

## UNIVERSAL DESIGN: LIGHTING

### INTRODUCTION

Lighting, natural or artificial, can assist people to orient themselves and navigate through the built environment. However, too much or too little lighting can affect visual acuity, cause inconvenience or discomfort, and potentially be unsafe and cause injury. Standards include both requirements and recommendations on the appropriate illumination levels for different spaces depending on their use.

### STANDARDS

The NCC outlines the Deemed-to-Satisfy provisions for natural and artificial lighting under BCA F6 in Volume One and BCA H4D6 in Volume Two. Performance requirements F6P2 in Volume One and H4P4 in Volume Two also note that artificial lighting must be installed to provide an illuminance of not less than 20 lux appropriate to the function or use of the building to enable safe movement by occupants.

Both AS 1428.2 and AS 1428.5 require provision of adequate lighting to enable lip reading and sign language communication. AS 1428.2 notes a minimum illumination level of 150 lux without glare should be maintained, and AS 1428.5 notes a minimum illumination of 240 lux for signage and 160 lux generally, where no higher illumination level is specified by AS/NZS 1680.1 and AS/NZS 1158. AS 1428.5 also requires even lighting levels to avoid illuminance variations and shadows, and minimisation of glare and unwanted reflections.

The AS/NZS 1680 series outlines recommendations for interior lighting. These recommendations presume that occupants do not have any visual impairment. AS/NZS 1680.0 echoes the NCC's requirement for a minimum illuminance of at least 20 lux throughout the space for safe movement. Table 3.1 of AS/NZS 1680.1 sets out the recommended minimum illuminance levels for various types of tasks, activities or interiors. Recommendations for lighting levels for specific applications, including office, educational, industrial, and medical tasks, are detailed in the AS/NZS 1680.2 parts.

AS 4299 requires an even degree of light, particularly along paths of travel, to be provided throughout the building. Use of dimmer switches and non-glare lighting which is easy-to-change or has a long-life light source is recommended. Natural lighting is encouraged in laundries and hallways. AS 4299 defers to the minimum maintenance illuminance levels under AS/NZS 1680.1 but notes a minimum illumination of 150 lux as being suitable in most instances. AS 4299 Table 4.1 outlines recommended illumination levels in typical residential areas for people with vision impairment.

### APPLICATION OF UNIVERSAL DESIGN

How can universal design be applied to lighting?

- Provide adequate illumination so the user can clearly identify obstacles and hazards. Consider the colour temperature and direction of lighting as this may cause certain building elements to be harder to see or discern from the background.
- Maintain uniform illumination where possible.
- Avoid harsh, direct lighting which may cause glare, discomfort and visual fatigue. Consider diffuse lighting, anti-glare devices, fixed and adjustable shading devices and other forms of lighting control by the user.
- Locate lighting at an appropriate height, e.g. strip lighting installed under cupboards may be problematic for people with a lower vantage point. Height also affects the ease of changing lamps.
- Locate controls at an appropriate height. Consider push pads which may be easier to operate or dimmer switches which allow variable illumination levels to assist with visual acuity.
- Provide supplementary lighting where appropriate, e.g. near grab rails, at low or ground level, and if motion sensor activated lighting, e.g. in bathrooms and outdoor areas.



#### Universal design

Universal design is the design of buildings, products or environments to make them accessible and usable to all people of different ages and abilities over time, without the need for adaptation or specialised design.

#### Relevant standards

NCC Volume One

- BCA F6 *Light and ventilation*.

NCC Volume Two

- BCA H4D6 *Light*.

AS/NZS 1158 *Lighting for roads and public spaces*.

AS 1428 *Design for access and mobility*

Part 2: *General requirements for access - Enhanced and additional requirements - Buildings and facilities*.

Part 5: *Communication for people who are deaf and hearing impaired*.

AS/NZS 1680 *Interior and workplace lighting*.

Part 0: *Safe movement*.

Part 1: *General principles and recommendations*.

Part 2.1: *Specific applications - Circulation spaces and other general areas*.

Part 2.2: *Specific applications - Office and screen based tasks*.

Part 2.3: *Specific applications - Educational and training facilities*.

Part 2.4: *Industrial tasks and processes*.

Part 2.5: *Hospital and medical tasks*.

Part 5: *Outdoor workplace lighting*.

AS 2560 *Sports lighting*.

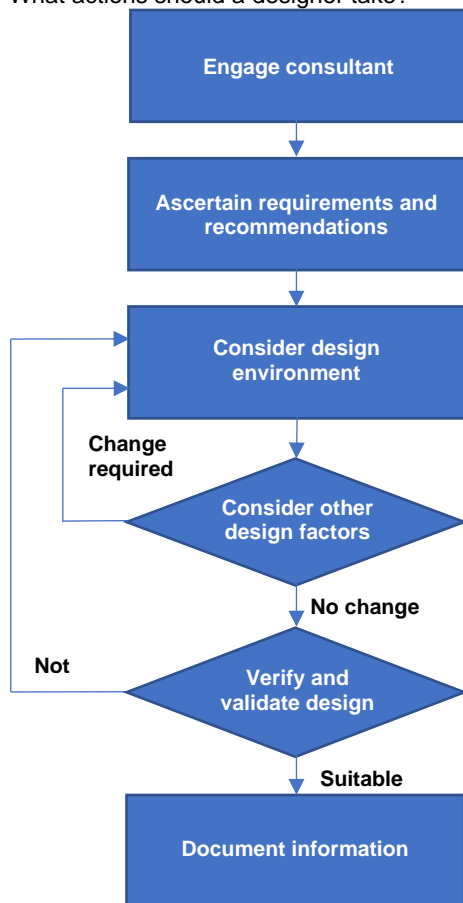
AS/NZS 4282 *Control of the obtrusive effects of outdoor lighting*.

AS 4299 *Adaptable housing*.

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### DESIGN PROCESS

What actions should a designer take?



#### Actions prior to design:

- Consult independent specialist if appropriate. Typically required for medium to large projects. If required, consultation and engagement may take place earlier

#### Requirements/Recommendation:

- BCA F6 or BCA H4D6.
- AS 1428.2 & AS 1428.5.
- AS 1680 series.
- Universal design.  
e.g. LHDG performance level.

#### Considerations may include:

- Building class.
- Building orientation.
- Spatial requirements.
- User type and activity.

#### Considerations may include:

- Function of lighting (ambient, task, accent).
- Product selection (luminaires and surface finishes).
- Security.

#### Confirm suitability in relation to:

- Statutory requirements.
- Design brief/client requirements.

#### Actions following review:

- Document design process and compliance information.

### Relevant documents

*Livable Housing Design Guidelines*, Livable Housing Australia

#### NATSPEC TECHnotes

- *DES 037 Accessible housing*
- *DES 038 Universal design: Introduction*
- *DES 039 Universal design: Slip resistance*
- *DES 040 Universal design: Trip avoidance*
- *DES 043 Universal design: Wayfinding*
- *DES 046 Universal design: Acoustics*

### Relevant worksections

*0451 Windows and glazed doors*

*0456 Louvre windows*

*0671 Painting*

*0902 Electrical design and install*

*0951 Lighting*

### OTHER CONSIDERATIONS

The designer should also consider the following:

- Lighting types vary in performance and lifespan. Lamps can also vary in colour temperature, which can affect visual acuity.
- Brighter does not necessarily equate to a better performance or environment. Bright lights and over illumination may cause glare and discomfort for those with light sensitivity. In external spaces, night lighting can be obtrusive and contribute to light pollution. Lighting and illumination levels should be suitable for the purpose or task.
- Inadequate illumination lowers visual acuity and the ability to identify hazards and obstructions. It also lowers the ability to discern building elements that are designed to have luminance contrast, e.g. stair treads. People who have a hearing impairment may rely on there being adequate illumination to discern lip reading or sign language.
- Shared or public areas are likely to be maintained by a facilities management company. Facilities may not be managed around the clock and lighting may be insufficient or replaced infrequently and hazards may not be attended to promptly. Flashing lights can cause adverse health effects.
- Improvements in lighting may have an added benefit of improved security.
- Lighting can be designed or set to operate on a circadian friendly cycle, which can vary from person to person.
- Manual overrides should ideally still be available in automatic sensor operated spaces to allow users to adjust lighting and illumination levels.
- Strong contrast between lighting in adjacent areas may be appropriate in certain cases, e.g. to create visual interest and for wayfinding. It is not as appropriate for task lighting as it can contribute to visual strain and fatigue.
- Consider the effect of lighting on different materials and finishes, e.g. glossy materials can reflect light and cause glare.