RMIT UNIVERSITY

Property Services

Design Standards Brief

Section 14 – Design of Lighting Systems

Issue 6

2009

14 CONTENTS

14.1 SPECIFIC REQUIREMENTS

The Lighting Consultant shall design, specify and certify lighting systems that comply with the following performance criteria:-

- Occupational Health and Safety mandatory Standards including AS/NZS1680.0 and AS/NZS 2293.
- Recommended Illuminance and glare control values as agreed with RMIT Project Manager.
- Incorporation of energy efficient lamps and control systems, **Section 4, Clause 4.8.**
- Maximise the utilisation of daylight where possible.
- Incorporate switching and manual controls as necessary to integrate with daylight and energy-saving devices.
- Design to obtain optimum values of low maintenance and life expectancy of lamps and luminaires.

14.2 DEFINITIONS AND STANDARDS

Refer to: AS1680.1 – Interior lighting: general principles and recommendations.

AS 2633 – Guide to specification of colours.

AS 3665 – Simplified definitions of lighting terms and quantities.

Maintenance Illuminance - The value of average illuminance below which it is necessary to take remedial action in terms of maintaining the lighting system, e.g. by replacing the lamps or by cleaning the luminaires, windows, roof lights and room surfaces.

14.3 DESIGN VALUES

- Recommended design values for various areas and tasks will be selected from the following: AS 1680.2.1 - 2008 - Circulation spaces and general areas – Table E1

  AS 1680.2.2 - 2008 - Office and screen based tasks - Table F1

  AS 1680.2.3 - 2008 - Education and training facilities - Table E1
- Recommended levels of illuminance for selected building area

LL — Local lighting necessary or desirable

UR — Unwanted reflections possible

Type of Task Requirement	Illuminance (Lux)
Libraries	
Reading tables, desks	320 LL, UR
General Office	
Typing, reading, filing	320 UR
Drawing boards	600 LL, UR
Copying rooms	240

LL — Local lighting necessary or desirable

UR — Unwanted reflections possible

Type of Task Requirement	Illuminance (Lux)
Meeting / Staff Room	320
Counters	240
Store Rooms	
Rough, bulky live	80
Rough, bulky dead	40
Fine/papers live	160
Fine/papers dead	80
Corridors	
Light traffic	20
Heavy traffic	40
Stairs	40
Computer rooms	
General	320
Terminals	320 LL, UR
Toilets/Locker rooms	80
Plant Rooms	
General	80
Control panels, switchboards	160
Assembly Halls	
General	80
Examination	240
Kitchens	
General	160
Food preparation, cooking	240
Indoor Car Park (General)	40
Lecture Theatres, Tutorial/Seminar Room	see Section 2F - *Teaching Space Design Guidelines*
Outdoor Spaces	see *Landscape Elements Report*

14.4 SELECTION OF LIGHTING EQUIPMENT

The Lighting Consultant shall specify luminaires, lamps, and control equipment appropriate to achieve the design criteria above together with compliance with RMIT specific preferences. Luminaires (including lamps) and control equipment are subject to various standards including photometric performance, electrical safety, flammability, radio frequency interference. In special circumstances the need for suitable lighting equipment or design may require reference to other standards as listed in:-

AS 1680.1 – Appendix A

AS/NZS 1680.2.4:1997 – Industrial tasks and processes

AS/NZS 4293:1995 – International lamp coding system.

The Consultant, after consultation with the RMIT Project Manager shall list in detail in the Lighting specification, the appropriate relevant clauses of these standards. In particular, the specification shall:-

- Require photometric and thermal performance testing to be done by a NATA registered laboratory or other approved laboratory.
- Unless otherwise agreed (see later) the Consultant shall specify the use of efficient fluorescent lamps in all areas.
- Where elongated luminaires are not appropriate and dimming is not required, compact fluorescent lamps may be specified.
- In some instances eg. infrequent occupancy, storage, or those with special requirements eg glare control, colour rendering, hazardous locations, plant rooms, service areas, tubular fluorescent lamps T8 (26 mm) type using standard low loss (LLEC) ballasts may be allowed. Each case shall be approved in writing by the RMIT Project Manager before specifying. The design shall include provision for automatic switching off when not in use.
- The Consultant shall not specify the use of incandescent or tungsten – halogen lamps unless for specific use in display or decorative lighting or where necessary for specific tasks. This will also require approval in writing by the RMIT Project Manager.
- The Consultant shall provide in the Lighting specification for a schedule of technical data to be provided by Tenderers to enable assessment of tenders in regard to compliance with specified requirements. Except in special cases it should be made clear that non-compliance with the requirements with the specification may lead to rejection of the tender outright. Where a tenderer considers he can offer an improved design or generally better method of achieving the performance requirements then he should be encouraged to include in his bid an alternative for the concepts he believes will be attractive to the University.
- The Consultant shall discuss with the RMIT Project Manager the specification of materials, finishes and quality required for a particular project. The agreed details for the project will then be incorporated into the project documentation.
- The Consultant shall provide to the RMIT Project Manager, based on data from nominated Tenderer/s, an assessment of manufacturing quality, compliance with requirements, maintenance liability and life expectancy of the lighting products offered.

14.5 INSTALLATION OF LIGHTING SYSTEMS

14.5.1 Fluorescent Luminaires

Refer to **Section 4.8.2** regarding the use of T5 fluorescent lamps. As a minimum the Consultant shall specify luminaires which incorporate 1200 mm long, 13 diameter fluorescent lamps. All light fittings shall be HPF. Min 0.9 P.F.

The following items shall be taken into account when specifying fluorescent luminaires. (See also Section 4).

14.5.1.1 Ballasts

Separate ballast shall be specified for each fluorescent lamp. Ballasts shall be complete with quick-connect terminals. They shall be of the full low-loss Atco LLEC range or similar.

14.5.1.2 T5 Lamps

The colour temperature of the lamps shall be 3000 degrees kelvin. The minimum lumen output for a 36 W fluorescent lamp at 100 hours shall be a minimum of 2700 lumens. Lamps shall be selected from the Thorn, Sylvania, Osram, or Philips range or equal approved.

14.5.1.3 Capacitors

Capacitors shall maintain the Power Factor at or better than 0.9 lagging and have a minimum clearance of 75 mm and 100 mm from any ballast.

14.5.1.4 Starter Switches

Starter switches shall be Wotan ST171 or similar for 36 W lamps and shall be capable of a minimum of 5000 operations. They shall be complete with a manual reset.

14.5.1.5 Lamp Holders

Tombstone lamp holders, *HPM 380* or similar, shall be specified. Lamp holders shall be made from non-flammable materials and shall not be starter/lamp holder combined type.

Lamp holders with snap-in wiring terminals shall only be accepted if solid conductor (1/0.80) wiring is utilized.

14.5.1.6 Fuse Protection

Each light fitting shall be provided with a fuse of a suitable rating to isolate the fitting in the event of a fault within the light fitting. Such fuses shall be readily accessible.

14.5.1.7 Fixings

Galvanised Loxins, dynabolts or approved metal expansion devices shall be used for securing light fittings to concrete ceilings. Wooden or plastic plugs will not be accepted. The minimum number of fixings per light fitting shall be as follows:

1 x 36 W fluorescent light fitting — 2 fixings

2 x 36 W fluorescent light fitting — 4 fixings.

14.5.1.8 Down Lights

Luminaires shall be selected from the range which incorporates compact fluorescent lamps.

Down lights with incandescent lamps will not be accepted.

A separate ballast shall be provided for each lamp and a suitable label shall be located adjacent to each lamp holder as a means of identification of the required lamp wattage.

Ballasts should be the switched-start type with losses after fifteen minutes of no greater than:

- • 7 watt lamp — 3.5 watts
- • 9 watt lamp — 3.5 watts
- • 18 watt lamp — 5.5 watts

Reflectors should be of high quality, super purity polished.

14.5.1.9 General

Diffusers, reflectors and the like shall be installed just prior to Practical Completion so as to limit dust build up.

Reflectors shall be manufactured from high quality steel or aluminium.

Luminaires shall be selected for ease of lamp changing and cleaning and have adequate mechanical and electrical features to ensure durability and lack of deterioration.

Diffusers shall be strong and of rigid construction.

Luminaires selected for computer laboratories or VDU applications shall be of the low brightness type.

Switching shall be arranged to provide for 50% illuminance. Where entire floor levels are being documented, the installation of 24 hour light fittings at strategic locations for general security lighting shall be discussed.

Excess illumination shall be discouraged.

Where possible, all luminaires shall be installed using the plug-in method.

Installations shall conform to AS 3145 for minimum radio interference.

Prismatic diffusers for office, public or common areas shall be K19 (only where there are no computer monitors); and for special purpose rooms K19 with silver tint.

Design Standards Brief **Section 6** - Electrical Services

Fittings which incorporate single end PL or PLC fluorescent lamps shall not be specified without approval from the Senior Project Manager Services.

Each luminaire shall be supplied with a fixed terminal block. The terminal block shall accommodate a minimum 4 mm2 cable. Each terminal block shall incorporate a spare 'loop' terminal.

14.6 INCANDESCENT LUMINAIRES

14.6.1.1 Supply Voltage Light Fittings

Installation of incandescent luminaires shall be avoided. This clause may not apply to lecture theatres; in all cases the Consultant shall discuss this issue with the RMIT Project Manager.

Incandescent light fittings shall only be considered where there are no other possible solutions.

Where permitted, incandescent light fittings shall be supplied with long-life 250 V lamps and the lamp holders shall be porcelain.

14.6.1.2 Extra Low Voltage (ELV) Light Fittings

A separate step down transformer shall be required for each ELV lamp. The transformer for each ELV light fitting shall be readily accessible. Traffolyte labels shall be installed (light fitting and associated transformer) where the transformer is installed remote from the light fitting and not more than 2 metres from the lamp.

ELV Luminaires shall be selected on the following criteria:

- ease of lamp replacement;
- ease of cleaning;
- adequate ventilation.

Where the luminaires are recessed, the fitting specified shall incorporate a design to prevent contact with materials such as ceiling insulation, with the ELV lamp, or hot luminaire components.

ELV dichroic halogen lamps shall be GE, or approved equivalent, with an average rated lamp life of 3000 hours as a minimum.

Where dimming of ELV lamps is required, the dimmer unit shall incorporate the following:

- Soft start;
- digital control;
- halogen clean-up cycle;
- in-built surge protector;
- internal time clock;
- RF suppression;

ELV dimmer units shall be selected from the DYNALITE range or similar University-approved.

Lamp holders shall be the bi pin, high temperature, ceramic base variety. The wattage of the lamp shall be identified at the lamp holder. In particular applications ELV lamps shall be supplied with a suitable UV filter glass.

14.6.2 Wiring

The installation shall be designed so that future additional luminaires can be easily added to the circuit. The current load of the initial circuit when installed should not be more than 50% of capacity. Unswitched active conductors shall terminate in each luminaire. This will allow for simple future alterations, should they occur.

Ceiling pull cord switches are not acceptable.

14.7 EXTERNAL LIGHT FITTINGS/LUMINAIRES

External luminaires shall be specified from the HID range and shall conform to the following:

- self-ballasted lamps will not be accepted;
- HID ballasts shall be of energy efficient design;
- capacitors for each light fitting shall maintain the Power Factor at, or better than, 0.9 lagging.

Luminaires which incorporate the following types of lamps will not be accepted:

- incandescent lamps;

- dichroic (halogen) ELV lamps.

External luminaires shall be individually protected by HRC fuses and have adequate ventilation.

Reflectors should be manufactured from high quality super (purity) aluminium.

Luminaires shall be selected for ease of lamp changing and cleaning and have adequate mechanical and electrical features to ensure durability and lack of deterioration. They shall be treated to prevent corrosion.

External security and street lighting shall be colour corrected mercury vapour. External building security lighting shall be an approved type, painted to match the building structure. Street lighting shall comply with the principles detailed in the Technical Notes, Urban Spaces City and Bundoora Campus, June 1996. All external security and street lighting shall be controlled by photo cell switching. By-pass switches shall be provided on all circuits. Each street light pole shall be separately fused; where appropriate photo-electric cell switching is to be considered.

14.7.1 Internal Light Fittings/Luminaires

Internal security lighting shall be provided in the following areas of the Buildings:

- Balconies;
- Verandas;
- Corridors; and
- All stairways and exterior doors.

The lighting shall be controlled by an externally mounted photo electric cell and a bypass switch, located in the distribution switchboard cupboard.

Light Switching — two way switching and time clock control shall be provided on all stairways and corridors subject to approval.

Light switches in tunnels shall be fitted with continuously operating amber coloured neon indicators.

Light switches in tunnels and all service areas shall be the protected type.

Sufficient controls, both automatic and manual, shall be provided so that energy can be saved when spaces are not in use or when systems require modification.

Energy management timing systems shall be considered for lecture rooms, seminar rooms, laboratories and any other areas have high usage. Consideration shall be given to the use of occupancy sensors.

Rooms containing one or more luminaires shall be provided with multiple switching.

Metalware shall be not less than 0.8 mm thick with adequate folds and return edges to provide stiffness and rigidity. All corners and joints exposed to view shall be welded, ground smooth and filed where necessary before painting. All metal work shall be treated with a rust inhibitor or alternatively manufactured out of zincanneal.

All recessed luminaires shall have prismatic hinged frame supported diffusers.

All luminaires shall be power factor corrected to not less than 0.9 lagging.

Luminaires in computer areas shall be provided with low brightness glare control diffusers to prevent discomfort to computer operators.

A fluorescent luminaires and power point shall be provided in every telephone and computer frame cupboard.

14.7.1.1 Exit ad Emergency Lighting

Emergency light fittings or fittings incorporating an additional lamp for emergency lighting shall also comply with AS. 2293 complete with "NATA" Test Certificate.

The computerized monitoring system is located as follows:

City Campus	Building 14, Level 3
Bundoora Campus	Building 202, Level 1, Room 20
Brunswick Campus	Building 512, Level 1, Room 101

14.7.2 Bollard Luminaires, Post Top Luminaires and In-ground Lighting

Consultants should contact the Senior Project Manager (Services) for advice of specialist lighting. Installation should reflect the current installations.