EXPOSED GRID CEILINGS

OPTIMISING PERFORMANCE, ACOUSTICS AND STRUCTURAL INTEGRITY

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This configuration allows for a modular, adaptable ceiling design that accommodates changing spatial layouts and service requirements over the building's life cycle.

INTRODUCTION

Exposed grid ceilings have become a defining feature of modern architecture. In these systems, the metal grid remains visible, functioning as both the ceiling's structural framework and a design. Ceiling tiles, acoustic panels, luminaires and other building services are integrated within the ceiling system, either suspended from the grid or fixed directly to the structure above. This configuration allows for a modular, adaptable ceiling design that accommodates changing spatial layouts and service requirements over the building's life cycle.

Effective design of exposed ceiling systems extends beyond selecting a grid and panel type. Exposed systems can introduce acoustic challenges, as reflective surfaces and unsealed plenums often amplify noise transmission. Compliance with relevant codes and standards, particularly those governing structural loading and seismic restraint, is essential to ensure safety and durability. Architects must also consider the coordination of suspended elements, ensuring that lighting, baffles and services are independently and securely supported.

This paper examines these considerations in detail, providing architects with a framework for specifying exposed grid ceilings that achieve both design intent and technical performance.

REGULATORY AND COMPLIANCE CONSIDERATIONS

National Construction Code (NCC)
The National Construction Code Volume 1 sets the overarching performance requirements for health, safety, amenity and sustainability in Australian buildings. For exposed grid ceilings, the NCC is relevant to fire performance (Section C), structural adequacy (Section B) and, in some building classes, acoustic separation (Section F).

AS/NZS 2785:2020 Suspended Ceilings – Design and Installation
AS/NZS 2785 defines the minimum requirements for the design, fixings, bracing, installation, maintenance and testing of suspended ceiling systems. It prescribes how the suspension grid, hangers/struts, fixings into the structure and attachments (tiles, acoustic/decorative panels, luminaires, services) must be selected, detailed, installed and anchored.

The 2020 version of this Standard introduces comprehensive requirements for the design and restraint of suspended ceilings under seismic actions, which is a significant update from earlier editions.

AS/NZS 1170: Structural Design Actions
The AS/NZS 1170 series sets out the actions (loads) that a building and its non-structural elements must be designed to resist. This includes dead load, live load, wind actions and earthquake actions. Suspended ceilings are considered non-structural building elements but must still be designed to withstand these actions without collapse, detachment or dangerous movement.

AS 1170.4 provides requirements for the seismic design of building structures and non-structural components in Australia. Exposed grid ceilings, light fittings, baffles and other suspended elements must be detailed so they remain supported and do not pose a hazard during seismic events. If your project is in New Zealand, the related standard is NZS 1170.5, but note this Standard is intended for a different seismic environment, and thus its requirements will differ from AS 1170.4.

Acoustic guidelines
Where the ceiling contributes to acoustic performance, the specification must address relevant project acoustic criteria. In education, healthcare, commercial workplace and public spaces, for example, this typically includes reverberation control, background noise limits and sound separation between zones. AS/NZS 2107:2016 sets out recommended design sound levels and reverberation times for building interiors.

Early consultation with manufacturers is essential to ensure that exposed ceiling systems meet all functional, compliance and aesthetic requirements.

ALUMINIUM AND STEEL CEILING GRIDS

The choice between steel and aluminium ceiling grids affects structural performance, corrosion resistance and maintenance. Steel has a significantly higher tensile strength and strength-to-weight ratio than aluminium. This makes it the ideal choice for large open spaces or areas where the grid system needs to support heavy fixtures like speakers, large light fixtures or HVAC components. In comparison, aluminium provides lighter weight and superior corrosion resistance, which is more advantageous in humid or high-moisture environments.

The long-term performance of ceiling grids depends on several factors, one of which is surface finishing. Finishes such as polymer-painted or powder-coated surfaces provide protection against oxidation, moisture ingress and general wear. In certain applications, particularly healthcare, antimicrobial coatings can offer additional protection by supporting hygiene and reducing microbial growth. Specifiers should ensure that coatings meet relevant durability standards and are suitable for the project's environmental conditions.

From a sustainability perspective, the embodied impact of ceiling grid materials and their recyclability/reusability are increasingly considered during specification. Ceiling system manufacturers, such as Rondo, often incorporate a proportion of recycled content in their products. Aluminium grids, while more energy-intensive to produce, are fully recyclable at end of life. Additionally, manufacturers such as Fricker design systems with reusable main runners, allowing joiner clips to be replaced without damaging the core structure.

Download EPDs in Construction: Building Transparency, Trust, and Sustainability to learn more about Environmental Product Declarations and their role in sustainable, evidence-based material specification.

UNDERSTANDING LOAD REQUIREMENTS

Dead loads (permanent loads)
Dead loads comprise the weight of ceiling components such as metal grids, acoustic panels, insulation and lighting tracks. Fixed elements like ductwork, conduits and mechanical systems should be independently suspended from the structure above, not from the ceiling grid. Integrated lighting and fire protection fittings should be confirmed as compatible with the ceiling's load capacity.

Live loads (variable loads)
Live loads are temporary or variable actions acting on the ceiling system. These may include maintenance access or suspended decorative elements such as planters, banners, digital signage and installations. Each must be assessed to ensure connection points comply with manufacturer-specified load limits.

Wind loads
Under the AS/NZS 1170 series, ceilings must be designed and braced to resist both positive and negative pressures, and account for internal air movement. For interior systems, this means ensuring grids, hangers and perimeter restraints can maintain stability under suction or uplift. Fixings must have adequate pull-out strength, and perimeter support and restraint details should be designed to prevent ceiling tiles from dislodging under wind or seismic actions.

Seismic loads
Ceiling systems must be detailed to prevent detachment or collapse during an earthquake. AS/NZS 2785:2020 requires suspended ceilings to include seismic-rated supports, perimeter restraints and bracing members designed in accordance with AS 1170.4. Components such as lighting and services must be independently supported. Ceiling systems must accommodate building drift and movement without failure of the grid or fixings.

DESIGN FOR STRUCTURAL PERFORMANCE

1. Select the ceiling grid system: Select an exposed grid system suited to the project application, such as Rondo DONN or DUO, which are designed for suspended ceiling tiles and lightweight acoustic panels. These systems provide flexibility and ease of installation but have limited load capacity, meaning heavier fixtures or services typically require additional reinforcement or independent suspension from the primary structure.

2. Calculate design actions (AS/NZS 1170): Assess the ceiling's design actions (i.e. dead, live, wind and seismic loads) in accordance with the AS/NZS 1170 series. This establishes the basis for determining allowable loads on the grid, hangers and fixings. The calculation should consider the ceiling's own weight, attached components and environmental factors such as air pressure or seismic zone classification.

3. Determine load capacity: Refer to the manufacturer's structural capacities for main runners, cross tees and hangers, and confirm that they align with the calculated design actions under AS/NZS 1170. Specify heavy-duty components where higher loads are expected and ensure mechanical and electrical services do not exceed allowable point loads. Heavier services must be independently supported from the structure above rather than suspended from the ceiling grid.

4. Coordinate load transfer and structural anchoring: Where imposed loads exceed the ceiling grid's capacity, fix suspended items directly to primary structural elements such as beams, trusses or concrete slabs. Use supplementary steel angles, channels or framing to distribute loads across multiple suspension points. Consider double hanger systems to reduce bending and long-term deflection.

5. Provide restraint and bracing: Specify lateral bracing to prevent movement or detachment of suspended components, particularly in areas of high wind loads or where the supporting structure is subject to greater movement (e.g., large inter-storey drift). Incorporate seismic retention clips or equivalent restraint hardware to prevent tiles and fixtures from disengaging during seismic movement. Document perimeter restraint and support details in accordance with AS/NZS 2785:2020 to ensure ceiling tiles remain seated under wind or seismic actions.

IMPROVING ACOUSTICS

Exposed ceiling systems can present acoustic challenges due to the lack of continuous absorptive surfaces, with exposed hard materials and services increasing sound reflection and causing longer reverberation times and reduced speech intelligibility. To improve performance, suspended acoustic treatments, such as clouds, baffles or rafts, can be integrated into the ceiling design to absorb sound energy, reduce echo and enhance acoustic comfort:

- **Acoustic clouds:** Horizontally suspended panels that absorb sound from multiple directions. Available in various forms and materials, including fabric-wrapped and PET-based panels. Suitable for offices, atriums, lobbies and hospitality spaces where controlling overhead sound reflections is essential.

- **Acoustic baffles:** Vertically suspended panels designed to absorb sound and reduce reverberation in large or open spaces. Their vertical orientation allows sound absorption from both sides. Baffles can be configured to balance acoustic performance with HVAC and lighting requirements. Commonly used in corporate offices, educational facilities, auditoriums and conference rooms.

- **Acoustic rafts:** Horizontally suspended panels that provide broad-spectrum sound absorption across open areas by absorbing sound on both their face and perimeter surfaces. They can be installed as individual decorative features or arranged in grid formations to achieve targeted acoustic control. Because they allow air circulation and lighting integration, rafts are best suited for large meeting rooms, call centres and open-plan offices where maintaining ceiling openness is a priority.

When specifying acoustic treatments, performance should be verified through measurable acoustic criteria. A **Noise Reduction Coefficient (NRC)** of 0.75 to 1.00 is recommended for effective absorption. A **Ceiling Attenuation Class (CAC)** of 35 or greater typically denotes a high-performing ceiling system capable of supporting speech privacy between adjoining spaces. This performance level is generally preferred in commercial and office settings where acoustic separation contributes to occupant comfort and productivity. Selecting treatments with tested NRC and CAC values helps ensure compliance with acoustic targets.

SUSPENDED ATTACHMENTS

While acoustic treatments and decorative elements enhance performance and aesthetics in exposed ceiling environments, their installation must comply with structural load requirements and approved suspension systems. All suspended fixtures, such as lighting, acoustic panels and feature elements, should be verified against manufacturer load tables to ensure the grid and hangers can safely support the imposed loads.

Seismic-rated attachments and restraint clips must be used to prevent detachment or displacement during seismic events. Where heavier fixtures are specified, grid reinforcement may be required, including additional bracing, secondary framing or direct-fix suspension to structural elements such as beams or slabs. Spring clips, seismic retention clips and direct-fix straps help secure fixtures while allowing for controlled movement under load.

Ceiling layouts should also facilitate service access for HVAC and electrical maintenance. This includes coordinating fixture placement, access panels and removable elements to ensure that ongoing inspection and servicing can occur without compromising ceiling integrity or safety.

CEILING TILES FOR EXPOSED CEILINGS

In exposed grid systems, ceiling tiles play both a functional and aesthetic role in that they provide acoustic control, fire and moisture resistance and light reflectance while providing a clean, modern appearance. When specifying ceiling tiles, consider the following key factors:

Material options

- **Mineral fibre:** Excellent acoustic absorption and fire performance.
- **Plasterboard:** Durable and suited for aesthetic integration with acoustic backing.
- **Glasswool:** Provides excellent acoustic absorption and thermal insulation and can be used as a ceiling tile or backing material to enhance overall system performance.
- **Timber veneer or wood-look tiles:** Provide warmth and texture while supporting acoustic control when perforated or backed.

Performance requirements

- **Acoustic performance:** Select tiles with suitable NRC and CAC values.
- **Fire resistance:** Confirm compliance with NCC and AS/NZS fire performance standards. Note that a fire-resistant tile alone does not make the entire ceiling system fire-resistant; overall system performance depends on the complete assembly and its tested configuration.
- **Moisture resistance:** Ceiling tiles are rated for humidity resistance, which indicates their ability to maintain shape and strength under high relative humidity (RH). Tiles rated up to 90-100% RH are suitable for humid areas such as bathrooms and kitchens.
- **Low-VOC emissions:** Specify tiles tested for indoor air quality compliance (e.g., GreenTag or GECA).
- **Light Reflectance Value (LRV):** Choose high-LRV tiles to improve brightness and energy efficiency in interior spaces.

Size and dimensions

- **Weight and thickness:** Ensure compatibility with grid system load limits and hanger spacing.
- **Tile size and edge detail:** Verify fit within the chosen grid profile.

Installation and maintenance

- **Lay-in tiles:** Drop-in type panels for standard T-bar or tee grids; allow easy access to ceiling voids.
- **Clips and restraints:** Use hold-down clips or seismic restraints where required for wind uplift, fire-rated systems or seismic compliance.

CEILING TILES FOR EXPOSED CEILINGS

Selecting the right exposed ceiling system involves aligning design intent, performance requirements and compliance with NCC. Architects should assess project-specific priorities such as durability, acoustics, fire performance, structural design, seismic performance and service accessibility to determine the most suitable combination of materials and systems.

Early consultation with manufacturers is essential to ensure that exposed ceiling systems meet all functional, compliance and aesthetic requirements. Verified test data, load capacities and detailing should be considered during specification to reduce risk and ensure compliance. Coordination is critical to avoid clashes with services and ensure ceiling elements are safely suspended and maintain long-term performance.

A wide range of integrated ceiling and acoustic solutions are available within the Himmel and Rondo family of brands, enabling architects to specify complete, tested systems:

- **Rondo:** DONN and DUO grid systems designed for exposed ceilings, providing engineered strength, seismic-rated components and compatibility with a variety of tile types.
- **Fricker:** Aluminium grid systems designed for modular suspended ceilings with a long service life and reusability of main runners.
- **Gyprock:** Plasterboard ceiling tiles offering a variety of profiles and finishes combined with proven performance for acoustic and fire-rated applications.
- **OWA:** Acoustic ceiling tiles with high NRC and CAC ratings for noise control and visual consistency.
- **Ecophon:** Acoustic ceiling tiles and wall coverings designed for sound absorption and interior comfort.
- **Martini:** dECO Collection decorative ceiling panels supporting both aesthetics and sound management.
- **Troldtekt:** Natural wood-based ceiling tiles and wall panels providing durable, sustainable acoustic performance.

Together, these systems enable architects and specifiers to achieve lasting performance and ensure that exposed ceiling systems not only meet technical requirements but also enhance the spatial and acoustic quality of every project.

About Himmel Interior Systems & Rondo

CSR Himmel Interior Systems is the leading Australian brand in aesthetic and acoustic interior solutions for Australian commercial buildings. Himmel distributes a wide range of trusted brands essential to the commercial building and design industry. Among them is Rondo, a recognised leader in ceiling and wall framing systems that complement Himmel's ceiling, acoustic and interior product portfolio.

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