

**East Midlands Gateway
Phase 2 (EMG2)**

Document DCO 6.11D/MCO 6.11D

ENVIRONMENTAL STATEMENT

Volume 2 Technical Appendices

Appendix 11D

Obtrusive Light Calculation

July 2025

11

The East Midlands Gateway Phase 2
and Highway Order 202X and The East Midlands Gateway
Rail Freight and Highway (Amendment) Order 202X

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SEGRO

10/06/2025



EAST MIDLANDS GATEWAY

CHAPTER 11 APPENDIX 11D

OBTRUSIVE LIGHT CALCULATIONS

DOCUMENT DCO/MCO 6.11D

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Designs for Lighting (DFL) is a business built on successfully collaborating with our clients. We have over 20 years proven experience in our industry, listening to the challenges our clients face, developing the best solutions and being innovators in our specialism. Our role is to find the most effective and sustainable outcome to enhance and support your projects. We proudly work with recognised industry bodies to promote and shape the future of the industry and ensure our staff are trained to exceed the required competency levels of our industries. Above all, we ensure each project delivers against our values.



Quality



Knowledgeable



Dependable



Clear Advice

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1. INTRODUCTION

- 1.1.1. This technical appendix details the obtrusive light calculation that have been conducted for the **EMG2 Project**.
- 1.1.2. This includes horizontal light spill diagrams for EMG2 Main Site and EMG1 Plot 16.
- 1.1.3. Both horizontal light spill diagrams and vertical illuminance calculation have been conducted for these two sites.
- 1.1.4. All calculations use a maintenance factor of 1, thus they represent luminaire output at the start of luminaire life. This is the point in the luminaires useable life where it has the highest light output, and therefore the calculation represents a reasonable worst-case scenario.
- 1.1.5. The embedded mitigation as detailed in **Appendix 11A (Document DCO/MCO 6.11A)** and **Chapter 11 (Document DCO/MCO 6.11)** is included in the lighting calculations where it is possible to do so.

2. EMG2 MAIN SITE OBTRUSIVE LIGHT CALCULATIONS

- 2.1.1. The following pages show the results of the obtrusive light calculations for EMG2 Main Site.
- 2.1.2. This includes a Light Spill Diagram and Vertical Illuminance Calculations.

2.2. EMG 2 Main Site Horizontal Light Spill Diagram



2.3. EMG 2 Main Site Vertical Illuminance Calculations

DATE: 16 December 2024
DESIGNER: DFL-UK (LM)
PROJECT No: 2398
PROJECT NAME: East Midlands Gateway 2



This document shows the obtrusive light calculations for the sensitive receptors that have been identified in ES Chapter 11.

This document forms an appendix to ES Chapter 11 and therefore must be read in conjunction with this chapter.

All lighting calculations have been conducted using a maintenance factor of 1 and shows a reasonable worst case at the start of luminaire life.

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Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1	445407.16	323938.65	1929.07	1779.82	7.72	7.12
2	PHAR 001	445737.53	324496.67	614.35	12.00	2.46	1.50
3	PHAR 004	446092.10	323982.28	356.22	12.00	1.50	1.50
4	PHAR 003	447222.26	323907.22	726.44	12.00	2.91	1.50
5	PSEER 002	446594.77	325136.42	297.20	12.00	1.49	1.50
6	PSEER 002	446594.04	325137.53	347.64	12.00	1.50	1.50
7	PHAR 002	445346.29	325161.68	242.69	12.00	1.50	1.50

Luminaires

Luminaire B Data



Supplier	D W Windsor
Type	Sabre 64LED 3k C2 1000mA UMSUG 42 019 8 0000 100
Lamp(s)	64 x 3k LED
Lamp Flux (klm)	20.34
File Name	Sabre 64LED 3k C2_1000mA UMSUG 42 019 8 0000 100.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	853.5, 62.5, 0.0
No. in Project	234

Luminaire C Data



Supplier	Urbis Schreder
Type	AXIA 3.3 5267 Integrated lenses 48 OSLON SQUARE GIANT@400mA
Lamp(s)	48 OSLON SQUARE GIANT@400mA WW 73 0 230V
LampFlux(klm)/Colour	8.12 WW 3000K/70
File Name	AXIA 3.3 5267 48 OSLON SQUARE GIANT 4 00mA WW 730 56W 429224 Integrated lens...
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	980.0, 156.0, 9.0
No. in Project	137

Luminaire D Data



Supplier	D W Windsor
Type	Milano Classic-16LED-3k-C3 800mA UMSUG 42 0148 0000 100
Lamp(s)	16 x 3k LED
Lamp Flux (klm)	17.36
File Name	Milano Classic-16LED-3k-C3_800mA UMSUG 42 0148 0000 100.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	336.0, 30.0, 2.0
No. in Project	42

Luminaire E Data



Supplier	Urbis Schreder
Type	AXIA 3.3 5279 Integrated lenses 48 OSLON SQUARE GIANT@400mA
Lamp(s)	48 OSLON SQUARE GIANT@400mA WW 73 0 230V
LampFlux(klm)/Colour	8.12 WW 3000K/70
File Name	AXIA 3.3 5279 48 OSLON SQUARE GIANT 4 00mA WW 730 56W 429344 Integrated lens...
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	781.4, 152.7, 3.9
No. in Project	25

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
1	D	446140.04	325372.45	8.00	90.35	0.00	0.00	0.00	100%			
2	D	446180.02	325372.69	8.00	90.35	0.00	0.00	0.00	100%			
3	D	446220.00	325372.93	8.00	90.35	0.00	0.00	0.00	100%			
4	D	446259.99	325373.17	8.00	90.35	0.00	0.00	0.00	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
5	D	446299.97	325373.41	8.00	90.35	0.00	0.00	0.00	100%			
6	D	446339.95	325373.65	8.00	90.35	0.00	0.00	0.00	100%			
7	C	446159.85	325352.64	8.00	95.00	0.00	0.00	0.40	100%			
8	C	446200.08	325352.64	8.00	95.00	0.00	0.00	0.40	100%			
9	C	446240.00	325352.94	8.00	95.00	0.00	0.00	0.40	100%			
10	C	446279.92	325352.94	8.00	95.00	0.00	0.00	0.40	100%			
11	C	446320.29	325353.09	8.00	95.00	0.00	0.00	0.40	100%			
12	C	446341.04	325317.61	8.00	359.00	0.00	0.00	0.40	100%			
13	C	446321.02	325391.39	8.00	269.00	0.00	0.00	0.40	100%			
14	C	446278.67	325391.22	8.00	273.00	0.00	0.00	0.40	100%			
15	C	446238.47	325390.62	8.00	275.00	0.00	0.00	0.40	100%			
16	C	446127.30	325355.41	8.00	158.00	0.00	0.00	0.40	100%			
17	C	446340.81	325344.19	8.00	1.00	0.00	0.00	0.40	100%			
18	C	445812.87	325356.67	8.00	270.44	0.00	0.00	0.40	100%			
19	C	445838.47	325356.90	8.00	270.44	0.00	0.00	0.40	100%			
20	C	445866.17	325357.06	8.00	270.44	0.00	0.00	0.40	100%			
21	C	445893.89	325357.28	8.00	270.44	0.00	0.00	0.40	100%			
22	C	445921.61	325357.43	8.00	270.44	0.00	0.00	0.40	100%			
23	C	445949.28	325357.62	8.00	270.44	0.00	0.00	0.40	100%			
24	C	445975.40	325357.78	8.00	270.44	0.00	0.00	0.40	100%			
25	C	446005.27	325357.94	8.00	270.44	0.00	0.00	0.40	100%			
26	C	446030.36	325358.20	8.00	270.44	0.00	0.00	0.40	100%			
27	C	446055.29	325358.33	8.00	270.44	0.00	0.00	0.40	100%			
28	C	446076.67	325341.03	8.00	180.48	0.00	0.00	0.40	100%			
29	C	446076.99	325302.98	8.00	180.48	0.00	0.00	0.40	100%			
30	C	446077.31	325264.94	8.00	180.48	0.00	0.00	0.40	100%			
31	C	446077.63	325226.89	8.00	180.48	0.00	0.00	0.40	100%			
32	C	446056.81	325322.43	8.00	359.00	0.00	0.00	0.40	100%			
33	C	446056.95	325281.04	8.00	357.00	0.00	0.00	0.40	100%			
34	C	446056.95	325243.11	8.00	359.00	0.00	0.00	0.40	100%			
35	D	446059.64	325163.09	8.00	0.39	0.00	0.00	0.00	100%			
36	D	446059.89	325125.89	8.00	0.39	0.00	0.00	0.00	100%			
37	D	446060.14	325088.69	8.00	0.39	0.00	0.00	0.00	100%			
38	D	446060.40	325051.49	8.00	0.39	0.00	0.00	0.00	100%			
39	D	446101.44	325094.67	8.00	95.00	0.00	0.00	0.00	100%			
40	D	446102.07	325064.06	8.00	95.00	0.00	0.00	0.00	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
41	C	446038.97	325144.16	8.00	357.00	0.00	0.00	0.40	100%			
42	C	446039.07	325106.78	8.00	357.00	0.00	0.00	0.40	100%			
43	C	446039.71	325068.86	8.00	357.00	0.00	0.00	0.40	100%			
44	C	446098.29	325047.35	8.00	123.00	0.00	0.00	0.40	100%			
45	C	446088.60	325153.99	8.00	175.00	0.00	0.00	0.40	100%			
46	C	446088.69	325127.87	8.00	181.00	0.00	0.00	0.40	100%			
47	D	446123.74	325077.98	8.00	357.00	0.00	0.00	0.00	100%			
48	D	446349.55	325061.50	8.00	265.00	0.00	0.00	0.00	100%			
49	D	446348.82	325040.24	8.00	265.00	0.00	0.00	0.00	100%			
50	D	446348.10	325020.33	8.00	263.00	0.00	0.00	0.00	100%			
51	D	446347.09	324999.52	8.00	263.00	0.00	0.00	0.00	100%			
52	D	446316.32	325043.16	8.00	357.00	0.00	0.00	0.40	100%			
53	D	446314.45	325000.87	8.00	357.00	0.00	0.00	0.40	100%			
54	C	446292.10	325009.94	8.00	357.00	0.00	0.00	0.40	100%			
55	C	446296.43	325038.94	8.00	357.00	0.00	0.00	0.40	100%			
56	C	446326.85	325066.27	8.00	313.00	0.00	0.00	0.40	0%			
57	D	446254.79	324963.82	8.00	0.00	0.00	0.00	0.00	100%			
58	D	446253.45	324929.81	8.00	27.00	0.00	0.00	0.00	100%			
59	D	446252.10	324895.79	8.00	24.00	0.00	0.00	0.00	100%			
60	D	446250.76	324861.77	8.00	30.00	0.00	0.00	0.00	100%			
61	D	446218.23	324862.43	8.00	177.00	0.00	0.00	0.00	100%			
62	D	446222.16	324966.20	8.00	178.00	0.00	0.00	0.00	100%			
63	D	446220.72	324931.23	8.00	180.00	0.00	0.00	0.00	100%			
64	D	446219.28	324897.12	8.00	181.00	0.00	0.00	0.00	100%			
65	C	446134.51	324916.34	8.00	0.00	0.00	0.00	0.40	100%			
66	C	446133.17	324892.41	8.00	0.00	0.00	0.00	0.40	100%			
67	C	446131.83	324868.49	8.00	0.00	0.00	0.00	0.40	100%			
68	C	446130.48	324844.56	8.00	0.00	0.00	0.00	0.40	100%			
69	C	446166.22	324842.85	8.00	176.65	0.00	0.00	0.40	100%			
70	C	446167.62	324866.85	8.00	176.65	0.00	0.00	0.40	100%			
71	C	446169.03	324890.85	8.00	176.65	0.00	0.00	0.40	100%			
72	C	446170.23	324915.59	8.00	176.65	0.00	0.00	0.40	100%			
73	C	446147.71	324824.21	8.00	92.00	0.00	0.00	0.40	100%			
74	C	446152.81	324924.01	8.00	268.00	0.00	0.00	0.40	100%			
75	C	446122.39	324703.32	8.00	356.60	0.00	0.00	0.40	100%			
76	C	446124.26	324738.25	8.00	356.60	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
77	C	446126.43	324774.88	8.00	356.60	0.00	0.00	0.40	100%			
78	C	446128.45	324811.58	8.00	356.60	0.00	0.00	0.40	100%			
79	C	446163.89	324805.95	8.00	177.31	0.00	0.00	0.40	100%			
80	C	446162.57	324780.82	8.00	177.31	0.00	0.00	0.40	100%			
81	C	446160.72	324750.90	8.00	177.31	0.00	0.00	0.40	100%			
82	C	446159.04	324719.73	8.00	177.31	0.00	0.00	0.40	100%			
83	C	446157.23	324688.57	8.00	177.31	0.00	0.00	0.40	100%			
84	C	446106.52	324699.14	8.00	271.00	0.00	0.00	0.40	100%			
85	C	446114.41	324677.48	8.00	85.00	0.00	0.00	0.40	100%			
86	C	446140.14	324676.06	8.00	90.00	0.00	0.00	0.40	100%			
87	D	446140.17	324578.39	8.00	0.00	0.00	0.00	0.00	100%			
88	D	446138.83	324554.38	8.00	0.00	0.00	0.00	0.00	100%			
89	D	446137.49	324530.37	8.00	0.00	0.00	0.00	0.00	100%			
90	D	446136.15	324506.37	8.00	0.00	0.00	0.00	0.00	100%			
91	C	446169.65	324584.68	8.00	176.98	0.00	0.00	0.40	100%			
92	C	446168.11	324555.61	8.00	176.98	0.00	0.00	0.40	100%			
93	C	446166.58	324526.53	8.00	176.98	0.00	0.00	0.40	100%			
94	C	446165.04	324497.46	8.00	176.98	0.00	0.00	0.40	100%			
102	C	446257.55	324657.06	8.00	178.00	0.00	0.00	0.40	100%			
103	C	446255.57	324619.35	8.00	173.00	0.00	0.00	0.40	100%			
104	C	446253.91	324580.92	8.00	179.00	0.00	0.00	0.40	100%			
105	C	446251.97	324542.25	8.00	177.00	0.00	0.00	0.40	100%			
106	C	446252.25	324514.89	8.00	267.31	0.00	0.00	0.40	100%			
107	C	446270.63	324514.02	8.00	267.31	0.00	0.00	0.40	100%			
108	C	446289.01	324513.16	8.00	267.31	0.00	0.00	0.40	100%			
109	C	446307.39	324512.30	8.00	267.31	0.00	0.00	0.40	100%			
110	C	446325.77	324511.43	8.00	267.31	0.00	0.00	0.40	100%			
111	C	446185.16	324480.81	8.00	357.30	0.00	0.00	0.40	100%			
112	C	446186.39	324505.13	8.00	357.30	0.00	0.00	0.40	100%			
113	C	446187.52	324529.52	8.00	357.30	0.00	0.00	0.40	100%			
114	C	446188.71	324553.94	8.00	357.30	0.00	0.00	0.40	100%			
115	C	446189.88	324578.33	8.00	357.30	0.00	0.00	0.40	100%			
116	C	446191.07	324602.73	8.00	357.30	0.00	0.00	0.40	100%			
117	C	446192.31	324627.12	8.00	357.30	0.00	0.00	0.40	100%			
118	C	446193.54	324651.40	8.00	357.30	0.00	0.00	0.40	100%			
120	C	446194.19	324664.87	8.00	357.40	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
121	C	446195.17	324685.20	8.00	357.40	0.00	0.00	0.40	100%			
122	C	446196.12	324705.50	8.00	357.40	0.00	0.00	0.40	100%			
123	C	446197.14	324725.80	8.00	357.40	0.00	0.00	0.40	100%			
124	D	446213.47	324486.38	8.00	357.20	0.00	0.00	0.00	100%			
125	D	446215.08	324519.33	8.00	357.20	0.00	0.00	0.00	100%			
126	D	446216.69	324552.28	8.00	357.20	0.00	0.00	0.00	100%			
127	D	446218.31	324585.22	8.00	357.20	0.00	0.00	0.00	100%			
128	D	446219.92	324618.17	8.00	357.20	0.00	0.00	0.00	100%			
129	D	446221.53	324651.11	8.00	357.20	0.00	0.00	0.00	100%			
138	D	446244.01	324487.25	8.00	310.00	0.00	0.00	0.00	100%			
139	D	446281.08	324485.35	8.00	267.00	0.00	0.00	0.00	100%			
140	D	446318.15	324483.46	8.00	219.00	0.00	0.00	0.00	100%			
133	D	446223.14	324684.06	8.00	357.20	0.00	0.00	0.00	100%			
134	D	446224.75	324717.01	8.00	357.20	0.00	0.00	0.00	100%			
135	C	446254.98	324718.96	8.00	178.00	0.00	0.00	0.40	100%			
136	C	446253.64	324681.32	8.00	178.00	0.00	0.00	0.40	100%			
1	B	446499.32	325324.17	10.00	1.01	0.00	0.00	0.40	100%			
3	B	446498.17	325351.84	10.00	1.01	0.00	0.00	0.40	100%			
4	B	446497.22	325379.13	10.00	1.01	0.00	0.00	0.40	100%			
5	B	446515.46	325398.01	10.00	272.16	0.00	0.00	0.40	100%			
6	B	446539.87	325398.90	10.00	272.16	0.00	0.00	0.40	100%			
7	B	446564.46	325399.82	10.00	272.16	0.00	0.00	0.40	100%			
8	B	446588.97	325400.77	10.00	272.16	0.00	0.00	0.40	100%			
9	B	446613.65	325401.62	10.00	272.16	0.00	0.00	0.40	100%			
10	B	446638.06	325402.58	10.00	272.16	0.00	0.00	0.40	100%			
11	B	446662.65	325403.46	10.00	272.16	0.00	0.00	0.40	100%			
12	B	446485.81	325323.21	10.00	249.00	0.00	0.00	0.40	100%			
13	B	446540.86	325320.47	10.00	291.92	0.00	0.00	0.40	100%			
15	B	446574.19	325332.51	10.00	291.92	0.00	0.00	0.40	100%			
17	B	446605.98	325346.21	10.00	291.92	0.00	0.00	0.40	100%			
19	B	446682.98	325376.18	10.00	186.00	0.00	0.00	0.40	100%			
20	B	446646.44	325352.13	10.00	116.00	0.00	0.00	0.40	100%			
21	B	446559.09	325346.91	10.00	91.83	0.00	0.00	0.40	100%			
23	B	446595.27	325348.24	10.00	91.83	0.00	0.00	0.40	100%			
26	B	446554.16	325337.32	10.00	0.00	0.00	0.00	0.40	100%			
20	B	446142.21	325206.00	10.00	270.60	0.00	0.00	0.90	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
21	B	446158.35	325206.17	10.00	270.60	0.00	0.00	0.90	100%			
22	B	446174.50	325206.34	10.00	270.60	0.00	0.00	0.90	100%			
23	B	446190.64	325206.51	10.00	270.60	0.00	0.00	0.90	100%			
24	B	446206.78	325206.68	10.00	270.60	0.00	0.00	0.90	100%			
25	B	446116.93	325160.94	10.00	0.00	0.00	0.00	0.40	100%			
26	B	446116.93	325196.86	10.00	0.00	0.00	0.00	0.40	100%			
27	B	446169.12	325155.43	10.00	90.47	0.00	0.00	0.40	100%			
28	B	446194.83	325155.64	10.00	90.47	0.00	0.00	0.40	100%			
29	B	446220.55	325155.85	10.00	90.47	0.00	0.00	0.40	100%			
30	B	446246.26	325156.06	10.00	90.47	0.00	0.00	0.40	100%			
31	B	446271.97	325156.27	10.00	90.47	0.00	0.00	0.40	100%			
32	B	446297.68	325156.48	10.00	90.47	0.00	0.00	0.40	100%			
33	B	446229.92	325207.28	10.00	270.36	0.00	0.00	0.90	100%			
34	B	446245.68	325207.38	10.00	270.36	0.00	0.00	0.90	100%			
35	B	446261.45	325207.48	10.00	270.36	0.00	0.00	0.90	100%			
36	B	446277.21	325207.58	10.00	270.36	0.00	0.00	0.90	100%			
37	B	446292.97	325207.67	10.00	270.36	0.00	0.00	0.90	100%			
38	B	446308.73	325207.77	10.00	270.36	0.00	0.00	0.90	100%			
39	B	446156.85	325137.66	8.00	152.00	0.00	0.00	0.40	100%			
40	B	445821.56	325224.21	10.00	270.58	0.00	0.00	0.90	100%			
41	B	445837.46	325224.37	10.00	270.58	0.00	0.00	0.90	100%			
42	B	445853.36	325224.53	10.00	270.58	0.00	0.00	0.90	100%			
43	B	445869.26	325224.69	10.00	270.58	0.00	0.00	0.90	100%			
44	B	445885.16	325224.85	10.00	270.58	0.00	0.00	0.90	100%			
45	B	445901.06	325225.01	10.00	270.58	0.00	0.00	0.90	100%			
46	B	445916.97	325225.17	10.00	270.58	0.00	0.00	0.90	100%			
47	B	445940.47	325225.79	10.00	270.28	0.00	0.00	0.90	100%			
48	B	445954.64	325225.86	10.00	270.28	0.00	0.00	0.90	100%			
49	B	445968.81	325225.93	10.00	270.28	0.00	0.00	0.90	100%			
50	B	445982.98	325226.00	10.00	270.28	0.00	0.00	0.90	100%			
51	B	445997.15	325226.07	10.00	270.28	0.00	0.00	0.90	100%			
52	B	446011.32	325226.13	10.00	270.28	0.00	0.00	0.90	100%			
53	B	446025.49	325226.20	10.00	270.28	0.00	0.00	0.90	100%			
54	B	445820.52	325171.75	10.00	90.42	0.00	0.00	0.40	100%			
55	B	445861.71	325172.05	10.00	90.42	0.00	0.00	0.40	100%			
56	B	445902.89	325172.35	10.00	90.42	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
57	B	445944.08	325172.65	10.00	90.42	0.00	0.00	0.40	100%			
58	B	445985.26	325172.95	10.00	90.42	0.00	0.00	0.40	100%			
59	B	446026.45	325173.25	10.00	90.42	0.00	0.00	0.40	100%			
60	B	446055.22	325212.16	10.00	270.00	0.00	0.00	0.40	100%			
61	B	445824.38	325025.67	10.00	270.58	0.00	0.00	0.90	100%			
62	B	445839.41	325025.82	10.00	270.58	0.00	0.00	0.90	100%			
63	B	445854.45	325025.97	10.00	270.58	0.00	0.00	0.90	100%			
64	B	445869.48	325026.13	10.00	270.58	0.00	0.00	0.90	100%			
65	B	445884.52	325026.28	10.00	270.58	0.00	0.00	0.90	100%			
66	B	445899.55	325026.43	10.00	270.58	0.00	0.00	0.90	100%			
67	B	445914.58	325026.59	10.00	270.58	0.00	0.00	0.90	100%			
68	B	445937.23	325026.40	10.00	270.62	0.00	0.00	0.90	100%			
69	B	445954.13	325026.59	10.00	270.62	0.00	0.00	0.90	100%			
70	B	445971.03	325026.77	10.00	270.62	0.00	0.00	0.90	100%			
71	B	445987.93	325026.95	10.00	270.62	0.00	0.00	0.90	100%			
72	B	446004.83	325027.14	10.00	270.62	0.00	0.00	0.90	100%			
73	B	446021.73	325027.32	10.00	270.62	0.00	0.00	0.90	100%			
74	B	445824.75	324975.59	10.00	90.07	0.00	0.00	0.40	100%			
75	B	445864.56	324975.64	10.00	90.07	0.00	0.00	0.40	100%			
76	B	445904.37	324975.68	10.00	90.07	0.00	0.00	0.40	100%			
77	B	445944.18	324975.73	10.00	90.07	0.00	0.00	0.40	100%			
78	B	445983.99	324975.78	10.00	90.07	0.00	0.00	0.40	100%			
79	B	446062.90	325031.51	10.00	292.00	0.00	0.00	0.40	100%			
80	B	446016.51	324988.63	10.00	112.00	0.00	0.00	0.40	100%			
81	B	446053.21	325004.58	10.00	112.00	0.00	0.00	0.40	100%			
82	B	445942.79	324837.44	10.00	356.87	0.00	0.00	0.40	100%			
83	B	445943.99	324859.32	10.00	356.87	0.00	0.00	0.40	100%			
84	B	445945.18	324881.20	10.00	356.87	0.00	0.00	0.40	100%			
85	B	446045.35	324906.39	10.00	87.08	0.00	0.00	0.90	100%			
86	B	445984.44	324838.45	10.00	176.96	0.00	0.00	0.40	100%			
87	B	445985.64	324860.95	10.00	176.96	0.00	0.00	0.40	100%			
88	B	445986.83	324883.46	10.00	176.96	0.00	0.00	0.40	100%			
89	B	446068.81	324905.19	10.00	87.08	0.00	0.00	0.90	100%			
90	B	446092.28	324904.00	10.00	87.08	0.00	0.00	0.90	100%			
91	B	446086.49	324940.24	10.00	266.77	0.00	0.00	0.40	100%			
92	B	446112.82	324938.76	10.00	266.77	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
93	B	446139.16	324937.28	10.00	266.77	0.00	0.00	0.40	100%			
94	B	445954.13	324907.97	10.00	287.64	0.00	0.00	0.40	100%			
95	B	445984.39	324917.60	10.00	287.64	0.00	0.00	0.40	100%			
96	B	446014.65	324927.22	10.00	287.64	0.00	0.00	0.40	100%			
97	B	446044.92	324936.84	10.00	287.64	0.00	0.00	0.40	100%			
98	B	446115.74	324902.80	10.00	87.08	0.00	0.00	0.90	100%			
99	B	446204.53	324834.52	10.00	85.00	0.00	0.00	0.40	100%			
100	B	446232.76	324830.76	8.00	88.00	0.00	0.00	0.40	100%			
101	B	446262.09	324824.30	8.00	89.00	0.00	0.00	0.40	100%			
102	B	446292.32	324823.12	8.00	88.00	0.00	0.00	0.40	100%			
103	B	446272.66	324860.02	10.00	267.52	0.00	0.00	0.90	100%			
104	B	446295.44	324859.04	10.00	267.52	0.00	0.00	0.90	100%			
105	B	446318.21	324858.05	10.00	267.52	0.00	0.00	0.90	100%			
106	B	446340.99	324857.07	10.00	267.52	0.00	0.00	0.90	100%			
107	B	446363.76	324856.08	10.00	267.52	0.00	0.00	0.90	100%			
108	B	446386.54	324855.09	10.00	267.52	0.00	0.00	0.90	100%			
109	B	446409.31	324854.11	10.00	267.52	0.00	0.00	0.90	100%			
110	B	446299.79	324808.58	10.00	87.70	0.00	0.00	0.40	100%			
111	B	446327.55	324807.47	10.00	87.70	0.00	0.00	0.40	100%			
112	B	446355.30	324806.35	10.00	87.70	0.00	0.00	0.40	100%			
113	B	446383.06	324805.24	10.00	87.70	0.00	0.00	0.40	100%			
114	B	446407.75	324803.89	10.00	87.14	0.00	0.00	0.40	100%			
115	B	446438.01	324802.37	10.00	87.14	0.00	0.00	0.40	100%			
116	B	446468.27	324800.86	10.00	87.14	0.00	0.00	0.40	100%			
117	B	446498.54	324799.35	10.00	87.14	0.00	0.00	0.40	100%			
118	B	446528.80	324797.83	10.00	87.14	0.00	0.00	0.40	100%			
119	B	446559.06	324796.32	10.00	87.14	0.00	0.00	0.40	100%			
120	B	446438.02	324853.45	10.00	267.58	0.00	0.00	0.90	100%			
121	B	446457.08	324852.65	10.00	267.58	0.00	0.00	0.90	100%			
122	B	446476.15	324851.84	10.00	267.58	0.00	0.00	0.90	100%			
123	B	446495.21	324851.04	10.00	267.58	0.00	0.00	0.90	100%			
124	B	446514.28	324850.24	10.00	267.58	0.00	0.00	0.90	100%			
125	B	446533.35	324849.43	10.00	267.58	0.00	0.00	0.90	100%			
126	B	446552.41	324848.63	10.00	267.58	0.00	0.00	0.90	100%			
127	B	446680.23	324696.42	10.00	87.12	0.00	0.00	0.90	100%			
128	B	446655.93	324697.64	10.00	87.12	0.00	0.00	0.90	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
129	B	446631.64	324698.86	10.00	87.12	0.00	0.00	0.90	100%			
130	B	446607.34	324700.08	10.00	87.12	0.00	0.00	0.90	100%			
131	B	446583.05	324701.30	10.00	87.12	0.00	0.00	0.90	100%			
132	B	446558.75	324702.52	10.00	87.12	0.00	0.00	0.90	100%			
133	B	446534.46	324703.74	10.00	87.12	0.00	0.00	0.90	100%			
134	B	446289.42	324715.86	10.00	87.14	0.00	0.00	0.90	100%			
135	B	446313.02	324714.69	10.00	87.14	0.00	0.00	0.90	100%			
136	B	446336.62	324713.51	10.00	87.14	0.00	0.00	0.90	100%			
137	B	446360.21	324712.33	10.00	87.14	0.00	0.00	0.90	100%			
138	B	446383.81	324711.15	10.00	87.14	0.00	0.00	0.90	100%			
139	B	446407.41	324709.98	10.00	87.14	0.00	0.00	0.90	100%			
140	B	446431.01	324708.80	10.00	87.14	0.00	0.00	0.90	100%			
141	B	446454.61	324707.62	10.00	87.14	0.00	0.00	0.90	100%			
142	B	446478.20	324706.44	10.00	87.14	0.00	0.00	0.90	100%			
143	B	446501.80	324705.27	10.00	87.14	0.00	0.00	0.90	100%			
144	B	446292.02	324767.60	10.00	267.12	0.00	0.00	0.40	100%			
145	B	446332.77	324765.55	10.00	267.12	0.00	0.00	0.40	100%			
146	B	446373.53	324763.50	10.00	267.12	0.00	0.00	0.40	100%			
147	B	446414.28	324761.45	10.00	267.12	0.00	0.00	0.40	100%			
148	B	446455.04	324759.40	10.00	267.12	0.00	0.00	0.40	100%			
149	B	446495.79	324757.34	10.00	267.12	0.00	0.00	0.40	100%			
150	B	446536.55	324755.29	10.00	267.12	0.00	0.00	0.40	100%			
151	B	446577.30	324753.24	10.00	267.12	0.00	0.00	0.40	100%			
152	B	446618.06	324751.19	10.00	267.12	0.00	0.00	0.40	100%			
153	B	446658.81	324749.14	10.00	267.12	0.00	0.00	0.40	100%			
154	B	446699.57	324747.09	10.00	267.12	0.00	0.00	0.40	100%			
155	B	446740.32	324745.04	10.00	267.12	0.00	0.00	0.40	100%			
156	B	446675.27	324508.54	10.00	357.19	0.00	0.00	0.90	100%			
157	B	446677.04	324544.62	10.00	357.19	0.00	0.00	0.90	100%			
158	B	446678.81	324580.71	10.00	357.19	0.00	0.00	0.90	100%			
159	B	446680.58	324616.79	10.00	357.19	0.00	0.00	0.90	100%			
160	B	446682.34	324652.87	10.00	357.19	0.00	0.00	0.90	100%			
161	B	446684.11	324688.95	10.00	357.19	0.00	0.00	0.90	100%			
162	B	446755.14	324718.91	10.00	176.46	0.00	0.00	0.40	100%			
163	B	446753.78	324696.91	10.00	176.46	0.00	0.00	0.40	100%			
164	B	446752.42	324674.90	10.00	176.46	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
165	B	446751.06	324652.90	10.00	176.46	0.00	0.00	0.40	100%			
166	B	446749.70	324630.90	10.00	176.46	0.00	0.00	0.40	100%			
167	B	446741.04	324611.70	10.00	152.31	0.00	0.00	0.90	100%			
168	B	446725.75	324582.57	10.00	152.31	0.00	0.00	0.90	100%			
169	B	446710.46	324553.43	10.00	152.31	0.00	0.00	0.90	100%			
170	B	446733.22	324688.33	10.00	178.00	0.00	0.00	0.40	100%			
171	B	446731.01	324640.76	10.00	176.00	0.00	0.00	0.40	100%			
172	B	446247.45	324755.32	10.00	270.00	0.00	0.00	0.40	100%			
173	B	446221.14	324733.23	10.00	86.00	0.00	0.00	0.40	100%			
174	B	446194.61	324757.89	10.00	268.00	0.00	0.00	0.40	100%			
175	B	446347.85	324520.93	10.00	267.29	0.00	0.00	0.90	100%			
176	B	446371.71	324519.80	10.00	267.29	0.00	0.00	0.90	100%			
177	B	446395.57	324518.67	10.00	267.29	0.00	0.00	0.90	100%			
178	B	446419.44	324517.54	10.00	267.29	0.00	0.00	0.90	100%			
179	B	446443.30	324516.41	10.00	267.29	0.00	0.00	0.90	100%			
180	B	446467.16	324515.29	10.00	267.29	0.00	0.00	0.90	100%			
181	B	446491.02	324514.16	10.00	267.29	0.00	0.00	0.90	100%			
182	B	446514.96	324512.95	10.00	267.28	0.00	0.00	0.90	100%			
183	B	446543.50	324511.59	10.00	267.28	0.00	0.00	0.90	100%			
184	B	446572.04	324510.24	10.00	267.28	0.00	0.00	0.90	100%			
185	B	446600.58	324508.88	10.00	267.28	0.00	0.00	0.90	100%			
186	B	446629.11	324507.53	10.00	267.28	0.00	0.00	0.90	100%			
187	B	446657.65	324506.18	10.00	267.28	0.00	0.00	0.90	100%			
188	B	446337.69	324470.87	10.00	87.24	0.00	0.00	0.40	100%			
189	B	446372.26	324469.20	10.00	87.24	0.00	0.00	0.40	100%			
190	B	446406.83	324467.53	10.00	87.24	0.00	0.00	0.40	100%			
191	B	446441.40	324465.86	10.00	87.24	0.00	0.00	0.40	100%			
192	B	446475.97	324464.19	10.00	87.24	0.00	0.00	0.40	100%			
193	B	446510.54	324462.53	10.00	87.24	0.00	0.00	0.40	100%			
194	B	446545.12	324460.86	10.00	87.24	0.00	0.00	0.40	100%			
195	B	446579.69	324459.19	10.00	87.24	0.00	0.00	0.40	100%			
196	B	446614.26	324457.52	10.00	87.24	0.00	0.00	0.40	100%			
197	B	446648.83	324455.85	10.00	87.24	0.00	0.00	0.40	100%			
198	B	446320.22	324522.65	10.00	271.00	0.00	0.00	0.40	100%			
199	B	445949.30	324642.16	10.00	266.81	0.00	0.00	0.40	100%			
200	B	445975.20	324640.72	10.00	266.81	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
201	B	446001.11	324639.28	10.00	266.81	0.00	0.00	0.40	100%			
202	B	446027.01	324637.83	10.00	266.81	0.00	0.00	0.40	100%			
203	B	446052.91	324636.39	10.00	266.81	0.00	0.00	0.40	100%			
204	B	446078.82	324634.95	10.00	266.81	0.00	0.00	0.40	100%			
205	B	446104.72	324633.51	10.00	266.81	0.00	0.00	0.40	100%			
206	B	445948.73	324591.54	10.00	86.90	0.00	0.00	0.40	100%			
207	B	445965.75	324590.61	10.00	86.90	0.00	0.00	0.40	100%			
208	B	445982.76	324589.69	10.00	86.90	0.00	0.00	0.40	100%			
209	B	445999.78	324588.77	10.00	86.90	0.00	0.00	0.40	100%			
210	B	446016.80	324587.85	10.00	86.90	0.00	0.00	0.40	100%			
211	B	446042.47	324586.43	10.00	86.99	0.00	0.00	0.90	100%			
212	B	446058.64	324585.58	10.00	86.99	0.00	0.00	0.90	100%			
213	B	446074.80	324584.73	10.00	86.99	0.00	0.00	0.90	100%			
214	B	446090.97	324583.88	10.00	86.99	0.00	0.00	0.90	100%			
215	B	446107.13	324583.03	10.00	86.99	0.00	0.00	0.90	100%			
216	B	446119.85	324618.03	10.00	262.00	0.00	0.00	0.40	100%			
217	B	445934.37	324713.23	10.00	266.80	0.00	0.00	0.90	100%			
218	B	445949.12	324712.40	10.00	266.80	0.00	0.00	0.90	100%			
219	B	445963.88	324711.58	10.00	266.80	0.00	0.00	0.90	100%			
220	B	445978.63	324710.75	10.00	266.80	0.00	0.00	0.90	100%			
221	B	445993.38	324709.93	10.00	266.80	0.00	0.00	0.90	100%			
222	B	446008.14	324709.10	10.00	266.80	0.00	0.00	0.90	100%			
223	B	446030.98	324707.52	10.00	267.36	0.00	0.00	0.90	100%			
224	B	446046.49	324706.80	10.00	267.36	0.00	0.00	0.90	100%			
225	B	446061.99	324706.09	10.00	267.36	0.00	0.00	0.90	100%			
226	B	446077.50	324705.38	10.00	267.36	0.00	0.00	0.90	100%			
227	B	446093.01	324704.66	10.00	267.36	0.00	0.00	0.90	100%			
228	B	445932.47	324663.10	10.00	86.76	0.00	0.00	0.40	100%			
229	B	445961.09	324661.48	10.00	86.76	0.00	0.00	0.40	100%			
230	B	445989.71	324659.86	10.00	86.76	0.00	0.00	0.40	100%			
231	B	446018.33	324658.24	10.00	86.76	0.00	0.00	0.40	100%			
232	B	446046.94	324656.63	10.00	86.76	0.00	0.00	0.40	100%			
233	B	446075.56	324655.01	10.00	86.76	0.00	0.00	0.40	100%			
234	B	446108.08	324650.88	10.00	90.00	0.00	0.00	0.40	100%			
235	C	446291.90	324523.77	8.00	270.00	0.00	0.00	0.40	100%			
236	C	446265.86	324525.05	8.00	264.00	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
237	C	446263.04	324540.83	8.00	177.00	0.00	0.00	0.40	100%			
238	C	446264.45	324571.18	8.00	182.00	0.00	0.00	0.40	100%			
239	C	446266.15	324602.81	8.00	180.00	0.00	0.00	0.40	100%			
240	C	446267.38	324631.23	8.00	174.00	0.00	0.00	0.40	100%			
241	C	446268.96	324661.32	8.00	180.00	0.00	0.00	0.40	100%			
242	C	446270.37	324690.97	8.00	181.00	0.00	0.00	0.40	100%			
243	C	446271.51	324713.93	8.00	182.00	0.00	0.00	0.40	100%			
1	C	446108.54	325238.47	8.00	175.00	5.00	0.00	0.40	100%			
2	C	446089.73	325220.02	8.00	6.00	5.00	0.00	0.40	100%			
3	C	446108.59	325200.97	8.00	181.00	5.00	0.00	0.40	100%			
4	C	446089.80	325175.73	8.00	359.00	5.00	0.00	0.40	100%			
5	C	446110.62	325150.90	8.00	188.00	5.00	0.00	0.40	100%			
6	C	446154.90	325103.44	8.00	231.00	0.00	0.00	0.40	100%			
7	C	446475.70	325381.92	8.00	178.00	0.00	0.00	0.40	100%			
8	C	446447.11	325382.67	8.00	352.00	0.00	0.00	0.40	100%			
9	C	446473.32	325340.89	8.00	168.00	0.00	0.00	0.40	100%			
10	C	446446.18	325354.00	8.00	335.00	0.00	0.00	0.40	100%			
11	C	446461.37	325301.73	8.00	158.00	0.00	0.00	0.40	100%			
12	C	446434.69	325310.16	8.00	339.00	0.00	0.00	0.40	100%			
13	C	446435.89	325262.01	8.00	137.00	0.00	0.00	0.40	100%			
14	C	446417.66	325280.36	8.00	322.00	0.00	0.00	0.40	100%			
15	C	446408.36	325234.43	8.00	139.00	0.00	0.00	0.40	100%			
16	C	446393.72	325253.19	8.00	317.00	0.00	0.00	0.40	100%			
17	C	446376.80	325202.78	8.00	136.00	0.00	0.00	0.40	100%			
18	C	446362.81	325218.64	8.00	319.00	0.00	0.00	0.40	100%			
19	C	446344.32	325170.98	8.00	139.00	0.00	0.00	0.40	100%			
20	C	446330.70	325183.36	8.00	317.00	0.00	0.00	0.40	100%			
21	C	446312.04	325139.04	8.00	132.00	0.00	0.00	0.40	100%			
22	C	446302.49	325154.85	8.00	311.00	0.00	0.00	0.40	100%			
23	C	446274.97	325111.58	8.00	123.00	0.00	0.00	0.40	100%			
24	C	446271.46	325130.49	8.00	302.00	0.00	0.00	0.40	100%			
25	C	446231.29	325088.53	8.00	119.00	0.00	0.00	0.40	100%			
26	C	446238.57	325111.63	8.00	293.00	0.00	0.00	0.40	100%			
27	C	446155.43	325046.35	8.00	113.00	0.00	0.00	0.40	100%			
28	C	446147.32	325061.58	8.00	293.00	0.00	0.00	0.40	100%			
29	C	446126.95	325037.21	8.00	118.00	0.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
30	C	446094.69	325023.03	8.00	119.00	0.00	0.00	0.40	100%			
31	C	446089.43	325044.47	8.00	285.00	0.00	0.00	0.40	100%			
32	E	446177.45	325018.69	8.00	5.00	0.00	0.00	0.40	100%			
33	E	446178.92	324985.24	8.00	4.00	0.00	0.00	0.40	100%			
34	E	446197.18	325003.60	8.00	180.00	0.00	0.00	0.40	100%			
35	E	446196.09	325032.36	8.00	180.00	0.00	0.00	0.40	100%			
36	E	446198.85	324962.48	8.00	180.00	0.00	0.00	0.40	100%			
37	E	446180.67	324944.17	8.00	4.00	0.00	0.00	0.40	100%			
38	E	446199.28	324926.27	8.00	175.00	0.00	0.00	0.40	100%			
39	E	446179.17	324905.45	8.00	356.00	0.00	0.00	0.40	100%			
40	E	446195.81	324885.50	8.00	180.00	0.00	0.00	0.40	100%			
41	E	446175.70	324873.91	8.00	359.00	0.00	0.00	0.40	100%			
42	E	446192.97	324856.87	8.00	180.00	0.00	0.00	0.40	100%			
43	E	446172.31	324834.72	8.00	0.00	0.00	0.00	0.40	100%			
44	E	446189.66	324817.60	8.00	176.00	0.00	0.00	0.40	100%			
45	E	446164.29	324755.16	8.00	350.00	0.00	0.00	0.40	100%			
46	E	446168.45	324797.18	8.00	359.00	0.00	0.00	0.40	100%			
47	E	446185.27	324773.06	8.00	180.00	0.00	0.00	0.40	100%			
48	E	446179.96	324726.91	8.00	176.00	0.00	0.00	0.40	100%			
49	E	446160.18	324712.71	8.00	356.00	0.00	0.00	0.40	100%			
50	E	446177.55	324694.67	8.00	174.00	0.00	0.00	0.40	100%			
51	C	446149.46	324673.08	8.00	281.00	0.00	0.00	0.40	100%			
52	C	446149.63	324646.15	8.00	75.00	0.00	0.00	0.40	100%			
53	C	446171.74	324650.46	8.00	180.00	0.00	0.00	0.40	100%			
54	E	446153.88	324632.21	8.00	356.00	0.00	0.00	0.40	100%			
55	E	446167.90	324610.75	8.00	178.00	0.00	0.00	0.40	100%			
56	E	446142.59	324616.75	8.00	266.00	0.00	0.00	0.40	100%			
57	E	446144.03	324592.69	8.00	82.00	0.00	0.00	0.40	100%			
58	E	446166.43	324586.88	8.00	180.00	0.00	0.00	0.40	100%			
59	E	446157.19	324680.68	8.00	359.00	0.00	0.00	0.40	100%			
60	C	446102.48	325124.01	8.00	34.00	5.00	0.00	0.40	100%			
61	C	446126.20	325100.43	8.00	49.00	5.00	0.00	0.40	100%			
62	C	446149.88	325076.84	8.00	359.00	5.00	0.00	0.40	100%			
63	C	446170.27	325044.41	8.00	56.00	5.00	0.00	0.40	100%			
64	C	446204.58	325057.65	8.00	164.00	5.00	0.00	0.40	100%			
65	C	446202.89	325101.23	8.00	276.00	5.00	0.00	0.40	100%			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Dimmed to	Target X	Target Y	Target Z
66	C	446214.54	325077.57	8.00	146.00	5.00	0.00	0.40	100%			
67	C	446174.80	325103.53	8.00	284.00	5.00	0.00	0.40	100%			

Illuminance (lux)

PHAR 001



Results

Eav	0.01
Emin	0.00
Emax	0.01
Emin/Emax	0.20
Emin/Eav	0.45

Illuminance (lux)

PHAR 004



Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PHAR 003

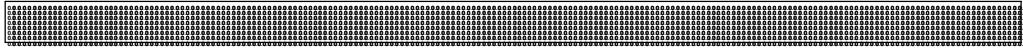


Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PSER 002



Results

Eav	0.01
Emin	0.00
Emax	0.02
Emin/Emax	0.08
Emin/Eav	0.22

Illuminance (lux)

PSER 002



Results

Eav	0.02
Emin	0.00
Emax	0.17
Emin/Emax	0.02
Emin/Eav	0.23

Illuminance (lux)

PHAR 002



Results

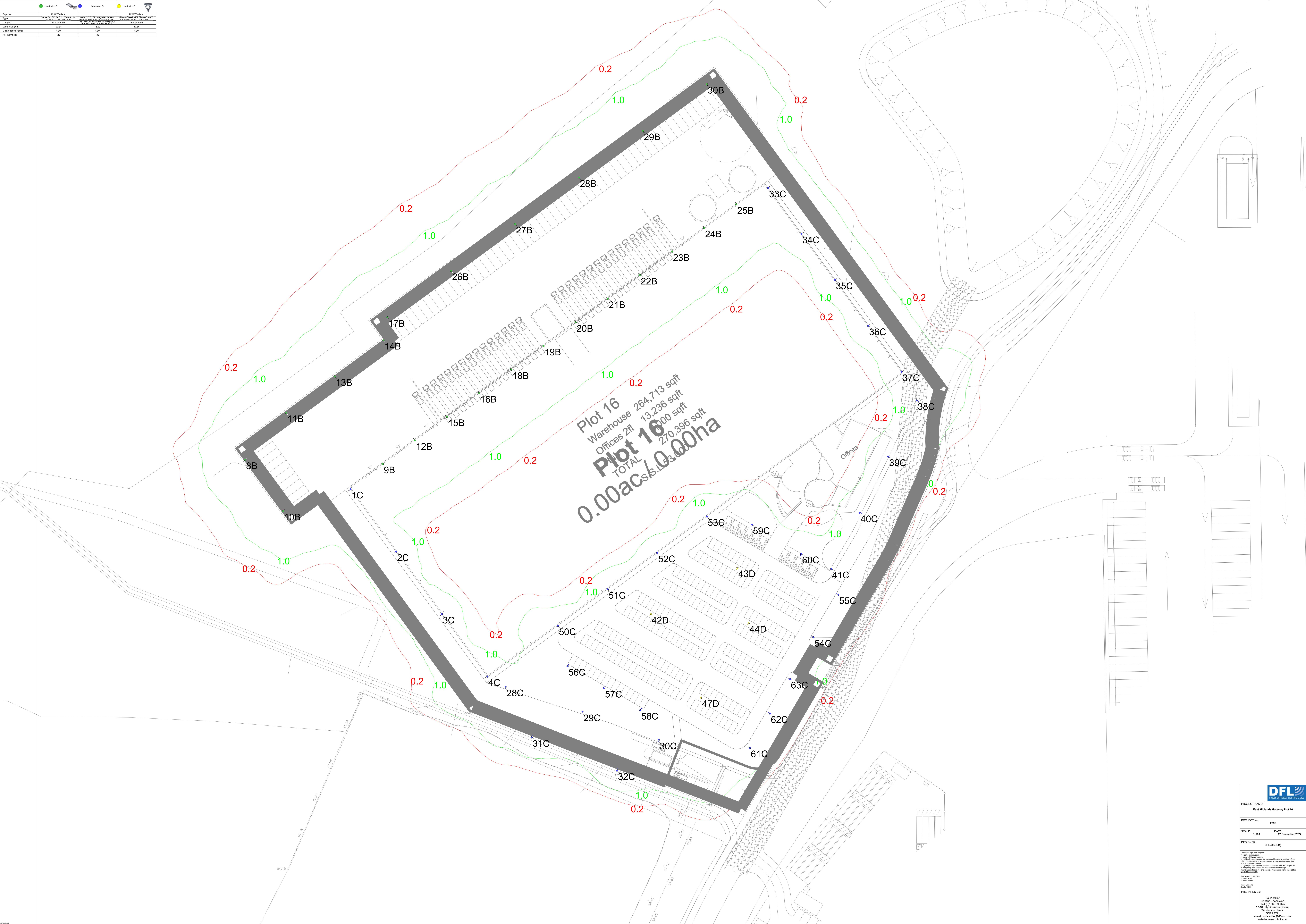
Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.37
Emin/Eav	0.55

3. EMG1 PLOT 16 OBTRUSIVE LIGHT CALCULATIONS

- 3.1.1. The following pages show the results of the obtrusive light calculations for EMG Plot 16.
- 3.1.2. This includes a Light Spill Diagram and Vertical Illuminance Calculations.

3.2. EMG1 Plot 16 Horizontal Light Spill Diagram

	 Luminare B	 Luminare C	 Luminare D
Supplier	D W Window	D W Window	D W Window
Size	36x42 LED 10000 LM SUG 42 0718 0000 330	36x42 LED 10000 LM SUG 42 0718 0000 330	36x42 LED 10000 LM SUG 42 0718 0000 330
Lamp	6x4 x LED	6x4 x LED	6x4 x LED
Power Flux (lm)	25.34	17.36	17.36
Maintenance Factor	1.00	1.00	1.00
No. in Project	23	32	4



3.3. EMG1 Plot 16 Vertical Illuminance Calculations

DATE: 17 December 2024
DESIGNER: DFL-UK (LM)
PROJECT No: 2398
PROJECT NAME: East Midlands Gateway Plot 16



This document shows the obtrusive light calculations for the sensitive receptors that have been identified in ES Chapter 11.

This document forms an appendix to ES Chapter 11 and therefore must be read in conjunction with this chapter.

All lighting calculations have been conducted using a maintenance factor of 1 and shows a reasonable worst case at the start of luminaire life.

2398-DFL-ELG-XX-CA-EO-13002

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Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1	446672.37	327162.45	560.58	440.89	2.24	1.76
2	PSER 004	446821.59	327276.34	150.10	12.00	1.49	1.50
3	PSER 005	446090.01	327385.01	1098.18	12.00	4.39	1.50
4	PHAR 007	446234.90	327813.29	831.71	12.00	3.33	1.50
5	PSER 003	447853.84	328113.46	319.62	12.00	1.28	1.50
6	PHAR 008	448070.02	327152.52	503.30	12.00	2.01	1.50

Luminaires



Luminaire B Data

Supplier	D W Windsor
Type	Sabre 64LED 3k C2 1000mA UMSUG 42 019 8 0000 100
Lamp(s)	64 x 3k LED
Lamp Flux (klm)	20.34
File Name	Sabre 64LED 3k C2_1000mA UMSUG 42 019 8 0000 100.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	853.5, 62.5, 0.0
No. in Project	23

Luminaire C Data

Supplier	
Type	AXIA 3.3 5267 Integrated lenses Rear louvers 48 OSLO SQUARE
Lamp(s)	48 OSLO SQUARE GIANT@400mA WW 73 0 230V 00-36-649
LampFlux(klm)/Colour	6.29 WW 3000K/70
File Name	AXIA 3.3 5267 48 OSLO SQUARE GIANT 4 00mA WW 730 57W 479482 Integrated lens...
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	1149.7, 130.7, 0.0
No. in Project	32



Luminaire D Data

Supplier	D W Windsor
Type	Milano Classic-16LED-3k-C3 800mA UMSUG 42 0148 0000 100
Lamp(s)	16 x 3k LED
Lamp Flux (klm)	17.36
File Name	Milano Classic-16LED-3k-C3_800mA UMSUG 42 0148 0000 100.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	336.0, 30.0, 2.0
No. in Project	4

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	C	446815.02	327370.55	8.00	216.14	0.00	0.00	0.90			
2	C	446835.79	327342.11	8.00	216.14	0.00	0.00	0.90			
3	C	446856.56	327313.67	8.00	216.14	0.00	0.00	0.90			
4	C	446877.33	327285.23	8.00	216.14	0.00	0.00	0.90			
8	B	446767.07	327383.87	8.00	36.51	0.00	0.00	0.90			

Layout Continued

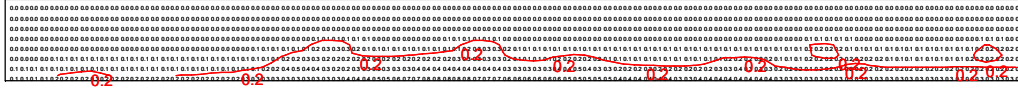
ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
9	B	446829.71	327381.96	10.00	126.29	5.00	0.00	0.90			
10	B	446784.32	327360.56	8.00	36.51	0.00	0.00	0.90			
11	B	446785.74	327405.28	8.00	306.73	0.00	0.00	0.90			
12	B	446844.34	327392.70	10.00	126.29	5.00	0.00	0.90			
13	B	446807.87	327421.79	8.00	306.73	0.00	0.00	0.90			
14	B	446830.01	327438.31	8.00	306.73	0.00	0.00	0.90			
15	B	446858.97	327403.44	10.00	126.29	5.00	0.00	0.90			
16	B	446873.60	327414.19	10.00	126.29	5.00	0.00	0.90			
17	B	446831.76	327448.70	8.00	306.12	0.00	0.00	0.90			
18	B	446888.23	327424.93	10.00	126.29	5.00	0.00	0.90			
19	B	446902.86	327435.67	10.00	126.29	5.00	0.00	0.90			
20	B	446917.48	327446.41	10.00	126.29	5.00	0.00	0.90			
21	B	446932.11	327457.16	10.00	126.29	5.00	0.00	0.90			
22	B	446946.74	327467.90	10.00	126.29	5.00	0.00	0.90			
23	B	446961.37	327478.64	10.00	126.29	5.00	0.00	0.90			
24	B	446976.00	327489.39	10.00	126.29	5.00	0.00	0.90			
25	B	446990.63	327500.13	10.00	126.29	5.00	0.00	0.90			
26	B	446860.84	327469.92	8.00	306.12	0.00	0.00	0.90			
27	B	446889.92	327491.14	8.00	306.12	0.00	0.00	0.90			
28	B	446919.00	327512.37	8.00	306.12	0.00	0.00	0.90			
29	B	446948.07	327533.59	8.00	306.12	0.00	0.00	0.90			
30	B	446977.15	327554.81	8.00	306.12	0.00	0.00	0.90			
28	C	446885.62	327280.51	8.00	250.50	5.00	0.00	0.40			
29	C	446920.60	327269.17	8.00	250.55	0.00	0.00	0.40			
30	C	446955.30	327256.39	8.00	250.50	5.00	0.00	0.40			
31	C	446897.44	327257.53	8.00	68.60	5.00	0.00	0.40			
32	C	446936.31	327242.43	8.00	68.60	5.00	0.00	0.40			
33	C	447005.09	327507.57	8.00	36.01	0.00	0.00	0.90			
34	C	447020.28	327486.66	8.00	36.01	0.00	0.00	0.90			
35	C	447035.48	327465.75	8.00	36.01	0.00	0.00	0.90			
36	C	447050.67	327444.84	8.00	36.01	0.00	0.00	0.90			
37	C	447065.86	327423.94	8.00	36.01	0.00	0.00	0.90			
38	C	447072.75	327410.88	8.00	-26.90	0.00	0.00	0.40			
39	C	447059.78	327385.31	8.00	-26.90	0.00	0.00	0.40			
40	C	447046.81	327359.74	8.00	-26.90	0.00	0.00	0.40			
41	C	447033.84	327334.17	8.00	-26.90	0.00	0.00	0.40			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
42	D	446951.70	327313.61	8.00	237.00	0.00	0.00	0.00			
43	D	446991.13	327334.72	8.00	236.00	0.00	0.00	0.00			
44	D	446996.23	327309.49	8.00	239.00	0.00	0.00	0.00			
47	D	446974.62	327275.64	8.00	65.00	0.00	0.00	0.00			
50	C	446909.44	327308.35	6.00	306.28	0.00	0.00	1.00			
51	C	446932.03	327324.94	6.00	306.28	0.00	0.00	1.00			
52	C	446954.63	327341.52	6.00	306.28	0.00	0.00	1.00			
53	C	446977.22	327358.10	6.00	306.28	0.00	0.00	1.00			
54	C	447025.71	327303.09	8.00	149.76	0.00	0.00	0.40			
55	C	447037.02	327322.49	8.00	149.76	0.00	0.00	0.40			
56	C	446913.81	327289.95	8.00	58.88	0.00	0.00	0.40			
57	C	446930.39	327279.94	8.00	58.88	0.00	0.00	0.40			
58	C	446946.96	327269.94	8.00	58.88	0.00	0.00	0.40			
59	C	446997.73	327354.33	8.00	238.00	0.00	0.00	0.40			
60	C	447020.19	327341.05	8.00	244.00	0.00	0.00	0.40			
61	C	446996.78	327252.79	8.00	149.66	0.00	0.00	0.40			
62	C	447005.93	327268.42	8.00	149.66	0.00	0.00	0.40			
63	C	447015.07	327284.05	8.00	149.66	0.00	0.00	0.40			

Illuminance (lux)

PSER 004



Results

Eav	0.11
Emin	0.00
Emax	0.79
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PSER 005



Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PHAR 007

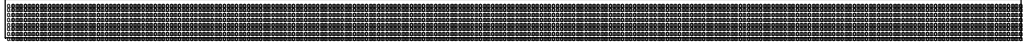


Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PSER 003



Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

Illuminance (lux)

PHAR 008



Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

TECHNICAL DESCRIPTIONS, DEFINITIONS & ABBREVIATIONS

Obtrusive Light: refers to excessive or bothersome artificial light that goes where it shouldn't, causing discomfort and disruption. *Spill light which because of quantitative, directional or spectral attributes in a given context gives rise to annoyance, discomfort, distraction or reduction in the ability to see essential information.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Sky glow: When lights are directed upwards or light is scattered by particles in the air, like dust or water droplets, it creates a glow that makes it hard to see stars. *The increase in diffuse illuminance of the night sky above that produced by natural sources such as the moon and visible star.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Vertical Illuminance: is how much light lands on upright surfaces like walls. It's measured in lux or footcandles and matters for places where the view from a vertical angle is important. *Lighting of vertical surfaces such as walls, windows, statues, sculptures and people's faces.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Correlated colour temperature (CCT): the appearance of light emitted by a light source measured in Kelvin (K), Lower CCT values such as 2700K represent warmer, more yellowish light, *similar to the light from older incandescent lamps. (Tcp)The temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions, measured in absolute temperature on the kelvin (K) scale.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Lux: measures the brightness of light as perceived by the human eye at a specific point on a surface. *The SI derived unit of illuminance, measuring luminous flux per unit area (1 lux = 1 lumen/m²).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Lumens: measure how bright a light appears to our eyes. *The SI derived unit of luminous flux; a measure of the total quantity of visible light emitted by a source or received by a surface (unit: lumen).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

Glare: refers to an excess of bright light that makes you uncomfortable or hinders your vision. It happens when there's a big difference between a bright light and the rest of the surroundings. *Glare: condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts.* [BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.1.8](#)

Luminous intensity: is light brightness or how intense the light source is. light intensity is how intense a light source is emitted or received in a particular direction, this is measured candelas and is termed as luminous intensity I_v <of a source, in a given direction> quotient of the luminous flux, $d\Phi_v$, leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle (unit: $cd = lm \cdot sr^{-1}$). BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

Candela: is a measurement for the brightness of a light source, taking into account the direction in which the light is emitted. Base unit of luminous intensity in the International System of Units (SI); the luminous power per unit solid angle emitted by a point light source in a particular direction. CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Uniformity (Uo): is an explanation for the even distribution of light across an area or surface. The overall uniformity shall be calculated as the ratio of the lowest luminance, occurring at any grid point in the field of calculation, to the average luminance. BS EN 13201-3-2015, Calculation of Performance Section 8.3.

Luminance: is how bright a surface appears to our eyes. It considers the light coming from or reflected by an object. L_v <in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula (unit: $cd \cdot m^{-2} = lm \cdot m^{-2} \cdot sr^{-1}$) BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.3.

Illuminance is how much light lands on a surface per square meter. It's measured in lux. More lux means a brighter area. E_v (unit: $lx = lm \cdot m^{-2}$) 1. <at a point of a surface> quotient of the luminous flux $d\Phi_v$ incident on an element of the surface containing the point, by the area dA of that element 2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.10.

Luminaire: a light fixture, this is also sometimes referred to as a lantern or a light fitting, is a product that produces artificial light. apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.3

ULOR: upward light output ratio or ULOR refers to the amount of light the light fixture will produce upwards as a percentage of its total light output. $RULO$ <of a luminaire> ratio of the upward luminous flux of the luminaire, measured under specified practical conditions with its own lamp(s) and equipment, to the sum of the individual luminous fluxes of the same lamp(s) when operated outside the luminaire with the same equipment, under specified conditions BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.12.

Maintenance factor (MF): is an allowance for how well the lights keep working overtime. It considers things like dirt on the light fittings and "wear and tear". DEPRECATED: light loss factor ratio of illuminance produced by the lighting installation after a certain period to the illuminance produced by the installation when new Note 1 to entry: The term depreciation factor has been formerly used to designate the reciprocal of the above ratio. Note 2 to entry: The maintenance factor takes into account light losses caused by dirt accumulation on luminaires and room surfaces (in interiors) or other relevant surfaces (in exteriors, where appropriate), and the decrease of the luminous flux of lamps. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.5.18.

Tilt: is how much the luminaire is lifted based on the fitting facing flat to the ground.

Outreach: how far away the fitting is from the column/wall its mounted on to the light source.

This isn't the end...

We don't just have the solution for what you need today. We also have the solutions you might need for the future. We have dedicated teams that deliver.

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- **Residential** teams that cover all aspects of new development and redevelopment spanning private, section 38 and section 278 design packages.
- **Public Realm** teams that are experts in enhancing night-time public spaces to create inviting spaces and opportunity for local economies to thrive during the hours of darkness.
- **Electrical** teams – we don't just put a light in the ground, we can help you get power to it as well! Additionally, we also offer design services for EV charging. As this market rapidly expands, make sure you have the experts managing the load, otherwise your EV charging solutions might not live up to expectations.
- **Strategic Infrastructure** teams that offer Lighting and Electrical expertise for complex transport networks and interchanges.
- **Consultancy Services** teams that help when you know what you want but you need someone to help you turn the idea into a project.

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