

TWEED SHIRE COUNCIL

**ELECTRICAL
DESIGN
SPECIFICATION**

EL10

LIGHTING AND SMALL POWER

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1 CITATION

This document is named “Tweed Shire Council, Electrical Design Specification EL10 - Lighting and Small Power”

2 ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally produced for Tweed Shire Council. This document is copyright to Tweed Shire Council.

3 VERSIONS

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director of Engineering Services
1.1	Original version		1 November 2005	

4 STANDARDS

The equipment and materials supplied under this Specification must comply with the latest relevant Australian Standards, or, in their absence, with the latest relevant IEC Standards, together with the requirements of competent Authorities having jurisdiction over all or part of their manufacture, installation and operation.

In particular, all equipment and materials supplied must comply with the relevant requirements of the following Regulations, Standards and Reference Specifications.

AS 1158	Road Lighting
AS 1680	Interior Lighting
AS 1798	Lighting Poles and Bracket Arms - Preferred Dimensions
AS 1939	Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)
AS 2293	Emergency Evacuation Lighting for Buildings
AS 3000	Australian Wiring Rules
AS 4282	Control of the Obtrusive Effects of Outdoor Lighting
Building Code of Australia	

5 GENERAL

This Standard Specification sets out the minimum requirements for the design, equipment selection installation of plant lighting and general power.

This Specification must be used in conjunction with [Standard Specification EL02](#).

The Contractor must design, supply and install the lighting and general power installation together with all supports, wires, cables, lamps, ballasts, transformers, switches, controls and other apparatus needed for completion in full working order. The number and type of luminaires must be determined by this Specification.

The number and type of small power outlets have been set and are detailed in the Contract Drawings and Schedules.

6 POWER SUPPLY

Unless otherwise specified, lighting and small power must operate from a single phase, 50Hz supply, subject to conditions as specified herein.

Lighting must be suitable for operation at 240V single phase, or, in the case of sports field lighting, at 415V across phases, with a voltage variation of $\pm 10\%$, transient voltage dips of up to 20%, and a supply frequency variation of $\pm 2\text{Hz}$.

All luminaires must be of the high power factor type to ensure a power factor of not less than 0.8 lagging.

7 LIGHTING AND SMALL POWER DISTRIBUTION BOARDS

During installation, care must be taken to avoid the ingress of dust and other foreign bodies into distribution boards.

The Contractor must provide and fix, inside each distribution board, a schedule bearing the board number and clearly indicating the circuits controlled from there. This schedule should be on material of permanence, suitably protected by a transparent cover. The poles of circuit breaker chassis must be coloured according to the phase to which they are connected. Red, white and blue must be used for the phase colours and black for the neutral.

Labels must be affixed adjacent to each individually mounted circuit breaker to indicate the rating and to designate the circuit. Labelling must comply with [Standard Specification EL01](#).

Circuit loadings must be restricted to a maximum of 75% the circuit rating. The circuit rating must be the cable rating with de-ratings from AS3008 applied.

All area lighting and certain other fittings, as shown on the Drawings, must be controlled by the control system, or photo-electric cell. The photo-electric cell must be an adjustable type, in weatherproof enclosure, mounted in a suitable location on the outside of a building such that its operation is not effected by the light fittings. A 3-position bypass switch labelled "Bypass-Off-

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Auto", and contactor, suitably rated with a minimum of 50% spare capacity, must be included in the distribution panel.

Circuit breakers supplying general purpose outlets must incorporate earth leakage protection units, set to operate at not more than 30mA. Single-phase circuits must be protected by single pole circuit breakers. Three-phase circuits must be protected by three pole circuit breakers.

Circuit breakers supplying welding outlets must incorporate 30mA earth leakage protection.

Circuit breakers supplying lighting must incorporate 30mA earth leakage protection.

8 LIGHTING DESIGN CRITERIA

The lighting system must be designed in accordance with AS 1680, subject to the following criteria:

- a) The levels of illuminance specified herein refer to the "maintenance illuminance" as defined in AS 1680.1.
- b) The contribution of daylight must be excluded from any illuminance calculations.
- c) Unless specified otherwise in the Duty Specification, the "uniformity of illuminance" must be not less than 0.7.
- d) The luminaire, activity and location categories in terms of AS 1680.1 must be "C".
- e) The "light output from a luminaire" (luminaire light loss factor) after 6 months must be not more than 80% (6 month cleaning cycle).
- f) The minimum levels must not be reached until after 16000 hours of lighting operation.
- g) The lamp's deteriorating light output with age must be taken into consideration by the use of a minimum lumen maintenance factor of 75%.
- h) The value of reflectance for all surfaces must be considered zero for the purpose of any illuminance calculations.

9 ILLUMINATION LEVELS

Unless specified otherwise in the Duty Specification or on the contract drawings, illumination levels must be as set out herein.

Area	Minimum Average Maintenance Luminance (Lux)	Maximum Working Plane (m)
Switchrooms and Control Rooms	240	0.75
MCC Control Panels	160	0.75
Compressors and Pumps	160	On Drive
Screens	160	On Deck

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Intermittent Inspection Area/Tasks	80	0.75
Internal Walkways	40	0
Platforms	40	0
Internal Stairs	80	0
Building Access	10	0
External Stairs and Catwalks	20	0
Access Roadways	10	0
Building Surrounds	5	0

Control panel lighting must be provided with electronic dimmers. Control Room lighting must be designed such that light images or reflections will be minimised on computer monitors.

Lighting in and around existing plant areas where equipment is added, removed or modified, must be upgraded, where necessary, to comply with the above requirements.

9.1 Emergency Lighting, Exit Signs and Warning Systems

Emergency lighting, exit signs and warning systems, must be provided in accordance with AS 2293 and the Building Code of Australia to enable the safe movement around and evacuation of persons from all plant areas in the event of power failure. This includes all switch rooms, control rooms, conveyor walkways, thickener access areas, and other outside access areas.

Except where otherwise specified in the Duty Specification, emergency lighting must be of the non-maintained type, on a dedicated circuit, using batteries and fluorescent or quartz halogen lamps.

10 LIGHTING EQUIPMENT

10.1 Luminaires

The lighting installation must provide adequate illuminance levels around mechanical and electrical equipment (including drive units) to permit safe and efficient operation and maintenance at night.

Luminaires must be suitably designed for their intended environment, which includes high levels of vibration, water, dust, and corrosive atmosphere.

Luminaires must be constructed of stainless steel or epoxy coated cast alloy and fitted with stainless steel screws and hinges. Threaded fixing holes must be of stainless steel or, in the case of cast alloy, fitted with stainless steel helicoils or similar.

All general access lighting, including preparation plant and similar environments, must use bulkhead type luminaires, protected to not less than IP66, with lamps 70 or 110W as nominated in Standard EL10.

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All task area lighting must be provided by floodlight luminaire, protected to not less than IP66, with lamps ranging from 70W to 250W.

Luminaires suspended from the roof must be anti-vibration type floodlight fittings with 360/400W lamps.

General floodlighting must use 360/400W fittings where positioned not more than 12 metres above the working plane, and 940/1000W fittings where positioned higher.

All externally mounted luminaires and their associated lamps must be designed to meet the requirements and recommendations of AS 4282. In particular, cut-off angles must be such as to minimise the effect of the lighting system on nearby residents.

Switch rooms and control rooms must use fluorescent or incandescent down light fittings, protected to not less than IP5X.

All removable parts of luminaires must be hinged or made captive to facilitate maintenance.

The number of different types of luminaires, lamps and control gear must be kept to a minimum in order to reduce spares holding.

Transmitting surfaces and diffusers must be made of a suitable material that will not become opaque or “yellow” from age or prolonged heat. In addition, they must be capable of withstanding sudden changes in temperature from high pressure water hose down, without cracking or otherwise affecting their properties in any way.

Luminaires must be designed to accommodate two separate cable entries without drilling or affecting IP ratings in any way. Sufficient space must be provided for termination of incoming and outgoing cables. Unused cable entries must be fitted with blanks protected to not less than IP66.

Where luminaires require additional mechanical protection they must be fitted with suitable proprietary guarding.

10.2 Lamps

All 70/110W lamps must be fitted with internal igniters.

The standard lamp sizes to be used on site must be 70/110W, 150/250W, 360/400W, and 940/1000W.

The 70/110W lamps must have an average life of not less than 16,000 hours and be of the sintered electrode type. The 150/250W, 360/400W and 940/1000W lamps must have an average life of not less than 24,000 hours.

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Lamps of the specified type, size and manufacture must be installed in the luminaires.

10.3 Controlgear

Controlgear components must be physically and electrically identical for each type of luminaire supplied at the same lamp wattage.

Controlgear must be securely mounted on suitable gear trays, in such a manner as to facilitate ease of maintenance and component replacement.

Single ballast configurations must be used. Split ballasts are not acceptable.

11 LIGHTING INSTALLATION

11.1 Positioning

Luminaires must be located in positions that facilitate ease of maintenance without the use of ladders, steps, harnesses and the like. In general, luminaires must be mounted not less than 2100mm or more than 2400mm above a safe access level or walkway. Where specifically agreed in writing by the Council, luminaires may be mounted higher than 2400mm, if attached to a suitably designed structure that collapses into a safe maintenance position.

Care must be taken to ensure that light is directed towards the intended areas. In particular, glare from lighting on a lower level shining through floor grating is not acceptable.

Luminaires must not be mounted in positions where the accumulation of dirt from general build-up or process spillage will cause significant reduction in light output or overheating outside the manufacturer's recommendations.

Luminaires suspended from the roof must be positioned to enable safe access for maintenance from overhead cranes; if crane access is not available lowering mechanisms must be provided.

Where light fittings are arranged in rows, they must be mounted such that they are aligned both horizontally and vertically.

Floodlights must be mounted such that beam aiming angles and distances are in accordance with the layout drawings. Notwithstanding, the Contractor must be responsible for the final adjustment (to give the best coverage) and clamping, as directed by the Council.

Externally mounted luminaires may require additional shielding to minimise the effects of the lighting system to nearby residents. Luminaires mounted inside areas surrounded by cladding may not require shields. This requirement will have a significant effect on the minimum maintenance illuminance levels and therefore must be carefully considered in the calculations.

11.2 Mounting

The Contractor must supply and install all light supports and brackets, which must be subject to the approval of the Council.

Pipe used for lighting standards must be not less than 50mm water pipe.

Where possible, all luminaires must be mounted on solid structural members not subject to vibration. Where vibration cannot be avoided, luminaires must be provided with suitable anti-vibration mountings, in accordance with manufacturer's recommendations, such as to avoid any reduction in the working life of lamps and luminaires.

Unless specifically approved by the Council, no luminaires must be mounted from hand-rails.

Where approval is granted for poles to be mounted from hand-rails, they must not hinder persons gripping or sliding their hands along the hand-rails. The installation must comply with all relevant access and walkway codes and standards.

All luminaires must be solidly supported. Chain suspensions are not acceptable.

All luminaires must be erected and fixed in such a manner that they may be readily removed and replaced as a whole, without disassembly. All fittings must be jig positioned so that similar fittings and their fixings may be interchanged. Unistrut brackets must be used where possible.

Floodlight supports and mountings must be arranged so that they allow full adjustment and maintenance of the fitting.

Brackets for fixing lamps must be provided where necessary and must be to a standard agreed by the Council.

11.3 Circuit Configuration

The main lighting supply must be a 3 phase, 240 V, restricted earthed neutral system. Each sub circuit must emanate from the Switchroom via a circuit breaker distribution board and reticulate to a distribution board. These circuits must be 3 phase with 300 mA RCD circuit breakers for each distribution board.

Lighting circuits must be divided into logical groups such that the failure of any individual group will not result in total darkness in any one area. However, care must be taken to ensure that circuit location and identification can be clearly understood by maintenance personnel for isolation purposes.

The final sub-circuit from each distribution board must be restricted to a single level and cover an area of not more than 300 m².

Distribution boards must be located in switch rooms or at locations specifically designated by Council for that purpose.

All lights must have their own individual 2 pole switch adjacent to the light.

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The Contractor must be responsible for routing the cables in such a way as to avoid interference with other equipment and must finalise the route to the acceptance of the Council.

All area lighting and certain other fittings, as shown on the drawings, must be controlled by a photo-electric cell. The PE cell must be an adjustable type in weather proof enclosure mounted in a suitable location on the outside of building such that its operation is not effected by lighting fittings.

A 3 position bypass switch labelled "Bypass-Off-Auto" and contactor (suitable rated with 50% spare capacity) must be included in the distribution panel.

Lighting circuits must be controlled only from their individual circuit breakers at the distribution board or through a PE cell controlled contactor as required.

12 GENERAL POWER

The following types of power outlets must be used:

1. 5 pin, 415 V, 50A for 3 phase outlets.
2. 3 pin, 240 V, 10A, for 1 phase outlets.

The location of the power outlets must be generally in accordance with the layout drawings supplied by the Council. However, the final position of each outlet must be approved by the Council.

At each nominated location one of each of the above items must be provided in an integrated, surface mounted, IP66 enclosure protected by a 316 stainless steel shroud with a 40° peaked cover

Each 240 V outlet must have two pole switching and each 3 phase outlet must be supplied complete with a plug top.

All switch socket outlets must be of the make and types specified. They must be surface mounted.

All 240 V outlets must be heavy duty polycarbonate. Welding outlets must be 500 V, 50A, 4 pole switch.

Circuits must be arranged such that the maximum demand does not exceed Australian standard requirement or the current rating of the circuit. However not more than five outlets must be connected to any circuit. Due to voltage drop considerations the size of cable required for the three phase outlets may be large and difficult to terminate in Combination Power Outlet. This problem may be overcome by reducing the total number of outlets per circuit.

General purpose outlets must be supplied from a combined 30 mA RCD/MCB. Three phase outlets must be supplied from a combined 300 mA RCD/MCB.

Unless other wise accepted by the Council all cable entries to power outlets must be from below.

13 EARTHING SYSTEM (FAULT-LOOP) IMPEDANCE

The Contractor must ensure that the earthing system (fault loop) impedance of all lighting and small power circuits meets the requirements of AS 3000 and AS 3007.

14 LABELLING

All lighting and power distribution boards must be labelled according to the board name and equipment number. All Power outlets and luminaires must be labelled with their description, supply point and circuit number.

15 COMMISSIONING

The Contractor must check the correct operation of all lighting and small power circuits.

Before finally handing over the installation to the Council, the Contractor must thoroughly clean all light fittings, including reflectors, associated glassware, and internal components. All faulty lamps, tubes, ballasts, and broken fittings must be replaced.

The Contractor must complete a lighting review in accordance to the requirements of AS 1680.