

DOCKETED

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Document Title:	Outdoor Legacy Luminaire Analysis - An Alternate Proposal to the Legacy Lumen Output Recommendation
Description:	This document analyzes the proposed threshold for backlight, upright and glare requirements, and proposes a higher threshold that accounts for lumen maintenance.
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Outdoor Legacy Luminaire Analysis - An Alternate Proposal to the Legacy Lumen Output Recommendation

3-19-2018

GOAL

To recommend an initial luminaire lumen value as the exception threshold for all outdoor luminaires for 2019 Standards.

INITIAL LUMENS VS MAINTAINED LUMENS

Definitions from IES LM-80:

LUMEN MAINTENANCE LIFE, the elapsed operating time at which the specific percentage of the lumen depreciation or lumen maintenance is reached, expressed in hours.

RATED LUMEN MAINTENANCE LIFE is measured in hours with associated percentage of light output. L₇₀ of 30,000 hours means that the tested LEDs produce 70% of the initial light output at 30,000 hours. L₇₀ of 60,000 hours means that the tested LEDs produce 70% of the initial light output at 60,000 hours.

ANALYSIS

Estimate the lumen output at the end of 15-year or 60,000 hr, which is the length of time for life cycle analysis for Title 24 nonresidential lighting measure.

General Hardscape LED Luminaire Reported Lumen Maintenance @60,000 hr

= 0.9 (from Table 101)

Specific Application LED Luminaire Reported Lumen Maintenance @60,000 hr

= 0.831 (from Table 103)

For LED Luminaires:

Outdoor LED Luminaire Reported Lumen Maintenance @60,000 hr

= Larger of the General Hardscape Reported Lumen Maintenance and Specific Application Reported Lumen Maintenance

= Larger of 0.9 and 0.831

= 0.9

(We use the larger of the two Reported Lumen Maintenance values as LED light sources have reported to produce usable light beyond 60,000 hr and many have reported 100,000 hour of reported life.)

Estimate the initial LED luminaire lumen output in the beginning:

Luminaire Lumen Time = 60,000 hr		Luminaire Lumen at Time = 0
5595 lm (from Table 1 of Addendum to CASE Report)	divide 5595 lm by 0.9 →	5595 lm / 0.9 = 6217 lm

For a maintained luminaire lumen of 5595 lm at 60000 hr for outdoor LED luminaires, the initial luminaire lumen is estimated to be 6217 lm, or rounded to be 6200 lm.

RECOMMENDATIONS

Based on the above, we propose for the initial luminaire lumens to be 6,200 lm in the 15 Day language.

REFERENCES

1. Table 101, General Hardscape LED Luminaire Reported Lumen Maintenance ¹
2. Table 103, Specific Application LED Luminaire Reported Lumen Maintenance ¹
3. Table 1 (Addendum), 150 Watt PSMH Luminaire Lumen Outputs ¹

¹ Table 101, Table 103 and Table 1 (Addendum) of the 2019 Statewide Utility CASE Team Outdoor Lighting Power Allowances Final Report, December 2017 (Addendum added).

Table 101: General Hardscape LED Luminaire

Luminaire ID	Reported Life	Reported Lumen Maintenance at 60,000hr
PL01	100,000	0.990
PL03	100,000	0.990
PL05	100,000	0.990
PL06	60,000	0.930
PL07	60,000	0.930
PL08	60,000	0.700
PL09	60,000	0.700
PL11	100,000	0.840
PL12	100,000	0.840
PL13	154,000	0.910
PL14	100,000	0.887
PL15	100,000	0.887
PL16	100,000	0.887
PL17	100,000	0.887
PL18	100,000	0.887
PL19	90,000	0.864
PL20	100,000	0.887
PL21	100,000	0.887
PL22	100,000	0.887
PL23	100,000	0.887
PL24	100,000	0.887
PL25	100,000	0.887
PL26	154,000	0.910
PL27	154,000	0.910
PL29	150,000	0.950
PL30	150,000	0.950
PL31	150,000	0.950
PL32	150,000	0.950
PL33	150,000	0.950
PL34	150,000	0.950
PL35	150,000	0.950
Average	111,032	0.900

Table 103: Specific Applications LED Luminaire Reported Life

Luminaire ID	Reported Life	Reported Lumen Maintenance at 60,000 hr	Luminaire ID	Reported Life	Reported Lumen Maintenance at 60,000 hr	Luminaire ID	Reported Life	Reported Lumen Maintenance at 60,000 hr
L001	100,000	0.960	L046	100,000	0.887	L091	60,000	0.800
L002	70,000	0.781	L047	100,000	0.887	L092	60,000	0.800
L003	70,000	0.781	L048	100,000	0.887	L093	100,000	0.900
L004	50,000	0.700	L049	100,000	0.950	L094	100,000	0.900
L005	50,000	0.700	L050	100,000	0.930	L095	50,000	0.700
L006	50,000	0.700	L051	60,000	0.700	L096	50,000	0.700
L007	50,000	0.700	L052	60,000	0.700	L097	60,000	0.700
L008	50,000	0.700	L053	60,000	0.700	L098	100,000	0.940
L009	50,000	0.700	L054	60,000	0.700	L099	60,000	0.700
L010	50,000	0.700	L055	60,000	0.700	L100	60,000	0.700
L011	50,000	0.700	L056	60,000	0.700	L101	100,000	0.960
L012	70,000	0.781	L057	60,000	0.700	L089	60,000	0.850
L013	60,000	0.700	L058	60,000	0.700	L103	100,000	0.900
L014	100,000	0.970	L059	60,000	0.700	L104	60,000	0.700
L015	205,000	0.900	L060	100,000	0.962	L105	60,000	0.700
L016	205,000	0.900	L061	100,000	0.962	L106	60,000	0.700
L017	205,000	0.900	L062	100,000	0.964	L107	60,000	0.700
L018	205,000	0.900	L063	100,000	0.964	L108	60,000	0.700
L019	205,000	0.900	L064	100,000	0.964	L109	60,000	0.700
L020	70,000	0.781	L065	100,000	0.959	L110	60,000	0.700
L021	70,000	0.781	L066	100,000	0.959	L111	60,000	0.700
L022	60,000	0.700	L067	60,000	0.700	L112	60,000	0.700
L023	100,000	0.970	L068	60,000	0.700	L113	60,000	0.700
L024	100,000	0.880	L069	100,000	0.940	L114	200,000	0.954
L025	100,000	0.880	L070	100,000	0.940	L115	200,000	0.954
L026	100,000	0.880	L071	100,000	0.940	L116	200,000	0.954
L027	70,000	0.781	L072	100,000	0.940	L117	200,000	0.954
L028	60,000	0.700	L073	100,000	0.940	L118	200,000	0.954
L029	60,000	0.700	L074	100,000	0.960	L119	200,000	0.954
L030	60,000	0.700	L075	100,000	0.960	L120	200,000	0.954
L031	60,000	0.700	L076	100,000	0.960	L121	200,000	0.954
L032	250,000	0.961	L077	100,000	0.960	L122	200,000	0.954
L033	250,000	0.961	L078	100,000	0.960	L123	200,000	0.954
L034	60,000	0.700	L079	100,000	0.960	L124	60,000	0.700
L035	60,000	0.700	L080	100,000	0.887	L125	60,000	0.700
L036	60,000	0.700	L081	50,000	0.700	L126	60,000	0.700
L037	150,000	0.938	L082	50,000	0.700	L127	60,000	0.700
L038	100,000	0.887	L083	50,000	0.700	L128	60,000	0.700
L039	100,000	0.960	L084	100,000	0.887	L129	100,000	0.960
L040	100,000	0.960	L085	100,000	0.887	L130	100,000	0.960
L041	100,000	0.880	L086	100,000	0.887	L131	70,000	0.781
L042	100,000	0.940	L087	60,000	0.850	L132	60,000	0.970
L043	100,000	0.880	L088	60,000	0.850	L133	60,000	0.970
L044	100,000	0.960	L089	60,000	0.850	L134	60,000	0.850
L045	100,000	0.887	L090	60,000	0.800	L135	60,000	0.850
						Average	93,000	0.831

Table 1: 150 Watt PSMH Luminaire Lumen Outputs

Luminaire Type	Lamp Wattage	Lamp Type	Initial Luminaire Luminous Flux (Lumens)	Maintained Luminaire Luminous Flux (Lumens)	BUG Rating⁵
Area Light	150	PSMH	10,616	7,855	3-1-3
Area Light	150	PSMH	7,703	5,700	2-0-1
Area Light	150	PSMH	10,173	7,527	2-0-2
Area Light	150	PSMH	6,749	4,994	1-0-2
Area Light	150	PSMH	11,055	8,180	2-1-2
Area Light	150	PSMH	6,775	5,013	1-0-2
Area Light	150	PSMH	9,517	7,042	3-0-3
Area Light	150	PSMH	8,483	6,277	2-0-2
Area Light	150	PSMH	8,906	6,590	2-2-2
Area Light	150	PSMH	6,886	5,095	2-2-2
Area Light	150	PSMH	6,675	4,939	2-0-1
Area Light	150	PSMH	8,192	6,061	2-0-2
Area Light	150	PSMH	8,255	6,108	2-2-2
Area Light	150	PSMH	6,558	4,852	1-2-2
Area Light	150	PSMH	5,401	3,996	1-0-2
Area Light	150	PSMH	7,691	5,691	2-0-2
Area Light	150	PSMH	8,092	5,987	2-2-2
Area Light	150	PSMH	6,052	4,478	1-2-2
Area Light	150	PSMH	4,972	3,679	1-0-2
Area Light	150	PSMH	9,147	6,768	3-0-1
Area Light	150	PSMH	8,972	6,639	3-2-1
Area Light	150	PSMH	9,187	6,798	3-0-3

Luminaire Type	Lamp Wattage	Lamp Type	Initial Luminaire Luminous Flux (Lumens)	Maintained Luminaire Luminous Flux (Lumens)	BUG Rating ⁵
Area Light	150	PSMH	6,296	4,659	1-0-1
Area Light	150	PSMH	9,916	7,337	2-0-2
Area Light	150	PSMH	7,134	5,279	2-0-2
Area Light	150	PSMH	6,703	4,960	1-0-2
Area Light	150	PSMH	9,869	7,302	3-0-1
Area Light	150	PSMH	9,033	6,684	3-0-1
Decorative Area	150	PSMH	10,462	7,741	2-0-2
Decorative Area	150	PSMH	6,563	4,856	2-0-2
Decorative Area	150	PSMH	9,329	6,903	2-0-2
Decorative Area	150	PSMH	6,656	4,925	2-0-2
Post Top	150	PSMH	4,602	3,405	1-0-1
Post Top	150	PSMH	8,784	6,499	2-0-2
Post Top	150	PSMH	5,848	4,327	1-0-1
Post Top	150	PSMH	7,023	5,196	1-0-1
Post Top	150	PSMH	8,556	6,331	2-0-2
Post Top	150	PSMH	9,419	6,969	3-0-3
Post Top	150	PSMH	5,812	4,300	3-0-1
Post Top	150	PSMH	5,426	4,015	2-4-1
Post Top	150	PSMH	7,648	5,659	2-5-2
Post Top	150	PSMH	5,021	3,715	3-0-3
Post Top	150	PSMH	3,247	2,403	1-0-1
Post Top	150	PSMH	6,704	4,960	3-3-3
Post Top	150	PSMH	3,320	2,457	0-3-1
Post Top	150	PSMH	6,323	4,679	3-5-3
Post Top	150	PSMH	4,056	3,001	0-4-2
Bollard	150	PSMH	2,832	2,095	1-3-2
Ceiling mounted	150	PSMH	5,813	4,301	2-3-2
Ceiling mounted	150	PSMH	6,693	4,952	3-0-1
Ceiling mounted	150	PSMH	6,999	5,179	3-0-1
Ceiling mounted	150	PSMH	5,519	4,084	3-0-0
Ceiling mounted	150	PSMH	5,483	4,057	3-0-0
Ceiling mounted	150	PSMH	7,319	5,415	3-0-1
Ceiling mounted	150	PSMH	6,821	5,047	3-0-1
Ceiling mounted	150	PSMH	8,855	6,552	3-3-3
Floodlight	150	PSMH	6,013	4,449	3-0-1
Floodlight	150	PSMH	10,000	7,399	4-0-1
Floodlight	150	PSMH	7,519	5,563	3-0-1
Floodlight	150	PSMH	11,289	8,353	4-0-2
Floodlight	150	PSMH	8,693	6,432	3-0-1
Floodlight	150	PSMH	6,899	5,105	3-0-1
Floodlight	150	Ceramic Metal Halide	8,788	6,502	4-1-1
Floodlight	150	Ceramic Metal Halide	8,756	6,479	4-1-1
Floodlight	150	Ceramic Metal Halide	5,610	4,151	UNKNOWN
Floodlight	150	Ceramic Metal Halide	9,624	7,121	4-1-0
Floodlight	150	Ceramic Metal Halide	9,569	7,080	UNKNOWN
Floodlight	150	Ceramic Metal Halide	6,625	4,902	4-1-1
Floodlight	150	Ceramic Metal Halide	8,951	6,623	4-1-1
Floodlight	150	Ceramic Metal Halide	7,824	5,789	4-1-1
Floodlight	150	Ceramic Metal Halide	6,527	4,829	UNKNOWN
Floodlight	150	Ceramic Metal Halide	8,838	6,539	UNKNOWN

Luminaire Type	Lamp Wattage	Lamp Type	Initial Luminaire Luminous Flux (Lumens)	Maintained Luminaire Luminous Flux (Lumens)	BUG Rating ⁵
Floodlight	150	Ceramic Metal Halide	6,111	4,522	4-0-0
Floodlight	150	Ceramic Metal Halide	10,231	7,570	UNKNOWN
Floodlight	150	Ceramic Metal Halide	6,464	4,783	UNKNOWN
Floodlight	150	PSMH	8,238	6,095	UNKNOWN
Floodlight	150	PSMH	9,627	7,123	UNKNOWN
Floodlight	150	PSMH	9,483	7,017	UNKNOWN
Floodlight	150	PSMH	8,312	6,150	UNKNOWN
Floodlight	150	PSMH	8,769	6,488	UNKNOWN
Floodlight	150	PSMH	8,546	6,323	UNKNOWN
Floodlight	150	PSMH	7,872	5,825	UNKNOWN
Wall mounted	150	PSMH	9,613	7,113	2-0-2
Wall mounted	150	PSMH	5,898	4,364	3-0-0
Wall mounted	150	PSMH	5,887	4,356	3-0-0
Average			7,561	5,595	