Lighting Mitigation Plan

For

Kerr McGee Oil & Gas Onshore LP

Paul Nelson 25-29 HZ

Project Number: 21010-07

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1.0 EXECUTIVE SUMMARY

Kerr McGee Oil & Gas Onshore LP commissioned Samuel Engineering to develop a lighting mitigation plan for the Paul Nelson 25 - 29 HZ pad site. The purpose of this report is to demonstrate compliance with the various State and Local lighting regulations, predict lighting impacts for the different development phases, and to detail the various lighting mitigation techniques used to limit light pollution.

Specifically, the key points of the study are:

- Demonstrate compliance with Colorado Oil and Gas Conservation Commission (COGCC) Rule 424 and Weld County Regulations.
- Identify the light level impacts associated with each phase of the facility operations on surrounding buildings.
- Demonstrate compliance with the total lighting used based on site working surfaces.
- Demonstrate the various lighting mitigation techniques that were implemented.

Site specific three-dimensional lighting models were developed for each of the phases to determine their associated lighting impacts. The lighting fixtures used in the models were selected based on currently operated representative sites and research conducted into available vendor lighting systems.

The following Table 1.0 summarizes the calculated maximum values compared to the regulatory limits:

Calculated Lighting Values and Regulatory Limits Summary			
	Calculated Value	**Regulatory Limit**	**Code Reference**
Max. Light Impact on Surrounding Building	1.13 lux	≤ 4.0 lux	*COGCC 424.f*
Pre-Production – Drilling Phase (Lumens / Hardscape)	5.2 lm/ft²	≤ 12 lm/ft²	*Weld County Ordinance ORD2020-12 Table 405.B.1*
Pre-Production – Completions Phase (Lumens / Hardscape)	8.74 lm/ft²	≤ 12 lm/ft²	*Weld County Ordinance ORD2020-12 Table 405.B.1*
Production (Lumens / Hardscape)	0.1 lm/ft²	≤ 2.5 lm/ft²	*Weld County Sec 21-5-405 Table 405.C.1 for land use LZ-2 and COGCC Rule 424.d.(2) for Agricultural/Commercial*

Table 1.0 - Calculated Lighting Values and Regulatory Limits

All calculated values are within prescribed regulatory limits.

2.0 INTRODUCTION AND DEFINITION OF TECHNICAL TERMS

2.1 INTRODUCTION

Light mitigation plans seek to quantify and prescribe methods to address the negative effects of multiple forms of light pollution. Effective lighting mitigation plans address light pollution by limiting the impacts on the surrounding communities, preserving the overall night-sky aesthetics, and maintaining existing ecosystems, all while maintaining a safe work environment.

There are a number of standards, best practices, and regulations which are used as guidelines when developing lighting plans for reducing the negative effects of artificial lighting. The applicable regulation used for this report is COGCC Rule 424 and Weld County Ordinance ORD2020-12.

2.2 DEFINITION OF TECHNICAL TERMS

A number of technical terms are used throughout this report and, as an aid to the reader, are defined below.

Illuminance (lx)

Illuminance is defined as the amount of light falling on a surface area. It is measured in Lux (lx). One lux is equal to one lumen per square meter. As an example, the photo in Figure 2.2 shows the lux levels decreasing on the sidewalk, as the distance from the light source increases.

Illuminance is often associated with values for lighting levels for safe operation in various standard codes. In addition, photometric plans are used to predict the illuminance on surfaces of an area to provide minimum lighting levels and for mitigation of light trespass into adjoining properties or areas. Most lighting meter units used today are in lux and used to measure these values at a given distance. It should be noted that the measured value is dependent on angle, sensitivity, and optics.

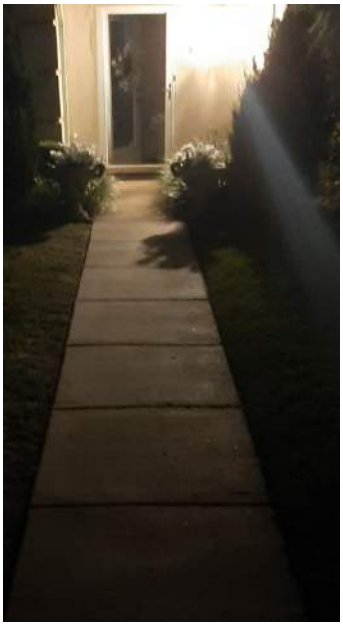


Figure 2.2–Illuminance (lx) level decreasing with distance from light source.

Table 2.2 below provides examples of typical Lux values.

Typical Lux Values	
Clear night, no moon:	0.002 lx
Clear night, full Moon:	0.27 to 1 lx
Family Living Room	50 lx
Sunrise/sunset	300-500 lx
Overcast day:	1000 lx
Daylight:	10,000-25,000 lx
Direct sunlight:	32,000-130,000 lx

Table 2.2 – Typical Lux Values

Luminous Flux(lm)

Luminous Flux is defined as the amount of light energy produced per unit time and is measured in Lumens (lm). It is a physical property of light and, in general terms, is a measurement of the total amount of light emanating from a source. It is important to note that the luminous flux value of a given source is independent of where a measurement is taken.

For example, a 60-watt light bulb produces approximately 800 lumens, regardless of if the measurement is taken at 1 foot, 10 miles, or 10,000 miles away from the source.

3.0 MODEL AND ANALYSIS DEVELOPMENT

Site-specific three-dimensional models were developed for each of the major project development phases. These phases being Pre-Production Drilling, Pre-Production Completions, and final Production. Elements incorporated into the models, among others, were the local site topographical information, major lighting obstructions (sound wall, large equipment, etc), individual luminaire lighting qualities, lighting mounting characteristics and surrounding building units.

The site geographical information was obtained using USGS topographical information to model the surrounding 1-mile landscape.

To determine the lighting impacts on local building units, 25-foot vertical walls were modeled at the units' locations, at the USGS identified elevations.

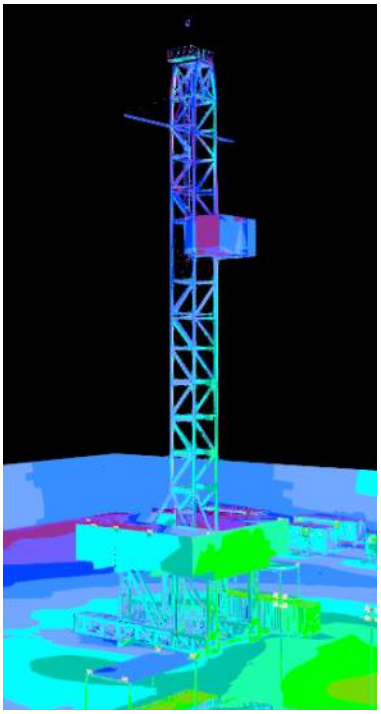


Figure 3.0–Screenshot from a representative 3-D model showing a false color rendering

Modeling of site-specific information (including large equipment, type of luminaire, and sound wall locations) were based on inspections of operational representative sites, provided vendor information, and research into various available lighting systems. The major pieces of equipment modeled included:

- Drilling: Drill rig floor, derrick, substructure, temporary lighting, sound barriers, backyard, and trailers.
- Completions: Temporary lighting, sound barriers, completion fleet equipment, and trailers.
- Production: LACT skids, separators, large tanks, and associated equipment.

Once site-specific topographical information and equipment were modeled, lighting characteristics were placed within the model. These characteristics were obtained from the various manufacturers and were specific to the make/model of the light to be used. The luminaires information included in the model were the type, quantity, mounting height, orientation, and tilt angle.

Models for each of the various project phases were developed in a similar manner and the resulting calculated lighting impacts were tabulated. An Excel spreadsheet was used to total the site lumens for each fixture and compared it to the site working pad surface (hardscape).

In the Pre-Production phases, temporary lighting fixtures were based on currently available rental units and on observations from representative sites. The temporary lighting system that will be used might vary based on rental availability at the time of procurement but is expected to be representative of the lumens values used in this analysis.

4.0 LIGHTING ANALYSIS RESULTS

4.1 CUMULATIVE LIGHTING IMPACTS

Applicable Code Reference: COGCC Rule 424.f:
"Operators will develop site lighting to reduce cumulative nighttime light intensity from all Oil and Gas Facilities to 4 lux at any Residential Building Unit or High Occupancy Building Unit within 1 mile of any Oil and Gas Facility, measured at 5.5 feet above grade in a direct line of sight to the brightest light fixture onsite."

Due to the large number of buildings units located within the 1-mile radius of the site, buildings were grouped into clusters and a representative "wall" location was selected for analysis. These analyzed "wall" locations were selected to determine an upper cumulative light impact limit for that clustered group, considering the local topography, orientation, and distance to the site.

Figure 4.1 shows the building units that are located within a 1-mile radius of the Paul Nelson 25 - 29 HZ site.

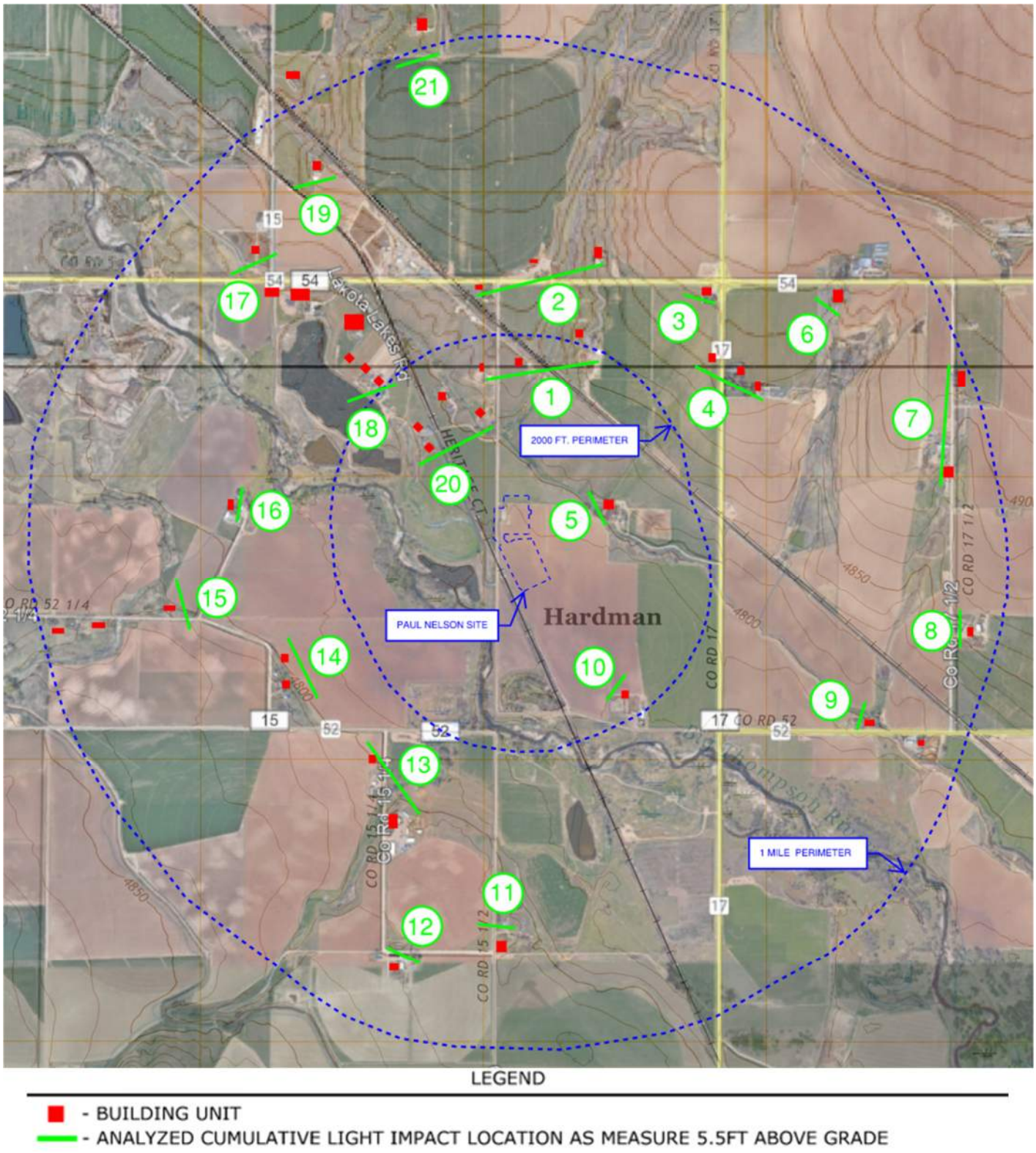


Figure 4.1 –Building Units Within a 1-Mile Radius of Paul Nelson 25 - 29 HZ

Calculated Lighting Impact Results Building Units				
Location Unit No.	Pre-Production Drilling	Pre-Production Completions	Production	Regulatory Limit
1	0.14 lux	0.5 lux	< 0.1 lux	4 lux
2	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
3	< 0.1 lux	0.18 lux	< 0.1 lux	4 lux
4	< 0.1 lux	0.27 lux	< 0.1 lux	4 lux
5	0.29 lux	1.13 lux	< 0.1 lux	4 lux
6	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
7	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
8	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
9	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
10	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
11	0.14 lux	0.18 lux	< 0.1 lux	4 lux
12	< 0.1 lux	0.14 lux	< 0.1 lux	4 lux
13	0.31 lux	0.38 lux	< 0.1 lux	4 lux
14	0.34 lux	0.22 lux	< 0.1 lux	4 lux
15	< 0.1 lux	0.14 lux	< 0.1 lux	4 lux
16	< 0.1 lux	0.36 lux	< 0.1 lux	4 lux
17	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
18	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
19	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux
20	0.19 lux	0.22 lux	< 0.1 lux	4 lux
21	< 0.1 lux	< 0.1 lux	< 0.1 lux	4 lux

Table 4.1 –Calculated Lighting Impact Results Building Units

Table 4.1 demonstrates compliance with COGCC Rule 424.f.

4.2 HARDSCAPE AND LUMEN LEVEL RESULTS

Applicable Code Reference: Weld County Ordinance ORD2020-12 Tabel 405 B.1 (B)
Construction base allowance for lighting is stated as 12.0 lumens per square foot of hardscape.

Lumens per Hardscape calculations were performed based on the number of exterior fixtures light output (lumens) and the working pad surface (hardscape). These values were then compared to the regulatory allowed site lumens per square foot to demonstrate compliance.

4.2.1 PRE-PRODUCTION DRILLING LUMENS PER HARDSCAPE COMPLIANCE

Pre-Production Drilling Lighting Compliance		
	Calculated Value	Notes
Site Hardscape Area:	246,985 ft²	
Site Hardscape Acres:	5.67 Acres	Not to Exceed 12 Acres (ORD2020-12)
Site Total Lumens:	1,284,572 lm	See Section 5.2
Site Allowance Initial Lumens Total:	2,963,820 lm	
Calculated Site (Lumens / ft²):	5.2 lm/(ft²)	Construction Site is Verified
Regulatory Allowed Limit:	12.0 lm/(ft²)	Per Weld County Ordinance ORD2020-12 Table 405 B.1

Table 4.2.1 –Pre-Production Drilling Operation Compliance Calculation

Based on the calculation shown in Table 4.2.1, the estimated site lighting during the Pre-Production Drilling operation phase is 5.2 lumens per square foot and is in compliance with Weld County Ordinance ORD2020-12.

4.2.2 PRE-PRODUCTION COMPLETIONS LUMENS PER HARDSCAPE COMPLIANCE

Pre-Production Completions Lighting Compliance		
	Calculated Value	Notes
Site Hardscape Area:	246,985 ft²	
Site Hardscape Acres:	5.67 Acres	
Site Total Lumens:	2,159,680 lm	See Section 5.5
Site Allowance Initial Lumens Total:	2,963,820 lm	
Calculated Site (Lumens / ft²):	8.74 lm/(ft²)	Construction Site is Verified
Regulatory Allowed Limit:	12.0 lm/(ft²)	Per Weld County Ordinance ORD2020-12 Table 405 B.1

Table 4.2.2 –Pre-Production Completions Operation Compliance Calculation

Based on the calculation shown in Table 4.2.2, the estimated site lighting during the Pre-Production Completions operation phase is 8.74 lumens per square foot and is in compliance with Weld County Ordinance ORD2020-12.

4.2.3 PRODUCTION LUMENS PER HARDSCAPE COMPLIANCE

Production Lighting Compliance		
	Calculated Value	Notes
Site Hardscape Area:	155,074 ft²	
Site Hardscape Acres:	3.56 Acres	
Site Total Lumens:	10,056 lm	See Section 5.6
Planning Zone for Weld County:	LZ-2	Near-Urban based on Weld County Appendix 21-B
Calculated Site Value:	0.1 lm/(ft²)	Production Site is Verified
Regulatory Allowed Limit:	2.5 lm/(ft²)	Weld County Sec. 21-5-405 Table 405.C.1 & COGCC Rule 424.d.(2)

Table 4.2.3 –Pre-Production / Construction Completions Operation Compliance Calculation

Based on the calculation shown in Table 4.2.3, the estimated site lighting during the Production operation phase is less than the regulatory maximum value and in compliance with Weld County Ordinance ORD2020-12 and COGCC Rule 424.d.(2) for Commercial/Agricultural.

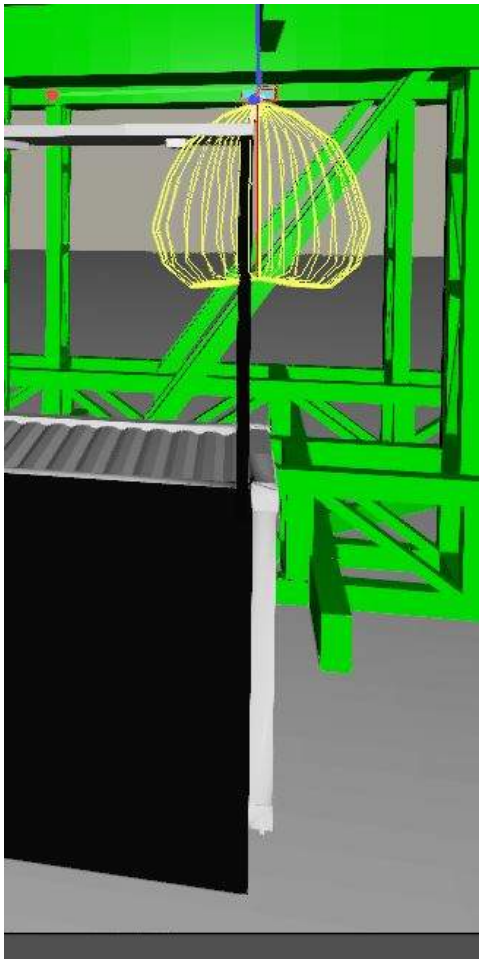
5.0 SITE LIGHTING POSITIONS AND ORIENTATION

5.1 SITE LIGHTING NOTES

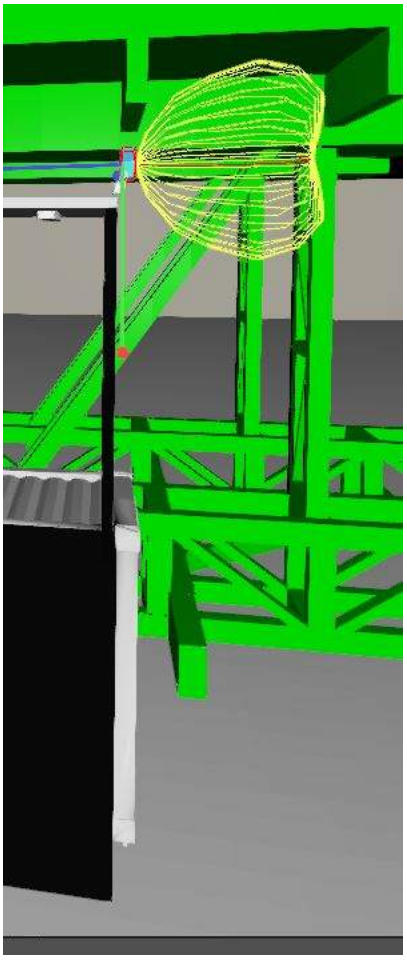
Applicable Code Reference: COGCC Rule 424(a)(2)(A)(ii)
Pertaining to Pre-Production activities: *"The proposed anticipated location, mounting, height, and orientation of all outdoor lighting fixtures on the site during pre-production activities"*

The following figures and tables in this section show the lighting location, mounting, height, and orientations for the Pre-Production Drilling, Completions, and Production Operations, in accordance with COGCC Rule 424(a)(2)(A)(ii). The following notes apply:

1) Stated tilt at zero (0) degrees represents a luminaire facing directly downward.



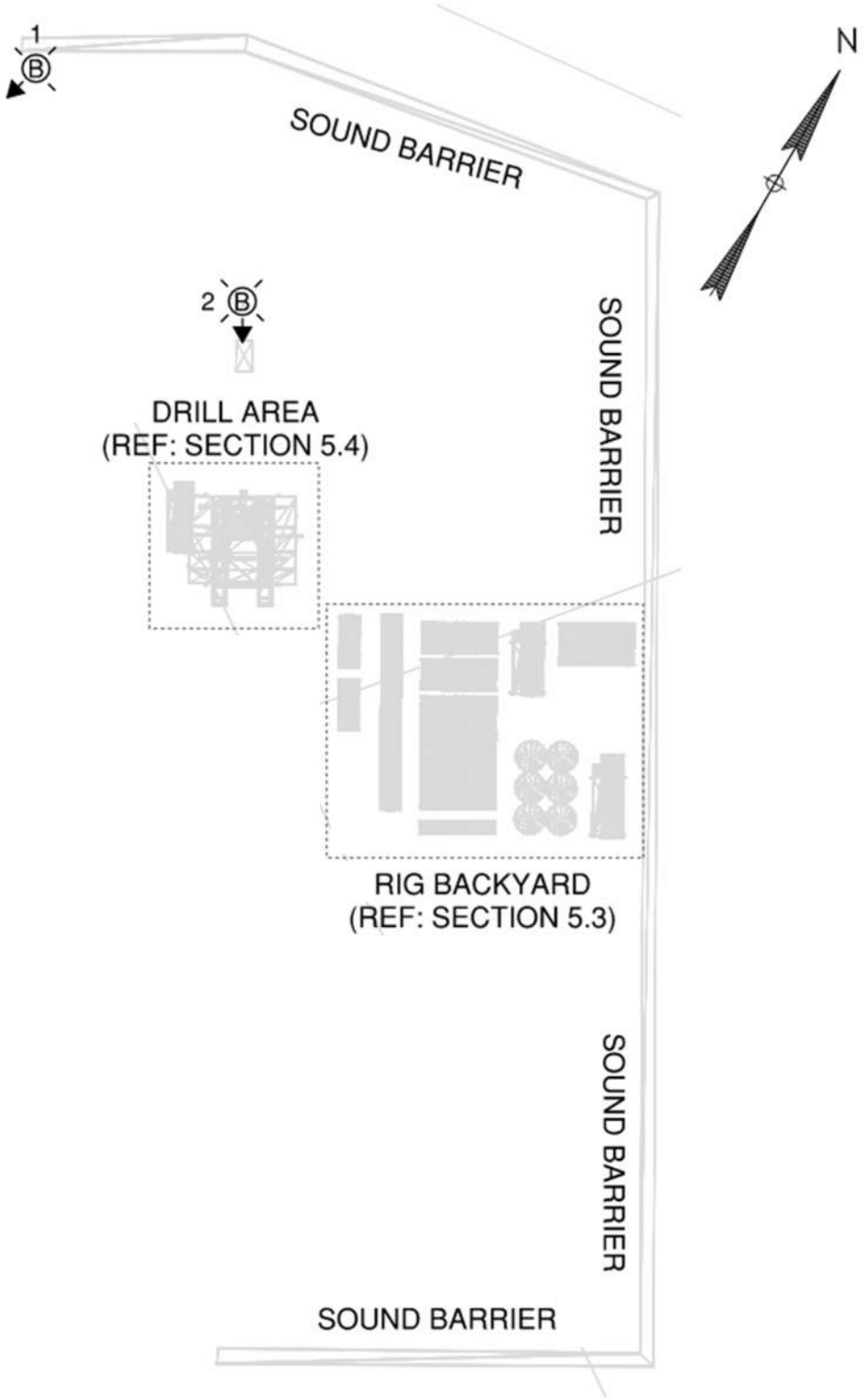
Example 0 degrees



Example 90 degrees

2) Intermittent sources of lights such as glow from on-site combustor and alarm lights are not included in this analysis.
3) Temporary lighting where necessary for safety reasons per COGCC 424.a.2.A.iii have not been modeled or accounted for in this analysis.
4) The quantity of lights and calculated values shown represents an estimated upper limit to the actual values that will be present on-site.
5) Refer to Attachment A for further lighting fixture information.

5.2 PRE-PRODUCTION - DRILLING SITE LAYOUT AND LUMINAIRE SCHEDULE



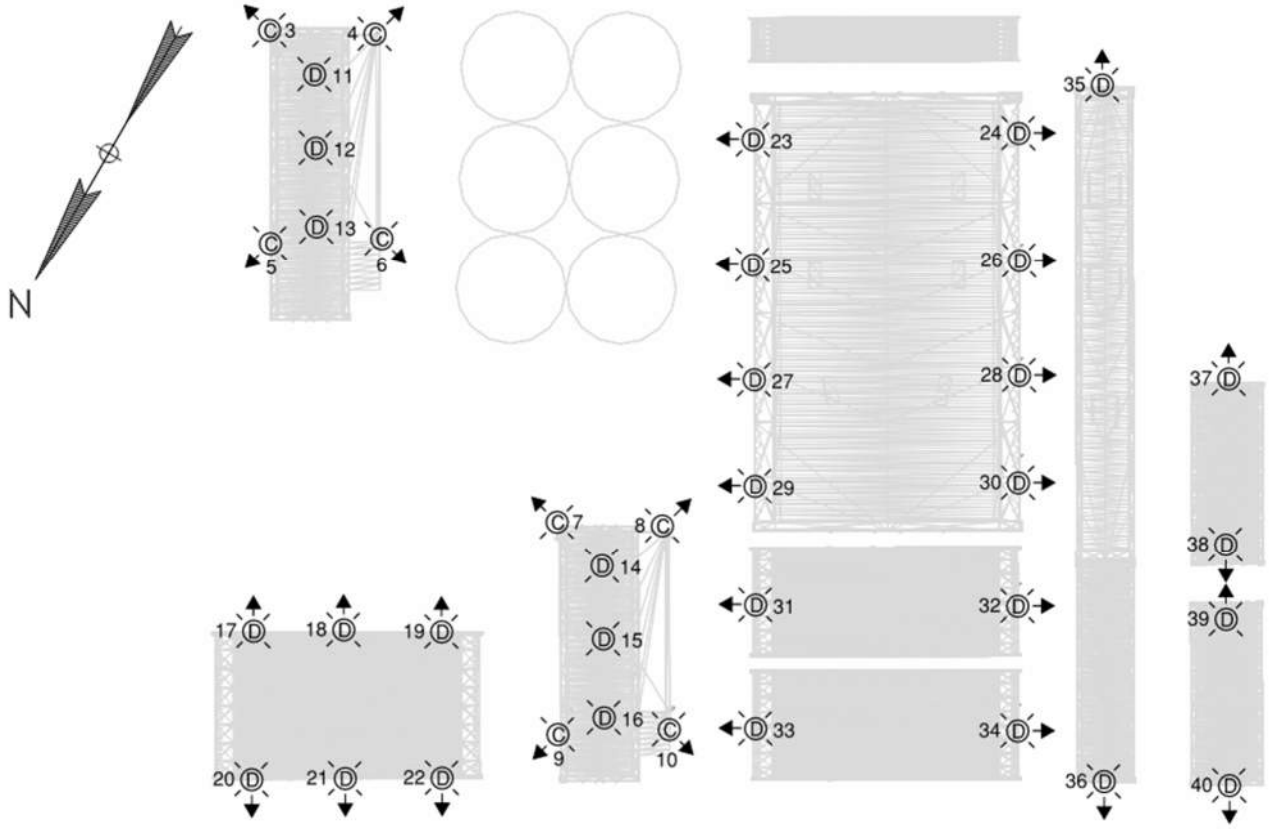
LUMINAIRE LAYOUT
PAUL NELSON 25 - 29 HZ – OVERALL PRE-PRODUCTION
DRILLING OPERATIONS

Luminaire Schedule					
Luminaire Type	**Manufacturer**	**Model Number**	**Description**	**Power (Watts)**	**Luminous Flux (Φ)**
B	HPWINNER	M4	LED - TEMP. LIGHTING SYSTEM	1,696 W	213,648 lm

Luminaire Position and Tilt				
Luminaire No.	**Mounting Height (ft)**	**Tilt (Degrees)**	**Luminaire Type**	**Luminous Flux (Φ)**
1	30’	75°	B	213,648 lm
2	30’	75°	B	213,648 lm

Total Lumens Calculation	
Subtotal Area Calculation:	427,296 lm
Total Section 5.3 Lumens:	421,298 lm
Total Section 5.4 Lumens:	435,978 lm
Total Area Lumens:	**1,284,572 lm**

5.3 PRE-PRODUCTION - DRILLING –RIG BACKYARD- SITE LAYOUT AND LUMINAIRE SCHEDULE



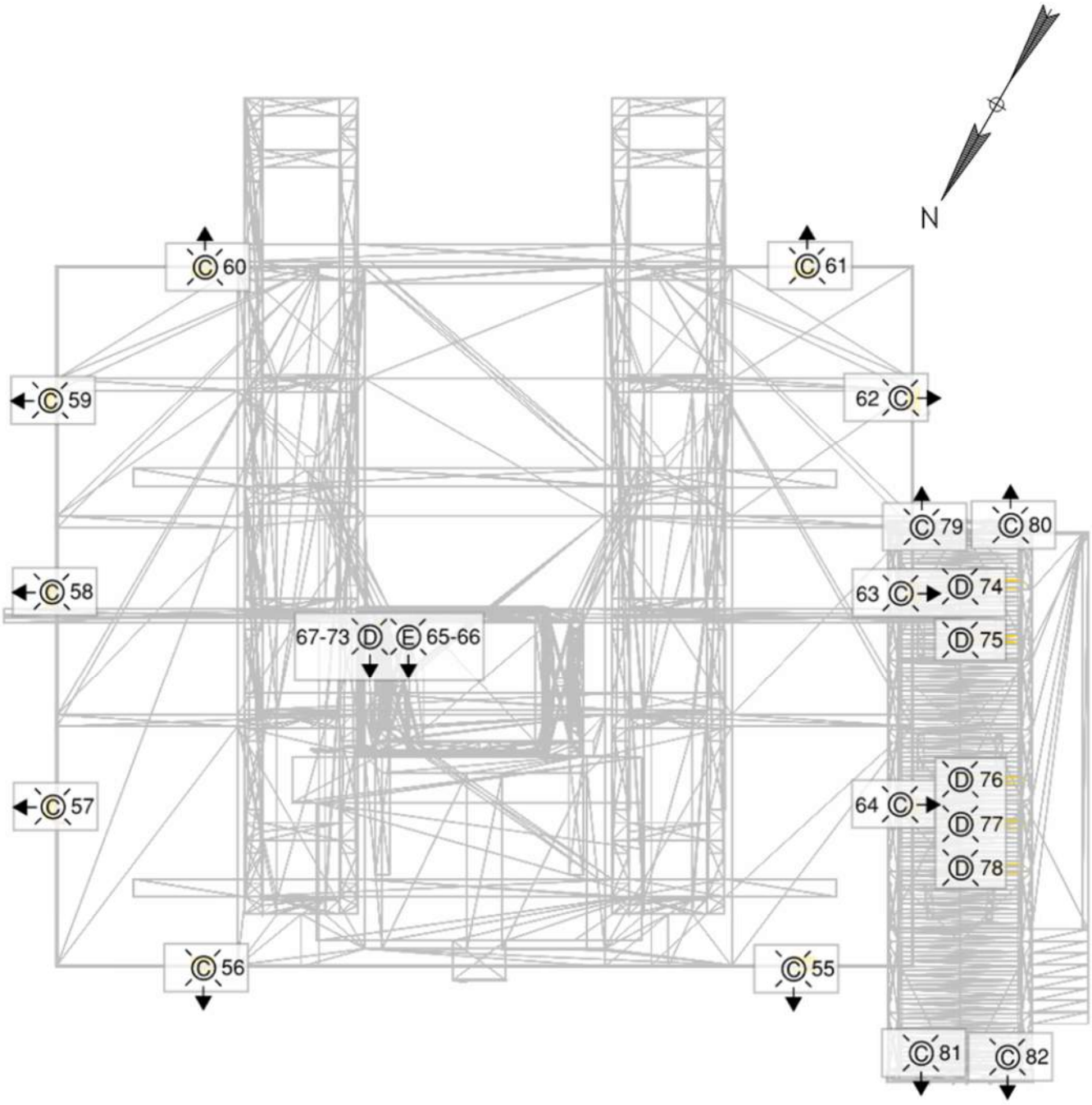
LUMINAIRE LAYOUT
PAUL NELSON 25 - 29 HZ – RIG BACKYARD
DRILLING OPERATIONS

Luminaire Schedule					
Luminaire Type	**Manufacturer**	**Model Number**	**Description**	**Power (Watts)**	**Luminous Flux (Φ)**
C	EATON – COOPER CROUSE HINDS	DFLMYM400	HID – HAZ. AREA CLEAR CLASS	400 W	24,091 lm
D	EATON – COOPER CROUSE HINDS	DLL4/UNV1S903	LED – 4FT LINEAR POLYCARBONATE	63 W	7,619 lm

Luminaire Position and Tilt				
Luminaire No.	**Mounting Height (ft)**	**Tilt (Degrees)**	**Luminaire Type**	**Luminous Flux (Φ)**
3	21'	75°	C	24091 lm
4	21'	75°	C	24091 lm
5	21'	75°	C	24091 lm
6	21'	75°	C	24091 lm
7	21'	75°	C	24091 lm
8	21'	75°	C	24091 lm
9	21'	75°	C	24091 lm
10	21'	75°	C	24091 lm
11	20'	0°	D	7619 lm
12	20'	0°	D	7619 lm
13	20'	0°	D	7619 lm
14	20'	0°	D	7619 lm
15	20'	0°	D	7619 lm
16	20'	0°	D	7619 lm
17	9'	75°	D	7619 lm
18	9'	75°	D	7619 lm
19	9'	75°	D	7619 lm
20	9'	75°	D	7619 lm
21	9'	75°	D	7619 lm
22	9'	75°	D	7619 lm
23	9'	75°	D	7619 lm
24	9'	75°	D	7619 lm
25	9'	75°	D	7619 lm
26	9'	75°	D	7619 lm
27	9'	75°	D	7619 lm
28	9'	75°	D	7619 lm
29	9'	75°	D	7619 lm
30	9'	75°	D	7619 lm
31	9'	75°	D	7619 lm
32	9'	75°	D	7619 lm
33	9'	75°	D	7619 lm
34	9'	75°	D	7619 lm
35	9'	75°	D	7619 lm
36	9'	75°	D	7619 lm
37	9'	75°	D	7619 lm
38	9'	75°	D	7619 lm
39	9'	75°	D	7619 lm
40	9'	75°	D	7619 lm

Subtotal Lumens Calculation Section 5.3	
Subtotal Area Lumens:	**421,298 lm**

5.4 PRE-PRODUCTION - DRILLING –DRILL AREA - SITE LAYOUT AND LUMINAIRE SCHEDULE



LUMINAIRE LAYOUT
PAUL NELSON 25 - 29 HZ – DRILL AREA
DRILLING OPERATIONS

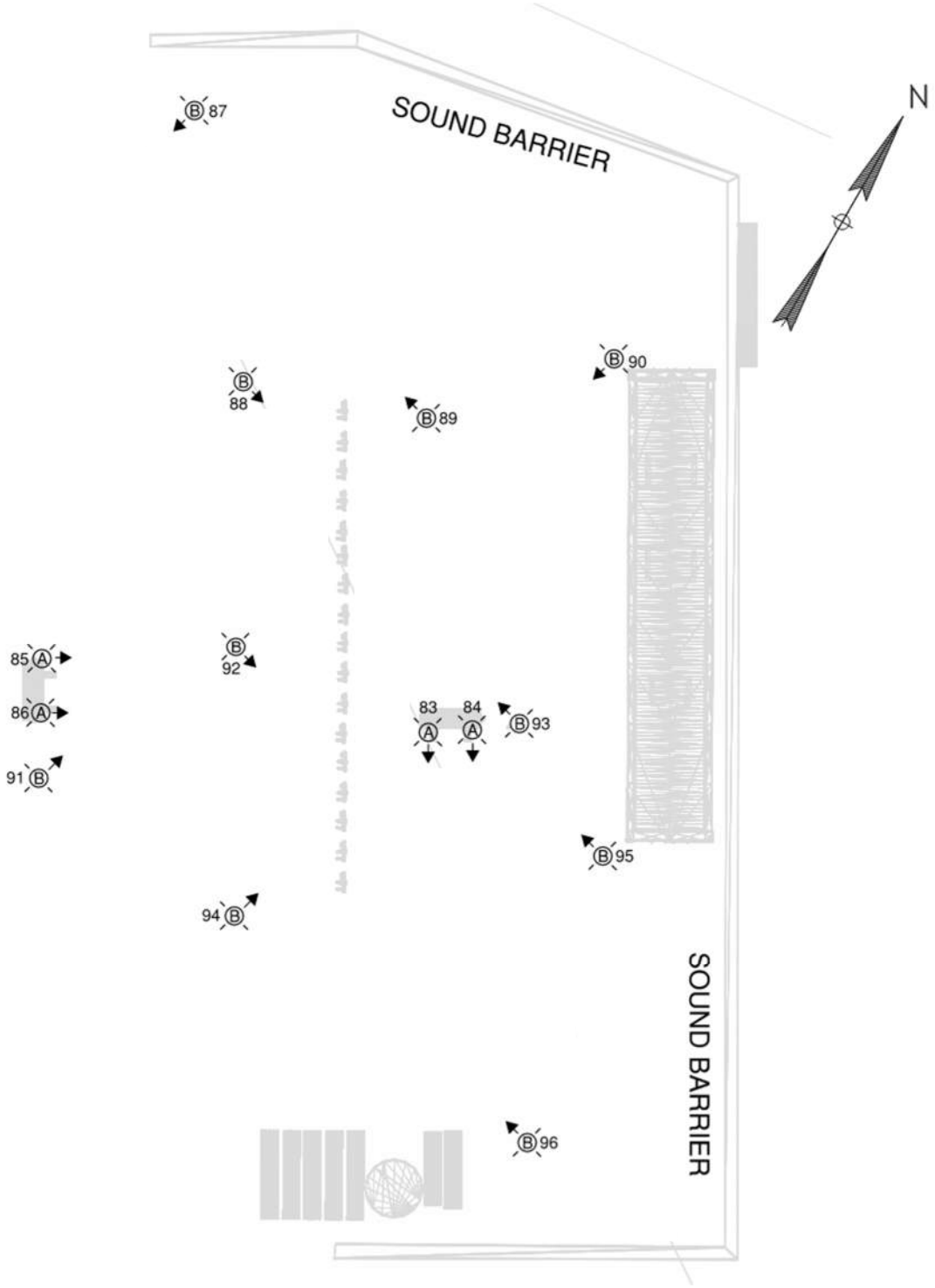
Luminaire Schedule					
Luminaire Type	**Manufacturer**	**Model Number**	**Description**	**Power (Watts)**	**Luminous Flux (Φ)**
C	EATON – COOPER CROUSE HINDS	DFLMYM400	HID – HAZ. AREA CLEAR CLASS	400 W	24,091lm
D	EATON – COOPER CROUSE HINDS	DLL4/UNV1S903	LED – 4FT LINEAR POLYCARBONATE	63 W	7,619 lm
E	EATON – COOPER CROUSE HINDS	DLL2/UNV1S903	LED – 2FT LINEAR POLYCARBONATE	32 W	3,958 lm

Luminaire Position and Tilt				
Luminaire No.	**Mounting Height (ft)**	**Tilt (Degrees)**	**Luminaire Type**	**Luminous Flux (Φ)**
55	36'	75°	C	24091 lm
56	36'	75°	C	24091 lm
57	36'	75°	C	24091 lm
58	36'	75°	C	24091 lm
59	36'	75°	C	24091 lm
60	36'	75°	C	24091 lm
61	36'	75°	C	24091 lm
62	36'	75°	C	24091 lm
63	36'	75°	C	24091 lm
64	36'	75°	C	24091 lm
65	41'	90°	E	3638 lm
66	167'	90°	E	3638 lm
67	53'	90°	D	7619 lm
68	61'	90°	D	7619 lm
69	73'	90°	D	7619 lm
70	82'	90°	D	7619 lm
71	92'	90°	D	7619 lm
72	149'	90°	D	7619 lm
73	158'	90°	D	7619 lm
74	19'	0°	D	7619 lm
75	19'	0°	D	7619 lm
76	19'	0°	D	7619 lm
77	19'	0°	D	7619 lm
78	19'	0°	D	7619 lm
79	20'	75°	C	24091 lm

Luminaire Position and Tilt *Continued*				
Luminaire No.	**Mounting Height (ft)**	**Tilt (Degrees)**	**Luminaire Type**	**Luminous Flux (Φ)**
80	20'	75°	C	24091 lm
81	20'	75°	C	24091 lm
82	20'	75°	C	24091 lm

Subtotal Lumens Calculation Section 5.4	
Subtotal Area Lumens:	435,978 lm

5.5 PRE-PRODUCTION - COMPLETIONS - SITE LAYOUT AND LUMINAIRE SCHEDULE



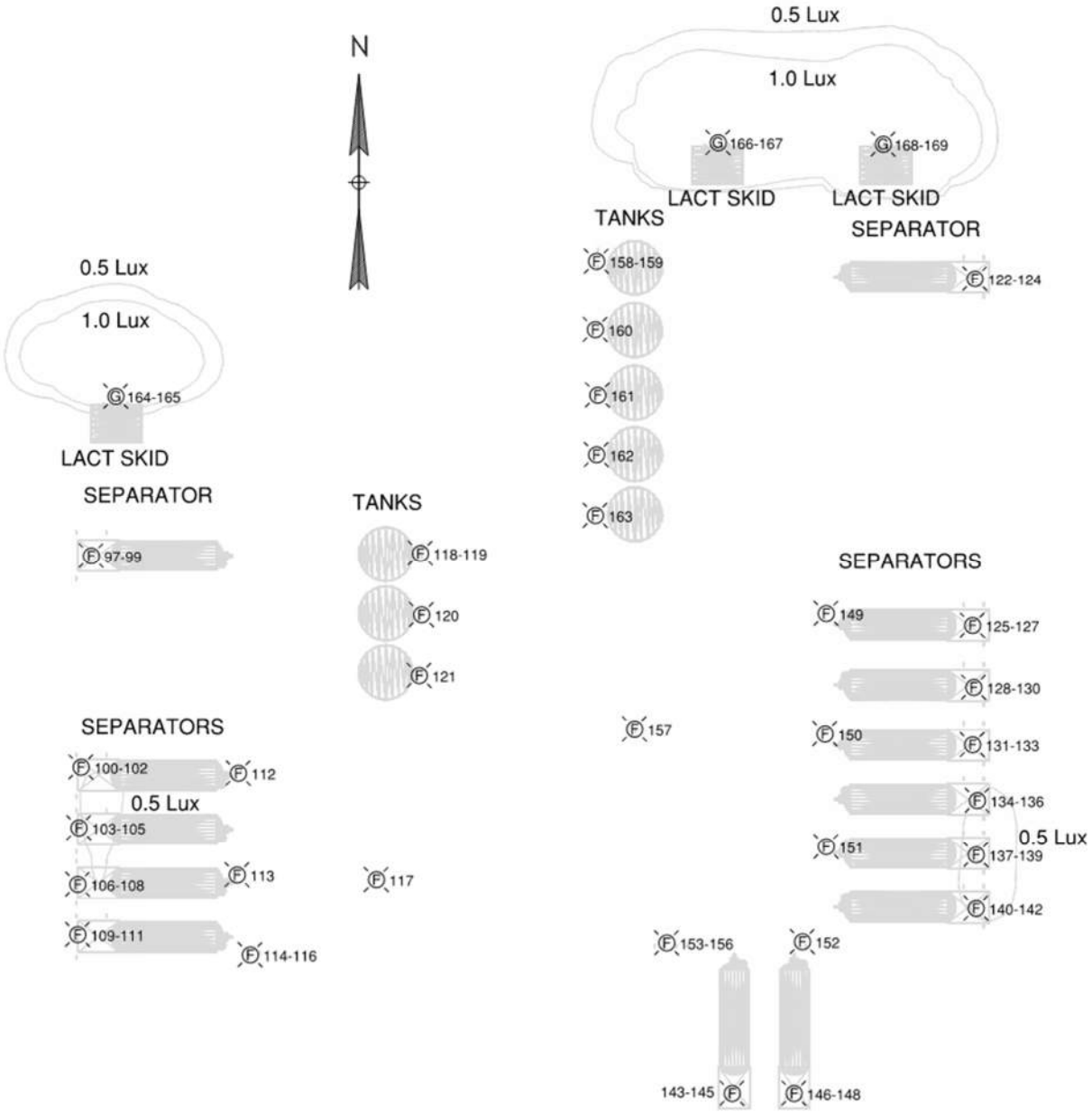
LUMINAIRE LAYOUT
PAUL NELSON 25 - 29 HZ – COMPLETIONS AREA
COMPLETIONS OPERATIONS

Luminaire Schedule					
Luminaire Type	**Manufacturer**	**Model Number**	**Description**	**Power (Watts)**	**Luminous Flux (Φ)**
A	STANPRO	WPS	LED –WALL PACK	40 W	5,800 lm
B	HPWINNER	M4	LED - TEMP. LIGHTING SYSTEM	1,696 W	213,648 lm

Luminaire Position and Tilt				
Luminaire No.	**Mounting Height (ft)**	**Tilt (Degrees)**	**Luminaire Type**	**Luminous Flux (Φ)**
83	11'	0°	A	5800 lm
84	11'	0°	A	5800 lm
85	11'	0°	A	5800 lm
86	11'	0°	A	5800 lm
87	30'	75°	B	213648 lm
88	30'	75°	B	213648 lm
89	30'	75°	B	213648 lm
90	30'	75°	B	213648 lm
91	30'	75°	B	213648 lm
92	30'	75°	B	213648 lm
93	30'	75°	B	213648 lm
94	30'	75°	B	213648 lm
95	30'	75°	B	213648 lm
96	30'	75°	B	213648 lm

Total Lumens Calculation	
Total Area Lumens:	2,159,680 lm

5.6 PRODUCTION - SITE LAYOUT, LUMINAIRE SCHEDULE, AND PHOTOMETRIC



LUMINAIRE LAYOUT& PHOTOMETRIC
PAUL NELSON 25 - 29 HZ – PRODUCTION AREA
PRODUCTION OPERATIONS

Luminaire Schedule					
Luminaire Type	**Manufacturer**	**Model Number**	**Description**	**Power (Watts)**	**Luminous Flux (Φ)**
F	RAYCHEM	E-100	LED HEAT TRACE END SEAL KIT	2 W	60 lm
G	PHOENIX	CL	LED CUBE LIGHT	13 W	1006 lm

Luminaire Position and Tilt				
Luminaire No.	Mounting Height (ft)	Tilt (Degrees)	Luminaire Type	Luminous Flux (Φ)
98	5'	180°	F	60 lm
99	5'	180°	F	60 lm
100	5'	180°	F	60 lm
101	5'	180°	F	60 lm
102	5'	180°	F	60 lm
103	5'	180°	F	60 lm
104	5'	180°	F	60 lm
105	5'	180°	F	60 lm
106	5'	180°	F	60 lm
107	5'	180°	F	60 lm
108	5'	180°	F	60 lm
109	5'	180°	F	60 lm
110	5'	180°	F	60 lm
111	5'	180°	F	60 lm
112	5'	180°	F	60 lm
113	5'	180°	F	60 lm
114	5'	180°	F	60 lm
115	5'	180°	F	60 lm
116	5'	180°	F	60 lm
117	5'	180°	F	60 lm
118	5'	180°	F	60 lm
119	5'	180°	F	60 lm
120	5'	180°	F	60 lm
121	5'	180°	F	60 lm
122	5'	180°	F	60 lm
123	5'	180°	F	60 lm
124	5'	180°	F	60 lm
125	5'	180°	F	60 lm
126	5'	180°	F	60 lm
127	5'	180°	F	60 lm
128	5'	180°	F	60 lm
129	5'	180°	F	60 lm
130	5'	180°	F	60 lm
131	5'	180°	F	60 lm
132	5'	180°	F	60 lm
133	5'	180°	F	60 lm
134	5'	180°	F	60 lm
135	5'	180°	F	60 lm
136	5'	180°	F	60 lm
137	5'	180°	F	60 lm

Luminaire Position and Tilt				
Luminaire No.	Mounting Height (ft)	Tilt (Degrees)	Luminaire Type	Luminous Flux (Φ)
138	5'	180°	F	60 lm
139	5'	180°	F	60 lm
140	5'	180°	F	60 lm
141	5'	180°	F	60 lm
142	5'	180°	F	60 lm
143	5'	180°	F	60 lm
144	5'	180°	F	60 lm
145	5'	180°	F	60 lm
146	5'	180°	F	60 lm
147	5'	180°	F	60 lm
148	5'	180°	F	60 lm
149	5'	180°	F	60 lm
150	5'	180°	F	60 lm
151	5'	180°	F	60 lm
152	5'	180°	F	60 lm
153	5'	180°	F	60 lm
154	5'	180°	F	60 lm
155	5'	180°	F	60 lm
156	5'	180°	F	60 lm
157	5'	180°	F	60 lm
158	5'	180°	F	60 lm
159	5'	180°	F	60 lm
160	5'	180°	F	60 lm
161	5'	180°	F	60 lm
162	5'	180°	F	60 lm
163	5'	180°	F	60 lm
164	8'	0°	G	1006 lm
165	8'	0°	G	1006 lm
166	8'	0°	G	1006 lm
167	8'	0°	G	1006 lm
168	8'	0°	G	1006 lm
169	8'	0°	G	1006 lm

Total Lumens Calculation	
Total Area Lumens:	**10,056 lm**

6.0 SITE MITIGATION NOTES AND BEST MANAGEMENT PRACTICES

The following mitigation notes and techniques apply:

1) To the extent possible, LED fixtures are used to reduce skyglow. This is based on the calculated results of the relative impact versus traditional lighting methods using DOE Skyglow comparison tool PNNL-SA-138348. (Pre-Production and Production Phase)

2) All lights have been positioned to point in a downward direction where vertical lighting is not required. Where it is required, lights are angled in a vertical direction to provide task lighting for safety and operations involving personnel. (Pre-Production and Production Phase)

3) Luminaire Type E and D used on the Derrick mast in Section 5.4 are facing horizontally to provide adequate lighting for safe operations.

4) To the extent possible, design considerations have been made regarding the type of light fixtures used, quantity, and positioning to reduce various forms of lighting pollution. Examples include:

   - Lighting is angled away from surrounding off site buildings.
   - Lighting within the Production area has been reduced to provide a minimum acceptable value for safe operations.
   - Light masts are automatically switched off/on based on lighting sensors.
   - Lights are switched off when not required.
   - Lights are directed to task areas only.
   - Low power (63W) LED lights are used for the drill rig.
   - Sound barriers are positioned to reduce lighting trespass to surrounding off-site buildings.
   - The calculated cumulative light impacts, as indicated in Section 4.1, on surrounding buildings within a one-mile radius area below 4 lux when measured 5.5 feet above grade.

5) Lighting Cut Sheet Notes for Attachment A

   1. Type A Fixtures (Pre-Production Phase)
      - Type A fixtures are construction trailer lights. These units vary significantly depending on supplier, rental agency, inventory, and current market available fixtures. Lights varied significantly during site inspections. A representative model was selected based on a lumen output for a trailer.

   2. Type B Fixtures (Pre-Production Phase)
      - Type B fixtures are portable construction light towers with vertical masts. These units vary significantly depending on supplier, rental agency, inventory, and current market available fixtures. HP Winner M4 Model was selected for this analysis based on site inspections and current available units; however specific site units may vary based on time of construction. The model for these portable light towers consisted of a LED light source with 4 fixtures. Each of these fixtures were comprised of 4 LED modules mounted in a rectangular arrangement. The attached cut sheet for HP Winner represents 1 LED module. 16 total modules were modeled for each light mast.

- The typical light pole center of fixtures is raised approximately 30 feet from grade and pointed downward toward work area.

- The fixture mounting for portable light towers are articulated mountings which allows for both vertical and horizontal plane adjustments. For this analysis, the light mast fixtures were modeled at indicated angles.

3. Type C Fixtures (Pre-Production Phase) are representative of current fixtures used during drilling operations.
4. Type D Fixtures (Pre-Production Phase) are representative of current fixtures used during drilling operations.
5. Type E Fixtures (Pre-Production Phase) are representative of current fixtures used during drilling operations.
6. Type F Fixtures (Production Phase)
   - Type F Fixtures is an estimation of heat trace end kits. Photometric data from the manufacturer is not available. These lights are low power LED's mounted on the pipe where heat trace is installed. Mounting height, and location vary based on final design and installation.
7. Type G Fixtures (Production Phase) are representative of current fixtures used for LACT skids and mounted near the doors to the skids.

7.0 ATTACHMENT

Attachment A – 21010 Paul Nelson 25 - 29 HZ Lighting Fixture Cut Sheets Attachment

END OF REPORT

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ATTACHMENT A

FIXTURE CUT SHEETS TYPES A,B,C,D,E,F,G

LIGHTING MITIGATION PLAN

FOR

KERR MCGEE OIL & GAS ONSHORE LP

PAUL NELSON 25-29 HZ

Project Number: 21010-07

Fixture Cut Sheet
Type A

STANPRO

Project: _____ Type: _____

Drawn by: _____ Catalogue #: _____ Date: _____

Series Spec Sheet

WPS GEN 4

CLASSIC WALL PACK

Selectable color temperature (3 000 K / 4 000 K / 5 000 K)[1]
Power selectable[1]
Integrated photocell[1]
Multi-Voltage (120-347 V)[1]

This wall pack series is a classic and familiar design integrated with modern LED technology to promote better energy efficiency and long life. Certain configurations come with integrated photocell, selectable power and/or selectable color temperature. It is best suited for entrances, underpasses or anywhere controlled security lighting is required, the series luminaire is a great addition to any commercial or industrial outdoor wall mount application. The tough die cast aluminum housing is moisture and dustproof. [1]

FEATURES AND SPECIFICATIONS

- **Construction**

  Housing

  – This luminaire is made of aluminum die cast and comes standard in a bronze powder coat finish.

  – The housing has four conduit entries of 1/2" on each sides and some of the configurations comes with a button type photocell that can be turned off by using the internal switch if needed.[1]

  Lens

  Prismatic tempered glass lens is standard in this product series.

- **Electrical**

  – The drivers allows an input voltage from 120-277 V or 120-347 V AC 50/60 Hz and are 0-10 V dimmable. They are coming with an onboard surge protection:
  – NS29: 2.5kV standard
  – NS40, NS60, NS80, PS40, PS100: 2kV standard
  – NS120: 4kV standard

  – This wall pack series is suitable for ambient temperature range of -40°C to +50°C. Available in color temperatures of 4 000 K, 5 000 K or 3CCT selectable (3 000/4 000/5 000 K) with a lumen per watt ratio of 140 lm/W to 152 lm/W depending on the lumen package.

  – The color temperature of the fixture is set by default at 4 000 K and can be changed on the field.

- **Compliances**

  – Wet location
  – IP65
  – Meets requirements of ICES-005 issue 5 for class B products
  – cULus
  – IK06
  – BC Hydro

OVERVIEW

Light source	LED
Watts (W)	25/30/40, 60/80/100 30, 40, 60, 80, 120
Lumens output (lm)	3 625 - 17 885
Efficiency (lm/W)	140 - 152
Color temperature (K)	3CCT (3 000/4 000/5 000) 4 000, 5 000
CRI	> 80

[1] Integrated photocell, multi-volt driver, CCT and Power selectable on some configurations. Consult Quick ship and technical specification table for more details.

5 yrs warranty

quick ship

LED fixture

power selectable [1]

3 CCT TCC [1]
3000 K / 4000 K / 5000 K

dimmable fixture

wet location

IP 65

ICES 005

IK06

DLC QPL LISTED PREMIUM

cULus

Not all products are qualified on the DLC QPL. To view our DLC qualified products, please consult the DLC Qualified Products List at www.designlights.org/search.

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STANPRO

QUICK SHIP AND TECHNICAL SPECIFICATION TABLE [1]

Order code	Model number	DLC unique ID	Watts (W)	Volts (V)	Color temp. (K)[2]	Lumen output (lm)[3]	Effi-ciency (lm/W)	Photo-cell[6]	CRI	Life L70 (hrs)[5]	Tested hours LM-80 (hrs)[5]	Calculated TM21 (hrs)[5]	Finish	Dim-ming	B.U.G.	LED current (mA)	Power factor	THD (%)	Case qty (master)
Power Select, CCT Select and Integrated Photocell[6]																			
68314	WPS-PS40-Q-3C	PLW61NEJG50K	25/30/40	120-347	3000/4000/5000	3875/4500/5800[4]	141	Yes	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G4	850	≥0.9	≤20	1
68315	WPS-PS100-Q-3C	PLE7PYF9LCSH	60/80/100	120-347	3000/4000/5000	9300/12000/14500[4]	137	Yes	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G4	2 100	≥0.9	≤20	1
Single Power, Single CCT and Integrated Photocell[6]																			
68524	WPS-NS30-W-40K/P127		29	120-277	4 000	4 200	150	Yes	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G5	230	≥0.9	≤20	1
68525	WPS-NS30-W-50K/P127		29	120-277	5 000	4 300	148	Yes	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G5	230	≥0.9	≤20	1
Single Power and Single CCT																			
68490	WPS-NS40-W-40K	PLVM09BUX07G	40	120-277	4 000	6 004	142	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G4	354	≥0.9	≤20	1
68491	WPS-NS40-W-50K	PL3ULW7TEV5H	40	120-277	5 000	6 034	144	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G4	354	≥0.9	≤20	1
68492	WPS-NS60-W-40K	PL6EFOUTBPWB	60	120-277	4 000	8 458	146	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G5	486	≥0.9	≤20	1
68493	WPS-NS60-W-50K	PL01JETYSQ80	60	120-277	5 000	8 611	147	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U3G5	486	≥0.9	≤20	1
68497	WPS-NS80-W-40K	PLVXL8TOP2UF	80	120-277	4 000	11 242	146	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U4G5	645	≥0.9	≤20	1
68498	WPS-NS80-W-50K	PL2AZJG3L0RQ	80	120-277	5 000	11 446	148	No	>80	54 000	9 000	173 600	Bronze	Yes	B1U4G5	645	≥0.9	≤20	1
Single Power, CCT Select and Integrated Photocell[6]																			
68316	WPS-NS120-Q-3C	PLYRMZYS3AY3	120	120-277	3000/4000/5000	16 943	137	Yes	>80	54 000	9 000	173 600	Bronze	Yes	B2U4G5	2 600	≥0.9	≤20	1

[1] **QUICK SHIP:** Product availability is subject to change without notice. Please contact your Stanpro customer service representative to confirm inventory levels at time of order.
[2] Typical color temperature range: +/- 5 %.
[3] Lumen values are derived from photometric testing. Initial lumens range: +/- 10 %.
[4] Lumen values are based on 4 000 K default settings. Please refer to Quick ship Technical Specification Table for more details on other color temperatures.
[5] Life hours are derived from IESNA LM-80-08 testing report and projected per IESNA TM-21-11 extrapolations.
[6] Integrated ON/OFF photocell that can be easily disabled.

ACCESSORIES (order separately)

Order code	Description
68370	18'' Bronze metal backplate
68371	Bronze glareshield
68372	Stainless Steel wireguard

ORDERING GUIDE

WPS — ____ — ____ — ____ — ____ / ____

Series	Lumen package (W)	Volts (V)	Color temp. (K)	Casting color	Options
WPS	**PS40 -** 25/30/40 **PS100 -** 60/80/100 **NS120 -** 120	**Q -** 120-347	**3C -** 3 000/4 000/5 000	**BR -** Bronze (standard) **BK -** Black **WH -** White **SP-** Special color	**KV -** 10 kV surge Protection **PC -** Polycarbonate lens
	NS30 [1] **-** 29 **NS40 -** 40 **NS60 -** 60 **NS80 -** 80	**W -** 120-277	**40K -** 4 000 **50K -** 5 000		**KV -** 10 kV surge Protection **P127** [1] **-** Button type photocell 120-277 V **PC -** Polycarbonate lens

[1] Button type photocell 120-277 V comes standard with the ''NS30'' lumen package.

Data is based upon tests performed in a controlled environment. Actual performance can vary depending on operating conditions.
All products are subject to change or may be discontinued any time without notice.

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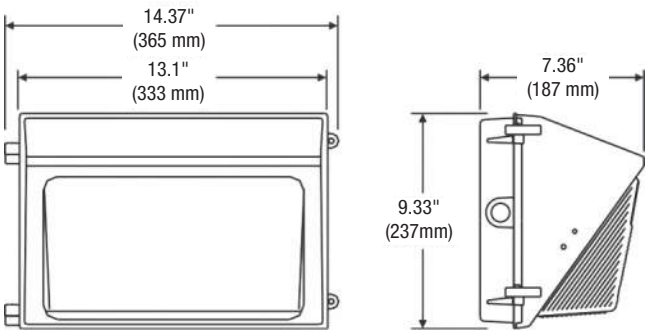
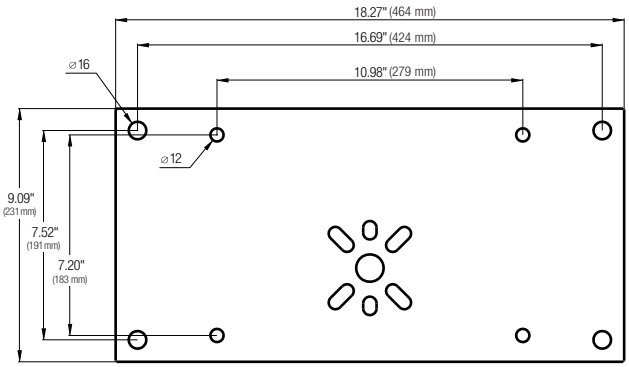
DIMENSIONS



BACKPLATE



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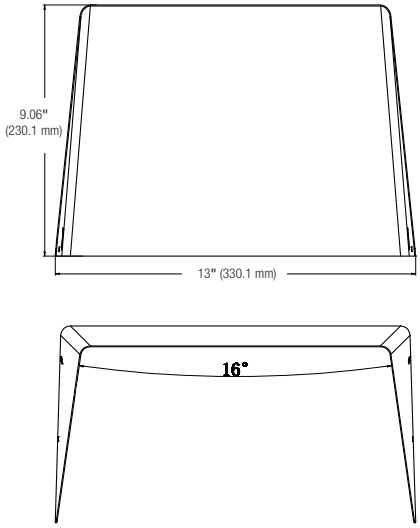
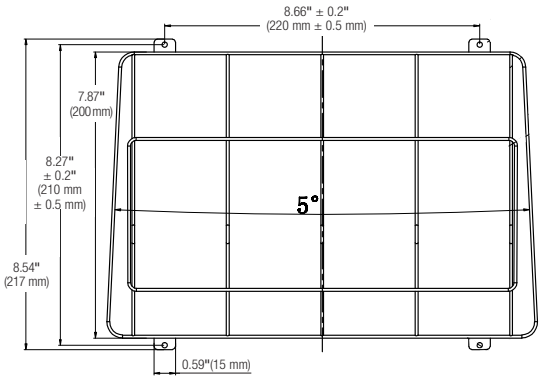


WIREGUARD



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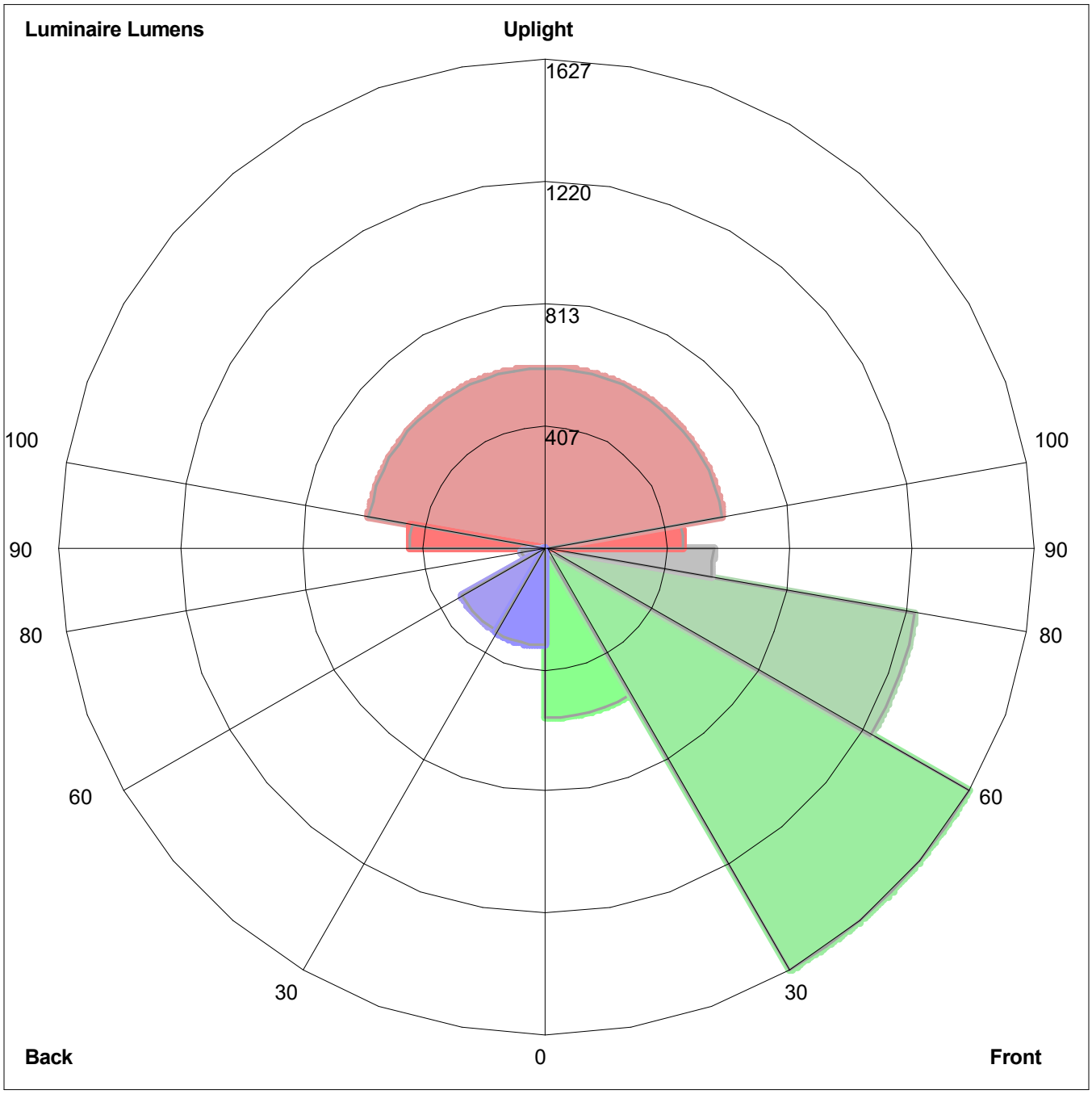
IES ROAD REPORT
PHOTOMETRIC FILENAME : WPS-PS40-Q-3C-40W-40K-68314.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=566.0, Medium=1626.5, High=1251.8, Very High=558.0
Back: Low=327.7, Medium=323.2, High=79.4, Very High=11.6
Uplight: Low=456.3, High=599.7

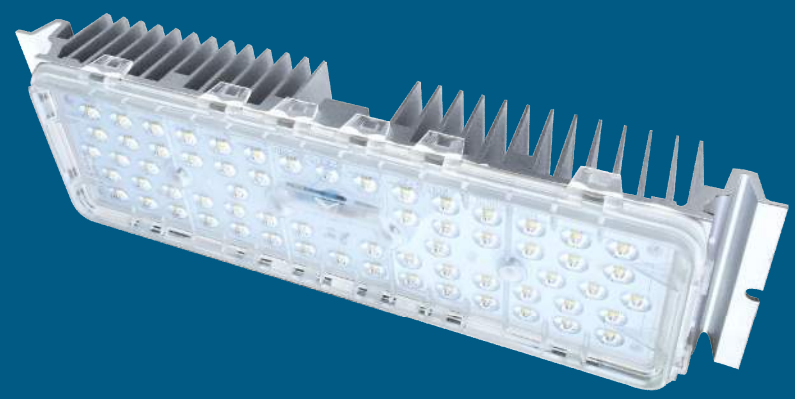
BUG Rating : B1-U4-G4

Photometric Toolbox® Copyright 2002-2019 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type B

Example Used

LED Module M8B Series



Specification

Working Environment: -40℃~+50℃

Storage Temperature: -40℃~+50℃

Relative humidity: 10%~90%RH

Typical value of pad temperature[1]: 70℃

IP Rating of LED Light Engine: IP68

Impact Protection Level: IK09

Color Temperature (CCT)[2]: 3000K, 4000K, 5000K, 5700K

Main Material: Aluminum 6063

Module N.W.: 0.67±0.04 kg

Note :

[1] Typical values of pad temperature is obtained based on 60W with a ambient temperature of 25℃.

[2] Efficacy of 3000K is 5% lower than other CCTs.

Features

- Lumileds Luxeon 3030;
- Super long lifetime(Lumen maintenance);
- Multiple lighting distributions available;
- Wide applicability for complex situations;
- High versatility apply for all sorts of lamps retrofit.

Application

- Street lighting retrofit and application;
- Factory lighting retrofit and application;
- Tunnel lighting retrofit and application;
- Sports lighting retrofit and application.

Ordering Information

For example: M8B-VCA-63 -1321-7040-LU

Module Model	Interface	Dimension of LEDS	Wire Material	LED Qty	Lens Model		Ra & CCT	LED Brand
M8B	**V:** V-shape Groove	**C:** 3030	**A:** CCC+VDE	**49** 49PCS	**1324** Type II Short	**1325** 25 DEG	**7030:** Ra≥70, 3000K	**LU:** Lumileds
			C: PSE	**63** 63PCS	**2322** Type II Short (V)	**2360** 60 DEG	**8040:** Ra≥80, 4000K	**SN:** Sanan
			H: UL		**5321** Type II Short	**5340** 40 DEG	...	**XX:** Others
			X: Others		**2321** Type II Short	**5390** 90 DEG		
					1321 Type III Medium	**1310** Lambert Type		
						1390 Tunnel Lighting		

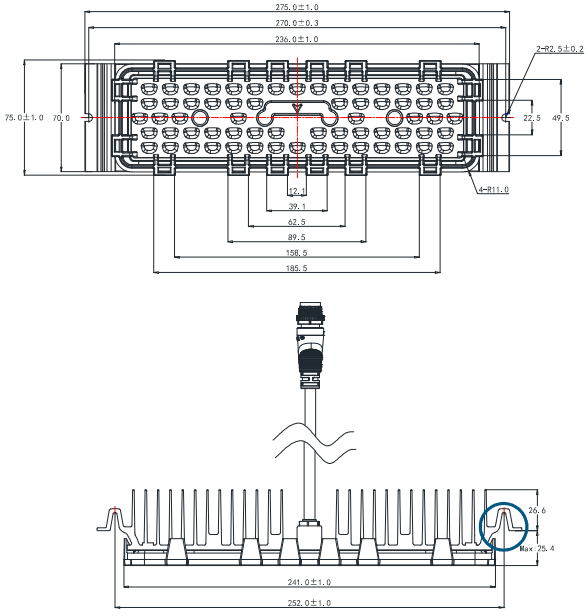
Performance

Model	Power (W)	Driving current (mA)	Input voltage (Vdc)	Efficacy (lm/W)	Lumens (lm)
M8B-VCA-63	40	700	48~61	140	5600
M8B-VCA-49	50	1050	38~48	127	6350
M8B-VCA-63	50	860	48~61	135	6750
M8B-VCA-63	60	1050	48~61	127	7620

Note : Values shown are subject to ±5%~±8% tolerance; Cable default A type;

Efficacy above is based on calculated @92% power efficiency ; Light efficacy of 3000K is 5% lower than other CCTs.

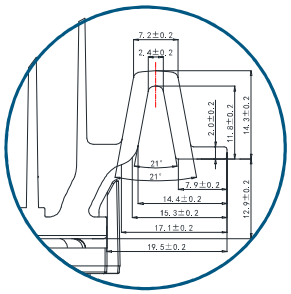
Dimensions



L (mm)	W (mm)	H (mm)
275	75	Max52

The height of the module is the maximum value.

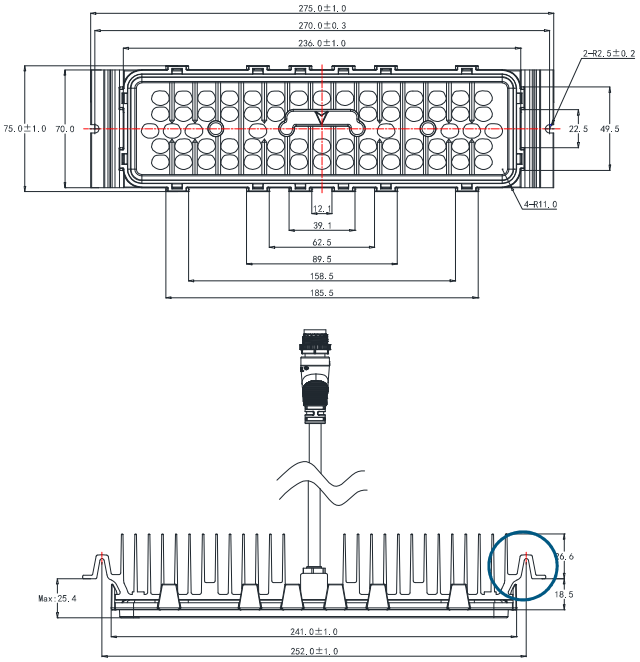
Tolerance: ±0.5mm



Available Lens Model

1321	1324	1390
1232	2322	5321

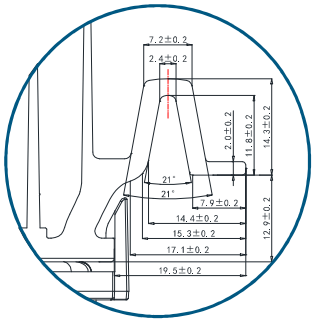
Dimensions



L (mm)	W (mm)	H (mm)
275	75	Max52

The height of the module is the maximum value.

Tolerance: ±0.5mm



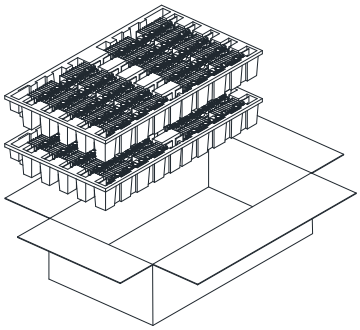
Available Lens Model

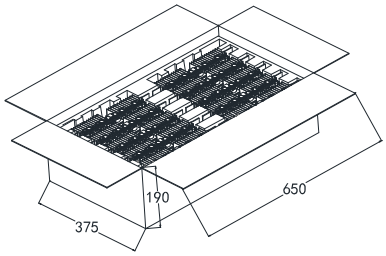
1310	1325	5340	2360
5390			

Package Information

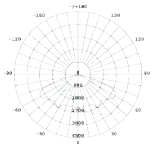
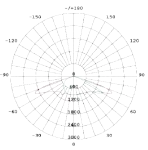
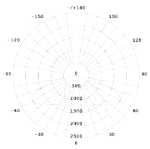
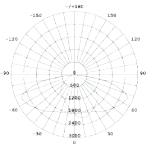
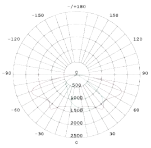
L (mm)	W (mm)	H (mm)	Module pcs/carton (PCS)	Package weight (kg)
650	375	190	20	14.9

Values shown are subject to ±5% tolerance.





Lighting distributions

T2S1324	T2S(V)2322	T2S5321	T2S2321	T3M1321
				

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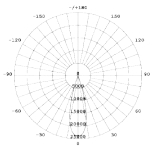
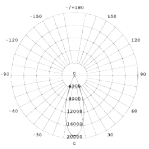
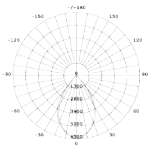
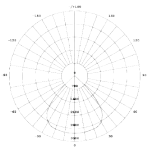
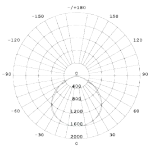
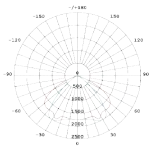
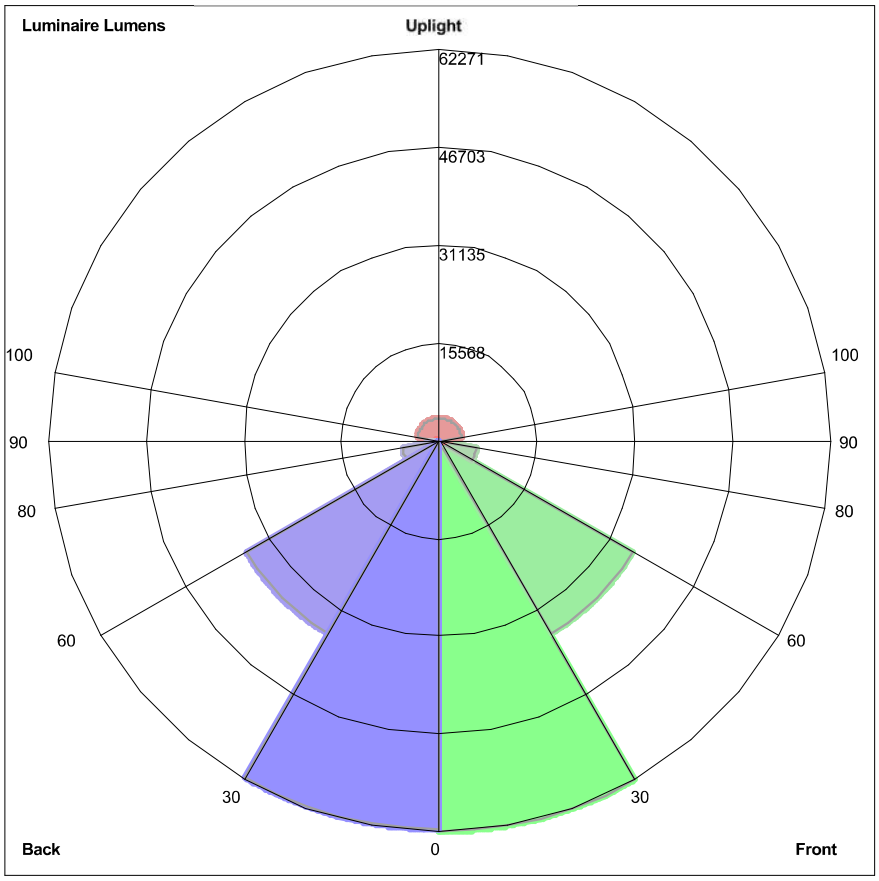
					

Version History

Change Date	Version	Description of Change		
		Item	From	To
20190905	Ver2.0	Data sheets release (new version)		
		Update of luminous efficacy		
		Optimized G.W of Module package	16.2kgs	14.9kgs

IES ROAD REPORT
PHOTOMETRIC FILENAME : 3560-400W 16 BANKS ESTIMATE.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=62270.6, Medium=35421.7, High=5946.3, Very High= 1328.0
Back: Low= 61920.0, Medium=35466.8, High=5958.8, Very High=1320.7
Uplight: Low=493.0, High=3564.5

BUG Rating : B5-U5-G5

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Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type C

Pauluhn DFL HID hazardous area floodlights

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2, AEx nR II
Cl. II, Div. 1, Groups F, G (250W max.)
Ex nR II

Marine & Wet Locations
NEMA 4X
IP66

Applications:

- Onshore drilling and exploration
- Pipeline compressor and storage
- Corrosive environments
- Façade security lighting

Features:

- 150-400W high pressure sodium or 175-400W metal halide
- AEx nR, Ex nR restricted breathing rating is standard – restricted breathing offers cooler T-numbers for increased hazardous locations suitability
- NEMA 7x6 butterfly beam floodlight pattern – wide, uniform and far reaching to provide excellent efficiency and more light where you need it
- NEMA Type 4X and IP66 heavy duty, die cast copper-free aluminum construction is designed for use indoors and outdoors in marine and wet locations with stainless steel external hardware suitable for saltwater and corrosive applications
- 40°C, 55°C and 65°C ambient suitability – addresses high ambient common at industrial facilities
- Low ambient capability to -40°C – perfect for colder climates
- Hinged door frame assembly – has captive cover screws for ease of relamping
- Yoke mount design – standard construction provides the greatest mounting flexibility; can be mounted vertically (wall), horizontally (rooftop or floor) or any angle in between
- 3-axis resonance withstand and UL844 vibration compliant – can stand up to the tough jobs
- Precision formed aluminum reflector – superior beam control, distribution and efficiency
- High light output with a low cost of operation – cost-effectiveness in a high wattage floodlight
- Slipfitter adapter for pole mounting and wall mounting bracket available

Certifications and compliances:

- Class I, Division 2, Groups A, B, C, D
- Class I, Zone 2, AEx nR II
- Class II, Division 1, Groups F, G (250W maximum)
- Ex nR II
- UL/cUL844 – Hazardous Locations
- UL/cUL1598 – Luminaires
- UL/cUL1598A – Supplemental Requirements for Luminaires for Installation on Marine Vessels
- 60079-15
- NEMA Type 4X
- IP66
- Marine and wet locations
- ABS

Standard materials and finishes:

- Housing and lens frame – heavy duty die cast copper-free aluminum with Corro-free epoxy powder coat finish
- Lens – heat- and impact-resistant tempered glass
- Gasket – one-piece silicone
- Mounting brackets – aluminum with Corro-free epoxy powder coat finish
- Reflector – precision formed aluminum
- Lamp holder – porcelain
- Hardware – stainless steel

Technical specifications:

- Entries – one ¾" AEx/Ex gland
- Wind rating – EPA: 2.90 at vertical
- Lamp type – high pressure sodium; probe start metal halide[A]; pulse start metal halide (lamps not provided)
- Lamp holder – mogul base
- Ballast – multi-tap 120/208/240/277V, 60 Hz (standard); 220-240V, 50 Hz (optional); tri-tap 120/277/347V (optional); 480V (optional)

Mounting option:

- Yoke mount

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

[A] Not available in the U.S.

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Pauluhn DFL HID hazardous area floodlights

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2, AEx nR II
Cl. II, Div. 1, Groups F, G (250W max.)
Ex nR II

Marine & Wet Locations
NEMA 4X
IP66

Options:

Description	Suffix
• Lamps included	L[B]
• 480V	480
Replace /MT in catalog number with /480	
• 230V	230
Replace /220 ONLY in catalog number with /230	

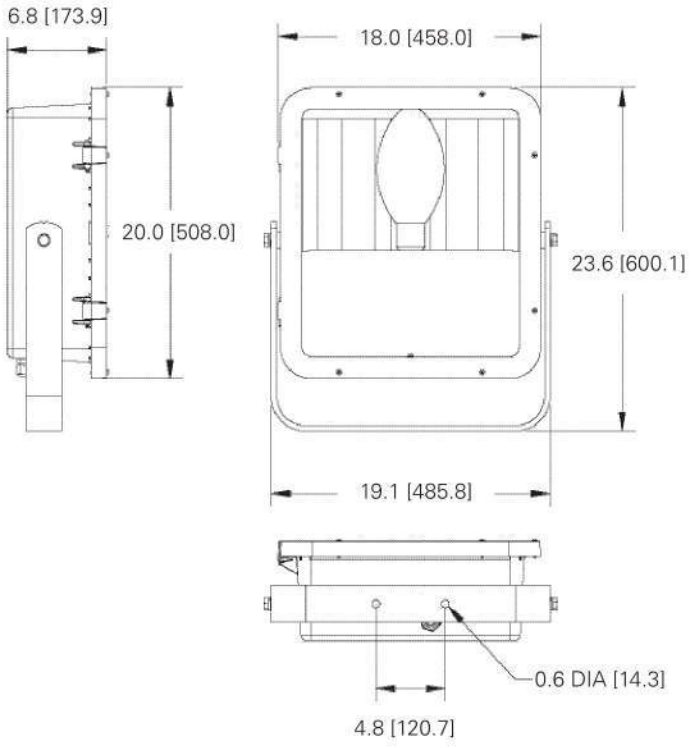
Accessories (ordered separately):

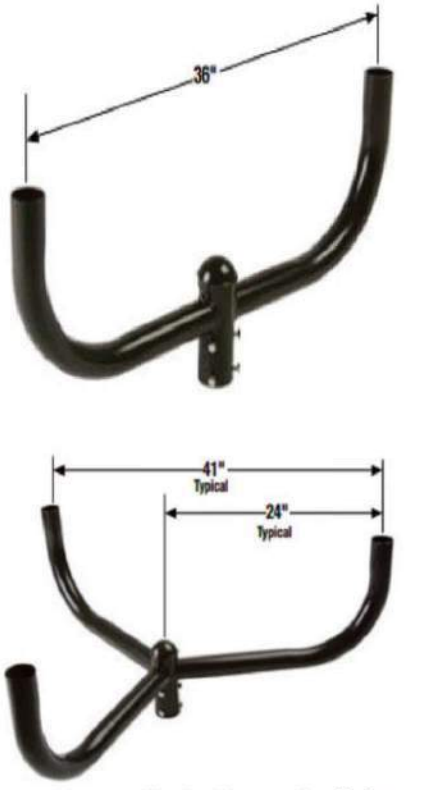
Description	Cat. #
• Pole mount slipfitter adapter	SFA6
• Wall mount bracket adapter	SWB6
• Bull horn, 2 tenon, gray	BLHN2
• Bull horn, 3 tenon, gray	BLHN3

Ordering information:

Cat. #	Lamp type	Watts	Weight (lbs.)	ANSI lamp type	Zone T-code	Division T-code	Ambient temperature °C	Supply wire °C
DFLMY250/MT 76 S828	Pulse start metal halide	250	42.0	M153	T3	T1	40/55/65	90/90/105
DFLMY400/MT 76 S828	Pulse start metal halide	400	44.0	M155	T3	T1	40/55	105/105
DFLMY320/MT 76 S828	Pulse start metal halide	320	44.0	M154	T3	T1	40/55	105/105
DFLMY250/TT 76[C]	Probe start metal halide	250	42.0	M58[C]	T3	T1	40/55/65	90/90/105
DFLMY400/TT 76[C]	Probe start metal halide	400	44.0	M59[C]	T3	T1	40/55	90/105
DFLMY250/220 50 76[C]	Probe start metal halide	250	42.0	M58[C]	T3	T1	40/55/65	90/90/105
DFLMY400/220 50 76[C]	Probe start metal halide	400	44.0	M59[C]	T3	T1	40/55	90/105
DFLSY250/MT 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/MT 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105
DFLSY250/TT 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/TT 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105
DFLSY250/220 50 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/220 50 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105

Dimensions (in inches):





Bull horns – provided with 2 3/8" pole tenon

[B] Lamp is not included unless option 'L' is selected.
[C] Not available in the U.S.

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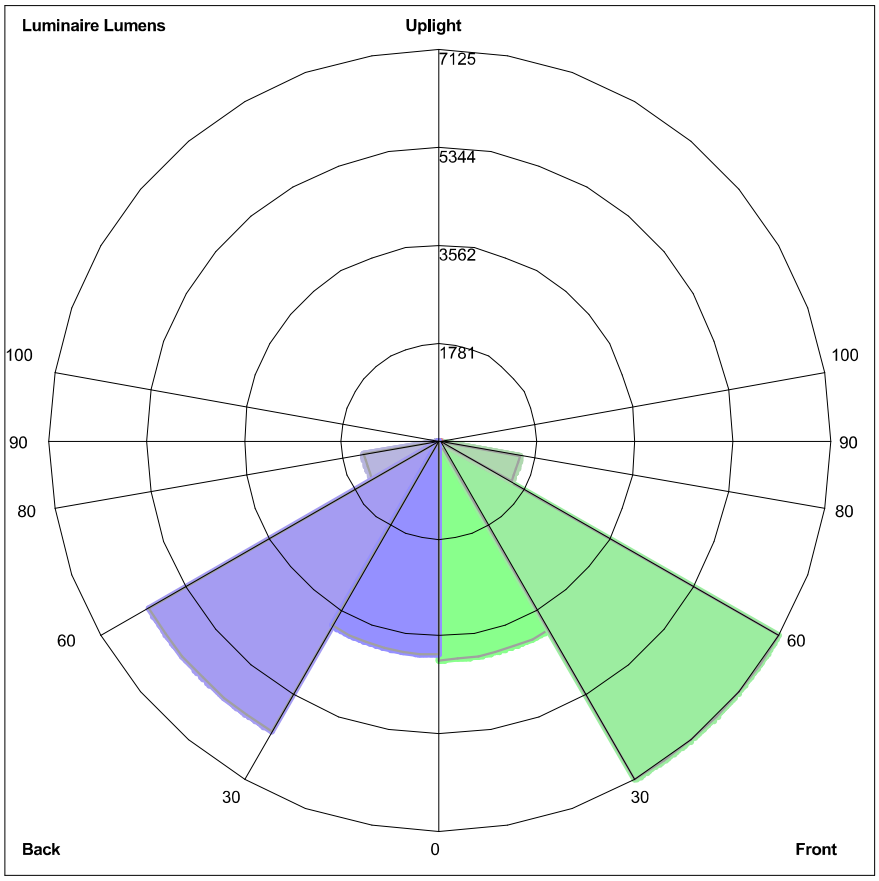
IES ROAD REPORT
PHOTOMETRIC FILENAME : DFLMYM400.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=3985.6, Medium= 7125.0, High=1500.3, Very High=28.6
Back: Low=3894.8, Medium=6102.1, High=1404.5, Very High=40.2
Uplight: Low=0.0, High=0.0

BUG Rating : B4-U0-G3

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Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type D

Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

The Pauluhn™ DLL linear LED is specifically designed to replace fluorescent T12, T8 and T5HO lighting on land-based and offshore drilling platforms. The rugged and durable design features the industry's most versatile and flexible mounting options. The Pauluhn DLL is the ideal solution for high vibration, impact and hose down in drilling applications.

Model	Typical lumens	Watts	Lumens per watt	Equivalent HID luminaire	Typical energy savings / lifetime
DLL2	3,958	32	124	T12HO	Up to 63%
				T8HO	Up to 59%
				T5HO	Up to 47%
				T12	Up to 36%
				T8	Up to 25%
				T5	Up to 9%
DLL4	7,900	63	130	T12HO	Up to 58%
				T8HO	Up to 54%
				T5HO	Up to 43%
				T12	Up to 37%
				T8	Up to 22%
				T5	Up to 10%

Applications:

- Land-based and offshore rigs; areas include: derrick, mast, SCR house, top drive, operator's house, power and pump stations

Features:

- High efficacy: up to 120 LPW
- -40°C to +65°C ambient operating temperature (standard model)
- Low profile (<3" height)
- Versatile ceiling/swivel, wall, flush, pole and pendant mounting options
- Wide and narrow optics for uniform illumination in control room and drill mast
- Four points of secondary retention
- 2,000 PSI high pressure hose rated
- High vibration resistance
- Emergency battery back-up (90 minutes) and surge protection options (up to 10 kV)Ⓐ
- DesignLights Consortium® Qualified (some models are not DLC qualified)Ⓑ
- 5 year fixture warranty

Standard materials:

- Housing – copper-free aluminum; Corro-free epoxy powder coat (optional)
- Lens – clear polycarbonate; diffused polycarbonate

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

Temperature performance data:

				Simultaneous rating
Ambient temp. °C	Min. temp. supply wire °C	Class I, Div. 2	Class II, Div. 2	Class I, Div. 2; Class II, Div. 2
40	60	T6	T6	T6
55	75	T5	T5	T5
65	90	T5	T5	T5

Mounting (ordered separately):

Versatile mounting options:

- Flush back mount
- Swivel/ceiling back mount
- Offset ceiling mount
- Offset wall mount
- Pole mount
- Pendant mount

Easily retrofit to:

- Existing Pauluhn DuraPro and MagnaPro fluorescent light fixtures
- Rig-A-Lite and Snelson C1D2 fluorescent lighting fixtures

Certifications and compliances:

NEC:

- Class I, Division 2, Groups A, B, C, D
- Class I, Zone 2
- Class II, Division 2, Groups F, G
- Class III
- NEMA 4X, IP66
- Marine and wet locations

UL standards:

- UL844 – Electrical Fixture Hangers for Hazardous Locations
- UL1598 – Luminaire
- UL1598A – Luminaire for Installation on Marine Vessels
- UL924 – Emergency Lighting

CSA standard:

- C22.2 No. 137

Additional certifications:

- ABS design assessed

Electrical ratings:

	DLL2	DLL4
Lumen output	3,958	7,900
Frequency	50/60 Hz	50/60 Hz
Voltage	100-277 VAC, 108-250 VDC; 347-480 VAC	

Model	Voltage	Current (A)	Watts	Power factor	THD
DLL2/UNV1	100	0.33	32.5	0.92	<20%
DLL2/UNV1	277	0.13	34.3	0.92	<20%
DLL2/UNV34	347	0.10	32.2	0.92	<20%
DLL2/UNV34	480	0.07	34.5	0.92	<20%
DLL4/UNV1	100	0.63	63.4	0.92	<20%
DLL4/UNV1	277	0.23	62.5	0.92	<20%
DLL4/UNV34	347	0.18	61.4	0.92	<20%
DLL4/UNV34	480	0.13	63.9	0.92	<20%

Weights:

Model	Lbs.	Kg.
DLL2	12.50	5.70
DLL4	22.50	10.20

Ⓐ One year warranty.

Ⓑ Refer to www.designlights.org Qualified Products List under Family Models for full listing details. Not all models are approved for all application categories.

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Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Designed for drilling. Pauluhn DLL linear LED luminaires are engineered to handle demanding conditions faced on land-based drilling rigs. The DLL stands up to high vibration, hose down, shock and impact, while delivering long life and high lumen performance for up to 20 years.

Custom optics:

- Standard wide (120°) beam spread for control room and indoor application maximizes illumination on wall panels
- Narrow (80°) beam spread option for high mast/derrick application avoids spillage and light loss

Comprehensive certification:

- Single model certified for use in Class I, Division 2 and Class II, Division 2 harsh and hazardous applications

Quick & easy installation:

- Easy access to drivers and wiring
- No custom brackets or hardware needed
- Seven mounting options available
- Easily retrofit to Pauluhn DuraPro and MagnaPro, Rig-A-Lite and Snelson

Slim profile:

- 2.7" fixture height (excluding mounting brackets)
- Perfect for mounting in confined or low height areas

Built to last:

- Ingress protection from hose down water or diesel fuel in harsh operational conditions – passed 2,000 PSI high pressure test
- Vibration-, impact- and shock-resistant – passed 5G, 3-axis vibration test
- 60,000 hour lifetime at 55°C ambient

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Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Ordering information:

Part number example

DLL4N/UNV1 S903 TF P EM1

DLL **4** **N** **/UNV1** **S903** **TF** **P** **EM1**

Series	
DLL	Pauluhn DLL linear LED luminaire

Length / lumens	
4	4 ft. length, 7,900 lumens
2	2 ft. length, 3,958 lumens

Optics	
BLANK	Wide (120°)
N	Narrow (80°)

Voltage	
/UNV1	100-277 VAC; 108-250 VDC
/UNV34	347-480 VAC

Lens	
S903	Clear polycarbonate
S903D	Diffused polycarbonate

Options	
TF	Pull wire included in fixture

Finish	
BLANK	Natural aluminum
P	Painted (gray, epoxy)
WH	Painted (white, epoxy)

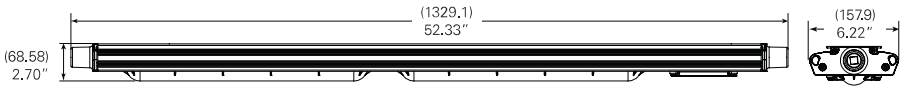
Emergency back-up	
BLANK	Standard model (no battery back-up)
EM1[C]	Integrated emergency battery back-up
EM	Remote emergency kit

Accessories (ordered separately):

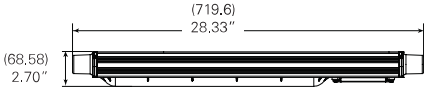
Description	Cat. #
• Flush/back mount back plate *Compatible with DuraPro*	**DP1057MTK**
• Ceiling/swivel mount *Compatible with DuraPro*	**DP1050MTK**
• Ceiling/wall mount offset *Compatible with DuraPro*	**DP1053MTK**
• Ceiling mount bracket and adapter kit *Compatible with MagnaPro*	**MP1054MTK KIT**
• Offset wall mount *Compatible with DuraPro*	**DP1052MTK**
• Pole mount kit, 1.25" conduit	**PM KIT 1.25**
• Pole mount kit, 1.50" conduit	**PM KIT 1.5**
• Pole mount kit, 2.00" conduit	**PM KIT 2.0**

Description	Cat. #
• Pendant mount kit	**PEND HAZ KIT**
• Safety chain kit	**SS KIT**
• 1 amp driver replacement kit, 100-277 VAC for 4 ft. linear	**VMVL/UNV1 80W 1A KIT**
• 1 amp driver replacement kit, 347-480 VAC for 4 ft. linear	**VMVL/UNV34 80W 1A KIT**
• 0.5 amp driver replacement kit, 100-277 VAC for 2 ft. linear	**VMVL/UNV1 80W 0.5A KIT**
• 0.5 amp driver replacement kit, 347-480 VAC for 2 ft. linear	**VMVL/UNV34 80W 0.5A KIT**

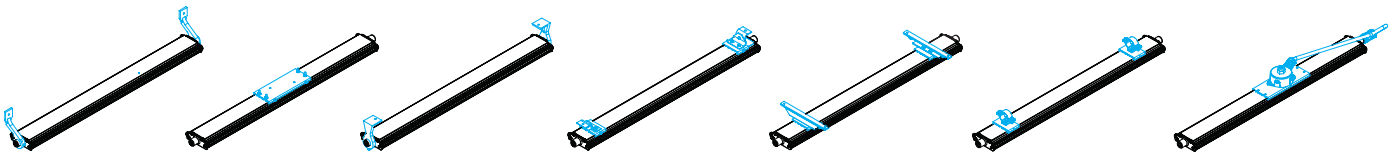
Dimensions and mounting options:



DLL4



DLL2



Offset wall
DP1052MTK

Flush ceiling
DP1057MTK

Offset ceiling
DP1053MTK

Ceiling/swivel
DP1050MTK

Ceiling and adapter
MP1054MTK KIT

Pole mount
PM KIT 1.25/1.5/2.0

Pendant mount
PEND HAZ KIT

[C] One year warranty. Remote EM kit also available, 120-277 VAC only. Available with 4 ft. model only.

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Pauluhn DLL LED luminaires

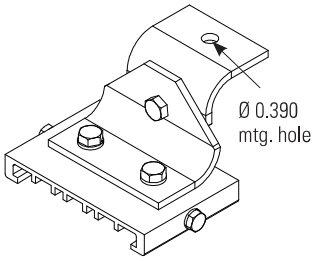
For land-based drilling

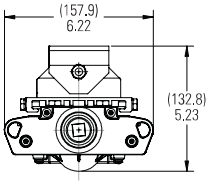
Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

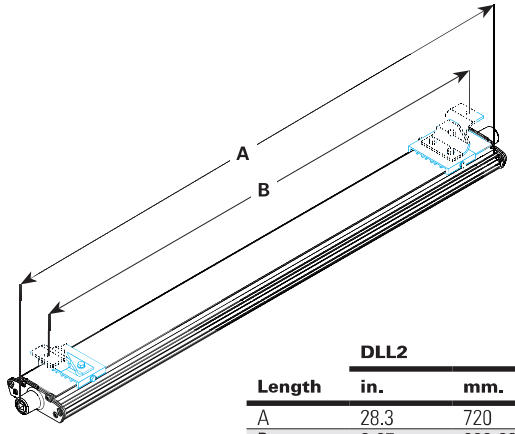
UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Mounting options:

Ceiling/swivel mount
DP1050MTK

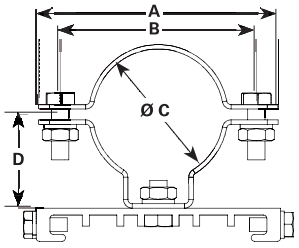




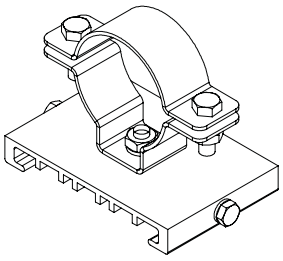


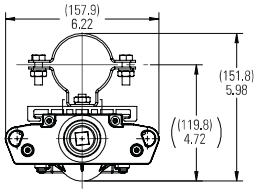
	DLL2		DLL4	
Length	in.	mm.	in.	mm.
A	28.3	720	52.3	1329
B	9-27	222-681	9-51	222-1289

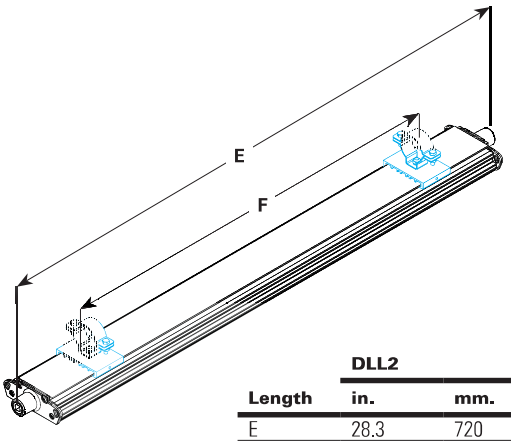
Pole mount
PM KIT 1.25/1.5/2.0



	ALL MEASUREMENTS IN INCHES			
Configuration	A	B	C	D
PM KIT 1.25	4.331	3.543	1.680	1.693
PM KIT 1.5	3.740	2.953	2.000	1.535
PM KIT 2.0	3.386	2.598	2.360	1.378

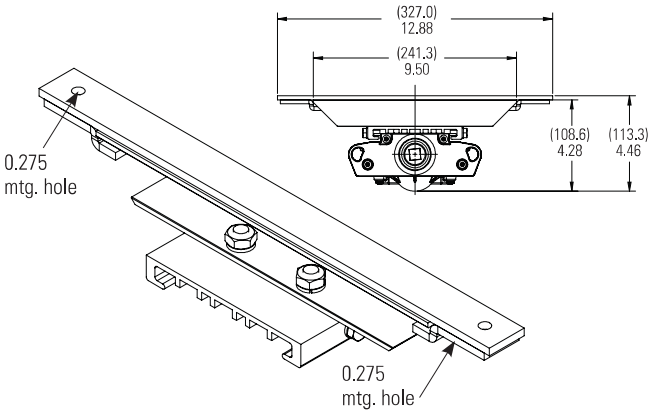


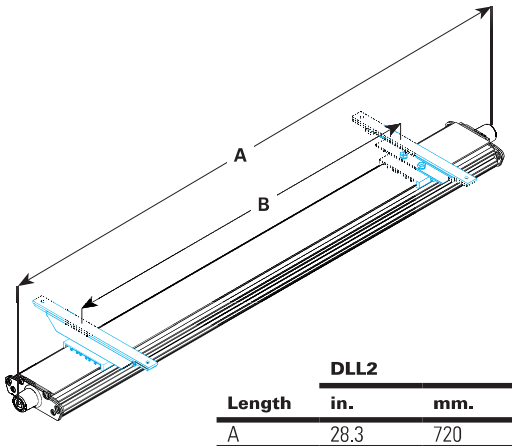




	DLL2		DLL4	
Length	in.	mm.	in.	mm.
E	28.3	720	52.3	1329
F	12-21	305-533	24-45	610-1143

MagnaPro mount
MP1054MTK KIT





	DLL2		DLL4	
Length	in.	mm.	in.	mm.
A	28.3	720	52.3	1329
B	12-22	305-559	24-46	610-1168

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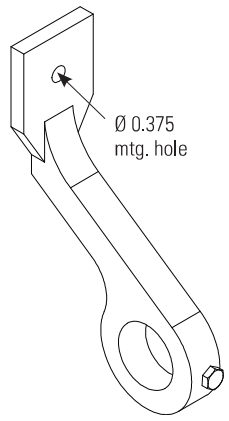
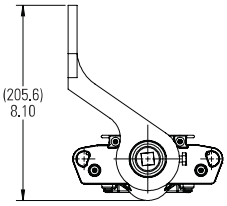
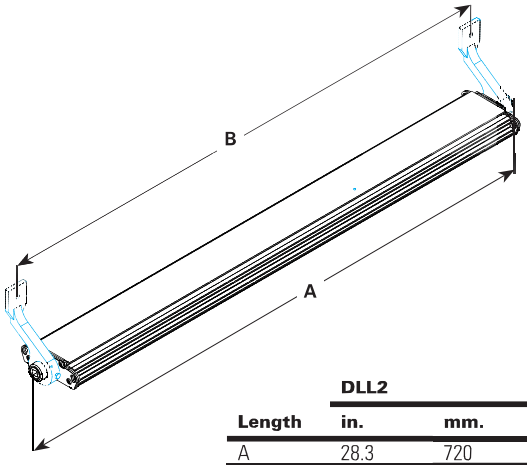
Mounting options (continued):

Offset wall
DP1052MTK

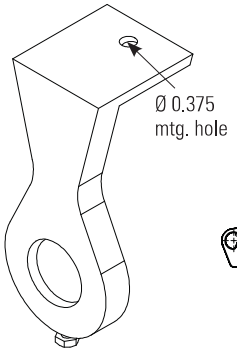


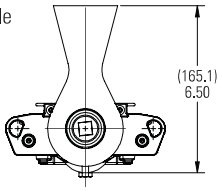


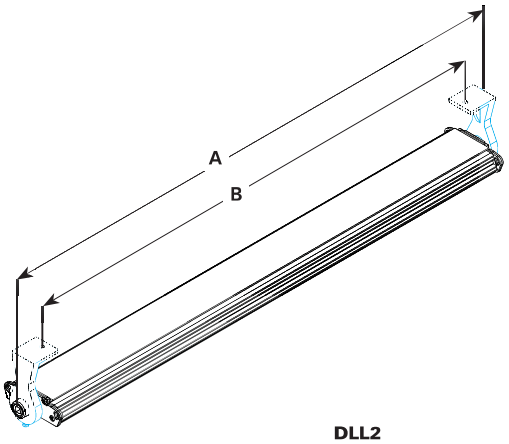


	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720	52.3	1329
B	26.3	669	50.3	1278

Offset ceiling/wall mount
DP1053MTK

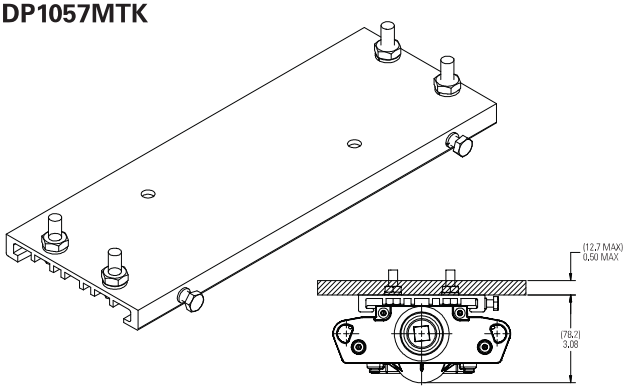


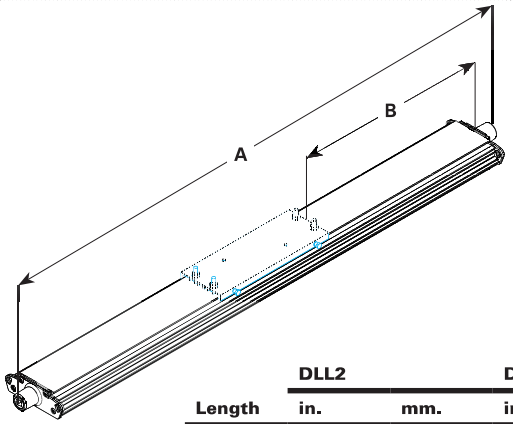




	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720	52.3	1329
B	26.3	584	47.0	1194

Flush ceiling
DP1057MTK



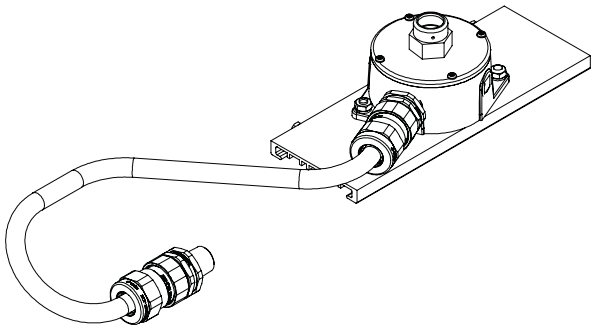


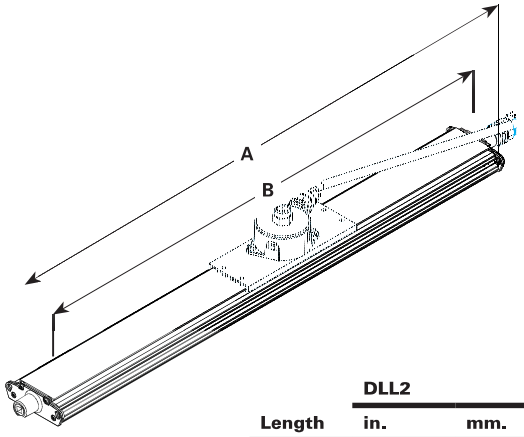
	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720.0	52.3	1329.0
B	6.2	157.5	18.2	462.0

www.crouse-hinds.com US: 1-866-764-5454 CAN: 1-800-265-0502 Copyright® 2019 Eaton

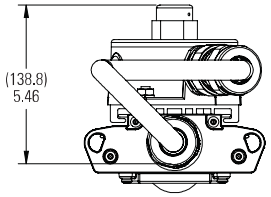
Mounting options (continued):

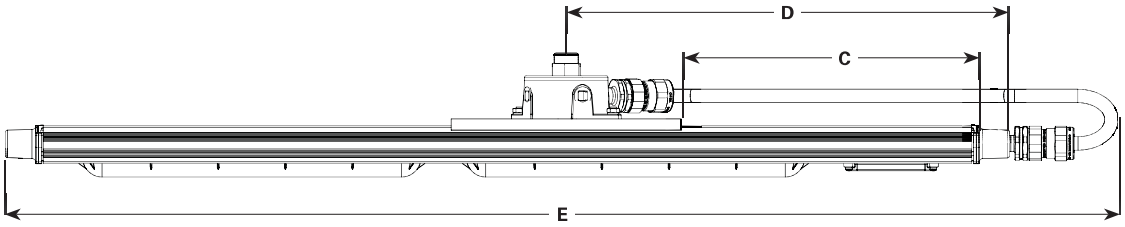
Pendant mount – Class I, Division 2 only
PEND HAZ KIT





	DLL2		DLL4	
Length	in.	mm.	in.	mm.
A	31.7	805	55.8	1418
B	28.3	720	52.3	1329
C	4.2	108	16.0	406
D	12.2	310	24.0	610
E	34.9	886	58.9	1495





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Pauluhn DLL LED luminaires

Integral battery back-up

Cl. I, Div. 2, Groups A, B, C, D
Cl. II, Div. 2, Groups F, G

UL Listed
CSA Certified
Wet Locations
Type 4X; IP66

Pauluhn DLL linear LED luminaires are available with an integral battery back-up module. Virtually the same size as the standard 4 foot model and 90 minutes of emergency lighting to keep your facility and personnel safe.

Model	EM output	Normal output
DLL4/UNV1 S903 EM1	1,400 lumens (100-277V)	6,720 lumens (100-277V)

Applications:

- Egress and emergency lighting for areas requiring uninterrupted lighting during power failure
- Hazardous rated indoor and outdoor emergency lighting in manufacturing plants, heavy industrial, chemical and petrochemical facilities, platforms, loading docks and parking areas

Features:

- Operating ambient: 0°C to +40°C
- 90-minute run time in emergency mode
- 6,720 lumen output for normal operation; 1,400 lumen output in emergency mode
- 50,000 hours rated life at 40°C
- IP66 rated enclosure
- LED indicator to check battery operation
- Nickel cadmium battery
- 1 year warranty

Certifications and compliances:

NEC/CEC:

- Class I, Division 2, Groups A, B, C, D
- Class II, Division 2, Groups F, G
- Wet locations, Type 4X, IP66

UL standards:

- UL844 – Hazardous (Classified)
- UL1598 – Luminaires
- UL1598A – Marine
- UL924 – Emergency Lighting

CSA standard:

- CSA C22.2 Nos. 137, 141

Electrical ratings:

	EM output	Normal output
Voltage	120	277
Amperage at 120 VAC	0.480	0.212
Wattage at 120 VAC	57.8	57.7
Lumen output	1,400	6,720
Frequency	50/60 Hz	50/60 Hz
Power factor at 100 VAC	>0.90	>0.90
THD	6.58	11.70

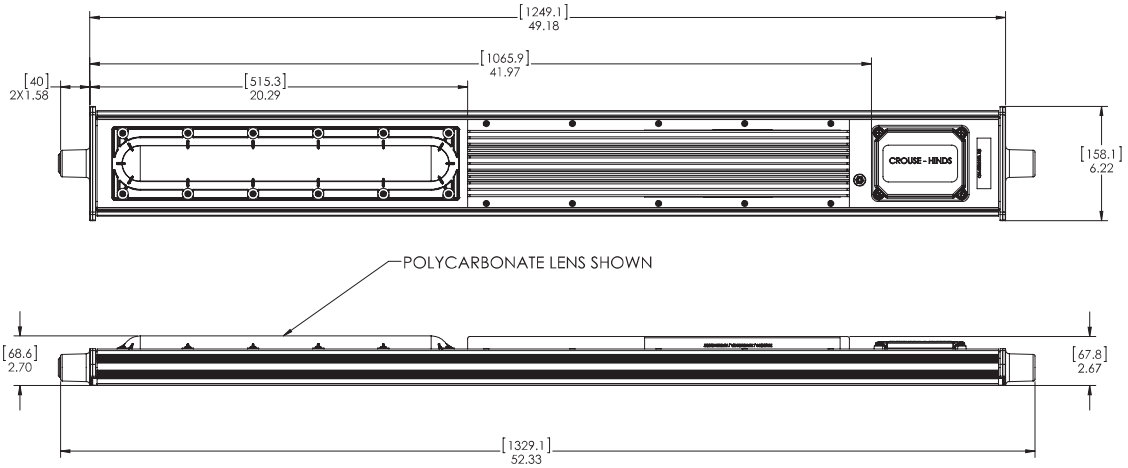
Temperature performance data:

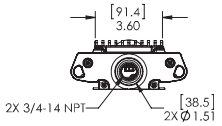
				Simultaneous rating
Ambient temp. °C	**Min. temp. supply wire °C**	**Class I, Div. 2**	**Class II, Div. 2**	**Class I, Div. 2; Class II, Div. 2**
40	60	T5	T6	T5

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

Dimensions:





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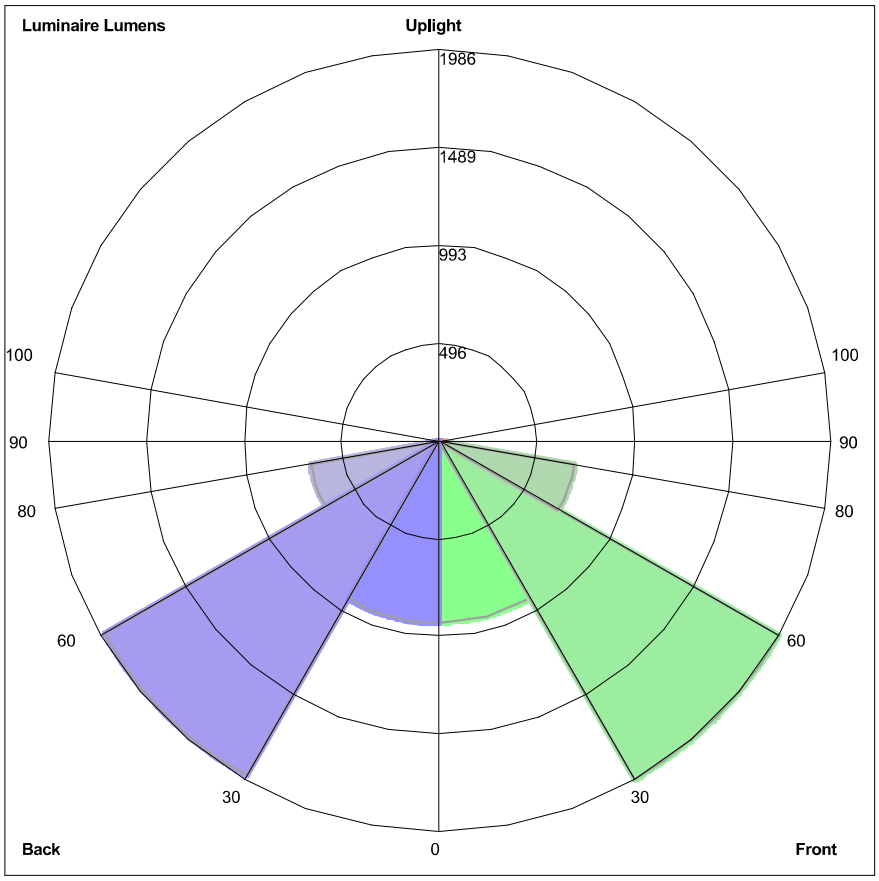
IES ROAD REPORT
PHOTOMETRIC FILENAME : DLL4 UNV1-S903.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=921.0, Medium=1985.6, High=698.7, Very High=29.2
Back: Low=925.1, Medium=1963.4, High=664.7, Very High=26.5
Uplight: Low=4.7, High=1.2

BUG Rating : B2-U1-G1

Photometric Toolbox® Copyright 2002-2019 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type E

Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

The Pauluhn™ DLL linear LED is specifically designed to replace fluorescent T12, T8 and T5HO lighting on land-based and offshore drilling platforms. The rugged and durable design features the industry's most versatile and flexible mounting options. The Pauluhn DLL is the ideal solution for high vibration, impact and hose down in drilling applications.

Model	Typical lumens	Watts	Lumens per watt	Equivalent HID luminaire	Typical energy savings / lifetime
DLL2	3,958	32	124	T12HO	Up to 63%
				T8HO	Up to 59%
				T5HO	Up to 47%
				T12	Up to 36%
				T8	Up to 25%
				T5	Up to 9%
DLL4	7,900	63	130	T12HO	Up to 58%
				T8HO	Up to 54%
				T5HO	Up to 43%
				T12	Up to 37%
				T8	Up to 22%
				T5	Up to 10%

Applications:

- Land-based and offshore rigs; areas include: derrick, mast, SCR house, top drive, operator's house, power and pump stations

Features:

- High efficacy: up to 120 LPW
- -40°C to +65°C ambient operating temperature (standard model)
- Low profile (<3" height)
- Versatile ceiling/swivel, wall, flush, pole and pendant mounting options
- Wide and narrow optics for uniform illumination in control room and drill mast
- Four points of secondary retention
- 2,000 PSI high pressure hose rated
- High vibration resistance
- Emergency battery back-up (90 minutes) and surge protection options (up to 10 kV)Ⓐ
- DesignLights Consortium® Qualified (some models are not DLC qualified)Ⓑ
- 5 year fixture warranty

Standard materials:

- Housing – copper-free aluminum; Corro-free epoxy powder coat (optional)
- Lens – clear polycarbonate; diffused polycarbonate

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

Temperature performance data:

				Simultaneous rating
Ambient temp. °C	Min. temp. supply wire °C	Class I, Div. 2	Class II, Div. 2	Class I, Div. 2; Class II, Div. 2
40	60	T6	T6	T6
55	75	T5	T5	T5
65	90	T5	T5	T5

Mounting (ordered separately):

Versatile mounting options:

- Flush back mount
- Swivel/ceiling back mount
- Offset ceiling mount
- Offset wall mount
- Pole mount
- Pendant mount

Easily retrofit to:

- Existing Pauluhn DuraPro and MagnaPro fluorescent light fixtures
- Rig-A-Lite and Snelson C1D2 fluorescent lighting fixtures

Certifications and compliances:

NEC:

- Class I, Division 2, Groups A, B, C, D
- Class I, Zone 2
- Class II, Division 2, Groups F, G
- Class III
- NEMA 4X, IP66
- Marine and wet locations

UL standards:

- UL844 – Electrical Fixture Hangers for Hazardous Locations
- UL1598 – Luminaire
- UL1598A – Luminaire for Installation on Marine Vessels
- UL924 – Emergency Lighting

CSA standard:

- C22.2 No. 137

Additional certifications:

- ABS design assessed

Electrical ratings:

	DLL2	DLL4
Lumen output	3,958	7,900
Frequency	50/60 Hz	50/60 Hz
Voltage	100-277 VAC, 108-250 VDC; 347-480 VAC	

Model	Voltage	Current (A)	Watts	Power factor	THD
DLL2/UNV1	100	0.33	32.5	0.92	<20%
DLL2/UNV1	277	0.13	34.3	0.92	<20%
DLL2/UNV34	347	0.10	32.2	0.92	<20%
DLL2/UNV34	480	0.07	34.5	0.92	<20%
DLL4/UNV1	100	0.63	63.4	0.92	<20%
DLL4/UNV1	277	0.23	62.5	0.92	<20%
DLL4/UNV34	347	0.18	61.4	0.92	<20%
DLL4/UNV34	480	0.13	63.9	0.92	<20%

Weights:

Model	Lbs.	Kg.
DLL2	12.50	5.70
DLL4	22.50	10.20

ⒶOne year warranty.

ⒷRefer to www.designlights.org Qualified Products List under Family Models for full listing details. Not all models are approved for all application categories.

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Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Designed for drilling. Pauluhn DLL linear LED luminaires are engineered to handle demanding conditions faced on land-based drilling rigs. The DLL stands up to high vibration, hose down, shock and impact, while delivering long life and high lumen performance for up to 20 years.

Custom optics:

- Standard wide (120°) beam spread for control room and indoor application maximizes illumination on wall panels
- Narrow (80°) beam spread option for high mast/derrick application avoids spillage and light loss

Comprehensive certification:

- Single model certified for use in Class I, Division 2 and Class II, Division 2 harsh and hazardous applications

Quick & easy installation:

- Easy access to drivers and wiring
- No custom brackets or hardware needed
- Seven mounting options available
- Easily retrofit to Pauluhn DuraPro and MagnaPro, Rig-A-Lite and Snelson

Slim profile:

- 2.7" fixture height (excluding mounting brackets)
- Perfect for mounting in confined or low height areas

Built to last:

- Ingress protection from hose down water or diesel fuel in harsh operational conditions – passed 2,000 PSI high pressure test
- Vibration-, impact- and shock-resistant – passed 5G, 3-axis vibration test
- 60,000 hour lifetime at 55°C ambient

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Pauluhn DLL LED luminaires

For land-based drilling

Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Ordering information:

Part number example

DLL4N/UNV1 S903 TF P EM1

DLL 4 N /UNV1 S903 TF P EM1

Series	
DLL	Pauluhn DLL linear LED luminaire

Length / lumens	
4	4 ft. length, 7,900 lumens
2	2 ft. length, 3,958 lumens

Optics	
BLANK	Wide (120°)
N	Narrow (80°)

Voltage	
/UNV1	100-277 VAC; 108-250 VDC
/UNV34	347-480 VAC

Lens	
S903	Clear polycarbonate
S903D	Diffused polycarbonate

Options	
TF	Pull wire included in fixture

Finish	
BLANK	Natural aluminum
P	Painted (gray, epoxy)
WH	Painted (white, epoxy)

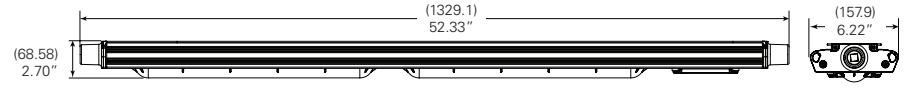
Emergency back-up	
BLANK	Standard model (no battery back-up)
EM1[C]	Integrated emergency battery back-up
EM	Remote emergency kit

Accessories (ordered separately):

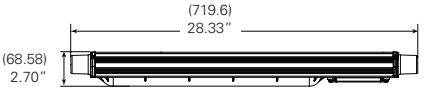
Description	Cat. #
• Flush/back mount back plate *Compatible with DuraPro*	**DP1057MTK**
• Ceiling/swivel mount *Compatible with DuraPro*	**DP1050MTK**
• Ceiling/wall mount offset *Compatible with DuraPro*	**DP1053MTK**
• Ceiling mount bracket and adapter kit *Compatible with MagnaPro*	**MP1054MTK KIT**
• Offset wall mount *Compatible with DuraPro*	**DP1052MTK**
• Pole mount kit, 1.25" conduit	**PM KIT 1.25**
• Pole mount kit, 1.50" conduit	**PM KIT 1.5**
• Pole mount kit, 2.00" conduit	**PM KIT 2.0**

Description	Cat. #
• Pendant mount kit	**PEND HAZ KIT**
• Safety chain kit	**SS KIT**
• 1 amp driver replacement kit, 100-277 VAC for 4 ft. linear	**VMVL/UNV1 80W 1A KIT**
• 1 amp driver replacement kit, 347-480 VAC for 4 ft. linear	**VMVL/UNV34 80W 1A KIT**
• 0.5 amp driver replacement kit, 100-277 VAC for 2 ft. linear	**VMVL/UNV1 80W 0.5A KIT**
• 0.5 amp driver replacement kit, 347-480 VAC for 2 ft. linear	**VMVL/UNV34 80W 0.5A KIT**

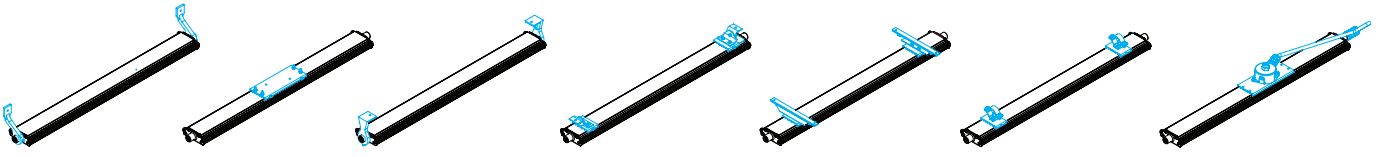
Dimensions and mounting options:



DLL4



DLL2



Offset wall
DP1052MTK

Flush ceiling
DP1057MTK

Offset ceiling
DP1053MTK

Ceiling/swivel
DP1050MTK

Ceiling and adapter
MP1054MTK KIT

Pole mount
PM KIT 1.25/1.5/2.0

Pendant mount
PEND HAZ KIT

[C] One year warranty. Remote EM kit also available, 120-277 VAC only. Available with 4 ft. model only.

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Pauluhn DLL LED luminaires

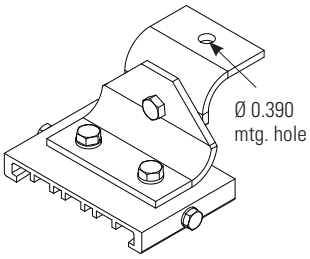
For land-based drilling

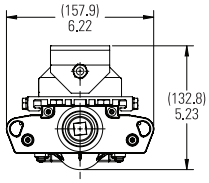
Cl. I, Div. 2, Groups A, B, C, D
Cl. I, Zone 2
Cl. II, Div. 2, Groups F, G
Cl. III

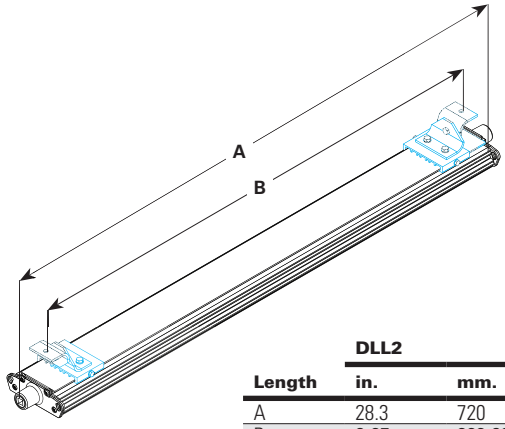
UL Listed
CSA Certified
Marine & Wet Locations
NEMA 4X; IP66

Mounting options:

Ceiling/swivel mount
DP1050MTK

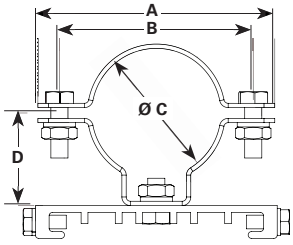




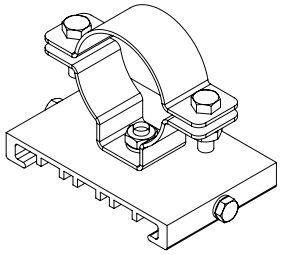


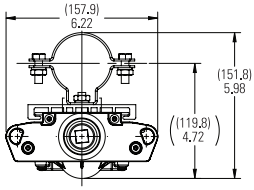
	DLL2		DLL4	
Length	in.	mm.	in.	mm.
A	28.3	720	52.3	1329
B	9-27	222-681	9-51	222-1289

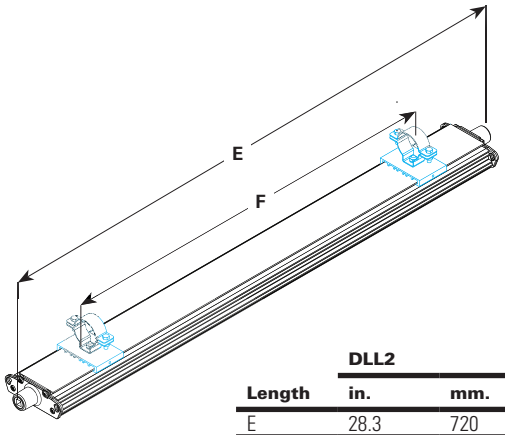
Pole mount
PM KIT 1.25/1.5/2.0



	ALL MEASUREMENTS IN INCHES			
Configuration	A	B	C	D
PM KIT 1.25	4.331	3.543	1.680	1.693
PM KIT 1.5	3.740	2.953	2.000	1.535
PM KIT 2.0	3.386	2.598	2.360	1.378

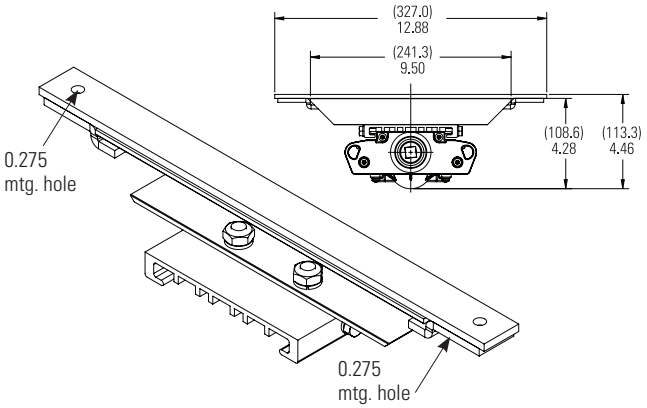


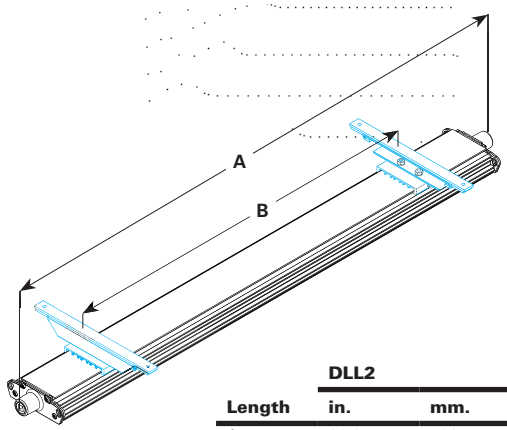




	DLL2		DLL4	
Length	in.	mm.	in.	mm.
E	28.3	720	52.3	1329
F	12-21	305-533	24-45	610-1143

MagnaPro mount
MP1054MTK KIT





	DLL2		DLL4	
Length	in.	mm.	in.	mm.
A	28.3	720	52.3	1329
B	12-22	305-559	24-46	610-1168

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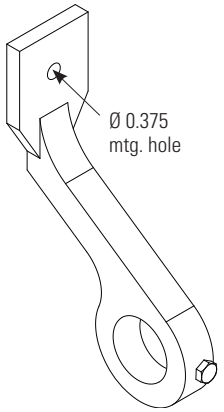
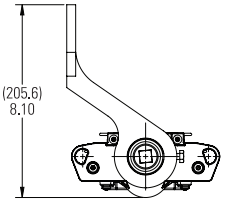
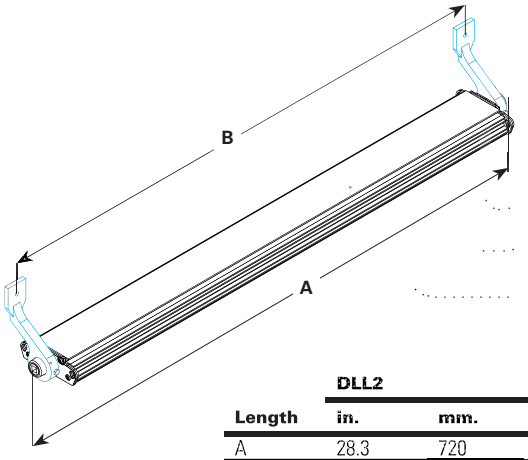
Mounting options (continued):

Offset wall
DP1052MTK

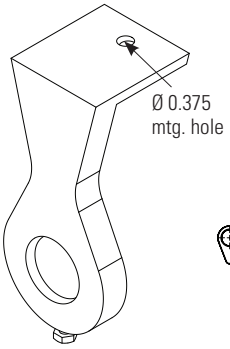


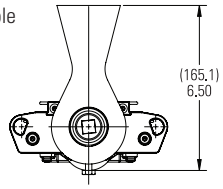


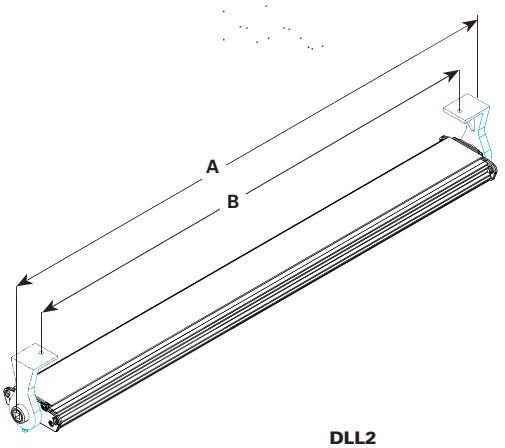


	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720	52.3	1329
B	26.3	669	50.3	1278

Offset ceiling/wall mount
DP1053MTK

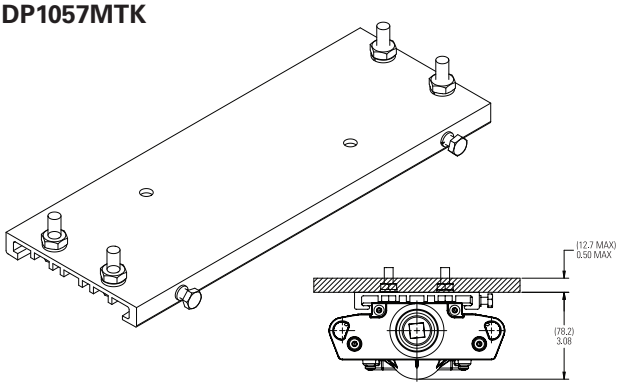


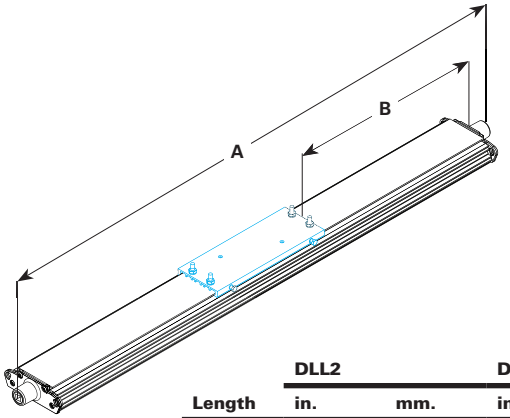




	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720	52.3	1329
B	26.3	584	47.0	1194

Flush ceiling
DP1057MTK





	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	28.3	720.0	52.3	1329.0
B	6.2	157.5	18.2	462.0

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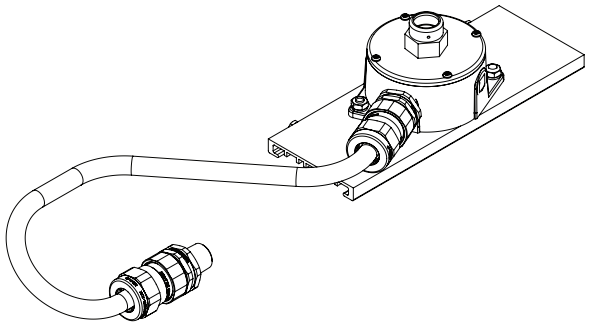
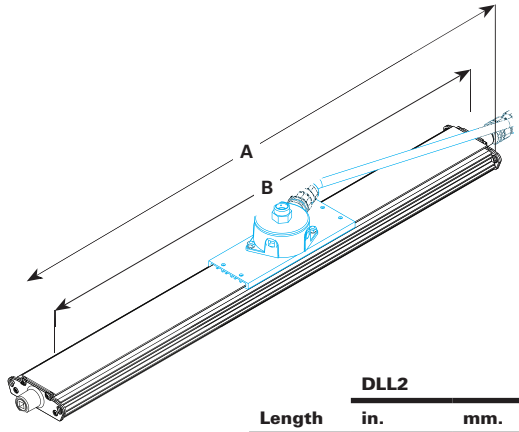
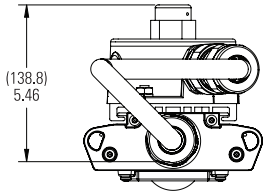
Mounting options (continued):

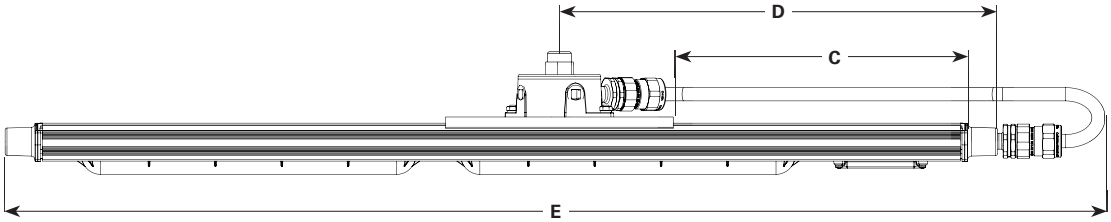
Pendant mount – Class I, Division 2 only
PEND HAZ KIT







	DLL2		DLL4	
Length	**in.**	**mm.**	**in.**	**mm.**
A	31.7	805	55.8	1418
B	28.3	720	52.3	1329
C	4.2	108	16.0	406
D	12.2	310	24.0	610
E	34.9	886	58.9	1495



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Pauluhn DLL LED luminaires

Integral battery back-up

Cl. I, Div. 2, Groups A, B, C, D
Cl. II, Div. 2, Groups F, G

UL Listed
CSA Certified
Wet Locations
Type 4X; IP66

Pauluhn DLL linear LED luminaires are available with an integral battery back-up module. Virtually the same size as the standard 4 foot model and 90 minutes of emergency lighting to keep your facility and personnel safe.

Model	EM output	Normal output
DLL4/UNV1 S903 EM1	1,400 lumens (100-277V)	6,720 lumens (100-277V)

Applications:

- Egress and emergency lighting for areas requiring uninterrupted lighting during power failure
- Hazardous rated indoor and outdoor emergency lighting in manufacturing plants, heavy industrial, chemical and petrochemical facilities, platforms, loading docks and parking areas

Features:

- Operating ambient: 0°C to +40°C
- 90-minute run time in emergency mode
- 6,720 lumen output for normal operation; 1,400 lumen output in emergency mode
- 50,000 hours rated life at 40°C
- IP66 rated enclosure
- LED indicator to check battery operation
- Nickel cadmium battery
- 1 year warranty

Certifications and compliances:

NEC/CEC:

- Class I, Division 2, Groups A, B, C, D
- Class II, Division 2, Groups F, G
- Wet locations, Type 4X, IP66

UL standards:

- UL844 – Hazardous (Classified)
- UL1598 – Luminaires
- UL1598A – Marine
- UL924 – Emergency Lighting

CSA standard:

- CSA C22.2 Nos. 137, 141

Electrical ratings:

	EM output	Normal output
Voltage	120	277
Amperage at 120 VAC	0.480	0.212
Wattage at 120 VAC	57.8	57.7
Lumen output	1,400	6,720
Frequency	50/60 Hz	50/60 Hz
Power factor at 100 VAC	>0.90	>0.90
THD	6.58	11.70

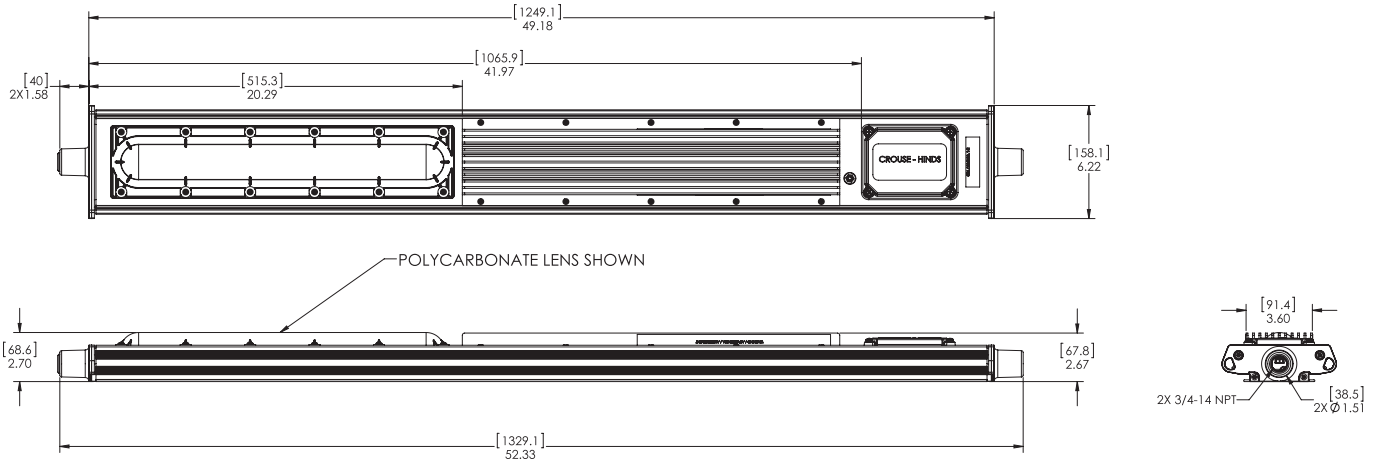
Temperature performance data:

				Simultaneous rating
Ambient temp. °C	**Min. temp. supply wire °C**	**Class I, Div. 2**	**Class II, Div. 2**	**Class I, Div. 2; Class II, Div. 2**
40	60	T5	T6	T5

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

Dimensions:



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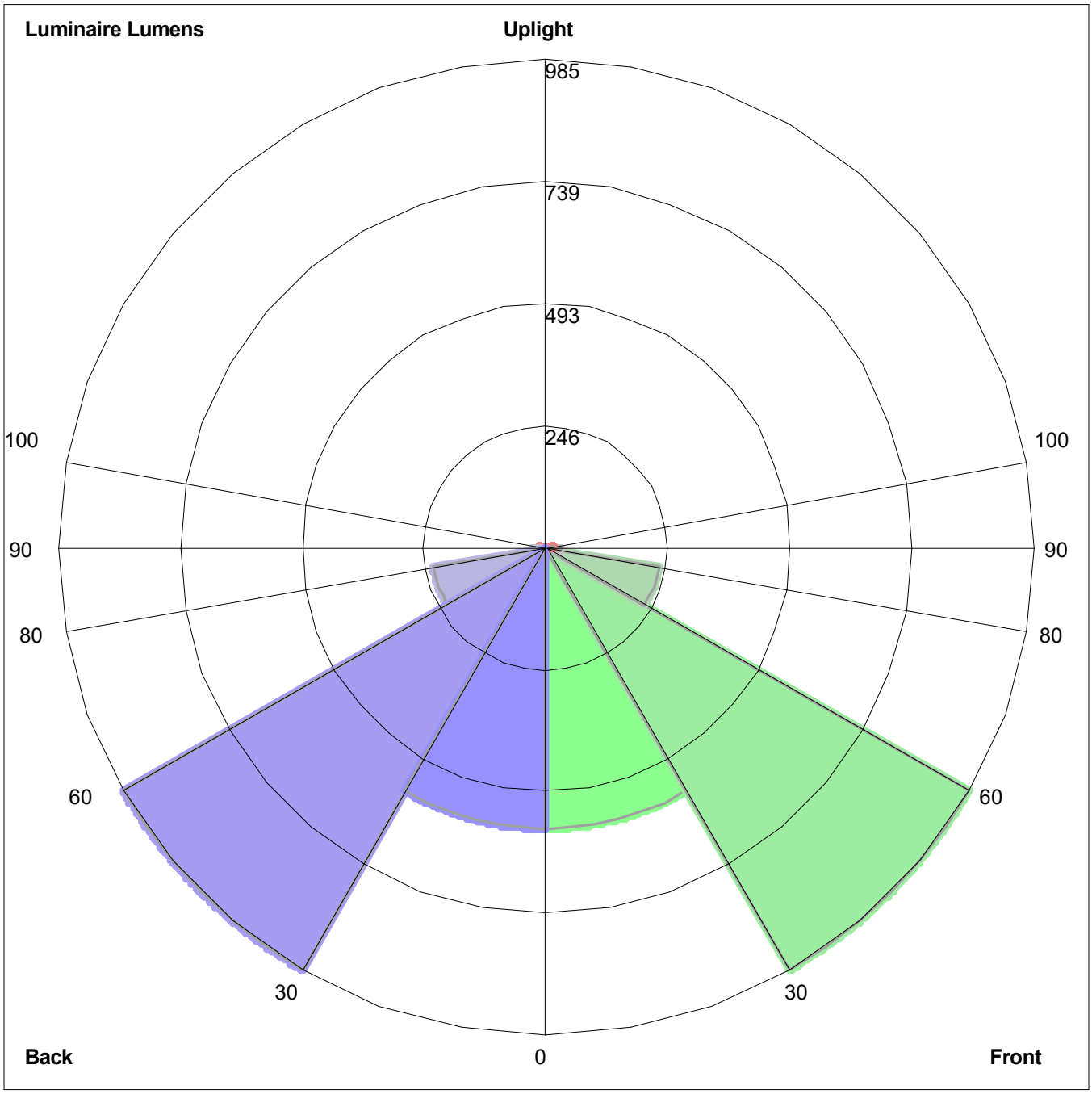
IES ROAD REPORT
PHOTOMETRIC FILENAME : DLL2-UNV1-S903.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=568.6, Medium=985.4, High=230.6, Very High=28.4
Back: Low=568.6, Medium=985.4, High=230.6, Very High=28.4
Uplight: Low=12.8, High=0.3

BUG Rating : B2-U2-G1

Photometric Toolbox® Copyright 2002-2019 by Lighting Analysts, Inc.
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type F

Mounting: Vertical Green LED Heat Trace End Seal Kit

Mounting Height: Piping Height Varies.

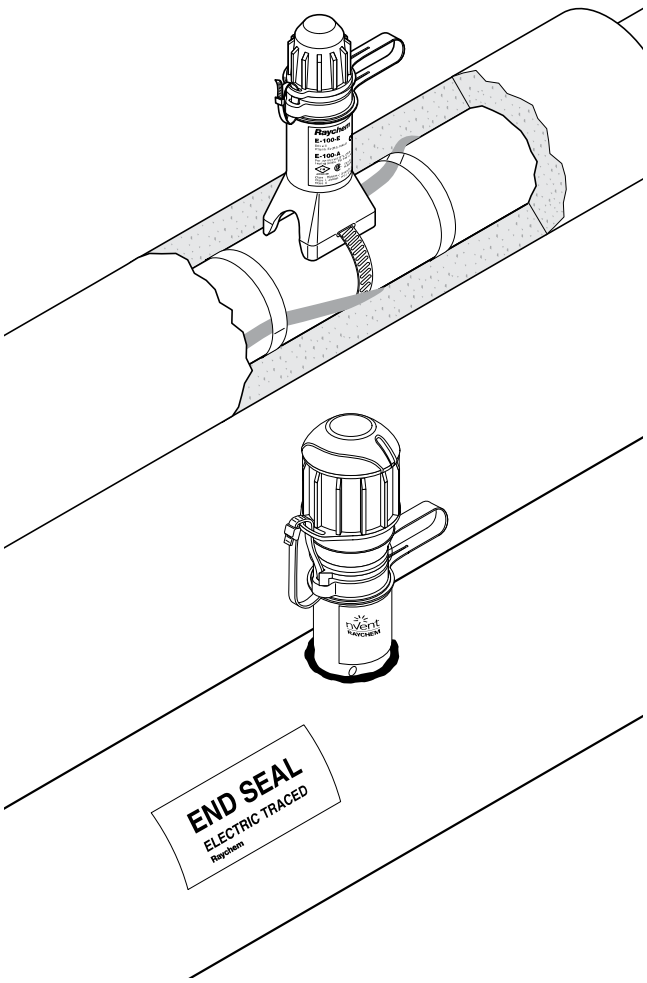
Part Number: E-100-L-A

Manufacturer: Raychem

Wattage: 2 watts at 60 Lumens/watt LED. 120 Lumens per end seal

E-100-E AND E-100-L-E

END SEAL AND LIGHTED END SEAL



Both the nVent RAYCHEM E-100-E and E-100-L-E are accessible, re-entrable end seals, the E-100-E without a light, the E-100-L-E with a signal light. Both end seals can be used with all nVent RAYCHEM BTV, QTVR, XTV, KTV or VPL industrial parallel heating cables. They are approved for use in hazardous areas. They are extremely rugged - made of a strong, moulded part with 4 mm wall thickness.

The heating cable is firmly kept in place by the integral strain relief.

Sealing is done twice. First a dry compartment for the heating cable is created, then a boot filled with a non-curing sealant (silicone free) is placed over the end of the heating cable inside the compartment.

The end seals are mounted on the pipe and project through the cladding.

The light module of the E-100-L-E uses an array of super-bright green LEDs for long life and excellent visibility from almost any angle. The robust industrial-grade electronics are encapsulated to reliably seal out moisture.

Extra sealant filled boots for the E-100-E end seal can be ordered separately.

KIT CONTENTS

	E-100-E	E-100-L-E
	1 end seal 1 cable tie 1 polywater sachet 1 installation instruction	1 end seal with indicator light 1 cable tie 1 polywater sachet 2 insulated parallel crimps 1 core sealer 1 installation instruction

APPROVAL DATA

Area of use	Hazardous or ordinary (indoors and outdoors)

APPROVALS

E-100-E	E-100-L-E
PTB 09 ATEX 1060 U Ⓔx II 2G Ex e II II 2D Ex tD A21 IP66 IECEx PTB 09.0038U Ex e II Ex tD A21 IP66 SP Ex e II T*	Sira 14ATEX3015X Ⓔx II 2GD Ex e mb IIC T* Gb Ex tb IIIC T***°C Db Ta = -40°C to +40°C IECEx SIR 14.0007X Ex e mb IIC T* Gb Ex tb IIIC T***°C Db Ta = -40°C to +40°C FM CLI, ZN1, AEx e mb IIC T* Gb (1) ZN21 AEx tb IIIC T* SP Ex e mb IIC T* Gb Ex tb IIIC T***°C Db

DNV Certificate No. E-11564 and E-11565
*For T-rating, see heating cable or design documentation
(1) Except VPL

EAC Ex	TC RU C-BE.МЮ62.B.00054/18 Ex e IIC Gb U Ex tb IIIC Db U Ex e mb IIC Gb U Ex tb mb IIIC Db U Ta -55°C...+56°C IP66 ООО "ТехИмпорт"
EAC Ex	TC RU C-BE.МЮ62.B.00054/18 Ex e IIC Gb U Ex tb IIIC Db U Ex e mb IIC Gb U Ex tb mb IIIC Db U Ta -55°C...+56°C IP66 ООО "ТехИмпорт"

PRODUCT SPECIFICATIONS

	E-100-E	E-100-L-E
Max. pipe temperature	Refer to heating cable specification (absolute maximum is 260°C)	
Max. operating voltage	480 V*	277 V
	*Extra conditions for safe use apply for voltages above 277 V. Please refer to the certificate or installation instructions for full details.	
Ambient temperature range	−50°C to +56°C*	−40°C to +40°C
	*Extra conditions for safe use apply for ambient temperatures above +40°C. Please refer to the summary the certificate or installation instructions for full details.	
Min. installation temperature	−50°C	−40°C
Overall height	171 mm	197 mm
Outer diameter	46 mm Usable with up to 100 mm thermal insulation	66 mm
Ingress protection	IP66, Type 4X	IP66, Type 4X
Impact resistance	EN 60079-30-1, ≥ 7 joules	EN 60079-30-1, ≥ 7 joules
UV stability	No degradation after > 1000 h	No degradation after > 1000 h
Solvent resistance	Excellent	Excellent
Strain relief	> 250 N	> 250 N

LIGHT SOURCE

Type	Green LEDs
Voltage rating range	110-277 Vac, 50/60 Hz
Power consumption	< 2 W
Electromagnetic immunity/emissions	Complies with IEC61000-6 and IEC61000-4

INSTALLATION DATA

Tools required	Cable knife, wire cutters, screwdriver	Cable knife, wire cutters, screwdriver, crimp tool (Panduit-CT-100), long nose pliers

ORDERING DETAILS

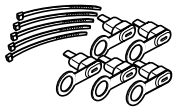
End seal		
Part description	E-100-E	E-100-L-E
PN (Weight)	101255-000 (0.22 kg) Requires one pipe strap (not supplied)	P000001583 (0.63 kg) Requires one pipe strap (not supplied) PTB, DNV and EAC approved product

ACCESSORIES

Small pipe adaptor	JBS- SPA, required for pipes ≤ 1" (DN 25), E 90515-000 (bag of 5 adaptors)

SPARE PART

Boot pack for E-100-E



Part description	E-100-BOOT-5-PACK
PN (Weight)	281053-000 (140 g)
Pack size	5 sealant filled boots and 5 cable ties

Replacement indicator light for E-100-L

Part description:	E-100-LR-E
PN	P000001586

North America
Tel +1.800.545.6258
Fax +1.800.527.5703
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Fax +86.21.5426.3167
cn.thermal.info@nVent.com

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Fax +1.713.868.2333
thermal.info@nVent.com

nVent

nVent.com

Our powerful portfolio of brands:
CADDY ERICO HOFFMAN RAYCHEM SCHROFF TRACER

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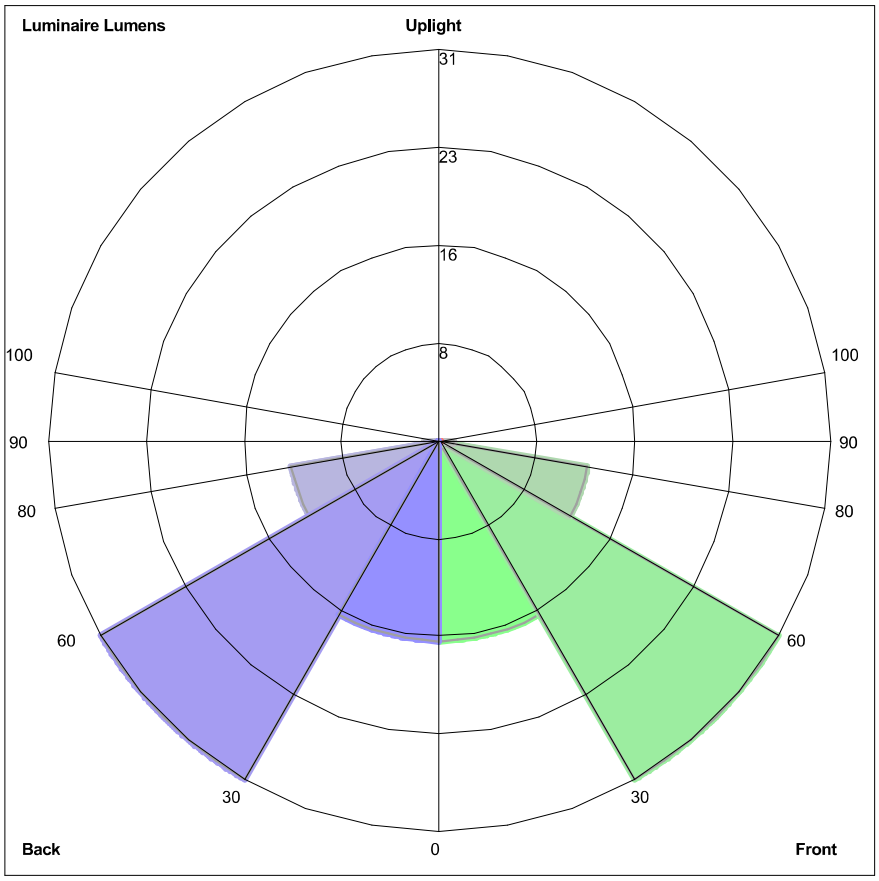
nVent reserves the right to change specifications without notice.

RAYCHEM-DS-EU1421-E100EE100LE-EN-1911

IES ROAD REPORT
PHOTOMETRIC FILENAME : APPROXIMATION RAYCHEM END KITS.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=16.0, Medium=31.2, High=12.0, Very High=1.2
Back: Low=16.0, Medium=31.2, High=12.0, Very High=1.2
Uplight: Low=0.0, High=0.0

BUG Rating : B0-U0-G0

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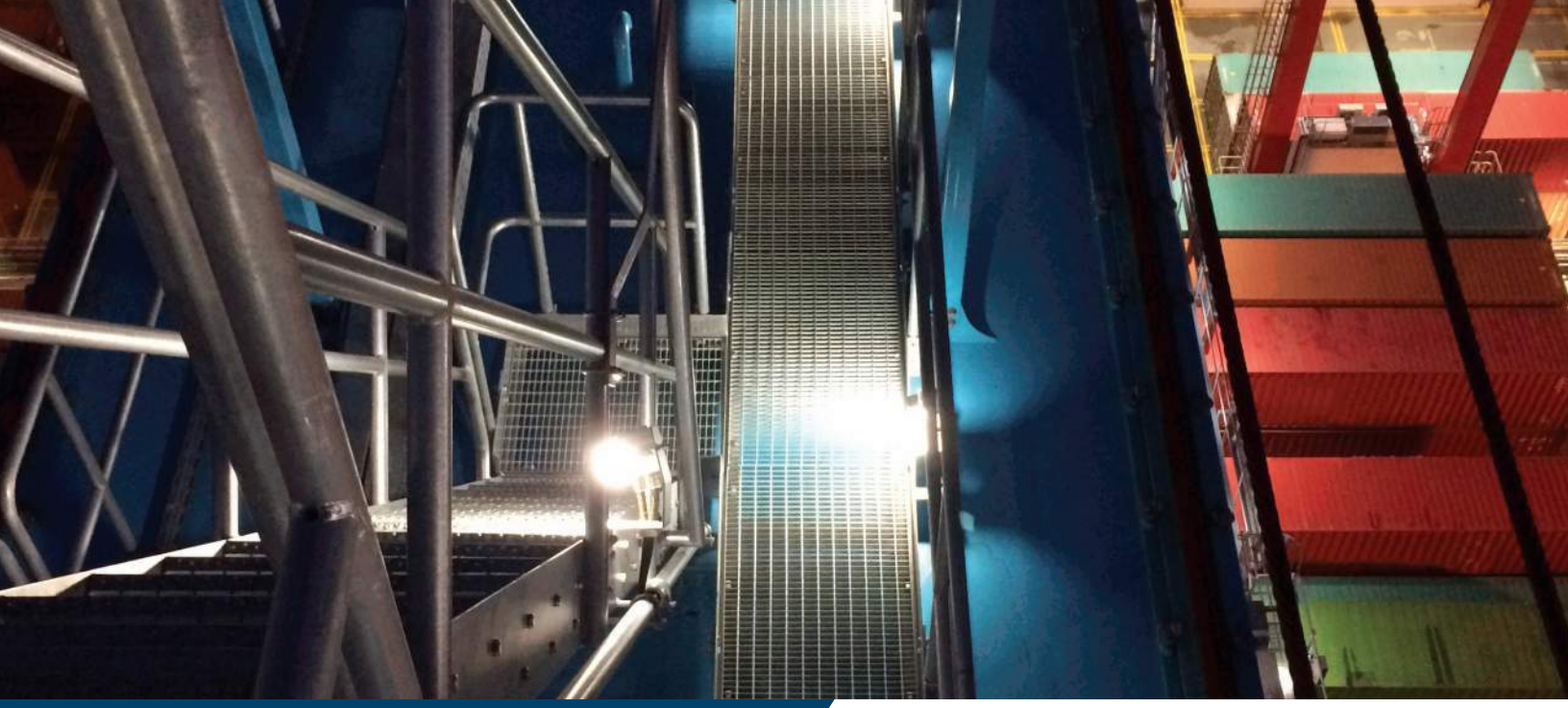
Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.

Fixture Cut Sheet
Type G



PHOENIX®
DURABILITY X DESIGN™

Cube-Light

Compact LED Area Light

Australian Design No. 359170
US Patent No. D762,321 S

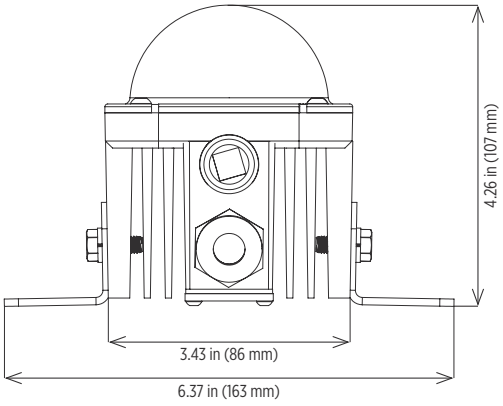
Delivers up to 1000 lumens to doorways, walkways, cabins or other small areas

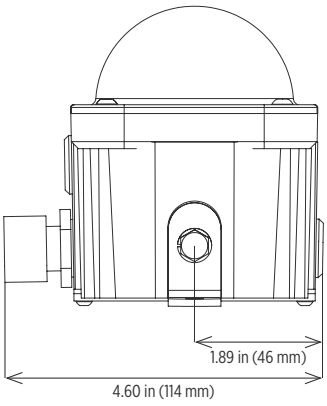
Competitive pricing with short lead times

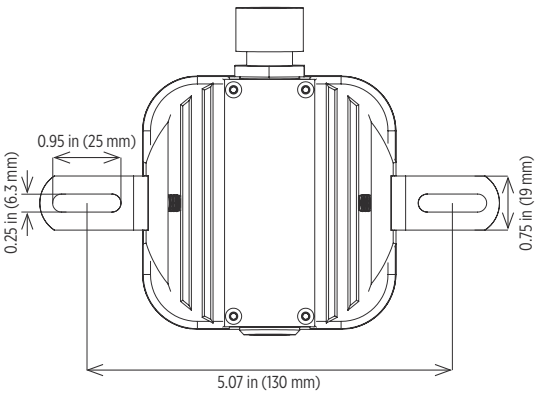
Various mounting options for maximum versatility

LED technology increases efficiency, eliminates maintenance and supports green initiatives

Dimensions







Phoenix Products LLC 8711 West Port Avenue Milwaukee, WI 53224 USA
Phone: +1 414.973.3300 Toll Free: 800.438.1214 Fax: +1 414.973.3210 **www.phoenixlighting.com**

Cube-Light

Compact LED Area Light

Specifications

Construction	Cast aluminum housing
Finish	White thermoset powder coat
Hardware	Marine grade (316) stainless steel
Lens	Impact-resistant, diffuse polycarbonate Diffuse red, green, blue and amber lens accessories available (AMB-CL, BLU-CL, GRN-CL, RED-CL)
Light source	13W, up to 1000 lumens Conformal coated CRI ≥ 70 CCT 5000K 50,000 hour rated life
Power source	120-240V, 50/60Hz 240V, 50/60Hz 13-27V DC
Wiring	Stranded wires Cord not included - standard 72.00 inch (1829 mm) cord with pigtail option (CD) NEMA 5-15 plug (120V only) sold separately (PLG-515)
Through wiring	Continuous row mounting option (TW)
Ambient operating temperature	-30°C to +50°C
Mounting	Flush mount brackets - standard Harp mount available Rail mount available - 2.00 inch overall diameter Fixture can be mounted in any orientation
Weight	2.0 lb (0.9 kg)
Warranty	3 years

For IES files, see website or contact factory

Compliances

ETL/cETL Listed to:

- UL 1598 Suitable for Wet Locations
- UL 1598A Marine Outside Type (Saltwater)
- CSA C22.2 No. 250.0

CE
ABS
IP66 rated
LM79 and LM80 reports available

The Cube-Light on an STS crane

Phoenix Products LLC 8711 West Port Avenue Milwaukee, WI 53224 USA
Phone: +1 414.973.3300 Toll Free: 800.438.1214 Fax: +1 414.973.3210 **www.phoenixlighting.com**

Ordering Information

Example: CL-13LED-120-240

Fixture	Wattage/Type	Voltage	Options
CL	13LED	120-240 [1,2]	CD
		240 [2]	TW
		DC [3]	

Wattage/Type

13LED	13W, up to 1000 lumens

Voltage

120-240 [1,2]	120-240V, 50/60Hz
240 [2]	240V, 50/60Hz
DC [3]	13-27V DC

Options

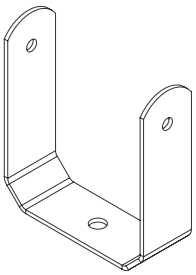
CD	72.00 inch (1829 mm) cord with pigtail option
TW	Continuous row mounting

Notes

1	ETL/cETL listed
2	CE
3	No certifications

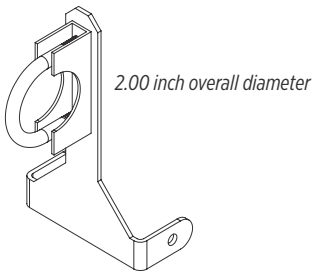
Special Projects: We may be able to accommodate your special projects, so please don't hesitate to ask about additional options. Minimum order quantities and/or extended lead times will apply. Contact your Phoenix representative with specific inquiries.

Mounting (order separately)



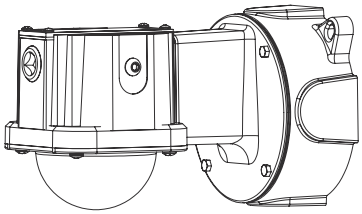
Harp Mount

HRP-CL



Rail Mount

RLMT-CL
Contact factory

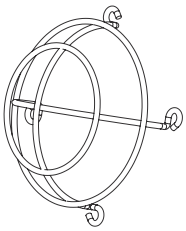


Wall Mount

Complete fixture sold separately
Refer to Cube-Light Wall Mount spec sheet

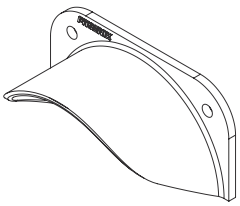
Flush mount comes standard with fixture

Accessories (order separately)



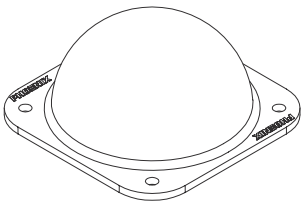
Wire Guard Kit

WG-CL



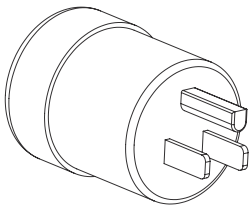
Visor Kit

VSR-CL



Color Lens Kits

AMB-CL	amber lens kit
BLU-CL	blue lens kit
GRN-CL	green lens kit
RED-CL	red lens kit

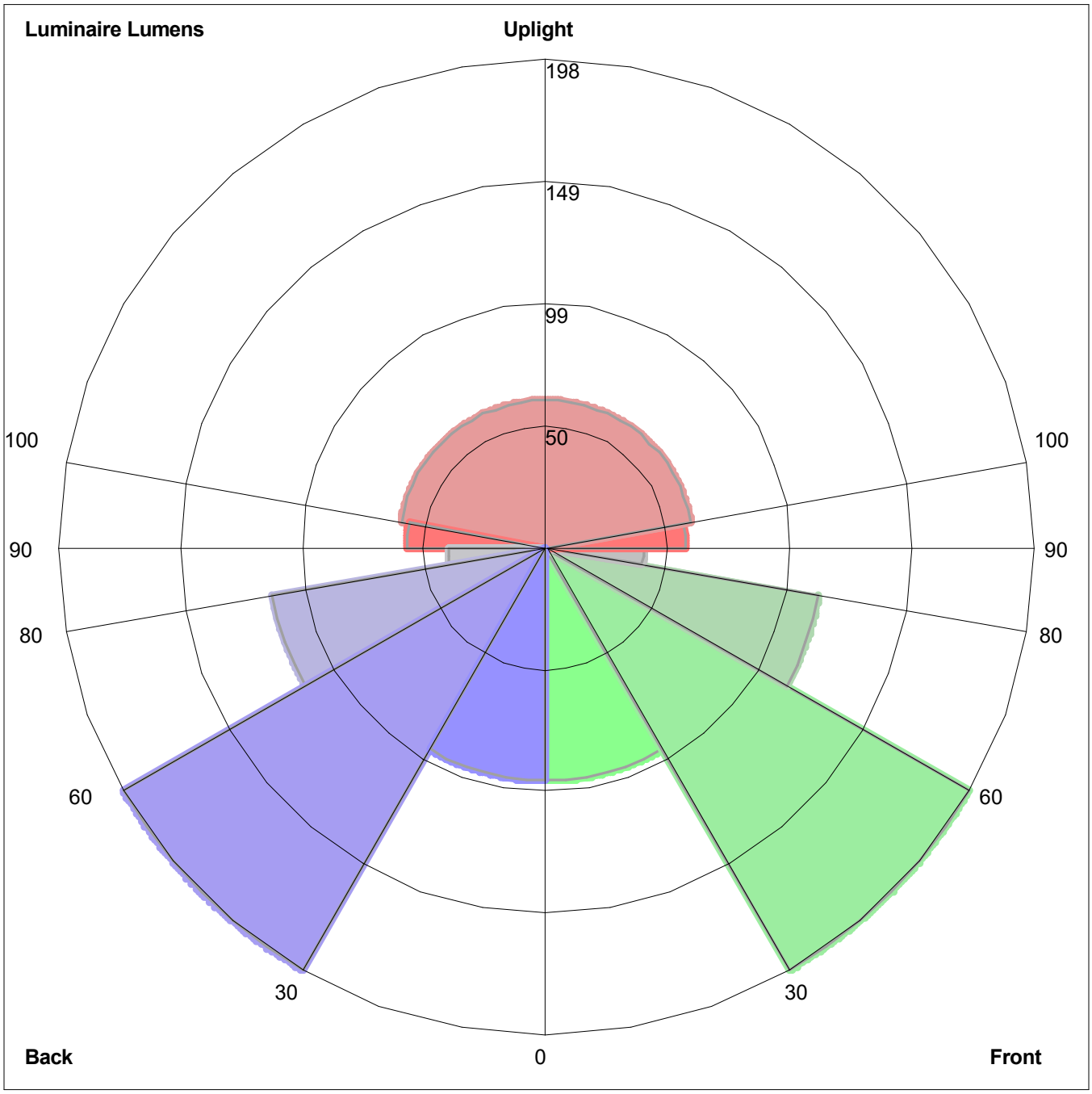


NEMA 5-15 plug (120V only)

PLG-515

IES ROAD REPORT
PHOTOMETRIC FILENAME : CL-13LED (CUBE 120V ITL TESTED).IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:
Front: Low=94.7, Medium=198.1, High=112.5, Very High=39.7
Back: Low=94.7, Medium=198.1, High=112.5, Very High=39.7
Uplight: Low=56.4, High=59.7

BUG Rating : B1-U3-G1

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Calculations based on published IES Methods and recommendations, values rounded for display purposes.
Results derived from content of manufacturers photometric file.