

Australian/New Zealand Standard™

Interior and workplace lighting

Part 2.3: Specific applications— Educational and training facilities



AS/NZS 1680.2.3:2008

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Australian Chamber of Commerce and Industry
Australian Electrical and Electronic Manufacturers Association
Energy Efficiency & Conservation Authority of New Zealand
Engineers Australia
IES: The Lighting Society
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Part 2.3: Specific applications— Educational and training facilities

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee LG-001, Interior and Workplace Lighting to supersede AS 1680.2.3—1994, *Interior lighting—Educational and training facilities*.

The objective of this Standard is to provide those involved with the lighting of educational and training facilities, whether knowledgeable in lighting design or not, with understanding of the various aspects involved in creating strong visual conditions by the choice of lighting appropriate to the task and relevant surface colours and finishes. However precise lighting arrangements are not specific and it is envisaged that creating a design to provide such conditions will typically require the knowledge and expertise of a qualified lighting designer.

This Standard forms Part 2.3 of the AS/NZS 1680 series, which covers lighting of interiors and work places. It is intended to be read in conjunction with the general recommendations and requirements of AS/NZS 1680.1, and the structures of the two Standards are closely aligned to facilitate this. It is also noted that, in many cases, parts of various other Standards in the AS/NZS 1680 series will also be applicable, depending on the nature of the building and the visual tasks involved.

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: Specific applications—Circulation spaces and other general areas
1680.2.2	Part 2.2: Specific applications—Office and screen-based tasks
1680.2.3	Part 2.3: Specific applications—Educational and training facilities (this Standard)
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

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

The significant changes that have been made in this Standard in relation to the previous publication include the following:

- (a) Updating of recommendations in relation to lighting for the vision impaired.
- (b) Upgrading of advice on various types of projection tasks.
- (c) Significant revision of the information provided in relation to theatre and stage lighting.
- (d) Alteration of the recommended maximum glare index from 16 to 19 in all applicable areas (Appendix D).

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD.....	5
 SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	6
1.2 APPLICATION	6
1.3 REFERENCED DOCUMENTS	6
1.4 DEFINITIONS	6
 SECTION 2 GENERAL REQUIREMENTS OF GOOD LIGHTING	
2.1 INTRODUCTION	7
2.2 GENERAL	7
2.3 SPECIAL CONSIDERATIONS	7
 SECTION 3 TASK VISIBILITY	
3.1 GENERAL	8
3.2 SPECIAL CONSIDERATIONS FOR VERY YOUNG OBSERVERS.....	8
3.3 DIVERSITY OF TASKS.....	8
3.4 NEED FOR FLEXIBILITY	8
3.5 SPECIAL CONSIDERATIONS FOR THE VISION IMPAIRED	8
3.6 SPECIAL CONSIDERATIONS FOR SCREEN-BASED TASKS.....	9
3.7 SPECIAL CONSIDERATIONS FOR OVERHEAD PROJECTION TASKS.....	9
3.8 SPECIAL CONSIDERATIONS FOR VIDEO PROJECTION TASKS	9
3.9 SPECIAL CONSIDERATIONS FOR VIDEO MONITOR TASKS	9
3.10 SPECIAL CONSIDERATIONS FOR SLIDE AND CINE PROJECTION	9
3.11 SPECIAL CONSIDERATIONS FOR VERY SMALL TASKS.....	10
3.12 RECOMMENDED ILLUMINANCES	10
 SECTION 4 DIRECTIONAL EFFECTS OF LIGHTING	
11	
 SECTION 5 UNWANTED REFLECTIONS	
5.1 GENERAL	11
5.2 SPECIAL ADVICE ON TASKS	11
 SECTION 6 SURFACES	
6.1 GENERAL	12
6.2 SPECIAL CONSIDERATIONS FOR SCREEN-BASED TASKS.....	12
6.3 SPECIAL CONSIDERATIONS FOR SINGLE-SIDE LIT CLASSROOMS	12
6.4 SPECIAL CONSIDERATIONS FOR LECTURE ROOMS	12
 SECTION 7 LIGHT SOURCE COLOUR	
7.1 GENERAL	13
7.2 LAMP COLOUR APPEARANCE AND COLOUR RENDERING PROPERTIES...	13
 SECTION 8 GLARE AND RELATED EFFECTS	
8.1 GENERAL	13
8.2 MAXIMUM GLARE INDEX VALUES	13
 SECTION 9 LIGHT SOURCES, LUMINAIRES AND CONTROL SYSTEMS	
9.1 GENERAL	13
9.2 SELECTION OF LIGHTING EQUIPMENT.....	13

SECTION 10 LIGHTING SYSTEMS

10.1 GENERAL	14
10.2 SPECIAL CONSIDERATIONS FOR SCREEN-BASED TASKS.....	14
10.3 DIVERSITY OF TASKS.....	14
10.4 INTEGRATION OF DAYLIGHT AND ELECTRIC LIGHT.....	14
10.5 GENERAL PURPOSE CLASSROOMS.....	14
10.6 ART ROOMS.....	15
10.7 CLASSROOMS FOR THE VISION IMPAIRED.....	15
10.8 CLASSROOMS FOR THE HEARING IMPAIRED	15
10.9 DRAFTING ROOMS	15
10.10 LABORATORIES	15
10.11 SEWING ROOMS.....	16
10.12 INDUSTRIAL ARTS AND CRAFTS WORKSHOPS	16
10.13 COMPUTER TRAINING ROOMS.....	16
10.14 LECTURE THEATRES	16
10.15 AUDITORIUMS AND GENERAL PURPOSE HALLS	17
10.16 VIDEOCONFERENCING ROOMS.....	19
10.17 CORRIDORS AND STAIRS.....	19
10.18 FOOD SERVICE FACILITIES	19
10.19 LIBRARIES AND LEARNING RESOURCE CENTRES.....	19
10.20 FIRST AID FACILITIES	20
10.21 OFFICES	20
10.22 PHYSICAL EDUCATION SPACES.....	20
10.23 SAFETY LIGHTING	20

SECTION 11 LIGHTING DESIGN PROCEDURE	20
--	----

SECTION 12 MAINTENANCE OF LIGHTING SYSTEMS AND EQUIPMENT	20
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APPENDICES

A MEASUREMENT OF ILLUMINANCE	22
B NOTES ON THE USE OF UTILIZATION FACTOR TABLES BY THE LIGHTING DESIGNER	23
C NOTES ON CHANGES TO ILLUMINANCE RECOMMENDATIONS	24
D SPECIFIC RECOMMENDATIONS FOR EDUCATIONAL AND TRAINING FACILITIES	25
E BIBLIOGRAPHICAL REFERENCES	30

FOREWORD

The aim of this Standard is to create a visual environment in which essential task details are made easy to see and adverse features which may cause visual fatigue are either excluded or appropriately controlled. The Committee is of the view that the greatest scope for achieving this lies with improvements in lighting quality rather than in the provision of higher illuminances.

While the provision of sufficient illuminance on the task is necessary in many instances task visibility depends more on the way in which the light is applied. Furthermore, the creation of the comfortable visual conditions required in order to maintain efficiency throughout the whole work period depends less on the quantity of light than on factors such as the distribution of light throughout the workplace; the use of suitable finishes on the walls, ceiling and equipment; the choice of luminaries with adequate glare control; and the elimination of unwanted reflections.

This is not a code to be followed rigidly, allowing no room for individual choice. It is a Standard that indicates paths to be followed and gives reasons for the advisability of following them. In some cases, it mentions limits within which lighting systems should be kept. Within these limits designers and engineers have great latitude in creating energy efficient and pleasing lighting designs.

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Australian/New Zealand Standard
Interior and workplace lighting**Part 2.3: Specific applications—Educational and training facilities**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out recommendations for the creation of good seeing conditions in educational and training facilities by means of appropriate lighting and interior colour treatment. This Standard contains material that adds to or amends the recommendations in AS/NZS 1680.1:2006 and is intended to be read in conjunction with that Standard and with any applicable specific recommendations in other Standards in the AS/NZS 1680.2 series.

The use of this Standard without reference to AS/NZS 1680.1:2006 is a misapplication of the Standard.

1.2 APPLICATION

If any recommendation in this Standard differs from the general recommendations of AS/NZS 1680.1, the recommendation in this Standard should prevail apart from departures from the illuminance recommendations in this Standard where it should be in accordance with the clauses specifically addressing this matter in Section 3 of AS/NZS 1680.1:2006.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS

- | | |
|----------|--|
| 1680 | Interior and workplace lighting |
| 1680.1 | Part 1: General principles and recommendations |
| 1680.2.1 | Part 2.1: Specific applications—Circulation spaces and other general areas |
| 1680.2.2 | Part 2.2: Specific applications—Office and screen-based tasks |

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- | | |
|----------|--|
| 2293 | Emergency escape lighting and exit signs for buildings |
| 2293.1 | Part 1: System design, installation and operation |
| 2560 | Guide to sports lighting |
| 2560.2.2 | Part 2.2: Lighting of multipurpose indoor sports centres |

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 1680.1:2006 and those below apply.

1.4.1 Educational and training facilities

An interior space or building complex comprising many such spaces, which provides facilities for structured learning or training programs for applications that may range from pre-school to tertiary levels.

NOTE: Throughout this Standard, educational and training facilities are referred to as 'educational facilities'.

SECTION 2 GENERAL REQUIREMENTS OF GOOD LIGHTING

2.1 INTRODUCTION

Section 2 of AS/NZS 1680.1:2006 applies with the exception of the recommendations in Clauses 2.2 and 2.3.

2.2 GENERAL

While any visual task requires the provision of a certain, minimum level of illumination, the creation of the visual conditions required to maintain comfort and efficiency throughout the whole work period also depends greatly on how the light generated is applied, including factors such as the distribution of light throughout the workplace; the use of suitable finishes on the walls, ceiling and equipment; the choice of luminaires with adequate glare control; and the elimination of unwanted reflections.

While this is true of all illuminated environments, in educational and training facilities it is especially important to address all of the relevant factors, including those stated above, and not to adopt or accept an approach that concentrates purely on simple parameters such as average illuminance.

2.3 SPECIAL CONSIDERATIONS

Although good lighting is essential in educational and training facilities, difficulties with visual tasks in such environments cannot always be solved by adjustments to the lighting. Tasks in educational and training facilities can be located at various distances from the eyes, ranging from normal reading distances to, for example, reading chalkboards from the back of a classroom. Other tasks, such as screen-based tasks, may be located at middle distances. Students might have visual correction (e.g. spectacles) for an assumed near viewing distance, e.g. reading, but unless refractive errors are corrected for all viewing distances, people may complain of maladjusted equipment or poor lighting.

Further, as the eyes are not dimensionally stable until about age 20, in schools there may be a range of uncorrected refractive errors present in the population.

So, notwithstanding the fact that good lighting and good task design can assist with any vision difficulty, in such cases the most helpful action will be to provide the appropriate vision correction.

SECTION 3 TASK VISIBILITY

3.1 GENERAL

The following applies in addition to Section 3 of AS/NZS 1680.1:2006. Where any conflict arises between the two documents, the recommendations in this Section are to be applied.

3.2 SPECIAL CONSIDERATIONS FOR VERY YOUNG OBSERVERS

While not strictly a lighting matter, it must be noted that the visual system of very young observers (i.e. up to about 6 to 8 years of age) cannot achieve the acuity (the ability to detect fine detail) that older observers can: this is the reason for large print in children's books. Consequently, it is important that the designers of visual tasks for the very young are aware of the limits of the visual system and that lighting designers are aware of which characteristics of tasks can be significantly affected by lighting decisions and which are user dependent.

3.3 DIVERSITY OF TASKS

Educational facilities contain a wide range of tasks with visual components varying from very demanding, such as dissection and sewing, to easy and casual, such as movement and orientation. The tasks can be located on planes from the horizontal (writing) to the vertical (chalkboard, etc.) and can be at various distances from the observer (see Clause 2.3).

A feature of most spaces is that they are multi-function and multi-task. This makes the design of most spaces very difficult if ideal seeing conditions are to be provided for all tasks.

It should be noted that educational facilities can contain the full range of visual tasks found in industrial, office and medical facilities. The relevant Standards in the AS/NZS 1680.2 series should be consulted for advice on the lighting of such tasks.

3.4 NEED FOR FLEXIBILITY

Clause 3.3 suggests that there needs to be flexibility in the lighting solutions proposed so that the various tasks can be best performed. Ideally, the capacity should be available to vary the illuminance and vary the direction of lighting by switching, and to control daylight entry. Some tasks, principally slide and cine projection, require almost total blackout conditions. Further advice is given in Section 10.

3.5 SPECIAL CONSIDERATIONS FOR THE VISION IMPAIRED

The vision impaired are those who, even with the best correction, continue to have visual defects. These may be acuity, contrast or visual field defects. Descriptions of the degree of visual impairment include terms such as 'partially sighted' and the classification 'legally blind'. The designer of lighting for an educational or training facility should seek advice regarding the specific nature and degree of any impairment among students to be catered for.

It is beyond the scope of this Standard to provide detailed advice on lighting for the vision impaired but, with the assistance of appropriate medical advice, suitable local lighting solutions can be achieved for many visual defects, in spaces designed for general use. Attention is particularly drawn to recommendations covering lighting needs for the partially sighted issued by the International Commission on Illumination (CIE) [Ref. 1]. Refer also to Clause 10.7.

3.6 SPECIAL CONSIDERATIONS FOR SCREEN-BASED TASKS

Screen-based tasks in educational and training facilities include microfiche readers and personal computers but not images from overhead projectors, data projectors, video monitors or slide or cinema projectors (see Clauses 3.7 to 3.10). Screen-based tasks are increasingly common in educational facilities. Advice on the task characteristics of and the lighting requirements for screen-based tasks is given in AS/NZS 1680.2.2.

3.7 SPECIAL CONSIDERATIONS FOR OVERHEAD PROJECTION TASKS

Overhead projection refers to the projection of an image, normally from a large transparency, to a suitable screen. The quality of the projected image depends upon the quality of the projector, the correct location and adjustment (including focus) of the projector and the provision of suitable transparencies that provide an image that is sufficiently large and sharp for legibility from the most distant viewing position. The foregoing are all equipment and task design matters, beyond the scope of this Standard.

Because they project a high luminance image, overhead projectors can be used with normal room lighting, allowing writing tasks to be undertaken and the speaker to be seen. Further, the surround illuminances can be designed to produce comfortable and pleasant viewing conditions.

However, care is needed to ensure that good contrast is maintained in the projected image by minimizing the direct light from luminaires that could arrive on the projection screen. This is especially important if low-contrast images are to be presented.

3.8 SPECIAL CONSIDERATIONS FOR VIDEO PROJECTION TASKS

Video projectors usually project images onto a screen from high-luminance cathode ray tube (CRT) displays using suitable optics. (Other technologies are used but rarely in educational facilities.) While relatively bright images are possible, most video projectors require dimmed lighting conditions to maintain good luminance contrasts and saturation of colour. The dimmed conditions are usually not suitable for sustained reading or writing tasks.

3.9 SPECIAL CONSIDERATIONS FOR VIDEO MONITOR TASKS

Video monitors are similar to a traditional television receiver, using a CRT, and are often used in educational buildings either on stands (in small rooms) or suspended from the ceiling (normally in larger rooms). In larger rooms more than one monitor may be installed. The luminance of the monitors is sufficient for their use under normal room lighting conditions but veiling reflections in the screen may be a major problem.

The problems are similar to those with screen-based equipment (SBE) but there is usually a much wider range of viewing angles and the avoidance of unwanted reflections can be very difficult to achieve. Flat screens with diffusing surfaces on monitors can reduce the problems. Care is needed in the location of monitors and the selection of suitable lighting equipment for rooms containing monitors.

3.10 SPECIAL CONSIDERATIONS FOR SLIDE AND CINE PROJECTION

Due to the small size of the transparency being projected it is not usual to be able to achieve sufficiently high screen luminances to maintain contrast and colour saturation under normal lighting conditions, except where the projected image is quite small. In general, slide and cine projection require full blackout conditions or a degree of dimming that makes other tasks difficult or impossible to perform. If slides are being used by a speaker, it is important the speaker is visible to the audience and able to read any notes. Special lighting is needed for both.

Special care is needed with rear projection systems since veiling reflections can occur in the protective transparent screen that typically exists.

3.11 SPECIAL CONSIDERATIONS FOR VERY SMALL TASKS

High levels of local lighting can assist with very small tasks, such as jewellery making, some electronics assembly, some anatomical procedures and some small mechanical systems. However consideration should be given to the use of magnification when very small tasks are involved.

3.12 RECOMMENDED ILLUMINANCES

For educational and training facilities, the maintenance illuminance should be not less than the applicable value given in Appendix D.