



Eco-Smart, Inc.

(888)329-2705 info@eco-smart.com www.eco-smart.com

Induction Lighting vs HID Lighting

Induction Lighting produces better light at lower operating temperatures and lower cost with 5 times the rated lamp life.

	Induction Lighting	Metal Halide	High Pressure Sodium
Watts- Electrical Usage	200w	400w	400w
Kelvin Temp	5000k	3700k	2100k
CRI	90+	65	22
Rated Lamp Life	100,000 hours	20,000 hours	21,000 hours
Fixture S/P Factor	1.96	1.26	0.76
Fixture Lumens - Photopic	20,500	28,800	40,800
Visual Acuity Lumens	40,180	36,288	31,008
Visual Acuity L/W (with ballas)	191	79	67
Operating Temperature	200° F	900° F	900° F
Annual Operating Cost*	\$183.96	\$478.21	\$477.46

*for comparison only, costs will vary.

Contact Eco-Smart for more information.

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Image	Description	Catalog #	Qty 1-39	Qty 40-99	Qty 100-199	Qty 200+
High Bay Fixtures						
	US Made Acrylic Induction High Bay Series: EHBUS-CC	EHBUS-CC-100w	\$365	\$355	\$345	\$325
		EHBUS-CC-120w	\$425	\$415	\$405	\$385
		EHBUS-CC-150w	\$430	\$420	\$410	\$390
		EHBUS-CC-200w	\$470	\$460	\$450	\$430
		EHBUS-CC-250w	\$500	\$490	\$480	\$460
		EHBUS-CC-300w	\$580	\$570	\$560	\$540
	US Made Interface Induction High Bay - Series: EHBUS-RC	EHBUS-RC-100w	\$385	\$375	\$365	\$345
		EHBUS-RC-120w	\$445	\$435	\$425	\$405
		EHBUS-RC-150w	\$450	\$440	\$430	\$410
		EHBUS-RC-200w	\$490	\$480	\$470	\$450
		EHBUS-RC-250w	\$520	\$510	\$500	\$480
		EHBUS-RC-300w	\$600	\$590	\$580	\$560
	US Made Aluminum Induction High Bay Series: EHBUS-AC	EHBUS-AC-100w	\$390	\$380	\$370	\$350
		EHBUS-AC-120w	\$425	\$415	\$405	\$385
		EHBUS-AC-150w	\$430	\$420	\$410	\$390
		EHBUS-AC-200w	\$480	\$470	\$460	\$440
		EHBUS-AC-250w	\$490	\$480	\$470	\$450
		EHBUS-AC-300w	\$560	\$550	\$540	\$520
	Acrylic Gum Drop Induction High Bay Series: EHB-GC	EHB-GC-150w	\$520	\$510	\$500	\$480
		EHB-GC-200w	\$540	\$530	\$520	\$500
		EHB-GC-250w	\$560	\$550	\$540	\$520
	IP 65 Enclosed Induction High Bay Series: EHB-ED	EHB-ED-70W	\$350	\$340	\$330	\$310
		EHB-ED-80W	\$370	\$360	\$350	\$330
		EHB-ED-100w	\$390	\$380	\$370	\$350
		EHB-ED-120w	\$425	\$415	\$405	\$385
		EHB-ED-150w	\$445	\$435	\$425	\$405
		EHB-ED-200w	\$505	\$495	\$485	\$465
		EHB-ED-250w	\$565	\$555	\$545	\$525
		EHB-ED-300w	\$600	\$590	\$580	\$560
		EHB-ED-400w	\$630	\$620	\$610	\$590
	Open Rectangular Induction High Bay Series: EHB-OD	EHB-OD-400w	\$530	\$520	\$510	\$490
Low Bay Fixtures						
	Induction Low Bay Fixture Series: ELBUS-LC	ELBUS-EC-100w	\$390	\$380	\$370	\$350
		ELBUS-EC-120w	\$425	\$415	\$405	\$385
		ELBUS-EC-150w	\$430	\$420	\$410	\$390
		ELBUS-EC-200w	\$480	\$470	\$460	\$440
		ELBUS-EC-250w	\$490	\$480	\$470	\$450
Parking Garage Fixtures						
	US Made Induction Parking Garage Series: EGFUS-EC	EGFUS-EC-40w	\$405	\$395	\$385	\$365
		EGFUS-EC-55w	\$445	\$435	\$425	\$405
		EGFUS-EC-70w	\$450	\$440	\$430	\$410
		EGFUS-EC-80w	\$455	\$445	\$435	\$415
		EGFUS-EC-100w	\$460	\$450	\$440	\$420
		EGFUS-EC-120w	\$550	\$540	\$530	\$510
	Bi-Level US Made Induction Garage Series: EGFUS-EC-xx-BL	EGFUS-EC-70w-BL	\$520	\$510	\$500	\$480
		EGFUS-EC-80w-BL	\$525	\$515	\$505	\$485
		EGFUS-EC-100w-BL	\$530	\$520	\$510	\$490
		EGFUS-EC-120w-BL	\$620	\$610	\$600	\$580
	Classic Induction Parking Garage Series:	EGF-EC-40w	\$390	\$380	\$370	\$350
		EGF-EC-55w	\$420	\$410	\$400	\$380












Image	Description	Catalog #	Qty 1-39	Qty 40-99	Qty 100-199	Qty 200+
	Classic Induction Parking Garage Series: EGF-EC	EGF-EC-70w	\$425	\$415	\$405	\$385
		EGF-EC-80w	\$430	\$420	\$410	\$390
		EGF-EC-100w	\$435	\$425	\$415	\$395
	Bi-Level Classic Induction Parking Garage Series: EGF-EC-XX-BL	EGF-EC-70w-BL	\$510	\$500	\$490	\$470
		EGF-EC-80w-BL	\$515	\$505	\$495	\$475
		EGF-EC-100w-BL	\$520	\$510	\$500	\$480
BioLume Garage Fixtures						
	BioLume Garage Fixture w/ 20w Amber LEDs -Series: BLGFUS-20A-EC	BLGFUS-20A-EC-40w	\$665	\$655	\$645	\$625
		BLGFUS-20A-EC-55w	\$720	\$710	\$700	\$680
		BLGFUS-20A-EC-70w	\$725	\$715	\$705	\$685
		BLGFUS-20A-EC-80w	\$730	\$720	\$710	\$690
		BLGFUS-20A-EC-100w	\$735	\$725	\$715	\$695
		BLGFUS-20A-EC-120w	\$785	\$775	\$765	\$745
	BioLume Garage Fixture w/ 20w Daylight LEDs Series: BLGFUS-20A-EC	BLGFUS-20D-EC-40w	\$665	\$655	\$645	\$625
		BLGFUS-20D-EC-55w	\$720	\$710	\$700	\$680
		BLGFUS-20D-EC-70w	\$725	\$715	\$705	\$685
		BLGFUS-20D-EC-80w	\$730	\$720	\$710	\$690
		BLGFUS-20D-EC-100w	\$735	\$725	\$715	\$695
		BLGFUS-20D-EC-120w	\$785	\$775	\$765	\$745
Wall Pack Fixtures						
	Semi Cut-Off Induction Wall Pack Series: EOF-ED	EOF-ED-40w	\$375	\$365	\$355	\$335
		EOF-ED-55w	\$410	\$400	\$390	\$370
		EOF-ED-70w	\$415	\$405	\$395	\$375
		EOF-ED-80w	\$420	\$410	\$400	\$380
		EOF-ED-100w	\$425	\$415	\$405	\$385
		EOF-ED-120w	\$455	\$445	\$435	\$415
		EOF-ED-150w	\$460	\$450	\$440	\$420
	Bi-Level Semi Cut-Off Induction Wall Pack Series: EOF-ED-XX-BL	EOF-ED-70w-BL	\$490	\$480	\$470	\$450
		EOF-ED-80w-BL	\$495	\$485	\$475	\$455
		EOF-ED-100w-BL	\$500	\$490	\$480	\$460
		EOF-ED-120w-BL	\$560	\$550	\$540	\$520
	Full Cut-Off Induction Wall Pack Series: EOF-ED	EOF-ED-40w	\$400	\$390	\$380	\$360
		EOF-ED-55w	\$435	\$425	\$415	\$395
		EOF-ED-70w	\$440	\$430	\$420	\$400
		EOF-ED-80w	\$445	\$435	\$425	\$405
		EOF-ED-100w	\$450	\$440	\$430	\$410
		EOF-ED-120w	\$510	\$500	\$490	\$470
		EOF-ED-150w	\$515	\$505	\$495	\$475
	Bi-Level Full Cut-Off Induction Wall Pack Series: EOF-ED-XX-BL	EOF-ED-70w-BL	\$525	\$515	\$505	\$485
		EOF-ED-80w-BL	\$530	\$520	\$510	\$490
		EOF-ED-100w-BL	\$535	\$525	\$515	\$495
US Made Induction Shoe Box Fixtures						
	US Made Induction Shoe Box Series: ESBUS-EC	ESBUS-EC-40w	\$390	\$380	\$370	\$350
		ESBUS-EC-55w	\$425	\$415	\$405	\$385
		ESBUS-EC-70w	\$430	\$420	\$410	\$390
		ESBUS-EC-80w	\$445	\$435	\$425	\$405
		ESBUS-EC-100w	\$450	\$440	\$430	\$410
		ESBUS-EC-120w	\$460	\$450	\$440	\$420
		ESBUS-EC-150w	\$555	\$545	\$535	\$515
	Bi-Level US Made Induction Shoe Box Fixture Series: ESBUS-EC-XX-BL	ESBUS-EC-70w-BL	\$515	\$505	\$495	\$475
		ESBUS-EC-80w-BL	\$525	\$515	\$505	\$485
		ESBUS-EC-100w-BL	\$535	\$525	\$515	\$495
		ESBUS-EC-120w-BL	\$545	\$535	\$525	\$505
Classic Parking Lot and Area Lights						
	Classic Rectangular Induction Shoe Box	ESB-ED-40w	\$370	\$360	\$350	\$330
		ESB-ED-55w	\$375	\$365	\$355	\$335





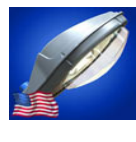

















Image	Description	Catalog #	Qty 1-39	Qty 40-99	Qty 100-199	Qty 200+
	Classic Rectangular Induction Shoe Box Series: ESB-ED	ESB-ED-70w	\$380	\$370	\$360	\$340
		ESB-ED-80w	\$385	\$375	\$365	\$345
		ESB-ED-100w	\$390	\$380	\$370	\$350
	Bi-Level Classic Rectangular Induction Shoe Box Series: ESB-ED	ESB-ED-70w-BL	\$460	\$450	\$440	\$420
		ESB-ED-80w-BL	\$470	\$460	\$450	\$430
		ESB-ED-100w-BL	\$480	\$470	\$460	\$440
	Classic Rectangular C Lamp Induction Shoe Box Series: ESB-EC	ESB-EC-150w	\$480	\$470	\$460	\$440
		ESB-EC-200w	\$520	\$510	\$500	\$480
		ESB-EC-250w	\$580	\$570	\$560	\$540
		ESB-EC-300w	\$605	\$595	\$585	\$565
US Made Induction Roadway Fixtures						
	US Made Type III Induction Cobra Head Series: ECHUS-EC	ECHUS-EC-40w	\$390	\$380	\$370	\$350
		ECHUS-EC-55w	\$425	\$415	\$405	\$385
		ECHUS-EC-70w	\$430	\$420	\$410	\$390
		ECHUS-EC-80w	\$445	\$435	\$425	\$405
		ECHUS-EC-100w	\$450	\$440	\$430	\$410
		ECHUS-EC-120w	\$480	\$470	\$460	\$440
	Bi-Level US Made Type III Induction Cobra Head Series: ECHUS-EC-XX-BL	ECHUS-EC-70w-BL	\$515	\$505	\$495	\$475
		ECHUS-EC-80w-BL	\$525	\$515	\$505	\$485
		ECHUS-EC-100w-BL	\$535	\$525	\$515	\$495
		ECHUS-EC-120w-BL	\$565	\$555	\$545	\$525
	Charlevoix - US Made Induction Cobra Head Series: ECHUS-EC	ECHCUS-EC-40w	\$505	\$495	\$485	\$465
		ECHCUS-EC-55w	\$515	\$505	\$495	\$475
		ECHCUS-EC-70w	\$520	\$510	\$500	\$480
		ECHCUS-EC-80w	\$525	\$515	\$505	\$485
		ECHCUS-EC-100w	\$530	\$520	\$510	\$490
		ECHCUS-EC-120w	\$535	\$525	\$515	\$495
	Bi-Level Charlevoix - US Made Induction Cobra Head Series: ECHUS-EC-XX-BL	ECHCUS-EC-70w-BL	\$605	\$595	\$585	\$565
		ECHCUS-EC-80w-BL	\$610	\$600	\$590	\$570
		ECHCUS-EC-100w-BL	\$615	\$605	\$595	\$575
		ECHCUS-EC-120w-BL	\$620	\$610	\$600	\$580
		ECHCUS-EC-150w-BL	\$650	\$640	\$630	\$610
Classic Roadway Fixtures						
	Classic Cobra Head Induction Roadway Series: ECH-EC	ECH-EC-40w	\$350	\$340	\$330	\$310
		ECH-EC-55w	\$380	\$370	\$360	\$340
		ECH-EC-70w	\$400	\$390	\$380	\$360
		ECH-EC-80w	\$410	\$400	\$390	\$370
	Classic Cobra Head Induction Roadway Series: ECH-ED	ECH-ED-100w	\$450	\$440	\$430	\$410
		ECH-ED-120w	\$480	\$470	\$460	\$440
		ECH-ED-150w	\$510	\$500	\$490	\$470
		ECH-ED-200w	\$555	\$545	\$535	\$515
		ECH-ED-250w	\$610	\$600	\$590	\$570
	Classic Cobra Head Induction Roadway Series: ECHBC-ED	ECHBC-ED-200w	\$640	\$630	\$620	\$600
		ECHBC-ED-250w	\$700	\$690	\$680	\$660
		ECHBC-ED-300w	\$730	\$720	\$710	\$690
		ECHBC-ED-350w	\$745	\$735	\$725	\$705
		ECHBC-ED-400w	\$755	\$745	\$735	\$715

Image	Description	Catalog #	Qty 1-39	Qty 40-99	Qty 100-199	Qty 200+
US Made Acorn Walkway Fixture						
	US Made Acorn Type III Acrylic Induction Walkway Series: EAWUS-EC-III	EAWUS-EC-AIII-40w	\$505	\$495	\$485	\$465
		EAWUS-EC-AIII-55w	\$530	\$520	\$510	\$490
		EAWUS-EC-AIII-70w	\$535	\$525	\$515	\$495
		EAWUS-EC-AIII-80w	\$550	\$540	\$530	\$510
		EAWUS-EC-AIII-100w	\$555	\$545	\$535	\$515
	US Made Acorn Type V Acrylic Induction Walkway Series: EAWUS-EC-V	EAWUS-EC-AV-40w	\$505	\$495	\$485	\$465
		EAWUS-EC-AV-55w	\$530	\$520	\$510	\$490
		EAWUS-EC-AV-70w	\$535	\$525	\$515	\$495
		EAWUS-EC-AV-80w	\$550	\$540	\$530	\$510
		EAWUS-EC-AV-100w	\$555	\$545	\$535	\$515
	US Made Acorn Type V Poly C Induction Walkway Series: EAWPUS-EC-III	EAWUS-EC-PV-40w	\$580	\$570	\$560	\$540
		EAWUS-EC-PV-55w	\$605	\$595	\$585	\$565
		EAWUS-EC-PV-70w	\$610	\$600	\$590	\$570
		EAWUS-EC-PV-80w	\$625	\$615	\$605	\$585
		EAWUS-EC-PV-100w	\$630	\$620	\$610	\$590
Induction Walkway Fixtures						
	Bell Fixture Induction Walkway Series: EBW-EC	EBW-EC-40w	\$375	\$365	\$355	\$335
		EBW-EC-55w	\$415	\$405	\$395	\$375
		EBW-EC-70w	\$420	\$410	\$400	\$380
		EBW-EC-80w	\$430	\$420	\$410	\$390
		EBW-EC-100w	\$440	\$430	\$420	\$400
	Decorative Fixture Induction Walkway Series: EDW-EC	EDW-EC-40w	\$460	\$450	\$440	\$420
		EDW-EC-55w	\$480	\$470	\$460	\$440
		EDW-EC-70w	\$490	\$480	\$470	\$450
		EDW-EC-80w	\$500	\$490	\$480	\$460
		EDW-EC-100w	\$510	\$500	\$490	\$470
	Modern Fixture Induction Walkway Series: EMW-EC	EMW-EC-40w	\$460	\$450	\$440	\$420
		EMW-EC-55w	\$480	\$470	\$460	\$440
		EMW-EC-70w	\$490	\$480	\$470	\$450
		EMW-EC-80w	\$500	\$490	\$480	\$460
		EMW-EC-100w	\$510	\$500	\$490	\$470
	Pendant Fixture Induction Walkway Series: EPW-EC	EPW-EC-40w	\$465	\$455	\$445	\$425
		EPW-EC-55w	\$485	\$475	\$465	\$445
		EPW-EC-70w	\$495	\$485	\$475	\$455
		EPW-EC-80w	\$505	\$495	\$485	\$465
		EPW-EC-100w	\$515	\$505	\$495	\$475
	Contemporary Fixture Induction Walkway Series: ELW-EC	ELW-EC-40w	\$505	\$495	\$485	\$465
		ELW-EC-55w	\$525	\$515	\$505	\$485
		ELW-EC-70w	\$535	\$525	\$515	\$495
		ELW-EC-80w	\$545	\$535	\$525	\$505
		ELW-EC-100w	\$555	\$545	\$535	\$515
Induction Flood / Area Fixtures						
	Induction Flood Light Series: EFL-ED	EFL-ED-70w	\$380	\$370	\$360	\$340
		EFL-ED-80w	\$385	\$375	\$365	\$345
		EFL-ED-100w	\$390	\$380	\$370	\$350
	Induction Flood Light Series: EFL-ED	EFL-ED-120w	\$435	\$425	\$415	\$395
		EFL-ED-150w	\$440	\$430	\$420	\$400
		EFL-ED-200w	\$500	\$490	\$480	\$460
	Induction Spot Light Series: ESF-EC	ESF-EC-150w	\$480	\$470	\$460	\$440
		ESF-EC-200w	\$520	\$510	\$500	\$480
		ESF-EC-250W	\$560	\$550	\$540	\$520

|  | **EBF-EC-40w** | \$300 | \$290 | \$280 | \$260 |

Image	Description	Catalog #	Qty 1-39	Qty 40-99	Qty 100-199	Qty 200+
	Induction Barn Fixture Series: EBF-EC	EBF-EC-55w	\$310	\$300	\$290	\$270
		EBF-EC-70w	\$315	\$305	\$295	\$275
		EBF-EC-80w	\$320	\$310	\$300	\$280
		EBF-EC-100w	\$325	\$315	\$305	\$285
Induction Canopy/Freezer Fixtures						
	Induction Canopy/Freezer Series: EGS-ED	EGS-ED-70w	\$420	\$410	\$400	\$380
		EGS-ED-80w	\$425	\$415	\$405	\$385
		EGS-ED-100w	\$430	\$420	\$410	\$390
		EGS-ED-120w	\$440	\$430	\$420	\$400
		EGS-ED-150w	\$450	\$440	\$430	\$410

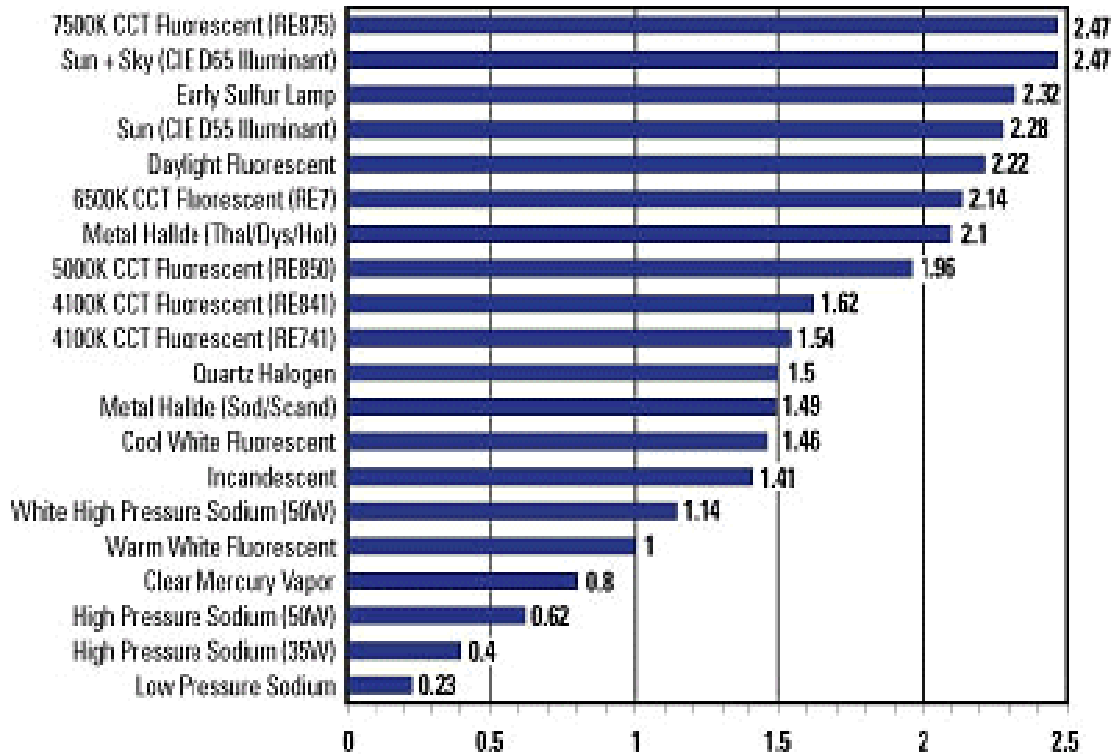
Accessories

Model #	Price	Description	Applicable Fixtures
Dawn to dusk photocell			
A-105	\$15.00	Button Photocell for fixtures operating at 120v	EOF, EGF, EAWUS, EFL-100W
A-1068	\$15.00	Button Photocell for fixtures operating at 208v - 277v	EOF, EGF, EAWUS, EFL-100W
A-105 EFL-ED-150	\$35.00	Button Photocell for EFL-ED-150W operating at 120v	EFL-ED-150W
A-1068 EFL-ED-150	\$35.00	Button Photocell for EFL-ED-150W operating on 208v - 277v	EFL-ED-150W
Twistlock Photocell	\$12.00	Twist lock photocell	ESB & ESBUS (all wattages)
24v Photocell ECH			
24v Photocell ECH	\$29.00	24v Low Voltage Photocell	ECH-DC (all wattages)
24v Photocell ECHUS	\$40.00	24v Photocell	ECHUS-DC (all wattages)
Power Supply			
FSS5-15	\$8.00	Standard 3 prong 120-277v 6'cord	Any fixture
FSSL5-15P	\$10.00	NEMA L5-15 120v twist lock 6'	
FSSL6-30P	\$19.00	NEMA L6-30 240v twist lock 6'	
FSSL7-15P	\$10.00	NEMA L7-15 277v twist lock 6'	
Wireguard			
EHB-AC-22WG	\$39.00	22" Circular Wire Guard	EHBUS-AC-150, 200, 250
ULHBT5WG4	\$22.50	Rectangular Wire Guard	EHB-ED/OD-400w
EOFWG	\$19.00	Wall Pack Wire Guard	EOF all wattages
EGFWG	\$27.00	Garage Fixture Wire Guard	EGF all wattage
HB Wire Guard	\$170.00	Wire Guard for High Bay fixture "bird cage"	EHBUS-AC, EHBUS-CC, EHBUS-RC all wattages
Vandal shield			
EOFVS	\$29.00	Wall pack vandalism shield	EOF all wattages
Smart Light On/Off Occupancy Sensor			
FSS-355-FSL2	\$49.00	Smart Light On/Off Occupancy Sensor below 15'	ECH, ECHUS, ESB, ESBUS, EOF, EGF, EFL, (all wattages)
FSS-355-FSL3	\$49.00	Smart Light On/Off Occupancy Sensor above 15'	
Smart Light Bi-Level Occupancy Sensor			
FSS-305-FSPPV2-FSL2	\$75.00	Smart Light Bi Level On/Off Occupancy Sensor below 15'	EGF-70 & 100W-BL, ECH & ECHUS 70-150W-BL, ESB, ESBUS 70-120W-BL, EOF 70 & 100W-BL
FSS-305-FSPPV2-FSL3	\$75.00	Smart Light Bi Level On/Off Occupancy Sensor above 15'	
Polycarbonate Lens			
ECHUSPCL	contact for pricing	US-Cobra optional polycarbonate lens	ECHUS all wattages
ESBUSPCL	contact for pricing	US Shoebox optional polycarbonate lens	ESBUS all wattages
480v Transformer 1-99 pcs / 100+ pcs			
74120	\$36.00 / \$32.00	GE 480v Transformer	40, 55, 70, 100, 120, 150, 200, 250w fixtures
DON500500134	\$120.00 / \$95.00	Dongan 50-0500-134 480v Transformer	300w fixtures
DON500750134	\$167.00 / \$132.00	Dongan 50-0750-134 480v Transformer	400w fixtures
High Bay 480V Transformer			
480v HB	\$80.00	480v Tranformer & Box for High Bay Fixtures	EHBUS-AC, EHBUS-CC, EHBUS-RC all wattages
Acorn Walkway Light Lids and Finial			
EAPW-LLS	\$30.00	Solid Light Lid	EAWUS & EWPUS
EAPW-LLP	\$40.00	Perforated Light Lid	EAWUS & EWPUS
EAPW-FF	\$12.00	Flame Finial	EAWUS & EWPUS
EAPW-FS	\$12.00	Spike Finial	EAWUS & EWPUS

Mounting Hardware Price List

Model #	Price	Description	Applicable Fixtures
EMH-KSF 	\$53.33	Knuckle Slip Fitter, 2 1/2" OD	ESB-EC Series
EMH-JB-R 	\$46.67	6" Straight Surface Mount To Round Pole	ESB Series
EMH-JB-S 	\$46.67	6" Straight Surface Mount To Square Pole	ESB Series
EMH-JB-R-US 	\$46.67	6" Straight Surface Mount to Round Pole	ESBUS Series
EMH-JB-S-US 	\$46.67	6" Straight Surface Mount to Square Pole	ESBUS Series
EMH-KSM-R 	\$53.33	Knuckle Surface Mount to Round Pole	ESB-EC Series
EMH-KSM-S 	\$53.33	Knuckle Surface Mount to Square Pole	ESB-EC Series
EMH-SSM-CH 	\$80.00	Straight Surface Mount with extension arm, 2.5" OD	ECH series ECHUS series ECHCUS series
EMH-CCH 	\$33.33	2" Cobra Coupler	ECHUS series

Range of S/P Ratios



Commercially available light sources are available in a range of Scotopic/Photopic (S/P) ratios, but these are often not published by manufacturers, making it difficult for engineers and designers to make use of this performance parameter. Fig. 3

Apply the ratio to the foot candles on the ground for mean visual acuity - the human eye.

Chart and reference by Dr. Sam Berman

Dr. Sam Berman is presently senior scientist emeritus at the Lawrence Berkeley National Laboratory (LBNL). He was the originator and the first leader of the lighting research program. Before joining LBNL, he was professor of physics at Stanford University, where he was a member of the team that founded the Stanford Linear Accelerator.

Application 1.

Ambient lighting also provides task lighting, and Visual performance is important.

In this case, the lighting should be judged on the basis of achieving the clearest vision. Research has determined that the relevant photometric factor is the equivalent pupil luminance or illuminance which is given by the quantity $P[(S/P)^{0.78}]$, where P is the photopic amount and the exponent (0.78) of the S/P value has been determined empirically in laboratory studies. Consider the comparison of two T8, 32-watt (W) readily available fluorescent lamps costing about the same and with the same color rendering index (CRI) of 85. For this example, lamp A would have a correlated color temperature (CCT) of 3500 Kelvin (K), and 2950 initial rated (photopic) lumens. Lamp B would have CCT of 5000K and 2800 initial rated (photopic) lumens. The choice of lamp is generally made on grounds of luminous efficacy, which favors lamp A. On the basis of the new findings it is the visually effective lumens that should be compared, which means multiplying the photopic lumens by the factor $(S/P)^{0.78}$.

The S/P value for the lamp A is $S/P = 1.4$; for lamp B, $S/P = 1.9$. As a result, lamp B produces more visually effective lumens than lamp A (4619 for lamp B, 3835 for lamp A). In other words, lamp B is 20% more visually effective per watt than lamp A, just the opposite of current wisdom.

Barriers to Application?

It has been more than 13 years since the first studies demonstrating significant rod activity at typical interior light levels along with arguments for major consequences in lighting practice, were published in the Journal of the IES. Since then over a dozen papers have been published and many presentations have been made at national and international venues. Except for a few lighting retrofit companies that have adopted the new findings, there is a noticeable lack of mention of these results by the mainstream lighting community. Even a basic property of lamps, namely their S/P value, is absent from the lamp industry catalogues.

Why? Perhaps there is great difficulty in accepting a substantial and sometimes nearly radical change from what has been the standard practice for the entire past century, even though this change is supported by solid scientific evidence. Witness the dramatic example of the computer environment where the relevant photometric quantity needs to shift from photopic to scotopic illuminance.

What is even more surprising is the total absence of any attempts by the small lighting research community to replicate and independently confirm or deny the findings. In other scientific areas there is usually a mad rush to replicate, disprove, or confirm a new and revolutionary result. The only response from this lighting research community has been to either ignore the new results or to claim they are irrelevant.

Vision scientists have given names to the cone and rod sensitivity functions, which are referred to as photopic and scotopic responses. The new research findings explain how to put these together to yield a valid measure of brightness for the full scene viewing of lighting practice. One might think that it would take two light meters to achieve the evaluation, but in many lighting applications the traditional light meter can be used if an additional property of the lighting is known.

For any light source or any lighting that has a stable and approximately constant color temperature, the ratio of scotopic to photopic output is a fixed constant independent of intensity, which can be measured with instruments and can be supplied by the lamp manufacturer. Once this ratio is known, a scotopic value can be determined simply by multiplying the known ratio by the measured or given photopic value. The specific ratio is noted as the quantity S/P where S is the scotopic measure and P is the analogous photopic measure. The new research explains that brightness perception is simply correlated to the value $(S/P)^{0.78}$ rather than just P alone. See attached energy user news as a reference.

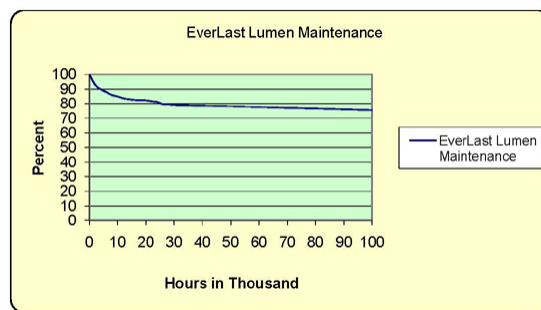
An example will illustrate the simplicity and usefulness of the new research findings. Consider a comparison between two lamps: A low color temperature (HPS) 2100k, and in comparison to the cooler Induction lamp which has a color temperature of 5000k in this case. The S/P ratio for the 2100k lamp is given by a lamp catalogue value of 0.57 while the value measured for the Induction lamp is 2.10. Thus, the two lamps when lighting the same scene will yield an equal sensation of brightness with the regular HPS street light photopic illuminance of the 2100k lamp needing to be about 38% higher than the photopic illuminance of the Induction lamp.

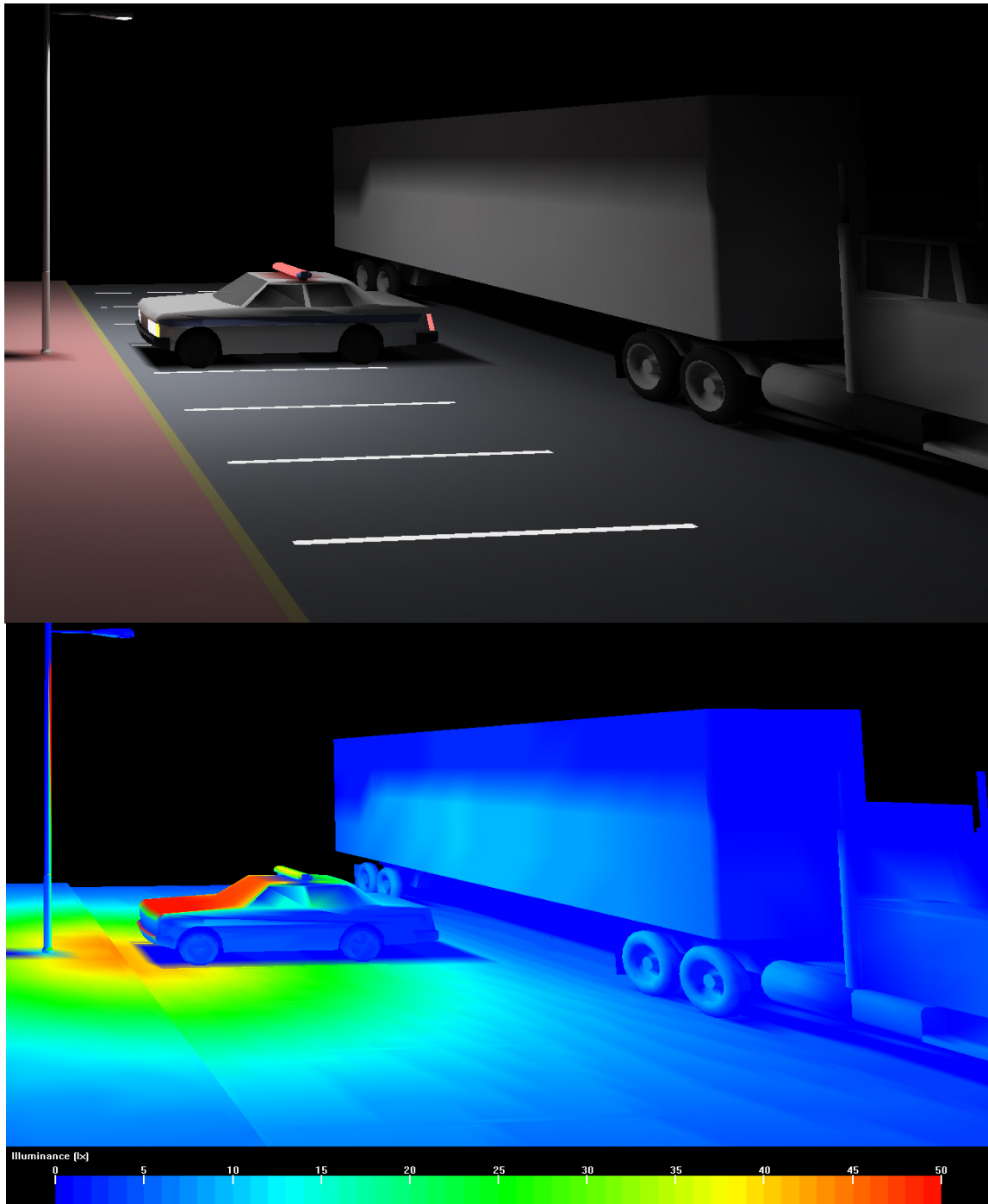
That value is obtained by computing the ratio [20,212 Scotopic lumen of Induction lamp by 14,592 lumen of HPS lamp] or in this case the Induction is 38% more visually effective per watt than HPS and or after 10,000 hours lumen depreciation this would reach larger differences which employs the rule given above as specified by the research findings. See simulation results utilizing various fixture and induction lights

	Fixture Performanc	Photopic Lumens (Mean Lumens)	Scotopic/Photopic	Scotopic Lumens (Pupil	Lumen Depreciation at	Net Pupil Lumens at 10,000 hrs	Net Usable Illuminance at 10,000
HPS 250watt w/ prismatic lens.	78%	25,600	0.57	25,600 x 0.57 = 14,592	32%	9,721	9,721 x 78 = 7582
Everlast 100watt Cobra with clear lens.	94%	9,625	2.10	9,625 x 2.1 = 20,212	14%	17,382	17,382 x .94 = 16,339



Induction Lamp





Simulation Results using the Induction Lamps