

Public Lighting Equipment – Luminaires, Lamps & Ancillary Equipment

Technical Specification

Ausgrid / Endeavour Energy / Essential Energy

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Contents

1.0	PURPOSE.....	3
2.0	SCOPE.....	3
3.0	REFERENCES	4
4.0	DEFINITIONS AND ABBREVIATIONS	7
5.0	TECHNICAL REQUIREMENTS.....	8
5.1	Luminaires	8
5.1.1	Category V Road Lighting Luminaires	8
5.1.2	Category P Road Lighting Luminaires	16
5.2	Lamps.....	22
5.2.1	General Requirements.....	22
5.2.2	High Pressure Mercury Vapour Lamps	23
5.2.3	High Pressure Sodium Lamps	24
5.2.4	Fluorescent Lamps	26
5.2.5	Metal Halide Lamps.....	28
5.3	Floodlights.....	30
5.4	Photoelectric Control Switches.....	35
6.0	APPENDIX A – PRODUCT LIST	38

1.0 PURPOSE

To set out in detail the requirements for manufacturing, testing and delivery of:

- a) Category V and P road lighting luminaires (excluding LED's), and
- b) Lamps and ancillary equipment,

for use on Ausgrid, Endeavour Energy and Essential Energy electrical networks.

2.0 SCOPE

This specification has been prepared in conjunction with Ausgrid, Endeavour Energy and Essential Energy.

This specification covers the items detailed in table 1.

Table 1: Items included in scope

Category	Sub-category
Luminaires	Category V Road Lighting Luminaires
	Category P Road Lighting Luminaires
	Pedestrian Floodlights
Lamps	High Pressure Mercury Vapour Lamps
	High Pressure Sodium Lamps
	Fluorescent Lamps
	Metal Halide Lamps
Photoelectric Control Switches	NEMA
	D2

3.0 REFERENCES

All items shall be designed and manufactured in accordance with the following industry standards detailed in table 2.

Table 2: Industry Standards

Standard	Standard Name
Luminaires	
AS/NZS 1158.0:2005	Lighting for roads and public spaces - Introduction
AS/NZS 1158.1.1:2005	Lighting for roads and public spaces - Vehicular traffic (Category V) lighting - Performance and design requirements
AS/NZS 1158.2:2005	Lighting for roads and public spaces - Computer procedures for the calculation of light technical parameters for Category V and Category P lighting
AS/NZS 1158.3.1:2005	Lighting for roads and public spaces - Pedestrian area (Category P) lighting - Performance and design requirements
AS/NZS 1158.1.2:2010	Lighting for roads and public spaces - Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance
AS/NZS 1158.6:2010	Lighting for roads & public spaces - Part 6: Luminaires
AS/NZS 60598.1: 2003	Luminaires - General requirements and tests
Lamps	
AS 4111-1993	Starters for fluorescent lamps - Performance requirements
AS/NZS 4782.1:2004	Double-capped fluorescent lamps - Performance specifications – General (IEC 60081:2000, MOD)
AS/NZS 4782.2:2004	Double-capped fluorescent lamps - Performance specifications - Minimum Energy Performance Standard (MEPS)
AS/NZS 4847.2:2010	Self-ballasted lamps for general lighting services - Minimum Energy Performance Standard (MEPS)
AS/NZS 6090:2003	Single-capped fluorescent lamps - Performance specifications
BS EN 60662:2012	High pressure sodium vapour lamps. Performance specifications
IEC 61167:2011	Metal halide lamps
IEC 60188:2001	High pressure mercury vapour lamps

Ballasts and control gear assemblies	
AS/NZS 60155:2000	Glow starters for fluorescent lamps
AS/NZS 60921:2002	Ballasts for tubular fluorescent lamps - Performance requirements (IEC 60921:1988, MOD)
AS/NZS 60923:1998	Auxiliaries for lamps - Ballasts for discharge lamps (excluding tubular fluorescent lamps) - Performance requirements
AS/NZS 60929:2005	A.C. supplied electronic ballasts for tubular fluorescent lamps - Performance requirements
AS/NZS 61347.1:2002	Lamp control gear - General and safety requirements
AS/NZS 61347.2	Lamp control gear Part 2: Particular requirements (2007 series of standards)
AS/NZS 61347.2.8:2003	Lamp control gear - Particular requirements for ballasts for fluorescent lamps
AS/NZS CISPR 15	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
Photoelectric control cells	
BS 5972:1980	Specification for photoelectric control units for road lighting
General	
AS/NZS 9001:2008	Quality Management Systems – Requirements
AS/NZS 60038:2012	Standard voltages
BS 5733:2010	General requirements for electrical accessories. Specification
IEC 60085:2007	Electrical insulation - Thermal evaluation and designation
BS 1362:1973	Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs)
IEC 60927:2007	Auxiliaries for lamps – Starting devices (other than glow starters) – Performance requirements

Where Australian Standards are not published for the equipment that is subject to this specification, equivalent international standards, such as IEC or BS, shall apply.

If any inconsistencies are identified between the standards and/or this specification, the tenderer shall refer such inconsistencies to Network NSW for resolution

4.0 DEFINITIONS AND ABBREVIATIONS

Table 3: Abbreviations

Abbreviation	Definition
ARR	Arrangement – The layout, in plan, of the luminaires in a lighting scheme, e.g. single sided, staggered, opposite or central. As per AS1158.2 Figure 5.1
AS	Australian Standard
BS	British Standard
CFL	compact fluorescent lamp
CIE	International Commission on Illumination
FMECA	Failure mode, effects and criticality analysis
H	The vertical distance in meters between the photometric centre of a luminaire and the surface which is to be illuminated
HID	high intensity discharge
HPS	high pressure sodium
IEC	International Electrotechnical Commission
IP	Ingress Protection
ISO	International Organisation for Standardisation
MH	metal halide
MOV	metal oxide varistor
NEMA	National Electrical Manufacturers Association
NZS	New Zealand Standard
O.D.	Outer Diameter
Wk	The width of a carriageway that is used for the determination of the performance of any given Category V road lighting scheme

5.0 TECHNICAL REQUIREMENTS

A complete list of products included in this specification is provided in Appendix A. Further detail on product requirements is given in the relevant category section.

5.1 Luminaires

5.1.1 Category V Road Lighting Luminaires

5.1.1.1 Specification

The specification covers the supply and delivery of the following Category V Road Lighting Luminaires as detailed in Table 4:

Table 4: Category V Luminaires

Item	Description
F4.1a	100W HPS Category V Luminaire
F4.2a	150W HPS / MH Category V Luminaire
F4.3a	250W HPS / MH Category V Luminaire
F4.4a	400W HPS / MH Category V Luminaire
F4.5a	100W HPS Category V Luminaire Aeroscreen
F4.6a	150W HPS / MH Category V Luminaire Aeroscreen
F4.7a	250W HPS / MH Category V Luminaire Aeroscreen
F4.8a	400W HPS / MH Category V Luminaire Aeroscreen

5.1.1.2 Purpose of Equipment

The luminaires will be connected to low voltage distribution network with nominal voltage of 230V +10% to -6% at 50Hz as per AS 60038 on either dedicated street lighting mains or directly connected to the low voltage distribution network. They will be mounted on steel or concrete lighting poles or on steel or aluminium street lighting brackets on timber poles. The arm projection of supporting structures may be up to 6m.

Items F4.2a – F4.4a, F4.6a – F4.8a(150W, 250W & 400W) shall be suitable for use with both high pressure sodium tubular clear lamps and metal halide tubular clear lamps.

The luminaires shall be suitable for use with the following lamp types:

- high pressure sodium vapour 100W, 150W, 250W and 400W clear tubular lamps, and
- metal halide 150W, 250W and 400W.

The light technical parameters given in AS/NZS 1158.1.1 for lighting categories V1, V3 and V5 shall be calculated when luminaires are used above dry road surfaces having reflecting properties as prescribed for the CIE standard road surface R3 in CIE Publication No. 30-2 calculated in the manner prescribed by AS/NZS 1158.2.

5.1.1.3 Construction

The luminaires shall comply with AS/NZS 1158.6 and this specification. Where there is conflict between AS/NZS 1158.6 and this specification, the latter applies.

Items 4.1a – 4.8a shall all be:

- with NEMA photoelectric cell base,
- with integral control gear,
- designed for clear tubular lamp,

- d) single insulated,
- e) with radio and television interference suppression capacitors, and
- f) with a metal oxide varistor (MOV) – minimum 320 Joules.

All items shall include a shorting cap installed in the luminaire.

All items shall not include a lamp.

5.1.1.4 Variations and minor additions to the requirements of AS/NZS 1158.6 (to be read in conjunction with AS1158.6)

Clause 1.5 “Environmental Conditions”

Additionally all items shall have an effective service life of 20 years in areas of coastal sea spray and industrial pollution with an equivalent salt deposit density of 3g/m^2 .

Clause 2.2.2 “Required Ingress Protection”

Luminaires shall have a minimum IP65 lamp chamber rating.

The luminaire canopy shall provide a skirt to extend down past the gasket at least 6mm.

Clause 2.4.2 “Component Fixing Devices”

Toggle latches, catches, clips and hinges shall be stainless steel of not less than grade 304.

In order to avoid electrolysis corrosion, brass and other copper alloys shall not be used in contact with aluminium or aluminium alloy.

Control gear / terminal block chamber shall be accessible without the use of tools.

Where toggle latches are used to secure an external supplementary visor, they shall be capable of maintaining the IP rating of the optical chamber throughout the design life of the luminaire as well as being capable of resisting inadvertent opening by animals.

Clause 2.5 “Visors”

The visor must be capable of being accessed without the use of tools by personnel working in leather gloves.

The visor should be fastened by not less than three stainless steel toggle latches capable of exerting a maximum tension of 50kg.

Clause 2.6 “Optical System”

The lampholder and supporting hardware shall be sufficiently robust as to render additional mechanical support for the lamp unnecessary.

Reflective paint finishes must be proved by accredited accelerated aging tests that the finishes are durable and will not discolour with age in the environments of heat, change of temperature, ultraviolet radiation, ozone, salt spray, airborne industrial contamination and motor vehicle exhaust emissions, for the design life of the luminaire. Tenderers shall include test reports.

Clause 2.9 “Fixing Spigot Entry”

The luminaires shall be suitable for mounting on a 42mm O.D. spigot to AS 1798. Luminaires must have fixing spigot entry designed for zero degree upcast.

Clause 2.10

In addition to the mass requirements specified in this clause the luminaire shall not exceed a sail area of 0.18m^2

Clause 3.2 "Ballasts"

The ballasts shall be enclosed and sealed with epoxy resin or vacuum impregnated. The ballasts shall not produce any appreciable hum.

The associated control gear shall be integral to the luminaire and be easily accessible. Control gear is to be fixed to the inside of the luminaire.

The ballast shall be marked with the month and year of manufacture in addition to standard markings to AS 60923.

Ballasts shall be suitable for use with both single and twin-arc lamps.

Clause 3.2.2 "Igniters"

Timed igniters shall be used.

Igniters shall be suitable for use with both single and twin arc lamps and shall allow for tool free replacement.

Clause 3.4.2 "Lampholder Requirements"

Lampholder shall accommodate lamp with E40 cap.

Lampholder shall be provided with anti-vibration springs where necessary, to ensure that the lamp does not unscrew in service.

Clause 3.8 "Terminal Block"

The terminal block shall be placed suitable for use with 4.0mm² two or three core PVC supply cables. An insulated clamp shall be provided near this terminal block to enable the incoming supply cable to be anchored in position without causing pinching of the cable or imposing mechanical strain on the terminal block.

Clause 3.10 "Socket for Photoelectric Cell Switch"

The photoelectric cell socket shall be NEMA type.

The base shall be so fitted that the cell "window" faces the fixing spigot and can be located at either the top or the bottom of the luminaire.

5.1.1.5 Requirements beyond the scope of AS/NZS 1158.6

Insulation Tests

Luminaires must be tested after manufacture and before packaging to ensure compliance with the following electrical tests;

- a) Insulation Resistance Test – Clause 8.3.1 of AS 3100
 - Insulation resistance shall be measured at a voltage of 500 V d.c.
 - The resistance between live parts and the external metallic body shall be not less than 10 MΩ.
- b) High Voltage (Electric Strength Test) – As per clause 8.4.3 of AS 3100. Test shall be applied as per clause 8.4.5 of AS 3100 and there shall be no disruptive discharges, that is flashovers of insulation punctures during any high voltage test.

5.1.1.6 Shading Devices to Minimise the Effects of Obtrusive Light

The Purchaser may be required to affix glare shielded visors to luminaires to minimise the obtrusive effects of spill light. These visors shall be interchangeable with the luminaires standard visor. This requirement may be at the time of initial installation or during the life of the luminaire. This shading is not to be confused with the "cut-off" and "aeroscreen" luminaires normally available. Luminaires with an essential "semi-cut-off" distribution may be required to

be fitted with shades to partially or severely restrict light emitted into the azimuthal sector C45° to C135° above a gamma angle of 75° and in the azimuthal sector C225° to C315° above a gamma angle of 60°.

Tenderers are required to provide details of glare shielded visors which can be fitted to the luminaires offered, as well as some quantification of their effect. This information should be provided in the Technical Schedule.

5.1.1.7 Specified Installation Parameters

Luminaires will be used typically for the lighting categories and geometrical configurations indicated in the tables below. Requirements of AS1158.1.1 table 2.2 should be met using the minimum spacings as indicated in each table using a maintenance factor of 0.7. Category V luminaires are required to meet all requirements of AS1158.1.1 table 2.2. In addition to this requirement and where an “Aeroscreen” visor is specified the Upward Waste Light Ratio (UWLR) shall be 0%.

For the purpose of calculating the light technical parameters for the luminaires offered, lamp flux values shall be assigned as detailed in Table 5 to Table 19:

Table 5: High Pressure Sodium installation parameters

High Pressure Sodium Vapour (SON)	Initial Lamp lumens
100 W Tubular clear envelope	10 000 lumens
150 W Tubular clear envelope	14 500 lumens
250 W Tubular clear envelope	28 000 lumens
400 W Tubular clear envelope	48 000 lumens

Table 6: Metal Halide installation parameters

Metal Halide (MH)	Initial Lamp lumens
150 W Tubular clear envelope	12000 lumens
250 W Tubular clear envelope	20000 lumens
400 W Tubular clear envelope	36000 lumens

Table 7: Spacing - 100 Watt High Pressure Sodium Vapour

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing M
V5	3	13	9	2	5	31
	3	13	10.5	3		35
	4	23	9	2		63
	4	23	10.5	3		68

Table 8: Spacing - 100 Watt High Pressure Sodium Vapour Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V5	3	13	9	2	5	26
	3	13	10.5	3		30
	4	23	9	2		53
	4	23	10.5	3		55

Table 9: Spacing - 150 Watt High Pressure Sodium Vapour

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V3	3	13	9	2	5	29
	3	13	10.5	3		32
	4	23	9	2		45
	4	23	10.5	3		44

Table 10: Spacing - 150 Watt High Pressure Sodium Vapour Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V3	3	13	9	2	5	26
	3	13	10.5	3		27
	4	23	9	2		37
	4	23	10.5	3		37

Table 11: Spacing - 250 Watt High Pressure Sodium Vapour

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V1	3	13	10.5	3	5	33
	3	13	12	3		30
	4	23	10.5	3		42
	4	23	12	3		40

Table 12: Spacing - 250 Watt High Pressure Sodium Vapour Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V1	3	13	10.5	3	5	25
	3	13	12	3		24
	4	23	10.5	3		34
	4	23	12	3		33

Table 13: Spacing - 400 Watt High Pressure Sodium Vapour

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V1	3	13	12	3	5	46
	3	13	13.5	3		46
	4	23	12	3		61
	4	23	13.5	3		65

Table 14: Spacing - 400 Watt High Pressure Sodium Vapour Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V1	3	13	12	3	5	36
	3	13	13.5	3		39
	4	23	12	3		56
	4	23	13.5	3		53

Table 15: Spacing - 150 Watt Metal Halide

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V5	3	13	9	2	5	29
	3	13	10.5	3		37
	4	23	9	2		60
	4	23	10.5	3		64

Table 16: Spacing - 150 Watt Metal Halide Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V5	3	13	9	2	5	27
	3	13	10.5	3		40
	4	23	9	2		51
	4	23	10.5	3		53

Table 17: Spacing - 250 Watt Metal Halide

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V3	3	13	9	2	5	27
	3	13	10.5	3		34
	4	23	9	2		61
	4	23	10.5	3		60

Table 18: Spacing - 250 Watt Metal Halide Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V3	3	13	9	2	5	22
	3	13	10.5	3		26
	4	23	9	2		48
	4	23	10.5	3		52

Table 19: Spacing - 400 Watt Metal Halide Aeroscreen

Lighting category	ARR	W _k m	H m	Overhang m	Upcast degree	Required minimum spacing m
V1	3	13	10.5	3	5	27
	3	13	12	3		31
	4	23	10.5	3		44
	4	23	12	3		42

5.1.1.8 Technical information to be maintained and made available by the contractor

The contractor shall provide the information referenced below. Any supplementary information, together with any proposed departures from this specification in the luminaires offered, shall be clearly set out.

5.1.1.9 Technical particulars of luminaires offered

- a) General
- b) Salient photometric details
- c) Luminaire performance for situations as specified in tables above
- d) Ballast and igniter
- e) PE Cell Base

5.1.1.10 Dimensional Outline Drawing

Tenderers shall provide dimensional outline drawings of the luminaires offered. The drawings shall include the information specified in Clause 6.2 of AS/NZS 1158.6.

5.1.1.11 Detailed Photometric Information

Tenderers shall provide the salient photometric features of the luminaire offered, including information detailed in Clause 4.1 of AS/NZS 1158.1.1. Additionally, the following information shall be provided:

- a) Polar curves of luminous intensity distribution in the vertical plane;
 - At the 'C' angles at which the maximum intensity occurs (means of both sides of luminaire)
 - At 'C' angles of 0°/180° (mean)
 - At a 'C' angle of 90°
 - At a 'C' angle of 270°
 - At 'C' angles of 45°/135° (mean)
 - At 'C' angles of 225°/315°
- b) Polar curve of luminous intensity distribution in azimuth on the conical surface at the gamma angle at which the maximum intensity occurs. Where only 1 side is shown, it shall be the mean of both sides.

5.1.1.12 Evidence of Compliance – Documentation

Except in the case of component materials, in which case suppliers' data sheets are an acceptable alternative, compliance with this Technical Specification shall be claimed in writing by the supplier and shall be substantiated by reference to appropriate test reports from a laboratory accredited by signatories to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA).

Test reports demonstrating compliance with AS/NZS 1158.6 and other applicable standards shall be provided as follows:

- a) Ballast loss requirements, Clause 5.3 of AS/NZS 1158.6,
- b) Wind force test, Clause 5.4 of AS/NZS 1158.6,
- c) Vibration Test, Clause 5.5 of AS/NZS 1158.6,
- d) Ingress Protection Test, Clause 5.6 of AS/NZS 1158.6,
- e) Resistance to external mechanical impact, Clause 5.7 of AS/NZS 1158.6,
- f) Impulse voltage test, Clause 5.8 of AS/NZS 1158.6,
- g) Thermal Endurance and Thermal test requirements, 5.9 of AS/NZS 1158.6,
- h) Insulated incoming supply cable clamp will satisfy the mechanical requirements of this Specification,
- i) Insulation tests as detailed in 5.1.1.5,
- j) A luminous intensity distribution Table (I - Table) for the luminaire in CIE and IES file formats; and an Isolux Diagram,
- k) Evidence of accreditation of the laboratory providing the photometric information as per (j) above.

5.1.1.13 Packing and Marking

The luminaires shall be supplied separately and carefully packed in strong containers suitable for transport, handling and storage.

The containers shall be clearly and indelibly marked with the following information:

- a) Purchaser Stockcode No.
- b) Lamp size
- c) Lamp type

The coding of Table 1.1 of AS/NZS 1158.6 shall be used.

Contractors shall use the method of marking for the duration of the contract, as specified prior to contract execution unless an alternative method is expressly agreed between parties.

5.1.2 Category P Road Lighting Luminaires

5.1.2.1 Specification

The specification covers the supply and delivery of the following Category P Lighting Luminaires:

Table 20: Category P Luminaires

Item	Description	Lighting Cat
F4.9a	70W HPS (without external igniter)	P3
F4.10a	70W HPS (with external igniter)	P3
F4.11a	70W HPS Aeroscreen (without external igniter)	P3
F4.12a	70W HPS Aeroscreen (with external igniter)	P3
F4.13a	42W CFL	P4/5
F4.14a	42W CFL Aeroscreen	P4/5
F4.15a	80W MBF (For use with 72 ceramic metal halide lamp)	P3
F4.16a	80W MBF Aeroscreen (For use with 72 ceramic metal	P3
F4.17a	2 x 14W T5	P4/5
F4.18a	2 x 24W T5	P3

5.1.2.2 Purpose of Equipment

The luminaires will be connected to low voltage distribution network with nominal voltage of 230V at 50Hz as per AS 60038 on either dedicated street lighting mains or directly connected to the low voltage distribution network. They will be mounted on steel or concrete lighting poles or on steel or aluminium street lighting brackets on timber poles. The arm projection of supporting structures may be up to 6m.

Luminaires shall be suitable for the following lamp types;

- a) H.P.S
 - The luminaires shall be suitable for the horizontal burning of 50 watt and 70 watt E 27 high pressure sodium vapour lamps with external or internal igniters complying with IEC-60662.
- b) CFL
 - The luminaires shall be suitable for the horizontal burning of 42 watt compact fluorescent lamps complying with AS/NZS 60901.
- c) T5
 - The luminaires shall be suitable for the horizontal burning of 2 x 14 watt and 2 x 24 watt T5 tubular fluorescent lamps complying with AS/NZS 4782.1.

5.1.2.3 Construction

The luminaires shall comply with AS/NZS 1158.6 and this specification. Where there is conflict between AS/NZS 1158.6 and this specification, the latter applies;

- a) with D2 or NEMA photoelectric cell base (cell shall not be supplied with luminaire),
- b) with Integral control gear,
- c) designed for diffused lamps (lamp shall not be supplied with luminaire),
- d) single insulated,
- e) with radio and television interference suppression capacitors,
- f) with a metal oxide varistor (MOV) – minimum 320 Joules.

All items shall not include a lamp.

5.1.2.4 Variations and minor additions to the requirements of AS/NZS 1158.6

Clause 1.5 “Environmental Conditions”

Additionally all items shall have an effective service life of 20 years in areas of coastal sea spray and industrial pollution with an equivalent salt deposit density of 3g/m².

Clause 2.2.2 - “Required Ingress Protection”

Luminaires shall have a minimum IP65 lamp chamber rating.

The luminaire canopy shall provide a skirt to extend down past the gasket at least 6mm.

Clause 2.4.2 - “Component Fixing Devices”

Toggle latches, catches, clips and hinges shall be stainless steel of not less than grade 304.

In order to avoid electrolysis corrosion, brass and other copper alloys shall not be used in contact with aluminium or aluminium alloy.

Control gear / terminal block chamber shall be accessible without the use of tools.

Where toggle latches are used to secure an external supplementary visor, they shall be capable of maintaining the IP rating of the optical chamber throughout the design life of the luminaire as well as being capable of resisting inadvertent opening by animals.

Clause - 2.5 “Visors”

The visor must be capable of being accessed without the use of tools by personnel working in leather gloves.

The visor should be fastened by not less than three stainless steel toggle latches capable of exerting a maximum tension of 50kg.

Clause - 2.6 “Optical System”

The lampholder and supporting hardware shall be sufficiently robust as to render additional mechanical support for the lamp unnecessary.

Reflective paint finishes must be proved by accredited accelerated aging tests that the finishes are durable and will not discolour with age in the environments of heat, change of temperature, ultraviolet radiation, ozone, ocean spray, airborne contamination and motor vehicle exhaust emissions for the design life of the luminaire. Tenderers shall include test reports.

Clause 2.9 - “Fixing Spigot Entry”

The luminaires shall be suitable for mounting on a 34mm O.D. spigot to AS 1798. Luminaires must have fixing spigot entry designed for zero degree upcast.

Clause 2.10 – “Sail Area”

In addition to the mass requirements specified in this clause the luminaire shall not exceed a sail area of 0.18m²

Clause 3.2.1 – “Ballasts”

The ballasts shall be enclosed and sealed with epoxy resin or vacuum impregnated. The ballasts shall not produce any appreciable hum.

The associated control gear shall be integral to the luminaire and be easily accessible. Control gear is to be fixed to the inside of the luminaire.

The ballast shall be marked with the month and year of manufacture in addition to standard markings to AS 60923.

Items F4.9a – F4.18a require use of ECG (Electronic control gear). The ECG shall comply with AS/NZS 60929 and IEC 61547 and be compatible with multiple wattages of lamp. Because ECG may have an effective service life of less than 20 years, design of the luminaire must cater for ease of replacement of this consumable part, preferably without the use of tools. Refer to Clause A5 of AS/NZS 1158.6 for further information on ECGs.

Clause 3.4.2 - “Lampholder Requirements”

For Items F4.9a - F4.14a, the lampholder shall accommodate lamp with GX24q-4 cap.

For Items F4.15a - F4.16a, the lampholder shall accommodate lamp with E27 cap.

For Items F4.17a - F4.18a, the lampholders shall accommodate lamps with G5 cap.

Lampholder shall be provided with anti-vibration springs where necessary, to ensure that the lamp does not unscrew in service.

Clause 3.5.1 - "Required lamp types"

For Items F4.10a and F4.12a, the HPS lamp shall have an external igniter.

For Items F4.9a, F4.11a, and F4.13a - F4.17a inclusive, the HPS lamp shall have an internal igniter.

For Items F4.13a - F4.14a, the CFL lamp shall comply with AS/NZS 60901, and be 'Amalgam' type.

For Items F4.15a - F4.16a inclusive, the lamp shall be of CMI type and be compatible with mercury vapour control gear.

For Items F4.17a - F4.18a, the T5 lamp shall comply with AS/NZS 4782.1.

Clause 3.8 - "Terminal Block"

The terminal block shall be placed suitable for use with 4.0mm² two or three core PVC supply cables. An insulated clamp shall be provided near this terminal block to enable the incoming supply cable to be anchored in position without causing pinching of the cable or imposing mechanical strain on the terminal block.

Clause 3.10 - "Socket for Photoelectric Cell Switch"

The photoelectric cell socket shall be D2 or NEMA type.

The base shall be so fitted that the cell "window" faces the fixing spigot.

5.1.2.5 Requirements beyond the scope of AS/NZS 1158.6

Insulation Tests

Luminaires shall be tested after manufacture and before packaging to ensure compliance with the following electrical tests;

- a) Insulation Resistance Test – Clause 8.3.1 of AS 3100
 - Insulation resistance shall be measured at a voltage of 500 V d.c.
 - The resistance between live parts and the external metallic body shall be not less than 10 MΩ.
- b) High Voltage (Electric Strength Test) – As per clause 8.4.2 of AS 3100. Test shall be applied as per clause 8.4.5 of AS 3100 and there shall be no disruptive discharges, that is, flashovers or insulation punctures during any high voltage test.

Shading Devices to Minimise the Effects of Obtrusive Light

The Purchaser may be required to affix glare shielded visors to luminaires to minimise the obtrusive effects of spill light. These visors shall be interchangeable with the luminaire standard visor. This requirement may be at the time of initial installation or during the life of the luminaire. This shading is not to be confused with the "cut-off" and "aeroscreen" luminaires normally available. Luminaires with an essential "semi-cut-off" distribution may be required to be fitted with shades to partially or severely restrict light emitted into the azimuthal sector C45° to C135° above a gamma angle of 75° and in the azimuthal sector C225° to C315° above a gamma angle of 60°.

Tenderers are required to provide details of glare shielded visors which can be fitted to the luminaires offered, as well as some quantification of their effect. This information should be provided in the Technical Schedule.

5.1.2.6 Specified Installation Parameters

Luminaires will be used typically for the lighting categories and geometrical configurations indicated in Table 22. Category P luminaires shall comply with light distribution, glare criteria and Upward Waste Light Ratio for a Type 4 luminaire as detailed in Table 2.10 of AS/NZS 1158.3.1 and Type 6 where “Aeroscreen” is specified.

Light distribution requirements of AS1158.3.1 table 2.6 must be met using the minimum spacings as indicated in Table 22 using a maintenance factor of 0.7.

For the purpose of calculating the light technical parameters for the luminaires offered, lamp flux values shall be assigned as indicated in Table 21.

Table 21: Initial lamp lumens

Lamp	Lumens
72W CMI	7,700 lumens
70W HPS	5,800 lumens
42W CFL	3,200 lumens
2 x 14W T5	2,400 lumens
2 x 24W T5	4,000 lumens

Table 22: Typical required AS/NZS 1158.3.1 spacings for Category P luminaires

Luminaire type	Category P3	Category P4	Category P5
	7.5m mounting height (H)	7.5m mounting height (H)	7m mounting height (H)
70W HPS	50	65	80
70W HPS Aeroscreen	-	45	60
80W MBF (For use with 72 ceramic metal halide lamp)	55	75	80
80W MBF Aeroscreen (For use with 72 ceramic metal halide lamp)	40	55	65
42W Amalgam CFL	-	65	75
42W Amalgam CFL Aeroscreen	-	40	55
2 x 14W T5	-	65	75
2 x 24W T5	30	65	-

Note: The following parameters are assumed:

- RRW (Road Reserve Width) = 20 m
- Offset distance = 0.25 x RRW
- Maintenance factor = 0.7
- Upcast angle = 5 degrees

5.1.2.7 Technical information to be supplied with offer

Contractors shall provide the information referenced below. Any supplementary information, together with any proposed departures from this specification in the luminaires offered, shall be clearly set out.

Technical particulars of luminaires offered

- a) General,

- b) Salient photometric details,
- c) Luminaire performance for situations specified in table 22x (spacing table),
- d) Ballast and igniter (if applicable), and
- e) PE Cell Base.

Dimensional Outline Drawing

Contractors shall provide dimensional outline drawings of the luminaires offered. The drawings shall include the information specified in Clause 6.2 of AS/NZS 1158.6.

Photometric Information

Contractors shall provide the salient photometric features of the luminaire offered, including information detailed in Clause 4.1 of AS/NZS 1158.3.1. Additionally, the following information shall be maintained:

- a) Polar curves of luminous intensity distribution in the vertical plane
 - At the 'C' angles at which the maximum intensity occurs (means of both sides of luminaire)
 - At 'C' angles of 0°/180° (mean)
 - At a 'C' angle of 90°
 - At a 'C' angle of 270°
 - At 'C' angles of 45°/135° (mean)
 - At 'C' angles of 225°/315°
- b) Polar curve of luminous intensity distribution in azimuth on the conical surface at the gamma angle at which the maximum intensity occurs. Where only 1 side is shown, it shall be the mean of both sides.

Evidence of Compliance - Documentation

Except in the case of component materials, in which case suppliers' data sheets are an acceptable alternative, compliance with this Technical Specification shall be claimed in writing by the supplier and shall be substantiated by reference to appropriate test reports from a laboratory accredited by signatories to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA).

Test reports demonstrating compliance with AS/NZS 1158.6 and other applicable standards shall be maintained as follows;

- a) Ballast loss requirements, Clause 5.3 of AS/NZS 1158.6.
- b) Wind force test, Clause 5.4 of AS/NZS 1158.6
- c) Ingress Protection Test, Clause 5.6 of AS/NZS 1158.6
- d) Resistance to external mechanical impact, Clause 5.7 of AS/NZS 1158.6
- e) Impulse voltage test, Clause 5.8 of AS/NZS 1158.6.
- f) Thermal Endurance and Thermal Testing requirements, Clause 5.9 AS/NZS 1158.6
- g) Insulated incoming supply cable clamp will satisfy the mechanical requirements of this Specification.
- h) Insulation tests as detailed in 5.1.2.5,
- i) A luminous intensity distribution Table (I - Table) for the luminaire offered in CIE and IES format; and an Isolux Diagram.

- j) Evidence of accreditation of the laboratory providing the photometric information as per (i) above.

5.1.2.8 Packing and Marking

The luminaires shall be supplied separately and carefully packed in strong containers suitable for transport, handling and storage. Contractors shall state the type and method of packing offered.

The containers shall be clearly and indelibly marked with the following information;

- a) DNSP Stockcode No,
- b) Lamp size,
- c) Lamp type.

The coding of Table 1.1 of AS/NZS 1158.6 shall be used.

Contractors shall use the method of marking for the duration of the contract, as specified prior to contract execution unless an alternative method is expressly agreed between parties.

5.2 Lamps

5.2.1 General Requirements

Lamp lumen maintenance and mortality requirements for each lamp category are minimum requirements.

Unless otherwise specified, lamps shall be suitable for universal burning.

5.2.1.1 Technical information to be supplied with offer

The Contractor shall supply results of mortality and lumen depreciation tests in tables and spectral energy distributions in graphical form. Mortality and lumen depreciation information shall be provided at intervals not exceeding 2000 hours up to a minimum of 16000 hours.

Evidence of performance should be provided in the form of test certificates / reports from an accredited testing organisation. Certificates / reports shall be for the lamps offered and shall include dates of testing and testing conditions.

5.2.2 High Pressure Mercury Vapour Lamps

5.2.2.1 Specification

The specification covers the supply and delivery of the following high pressure mercury lamps:

Table 23: High Pressure Mercury Lamps

Item	Description	Cap Type	Lamp Type	Coated/Clear
F6.1a	50W High Pressure Mercury elliptical	E27	MBF/U	Coated
F6.2a	80W High Pressure Mercury elliptical	E27	MBF/U	Coated
F6.3a	125W High Pressure Mercury elliptical	E27	MBF/U	Coated
F6.4a	125W High Pressure Mercury elliptical	E40	MBF/U	Coated
F6.5a	250W High Pressure Mercury elliptical	E40	MBF/U	Coated
F6.6a	400W High Pressure Mercury elliptical	E40	MBF/U	Coated

5.2.2.2 Purpose of Equipment

Lamps will be used in luminaires that are operated with 2-terminal ballasts compliant with AS/NZS 61347 and AS/NZS CISPR 15. The luminaires will be connected to 230V nominal, 50Hz distribution network on either dedicated street lighting mains or directly connected to the low voltage distribution network.

Lamps shall operate normally given the standard voltage ranges specified in AS 60038.

5.2.2.3 Technical requirements

The lamps shall be high pressure mercury vapour with a red correcting fluorescent coating, complying with the requirements of IEC 60188. All lamps shall be suitable for use with ballasts rated for 250V operation.

5.2.2.4 Lamp Lumen Maintenance Factor Requirements (LLMF)

Lamps shall have a minimum lumen maintenance value of not less than 70% of initial luminous flux at 16000 hours based on 11 hours each start.

5.2.2.5 Lamp Survival Factor (LSF)

For lamps 125W and below (items F6.1a – F6.4a) the proportion of lamps surviving after 16000 hours shall be not less than 90% based on 11 hours each start.

For lamps greater than 125W (items F6.5a and F6.6a) the proportion of lamps surviving after 12000 hours shall not be less than 90% based on 11 hours each start.

5.2.3 High Pressure Sodium Lamps

5.2.3.1 Specification

The specification covers the supply and delivery of the following high pressure sodium lamps:

Table 24: High Pressure Sodium Lamps

Item	Description	Cap Type	Lamp Type	Coated/Clear
F6.7a	50W High Pressure Sodium (Internal igniter)	E27	Elliptical	Coated
F6.8a	50W High Pressure Sodium Twin Arc	E27	Elliptical	Coated
F6.9a	70W High Pressure Sodium (internal igniter)	E27	Elliptical	Coated
F6.10a	70W High Pressure Sodium	E27	Tubular	Clear
F6.11a	70W High Pressure Sodium	E27	Elliptical	Clear
F6.12a	70W High Pressure Sodium Twin Arc	E27	Elliptical	Coated
F6.13a	100W High Pressure Sodium	E40	Tubular	Clear
F6.14a	150W High Pressure Sodium	E40	Elliptical	Coated
F6.15a	150W High Pressure Sodium	E40	Tubular	Clear
F6.16a	150W High Pressure Sodium Twin Arc	E40	Tubular	Clear
F6.17a	250W High Pressure Sodium	E40	Elliptical	Coated
F6.18a	250W High Pressure Sodium	E40	Tubular	Clear
F6.19a	250W High Pressure Sodium Twin Arc	E40	Tubular	Clear
F6.20a	400W High Pressure Sodium	E40	Elliptical	Coated
F6.21a	400W High Pressure Sodium	E40	Tubular	Clear
F6.22a	400W High Pressure Sodium Twin Arc	E40	Tubular	Clear
F6.23a	1000W High Pressure Sodium	E40	Tubular	Clear

5.2.3.2 Purpose of Equipment

Lamps will be used in luminaires that are operated with 2-terminal ballasts compliant with AS/NZS 61347 and AS/NZS CISPR 15 and 3-terminal superimposed pulse igniters compliant with AS/NZS 61347 and AS/NZS 60927 (where the lamps do not contain internal igniters). The luminaires will be connected to 230V nominal, 50Hz distribution network on either dedicated street lighting mains or directly connected to the low voltage distribution network. Control gear may be integrated with the luminaire or remote e.g. at the base of the steel lighting column.

Lamps shall operate normally given the standard voltage ranges specified in AS 60038.

Lamps shall comply with the requirements of IEC 60662.

Lamps shall be of the non-reflector type.

5.2.3.3 Lamp Lumen Maintenance Factor Requirements (LLMF)

Lamps shall have a minimum lumen maintenance value of not less than 70% of initial luminous flux at 16000 hours based on 11 hours each start.

5.2.3.4 Lamp Survival Factor Requirements (LSF)

The proportion of lamps surviving after 16000 hours shall not be less than 90% based on 11 hours each start.

5.2.4 Fluorescent Lamps

5.2.4.1 Specification

The specification covers the supply and delivery of the following fluorescent lamps:

Table 25: Fluorescent Lamps

Item	Description	Length	Type	Colour Temperature
F6.24a	18W, 250V Bi-pin, hot cathode tubular fluorescent lamp	600mm	Tubular	4000K
F6.25a	36W , 250V, Bi-pin, hot cathode tubular fluorescent lamp	1200mm	Tubular	4000K
F6.26a	14W, 250V, G5base/ 11x15 cap 16 mm diameter amalgam tubular fluorescent lamp	549mm	Tubular T5	4000K
F6.27a	24W , 250V, G5 base/ 11x15 cap, 16 mm diameter amalgam tubular fluorescent lamp	549mm	Tubular T5	4000K
F6.28a	42W, GX24q-4 base amalgam compact fluorescent lamp		Compact	4000K

5.2.4.2 Purpose of Equipment

The lamps (tubular, T5 and compact) are required for street lighting luminaires connected to a 230V nominal, 50Hz supply network in conjunction with:

- Ballasts complying with AS/NZS 60921 and starters complying with AS/NZ 60155
- Electronic control gear complying with AS/NZ 60929

Lamps may be operated in any burning position, with or without enclosure, at ambient temperatures ranging from -10 deg. C to 40 deg. C, as set out in Clause 1.5 of AS/NZS 1158.6.

Lamps shall operate normally given the standard voltage ranges specified in AS 60038.

5.2.4.3 Tubular requirements

Items F6.24a and F6.25a shall conform to AS 4782 Double-capped fluorescent lamps – Performance specifications

- The minimum rated luminous flux (100 hours) shall be 1300 lumens for Item F6.24a, 3300 lumens for Item F6.25a.
- A minimum lamp lumen maintenance value (LLMF) of 70% shall apply at 16000 hours and;
- The lamp survival factor (LSF) at 16000 hours should not be less than 90% based on 11 hours each start

Lamps shall have cathodes pre-heated by the use of a starter. They shall be of the non-reflector type.

Pins shall be tinned and free from any welding or manufacturing residue that could affect contact resistance in areas of salt laden air and industrially contaminated atmospheres.

5.2.4.4 T5 requirements

Items F6.26a and F6.27a shall conform to AS 4782 Double-capped fluorescent lamps – Performance specifications. T5 lamps will be used in conjunction with electronic control gear.

- a) The minimum rated luminous flux (100 hours) shall be 1200 lumens for Item F6.26a and 1950 lumens for Item F6.27a.
- b) A minimum lamp lumen maintenance factor (LLMF) value of 70% shall apply at 16000 hours and;
- c) The survival factor (LSF) at 16000 hours should not be less than 90% based on 11 hours each start

Lamps shall be of the non reflector type

Pins shall be tinned and free from any welding or manufacturing residue that could affect contact resistance in areas of salt laden air and industrially contaminated atmospheres.

5.2.4.5 Compact fluorescent requirements

Item F6.28a shall conform to AS/NZS 60901. These lamps will be used in conjunction with electronic control gear.

- a) The minimum rated luminous flux (100 hours) shall be 3200 lumens
- b) A minimum lamp lumen maintenance factor (LLMF) value of 70% shall apply at 16000 hours and;
- c) The lamp survival factor (LSF) at 16000 hours should not be less than 90% based on 11 hours each start

Contractors shall supply results of life and lumen depreciation tests in tables and spectral energy distributions in graphical form. Mortality and lumen depreciation information shall be provided at intervals not exceeding 2,000 hours up to a minimum of 16,000 hours. Failure to provide this information shall be sufficient cause to terminate any existing contract.

Evidence of performance should be provided in the form of test certificates / reports from an accredited testing organisation. Certificates / reports shall be for the lamps offered and shall include dates of testing and testing conditions.

5.2.5 Metal Halide Lamps

5.2.5.1 Specification

The specification covers the supply and delivery of the following metal halide lamps:

Table 26: Metal Halide Lamps

Item	Description	Cap Type	Lamp Type	Coated/Clear
F6.29a	70W Metal Halide	E27	Elliptical	Coated
F6.30a	72W Ceramic Metal Halide (for use with 80W mercury ballasts, horizontal burning)	E27	Elliptical	Coated
F6.31a	100W Metal Halide	E27	Elliptical	Coated
F6.32a	100W Metal Halide	E27	Tubular	Clear
F6.33a	100W Metal Halide	E40	Tubular	Clear
F6.34a	150W Metal Halide	E27	Tubular	Clear
F6.35a	150W Metal Halide	E40	Tubular	Clear
F6.36a	250W Metal Halide	E40	Tubular	Clear
F6.37a	400W Metal Halide	E40	Tubular	Clear
F6.38a	400W Metal Halide Reduced Jacket	E40	Elliptical	Clear
F6.39a	1000W Metal Halide	E40	Tubular	Clear
F6.40a	1000W Metal Halide Reduced Jacket (To Be Used With 4.1A Control Gear)	E40	Elliptical	Clear
F6.41a	1000W Metal Halide Reduced Jacket (To Be Used With 8.2A Control Gear)	E40	Elliptical	Clear

5.2.5.2 Purpose of Equipment

Lamps will be used in luminaires that are operated with 2-terminal ballasts compliant with AS/NZS 61347 and AS/NZS CISPR 15 and 3-terminal superimposed pulse igniters compliant with AS/NZS 61347 and AS/NZS 60927 (where the lamps do not contain internal igniters). The luminaires will be connected to 230V nominal, 50Hz distribution network on either dedicated street lighting mains or directly connected to the low voltage distribution network.

Where control gear is integral with the luminaire it shall be in accordance with the requirements of AS/NZS 1158:6. These lamps will be used for special purpose lighting including floodlights and spotlights.

In addition to dedicated metal halide control gear, the lamps shall be suitable for use with high pressure sodium ballasts and igniter circuits.

Lamps shall operate normally given the standard voltage ranges specified in AS 60038.

Lamps shall comply with the requirements of IEC 61167.

Lamps shall have a correlated colour temperature (CCT)¹ of nominal 4000K (i.e. 3985K ± 275K).

5.2.5.3 Lamp Survival Factor (LSF)

For items F6.29a - F6.38a the proportion of lamps surviving after 15,000 hours shall be indicated by the Tenderer based on 11 hours each start. The proportion of lamps surviving after 15,000 hours shall not be less than 70% based on 11 hours each start. Lamps with a survival rate of less than 70% will not be considered.

Items F6.39a - F6.41a will be operated in a horizontal position connected to reactor/ igniter type control gear. All lamps must have physical dimensions to allow their operation in a Philips HNF 901 luminaire. The lamp operating current is 8.25 Amps. The proportion of lamps surviving after 12,000 hours shall be indicated by the Tenderer based on 11 hours each start. The proportion of lamps surviving after 12,000 hours shall not be less than 50% based on 11 hours each start. Lamps with a survival rate of less than 50% will not be considered.

Contractors shall supply results of life and lumen depreciation tests in tables, and spectral energy distributions in graphical form. Mortality and lumen depreciation information shall be provided at intervals not exceeding 2,000 hours, up to a minimum of 16,000 hours. Failure to provide this information shall be sufficient cause to terminate any existing contract.

Certificates/reports shall be for the lamps offered and shall include dates of testing and testing conditions. The Tenderer shall supply mean time between failures and other relevant data to support their claim of mortality rates for the lamps.

¹ The degree to which the colours of objects illuminated by a given lamp conform to those of the same objects illuminated by the appropriate reference light source for that lamp.

5.3 Floodlights

5.3.1.1 Specification

The specification covers the supply and delivery of the following floodlights (bi-symmetrical and asymmetrical):

Table 27: Floodlights

Item	Description	Type
F7.1a	150 Watt High Pressure Sodium / Metal Halide –Narrow beam	Asymmetrical
F7.2a	150 Watt High Pressure Sodium / Metal Halide	Bi-symmetrical
F7.3a	250 Watt High Pressure Sodium / Metal Halide – Narrow beam	Asymmetrical
F7.4a	250 Watt High Pressure Sodium / Metal Halide	Bi-symmetrical
F7.5a	400 Watt High Pressure Sodium / Metal Halide – Narrow beam	Asymmetrical
F7.6a	400 Watt High Pressure Sodium / Metal Halide	Bi-symmetrical
F7.7a	1000 Watt High Pressure Sodium / Metal Halide	Bi-symmetrical

5.3.1.2 Purpose of Equipment

The floodlights will be connected to 230V, 50Hz distribution network on either dedicated street lighting mains or directly connected to the low voltage distribution network. They will be mounted on steel or concrete lighting poles or on steel or aluminium street lighting brackets on timber poles.

Floodlights will be used for two main purposes:

- Pedestrian crossing lighting
- Lighting Solutions/ Nightwatch/Night Vision lighting product where the floodlights are installed on the network poles and columns for the purposes of illuminating private customer premises.

5.3.1.3 Technical requirements

Floodlights offered shall be in compliance with design and construction standards specified in AS/NZS 1158.6:2010.

Floodlights must have a clear toughened glass visor.

There shall be no electrical connections between the neutral block and the luminaire body.

Floodlights must be fitted with a lamp holder suitable for E40 lamps.

Contractors shall specify full details of a satisfactory method employed to ensure the lamp-holder/lamp will not move within the floodlight during the expected life of the luminaire, thereby ensuring the stated photometric distribution of the floodlight will be maintained.

Floodlights are to be supplied without a lamp and PE Cell, but should have an option to be equipped with a NEMA PE Cell or PE Cell receptor.

Maximum weight for the floodlight/control gear will be 15 kilograms when the PE cell and lamp is installed on it.

5.3.1.4 Ingress protection

The form and construction of the floodlight shall be such as to ensure that:

- a) rain water will not collect in the floodlight; and,
- b) protection is provided against rain from any direction above the horizontal falling directly onto the joint between the floodlight body and the cover plates.

The floodlight shall have an ingress protection of IP54 or greater for the lamp chamber, and IP24 or greater for the control-gear chamber. (refer to AS/NZS 1158.6:2010 Clause 2.2.2).

5.3.1.5 Power factor correction

Where required, power factor correction capacitors for floodlights with ferromagnetic control gear shall be incorporated in the floodlights to provide operation at a nominal power factor of not less than 0.85.

The power factor correction capacitors shall comply with section 4.1.1 of AS/NZS 1158.6:2010.

Where power factor correction capacitors are used, blocking inductors in accordance with the requirements of AS/NZS 1158.6:2010 Clause 4.1.2 shall be provided.

The blocking inductor shall:

- a) be suitable for operation under the supply conditions specified in Clause 3.6 of AS/NZS 1158.6:2010;
- b) be matched to the power factor correction capacitor to block signal frequencies of 750Hz and 1050Hz;
- c) have a nominal series resonant frequency of 320Hz; and
- d) have an insulation rating not inferior to Class H.

5.3.1.6 Ballasts and igniters

Ballasts shall be of the reactor type, complying with AS/NZS 60923:1998 (where applicable) and AS/NZS 61347.2 series except that those to be used with metal halide lamps may be of the constant wattage type complying with the same standards.

The ballast shall:

- a) not be tapped;
- b) be connected to an appropriately identified terminal block;
- c) be rated for operation at 230V, +10%/-6%, 50Hz; and,
- d) have an insulation rating not inferior to Class H in accordance with IEC 60085:2007.

All igniters shall be electrically compatible with the associated ballast in the floodlight. Timed igniters (which disable the igniter after a predetermined period of time in case of lamp failure or removal to prevent cycling), shall be fitted in all HID floodlights. Igniters shall comply with AS/NZS 61347.1:2002, AS/NZS 61347.2.1:2002 and IEC 60927:2007 and be solid state fully

electronic, three-wire, multiple-pulsed, superimposed, which shall not require the use of tapped ballasts nor be dependent on external capacitors. They shall not produce a high voltage pulse across the ballast winding.

Igniters shall be fully encapsulated to prevent the ingress of moisture and shall have a temperature rating suitable for continuous use under temperature conditions attained in the control gear compartment. Igniters shall comply with the thermal and thermal endurance testing requirements in AS/NZS 60598.1:2003.

5.3.1.7 Fuse

Where required floodlights shall be fitted with a three pole combined fuse/terminal block (fuse cartridge in active only) complying with the requirements of BS 5733: 2010. The fused terminal block shall have a completely withdrawable fuse holder, and shall have a current rating as follows:

- a) For lamp currents $\geq 1.5A$, fuse current rating shall be 10A.
- b) The fused terminal block shall be made of polycarbonate and shall have a minimum current rating of 13A at 250V ac, 50Hz supply. The fused terminal block shall have brass inserts for holding the fuse in place with end user terminal capacity for connecting 2.5mm² supply cables.
- c) All terminal screws (for both supply and original equipment connections) shall be enclosed by an individual well that is longer than the screw. This will prevent the screw from falling by holding its full length when it is fully unscrewed to allow connection or disconnection of cables. Screws shall be used for mounting the fused terminal block.

A fuse cartridge shall be supplied and fitted, which shall:

- a) remain captive within the fuse-holder when it is withdrawn from the fused terminal block; and,
- b) comply with the requirements of BS 1362:1973.

The cylindrical fuse shall be ceramic tube cartridge with silver-plated copper end caps. The fast acting fuse shall have a maximum power dissipation of 1W at rated voltage of 240V ac. The fuse shall have a maximum breaking capacity of 6000A at a maximum voltage of 264V ac.

5.3.1.8 Glass Cover

Glass covers that can be opened for the purpose of lamp replacement shall be constructed of borosilicate glass or tempered glass. Glass covers shall be secured to the luminaire body, so that they are safely restrained, by quick-release stainless steel latches or other appropriate means that will allow ease of access for maintenance purposes.

Glass covers constructed from alternative materials not specified in Appendix A of AS/NZS 1158.6:2010 will not be accepted unless specifically requested for reasons such as increased vandal resistance.

The design and arrangement of the pivots and fixings shall ensure that:

- a) they cannot work loose under service conditions;
- b) they cannot be damaged or strained by opening the cover to its fullest extent;
- c) the ingress protection of not less than IP54 for lamp chamber and IP24 for the control-gear chamber is maintained in service by compensating for loss of resilience of the visor gasket over time;
- d) the closing of the cover does not roll or dislodge the gasket, nor subject the gasket adhesive to excessive stress; and,

- e) they allow easy removal of the cover and any retaining lanyard, where fitted, for maintenance and replacement purposes.

5.3.1.9 Gaskets

Glass covers shall seal by means of a gasket to seal the lamp chamber. Gaskets shall be made of silicone rubber and shall maintain an effective seal during the service life of the luminaire.

Gaskets shall be:

- a) securely fixed to the body of the floodlight or cover so that they will remain in place when the cover is opened; and,
- b) continuous or, if joined, the gasket ends shall provide an effective seal.
- c) Be resistant to heat, ultraviolet radiation and ozone.
- d) Be impermeable to water.
- e) Not lose appreciable tensile strength or resilience after ageing.
- f) Not emit any corrosive gas under normal operating conditions.

5.3.1.10 Means of attachment

Each luminaire shall incorporate a trunnion arm which is able to rotate around the body of the luminaire allowing for over and under slinging of the luminaire.

The trunnion arm will also be provided with a M12 clearance hole to allow for the mounting of the luminaire to the appropriate fixing bracket.

5.3.1.11 Accessories

Glare control louvres that affix to the luminaire will be required as an option.

Louvres will accommodate for both horizontal and vertical glare situations.

Wire guard options to reduce vandalism to the luminaire will be required.

5.3.1.12 Photometric requirements

- a) Pedestrian Crossing

Floodlights shall comply with AS/NZA 1158.4, section 3.2.

- b) Lighting Solutions/Nightwatch/Night Vision floodlighting

Beam pattern required (Narrow/Medium/Wide) will be determined based on specifics of the floodlight.

Test case for sample results to be based on following situation:

- a) Subject size: 6 metre high x 40 metre wide building
- b) Pole location: 30 metre away – centre of building
- c) Mounting height of floodlight: 7 metres
- d) Aiming point: middle of building

Results:

- a) Luminous flux of floodlight
- b) Luminous flux of lamp
- c) Luminaire wattage
- d) Lighting levels on the front façade of the building

- e) Eav (lx)
- f) Emin (lx)
- g) Emax (lx)
- h) Uniformity Emax/Eav
- i) Photometric Distribution – chart / table / simulation sketch

For the purpose of calculating the light technical parameters for the luminaires offered, lamp flux values shall be assigned as follows:

Table 28: High pressure sodium lamp flux

High Pressure Sodium Vapour (HPSV)	Initial Lamp lumens
150 W Tubular clear envelope	14500 lumens
250 W Tubular clear envelope	28000 lumens
400 W Tubular clear envelope	48000 lumens
1000 W Tubular clear envelope	130000 lumens

Table 29: Metal halide lamp flux

Metal Halide (MH)	Initial Lamp lumens
150 W Tubular clear envelope	12000 lumens
250 W Tubular clear envelope	20000 lumens
400 W Tubular clear envelope	36000 lumens
1000 W Tubular clear envelope	85000 lumens

5.4 Photoelectric Control Switches

5.4.1.1 Specification

The specification covers the supply and delivery of the following photo electric control switches:

Table 30: Photoelectric control switches

Item	Description
F9.1a	10A nominal NEMA twist lock socket type photoelectric control switch
F9.2a	Blanking cap for NEMA photoelectric switch base
F9.3a	Base for NEMA complete with mounting bracket
F9.4a	3A nominal D2 type photoelectric control switch

5.4.1.2 Purpose of Equipment

Photoelectric cells will be connected to 230V nominal, 50Hz distribution network.

Photoelectric cells shall operate normally given the standard voltage ranges specified in AS 60038.

Item F9.1a will be used for the control of both individual luminaires and street lighting networks.

Item F9.2a will be used to electrically short out NEMA base photoelectric control switch bases on luminaires where they are not required.

Item F9.3a will be used for the control of individual luminaires where a D2 base is used.

Item F9.4a may be used in conjunction with item F6.24a and may be mounted on either wood / steel poles or other structures.

5.4.1.3 Construction

The construction of the photoelectric control switches shall be either a non drifting cadmium sulphide or silicon light sensors (photo transistor/ photo diode photoconductive element); fully electronic (solid state) series connected to a DC operated or thermally operated metal relay.

Item F9.1a shall comply with AS/NZS 1158.6 and ANSI C136.10. The cover shall be made of impact resistant, UV stabilised polypropylene, or equivalent, with an UV stabilised acrylic side window

Item F9.3a shall be of a NEMA twist-lock socket-type in a weatherproof enclosure. They shall comply with ANSI C136.10 and shall be suitable for 10 A (nominal) photoelectric control switches.

Item F9.4a shall comply with AS/NZS 1158.6 and JIS C 8369. The cover shall be made of impact resistant, UV stabilised polypropylene, or equivalent.

Each base shall be supplied with an aluminium or hot-dipped galvanised steel bracket. The bracket shall have provision for two M10 mounting coach screws.

The base and enclosure shall be fully rotatable in azimuth on the bracket.

The base of item F9.3a shall be provided with three multi-stranded copper conductors, polymer insulated leads. The leads shall be not less than 1000mm long and shall have a cross-sectional area of not less than 1.5mm².

The colour of the lead insulation shall be:

Table 31: Lead insulation colours

Status	Colour
Active	Red
Neutral	Black
Load	White

Items F9.1a, F9.2a and F9.4a shall have solid brass contacts to maximise operation life in high salt areas

Items F9.1a and F9.4a shall have silver alloy relay contacts to reduce damage from arcing

5.4.1.4 Marking

The photoelectric control switches shall be legibly and indelibly marked with:

- a) The name or registered trade name or mark of the manufacturer.
- b) Catalogue or type number.
- c) Batch number/date of manufacture
- d) Rated supply voltage.
- e) Rated current.
- f) A letter or symbol showing the direction of the light receiving plane where the unit requires orientation for proper operation.
- g) The base of 42 shall be capable of being readily marked with the year and month of installation.

5.4.1.5 Temperature Range

Items F9.1a, F9.2a and F9.4a shall have a continuous operating temperature range of -10°C to 65°C.

5.4.1.6 Performance

The photoelectric control switches shall be supplied with a “fail-on” feature, which causes the luminaire to become energised should the photosensitive element fail.

Photoelectric control switches shall have a “turn-on” light level of 15 lux +/- 20% and a “turn-off” light level of 30 lux +/- 20%.

Solid state photoelectric control switches shall have a time delay of not less than 3 seconds and no more than 15 seconds to prevent inadvertent operation as a result of lightning or other transient illumination.

Item F9.1a shall be capable of a minimum 6,000 switching cycles.

Item F9.4a shall be capable of a minimum 4,000 switching cycles.

5.4.1.7 Electrical

Power Consumption

The average daily power consumption of Items F9.1a and F9.4a shall not exceed 1 watt at 230 volts AC nominal, 50Hz.

Operating Voltage

The photoelectric control switches shall be unaffected by voltage variations and shall operate satisfactorily over the voltage ranges specified in AS 60038 for a 230V nominal, 50Hz distribution network.

Surge Protection and Impulse Withstand

Item F9.1a shall be fitted with a metal oxide varistor (MOV) type surge suppressor with an energy absorption capacity of not less than 320 Joules.

Item F9.4a shall be fitted with a metal oxide varistor (MOV) type surge suppressor with an energy absorption capacity of not less than 175 Joules.

Electromagnetic Interference

The photoelectric control switches shall be capable of meeting the requirements of AS/NZS CISPR 15.

Electronic and hybrid electronic/thermal photoelectric cells will be considered but should be tendered separately as alternative items.

6.0 APPENDIX A – PRODUCT LIST

Item	Description	Category	Ausgrid Stockcode	Endeavour Stockcode	Essential Stockcode
F4.1a	100W HPS / MH Category V Luminaire	Luminaire – V Category	177243	1540483	NA
F4.2a	150W HPS / MH Category V Luminaire	Luminaire – V Category	182539	1540491	500974
F4.3a	250W HPS / MH Category V Luminaire	Luminaire – V Category	182538	1540517	501008
F4.4a	400W HPS / MH Category V Luminaire	Luminaire – V Category	182516	1540533	500982
F4.5a	100W HPS / MH Category V Luminaire Aeroscreen	Luminaire – V Category	179811	N/A	NA
F4.6a	150W HPS / MH Category V Luminaire Aeroscreen	Luminaire – V Category	182676	1540509	500978
F4.7a	250W HPS / MH Category V Luminaire Aeroscreen	Luminaire – V Category	182677	1540525 / 1549633	501004
F4.8a	400W HPS / MH Category V Luminaire Aeroscreen	Luminaire – V Category	182678	1541192	510162
F4.9a	70W HPS (without external igniter)	Luminaire – P Category	58289	N/A	N/A
F4.10a	70W HPS (with external igniter)	Luminaire – P Category	N/A	1082942	N/A
F4.11a	70W HPS Aeroscreen (without external igniter)	Luminaire – P Category	177886	N/A	N/A
F4.12a	70W HPS Aeroscreen (with external igniter)	Luminaire – P Category	N/A	N/A	N/A
F4.13a	42W CFL	Luminaire – P Category	N/A	1555564	500900
F4.14a	42W CFL Aeroscreen	Luminaire – P Category	N/A	1561638	500906
F4.15a	80W MBF (For use with 72 ceramic metal halide lamp)	Luminaire – P Category	182481	N/A	N/A
F4.16a	80W MBF Aeroscreen (For use with 72 ceramic metal halide lamp)	Luminaire – P Category	182482	1542703	N/A
F4.17a	2 x 14W T5	Luminaire – P Category	180263	1548395	N/A
F4.18a	2 x 24W T5	Luminaire – P Category	N/A	1548403	N/A
F6.1a	50W High Pressure Mercury elliptical	Lamp - HPM	182091	1015618	NA
F6.2a	80W High Pressure Mercury elliptical	Lamp - HPM	182094	1015620	522620
F6.3a	125W High Pressure Mercury elliptical	Lamp - HPM	182095	1015631	NA
F6.4a	125W High Pressure Mercury elliptical	Lamp - HPM	11890	N/A	NA

F6.5a	250W High Pressure Mercury elliptical	Lamp - HPM	11874	1015679	523640
F6.6a	400W High Pressure Mercury elliptical	Lamp - HPM	11833	1015680	523760
F6.7a	50W High Pressure Sodium (Internal igniter)	Lamp - HPS	12161	N/A	523790
F6.8a	50W High Pressure Sodium Twin Arc	Lamp - HPS	N/A	N/A	523792
F6.9a	70W High Pressure Sodium (internal igniter)	Lamp - HPS	12120	N/A	523820
F6.10a	70W High Pressure Sodium	Lamp - HPS	150524	N/A	510350
F6.11a	70W High Pressure Sodium	Lamp - HPS	N/A	1083960	NA
F6.12a	70W High Pressure Sodium Twin Arc	Lamp - HPS	N/A	N/A	523822
F6.13a	100W High Pressure Sodium	Lamp - HPS	182081	1081081	NA
F6.14a	150W High Pressure Sodium	Lamp - HPS	81505	N/A	523550
F6.15a	150W High Pressure Sodium	Lamp - HPS	182070	1015539	523580
F6.16a	150W High Pressure Sodium Twin Arc	Lamp - HPS	H118521	N/A	520792
F6.17a	250W High Pressure Sodium	Lamp - HPS	12187	N/A	523670
F6.18a	250W High Pressure Sodium	Lamp - HPS	182069	1015527	19165253
F6.19a	250W High Pressure Sodium Twin Arc	Lamp - HPS	N/A	N/A	524182
F6.20a	400W High Pressure Sodium	Lamp - HPS	12088	SL25896	523730
F6.21a	400W High Pressure Sodium	Lamp - HPS	182068	SL25888	NA
F6.22a	400W High Pressure Sodium Twin Arc	Lamp - HPS	N/A	N/A	523762
F6.23a	1000W High Pressure Sodium	Lamp - HPS	12260	N/A	NA
F6.24a	18W, 250V Bi-pin, hot cathode tubular fluorescent	Lamp - Fluorescent	11981	SL25047	NA
F6.25a	36W, 250V, Bi-pin, hot cathode tubular fluorescent	Lamp - Fluorescent	12005	SL25063	NA
F6.26a	14W, 250V, G5base/ 11x15 cap 16 mm diameter	Lamp - Fluorescent	180321	1551217	NA
F6.27a	24W, 250V, G5 base/ 11x15 cap, 16 mm diameter	Lamp - Fluorescent	N/A	1551255	NA
F6.28a	42W, GX24q-4 base amalgam compact fluorescent	Lamp - Fluorescent	180174	1555572	522780

F6.29a	70W Metal Halide	Lamp - MH	176203	N/A	NA
F6.30a	72W Ceramic Metal Halide (for use with 80W mercury	Lamp - MH	182483	N/A	NA
F6.31a	100W Metal Halide	Lamp - MH	176204	N/A	NA
F6.32a	100W Metal Halide	Lamp - MH	N/A	1562156	NA
F6.33a	100W Metal Halide	Lamp - MH	N/A	1544964	NA
F6.34a	150W Metal Halide	Lamp - MH	N/A	1562164	NA
F6.35a	150W Metal Halide	Lamp - MH	N/A	1544386	NA
F6.36a	250W Metal Halide	Lamp - MH	146191	1156090	524720
F6.37a	400W Metal Halide	Lamp - MH	12336	1082784	524750
F6.38a	400W Metal Halide Reduced Jacket	Lamp - MH	N/A	1500768	524810
F6.39a	1000W Metal Halide	Lamp - MH	180341	1082796	524570
F6.40a	1000W Metal Halide Reduced Jacket (To Be Used With	Lamp - MH	N/A	SN30023	NA
F6.41a	1000W Metal Halide Reduced Jacket (To Be Used With	Lamp - MH	N/A	N/A	NA
F7.1a	150 Watt High Pressure Sodium / Metal Halide	Floodlights	181741	N/A	NA
F7.2a	150 Watt High Pressure Sodium / Metal Halide	Floodlights	N/A	1561240	NA
F7.3a	250 Watt High Pressure Sodium / Metal Halide	Floodlights	57752	N/A	509912
F7.4a	250 Watt High Pressure Sodium / Metal Halide	Floodlights	N/A	1561257	509913
F7.5a	400 Watt High Pressure Sodium / Metal Halide	Floodlights	57513	N/A	500992
F7.6a	400 Watt High Pressure Sodium / Metal Halide	Floodlights	N/A	1561265	500990
F7.7a	1000 Watt High Pressure Sodium / Metal Halide	Floodlights	N/A	1087927	NA
F9.1a	10A nominal NEMA twist lock socket type photoelectric	PE Cell	182715	1066547	290340
F9.2a	Blanking cap for NEMA photoelectric switch base	PE Cell	176581	N/A	NA
F9.3a	Base for NEMA complete with mounting bracket	PE Cell	74922	1066559	NA
F9.4a	3A nominal D2 type photoelectric control switch	PE Cell	150425	1011420	290165