

13 January 2017

Travis Barker
Barker Group

Dear Travis,

Bowning Service Station Exterior Lighting

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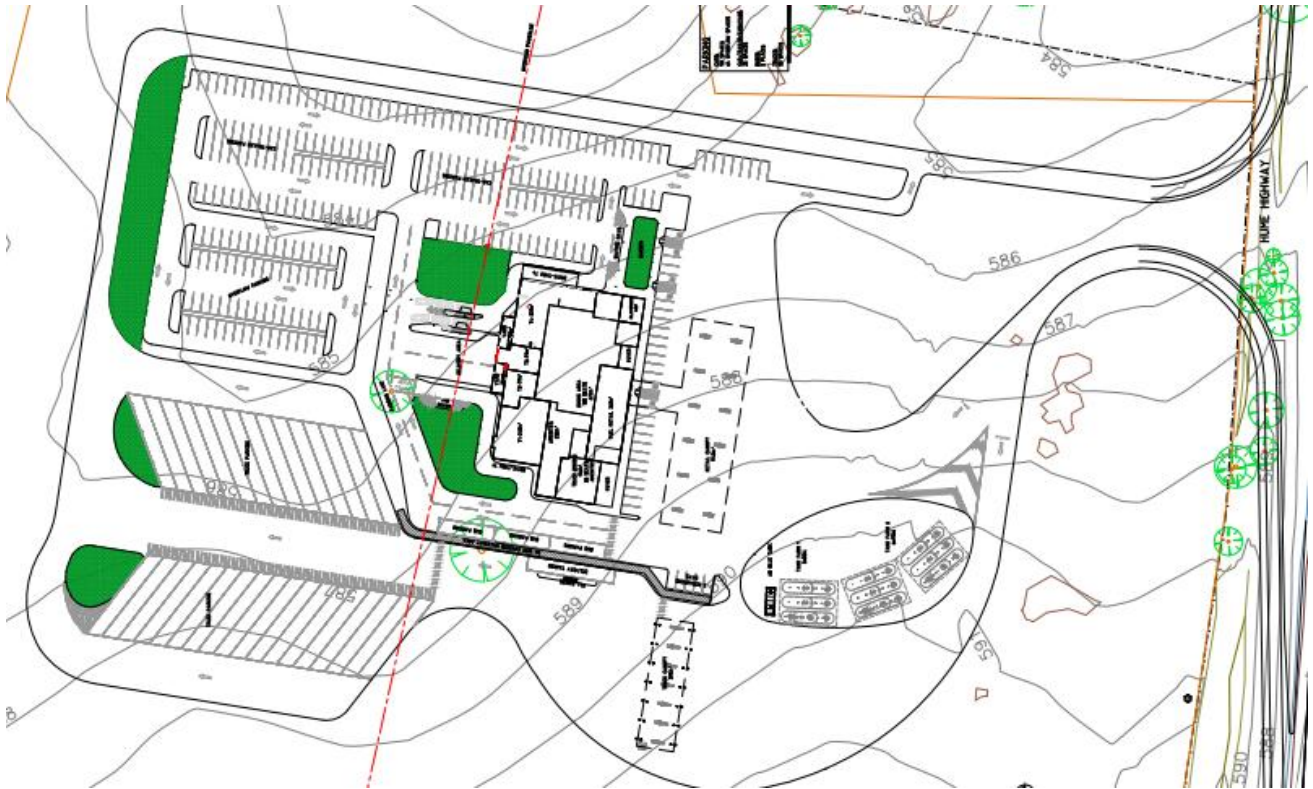
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Overview

As requested, we have provided a design for the exterior lighting of the site.

The proposed lighting will minimise any obtrusive effects (spill-light and glare) to nearby residences and to passing traffic on the Hume Highway.



The proposed scheme is shown on drawing 2521-E01 which is part of this submission.

Proposed scheme and equipment

All floodlights and proposed for the installation are manufactured by Cree and their details are shown below.

Cree Edge™ Series

LED High Output Area/Flood Luminaire featuring Cree TrueWhite® Technology

Product Description

The Cree Edge™ High Output Area/Flood luminaire is designed to deliver high lumen packages with precise optical control. The unit features a slim, low profile design that minimizes wind load and a rugged die cast aluminum adjustable arm that mounts to a horizontal or vertical 2" (51mm) IP, 2.375-2.50" (60-64mm) O.D. steel tenon. Tenon length must be a minimum of 3.75" (95mm). The direct mount bracket accessory allows for further mounting flexibility. Available with Cree TrueWhite® Technology, the Cree Edge™ High Output helps to beautifully render true colors and deliver value beyond energy savings.

Applications: Auto dealerships, parking lots, campuses, facade lighting, high-mast and general site lighting applications

Performance Summary

Utilizes Cree TrueWhite® Technology on 5000K Luminaires

Patented NanoOptic® Product Technology

Made in the U.S.A. of U.S. and imported parts

CRI: Minimum 70 CRI (4000K & 5700K); 90 CRI (5000K)

CCT: 4000K (+/- 300K), 5000K (+/- 300K), 5700K (+/- 500K) standard

Limited Warranty*: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

*See <http://lighting.cree.com/warranty> for warranty terms

Accessories

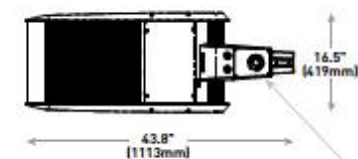
Field-Installed	
Bird Spikes XA-BRDSPK0AK12 - 120 LED XA-BRDSPK0AK24 - 240 LED	Backlight Control Shields XA-30BLS-4 - Four-pack for 120 LED - Unpainted stainless steel XA-30BLS-8 - Eight-pack for 240 LED - Unpainted stainless steel



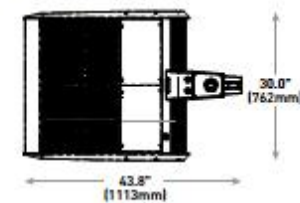
HV Mount (shown in horizontal position)



120 LED



240 LED



LED Count (x10)	Weight
12	45.3 lbs. (20.5kg)
24	80.5 lbs. (36.5kg)

HV Mount (shown in Vertical position) and Direct Mount Bracket • see page 13 for weight & dimensions

Ordering Information

Example: ARE-EHD-2M-HV-12-E-UL-SV-700

Product	Optic	Mounting*	LED Count (x10)	Series	Voltage	Color Options	Drive Current	Options
ARE-EHD	2M Type II Medium 2MB Type II Medium w/BLS 3M Type II Medium 4M Type II Medium w/BLS 5M Type V Medium SS Type V Short AF Automotive Frontline-Optic™	HV Horizontal/ Vertical Tenon - For EHD-UNV direct mount bracket, refer to Tenons & Brackets on page 12	12 24	E	UL Universal 120-277V 0N Universal 347-480V	BK Black BZ Bronze SV Silver WH White	700 700mA 1000 1000mA	DIM 0-10V Dimming - Control by others - Refer to UL spec sheet for details - Can't exceed specified drive current F Fuse - When code dictates fusing, use time delay fuse - Refer to UL spec sheet for availability with ML options - Not available with UL voltage - Available for U.S. applications only ML Multi-Level - Refer to ML spec sheet for details - Intended for downlight applications at 0° tilt - Not available with UL voltage or 240 LEDs with 1000mA drive current R NEMA® Photocell Receptacle - 3-pin receptacle per ANSI C136.10 - Intended for downlight applications with maximum 45° tilt - Consult factory for vertical tenon application - Photocell and shunting cap by others - Refer to ML spec sheet for availability with ML options RL Rotate Left - Optic is rotated to the left RR Rotate Right - Optic is rotated to the right 60K 4000K Color Temperature - Minimum 70 CRI - Color temperature per luminaire 50K 5000K Color Temperature - Minimum 90 CRI - Utilizes Cree TrueWhite® Technology - Color temperature per luminaire
FLD-EHD	15 15" Flood 25 25" Flood 35 35" Flood	40 40" Flood 70 70" Flood						

* Reference CTA and pole configuration suitability data beginning on page 11
NOTE: Price adder may apply depending on configuration



Rev. Date: V8 11/10/2016



US: lighting.cree.com/lighting

T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada

T (800) 473-1234 F (800) 890-7507

The LED canopy lights are manufactured by LSI, details shown below.

LED CANOPY LIGHT - LEGACY™ (CRUS)



DOE LIGHTING FACTS

Department of Energy has verified representative product test data and results in accordance with its Lighting Facts Program. Visit www.lightingfacts.com for specific catalog strings.

US & Int'l. patents pending.

HOUSING - Low profile, durable die-cast, aluminum construction, providing a reliable weather-tight seal.

LEDS - Features an array of select, mid-power, high brightness, high efficiency LED chips; 5000K color temperature, 70 CRI (nominal).

DRIVE CURRENT - Choice of Very Low Wattage (VLW), Low Wattage (LW), Super Saver (SS), High Output (HO) or Very High Output (VHO).

OPTICS / DISTRIBUTION - Choice of Symmetrical or Asymmetrical, which directs light through a clear tempered glass lens, to provide a uniform distribution of light to vertical and horizontal surfaces.

OPTICAL UNIT - Features an ultra-slim 7/8" profile die-cast housing, with a flat glass lens. Unit is water-resistant, sealed to an IP67 rating. Integral designed heat sink does not trap dirt and grime, ensuring cool running performance over the life of the fixture.

PRESSURE STABILIZING VENT - Luminaire assembly incorporates a pressure stabilizing vent breather to prevent seal fatigue and failure.

HAZARDOUS LOCATION - Designed for lighter than air fuel applications. Product is suitable for Class 1 Division 2 only when properly installed per LSI installation instructions (consult factory).

DRIVER - State-of-the-art driver technology superior energy efficiency and optimum light output. Driver components are fully encased in potting for moisture resistance. Complies with IEC and FCC standards. 0-10 V dimming supplied standard with all drive currents.

DRIVER HOUSING - Die-cast aluminum, wet location rated driver/electrical enclosure is elevated above canopy deck to prevent water entry, provide easy "knock-out" connection of primary wiring and contributes to attaining the lowest operating temperatures available. Seals to optical housing via one-piece molded silicone gasket.

OPERATING TEMPERATURE - -40°C to 50°C (-40°F to +122°F)

ELECTRICAL - Universal voltage power supply, 120-277 VAC, 50/60 HZ input. Drivers feature two-stage surge protection (including separate surge protection built into electronic driver) meets IEEE C62.41.2-2002, Scenario 1, Location Category C.

FINISH - Standard color is white and is finished with LSI's DuraGrip® polyester powder coat process. DuraGrip withstands extreme weather changes without cracking or peeling.

INSTALLATION - One person installation. No additional sealant required. Installs in a 12" or 16" deck pan. Deck penetration consists of a 4" hole, simplifying installation and water sealing. Unit is designed to quickly retrofit into existing Scottsdale (4") hole as well as openings for Encore and Encore Top Access and to reconnect wiring for the SC/ECTA without having to relocate the conduit. Retro panels are available for existing Encores (see back page) as well as kits for recessed and 2x2 installations (see separate spec sheets). Support brackets are provided standard, to prevent sagging of deck.

SHIPPING WEIGHT - 27 pounds (single pack), 48 pounds (double pack).

EXPECTED LIFE - Minimum 60,000 to 100,000 hours depending upon the ambient temperature of the installation location. See LSI web site for specific guidance.

WARRANTY - Limited 5-year warranty.

LISTING - UL and ETL listed to UL 1598, UL 8750 and other U.S. and International safety standards. Suitable for wet locations.

PHOTOMETRICS - Please visit our web site at www.lsi-industries.com for detailed photometric data.

Consult Factory

Class 1, Division 2 - Standard on SS & LW.

T5 Temperature Classification - The surface temperature of this product will not rise above 100°C., within a 40°C ambient.

Gas Groups A,B,C, and D - Group A: Acetylene / Group B: Hydrogen / Group C: Propane and Ethylene / Group D: Benzene, Butane, Methane & Propane.

This product, or selected versions of this product, meet the standards listed below. Please consult factory for your specific requirements.



Project Name _____ Fixture Type _____
Catalog # _____

04/29/16
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LSI INDUSTRIES INC.

Method of assessment

The proposed scheme has been assessed for compliance with the following Australian Standards by qualified lighting engineers using proprietary software and accepted methods:

AS1158.3.1 – *Lighting for roads and public spaces*

Carparking areas and connecting elements are compliant with AS1158.3.1 Table 2.9 Cat P11(a) and P12 (disabled)

TABLE 2.9
VALUES OF LIGHT TECHNICAL PARAMETERS AND PERMISSIBLE
LUMINAIRE TYPES FOR OUTDOOR CAR PARKS
(INCLUDING ROOF-TOP CAR PARKS)

1	2	3	4	5	6
Lighting subcategory	Light technical parameters ^{a)}				Permissible luminaire type (see Table 2.5)
	Average horizontal illuminance ^{a,b)} ($\bar{E}_h$) lux	Point horizontal illuminance ^{a,b)} (E_{ph}) lux	Illuminance (horizontal) uniformity ^{c)} Cat. P (U_{E2})	Point vertical illuminance ^{a,b)} (E_{pv}) lux	
P11a	14	3	10	3	Types 3, 4, 5 or 6
P11b	7	1.5	10	1.5	
P11c	3.5	0.7	10	—	
P12	—	≥ 14 and $\geq \bar{E}_h$ ^{d)}	—	—	

AS1680.5 – Outdoor workplace lighting

Truck parking areas and connecting elements are compliant with AS1680.5 Table 3.1 for general storage with pedestrian access and through traffic

TABLE 3.1
RECOMMENDED LIGHT TECHNICAL PARAMETERS
FOR GENERAL OUTDOOR AREAS

Description	Basic operating characteristics	[*] E _{av} lx	[†] E _{min} lx	#U	[‡] GR _{max}
Assembly, fabrication, manufacture or maintenance	General access and movement around work areas and related areas.	80	10	5	45
Loading and unloading – manual	Loading and unloading of trucks by manual labour including manually moving objects between the truck and another form of transport.	40	5	5	45
Loading and unloading – forklift	Loading and unloading of trucks by forklift, the area surrounding the truck and route of the forklift.	40	5	5	45
General storage – pedestrian access with through traffic	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; general through traffic; controlled pedestrian access; no access to the general public.	20	2.5	7	50
General storage – pedestrian access	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; through traffic –internal only (site-inducted personnel); site-inducted pedestrian access only.	10	1	7	50
General storage – no pedestrian access	Large open area for storage of large objects; placement, movement and retrieval of objects by machines with integrated movement and working light; minimal through traffic; no pedestrian access; no access to the general public.	5	1	10	55

Calculations have been performed on the *Relevant Boundary* of the adjacent properties, to evaluate spill light from the proposed installation.

To evaluate any potential effects of glare to traffic on the Hume Highway, *Threshold Increment* calculations have been performed in both directions of traffic flow.

TABLE 2.1
RECOMMENDED MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS
FOR THE CONTROL OF OBTRUSIVE LIGHT
(See Clause 2.7)

1	2	3	4	5
Light technical parameter	Application or calculation conditions (see also Figure 2.1 and Section 5)	Recommended maximum values		
		In commercial areas or at boundary of commercial and residential areas*	Residential areas	
			Light surrounds†	Dark surrounds‡
Illuminance in vertical plane (E_v)	<i>Pre-curfew:</i> Limits apply at relevant boundaries of nearby residential properties, in a vertical plane parallel to the relevant boundary, to a height commensurate with the height of the potentially affected dwellings. Values given are for the direct component of illuminance	25 lx	10 lx	10 lx
	<i>Curfewed hours:</i> Limits apply in the plane of the windows of habitable rooms of dwellings on nearby residential properties. In the absence of development (i.e. vacant allotment), the limits apply on the potentially affected property, in a vertical plane parallel to the relevant boundary, at the minimum setback permitted for a dwelling, to a height commensurate with land use zoning provisions. Values given are for the direct component of illuminance	4 lx	2 lx	1 lx
Luminous intensity emitted by luminaires (I)	<i>Pre-curfew:</i> Limits apply to each luminaire (irrespective of the number on a head frame) in the principal plane, for all angles at and above the control direction, when aimed in accordance with the installation design	Limits as determined from Table 2.2. Alternatively, the limits and method of assessment associated with curfewed hours may be applied, at the discretion of the designer (see Clauses 2.7.1 and 2.7.2)		
	<i>Curfewed hours:</i> Limits apply in directions where views of bright surfaces of luminaires are likely to be troublesome to residents, from positions where such views are likely to be maintained, i.e. not where momentary or short-term viewing is involved	2 500 cd	1 000 cd	500 cd
Threshold increment (IT)	Limits apply at all times where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and viewing directions in the path of travel	20% based on adaptation luminance ($\bar{L}$) of 10 cd/m ²	20% based on adaptation luminance ($\bar{L}$) of 1 cd/m ²	20% based on adaptation luminance ($\bar{L}$) of 0.1 cd/m ²

* Applies to residential accommodation in commercial areas or at the boundary between commercial and residential areas. The term 'commercial' is used as a generic description for zoning which provides for urban uses other than residential.

† Where the affected property abuts roads that are lit to Category V5 or higher in accordance with AS/NZS 1158.1.1.

‡ Where the affected property abuts roads that are lit to Category B1 or lower in accordance with AS 1158.1, or where there is no lighting.

Test Parameters

 Standard AS 4282-1997 Application Conditions Post-Curfew Lighting Zone Commercial
Description AS 4282-1997, Post-Curfew, Commercial

☒ Illuminance: 4 Lux
☐ Luminous Intensity Per Luminaire: 7500 Cd - Large Area, Level 1 ☐ Show All Luminaires
 Controlling Angle 83 Degrees - Large Area
☒ Luminous Intensity At Vertical Planes: 2500 Cd
☒ Threshold Increment (TI): 20 %
☐ Total Offsite Lumens: 15 % Of Total Site Lumen Limit
 Allowed Lumens Per Area (Sq.m.) 0
 Allowed Base Lumens Per Site 0
 Additional Allowance 0 Allowance Worksheet...
☐ Upward Waste Light Ratio (UWLR) %

Run Test

Close

Help

Print

Test Results

Obtrusive Light - Compliance Report

AS 4282-1997, Post-Curfew, Commercial

Filename: 2521-1

16/01/2017 20:51:32

Illuminance

Maximum Allowable Value: 4 Lux

Calculations Tested (4):

Calculation Label	Test Results	Max. Illum.
RELEVANT BOUNDARY_III_Seg1	PASS	0
RELEVANT BOUNDARY_1_III_Seg1	PASS	1
RELEVANT BOUNDARY_1_III_Seg2	PASS	0
RELEVANT BOUNDARY_1_III_Seg3	PASS	0

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 2500 Cd

Calculations Tested (4):

Calculation Label	Test Results
RELEVANT BOUNDARY_Cd_Seg1	PASS
RELEVANT BOUNDARY_1_Cd_Seg1	PASS
RELEVANT BOUNDARY_1_Cd_Seg2	PASS
RELEVANT BOUNDARY_1_Cd_Seg3	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (2):

Calculation Label	Adaptation Luminance	Test Results
HUME HWY TI_1	10	PASS
HUME HWY TI	10	PASS

Summary

We have inspected the site surrounds and are mindful of its rural location. The nearest adjoining residential dwelling is located approximately 600m from the proposed highway service centre, (note this information and map is in the acoustic report). The distance between existing residences and the proposed development is substantial. Having regard for the location of adjoining properties and the rural nature of the locality, we have recommended the use of full-cutoff, flat-glass luminaires. The specifications for such lighting will minimise upward waste light and light 'spillage' onto adjoining land or the Hume Highway.

The proposed lighting is typical of that used for modern highway service centres and is not expected to adversely impact on adjoining lands or the rural amenity of the locality.

The proposed scheme is compliant with:

- AS4282 - *Control of the obtrusive effects of outdoor lighting* for pre-curfew and post-curfew (24 HRS) operation in a commercial area and at the boundary of commercial and residential areas.
- AS1158.3.1 – *Lighting for roads and public spaces* for Carparking areas and connecting elements Table 2.9 Cat P11(a) and P12 (disabled)
- AS1680.5 – *Outdoor workplace lighting* for Truck parking areas and connecting elements Table 3.1 for general storage with pedestrian access and through traffic

Yours faithfully,
NINOX ST Pty Ltd



Scott Forbes