

Australian/New Zealand Standard™

Interior and workplace lighting

Part 5: Outdoor workplace lighting



AS/NZS 1680.5:2012

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee LG-001, Interior and Workplace Lighting.

This Standard forms Part 5 of the AS/(NZS) 1680 series, which covers lighting of interiors and workplaces. It is intended to be read in conjunction with the general recommendations and requirements of AS/NZS 1680.1:2006 and the structures of the two Standards are closely aligned to facilitate this.

The AS/(NZS) 1680 series currently consists of the following:

AS/(NZS)

1680	Interior and workplace lighting
1680.0	Part 0: Safe movement
1680.1	Part 1: General principles and recommendations
1680.2.1	Part 2.1: Circulation spaces and other general areas
1680.2.2	Part 2.2: Office and screen-based tasks
1680.2.3	Part 2.3: Educational and training facilities
1680.2.4	Part 2.4: Industrial tasks and processes
1680.2.5	Part 2.5: Hospital and medical tasks
1680.3	Part 3: Measurement, calculation and presentation of photometric data
1680.4	Part 4: Maintenance of electric lighting systems
1680.5	Part 5: Outdoor workplace lighting (this Standard)

NOTE: Until the revision of this series is complete, some of the above Standards might have, as a main title, 'Interior lighting'.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard Interior and workplace lighting

Part 5: Outdoor workplace lighting

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements, general principles and recommendations for the permanent lighting of exterior workplaces. It applies to exteriors in which specific visual tasks are undertaken. It applies only when this area is being used as a workplace. The provisions have the object of producing a visual environment in which essential task details are made easy to see and adverse factors that may cause visual discomfort are either excluded or appropriately controlled.

Recommendations for the lighting of interiors or activities are provided in AS/NZS 1680.1 and the AS(NZS) 1680.2 series.

This Standard generally does not address:

- (a) Outdoor workplaces that are temporary and short term, e.g. emergency road or service repair. However, the recommendations in this Standard should be considered in selecting and locating the temporary lighting. Clause 4.1.2 contains specific considerations for the directional effects of lighting.
- (b) Any outdoor work area covered by a roof. Such work areas should be designed in accordance with AS/NZS 1680.1 and the AS(NZS) 1680.2 series. Refer also to AS/NZS 1680.0 for basic requirements for safe movement.
- (c) Lighting for the purposes of decoration, display, entertainment, dining, sport or security (including CCTV).
- (d) Lighting of Category V roads as defined in AS/NZS 1158.1.1.
- (e) Lighting for individual industries, such as airports, surface mines, chemical plants and railway stations. Many industries have internal or other lighting standards. However, in the absence of particular advice, the recommendations in this Standard should be considered.
- (f) Daylight design of exterior workplaces.

NOTE: Attention is drawn to the AS/NZS 2293 series, which sets out requirements for the lighting necessary to alleviate panic and to permit safe evacuation of the workplace should this be required in the event of loss of the normal lighting.

1.2 OBJECTIVE

The objective of this Standard is to provide the reader with an explanation of the factors relevant to exterior lighting and with recommendations and guidance in dealing with these factors. The intent of this guidance is to facilitate the creation of visual environments that exclude or, at least, control visual fatigue and thereby promote efficiency and wellbeing in the illuminated space.

The major purposes of the lighting covered in this Standard are to assist occupants to orientate themselves, detect potential hazards and perform work-related visual tasks in a comfortable, efficient, accurate and safe manner.

This Standard does not specify precise types and arrangements of lighting equipment necessary to meet the recommendations and it is anticipated that the technical knowledge and experience of a qualified lighting designer/engineer will normally be required to apply this Standard and create the most suitable lighting scheme for any particular exterior workplace.

Although the principles explained in this document are applicable to all aspects of exterior workplace lighting, this Standard is specifically intended for task-oriented and general movement lighting.

1.3 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix A.

NOTE: A number of additional documents that are considered useful sources of information are listed in Appendix C.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 2633, AS 1852(845) and those below apply.

1.4.1 Average illuminance

For a specified surface area (e.g. a particular task area, the surface or plane on which tasks may be placed) the arithmetic mean of the illuminance values, calculated or measured as applicable, from within the area.

(Refer also to Appendix B for details regarding the choice of the illuminance values to be averaged.)

1.4.2 General outdoor task

General tasks encountered in outdoor workplaces, including movement and orientation, loading and unloading a vehicle and some assembly work.

1.4.3 General outdoor task illuminance

The value of maintained illuminance that is recommended for a general outdoor visual task.

1.4.4 Initial illuminance

The value of average illuminance that is initially provided by the lighting system, i.e. with new lamps (aged to 100 h), clean luminaires and room surfaces.

1.4.5 Maintained illuminance

The defined level below that the average illuminance on any surface or plane is not allowed to fall. It is the minimum illuminance at which maintenance operations, such as replacing lamps and cleaning the luminaires and any surrounding surfaces, are to be carried out.

1.4.6 Outdoor circulation tasks

Vehicle and pedestrian movement-only tasks and outdoor car parking areas.

1.4.7 Specific outdoor task

An outdoor workplace task that is not a general outdoor or outdoor circulation task.

1.4.8 Specific outdoor task illuminance

The value of maintained illuminance that is recommended for a specific visual task. Recommended values are given in AS/NZS 1680.1 and for specific tasks in the various parts of the AS(NZS) 1680.2 series.

1.4.9 Uniformity of general outdoor task illuminance

The ratio of the maximum illuminance to the average illuminance on a given plane within the calculation area.

When determining the uniformity of illuminance for general lighting systems, the maximum illuminance considered is the highest value of the grid of calculated illuminances within the applicable calculation area.

SECTION 2 GENERAL OBJECTIVES OF GOOD OUTDOOR LIGHTING

2.1 GENERAL

The principles of Section 2 of AS/NZS 1680.1 apply with the addition of the following:

2.2 THE IMPORTANCE OF QUALITY OUTDOOR WORKPLACE LIGHTING

The simplest interpretation of providing lighting to a visual task is to provide 'light', i.e. illuminance. This leads to a simplistic but commonly held view that the only solution to any lighting problem is to provide more illuminance.

However, while merely supplying some specified quantity of light might provide an adequate viewing environment for simple viewing tasks, such an approach will rarely provide optimum viewing conditions and for more complex or detailed tasks will not meet even basic criteria.

While the provision of sufficient illuminance on the task is a necessary element, in many instances task visibility depends heavily on the way in which the light is applied. Critical factors are the luminance contrast of the task and luminance adaptation level of the observer. Further, creation of the comfortable visual conditions which people require in order to maintain efficiency over a period of time depends on factors such as the distribution of light throughout the space, the use of suitable colours and finishes on any relevant reflecting surfaces, the choice of luminaires with adequate glare control, and the elimination of unwanted reflection.

Attention to all of these factors produces 'good quality lighting'. Experience has shown that when inefficiency, eye fatigue, spoilt work or accidents are blamed on the lighting system, failure to meet one or more of the 'quality' recommendations is often a significant part of the problem and insufficient illuminance is either a contributing factor only or not an issue at all.

2.3 OBJECTIVES OF AN OUTDOOR LIGHTING SYSTEM

2.3.1 Outline

The objective of a lighting system in a given work area (typically a site or specific part of a site) is to contribute to the provision of the following in relation to the intended users of the space:

- (a) Safety.
- (b) Performance of physical tasks.
- (c) An appropriate visual environment.

The emphasis on each of these aspects will vary for different spaces and even within spaces.

Consideration of the above aspects is particularly important where visual tasks are critical and prolonged or are carried out under conditions of stress.

2.3.2 Specific considerations

2.3.2.1 *Safety*

The primary contribution of lighting to the safety of the users in a space consists of facilitating the recognition of hazards (such as obstacles or moving parts), both in general and in relation to specific physical tasks, and in illuminating safety warning signs and safe pathways within the space.

Allowing users of the space to avoid conditions such as mental fatigue and eye strain, especially in potentially hazardous environments, is a secondary safety benefit of good lighting.

To provide lighting for safety purposes, the specific details to be considered are as set out in Clauses 2.3.2.2 and 2.3.2.3.

2.3.2.2 *Performance of physical tasks*

Efficient seeing of the task depends mainly on—

- (a) adequate illumination of the task;
- (b) freedom from unwanted reflections;
- (c) freedom from strong shadows;
- (d) use of special techniques where appropriate; and
- (e) luminance of the surroundings correctly related to that of the task.

2.3.2.3 *General visual environment*

A safe and comfortable visual environment depends mainly on—

- (a) avoidance of excessive illuminance variations;
- (b) mitigation of direct glare from lamps and/or luminaires;
- (c) an appropriate luminance distribution on exterior surfaces;
- (d) use of suitable colours on any exterior vertical surfaces; and
- (e) use of luminaires with suitable colour characteristics.

2.4 OTHER CONSIDERATIONS

The recommendations of the AS(/NZS) 1680 series presume that occupants of an interior or exterior space have normal or near normal vision. Some people have reduced vision, usually as the result of uncorrected refractive errors (myopia, hypermetropia, astigmatism) or presbyopia (loss of ability to focus on near tasks that occurs universally with increasing age). Although these defects are readily corrected by spectacles or contact lenses, some people do not seek the correction they need. Increased lighting can help people with uncorrected vision defects; however, it is more economical and efficient to ensure that the occupants have normal or near normal vision rather than have the lighting system compensate for the reduced vision of any individuals who may be working in the specific area.

2.5 DAYLIGHT AND ELECTRIC LIGHT

Most exterior workplaces will be illuminated by daylight. Some will need electric lighting for the times that daylight is unavailable or is inadequate, e.g. stevedoring. In most cases, the illuminances recommended in this Standard are easily achieved by daylight during daylight hours. While the daylight design of exterior workplaces is not covered by this Standard the following should be noted:

- (a) Direct sunlight can produce very high brightnesses (luminances).
- (b) Sunlight is directional, with the direction being determined by the instantaneous position of the sun.

- (c) Direct sunlight can produce very deep shadows that can result in visual difficulties due to high contrasts or adaptation issues with surrounding sunlit areas.
- (d) Direct sunlight can be a hazard to unprotected skin and eyes.
- (e) Light from the sky is diffuse (from all directions above the horizontal) and produces soft shadows.

SECTION 3 TASK VISIBILITY

3.1 GENERAL

The principles of Section 3 of AS/NZS 1680.1 apply with the addition of the following.

This Section explains the major factors affecting the appearance of a task to a visual system and recommends minimum requirements for these factors in order to achieve 'good' general visibility. The emphasis will be on tasks performed outdoors, particularly at night.

3.2 VISIBILITY AND VISUAL PERFORMANCE

3.2.1 General

For any given task, the performance of a given person is essentially a function both of the ability of that person to perform that task (task performance potential) and of the person's attitude towards performance of that task (task performance attitude).

The attitude of the individual determines to what extent the task performance potential is realized and thus is the controlling factor in determining what the actual task performance will be. Attitude includes factors such as motivation, dedication and concentration, all of which are psychological or social in nature and beyond the scope of this Standard. Lighting, with all the other factors of the physical environment, may influence performance potential but cannot directly affect task performance attitude.

Visual performance is the rate of information processed by the visual system. One measure of the task visual performance would be the speed and accuracy with which the task (which is usually a part of another task) is accomplished.

Task visibility is the ease, speed and accuracy with which the task may be seen and can be considered as the visual task performance potential. It can be determined from measurements of visual task performance at the maximum level of task performance attitude.

3.2.2 Critical detail

For any visual task, the task visibility is generally determined by the visibility of the most difficult element that must be detected or recognized in order to perform the task. This detail is referred to as the critical detail. The visibility of the critical detail is a function of the difficulty experienced in discriminating it visually from the background against which it is seen.

The visibility of a detail depends on many factors including—

- (a) apparent size of the detail (the quotient of its size and the viewing distance);
- (b) luminance and colour of the detail;
- (c) adaptation luminance;
- (d) contrast in luminance and colour between the detail and its background;
- (e) available observation time;
- (f) form of the detail;
- (g) similarity in form and texture between the detail and the immediate surroundings;
- (h) advance knowledge about the moment when the detail will appear in the visual field;
- (i) position of the detail in the visual field;
- (j) advance knowledge about the position of the detail in the visual field; and
- (k) experience with the visual task.