

# ACOUSTIC CEILING

DESIGN AND MATERIAL OPTIONS



## INTRODUCTION

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The increase in open-plan living and work spaces results in much more chaotic sound sources, including multiple people conversing at once, noisy equipment and machinery, and other disturbances that can affect the health and wellbeing of users. These challenges require designers to consider a range of acoustic treatments and how they will impact the acoustic quality of the space and take greater care when selecting surfaces and building materials.

It can be difficult to focus and maintain attention spans when there is both internal noise from nearby spaces and external noise from outside sources. Reverberated noise in the internal environment can have a negative impact on productivity as well as mood and health if it is not controlled.

Over the years, acoustic ceiling products have proven to be an effective, go-to design solution to provide a quieter work or learning environment thanks to their ability to absorb sound over a large area. They have found applications in a variety of environments for both businesses (in work spaces, conference rooms, schools, restaurants and healthcare facilities) and residences (in home offices, home theatres and bedrooms).

In this whitepaper, we consider the importance of acoustics in modern building design and take a deep dive into design and material options for acoustic ceiling treatments.





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## WHY ACOUSTICS MATTER

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According to a growing body of research, poor acoustics can hinder our social interactions, limit workplace productivity, interfere with hospital recovery times, and reduce student learning. As we discuss below, the effects are wide and far reaching.

### Schools

In a learning environment, excess noise has been shown to negatively affect a student's ability to learn. For example, in one study, children's speech perception scores were consistently high in a quiet, enclosed classroom, but they dropped significantly in the noisiest open-plan classroom, especially for students who sat further away from the teacher.<sup>1</sup> Noise is also associated with stress-related factors in children's mental health,<sup>2</sup> and increased prevalence of symptoms of fatigue.<sup>3</sup>

Poor acoustics does not only hinder student performance and wellbeing, but also the ability for teachers to do their jobs effectively. In noisy classroom environments, teachers have reported being more distracted by noise, have greater difficulty with speech communication and believed children had difficulty hearing them.<sup>4</sup>

### Workplace

Acoustic sensory overload can be a detriment to productivity, satisfaction, and wellbeing, particularly in modern open-plan work environments. In a Finnish study comparing the perception

of workers in private rooms and open offices, it was found that open office workers experienced more stress symptoms, particularly overstrain and difficulties in concentration, due to office noise.<sup>5</sup> Individual productivity and wellbeing were particularly impacted, resulting in reduced quality of work, working overtime and greater exertion.<sup>6</sup>

These findings are backed up in other studies. For example, in studies conducted by furniture manufacturer Haworth, 70% of workers feel more productive in a less noisy environment with 50% of employers citing workplace acoustics to be a major interference on productivity.<sup>7</sup>

### Healthcare

The link between acoustic comfort and health is particularly important to consider in the design of healthcare facilities. Patients who are exposed to noise pollution may experience sleep disturbances, such as a reduction in sleep depth, consistency, or duration, as well as problems with their cardiovascular system, wound healing, and pain control.<sup>5</sup> Not only can poor acoustics compromise a patient's ability to heal, but it may also cause some people to withhold crucial medical information out of fear of being overheard.<sup>3</sup>

Hospital staff also suffer as a result of uncontrolled internal noise. Consequences include increased stress levels and fatigue, decreased job performance, hearing loss at high noise levels, general annoyance, and an increased rate of job burnout.<sup>8</sup>

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## WHY ACOUSTIC CEILINGS?

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Concrete and glass surfaces are more frequently used due to their aesthetic appeal, but these surfaces reflect sound and cause more reverberation, which results in poor sound quality and comfort. Reverberation time, which is the amount of time needed for sound to "fade away," is an important aspect of how a room sounds. A high reverberation time will cause a buildup of the noise level in a space and make it difficult to understand speech.

The addition of sound-absorbing materials improves comfort and productivity by reducing reverberation. It is no surprise that acoustic ceilings that absorb sound are extremely helpful for controlling noise levels in a space. Acoustic panels and

other similar treatments are significant tools for improving room acoustics, but they can get obstructed by furniture or other interior decorations. In comparison, an acoustic ceiling that spans across a room has the potential to make a greater impact.

Acoustic ceilings also lend themselves to easy installation. Modern suspension systems make it fast and easy for contractors to install acoustic ceilings. The additional benefit of acoustic ceilings is the growing number of contemporary designs that can add a striking, decorative element to a room or hide ductwork, electrical wires and other services. For these reasons, acoustic ceilings are a versatile design solution and a good choice for retrofits.

## TYPES OF ACOUSTIC CEILING TREATMENTS

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### Tiles.

Acoustic ceiling tiles are typically used in drop ceilings, where they are suspended below the actual ceiling, or directly attached to the ceiling. They work by blocking, diffusing and absorbing sound thus reducing reverberation and echo. Acoustic panels and tiles come in a wide variety of styles and designs to choose from.

### Rafts.

Acoustic rafts are horizontal sound absorption panels that hang from the ceiling. They are popular in commercial environments where it is not possible to fix acoustic ceiling tiles directly in place. Rafts provide absorption performance not only from the panel's face but also from its back. Available in a variety of shapes and profiles, they can be incorporated with your lighting design and also provide a decorative element to the room.

### Baffles.

Baffles are acoustic treatment panels that are suspended vertically from the ceiling. They are a great option for rooms that are large, have little wall space, or require materials to be out of reach. Due to the vertical installation of the product, sound is absorbed from both sides, increasing its ability to reduce reverberation.

## ACOUSTIC MATERIALS FOR CEILINGS

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### Mineral.

Mineral fibre acoustic systems are lower-priced and are mainly used in retail or office buildings. They are typically made from a mixture of naturally occurring, recycled and processed materials, including mineral wool, clay, perlite and recycled paper.

### Fibreglass.

A dense material with excellent sound-absorbing properties, fibreglass offers a wide variety of products and uses while looking pleasing to the eye. It is also generally easy to install, lightweight and widely available.

### Wood.

Despite not being the most sound-absorbing material, wood is a favorite among designers because there are so many species to choose from. Cork, Acoustic Plywood and Medium Density Fiberboard (MDF) are among the best wood types for acoustic applications.

### Specialty materials.

Acoustic foams, polyethylene felts, cementitious wood fibre, PVC stretch, and reinforced gypsum tiles are just a few examples of specialty ceiling materials. Due to their ability to disperse noise across various spaces, perforated panels are also frequently used in acoustic design.







## DESIGN CONSIDERATIONS

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### **The space itself.**

While closed plans will benefit from sound treatment, extra care must be taken to control noise in open-plan environments, which tend to suffer from excess noise and a lack of speech privacy. Open plenum ceilings also pose an acoustic challenge due to the amount of exposed hard surfaces, which can be addressed by specifying acoustic ceiling treatments. Other relevant considerations include how the space will be used, the shape of the space, what type of surfaces that form part of the room, and what sources of external and internal noise need to be controlled.

### **Sound rating.**

Acoustic ceiling products can be rated across several performance criteria. Sound absorption tends to be one of the most important design characteristics and is key to creating healthy and comfortable spaces for working, learning and healing. The Noise Reduction Coefficient (NRC) is used to measure the amount of sound absorption a material can offer; the higher the rating, the greater the sound absorption provided by the material.

### **Fire rating.**

Australian building regulations require the use of fire-resistant materials and sprinklers to minimise the spread of flame and smoke during a fire event. It is important to ensure the acoustic ceiling product has the required fire rating, and is tested and certified in accordance with the relevant Australian standards.

### **Sustainability.**

Property owners are prioritising sustainable design to positively impact the environment and stand out to future tenants.

Specifiers have access to a range of tools to evaluate and select products based on their environmental impact, including Environmental Product Declarations, sustainable product certifications, health and safety certifications, and eco-labels.

### **Colour and texture.**

Using acoustic ceilings allows for good sound absorption without compromising interior design. Products are available in a variety of colors and textures to meet any aesthetic, while some specialty solutions come with beautiful design features that make a massive visual as well as acoustic impact.

### **Shape.**

Ceiling materials can be manufactured into many different shapes to fit the preferred aesthetic vision including tiles, linear panels, grille and baffle, and cubes. The shape and configuration of the acoustic ceiling product can also be engineered to reflect distinctive types of sounds.

### **Light reflection.**

Highly reflecting materials increase the efficiency of lighting systems, particularly indirect lighting, while consuming less energy.

### **Durability.**

To ensure a long lifespan in commercial environments, consider materials that are impact resistant, scratch resistant and easy to clean and maintain. If the solution is being installed in a recreation or pool facility, it is important that it is able to withstand moisture and humidity without compromising aesthetics and performance.

## WHAT TO USE AND WHEN

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### **OWA Mineral Fibre Tiles**

OWA offers a range of suspended ceiling tiles made from mineral wool and their grids and accessories with different looks and acoustic capabilities. The Finetta and Constellation range, a cost-effective option with a fine fissure look, is especially suited to office environments. These products can be used in drop-in ceilings that provide easy access to the plenum, to maintain, change and replace, with a finish that disguises ceiling imperfection. It pairs these characteristics with good acoustic performance for noise control, increased speech intelligibility and reduced noise transmission between rooms.

The Sinfonia range combines high acoustic performance with premium aesthetics, making them the ideal option in offices, schools and healthcare environments. The Sinfonia range has a uniformed, clean, fleeced covered look, with many products in the range available with a concealed edge to provide a seamless, high-end modern look without a visible exposed T-Grid.

There are different products for specialised acoustic requirements, all with the same finish but with varying acoustic performance designed for specific areas. From Sinfonia Balance, with its all-round performance, and Sinfonia Privacy's high CAC to reduce noise transmission between rooms to Sinfonia Silencia's top-tier sound absorption capabilities and Sinfonia Humancare's cleanability and mould resistance, there is a solution for almost any acoustic problem.

### **Gyprock Plasterboard Tiles**

Gyprock offers a range of cost-effective suspended ceiling solutions, including Freshstone, Arctic White and Supatone Bright, for large ceiling spaces where durability and longevity are important. Available in crisp white or matt black finish, these tiles are sag-resistance, maintaining their crisp look for longer, and are also easy to maintain as they can be wiped down clean and

if required, can be easily removed and replaced. These solutions are suitable for a wide range of commercial building applications such as shopping centres, factories, warehouses, offices and retail spaces.

### **Martini dECO Polyester Ceiling Tiles**

When you want to add colour to a space, the Martini dECO range offers a variety of tones, textures and finishes. Engineered for high noise absorption properties for use in rooms with reverberation and echo, these products are good for the design-minded who want to increase acoustic comfort in open-plan offices, classrooms and retail spaces without compromising their aesthetic vision. With unique offerings such as dECO Quiet Panels and dECO Blades, you can match wall panel, blade colours and ceiling tiles for a harmonious and cohesive look.

The Martini dECO Ceiling Tiles are easy to install in drop-in suspension grids, and can be retrofitted into an existing space with an exposed grid. Made from up to 80% recycled PET fibre, these products also offer high fire resistance, achieving a Group 1 fire rating as tested to ISO 970, and excellent sustainability credentials.

### **Ecophon Glasswool Acoustic Tile**

Available in a broad selection of colors and finishes, Ecophon Glasswool Acoustic Tile are designed for specialty areas where high performance, high humidity resistance and cleanability is important such as hospitals and industrial workspace such as commercial kitchens. Products like Ecophon Hygiene Performance are appropriate for humid environments and resistant to advanced cleaning procedures (regular high pressure and steam cleaning). The surface is resistant to common cleaners, disinfectants, and bacteria, as well as mould. Additionally, it offers high absorption to lower noise levels that could disturb patients and staff, enhancing general comfort and accelerating healing.

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## ABOUT CSR HIMMEL

CSR Himmel aims to deliver smart spaces through a global product portfolio of ceilings, walls, aluminium and architectural hardware products, leading the way in aesthetic and acoustic solutions for both commercial and residential building spaces.



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