

# UC Berkeley

## Planning & Evaluation

### Title

Expanding PIER Partnerships: New Concepts for Development and Demonstration

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**Expanding PIER Partnerships:  
New Concepts for Development  
and Demonstration**

**Task 2 – National Guard Audit  
and Recommendations**



**PROJECT DATE**



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## **ABOUT CLTC**

California Lighting Technology Center's mission is to stimulate the development and application of energy-efficient lighting by conducting technology development and demonstrations, outreach and educational activities, in partnership with lighting manufacturers, lighting professionals, the electric utility community, and governmental agencies. CLTC was established as a collaborative effort between the California Energy Commission and UC Davis, with support by the U.S. Department of Energy and the National Electrical Manufacturers Association (NEMA).

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## 1.0 INTRODUCTION

The purpose of this contract was to help develop and expand Public Interested Energy Research (PIER) partnerships. The task related to this report was the expanded development and support of an energy efficiency lighting partnership between PIER and the California National Guard (CNG). Project goals focused on identification and development of a portfolio of standardized lighting retrofit measures which could be replicated at other CNG facilities. This report documents a basic framework of typical lighting applications and technologies, which are expected to be found at facilities throughout the CNG. Baseline and retrofit technologies are based on audits conducted at the Stockton Complex. The Stockton Complex (armory, organizational maintenance shop, combined support maintenance shop, and Army aviation support facility) of the California Army National Guard (CANG) was constructed in phases from the 1950s through the 1980s. The site is situated on a 55-acre parcel for all assigned units and operations. Buildings and infrastructure have undergone minimal retrofit or renovations, which is consistent with other Guard facilities across the State.

## 2.0 LIGHTING AUDIT AND RECOMMENDATIONS – CNG STOCKTON COMPLEX

CLTC staff conducted two site visits to the CNG Stockton Complex during 2010. Both visits consisted of facility tours and discussions with site personnel to identify and quantify baseline lighting technologies, energy use, and operating and maintenance schedules. Following these visits, CNG provided project staff with several sets of lighting plans for buildings at the Stockton Complex. From these plans, CLTC developed a portfolio of simple, energy-efficient lighting retrofit measures that could be replicated statewide. In some areas, minor lighting-efficiency retrofit projects had been completed but were undocumented. Therefore, alternates are available based on documented, as well as observed, lighting baselines. The following measures should be used as a starting point for forthcoming lighting energy-efficiency projects at the CNG. Future measures and associated energy and cost savings may be expanded from these initial concepts.

### 2.1 SUSPENDED HIGH BAY LUMINAIRES

The California National Guard is home to multiple aircraft support facilities. Facilities at the Stockton complex include one primary hangar, the Army Aviation Support Facility (AASF), which serves as a primary work area for aircraft and vehicle maintenance. A smaller hangar area located at the combined support maintenance shop (CSMS) has been converted into a gymnasium. Lighting for these areas is representative of similar facilities throughout the state. Primary lighting consists of suspended HID high bay luminaires, which operate continuously, regardless of occupancy or available daylight.



**Figure 1: Incumbent high bay luminaires – main hanger (left) and work bay (right).**

**2.1.1 EXISTING CONDITIONS**

Incumbent high bay luminaires consist of 400 watt (W) metal halide (MH) fixtures in the main hangar bay of the AASF facility, and 250W high pressure sodium (HPS) luminaires in the work bay of the CSMS facility. The total system wattage for the MH fixtures is 458W, and 295W for the HPS fixtures. Both types of luminaires use magnetic ballasts and are pendant mounted. Forty-eight of the MH fixtures are installed in the main hangar bay, and 45 HPS luminaires are installed in the work bay.

Photometric models indicate these spaces are well lit, with an average horizontal illuminance of 47 footcandles (fc) at floor level. Other illuminance metrics can be found in Table 1. Appendix A contains photometric models of existing and proposed lighting for the AASF hangar.

**Table 1: Illuminance metrics for the incumbent lighting system in the main hangar of the AASF facility.**

Space	Average	Max	Min	Uniformity
Main Hangar Floor	46.93	54.1	26.9	1.74

**2.1.2 RECOMMENDED RETROFIT**

The recommended replacements for these luminaires consist of fluorescent high bay luminaires coupled with tubular daylighting devices, where appropriate. The CSMS work bay retrofit would consist of one-to-one replacements of existing HID high bays with fluorescent high bay luminaires. These fixtures use four 4' T8 lamps per luminaire, powered by two energy-efficient electronic ballasts with a ballast factor (BF) of 0.88. Each luminaire consumes 126 W.



**Figure 2: Fluorescent high bay luminaire. Photos are courtesy of Lithonia.com.**

The lighting system recommended for the main hangar of the AASF consists of a combination of high bay fluorescent luminaires and tubular daylighting devices (TDD) manufactured by Orion Lighting. This combination of photo-controlled luminaires and TDDs provides the maximum amount of energy-free sunlight while also providing high bay fluorescent lighting to supplement cloudy days and evenings.

By replacing the existing luminaires with the recommended T5HO luminaires, CLTC was able to model the hangar during night hours by negating the contribution of the TDDs. Compared to the incumbent lighting system, the average illuminance was reduced by approximately 7 fc; however, the minimum illuminance stayed the same and the uniformity ratio was reduced. This lighting reduction would reduce overhead glare. Table 2 outlines the various illuminance metrics and compares the incumbent lighting system with the proposed lighting system.

**Table 2: Illuminance metrics comparing the existing lighting system and the proposed lighting system in the main hangar during night hours.**

Lighting System	Average	Max	Min	Uniformity
Incumbent	46.93	54.1	26.9	1.74
Retrofit	39.31	45	26.9	1.46

## 2.2 RECESSED AND SUSPENDED TROFFER LUMINAIRES

Recessed and suspended fluorescent troffer luminaires are located throughout the base. These luminaires are used in offices and most secondary support areas such as corridors, break rooms, and storage rooms. Many lamp burnouts were observed, as well as various color temperature lamps. Fluorescent troffers serve as one of the main luminaires used in office spaces with drop ceilings and as such a representative of office spaces at all National Guard bases. Luminaires consist of a combination of T8 and T12 linear fluorescent units due to undocumented retrofits of the energy inefficient T12 luminaires. These undocumented retrofits are represented in the lighting audit and recommendations as the alternative luminaire type.

### 2.2.1 EXISTING CONDITIONS

Incumbent recessed fluorescent luminaires are located throughout the base. These luminaires use either T12 lamps and magnetic rapid-start ballasts or T8 instant-start ballasts with a 0.88 BF. These troffers use two to four lamps depending on setup and location. Sixty-one recessed troffers are located throughout the building.



## NATIONAL GUARD AUDIT AND RECOMMENDATIONS

Table 3 outlines the various wattage and lamping combinations of recessed troffers throughout the CSMS and AASF.



**Table 3: Recessed troffer lamp type, wattage, and power consumption in the CSMS.**

Lamp Type	Lamp Qty	Lamp Size (W)	Ballast Type	Ballast Qty	Ballast Input Wattage	Power per luminaire (W)
T12 fluorescent	4	40	Magnetic T12 rapid start	2	89	178
T8 fluorescent	3	32	Electronic T8 instant start, 0.88BF	1	86	86
T12 fluorescent	2	40	Magnetic T12 rapid start	1	89	89
T8 fluorescent	2	32	Electronic T8 instant start, 0.88BF	1	59	59

### 2.2.2 RECOMMENDED RETROFIT

Retrofit recommendations consist of a one-to-one replacement of all existing recessed troffers with Lithonia 2VT volumetric troffers. These replacement luminaires use either one or two T5 lamps depending on the luminaire they are replacing. Two-lamp 2VT luminaires consume 62W, while one-lamp luminaires consume 30W. 2VT luminaires use Osram Sylvania ballasts with a 1.0 BF.



**Figure 3: The 2VT troffer by Lithonia (left) and the 2VT troffer installed (right). Photos are courtesy of Lithonia.com.**

## 2.3 FLUORESCENT 1X4 STRIP LUMINAIRE

Fluorescent strip fixtures can be found throughout the Stockton facility. They were observed mostly in industrial related spaces where additional illuminance was required. Strip luminaires consist of a mix of T12 and T8 linear fluorescent units using either 4' or 8' lamps. This mix of T12 and T8 luminaires is represented in the lighting audit and recommendations by the alternate luminaire type. As with the recessed and suspended troffer luminaires, CLTC observed many lamp burnouts and a mix of multiple color temperature lamps. Luminaires are controlled by wall switch and as such operate regardless of occupancy and or light levels. Strip luminaires are often used in locations where the original lighting for a space is not sufficient, and thus represent a regularly observed luminaire in older military and civilian buildings and facilities across California.

### 2.3.1 EXISTING CONDITIONS

Incumbent strip fixtures are located throughout the CSMS and AASF facilities. These luminaires use either T8 or T12 lamps and corresponding electronic ballasts with BF's of 0.88 or magnetic ballasts. Strip fixtures are surface mounted or pendant mounted and uses one- and two-lamp configurations. One-lamp T12 strip-mounted luminaires consume 45W of power, while two-lamp configurations consume 89W. One-lamp T8 strip-mounted luminaires consume 30W of power, while two-lamp configurations consume 59W.



**Figure 4: Two-lamp T12 incumbent strip fixtures in the CSMS facility.**

### 2.3.2 RECOMMENDED RETROFIT

Luminaires that already have been retrofitted to T8s require no further retrofit. Recommended replacements for existing T12 strip fixtures consist of Lithonia MS5 and MS5 R general-purpose strip fixtures that use T5 and T5HO lamps. The recommended luminaires are one-lamp T5 systems that use Osram Sylvania ballasts with a 1.0 BF. The MS5 has no reflector, while the MS5 R does. The product consumes 30W.



**Figure 5: The MS5 R (left) and MS5 (right). Photos are courtesy of Lithonia.com.**

## 2.4 WALL PACKS

Wall packs are located on the exterior of the CSMS building façade. The wall packs operate in evenings regardless of occupancy and make use of HPS lamps. Wall packs are used to provide lighting around the exterior for way finding, and as such serve as a great technology to make use of occupancy sensors. Low occupancy rates make exterior way finding lighting an efficient use of funds for maximum energy savings. Additionally, exterior lighting is existent on almost all military buildings and as such provides an avenue for energy savings on all facilities and military installations.

### 2.4.1 EXISTING CONDITION

Existing wall packs are on the exterior of the CSMS building. They consist of 70W HPS and 400W HPS fixtures that consume 91W and 464W respectively. Three 70W HPS luminaires are mounted at 8', while seven 400W luminaires are mounted at 20'.

### 2.4.2 RECOMMENDED RETROFIT

The recommended retrofit for the 70W HPS luminaires on the CSMS building exterior is a bi-level CFL wall pack by RAB lighting. This luminaire senses occupancy via a passive infrared (PIR) sensor and provides 100% of its light. However, when the space around the wall pack is not occupied, it reduces output and saves electricity. The luminaire consumes 42W in high mode and is a full-cutoff fixture to prevent light pollution.

The recommended retrofit for the 400W HPS luminaires is a 250W pulse-start MH luminaire manufactured by Daybrite. This luminaire also is full cutoff and consumes 288W of power.



Figure 6: Daybrite wall pack (left) and RAB lighting wall pack (right). Photos are courtesy of Daybrite.com and RABweb.com.

### 3.0 ENERGY SAVINGS

After the lighting audit, CLTC recommended lighting products and systems that would simultaneously meet lighting standards and provide energy savings. When applied across both the CSMS and AASF facilities, these retrofits will provide a demand savings of approximately 46 kW. This is a savings of more than 48% when compared with the incumbent lighting systems. These energy savings do not include savings from occupancy-sensing luminaires and daylighting luminaires. As a result, total energy savings actually will be more comprehensive than the energy savings outlined by this project.

Table 4: Retrofit Demand Savings.

Lighting Scenario	Energy Demand (kW)
Incumbent	96.86
Retrofit	50.79
Savings	46.07



## 4.0 ATTACHMENT A – PHOTOMETRIC MODELS

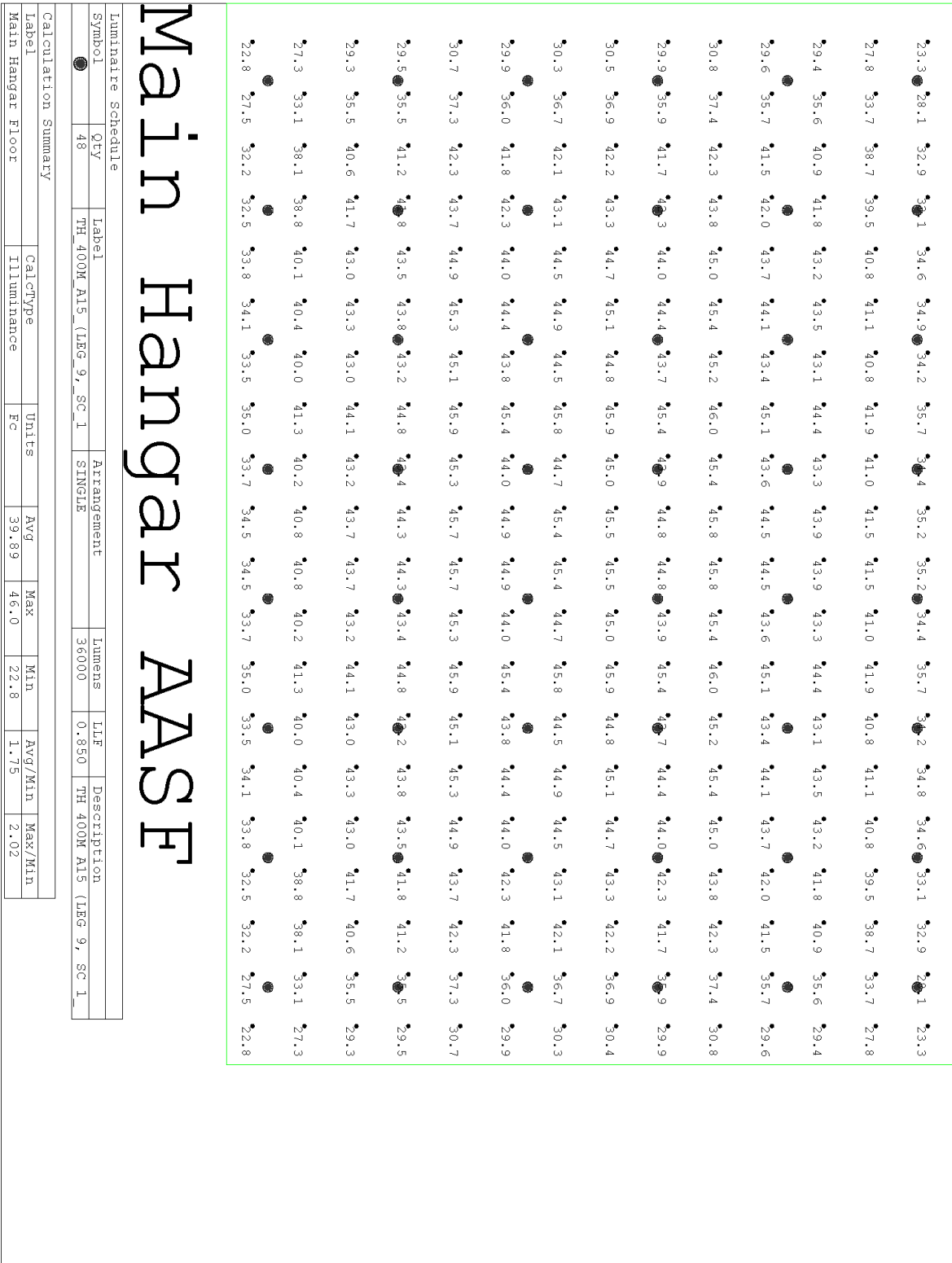


Figure 7: Photometric Model - AASF Hangar with Existing Lighting.

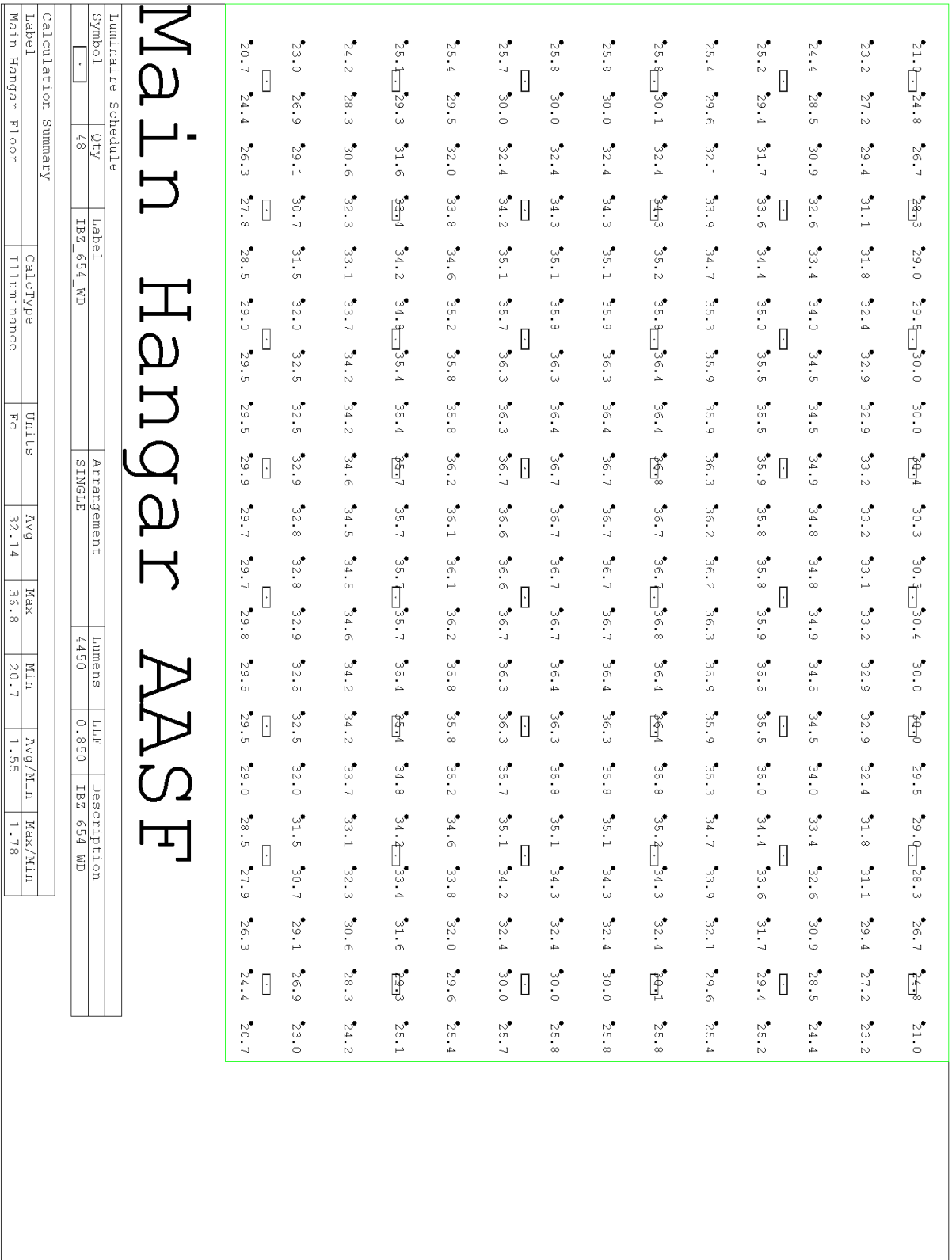


Figure 8: Photometric model - AASF hangar with new lighting.





# NATIONAL GUARD AUDIT AND RECOMMENDATIONS

## Retrofit Recommendations

Quantity	Replacement Fixture/Description	Lamp Type	Lamp Qty	Lamp Size (W)	Ballast Type	Ballast Qty	Ballast Input Wattage	Power per luminaire (W)	Total Power (W)	Demand Savings (%)	Demand Savings (kW)	Assumptions/Notes
45	fluorescent highbay, with half lamps sensor on/off	T8	4	32	Advance RCU-2532-SC, 0.88 BF	2	63	126	5670	40%	3.78	Lithonia IBZ with motion sensor option, savings do not include occupancy savings
45	fluorescent highbay, with half lamps sensor on/off	T8	4	32	Advance RCU-2532-SC, 0.88 BF	2	62	124	5580	58%	7.70	Lithonia IBZ with motion sensor option, savings do not include occupancy savings
59	fluorescent volumetric troffer	T5	2	28	QHEX28T5/JNV PSN	1	62	62	3658	63%	6.84	Lithonia 2VT volumetric troffer
59	fluorescent volumetric troffer	T5	2	28	QHEX28T5/JNV PSN	1	62	62	3658	28%	1.42	Lithonia 2VT volumetric troffer
32	fluorescent volumetric troffer	T5	1	28	QHEX28T5/JNV PSN	1	30	30	960	66%	1.89	Lithonia 2VT volumetric troffer
32	fluorescent volumetric troffer	T5	1	28	QHEX28T5/JNV PSN	1	30	30	960	49%	0.93	Lithonia 2VT volumetric troffer
47	fluorescent suspended strip	T5	2	28	QHEX28T5/JNV PSN	1	62	62	2914	63%	5.45	Lithonia MSS or MSS R general purpose strip
0	no alternative recommended											
81	fluorescent suspended strip	T5	1	28	QHEX28T5/JNV PSN	1	30	30	2430	66%	4.78	Lithonia MSS or MSS R general purpose strip
0	no alternative recommended											
15	fluorescent strip	T5	1	28	QHEX28T5/JNV PSN	1	30	30	450	66%	0.89	Lithonia MSS or MSS R general purpose strip
15	no alternative recommended											
3	cut-off, sensor wall pack	CEI	1	42		1	42	42	126	54%	0.15	8AB Lighting - WP2CF42MS
7	full cut off, metal halide wall pack	MH - pulse	1	250		1	288	288	2016	38%	1.23	Daybrite - WCL250PMT9C
26	RT5 reight kit with step-dimming	T5	2	28	QHEX28T5/JNV PSN	1	62	62	1612	14%	0.26	RT5 Reight Kit - Lithonia lighting
9	RT5 reight kit with step-dimming	T5	2	28	QHEX28T5/JNV PSN	1	62	62	558	47%	0.50	RT5 Reight Kit - Lithonia lighting
2	RT5 reight kit with step-dimming	T5	2	28	QHEX28T5/JNV PSN	1	62	62	124	57%	0.164	RT5 Reight Kit - Lithonia lighting
3	bilevel fluorescent strip fixture	T8	1	32		1	30	30	90	33%	0.045	Daybrite STW - 4' strip fixture, hi/low operation
12	bilevel fluorescent strip fixture	T8	2	32		1	59	59	708	18%	0.156	Daybrite STW - 4' strip fixture, hi/low operation
81	bilevel fluorescent strip fixture	T8	2	32		1	59	59	4779	18%	1.053	Daybrite STW - 4' strip fixture, hi/low operation
19	IP55 rated 1x8 fluorescent strip fixture	T8	1	32		1	30	30	570	58%	0.798	Lithonia PSW - 8' strip fixture, 8'
48	high bay, plus TOD	T5	6	32		2	96	192	9216	58%	12.768	
									Totals	48%	50.79	

# 5.0 ATTACHMENT C – PRODUCT CUT SHEETS

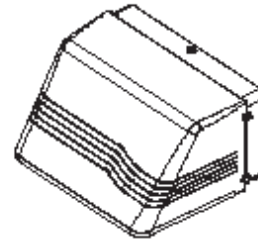


JOB NAME \_\_\_\_\_  
 TYPE \_\_\_\_\_

## WCL-LARGE CUTOFF WALL PACK

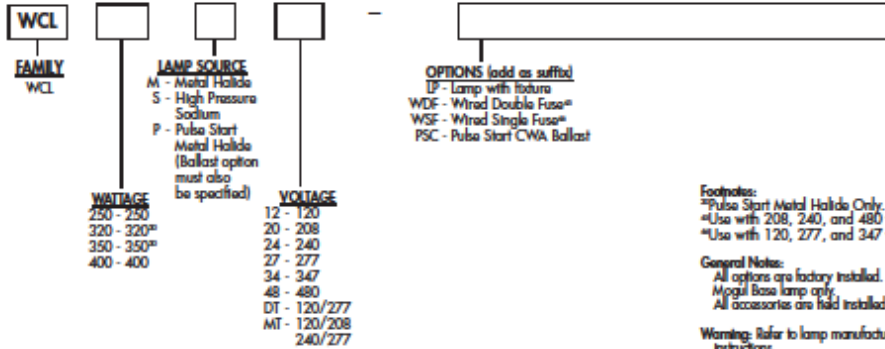
250-400 watt Metal Halide  
 250-400 watt High Pressure Sodium  
 250-400 watt Pulse Start Metal Halide

The WCL Large Cutoff Wall Pack offers a sleek design and cutoff performance with a wide range of uses. It delivers the lighting needed for the exteriors of retail buildings, businesses, walkways, underpasses or entrance doors.



### ORDERING MATRIX

SAMPLE CATALOG NUMBER: WCL400MMT-UP



**Footnotes:**  
<sup>PH</sup>Pulse Start Metal Halide Only.  
<sup>PH</sup>Use with 208, 240, and 480 volt.  
<sup>PH</sup>Use with 120, 277, and 347 volt.

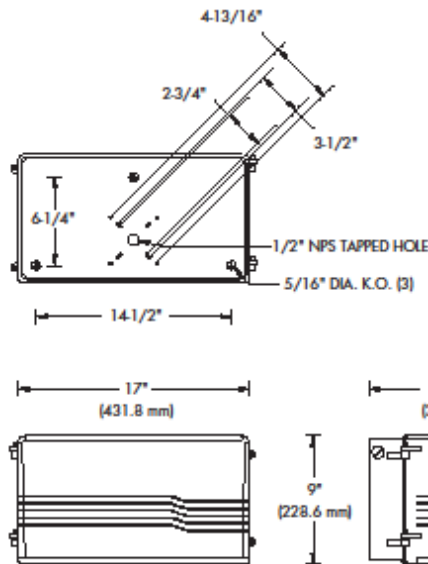
**General Notes:**  
 All options are factory installed.  
 Mogul Base lamp only.  
 All accessories are field installed.

**Warning:** Refer to lamp manufacturer's warnings and instructions.

### ACCESSORIES (order separately)

- WG-WCL - Wire Guard
  - RDA-WCL - Replacement Door Assembly
  - PEC-MT - Photo Control multi-volt
  - PEC-48 - Photo Control 480 volt
- (For additional descriptions of Wall Light accessories refer to sheet number OA-50030.)

### DIMENSIONS



### ENERGY DATA

#### HIGH PRESSURE SODIUM

CWA BALLAST INPUT WATTS  
 250 watt-295 watts  
 400 watt-464 watts

#### METAL HALIDE

CWA BALLAST INPUT WATTS  
 250 watt-285 watts  
 400 watt-485 watts

#### PULSE START METAL HALIDE

CWA BALLAST INPUT WATTS  
 250 watt-288 watts  
 320 watt-368 watts  
 350 watt-400watts  
 400 watt-452 watts

WEIGHT = 35 lbs. (max.)

WCL-LARGE CUTOFF WALL PACK

WL-43160



**FEATURES & SPECIFICATIONS**

**INTENDED USE**— The VT™ troffer combines the aesthetic and high performance levels of volumetric lighting, with the best value for offices, schools, retail locations and hospitals. Available in one-, two- or three-lamp configurations, with T5 or T8 lamps, this series provides the ultimate in design flexibility. Certain airborne contaminants can diminish integrity of acrylic. [Click here for Acrylic Environmental Compatibility table for suitable uses.](#)

**CONSTRUCTION**— Rugged, one-piece cold-rolled steel coated polyester, painted after fabrication with embossed facets (smooth also available; see Options).

Impact-modified, single clear acrylic diffuser provides excellent shielding and wide distribution.

End plates include integral T-bar dips.

Fixture may be mounted and wired in continuous rows.

Total fixture height is only 4-3/8".

**OPTICS**— Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions, vertical and horizontal work surfaces—redefining the inter of space, objects and occupants in a more balanced, complementary luminous environment.

Linear faceted reflector cavity softens and distributes light into the space while minimizing luminous contrast between the fixture and ceiling.

Sloped end plates provide a smooth, luminous transition between fixture and ceiling while enhancing the perception of fixture depth.

**ELECTRICAL**— Highly efficient program-staff electronic ballasts, Class P, thermally protected, retesting, HPI, non-PCB, UL Listed, CSA Certified, sound rated A.

Luminaire is suitable for damp locations. AWM, TRN or THHN wire used throughout, rated for required temperatures.

Step-level dimming option allows system to be switched to 50% power for compliance. SS option is available for use with SIMPLYS™ lighting intelligence system, with multi-level dimming. See SYNERGY™ Lighting Controls specification sheets for more information.

Ballast disconnect provided where required to comply with U.S. and Canadian codes.

**INSTALLATION**— Unique grid interfacing arrangement provides mounting into standard 1" and 9/16" tee bar or screw slot grids. 9/16" allows fixture trim to hang level with architectural ceiling tiles.

Drywall ceiling adaptor available.

**LISTING**— UL listed to U.S. and Canadian safety standard.

Patents pending.

**WARRANTY** — Fixture guaranteed for one year against mechanical defects in manufacture.

Note: Specifications subject to change without notice.

Ordering Number
Notes
Type



2' x 4'  
T5 or T8  
One, two or three lamps

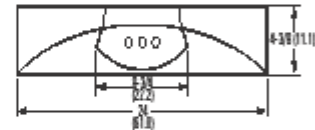
Specifications

Length: 48 (122.0)

Width: 24 (61.0)

Depth: 4-3/8 (11.1)

All dimensions are in inches (centimeters).



**ORDERING INFORMATION** Lead times will vary depending on options selected. Consult with your sales representative.

Example: ZVT8 2 32 ADP MVOLT GEB10IS LP835

Series	Air function	Number of lamps	Wattage	ADP	Diffuser	Voltage	Ballast configuration
ZVT5 T5 ZV4 volumetric troffer	(blank) Static H Heat removal	1 2	32 32W T8 (48") 28T5 28W T5 (48")	ADP	Acrylic linear prismatic	MVOLT 347	(blank) One of two lamps, per Lithonia Lighting standards
ZVT8 T8 ZV4 volumetric troffer		3	54T5HO 54W T5HO (48")				V3 One, three-lamp ballast <sup>1</sup>

Ballast	Lamp	Options
GEB10S T8 electronic, <10% THD, instant start	LP835 80+ CR, 3500 Kelvin	GUR Fast-blow fuse
GEB10RS T8 electronic, <10% THD, programmed rapid start	LP841 80+ CR, 4100 Kelvin	RSW Smooth reflector
GEB10PS T5 electronic, <10% THD, programmed start	LP830 80+ CR, 3000 Kelvin	EL14 Emergency battery pack, 1400 lumens
	LP735 70+ CR, 3500 Kelvin	EL Emergency battery pack
	LP741 70+ CR, 4100 Kelvin	CSA Meets Canadian standards
	LP830 70+ CR, 3000 Kelvin	

Accessories: Order as separate catalog number:	
DGA24	Drywall ceiling adaptor, unit installation
ZVT4 F916	Trim to adjust fixture mounting flush with 9/16" T-bar; for 2-lamp fixture

Notes  
1 Available with 32T5 and 54T5HO only.



**FEATURES & SPECIFICATIONS**

**INTENDED USE** — The I-BEAM fluorescent high bay is ideal for new construction and renovation projects. It is a one-for-one replacement of common metal halide high bay systems. Applications include manufacturing, warehousing, commercial and industrial facilities. The I-BEAM fixture performs well at mounting heights from 15'-40'. Certain airborne contaminants can diminish integrity of acrylic. [Click here for Acrylic Environmental Compatibility table for suitable uses.](#)

**CONSTRUCTION** — The highly configurable design of the I-BEAM high bay allows for a multitude of fixture options that can either be factory- or field-installed. The ballast can be accessed easily with the I-BEAM proprietary Z-strip channel design, which is thermally vented to provide years of trouble-free operation.

In addition to the reliable operation of I-BEAM fixtures, the reflectors tightly control the distribution of light and effectively manage lamp heat to increase the overall efficiency. The result is superior optics in either narrow distribution for aisles, or wide distribution for general lighting. Both distributions are available with or without uplight. Installation is made quick and easy with I-BEAM hanging accessories such as the aircraft cable and single-point mounting bracket. I-BEAM fixtures can be factory-wired to have both sensors and contacts, further reducing installation time. The configurability, performance and ease of installation make I-BEAM fixtures the preferred choice for fluorescent high bay lighting.

Channel is formed of heavy-duty cold-gauge (22-gauge) steel to stand up to the most demanding elements. Lamp holder assembly protects from incidental damage or movement of sockets during handling and installation. Sockets include secure positioning rotating collars with enclosed contacts. Access plate on the back of the channel housing allows quick and easy wiring.

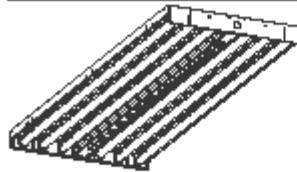
Finish: Channel is high-gloss white baked enamel; five-stage zinc phosphate pretreatment ensures superior paint adhesion and rust resistance.

**OPTICS** — Two optical systems are available. Narrow distribution is ideal for narrow or aisle lighting applications and features precision-formed segmented optics utilizing Alanoed Mir® 4 specular aluminum reflectors. Provides 95% reflectivity and warranted for 25 years. Wide distribution includes high-reflectance white finish for general or open areas.

**ELECTRICAL** — Thermally-protected, resetting, Class P, HPF, A+ sound-rated electronic ballast. AWM/TM or THHN wire used throughout rated for required temperatures. Ballast disconnect (BDP) is standard unless EL14 or cordset is requested.

**INSTALLATION** — Suitable for suspension by chain, cable, surface-mounting bracket, hook monopoint or single

Catalog Number
Notes
Type



SPECIFICATIONS			
	4-lamp	6-lamp	8-lamp
Length	48-1/16 (1227)	48-1/16 (1227)	48-1/16 (1227)
Width	13-1/4 (337)	18-1/8 (460)	23-7/8 (606)
Depth	2-3/8 (60)	2-3/8 (60)	2-3/8 (60)
Weight	15 lbs. (6.8 kg)	19 lbs. (8.6 kg)	24 lbs. (10.9 kg)

Fluorescent High Bay  
4-, 6- or 8-lamp TB  
Patent Pending

All dimensions are inches (millimeters) unless otherwise specified. Specifications subject to change without notice.

(pendant) monopoint.

**LISTINGS** — CSA Certified to U.S. and Canadian safety standards (UL1598 and CSA 250.0-08). Suitable for damp locations.

**WARRANTY** — Guaranteed for one year against mechanical defects in manufacturing.

Ballast is backed by manufacturer for five years.

**ORDERING INFORMATION** For shortest lead times, configure products using bolded options.

**Example:** IBZ 632 WDU GEB10PS

IBZ Series	Number of lamps/wattage		Shielding <sup>1,2</sup>		Distribution		Voltage		Ballast configuration	
IBZ I-BEAM <i>For tandem double-length unit, add prefix "T". Ex: 702</i>	<b>Lamps installed<sup>3</sup></b>	<b>Unlamped</b>	<b>(blank)</b> No shielding		<b>(blank)</b> Narrow distribution, <4% uplight	<b>(blank)</b> MVOLT:			<b>(blank)</b> Standard configuration	
	432L 4-lamp 32W TB	432 4-lamp 32W TB	A12125 Pattern 12 acrylic, 0.125"	ACL Clear acrylic, 0.125"	NDU Narrow distribution, enhanced uplight, <13% uplight	347 347V			For other options, refer to Ballast Configuration on page 2.	
	632L 6-lamp 32W TB	632 6-lamp 32W TB	PCL125 Clear polycarbonate, 0.125"	PCL125WG Pattern 12 acrylic, 0.125" w/ wireguard in door frame	WD Wide distribution, <6% uplight	480 480V				
	832L 8-lamp 32W TB	832 8-lamp 32W TB	A12125WG Pattern 12 acrylic, 0.125" w/ wireguard in door frame	ACLWG Clear acrylic, 0.125" w/ wireguard in door frame	WDU Wide distribution, enhanced uplight, <13% uplight					
		PCL125WG Clear polycarbonate, 0.125" w/ wireguard in door frame								

Ballast	Lamps installed	Options	
(blank) TB electronic, <10% THD, instant start, high BF	F32TB/841	EL14 Emergency battery pack <sup>4,5,6</sup>	MSI Aisle motion sensor pte-wired <sup>7</sup>
GEB0WS TB electronic, <10% THD, instant start, normal BF	LPB35 F32TB/835	EL14SD Emergency battery pack w/ self-diagnostics <sup>4,5,6</sup>	MSE360 360° motion sensor pte-wired <sup>8</sup>
GEB0PS TB electronic, <10% THD, programmed rapid start	LPB50 F32TB/850	ESP Integral side panels	MSE360 360° motion sensor embedded <sup>8,9</sup>
GEB0PSH TB electronic, <10% THD, programmed rapid start, high ballast factor (see Ballast Configuration chart on page 2)	LPB65 F32TB/865	GLR Internal fast-blow fuse <sup>10</sup>	OCS RELOC® OnePass® 5' installed
		GMF Internal slow-blow fuse <sup>10</sup>	
		IMP Integrated modular plug <sup>11</sup>	
		WGX External wireguard installed	
		ZWGX External wireguard installed on bottom of fixture <sup>8</sup>	
		INAG 1250 lumens per lamp battery <sup>9</sup>	
		OUTCTR Wiring leads pulled through back center of fixture <sup>8</sup>	

Accessories: Order as separate catalog number.			
IBAC120 M20 Aircraft cable 10' Y hanger (one pair)	IBZTFC Tandem coupler and side panel		
IBAC240 M20 Aircraft cable 20' Y hanger (one pair)	IBZPMP Pendant monopoint splice box, includes side covers <sup>11</sup>		
WGBZGX Wireguard, white finish (see chart on page 2)	IBZMPHBD Pendant monopoint splice box, includes side covers (3/4" hub) <sup>11</sup>		
IBHMP Hook monopoint	HBBS36 Chain hanger, 36" (one pair)		
	IBZSMB Surface-mounting bracket (one pair)		

- Notes**
- Lamps installed are F32TB/841.
  - UL Listed for 55°C. Output in emergency mode varies with ambient temperature. Single-lamp operation only. Not available with HVOLT.
  - Not available with MSE360 option.
  - Specify voltage.
  - Not available with IBZPMP.
  - Not available with 347.
  - Must be factory-installed.
  - Recommended for heights of 30'-45'. Not available with 208V or 480V.
  - One wireguard shipped as separate line item for top installation in field.
  - Max 3000 lumens when used with TB lamps up to 55°C ambient temperatures (not available with HVOLT).
  - When ordering IBZPMP, two ballast configurations are recommended. Ex: T72.



## FEATURES & SPECIFICATIONS

### INTENDED USE

T5 linear direct fluorescent intended for use in low-profile commercial, retail, manufacturing, warehouse, cove and display applications.

### ATTRIBUTES

Designed exclusively for use with T5 lamps, T5 sockets and T5 electronic ballasts.

### CONSTRUCTION

Housing formed from cold-rolled steel. No asbestos is used in this product. Heavy-duty 20-gauge channel.

Extended-height end caps retain and support sockets. Compact T5 socket features rotating collar and enclosed contacts.

### FINISH

High-gloss, baked white enamel finish. Five-stage iron-phosphate pretreatment ensures superior paint adhesion and rust resistance.

### OPTICAL SYSTEM

Reflector options include solid or perforated designs in both symmetric and asymmetric configurations.

### ELECTRICAL SYSTEM

Thermally protected, resetting, Class P, HPF, non-PCB, UL Listed.

Suitable for damp locations. AWM, TFN or THHN wire used throughout, rated for required temperatures.

### INSTALLATION

Labor-saving coupler supplied for row mounting. Numerous knockouts for easy installation. Surface-mount or suspended.

### LISTING

UL Listed and CSA Certified (see Options).

### WARRANTY

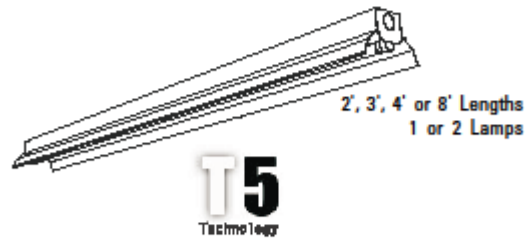
Guaranteed for one year against mechanical defects in manufacture.

Specifications subject to change without notice.

Catalog Number	
Notes	Type

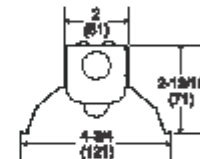
### Low-Profile T5 Direct Reflectors

# MS5



### Specifications

Length: 22-7/16 (568), 34-1/4 (869), 46-1/16 (1169) or 92-1/16 (2337)  
Width: 4-3/4 (121), 3-7/16 (87)  
Depth: 2-13/16 (71)  
Weight: 7.1 lbs (3.2 kg)



## ORDERING INFORMATION

Example: **MS5 1 54T5HO SMR MVOLT GEB10PS**

MS5		Lamp type		Configuration		Finish		Reflector type		Options		
Series	Number of lamps	14T5	14W T5 (22")	ASMR	Asymmetric reflector	(blank)	White	(blank)	Solid	GEB10PS		
MS5 T5 low-profile direct  For tandem double-length unit, add prefix T. Example: TM55	1, 2 Not included.	21T5	21W T5 (34")	SMR	Symmetric reflector	SAR95	Specular aluminum reflector - Miro™	GALV	Galvanized	Voltage 347 <sup>1</sup> MVOLT <sup>2</sup> Others available.	THD	Electronic ballast, 10% THD, Program Start
		24T5HO	24W T5 HO (22")			28T5	28W T5 (46")				GLR	Internal fast-blow fuse <sup>4</sup>
		39T5HO	39W T5 HO (34")			54T5HO	54W T5 HO (46")				GMF	Internal slow-blow fuse <sup>4</sup>
											PLF	Plug-in wiring, specify 1, 2 or 3 branch circuits and hot wires (A-black, B-red, C-blue, AB or AC)
											EL56	Emergency battery pack (nominal 390-700 lumens; see Fluorescent Battery Packs tab) <sup>4</sup>
										CSA	CSA Certified	

### Accessories

Order as separate catalog number.

THMS5	Tong hanger
MSSEP	Full depth end plate for standard reflector (1 pair)
1B	Ceiling spacer (adjusts from 1-1/2" to 2-1/2" from ceiling)
S0	Swivel stem hanger (specify length in 2" increments)
MSSACF	Adjustable aircraft cable system with power feed (specify length as 36, 72 or 108 inches) <sup>6, 7</sup>
MSSAC	Adjustable aircraft cable system (specify 36, 72 or 108 inches) <sup>7</sup>

### NOTES:

- 1 Only available with 28W and 54W.
- 2 Only available with 54W.
- 3 MVOLT (120-277V).
- 4 Specify voltage.
- 5 Available with 3', 4' and 8' lengths only.
- 6 120-277V only for power feed.
- 7 Standard wire size for power feed is 18 gauge. For 12 gauge add 12AWG to the end of catalog number. Consult factory for length of runs and required wire size.

**RAB**  
LIGHTING  
**WP2CF42MS**



JOB NAME: \_\_\_\_\_  
DATE: \_\_\_\_\_  
TYPE: \_\_\_\_\_

**DESCRIPTION**

Sensor controlled WP2 Wallpack in 42 watt CFL cutoff & 84 watt CFL refractor models. Starting temperature 0° F/-18°C. Sensor has 180° detection and controls up to 250 watts. 120 volts only. Lamp supplied.

**SPECIFICATIONS**

**"No Hands" Auto Testing:**

Auto mode starts after 4 minutes of testing. No adjustment needed.

**Built for Severe Conditions:**

Double weatherproofing for long life

**LED Detection Indicator:**

Glowes red day and night for "on-guard" deterrence.

**Manual Override:**

Double flip wall switch logic prevents activation by short power outages. Resets after 8 hours. No extra wiring needed.

**Photocontrol:**

Deactivates lights during daylight. Fully adjustable for 24 hour operation or custom applications. Please specify voltage.

**Quick Test Time:**

5 seconds test time for fast installation. Works day or night.

**Sensor Case Construction:**

Precision molded Lexan®

**Surge Protection:**

Withstands up to 3000 volts

**UL Listing:**

Suitable for wet locations.

**Time Adjustment:**

5 seconds to 15 minutes CFL lamps have longer life if Time Adjustment is set to > 7 minutes.

**Vandal Resistant Lens:**

Hard lens resists vandalism

**Voltage:**

120 volts AC 60 Hz.

**Ballast Minimum Starting Temperature:**

-22

**Detection:**

180° detection

**Minimum Starting Temperature:**

0° F

**Patents:**

RAB sensor and fixture designs are protected under U.S. and International Intellectual Property laws.

**Switching Capacity:**

Controls up to 250 watts Fluorescent @ 120 volts

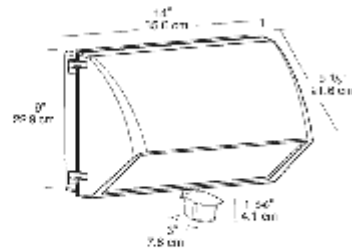
**Color:**

Bronze

**Weight:**

11.5

**DIMENSIONS**



**ORDERING INFORMATION**

Compact Fluorescent Lamp supplied with fixture	Total Watts	Lamp Type	Lamp Base	Ballast	Starting Ampe/ Operating Ampe				Input Watts	LAMP ANSI	Initial Lumens	Lamp Hours
					120V	208V	240V	277V				
	42	42W	GX24q-4	Elec HPF QT	0.38	0.3	0.2	0.17	46	0	3200	10000

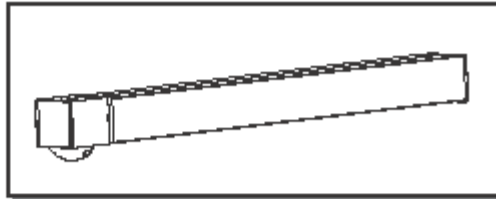
Factory Installed Options  
Add suffix to Catalog Number

Note: Specifications may change without notice.

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## 2', 3', OR 4' STAIRWELL LUMINAIRE



1 or 2 Lamp  
T8

### APPLICATION

- Surface mount luminaire with integral motion sensor to create an optimum combination of energy savings and safety.
- Enhances security by providing a visual indication of occupancy.
- Designed for use in applications with variable or minimal occupancy, such as stairwells, storage areas, and restrooms.
- Electronic dimming ballast operates in full dimmed (5% light level) mode until occupancy is detected, then automatically switches to full bright.
- Dimming ballast saves energy while providing illumination at all times for safety.
- Available for ceiling or wall installations.
- 2', 3', and 4' models available for application flexibility.
- Consult local code authority for applications where Stairwell luminaire will be used as emergency lighting. Wall mount configurations require 1fc on floor in emergency mode.

### CONSTRUCTION/FINISH

- Housing is multi-stage phosphate treated for maximum corrosion resistance and finish coat is high reflectance baked white enamel.
- Steel housing and end caps provide added durability.
- End caps are fixed for extra lens protection.
- Ultrasonic sensor is factory installed at the end of the luminaire.

- Multiple knockouts are provided on the rear of the housing to accommodate a variety of mounting methods.

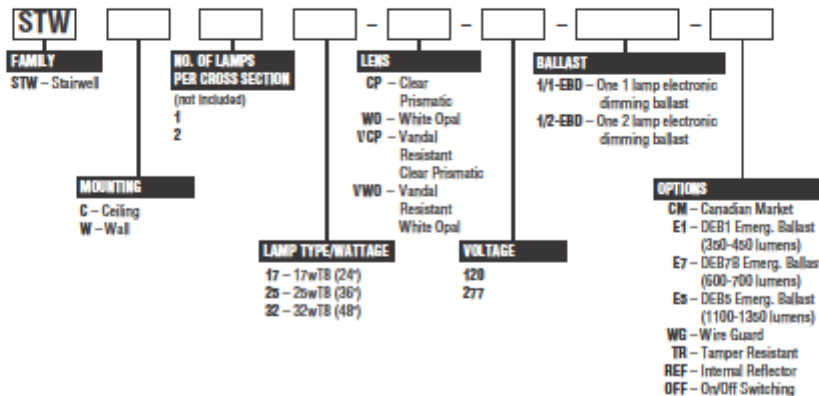
### ELECTRICAL

- Class P, HPF ballasts comply with Federal Ballast Law (Public Law 100-357, 1988.)
- Dimming delay is factory adjusted to approximately 8 minutes, can be field adjusted up to 100 minutes.
- On/off operation (OFF option) is available for areas where illumination is not required at all times.
- Wall models include a 180° sensor; ceiling models incorporate a 360° sensor.
- UL listed for damp location.
- Self-contained fluorescent emergency power packs can be incorporated. UL listed for dry locations.

### ENCLOSURES

- Choice of clear prismatic (CP) or smooth white opal (WO) lenses. Vandal resistant lenses are .125" nominal thickness hi-impact acrylic
- Available internal reflector (REF option) directs more light downward for applications requiring less uplight or when additional downlight is needed to meet minimum illumination requirements.
- Wireguard (WG) option provides added protection for the lens.
- Tamper resistant (TR) option prevents the lens from being removed by unauthorized personnel. Tamper proof driver (cat. #TPDTH) required (sold separately).

### CATALOG NUMBER



### JOB INFORMATION

740.1-SA