

Light Quality

Healthy

Credit: 11

Points: 4

Outcome

The building provides good daylight and its lighting is of high quality.

Criteria

Minimum Expectation	Nil	<ul style="list-style-type: none"> • Lighting within the building meets minimum comfort requirements. • Good lighting levels suitable for the typical tasks in each space are available. • The building provides adequate levels of daylight.
Credit Achievement	2 points	<p>In addition to the <i>Minimum Expectation</i>:</p> <ul style="list-style-type: none"> • The building provides best practice artificial lighting. or • The building provides best practice access to daylight.
Exceptional Performance	2 point	<p>In conjunction with the <i>Credit Achievement</i>:</p> <ul style="list-style-type: none"> • The building provides best practice artificial lighting. • The building provides best practice access to daylight.

Additional information

Stage implementation

Strategy Brief **Concept** Design Tender Construction Handover Use

Synergies with other credits

- Amenity and Comfort
- Verification and Handover

Sustainable Development Goals

- Goal 3 (Good Health and Wellbeing)

Relevant reporting initiatives

- None

Regularly occupied areas

This credit applies to all regularly occupied areas in the building (unless specified in credit requirements) – those continuously occupied or occupied for more than two hours (previously known as ‘primary’ and ‘secondary’ spaces) including living and sleeping areas. Areas that are either transient or accessed intermittently such as corridors, storage, back of house or plant rooms can be excluded. Spaces can also be excluded if the use of the space (for example, a laboratory) justifies specific conditions – a Technical Question must be submitted to the NZGBC for confirmation. Compliance is required to be demonstrated across at least 95% of the regularly occupied areas for this credit to be achieved.

Requirements

Minimum Expectation

The project must comply with **all three** of the following criteria:

- Lighting Comfort
- Glare from Light Sources
- Daylight

Lighting Comfort

Lighting within the building must meet the following requirements:

- All LED lighting installed across the whole project has no observable effect as per the standard IEEE 1789-2015 - IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers
- Light sources must have a minimum Colour Rendering Index (CRI) 85 or higher, in all internal and external applications
- Light sources must meet best practice illuminance levels for each task within each space type with a maintained illuminance that meets the levels recommended in AS/NZS 1680.1:2006 series applicable to the project type and including maintenance
- The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS/NZS 1680.1:2006, with a maintenance factor method as defined in AS/NZS 1680.4
- All light sources must have a MacAdam Ellipse or a Standard Deviation Colour Matching (SDCM) of 3 or lower.

Glare from Light Sources

Glare from light sources must be limited within the regularly occupied areas. Three options are provided for demonstrating compliance with this requirement: a performance method, and two prescriptive methods. A combination of methods can be used to demonstrate compliance to suit different spaces.

Prescriptive method 1

Bare light sources must be fitted with baffles, louvers, translucent diffusers, ceiling design, or other means that obscures the direct light source from normal viewing angles of occupants, including occupants looking directly upwards such as sleeping areas, subject to the occupancy of the space. The lighting density should be controlled to avoid sudden brightness and contrasts from normal viewing angles of occupants.

Alternatively, for LED luminaires in spaces where normal viewing angles are generally horizontal, the Unified Glare Rating (UGR), as estimated from the manufacturers data sheets for a standard room, must not exceed the maximum values listed in Table 8.2 of AS/NZS 1680.1:2006.

Prescriptive method 2	Where the nature of the tasks, layout, and surface reflectance in a space are not known (e.g., shell and core) the lighting system must comply with the Luminaire selection system as detailed in Clause 8.3.4 of AS/NZS 1680.1:2006.
Performance method	<p>The Unified Glare Rating (UGR) calculated for the lighting on a representative floor must not exceed the maximum values listed in Table 8.2 of AS/NZS 1680.1:2006.</p> <p>The UGR must be calculated in accordance with the procedure outlined in Clause 8.3.3 of AS/NZS 1680.1:2006.</p> <p>The project team may nominate a grid for the calculation based on the specific requirements of the project.</p>

Daylight

This *Minimum Expectation* aims to ensure the building is providing daylight access to building occupants through solutions that exceed the typical relevant federal, state, or local regulations.

The project team is required to show how the building's design:

- Maximises the number of occupants that are in or near daylit areas during their daily activities for all building types
- Ensures regularly occupied areas are in reasonable proximity to glazed façades, windows, or skylights
- Controls or mitigates external glare in the daylit spaces
- Maximises daylight to spaces that prioritise learning, healing, and living:
 - For schools, how all classrooms have access to a view and daylight
 - For hospitals, how all areas where patients are expected to remain for longer than two hours have access to a view and daylight
 - For apartments, how in 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight.
- Provides building occupants with unrestricted access to daylit indoor public common spaces

As part of the submission, the project team is required to submit:

- A narrative describing the building's daylight, view, and external glare control strategy
- A simple calculation of the amount of space that has adequate daylight as a proportion of the total regularly occupied areas of the building
- An assessment against the five requirements above

Where the above requirements are unable to be met, the project team must:

- Outline the barriers to achieving the requirements and the measures taken to mitigate loss of daylight quality for occupants

Credit Achievement

In addition to the *Minimum Expectation*, the project must comply with **one** of the following criteria:

- Artificial Lighting
- Daylight

Artificial Lighting

The artificial lighting solution must address the quality of light in the space, provide highlights and contrasts, and seek to avoid excessive lighting or overly uniform solutions.

- Horizontal illuminance levels must meet or exceed the recommended levels in AS/NZS 1680 for the relevant task for at least 90% of the GFA

- At least one wall in the field of view of a regularly occupied area is to be illuminated to create demonstrable contrast and visual interest. The total area of illuminated wall must represent at least 20% of the area of walls in the field of view
- Vertical illuminance in all regularly occupied workplaces (e.g., offices, retail counters, etc), ensure that 50% of the horizontal task illuminance reaches the average eye height for 90% of primary spaces using vertical illuminance calculation grid.

The illuminance values must be calculated in accordance with AS/NZS 1680 series for the relevant task. Where unknown, a conservative estimate can be used. The illuminance values are maintained illuminance values and must be calculated using all of the maintenance factors as defined in the standard.

The lighting solution should provide for highlights of colour and contrast across multiple spaces. The contrast between spaces should not exceed the maximum luminance ratios as defined in AS 1680.1 Table 3.2 for visual task, immediate surrounds, and general surrounds.

Daylight

Daylight levels

For non-residential buildings, at least 40% of the regularly occupied areas across the building must receive high levels of daylight with no less than 20% on any floor or tenancy (whichever is smaller).

For dwellings, 60% of the combined living and bedroom area of each unit must comply with the daylight requirements. Kitchens are not included in the calculations. The daylight levels must also be present in at least 20% of the area of each bedroom and living area.

Daylight must be calculated using Daylight Autonomy.

External glare control

Glare from sunlight through all viewing façades and skylights must be reduced through a combination of blinds, screens, fixed devices, or other means. Three options are provided for demonstrating compliance with this requirement: a performance method, and two prescriptive methods. A combination of methods can be used to demonstrate compliance to suit different spaces.

Dwellings must provide room blackout blinds or curtains to all bedrooms. If blinds or curtains are part of a packaged décor, blackout blinds must be offered as standard inclusion.

Prescriptive method 1 – fixed shading devices	For viewing facades (except skylights) the nominated plane is at ground level and is a narrow band along the entire length of viewing façade, 1.5m in from the viewing façade. For skylights, the nominated plane is the skylight. The nominated plane must be shown to be shaded from direct sunlight for 80% of the nominated hours for each day of the autumn and spring equinoxes and the summer and winter solstices.
Prescriptive method 2 – blinds or screens	<p>All blinds or screens in the regularly occupied areas must meet the following requirements:</p> <ul style="list-style-type: none"> • The blinds must provide glare reduction to at least 95% of the area of viewing façades and skylights • Blinds must be controlled by all affected occupants within each individual space • Blinds must have a visual light transmittance (VLT) of $\leq 10\%$. <p>Manual or automated internal, in-glazing, or external blinds can be used. Where automated blinds are used, they must be controlled either by a management system or by a manually activated switch. If blinds and screens are automatically controlled, they must also be equipped with a manual override function accessible by occupants in each of the adjacent spaces served.</p>
Performance method	For this option, modelling can be used to demonstrate that any combination of tinted glazing, fixed shading devices and other solutions will meet the <i>Minimum Expectation</i> , provided that the model shows that the combined solution results in a reduction of glare equivalent to that achieved by the prescriptive methods.

Exceptional Performance

In conjunction with the *Credit Achievement*, the project must comply with **both** of the following criteria:

- Artificial Lighting
- Daylight

See *Credit Achievement* requirements for further information.

Submission content

Submissions for this credit must contain:

- **Submission form**
- **Evidence** to support claims made in the submission

Recommended evidence:

- Daylight modelling report or manual calculations
- Lighting Drawings
- Architectural Drawings
- Lighting Specifications/Schedules
- Product Data Sheets
- Isolux Plot Drawings

Alternate documentation can also be used by project teams to demonstrate compliance.

The recommended evidence listed above is applicable to the as built submission. See the *Design Assessment* section in the Introduction for more information on submitting evidence for the Design assessment.

The key requirement is that evidence is provided to support each claim made within the Submission form.

Guidance

Exclusions to the CRI

There are no exclusions to the CRI requirement for internal lighting. Exterior lighting not using LED may seek to justify an exemption in accordance with AS1158 via a Technical Question.

Space and activity types

Guidance for lighting levels for different space types and activity types are listed in AS/NZS 1680.1:2006. Where recommended maintained illuminance values for a particular space are not specified, the values to be used must relate to the closest type of task as defined in AS/NZS 1680.1:2006 Table 3.1.

Glare control for daylight

Tinted glazing, fixed shading devices, or blinds and screens are acceptable methods of managing glare.

Daylight access – Minimum Expectation

For the purposes of the minimum expectations, project teams can use the *Green Star Daylight and Views Hand Calculation Guide* when calculating the compliant spaces for daylight and views

Calculating daylight autonomy

Calculations must be completed for at least every hour during the nominated hours. There are a number of dynamic simulation software programs that can be used to show compliance with the credit criteria. Daysim, ESP-r, Lightswitch Wizard, and SPOT (>Ver 4.0) can be used. Where other programs are used, the project team must demonstrate that the software is based on the Radiance

simulation engine, and that it uses the statistical sky, the daylight coefficients and Perez All Weather Sky model, or the annual CIE sky simulation algorithms.

High levels of daylight

High levels of daylight are deemed to have at least 160 lux due to daylight during 80% of the nominated hours.

Nominated hours

Nominated hours shall be defined by the project team. The project team shall provide a summary of space types, uses, and nominated hours. Projects that are operational outside of daylight hours only need to demonstrate compliance for operational daylight hours.

Vertical illuminance in workspaces

This criterion is applicable to all building types where an occupant is expected to work. For example, it would apply in the office component of an industrial facility or at the checkout of a retail store.

Fitout Scope – *Minimum Expectation*

Project teams may use a Tenancy Fitout Guide and Model Lease Clauses to demonstrate compliance for any cold shell or excluded tenancy spaces in the *Minimum Expectation* only. Any fitout works within the scope of the rating, including those used to target *Credit Achievement* or *Exceptional Performance* must meet the requirements for *Minimum Expectation*.

Fitout scope – *Credit Achievement* or *Exceptional Performance*

Projects must include tenant fitouts for at least 80% of GFA to target points in the *Credit Achievement* – Artificial Lighting requirement. For any remaining excluded tenancies or cold shell spaces, project teams must provide a Tenancy Fitout Guide and Model Lease Clauses. For more information, see the Fitout Scope section.

Supporting information

The following resources support this credit:

- AS1680 series
- AS/NZS 1158
- IEEE 1789-2015 - IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers