DEE WHY CBD

PUBLIC DOMAIN LIGHTING

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CONTENTS

A. INTRODUCTION

This report addresses the existing and lighting options for the masterplan for the urban redevelopment of the Dee Why Central Business District.

The study area is shown on Figure 1 and includes a combination of main roads, high traffic council roads, residential streets that are progressively increasing density, public spaces, parkland and laneways.

Figure 1 Study area for the masterplan

We have carried out a general assessment of the existing lighting, however as we believe that all the lighting will be replaced as part of the works we have not carried out a detailed assessment of each street to determine the level of compliance with the standards of the existing lighting.

We have carried out some lighting studies for typical sections of road to determine typical spacing and pole configurations for different lighting options. The calculation and design for each street would be part of the detailed design.

B. EXISTING LIGHTING

The existing lighting in the space is Ausgrid Streetlighting supplemented by ad-hoc under-awning lighting.

The streetlighting is standard Ausgrid lighting.

All the streets are lit using steel poles and underground power. The poles are in reasonable condition however the lights fittings are a mixture of High Pressure Sodium and Mercury Vapour. The lighting installation dates from before the current standard and although it provides reasonable light levels it would not comply with the current requirements. In addition as fittings have failed over the years they have been replaced by what is available. As a result there is an inconsistency in the uniformity and quality of the lighting.

The lighting provided by Ausgrid is purely functional and does little to improve the night environment.

C. BACKGROUND INFORMATION

To understand the light technical parameters it is necessary to understand some fundamental lighting concepts:

Luminous Flux: This is the total amount of light that leaves a light source, independent of direction and is measured ***lumens***. The lumen is related to the sensitivity of the eye rather that the incident radiant flux. As a result one watt at 555nm (green), (produces around 680 lumens whereas one watt at 700nm (red) produces only 3 lumens.

Luminous Intensity: This is a measure of the amount of light that leaves a light source in a given direction and is used to define the light distribution of a light source. This is measured in ***Candelas***.

Illuminance: This is a measure of the amount of light that falls onto a surface. It is independent of the reflectivity of the surface. It is measured in ***lux*** or lumens /m^2.

This is the normal parameter that is used for compliance as it is the easiest to measure. It does not necessarily mean that it is the most important.

Luminance: This is a measure of light that is leaving a surface. With a reflective surface it is dependent on the reflectivity of the surface. It is measured in ***Candelas/m^2***. The eye reacts to the luminance of the objects in the field of view.

Efficacy: As the output of a light source is measured in lumens, where as its input is **measured** in Watts the term efficacy is used rather than efficiency. It is still an indication of the efficiency of the conversion from electrical energy to light and it is measured in ***lumens/Watt***.

Luminaire

This is the technical term for the complete light fitting including the light source and any control gear.

Colour Appearance or **Correlated Colour Temperature** (CCT) is a measure of the colour appearance of a white light source. It is expressed as the equivalent temperature of a black body radiator or object heated to that temperature. It is expressed in absolute temperature in degrees ***Kelvin***.

As an indication of the scale an incandescent lamp has a CCT of 2700K whereas daylight is anywhere between 5000 and 7000K. For night public spaces we believe that the CCT should usually be between 3000 and 4000K.

Light is made up of the energy in the visible spectrum between 380nm and 780nm. Each wavelength of light comprises a different colour of light with 380nm being blue, 500nm being orange and 700nm being red.

All light sources do not produce all wavelengths or colours of light, in the same relative quantities. Colours and white light are produced by the presence of specific proportions of certain wavelengths of light.

The mechanism for seeing colour is that the surface of an object reflects the wavelengths that make up the colour of the object and absorb all other wavelengths.

As a result a colour object will not appear to have the correct colour if the relevant colours needed are not in the incident light.

Colour Rendering Index is a measure of how accurately a light source renders a range of colours. It is expressed as an index where 100 is a perfect match and 0 represents no match. Colour rendering is important because it affects how the space appears. Good colour rendering not only makes the space appear more visually interesting and brighter, but it assists with the colour recognition of clothes on the CCTV and generally makes people look healthier.

Figure 2 Difference in effect of colour rendering *(2)*

Figure 2 shows the difference colour rendering makes to the perception of a space or object.

Glare is light that inhibits vision rather than enabling it. Glare results when the relative luminance of a light source is significantly higher than the background luminance. Glare is particularly significant in outdoor environments as the background often approaches black. There are several glare indices that can be calculated but none are relevant to this application.

C. SAFETY AND SECURITY

Safety and security is an important consideration in the lighting of city centres.

There needs to be delineation between safe movement with respect to trips and falls and personal security.

The lighting levels that are required for safe movement are much lower than the levels generally specified for public spaces. This is reflected in the minimums that are recommended in residential streets, in AS/NZS 1158.3, of 0.14 Lux.

The major criterion for public pedestrian lighting is personal security. This is a combination of a deterrent to the perpetrator, the feeling of personal safety and confidence to the person.

If a path is well lit then there is a perception that it is safe. It is therefore important that people are not encouraged to use paths that lead to locations with minimal public surveillance as this can result in attracting people to an unsafe area. In some situations it may be better to not light a path to discourage its use.

There has been a long standing acceptance that there is a relationship between the rate of crime and the presence of public lighting.

Most of the evidence for this is based on sociological studies that relate crime statistics to the presence of the public lighting. In lighting terms these studies are reasonably simplistic as they do not relate the crime level to the actual level of illuminance nor look at the quality aspects of the lighting, such as glare and visual comfort, or the visibility within the space. We are not aware of any research that indicates that once a reasonable level of illumination has been achieved, further increase in the illumination will further reduce the level of crime.

It is important to understand the mechanism by which public lighting reduces crime:

- Public lighting increases the likelihood that the perpetrator will be observed and identified. This increases the risk to the perpetrator.
- Where public lighting generates a comfortable environment it encourages people to meet and utilise the space. This increases the number of people in the space and therefore increases the chance of a perpetrator being observed.

- High levels of lighting in areas that have very limited natural surveillance can assist the crime rather than discourage it. It can assist the perpetrator to select their victim or enable illegal deals to be carried out where the merchandise can be inspected.
- Public lighting that has controlled glare provides good distant views so that the person has the ability to recognise a potential risk at a distance and take evasive action. Lower illumination levels with good glare control and lighting of peripheral areas may be more effective than simple increases in illumination.
- Finally lighting does not generally prevent crime. The result is usually relocation of the crime to a site safer for the perpetrator.

Nevertheless there is evidence that in general adequate public lighting will reduce the incidence of crime in that area.

D. AUSTRALIAN STANDARD COMPLIANCE

There is an Australian Standard for public lighting, **AS/NZS1158** ***Lighting of roads and public spaces***. The standard is not mandatory but gives a good yardstick for the design of lighting installations and it will invariably be used as a benchmark if there is a compensation claim made against the Council associated with public lighting.

The standard has several sections relating to lighting for vehicular traffic (V- Category) pedestrian traffic (P-Category) and supplementary lighting for pedestrian crossings.

The V-Category lighting is designed from the perspective of the driver and endeavours to identify objects on the road by seeing them in silhouette against the illuminated road surface. This is generally only applied to main roads and feeder roads.

P-Category lighting is designed from the perspective of the pedestrian and is designed to enable the pedestrian to safely navigate the space.

It is not necessary to have a V and P category for every road. Residential and minor roads usually only have a P category. There is also a provision in the standard that if a road is lit to a V category then is can be assumed that the verge will be adequately lit, provided that there are not significant trees or awnings to obstruct the light.

The standard divides lighting requirements into different Categories based on the nature of the space and the level of usage and recommends different lighting levels and parameters for each Category. With both V and P Category lighting, the lower the number, the more stringent the requirements.

The V Categories are based on the level of vehicular and pedestrian traffic in the street, the speed of the traffic, whether there are parked cars and the source of the traffic.

P- Categories are based on the 'level of pedestrian usage', 'the risk of crime' and the 'need to enhance the prestige' of the space. With the lower categories, P3, P4 & P5 the concentration is purely on safe movement and as a result the only requirements are illuminance on the horizontal plane and the uniformity of the illumination.

The P Category is more relevant to public amenity.

In the higher categories, P1, P2 & P3, other than P3 on a residential street, then there is an additional requirement for vertical illuminance 1.5 metres above the ground. This is designed to assist identification of a person. It was originally designed to give a person advanced warning to assess whether someone else on the path was a friend of foe, while still at a reasonable distance to take evasive action and to increase the natural surveillance of the area. It also improves the functionality of CCTV.

The standard does not include inter-reflected light in the calculations so the compliance point is generally higher under the adjacent light fitting facing the other light. With modern fittings that limit the light leaving the fitting above the horizontal plane, the vertical illuminance usually becomes the critical design criteria on the basis that it complies, then all other criteria are met.

As the compliance criteria is the minimum vertical illuminance then it directly effects the spacing of the poles and as a result a path that is designed to comply with P3 category lighting will comply with P2 for about 80% of its length and P1 for about 60% of its length. In the area where the formal non-compliance occurs there will generally be adequate vertical illuminance in the direction of the nearest pole. In the other direction, even though the calculated vertical illuminance will not comply there will be significant light reflected from the ground plane. It is therefore often better to allow some small areas of non-compliance rather than reduce the spacing of the poles.

In CBD areas however it is not uncommon to recommend a P category as well as a V category as the pedestrian requirements are often higher than the vehicle ones.

Table 2.1 from AS/NZS1158.1 and Tables 2.1 to 2.5 from AS/NZS1158.3.1 show the criteria for the Categories are included in Appendices 1 and 2 respectively.

The City of Sydney not only applies V and P categories through the Sydney CBD, but also specifies an increased vertical illumination of 4 lux compared with the highest P Category requirement of 2 lux for the CCTV monitoring. This requirement is relatively old and with the improvement in camera technology, it may no longer be necessary.

The Council's CCTV consultant should provide the illumination requirements for the cameras.

We have prepared a table for the roads indicating a V category and P Category for each road space within the area based on the assessment of the relevant criteria.

Normally the council and the RMS nominate the lighting categories that apply. In the absence of any instructions we have assumed the following categories:

Road	Lighting Category
Pittwater Road	V2
Howard Avenue, Oaks Avenue, Pacific Parade, Fisher Road	V3
Public Pathways, Parks	P2
Dee Why Parade, Clarence Avenue, St Davids Avenue	P3
Richmond Avenue, Avon Road	P4

Table 1 – Assumed Streetlighting Categories

We have assumed the P2 level due to a lower perceived risk of crime. We assume that the Council will undertake a Safer-By-Design report with the police. Based on their report we may need to amend the categories in some streets.

Complying with the standard may provide adequate lighting for safe movement but does not necessarily provide a comfortable space that people will enjoy occupying. If the spaces are to be revitalised then it is important that the space be comfortable.

E. LIGHT SOURCES

We have limited our assessment to three light sources:

HIGH PRESSURE SODIUM (HPS)

This is the standard lamp used by Ausgrid. A high pressure sodium lamp is a discharge lamp that has a combination of a small quantity of mercury and sodium in the arc tube. This converts to gas when operating. The gas mixture and the pressure at which the lamp operates, determines the colour. High pressure sodium lamps have the highest efficacy of high pressure discharge lamps. As explained the lumen is weighted to the frequency response of the human eye. The HPS lamp produces the majority of its light in the orange and yellow part of the spectrum which is where the eye is the most sensitive. This results in the major advantage and disadvantage of the lamps. The advantage is high efficacy. The disadvantage is that as all the light is generated in the orange and yellow part of the spectrum the light lacks red and blue light. As a result the lamps have very poor colour rendering.

METAL HALIDE

This is a higher quality light source with superior colour rendering and white appearance.

This is a high pressure mercury lamp that has some additional rare earth metal gases included that broadens the frequency response. As a result the lamp has a much better colour rendering than high pressure sodium however as a consequence of generating light in the

blue and red spectrum the overall efficacy of the lamp is lower than high pressure sodium. In smaller wattages however, less than 150 Watts the metal halide lamp has a higher efficacy than the HPS.

Prior to the roll out of the LEDs in the City of Sydney, metal halide was the standard light source for the Smartpoles as the improved colour performance was considered more important than the energy difference.

There are two basic types of metal halide lamps; quartz arc and ceramic arc. The quartz arc is traditionally used in the US while the ceramic arc is a European development. The ceramic arc lamps is more expensive but has better efficacy, colour rendering, colour constancy through life and from lamp to lamp and better lumen maintenance. Ceramic Arc lamps are only available in wattages up to 150 Watts and recently 250 Watts have also become available.

Quartz arc lamps have traditionally been used for street lighting and by supply authorities for public domain lighting. Prior to the roll out of LEDs the City of Sydney used ceramic arc lamps for all their public domain lighting.

LIGHT EMITTING DIODES (LED)

Lighting emitting diodes are not a lamp as such, but rather a semi-conductor device. They are based on traditional semi-conductor diode used to rectify electricity. All diodes emit light, however in most cases the amount of light is relatively small and the housing prevents the light from escaping.

The first LEDs were produced as low level indicator lights on electronic equipment.

In recent years they have been developed to produce white light and with increasing efficacy. As LEDs are not lamps it cannot be assumed that they will behave similarly to lamps in luminaires.

LEDs have similar efficacies to fluorescent and metal halide lamps. A tubular fluorescent or metal halide lamp produces around 100 lumens per watt. This only accounts for around 25% of the power consumption. The majority of the remaining energy is produced as heat. Most of this is emitted in the infrared as radiant energy as part of the output of the luminaire.

With LEDs the light produced is much more wavelength specific so that the LED does not necessarily produce infrared as part of its beam distribution. As the overall efficiency of the LED is of a similar order of magnitude to fluorescent and metal halide lamps, the waste energy must be removed from the LED by conduction.

For a LED to operate efficiently then the junction of the LED must be maintained at a low temperature. If the junction temperature exceeds around 80^{0}C the efficacy and life of the LED are significantly reduced. The power densities of LEDs are extremely high and are increasing as the output of LEDs increase. There are now commercial LEDs running at currents as high as 2 Amps in a LED that is approximately 1mm^2. This is a current density of 2 million Amps per m^2 compared with a 100 Amp power cable which is around 6000 Amps per m^2. As a result the design of the heatsinks and the luminaire is critical to the efficacy and the life of the LED.

With a conventional lamp the life and lumens output is relatively independent of the luminaire.

There are still no international standards for the testing and measurement of the lighting performance of LEDs at present due to the difficulty in getting consistent results between testing facilities and the dependency of the LED on the luminaire performance.

As a result the selection of the luminaires is just as important as the selection of the LED in achieving an efficient lighting installation.

LAMP LIFE

The life of a lamp can be expressed in two ways:

- **Lamp Life** has traditionally been expressed in terms of **survival rate**. That is the rated life is the 50% failure rate of the lamp. The standard life for fluorescent fittings as quoted in data is based on a 3 hour switching cycle. If the switching cycle is increased to 10 hours the life is increased by 30% and for 24 hour operation it is increased by 50%. The 10 hour life is probably more applicable to the public lighting mode of operation.
- The luminous flux of all lamps decreases through life. This is called the **lumen maintenance** of the converse, **lumen depreciation**.

The useful life of a lamp is when the luminous flux reaches a point where the lamp is no longer economically viable. This is often called the **useful life**. With most conventional lamps there is not a large difference between the lamp life and the useful life.

It has traditionally been the case that the useful life of a lamp tended to be around the 70% depreciation level. Modern fluorescent lamps and some ceramic arc metal halide lamps have a lumen maintenance >90% at the end of their rated life.

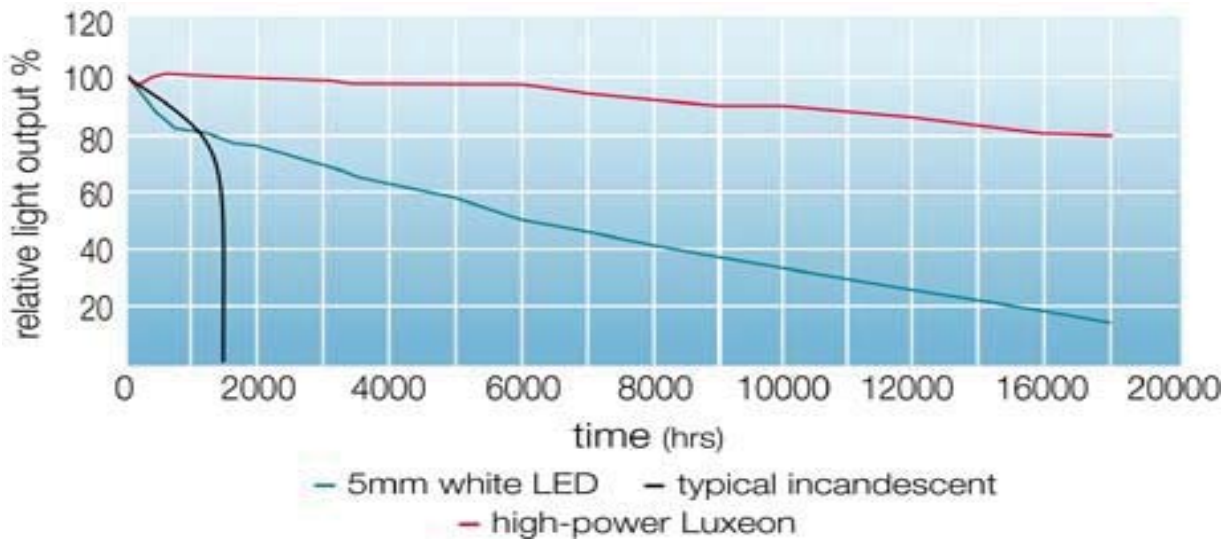


Figure 3 comparison of the lumen maintenance of a good and poor quality LED. (3)

With LEDs it is possible to have a long life with very poor lumen maintenance. Figure 3 shows a comparison of lumen maintenance of a poor quality LED against a higher quality LED. The high quality LEDs have improved, however there are still LEDs similar to the poor quality ones used in cheaper downlights and replacement lamps for domestic reflector lamps.

To protect against this the North American IES have prepared a technical standard IES-LM80 which specifies tests for a L_{70} life rating which is the life defined at the point that the lumen maintenance drops to 70% of the initial lumens.

Table 2 gives a comparison of the major properties for each lamp.

Light Source	Efficacy Lumens/Watt	Rated Life	Lumen maintenance at end of life	Colour Rendering index	Correlated colour temperature
High Pressure Sodium	110	20000	70%	25	2000
Metal Halide Quartz Arc	84	15000	70%	60	3000 or 4500
Light Emitting Diode (note 1)	60 to 100	50000	70%	60 to 90	3000 to 6000

Table 2 Comparison of light sources

Note 1: There is a wide range of LED quality and performance. The data included in the table represents the higher quality units.

F. QUALITY OF LIGHTING

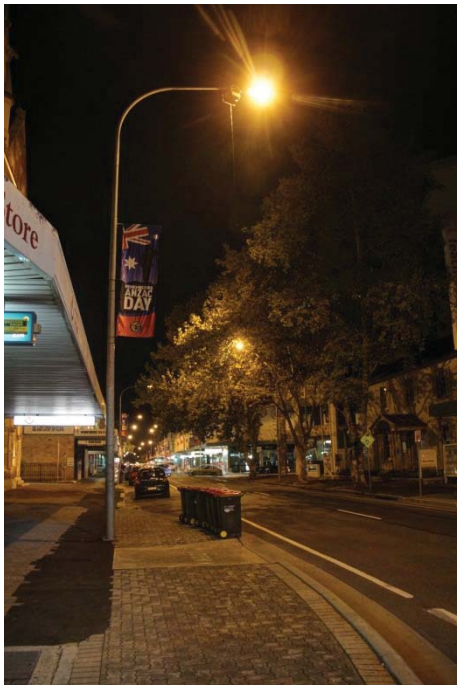
Compliance with the Public Lighting standard may give some control to ensure a minimum standard but will not necessarily deliver a quality or comfortable lighting installation.

The standard limits the light technical parameters of illuminance in the horizontal and vertical planes, luminance in the horizontal plane and uniformity in the horizontal plane.

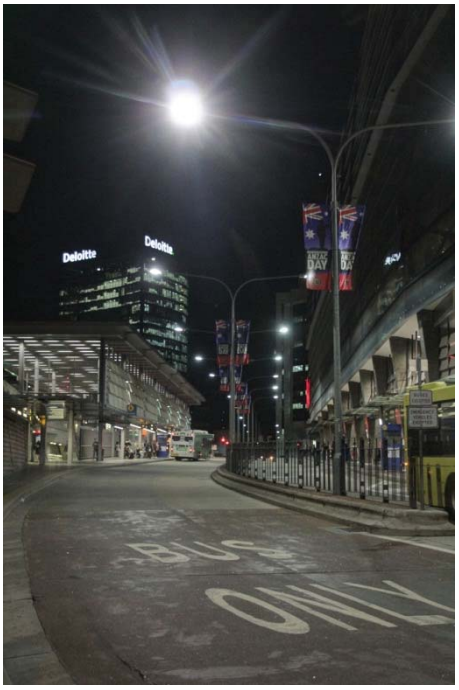
Our experience in Australia, United States and Europe has shown that if a space is to be successful as a night environment, then it needs to have the following quality aspects:

a) The colour rendering of the light needs to be high so that peoples skin tones are flattering and the space appears colourful and alive.

b) The colour appearance of the light is warm as cold light makes a space appear harsh and sterile.



Picture 1 HPS



Picture 2 Metal Halide

Picture 1 is a street lit with high pressure sodium lighting. This light has a very yellow correlated colour temperature and poor colour rendering. Note yellow/brown appearance of the space and the lack of colour in the Anzac Day banner in picture 3 which is an enlargement of the banner in Picture 1.

Picture 2 is a street lit with metal halide lights. This is a relatively high colour rendering and a whiter colour appearance. Note the increased colour in the Anzac Day banner in picture 4 and the general crispness of the space.

Picture 3 Banner under HPS

Picture 4 Banner under Metal Halide

c) Glare from the lights should be minimised.

Glare is a major factor in night environments. Glare is a measure of the contrast between the light source and the background and the direction of view: The greater

the difference, the greater the glare. The greater the offset between the direction of view and the glare source, the less the glare.

As the night background is often very dark it is very hard to control glare in external environments. The retina of the eye changes its sensitivity to suit the ambient lighting conditions. The presence of glare in an external installation causes the eye to overestimate the ambient light and therefore the space looks darker than it should. The lighting may be adequate by the standard, but the space will still look under illuminated. Increasing the light level may not improve the situation if the glare increases as well.

In addition glare tends to mask the ability to see past the glare source. People's perception of personal safety in a space is related to their distant views and the confidence that there is not a threat in the area they are approaching. With glaring sources the night view is claustrophobic as people's views are limited to the immediate area within the surrounding lights. Again, even if the installation has adequate illumination the perception is that it is a dark or an under lit space.

In many of the spaces within the Dee Why CBD the glare will not be as significant a problem as there is a higher level of ambient light and light reflected from facades. While this reduces the impact compared to a black background it is still a major problem, particularly with lower mounting heights and areas with high pedestrian activity.

Pictures 5 and 6 show the difference between a high colour rendering light with good glare control and poor colour rendering lighting with poor glare control. Note that with the good glare control fitting the person at the end of the path is visible.

Picture 5- high colour rendering and low glare

Picture 6 – low colour rendering, poor glare control

Many LED fittings generate significantly more glare than conventional fittings. The selection of the fittings should take this into account.

The introduction of LEDs into external lighting has highlighted a problem in the definition of glare in the standards. The glare control was introduced into the standard when streetlights

used large coated mercury vapour lamps in large fittings with diffuse reflectors. Glare was defined in these standards as the luminance of the fittings and is calculated as the luminous Intensity of the fitting divided by the projected area of the optical opening.

As lamps have developed the light output of the lamps has increased and with clear lamps the physical size of the light source has reduced.

With LED lights there are two basic ways of designing a light; they can either be based on an array of bare LEDs that are directed into different parts of the distribution, or the LEDs can be fitted with lenses so that all the LEDs have the same distribution. Because the physical size of the light emitting part of the LED is very small the resulting luminance is very high.

Refer to Table 3 extracted for *"The relevance of current Standards when using LEDs in public lighting" Peter McLean, Warren Julian – Lighting, August/September 2103*

Luminaire type	**Light source**	**Typical luminance at peak intensity kcd/m²**
Streetlight	250W MV	23
Streetlight Aeroscreen	150W HPS	79
Streetlight Semi-cutoff	150W HPS	145
Streetlight Aeroscreen	250W HPS	140
Streetlight Semi-cutoff	250W HPS	250
LED streetlight direct view	High performance 350mA	48000
LED streetlight direct view	High performance 750mA	69000
LED streetlight direct view	High performance 1000mA	120000
LED streetlight Lens 65˚	High performance 750mA	330
LED streetlight Lens 65˚	High performance 1000mA	390

Table 3 Approximate peak intensity luminance of typical luminaires

As can be seen the luminance of lensed LED fittings is much lower than direct LED lights.

We are not aware of any research that has examined the visual impact of extremely intense very small light sources.

Pictures 7, 8 and 9 show the difference between a metal halide, a direct LED and a lensed LED streetlight.

The pictures show how a traditional light put a moderate amount of light at the base of the pole. This was the distribution that was expected when the standards were written.

The introduction of LEDs gave greater ability to direct the light into specific areas on the distribution. As a result the fitting can be designed to specifically meet the requirements of the standard rather than necessarily effectively lighting the space.

With some of the LED fittings the light is specifically aimed to achieve the vertical illuminance at the expense of light under the fitting. The fittings achieve excellent uniformity on the horizontal plane; however they do not provide the light directly under the fitting. As a result they generate glare, make the space look dark and hide people and objects directly under the fitting.

Picture 7 shows a conventional metal halide fitting.

Picture 8 shows a direct LED fitting. Note the difficulty in seeing the person under the pole.

Picture 9 shows a lensed LED fitting. Note the glare is less and the person under the pole is more visible.

Picture 7 – Discharge lamp luminaire

Picture 8 – Direct LED luminaire

Picture 9 – Lens LED luminaire

None of these quality aspects are addressed by the standards and rarely are they considered in lighting designs for supply authority owned assets.

LUMINAIRE OPTIONS

Although there are many LED streetlighting options available, not all have the flexibility to suite a variety of applications. We cannot recommend lights that use direct LEDs as we believe that the glare is excessive. Many of the fittings only come in a limited range of sizes and although they may be quite acceptable for some of the minor roads, do not have an adequate output to light the major roads and the associated intersections.

Based on our previous investigations we believe that the major options are:

- Philips XCeed LED range
- WE-EF VFL Range
- WE-EF RFL Range - the RFL range is more expensive than the VFL but has a round profile if it is preferred for aesthetics.

Picture 10 - Sylvania Roadster HID Lamp – Ausgrid Standard Streetlight

Picture 11 - Philips XCeed LED Range

Picture 12 - We-ef VFL LED Range

Picture 13 - We-ef RFL LED Range

The Philips XCeed fittings are generally less expensive than the WE-EF range, though still of high quality and are well engineered. The Philips fittings however only come in a street lighting distribution. As European street lighting is generally located at the property line they are generally designed with very little back throw behind the fitting. In Australia the footpaths are wider and the lights are generally mounted behind the kerb. As a result in some instances the lighting does not provide adequate light on the verge to achieve compliance with the standard. In these instances it may be necessary to provide some supplementary lighting.

In the trial calculations that we did this was only the case in a few isolated areas.

The WE-EF fittings come in a variety of distributions and cut off angles. The lens modules can be mixed and matched to provide the distribution required. As well as the 'S' distribution for streetlighting and 'A' distribution for area lighting they have an 'R' distribution that has been specifically designed for Australian conditions and throws additional light behind the pole.

Although the Philips fitting is considerably cheaper than the WE-EF, if multifunction poles are to be used the cost of either light is considerably less than the pole.

G. POLES

Ausgrid use sheet steel, cylindrical or hexagonal poles.

There are a few concrete poles left in the area. These are generally around 40 years old and a lot have developed concrete cancer. These are generally replaced where there is an opportunity.

If the Council opts for private poles there are basically two main options:

a) Use a standard sheet steel pole, similar to the Ausgrid standard. Although similar to the existing it would allow consistent appearance and fitting of banner arms etc. This will give the Council free choice of luminaire and the ability to include CCTV equipment etc.

b) Use a decorative pole. These can be a variation of the standard steel pole.

c) Use a multi-function pole. Whereas standard sheet poles are designed for a specific outreach arm and function the multi-function pole is a pole where the pole and the footing are designed to bolt on a range of additional equipment, either initially or in the future, without the need to redesign the pole or the footing.

The selection of the light is paramount to the compliance and quality of the visual experience, from a lighting aspect the pole is little more than a reliable mechanism of holding the light in the correct position and connecting power to it.

The selection of the pole however is important to the daytime visual environment and the other services that they support. The selection of the pole has a significant impact on the cost of the installation.

There are several manufacturers of standard poles. We have used Ingal EPS as representative rather than a preference.

Most manufacturers of standard poles also make decorative poles. These can either be from their standard decorative range or they will produce special designs. It should be noted that these are only decorative and not multi-functional poles.

Although the multi-function poles are generally a standard suite of components, it is possible have the poles provided in a Dee Why specific colour and in the past Smartpoles were provided in different colours for different areas and with a special designed cladding for the base of the poles for Taylor Square.

H. ASSESSMENT OF POLES

STANDARD POLES

The standard pole is a sheet metal pole that is post galvanised. The poles are a standard design and are used generally by supply authorities and the RMS. The poles are designed for general lighting and are capable of taking standard street lighting and pedestrian crossing lights and standard banner poles. They can also take mobile phone transponders.

The pole is a standard pole and the addition of other equipment while functionally adequate does little for the aesthetics on the pole.

A standard pole is generally made from rolled or folded sheet steel that is seam welded and hot dipped galvanised.

The quality of the finish of the pole will generally depend on the neatness of the weld, the amount of surplus build-up of metal and the welding dags.

The standard pole is generally not acceptable for CCTV as the pole is not rigid enough and the image is deteriorated due to camera shudder. The movement also negates image compression and therefore increases the data traffic and storage capacity required for the images.

If these poles are to be used for CCTV it is normal to construct special poles of the same dimensions but with increased wall thickness.

DECORATIVE POLES

This covers a broad range of poles that are modified in their construction to improve their appearance. They are still a standard pole that is designed to basically support a street light and a banner arm.

The variations between the poles that fall into this category are large and include:

- painted steel poles
- stainless steel poles
- aluminium poles
- steel or aluminium poles with metal or timber embellishments

The cost variation of these poles can also be considerable depending on the design.

Many of the decorative poles are fabricated in the same manner as standard poles except that the welds are ground back and the poles have a paint finish after galvanising. One of the limitations with decorative poles is that if another arm or accessory is to be mounted at a later date then it either needs to be strapped on with stainless steel packing straps or the paint work and galvanising will be damaged and will need to be repaired.

If the poles are to accommodate CCTV, Wi-Fi, interactive signage etc. then the poles design will need to be modified to accommodate them. This may involve increasing the diameter of some or all of the poles.

MULTI-FUNCTION POLES

Multi-function poles are designed as a base pole with accessories that can be added initially or at a future date. These accessories can include:

- Variable length outreach arms for streetlights
- Multiple outreach arms
- Outreach arms to support electronic signage
- Mobile phone transponders
- CCTV cameras
- Traffic Signals
- General Signage
- Banner Poles
- High and low level power outlets for events
- Wi-Fi nodes
- Interactive signage

There are several versions of the multifunction pole available.

- The City of Sydney owns the Smartpole design. We have contacted Hub Streetlight for a quote and have been told that they have been instructed by the City of Sydney that, until the court case over the poles has been concluded they are not to quote to supply the fittings to other organisations.

  The Smartpole is a steel structural element with an aluminium shroud. All the accessories attach to the steel structure. This gives a high degree of flexibility.

  In addition there is a distribution board in the base of each pole so that there is separate control of the light and other power for accessories.

  The Smartpole is approved by the RMS for the attachment of traffic signals.

  The disadvantages of the Smartpole are that as they can take accessories at a future date the pole structure and footing has to be significantly overdesigned with respect to its normal duty. In addition from an embodied energy aspect, the pole not only has more steel in it than a conventional pole, but there is also a significant amount of extruded aluminium that is only decorative.

- HUB also makes another multifunction pole, the MFP, which is their own design. This is similar in principal to the Smartpole but has a different assembly method and appearance.

- Fyntrim make a multi-function pole that is different to the others in that it is an all-aluminium pole. It does not have the same load capability as other multifunction poles but will still perform the majority of functions.

  The Fyntrim pole is less expensive than the others as it has less material.

Fyntrim poles were used in the Castle Hill main street upgrade.

Number	Manufacturer	Description	Supply price per unit
1	Ingal EPS	Standard Pole Galvanised Sheet steel (Ausgrid Compliant)	$500
2	Ingal EPS	Decorative Pole	$1500
3	Fyntrim Poles	All aluminium multi-function pole	$4450
4	Hub Furniture	Aluminium Clad, steel, 'Smartpole' (City of Sydney)	No price provided
5	Hub Furniture	MFP	$5842

Table 4 Pole Options

Picture 14 – Ausgrid Standard Poles

Picture 15 – Typical Decorative Poles

Picture 16 – Hub and Fyntrim Multifunction poles

More details of multifunction poles are included in Appendix

I. OWNERSHIP OF PUBLIC LIGHTING

Traditionally public lighting has been supplied, installed, maintained and owned by the supply authority and leased by the local government on a fitting by fitting basis.

This appears to be a unique situation in Australia. Overseas it is more normal for the public lighting to be owned and operated by the city. They are generally much larger than our local government areas, particularly at the time when this arrangement was conceived.

The advantage of this arrangement, particularly for small councils, is that the council does not have to fund the capital cost of the works or be responsible for the maintenance of the lighting. The main disadvantage is that the supply authority has many councils that they are

dealing with and in the interests of cost efficiency attempt to have a consistent approach to all. This severely limits the ability to do something special and limits the speed of change.

The supply authority therefore has a limited range of poles and fittings that they will accept. This is done to reduce their maintenance costs, but it also imposes limitations on the ability for the council to improve the quality of the visual environment or the urban environment.

Ausgrid is among the more flexible supply authorities with respect to the public lighting.

There are other options that are available to the Council with respect to Public Lighting:

1. The council can opt to privately own the poles and lights. This means that the poles, lights and cabling are owned and maintained by the council. This involves the installation of main switchboards at regular points through the installation for the connection to the power grid and to meter the energy usage.

   This has the advantage that the council can use whatever light and pole they desire. It also allows the Council freedom to attach banners, CCTV and other equipment to the poles. They will however become responsible for the maintenance of the lights and poles, including out of hours emergency calls.

   The council also has to buy the power from the supply authority at commercial rates, whereas when the supply authority owned the lighting they would be paying at wholesale rates.

   Ausgrid did have an arrangement where they would provide limited maintenance including lamp, fuse and photocell replacement. This is now available for installations prior to 2009.

2. There is some precedent for Councils purchasing existing streetlighting assets from the supply authority. This has occurred in some parks and streets in the City of Sydney. The City of Sydney has also done this with the majority of Smartpoles that were installed in the Sydney CBD prior to 2000. They were originally installed as an Energy Australia asset, however Ausgrid decided that they no longer wanted to be involved and the City of Sydney has taken them back.

   This could be considered in Dee Why for significant streets that the Council would like to upgrade.

   This has the advantage that the Council can use whatever equipment they like while retaining the infrastructure and any equipment that is not affected. There may be some complications in effecting the changeover of the ownership:

   a) There would need to be main switchboards installed at regular points in the installation to meter the power usage.

   b) There may be lights in adjacent areas that come off the same lighting circuit as the purchased assets. These would need to be rewired to a new point of supply.

   c) A supply authority is exempt from AS3000 *SAA Wiring Rules* for their distribution systems. This will mean that their cabling may not meet the earthing regulations and fault-loop-impedance limits. This may involve some rewiring of the installation.

d) There are still some timber poles with aerial cabling within the City Centre. As these are supplying local customers it would not be possible to take them over as Council assets. The only option is if the lighting were to be upgraded would be for Ausgrid to underground the mains and the council install private lighting. Most of these situations occur on the peripheral of the City Centre

e) Mobile phone companies often lease pole space from the supply authorities to mount their transponders. The Council will need to include the reassignment of these leases to them with the poles and if they are to remove or replace the pole, they will need to renegotiate the lease with the telephone service provider.

d) There are a few streets where the lighting has been upgraded in a reasonable section of road, usually as part of undergrounding or pavement treatment. In these cases there is usually consistency in set out of the poles and the style of the poles. In many of the areas the poles have been upgraded on an ad-hoc basis and there is a wide variety of style of pole within a relatively small area.

e) Some of the poles have Nightwatch floodlights mounted on them. These are floodlights that Ausgrid provides to light private facilities from the street. These are generally provided as security lighting, but are also used for façade floodlighting. Ausgrid charge an annual rental for the supply, energy usage and maintenance of the fitting. If the Council takes over the ownership of the poles they will need to address whether and how they are going to continue this service.

PRIVATE OWNERSHIP OF PUBLIC LIGHTING

There are some proposals available for a separate company to supply, install, maintain and operate the streetlights. The contractual details would need to be negotiated however a typical arrangement may be an annual fee per light and an energy cost charge. The fees may be more or less than currently charged by Ausgrid.

While the contract would supply lighting for the streets it would also entitle the owner to lease the uses of the pole for additional uses to the council or other organisations for decorative banners, advertising, mobile transponders, CCTV cameras, Wi-Fi etc.

Before the council enters into such an arrangement it is important that the Councils rights and responsibilities are clarified. This is not an exhaustive list but highlights some of the things that the council should consider:

- What happens to the assets if the company ceases to trade for some reason?
- Is there an escalation in the maintenance of lighting energy costs over the contract period? This could be a high risk to the company given the rate of increase in energy costs at the moment. Increase in interest rates could also have an effect.
- Can the company sell off the assets to another operator?
- What are the performance criteria for the design and maintenance of the system? E.g. Quality of Lighting equipment installed, compliance with non-mandatory standards, minimum outage time.

- If the company fails to meet the performance criteria what comeback does the Council have?
- Does the company intend to set up a maintenance unit within its organisation to manage the lamp replacement, call outs etc. or will they subcontract it to someone else?
- Is the contractor responsible for repair and replacement of accidental or malicious damaged equipment other than general wear and tear?
- Does the company's capital cost include the cost of removal and the residual value of Ausgrid's assets?
- If there is currently an aerial power reticulation system who pays for the undergrounding?
- What happens to the assets at the end of the contract period? Do they vest to the council or do they remain the property of the company?
- Does the council have to pay extra to mount banners and Christmas decorations on the poles?
- Does the council have to pay extra to have CCTV on the poles?
- Does the company have the right to install advertising, illuminated or not, on the poles? If so does the council have any control over the extent and the content?
- Does the offer include the integration of traffic control signals on the poles?
- Is the contract viewed as a lease and does it affect the Council's loan ceiling?

J. DECORATIVE LIGHTING

Although the streetlighting has a predominately functional purpose, the selection of higher quality equipment can add to the general urban design of the space and create a more comfortable and visually interesting space.

There are other areas in the masterplan areas where, although they still need to provide adequate lighting, they are predominately people spaces and there is a greater priority on making them attractive as well as comfortable.

In these areas it is important that the lighting has a scale that relates better to people. This tends to make the space more interment and relaxing. This also provides the opportunity to use lights and poles that are more decorative.

POSTTOP FITTINGS

Posttop lights are normally between 4 and 5 metres high as this gives a good compromise between human scale, spacing of poles and protection against vandalism.

With poles of this height it is more important that the glare be controlled as the lights are much closer to people's heads.

The postop fittings can be a smaller or related fitting to the streetlights or can be totally unique.

Although there is a broad range of fittings that are available, in addition to the aesthetic requirements, the selected fittings need to achieve the desired level of glare control, energy efficiency, control of the light distribution and cost.

As a general guide the fitting should have a flat glass so that no light is emitted in or above the horizontal plane.

With some brands of metal halide and LED fittings it is possible to get a range of fittings that can have path lighting, forward throw area lighting, or symmetrical distributions and different wattages, all in fittings that have the same external appearance.

The postop lights can be provided with smaller versions of the Philips or WE-EF fittings.

There is also the opportunity for some more unique fittings such as the WE-EF RMC Family. One of the advantages of LEDs is that the shape of the fitting is now less controlled by the distribution.

Picture 17- WE-EF RMC Family

There is also an opportunity to provide different lighting solutions in different spaces to create a unique experience for the space.

There are several options that are available to change the atmosphere of specific space.

CATENARY LIGHTING

Catenary lighting moves the lights from poles and creates a ceiling of lights over the space. Depending on the size and light output this can vary from a few larger fittings to a ceiling of stars. The effect defines the area as something special and intimate.

Pictures 18 – Catenary Examples

DIRECTIONAL LIGHTING

Another way of lighting an open space is to use slightly higher poles with a series of narrow beam floodlights. This enables an open space to be lit without a myriad of poles. It also enables different areas to be accented.

Pictures 19 – Directional Examples

UPLIGHTING AND LIGHTING OF VERTICAL SPACES

Uplighting and lighting of vertical surfaces has a significant effect on and outside public space. Both increase the visual size of the space and reduce the extent and intensity of shadows. This improves peoples feeling of safety and comfort as they can identify the presence of other people and objects in the space.

Although uplights have often been considered a maintenance liability, particularly if poor quality fittings were used, with the introduction of LED fittings it is possible to get factory sealed fittings that can be plugged into an inground socket without the need for the electrician to open the fitting. The fittings are therefore guaranteed against ingress of water as long as they are not opened. When the lamps eventually fail the fitting can be returned to the manufacturer to be re-lamped and re-guaranteed.

Vertical illumination can also be added through the lighting of the facades.

UNDER-AWNING LIGHTING

One of the problems experienced in lighting of strip shopping is the night shadowing effect of awnings and trees. This can be addressed either by the addition of lower level postop fittings or the provision of under-awning lighting.

Under-awning lights, although providing a good lighting solution have inherent problems that need to be addressed.

The first is ownership of the lighting. If the lighting is privately owned then there has to be some regulation or incentive to encourage people to install the lights and run them all night. For new installations this can be done through inclusion in the LEP. There also needs to be some regulation to encourage consistency in the designs. The City of Sydney has two requirements for under-awning lights. One specifies a minimum lighting level while the other a maximum level to prevent convenience stores lining the soffit of the awning with bare lamps.

The City of Sydney also has a suite of acceptable luminaires for under-awning lighting.

With existing awnings there is probably the need for the Council to subsidise a private installation or supply the lighting as a council owned and maintained asset.

If the lights are owned, maintained and operated by the building owner there needs to be some method of ensuring that the lights will be maintained and operated for the required hours.

If the council owns the lighting there is the difficulty that the awnings are owned privately. When the City of Sydney redeveloped Darlinghurst Road in Kings Cross they replaced around 30% of the awnings as the awnings were structurally suspect. The other awnings had lights installed. In both cases the wiring had to be brought down the front of the building to link back to the cables in the street. The continuity of the cabling will be affected if there is a building without an awning or if there is an owner that does not give permission for the lighting and cabling to be attached to their awning.

If the lighting is council owned then it is possible to make the lighting a feature of the space such as the line of pearls in King Street Newtown or Sydney Road Manly.

K. RECOMMENDATIONS

Installing a private network of public lighting allows the flexibility to change the lighting from the existing high pressure sodium and mercury vapour streetlights to the latest technology LED streetlights, saving energy and reducing grennhouse gas emissions. The use of multi-function poles (MFP's) has the advantage of reducing street clutter by incorporating streetlights, banners, Wi-Fi antennas, CCTV's and signage. By standardising on a mutli-function pole uniformity throughout the precinct is maintained. By comparison if standard poles are used either special poles need to be made for each situation where additional equipment is to be added or the equipment will just be strapped to the pole with stainless steel packing straps.

The RMS have categorised Pittwater Road as a 'V2' road. Input from traffic division within council and the local police should determine the categories for the minor roads, parks, carparks, cycleways and public spaces. Appendix 1 and 2 detail the criteria for selection of the V and P Categories.

We have made suggestions of the possible V and P category for each of the roads and paths in the masterplan area based upon our experience, the outcomes are depicted below. The council should review these suggestions and nomilate the categories to be used in the design.

Possible V and P Category Public Lighting Options

L. APPENDICES

APPENDIX 1 – EXTRACTS FROM AS/NZS1158.1

TABLE 2.1

CATEGORY V LIGHTING AND TYPICAL APPLICATIONS

Typical applications		Lighting subcategory
Description of road or area type	**Operating characteristics**	
Arterial or main roads in central and regional activity centres of capital and major provincial cities, and other areas with major abutting traffic generators	—Mixed vehicle and pedestrian traffic —High to very high vehicle volume —High to very high pedestrian volume —Moderate to low vehicle speeds —Stationary vehicles alongside the carriageway —Through and local traffic —High traffic generation from abutting properties	V1
Arterial roads that predominantly carry through traffic from one region to another, forming principal avenues of communication for traffic movement, with major abutting traffic generators	—Mixed vehicle and pedestrian traffic —High vehicle volume —High pedestrian volume —Moderate to high vehicle speeds —Stationary vehicles alongside the carriageway —Through and local traffic —High traffic generation from abutting properties	V2
Freeways, motorways and expressways consisting of divided highways for through traffic with no access for traffic between interchanges and with grade separation at all intersections	—Vehicle traffic only —High to very high vehicle volume —High speeds	V3
Arterial roads that predominantly carry through traffic from one region to another, forming principal avenues of communication for traffic movements	—Mixed vehicle and pedestrian traffic —Moderate to high vehicle volume —High pedestrian volume —Moderate to low vehicle speeds —Stationary vehicles alongside the carriageway —Through and local traffic —Moderate traffic generation from abutting properties	
Sub-arterial or principal roads which connect arterial or main roads to areas of development within a region, or which carry traffic directly from one part of a region to another part	—Mixed vehicle and pedestrian traffic —Moderate traffic volume —Low pedestrian volume —Moderate to low vehicle speeds —Low traffic generation from abutting properties	V4* or V5

* V4 is the minimum subcategory recommended for application in New Zealand.

APPENDIX 2 – EXTRACTS FROM AS/NZS1158.3

TABLE 2.1

LIGHTING CATEGORIES FOR ROAD RESERVES IN LOCAL AREAS

1	2	3	4	5	6
Type of road or pathway		**Selection criteria[a,b)]**			**Applicable lighting subcategory[c,d)]**
General description	**Basic operating characteristics**	**Pedestrian/ cycle activity**	**Risk[f)] of crime**	**Need to enhance prestige**	
Collector roads or non-arterial roads which collect and distribute traffic in an area, as well as serving abutting properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Low	Medium	P3
		Low	Low	N/A	P4
Local roads or streets used primarily for access to abutting properties, including residential properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Medium	Medium	P3
		Low	Low	N/A	P4
		Low	Low	N/A	P5[e)]
Common area, forecourts of cluster housing	Mixed vehicle and pedestrian traffic	N/A	High	N/A	P1
		High	Medium	High	P2
		Medium	Low	Medium	P3
		Low	Low	N/A	P4

TABLE 2.2

LIGHTING CATEGORIES FOR PATHWAYS (INCLUDING CYCLEWAYS)

1	2	3	4	5	6
Type of pathway		**Selection criteria[a,b)]**			**Applicable lighting subcategory**
General description	**Basic operating characteristics**	**Pedestrian/ cycle activity**	**Risk of crime[f)]**	**Need to enhance prestige**	
Pedestrian or cycle orientated pathway, e.g. footpaths, including those along local roads[d)] and arterial roads[e)], walkways, lanes, park paths, cycleways	Pedestrian/cycle traffic only	N/A	High	N/A	P1[c)]
		High	Medium	High	P2[c)]
		Medium	Low	Medium	P3
		Low	Low	N/A	P4

TABLE 2.3

LIGHTING CATEGORIES FOR PUBLIC ACTIVITY AREAS (EXCLUDING CAR PARKS)

1	2	3	4	5	6
Type of area or activity		**Selection criteria[a,b)]**			**Applicable lighting subcategory**
General description	**Basic operating characteristics**	**Night time vehicle movements**	**Risk of crime[c)]**	**Need to enhance prestige**	
Areas primarily for pedestrian use, e.g. city, town, suburban centres, including outdoor shopping precincts, malls, open arcades, town squares, civic centres	Generally pedestrian movement only	N/A	High	High	P6
		Medium	Medium	Medium	P7
		Low	Low	N/A	P8
Transport terminals and interchanges, service areas	Mixed pedestrian and vehicle movement	High	High	High	P6
		Medium	Medium	Medium	P7
		Low	Low	N/A	P8

TABLE 2.4

LIGHTING CATEGORIES FOR CONNECTING ELEMENTS

Type of area	Applicable lighting subcategory
Steps and stairways, ramps, footbridges, pedestrian ways	P9
Subways, including associated ramps or stairways	P10

NOTE: Subways are listed as a separate subcategory because of a high risk of crime.

TABLE 2.5

LIGHTING CATEGORIES FOR OUTDOOR CAR PARKS (INCLUDING ROOF-TOP CAR PARKS)

1	2	3	4	5
	Selection criteria[a]			
Type of area	Night time vehicle or pedestrian movements	Night time occupancy rates (NTOR)	Risk of crime[b]	Applicable lighting subcategory[c]
Parking spaces, aisles and circulation roadways	High	>75%	High	P11a
	Medium	≥25%, ≤75%	Medium	P11b
	Low	<25%	Low	P11c
Designated parking spaces specifically intended for people with disabilities	N/A	N/A	N/A	P12

a) The selection criteria of Columns 2 to 4 should be separately evaluated. The highest level of any of the selection criteria that is deemed appropriate for the area type will determine the applicable lighting subcategory.

b) The risk levels 'High', 'Medium' and 'Low' correspond to the classifications of the same names in HB 436.

c) Providing a lighting scheme that meets the requirements of more than one subcategory by the use of switching is permitted.

APPENDIX 3 - MULTI-FUNCTION POLES

Multipole™

Multifunction Pole Design Systems

Use the system that fulfills all pole requirements.

Customize the design to deliver unique solutions.

Multipole

Multipole™ Advantages

- Multipole™ comprises a new generation of extruded aluminium street poles; more efficient and less expensive than earlier versions of multi-function street poles.

- Applications utilize an all aluminium pole without the disadvantage of a heavy steel spigot. An all aluminium Multipole™ is inherently energy absorbing frangible, thereby eliminating the need for inherently dangerous slip base arrangements for highway applications.

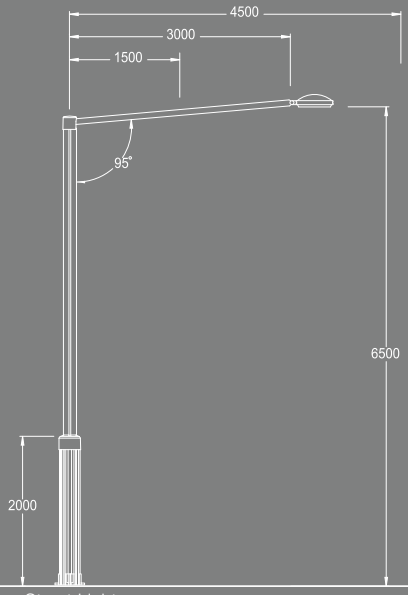
- Aluminium construction is about one third the mass of comparable steel products; therefore, installation and transport costs are much lower.

- The standard anodized finish virtually eliminates oxidation; consequently Multipole™ has an exceptional life span generally exceeding 60 years.

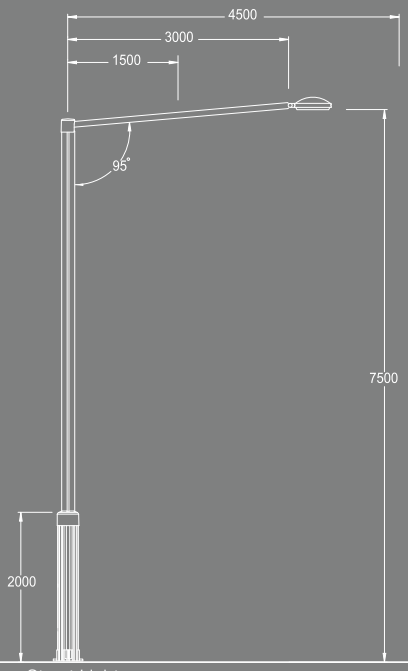
- Outreach arms are made in various lengths and spigot sizes; suitable to attach virtually all available outdoor lights. Stylish conical tapered arms are also available.

- Ventilation system to minimize internal humidity and moisture build up that can corrode switch gear.

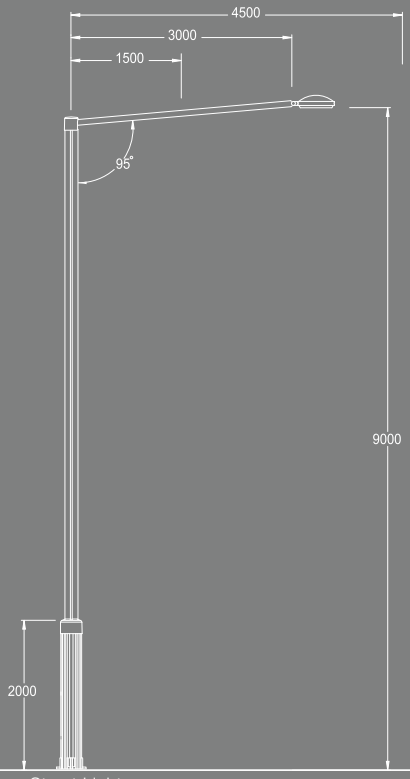
- The patented extrusion profiles with integral external tracks include internal grooves to aid in the mounting of switch gear and electric panels.



Street Light



Street Light



Street Light
Major Road

The Macarthur Range. Low cost Multipole™ System with angled outreach arms. Integral Energy Approved.

Multipole

- Vandal resistant patented deformable clamps are used to securely fit various items to the Multipole™ external tracks at almost any desired height. Items include but are not limited to promotional banners, traffic lights, street name signs, parking signs, CCTV cameras, solar panels, bicycle racks, pole mounted bus shelters and seats.

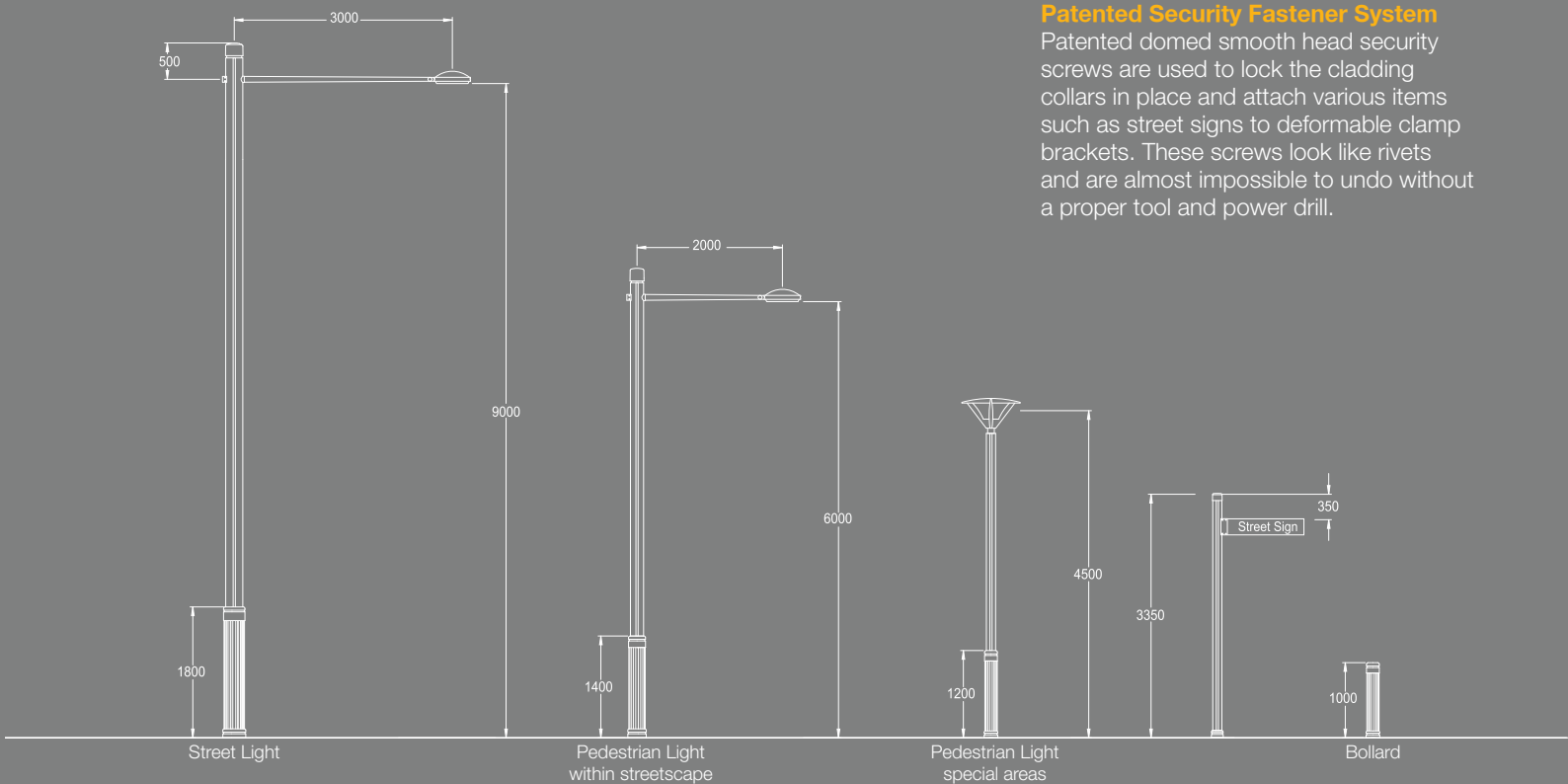
- Installation choices include direct bury or a robust patented extruded foot assembly, with mounting slots ready for installation via foundation bolts.

- An optional prefabricated pit mounting foundation design simplifies installation and inspection of foundation bolts.

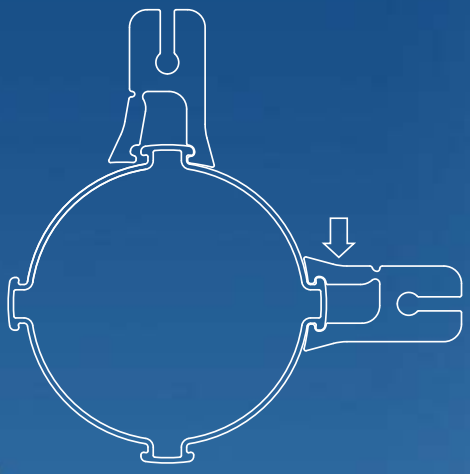
- Multipole™ is water proof rated IP23.

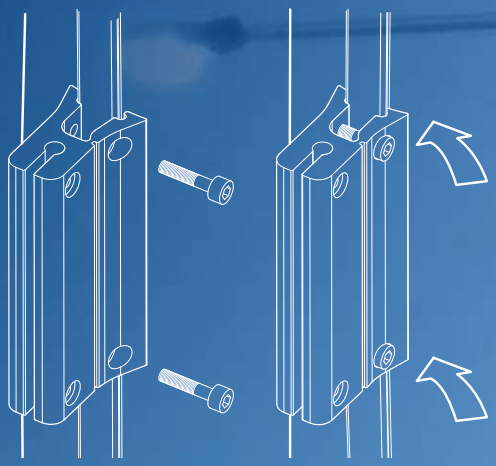
Patented Adjustable Cladding System
The four pieces of heavy gauge 4mm thick inter-locking extruded cladding are held in place top and bottom by robust cast aluminium collars. The cladding assembly can be adjusted in height so the bottom collar casting sits neatly on the pavement. The cladding hides the electrical hatch that is isolated by a clip on PVC cover. The collar castings are hard anodized to minimize scratching.

Patented Security Fastener System
Patented domed smooth head security screws are used to lock the cladding collars in place and attach various items such as street signs to deformable clamp brackets. These screws look like rivets and are almost impossible to undo without a proper tool and power drill.



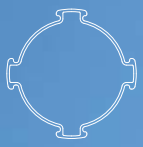
The Canberra Range. Multipole™ System with cast transitions and removable cladding. ACTEW Approved. Roads ACT Approved.



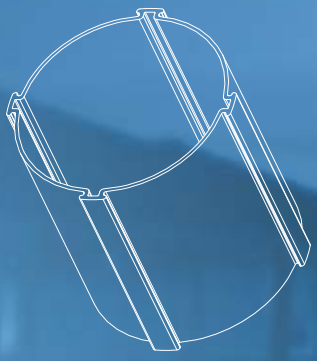


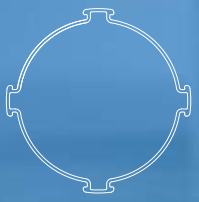
Patented Deformable Clamps
Enable secure vandal resistant attachment of various items including signs, traffic lights and CCTV at almost any angle.

Patented Extrusion Profiles
107, 161 and 232mm OD diameter tubes with integral external tracks; configurable to suit a wide range of applications.



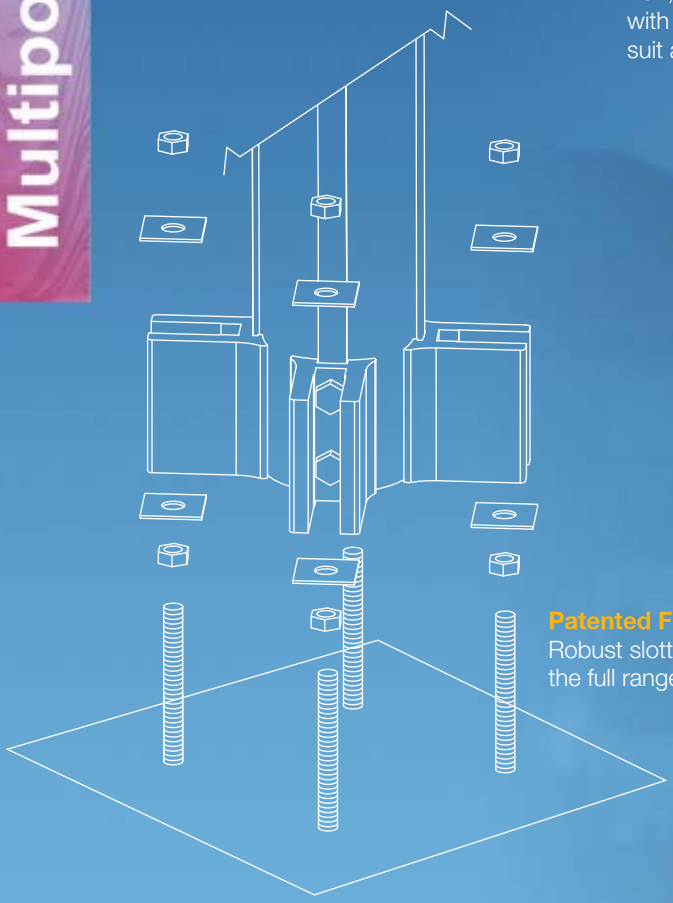
Dia 107 Multipole





Dia 161 Multipole™

Dia 232 Multipole™



Patented Footing System
Robust slotted foot extrusions are available to suit the full range of Multipole™ extrusion profiles.

7.5m long Macarthur Multipole™ with banner arm and 1.5m outreach arm

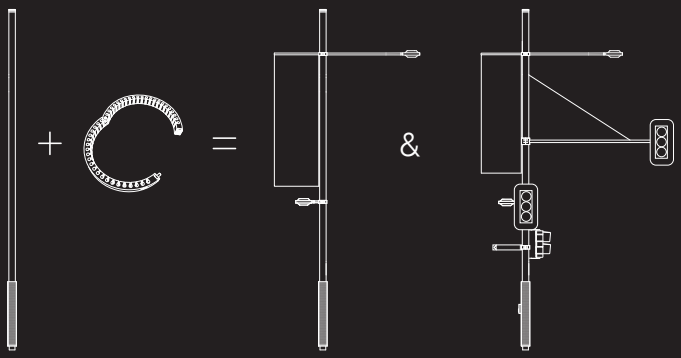
Fyntrim Pty Ltd

PO Box 588 Mona Vale NSW 2017 Australia
Telephone +61 2 9997 1278 Facsimile +61 2 9997 3533 Email sales@lightpole.com.au
www.lightpole.com

HUB MFP
Multi Function Pole System

Beautiful Functional Robust™

HUB MFP
Key Benefits



HUB-MFP REDUCES STREET CLUTTER

The HUB Multi Function Street Pole System combines all Street Pole Functions onto one beautifully designed structural urban element.

HUB-MFP IS A MODULAR SYSTEM

The HUB MFP System is a fully modular System that can be adapted to the needs of any modern city. It is completely flexible in terms of:

1. Pole Height
2. Pole diameters
3. Accessories accommodated immediately
4. Accessories accommodated in the future
5. Ability to customise the aesthetics to suit the character of each city

HUB UNIVERSAL MOUNTING SYSTEM (UMS)

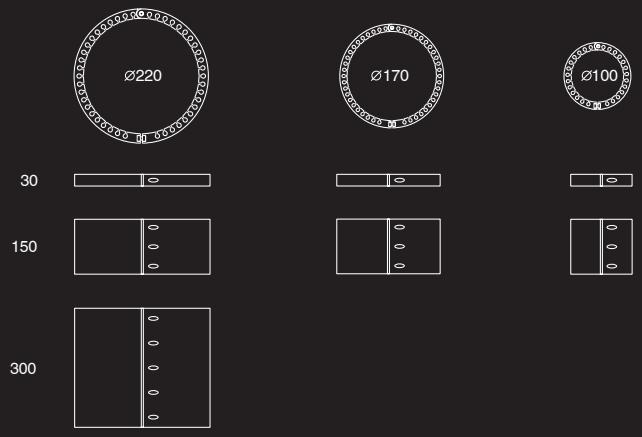
Functionality of the HUB MFP is delivered by an ingeniously simple and inexpensive Universal Mounting System (HUB UMS), designed as a single beautifully resolved extrusion which is docked and post machined. The HUB UMS ensures that the HUB MFP system is:

FUTURE PROOF
The system allows for all current and future street pole requirements as needs evolve.

COST EFFECTIVE
The elegance and simplicity of the system minimises all related costs.

COMPLETELY FLEXIBLE
All accessories can be mounted at any height and in any orientation through 360 degrees

RETRO-FITTABLE
The HUB UMS can also be retro fitted to existing poles. This means that the premium HUB Pole System can be deployed for the highest profile streets in a city while the functional core of the system, the HUB UMS, can be extended onto an existing pole infrastructure.



UMS - GEOMETRY

The design of this extrusion not only provides maximum flexibility in regards to mounting orientation but the mounting detail ensures that when the HUB UMS is attached to the pole the assembly actually flexes and conforms to the often imperfect circular shape of the pole.

POLE - RANGE OF SIZES
The HUB MFP System comes in a range of sizes:

1. Diameter 220mm
2. Diameter 170mm
3. Diameter 100mm

UMS - RANGE OF SIZES
The HUB UMS comes in 3 sizes:

1. Mini HUB - 25mm (all on-pole accessories)
2. Minor HUB - 100mm (Street lighting and banners)
3. Major HUB - 200mm (Traffic outreaches)

HUB MFP
Details

BEAUTIFUL DESIGN DETAILS

Inherent beauty in the details, finishes and forms
Discrete aluminium to steel connection
Integrated Pedestrian Push Button assembly ensures no rubbish build-up
Minimal architectural styling
Discrete HUB UMS fixing detail
Bold and robust hinge detail
Maximum surface contact / Maximum grip
Material + Process consistency

HUB-UMS VS TRACK BASED MFP'S

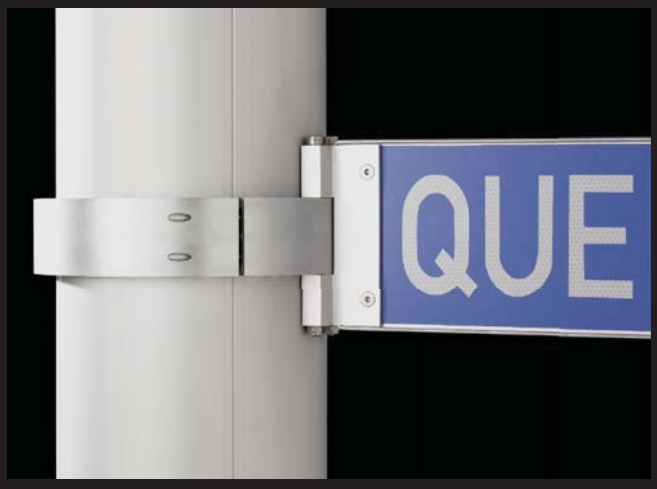
The benefits of the HUB-UMS over traditional track based systems is that the track on track-based systems is predominately redundant. The majority of poles (mid block) require only a streetlight, a banner and some minor signage. The majority of the track on these poles is not required. Further, track based systems limit orientation of accessories to 4 directions (90 degree increments).

Whereas the HUB-UMS is only used / applied when multi functionality is required making it a more appropriate and more efficient approach. The HUB-UMS offers orientation of accessories through 360 degrees.

CUSTOM OPTIONS

LED fittings deployed on high profile streets:
1. Pole Cap LED
2. Base Cladding LED

Cladding relfects the character of each city



HUB MFP
Features

HUB MFP ACCESSORIES

LIGHTING
Street Lighting
Pedestrian Lighting
Feature Lighting

TRAFFIC
Traffic Signals
Pedestrian Signals
Variable Message Signs (VMS)

SIGNAGE
Banners
Street Name
Traffic Control
Parking Control
Advertising

TELECOMMUNICATIONS
Panel Antenna
Microcell
Omni Antenna

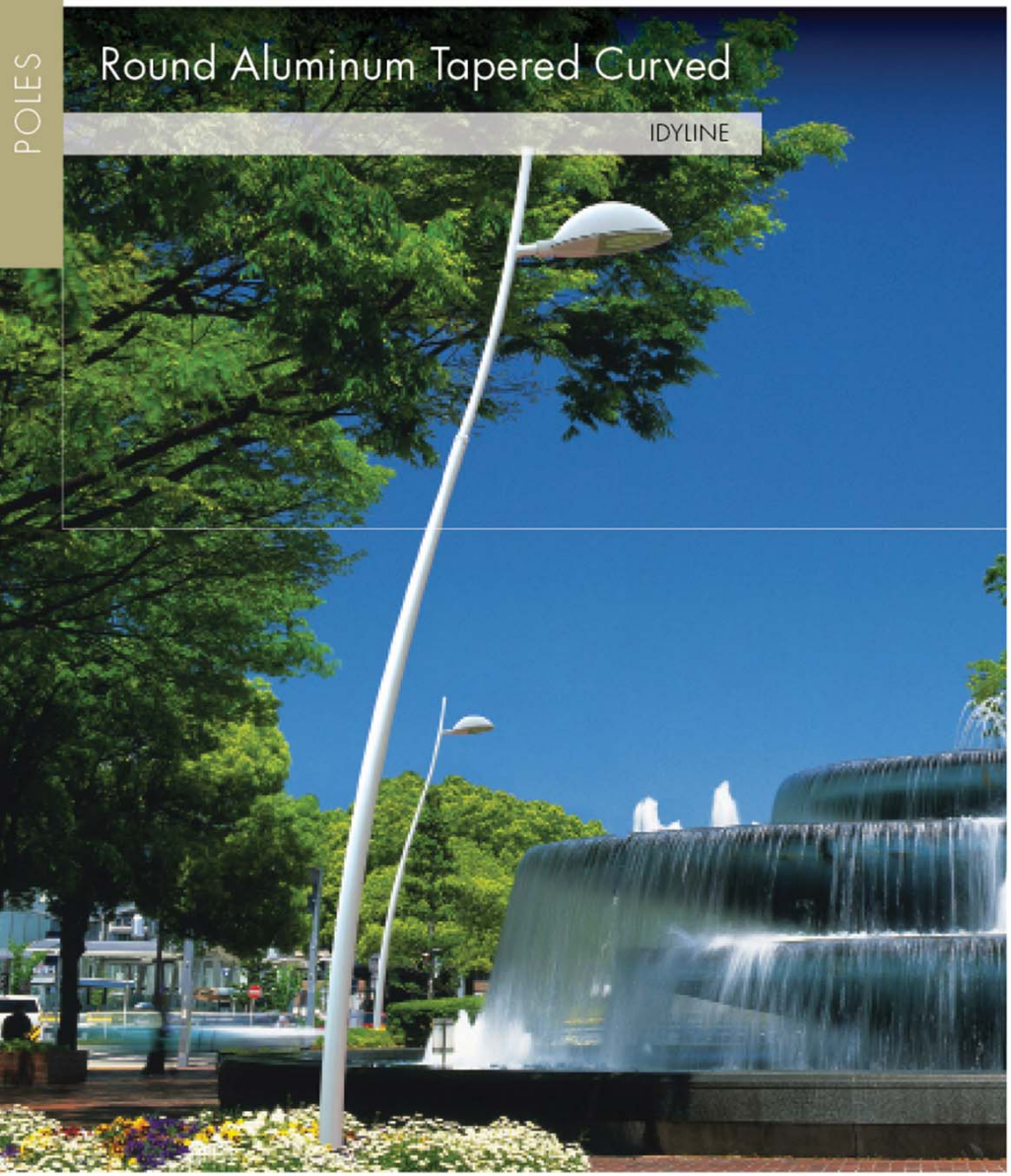
STANDARDS

The standards to which this design complies are:

AS 1170.2 - 2002 Structural Design Actions, Wind Actions
AS 2979 Traffic Signal Mast Arms
AS/NZS 4676 – 2000 Structural Design Requirements for Utility Service Poles
AS 4100 – 1998 Steel Structures
AS/NZS 1664 – 1997 Aluminium Structures
AS/NZS 3000:2000 Australia / New Zealand Wiring Rules
AS/NZS 2276.1 Cables for Traffic Signal Installations, Part 1- Multicore Power Cables
NZS 3404 – 1997 Steel Structures
NZS 4701:1981 Metal-arc Welding of Steel Structures

Round Aluminum Tapered Curved

IDYLINE



The contemporary, sleek design of Idyline is just the beginning of their appeal. Choose from Valmont's Sanded Black, Sanded Brown, Natural Aluminum or additional colors to create an iconic design. Also recyclable, lightweight and corrosion resistant.

ROUND TAPERED
IDYLINE CURVE
APPROX. 16.5'-28.0'

ROUND TAPERED
IDYLINE SIGMA
APPROX. 17.5'-31.5'