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Australian Standard 2501-1981

SURGICAL LUMINAIRES



STANDARDS ASSOCIATION OF AUSTRALIA
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Association of Consulting Engineers, Australia
Australian Chamber of Commerce
Australian Optometrical Association
Australian Society of Anaesthetists
Confederation of Australian Industry
Department of Housing and Construction
Department of Industrial Relations, N.S.W.
Department of Public Works, N.S.W.
Department of Science and Technology
Electricity Supply Association of Australia
Illuminating Engineering Societies of Australia
Institute of Hospital Engineers, Australia
Other medical interests, viz surgeons and nurses
Public Works Department, Vic.
Royal Australian Institute of Architects

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PREFACE

This standard was prepared by a specialist panel of the Association's Committee on Interior Lighting in response to a submission from a private group which investigated all aspects of the lighting requirements for operating theatres.*

The standard contains requirements for the design, construction and performance of luminaires of the type which are intended to provide the very high levels of local illumination necessary for general surgical and/or obstetrical procedures. The minimum illuminance and size of light patch specified have been derived from an investigation of the visual conditions required for a wide range of surgical procedures, including the most severe constraint, i.e. the illumination of deep body cavities. It is recognized, however, that some surgical procedures will always require a supplementary light source such as a headlight.

It is necessary also to restrict the heat radiated by the surgical luminaire, to ensure that body tissues exposed during an operation are not burnt, excessively heated or dried. Insufficient data are available at the present time to enable quantitative limits to be prescribed; however, the standard requires information to be provided on the maximum irradiance produced by the surgical luminaire.

The standard does not specify the voltage at which the lamps of surgical luminaires should be supplied, as it was considered that this might restrict the application of future developments in lamp technology.

The lighting provided by surgical luminaires is but one of the elements involved in the provision of efficient and comfortable visual conditions. Requirements for the installation of surgical luminaires and for their integration with the general lighting system within the operating rooms, are prescribed in AS 2502.

The panel is indebted to many individuals and organizations who have assisted in the investigations which led to the development of this standard. Acknowledgement is especially made of the assistance given by staff at the Alfred Hospital, Monash University Department of Surgery, and the Linacre Hospital.

This standard may require reference to the following standards:

AS 1765	Code of Practice for Artificial Lighting for Clinical Observation
AS 2502	The Lighting of Operating Rooms
AS 3137	Approval and Test Specification for Luminaires (Lighting Fittings)
AS 3200	Approval and Test Specification for Electromedical Equipment—General Requirements
AS C100	Approval and Test Specification for Definitions and General Requirements for Electrical Materials and Equipment
BS 667	Portable Photoelectric Photometers

*The findings of the group are contained in a report 'Lighting the Operating Theatre and Operation Site—An Investigation', November 1973.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
SURGICAL LUMINAIRES

1 SCOPE. This standard specifies requirements for luminaires which, in conjunction with the general lighting in an operating room, are intended to facilitate general surgical and/or obstetrical procedures. It applies to surgical luminaires which are designed for installation as a fixture within an operating room and to portable surgical luminaires which may be used in such rooms.

Requirements for the installation of surgical luminaires and for their integration with the general lighting system within operating rooms are prescribed in AS 2502.

NOTES:

1. The requirements prescribed in Clause 4.1 for the light patch provided by surgical luminaires are intended to suit a wide range of surgical procedures. However, it is recognized that the requirements may not be appropriate for certain types of surgical procedure, e.g. eye surgery.
2. Additional requirements may apply for the design of surgical luminaires intended for use in operating rooms which are provided with laminar flow ventilation.

2 DEFINITIONS. For the purpose of this standard, the following definitions apply.

2.1 Luminaire—apparatus (fixed or portable) which distributes, filters or transforms the light given by a lamp or lamps and which includes all the items necessary for fixing and protecting these lamps and for connecting them to the supply circuit.

2.2 Surgical luminaire—a luminaire which is designed specifically to assist in the performance of surgical and/or obstetrical procedures.

2.3 Single-unit surgical luminaire*—a surgical luminaire, incorporating one or more light sources spatially fixed in relation to each other, which is designed for use as the sole means of illuminating the operation site.

2.4 Multi-unit surgical luminaire—a surgical luminaire comprising two or more luminaires which are capable of being independently positioned, and which singly or in combination are designed for use as the source of illumination for the operating site.

2.5 Light patch—the area which is effectively illuminated by the surgical luminaire, determined in accordance with Appendix A.

3 SAFETY REQUIREMENTS. The surgical luminaire shall comply with the relevant requirements of AS 3200, AS C100, AS 3137 and other applicable approval and test specifications.

4 PHOTOMETRIC PERFORMANCE.

4.1 Size and Appearance of Light Patch. Single-unit surgical luminaires and each assembly of a multi-unit surgical luminaire shall provide a light patch† complying with the following requirements:

- (a) The light patch shall be adjustable in size over the range from 250 mm to 400 mm in diameter.

- (b) When the surgical luminaire is adjusted to provide the smallest light patch of the range specified in (a), the maximum illuminance reading within the grid of measurements required by Appendix A shall be not less than 20 000 lx.

- (c) All light patches within the range required by (a) shall be uniform in appearance, and shall be free from dark holes or striations.

- (d) The light patches shall not have hard edges but shall merge gradually with the surrounding general illumination.

The arrangement of the light sources and optical elements used in providing the light patch shall control stray light so as to minimize the possibility of distraction or glare to theatre staff in normal use.

4.2 Spectral Characteristics. The spectral energy distribution of the light emitted by the surgical luminaire shall be continuous, such as that provided by an incandescent filament lamp. If a discharge lamp is used, the spectral energy distribution shall be such as will comply with AS 1765.

4.3 Provision for Lamp Failure. Single-unit surgical luminaires shall either incorporate at least two lamps or, where a single lamp is utilized, provide an auxiliary filament in addition to the main filament. In either case, the single-unit surgical luminaire shall be designed or arranged so that—

- (a) the illuminance provided by operation with one lamp or the auxiliary filament alone, is not less than 50 percent of that required in Clause 4.1(b);
- (b) changeover to operation with the standby lamp or auxiliary filament is automatically carried out upon failure of the other lamp(s) or filament(s); and
- (c) visual indication is given when only the standby lamp or auxiliary filament remains in operation.

4.4 Focusing and Dimming Controls. Dimming controls shall preferably not be located on the surgical luminaire. Dimming controls, where located on the surgical luminaire, and focusing controls, shall—

- (a) be located so as to permit adjustments to be effected without intrusion into the operating field or movement of the surgical luminaire;
- (b) be arranged so that adjustments can be readily made with the surgical luminaire in all normal working positions (see Clause 6.1); and

*Use of a single-unit surgical luminaire will result in some limitation in the types of procedure which can be carried out unless provision is made for a supplementary light source, e.g. a portable surgical luminaire. A greater degree of flexibility is provided by the use of multi-unit surgical luminaires.

†See Appendix A for the method of determining the size of the light patch provided by surgical luminaires.