

# Tahoe Center for Environmental Sciences

Dave Maino  
Progress report  
2/3/06

# Design Criteria

## **Reflected Glare:**

The high level of risk involved in some chemistry experiments necessitates restricting the amount of glare and the number of glare sources in the space. Since there will be large amounts of glass in the space in the form of windows, beakers and jars elimination of glare sources is essential.

## **Direct Glare:**

As with reflected glare, direct glare from the fixtures cannot be tolerated as it may pose a safety hazard to those in the lab as they work on experiments.

## **Power Density:**

Currently the power density is over the allowable watts per square foot, so reducing the power density to acceptable levels is critical to the redesign.

# Lamps, Ballasts, Controls and Fixtures

Lamps: F32T8/835 ALTO

Ballasts: 2 Lamp instant start electronic ballast

Motion Sensors: The Wattstopper DT-200 dual-tech motion sensor

Luminaires:

A: Prudential PRU-7 open-blade louver, semi direct pendant fixture (2 lamps per fixture)

B: Prudential PRU-5900 recessed wallwasher (1 lamp per fixture)



## F32T8 ADV835 48 ALTO 1LP

Product family description  
High performance, long life,  
environmentally- responsible lamps.

### Features/Benefits

- 3100 lumens is 10% more than standard T8 lamps.
- Low mercury: TCLP\* compliant.
- Sustainable lighting solutions; Less mercury and fewer lamps in landfills, combined with energy efficiency and long life reduces the impact on the environment.
- HI- VISION® Phosphor combined with Philips exclusive cathode guard delivers: 95% lumen maintenance; reduced lamp- end blackening.
- Our Green End- Caps mean you are using environmentally- responsible lamps.
- 85 CRI.
- Higher lumens enables multiple system options to maximize energy saving and reduce lighting costs.
- Fully dimmable without burn- in.

### Applications

- Ideal for T8 applications requiring maximum light output and long life. Ideal for light harvesting.

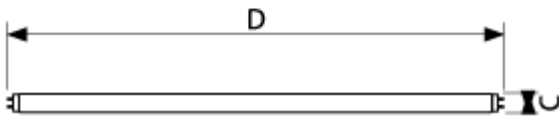
### Notes

- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less

- frequently. (202)
- Average life under engineering data with lamps turned off and restarted once every 12 operating hours. (241)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- For expected lamp lumen output, commercial ballast manufacturers can advise the appropriate Ballast Factor for each of their ballasts when they are informed of the designated lamp. The Ballast Factor is a multiplier applied to the designated lamp lumen output. (204)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)
- Design lumens rated at 3 hours per start on Instant Start ballast. (239)
- Exclusive to Philips Lighting Company.

Product data	
Product Number	139881
Full product name	F32T8 ADV835 48 ALTO 1LP
Ordering Code	F32T8/ADV835/ALTO
Pack type	1 Lamp Packed in Case Qty
Pieces per pack	1
Packs per case	25
Pack UPC	046677139889
EAN2US	
Case Bar Code	50046677139884

Product data	
Successor Product number	
Name Type	F32T8
Nominal Length [inch]	48
Feature	ALTO [ALTO®]
Packing Type	1LP [1 Lamp Packed in Case Qty]
Packing Configuration	25
Base	Medium Bi- Pin[Medium Bi- Pin]
Base Information	Green Base
Bulb	T8[Diameter: 1 inch]
Rated Avg. Life [3 hr Start][hr ]	25000
Rated Avg. Life [12- Hr Start][hr ]	30000
Energy Saving Product	Energy Saving
Wattage[W ]	32
Mercury (Hg) Content[mg ]	3.5
Color Code	Advantage 835[CCT of 3500K]
Color Rendering Index[Ra8 ]	85
Color Temperature[K ]	3500
Initial Lumens[Lm ]	3100
Design Mean Lumens[Lm ]	2950



F- T8- Adv Med Bipin



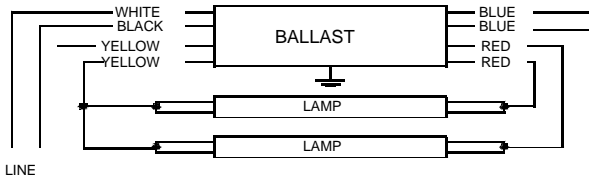


<b>VOP-4P32-SC</b>	
Brand Name	OPTANIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

### Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* F32T8	2	32	0/-18	0.25	66	1.04	15	0.97	1.7	1.58
F32T8	3	32	0/-18	0.33	89	0.92	10	0.99	1.7	1.03
F32T8	4	32	0/-18	0.39	107	0.88	10	0.99	1.7	0.82

### Wiring Diagram



Diag. 71A

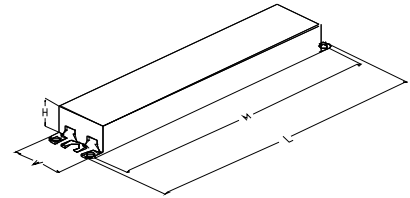
Insulate unused lead for 1000V

The wiring diagram that appears above is for the lamp type denoted by the asterisk (\*)

### Standard Lead Length (inches)

	in.	cm.		in.	cm.
Black	25L	63.5	Yellow/Blue		0
White	25L	63.5	Blue/White		0
Blue	31R	78.7	Brown		0
Red	31R	78.7	Orange		0
Yellow	39L	99.1	Orange/Black		0
Gray		0	Black/White		0
Violet		0	Red/White		0

### Enclosure



### Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1 7/10	1 9/50	8 9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 04/28/2005



Data is based upon tests performed by Advance Transformer in a controlled environment and representative of relative performance. Actual performance can vary depending on operating conditions. Specifications are subject to change without notice. All specifications are nominal unless otherwise noted.

### ADVANCE TRANSFORMER CO.

O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071

Corporate Offices: Phone: 800-322-2086



<b>VOP-4P32-SC</b>	
Brand Name	OPTANIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

## **Electrical Specifications**

### **Notes:**

#### Section I - Physical Characteristics

- 1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
- 1.2 Ballast shall be provided with integral leads color-coded per ANSI C82.11.

#### Section II - Performance Requirements

- 2.1 Ballast shall be Instant Start.
- 2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail.
- 2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
- 2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.
- 2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 42 kHz through 52 kHz to avoid interference with infrared devices and eliminate visible flicker and avoid Article Surveillance System, such as anti-theft devices.
- 2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.
- 2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.78 for Low Watt, 0.88 for Normal Light Output, and 1.18 for High Light.
- 2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.
- 2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
- 2.10 Ballast shall have a Class A sound rating for all 4-foot lamps and smaller.
- 2.11 Ballast shall have a minimum starting temperature of 0F (-18C) and 60F (16C) for energy-saving T8 lamps.
- 2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

#### Section III - Regulatory Requirements

- 3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).
- 3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
- 3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.
- 3.4 Ballast shall comply with ANSI C82.11 where applicable.
- 3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
- 3.8 Ballast shall meet NEMA/CEE High Performance T8 Lighting System Specifications.

#### Section IV - Other

- 4.1 Ballast shall be manufactured in a factory certified to ISO 9001:2000 Quality System Standards.
- 4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C. Ballasts with a "90C" designation in their catalog number shall also carry a three-year warranty at maximum case temperature of 90C.
- 4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.
- 4.4 Ballast shall be Advance Transformer part # \_\_\_\_\_ or approved equal.
- 4.5 All products except for Optanium 2.0 (IOP) models may experience lamp striations when operating 25W, 28W, or 30W energy saving lamps.

4.6 Only the Optanium 2.0 (IOP) models are suitable for tandem-wiring applications operating 25W, 28W, or 30W energy saving lamps.

Revised 04/28/2005



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**ADVANCE TRANSFORMER CO.**  
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD  
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# DT-200 Dual Technology Sensor

Combines passive infrared and ultrasonic technologies

SmartSet™ automatically selects optimal settings for each space



Built-in light level sensor

Accepts low voltage switch input for manual-on operation

Walk-through mode increases savings potential

PROJECT

LOCATION/TYPE

## Product Overview

### Description

Watt Stopper/Legrand's DT-200 Dual Technology occupancy sensors combine passive infrared (PIR) and ultrasonic technologies into one unit to achieve precise coverage.

### Operation

The DT-200 turns lighting on when both PIR and ultrasonic technologies detect occupancy. It can also work with a low voltage switch for manual-ON operation. PIR technology senses the difference between infrared energy from a human body in motion and the background space. Ultrasonic technology uses the Doppler Principle and high frequency (40 kHz) ultrasound to sense motion within the space. Once lighting is on, detection by either technology holds lighting on. When no occupancy is detected for the length of the time delay, lighting turns off. The DT can also be set so that only one technology is needed to trigger lighting on or both technologies are needed to hold lighting on. The sensors are low voltage and utilize a Watt Stopper power pack.

### SmartSet

Using SmartSet™ technology, the DT-200 sensors require no adjustment at installation. SmartSet monitors the controlled space to identify usage patterns. Using this information, it automatically adjusts the time delay and sensitivity for optimal performance and energy efficiency. The sensor assigns short delays (as low as 5 minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times.

### Application

Watt Stopper/Legrand dual technology sensors have the flexibility to work in a variety of applications. Mounted at 10 feet, the sensors can cover up to 2000 square feet of walking motion and 1000 square feet of desktop motion. The sensors are designed to control lighting in difficult applications, such as classrooms, where one technology alone could encounter false triggers. In addition to classrooms, the DT-200 works well in warehouses, large offices, open office spaces, and computer rooms.

## Features

- Advanced control logic based on RISC micro-controller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
  - Walk-through mode turns lights off 3 minutes after the area is initially occupied – ideal for brief visits such as mail delivery
- Available with built-in light level sensor featuring simple, one-step setup
- Sensors work with low voltage momentary switches to provide manual control
- LEDs indicate occupancy detection
- 8 occupancy logic options give users the ability to customize control to meet application needs
- Available with isolated relay for integration with BAS or HVAC
- Swivel mounting bracket for convenient corner mounting to wall or ceiling



www.wattstopper.com  
800.879.8585



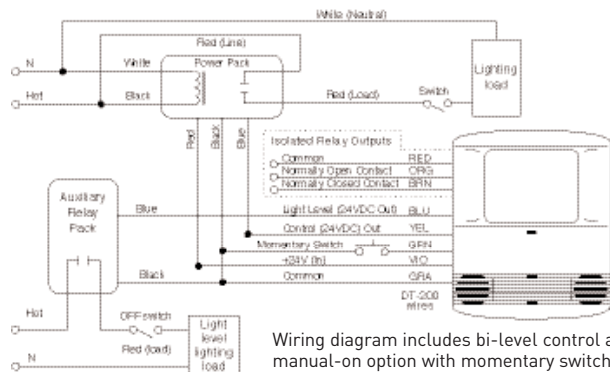
# DT-200 Technical Information

## Specifications

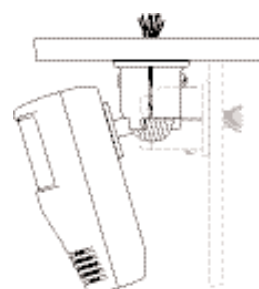
- 24 VDC/VAC and halfwave rectified AC
- 40 kHz frequency ultrasonic transmission
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), walk-through, test-mode
- Sensitivity adjustment: SmartSet (automatic) or reduced sensitivity (for PIR sensitivity); ultrasonic sensitivity is variable with trimpot
- Built-in light level sensor (DT-200) – works from 2 to 200 footcandles (21 to 2,152 lux)
- Low voltage, momentary switch input for manual operation
- DT-200 contains an isolated relay with N/O and N/C outputs; rated for 1 Amp at 24 VDC/VAC
- 2000 ft<sup>2</sup> of walking motion mounted at 10 ft; 1000 ft<sup>2</sup> of desktop motion
- Units per power pack: DT-200: up to 2 (B), up to 3 (BZ); DT-205: up to 3 (B), up to 4 (BZ)
- Dimensions: 4.4" x 3.4" x 2" (110.3mm x 85.9mm x 49.6mm) LxWxD
- UL and CUL listed; Five year warranty

## Wiring & Mounting

### Wiring Diagram



### Mounting

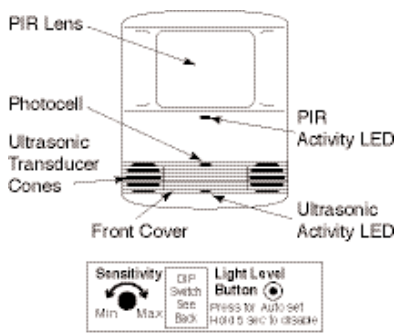


A swivel mounting bracket, attached to the sensor, allows the sensor to be angled for wall or ceiling mounting.

Grooves on the bracket help to achieve desired angle for coverage.

## Controls & Settings

### Product Controls



### DIP Switch Settings

Trigger	Walk Occupancy	Walking Occupancy	Walkthrough Occupancy
Standard	Bot	Bot	Bot
Option 1	Bot	Bot	Bot
Option 2	Bot	Bot	Bot
Option 3	Bot	Bot	Bot
Option 4	Bot	Bot	Bot
Option 5	Bot	Bot	Bot
Option 6	Bot	Bot	Bot
Option 7	Bot	Bot	Bot

Time Delay	4	5	6
5 sec SmartSet	↑	←	→
5 minutes	←	→	●
10 minutes	←	→	●
15 minutes	←	→	●
20 minutes	←	→	●
30 min	←	→	●

LEDs 7

Disabled

Enabled

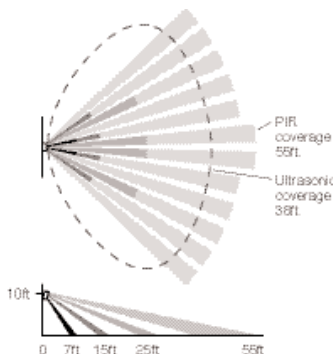
  

PIR Sensitivity 8

Minimum

Max SmartSet

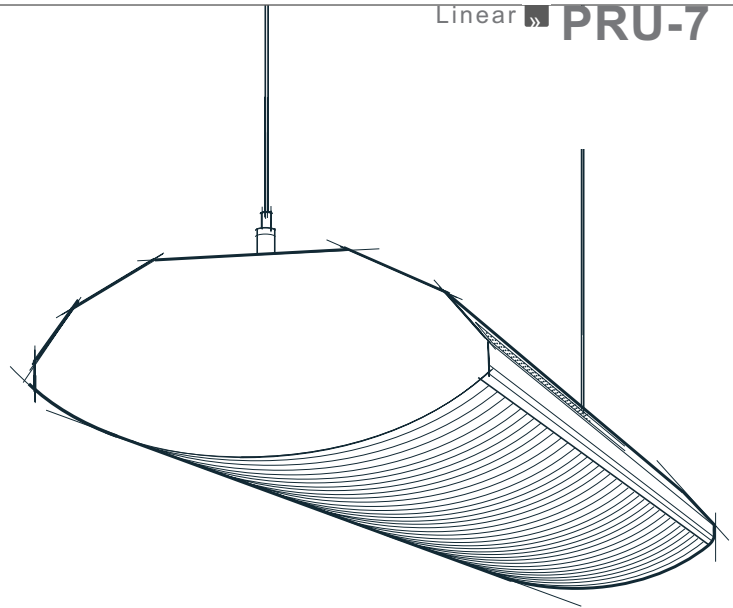
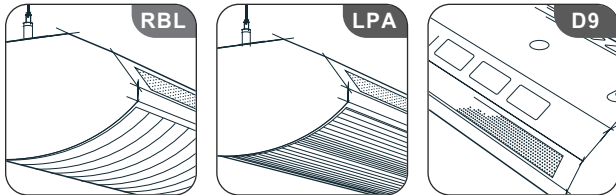
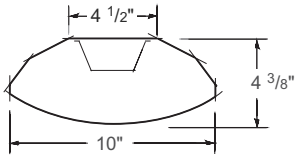
## Coverage



Coverages shown are maximum and represent half-step walking motion. Under ideal conditions, with no barriers or obstacles, coverage for half-step walking motion can reach up to 2000 ft<sup>2</sup> while coverage for typical desktop activity can reach up to 1000 ft<sup>2</sup>.

## Ordering Information

Catalog No.	Voltage	Current	Coverage	Features
<input type="checkbox"/> DT-200	24 VDC	43 mA	2000 ft <sup>2</sup> (185.8 m <sup>2</sup> )	light level, isolated relay
<input type="checkbox"/> DT-205	24 VDC	35 mA	2000 ft <sup>2</sup> (185.8 m <sup>2</sup> )	



**ordering**

lamp series/rows	nominal length	shielding	color/finish	distribution	circuiting	voltage	mounting	ceiling system	options	
<b>PRU-7-</b>										
2T8	04'	RBL*	radial blade louver	TMW* textured matte white	D1 direct	SC single circuit	120	CA48** aircraft cable (adjustable)	X1* exposed T-bar	EML
3T8	08'				D9 semi-direct (85/15)	DC dual circuit (in-line)	277		X3 hard ceiling	EMH
	12'	RBL-OL	radial blade louver with acrylic overlay	YGW gloss white			347	CA96" aircraft cable (adjustable)	X6 slot grid	DM
	R_*			Y__ premium color				CA144" aircraft cable (adjustable)	*standard	RSE
	*row length	LPA	linear prismatic acrylic lens	CC custom color				SSC__ top-swivel stem mount (specify length in inches)		10THD
				GLV galvanized				SUR surface mount		B__
		*standard		*standard						FH
										BSH*
										WBC
										*stem-mounting only
								*standard		

**Applications** Classrooms, libraries, laboratories, open offices, small offices, mixed-use areas, retail.

**Features** A versatile linear direct or semi-direct lighting system. Available with a choice of an aluminum radial blade louver 3/4" high and 1" on center with a 36° longitudinal cutoff, or an extruded, linear prismatic acrylic lens. Upper side of housing is perforated to articulate housing form. Optional slotted top housing offers a semi-direct distribution for illuminating ceilings when stem- or cable-mounted. Finish plates can be removed for continuous-row installation. Fixtures are aligned and secured together with an internal aligner spline. When row-mounting is specified, quick-connect circuit assemblies are supplied.

**Construction** The housing, available in 4-, 8- or 12-foot standard lengths, and finish plates are made of 20-gauge steel.

**Finish** The standard exterior body color is textured matte white (TMW) or optional gloss white (YGW) using polyester powder paint. Refer to ordering matrix for optional metal finishes or refer to **Defining Section** for optional paint colors. Blade louvers, ballast cover, canopies and stems match body

color unless otherwise specified. Galvanized fixtures come with galvanized canopies and pewter (YMP) stems when stem-mounting is specified.

**Electrical** T8 fixtures have instant-start electronic ballasts with less than 20% THD. Fixtures are U.L. Damp labeled (non-emergency) and I.B.E.W. manufactured. Maximum ballast size available: 2 3/8" width x 1 1/2" height.

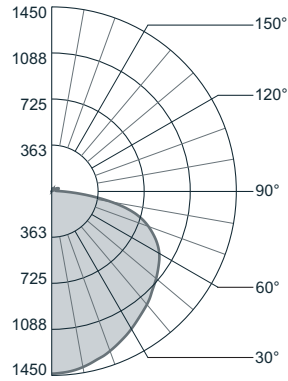
**Mounting** Fixture is surface-mounted or suspended with aircraft cables or stems.

**Options** **EML**: emergency battery (T8=600 lumens); **EMH**: emergency battery (T8=1200 lumens); **DM**: dimming (consult factory); **RSE**: rapid-start electronic; **10THD**: ballast with < 10% total harmonic distortion; **B\_**: specific ballast, specify manufacturer and catalog number (consult factory); **FH**: fixture fusing (slow blow); **BSH**: longitudinal body sway hanger (stem-mounting only); **WBC**: white ballast cover (for increased luminaire efficiency).

photometric data

PRU-7-2T8-04-RBL-TMW-D1

Report # LSI13486 D=96.9% I=3.1%  
Spacing Criteria: Along 1.1; Across 1.3  
Lamp Lumens: 3050 Input Watts: 57



Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
0	1433	1433	1433	1433	1433	
5	1422	1422	1425	1422	1424	137
15	1321	1323	1340	1357	1368	378
25	1159	1167	1208	1258	1291	559
35	961	974	1043	1139	1200	662
45	737	757	865	1018	1109	686
55	492	528	679	890	1020	637
65	255	312	501	761	896	532
75	125	164	336	576	670	384
85	26	55	151	205	187	151
90	0	28	75	78	37	
95	0	12	55	73	33	43
105	0	3	36	64	47	33
115	3	3	20	43	50	23
125	5	6	9	22	28	12
135	8	7	6	5	5	5
145	11	9	6	5	4	5
155	13	12	9	6	7	4
165	13	13	12	10	11	3
175	15	14	13	13	13	1
180	13	13	13	13	13	

Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	67.62	96.94
90-180	2.14	3.06

Efficiency = 69.8%

Luminance Summary (cd/m<sup>2</sup>)

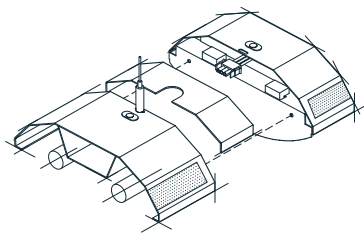
Angle	0°	45°	90°
45	3904	4596	5895
55	3211	4451	6682
65	2263	4450	7970
75	1809	4868	9733
85	1121	6489	8060

Coefficients of Utilization (%)

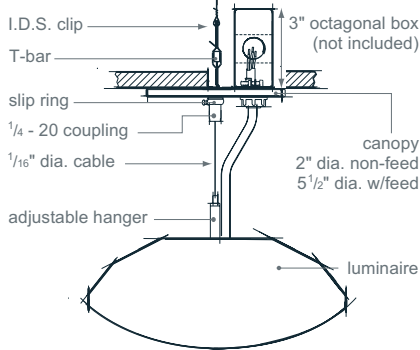
Floor Ceiling Wall	effective floor cavity reflectance = .20											
	80			70			50			50		
	70	50	30	10	70	50	30	10	50	30	10	
RCR 0	83	83	83	83	80	80	80	80	76	76	76	
1	75	72	69	66	73	70	67	65	67	64	62	
2	68	63	58	54	66	61	57	53	58	55	51	
3	62	55	49	45	60	54	49	44	51	47	43	
4	57	49	43	38	55	48	42	38	46	41	37	
5	52	43	37	32	50	42	36	32	40	35	31	
6	48	39	32	28	46	38	32	28	36	31	27	
7	44	35	29	24	43	34	28	24	33	27	24	
8	41	31	25	21	40	31	25	21	29	24	21	
9	38	28	22	18	37	28	22	18	27	21	18	
10	35	26	20	16	34	25	20	16	24	19	16	

installation

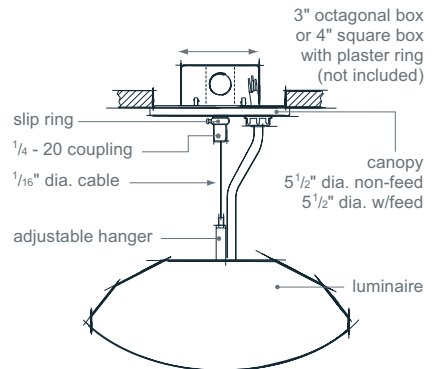
Adjoining Detail



Suspension (x1)

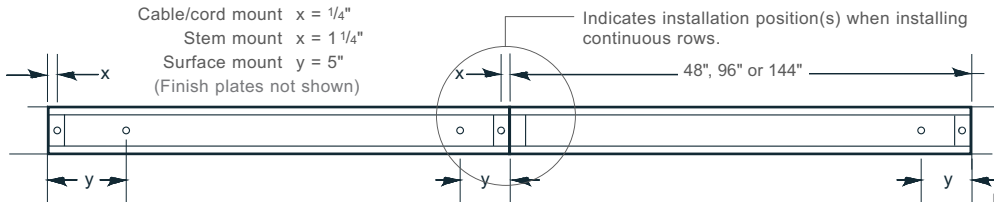


Suspension (x3)



Mounting Locations

- Cable mount x = 1/4"
- Cable/cord mount x = 1/4"
- Stem mount x = 1 1/4"
- Surface mount y = 5"
- (Finish plates not shown)

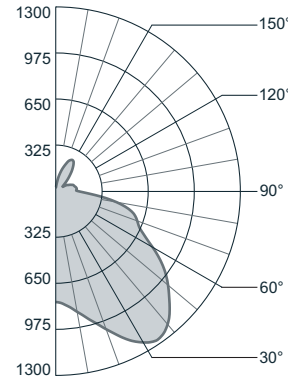


Note: When connecting two or more fixtures in a row, mounting assemblies are required on both ends of the first fixture, with only one mounting assembly required on each additional fixture.

photometric data

PRU-7-2T8-04-LPA-TMW-D9

Report # LSI13850 D=85.5% I=14.5%  
Spacing Criteria: Along 1.3; Across 2.1  
Lamp Lumens: 3000 Input Watts: 55



Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
0	775	775	775	775	775	
5	776	778	786	793	799	77
15	751	783	846	904	930	240
25	707	776	915	1069	1132	426
35	637	738	970	1212	1273	604
45	544	667	965	1148	1156	697
55	430	549	852	953	950	677
65	272	396	667	687	693	554
75	111	227	441	538	577	406
85	14	90	232	291	314	216
90	0	46	132	177	197	
95	3	33	90	131	147	96
105	16	25	84	127	146	85
115	24	80	76	104	124	81
125	26	149	81	63	82	79
135	28	154	175	122	103	99
145	30	134	230	226	213	110
155	32	101	188	241	251	77
165	32	58	115	150	163	31
175	34	32	40	46	52	5
180	33	33	33	33	33	

Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	64.97	85.46
90-180	11.05	14.54

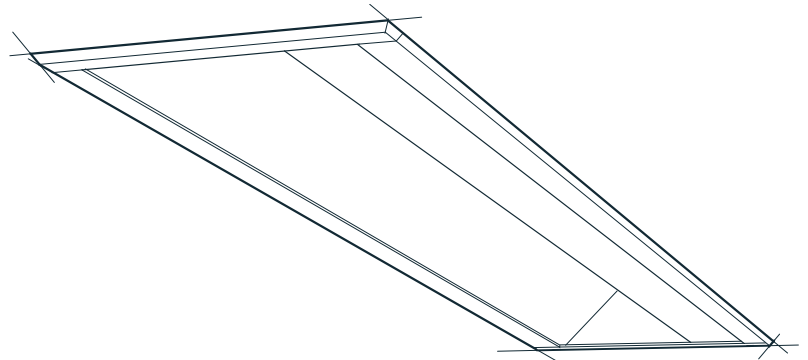
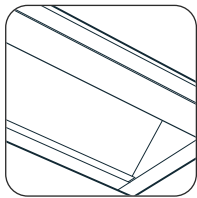
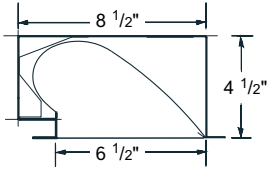
Efficiency = 76.0%

Luminance Summary (cd/m<sup>2</sup>)

Angle	0°	45°	90°
45	2485	4445	5306
55	2418	4822	5308
65	2079	5036	4970
75	1387	4916	5628
85	535	4234	4386

Coefficients of Utilization (%)

Floor Ceiling Wall	effective floor cavity reflectance = .20											
	80			70			50			50		
	70	50	30	10	70	50	30	10	50	30	10	
RCR 0	88	88	88	88	85	85	85	85	78	78	78	
1	79	75	72	68	76	73	69	66	67	65	62	
2	71	65	59	55	69	62	57	53	58	54	50	
3	65	57	50	45	62	54	49	44	51	46	42	
4	59	50	43	37	57	48	42	37	45	39	35	
5	54	43	36	31	51	42	35	30	39	33	29	
6	49	38	31	26	47	37	30	26	35	29	25	
7	45	34	27	23	43	33	27	22	31	25	21	
8	41	30	24	19	39	29	23	19	27	22	18	
9	38	27	21	16	36	26	20	16	25	19	15	
10	35	25	18	14	34	24	18	14	22	17	13	



**ordering**

series	lamp rows	nominal length	voltage	ceiling system	options
P-5900					
	1T8	02'	120	X1 exposed T-bar	AL
	1T5	03'	277	X3B hard ceiling	EML*
	1T5HO	04'	347*		EMH*
	1BX39w (3' only)	R_*	*T8 & T5;HO only		DM
	1BX_w*	*row length			RSE†
	* bias, specify 40w, 50w or 55w				10THD†
					B_
					FH
					*consult factory for fixture lengths < 4'
					†T8 & bias only

**Applications** Retail displays, art galleries, corridors.

**Features** A recessed luminaire perfect for displaying art, merchandise or highlighting vertical surfaces. The semi-specular reflector gives punch to the wall while concealing the lamp source.

**Construction** The housing, available in 2-, 3- or 4-foot standard lengths, and flange trim are made of die-formed, 20-gauge steel.

**Finish** The standard housing and trim color is gloss white (YGW) using polyester powder paint.

**Electrical** T8 and bias fixtures have instant-start electronic ballasts with less than 20% THD. T5/HO fixtures have programmed-start electronic ballasts with less than 10% THD. Fixtures are U.L. Damp

labeled (non-emergency) and I.B.E.W. manufactured. Maximum ballast size available: 2 3/8" width x 1 1/2" height.

**Mounting** Fixture is recess-mounted in either exposed T-bar or hard ceiling application(s).

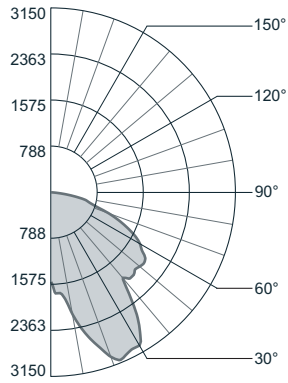
**Options** **AL:** aluminum body; **EML:** emergency battery (T5/HO=700; T8=600 lumens; BX=600-700 lumens); **EMH:** emergency battery (T5/HO=1200 lumens; T8=1200 lumens; BX=900-1100 lumens); **DM:** dimming (consult factory); **RSE:** rapid-start electronic (T8 & bias only); **10THD:** ballast with < 10% total harmonic distortion (T8 & bias only); **B\_;** specific ballasts, specify manufacturer and catalog number (consult factory); **FH:** fixture fusing (slow blow).

# P-5900 Wall Wash & Stack

## photometric data

### P-5900-1BX50W-04

Report # LSI16359 D=100.0% I=0.0%  
Lamp Lumens: 8000 Input Watts: 98



### Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
0	1543	1543	1543	1543	1543	84
5	1484	1704	1727	1738	1743	
10	1471	1711	1748	1911	2145	
15	1441	1688	2075	2413	2619	293
20	1395	1675	2408	2779	3020	
25	1324	1767	2663	3066	3079	557
30	1231	1925	2852	2989	3047	
35	1119	2024	2758	2860	2571	732
40	995	2064	2639	2298	1925	
45	872	2061	2232	1872	2011	734
50	738	1982	1635	1885	1990	
55	601	1759	1580	1896	1980	720
60	467	1517	1467	1746	1764	
65	332	1144	1346	1533	1451	599
70	226	804	1102	1175	1049	
75	136	655	733	755	681	343
80	70	445	429	531	421	
85	38	203	148	187	74	91
90	0	0	0	0	0	

### Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	56.39	100.00
90-180	0.00	0.00

Efficiency = 56.4%

### Luminance Summary (cd/m²)

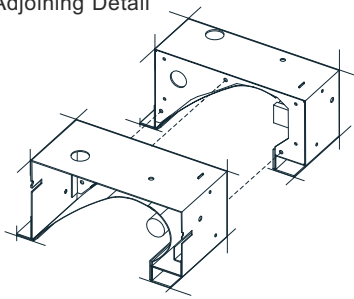
Angle	0°	45°	90°
45	6925	17792	16036
55	5884	15530	19459
65	4411	17952	19355
75	2950	15932	14833
85	2448	9549	4780

### Coefficients of Utilization (%)

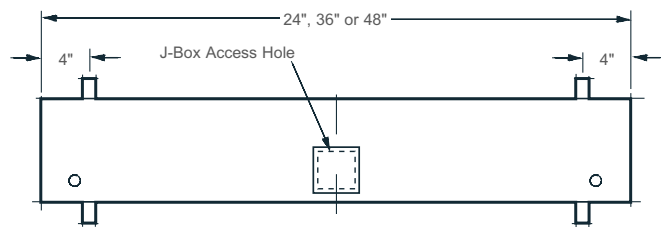
Floor	effective floor cavity reflectance = .20										
	Ceiling		80		70		50		30		10
Wall	70	50	30	10	70	50	30	10	50	30	10
RCR 0	67	67	67	67	66	66	66	66	63	63	63
1	61	59	56	54	60	58	55	53	55	53	52
2	56	51	48	44	55	50	47	44	48	45	43
3	51	45	41	37	50	44	40	37	43	39	36
4	47	40	35	32	46	39	35	31	38	34	31
5	43	36	31	27	42	35	30	27	34	30	26
6	39	32	27	23	38	31	26	23	30	26	23
7	36	28	23	20	35	28	23	20	27	22	19
8	33	25	21	17	32	25	20	17	24	20	17
9	31	23	18	15	30	23	18	15	22	18	15
10	28	21	16	13	28	21	16	13	20	16	13

## installation

### Adjoining Detail



### Mounting Locations



In an effort to continually provide the highest quality products, Prudential reserves the right to change design specifications and/or materials, without notice.

## wall wash application

### 20' x 9' wall wash layout

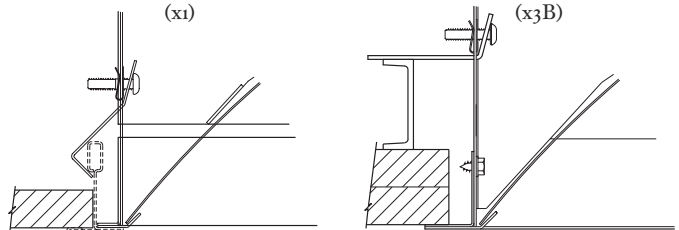
Fixture mounted 2' from wall  
Average Illuminance/Vertical Grid (Wall Surface)



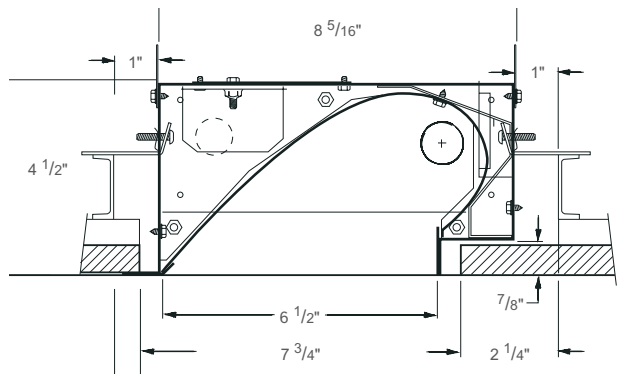
### Individual Fixtures on 8' Centers - P-5900-1BX50W-04 Vertical Footcandles

Average Illuminance maintained (LLF = .70)	Max FC	Max : Min	FC's 1'A.F.F.
35.7 FC	125.7	19.2 : 1	8.8

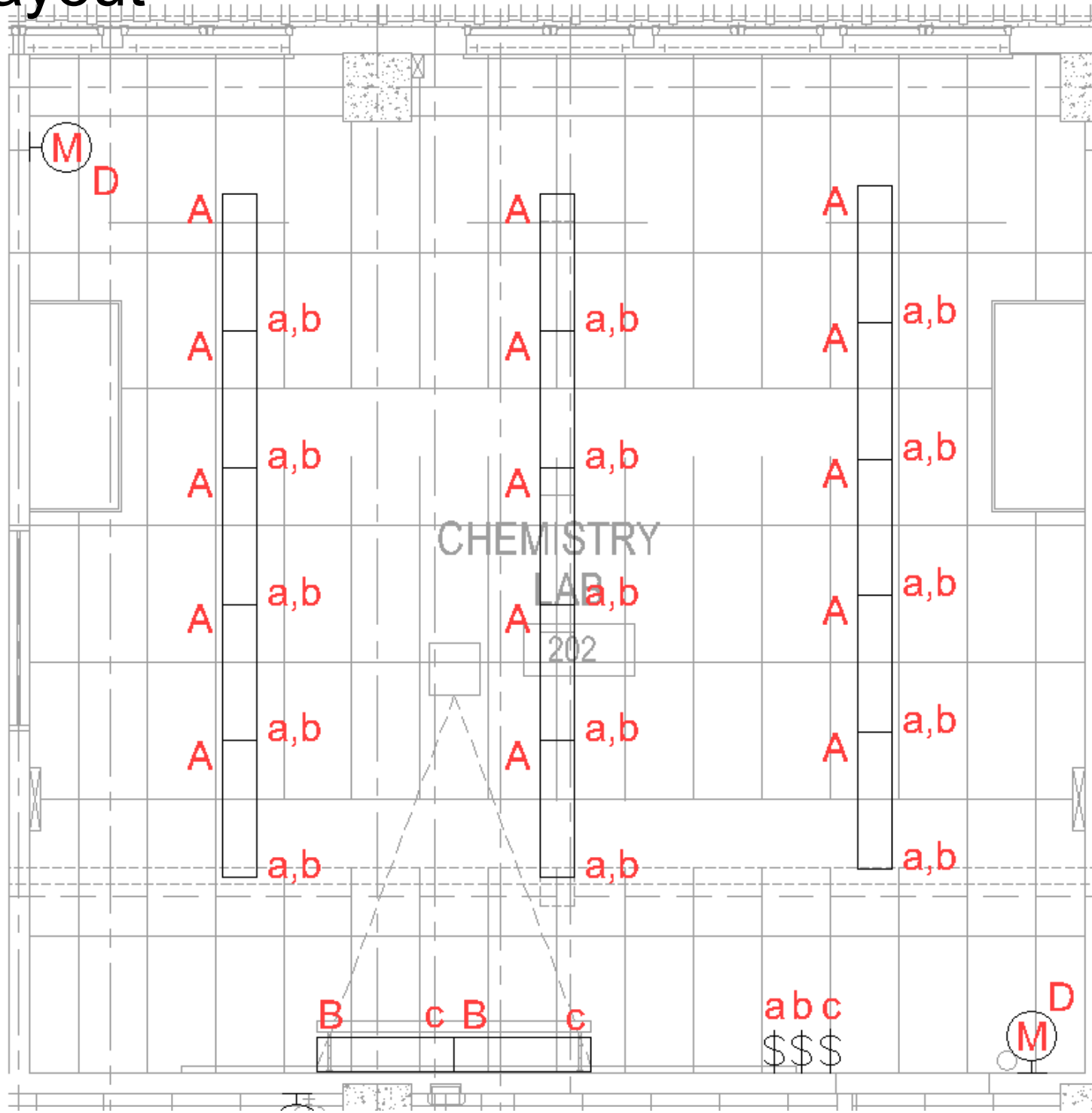
### Ceiling Systems



### Ceiling Detail (x3B)



# Layout



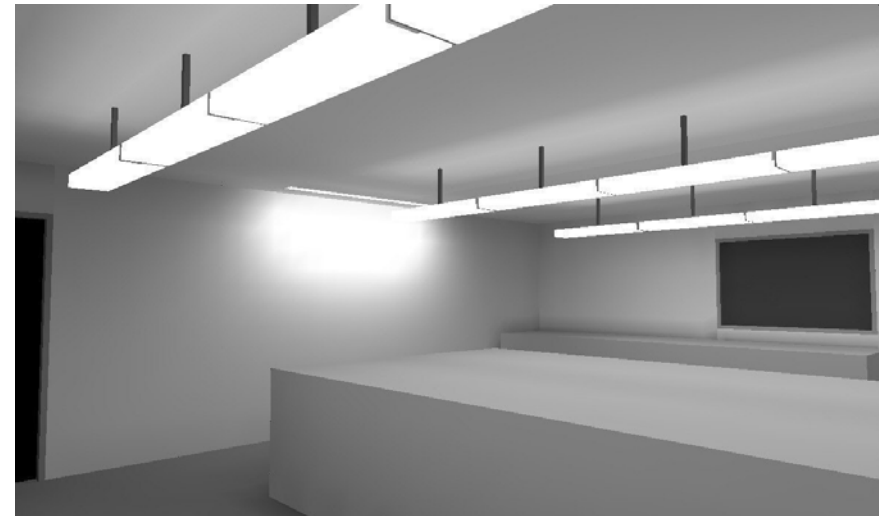
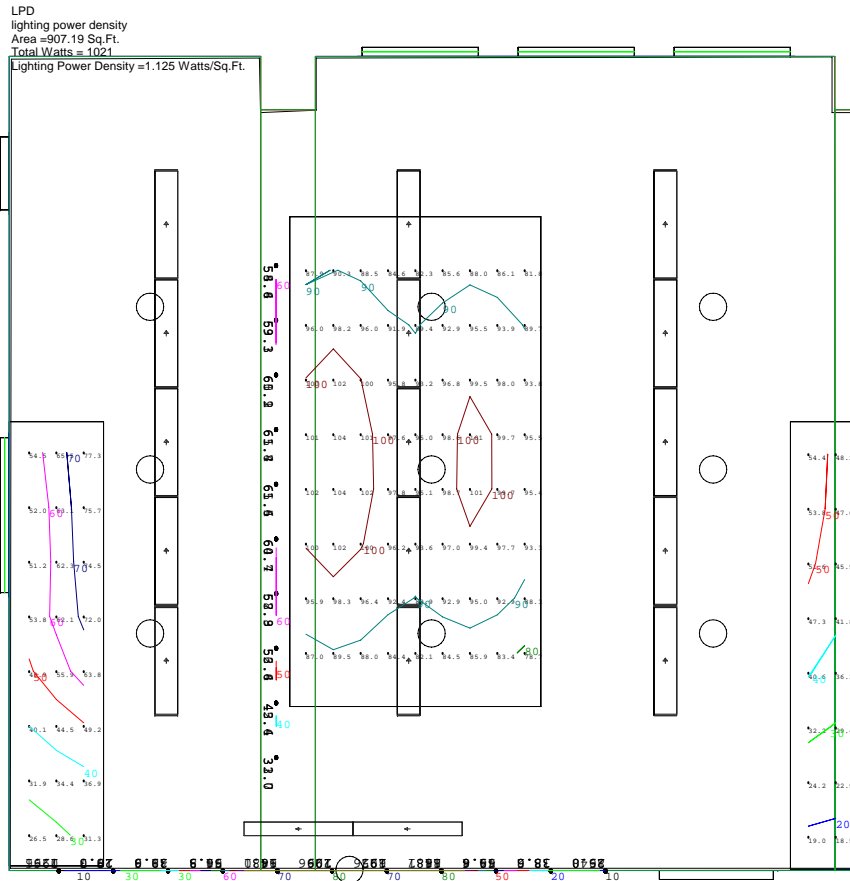
Luminaires  
A: Pru-7  
B: Pru-5900



# TCES - Chemistry Lab

Numeric Summary							
Project: All Projects							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
vertical	Illuminance	Fc	55.69	65.8	31.7	1.76	2.08
blackboard_Planar_4	Illuminance	Fc	72.05	226	0.9	80.06	251.44
workplane_right	Illuminance	Fc	38.32	54.4	18.5	2.07	2.94
workplane_middle	Illuminance	Fc	94.11	104	78.7	1.20	1.33
workplane_left	Illuminance	Fc	52.33	77.3	26.5	1.97	2.92
floor_TotalTop	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.
workplane_TotalTop	Illuminance	Fc	77.19	104	18.5	4.17	5.64

Luminaire Schedule						
Project: All Projects						
Symbol	Qty	Label	Arrangement	Lumens	LLF	Description
+	2	P59001BX50W04	SINGLE	2950	0.850	P5900-1T832W-04
+	15	PRU72T8LPAD9	SINGLE	2950	0.820	PRU7-2T8-04-LPA-D9





# Power Density

Existing: 1.7 W/sf

Allowed: 1.6 W/sf

Redesign:  $(66 \text{ W/ballast}) \times (16 \text{ ballasts}) / (907 \text{ sf}) = 1.2 \text{ W/sf}$

# Controls

Dual-tech motion sensors (infra-red and ultrasonic)

Manual Switches – bi-level switching for main work area

# LLF

PRU-7:

BF: 1.04

LLD: 1\*

RSDD: .97

LDD: .85

LLF: .85

Use: .82

PRU-5900:

BF: 1.04

LLD: 1\*

RSDD: .97

LDD: .89

LLF: .89

\* mean lumens used for calculations, so LLD = 1.0