare settings often rely on hard, non-porous surfaces for ease of cleaning and hygiene, but these materials can significantly increase sound reverberation. Engaging a specialist can help address these issues early through thoughtful zone planning and material selection.

## 2. Identifying potential noise sources

A comprehensive approach to acoustic design in healthcare facilities begins with identifying and addressing all potential noise sources, both external and internal. External noise, such as traffic from highways, nearby airports, or industrial activity, can significantly impact the acoustic environment within the building. To mitigate these effects, site noise measurements should be conducted early in the design process to understand ambient noise levels.

Interior noise sources are equally critical to manage. Common contributors include HVAC systems, medical equipment, alarms, and foot traffic. A thorough assessment of these noise sources allows for effective mitigation strategies, such as selecting low-noise mechanical systems, implementing sound-absorbing materials, and optimising spatial layouts to minimise sound transmission between high-activity and quiet areas.

## 3. Zoning and space planning strategies

Thoughtful zoning and space planning can significantly enhance the acoustic environment. Patient rooms should be shielded from louder spaces like corridors, nurse stations, and visitor areas. Decentralising nurse stations not only reduces corridor traffic noise but also improves patient monitoring and care efficiency. Similarly, designating separate gathering areas for families helps contain noise away from patient care zones.

Single-bed patient rooms are a critical element in modern healthcare design. These rooms reduce infection risks, improve sleep quality, and enhance privacy, enabling better communication between patients, families, and healthcare professionals. Single-patient rooms have been widely adopted in facilities across countries such as the U.S., France, the UK, and Canada, and are increasingly featured in new healthcare developments worldwide.<sup>8</sup>

*“Elevated noise levels have far-reaching implications for both patients and healthcare staff, directly influencing health outcomes and operational efficiency.”*

## UNDERSTANDING ACOUSTIC PERFORMANCE RATINGS

When specifying wall and ceiling solutions for healthcare spaces, it is essential to understand key acoustic performance ratings, as these directly influence the effectiveness of the design in managing sound. One key rating is Ceiling Attenuation Class (CAC), which measures a ceiling system's ability to act as a barrier to airborne sound transmission between adjacent enclosed spaces that share a common air plenum. A higher CAC rating indicates better performance, with ceilings rated below 25 offering low sound attenuation and those with a CAC of 35 or greater considered high-performing.

Another important rating is the Noise Reduction Coefficient (NRC), which represents the average sound absorption efficiency of an acoustic product. NRC ratings range from 0 to 1, where a rating of 0 indicates no sound absorption and a rating of 1 indicates complete absorption of sound. For example, a product with an NRC of 0.95 absorbs 95% of sound within a space, reflecting only 5%. Materials with high NRC ratings are often required in spaces where controlling reverberation and reducing noise levels are critical.

## CEILINGS

### Selecting the right ceiling solutions for healthcare environments

Healthcare environments require a tailored approach, as different areas demand varying levels of sound absorption, blocking, or masking. Ceilings with a Ceiling Attenuation Class (CAC) rating of 35 or higher effectively block sound transmission through the ceiling plenum, offering improved sound isolation, enhanced speech privacy, and greater design flexibility. Sound-absorbing materials, such as acoustic ceiling tiles, are highly effective in spaces like patient rooms, corridors, and waiting areas for reducing reverberation.

Spaces with non-absorbing ceilings risk sound reflection or transmission through the ceiling plenum, potentially leading to privacy issues or heightened noise levels. In noisy environments with equipment above the ceiling or walls that do not extend fully into the plenum, ceiling tiles with a CAC rating of 35 or higher are needed to maintain sound isolation.

### Acoustic treatments for healthcare ceilings

A variety of acoustic treatments and materials are available to address the unique needs of healthcare spaces. Sound-absorbing tiles are a popular choice for reducing reverberation and enhancing speech intelligibility. Typically made from mineral fibre or fibreglass, these tiles offer high NRC ratings. Some products feature antimicrobial coatings, which are crucial for maintaining infection control in healthcare settings.

Perforated panels, made from materials like metal, wood, or gypsum, are designed to absorb and diffuse sound through strategically placed holes or slots. These panels are particularly effective in controlling echo and reverberation in larger spaces, such as lobbies, auditoriums, or conference rooms. Available in a wide range of finishes, perforated panels not only provide excellent acoustic function but also enhance interior design aesthetics.

Noise-dampening insulation further enhances the acoustic performance of ceilings by preventing sound transmission between spaces. Installed above ceiling tiles or within ceiling cavities, materials like fibreglass, rock wool, or cellulose effectively absorb and block airborne and impact noise. This insulation is especially valuable in isolating noise from mechanical equipment, ductwork, or between floors.

## WALLS AND PARTITIONS

### Optimising wall construction for acoustic performance

A key consideration when designing and specifying walls and partitions is preventing flanking noise. Any breaches in partitions, such as poorly sealed joints or gaps, significantly reduce the wall's ability to isolate sound. To mitigate this, it is best practice to extend walls fully to the structural slab. In cases where walls terminate at the ceiling, additional detailing—such as sound seals or barriers—is required to maintain acoustical performance.

Attention to detail is crucial to avoid features that compromise sound isolation. For example, back-to-back electrical outlets, lowered walls, and air gaps should be avoided, as these create pathways for sound transmission. Doors and glazing, while necessary for functionality and aesthetics, inherently reduce wall acoustic performance and must be factored into the design. Positioning doors strategically and designing HVAC duct layouts with privacy in mind can further enhance the acoustical integrity of healthcare spaces. At intersections, ensuring that gypsum panels are continuous and properly sealed is critical for preventing flanking noise.

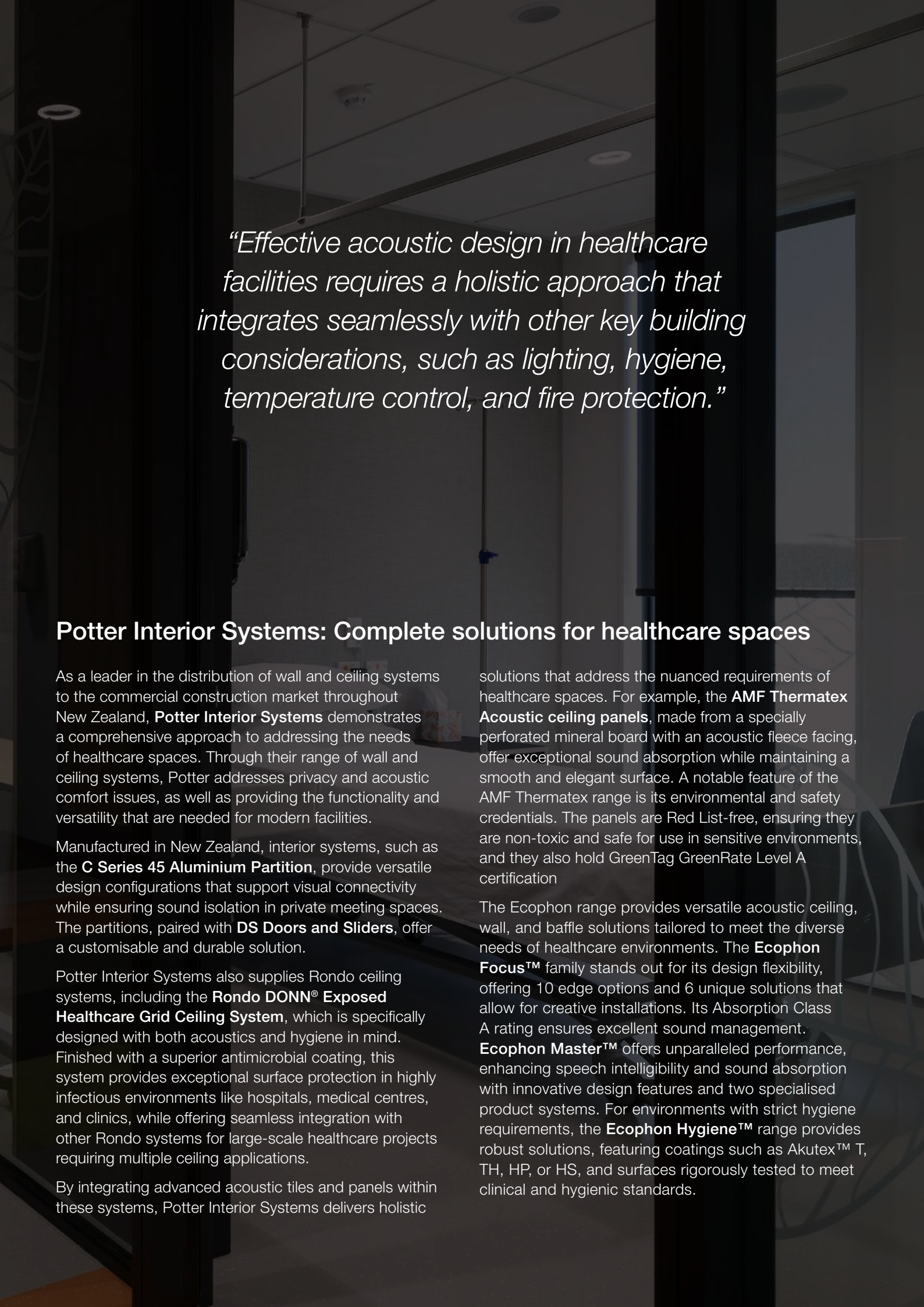
### Acoustic treatments for healthcare walls

Choosing wall materials and acoustic treatments tailored to specific needs is vital for achieving optimal sound control in spaces with high acoustic demands. The thickness and density of materials, such as plasterboard or glazing, directly impact their ability to absorb or block sound.

Acoustic panels, which can be strategically placed within rooms, are also an option to control sound. For clinical areas, sound-absorbing panels covered with a cleanable film provide both functionality and hygiene, while fabric-wrapped panels can be used in non-clinical spaces to absorb sound. Installing sound-absorbing materials perpendicular to surfaces helps to minimise flutter echoes, which can be particularly disruptive in spaces like conference rooms or staff meeting areas.

Perforated boards are another effective solution for reducing noise levels. These boards, often paired with sound-absorbing backings, provide an additional layer of acoustic control while integrating seamlessly into the design of the space.



A background image showing a modern healthcare interior with glass partitions, ceiling systems, and lighting fixtures.

*“Effective acoustic design in healthcare facilities requires a holistic approach that integrates seamlessly with other key building considerations, such as lighting, hygiene, temperature control, and fire protection.”*

## Potter Interior Systems: Complete solutions for healthcare spaces

As a leader in the distribution of wall and ceiling systems to the commercial construction market throughout New Zealand, **Potter Interior Systems** demonstrates a comprehensive approach to addressing the needs of healthcare spaces. Through their range of wall and ceiling systems, Potter addresses privacy and acoustic comfort issues, as well as providing the functionality and versatility that are needed for modern facilities.

Manufactured in New Zealand, interior systems, such as the **C Series 45 Aluminium Partition**, provide versatile design configurations that support visual connectivity while ensuring sound isolation in private meeting spaces. The partitions, paired with **DS Doors and Sliders**, offer a customisable and durable solution.

Potter Interior Systems also supplies Rondo ceiling systems, including the **Rondo DONN® Exposed Healthcare Grid Ceiling System**, which is specifically designed with both acoustics and hygiene in mind. Finished with a superior antimicrobial coating, this system provides exceptional surface protection in highly infectious environments like hospitals, medical centres, and clinics, while offering seamless integration with other Rondo systems for large-scale healthcare projects requiring multiple ceiling applications.

By integrating advanced acoustic tiles and panels within these systems, Potter Interior Systems delivers holistic

solutions that address the nuanced requirements of healthcare spaces. For example, the **AMF Thermatex Acoustic ceiling panels**, made from a specially perforated mineral board with an acoustic fleece facing, offer exceptional sound absorption while maintaining a smooth and elegant surface. A notable feature of the AMF Thermatex range is its environmental and safety credentials. The panels are Red List-free, ensuring they are non-toxic and safe for use in sensitive environments, and they also hold GreenTag GreenRate Level A certification.

The Ecophon range provides versatile acoustic ceiling, wall, and baffle solutions tailored to meet the diverse needs of healthcare environments. The **Ecophon Focus™** family stands out for its design flexibility, offering 10 edge options and 6 unique solutions that allow for creative installations. Its Absorption Class A rating ensures excellent sound management.

**Ecophon Master™** offers unparalleled performance, enhancing speech intelligibility and sound absorption with innovative design features and two specialised product systems. For environments with strict hygiene requirements, the **Ecophon Hygiene™** range provides robust solutions, featuring coatings such as Akutex™ T, TH, HP, or HS, and surfaces rigorously tested to meet clinical and hygienic standards.



## REFERENCES

- <sup>1</sup> Busch-Vishniac I, West JE, Barnhill C, Hunter T, Orellana D, Chivukula R. "Noise levels in Johns Hopkins Hospital." *Journal of the Acoustical Society of America*, Vol. 118, No. 6 (2005): 3629-3645.
- <sup>2</sup> Zhou T, Wu Y, Meng Q, Kang J. "Influence of the Acoustic Environment in Hospital Wards on Patient Physiological and Psychological Indices." *Frontiers in Psychology*, Vol. 11 (2020): <https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2020.01600/full> (accessed 27 November 2024).
- <sup>3</sup> Johns Hopkins University. "Rise In Hospital Noise Poses Problems For Patients And Staff." *ScienceDaily*. <https://www.sciencedaily.com/releases/2005/11/051121101949.htm> (accessed 27 November 2024).
- <sup>4</sup> Ibid.
- <sup>5</sup> Ceilings & Interior Systems Construction Association. "Acoustics in Healthcare Environments." CISCA. [https://www.cisca.org/files/public/acoustics%20in%20healthcare%20environments\\_cisca.pdf](https://www.cisca.org/files/public/acoustics%20in%20healthcare%20environments_cisca.pdf) (accessed 27 November 2024).
- <sup>6</sup> Detsky ME, Etchells E. "Single-Patient Rooms for Safe Patient-Centered Hospitals." *JAMA: The Journal of the American Medical Association*, Vol. 300, No. 8 (2008): 954-956.

All information provided correct as of December 2024