final report

Denver Police Department Crime Lab || Denver, Colorado

lighting || electrical

Jackie Eury || April 8, 2015 || Shawn Good || Spring 2015

DENVER POLICE DEPARTMENT CRIME LAB
DENVER, CO

STATISTICS

Occupant Name | Denver Police Dept.
Owner | Denver Police Dept.
Type | Laboratory
Classification | B, A-3
Size | 60,000 GSF
Number of Stories | 3
Dates of Construction | Mar. 2011 – Jul. 2012
Actual Cost Information | $28 million
Project Delivery Method | CM at Risk

PROJECT TEAM

GC & CM | JE Dunn
Architect | Durrant
Design A&E | SmithGroupJJR
Electrical | Scanlon Szynskie Group
Mechanical | Gehring and Associates
Structural | MNA
Civil Engineer | S.A. Miro, Inc.

ARCHITECTURE

The lab utilizes a contemporary approach to architecture, with pieces of the building boldly extruding from the façade and an elevation that undulates. The materials that make up the exterior are a combination of metal and glass curtain walls, as well as concrete panels. The interior of the building is broken up into a variety of laboratories, meeting spaces, and offices. One room doubles as an emergency command center if the occasion arises. The ceilings are composed of metal, wood, and acoustic ceiling tiles while the flooring is either terrazzo or rubber tiles.

SUSTAINABILITY

Falling under LEED Gold for New Construction, the Denver Police Department Crime Lab has multiple sustainable facets. Water usage in the building was reduced by using low-flow fixtures. In addition to this, 20% of the materials in the building are recycled. The Crime Lab also has features like light pollution reduction, water efficient landscaping, and construction waste management.

MECHANICAL

Air distribution throughout the building is performed by two air-handling units located in the penthouse on the top level. These units supply a total of 90,000 CFM to the Crime Lab. There is also an exhaust energy recovery system. These systems are all variable air volume.

LIGHTING | ELECTRICAL

The lighting throughout the building is mainly fluorescent T8 recessed fixtures, either linear or parabolic. Downlights are predominantly compact fluorescent. Occupancy sensors, zoned, and low voltage switches are present in most of the labs.

Power is supplied through Xcel Energy, a utility provider in Colorado. Three 750 kVA, 480/277V 3ϕ secondary transformers are located at the service entrance to feed the rest of the building. A 500 kilowatt diesel-fueled generator serves as emergency power for the building and can be accessed through automatic transfer switches.

STRUCTURAL

The Crime Lab comprises of retaining walls, slab on grade, and a steel frame. Primarily, the lab is constructed with wide-flange and hollow structural steel columns. The main wind force resisting system is braced frames.

NORTHEAST CORNER
EXTERIOR VIEW

JACKIE EURY
LIGHTING | | ELECTRICAL
SHAWN GOOD

Image courtesy of SmithGroupJJR
Check it out online!
https://www.engr.psu.edu/ae/thesis/portfolios/2015/jze5059

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I would also like to thank my family, who have been with me through the rollercoaster ride that has been the Architectural Engineering program. I would not be here without the endless encouragement and love I have received from you.

Executive Summary

The purpose of this report is to propose an improved design for the Denver Police Department Crime Lab. The report breaks down into lighting and electrical depths, as well as construction and structural breadths.

In the lighting portion of this report, a redesign of four different spaces is performed. The spaces are embodied by the concept of "Identity," which is touched upon in the summary of each space. The spaces: the Lobby, the Main DNA Lab, the Multipurpose Room, and the South Plaza are described and overviewed, including dimensions, materials and typical furnishings for the space. Design criteria, both qualitative and quantitative, are established using the IES Lighting Handbook, 10th Edition and 2012 IECC. The final design showcases the fixture schedule, reflected ceiling plans, and renderings for each space. Lighting calculations, performed via Revit 2015's plugin ElumTools are reviewed and discussed as to whether they met the initial design criteria. A summary located at the end of each section brings together the criteria and calculations along with the concept to wrap up each space.

The electrical depth contains a branch circuit redesign, a fire alarm integration analysis and the implementation of a photovoltaic array on the roof of the Crime Lab. The branch circuit redesign analyzes the panelboards that contain the existing and new lighting loads for the four spaces designed in the lighting breadth. The new lighting loads were calculated and each fell within the maximum load per circuit, 16 kVA. This meant that a new design of the branch circuits was not necessary. As for the fire alarm integration, it proved uneconomical to install as a redesign. A building undergoing new construction could greatly benefit from Power over Ethernet cabling, but a retrofit would have great labor and material costs. The photovoltaic array located next to the penthouse on the Denver Crime Lab roof would supply over 160,000 kWh a year, but the system cost of $650,000 would null the payback period. A full analysis of the array was performed with the National Renewable Energy Lab's System Advisor Model (SAM).

Within the construction breadth, an analysis of the cost and construction schedule for the photovoltaic array are performed. Using RS Means Green Building 2015, the total cost of the PV installation came to nearly $830,000. This cost, which was a $180,000 increase from the SAM estimated cost, includes exact material and labor data. The duration times for the installation were taken for the RS Means Cost Data and the project would take approximately one month. Also within the construction breadth is an energy analysis of the existing and new fixtures within the building. Using Denver's commercial utility rate of $0.06/kWh, around $600 are saved a year by implementing the new fixtures.

The structural breadth takes into account the added weight of the photovoltaic array on the existing roof systems. The entire array takes up most of the east side of the roof, and is supported by roof and composite deck. After performing structural calculations on the amount of PSF the decks could support, it was discovered that the PV array would be more than well supported atop the existing roof.

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Building Overview

All 60,000 SF of the Denver Police Department Crime Lab serve the public of Colorado through proper and thorough forensic investigation. Neighboring the lab in downtown Denver is the Police Department and Department of Safety, along with several other government buildings. The building itself houses many facilities such as conference rooms, a multipurpose room, open offices, and various laboratories that allow their users to be able to work efficiently and effectively. Architecturally, the crime lab showcases a unique façade that was modeled after a double helix, or DNA molecule. This contemporary look continues on the interior of the building, where distinctive ceiling systems and modern labs are present.

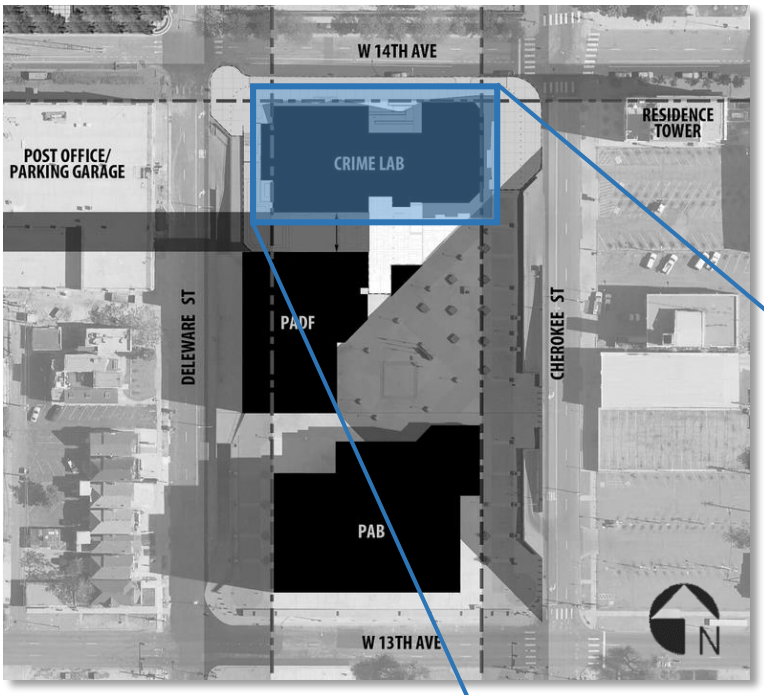


Figure 1.1 (above)
Bird's Eye View of Site
Diagram via SmithgroupJJR

Figure 1.2 (right)
Perspective View from Southeast Corner of Plaza
Photograph via SmithgroupJJR

Building Statistics

Building Name: Denver Police Department Crime Lab
Location and Site: 1371 Cherokee Street, Denver, CO 80204
Building Occupant Name: Denver Police Department
Occupancy or Function Types: Laboratory
Classification: B, A-3
Size: 60,000 GSF
Stories: 3
Dates of Construction: March 2011 – July 2012
Actual Cost Information: $28 million
Project Delivery Method: CM at Risk

Primary Project Team

Owner: Denver Police Department
General Contractor and Construction Management: JE Dunn
Architect: Durrant
Design Architect and Engineer, Lab Planner: SmithGroupJJR
Electrical Engineer: Scanlon Szynskie Group
Mechanical Engineer: Gehring and Associates
Structural Engineer: MNA
Civil Engineer: S.A. Miro, Inc.

Figure 1.3
Perspective view from Northeast Corner
Rendering via SmithgroupJJR

Zoning

The district the lab is located in is titled D-GT (Downtown Golden Triangle). Neighborhoods within this district are housing, office, commercial, retail and mixed use. The maximum height for buildings in this vicinity is 175 feet above the elevation of Broadway St.

Major National Model Codes

IBC 2006 | IMC 2006 | IPC 2006 | NEC 2005 | IFC 2006 | IECC 2006

Historical Requirements

There are no historical requirements.

Building Enclosure

Façade

A mixture of cladding systems makes up the building envelope of the crime lab. There are aluminum curtain walls, and precast concrete and composite metal panels. The structure itself is steel frame with composite and concrete decking.

Glazing

The glazing on the structure consists of four different glasses: spandrel, vision, frosted, and gradieted frit.

Figure 1.4
Double-helix Façade from Northwest Corner
Rendering via SmithgroupJJR

Roofing

Single Ply Membrane Roofing System from Everguard TPO. This light grey colored membrane is smooth type, polyester scrim reinforced thermoplastic polyolefin. This thermoplastic roofing does not allow water penetration and has a UL Class A fire rating.

Sustainability Features

Falling under LEED Gold for New Construction, the Denver Police Department Crime Lab has multiple sustainable facets. Water usage in the building was reduced by using low-flow fixtures. In addition to this, 20% of the materials in the building are recycled. Listed below are some other features that were placed into the building to achieve the LEED Gold rating:

- Heat Island Effect
- Light Pollution Reduction
- Water Efficient Landscaping
- Construction Waste Management
- Daylight and Views

Primary Engineering Systems

Lighting

The Denver Police Crime Lab is primarily lit with fluorescent fixtures. Direct/indirect pendant luminaires light the laboratories and open offices, while recessed, narrow luminaires are common in the hallways, and troffers in small, enclosed offices. Compact fluorescent downlights serve as support for rooms and corridors. The lighting is controlled through passive infrared and dual technology occupancy sensors, and dual-level switching. Daylight is largely used to light the lobby and atrium, as well as give the building a more "natural" feel in the lab and corridor spaces.

Electrical

The primary service enters the crime lab through a transformer vault in the basement. From here, it is stepped down to 480/277V and distributed by a 2500A switchboard throughout the building. There are transformers located on all levels to bring the voltage down to 208/120V for lighting, receptacles, and small equipment. There is a diesel generator on the western exterior of the building that will turn on via the use of automatic transfer switches. A UPS on the third floor backs-up security, telecommunications, and data within the building.

Mechanical

Air distribution throughout the building is performed by two air-handling units located in the penthouse. These units supply a total of 90,000 CFM to the lab. The laboratories are equipped with exhaust fans that bring any contaminants up to the penthouse. There is also an exhaust energy recovery system that serves the laboratory ductwork. These systems are all variable air volume.

Structural

The lab is composed of a moment resisting frame system with a slab-on-grade foundation. Columns, beams, and girders are structural steel while the flooring is concrete. The wide flange columns that support the building are 12-0" deep or 14-0" deep. The majority of steel beams supporting the floors are W27x94. Girders are typically W24x62 and W37x84. The floor slabs are mainly 4-1/2" normal weight concrete on 2-0" deep 16 gage composite floor deck. The mechanical yard, which exists in the penthouse, contains a slab of 6-0" normal weight concrete on 2-0" deep 20 gage composite deck. Roof deck is 1-1/2" deep 20 gage type B deck. Balconies have depressed slabs.

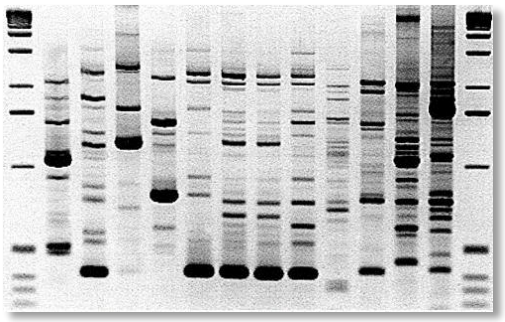
Construction

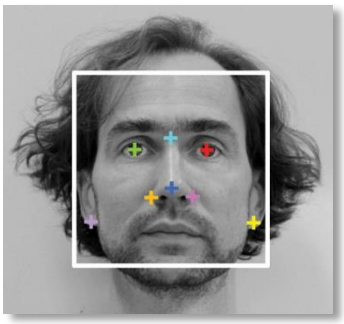
The project delivery method that was used was CM at-risk, and construction was performed by JE Dunn. The lab was constructed from March 2011 to July 2012. Upon completion, the building came to $28 million and obtained LEED Gold.

Lighting Depth

Concept

The people of the Denver Crime Lab are constantly researching, studying, and analyzing evidence. Their work leads to the solution of a case, the conviction of a criminal, and the peaceful mind of a victim. What the employees are ultimately doing is discovering someone's **IDENTITY**. It could be a drop of blood left at a crime scene, a physical feature observed by a witness, or a fingerprint on a murder weapon. All of these components are ways to discover a person's identity. This concept, along with the architecture and function of each space influence the lighting design.





Lobby

Space Overview

As the main entrance space, and first visually impactful room in the crime lab, the lobby should be aesthetically pleasing. The lobby stretches from the south to north end of the building, with occupants entering through the south. Within the lobby are two atriums that carry through the three stories of the building and accommodate corridors. An elevator and large staircase help transition employees throughout the building.

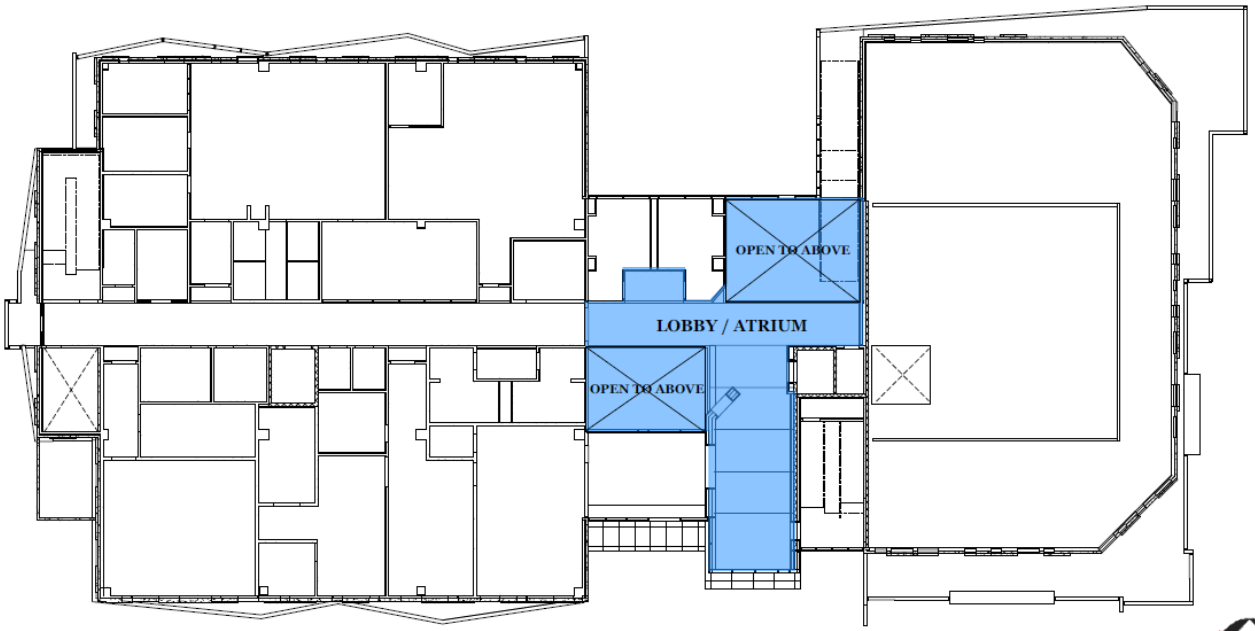


Figure 2.1 | First Floor Plan
Lobby Location with North and South Atrium

Space Overview *(continued)*

The section in Figure 1.5 shows the extent of the lobby atrium, as well as the corridors that look out into the space. Below are some of the space logistics for the lobby.

Dimensions
Area | 1903 ft^2
Ceiling Height | 12'-0," 46'-0"
Room Length | 71'-0"
Room Width | 51'-0"

Materials
Ceiling | Perforated Metal Panels
Walls | Gypsum, Composite Panels, Wood Panels
Floor | Terrazzo, Carpet

Furnishings
Chairs + Couches + End tables
Reception Desk

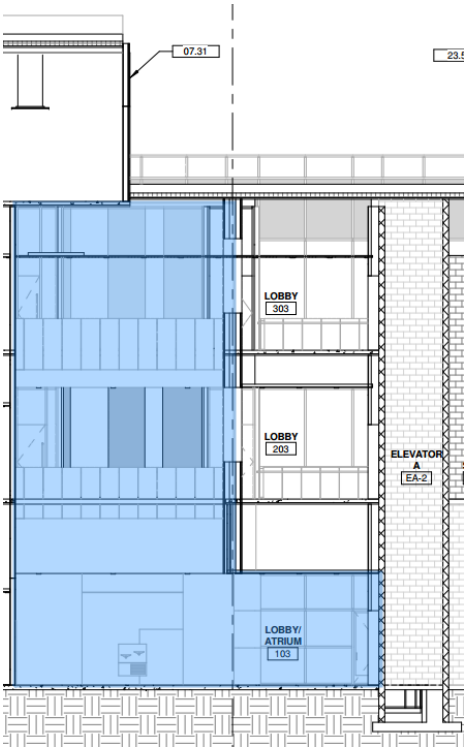


Figure 2.2 | Lobby Section through South Atrium

Criteria

The lobby mainly functions as a transition space, with a reception desk near the entrance. However, there is seating for leisure activities. In the IES Lighting Handbook, 10th edition, the task illuminances are as follows:

Table 2.1 | Lobby Task Illuminance

Task	E_h (lux)	E_v (lux)	Avg:Min
Transition			
Day	100	30	4:1
Night	50	20	4:1
Reception	150	50	4:1
Lounge	150	50	2:1

The lighting power density for the space is defined by IECC 2012, and the recommended values for the space can be seen in Table 2.2.

Table 2.2 | Lighting Power Density

Space	Allowance (W/ft^2)
Lobby	1.10

Since the lobby is the first thing you see upon entering the building and remains lit twenty-four seven, it is important for it to appear welcoming and bright. The light should create visual interest for visitors and employees alike. With so much illuminance, power density may be an issue so it will be vital to use fixtures with lower input wattages. The light should also assist visitors in transitioning through the space.

Design

The design for the lobby is meant to create visual interest for the employees and visitors, while drawing them to where they need to be. That beign said, the lobby has the most diverse set of fixtures. Table 2.3 lists all of the fixtures that assisted in creating this design. It is used in conjunction with the reflected ceiling plans (Figures 2.3a and 2.3b) on the following page. In addition, the Lobby is controlled by dimming switches located behind the reception desk.

Table 2.3 | Lobby Fixture Schedule

Type	Tag	Description	Manufacturer	Model	Lamp	Input Wattage	Input Voltage	Notes
	DL1	LED 6" APERTURE DOWNLIGHT. 3200 LM OUTPUT.	ZUMTOBEL	BR6DLED2-N-46W-835-M5-DH2	LED 3500K, 85CRI	44.8 W	277 V	LUTRON HILUME A SERIES DRIVER.
	PL1	LINEAR LED DIRECT/INDIRECT 4'-0" PENDANTS. ARRANGED IN A 8'-0" BY 4'-0" RECTANGLE ABOVE RECEPTION.	AXIS LIGHTING	BBDILED-B3-640-320-40-SO-4-MR16LED-AP-277-D-1	LED 4000K, >80CRI	34.4 W	277 V	LUTRON HILUME DRIVER. WATTAGE FOR ENTIRE FIXTURE IS 206.4 W. BBPAT-REC-90-24-EX-LED-AP FOR CORNERS.
	RL2A	LUMISHEET LED LIGHT PANEL 12"x3." PART OF DNA WALL.	EVO-LITE	LLP12-12X3-NW-SFI-WL15-L1	LED 4100K, >80CRI	2 W	277 V	79 RL2A PANELS ARE USED WITHIN THE DNA WALL. DIMMABLE MAGNETIC TRANSFORMER.
	RL2B	LUMISHEET LED LIGHT PANEL 12"x5." PART OF DNA WALL.	EVO-LITE	LLP12-12X5-NW-SFI-WL15-L1	LED 4100K, >80CRI	2 W	277 V	48 RL2B PANELS ARE USED WITHIN THE DNA WALL .DIMMABLE MAGNETIC TRANSFORMER.
	RL2C	LUMISHEET LED LIGHT PANEL 12"x8." PART OF DNA WALL.	EVO-LITE	LLP12-12X8-NW-SFI-WL15-L1	LED 4100K, >80CRI	3 W	277 V	33 RL2C PANELS ARE USED WITHIN THE DNA WALL. DIMMABLE MAGNETIC TRANSFORMER.
	RL2D	LUMISHEET LED LIGHT PANEL 12" WIDE. RECESSED INTO METAL PANELS TO CREATE LINE OF LIGHT ALONG CORRIDOR.	EVO-LITE	LLP12-12X600-NW-SFI-WL15-L2	LED 4100K, >80CRI	200 W	277 V	RADIO FREQUENCY REMOTE CONTROLLED DIMMING.
	PF1	STICK T5 8'-0" BARE LAMP	DELRAY LIGHTING INC.	ST48228-2-DPB-SD8	2 (T5) 4100K, 85CRI	63 W	277 V	LUTRON HILUME DIMMING BALLAST
	RL3A	LIGHT FIELD LED RECESSED 1X1 FOOT FIXTURE. 1300 LM OUTPUT.	ZUMTOBEL	LFULED-11-20-K40-MP-DH2-WF	LED 4000K, 85CRI	20 W	277 V	LUTRON HILUME A SERIES DIMMING DRIVER

Design *(continued)*

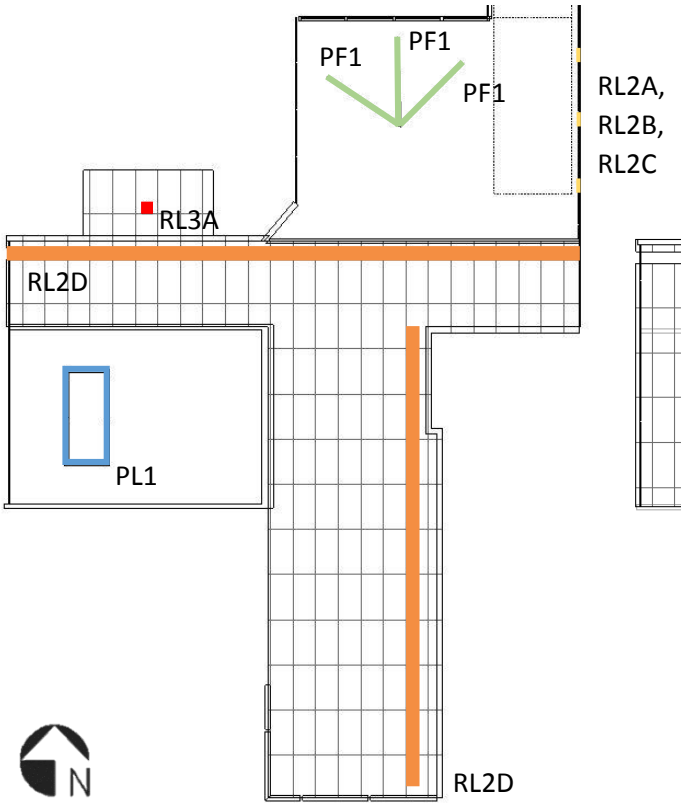


Figure 2.3a | Reflected Ceiling Plan
Lobby Level 1

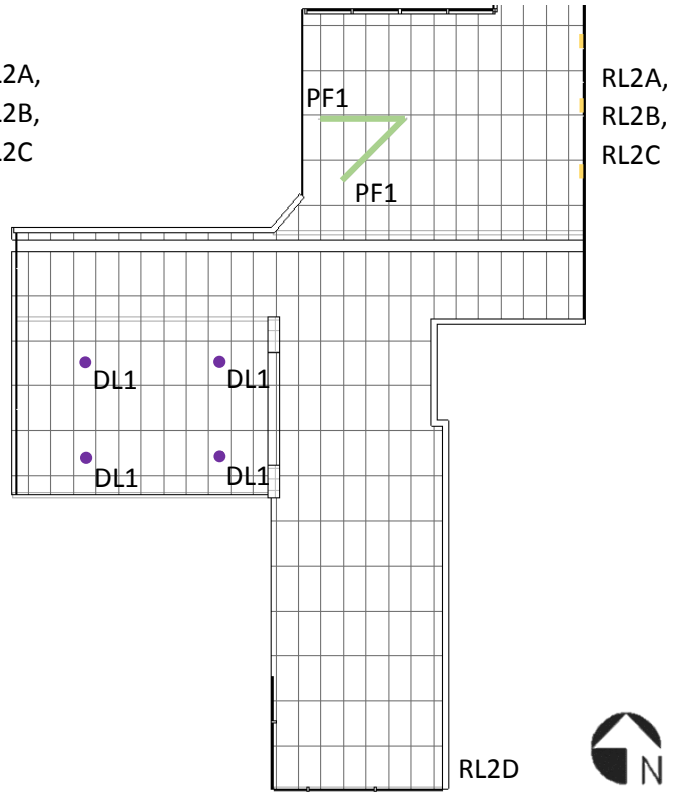
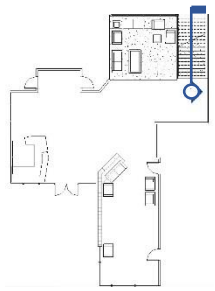


Figure 2.3b | Reflected Ceiling Plan (above)
Lobby Level 3



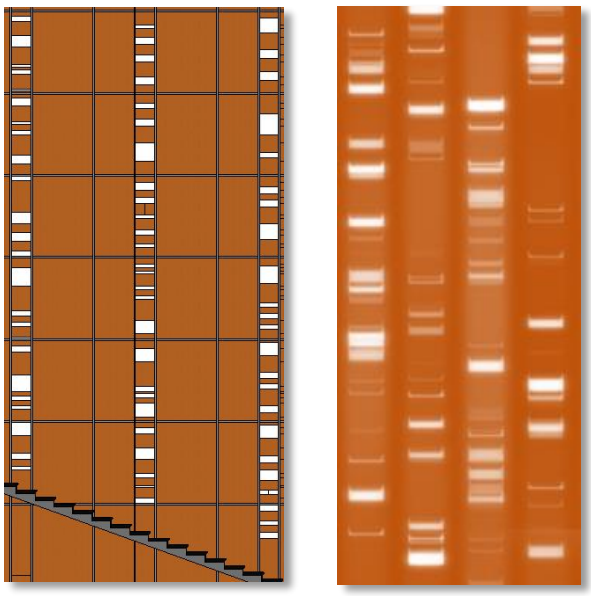


Figure 2.4 & 2.5 | Section View & DNA Fingerprint
Wood Paneled Wall with DNA design
This design incorporates LED panels of three different sizes to achieve the DNA Fingerprint look.

Renderings

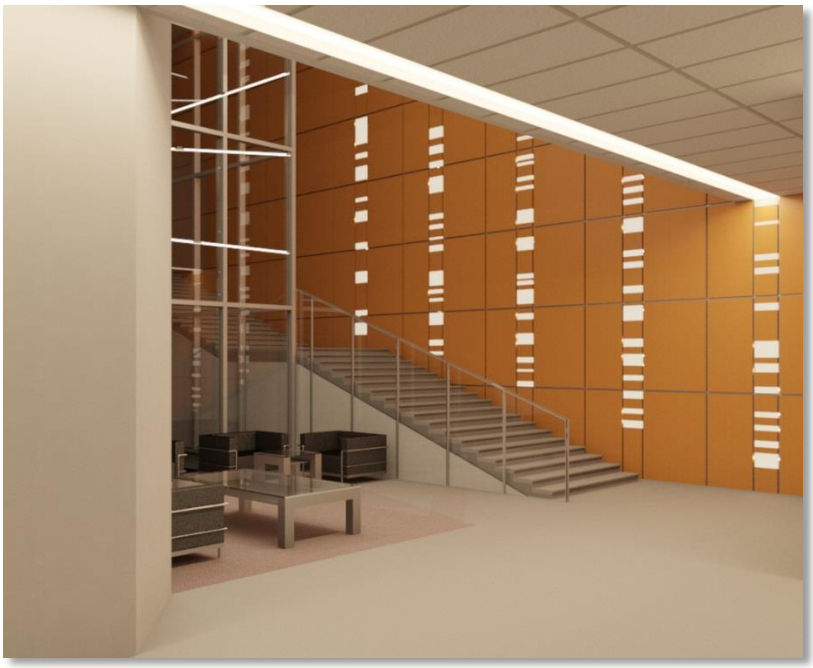


Figure 2.6 | Lobby Perspective Rendering
Facing Wood Wall

Figure 2.7 | Lobby Perspective Rendering
Reception and Entrance

Renderings *(continued)*

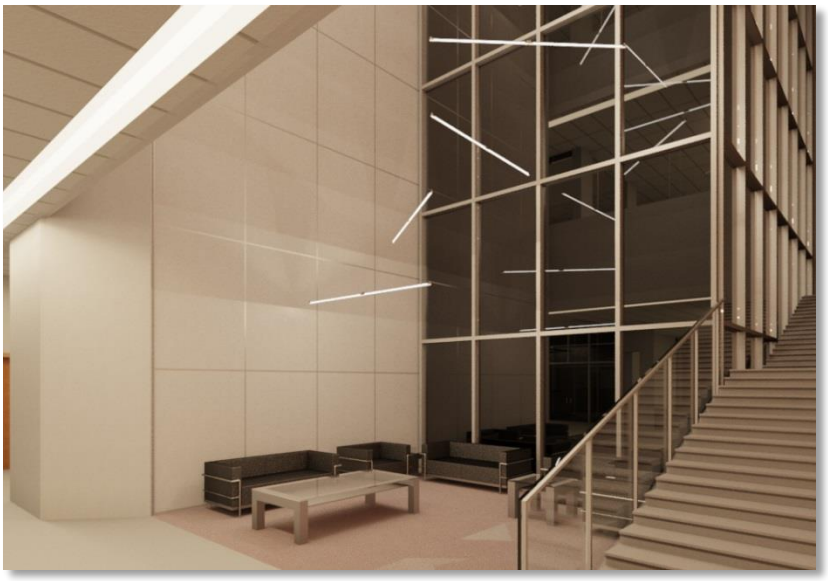


Figure 2.8 | Lobby Perspective Rendering
DNA Pendant from Base of Staircase in North Atrium

Figure 2.9 | Worm's Eye Rendering
DNA Pendant in North Atrium

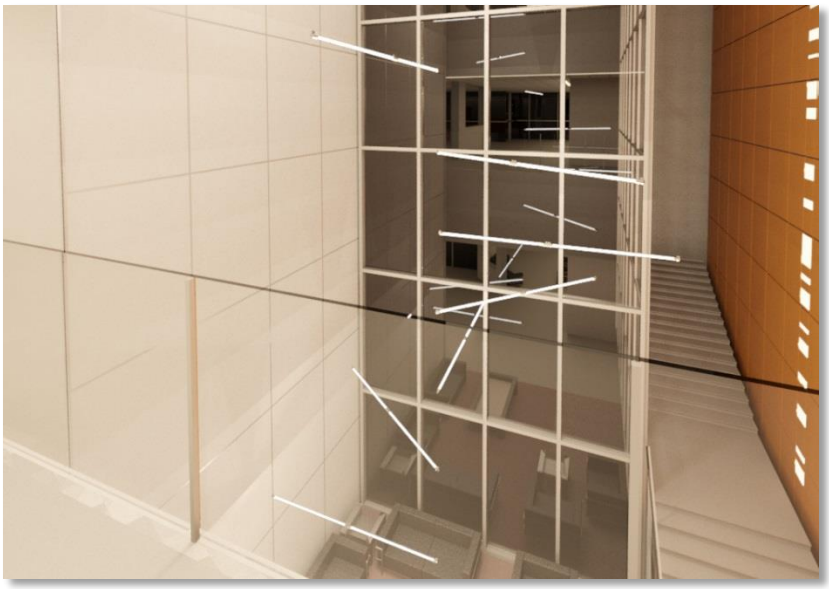


Figure 2.10 | Lobby Perspective Rendering
DNA Pendant from the Second Floor

Calculations

A calculation was performed using ElumTools in Revit 2015. The average illuminance for the space was 206 lux which meets all of the design criteria. The Average/Min ratio also is close to the 4:1 ratio recommended in the IES Handbook, 10th Edition. Reference Table 2.4 for a summary of all calculated data including power density.

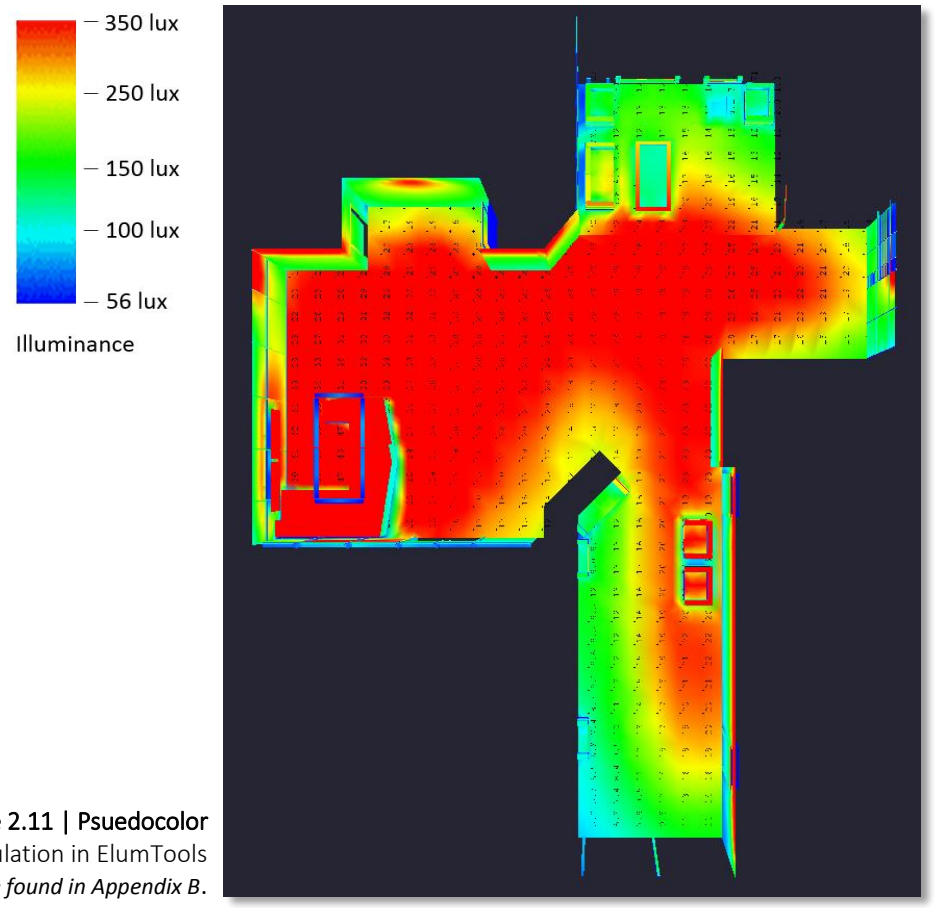


Figure 2.11 | Psuedocolor
Lobby calculation in ElumTools
A readable illuminance calculation can be found in Appendix B.

Table 2.4 | Summary of Quantitative Data

Space	Avg. (lux)	Max. (lux)	Min. (lux)	Avg/Min.	LPD (W/ft^2)
Lobby	206	503	56	3.7:1	1.00

Table 2.5 | Light Loss Factors

Luminaires	LLD*	LDD	BF**	LLF
DL1	0.7	0.89	-	0.62
PL1	0.7	0.94	-	0.66
RL2A	0.7	0.89	-	0.62
RL2B	0.7	0.89	-	0.62
RL2C	0.7	0.89	-	0.62
RL2A	0.7	0.94	-	0.66
PF1	0.93	0.89	1.0	0.83
RL3A	0.7	0.94	-	0.66

**LLD for all LED fixtures has been determined as 0.7 per L70.*
***Ballast Factor information can be found in Appendix C.*

Summary

Just as a strand of DNA becomes the genetic material of a person's beginning, the Lobby represents the start of the building and is truly its core. When walking into the Denver Crime Lab, a visitor is immediately drawn to the reception desk, which is brightly illuminated. From there, one can be guided to the elevator or corridors through recessed linear LED panels that create a line of transition. However, one may be drawn to the exposed staircase via the DNA fingerprint design incorporated in the wood-paneled wall. This LED design is intended to be eye-catching, and can be seen upon turning away from the reception desk. In contrast to the wall, there is a DNA helix inspired pendant that hangs in the North Atrium above the lounge. The helix, which is composed of bare fluorescent lamps represents the older idea of DNA whereas the LED DNA wall represents the leaps technology has made in crime investigation and lamp type together.

This lighting design accomplishes the initial criteria of creating a space that can easily by transitioned through. In addition, the recommended illuminance levels were achieved as well as a power density that falls 0.10 W/ft^2 below the 2012 IECC value.

Main DNA Lab

Space Overview

The lab is located on the second floor in the southwest corner of the building. This is where the majority of labwork is done and occupants need a bright, uniformly lit space. The DNA Lab is a mostly rectangular room with rubber tiles, a 10'-0" ACT ceiling and 12'-0" gypsum ceiling near the windows. With the south walls consisting of glazing, a lot of daylight fills the space.

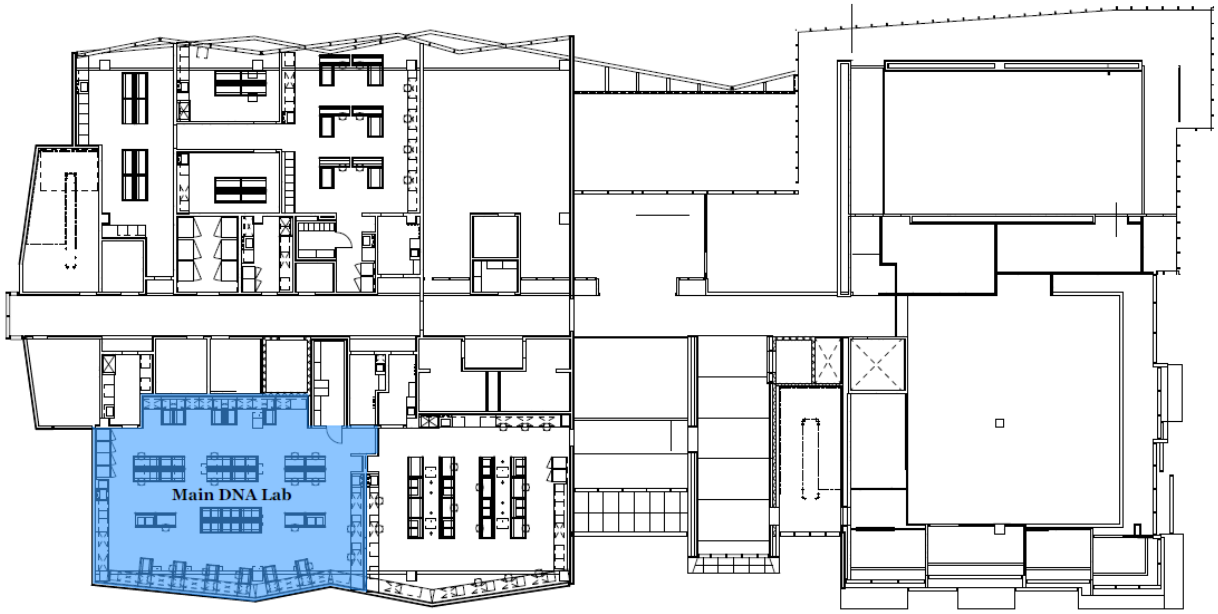


Figure 3.1 | Second Floor Plan
Main DNA Lab Location

Space Overview *(continued)*

Dimensions
Area | 2041 ft^2
Ceiling Height | 10’-0,” 12’-0”
Room Length | 52’-6”
Room Width | 39’-0”

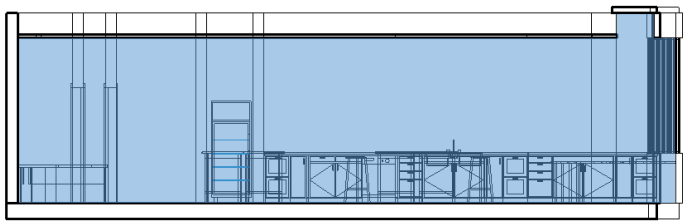


Figure 3.2 | Transverse Section
Main DNA Lab

Materials
Ceiling | 2’x2’ Acoustic Ceiling Tile, Gypsum
Walls | Gypsum
Floor | Seamless Rubber Tile

Furnishings
Counters
Cabinets
Lab Tables

Criteria

Since the labs can be occupied until 3 AM at night, it will be important for the fixtures to maintain consistent luminous task lighting. The lab is to be brightly illuminated, much like the physical features of a suspect’s profile. Task is very important for the lab, so by creating a visually clear area for the technicians to work in, a safe environment will be maintained. In addition, the lamp type must remain fluorescent as to not interfer with the equipment used in the lab. The main fixtures in the lab will be equipped with dimming ballasts so that when large amounts of daylight are in the lab, the level of light can be adjusted to what the employee’s deem adequate.

In the IES Lighting Handbook, 10th edition, the task illuminances are as follows:

Table 3.1 | Main DNA Lab Task Illuminance

Task	E_h (lux)	E_v (lux)	Avg:Min
Laboratory	500	150	2:1

The lighting power density for the space is defined by IECC 2012, and the recommended values for the space can be seen in Table 3.2.

Table 3.2 | Lighting Power Density

Space	Allowance (W/ft^2)
Main DNA Lab	1.8

Design

The Main DNA Lab is designed to achieve high illuminance levels while maintaining a uniform appearance. Table 3.3 lists all of the fixtures that assisted in creating this design. It is used in conjunction with the reflected ceiling plan (Figure 3.3) below. The lab is also required to have an occupancy sensor with a 30 minute time delay via the IECC 2012.

Table 3.3 | Main DNA Lab Fixture Schedule

Type	Tag	Description	Manufacturer	Model	Lamp	Input Wattage	Input Voltage	Notes
	RF1	P43 RECESSED FLUORESCENT FIXTURES LOCATED NEAR WINDOWS.	PRUDENTIAL	P43-1T5-04-TMW-D1-SC-277-X3B-DM	(1) T5 4100K, 85CRI	32 W	277 V	OSRAM SYLVANIA 0-10V DIMMING BALLAST.
	PF2	LINEAR FLUORESCENT DIRECT/INDIRECT 4'-0" PENDANTS. ARRANGED IN "L" SHAPE WITH 90 DEGREE CORNER.	AXIS LIGHTING	BB-F-NO-4-EX4-T5HO-1-1-W-277-D-1-D	(2) T5HO 4100K, 85CRI	117 W	277 V	OSRAM SYLVANIA 100-1% DIMMING RANGE QT2X54/277PHO-DIM BALLAST. SUSPENDED AT 2.5'
	RF2	LIGHTLINE RECESSED SYMMETRIC PERIMETER FIXTURES.	PEERLESS	LSR9-G-1-28T5-LDL-U4-277-OSDIM-LP841-C200-FLNGW	(1) T5 4100K, 85CRI	32 W	277 V	OSRAM SYLVANIA 0-10V DIMMING BALLAST.

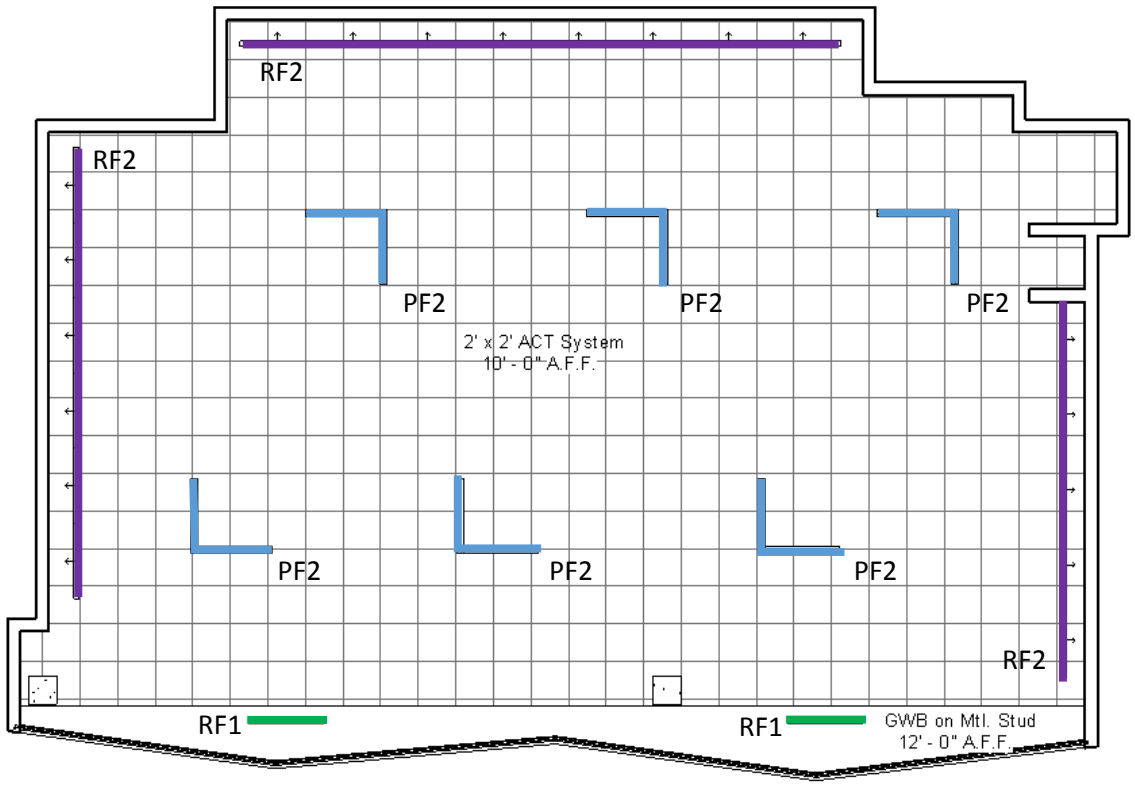


Figure 3.3 | Reflected Ceiling Plan
Main DNA Lab

Renderings

Figure 3.4 | Revit 2015 Rendering
Perspective View from Entrance

Figure 3.5 | Revit 2015 Rendering
Perspective View from Middle Aisle

Figure 3.6 | Revit 2015 Rendering
Perspective View from Southwest Corner

Calculations

A calculation was performed using ElumTools in Revit 2015. The average illuminance for the space was 575 lux which meets the design criteria of 500 lux. In addition the Average/Min illuminance ratio is close to the 2:1 ratio recommended in the IES Handbook, 10th Edition. Reference Table 3.4 for a summary of all calculated data.

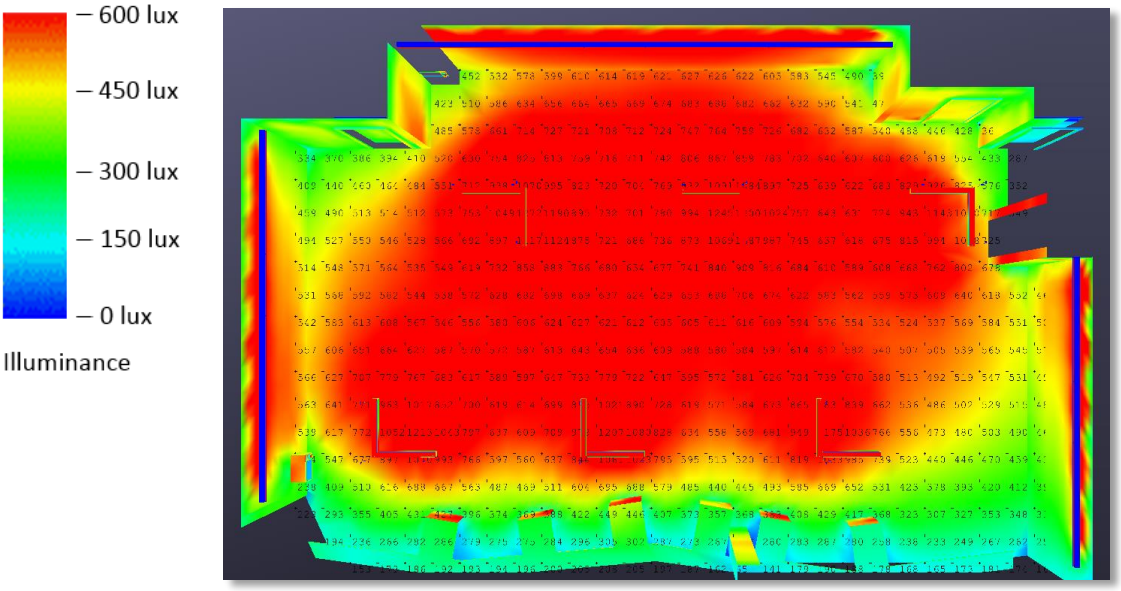


Figure 3.7 | Psuedocolor
DNA Lab calculation in ElumTools
A readable illuminance calculation can be found in Appendix B.

Table 3.4 | Summary of Quantitative Data

Space	Avg. (lux)	Max. (lux)	Min. (lux)	Avg/Min.	LPD (W/ft^2)
Main DNA Lab	575	1084	167	3.4:1	1.02

Table 3.5 | Light Loss Factors

Luminaires	LLD*	LDD	BF**	LLF
RF1	0.93	0.85	1.0	0.79
RF2	0.93	0.85	1.0	0.79
PF2	0.93	0.90	1.0	0.84

**LLD for all LED fixtures has been determined as 0.7 per L70.*
***Ballast Factor information can be found in Appendix C.*

Summary

In the Main DNA lab, direct/indirect pendants create a uniform layer of light for the task plane. Placed in an "L" formation, these shapes are intended to look like they are framing the areas underneath them, much like one narrows down suspect's profiles in a criminal investigation. Wall-washers along the north, east and west walls balance the daylight coming in through the south glazing while providing task light for the counter space. The intended design achieves an impression of spaciousness and visual clarity by keeping the perimeters brightly lit and maintaining uniform light across the space.

Summary *(continued)*

This space falls beneath the IECC 2012 value of 1.8 W/ft^2, with an achieved value of 1.02 W/ft^2. The average illuminance level recommended by the IES Handbook, 10th Edition were met. The illuminance maximum was high, but since this space is a lab, brighter levels may be wanted. The pendant fixtures are also powered through a dimming ballast so occupants can adjust the light levels as needed. Although the Average/Minimum ratio was not met, the 3.4:1 ratio is relatively close to the guideline of 2:1. This is much improved from the original design for the lab, which was 11:1.

Multipurpose Room

Space Overview

In the northeast corner of the Denver Crime Lab's second floor is the multipurpose room, where lectures and meetings occur. The ceiling system is composed of 2'x2' wood panels and slopes (see Figure 4.1). In addition, the floor terraces to create optimal viewing. Gypsum wall board makes up the walls in the multipurpose room while carpet is present on the floor. This space also contains an Audio/Visual system to use for presentations.

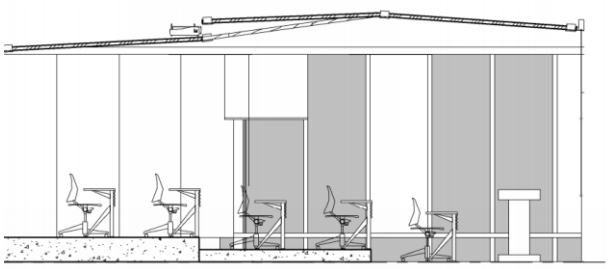


Figure 4.1 | Transverse Section
Multipurpose Room Sloped Wood Ceiling

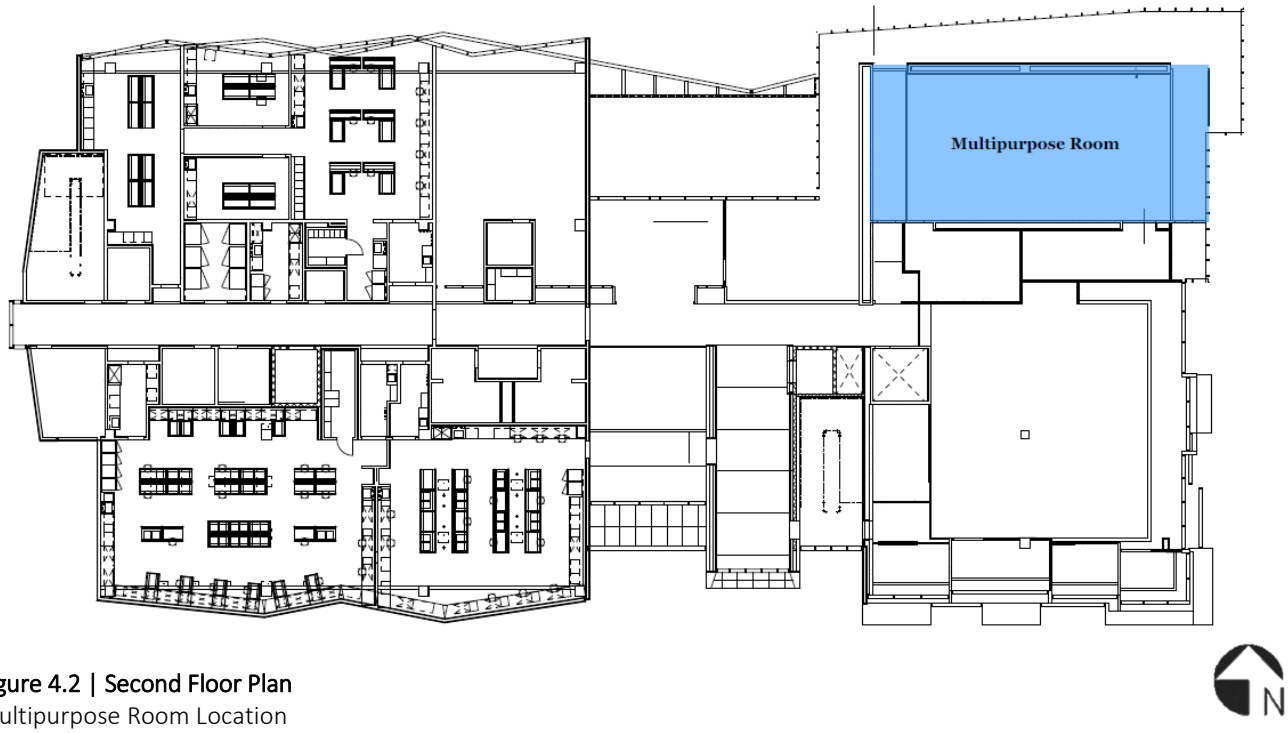


Figure 4.2 | Second Floor Plan
Multipurpose Room Location

Space Overview *(continued)*

Dimensions
Area | 2287 ft^2
Ceiling Height | Various heights (Reference Figure 4.3)
Room Length | 71’-0”
Room Width | 32’-0”

Materials
Ceiling | Wood Laminate Panels, Gypsum
Walls | Gypsum
Floor | 1’x1’ Carpet Tile

Furnishings
Long Table + Chairs
Podium
Projection Screens

Criteria

The multipurpose room is a very functional room, so it will be vital to create a space that has fixtures that are adjustable. Since it functions as an emergency center and an A/V room, high and low light levels will be desired. Manual dimming would also benefit this space to accommodate any emergency situations.

The multipurpose room can be used as a training room, lecture area, and emergency command center. In the IES Lighting Handbook, 10th edition, the task illuminances are as follows:

Table 4.1 | Multipurpose Room Illuminance

Task	E_h (lux)	E_v (lux)	Avg:Min
Reading & Writing	300	150	2:1
A/V	50	15	2:1

The lighting power density for the space is defined by IECC 2012, and the recommended values for the space can be seen in Table 4.2.

Table 4.2 | Lighting Power Density

Space	Allowance (W/ft^2)
Multipurpose Room	1.3

Design

When investigating a case, the subject will take on the identity of the victim or the suspect. The victim is often, naïve, pure and innocent. The multipurpose room will have linear fixtures that stretch from the back to the front of the room, basking the long desks in light. The perimeter walls will have wall-washers to embrace the participants with light. This is to create the feeling of a public space, one that is spacious and safe. For the presentation mode, the room will take on the concept of the suspect. Controls will allow the fixtures to be dimmed and a somber mood will take over the room. An angled downlight will shine light on the presenter, illuminating their features. This lighting design creates a dark atmosphere with the majority of light being on the

Design *(continued)*

presentation board. This allows the employees to focus on their lecture and lecturer. An occupancy sensor with a time delay of 30 minutes will also be located in the center of the room. In order to achieve this design, the fixtures located in Table 4.3 were used. The fixture schedule should be viewed with the Reflected Ceiling Plan (Figure 4.3) located further down the page.

Table 4.3 | Multipurpose Room Fixture Schedule

Type	Tag	Description	Manufacturer	Model	Lamp	Input Wattage	Input Voltage	Notes
	RL3B	LIGHT FIELD LED RECESSED 1X1 FOOT FIXTURE. 1300 LM OUTPUT.	ZUMTOBEL	LFULED-11-24-K40-MP-DH2-WF	LED 4000K, 85CRI	24 W	277 V	LUTRON HILUME A SERIES 0-10V 1% DIMMING DRIVER.
	RL4	P43 RECESSED LED 8'-0" FIXTURES INSTALLED IN WOOD PANELED CEILING VIA CUTS. 3000 LM OUTPUT.	PRUDENTIAL	P43LED4SO-R08-SAL-YPE-D1-SC-UNV-X3B-DM01	LED 4000K, 87CRI	78 W	277 V	LUTRON HILUME A SERIES 0-10V 1% DIMMING DRIVER.
	WW1	LIGHTLINE RECESSED WALLWASH PERIMETER FIXTURES.	PEERLESS	LWR9-G-1-14T5-LDL-U4-277-ADZT-LP841-C200-GEB10	(1) T5 4100K, >80CRI	17 W	277 V	LUTRON HILUME A SERIES 0-10V 1% DIMMING DRIVER. 3 WIRE LINE VOLT.
	DL2	IRIS LED WALLWASH DOWNLIGHT. 3.5" APERTURE.	COOPER	P3LED-09-FL40-840-EL3D-E3LWW-WH-RG50FL40	LED 4000K, 80CRI	16 W	277 V	45 DEGREE TILT ANGLE. LUTRON HILUME A SERIES 0-10V 1% DIMMING DRIVER.
	DL3	IRIS LED ADJUSTABLE DOWNLIGHT. 3.5" APERTURE. USED FOR PODIUM.	COOPER	P3LED-09-FL40-930-EL3D-E3AA-WH-RG50FL40	LED 3000K, 90CRI	16 W	277 V	30 DEGREE TILT ANGLE. LUTRON HILUME A SERIES 0-10V 1% DIMMING DRIVER.

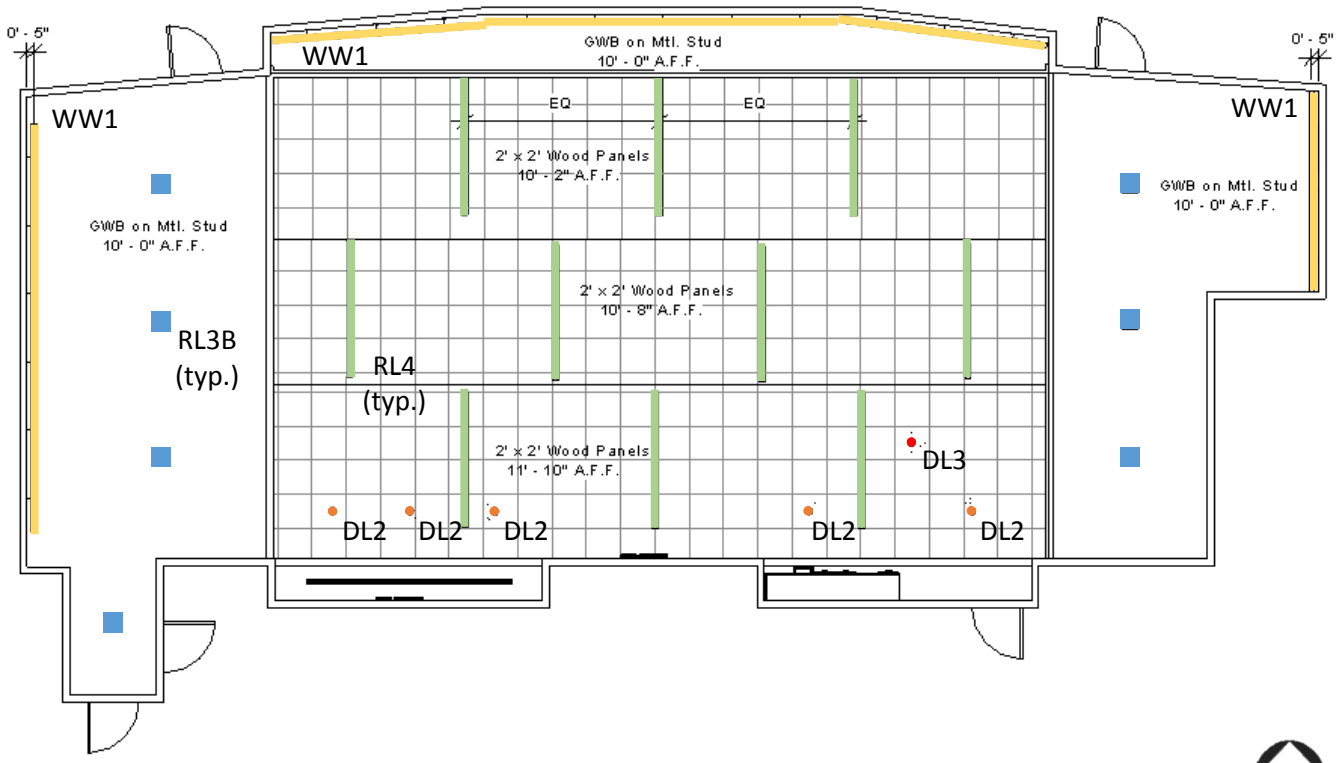


Figure 4.3 | Reflected Ceiling Plan
Multipurpose Room

Renderings

Figure 4.4 | Revit 2015 Rendering
Perspective View upon entry to the Multipurpose Room

Figure 4.6 | Revit 2015 Rendering
Perspective View from the front of the Multipurpose Room

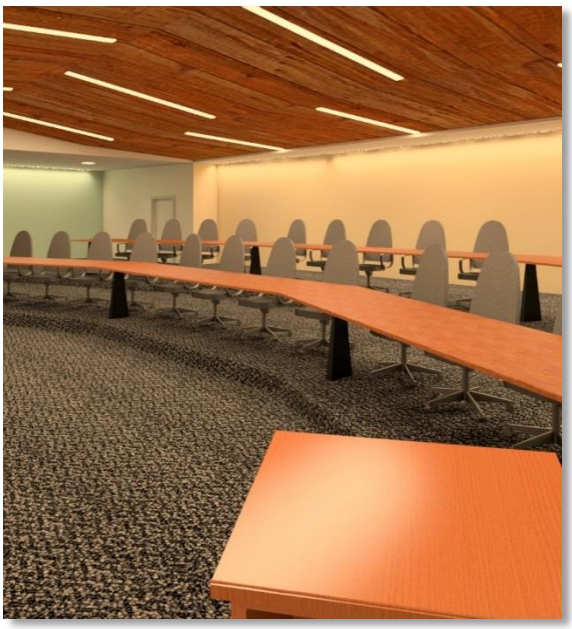


Figure 4.5 | Revit 2015 Rendering
Perspective View from Podium

Calculations

A calculation was performed using ElumTools in Revit 2015. The average illuminance for the space was 333 lux which meets the design criteria of 300 lux. The Average/Min ratio is just above the 2:1 ratio recommended in the IES Handbook, 10th Edition. Reference Table 4.4 for a summary of all calculated data including power density.

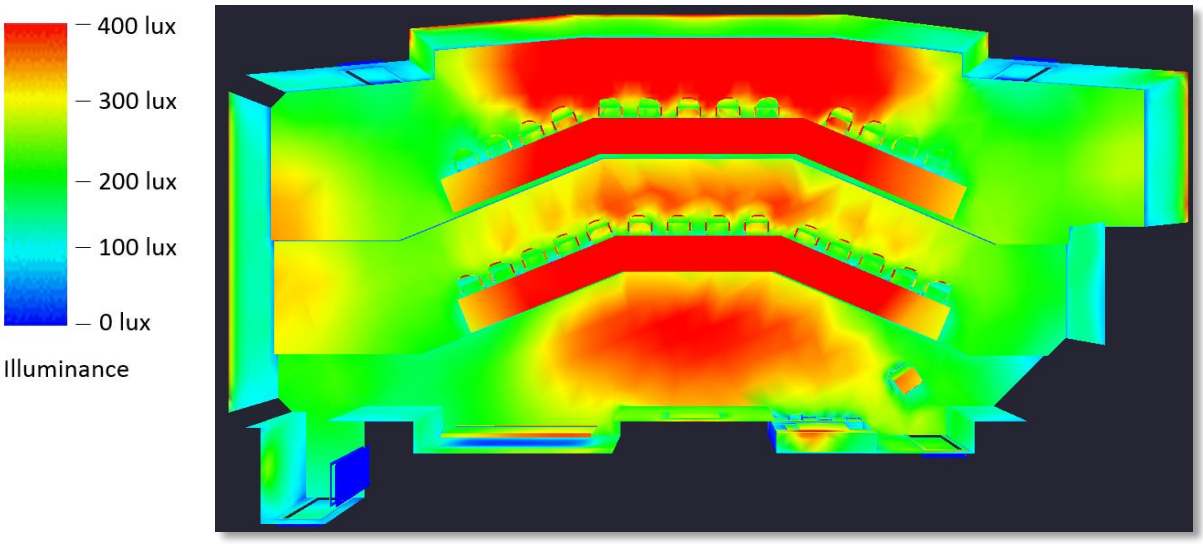


Figure 4.7 | Psuedocolor
Multipurpose Room calculation in ElumTools
A readable illuminance calculation can be found in Appendix B.

Table 4.4 | Summary of Quantitative Data

Space	Avg. H (lux)	Avg. V (lux)	Max. H (lux)	Min. H (lux)	Avg/Min.	LPD (W/ft²)
Multipurpose Room	333	198	591	134	2.5:1	0.61

Table 4.5 | Light Loss Factors

Luminaires	LLD*	LDD	BF**	LLF
RL3B	0.7	0.94	-	0.66
RL4	0.7	0.94	-	0.66
WW1	0.93	0.94	1.0	0.87
DL2	0.7	0.94	-	0.66
DL3	0.7	0.94	-	0.66

**LLD for all LED fixtures has been determined as 0.7 per L70.*
***Ballast Factor information can be found in Appendix C.*

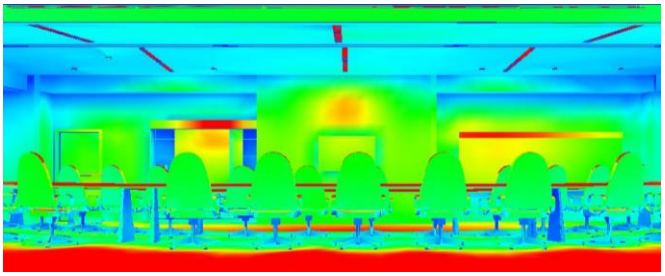


Figure 4.8 | Psuedocolor
Uniformly lit presentation wall from back of classroom

Figure 4.9 | Revit 2015 Rendering
Uniformly lit presentation wall from back of classroom

Summary

The multipurpose room surpasses all of its target criteria. As indicated in the psuedocolor (Figure 4.7), the main writing and reading area is brightly lit. During a presentation, the presenter will have the option to select the "A/V scene" which lowers the output of the perimeter wallwashers and turns off the linear LED slot lights and square LED fixtures above. This successfully achieves the criteria of creating two different scenes in the space, one of bright, visual clarity and another of non-uniform accents to help focus on the speaker. This way, occupants of the room will have the power to control what scene they would like depending on what function they are performing in the space.

The original design of the multipurpose room exceeded the IECC 2012 LPD of 1.3 W/ft^2, at 1.4 W/ ft^2. With the new design, the lighting power density drops 0.79 W/ft^2 to 0.61 W/ft^2. The average illuminance levels for both horizontal and vertical surfaces recommended by the IES Handbook, 10th Edition were met.

South Plaza

Space Overview

Right outside the south entrance to the building is the plaza. The plaza has colored concrete tile and low concrete walls for seating, as well as vegetation for a varied landscape. This space is mainly used as transition, but can also be a place to lounge and relax.

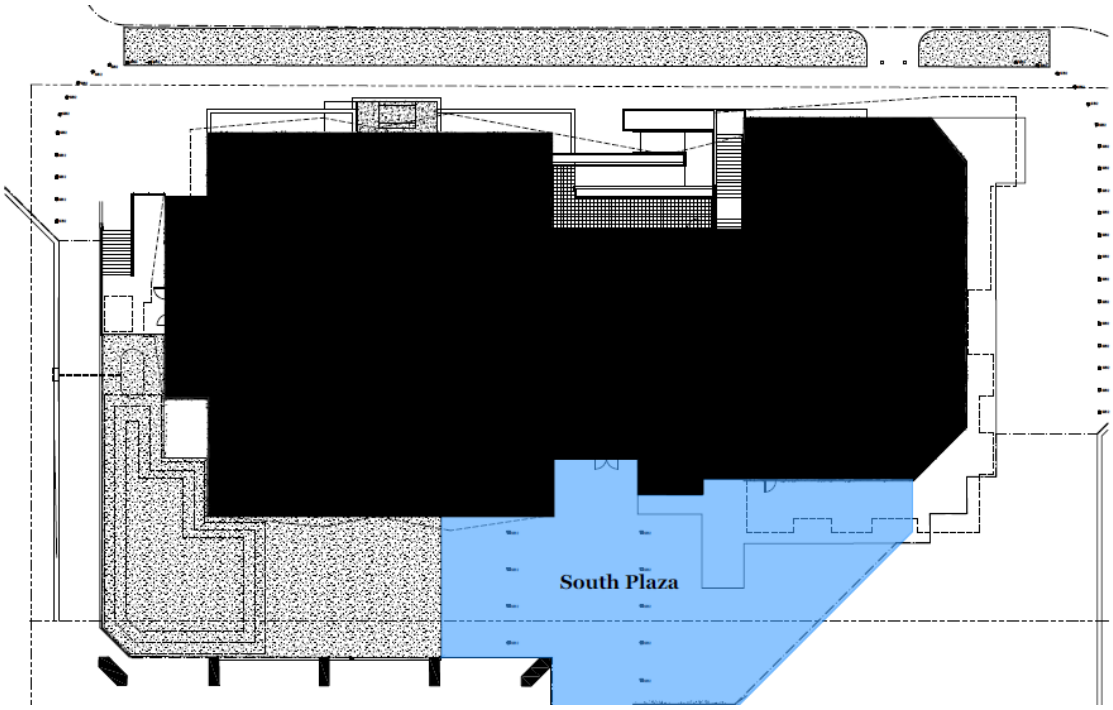


Figure 5.1 | Site Plan
South Plaza Location

Space Overview *(continued)*

Dimensions
Area | 5500 ft^2
Space Length | 92’-0”
Space Width | 66’-6”

Materials
South Façade | Frosted Glass
Composite Panels
Brown Brick
Floor | Grey & Blue Concrete Tiles

Furnishings
Concrete Seat Wall
Trees + Shrubs

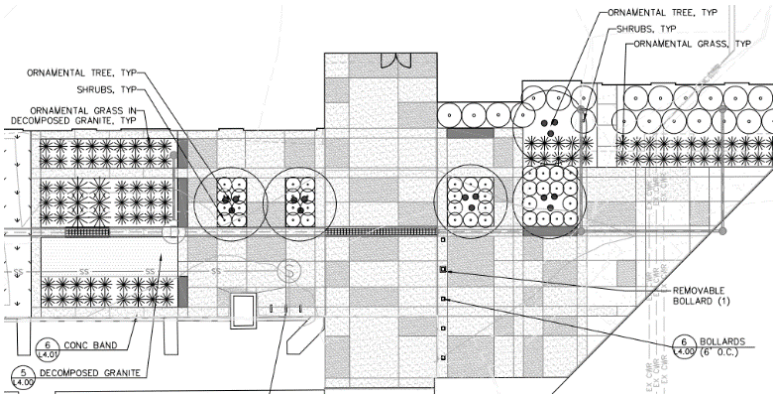


Figure 5.2 | Plan View
South Plaza landscaping

Criteria

The overall lighting objective in the south plaza is to create a safe, relaxing environment for the employees to enjoy. In the IES Lighting Handbook, 10th edition, the task illuminances are as follows:

Table 5.1 | South Plaza Illuminance

Task	E_h (lux)	E_v (lux)	Avg:Min
Transition – Plaza	6	2	5:1

The lighting power density for the space is defined by IECC 2012, and the recommended values for the space can be seen in Table 5.2. The plaza falls in to Lighting Zone 4, due to its location in a high-activity commercial district.

Table 5.2 | Lighting Power Density

Space	Base Allowance (W)	Allowance (W/ft^2)	Total Allowance (W)
South Plaza	1300	0.2	2400

In addition to illuminance and LPD, lumen output will be monitored via the International Dark Sky Association’s Model Lighting Ordinance for non-residential lighting.

Table 5.3 | Model Lighting Ordinance – Performance Method

Space	Lighting Zone	Allowance (LM/ft^2)
South Plaza	LZ4	7.5

Design

A fingerprint is a symbolic piece of someone's identity, and the plaza will be as unique as one. In-ground linear fixtures will weave between the tiles and cross through the foliage and stone benches. The light lines will never cross each other, creating an interesting pattern for the eye to follow. The low-lumen emitting fixtures will provide the psychological impression of relaxation for the employees that come in for the night shift. The in-ground lights and bollards along the main transition space will serve as a guide when it is dark, leading the employees from the main plaza to the entrance of the crime lab. The fixtures will be controlled via timeclock, and turn on at 6 PM and off at 7 AM every day. Table 5.3 lists the fixtures that assisted in creating this design. It is used along with the Site Lighting Plan (Figure 5.3) seen further down the page.

Table 5.3 | South Plaza Fixture Schedule

Type	Tag	Description	Manufacturer	Model	Lamp	Input Wattage	Input Voltage	Notes
	RL1	LUMENFACADE LED INGROUND. 55 LM/FT DIRECT VIEW.	LUMENPULSE	LOID-24V-48-40K-NO-ASL	LED 4000K, 80CRI	24 W	24 V	IP68 RATED. 6 W/FT. 0-10V DIMMING DRIVER.
	BL1	LINEA LED BOLLARD. 659 LM OUTPUT.	HESS	LN950-LED-NW-UNV-D-03SRA-SG-DIM	LED 4000K, 80CRI	16 W	277 V	0-10V DIMMING DRIVER.

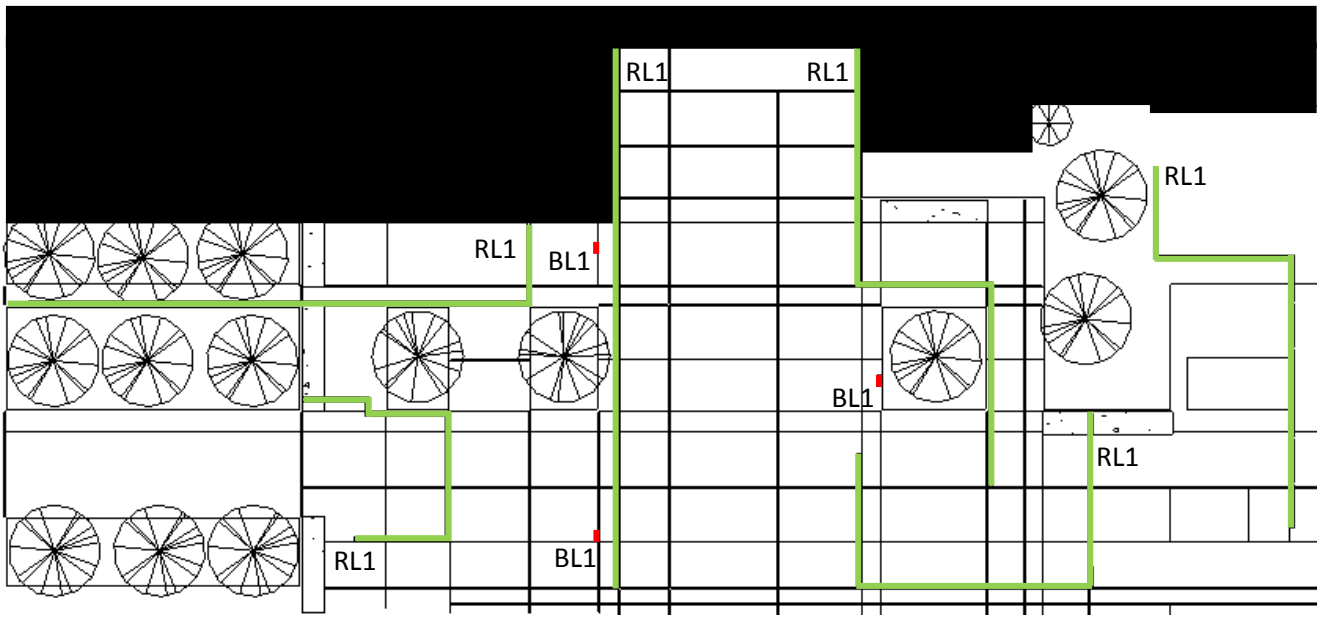


Figure 5.3 | Site Lighting Plan
South Plaza

Renderings

Figure 5.4 | Revit 2015 Rendering
Perspective View from front of Crime Lab looking North

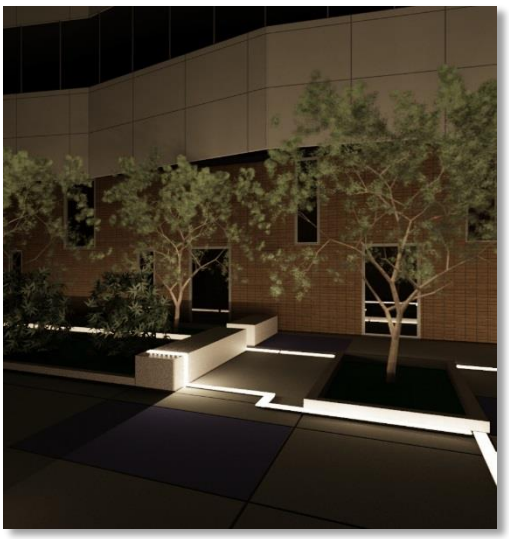


Figure 5.5 | Revit 2015 Rendering
Abstract Fingerprint grid going through bench

Figure 5.6 | Revit 2015 Rendering
Perspective View from Southeast corner

Calculations

A calculation was performed using ElumTools in Revit 2015. The average illuminance for the space was 15 lux which meets the design criteria of 6 lux. The Average/Min ratio was much larger than the recommended value, but this was anticipated due to the overall aesthetic goal of creating a relaxing, dimly lit space. Reference Table 5.4 for a summary of all calculated data. A readable illuminance level calculation can be found in Appendix B.

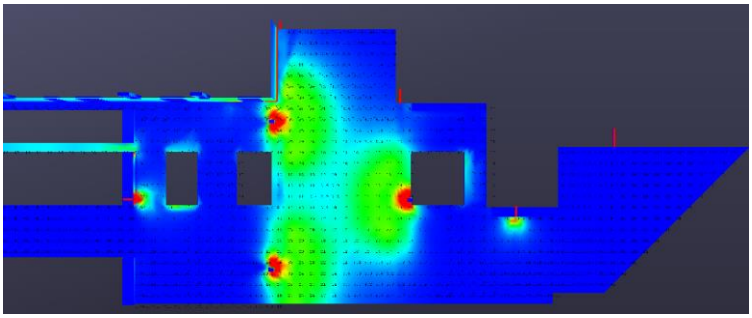


Figure 5.7 | Psuedocolor
South Plaza calculation Bird's Eye View

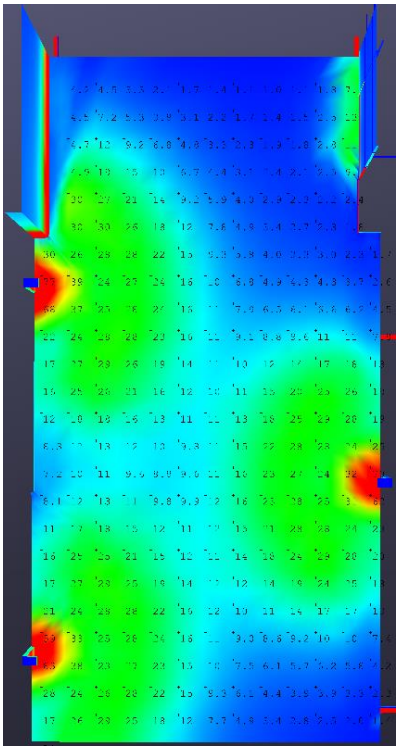


Figure 5.8 | Psuedocolor
South Plaza calculation in ElumTools
A readable illuminance calculation can be found in Appendix B.

Table 5.4 | Summary of Quantitative Data

Space	Avg. (lux)	Max. (lux)	Min. (lux)	Avg/Min.	LPD (W/ft^2)	Total Watts
South Plaza	15	77	1	21	0.34	2400

Table 5.5 | Light Loss Factors

Luminaires	LLD*	LDD	BF**	LLF
RL1	0.7	0.72	-	0.50
BL1	0.7	0.72	-	0.50

**LLD for all LED fixtures has been determined as 0.7 per L70.*
***Ballast Factor information can be found in Appendix C.*

Table 5.6 | Model Lighting Ordinance – Performance Method

Space	Total Site Lumens	LM/ft^2
South Plaza	18,552	3.37

Summary

The South Plaza creates a calm, tranquil atmosphere through the inground luminaires. The nonuniform "fingerprint" pattern gives a visitor a diverse focal point to observe. One can also feel the impression of privacy, which can be a luxury in the city of Denver. For the main transition path, bollards light the way to ensure employees and visitors know the direct way to get to the lab. The South Plaza utilizes low light levels to achieve an inviting, unique design.

Quantitatively, the inground LEDs pass the Model Lighting Ordinance test, coming in at 3.37 LM/ft^2. The LPD for the site was 0.34 W/ft^2 which comes in around 1870 W for the site. This is below the IES Lighting Handbook, 10^{th} Edition recommendation of 3200W.

Conclusion

Through all of these lighting designs, the parts and pieces that make up a person's identity help to define the spaces. The Lobby, a focal feature, creates a space that is easy to transition through, yet has multiple aesthetics. The contrasting DNA features of the fingerprint wood wall and helix pendant give the two other floors that look down into the atrium something intriguing to view. In the Main DNA Lab, a bright uniform light was achieved on the task plane, helping lab technicians come closer to solving a crime, and assisting to reveal a suspect's profile. The Multipurpose Room balances light and dark aspects of the identification process by having multiple dimming options available for both presentation and lecture. Finally, the South Plaza embodies uniqueness through its abstract fingerprint design. This allows employees to relax and let their minds wander like the weaving pattern. Overall, each of the rooms were successfully able to achieve their own identity through lighting design.

Branch Circuit Redesign

The installation of new fixtures and lamp types will result in new loads on the panelboards. This change in load means that a redesign of the branch circuit panels is necessary for the lobby, lab, multipurpose room, and south plaza. The loads for the four spaces are currently located on four separate panels. The lighting panels' voltages are 480/277 V and they are each protected by a 400 A Main Lug. In the following pages, the existing and new panels are analyzed by space.

Lobby

The lighting loads for the lobby are on two separate panels, Panel H1A and Panel H3A. H1A is located on the first floor, while H3A is located on the third floor of the crime lab.

Figure 6.1 | Existing Lighting Panel – Panel H1A

PANEL "H1A"

VOLTS: 480/277V,3PH,4W
MAINS: 400A M.L.O.
A.I.C.: 42KA

MTG: SURFACE NEMA 1
MFGR: SEE SPECS
TYPE: SEE SPECS

DESCRIPTION	T	KVA	BKR	CKT#		BKR	KVA	T	DESCRIPTION
LTG HALL & LOBBY	L	3.18	20A1P	1	2	20A	3.05	M	VFD-REF-1
LTG S LABS	L	3.53	20A1P	3	4		3.05	M	-
LTG N LABS	L	3.99	20A1P	5	6	3P	3.05	M	-
LTG EXT BLDG MOUNT	L	1.36	20A1P	7	8	20A	3.05	M	VFD-REF-2
LTG CENTER STAIR	L	1.05	20A1P	9	10		3.05	M	-
LTG ARTWORK	L	0.59	20A1P	11	12	3P	3.05	M	-
SHELL SPACE LTG	L	1.24	20A1P	13	14	20A	3.05	M	VFD-REF-3
SPACE				15	16		3.05	M	-
SPACE				17	18	3P	3.05	M	-
SPACE				19	20	20A	3.05	M	VFD-REF-4
SPACE				21	22		3.05	M	-
SPACE				23	24	3P	3.05	M	-
SPACE				25	26	20A	3.05	M	VFD-REF-5
SPACE				27	28		3.05	M	-
SPACE				29	30	3P	3.05	M	-
SPACE				31	32	20A	3.05	M	VFD-REF-6
SPACE				33	34		3.05	M	-
SPACE				35	36	3P	3.05	M	-
SPACE				37	38	15A	2.11	M	XEF-2
SPACE				39	40		2.11	M	-
SPACE				41	42	3P	2.11	M	-

LOAD KVA	LTG	MTR	TOTAL
CONNECTED	14.4	61.2	75.6
NEC DEMAND	17.6	63.5	81.2
AMPS			97.7

4

PHASE KVA A = 24.9 B = 25.0 C = 24.4
PHASE IMBALANCE (%) A/B = 0.2 B/C = 2.4 C/A = 2.3

Lobby *(continued)*

Figure 6.2 | Existing Lighting Panel – Panel H3A

PANEL "H3A"

VOLTS: 480/277V,3PH,4W
MAINS: 400A M.L.O.
A.I.C.: 42KA

MTG: SURFACE NEMA 1
MFGR: SEE SPECS
TYPE: BOLT-ON

DESCRIPTION	T	KVA	BKR	CKT#		BKR	KVA	T	DESCRIPTION
LTG HALL,CONF RM	L	3.75	20A1P	1	2				SPACE
LTG S-CENTER LABS	L	3.12	20A1P	3	4				SPACE
LTG SW LABS	L	1.30	20A1P	5	6				SPACE
LTG NW LABS	L	2.54	20A1P	7	8				SPACE
LTG N-CENTER LABS	L	1.43	20A1P	9	10				SPACE
LTG OFFICES	L	3.84	20A1P	11	12				SPACE
LTG PENTHOUSE	L	1.80	20A1P	13	14				SPACE
LTG ARTWORK	L	0.55	20A1P	15	16				SPACE
SPACE				17	18				SPACE
SPACE				19	20				SPACE
SPACE				21	22				SPACE
SPACE				23	24				SPACE
SPACE				25	26				SPACE
SPACE				27	28				SPACE
SPACE				29	30				SPACE
SPACE				31	32				SPACE
SPACE				33	34				SPACE
SPACE				35	36				SPACE
SPACE				37	38				SPACE
SPACE				39	40				SPACE
SPACE				41	42				SPACE

LOAD KVA	LTG	TOTAL
CONNECTED	17.8	17.8
NEC DEMAND	22.2	22.2
AMPS		27

PHASE KVA	A = 8.1	B = 4.5	C = 5.1
PHASE IMBALANCE (%)	A/B = 77.9	B/C = 13.1	C/A = 57.2

Lobby *(continued)*

Since the circuits powering the lobby carry additional loads, the existing fixtures' volt-amps from the lobby were subtracted from the circuit load of 3.18 kVA and 3.75 kVA for panels H1A and H3A respectively. This way, the kVA for the hall and conference room remains on the circuit and the new lighting loads can be added. The new lighting loads can be viewed in Table 6.1 and a panel comparison can be seen in Table 6.2.

Table 6.1 | New Lighting Load Summary - Lobby

Space	Panel	Fixture Type	Input Watts	Number of Fixtures	Total Watts
Lobby	H1A	RL2A	2	79	158
	H1A	RL2B	2	48	96
	H1A	RL2C	3	33	99
	H1A	RL3A	20	1	756
	H1A	RL2D	200	2	206.4
	H3A	PF1	63	12	400
	H3A	PL1	206.4	1	20
	H3A	DL1	44.8	4	179.2
					1914.6
				Total kVA	**1.9**

Table 6.2 | Lighting Panel Loads Comparison - Lobby

	Panel H1A		Panel H3A	
	Existing	New	Existing	New
Connected Load	14.4	13.89	17.8	16.6
NEC Demand (1.25)	17.6	17.4	22.2	20.8
Other Loads	63.5	63.5	0	0
Total kVA	81.2	80.9	22.2	20.8
Amps	97.7	**96**	27	**20.8**

As seen above in Table 6.2, the new design loads are less than the existing design loads. This way, no changes will be needed for Panels H1A and H3A for the lobby.

Main DNA Lab & Multipurpose Room

The circuits supplying light to the DNA Lab and Multipurpose Room are both on the same panel, H2A. Figure 6.3 showcases the existing panel.

Figure 6.3 | Existing Lighting Panel – Panel H2A

PANEL "H2A"

VOLTS: 480/277V,3PH,4W
MAINS: 400A M.L.O.
A.I.C.: 42KA

MTG: SURFACE NEMA 1
MFGR: SEE SPECS
TYPE: BOLT-ON

DESCRIPTION	T	KVA	BKR	CKT#		BKR	KVA	T	DESCRIPTION
LTG HALL,CONF RM	L	3.11	20A1P	1	2				SPACE
LTG S-CENTER LABS	L	2.48	20A1P	3	4				SPACE
LTG SW LABS	L	2.48	20A1P	5	6				SPACE
LTG NW LABS	L	3.41	20A1P	7	8				SPACE
LTG N-CENTER LABS	L	0.68	20A1P	9	10				SPACE
LTG MULTI-PURP,PRE	L	3.53	20A1P	11	12				SPACE
LTG OFFICES	L	2.61	20A1P	13	14				SPACE
LTG EXT WALL WASH	L	2.42	20A1P	15	16				SPACE
LTG ARTWORK	L	0.70	20A1P	17	18				SPACE
SPACE				19	20				SPACE
SPACE				21	22				SPACE
SPACE				23	24				SPACE
SPACE				25	26				SPACE
SPACE				27	28				SPACE
SPACE				29	30				SPACE
SPACE				31	32				SPACE
SPACE				33	34				SPACE
SPACE				35	36				SPACE
SPACE				37	38				SPACE
SPACE				39	40				SPACE
SPACE				41	42				SPACE

LOAD KVA	LTG	TOTAL
CONNECTED	20.7	20.7
NEC DEMAND	25.9	29.5
AMPS		31

PHASE KVA	A = 9.1	B = 5.6	C = 6.0
PHASE IMBALANCE (%)	A/B = 63.4	B/C = 7.1	C/A = 51.8

Main DNA Lab & Multipurpose Room *(continued)*

The new lighting loads for both room are summarized in Tables 6.3 and 6.4 below. The total kVA for each room is below 16 kVA per circuit so no additional circuits will be needed.

Table 6.3 | New Lighting Load Summary – Main DNA Lab

Space	Panel	Fixture Type	Input Watts	Number of Fixtures	Total Watts
Main DNA Lab	H2A	RF2	32	19	608
	H2A	PF2	117	12	1404
	H2A	RF1	32	2	64
					2076
				Total kVA	**2.1**

Table 6.4 | New Lighting Load Summary – Multipurpose Room

Space	Panel	Fixture Type	Input Watts	Number of Fixtures	Total Watts
Multipurpose Room	H2A	RL3B	24	7	168
	H2A	RL4	78	10	780
	H2A	WW1	17	20	340
	H2A	DL3	16	5	80
	H2A	DL4	16	1	16
					1384
				Total kVA	**1.4**

Table 6.5 | Lighting Panel Loads Comparison – Main DNA Lab & Multipurpose Room

	Panel H2A	
	Existing	New
Connected Load	20.7	18.7
NEC Demand (1.25)	25.9	23.4
Other Loads	0	0
Total kVA	25.9	23.4
Amps	31	**28**

Being that the new design comes to a total of 28 amps, three amps less than the original design, Panel H2A does not need to be resized.

South Plaza

The circuit that supplies power to the site is located on a panel in the basement, Panel HBA.

Figure 6.4 | Existing Lighting Panel – Panel HBA

PANEL "HBA"

VOLTS: 480/277V,3PH,4W
MAINS: 400A M.L.O.
A.I.C.: 50KA

MTG: SURFACE NEMA 1
MFGR: SEE SPECS
TYPE: BOLT-ON

DESCRIPTION	T	KVA	BKR	CKT#		BKR	KVA	T	DESCRIPTION
LTG BASEMENT EAST	L	2.08	20A1P	1	2	15A	2.11	M	XEF-1
LTG BASEMENT WEST	L	2.36	20A1P	3	4		2.11	M	-
LTG NW STAIR	L	1.12	20A1P	5	6	3P	2.11	M	-
LTG SITE	L	0.69	20A1P	7	8	20A	2.49	M	RO-1
RO-ST	M	2.11	15A	9	10		2.49	M	-
-	M	2.11		11	12	3P	2.49	M	-
-	M	2.11	3P	13	14	60A	7.48	M	HHWP-2
DI-CP	M	2.77	20A	15	16		7.48	M	-
-	M	2.77		17	18	3P	7.48	M	-
-	M	2.77	3P	19	20	15A	2.11	M	HEF-2
DI-1	M	1.66	15A	21	22		2.11	M	-
-	M	1.66		23	24	3P	2.11	M	-
-	M	1.66	3P	25	26	15A	2.66	M	BP-1
SPACE				27	28		2.66	M	-
SPACE				29	30	3P	2.66	M	-
SPACE				31	32				SPACE
SPACE				33	34				SPACE
SPACE				35	36				SPACE
SPACE				37	38				SPACE
SPACE				39	40				SPACE
SPACE				41	42				SPACE

LOAD KVA	LTG	MTR	TOTAL
CONNECTED	6.2	76.5	82.7
NEC DEMAND	7.8	82.1	89.9
AMPS			108.2

△2

PHASE KVA	A = 21.3	B = 20.9	C = 19.7
PHASE IMBALANCE (%)	A/B = 1.9	B/C = 6.3	C/A = 8.4

South Plaza *(continued)*

The new lighting load for the South Plaza is in Table 6.6 below. The total kVA for each room is below 16 kVA per circuit so no additional circuits will be needed.

Table 6.6 | New Lighting Load Summary – South Plaza

Space	Panel	Fixture Type	Input Watts	Number of Fixtures	Total Watts
South Plaza	HBA	RL1	24	75	1800
	HBA	BL1	16	3	48
					1848
				Total kVA	**1.8**

Table 6.7 | Lighting Panel Loads Comparison – South Plaza

	Panel HBA	
	Existing	New
Connected Load	6.2	7.8
NEC Demand (1.25)	7.8	9.8
Other Loads	82.1	82.1
Total kVA	89.9	91.9
Amps	108.2	**110**

The HBA panel is the only panel that has a slight increase in load. The new lighting is 1.8 A higher than the original design, which was to be expected since the South Plaza now has added fixtures for the South. This still does not exceed the allotted 16 kVA per circuit and the total amps are below 400. No resizing is necessary.

Fire Alarm Integration

The current security system incorporates PoE, or Power over Ethernet, which combines data and electrical power. After further studying Power over Ethernet, it has been deemed not feasible for this project. For a new project, PoE for the fire alarm system would be great to install. The cost of cablings and materials are saved due to there being only one cable that supplies data and power. It is also safer to install a PoE system because there are no high voltage connections. However, since this thesis is a redesign it would not be economical to install Power over Ethernet. It would require new fire alarm control panels to be purchased, in addition to fire alarm detectors that have inputs for cabling. The amount of labor to put in this new system would be tedious since the building's finishes have already been completed. In conclusion, power over ethernet is an efficient way to integrate a fire alarm system into a building's automated system for new construction, but it does not have the same appeal for a retrofit.

Photovoltaic Array

Denver, Colorado receives about 300 days of sunshine each year. This provides the perfect opportunity to install a photovoltaic array. The array will supply energy to the crime lab and reduce the cost of electricity. Not only does it decrease electricity use, but it also lessens the amount of carbon-dioxide emissions into the atmosphere. An addition of a PV array on the roof of the lab will be great for the environment and potential energy savings.

The array will offset the loads on one panel, Panel HBA. This was decided after calculating the total amperes, and cross-referencing it with that of the other lighting panels. Panel HBA had the largest kilo-volt-amp load, with 91 kVA, thus it was chosen for the PV Array study.

System Advisor Model (SAM)

Modeling for the PV array was performed using the National Renewable Energy Laboratory's program SAM (System Advisor Model). The program is able to incorporate a building's data and location into an energy and financial model.

After inputting the location data and loading the weather files, the next step is to choose a module and inverter. Deciding on these two systems can be determined two different ways. The first method is to pick a desired array size and then choose a module and inverter will result in the exact capacity (kW) needed. The second method is to specify how many modules, strings in parallel and inverters are wanted. It is the first method that was chosen for this report. In this method, the module and inverter types were decided based on the DC to AC ratio. This ratio can be seen in the formula below.

$$DC\text{-}AC\ ratio = \frac{DC\ capacity\ of\ PV\ (kW)}{AC\ capacity\ of\ inverter\ (kW)}$$

By choosing a module and inverter with similar capacities the ideal ratio of 1.00 was achieved, while the desired array size met close to 100 kWdc. Please reference Figure 7.1 on the following page for System Design Information.

The module that was chosen was the SunPower SPR-415E-WHT-D. This specific module is composed of monocrystalline cells. These cells have a greater efficiency than most competing PV arrays, such as polycrystalline or thin-film. Satcon Technology Corporations' PowerGate Plus 100 kW was picked as the inverter.

Table 7.1 | Module Statistics

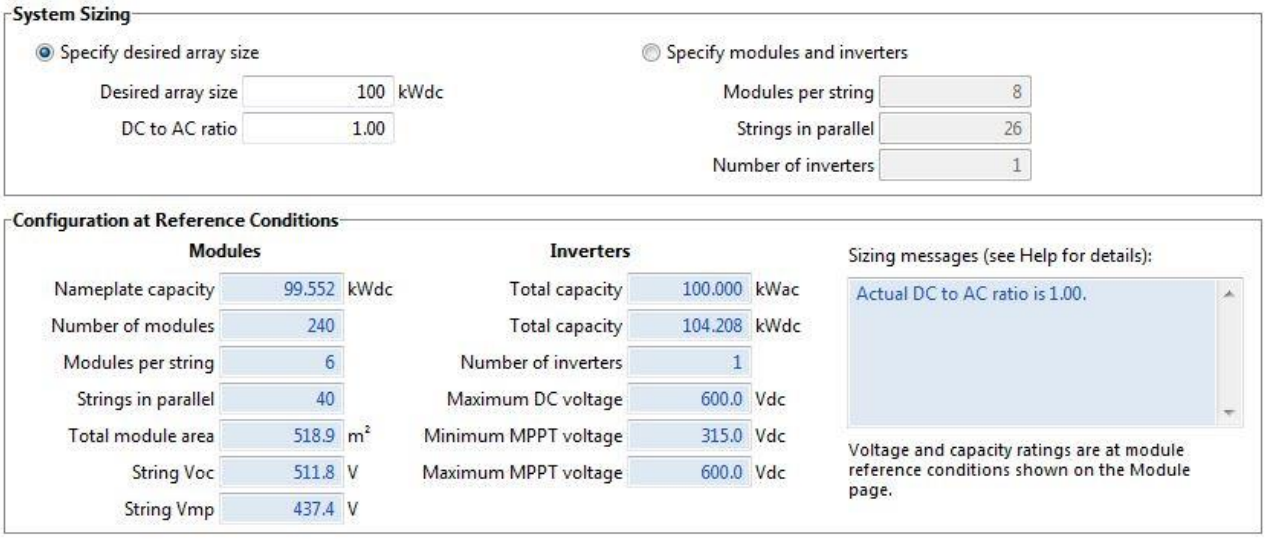
Manufacturer	SunPower
Nominal Efficiency	19.19%
Maximum Power	414.8 Wdc
Number of Cells	128
Length	7'-0"
Width	3'-3"
Number of Panels	240

Table 7.2 | Inverter Statistics

Manufacturer	Satcon Technology Corp.
CEC Weighted Efficiency	96.24%
Maximum Power (DC)	104 kWdc
Maximum Power (AC)	100 kWac
Nominal AC voltage	480 V
Number of Inverters	1

System Advisor Model (SAM) *(continued)*

Figure 7.1 | SAM System Design



Layout and Solar Angle

In order to achieve the desired array size of 100 kWdc 240 modules were required. The Sunpower modules are 3'-0" wide and 7'-0" long, and take up approximately 6308 ft² on the roof. To fit all of the panels it was necessary to evaluate the solar altitude and try moving them closer together without risking too much self-shading.

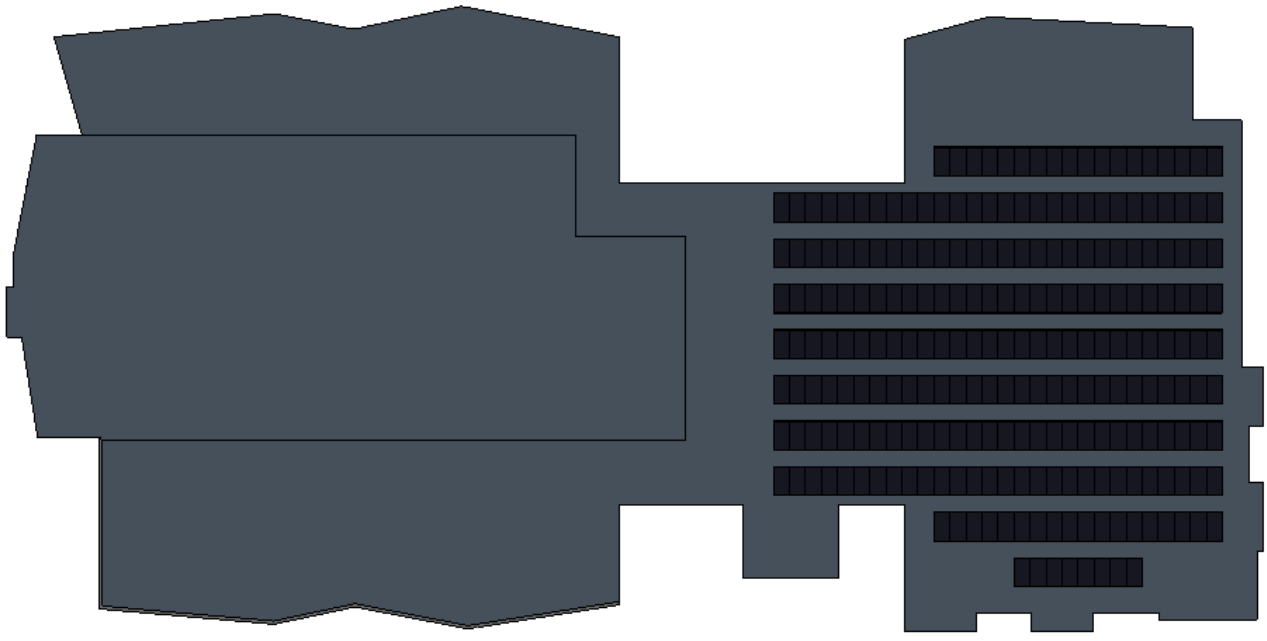


Figure 7.1 | Bird's Eye View
PV modules cover the East side of the roof

Layout and Solar Angle *(continued)*

Since the modules will be fixed, the angle for the altitude was calculated during the Fall Equinox, or September 23rd at noon. The sun's altitude should fall between the low angles of winter and the high angles of summer in Denver so there will be a better chance of maintaining an average amount of sunlight for the year. An angle of 33 degrees was chosen as the ideal angle for the solar panels due to the latitude of Denver, Colorado.

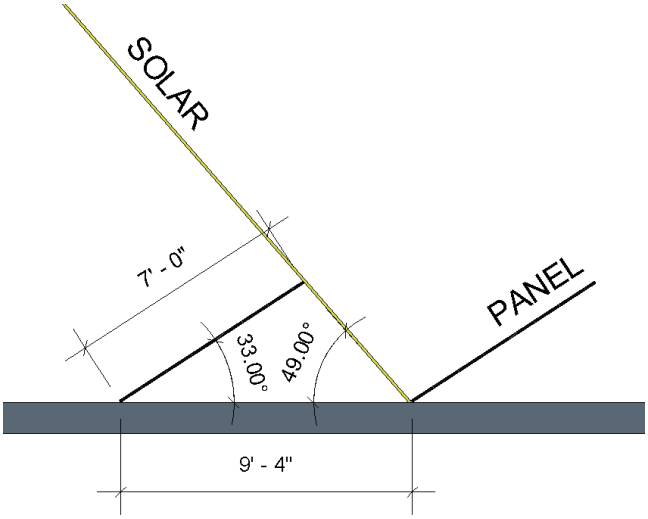


Figure 7.2 | Section View
Beams from the sun hit the panels at 49 degrees during the Fall Equinox

Shading Loss

Within SAM, a 3D shading tool was used to predict how much shade (as a percentage) is covering the arrays. Due to the penthouse, which stands 15'-0" high on the west portion of the roof, and the positioning of the arrays, a shading calculation was performed.

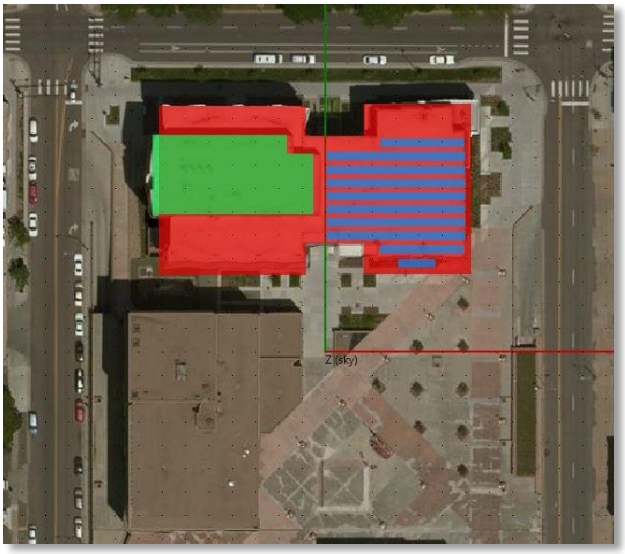


Figure 7.3 | Modeling Shading Loss in SAM

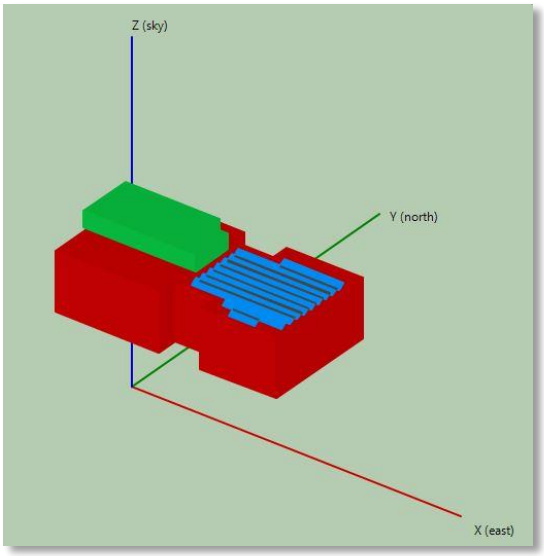


Figure 7.4 | Modeling Shading Loss in SAM

Shading Loss *(continued)*

Table 7.3 | Beam Shading Loss

	5am	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm
Jan	100	100	66.6262	41.4284	30.9819	26.1548	24.3441	24.0069	25.4262	31.477	43.3256	66.0323	100	100
Feb	100	100	38.6662	23.2976	17.1339	14.3545	13.1805	12.6909	13.6214	17.108	25.4686	43.101	73.5851	100
Mar	100	9.15711	4.28353	2.24689	1.49688	1.17057	0.832361	0.978999	0.923388	2.54405	7.19344	17.0431	57.1892	100
Apr	100	0	0	0	0	0	0	0	0	0.597934	4.19657	11.1939	29.4424	100
May	100	0	0	0	0	0	0	0	0	0.195979	3.21961	8.33564	21.2989	100
Jun	100	0	0	0	0	0	0	0	0	0.018403	2.41565	6.35199	15.5866	100
Jul	100	0	0	0	0	0	0	0	0	0.007914	2.28821	6.54035	15.3936	100
Aug	100	0	0	0	0	0	0	0	0	0.216182	3.30129	9.24263	21.5792	100
Sept	100	0	0	0	0	0	0	0	0	1.48456	5.83348	15.1104	60.0621	100
Oct	100	36.4335	18.6618	12.2612	9.63929	8.423	7.85318	8.19911	9.06049	14.0736	23.5467	47.9667	100	100
Nov	100	100	45.3173	30.6975	24.2614	21.5754	20.669	20.7049	23.4766	30.9598	45.2631	73.2618	100	100
Dec	100	100	65.4185	43.0801	33.367	29.0345	27.2614	27.3223	29.9461	37.6982	52.2935	79.0083	100	100

Key

100% shaded
60-99% shaded
30-59% shaded
20-29% shaded
01-19% shaded
00-0.99% shaded

It can be seen in Table 7.3 above that there is a small amount of shading loss due to the penthouse and to the arrays themselves. During the winter months, the low winter angles cause the arrays to self-shade, and some energy is lost. However, there is not much 100% loss during the day, and the worst loss occurs December at 4 pm with 79%.

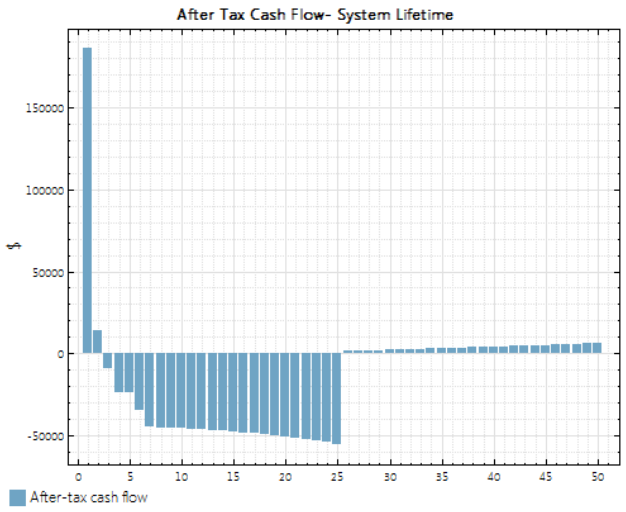
Results

After simulating the system, the outputs have been summarized in Table 7.4. The modules were able to produce a total of 160,128 kWh a year and offset electricity costs by over $15,000. In addition, the cash flow diagram can be viewed in Figure 7.5. This diagram shows the system's cash flow over its lifetime. After evaluating the installation, it would not be worth the cost of the system to install it for the Crime Lab. The initial cost of $646,431 makes the payback period greater than fifty years.

Table 7.4 | SAM Output

Annual Energy Production	160,128 kWh
Performance ratio	0.86
Electricity Cost without system	$92,605
Electricity Cost with system	$77,440
Initial Cost	$646,431
Payback Period	50 + Years
Number of Panels	240

Figure 7.5 | Cash Flow Diagram



Construction Breadth

The construction breadth is a cost analysis and construction schedule study. The analysis of the photovoltaic array installation on the roof was performed using RS Means. The schedule was studied according to the durations indicated in RS Means 2015. There is also an analysis of the new fixtures energy savings versus the existing fixtures.

Cost Analysis

In Table 8.1, the costs of installing the PV Array were obtained using RS Means Green Building 2015. In addition, the real costs were found for the modules and inverters, and adapted to the RS Means 2015 data for labor and crew.

Table 8.1 | RS Means Cost Data

RS MEANS 2015 COST DATA									
ITEM	CREW	DAILY OUTPUT	LABOR HOURS	UNIT	QUANTITY	2015 BARE COSTS			
						MATERIAL	LABOR	TOTAL	INCLUDING OVERHEAD & PROFIT
ALT. ENERGY SOURCE, SUNPOWER PHOTOVOLTAIC MODULE, 415 WATT, 73 VOLTS	2	8	1	1	240	1,785.00	109.00	454,560.00	522,744.00
SATCON CORP. DC TO AC INVERTER, 480 V, 100 KW	1	2	4	1	1	41,688.00	219.00	41,907.00	48,193.05
PV COMPONENTS, COMBINER BOX, NEMA 3R ENCLOSURE	1	4	2	1	1	191.00	109.00	300.00	345.00
FUSE, 15 A FOR COMBINER BOX	1	40	0.2	1	40	18.75	10.95	1,188.00	1,366.20
PV RACK SYSTEM, ROOF, NON-PENETRATING BALLAST, 1 PANEL	1	30.5	0.525	1	240	895.00	23.50	220,440.00	253,506.00

The total sum of costs for the installation of the photovoltaic array is **$826,154.25**. This number is very large, and mainly due to the high wattage modules. In comparison to SAM, this number is roughly $180,000 greater than the SAM estimate. This could be because the RS Means accounts for labor better than the algorithm used in the System Advisor Model.

Schedule *(continued)*

The impact on the construction schedule of the installation of the PV was investigated using RS Means Green Building 2015.

Table 8.2 | RS Means Schedule

SCHEDULE						
ITEM	**CREW**	**DAILY OUTPUT**	**LABOR HOURS**	**QUANTITY**	**HOURS**	**DAYS**
ALT. ENERGY SOURCE, SUNPOWER PHOTOVOLTAIC MODULE, 415 WATT, 73 VOLTS	2	8	1	240	120	15.00
SATCON CORP. DC TO AC INVERTER, 480 V, 100 KW	1	2	4	1	4	0.50
PV COMPONENTS, COMBINER BOX, NEMA 3R ENCLOSURE	1	4	2	1	2	0.25
FUSE, 15 A FOR COMBINER BOX	1	40	0.2	40	8	1.00
PV RACK SYSTEM, ROOF, NON-PENETRATING BALLAST, 1 PANEL	1	30.5	0.525	240	126	15.75

After analyzing the schedule, the activity that took the longest was installing the photovoltaic modules. With a daily output of eight modules, it would take 30 days to finish installing the panels. In order to cut down on time, two crews were assigned to the installation, so that the job could be done in 15 days. If there are six different crews working on the project, the entire installation would take approximately three weeks, with a day or so added as a cushion.

Energy Analysis

Table 8.3 breaks down the existing and new fixtures by their existing consumption and finds the total kilowatt-hours they use for the year. The occupied hours for the week were based on a 5-day work week for the Multipurpose Room and Main DNA Lab, while the Lobby and South Plaza function 7 days a week. The Main DNA Lab typically remains open until 3 AM during the week for the late shift, and the South Plaza lighting is on a timer that turns the fixtures on from 6 PM to 7 AM. The energy analysis was performed using Xcel Energy's commercial energy rate of $0.06/kWh. The existing fixtures are located on the left side of the chart while the new fixtures are located on the right. By installing the new fixtures, the annual kilo-watt-hours are reduced by 10,000 and there is a yearly savings of almost $600.

Table 8.3 | Energy Analysis

	EXISTING VERSUS NEW FIXTURES								
	Scheduled Hours (Weekly)	Existing Fixture	Number of Fixtures	LOAD (VA)	Existing Consumption (kWh)	Design Fixture	Number of Fixtures	LOAD (VA)	Design Consumption (kWh)
Lobby	168	SURFACE MOUNTED LED	14	50	118	6" LED DOWNLIGHT (DL1)	4	44.8	30
	168	LINEAR LED LIGHT STRIP	8	4	5	LINEAR LED PENDANT (PL1)	1	206.4	35
	168	RECESSED LINEAR FLUORESCENT	2	20	7	LED LIGHT PANEL (RL2A, RL2B)	127	2	43
	168	WALL MOUNTED FLUORESCENT	6	20	20	LED LIGHT PANEL (RL2C)	33	3	17
	168	RECESSED LINEAR FLUORESCENT	11	62	115	LED LIGHT PANEL (RL2D)	2	200	67
	168	COMPACT FLUORESCENT DOWNLIGHT	18	30	91	T5 BARE LAMP (PF1)	12	63	127
	168	WIDE APERTURE CFL DOWNLIGHT	8	187	251	RECESSED LED 1X1 (RL3A)	1	20	3
Main DNA Lab	100	FLUORESCENT PENDANT	15	124	186	RECESSED FLUORESCENT (RF1)	32	2	6
	100	FLUORESCENT PENDANT	3	62	19	RECESSED SYMMETRIC (RF2)	32	19	61
	100	-	0	0	0	FLUORESCENT PENDANT (PF2)	117	12	140
Multipurpose Room	55	RECESSED LINEAR FLUORESCENT	12	124	82	RECESSED LED 1X1 (RL3B)	7	24	9
	55	FLUORESCENT WALLWASHER	2	124	14	RECESSED LINEAR LED (RL4)	10	78	43
	55	CFL DOWNLIGHT	20	30	33	FLUORESCENT WALLWASHER (WW1)	20	17	19
	55	CFL DOWNLIGHT WALLWASHER	12	30	20	3.5" LED DOWNLIGHT (DL2)	5	16	4
	55	-	0	0	0	3.5" LED DOWNLIGHT WW (DL3)	1	16	1
South Plaza	91	CFL BOLLARD	9	30	25	LINEAR LED INGROUND (RL1)	75	24	164
	91	-	0	0	0	LED BOLLARD (BL1)	3	16	4
		Total Number of Fixtures:	140	**Total kWh:**	984	**Total Number of Fixtures:**	482	**Total kWh:**	774
				Annually:	48213			**Annually:**	37903
				Cost:	$ 2,892.75			**Cost:**	$ 2,274.21

Roof Analysis

With the addition of 240 photovoltaic modules on the roof, a structural analysis of the existing roof deck was performed. If unable to support the load, the deck will be redesigned to handle the additional weight from the array. The building's location in downtown Denver means that the impact of snow loads must be observed.

Deck

The area that the PV array covers is over two different types of deck. In Figures 9.1 & 9.2 the decks are highlighted in light and dark blue. The light blue region is the composite deck, which is a Vulcraft 2VLI20 deck with a 2" steel deck and 4.5" of normal weight concrete topping. The dark blue region is normal roof deck, a 1.5B20 deck from Vulcraft.

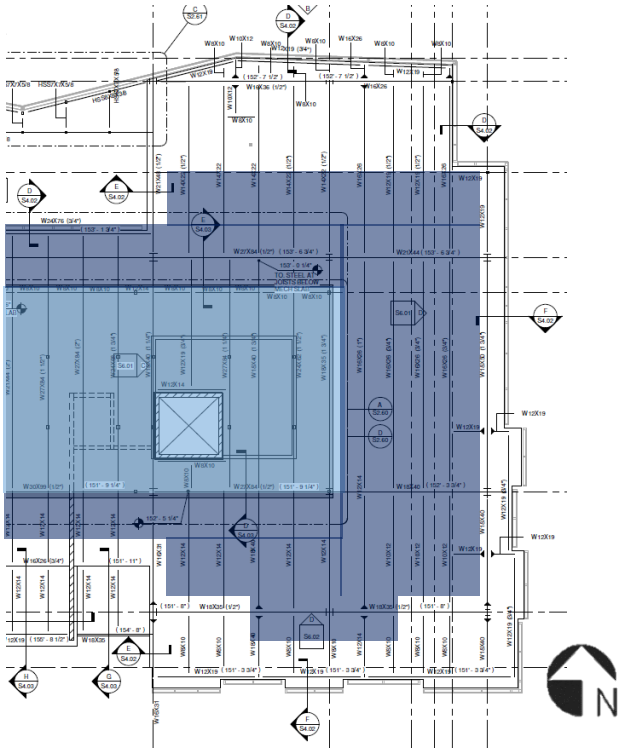


Figure 9.1 | Roof Structural Plan
Composite Deck and Roof Deck

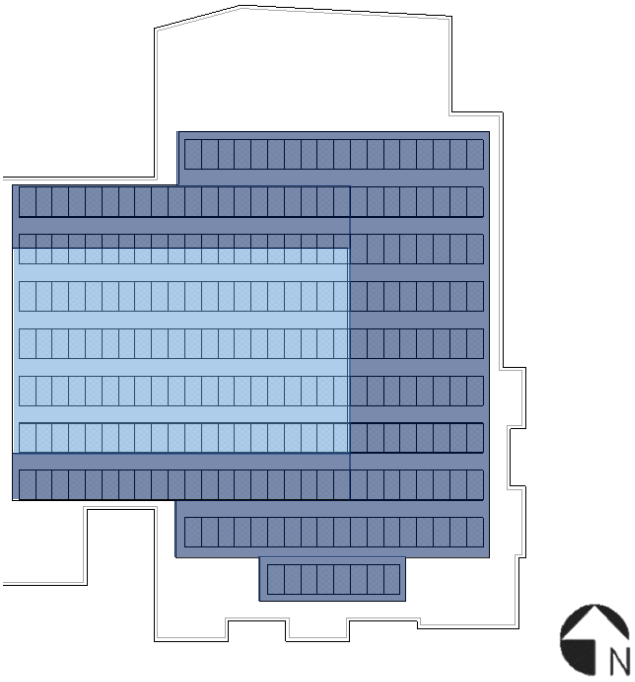


Figure 9.2 | Roof Plan
PV Module layout

The amount of modules on the composite (light blue) area of the roof sums to 100, while the normal roof deck (dark blue) supports 140 modules.

Calculation

Live Load

Minimum Live Load | 30 psf
Snow Load | 20 psf*

*In this instance, the minimum live load controls since it is the larger load.

Dead Load

Rigid Insulation | 2 psf
Superimposed Dead Load | 10 psf
Composite Deck Self-weight | 1.97 psf
Roof Deck Self-weight | 2.14 psf
Module Weight | 56 lbs.

Additional Information

Composite Deck | 2693 SF
Roof Deck | 4800 SF
Spans | 3 +
Largest Span | 6'-0"

Composite Deck Calculation

$$W_{TL} = 30\ psf + 2\ psf + 10\ psf + 1.97\ psf + \frac{56\ lbs. \times 100\ panels}{2693\ SF}$$

$$W_{TL} = 46\ psf < 400\ psf^{*} \quad \surd$$

*When cross-checked with the Vulcraft tables (Appendix D), the total allowed load for the 2VLI, 20 GA composite deck is 400 psf.

Roof Deck Calculation

$$W_{TL} = 30\ psf + 2\ psf + 10\ psf + 2.14\ psf + \frac{56\ lbs. \times 140\ panels}{4600\ SF}$$

$$W_{TL} = 45\ psf < 111\ psf^{**} \quad \surd$$

**When cross-checked with the Vulcraft tables (Appendix D), the total allowed load for the 1.5B, 20 GA roof deck is 111 psf.

Summary

In conclusion, no alterations to the existing decks need to be made. The weight of the added modules have little effect on the total load on the roof.

Conclusion

The Denver Crime Lab is a vital piece of the puzzle in the investigation of criminal activities. Redesigning its lighting and electrical systems lead to a building that functions more efficiently while exuding aesthetic appeal.

Within the lighting depth, the concept of "Identity" was envisioned in the Lobby, Main DNA Lab, Multipurpose Room and South Plaza. Each making up a different aspect of a person's true self, they became unique and effective spaces for their specific tasks to be performed.

The electrical depth ensured that the new loads for the building were not too large and tried to offset one of the panels with the installation of 240 photovoltaic modules on the roof. Unfortunately, the overall system cost outweighed the payback period, and it would not be economical to implement the modules. Lastly, fire alarm integration was considered via power over ethernet cabling, but this change to an existing building is not a smart one due to the additional labor.

The construction and structural analyses proved that the photovoltaic array, although expensive, would be supported by the existing structure on the roof. In addition, the entire installation would take around three weeks, or a little under a month. As for the savings from the newly designed spaces, they would total to nearly $600 year.

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Appendix A - Luminaire Cutsheets

BL1

.hess

LINEA LED

Specification

The simple linear form of LINEA combined with LED illumination provides a synergy of form and function. High-power LEDs provide a wide asymmetric distribution while generating no light above ninety degrees horizontal. Bollard housing and shaft are single-piece, fabricated from aluminum, and finished in finely textured paint. All hardware is stainless steel. Optional steel housing for high abuse environments available on request. Housing is hot-dip galvanized prior to being finished in finely textured paint. Standard colors; matte silver grey metallic or graphite grey. Special colors available.
CSA/US Certified for Wet Locations

LN950-LED-NW-UNV-D-034A-SG-DIM

Model	Lamp	Color Temperature	Volt	Mounting	Pole	Finish	Option
LN950	LED - Standard output	WW -3000K	UNV - 120-277V	D - Bollard	03SRA - 3' Straight Rectangular Aluminum	SG - Silver Grey	DIM - 0-10vDC Dimming
	HP/LED - High output	NW - 4000K				GG - Graphite Grey	EF - External Flange
						CC - Custom Color	N - None

Ordering Information

LINEA LED Specification

HOUSING
Single piece bollard consists of luminaire head and shaft fabricated from rectangular 6061 aluminum alloy with radiussed corners. Nominal wall thickness is 0.187" with cross-section of 7.5" x 3.5". LED light engine and driver are housed in self contained weather-proof powerpack enclosure within the bollard and removable with a single fastener. Lens is clear impact-resistant acrylic. LED array is thermally managed using convection and transmission of heat through the use of an aluminum heat sink and the luminaire housing. All hardware is stainless steel. Contact factory for hot-dip galvanized steel housing for high abuse environments.

OPTICS
LED light engine consists of five high output multi-chip LED arrayss fitted with prismatic lens optics to produce a uniform asymmetric light distribution pattern suitable for pathways and sidewalks. Luminaire emits zero uplight at or above 90 degrees horizontal and qualifies for use in LEED zones LZ1, LZ2, LZ3, and LZ4. Color temperature may be 3000K or 4000K.

ELECTRICAL
Standard output: Integral LED driver is housed in luminaire head and consumes 16 watts at 350 mA. Input voltage range is 120v - 277v AC, 50-60 Hz. LED driver shall be UL recognized.

High output: Integral LED driver is housed in luminaire head and consumes 33 watts at 700 mA. Input voltage range is 120v - 277v AC, 50-60 Hz. LED driver shall be UL recognized.

LED DELIVERED LUMENS / BUG RATING
Standard Output:
3000K - 568 delivered lumens / B0-U0-G1
4000K - 659 delivered lumens / B0-U0-G1

High Output:
3000K - 1061 delivered lumens / B0-U0-G2
4000K - 1216 delivered lumens / B0-U0-G2

NOTE : Due to rapid and continuous advances in LED technology, LED luminaire data is subject to change without notice and at the discretion of HessAmerica. Consult factory for more current technical data.

MOUNTING
Flangeless mounting is standard. Optional external flange mounting available on request.

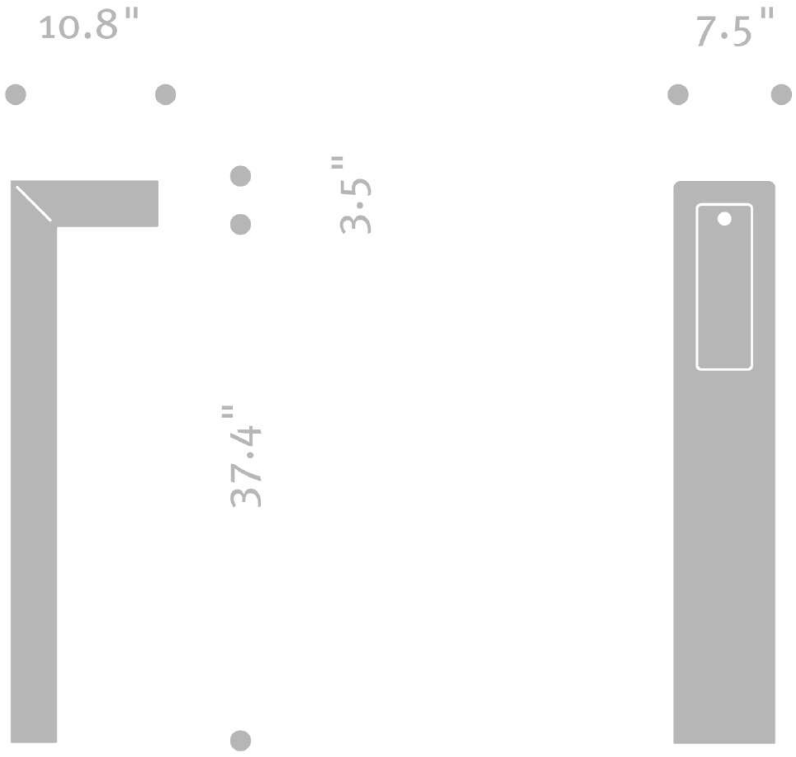
FINISH
Standard finishes are finely textured dark grey, graphite grey, or matte silver gray metallic. Special colors available on request.

CERTIFICATION
CSA/US Certified for Wet Locations

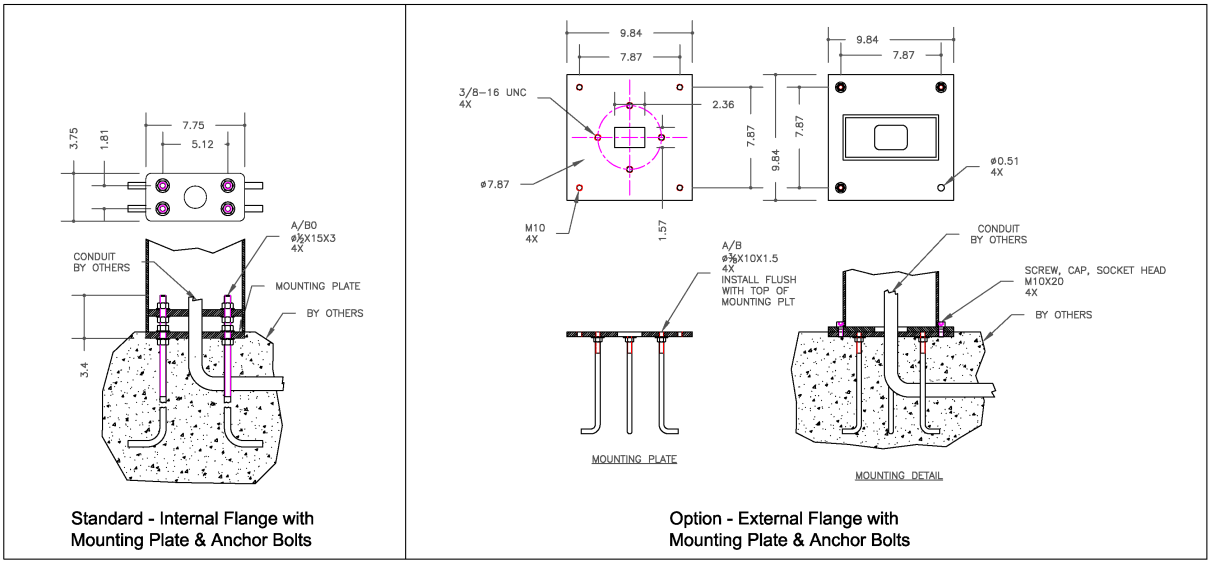
WARRANTY
Limited product warranty period including LEDs is five years. Driver shall carry the manufacturer's limited warranty.

Additional information

Dimensions



Mounting Detail



Standard - Internal Flange with Mounting Plate & Anchor Bolts

Option - External Flange with Mounting Plate & Anchor Bolts

Heidenheim . Germany
Heidenheim . Germany

LINEA

LINEA

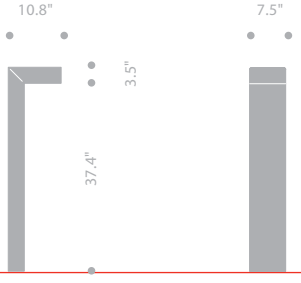
L I N E A

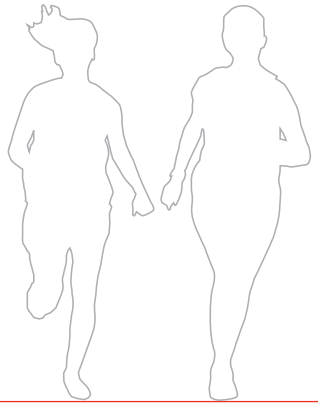
www.hessamerica.com/3111

L I N E A . LED Illuminating Bollard

The simple linear form of LINEA combined with LED illumination provides a synergy of form and function. The housing contains an array of high-power LEDs arranged to provide a wide asymmetric distribution while generating no light above ninety degrees horizontal. Bollard housing and shaft are single-piece, fabricated from aluminum, and finished in finely textured paint. All hardware is stainless steel. Optional steel housing for high abuse environments available on request. Steel housing is hot-dip galvanized prior to being finished in finely textured paint. Standard colors; matte silver grey metallic or graphite grey. Special colors available. CSA certified for Wet Locations.

Model	Height	Lamp
LN950	40.5“	LED

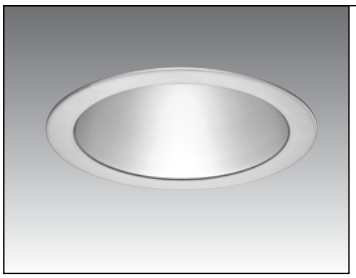




Phone: 864.487.3535 • Fax: 864.487.3175 • www.hessamerica.com
P.O. Box 28 • Gaffney, SC 29342-0028

Design: Dirk Bertuleit

DL1



BASYS™ LED II

Recessed Round Downlight 6"

Applications: The BASYS LED II family has a broad range of distributions, outputs, and finishes. Whether you are looking to get high light levels or a sleek, minimalist appearance, BASYS LED II has you covered. Perfect for offices, foyers, hallways, conference rooms, or educational areas.

online Find it Fast 1124

Type: _____

Project: _____

LED IBEW Union Made

BASYS LED II HOUSING

BR6DLED2-N-46W-835-M5-DH2

FIXTURE	TRIM/CEILING TYPE	WATTAGE/OUTPUT	LED MODULE	DISTRIBUTION	DRIVER	OPTIONS
BASYS LED II Round 6" Recessed Downlight Direct White LED CRI = 85 typical	**N** Standard Flange **F** Flangeless	**18W** 1400 lm **26W** 2150 lm **37W** 2800 lm **46W** 3200 lm *For exact Lumen Output and Wattage consumption data, please consult LM-79 reports.* **Trim Finish Multiplier for Lumen Output** Clear Specular 1.10 Clear Semi-Specular 1.00 Matte 0.87 White Matte 0.80	**827** 2700K, 85 typical CRI **830** 3000K, 85 typical CRI **835** 3500K, 85 typical CRI 3.5-step MacAdam **CCT Multiplier for Lumen Output** 2700K 0.87 3000K 0.93 3500K 1.00	**M5** Medium Distribution, 55º cutoff **W5** Wide Distribution, 55º cutoff	**D_*** Standard 0-10V Dimming Driver, 10% **DH_*** Lutron HiLume A Series, 1% **DD_*** DALI Dimming, 0.1% ** Specify "1" for 120V or "2" for 277V.*	**EM_*** Standby Battery Pack, 5W, 290lm **EMH_*** Standby Battery Pack, 22W, 1200lm **F** Fusing * Specify "1" for 120V or "2" for 277V.

BASYS LED II TRIM

BR6D LED2

FIXTURE	TRIM/CEILING TYPE	DISTRIBUTION	REFLECTOR FINISH	FLANGE FINISH	LENS
BASYS LED II Round 6" Recessed Downlight	**N** Standard Flange **F** Flangeless	**M5** Medium Distribution, 55º cutoff **W5** Wide Distribution, 55º cutoff	**CL** Clear Specular **CS** Clear Semi-Specular **MT** Matte **WH** White Matte **CC*** Custom *** For Custom Colors, please specify RAL #** _____	**N** Natural **W** White **C*** Custom **F** Flangeless	**SL** Solite Lens **SB** Sandblasted Lens **CA** Clear Tempered Glass Lens Solite Lens is standard.

BASYS LED II MOUNTING

OPTIONS	
9930	Set of two 27" C-Channel mounting bars
9952	Set of two 52" C-Channel mounting bars
9956	Set of two 28" 10 ga. one-piece universal mounting bars

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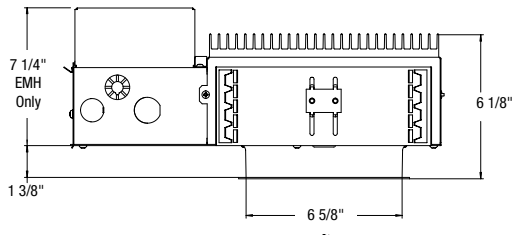
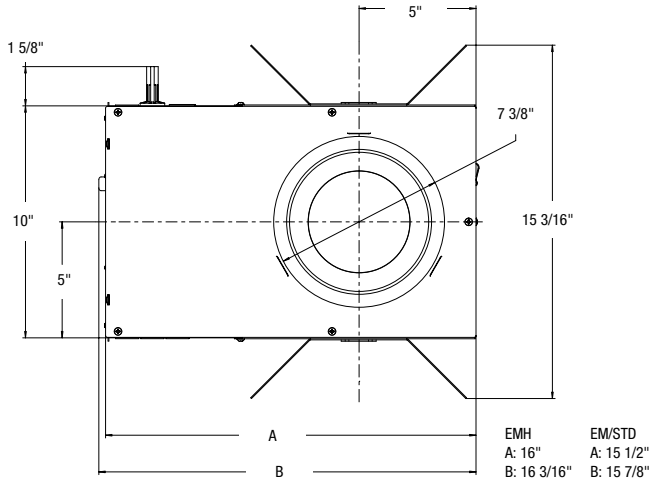
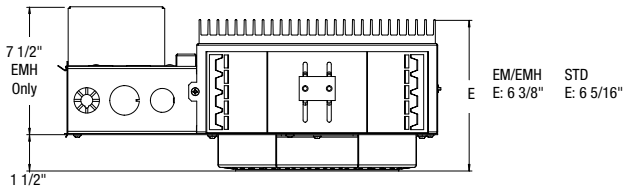
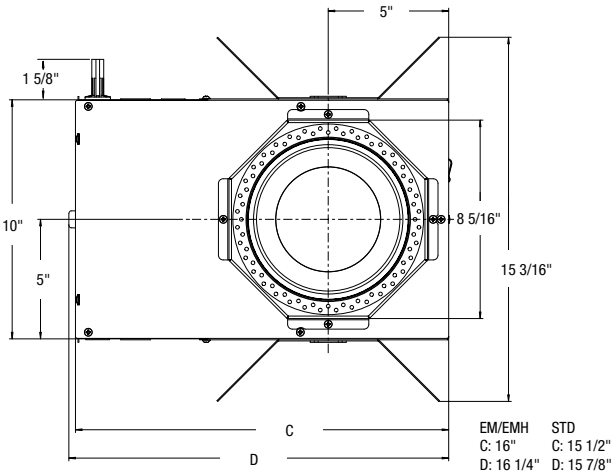
FLANGED VIEWS





FLANGELESS VIEWS





A ceiling cutout template will be provided with each fixture

NRTL

IBEW Union Made

Rated for Wet Locations

1) Housing - Enclosed housing is of 20-gauge galvanized steel. Shallow integral heat sink rests on top of the housing. 20-gauge aluminum plaster frame has a fixed throat of 1 3/8" to accommodate double-thickness plasterboard.

Thru Wire Box Oversized junction box is 16-gauge galvanized steel.

CSA listed for thru wiring (4 in and 4 out at 90°C) and has 7/8" and 1 1/8" knockouts.

Driver door provides access to driver and thru wire box through fixture aperture.

2) Wattage & CCT - Wattage options are 18W, 26W, 37W, or 46W. Available in 2700K, 3000K, or 3500K color temperatures. 3.5-step MacAdam.

3) Dimming - Basys LED II is available with 0-10V Dimming driver standard, with 10% dimming. 1% dimming is available with the Lutron HiLume A series. 0.1% dimming is available with a DALI driver. For non-dimming installations, the standard 0-10V dimming driver will be provided, and the dimming control wires can simply be capped off at installation.

Compatible 0-10V Dimmers:
- Lutron DVTV
- Lutron NTFTV
- LEVITON IP710-DLZ
- Wattstopper/Legrand ADF-120277

4) Driver - The driver can be removed either through the aperture or back of thru wire box for replacement and ease of wire connection.

Standard Quick Disconnect for driver module allows driver to be removed completely from housing without tools. It offers quick connection to building power supply.

5) Standby Battery Pack – EM = 5W, 290lm
EMH = 22W, 1200lm

6) Mounting - Rigid mounting brackets provide 3" vertical adjustment from inside aperture and plenum side of housing. Brackets accommodate One-Piece Universal Mounting Bar (mounting bars ordered as an optional accessory).

7) Reflectors – Upper Reflector - Reflector is anodized aluminum of high-specularity, vacuum metalized, designed to provide highest efficiency and effective beam distribution. The lens obscures direct view of the LEDs.

Lower Reflector - Compound parabolic curve of lower reflector provides optical and physical and 55° cutoff. Aluminum anodized lower reflector is designed to provide iridescent-free finish. Solite lens included.

Lower Reflector Finishes –

Specular – highly polished post-anodized finish with dark light appearance. Precise light distribution and glare limitation provides highest lumen output.

Semi-Specular – architectural visual identity is provided while maintaining precise directionality of light.

Matte – soft, diffuse, evenly illuminated surface provides a congruous appearance between the downlight and the ceiling.

White – Zumtobel White painted finish blends well with typical White painted ceilings.

8) Life – 50,000 hours rated life. L70.

9) Weight - 4" STD = 8.75 lbs.
4" EM = 11.25 lbs.

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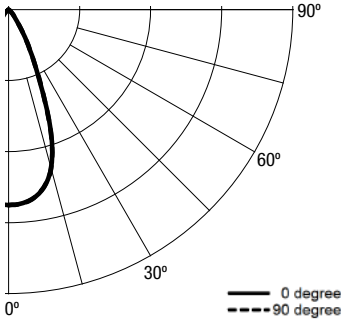
D01018TS 02/20/15

ZUMTOBEL

BASYS LED II
6" Round Downlight, 18W, 3500K, 80 CRI
Medium Beam, 55º cutoff
1535 lumens, 18.8W, 81.6 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	2752	2752	2752	
5°	2727	2727	2727	256.0
15°	2316	2316	2316	622.2
25°	929	929	929	441.8
35°	228	228	228	156.5
45°	60	60	60	48.8
55°	4	4	4	6.0
65°	0	0	0	0.0
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

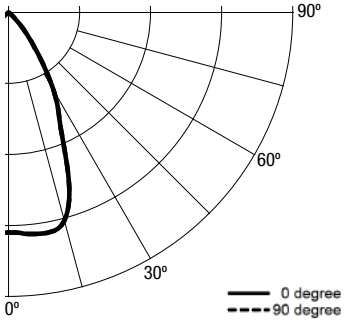
Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	336	427	509	583	346	430	506	575	436	501	561	441	497	548
2	289	352	405	449	295	354	403	445	357	400	437	361	398	430
3	254	299	333	361	258	300	332	359	302	331	355	304	329	350
4	227	259	282	300	229	259	281	298	260	280	296	261	279	294
5	205	227	243	255	206	228	243	254	228	242	253	229	241	251
6	186	202	213	221	187	202	213	220	203	212	219	203	212	218
7	171	182	189	194	171	182	189	194	182	188	193	182	188	192
8	157	165	169	172	158	164	169	172	164	169	172	164	168	171
9	146	150	153	155	146	150	153	154	150	152	154	150	152	154
10	135	138	139	140	135	138	139	140	137	139	139	137	138	139

BASYS LED II
6" Round Downlight, 18W, 3500K, 80 CRI
Wide Beam, 55º cutoff
1547 lumens, 18.8W, 82.3 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	1858	1858	1858	
5°	1878	1878	1878	179.5
15°	1822	1822	1822	495.6
25°	1026	1026	1026	484.2
35°	453	453	453	289.3
45°	102	102	102	88.1
55°	6	6	6	7.4
65°	0	0	0	0.0
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	320	405	481	550	329	408	479	543	413	474	530	418	470	518
2	273	331	378	418	279	332	377	415	335	374	408	338	371	401
3	238	278	308	332	242	278	307	330	280	305	327	281	304	323
4	211	238	258	273	213	238	257	272	239	256	269	240	255	267
5	189	207	220	229	190	207	220	229	207	219	227	208	218	226
6	171	183	191	197	171	183	190	196	183	190	195	182	189	194
7	155	163	167	171	155	163	167	171	162	167	170	162	166	169
8	142	146	149	150	142	146	148	150	146	148	150	145	148	149
9	131	132	133	134	131	132	133	133	132	132	133	131	132	133
10	121	120	120	120	121	120	120	120	120	120	119	119	119	119

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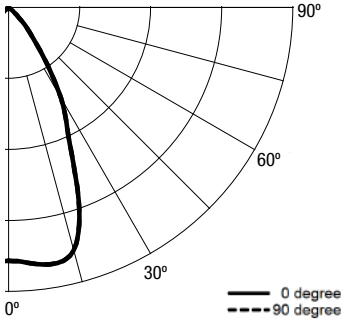
BASYS LED II
6" Round Downlight, 26W, 3500K, 80 CRI
Medium Beam, 55º cutoff
2251 lumens, 26.5W, 84.9 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	5348	5348	5348	
5°	5422	5422	5422	260.1
15°	5309	5309	5309	721.7
25°	2988	2988	2988	704.8
35°	1311	1311	1311	418.9
45°	306	306	306	129.8
55°	20	20	20	12.2
65°	1	1	1	0.4
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

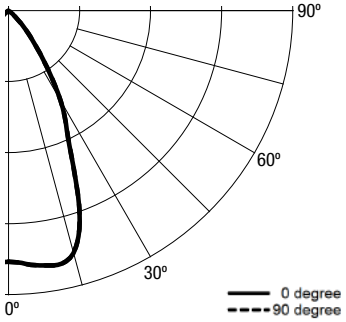
Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	194	225	253	279	196	225	251	275	225	247	268	224	243	261
2	168	185	200	212	168	185	199	210	184	196	206	183	193	203
3	148	157	163	169	148	156	162	168	155	161	165	153	159	163
4	132	135	137	139	131	134	136	138	133	135	137	132	134	135
5	119	118	117	117	118	117	117	116	116	116	115	115	115	115
6	108	104	102	100	107	104	101	100	103	101	99	101	100	99
7	99	93	90	87	98	93	89	87	92	89	86	91	88	86
8	91	84	80	77	90	83	79	76	83	79	76	82	78	76
9	84	76	71	68	83	76	71	68	75	71	68	74	70	68
10	78	70	64	61	77	69	64	61	68	64	61	68	64	61

BASYS LED II
6" Round Downlight, 26W, 3500K, 80 CRI
Wide Beam, 55º cutoff
2251 lumens, 26.5W, 84.9 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	5304	5304	5304	
5°	5387	5387	5387	258.2
15°	5300	5300	5300	721.2
25°	2978	2978	2978	703.8
35°	1317	1317	1317	420.1
45°	310	310	310	131.5
55°	20	20	20	12.3
65°	1	1	1	0.4
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	194	225	253	278	196	225	251	275	224	247	268	224	243	261
2	168	185	200	212	168	185	198	210	184	196	206	183	193	203
3	148	156	163	169	147	156	162	167	154	160	165	153	159	163
4	132	135	137	138	131	134	136	138	133	135	136	131	133	135
5	119	118	117	117	118	117	117	116	116	115	115	115	114	114
6	108	104	102	100	107	104	101	100	102	100	99	101	100	98
7	99	93	89	87	98	93	89	87	91	88	86	90	88	86
8	91	84	79	76	90	83	79	76	82	79	76	81	78	76
9	84	76	71	68	83	76	71	68	75	71	68	74	70	67
10	78	69	64	61	77	69	64	61	68	64	61	68	63	60

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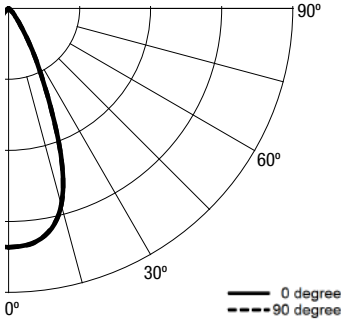
D01018TS 02/20/15

ZUMTOBEL

BASYS LED II
6" Round Downlight, 37W, 3500K, 80 CRI
Medium Beam, 55º cutoff
2892 lumens, 36W, 80.3 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	5042	5042	5042	
5°	5008	5008	5008	470.9
15°	4309	4309	4309	1160.3
25°	1776	1776	1776	843.5
35°	441	441	441	300.8
45°	116	116	116	94.8
55°	12	12	12	14.3
65°	0	0	0	0.4
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

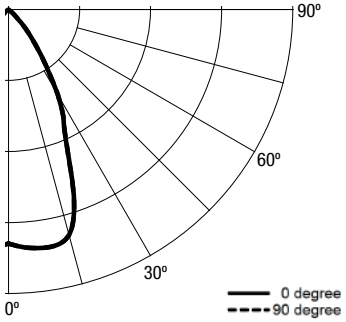
Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	335	425	507	580	345	429	504	573	434	500	559	440	495	546
2	288	351	403	447	294	353	401	443	356	399	436	359	396	428
3	253	297	332	359	257	298	331	357	300	329	353	302	327	349
4	226	257	280	298	228	258	280	297	259	279	294	260	278	292
5	204	226	242	253	205	226	241	253	227	241	251	227	240	249
6	185	201	212	219	186	201	211	219	201	211	218	202	210	217
7	170	180	188	192	170	180	187	192	180	187	191	180	186	191
8	156	163	168	171	157	163	168	171	163	167	170	163	167	170
9	145	149	152	153	145	149	151	153	149	151	153	148	151	152
10	135	137	138	139	134	136	138	138	136	137	138	136	137	138

BASYS LED II
6" Round Downlight, 37W, 3500K, 80 CRI
Wide Beam, 55º cutoff
2812 lumens, 34W, 82.7 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	3295	3295	3295	
5°	3367	3367	3367	322.2
15°	3289	3289	3289	892.2
25°	1858	1858	1858	875.0
35°	824	824	824	528.0
45°	195	195	195	169.4
55°	17	17	17	19.3
65°	1	1	1	1.5
75°	0	0	0	0.1
85°	0	0	0	0.0
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	319	404	480	548	328	407	477	541	412	472	528	416	468	516
2	272	329	377	416	278	331	375	413	334	372	406	336	370	399
3	237	276	307	331	241	277	306	329	279	304	325	280	302	321
4	210	237	256	271	212	237	256	270	238	255	268	238	253	266
5	188	206	219	228	189	206	218	227	206	217	226	207	217	224
6	170	182	190	195	170	182	189	195	181	189	194	181	188	193
7	154	162	166	170	155	162	166	169	161	166	169	161	165	168
8	141	145	148	149	141	145	147	149	145	147	149	144	147	148
9	130	131	132	133	130	131	132	132	131	132	132	130	131	132
10	120	119	119	119	120	119	119	119	119	119	118	119	118	118

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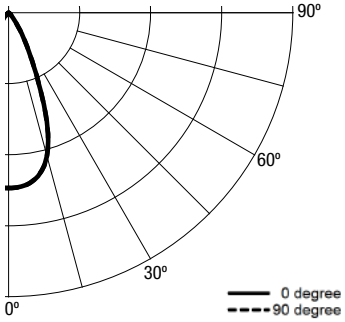
ZUMTOBEL

BASYS LED II
6" Round Downlight, 46W, 3500K, 80 CRI
Medium Beam, 55º cutoff
3496 lumens, 44.8W, 78 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	6171	6171	6171	
5°	6127	6127	6127	575.5
15°	5230	5230	5230	1407.9
25°	2127	2127	2127	1010.8
35°	525	525	525	360.1
45°	140	140	140	114.9
55°	15	15	15	17.5
65°	1	1	1	0.6
75°	0	0	0	0.0
85°	0	0	0	0.0
90°	0	0	0	

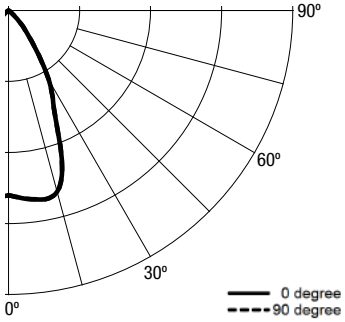
Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	335	426	507	581	345	429	505	574	435	500	560	440	496	547
2	288	351	403	447	295	353	402	443	356	399	436	359	396	429
3	253	298	332	360	257	299	331	357	301	330	353	302	328	349
4	226	258	281	299	229	258	280	297	259	279	295	260	278	292
5	204	226	242	254	206	227	242	253	227	241	251	228	240	250
6	186	201	212	220	187	201	212	219	202	211	218	202	211	217
7	170	181	188	193	171	181	188	193	181	187	192	181	187	191
8	157	164	168	171	157	164	168	171	164	168	171	163	167	170
9	145	149	152	154	145	149	152	154	149	151	153	149	151	153
10	135	137	138	139	135	137	138	139	137	138	139	136	138	138

BASYS LED II
6" Round Downlight, 46W, 3500K, 80 CRI
Wide Beam, 55º cutoff
3433 lumens, 42.7W, 80.4 lm/W

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	3904	3904	3904	
5°	3989	3989	3989	382.6
15°	3968	3968	3968	1080.5
25°	2260	2260	2260	1070.4
35°	1024	1024	1024	654.1
45°	251	251	251	214.8
55°	21	21	21	23.9
65°	2	2	2	2.0
75°	0	0	0	0.1
85°	0	0	0	0.0
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	319	403	478	546	328	405	476	539	411	471	526	415	466	514
2	272	328	375	415	277	330	374	411	333	371	404	335	368	398
3	236	275	305	329	240	276	304	327	277	303	323	279	301	320
4	209	236	255	270	211	236	254	269	237	253	266	237	252	264
5	187	205	217	227	188	205	217	226	205	216	225	205	215	223
6	169	181	188	194	169	181	188	194	180	187	193	180	187	192
7	154	161	165	168	154	161	165	168	160	164	168	160	164	167
8	140	144	146	148	140	144	146	148	144	146	147	143	145	147
9	129	130	131	131	129	130	131	131	130	130	131	129	130	131
10	119	119	118	118	119	118	118	118	118	118	117	118	117	117

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D01018TS 02/20/15

ZUMTOBEL

DL2

IRIS®

DESCRIPTION

Recessed 3.5" aperture lens wall wash luminaire utilizing a LED array. Housing is suitable for 2x8 residential or commercial constructions, airtight and can be used in direct contact with insulation. Housing platform + primary reflector + optical element combination supports various distributions and reflector types providing design flexibility. Use where excellent light control and low aperture brightness are demanded.

Catalog #		Type
Project		
Comments		Date
Prepared By		

SPECIFICATION FEATURES

Frame
Galvanized steel plaster frame with integral bar hanger receivers. Setscrews provide positive horizontal locking. Integral gun sights facilitate the use of guide strings or laser lines. Shipped with overspray protector installed.

Housing
Steel housing painted matte black for visually dark interior. Removable access panels allow splice inspection and service of all electrical components including LED module and driver from below the ceiling thru the aperture. Removable hinged top allow top access. All fasteners are captive.

Bar Hangers
Captive preinstalled bar hangers adjust from 8-1/2" to 24" wide; pass thru feature allows shortening without removal. Captive nail penetrates standard and engineered lumber. Mounting flange levels platform with ceiling. Integral clip attached directly to tee-bar.

Universal Mounting Bracket
Accepts 1/2" EMT, C channel and bar hangers and adjusts 3" vertically from above the ceiling.

Gaskets
Closed cell gaskets achieve restrictive airflow requirements without additional caulking.

Adjustment Mechanism
Dynamic aiming rotates 365°, tilts 45° and locks in position. Angle markings assist in repeatable settings. Translating center beam optics aligns axis of primary reflector with aperture from nadir to 45°.

LED Module
Field replaceable module utilizes Cree® MT-G2 LED array and conforms to Zhaga standards for interchangeability. Proximity phosphors over chip on board LEDs provide a uniform source with high efficiency and no pixilation. Color accuracy within 2 SDCM and optional 90 CRI provides excellent color. Passive cooling achieves L70 at 40,000 hours.

Primary Optic
Borosilicate glass segmented optic with > 95% reflective multi-layer hard coating delivers a highly efficient and uniform beam. Various distributions are available and can be interchanged without tools. Elastomeric glare shield accepts theatrical color filters and diffusion films.

Media
Optional media holder accepts one or two 3.0mm thick color filters or beam modifying lens. Order media holder, color filters and lens separately.

Lower Reflector
Spun 0.04" thick aluminum angle cut parabolic contour provides cutoff to lens. Neutral color glass linear spread lens provides smooth vertical illumination with a minimal downlight component. Available in a wide range of specular and semi-specular Alzak® finishes. Light trap eliminates spill light at edge of flange and reflector. Metal trim ring can be removed for painting and can be installed flush mount with optional flush mount collar accessory.

Trim Retention
Retained with two torsion springs holding the flange tightly to the finished ceiling surface and accommodates ceiling thickness from 1/2 - 1" thick. Use optional plaster lip extender for ceilings up to 2" thick.

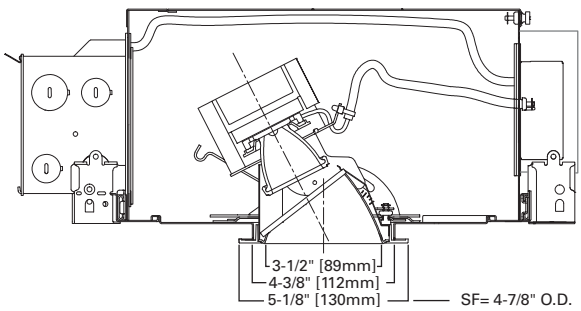
Junction Box
(6) 1/2" and (2) 3/4" trade size pry outs positioned to allow straight conduit runs.

Driver
Integral constant current driver provides noise free operation. Continuous, flicker-free 1% dimming, available with 2 or 3 wire phase cut and EcoSystem/DALI digital control interfaces. The DALI option is Fifth Light compatible.

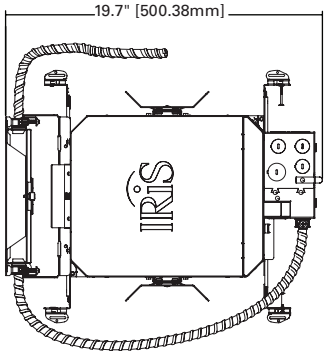
Emergency Option
Provides 90 minutes of standby lighting meeting most life safety codes for egress lighting. Remote charge indicator and test switch. The maximum battery pack ambient is 50°C.

Compliance
Type IC inherently protected, suitable for direct contact with insulation and cULus listed for wet locations. Restrictive airflow per ASTM-E283. EMI/RFI emissions per FCC 47CFR Part 18 consumer limits. Contains no mercury or lead and RoHS compliant. Photometric testing in accordance with IES LM79-08. Lumen maintenance projections in accordance with IES LM-80-08 and TM-21-11. Zhaga compliant. Meets EMI/RFI emission per FCC 47CFR Part 18 consumer limits at 120V input. Lighting Facts Labeled.

Warranty
5 year warranty.

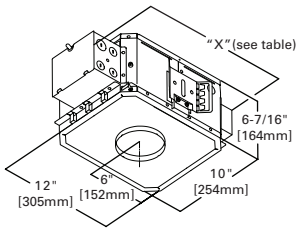


EM OPTION



P3LED09 E3LWW

LED Lens Wall Wash
3.5" Aperture
900 Lumen Series



Catalog #	X-Dimension
P3LED09*E	16.4" (416mm)
P3LED09*E010	16.25" (413mm)
P3LED09*E5LT	16.25" (413mm)
P3LED09*EDMX	16.25" (413mm)
P3LED09*1ELTE	16.9" (429mm)
P3LED09*EL3D	16.9" (429mm)

E Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.12	0.06
Input Power (W)	14.3	15
Inrush Current (A)	0.17	0.43
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

E010 Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	14.3	15
Inrush Current (A)	0.6	1
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

Zhaga
Cooper Lighting is a founding member of the Zhaga Consortium

powered by fifthlight technology

ORDERING INFORMATION

Complete luminaire consists of a housing platform and optical element. Housing platform can be ordered without primary optic. Order primary optics separately.

Example: P3LED09830E RG50NFL25 E3LWWH

Platform	Lumens[1]	Distribution	Color	Driver	Options
P3LED-09-FL40-840--EL3D-E3LWW-WH-RG50FL40					

P3LED = 3.5" Aperture IC, AT LED Housing Platform
P3LEDCP = 3.5" Aperture IC, AT LED Housing Platform, CCEA listed for City of Chicago Plenum Requirements

09 = 900 Lumens (Nominal)

[Blank] = Omit Primary Optic
NFL25 = 25° Beam
FL40 = 40° Beam

827 = 80 CRI Minimum, 2,700 K CCT
927 = 90 CRI Minimum, 2,700 K CCT
830 = 80 CRI Minimum, 3,000 K CCT
930 = 90 CRI Minimum, 3,000 K CCT
835 = 80 CRI Minimum, 3,500 K CCT
840 = 80 CRI Minimum, 4,000 K CCT

E = 120 – 277V 50/60Hz Leading or Trailing Edge Phase Cut 1% Dimming
E010 = 120 – 277V 50/60Hz 0 -10V 10% Dimming
E5LT = 120 – 277V 50/60Hz DALI 1% Dimming
1ELTE = 120V 60Hz Leading Edge 1% Dimming, Lutron A-Series
EL3D = 120 – 277V 50/60Hz 3-wire and EcoSystem 1% Dimming, Lutron A-Series

EM = Integral Battery Backup with Remote Test Switch and Indicator Light
(Not available with 1ELTE and EL3D driver options)

Optical Element	Finishes	Options	Accessories
E3LWW			

E3LWW = 3.5" Aperture Lens Wall Wash Reflector

Alzak® Finishes
C = Specular Clear
H = Semi-Specular Clear
G = Gold
WMH = Warm Haze
WH = Wheat
WHH = Wheat Haze
GP = Graphite
GPH = Graphite Haze
K = Cognac
KH = Cognac Haze
CC = Chocolate
CCH = Chocolate Haze
B = Black

Painted Finishes
MW = Matte white
W = Gloss white

[Blank] = Metal Trim Ring, Matte White
SF = Self-flanged
SFWF = Self-flanged, Matte White Flange

RG50NFL25 = 25° Beam Glass Reflector, 50mm
RG50FL40 = 40° Beam Glass Reflector, 50mm
FMC3 = Flush Mount Collar Accessory
PLE3 = Plaster Lip Extender for Up to 2" Thick Ceilings
ZLM03 = Replacement LED module, see specification sheet for catalog number and performance data

ENERGY DATA

1ELTE Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	
Input Power (W)	15.7	
Inrush Current (A)	1.9	
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

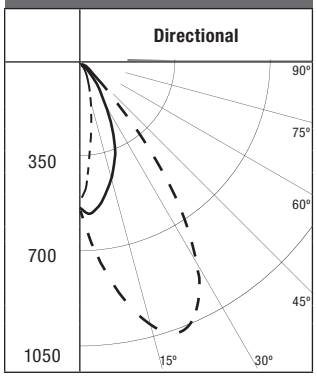
EL3D Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	15.6	16
Inrush Current (A)	1.9	2
THD	≤20%	
PF	≥0.90	≥0.80
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

E5LT Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.12	0.06
Input Power (W)	14.3	15.2
Inrush Current (A)	1.73	1.8
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

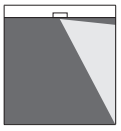
EDMX Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	15.1	16.1
Inrush Current (A)	1.82	1.89
THD	≤20%	
PF	≥0.90	≥0.60
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

PHOTOMETRICS

CANDLEPOWER DISTRIBUTION



Test Number	P106554
Platform	P3LED09830E
Element	E3LWWH RG50NFL25
Lumens	640
Efficacy	44.3 Lm/W



ZONAL LUMEN SUMMARY

Zone	Lumens	%Fixture
0-30	385	62.4
0-40	529	85.8
0-60	603	97.7
0-90	617	100
90-180	0	0
0-180	617	100

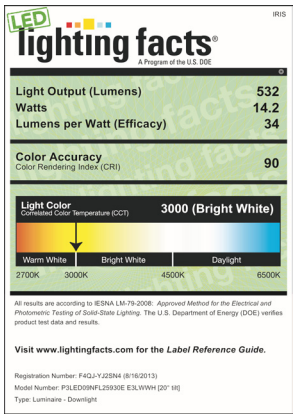
LEGEND:
0-deg: — — — —
90-deg: ————
180-deg: — — — —

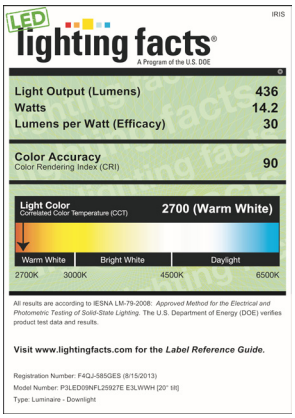
SINGLE UNIT FOOTCANDLES

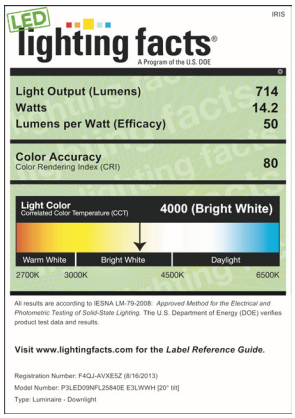
	3' FROM WALL (Distance From Fixture Along Wall)						
DD	●	1'	2'	3'	4'	5'	6'
1'	1.6	1.1	0.5	0.2	0.1	0	0
2'	2.5	2	1.1	0.4	0.2	0.1	0
3'	5.7	4	1.7	0.7	0.3	0.2	0.1
4'	12	8.9	3.9	1.4	0.5	0.2	0.1
5'	11.9	9.8	5.6	2.4	0.9	0.3	0.2
6'	9.4	8.2	5.5	3	1.3	0.5	0.2
7'	7	6.3	4.6	2.9	1.6	0.7	0.3
8'	5.1	4.7	3.6	2.5	1.5	0.9	0.4
9'	3.7	3.5	2.8	2.1	1.4	0.9	0.5
10'	2.7	2.6	2.2	1.7	1.2	0.8	0.5

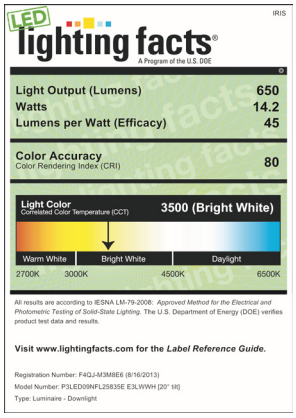
MULTIPLE UNIT FOOTCANDLES

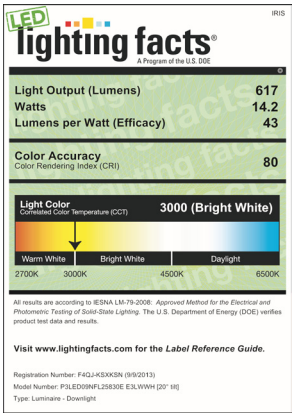
	2.5' FROM WALL (Spacing Between Fixtures)						3' FROM WALL (Spacing Between Fixtures)					
DD	●	2' apart	●	●	3' apart	●	●	2' apart	●	●	3' apart	●
1'	3.3	3.5	3.3	2.8	2.2	2.8	2.1	2.2	2.1	1.8	1.5	1.8
2'	5.9	6.1	5.9	5.1	4.1	5.1	3.6	3.9	3.6	2.9	2.9	2.9
3'	17.3	17.6	17.3	15.3	10.2	15.3	7.4	8	7.4	6.4	5.4	6.4
4'	23.3	26.3	23.3	19.4	18.3	19.4	15.9	17.8	15.9	13.4	12.3	13.4
5'	19.9	22.1	19.9	16.3	17.4	16.3	17.5	19.7	17.5	14.3	15.6	14.3
6'	14.8	16.3	14.8	12.4	13.6	12.4	14.9	16.3	14.9	12.4	13.7	12.4
7'	10.6	11.5	10.6	9.1	10	9.1	11.6	12.5	11.6	9.9	10.9	9.9
8'	7.6	8.1	7.6	6.6	7.3	6.6	8.7	9.3	8.7	7.6	8.4	7.6
9'	5.5	5.8	5.5	4.9	5.4	4.7	6.5	6.9	6.5	5.8	6.3	5.8
10'	4.1	4.2	4.1	3.7	4	3.8	4.9	5.2	4.9	4.4	4.8	4.4

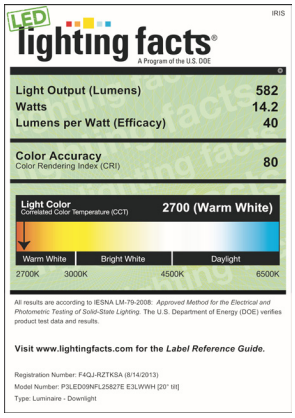












Please see LightingFacts.com for a complete listing of products.

DL3

IRIS®

DESCRIPTION

Recessed 3.5" aperture directional luminaire with angle cut shielding reflector utilizing a LED array. Housing is suitable for 2x8 residential or commercial constructions, airtight and can be used in direct contact with insulation. Housing platform + primary reflector + optical element combination supports various distributions and reflector types providing design flexibility. Use where excellent light control and low aperture brightness are demanded.

Catalog #		Type
Project		
Comments		Date
Prepared By		

SPECIFICATION FEATURES

Frame
Galvanized steel plaster frame with integral bar hanger receivers. Setscrews provide positive horizontal locking. Integral gun sights facilitate the use of guide strings or laser lines. Shipped with overspray protector installed.

Housing
Steel housing painted matte black for visually dark interior. Removable access panels allow splice inspection and service of all electrical components including LED module and driver from below the ceiling thru the aperture. Removable hinged top allow top access. All fasteners are captive.

Bar Hangers
Captive preinstalled bar hangers adjust from 8-1/2" to 24" wide; pass thru feature allows shortening without removal. Captive nail penetrates standard and engineered lumber. Mounting flange levels platform with ceiling. Integral clip attached directly to tee-bar.

Universal Mounting Bracket
Accepts ½" EMT, C channel and bar hangers and adjusts 3" vertically from above the ceiling.

Gaskets
Closed cell gaskets achieve restrictive airflow requirements without additional caulking.

Adjustment Mechanism
Dynamic aiming rotates 365°, tilts 45° and locks in position. Angle markings assist in repeatable settings. Translating center beam optics aligns axis of primary reflector with aperture from nadir to 45°.

LED Module
Field replaceable module utilizes Cree® MT-G2 LED array and conforms to Zhaga standards for interchangeability. Proximity phosphors over chip on board LEDs provide a uniform source with high efficiency and no pixilation. Color accuracy within 2 SDCM and optional 90 CRI provides excellent color. Passive cooling achieves L70 at 40,000 hours.

Primary Optic
Borosilicate glass segmented optic with > 95% reflective multi-layer hard coating delivers a highly efficient and uniform beam. Various distributions are available and can be interchanged without tools. Elastomeric glare shield accepts theatrical color filters and diffusion films.

Media
Optional media holder accepts one or two 3.0mm thick color filters or beam modifying lens. Order media holder, color filters and lens separately.

Lower Reflector
Spun 0.04" thick aluminum angle cut parabolic contour provides 50° room side cutoff and is available in a wide range of specular and semi-specular Alzak® finishes. Light trap eliminates spill light at edge of flange and reflector. Metal trim ring can be removed for painting and can be installed flush mount with optional flush mount collar accessory.

Trim Retention
Retained with two torsion springs holding the flange tightly to the finished ceiling surface and accommodates ceiling thickness from 1/2" - 1" thick. Use optional plaster lip extender for ceilings up to 2" thick.

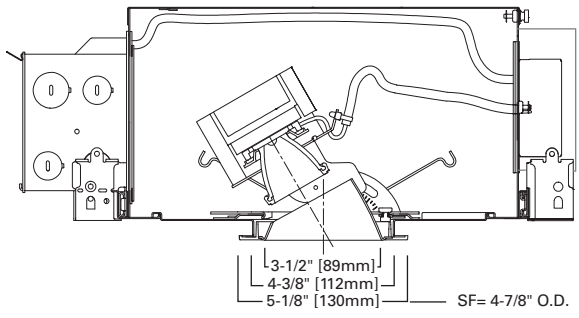
Junction Box
(6) 1/2" and (2) 3/4" trade size pry outs positioned to allow straight conduit runs.

Driver
Integral constant current driver provides noise free operation. Continuous, flicker-free 1% dimming, available with 2 or 3 wire phase cut and EcoSystem/DALI digital control interfaces. The DALI option is Fifth Light compatible.

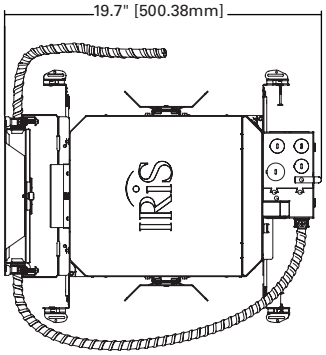
Emergency Option
Provides 90 minutes of standby lighting meeting most life safety codes for egress lighting. Remote charge indicator and test switch. The maximum battery pack ambient is 50°C.

Compliance
Type IC inherently protected, suitable for direct contact with insulation and cULus listed for damp locations. Restrictive airflow per ASTM-E283. EMI/RFI emissions per FCC 47CFR Part 18 consumer limits. Contains no mercury or lead and RoHS compliant. Photometric testing in accordance with IES LM-79-08. Lumen maintenance projections in accordance with IES LM-80-08 and TM-21-11. Meets California Title 24 residential fixture program and listed on appliance database. Energy Star listed. Zhaga compliant. Meets EMI/RFI emission per FCC 47CFR Part 18 consumer limits at 120V input. Lighting Facts Labeled.

Warranty
5 year warranty.

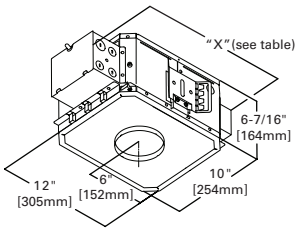


EM OPTION



P3LED09
E3AA, E3AA20

LED Directional Angle Cut and Shallow Angle Cut
3.5" Aperture
900 Lumen Series



Catalog #	X-Dimension
P3LED09*E	16.4" (416mm)
P3LED09*E010	16.25" (413mm)
P3LED09*E5LT	16.25" (413mm)
P3LED09*EDMX	16.25" (413mm)
P3LED09*1ELTE	16.9" (429mm)
P3LED09*EL3D	16.9" (429mm)

E Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.12	0.06
Input Power (W)	14.3	15
Inrush Current (A)	0.17	0.43
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

E010 Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	14.3	15
Inrush Current (A)	0.6	1
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

ENERGY STAR · Can be used for IECC International Energy Conservation Code High Efficacy Compliance · Can be used for T24 California Title 24 High Efficacy Compliance · Can be used for WSEC Washington State Energy Code High Efficacy Compliance

Zhaga

Cooper Lighting is a founding member of the Zhaga Consortium

powered by fifthlight technology

Cooper Lighting by EATON

Specifications and dimensions subject to change without notice.
Consult your representative for additional options and finishes.

ADI130306
02-05-2015

ORDERING INFORMATION

Complete luminaire consists of a housing platform and optical element. Housing platform can be ordered without primary optic. Order primary optics separately.

Example: PLED09830E RG50SP15 E3AAH

Platform	Lumens[1]	Distribution	Color	Driver	Options
P3LED-09-	FL40-	903-	EL3D-	E3AA-	WH-RG50FL40

Platform

P3LED = 3.5" Aperture IC, AT LED Housing Platform
P3LEDCP = 3.5" Aperture IC, AT LED Housing Platform, CCEA listed for City of Chicago Plenum Requirements

Lumens[1]

09 = 900 Lumens (Nominal)

Distribution

[Blank] = Omit Primary Optic
NSP10 = 10° Beam
SP15 = 15° Beam
NFL25 = 25° Beam
FL40 = 40° Beam

Color

827 = 80 CRI Minimum, 2,700 K CCT
927 = 90 CRI Minimum, 2,700 K CCT
830 = 80 CRI Minimum, 3,000 K CCT
930 = 90 CRI Minimum, 3,000 K CCT
835 = 80 CRI Minimum, 3,500 K CCT
840 = 80 CRI Minimum, 4,000 K CCT

Driver

E = 120 – 277V 50/60Hz Leading or Trailing Edge Phase Cut 1% Dimming
E010 = 120 – 277V 50/60Hz 0 -10V 10% Dimming
1ELTE = 120V 60Hz Leading Edge 1% Dimming, Lutron A-Series
EDMX = 120 – 277V 50/60Hz DMX 1% Dimming
E5LT = 120 – 277V 50/60Hz DALI 1% Dimming
EL3D = 120 – 277V 50/60Hz 3-wire and EcoSystem 1% Dimming, Lutron A-Series

Options

EM = Integral Battery Backup with Remote Test Switch and Indicator Light (Not available with 1ELTE and EL3D driver options)

Optical Element	Finishes	Options	Accessories
E3AA-			

Optical Element

E3AA = 3.5" Aperture Open Angle Cut Reflector
E3AA20 = 3.5" Aperture Shallow Open Angle Cut Reflector

Finishes

Alzak® Finishes
C = Specular Clear
H = Semi-Specular Clear
G = Gold
WMH = Warm Haze
WH = Wheat
WHH = Wheat Haze
GP = Graphite
GPH = Graphite Haze
K = Cognac
KH = Cognac Haze
CC = Chocolate
CCH = Chocolate Haze
B = Black

Painted Finishes
MW = Matte White
W = Gloss White
BB = Black Baffle
WB = White Baffle

Options

[Blank] = Metal Trim Ring, Matte White

Not available with BB or WB
SF = Self Flanged
SFWF = Self Flanged, Matte White Flange

Accessories

RG50NSP10 = 10° Beam Glass Reflector, 50mm
RG50SP15 = 15° Beam Glass Reflector, 50mm
RG50NFL25 = 25° Beam Glass Reflector, 50mm
RG50FL40 = 40° Beam Glass Reflector, 50mm
RG50MH = Media Holder for 50mm Reflector
FMC3 = Flush Mount Collar Accessory
PLE3 = Plaster Lip Extender for Up to 2" Thick Ceilings
ZLM03 = Replacement LED module, see specification sheet for catalog number and performance data

ENERGY DATA

P3LED E3AA/E3AA20

1ELTE Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	
Input Power (W)	15.7	
Inrush Current (A)	1.9	
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

EL3D Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	15.6	16
Inrush Current (A)	1.9	2
THD	≤20%	
PF	≥0.90	≥0.80
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

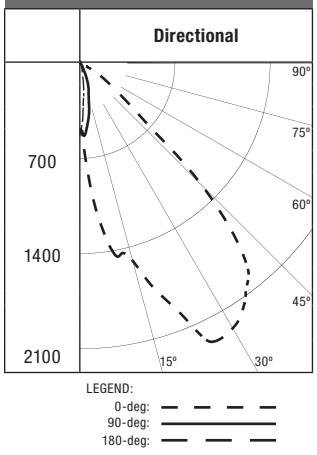
E5LT Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.12	0.06
Input Power (W)	14.3	15.2
Inrush Current (A)	1.73	1.8
THD: ≤ 20%		
PF: ≥ 0.90		
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

EDMX Driver Option		
Input Voltage	120V	277V
Input Current (A)	0.13	0.06
Input Power (W)	15.1	16.1
Inrush Current (A)	1.82	1.89
THD	≤20%	
PF	≥0.90	≥0.0
T Ambient: -20 to +40°C		
T Plenum: +65°C Max.		
Sound Rating: Class A		

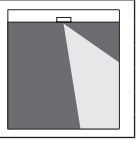
PHOTOMETRICS

P3LED E3AA/E3AA20

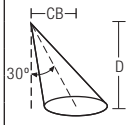
CANDLEPOWER DISTRIBUTION



Test Number	P106710
Platform	P3LED09830E
Element	E3AAC RG50FL40
Lumens	994 Lm
Efficacy	69.5 Lm/W

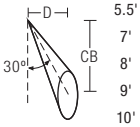


30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	21.5	5.8	4	3.2
7'	13.3	7.4	5	4
8'	10.2	8.5	5.8	4.6
9'	8	9.5	6.6	5.2
10'	6.5	10.6	7.2	5.8
12'	4.5	12.8	8.8	6.9

30° VERTICAL PLANE



D	FC	L	W	CB
5.5'	53.1	3.4	3.4	9.5
7'	32.8	4.3	4.4	12.1
8'	25.1	4.9	5.2	13.9
9'	19.8	5.6	5.8	15.6
10'	16.1	6.2	6.4	17.3
12'	11.2	7.4	7.8	20.8

ZONAL LUMEN SUMMARY

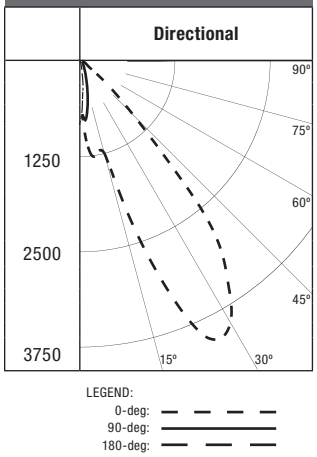
Zone	Lumens	%Fixture
0-30	475	51.4
0-40	744	80.5
0-60	922	99.7
0-90	924	100
90-180	0	0
0-180	924	100

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

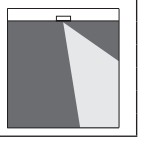
DD	●	1'	2'	3'	4'	5'	6'
1'	0	0	0	0.1	0	0	0
2'	12.2	6.6	0	0	0	0	0
3'	47.7	20.7	6.3	0.1	0	0	0
4'	49.2	35.8	9.9	2.8	0.3	0	0
5'	33.8	27.8	13.5	3.4	1.2	0.2	0
6'	22.8	19.2	11.1	4.7	1.4	0.5	0.1
7'	14.7	13.4	8.3	4.5	2	0.6	0.2
8'	9.2	9.8	6.1	3.8	2	0.8	0.2
9'	6.3	6.8	4.4	3	1.8	0.9	0.3
10'	4.4	4.5	3.4	2.3	1.5	0.9	0.4

CANDLEPOWER DISTRIBUTION

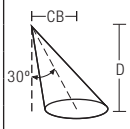


LEGEND:
0-deg:
90-deg:
180-deg:

Test Number	P106626
Platform	P3LED09830E
Element	E3AAC RG50NF25
Lumens	1016 Lm
Efficacy	71.6 Lm/W

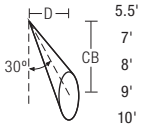


30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	27.7	7	4	3.2
7'	17.1	8.9	5	4
8'	13.1	10.2	5.8	4.6
9'	10.3	11.4	6.4	5.2
10'	8.4	12.7	7.2	5.8
12'	5.8	15.3	8.6	6.9

30° VERTICAL PLANE



D	FC	L	W	CB
5.5'	83.7	2.8	2.6	9.5
7'	51.7	3.6	3.4	12.1
8'	39.6	4.1	4	13.9
9'	31.3	4.6	4.4	15.6
10'	25.3	5.1	5	17.3
12'	17.6	6.1	6	20.8

ZONAL LUMEN SUMMARY

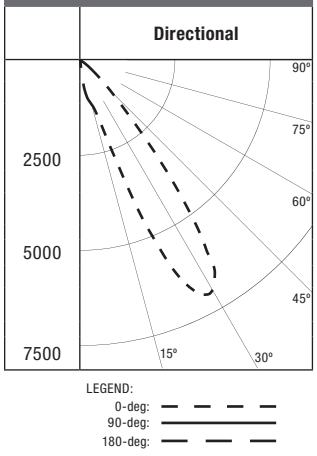
Zone	Lumens	%Fixture
0-30	559	59.2
0-40	866	91.6
0-60	944	99.9
0-90	945	100
90-180	0	0
0-180	945	100

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

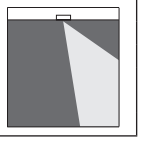
DD	●	1'	2'	3'	4'	5'	6'
1'	0.1	0	0	0	0	0	0
2'	0.3	0.3	0.1	0	0	0	0
3'	27.8	8.5	0.1	0.1	0	0	0
4'	71.3	32.4	7	0.1	0	0	0
5'	57.3	38.3	12.9	1.4	0	0	0
6'	40.2	29.7	13	3.8	0.6	0	0
7'	25.9	20.4	10.3	3.6	1.5	0.2	0
8'	15.5	13.6	7.5	3	1.5	0.5	0.1
9'	9.2	8.8	5.5	2.4	1.3	0.6	0.2
10'	5.5	5.4	4.2	1.9	1.2	0.5	0.2

CANDLEPOWER DISTRIBUTION

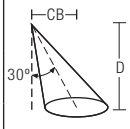


LEGEND:
0-deg:
90-deg:
180-deg:

Test Number	P106806
Platform	P3LED09830E
Element	E3AAC RG50SP15
Lumens	1129 Lm
Efficacy	78.4 Lm/W

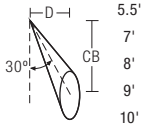


30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	40.2	4.8	2.8	3.2
7'	24.8	6.1	3.6	4
8'	19	7	4.2	4.6
9'	15	7.8	4.8	5.2
10'	12.2	8.8	5.2	5.8
12'	8.4	10.5	6.4	6.9

30° VERTICAL PLANE



D	FC	L	W	CB
5.5'	154.2	2.2	1.8	9.5
7'	95.2	2.7	2.4	12.1
8'	72.9	3.1	2.8	13.9
9'	57.6	3.6	3	15.6
10'	46.6	4	3.4	17.3
12'	32.4	4.8	4.2	20.8

ZONAL LUMEN SUMMARY

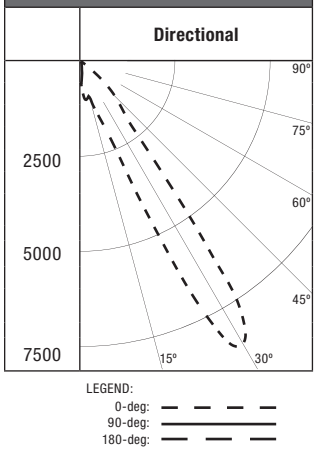
Zone	Lumens	%Fixture
0-30	554	52.8
0-40	938	89.4
0-60	1037	98.8
0-90	1050	100
90-180	0	0
0-180	1050	100

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

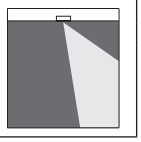
DD	●	1'	2'	3'	4'	5'	6'
1'	1.2	0.1	0.1	0	0	0	0
2'	3.2	0.1	0.2	0.2	0.1	0	0
3'	33.3	8.8	1.1	0.1	0.1	0.1	0.1
4'	109	34.2	7.8	0.1	0	0	0.1
5'	105.1	43.3	2.2	0.9	0.1	0	0
6'	68.2	35.4	12.1	3.1	0.4	0.1	0
7'	37.8	22.1	9.9	2.9	1.2	0.1	0
8'	8.4	13	6.9	2.6	1.2	0.4	0
9'	8.9	7.9	4.8	2.1	1.1	0.5	0.1
10'	4.8	4.8	3.5	1.6	0.9	0.5	0.2

CANDLEPOWER DISTRIBUTION

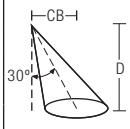


LEGEND:
0-deg:
90-deg:
180-deg:

Test Number	P106854
Platform	P3LED09830E
Element	E3AAC RG50NSP10
Lumens	1066 Lm
Efficacy	74.6 Lm/W

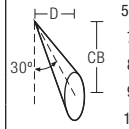


30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	41.6	4.	2.2	3.2
7'	25.7	5.	2.8	4
8'	19.7	5.8	3.2	4.6
9'	15.5	6.5	3.6	5.2
10'	12.6	7.2	4	5.8
12'	8.7	8.6	4.8	6.9

30° VERTICAL PLANE



D	FC	L	W	CB
5.5'	185.7	1.5	1.4	9.5
7'	114.7	1.8	1.8	12.1
8'	87.8	2.1	2	13.9
9'	69.4	2.5	2.2	15.6
10'	56.2	2.8	2.4	17.3
12'	39	3.3	3	20.8

ZONAL LUMEN SUMMARY

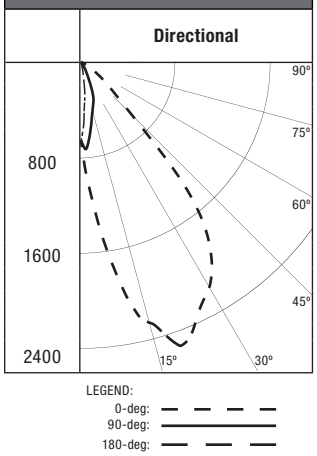
Zone	Lumens	%Fixture
0-30	518	52.2
0-40	869	87.6
0-60	982	99.1
0-90	991	100
90-180	0	0
0-180	991	100

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

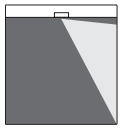
DD	●	1'	2'	3'	4'	5'	6'
1'	0.6	0.1	0.1	0.3	0.1	0.1	0.
2'	0.4	0.2	0.1	0	0.1	0	0.1
3'	42.8	15.7	0.1	0	0.1	0	0
4'	84.3	30.2	9.6	0.1	0	0	0
5'	127.1	29.7	12	2.2	0	0	0
6'	73.8	22.3	10.3	4	0.9	0.1	0
7'	24.5	13.7	7.6	3.7	1.6	0.3	0.1
8'	9.6	9.3	5.5	2.9	1.6	0.6	0.1
9'	5.6	6.2	4.3	2.3	1.4	0.6	0.2
10'	3.6	4	3.4	1.8	1.2	0.6	0.2

CANDLEPOWER DISTRIBUTION



LEGEND:
0-deg:
90-deg:
180-deg:

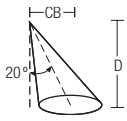
Test Number	P106002
Platform	P3LED09830E
Element	E3AA20C RG50FL40
Lumens	977 Lm
Efficacy	68.3 Lm/W



ZONAL LUMEN SUMMARY

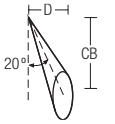
Zone	Lumens	%Fixture
0-30	565	62.1
0-40	806	88.8
0-60	907	99.9
0-90	908	100
90-180	0	0
0-180	908	100

30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	28.7	4.8	3.6	3.2
7'	17.7	6.1	4.6	4
8'	13.6	7	5.2	4.6
9'	10.7	7.9	6	5.2
10'	8.7	8.7	6.6	5.8
12'	6	10.5	8	6.9

30° VERTICAL PLANE



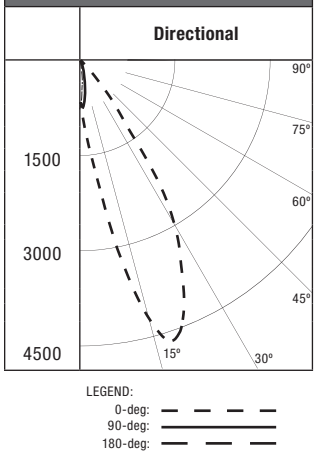
D	FC	L	W	CB
5.5'	47.7	4	3.6	9.5
7'	29.5	5.1	4.6	12.1
8'	22.6	5.8	5.2	13.9
9'	17.8	6.6	6	15.6
10'	14.4	7.3	6.6	17.3
12'	10	8.8	8	20.8

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

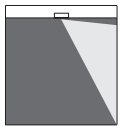
DD	●	1'	2'	3'	4'	5'	6'
1'	0	0	0	0	0	0	0
2'	5.7	0.6	0	0	0	0	0
3'	18.9	11.5	3.8	0	0	0	0
4'	41.3	27.2	6.6	1.9	0.1	0	0
5'	32.3	25.7	11.9	3	0.9	0.1	0
6'	22.8	19.3	11.2	4.3	1.3	0.4	0.1
7'	16.6	13.7	9	4.6	1.9	0.6	0.1
8'	12.2	9.9	7	4.1	2.1	0.8	0.3
9'	8.7	7.4	5.3	3.5	2	1	0.4
10'	6.2	5.7	4	2.8	1.7	1	0.5

CANDLEPOWER DISTRIBUTION



LEGEND:
0-deg:
90-deg:
180-deg:

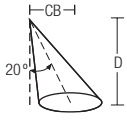
Test Number	P105990
Platform	P3LED09830E
Element	E3AA20C RG50NFL25
Lumens	955 Lm
Efficacy	66.8 Lm/W



ZONAL LUMEN SUMMARY

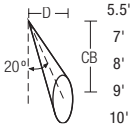
Zone	Lumens	%Fixture
0-30	656	73.8
0-40	863	97.1
0-60	888	99.9
0-90	889	100
90-180	0	0
0-180	889	100

30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	46.3	4.1	2.8	3.2
7'	28.6	5.2	3.6	4
8'	21.9	6	4	4.6
9'	17.3	6.8	4.6	5.2
10'	14	7.5	5	5.8
12'	9.7	8.9	6.2	6.9

30° VERTICAL PLANE



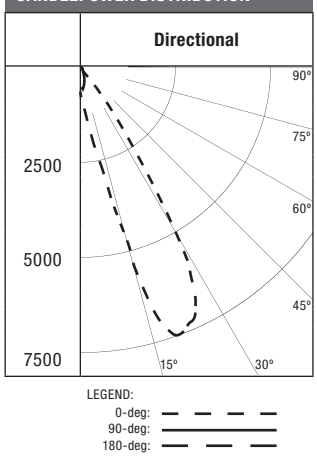
D	FC	L	W	CB
5.5'	74.9	3.3	2.6	9.5
7'	46.2	4.3	3.4	12.1
8'	35.4	4.9	4	13.9
9'	28	5.5	4.4	15.6
10'	22.7	6.2	5	17.3
12'	15.7	7.4	6	20.8

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

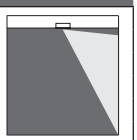
DD	●	1'	2'	3'	4'	5'	6'
1'	0.1	0	0	0	0	0	0
2'	0.3	0.2	0	0	0	0	0
3'	6.5	0.5	0.1	0	0	0	0
4'	35.5	18.2	1.1	0.1	0	0	0
5'	47.6	28.9	8.3	0.1	0	0	0
6'	38.4	28.2	8.7	2.7	0.1	0	0
7'	29.7	22.1	8.5	3.6	1	0.1	0
8'	22.1	16.4	7.6	3.2	1.4	0.4	0
9'	16	12	6.2	2.7	1.4	0.5	0.1
10'	11.3	8.8	4.8	2.3	1.3	0.6	0.2

CANDLEPOWER DISTRIBUTION



LEGEND:
0-deg:
90-deg:
180-deg:

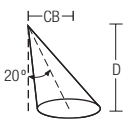
Test Number	P105978
Platform	P3LED09830E
Element	E3AA20C RG50SP15
Lumens	1081 Lm
Efficacy	75.6 Lm/W



ZONAL LUMEN SUMMARY

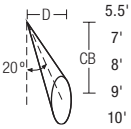
Zone	Lumens	%Fixture
0-30	765	76.1
0-40	969	96.4
0-60	997	99.2
0-90	1006	100
90-180	0	0
0-180	1006	100

30° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	68.6	3.7	2.2	3.2
7'	42.4	4.7	3	4
8'	32.4	5.4	3.4	4.6
9'	25.6	6	3.8	5.2
10'	20.8	6.7	4.2	5.8
12'	14.4	8.1	5.2	6.9

30° VERTICAL PLANE



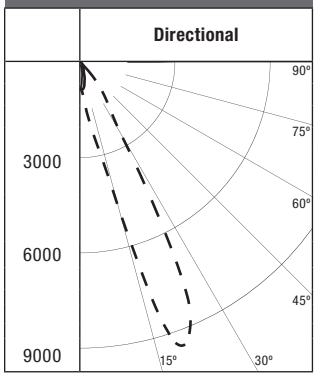
D	FC	L	W	CB
5.5'	130.2	2.5	2	9.5
7'	80.4	3.3	2.6	12.1
8'	61.5	3.8	2.8	13.9
9'	48.6	4.3	3.2	15.6
10'	39.4	4.7	3.6	17.3
12'	27.3	5.7	4.4	20.8

SINGLE UNIT FOOTCANDLES

3' FROM WALL
(Distance From Fixture Along Wall)

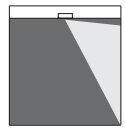
DD	●	1'	2'	3'	4'	5'	6'
1'	0.4	0.3	0	0	0.1	0.1	0
2'	0	0	0	0	0.1	0	0
3'	5.7	2.8	0	0	0	0	0
4'	33	17.5	1.8	0.1	0	0	0
5'	66.9	27	7.6	0.8	0.1	0	0
6'	67.1	34.1	8.6	2	0.3	0.1	0
7'	49.8	31.1	8.2	3.2	0.8	0.1	0
8'	36.1	23.3	7.2	2.9	1.3	0.3	0
9'	25	16	5.9	2.7	1.3	0.5	0.1
10'	16.1	10.8	4.6	2.3	1.2	0.5	0.1

CANDLEPOWER DISTRIBUTION

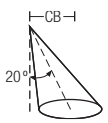


LEGEND:
0-deg: — — — —
90-deg: ———
180-deg: — — — —

Test Number	P105966
Platform	P3LED09830E
Element	E3AA20C RG50NSP10
Lumens	1055 Lm
Efficacy	73.3 Lm/W

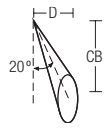


20° HORIZONTAL PLANE



MH	FC	L	W	CB
5.5'	87.3	2.7	1.8	3.2
7'	53.9	3.5	2.2	4
8'	41.3	4	2.6	4.6
9'	32.6	4.5	2.8	5.2
10'	26.4	5.1	3.2	5.8
12'	18.3	6.1	3.8	6.9

20° VERTICAL PLANE



D	FC	L	W	CB
5.5'	149.2	1.9	1.4	9.5
7'	92.1	2.4	2	12.1
8'	70.5	2.7	2.2	13.9
9'	55.7	3.1	2.4	15.6
10'	45.1	3.5	2.8	17.3
12'	31.4	4.1	3.4	20.8

ZONAL LUMEN SUMMARY

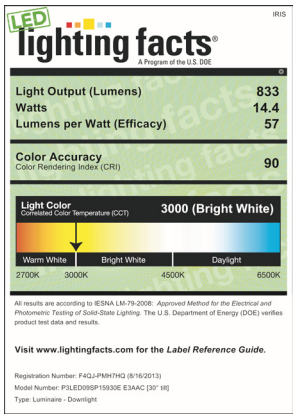
Zone	Lumens	%Fixture
0-30	780	79.5
0-40	941	95.9
0-60	968	98.7
0-90	981	100
90-180	0	0
0-180	981	100

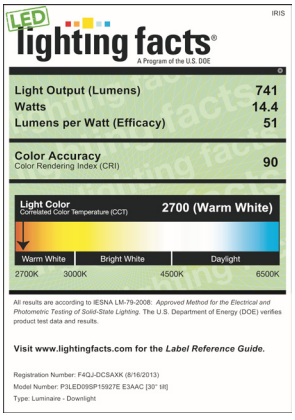
SINGLE UNIT FOOTCANDLES

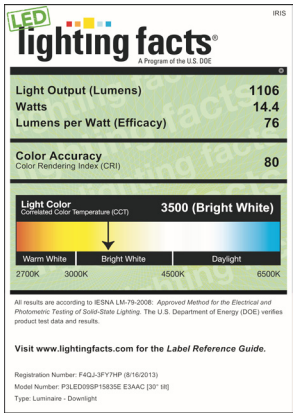
3' FROM WALL
(Distance From Fixture Along Wall)

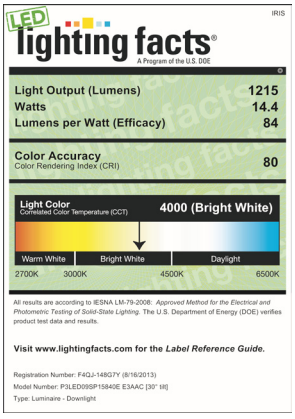
DD	●	1'	2'	3'	4'	5'	6'
1'	0	0	0.4	0.1	0	0	0
2'	1.3	0.2	0.1	0.2	0.1	0.1	0
3'	1.8	0.3	0.3	0.1	0.2	0	0.1
4'	26.4	15.3	1	0.1	0.1	0.1	0.1
5'	30.7	18.6	7.9	0	0	0	0
6'	58.5	20	8.5	2.6	0.1	0	0
7'	59.7	23.2	8	3.8	1	0	0
8'	45.1	21.1	6.6	3.5	1.7	0.4	0
9'	31.7	15.2	5.2	3	1.6	0.7	0.1
10'	19.6	9.8	4	2.6	1.5	0.8	0.2

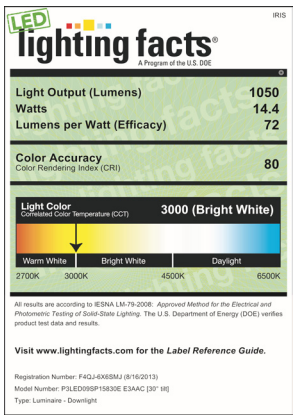
LIGHTING FACTS

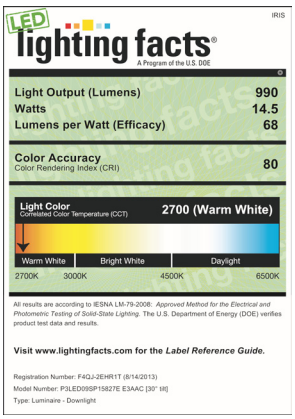


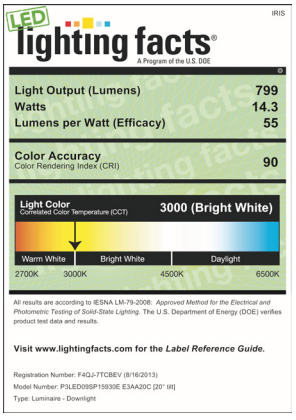


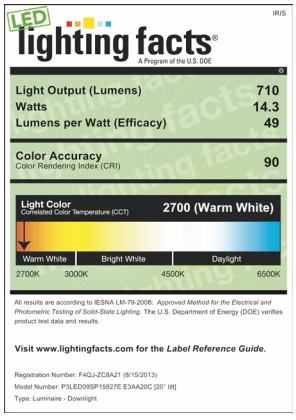


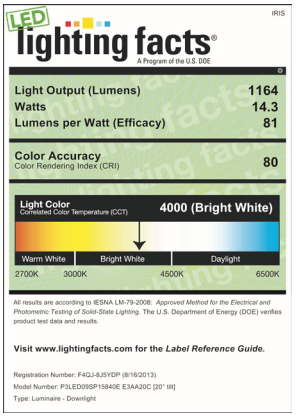


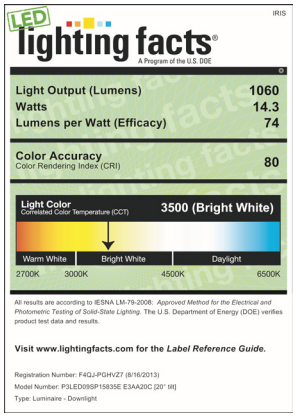


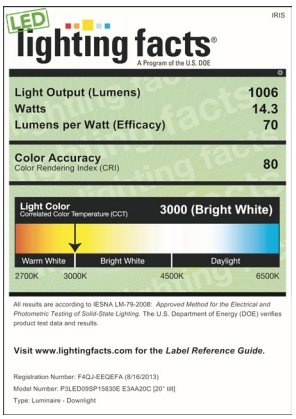


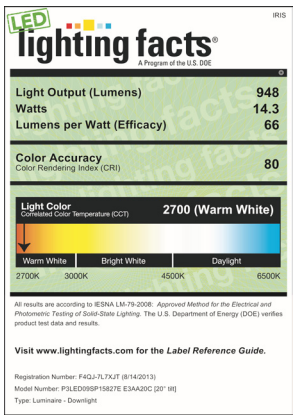












Please see LightingFacts.com for a complete listing of products.

Specifications and dimensions subject to change without notice.
Consult your representative for additional options and finishes.

PF1

STICK T5 SINGLE LAMP PENDANT & RAIL PENDANT

ST48228-2-DPB-SD8

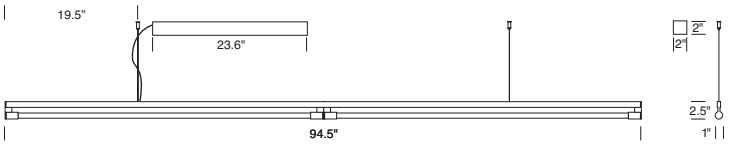
TYPE:	ST				
	48228	2	SFBS	Select	Select
	Model #	Voltage	Options*		Dimming*
ORDER NUMBER:		1–120V	DPB S100P	SPF4	SD3 SD9
		2–277V	SEM13 SAC	SPF5	SD5 SD10
PROJECT:			SMB SFBS		SD8 SD11
			SWRB SFBW		

*See back page for details.

Please review mounting info before ordering.

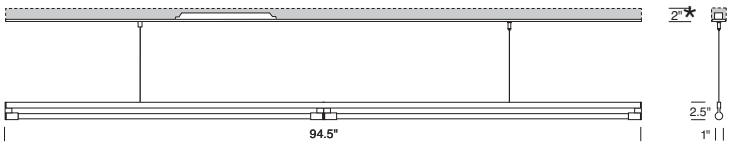
Run Length: 08' (enter in multiples of 4 ft.)

Standard	Length	Wattage
ST48228	8'	2-28
ST48254	8'	2-54

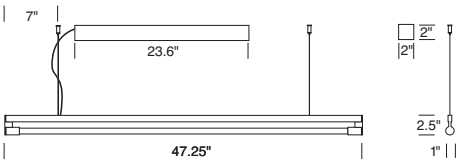


Rail Mount	Length	Wattage
ST68228	8'	2-28
ST68254	8'	2-54

*Rail parts ordered separately.

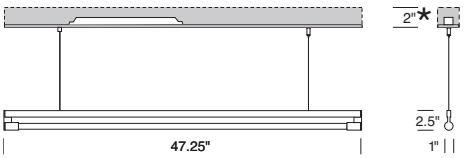


Standard	Length	Wattage
ST44128	4'	1-28
ST44154	4'	1-54



Rail Mount	Length	Wattage
ST64128	4'	1-28
ST64154	4'	1-54

*Rail parts ordered separately.

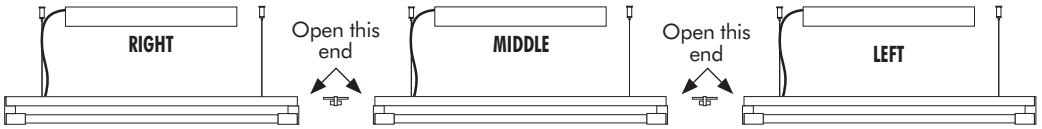


STICK CONNECTING SECTIONS

STR open on right side of cord

STM open on both ends

STL open on left side of cord



Standard	Length	Wattage
STR48228	8'	2-28
STR48254	8'	2-54
STR44128	4'	1-28
STR44154	4'	1-54

Rail Mount	Length	Wattage
STR68228	8'	2-28
STR68254	8'	2-54
STR64128	4'	1-28
STR64154	4'	1-54

Standard	Length	Wattage
STM48228	8'	2-28
STM48254	8'	2-54
STM44128	4'	1-28
STM44154	4'	1-54

Rail Mount	Length	Wattage
STM68228	8'	2-28
STM68254	8'	2-54
STM64128	4'	1-28
STM64154	4'	1-54

Standard	Length	Wattage
STL48228	8'	2-28
STL48254	8'	2-54
STL44128	4'	1-28
STL44154	4'	1-54

Rail Mount	Length	Wattage
STL68228	8'	2-28
STL68254	8'	2-54
STL64128	4'	1-28
STL64154	4'	1-54

DELRAY LIGHTING INCORPORATED

ST4&ST6/BARE

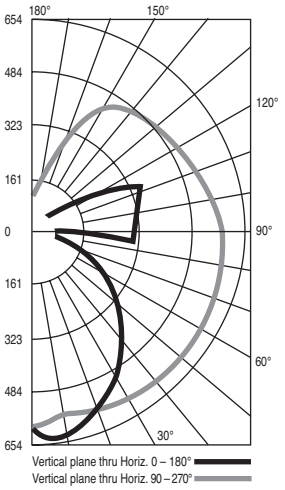
BURBANK,
CALIFORNIA,
91505
WWW.
DELRAY
LIGHTING.
COM

JAN 2014

4' 54W

ST44154
1-54W HO T5
G5 socket
Total lumens: 5000 mean
Total luminaire efficiency: 95.9%

CP DISTRIBUTION

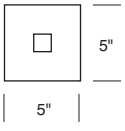


COEFFICIENTS

% CEILING 80	(20% FLOOR)		
% WALL 70		50	30
0	97	97	97
1	83	78	73
2	74	66	59
3	67	57	49
4	61	50	41
5	55	44	35
6	51	39	31
7	47	35	27
8	43	32	24
9	40	29	21
10	38	26	19

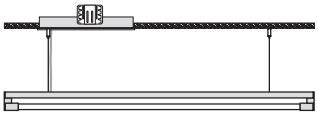
OPTIONAL J-BOX COVER

Cover plate mounts to maximum 4" square J-box. Ballast housing mounts to wall on top of cover plate, which may be painted to match ceiling or wall, and includes two mounting spacers to offset cover thickness. Order **S100P**.



FLUSH MOUNT

22" flush mount ballast housing, for joist mount rough-in. Order **SFBS** (silver) or **SFBW** (white).



STICK CONSTRUCTION

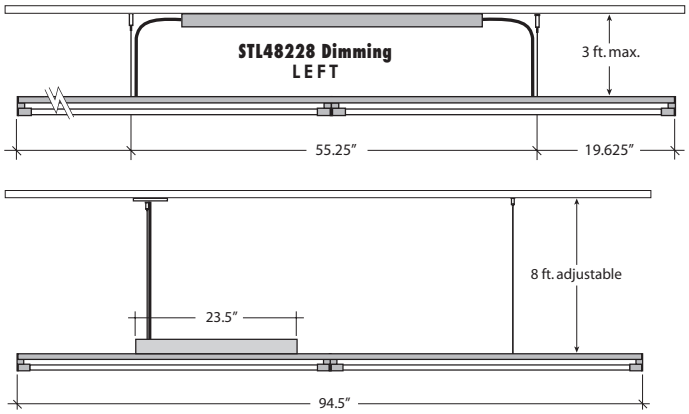
INLINE PENDANT

- ST4 is a 4' or 8' dual inline pendant fixture that can stand alone or be connected to other 8' or 4' Stick sections. (See connection order info on opposite side).Each section requires its own power feed.
- ST6 may be connected to a continuous overhead rail system.
- Zinc aluminum alloy and aluminum extrusion, with a matte anodized finish.
- Suspended with field-adjustable aircraft cable, with push-button glider.
- G5 twist-in lamp holders.
- 8' gray 18 AWG power cord.
- Standard output electronic ballasts are 120/277V, 50/60 Hz universal, in a remote housing.
- Back plate has a 7/8" opening for direct conduit feed and is not intended for J-box mount.
- U.L. listed for damp locations.

DIMMING INFORMATION

Standard Dimming
Due to lamp lead length limitations for dimming ballasts, all fixtures with two lamps require 4' ballast housings with a maximum cord drop of 3' on both sides of fixture to accommodate two ballasts. Voltage must be specified.

DPB Option
Mounts ballast housing directly to the fixture, for longer than 3 ft. mounting heights. Accomodates all dimming ballasts for 4 ft. and 8 ft. fixtures.

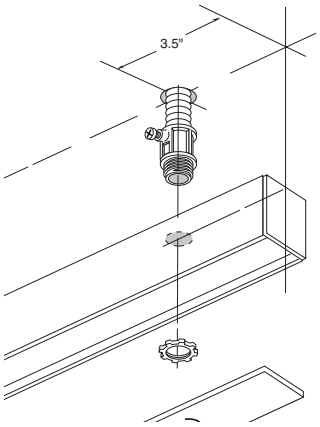


DIMMING BALLASTS

Cat. #	Type	Wattage
SD3	Advance Mark X	54
SD5	Advance Mark VII	28/54
SD8	Lutron Hi Lume H3D	28/54
SD9	Lutron Eco System EC5	28/54
SD10	Stepped dim, 50% for 2x28 only	2x28
SD11	Lutron EcoSystem H-Series EHD	28/54

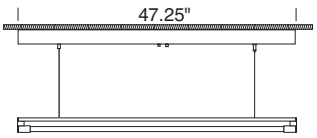
BALLAST/RAIL MOUNT INFO

Stick ballast and rail housings are shipped with one opening for direct connection to conduit with a third party 1/2" fitting (as shown below). To locate input power elsewhere, an alternate 7/8" opening may be drilled at the job site anywhere along the top of the aluminum rail housing.



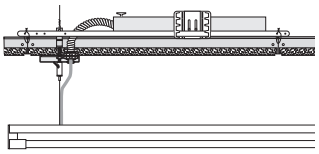
EMERGENCY BALLASTS

Emergency ballast provides 1300 lumens for 90 minutes. Charge light and test switch are visible from below. On 2 lamp fixture, lamp closest to power cord gets emergency power. Maximum 4' pendant length recommended. Voltage must be specified. Order **SEM13**.



RECESSED BALLAST

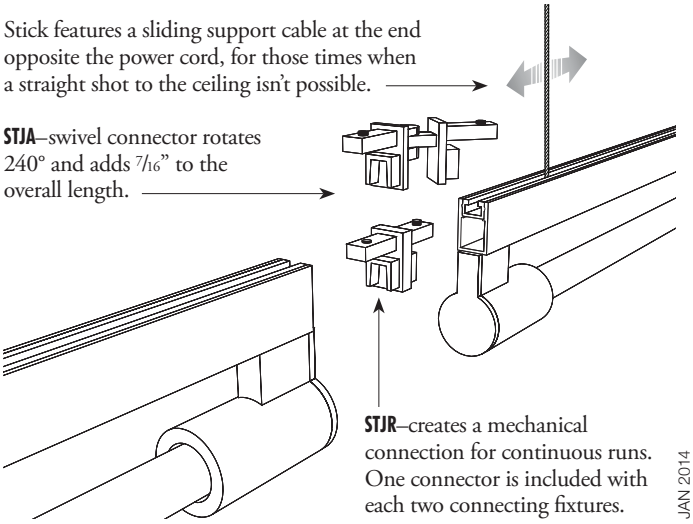
For suspended ceilings only. Order **SWRB**.



CONTINUOUS MOUNT INFORMATION

Stick features a sliding support cable at the end opposite the power cord, for those times when a straight shot to the ceiling isn't possible.

STJA–swivel connector rotates 240° and adds 7/16" to the overall length.



STJR–creates a mechanical connection for continuous runs. One connector is included with each two connecting fixtures.

JAN 2014

PF2

BEAM4 PENDANT MOUNT

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PROJECT INFORMATION

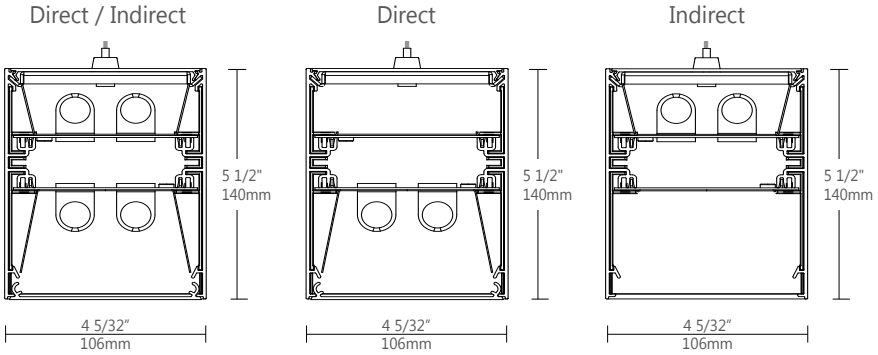
Project:

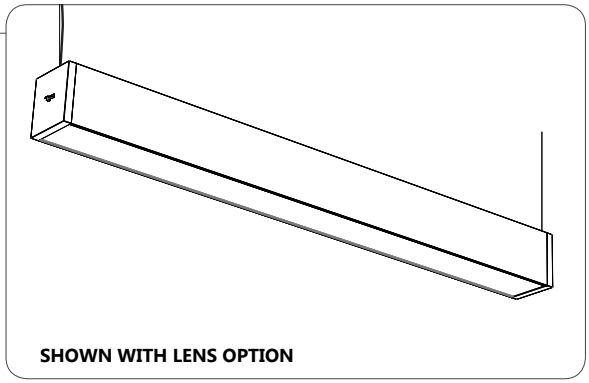
Type:

Notes:

DIMENSIONS

SECTION VIEWS





SHOWN WITH LENS OPTION

ORDERING CODE

BB-F-NO-4-EX4-T5HO-A-A-W-277-D-1-D

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

PRODUCT SPECIFICATIONS

1	PRODUCT ID
BB	pendant direct/indirect
BBD	pendant direct
BBI	pendant indirect

2	OPTICS DIRECT
S	satin lens
F	frosted lens(1)
PL	semi spec. para. louvers
B	blank

(1) not recommended with staggered lamping

3	OPTICS INDIRECT
NO	no lens

4	LENGTH/FT
2	2′
3	3′
4	4′
5	5′
6	6′
8	8′
12	12′
S#	System Run

5	SPECIFY LENGTH
NL	nominal (3′ & 4′ lamps)
NL4	nominal (4′ lamps only)
EX	exact (3′ & 4′ lamps)
EX4	exact (4′ lamps only)

6	LAMP
T5	T5
T5HO	T5HO
T8	T8

7	DOWN LAMP
0	0 lamp
1	1 lamp
2	2 lamp
+S	staggered

Staggered lamping and configurations must be the same up and down

8	UP LAMP
0	0 lamp
1	1 lamp
2	2 lamps
+S	staggered

Staggered lamping and configurations must be the same up and down

9	MR
M16#	MR 16 halogen
M16LED#	MR 16 LED

Add 9″ per lamp

10	FINISH
AP	aluminum paint
W	white
C	custom

11	VOLTAGE
120	120V
277	277V
347	347V(2)
UNV	universal

(2) Please consult factory

12	BALLAST
D	dimming
E	instant start(3)
ERS	rapid start
BI	bi-level dimming

(3) Available with T8 lamp only

13	CIRCUITS
1	1 regular
2	2 regular
2A/B	2 alternating
+E#	emergency section
+NL#	night light section
+GTD#	generator transfer device
+M	MR

14	MOUNTING/SUSPENSION
CA#	drywall+cable length (36″ std.)
CT9-#	TB/TG 9/16+cable length (36″ std.)
CT15-#	TB/TG15/16+cable length (36″ std.)
CTS#	ST+cable length (36″ std.)
SA#	drywall+stem length >48″ (18″ std.)

See ceiling mounting guide for further details

15	BATTERY
B#	battery pack 4′ sections

16	OTHER
D	dust cover
F	fuse

17	IC CONTROLS
DS#	daylight sensor
OS#	occupancy sensor
DS+OS#	daylight+occupancy sensor
DOS#	daylight&occupancy sensor

See integrated controls guide for further details

18	CUSTOM
C	custom

Please specify

Ballast, Battery Pack and Integrated Control Details and Custom Description:

FILE NAME:BB.SPEC February 2, 2015

BEAM4 PENDANT MOUNT

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CONSTRUCTION

Housing	Extruded Aluminum (0.075'' nominal) up to 70% Recycled Content
End Cap	Sheet Steel (18 ga)
Interior Brackets	Die Formed Sheet Steel (18 gauge)
Reflectors	White Powder Coated Sheet Steel (22 ga)
Louvers	Die Formed Semi-Specular Aluminum (22 ga)
White Louver	Die Formed Aluminum Painted White (22 ga)
Blank	Extruded Aluminum (0.075'' nominal)
Lenses	Extruded Acrylic (0.070'' nominal) Satin: 68% trans. Frosted: 85% trans.
Hanger	Die Formed Sheet Steel (16 gauge)
Suspension	Aircraft Cable or Ø 1/2" Stem
Cable Grips	Quick Connecting / Release

WEIGHT

4 ft	14.5 lbs / 6.6 kg
8 ft	29.0 lbs / 13.2 Kg
12 ft	43.5 lbs / 19.7 Kg

SYSTEM (S#)

BEAM 4 linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs.
Lengths of 4', 8', 12' as well as custom lengths are available.
Runs of BEAM 4 that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

ELECTRICAL

Ballast	Electronic IS, Electronic Rapid Start, Dimming (0-10V, Line, EcoSystem, DALI), BI-level dimming With preinstalled ballast disconnect as per NEC & CEC
Emergency	Emergency battery pack or emergency circuit
Voltage	120V, 277V, 347V, UNV

Incorporating these components may have limitations or effect the length of the luminaire, please contact factory for more details.

FINISH

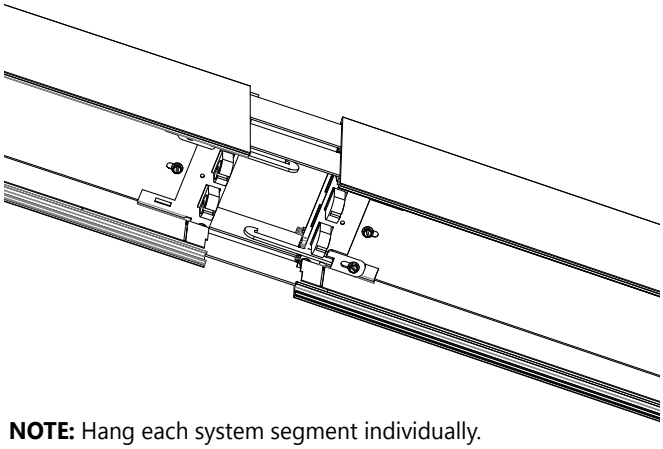
Aluminium paint, Powder Coated and custom finishes are also available.

APPROVALS

Certified to UL and CUL standards
Meets NYC requirements
Suitable for damp locations.

JOINERS

In order to allow very long runs of BEAM 4 luminaires, Axis has developed an effective joining system.
Special care has been taken to maximize the performance of the joiner for each BEAM option.



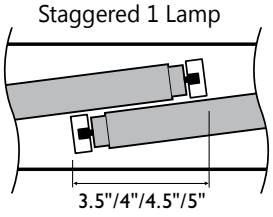
NOTE: Hang each system segment individually.
Do not assemble system prior to hanging.

STAGGERED LAMPING

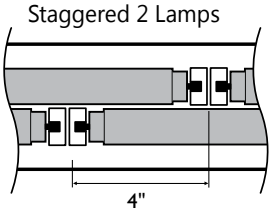
When BEAM 4 is used in continuous runs longer than 4', staggered lamping can be used to eliminate the appearance of socket shadows at the ends of the lamps. BEAM 4 uses a staggered overlap of 4 different overlapping bracket lengths (3.5", 4", 4.5" and 5"), along with 3' and 4' lamps, allowing us to match almost any row length requirements with optimal results. For example 3 x 3' staggered T5 lamps can be used to completely illuminate the lens of an 8' nominal luminaire.

LAMP TYPE	T5	T5HO	T8
1 lamp	•	•	•
2 lamps	•	•	•

Staggered 1 Lamp



Staggered 2 Lamps



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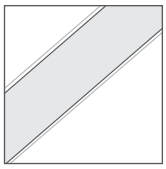
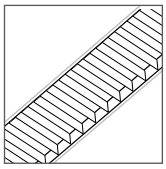
OPTICS

S satin lens



F frosted lens

SATIN & FROSTED LENS
(acrylic snap-in lens)
satin: 68% trans.
frosted: 85% trans.

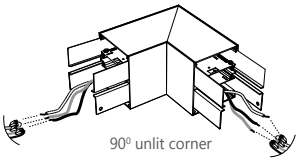


PL semi-specular parabolic louvers

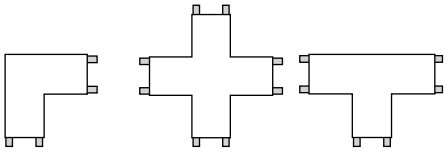
LOUVERS
(semi-spec. parabolic louver
9/16'' deep blades – 5/8'' spacing
72 blades per 4'

CORNERS

Unlit Corners - BEAM4 features a multitude of layout patterns with the use of a number of corners, 90° corner, T or X junctions.

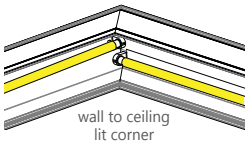


90⁰ unlit corner



90° corner X junction T junction

Lit Corners - In addition Axis offers Lit 90° Corners including Ceiling to Ceiling, Wall to Ceiling and Ceiling to Wall.

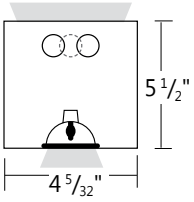


wall to ceiling lit corner

For custom corner angles, please consult factory. Specifications sheets for all corners are available at: www.axislighting.com

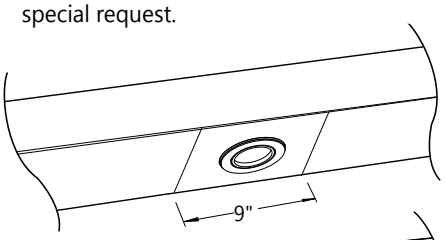
MR16

Blank	Extruded Aluminum (0.075'' nominal)
MR16 Halogens	2.0'' diameter (35W / 50W)
MR16 LED	2.0'' diameter
Quantity	For every 4' fluorescent lamp section, there may be up to a maximum of 4 x MR16 lamps.
Spacing	Each MR16 is placed centered on a blank section 9'' in length.

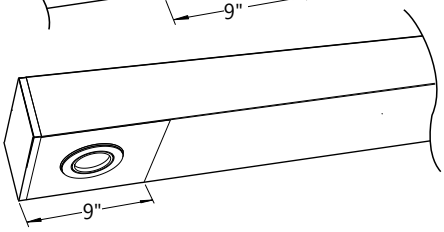


For a series of MR16's within a given section length, they will be spaced evenly on a longer blank section.
The directed light of MR16 Halogen lamps are fixed downward.
Custom spacing may be available on special request.

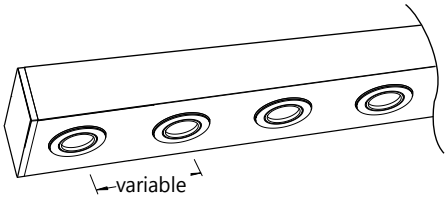
Between fluorescent lamps sections



At luminare ends



Several in a long blank section



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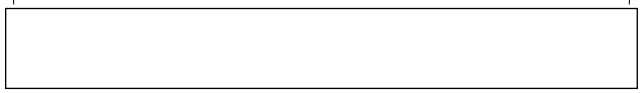
MOUNTING SPACING END TO END

T5/T5HO LAMP
- **4'** (46 5/16" C.C.)
- **8'** (92 5/8" C.C.)
- **12'** (138 15/16" C.C.)



T8 LAMP
- **4'** (48" C.C.)
- **8'** (96" C.C.)
- **12'** (144" C.C.)

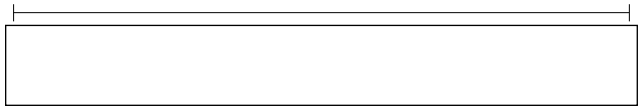
MOUNTING SPACING STAGGERED

T5/T5HO 1 LAMP
- **8'** 3X3' (95 1/2" C.C.)
- **8'** 2X4' (88 5/8" C.C.)
- **12'** 3X4' (130 15/16" C.C.)
- **12'** 2X4'+2X3' (149 5/8" C.C.)

T5/T5HO 2 LAMP
- **4'** (50 5/16" C.C.)
- **8'** (96 5/8" C.C.)
- **12'** (142 15/16" C.C.)

T8 1 LAMP
- **8'** (92" C.C.)
- **12'** (136" C.C.)

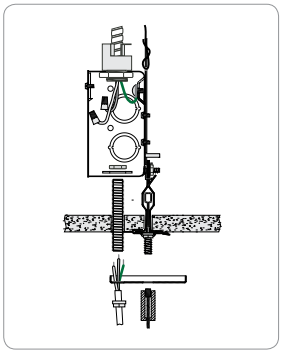
T8 2 LAMP
- **4'** (52" C.C.)
- **8'** (100" C.C.)
- **12'** (148" C.C.)



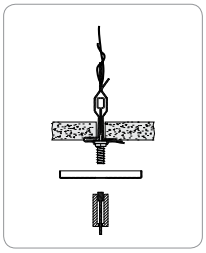
Row configuration and mounting spacing file is available for download at: www.axislighting.com

MOUNTING OPTIONS

CT TILE CEILING - ON GRID

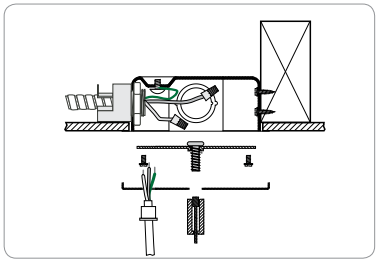


Power feed



Non power feed

CA DRYWALL CEILING



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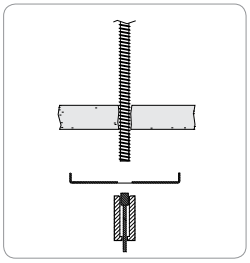
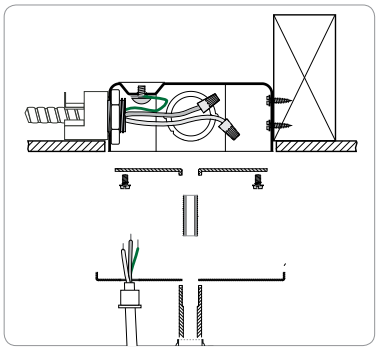
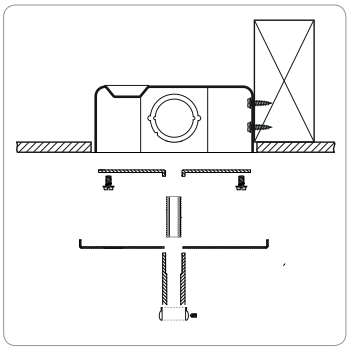


Non power feed

SA STEM MOUNT IN DRYWALL CEILING



Power feed



Non power feed

OTHER MOUNTING OPTIONS

BEAM 4 is also available with recessed, surface, wall, asymmetric, recessed wall and wall wash mounted options.

Specification sheets and Installation sheets for all mounting for BEAM luminaires are available for download at www.axislighting.com

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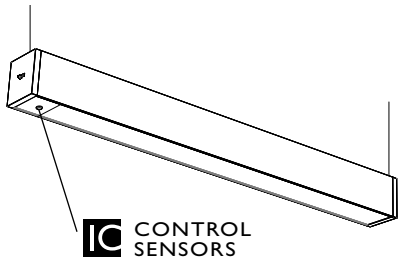
INTEGRATED CONTROL OPTIONS

BEAM 4 luminaires allow the use of integrated controls such as daylight sensors (DS), occupancy sensors (OS), individual daylight sensors and occupancy sensors (DS+OS), and combination daylight/occupancy sensors (DOS). These options can be seamlessly integrated into our luminaires. The control system could be used to optimize the lighting of the space by reducing energy consumption through daylight harvesting and occupancy, thereby improving the overall interior environment and allowing for LEED credits.

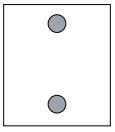


- Consult factory for other options.
- Refer to IC brochure for more information.

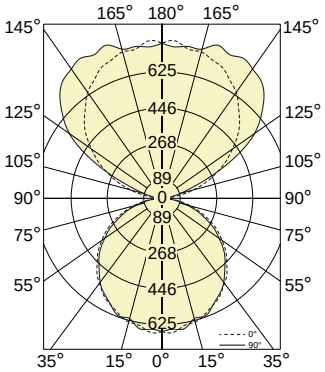
SENSORS	BRAND	Model	TYPE	CODE	COMPATIBLE DIMMING BALLAST
Daylight Sensor (DS)	Lutron	EC-DIR-WH	Daylight	LD	EcoSystem
	Wattstopper	FD-301	Daylight	WD	0-10V
	Philips	Luxsense	Daylight	PL	0-10V
Occupancy Sensor (OS)	Wattstopper	FS-205	PIR Occupancy	WP1	Programmed Rapid Start
		FS-355	PIR Occupancy	WP2	Programmed Rapid Start
		FM-105	High Frequency Occupancy	WH	Programmed Rapid Start
Daylight & Occupancy Sensors (DOS)	Philips	Actilume	Daylight & PIR Occupancy	PA	DALI or 0-10V

PHOTOMETRIC DATA

2 T5



PHOTOMETRIC CURVE



Test Lamp: 2xF28T5
IES FILE: BB-S-FL-4-T5-1-1

Efficiency: 77.6%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	657	657	657	657	657	
5	662	633	654	643	647	35
15	631	627	629	629	613	150
25	584	590	587	580	587	250
35	528	526	525	520	524	318
45	451	445	449	447	439	345
55	361	361	351	349	343	329
65	259	253	248	242	236	267
75	147	141	136	134	126	171
85	47	44	36	33	31	67
90	6	5	3	2	2	
95	30	24	19	17	16	13
105	160	196	132	104	93	112
115	295	373	377	314	285	286
125	423	502	560	562	557	448
135	540	595	671	706	710	502
145	638	673	721	768	778	468
155	709	718	752	788	782	376
165	747	746	758	771	761	249
175	778	755	768	747	749	108
180	764	764	764	764	764	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	82	82	82	82	75	75	75	75	62	62	62
1	75	71	68	65	68	65	62	60	54	52	50
2	68	62	57	53	62	57	53	49	47	44	41
3	62	54	49	44	56	50	45	41	41	38	34
4	56	48	42	37	51	44	39	34	36	32	29
5	52	43	36	32	47	39	33	29	33	28	25
6	47	38	32	27	43	35	29	25	29	25	22
7	44	34	28	24	40	31	26	22	26	22	19
8	41	31	25	21	37	29	23	19	24	20	17
9	38	28	22	18	34	26	21	17	22	18	15
10	35	26	20	16	32	24	19	15	20	16	13

Based on floor reflectance of 20

LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4510	2537	2162
55	4273	2022	1684
65	3895	1501	1187
75	3176	897	673
85	1863	272	184

All IES files for other lamping are available for download at: www.axislighting.com

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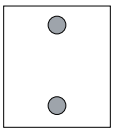
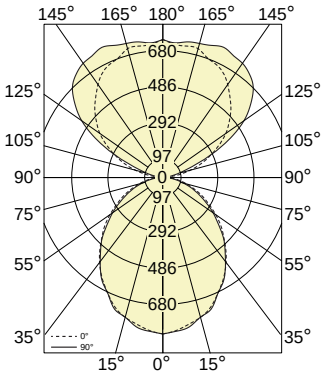
2 T5



PHOTOMETRIC CURVE



Test Lamp: 2xF28T5

IES FILE: BB-F-FL-4-T5-1-1

Efficiency: 80.6%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	875	875	875	875	875	
5	858	854	858	864	863	45
15	810	813	817	810	808	196
25	720	724	728	719	721	313
35	610	613	608	610	608	376
45	481	480	477	477	477	378
55	357	354	346	341	339	329
65	238	234	228	222	217	250
75	133	132	123	118	113	155
85	46	42	36	32	30	63
90	6	4	3	2	1	
95	30	23	18	17	16	13
105	161	195	132	102	93	111
115	294	376	375	316	290	288
125	429	498	561	563	553	448
135	537	596	672	703	713	502
145	631	668	725	769	777	467
155	698	722	753	778	802	376
165	747	750	758	770	775	249
175	746	778	749	763	755	108
180	770	770	770	770	770	

COEFFICIENTS OF UTILIZATION (%)

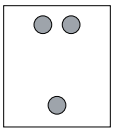
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	85	85	85	85	78	78	78	78	65	65	65
1	78	75	71	69	71	68	66	63	57	55	53
2	71	65	60	56	65	60	56	52	50	47	44
3	65	57	52	47	59	53	48	44	44	40	37
4	59	51	45	40	54	47	41	37	39	35	32
5	55	45	39	34	50	42	36	32	35	31	28
6	50	41	34	30	46	38	32	28	32	27	24
7	46	37	30	26	42	34	28	24	29	24	21
8	43	33	27	23	39	31	25	22	26	22	19
9	40	30	24	20	37	28	23	19	24	20	17
10	37	28	22	18	34	26	21	17	22	18	15

Based on floor reflectance of 20

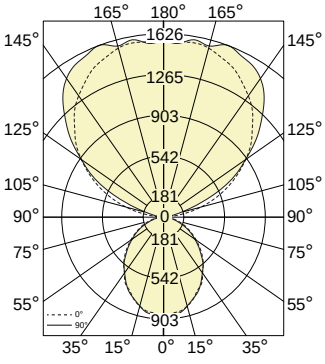
LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4817	2695	2349
55	4221	1990	1665
65	3584	1383	1091
75	2868	810	602
85	1851	268	178

3 T5



PHOTOMETRIC CURVE



Test Lamp: 3xF28T5

IES FILE: BB-F-FL-4-T5-1-2

Efficiency: 80.9%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	888	888	888	888	888	
5	856	869	863	861	868	45
15	817	811	814	816	816	196
25	715	720	729	724	728	313
35	606	607	608	616	602	375
45	488	483	476	475	474	379
55	356	355	351	341	339	330
65	235	234	230	221	220	249
75	134	132	121	116	113	155
85	47	43	36	32	30	63
90	6	5	3	2	2	
95	67	40	29	27	25	21
105	347	356	246	173	156	202
115	627	697	633	569	528	531
125	890	989	984	918	890	800
135	1115	1214	1278	1259	1233	938
145	1313	1379	1455	1480	1501	925
155	1462	1477	1546	1585	1594	764
165	1551	1550	1571	1612	1570	515
175	1562	1557	1567	1576	1546	224
180	1574	1574	1574	1574	1574	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	83	83	83	83	74	74	74	74	58	58	58
1	76	72	69	66	68	65	62	60	51	49	48
2	69	63	58	54	62	57	53	49	45	42	40
3	63	55	50	45	56	50	45	41	40	36	33
4	57	49	43	38	51	44	39	35	35	31	28
5	53	44	37	33	47	39	34	30	31	27	24
6	48	39	33	28	43	35	30	26	28	24	21
7	45	35	29	25	40	32	26	23	26	22	19
8	41	32	26	22	37	29	24	20	23	19	16
9	38	29	23	19	34	26	21	18	21	17	15
10	36	26	21	17	32	24	19	16	19	16	13

Based on floor reflectance of 20

LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4885	2689	2334
55	4217	2023	1664
65	3542	1394	1109
75	2887	798	602
85	1889	271	178

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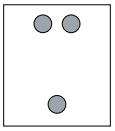
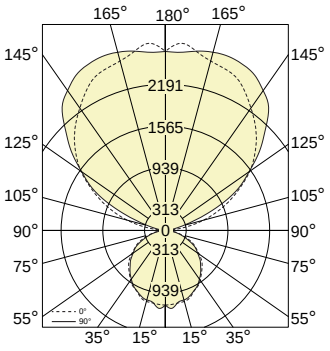
● PHOTOMETRIC DATA

3 T5HO



PHOTOMETRIC CURVE



Test Lamp: 3xF54T5HO
IES FILE: BB-S-FL-4-T5HO-1-2

Efficiency: 78.9%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	1118	1118	1118	1118	1118	
5	1115	1129	1141	1121	1172	61
15	1102	1071	1088	1077	1080	258
25	1009	1021	1021	1005	1005	430
35	911	920	899	900	891	549
45	779	770	773	764	748	593
55	619	617	609	605	590	564
65	454	439	433	424	419	463
75	253	253	236	227	228	297
85	85	73	64	57	53	116
90	11	9	5	4	3	
95	111	67	50	44	44	36
105	597	607	420	302	274	348
115	1074	1206	1087	986	917	917
125	1548	1713	1699	1587	1534	1380
135	1931	2098	2211	2161	2117	1618
145	2240	2381	2519	2567	2560	1594
155	2526	2547	2659	2745	2746	1318
165	2629	2673	2679	2741	2766	887
175	2816	2759	2671	2753	2680	389
180	2683	2683	2683	2683	2683	

COEFFICIENTS OF UTILIZATION (%)

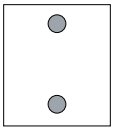
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	81	81	81	81	72	72	72	72	56	56	56
1	73	70	67	64	65	63	60	58	49	47	46
2	67	61	56	52	59	55	51	47	43	40	38
3	61	53	48	43	54	48	43	39	38	34	32
4	55	47	41	36	49	42	37	33	33	30	27
5	51	42	36	31	45	38	32	28	30	26	23
6	47	37	31	27	41	34	28	24	27	23	20
7	43	33	27	23	38	30	25	21	24	20	17
8	40	30	24	20	35	27	22	18	22	18	15
9	37	27	22	18	33	25	20	16	20	16	13
10	34	25	19	16	31	23	18	15	18	14	12

Based on floor reflectance of 20

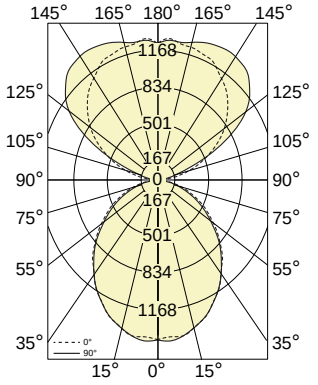
LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	7793	4367	3685
55	7325	3507	2891
65	6835	2621	2110
75	5444	1557	1218
85	3390	476	312

2 T5HO



PHOTOMETRIC CURVE



Test Lamp: 2xF54T5HO
IES FILE: BB-F-FL-4-T5HO-1-1

Efficiency: 80.6%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	1487	1487	1487	1487	1487	
5	1464	1470	1478	1482	1502	80
15	1404	1396	1407	1402	1407	337
25	1246	1260	1246	1248	1249	540
35	1041	1048	1046	1045	1044	646
45	833	835	830	819	819	651
55	609	609	605	585	580	568
65	412	408	395	382	374	433
75	231	226	214	205	199	268
85	81	70	62	55	51	109
90	10	8	4	3	3	
95	51	40	32	28	28	22
105	279	340	229	176	166	192
115	508	645	652	544	492	495
125	739	864	965	972	950	771
135	931	1021	1156	1225	1220	864
145	1091	1150	1248	1321	1349	808
155	1224	1233	1301	1343	1372	649
165	1278	1286	1313	1333	1330	431
175	1325	1325	1295	1316	1308	187
180	1271	1271	1271	1271	1271	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	86	86	86	86	78	78	78	78	65	65	65
1	78	75	72	69	71	69	66	63	57	55	53
2	71	65	60	56	65	60	56	52	50	47	44
3	65	57	52	47	59	53	48	44	44	41	37
4	59	51	45	40	54	47	41	37	39	35	32
5	55	45	39	34	50	42	36	32	35	31	28
6	50	41	34	30	46	38	32	28	32	27	24
7	46	37	30	26	43	34	28	24	29	24	21
8	43	33	27	23	39	31	25	22	26	22	19
9	40	30	24	20	37	28	23	19	24	20	17
10	37	28	22	18	34	26	21	17	22	18	15

Based on floor reflectance of 20

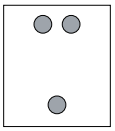
LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	8331	4693	4034
55	7212	3481	2844
65	6201	2395	1884
75	4972	1413	1060
85	3256	461	302

ℹ All IES files for other lamping are available for download at: www.axislighting.com

● PHOTOMETRIC DATA

3 T5HO



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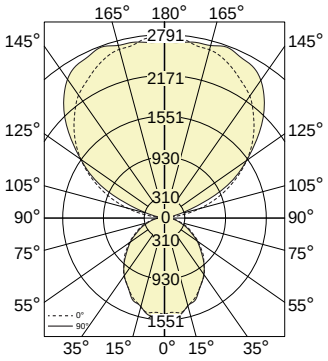


Test Lamp: 3xF54T5HO
IES FILE: BB-F-FL-4-T5HO-2-1

Efficiency: 80.9%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	1491	1491	1491	1491	1491	
5	1463	1484	1497	1494	1526	80
15	1401	1394	1406	1424	1398	338
25	1237	1239	1253	1258	1242	541
35	1063	1041	1042	1056	1050	646
45	842	832	831	823	812	653
55	617	617	599	590	593	570
65	412	413	395	382	378	431
75	227	225	211	204	196	265
85	81	72	62	56	54	109
90	12	8	5	4	3	
95	113	68	50	46	42	36
105	591	613	425	302	279	349
115	1076	1204	1085	980	924	914
125	1543	1716	1695	1586	1544	1382
135	1943	2093	2212	2167	2135	1618
145	2284	2349	2498	2547	2579	1588
155	2508	2568	2664	2718	2734	1320
165	2674	2671	2725	2743	2740	889
175	2773	2755	2708	2728	2704	389
180	2697	2697	2697	2697	2697	

COEFFICIENTS OF UTILIZATION (%)

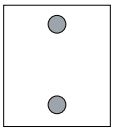
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	83	83	83	83	74	74	74	74	59	59	59
1	76	72	69	66	68	65	62	60	51	50	48
2	69	63	58	54	62	57	53	49	45	42	40
3	63	55	50	45	56	50	45	41	40	36	33
4	57	49	43	38	51	44	39	35	35	31	28
5	53	44	37	33	47	39	34	30	31	28	24
6	48	39	33	28	43	35	30	26	28	24	21
7	45	35	29	25	40	32	26	23	26	22	19
8	41	32	26	22	37	29	24	20	23	19	16
9	38	29	23	19	34	26	21	18	21	17	15
10	36	26	21	17	32	24	19	16	19	16	13

Based on floor reflectance of 20

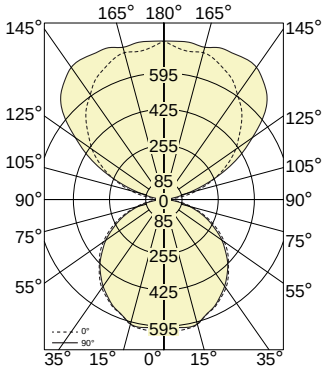
LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	8429	4695	3999
55	7299	3448	2908
65	6197	2391	1905
75	4890	1392	1048
85	3236	465	316

2 T8



PHOTOMETRIC CURVE



Test Lamp: 2xF32T8
IES FILE: BB-S-FL-4-T8-1-1

Efficiency: 74.7%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	626	626	626	626	626	
5	622	616	628	612	606	33
15	607	604	596	592	605	143
25	560	558	561	557	556	238
35	507	503	498	495	497	302
45	428	432	428	419	423	329
55	347	341	338	333	332	312
65	244	243	239	232	229	255
75	138	136	130	126	125	163
85	46	40	35	32	30	64
90	5	5	3	2	2	
95	32	25	18	17	16	13
105	161	193	153	126	113	120
115	290	363	353	320	307	290
125	411	483	545	523	507	427
135	516	571	648	678	685	482
145	602	640	700	742	758	450
155	673	690	728	756	760	362
165	714	716	732	741	740	241
175	716	753	727	736	746	105
180	745	745	745	745	745	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	79	79	79	79	72	72	72	72	59	59	59
1	72	69	66	63	65	63	60	58	52	50	48
2	65	60	55	51	59	55	51	47	45	42	40
3	59	52	47	42	54	48	43	39	40	36	33
4	54	46	40	36	49	42	37	33	35	31	28
5	50	41	35	30	45	38	32	28	31	27	24
6	46	37	31	26	42	34	28	24	28	24	21
7	42	33	27	23	38	30	25	21	25	21	18
8	39	30	24	20	36	27	22	19	23	19	16
9	36	27	22	18	33	25	20	17	21	17	14
10	34	25	19	16	31	23	18	15	19	16	13

Based on floor reflectance of 20

LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4153	2339	2014
55	3984	1884	1573
65	3575	1399	1115
75	2898	832	645
85	1795	254	169

All IES files for other lamping are available for download at: www.axislighting.com

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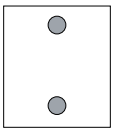
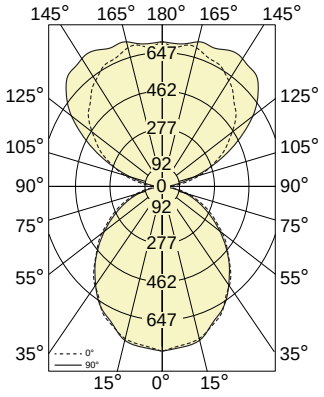
[F] 514.948.6271
www.axislighting.com

● PHOTOMETRIC DATA

2 T8



PHOTOMETRIC CURVE



Test Lamp: 2xF32T8
IES FILE: BB-F-FL-4-T8-1-1

Efficiency: 77.9%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	829	829	829	829	829	
5	810	832	827	814	818	33
15	778	776	780	779	785	143
25	702	693	700	689	695	238
35	591	586	586	585	582	302
45	462	465	460	462	457	329
55	343	344	337	331	328	312
65	233	226	226	218	210	255
75	130	127	119	115	111	163
85	46	41	35	31	30	64
90	6	4	3	2	2	
95	33	24	19	16	16	13
105	159	192	155	124	115	120
115	284	363	355	318	304	290
125	405	486	541	525	513	427
135	522	573	643	677	680	482
145	610	642	701	743	749	450
155	680	689	724	747	765	362
165	716	722	732	746	758	241
175	710	745	727	735	728	105
180	735	735	735	735	735	

COEFFICIENTS OF UTILIZATION (%)

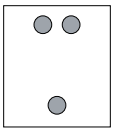
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	83	83	83	83	76	76	76	76	63	63	63
1	76	72	69	66	69	66	64	61	55	53	52
2	69	63	58	54	63	58	54	51	48	45	43
3	63	56	50	45	57	51	46	42	43	39	36
4	57	49	43	38	52	45	40	36	38	34	31
5	53	44	38	33	48	40	35	31	34	30	27
6	49	39	33	29	44	36	31	27	31	26	23
7	45	35	29	25	41	33	27	23	28	24	20
8	42	32	26	22	38	30	24	21	25	21	18
9	39	29	24	20	36	27	22	19	23	19	16
10	36	27	21	18	33	25	20	17	21	17	15

Based on floor reflectance of 20

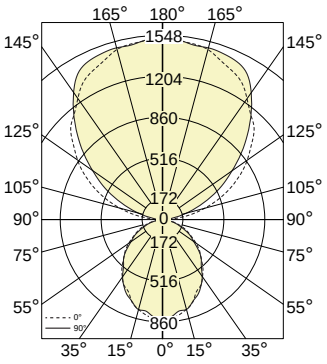
LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4478	2513	2173
55	3934	1878	1554
65	3406	1322	1020
75	2731	763	574
85	1807	253	168

3 T8



PHOTOMETRIC CURVE



Test Lamp: 3xF32T8
IES FILE: BB-F-FL-4-T8-1-2

Efficiency: 74.4%

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	825	825	825	825	825	
5	836	821	826	807	824	44
15	783	781	788	778	785	188
25	673	705	700	695	701	300
35	587	585	583	588	583	361
45	459	458	464	457	461	362
55	344	339	338	330	321	317
65	230	229	222	213	211	241
75	128	127	121	113	115	150
85	45	41	34	31	30	61
90	7	4	3	2	2	
95	69	38	26	21	21	19
105	352	284	221	193	182	192
115	626	612	497	444	435	453
125	871	915	809	743	710	683
135	1096	1142	1130	1039	1012	824
145	1248	1304	1347	1344	1309	841
155	1395	1425	1459	1483	1484	720
165	1494	1485	1524	1524	1511	492
175	1527	1543	1523	1548	1533	218
180	1530	1530	1530	1530	1530	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	77	77	77	77	69	69	69	69	54	54	54
1	70	67	64	61	63	60	58	56	48	46	45
2	64	58	54	50	57	53	49	46	42	39	37
3	58	51	46	42	52	46	42	38	37	34	31
4	53	45	40	35	48	41	36	32	33	29	26
5	49	40	34	30	44	36	31	28	29	26	23
6	45	36	30	26	40	33	28	24	26	23	20
7	41	32	27	23	37	29	24	21	24	20	17
8	38	29	24	20	34	27	22	18	22	18	15
9	36	27	21	18	32	24	20	16	20	16	14
10	33	24	19	16	30	22	18	15	18	15	12

Based on floor reflectance of 20

LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	4446	2537	2192
55	3945	1882	1519
65	3357	1298	1027
75	2693	769	592
85	1773	250	172

All IES files for other lamping are available for download at: www.axislighting.com

BEAM PENDANT MOUNT - REGULAR LIT CORNER PATTERNS

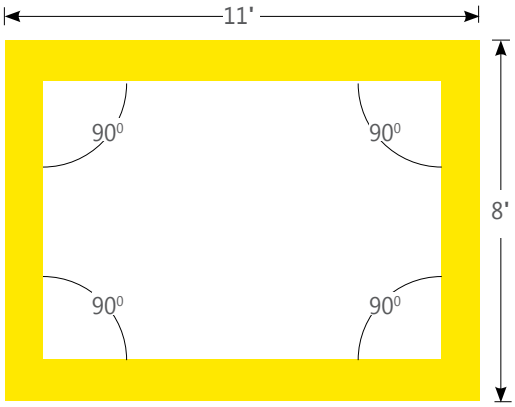
ÉCLAIRAGE axis LIGHTING
1.800.263.AXIS
[T] 514.948.6272
[F] 514.948.6271
www.axislighting.com

PROJECT INFORMATION

Project:

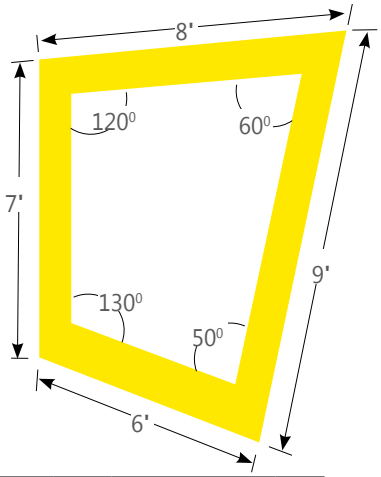
Type:

IMPORTANT – all corner patterns must be submitted with drawings indicating dimensions and angles degree.



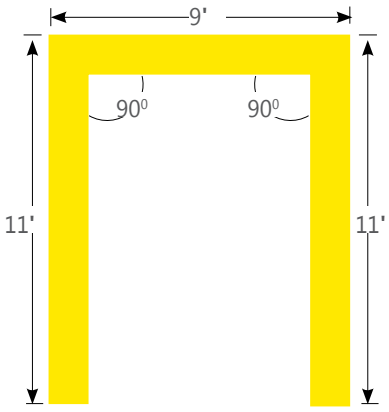
BMDPAT	REC	90+90+90+90	38'
1	2	3	5

TOP VIEW - Rectangle Corner Patterns



BDPAT	ASO	120+60+50+130	30'
1	2	3	5

TOP VIEW - Corner Patterns



BBDPAT	OPR	90+90	31'
1	2	3	5

TOP VIEW - Open Shape Corner Pattern

NOTE: Pattern length is determined by lamp length

ORDERING CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

PRODUCT SPECIFICATIONS

1	PRODUCT ID
BDPAT	beam2 pendant direct
BIPAT	beam2 pendant indirect
TBPAT	twinbeam pendant direct/indirect
TBDPAT	twinbeam pendant direct
TBIPAT	twinbeam pendant indirect
BMDPAT	beam3 pendant direct
BMIPAT	beam3 pendant indirect
BBPAT	beam4 pendant direct/indirect
BBDPAT	beam4 pendant direct
BBIPAT	beam4 pendant indirect
B6PAT	beam6 pendant direct/indirect
B6DPAT	beam6 pendant direct
B6IPAT	beam6 pendant indirect

2	PATTERNS
SQ	square regular lit corners
REC	rectangle regular lit corners
ASO	other shape regular lit corners
OPR	open shape regular lit corners

3	CORNER DEGREES
90	90 degrees
#	other degree

4	OPTICS DIRECT
S	satin lens
F	frosted lens(1)

(1) not recommended with staggered lamping

5	LENGTH/FT
#	total pattern length

6	SPECIFY LENGTH
NL	nominal (3' & 4' lamps)
NL4	nominal (4' lamps only)
EX	exact (3' & 4' lamps)
EX4	exact (4' lamps only)

7	LAMP
T5	T5
T5HO	T5HO
T8	T8(2)

(2) not available for beam2 and beam3 staggered

8	DOWN LAMP
0	0 lamp
1	1 lamp
2	2 lamps(3)
+S	staggered(4)

(3) not available for beam2 and beam3
(4) only T5/T5HO 1 lamp staggered for beam2 and beam3

9	UP LAMP
0	0 lamp
1	1 lamp
2	2 lamps(5)
+S	staggered(6)

(5) not available for beam2 and beam3
(6) only T5/T5HO 1 lamp staggered for beam2 and beam3

10	FINISH
AP	aluminum paint
W	white
C	custom

11	VOLTAGE
120	120V
277	277V
347	347V(7)
UNV	universal

(7) Please consult factory

12	BALLAST
D	dimming
E	instant start
ERS	rapid start
BI	bi-level dimming

13	CIRCUITS
1	1 regular
2	2 regular
2A/B	2 alternating
+E#	emergency section
+NL#	night light section
+GTD#	generator transfer device

14	MOUNTING/SUSPENSION
CA#	drywall+cable length (36"std)
CT9-#	TB/TG 9/16+cable length (36" std.)
CT15-#	TB/TG15/16+cable length (36" std.)
CTS#	ST+cable length (36" std.)
SA	drywall+stem length>48 (18"std)

15	BATTERY
B#	battery pack 4' sections

16	OTHER
F	fuse
D	dust cover

17	CUSTOM
C	custom

Please specify

FILE NAME:Beam Pendant LC November 20, 2014

PENDANT MOUNT - REGULAR LIT CORNERS

ÉCLAIRAGE axis LIGHTING
1.800.263.AXIS
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www.axislighting.com

LIT CORNER FEATURES

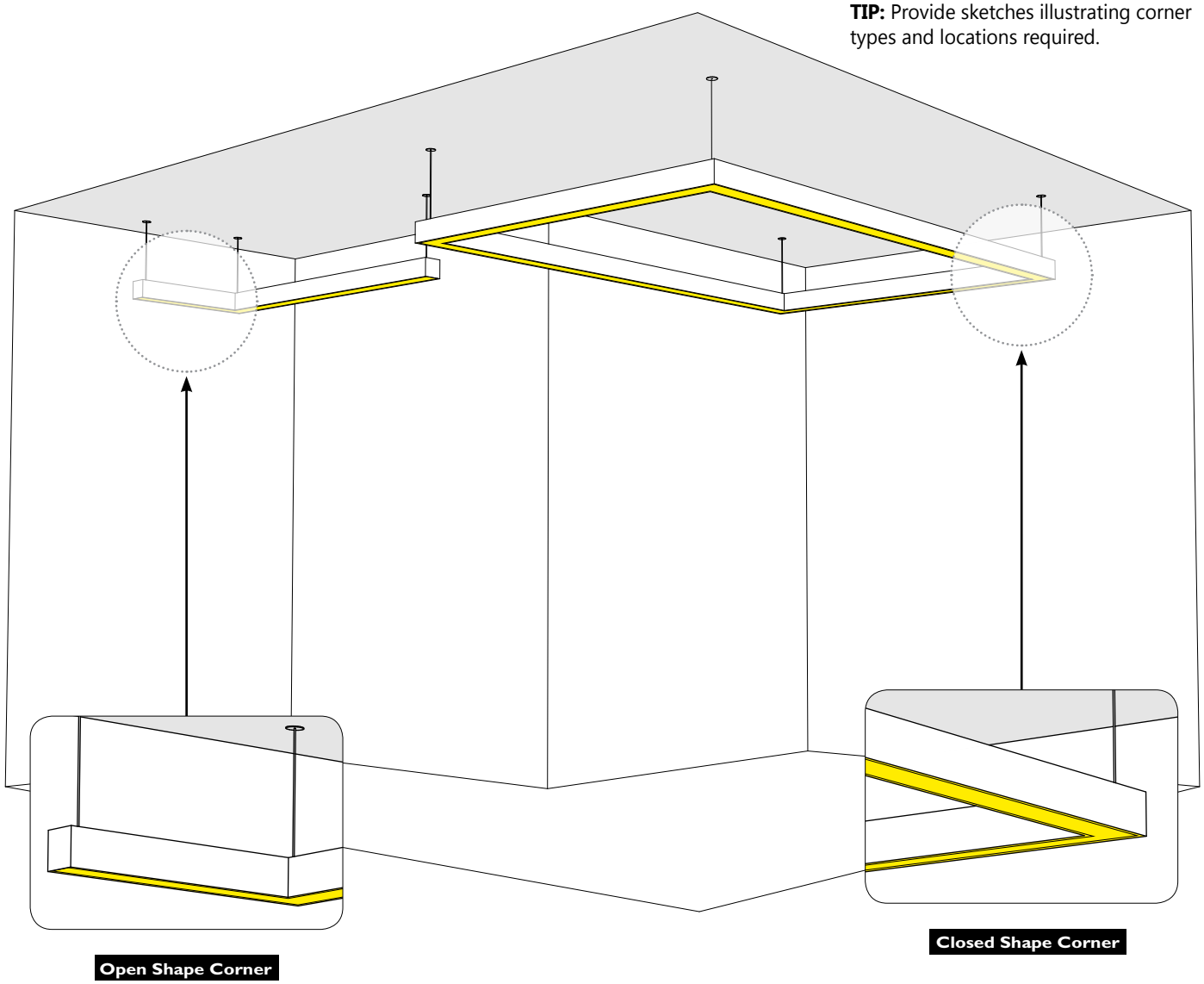
The Lit Corner system allows continuous illumination all the way through the corner section

To optimize corner illumination, lit corners are created as integral components of the linear sections. Linear sections have mitered ends that connect to corresponding mitered ends of neighboring linear sections.

Illuminated Corners are more complex. Because the corner is fully illuminated, the corner is not independent of the straight sections, but integrated into the straight segment's housing. The corner is mitered, allowing a seamless line of light.

Regular Illuminated Corner - A fully illuminated corner that lies on the same plane, for example, the ceiling. There are two corner options available for Regular Lit Corners: **Open Shape Corner** and **Closed Shape Corner**

TIP: Provide sketches illustrating corner types and locations required.



IMPORTANT – all corner patterns must be submitted with drawings indicating dimensions and angles degree.

PL1

BEAM4 LED PENDANT DIRECT/INDIRECT

ÉCLAIRAGE axis LIGHTING
1.800.263.AXIS
[T] 514.948.6272
[F] 514.948.6271
www.axislighting.com

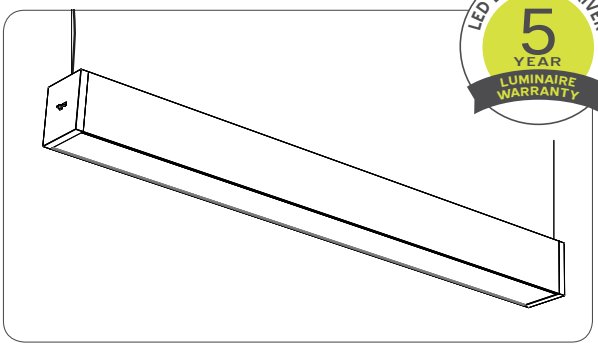
PROJECT INFORMATION

Project:

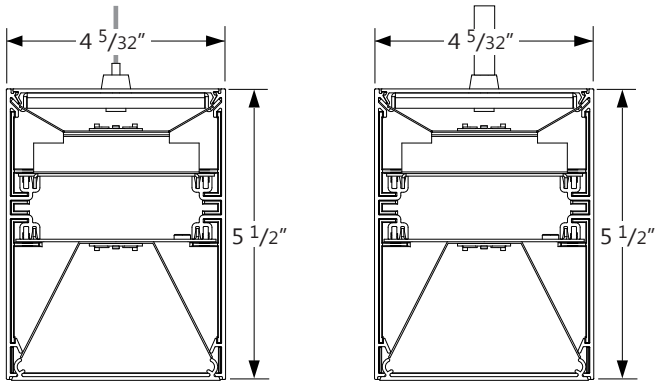
Type:

Notes:

08'



DIMENSIONS -SECTION VIEWS



CABLE STEM

PERFORMANCE PER LINEAR FOOT AT 3500K

NOMINAL LUMEN OUTPUT		INPUT WATTS*	EFFICACY
UPLIGHT	DOWNLIGHT		
640 lm/ft	320 lm/ft	8.61 W/ft	110 lm/W

Please consult factory for custom lumen output and wattage.

ORDERING CODE

BBDILED-B3-640-320-40-SO-4-MR16LED-AP-277-D-1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

PRODUCT SPECIFICATIONS

1	PRODUCT ID	2	VERSION	3	NOM. LUMENS/FT UPLIGHT	4	NOM. LUMENS/FT DOWNLIGHT	5	COLOR TEMPERATURE
BBDILED	pendant direct/indirect led	**B3**	B3 (factory preset)	**640**	640 lm/ft uplight	**320**	320 lm/ft downlight	**35**	3500 K
								30	3000 K(1)
								40	4000 K(1)
								Colour temperature is both for direct and indirect (1) 8 week lead time for 3000K and 4000K	

6	SHIELDING	7	LENGTH	8	MR	9	FINISH	10	VOLTAGE	11	DRIVER	12	CIRCUITS
SO	spotless lens	**2**	2'	**M16LED#**	MR 16 LED	**AP**	aluminum paint	**120**	120V	**D**	dimming(2)	**1**	1 circuit
		3	3'			**W**	white	**277**	277V	**LT**	lutron	**2**	2 circuits
		4	4'			**C**	custom	**UNV**	universal	**RD**	redwood(3)	**+E#**	emergency section
		5	5'							**BI**	bi-level dimming	**+NL#**	night light section
		8	8'									**+GTD#**	generator transfer device
		12	12'									**+M**	MR
		S#	System Run										
				Add 9" per lamp						(2) Standard with LED (3) Please consult factory			

13	MOUNTING/SUSPENSION	14	BATTERY	15	OTHER	16	IC CONTROLS	17	CUSTOM
CA#	drywall+cable length (36" std.)	**B#**	battery pack 4' sections	**F**	fuse	**DS#**	daylight sensor	**C**	custom
CT9-#	TB/TG 9/16+cable length (36" std.)			**D**	dust cover	**OS#**	occupancy sensor		
CT15-#	TB/TG15/16+cable length (36" std.)								
CTS-#	ST+cable length (36" std.)								
SA#	drywall+stem length >48" (18" std.)								
+SM	seismic option								
		Please consult factory				See integrated controls guide for further details		Please specify	

Driver, Battery Pack and Integrated Control Details and Custom Description:

ÉCLAIRAGE axis LIGHTING
1.800.263.AXIS
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www.axislighting.com

SPECIFICATIONS

CONSTRUCTION

Housing	Extruded Aluminum (0.075'' nominal) up to 70% recycled content
End Cap	Sheet Steel (18 ga)
Interior Brackets	Die Formed Sheet Steel (18 ga)
Reflectors	White Powder Coated Sheet Steel (22 ga)
Blank	Extruded Aluminum (0.075'' nominal)
Lens	Spotless frosted acrylic lens
Hanger	Die Formed Sheet Steel (16 gauge)
Suspension	Aircraft Cable or Ø 1/2" Stem
Cable Grips	Quick Connecting / Release

ELECTRICAL

LED	Use of OptimaLED technology based on mid-flux LED
Input Voltage	120V, 277V, UNV.
Driver	Dimming, HiLume, EcoSystem, DALI, Bi-Level dimming
CRI	Minimum 80 color rendering index
CCT	Choice of 3000K, 3500K and 4000K color temperature with a great color consistency (within 3.5–step MacAdam ellipse).
LED life	Minimum 50,000h with 70% of lumen maintenance in 25^{0}C ambient temperature, in compliance with IES LM-80 testing measurements.
Thermal management	Aluminium housing acting as the heat spreader to maximize life.
Emergency	Emergency battery pack or emergency circuit optional.

WARRANTY

Axis lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

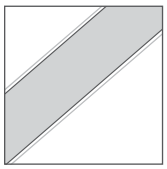
APPROVALS

Certified to UL and CUL standards
Meets NYC requirements
Suitable for damp locations.

SYSTEM (S#)

BEAM 4 linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 4', 8', 12' as well as custom lengths are available. Runs of BEAM 4 that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

OPTICS

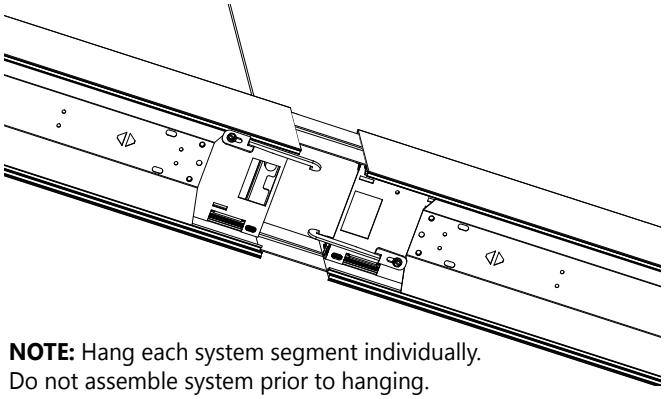


SO spotless lens

SPOTLESS LENS
Frosted acrylic snap-in lens with micro lens

JOINERS

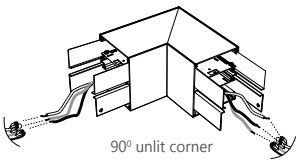
In order to allow very long runs of BEAM 4 luminaires, Axis has developed an effective joining system.
Special care has been taken to maximize the performance of the joiner for each BEAM option.



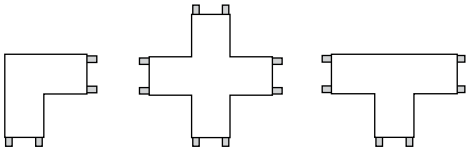
NOTE: Hang each system segment individually.
Do not assemble system prior to hanging.

CORNERS

Unlit Corners - BEAM4 features a multitude of layout patterns with the use of a number of corners, 90° corner, T or X junctions.

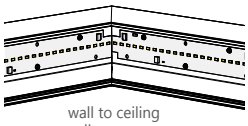


90^0 unlit corner



90° corner X junction T junction

Lit Corners - In addition Axis offers Lit 90° Corners including Ceiling to Ceiling, Wall to Ceiling and Ceiling to Wall.



wall to ceiling lit corner

For custom corner angles, please consult factory. Specifications sheets for all corners are available at: www.axislighting.com

WEIGHT

4 ft	14.5 lbs / 6.6 kg
8 ft	29.0 lbs / 13.2 kg
12 ft	43.5 lbs / 19.7 kg

FINISH

Powder Coated and custom finishes are also available.

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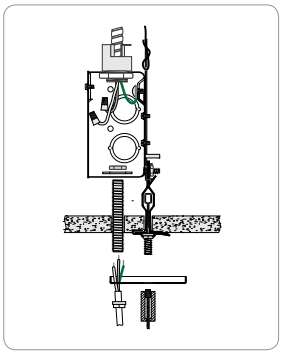
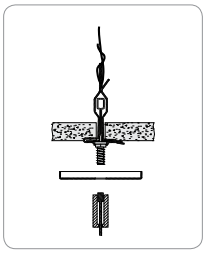
[F] 514.948.6271
www.axislighting.com

MOUNTING OPTIONS

CT TILE CEILING - ON GRID

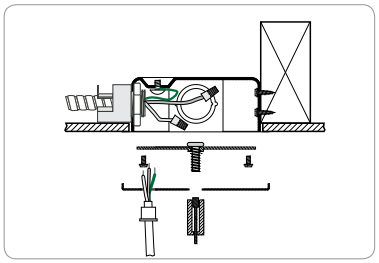


Power feed

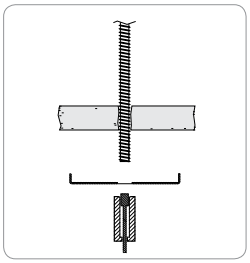


Non power feed

CA DRYWALL CEILING

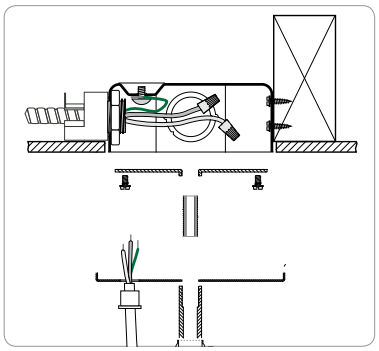


Power feed

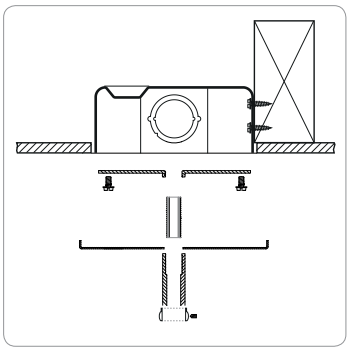


Non power feed

SA STEM MOUNT IN DRYWALL CEILING



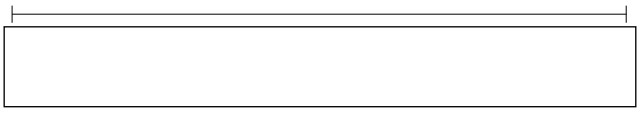
Power feed



Non power feed

MOUNTING SPACING END TO END

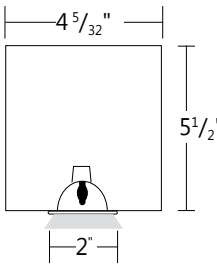
4' (48" C.C.)
8' (96" C.C.)
12' (144" C.C.)



Row configuration and mounting spacing file is available for download at: www.axislighting.com

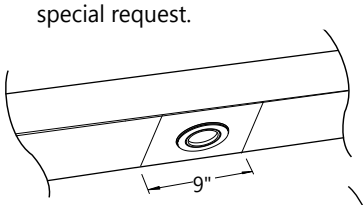
MR16 LED LAMPS

Blank Extruded Aluminum (0.075'' nominal)
MR16 LED 2.0'' diameter
Quantity For every 4' section, there may be up to a maximum of 4 x MR16 LED lamps.
Spacing Each MR16 LED lamp is placed centered on a blank section 9'' in length.

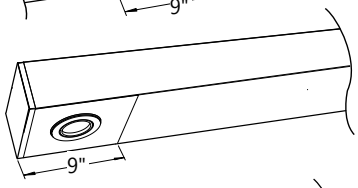


For a series of MR16's within a given section length, they will be spaced evenly on a longer blank section.
The directed light of MR16 LED lamps are fixed downward.
Custom spacing may be available on special request.

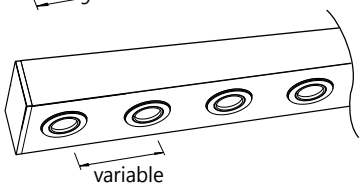
Between sections



At luminare ends



Several in a long blank section



Base Type GU 5.3
Beam Angle 40 nominal degrees
Input Watts 6W
Numinal Lumens 300 lumens
Efficacy 50 lumens per watt
Color Rendering Index (CRI) 85
Central Beam Candle Power (CBCP) 584 candelas
Life 25,000 hours at L_{70}
Correlated color temperature (CCT) 2700K

More options are available upon request. Please consult factory.

OTHER MOUNTING OPTIONS

BEAM 4 LED is also available with recessed, surface, wall and recessed vertical mounted options.

Specification sheets and Installation sheets for all mounting for BEAM luminaires are available for download at www.axislighting.com

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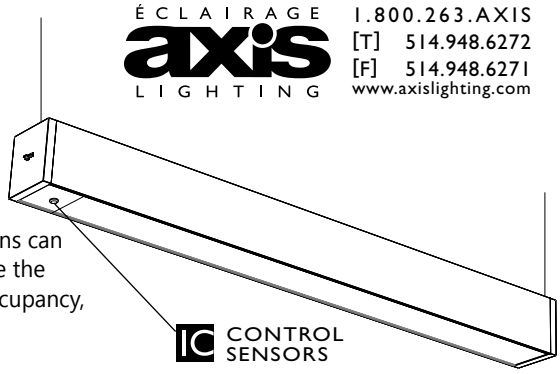


INTEGRATED CONTROL OPTIONS

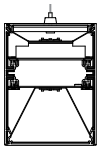
BEAM 4 LED luminaires allow the use of integrated controls such as daylight sensors (DS), occupancy sensors (OS) and combination daylight/occupancy sensors (DOS). These options can be seamlessly integrated into our luminaires. The control system could be used to optimize the lighting of the space by reducing energy consumption through daylight harvesting and occupancy, thereby improving the overall interior environment and allowing for LEED credits.

- Consult factory for other options.

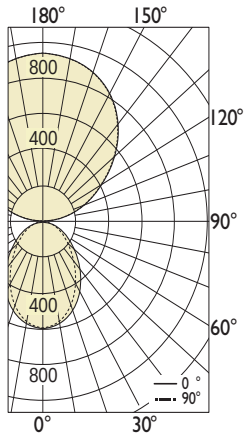
SENSORS	BRAND	Model	TYPE	CODE	COMPATIBLE DRIVER
Daylight Sensor (DS)	Lutron	EC-DIR-WH	Daylight	LD	EcoSystem
	Wattstopper	FD-301	Daylight	WD	Dimming 0-10V
	Philips	Luxsense	Daylight	PL	Dimming 0-10V
Occupancy Sensor (OS)	Wattstopper	FS-205	PIR Occupancy	WP1	Dimming or non-dimming
		FS-355 (Consult Factory)	PIR Occupancy	WP2	Dimming or non-dimming
Daylight and Occupancy Sensors (OS+DS)	Wattstopper Philips	Please consult factory			Dimming 0-10V

PHOTOMETRIC DATA

Uplight 70%
640 lm/ft
Downlight 30%
320 lm/ft



PHOTOMETRIC CURVE



Lumaire Lumens: 640 lm/ft up
320 lm/ft down
Input Watts: 8.61 w/ft
Efficacy: 110 lm/w
IES FILE: BBDILED-B2-640-320-35-SO.IES

CANDELA DISTRIBUTION

	Horizontal Angles					Zonal Lumens
Vertical Angle	0	22.5	45	67.5	90	
0	591	591	591	591	591	
5	584	587	584	587	589	14
15	552	553	546	541	539	39
25	491	486	473	459	454	55
35	407	399	379	358	350	60
45	312	304	282	263	256	55
55	219	213	195	180	175	44
65	135	132	120	112	109	30
75	65	64	59	56	55	16
85	13	13	14	14	13	4
90	0	0	0	0	0	
95	12	6	4	3	3	1
105	132	127	116	86	84	29
115	313	308	301	295	299	75
125	486	485	473	467	470	107
135	637	634	627	621	618	122
145	754	751	747	747	742	118
155	837	840	837	835	831	97
165	897	898	899	898	897	64
175	928	934	932	929	928	22
180	935	935	935	935	935	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	103	103	103	103	93	93	93	93	74	74	74
1	94	90	87	82	85	82	79	74	65	63	60
2	86	79	73	66	78	72	67	61	58	54	50
3	79	70	63	55	71	63	57	50	51	47	42
4	72	62	54	46	65	56	50	43	45	41	35
5	66	55	47	39	60	50	43	36	41	36	30
6	61	49	42	34	55	45	38	31	37	32	26
7	56	45	37	29	51	41	34	27	33	28	23
8	52	40	33	26	47	37	30	24	30	25	20
9	49	37	30	23	44	34	27	21	28	23	18
10	45	34	27	20	41	31	25	19	25	21	16

Based on floor reflectance of 20

LUMINANCE DATA (CD/M^2)

	Horizontal Angles		
Vertical Angle	0	45	90
45	3595	3249	2949
55	3111	2770	2486
65	2602	2313	2101
75	2046	1857	1731
85	1215	1309	1215

All IES files for other lamping are available for download at: www.axislighting.com

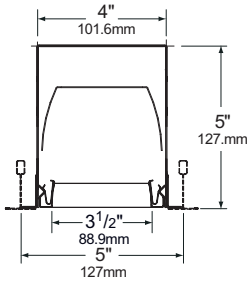
RF1

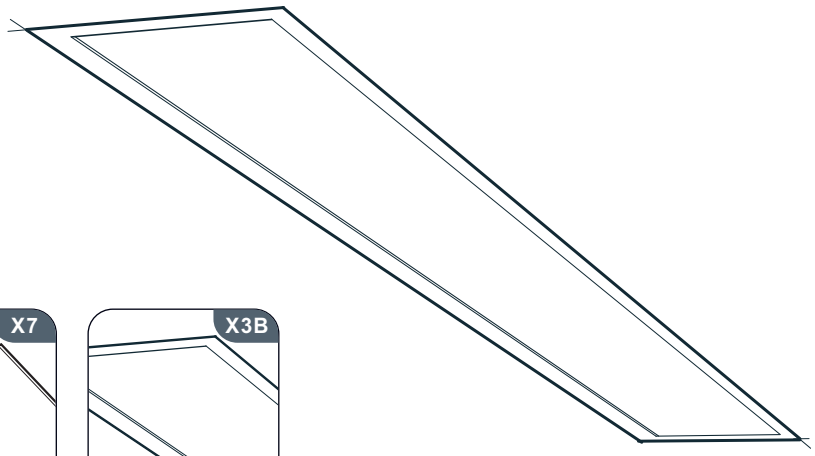
Type

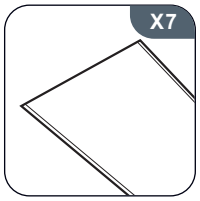
Job Name

Catalog Number

Recessed **P43**







ordering - Standard System*

lamp series/rows	nominal length	shielding	color/finish*	distribution	circuiting	voltage	ceiling system	options
P43-1T5-04-TMW-D1-SC-277-X3B-DM								
1T8	02'	SAL satin acrylic extruded lens	TMW textured matte white	D1 direct	SC single circuit	120	X1* exposed T-bar	CR
2T8	03'	OPL opal frost acrylic lens	YGW† gloss white		DC* dual circuit (in-line)	277	X3B hard ceiling (overhead mounting brackets)	EML*
1T5	04'	PRA prismatic acrylic extruded lens	YPE pewter		*2 lamp only	347	X7 hard ceiling (concealed flange)	EMH*
2T5	06'	SPL silver parabolic louver	Y__ premium color			UNV*	*standard	DM
1T5HO	08'	BLA blade louver-anodized	CC custom color			*120-277		RSE†
2T5HO	R_*	BLW blade louver white	*indicates color of flange -x1 and x3B ceiling systems only †standard					10THD†
	*row length							B__
								FH
								INTCW
								*consult factory for fixture lengths < 4' †T8 only

ordering - 1 lamp Staggered System*

lamp series/rows	nominal length	shielding	color/finish*	distribution	circuiting	voltage	ceiling system	options
P43-STG-								
1T8	08'	SAL satin acrylic extruded lens	TMW textured matte white	D1 direct	SC single circuit	120	X1* exposed T-bar	EML*
1T5	R_*	OPL opal frost acrylic lens	YGW† gloss white			277	X3B hard ceiling (overhead mounting brackets)	EMH*
1T5HO	*For rows of 6' or greater only	PRA prismatic acrylic extruded lens	YPE pewter			347	X7 hard ceiling (concealed flange)	DM
		SPL silver parabolic louver	Y__ premium color			UNV*	*standard	RSE†
		BLA blade louver-anodized	CC custom color			*120-277		10THD†
		BLW blade louver white	*indicates color of flange -x1 and x3B ceiling systems only †standard					B__
								FH
								INTCW
								*consult factory for fixture lengths < 4' †T8 only

*See drawings for row examples and lamping configurations.

P43 Recessed

Applications Classrooms, corridors, retail, healthcare, offices, hospitality, libraries.

Features A narrow 4” wide recessed lighting system in either a standard lamp configuration, or a staggered lamp configuration for single T8 or T5/HO lamp rows to provide continuous lighting without socket shadows along the entire row length. Standard lamping for 2T5 or T5HO lamp rows have offset lamps within modular rows to mitigate socket shadows. T8 lamps in standard configuration are end to end in modular rows and are not offset.

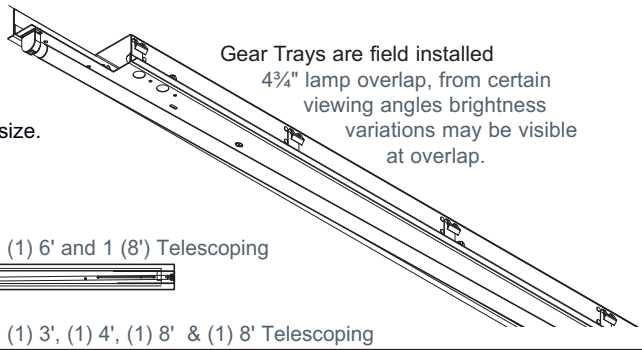
Construction The housing, available in 2-, 3-, 4-, 6- or 8-foot standard lengths, is made of die-formed 20-gauge steel. Louver material is semispecular, low iridescent aluminum. Snap-in prismatic lens is clear extruded acrylic. Snap-in satin acrylic lens is clear frost extruded acrylic with a matte finish for soft, even light transmission.

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

Electrical T8 fixtures have instant-start electronic ballasts with less than 20% THD. T5 and T5HO fixtures have programmed start electronic ballast with less than 10% THD. Fixtures are U.L. Damp labeled (non-emergency) and I.B.E.W. manufactured. Maximum ballast size available on non-staggered models: 2 3/8" width x 1 1/4" height. Maximum ballast size available on staggered models: 1 3/4" width x 1 1/4" height.

Mounting Fixture is to be recessed-mounted into exposed T-bar or hard ceiling applications.

Options **CR:** continuous-row installation (specify with non-staggered system only); **EML:** emergency battery (600-700 lumens); **EMH:** emergency battery (1100-1400 lumens); **DM:** dimming (consult factory); **RSE:** rapid-start electronic (T8 only); **10THD:** ballast with < 10% total harmonic distortion (T8 only); **B_:** specific ballast, specify manufacturer and catalog number (consult factory); **FH:** fixture fusing (slow blow); **INTCW:** integrates with Sense™ System as whiteboard luminaire.



Gear Trays are field installed 4¾" lamp overlap, from certain viewing angles brightness variations may be visible at overlap.

1 lamp Staggered System (STG)

Typical Row Examples - Lamp quantities and wattages are dependant on row size.

T5/T5HO - (3) 3' 21w or 39w lamps - Gear Trays: (1) 3' and 1 (6') Telescoping

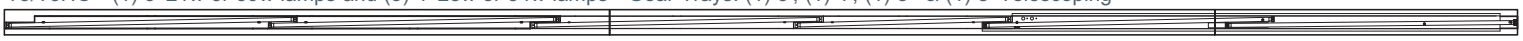
8'

T5/T5HO - (2) 3' 21w or 39w lamps and (2) 4' 28w or 54w lamps - Gear Trays: (1) 6' and 1 (8') Telescoping

12'

T5/T5HO - (1) 3' 21w or 39w lamps and (5) 4' 28w or 54w lamps - Gear Trays: (1) 3', (1) 4', (1) 8' & (1) 8' Telescoping

20'



T8 - (3) 3' 25w lamp - Gear Tray: (1) 8' indiviual

8'

T8 - (3) 3' 25w and (1) 32w lamps - Gear Trays (1) 3', (1) 4' and (1) 6', Telescoping

12'

T8 - (2) 3' 25w lamps and (4) 32w lamps - Gear Trays (2) 8' and (1) 6' Telescoping

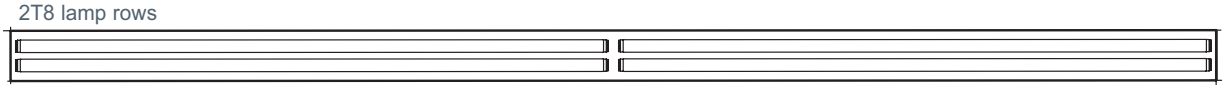
20'

Standard System

Typical Row Examples

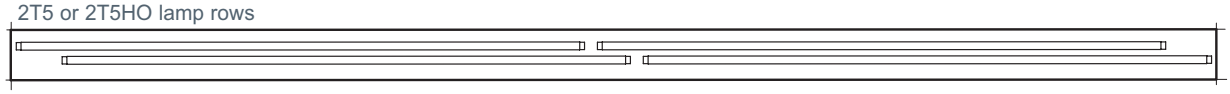
2T8 lamp rows

8'



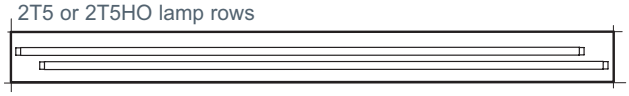
2T5 or 2T5HO lamp rows

8'



2T5 or 2T5HO lamp rows

4'



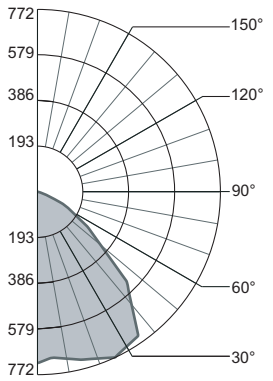
Factory supplied submittal drawing will be provided. Lamps are not supplied.

Prudential reserves the right to change design specifications or materials without notice.

photometric data

P-43-1T5-04'-SPL-TMW-D1

Report # LLI030708C D=100.0%
Spacing Criteria: Along 1.3; Across 1.5
Lamp Lumens: 2900 Input Watts: 33.82



Candlepower Summary

Vertical Angle	Horizontal Angle 0°	22.5°	45°	67.5°	90°
0	724	724	724	724	724
5	763	763	740	712	703
15	732	742	746	737	734
25	671	695	731	759	772
35	592	633	698	732	743
45	492	547	595	555	534
55	355	413	366	280	261
65	182	198	138	123	124
75	32	31	31	27	27
85	9	8	7	7	7
90	0	0	0	0	0

Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	68.2	100.00
90-180	00.0	0.00

Efficiency = 68.2%

Luminance Summary (cd/m²)

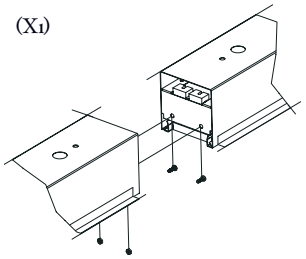
Angle	0°	45°	90°
45	7195	8701	7809
55	6400	6598	4705
65	4453	3376	3034
75	1278	1238	1079
85	1068	830	830

Coefficients of Utilization (%)

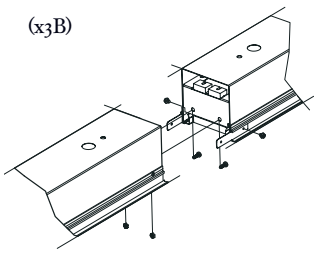
Floor	effective floor cavity reflectance = .20										
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
RCR **0**	81	81	81	81	79	79	79	79	76	76	76
1	74	71	68	66	73	70	67	65	67	65	63
2	68	62	57	53	66	61	56	53	58	55	52
3	61	54	49	44	60	53	48	44	51	47	43
4	56	48	41	37	54	47	41	37	45	40	36
5	51	42	36	31	50	41	35	31	40	35	31
6	47	37	31	27	46	37	31	27	36	30	26
7	43	34	27	23	42	33	27	23	32	27	23
8	40	30	24	20	39	30	24	20	29	24	20
9	37	28	22	18	36	27	22	18	26	21	18
10	35	25	20	16	34	25	19	16	24	19	16

Adjoining Detail

(X1)

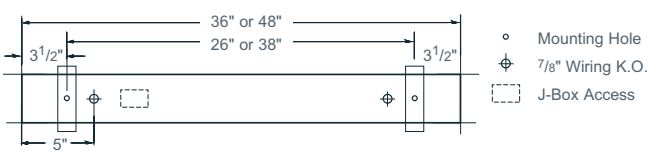


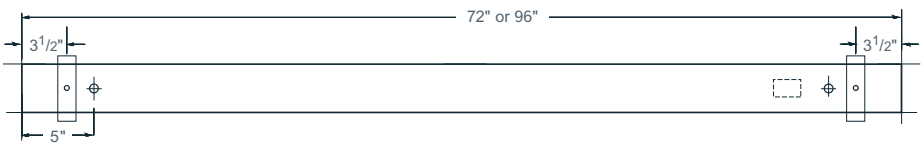
(x3B)



installation

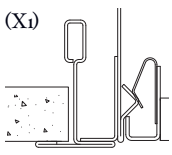
Mounting Locations



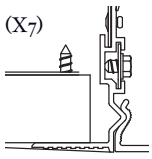


Ceiling Systems

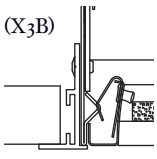
(X1)



(X7)



(X3B)



Framing Dimensions X3B & X7
Add 1/2" in fixture **width**, Add 5/8" in fixture **length**,

Prudential reserves the right to change design specifications or materials without notice.

RF2

Peerless®

Lightline® Recessed Symmetric Louver

Direct T5

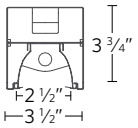
Type:

Project:

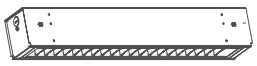
SPECIFICATIONS Recessed Mount **LSR9**

LAMPING OPTIONS

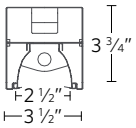
☐ **LSR9 - 1 2′**



2′



☐ **LSR9 - 1 4′**



4′

SPECIFICATIONS

Construction
Housing is formed, pre-finished steel. Four-stage, iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Painted parts are finished with low-gloss baked enamel.

Reflectors
Pre-finished white reflector system.

Shielding
Arc-shaped, parabolic low-iridescent semi-specular aluminum louver.

Electrical
Specify 120V, 277V, or 347V. For special circuits, consult factory. UL and C-UL listed (non-IC).

Luminaire Size
Nominal 2 ½″ aperture. 2′ and 4′ lengths available.

CATALOG NUMBER

LSR9-G-1-28T5-LDL-U4-277-OSDIM-LP841-C200-FLNGW

Examples: LSR9 G 1 28T5 LDL U4 120 GEB10 L/LP C201 — LSR9 G 1 14T5 LDL U2 277 GEB10 LP835 C201

Luminaire	Ceiling Type	# of Lamps in Cross Section	Lamp Type	Baffle	Luminaire Row Length	Voltage	Ballast Type
LSR9	**G** Lay in grid	**1**	**14T5** 2′ 14W T5 **28T5** 4′ 28W T5	**LDL** Low-iridescent louver	**U2** 2′ **U4** 4′	**120** **277** **347**	**GEB10** <10% THD Electronic **DMHL3D**[1,2] Lutron Hi-Lume dim **ADZT**[1,2] Advance Mark 7 0-10V dim **OSDIM**[1] Osram 0-10V dim *Reference Ballast Wizard on website or consult factory for other options.*

Emergency Type	Lamp Color	Finish	Options
EL[1,2] Emergency battery pack	**L/LP** No lamp **LP830** 3000K 80+ CRI **LP835** 3500K 80+ CRI **LP841** 4100K 80+ CRI **Available with 28T5 only:** **LP830P** 3000K 80+ CRI Premier **LP835P** 3500K 80+ CRI Premier **LP841P** 4100K 80+ CRI Premier *Reference Lamp Chart on website or consult factory for other options.*	**C200** White (low gloss) **C201** Black (low gloss)	**CP** Chicago plenum **FLNGW** Flange kit (dry wall only) white **FLNGB** Flange kit (dry wall only) black **GLR** Fusing (fast blow) **GMF** Fusing (slow blow) **NYC** New York City code

Notes:
1 Not available in 347V
2 Only available with 28T5

2246 5th Street, Berkeley, CA 94710 • Tel: 510.845.2760 • Fax: 510.845.2776 • Email: techsupport@peerlesslighting.com • PeerlessLighting.com

RL1

SPECIFICATION SHEET

lumenfacade™

INGROUND
DIRECT VIEW
WHITE & STATIC COLORS

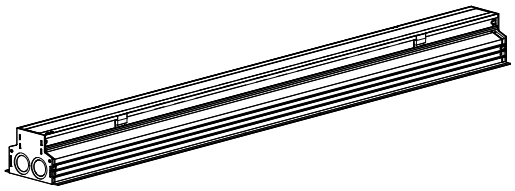
Client: _____

Project name: _____

Order #: _____

Type: _____ Qty: _____

FEATURES AND BENEFITS LOID-24V-48-40K-NO-ASL



Physical :

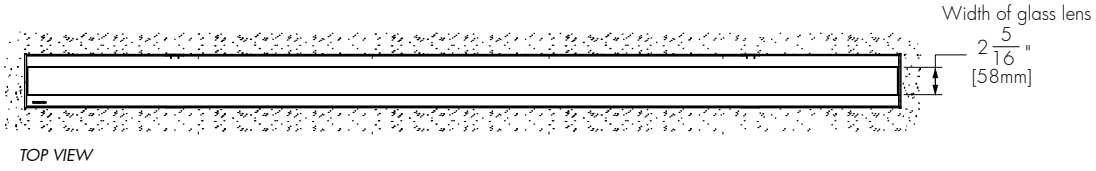
- Aluminum optical chamber housing
- Anodized aluminum flush trim
- Polymer recycled PVC blockout housing
- Available in 1', 2', 3' or 4' sections
- Die cast aluminum end caps
- Stainless steel hardware
- Frosted glass lens
- IP68 rated for up to 1' (30cm), not suitable for permanent immersion applications
- IK10 rated
- 1000kg max load, walk over only

Performance :

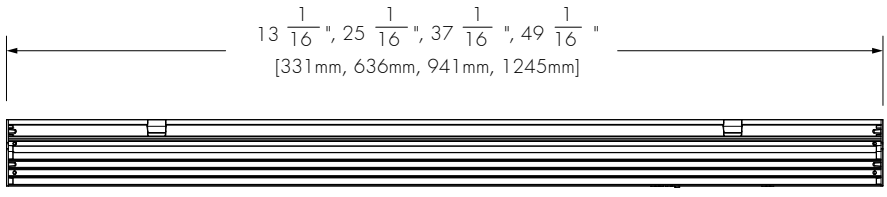
- Lumen maintenance 80,000 hrs [L70 @ 25°C]
- Lumen maintenance 60,000 hrs [L70 @ 50°C]
- Resolution per foot or per fixture
- Operating temperatures: -40° C to 50° C [-40F to 122F]

Electrical :

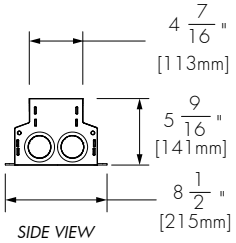
- 24V DC luminaire, see Power and Control box options on page 7
- Power and data in 1 cable (#16-5)
- IP68 push-lock connectors
- 6W/ft
- Dimming options: 0-10 volt, DMX, DALI, Lumentalk, or Lutron® EcoSystem® enabled



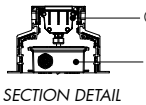
TOP VIEW



FRONT VIEW
*All dimensions are preliminary



SIDE VIEW



SECTION DETAIL

5 year warranty

Lumenpulse, 1751 Richardson, Suite 1505, Montreal (Quebec) Canada H3K 1G6 1.877.937.3003 P. 514.937.3003 F. 514.937.6289
info@lumenpulse.com **www.lumenpulse.com**

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ACCESSORIES

Order separately, refer to each item's specification sheet for ordering information

Control Systems:

LTO2 Lumentouch is a wall mount DMX 512 controller keypad.

LCU Lumencue is a USB / mini SD DMX 512 controller.

LID LumenID is a diagnostic and addressing DMX 512 controller.
It must be specified on all DMX applications.
Refer to LID specification sheet for details.

LTN Lumentone is a simple pre-programmed DMX 512 controller
with a push button rotary dial and live feedback.

Control Boxes:

CBX DMX/RDM control box.
Up to six power and data outputs to fixtures or fixture runs.
Ethernet enabled option.
Refer to CBX specification sheet for details.

Cables **(required)**:

Leader Cable for Lumenfacade Inground;10', 25' or 50' [3m, 7.6m or 15.2m] standard lengths

Jumper Cable for Lumenfacade Inground; 2', 4' or 10' [0.6m, 1.2m or 3m] standard lengths

Inground Junction Box (optional):

Lumenfacade Inground IP68 sealed junction box starter kit - **LOI-JBOX** order code.
*Use for stand alone fixtures and/or first of run fixtures

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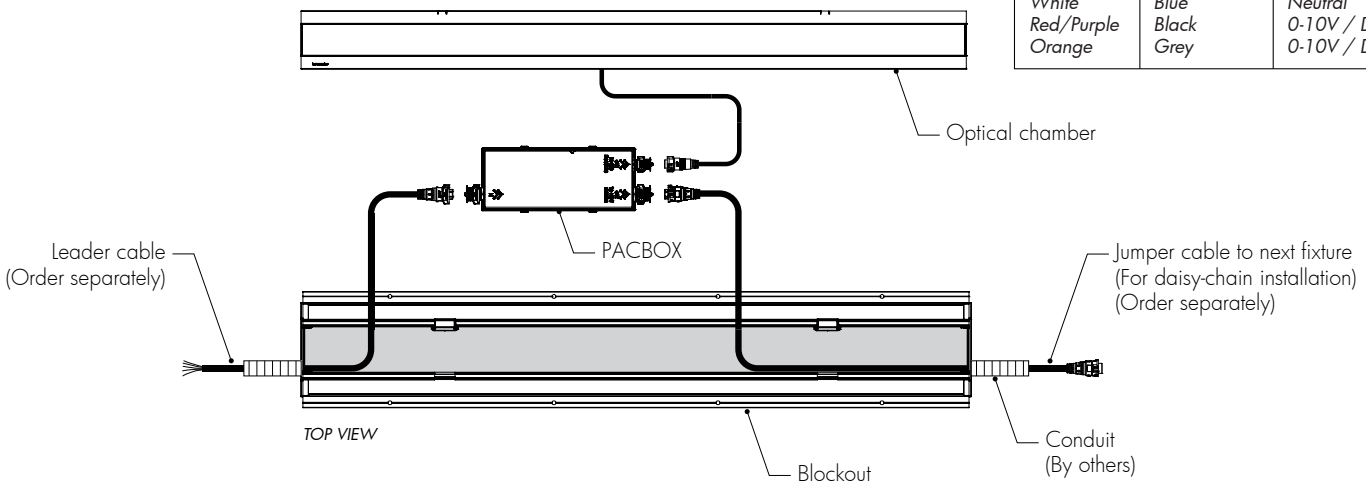
TYPICAL WIRING DIAGRAMS

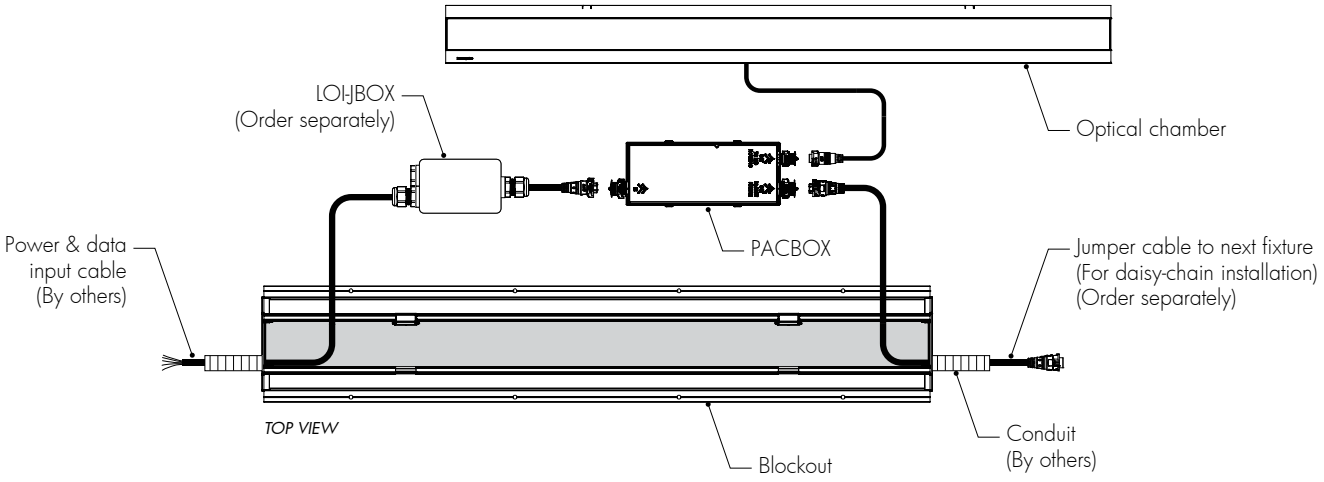
Typical Installation with Leader Cable

American Color Code	*CE Color Code*	*USE*
Green	*Yellow/Green*	*Ground*
Black	*Brown*	*Live 100-277V*
White	*Blue*	*Neutral*
Red/Purple	*Black*	*0-10V / Data +*
Orange	*Grey*	*0-10V / Data -*



Typical Installation with IP68 LOI-JBOX Accessory

Cannot be used with 1ft LOI fixture



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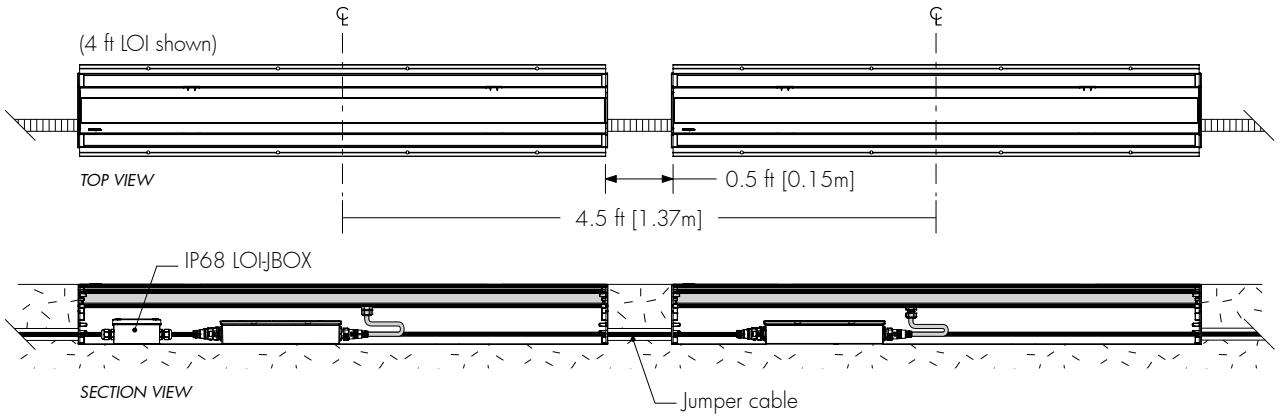
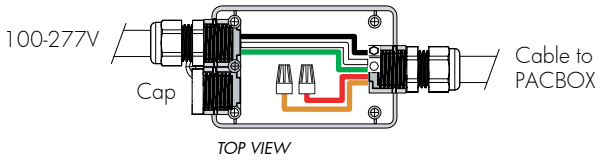
TYPICAL WIRING DIAGRAMS - continued

Non-Dimming or Lumentalk Dimming Version

1% minimum dimming value with Lumentalk dimming



IP68 LOI-JBOX Accessory - Wiring Detail



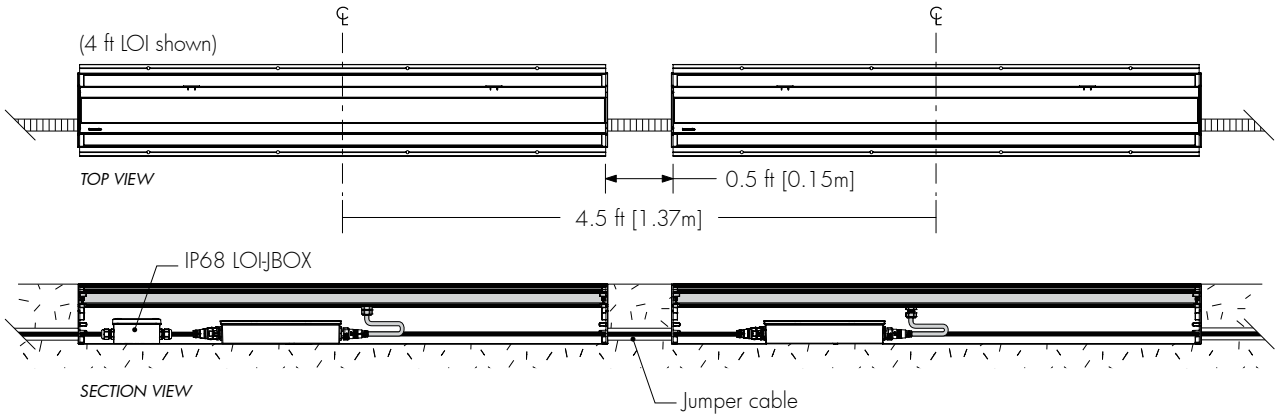
Jumper Cable Length

Estimate the center to center distance from one LOI to the following, and order the next longest jumper cable available.

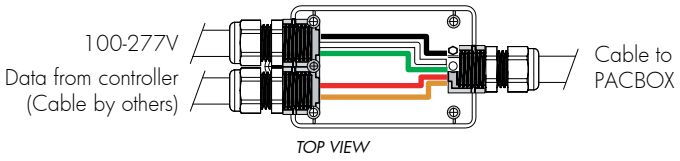
Ex: 10 ft (3m) jumper cable needed for the example shown.

Dimming Version (0-10V, DALI, EcoSystem®)

10% minimum dimming value for 0-10V, 1% minimum dimming value for DALI, EcoSystem®



IP68 LOI-JBOX Accessory - Wiring Detail



Jumper Cable Length

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Ex: 10 ft (3m) jumper cable needed for the example shown.

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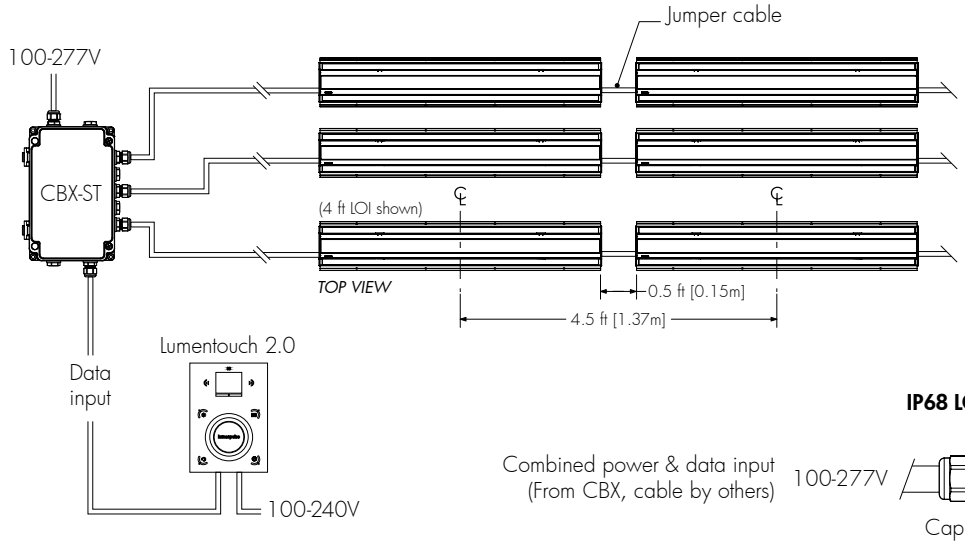
TYPICAL WIRING DIAGRAMS - continued

Star Layout (DMX Dimming)

1% minimum dimming value

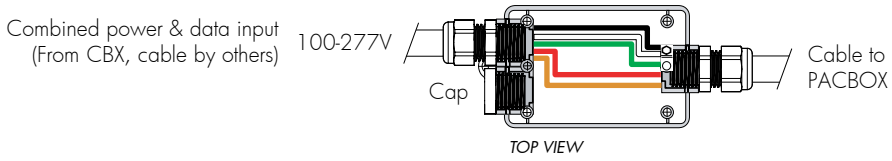


Jumper Cable Length

Estimate the center to center distance from one LOI to the following, and order the next longest jumper cable available.

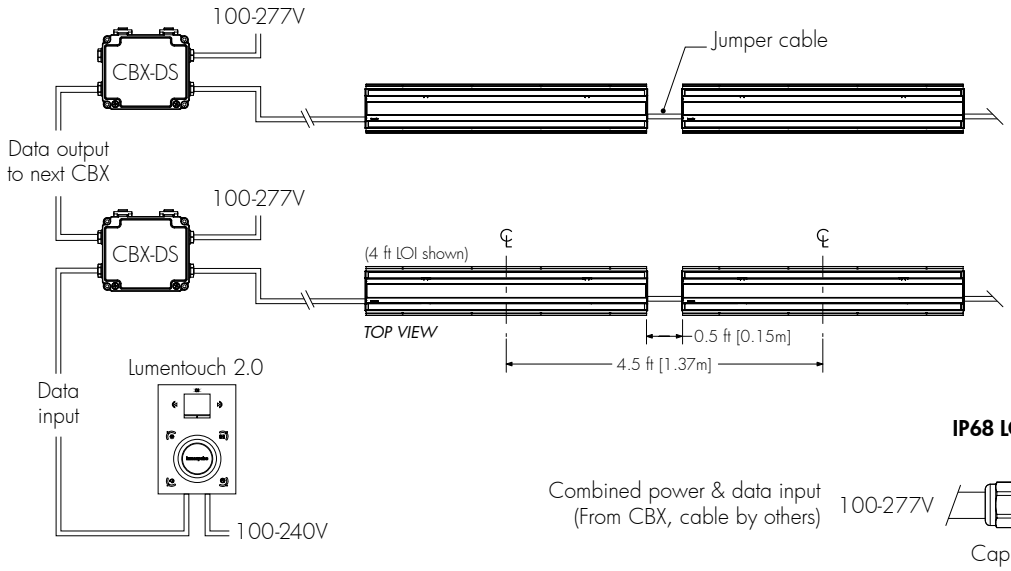
Ex: 10 ft (3m) jumper cable needed for the example shown.

IP68 LOI-JBOX Accessory - Wiring Detail



Daisy Chain Layout (DMX Dimming)

1% minimum dimming value

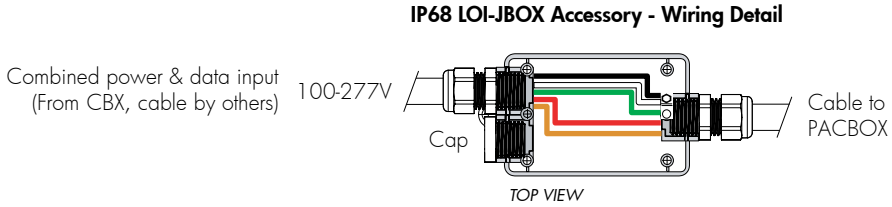


Jumper Cable Length

Estimate the center to center distance from one LOI to the following, and order the next longest jumper cable available.

Ex: 10 ft (3m) jumper cable needed for the example shown.

IP68 LOI-JBOX Accessory - Wiring Detail



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HOW TO ORDER

LOID	24V	Select:	Select:	Select:	Select:
Housing	Voltage	Length	Colors and color temperatures	Control	Option
1	2	3	4	5	6

1

Housing:

LOID - Lumenfacade™ Inground Direct View, 6W/ft

2

Voltage:

24V DC fixture. One **PACBOX** required per fixture, see page 7 to complete order code with input voltage.

3

Length:

12 - 13 1/16 inches (331mm)
24 - 25 1/16 inches (636mm)
36 - 37 1/16 inches (941mm)
48 - 49 1/16 inches (1245mm)

4

Colors and Color temperatures:

27K - 2700K
30K - 3000K
35K - 3500K
40K - 4000K
RD - Red (8-10 weeks lead time)
GR - Green (8-10 weeks lead time)
BL - Blue (8-10 weeks lead time)

5

Control:

NO - No Dimming
LT - Lumentalk Dimming
(1% minimum dimming value)
DIM - 0-10V Dimming
(10% minimum dimming value)
DMX 1FT - DMX Dimming, resolution per foot
(1% minimum dimming value)
DMX 1FX - DMX Dimming, resolution per fixture
(1% minimum dimming value)
DALI - DALI Dimming
(1% minimum dimming value)
ES - Lutron® EcoSystem® Enabled Dimming
(1% minimum dimming value)

6

Option:

ASL - Anti-slip lens

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HOW TO ORDER

INGROUND POWER AND CONTROL BOX (One **PACBOX** required per fixture)

PACBOX - WATTAGE	Select:	24V	Select:
Housing	Input Voltage	Output Voltage	Control
1	2	3	4

1

Housing:

The required PACBOX wattage varies with fixture selection. The correct PACBOX model will be provided based on fixture configuration.

2

Input Voltage:

100 - 100 volts
120 - 120 volts
208 - 208 volts
220 - 220 volts
240 - 240 volts
277 - 277 volts

3

Output Voltage:

24V - 24 volts DC

4

Control:

(fixture and PACBOX control option must be the same)

NO - No Dimming
LT - Lumentalk Dimming
DIM - 0-10V Dimming
DMX - DMX Dimming
DALI - DALI Dimming
ES - Lutron® EcoSystem® Enabled Dimming

PRE-INSTALLATION BLOCKOUT (One **LOI-RBO** required per fixture)

LOI-RBO	Select:	GRD
Housing	Length	Installation Type
1	2	3

1

Housing:

LOI-RBO - Lumenfacade™ Inground Blockout

2

Length:

12 - 13 1/16 inches (331mm)
24 - 25 1/16 inches (636mm)
36 - 37 1/16 inches (941mm)
48 - 49 1/16 inches (1245mm)

3

Installation Type:

GRD - Ground Recessed

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RL2 A, B, C, D

RL2A - LLP12-12X3-NW-SFI-WL15-L1
RL2B - LLP12-12X5-NW-SFI-WL15-L1
RL2C - LLP12-12X8-NW-SFI-WL15-L1

RL2D - LLP12-12X600-NW-SFI-WL15-L2

evo-lite LIGHT PANEL INTEGRATION SPECIALISTS

SPECIFICATION SHEET

LED LIGHT PANEL

1393 South Santa Fe Dr., Denver, CO 80223, USA | Toll Free: 1-888-887-2980 | www.Evo-Lite.com

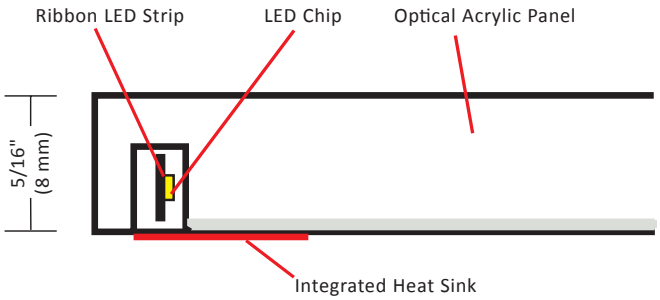
LumiSheet LED Light Panel

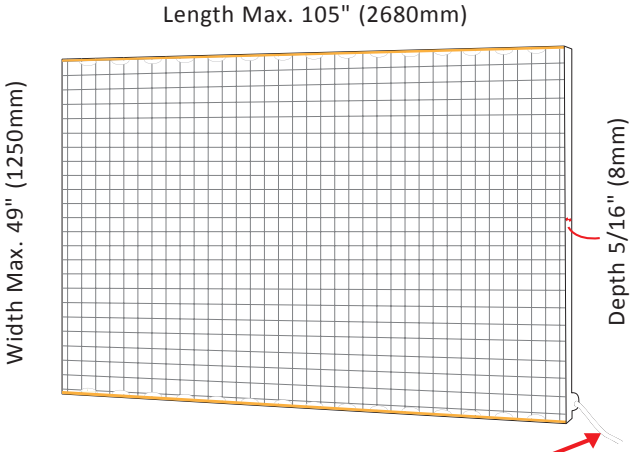
FEATURES & BENEFITS

- AVAILABLE IN CUSTOM SIZES & SHAPES
- CAN BE USED IN “FRAMELESS” DESIGNS
- 3D V-CUTTING TECHNOLOGY
- HIGH BRIGHTNESS (2,000 - 10,000 LUX)
- PATENTED HEAT SINK TECHNOLOGY TO MAXIMIZE LED LIFESPAN (70,000 HOURS)
- LOW POWER CONSUMPTION (70% LESS THAN FLUORESCENT)
- ENERGY SAVING AND MAINTENANCE FREE
- SUPERIOR CONSISTENT LIGHT QUALITY
- ADVANCED 3-YEAR WARRANTY

The **LumiSheet** is designed to emit a bright, even output of light across the entire surface of the panel. Unlike traditional light panels, which have the light source mounted on the exterior of the LGP (Light Guide Plate), LumiSheet integrates high brightness LEDs and heat sink into our exclusive 3D V-cutting LGP which makes it possible to produce "frameless", rectangular or special shaped LED light panels for various application needs.

PROFILE OF LUMISHEET



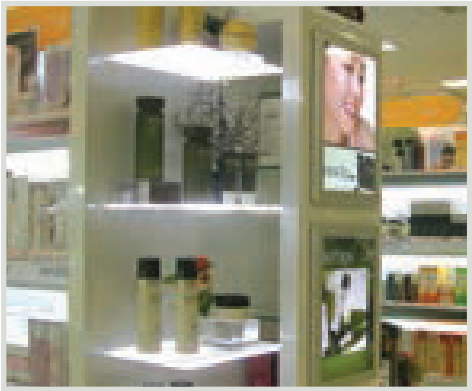


c UL us E346146

c UL us E325925

Power lead:
The power cord can be located around the perimeter of the panel as required, subject to the configuration of the LEDs, or the back of the panel.

Store Applications



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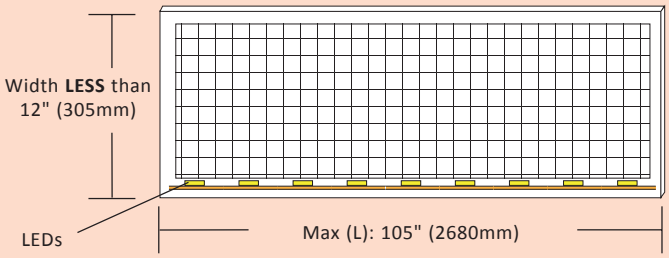
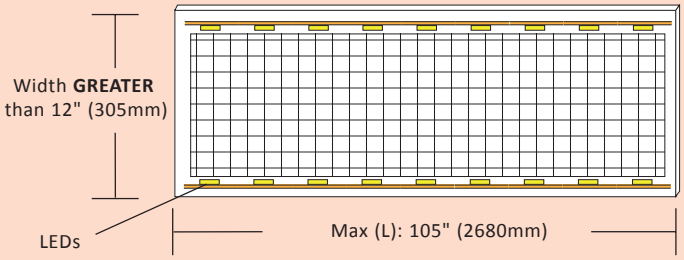
LED Light Location

LED light along 1 long edge

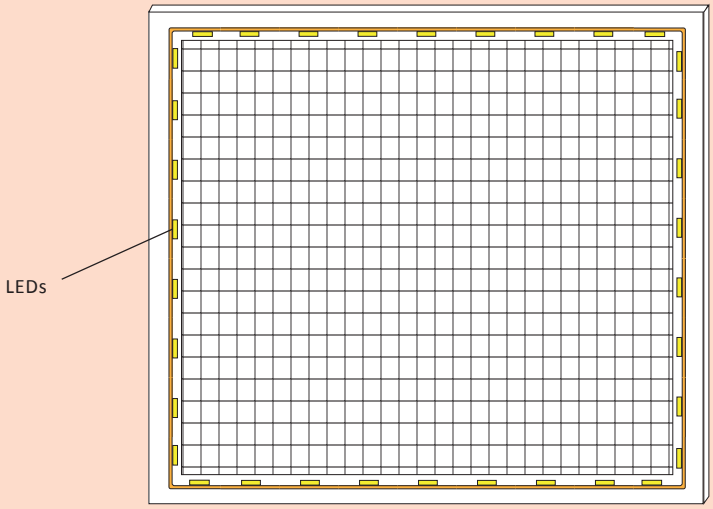


LED light along 2 long edges



LED light along all 4 edges

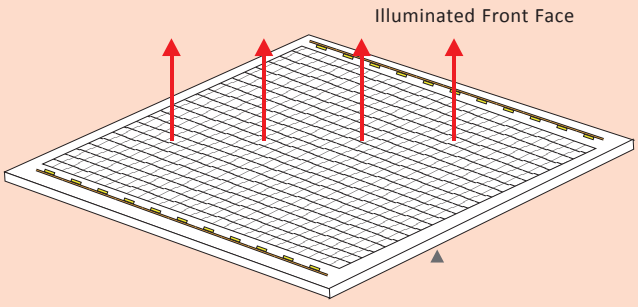
FOR SQUARE PANELS
For example: 36" x 36" or 48" x 48"



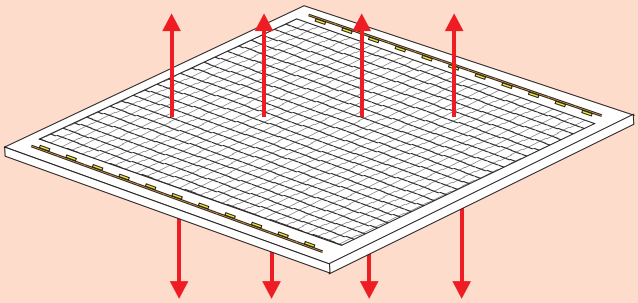
****This is only recommended for when panels are "nearly" square. It is not recommended for long narrow panels.**

Illuminated Face Options

Single Face Illumination (Standard)



Double Face Illumination (Option)



Both Front and Back Face Illuminated (no reflective white backer)

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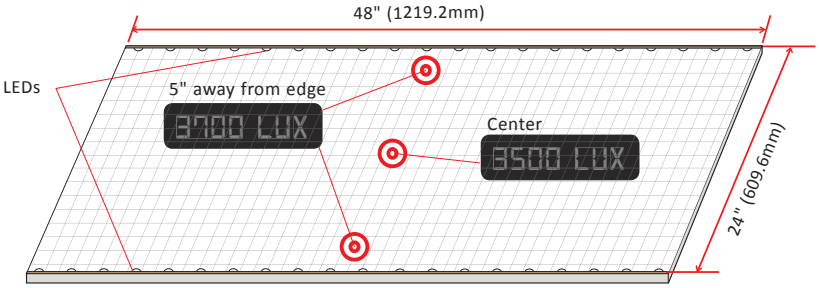
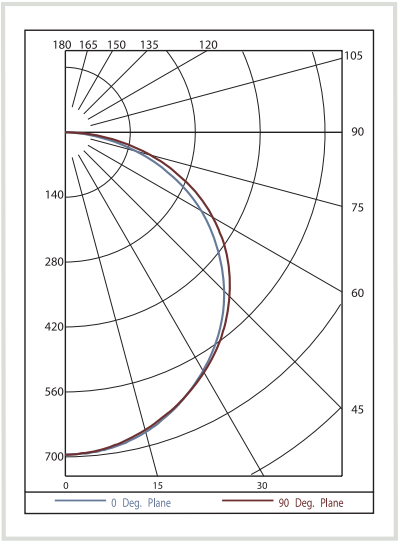
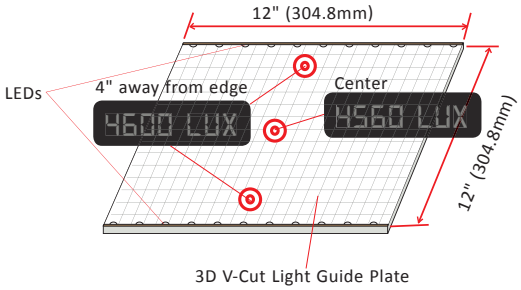
Typical Surface Brightness Measure

24" x 48" LumiSheet with high output 5300K LEDs lit along 2 long edges (40W)

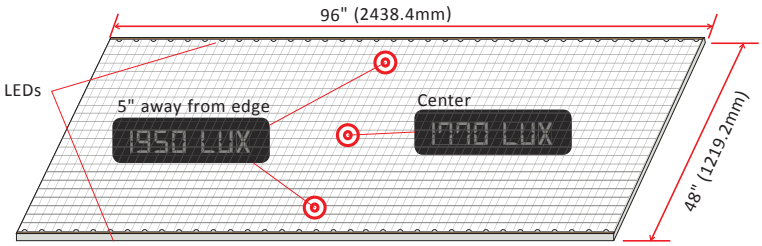




12" x 12" panel with regular 5300K LED lit along 2 edges (8W)



48" x 96" LumiSheet with high output 5300K LEDs lit along 2 long edges (80W)



*Brightness readings are for reference only. Actual reading may differ for different LEDs, LGPs or even different meters.

LumiSheet (Specifications by Size)				
Size (inch)	Size (mm)	LED Strip	*Average Surface Brightness (Lux)	Power Consumption (W)
6 x 6	150 x 150	1 side	5,000 (DL)	2.0
12 x 12	300 x 300	1 side	3,500 (DL)	4.0
24 x 24	600 x 600	2 sides	2,800 (DL)	15.0
36 x 36	900 x 900	2 sides	2,000 (DL)	23.0
48 x 48	1200 x 1200	2 sides	1,800 (HO)	40.0
48 x 96	1200 x 2400	2 sides	1,800 (HO)	80.0
Ø 6	Ø 152	all around	17,000 (DL)	5.8
Ø 12	Ø 300	all around	11,000 (DL)	11.2
Ø 24	Ø 600	all around	4,500 (DL)	24.0
Ø 36	Ø 900	all around	3,000 (DL)	36.0
Ø 48	Ø 1200	all around	2,200 (DL)	48.0
Brightness data was measured from Jan. to Aug., 2009. "DL" denotes regular LEDs. "HO" denotes high output LEDs				

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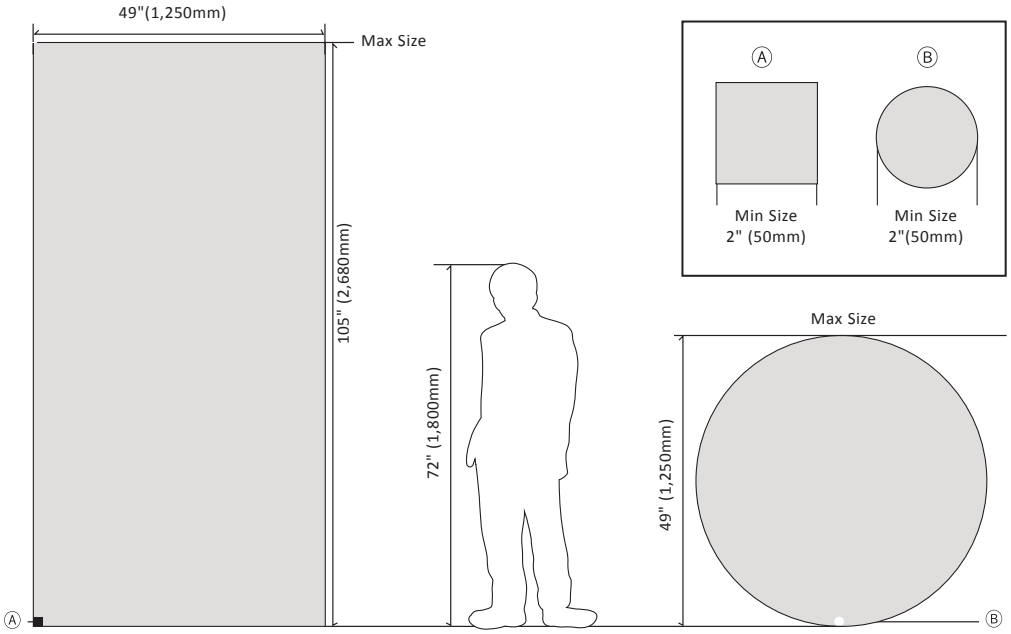
Specifications

LumiSheet - LED Light Panel			
Electrical			
Input Voltage	12 Volt DC		
Power Consumption	4.0 Watts/ft (Standard)	5.0 Watts/ft (High Output)	
Wire Size	20 AWG 2 wire		
Wiring	Each panel must have direct connection to power supply. Do not wire panels in series		
Connector	2.1/5.5mm barrel plug. Standard 5' (1500mm), Optional 10' (3000mm)		
Certification	UL / cUL (E346146, E325925)		
Physical			
Color Temperature	Warm White approx. 3000K	Neutral White approx. 4100K	Pure/Cool White approx. 5300K
Mounting	Wall mounted with screws, Z-clips, U-channel, mirror clips or Mounting with Stand offs		
Operating Temperature	- 30 °C (- 22 °F) ~ + 40 °C (+ 104 °F)		
Environment	Dry location only (Standard)	Wet location (Custom)	
Minimum Size	2"W x 2"L x 5/16" D (50mm x 50mm x 8mm)		
Maximum Size	49"W x 105"L x 5/16"D (1250mm x 2680 mm x 8mm)		
Weight	1.95 lbs /sq. ft.	9.54 kg/sq. M	
Plug-In Power Adaptors			
Power Adaptors	12V DC, 1A, 12W, UL listed	12V DC, 5A, 60W UL class 2 listed	
Spider Cables	PL-2 : 2-way long spider cable	PL-4 : 4-way long spider cable	PS-2 / PS-4 / PS-6: 2/4/6-way short spider cables
Hardwire Power Adaptors			
Power Adaptors	PA-60W-HW 60W 12V Hardwire power adaptor Input 110V AC ~ 240V AC	PA-150W-HW 150W 12V Hardwire power adaptor Input 110V AC ~ 240V AC	
Dimming	Refer to dimming options		

Color Temperature: *Warm White 3000K* *Neutral White 4100K* *Pure/ Cool White 5300K*

Max Size & Min Size



E346146 E325925

LumiSheet can be made from min. 2"(50mm) X 2"(50mm) to max. 49"(1,250mm) X 105" (2680mm)

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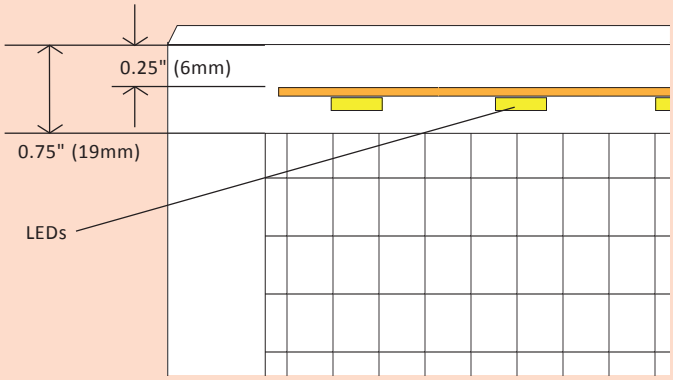
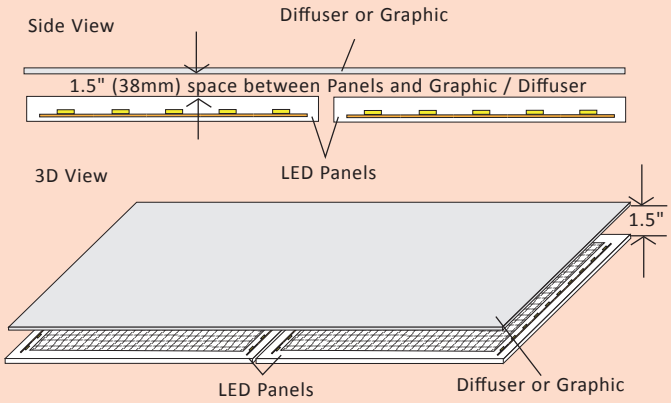
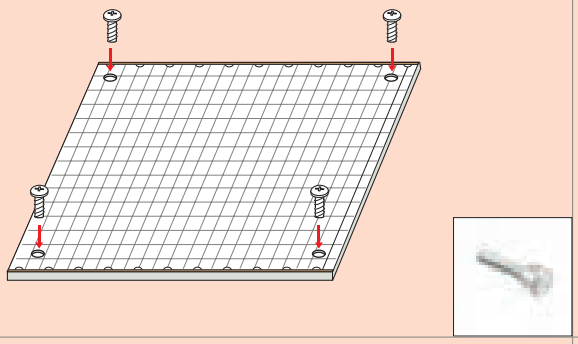
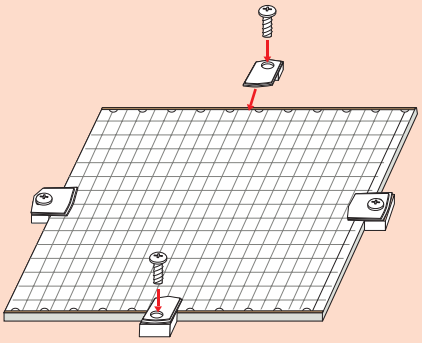
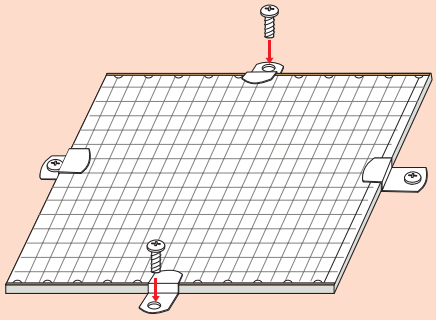
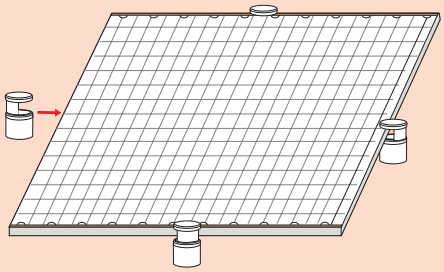
Installation Tips

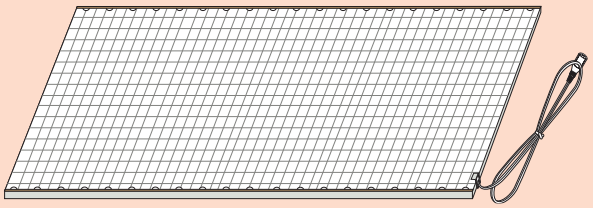
Single Panel	Multi-Panel
	
Typically LEDs are installed along a groove 0.25" away from the edge. To completely hide the LED light source (Hot Spots), recess the light panel into the fixture / frame by a minimum of 0.75" distance.	When placing panels side by side to form a longer panel, you may see a "hot line" where they meet. To avoid this you can use a diffuser (9mm thick or more) or leave a space (gap) of 1.5" or more between the light panel and front graphic etc.

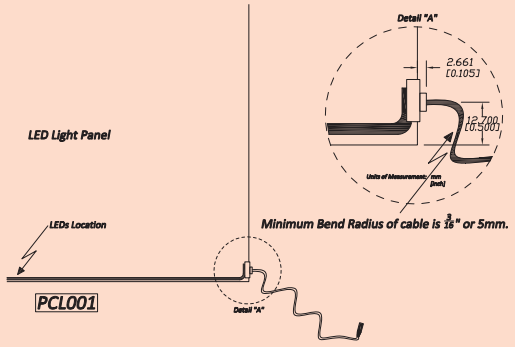
Surface Mounting

Option 1	Option 2
	 
Screw mounting with pre-drilled holes	**Mounting with mirror clips**
Option 3	**Option 4**
 	 
Mounting with Z-clips	**Mounting with Stand offs**

Typical Power Cord Exits

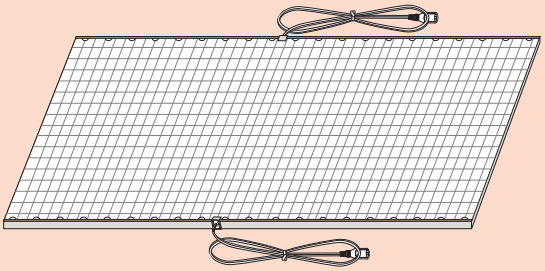
Standard 1

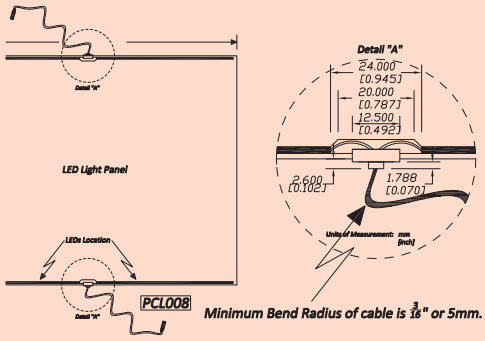




Power cord exits from short side (edge) corner (standard)

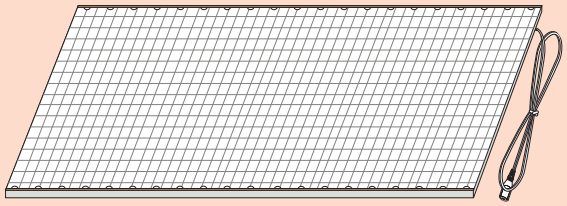
Standard 2

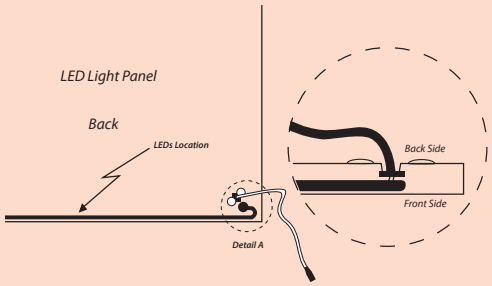




Power cord exits from the middle of each long side for Lumisheet longer than 6 ft

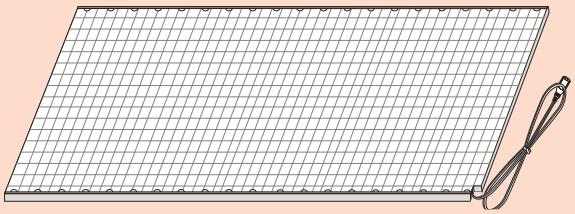
Option 1

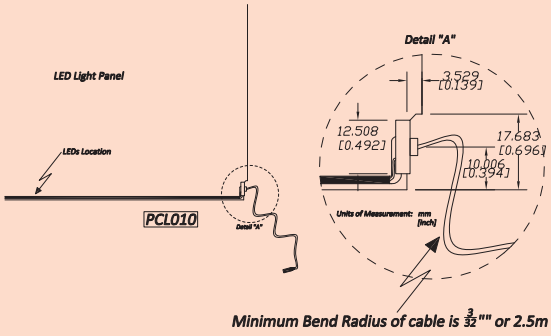




Power cord exits from the back side of Lumisheet

Option 2





Recessed (notched) power cord exits

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PHOTO

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Dimming Options

DIMMING OPTION 1: INLINE PLUG AND PLAY DIMMING SOLUTION

SENSOR DIMMER REMOTE

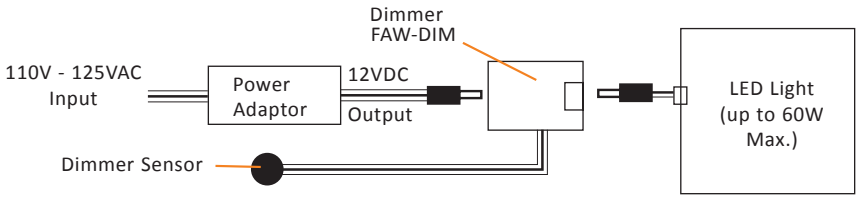
DIMMER

- REMOTE CONTROL MAINTAINS LAST SETTING MEMORY
- 60W PLUG & PLAY IR DIMMER

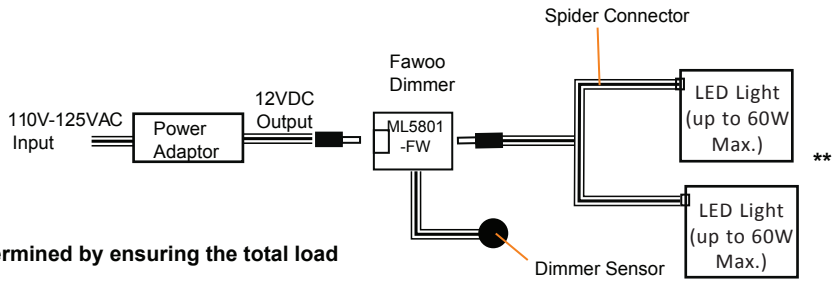
ADVANTAGES:
- PLUG AND PLAY: NO EXTRA WIRING REQUIRED
- REMOTED CONTROL WITH ON/OFF FUNCTION

DISADVANTAGES:
- 10% UP/DOWN DIMMING
- CAN CONTROL ONLY UP TO 60W
- DIMMING SETUP IS NOT RETAINED IN MEMORY AFTER POWER OFF
- CAN NOT BE CONTROLLED BY HOUSEDHOLD SLIDE/DIAL DIMMERS

Single Panel Wiring



Multiple Panel Wiring



**** Maximum number of light panels is determined by ensuring the total load of all panels is less than 60 watts.**

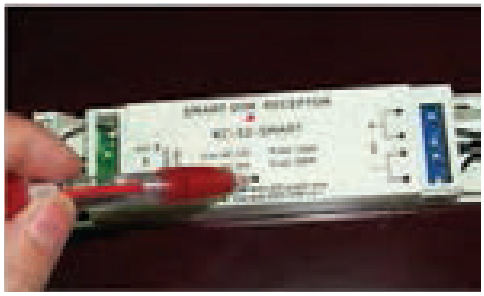
NOTE: ALL POWER ON/OFF OPERATIONS MUST BE PERFORMED USING THE REMOTE CONTROL IN ORDER TO MAINTAIN LAST SETTING MEMORY. THE LAST SETPOINT WILL BE RETAINED FOR POWER-UP PROVIDED THE RE-CONNECTION OF THE 12VDC INPUT POWER. THE DIMMER MODULE RESETS ITSELF TO 100% OUTPUT.

Dimming Options

DIMMING OPTION 2: RADIO FREQUENCY (RF) REMOTE CONTROLLED DIMMING SOLUTION

DIMMER

REMOTE



KC-32-SMART DIMMER

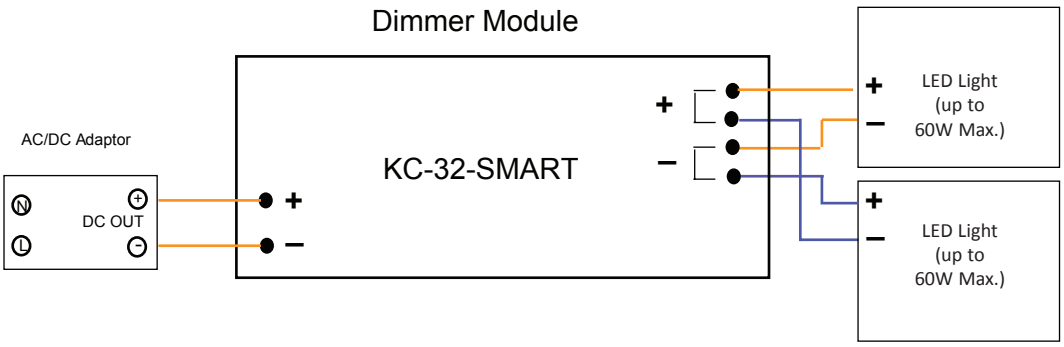
- 30 -10% BRIGHTNESS CONTROL. 256 LEVELS
- 12V DRIVEN, 2 CHANNEL OUTPUT, MAX 5A (60W) EACH CHANNEL
- MULTI GROUP CONTROL

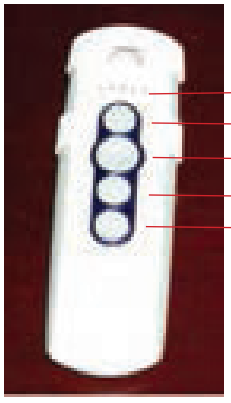
ADVANTAGES:
- EASY WIRING WITH REMOTE CONTROL PAD
- MAXIMUM 120W (2 CHANNEL TOTAL)
- DIMMING SETUP IS MEMORIZED AFTER POWER OFF

DISADVANTAGES:
- CAN NOT BE CONTROLLED BY HOUSEHOLD DIMMERS

The remote control pad can be set to control up to 5 different Groups (CH-Channels) of dimming modules. There is a “CH” button on the remote control pad which is used to select the dimming group to be controlled and 5 LED identifies which indicates the current group (CH) selected.

For example, there are 6 LED lights in a room, to all 6 lights at the same time, they should be in the same group (CH #1). But you can select 2 lights to be in CH#1, and the other 4 lights to be in CH#2, #3, #4, #5, respectively.
In this case, you can operate (dim) the 2 lights in CH#1 independently of others. For example, dim the 2 lights in CH#1 to 50%, turn the light in CH#2 off while maintaining the rest all on at 100% with one remote control. The 2 lights in CH#1 have to be wired to 1 dimming module, and the other 4 lights have to be wired to 4 different dimming modules independently.





KDD-DIM-L01 REMOTE CONTROL PAD

The remote control pad has to be initially synchronized with the dimming modules to be controlled. Follow the steps below for synchronization:
Step 1: Connect DC12V power supply to the input of KC-32-SMART dimming module, and connect the outputs of the dimming module to LED lights. The total wattage of each channel must be less than 60W.
Step 2: Press the“CH” button on the remote control pad to select the group (CH#1 for example). The LED indicator on the remote control pad indicates which group is selected.
Step 3: Use a pen or pencil to push and hold the recessed push button on the dimming module as shown below (Picture 2) while at the same time pressing the “B+” button on the remote control pad until the “RED” indicator light on the dimming module stops flashing.
Step 4: Release the pen, and press “B-“ on the remote control . If the LED lights connected dim down, it means the synchronization is completed successfully.
Step 5: If you have more dimming modules in the same group, repeat step 1-4 above while keep the CH# unchanged.
Step 6: If you have more groups in a system, change the “CH” number and repeat step 1-4 above.

Dimming Options

DIMMING OPTION 4: DIMMING MODULE SOLUTION

SWITCH

DIMMER

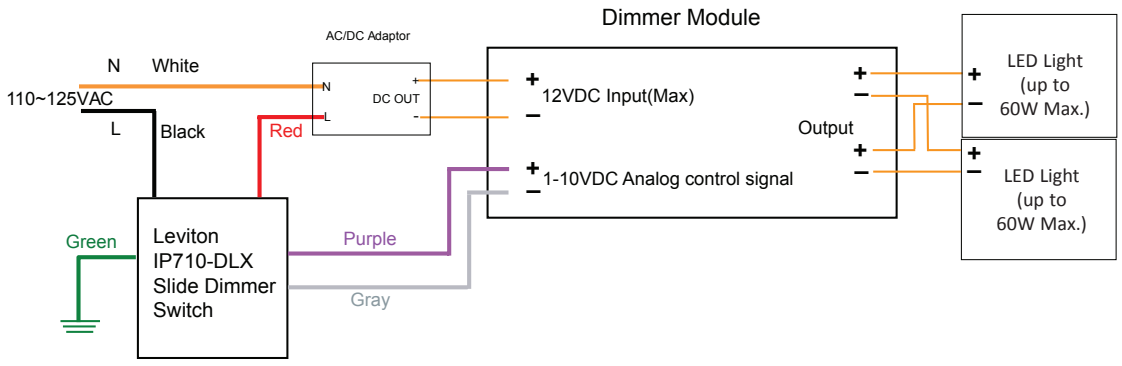
Class 2

XITANIUM™ DIMMER

- 0 - 10V DIMMING CONTROL
- UL CLASS2
- MAXIMUM 60W AT 12VDC INPUT
- IP 66

ADVANTAGES:
- MOOTH AND CONTINUOUS DIMMING BETWEEN 0% - 100% USING 0 - 10V WALL MOUNT SLIDE DIMMER

DISADVANTAGES:
- HARD WIRING REQUIRED
- MAY NOT BE SUITABLE FOR LARGE SCALE SYSTEMS (BECAUSE OF MASSIVE WIRING REQUIRED)



**The maximum number of dimmer modules in parallel is determined by the load rating of the dimmer switch and the maximum power output of the DC power supply.
**Control multiple panels/bars with one power supply and one slide/dial dimming module. The total power consumption (wattage) of the panels/bars to be controlled must be less than the wattage of the 12VDC power supply.
**This dimmer option is tested to work with the Leviton IP710-DLX slide switch. DLC does not guarantee that this dimmer module works with other dimming switches. It is the responsibility of the end user to test and ensure proper operation of any dimming switch that has been substituted for the unit specified.
**DLC accepts no responsibility for the dimmer and/or module performance if design changes are incorporated by the end user
**The Dimmer module will default to 100% output if the 0-10VDC Input control signal is removed or not connected

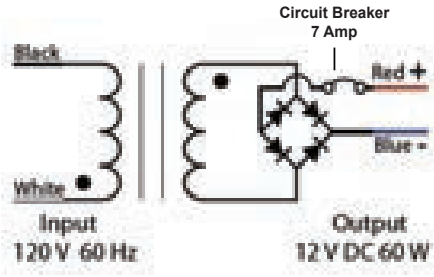
Dimming Options

DIMMING OPTION 6: DIMMABLE MAGNETIC TRANSFORMER SOLUTION

SWITCH

DIMMER

Class 2



PA-60W(MAG) M60L12DC DIMMER

- 60W/150W DIMMABLE MAGNETIC TRANSFORMER WITH DC 12V OUTPUT
- ETL CERTIFIED, CLASS 2 (60W ONLY)
- COMPATIBLE WITH MOST LUTRON MAGNETIC LOW VOLTAGE WALL MOUNT DIMMER

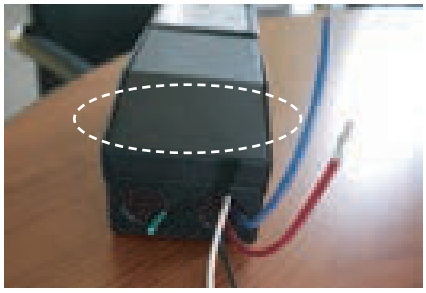
ADVANTAGES:
- SIMPLIFIED WIRING, ESPECIALLY FOR LARGE SCALE SYSTEMS

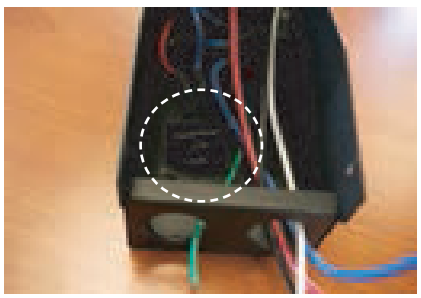
DISADVANTAGES:
- SIZE AND WEIGHT

ENCLOSURE:
• ENCLOSURE TEMPERATURE WILL NOT EXCEED 70 °C @ 40 °C AMBIENT.
• WIRING COMPARTMENT HAS 2 KNOCKOUTS SIZED FOR 3/4 INCH SCREW CABLE CONNECTORS.
• THE REMOVABLE COVER FOR THE WIRING COMPARTMENT IS SECURED IN PLACE BY A SCREW.
• THE ENCLOSURE IS BLACK POWDER COATED.

WIRE TYPE:
• INPUT LEADS ARE 20 AWG.
• OUTPUT LEADS ARE 14 AWG. LEAD INSULATION IS 105 °C.
• THE TRANSFORMER USES A CLASS B 130 °C INSULATION SYSTEM.

SPECIFICATION:	
Maximum Load	60W
Input Voltage	120V 60Hz
Output Voltage Full Load	11.5VDC
Input Current Full Load	540 mA
Open Circuit Volts	12.5 VDC
Output Current Full Load	4.8 A
Protections	Overload
	Over Current
	Short Current
Efficiency	89.20%
Coil Former	Double Section Bobbin
Thermal Class	B 130 °C
Leads Primary	PVC 600 V #20
Leads Secondary	PVC 300 V #14
Dimensions in inches	6.06" (L) x 2.59" (W) x 2.20" (D)





How to reset circuit breaker

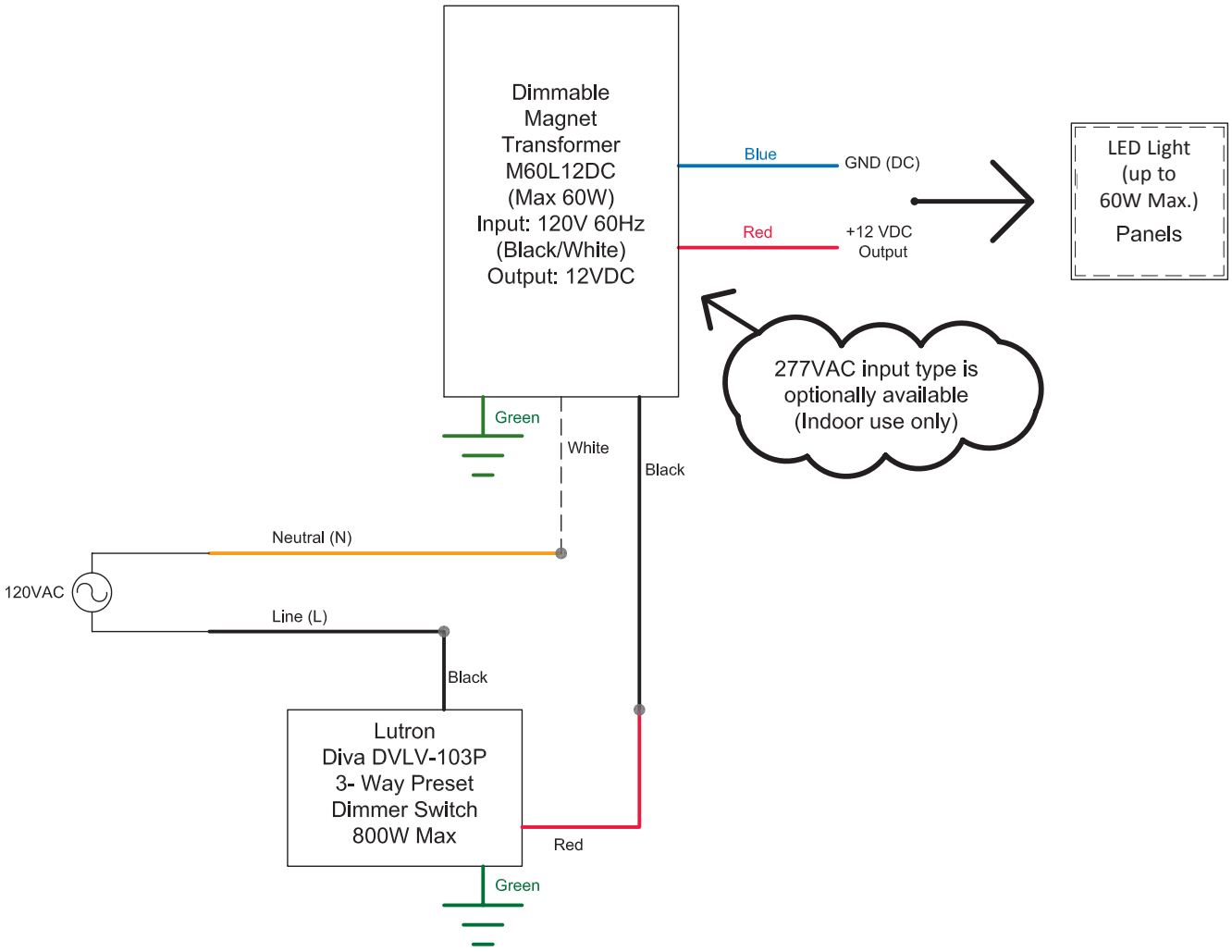
In the event of a short circle, overload, or over current the circuit breaker located inside the transformer enclosure will be tripped in order to protect equipment. Please follow the steps below to reset circuit breaker:

Step 1: Disconnect transformer from power.
Step 2: Open transformer enclosure by lifting up he enclosure open.
Step 3: Locate 20 amp circuit breaker shown below.
Step 4: Reset by flipping switch on circuit breaker.
Step 5: Close lid on the enclosure and connect back to power

Brand	Type	Dimmer	Control	Watts
Lutron Ariadni	AYLV-600P	Magnetic Low Voltage	Single Pole	450W
Lutron Ariadni	AYLV-603P	Magnetic Low Voltage	3-Way	450W
Lutron Nova	NTLV-600	Magnetic Low Voltage, Small Control	Single Pole	450W
Lutron Nova	NTLV-1000	Magnetic Low Voltage, Small Control	Single Pole	800W
Lutron Nova	NTLV-603P	Magnetic Low Voltage, Small Control	Single Pole/3-Way	450W
Lutron Nova	NTLV-1003P	Magnetic Low Voltage, Small Control	Single Pole/3-Way	800W
Lutron Nova	NLV-600	Magnetic Low Voltage, Small Control	Single Pole	450W
Lutron Nova	NLV-1000	Magnetic Low Voltage, Large Control	Single Pole	800W
Lutron Ceana	CNLV-603P	Magnetic Low Voltage	3-Way	450W
Lutron Diva	DVLV-103P	Magnetic Low Voltage	3-Way	800W
Lutron Diva	DVSCLV-103P	Magnetic Low Voltage	3-Way	800W

DIMMING OPTION 6:

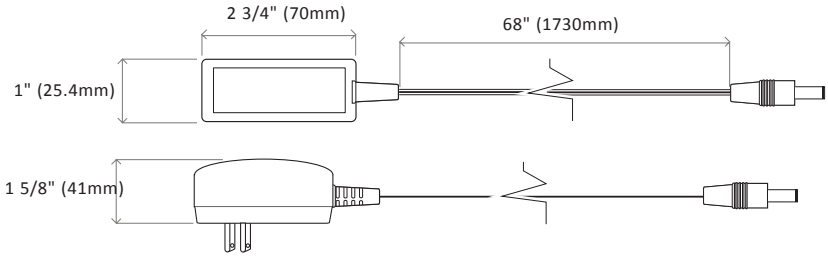
Standard Configuration



Plug-In Power Adaptor

Power Supply (DSA-12G-12FUS)

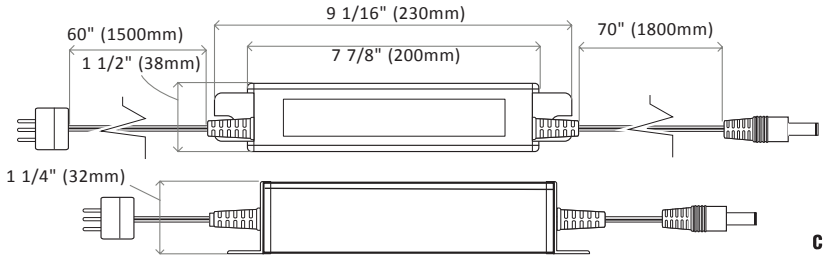
12 Watt Plug-In Power Supply; Input Voltage: 110AC - 240AC



Power Supply (PA-60W-i5)

Class 2

60 Watt Plug-In Power Supply; Input Voltage: 110AC - 240AC

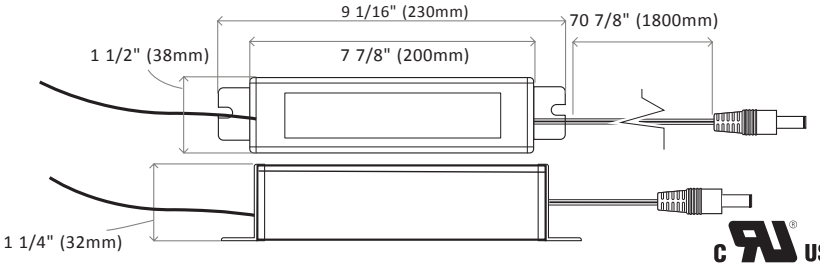


Hardwire Power Adaptors

Power Supply (PA-60W-HW)

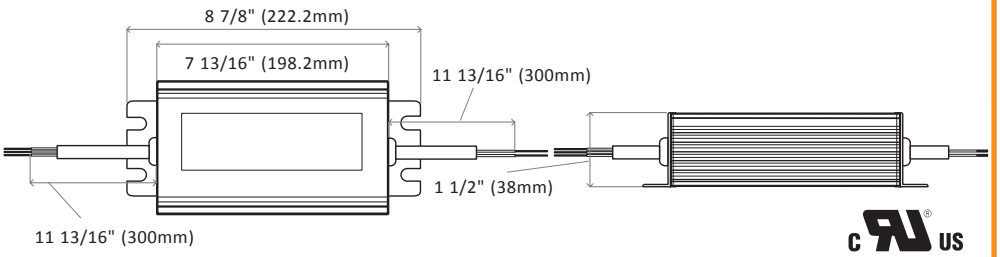
Class 2

60 Watt 12V Hardwire Power Supply ; Input Voltage: 110AC - 240AC



Power Supply (PA-150W-HW)

150 Watt 12V Hardwire Power Supply ; Input Voltage: 110AC - 240V AC, IP65 Outdoor Rated

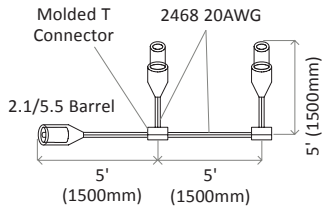


1393 South Santa Fe Dr., Denver, CO 80223, USA | Toll Free: 1-888-887-2980 | www.Evo-Lite.com

General Information For Spider Cables

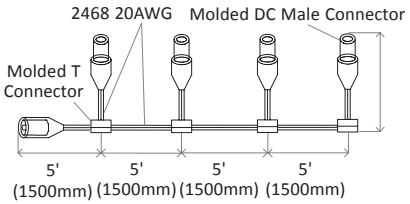
PL-2

2-Way Long Spider Cable



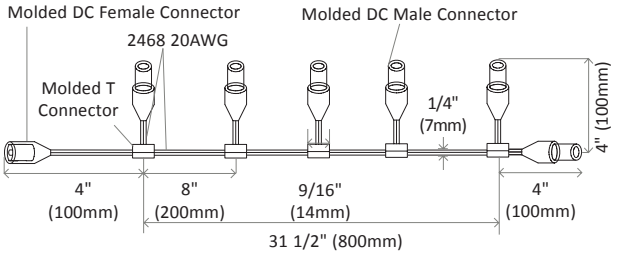
PL-4

4-Way Long Spider Cable



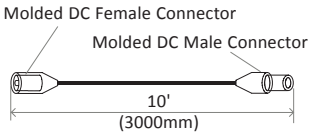
PS-6

6-Way Short Spider Cable



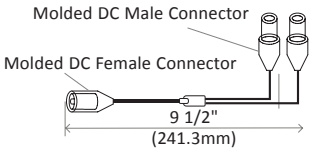
EX10

10' Extension Cable



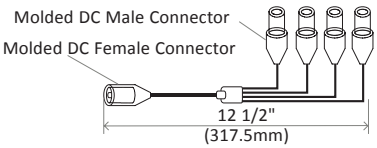
PS-2

2 Way Short Spider Cable



PS-4

4-Way Short Spider Cable



Order Information

LumiSheet - LED Light Panel

Series #	-	Size Length x Width (inch/mm)*	-	Color Temperature	-	Illuminated Face Option	-	Cable Length	-	LED Location
LLP 12 8mm 12V	-	**CS** - Custom shape (drawing may be required)	-	**WW** - Warm White 3000K - **NW** - Neutral White 4100K - **CW** - Pure/Cool White 5300K * - **CWHO** - Pure/Cool White 5300K High Output	-	**SFI** - Single face* - **DFI** - Double face	-	**WL15** - 5' (1500mm) power cord with 2.1/5.5mm barrel plug* - **WL30** - 10' (3000mm) power cord with 2.1/5.5mm barrel plug	-	**L1** - LED along 1 long edge - **L2** - LED along 2 long edges* - **S1** - LED along 1 short edge - **S2** - LED along 2 short edges - **S4** - LED along All 4 edges - **CI** - Custom Illumination

** Denotes standard configuration of rectangular or square light panel **Standard configuration for all Double sided panels is to use CWHO - Cool White 5300K high output LEDs*

Series #	-	Size Length x Width (inch/mm)*	-	Color Temperature	-	Illuminated Face Option	-	Cable Length	-	LED Location
LLP12	-	24" x 36"	-	CW	-	SFI	-	WL15	-	L2

PRODUCT OVERVIEW

LIGHT PANEL INTEGRATION SPECIALISTS

LumiSheet™

LED Light Panel

CUSTOMIZABLE
// Available in custom sizes & shapes
// Can be used in "frameless" designs

BIGHT & EVEN ILLUMINATION
// 3D V-Cutting technology
// High brightness (2,000 - 10,000 LUX)
// Superior consistent light quality

LONG LIFESPAN
// Patented heat sink technology to maximize LED lifespan (70,000 hours)

ENERGY EFFICIENT
// Low power consumption (70% less than fluorescent)
// Energy saving and maintenance free

WARRANTY
// Advanced 3-year warranty

PERFECT BACKLIGHTING SOLUTION

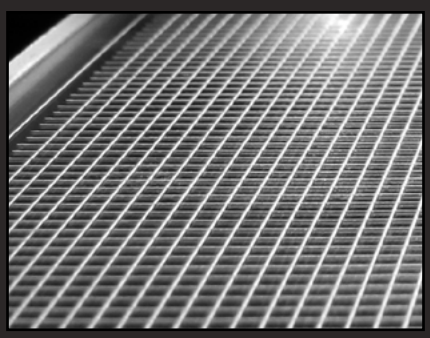
LumiSheet™ is designed to emit a bright, even output of light across the entire surface of the panel. Unlike traditional light panels, which have the light source mounted on the exterior of the LGP (Light Guide Plate), LumiSheet™ integrates high brightness LEDs and the heat sink into our exclusive 3D V-cutting LGP which makes it possible to produce "frameless", rectangular or special shaped LED light panels for various application needs.

INTEGRATED HIGH QUALITY LEDS

LumiSheet™ integrates high quality 12V, constant voltage LEDs into the perimeter of the LumiSheet™ panel without the use of rigid frame materials. This process allows the LEDs to conform to almost any shape.

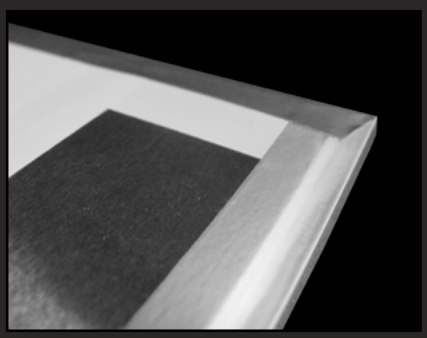
3D V-GROOVE LIGHT GUIDE PLATE (LGP)

LumiSheet™ utilizes crystal clear acrylic combined with a patented 3D V-groove etched grid pattern that provides even illumination to almost any shape imaginable.



INTEGRATED THERMAL MANAGEMENT

All LEDs create heat which is detrimental to their life span. LumiSheet™ implements a patented technology which integrates the heat sink into the LGP that is easily conformable which allows for customizable shapes.



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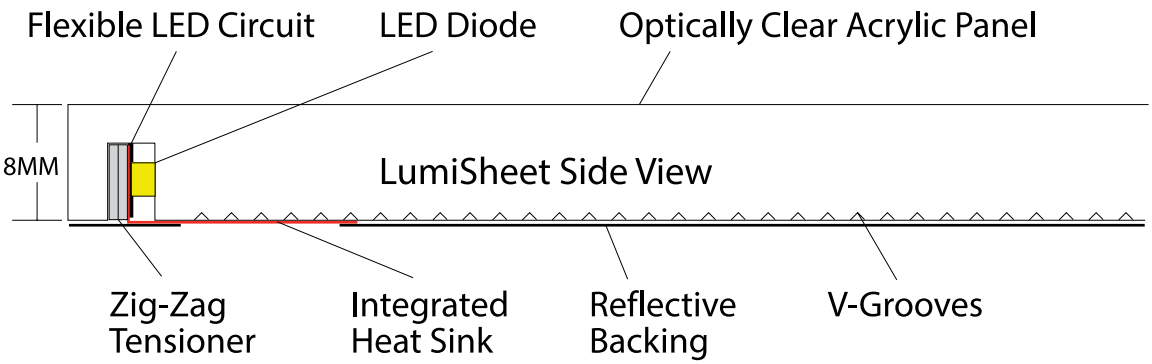
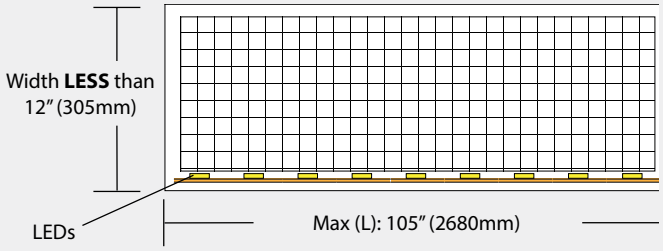
PROFILE OF LUMISHEET

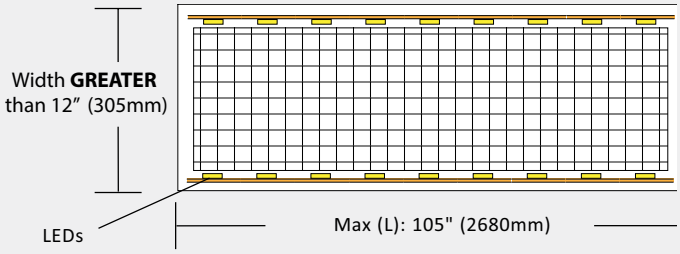


LED LIGHT LOCATIONS

LED LIGHT ALONG 1 EDGE

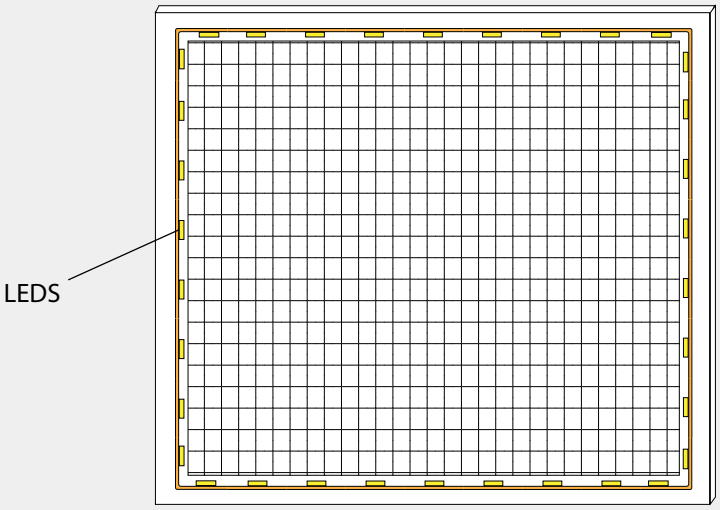


LED LIGHT ALONG 2 EDGES



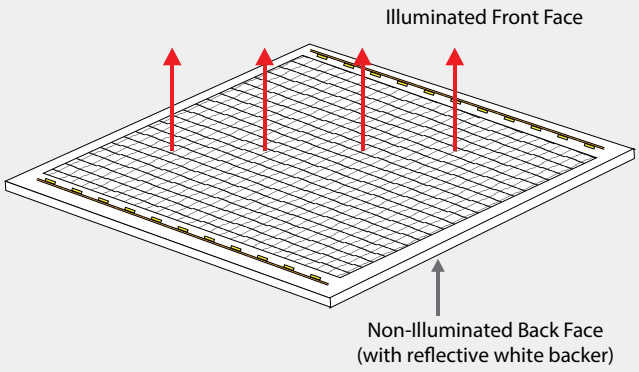
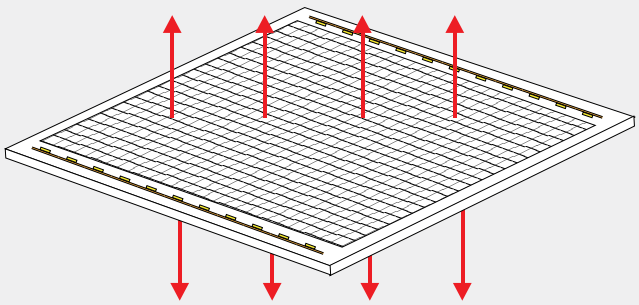
LED LIGHT ALONG ALL 4 EDGES

FOR SQUARE PANELS
For example: 36" x 36" or 48" x 48



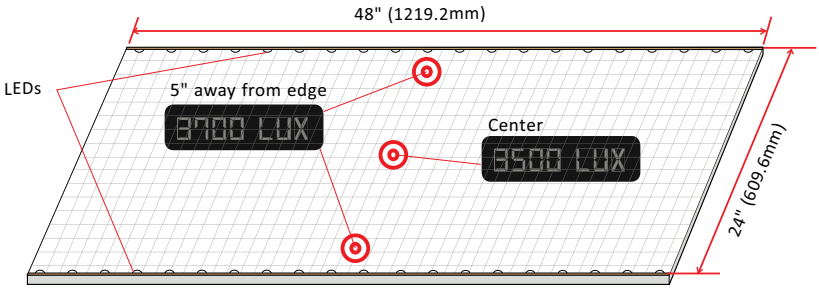
**This is only recommended for when panels are "nearly" square. It is not recommended for long narrow panels.

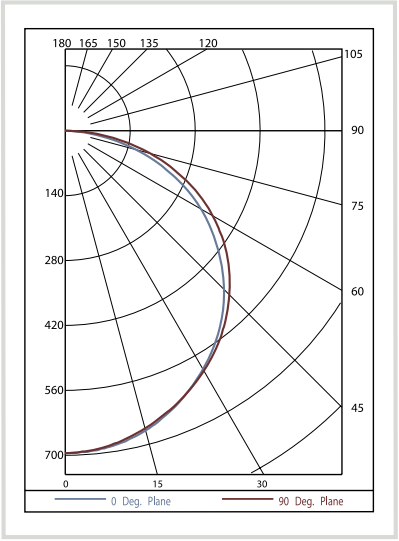
ILLUMINATED FACE OPTIONS

SINGLE FACE ILLUMINATION (STANDARD)	DOUBLE FACE ILLUMINATION (OPTION)
	 Both Front and Back Face Illuminated (no reflective white backer)

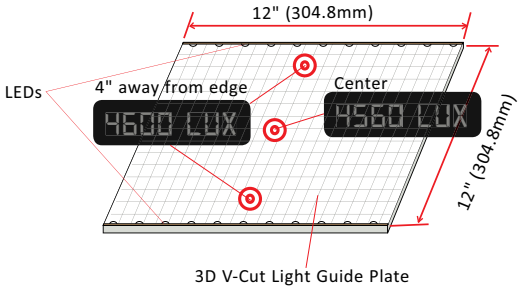
TYPICAL SURFACE BRIGHTNESS MEASURE

24" x 48" LumiSheet with high output 5300K LEDs lit along edges (40W)

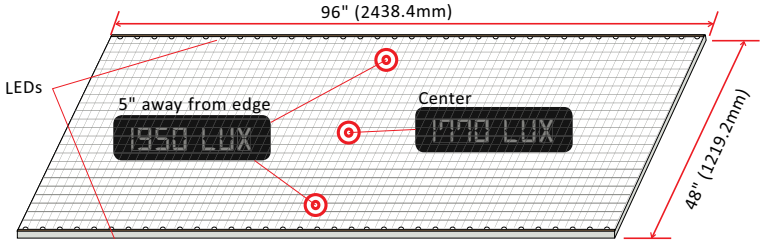




12" x 12" panel with regular 5300K LED lit along 2 edges (8W)



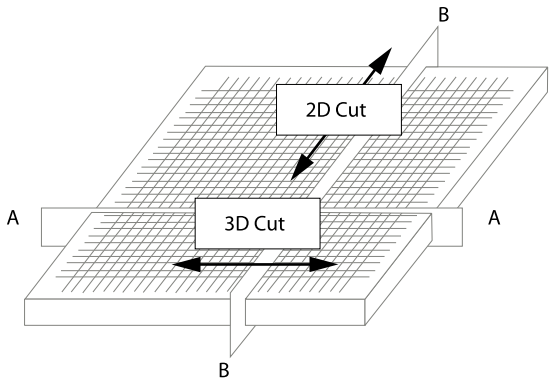
48" x 96" LumiSheet with high output 5300K LEDs lit along 2 long edges (80W)



*Brightness readings are for reference only. Actual reading may differ for different LEDs, LGPs or even different meters.

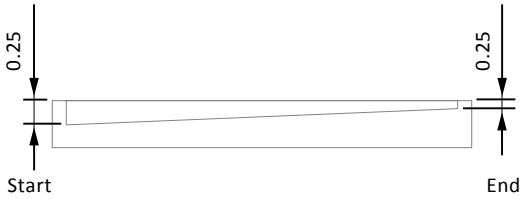
3D V-CUTTING TECHNOLOGY

A significant advantage to LumiSheet™ lies in the production of the Light Guide Plate (LGP). Sourced for its rigidity and light transmission properties, an optical grade PMMA acrylic is etched with multiple grooves using patented 3D V-cutting technology to create a uniform matrix. This etched matrix acts as a vehicle to transport light from the unit's embedded LEDs across the entire surface of the panel to deliver homogeneous illumination.

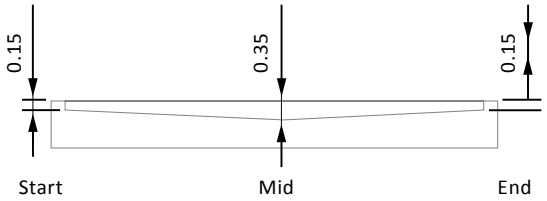


Section A-A

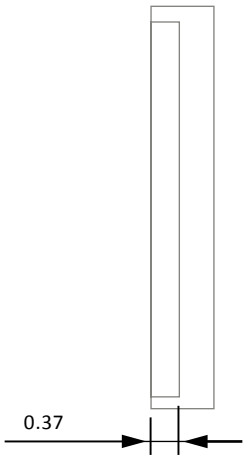
1 Side LED



2 Sides LED



Section B-B



3D V-cutting technology ensures that light is evenly reflected throughout the surface of the acrylic Light Guide Plate (LGP) by making grooves on the LGP at specific intervals according to the location of the light source and the direction of irradiation. The vertical V-grooves are widely spaced when they are close to the light source, but narrowly spaced when they are farther away from the light source. The horizontal V-grooves gradually grow wider and deeper as their distance from the light source increases. Therefore, the brightness of the front surface of the LGP is able to remain uniform.

SPECIFICATIONS

ELECTRICAL				
Input Voltage	12 Volt DC - Constant Voltage			
Power Consumption	4.0 Watts/ft (Standard LEDs)	5.0 Watts/ft (High Output LEDs)	5.0 Watts/ft (White Adjustable LEDs)	4.5 Watts/ft (RGB LEDs)
Wire Size	20 AWG 2 wire (Standard/HO LEDs)	20 AWG 3 wire (White Adjustable LEDs)	22 AWG 4 wire (RGB LEDs)	
Wiring	Each panel must have direct connection to power supply. Do not wire panels in series.			
***Connector**	2.1/5.5mm barrel plug (Standard/HO LEDs)	3 pin molex (White Adjustable LEDs)	No connector (RGB LEDs)	
Certification	UL / cUL (E334549)			

PHYSICAL					
Color Temperature	Warm White approx. 3000K	Neutral White approx. 4100K	Pure/Cool White approx. 5300K	White Adjustable 3000K - 6500K	Color Adjustable **RGB
Mounting Examples	Wall mounted with screws, Z-clips, U-channel, mirror clips or standoffs				
Operating Temperature	-30˚C (-22˚F) ~ +40 °C (+104 °F)				
Environment	Dry location (Standard)				
Thickness	***8MM (Standard), 6MM and 10MM also available depending on application				
Minimum Size	2”W x 2”L x 5/16” D (50mm x 50mm x 8mm)				
Maximum Size	59”W x 118”L x 5/16”D (1499mm x 2997mm x 8mm)				
Weight	1.95 lbs/sq. ft.			9.54 kg/sq. M	

STANDARD PLUG-IN POWER ADAPTORS			
Power Adaptors	12V DC, 1A, 12W, UL listed	12V DC, 5A, 60W UL class 2 listed	
Spider Cables	PL-2: 2-way long spider cable	PL-4: 4-way long spider cable	PS-2 / PS-4 / PS-6: 2/4/6-way short spider

STANDARD HARDWIRE POWER ADAPTORS		
Power Adaptors	**PA-60W-HW** 60W 12V Hardwire power adaptor Input 110V AC ~ 240V AC	**PA-150W-HW** 150W 12V Hardwire power adaptor Input 110V AC ~ 240V AC
Dimming & Controls	Refer to dimming & control options	

* Standard 5', Optional 10' **See RGB product line for more details ***Please consult an Evo-Lite™ sales engineer if a thickness other than 8MM is desired

Color Temperature: *Warm White 3000K* · *Neutral White 4100K* · *Pure / Cool White 5300K* · *White Adjustable 3000K - 6500K* · *Color Adjustable RGB*

BRIGHTNESS & POWER CONSUMPTION REFERENCE

SIZE (INCH)	SIZE (MM)	LED STRIP	*AVERAGE SURFACE BRIGHTNESS (LUX)	POWER CONSUMPTION (W)
6 x 6	150 x 150	1 side	5,000 (DL)	2.0
12 x 12	300 x 300	1 side	3,500 (DL)	4.0
24 x 24	600 x 600	2 sides	2,800 (DL)	15.0
36 x 36	900 x 900	2 sides	2,000 (DL)	23.0
48 x 48	1200 x 1200	2 sides	1,800 (HO)	40.0
48 x 96	1200 x 2400	2 sides	1,800 (HO)	80.0
Ø 6	Ø 150	all around	17,000 (DL)	5.8
Ø 12	Ø 300	all around	11,000 (DL)	11.2
Ø 24	Ø 600	all around	4,500 (DL)	24.0
Ø 36	Ø 900	all around	3,000 (DL)	36.0
Ø 48	Ø 1200	all around	2,200 (DL)	48.0

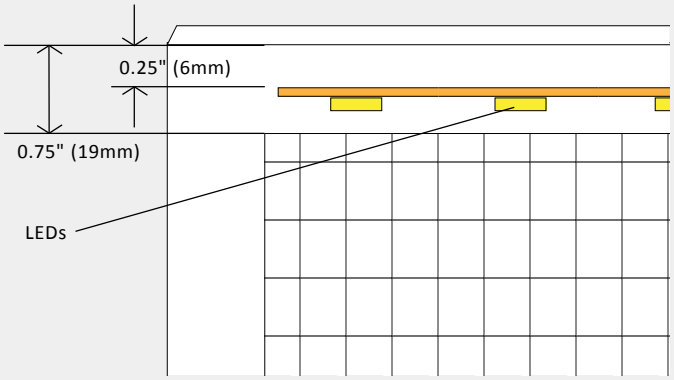
*Brightness data was measured from Jan. to Aug., 2009. "DL" denotes regular LEDs. "HO" denoted high output LEDs.

INSTALLATION TIPS

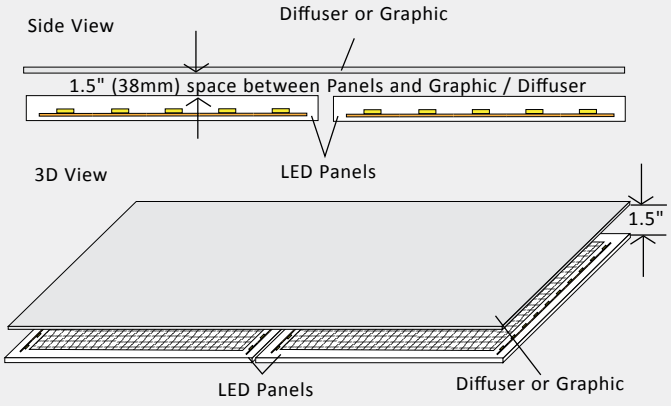
PRODUCT INTEGRATION ADVISORY

The use of adhesives of any type for the bonding of materials to LumiSheet or any other light guide product is strongly discouraged. Direct bonding can result in visual anomalies. Be sure to remove clear protective film before installation.

SINGLE PANEL



MULTI-PANEL

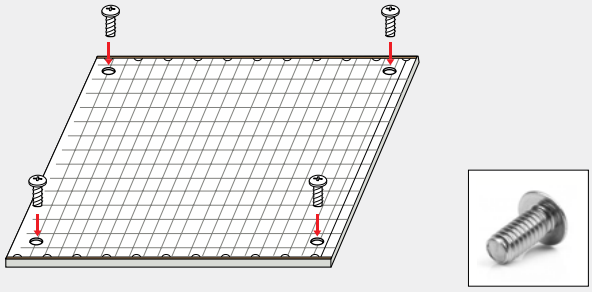


LEDs are typically installed along a groove 0.25" away from the edge. The hot spots created by the LEDs can be managed in many ways. We recommend testing the material to be backlit in order to determine if diffusion is necessary.

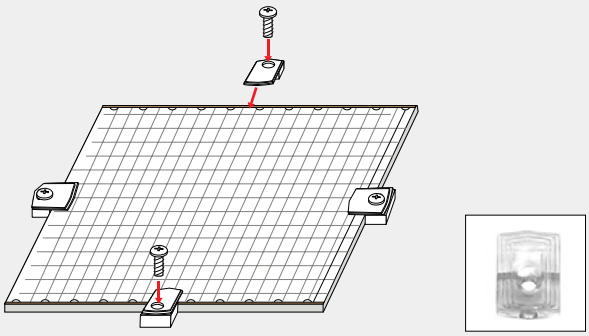
When placing panels side by side to create a larger illuminated area, you may see a bright line (LED illuminated edge) or dark line (non-illuminated edge) where they meet. These areas show differently depending on the overlay material being used. We recommend testing the material to be backlit in order to determine if additional diffusion or space is necessary.

SURFACE MOUNTING EXAMPLES

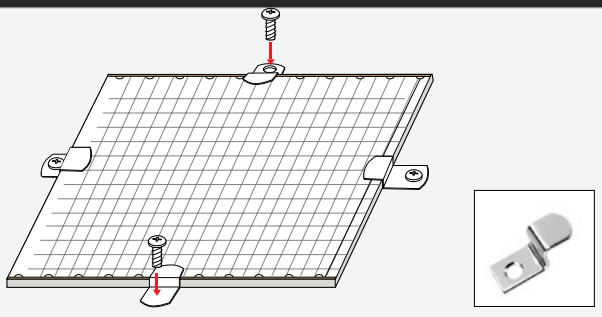
OPTION 1
Screw mounting with pre-drilled holes



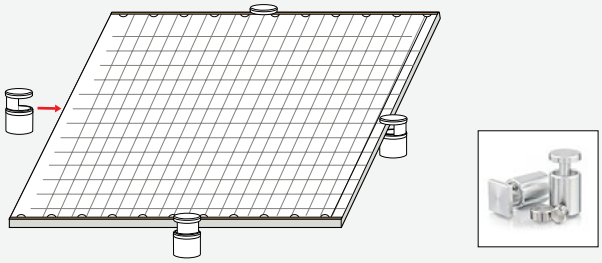
OPTION 2
Mounting with mirror clips



OPTION 3
Mounting with Z-clips

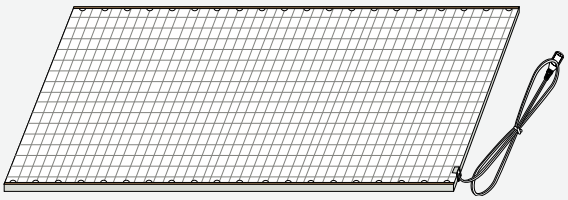


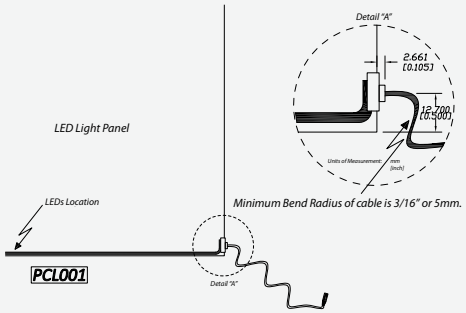
OPTION 4
Mounting with standoffs



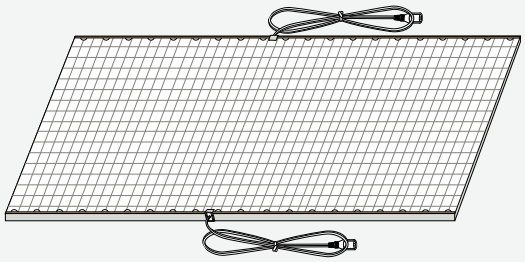
TYPICAL POWER EXITS

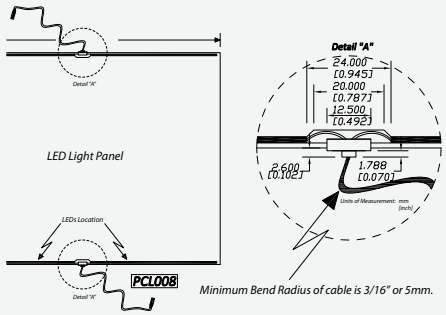
STANDARD 1
Power cord exits from short side (edge) corner (standard)



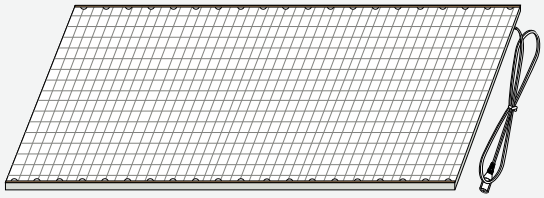


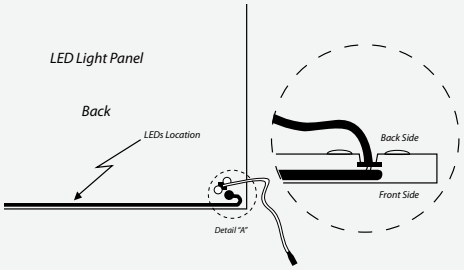
STANDARD 2
Power cord exits from the middle of each long side for LumiSheet longer than 6ft



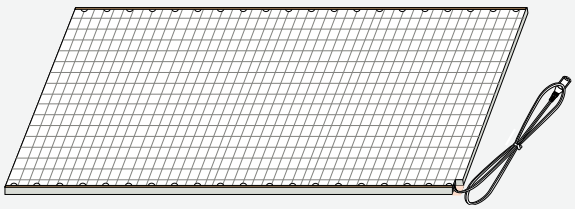


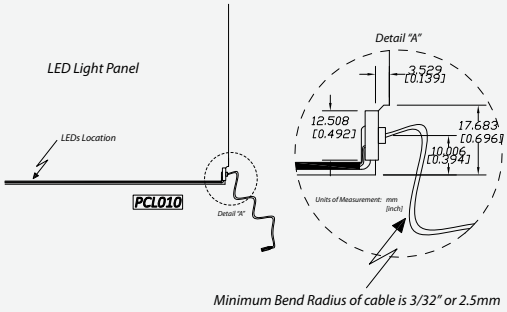
OPTION 1
Power cord exits from the back side of LumiSheet





OPTION 2
Recessed (notched) power cord exits





LIGHT PANEL INTEGRATION SPECIALISTS

Evo-Lite, LLC

1393 S. Santa Fe Dr. Denver, CO 80223

Main Phone: 303-996-2980
Toll Free: 1-888-887-2980
E-mail: info@Evo-Lite.com
URL: www.Evo-Lite.com

TERMS & CONDITIONS

Be sure to familiarize yourself with Evo-Lite's **Terms & Conditions**.
By ordering from Evo-Lite, the purchaser agrees to all **Terms & Conditions**.

PATENTS

LumiSheet™ PATENTS

USA: 7473022
CANADA: 2,626,448
JAPAN: 4427528
CHINA: ZL 200610085027.0
TAIWAN: 312899
SINGAPORE: 141901
SOUTH AFRICA: 2008/03676
EUROPEAN UNION: 1,780,584
(Germany, UK, France, Italy, Spain, The Netherlands, Belgium, Sweden, Austria, Poland, Denmark, Greece, Ireland, Finland, Portugal, Czech Republic, Hungary, Romania, Slovakia, Bulgaria, Switzerland, Luxembourg, Slovenia, Turkey, Latvia)

V-CUTTER FOR AN LCD LIGHT GUIDE PANEL

USA: 6619175
JAPAN: 3500466
TAIWAN: 155175

A LIGHT GUIDE PANEL WITH SALANT LIGHT GUIDING PARTS

USA: US 7,018,087 B2

PIN KIT FOR V-CUTTER

KOREA: 10-0552589, 10-0557738, 10-0557741, 0540055, 0540053, 10-0772921, 10-0716543, 10-0565890, 10-0753963, 10-0643604, 10-0736656, 10-0748074, 10-0748073, 10-0762741,
USA: 6792842
JAPAN: 3463060
EU: 1335817
CHINA: ZL 01818623.8
TAIWAN: 163820

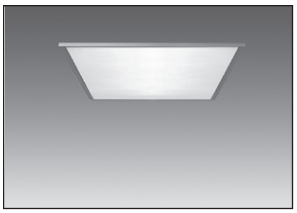
c UL us LISTED

RL3A

LIGHT FIELDS™ LED

LED
3000K, 3500K or 4000K

Recessed **1' x 1'**



Applications: LIGHT FIELDS™ LED offers flexibility in innovative office lighting. The Micro-Pyramidal Optic (MPO) produces an unusually brilliant lighting quality without glare or reflections on computer screens. Use not just in offices but for healthcare, retail, conference rooms, corridors and reception areas.

online
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Type: _____ **Quantity:** _____ **Project:** _____

LED

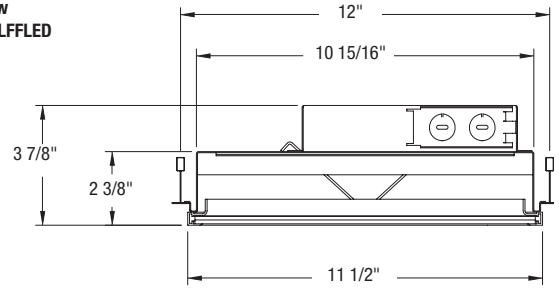
LFULED-11-20-K40-MP-DH2-WF

FIXTURE/CEILING TYPE	LENGTH	WATTAGE	CCT (K)	OPTIC	DRIVER	OPTIONS
LFULED LIGHT FIELDS™ LED 15/16" Lay-In, Flush 9/16" Slot-Grid, Flush 9/16" Lay-In, Tegular **LFFLED** LIGHT FIELDS™ LED 9/16" Lay-In, Flush **LFTLED** LIGHT FIELDS™ LED Center of Tile Mounting White LED **Typical Ra / R9 Values** 85CRI 10.7R9	**11** 1' x 1'	**20W** 20W 1300lm +/- 5% **24W** 24W 1600lm +/- 5% **CCT Multiplier for Lumen Output** 3000K 0.97 3500K 1.00 4000K 1.08	**K30** 3000K **K35** 3500K **K40*** 4000K * 4000K requires longer lead time 3.5-step MacAdam, +126K/-50K @ 3000K,+75K/-168K @ 3500K, +110K/-165K @ 4000K initial color binning	**MP** Micro-Pyramidal Diffuser	**DU** Standard 0-10V Universal Dimming Driver 120/277V **DH_*** Lutron HiLume A Series ** Specify " 1" for 120V or " 2" for 277V.*	**WF** Whip Flex 3/8" X 6' 14 AWG **WN_*** Whip Flex 3/8" X 6' 14 AWG (NYC) **CP**** Chicago Plenum **F** Fusing **PF** Concealed Ceiling Plaster Frame Kit, Flangeless Appearance *(can only be ordered with LFU fixtures)* **EM_*** Standby Battery Pack, 750 lm, 10W **WS105_*** WattStopper Super High Frequency Sensor FM-105 ** Specify " 1" for 120V or " 2" for 277V.* *** Chicago Plenum option not available for Sheetrock Ceiling*

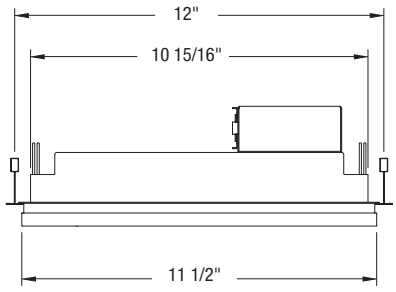
To order Plaster Frame Kit for sheetrock ceilings, select "PF" in the fixture options, along with the following:

LF11PF1 Concealed Ceiling Plaster Frame Kit, Flangeless Appearance, 1 Luminaire

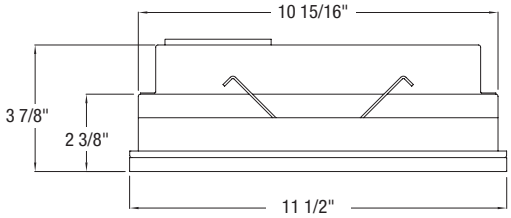
Side View
LFULED/LFFLED



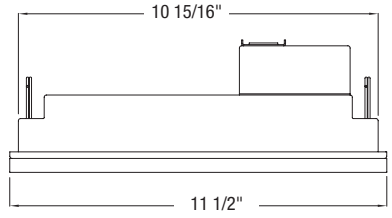
End View
LFULED/LFFLED



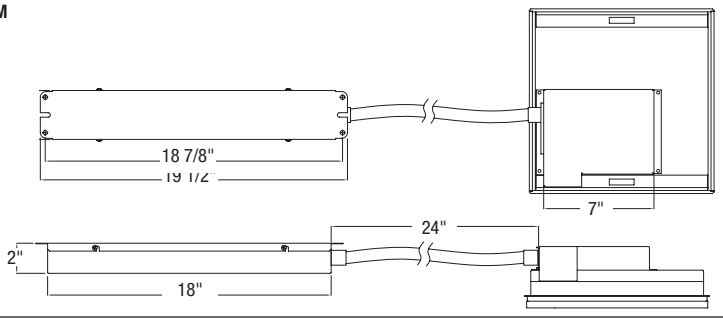
Side View
LFTLED



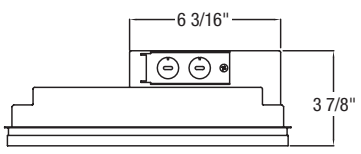
End View
LFTLED



Side View with EM



Top View with EM



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COMPANION LUMINAIRE OPTIONS	FIF #
2x2 LIGHT FIELDS™ LED – Recessed	1053
1x4 LIGHT FIELDS™ LED – Recessed	1050

COMPANION LUMINAIRE OPTIONS	FIF #
2x2 LIGHT FIELDS™ LED – Surface Mount / Suspended	1054
1x4 LIGHT FIELDS™ LED – Surface Mount / Suspended	1051

Descriptions

C US

IC-Rated

IBEW Union Made

Suitable for damp locations
NYC Approved

RoHS

ALL COMPONENTS REACH COMPLIANT
Registration, Evaluation and Authorisation of Chemicals

1. Housing – 20 gauge cold-rolled steel housing. Finish is powder-coated white. Post painted.

2. Wattage and CCT – 20W or 24W. Available in 3000K, 3500K or 4000K color temperatures. Initial color binning for LEDs is +126K/-50K @ 3000K, +75K/-168K @ 3500K, +110K/-165K @ 4000K, and potential color shift over the life of the LEDs is +/-50K @ 50,000 hrs.

3. Optics – MPO Micro-Pyramidal optic with seamless look and defined light emission for glare-free light distribution. Frame is extruded aluminum, painted Zumtobel Silver.

4. Driver – Universal voltage 120/277V with integral 0-10V dimming. For non-dimming requirements, order DU driver but do not connect to dimming control during installation. Also available with Lutron A-Series driver.

5. Mounting – Lay-in mounting for typical grid ceilings (LFULED). LFTLED mounting requires grid to be cutout. Fixture is supported by mounting bar attached to housing brackets with screws (by others). LFTLED mounting bracket is designed for 2' ceiling tiles only. Use PF (Plaster Frame kit) with LFULED fixture for sheetrock ceiling installation.

LIGHT FIELDS™ LED recessed can also be mounted into a sheetrock wall using the PF kit if the wall has appropriate spacing available, and blocking will have to be built out. Wall mount not recommended with EM fixtures. Follow PF kit installation instructions.

6. Occupancy Sensor – Option of WattStopper FM-105 occupancy sensor located behind lens. It detects motion via super high frequency (SHF) electromagnetic waves and the Doppler principle. Range sensitivity is up to 20'. Due to the nature of the LIGHT FIELDS™ LED optic and lens, the sensor shadow is visible through the lens.

Compatible with the following remote sensors:
- Philips ActiLume LR11655/00 Daylight and Occupancy Sensor
- Philips ActiLume Classic LRM2320
- Hubbell DLC-7 Daylight Sensor

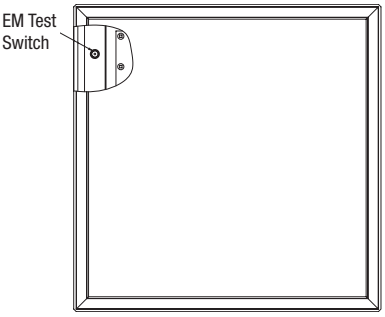
7. Life – 60,000 hours rated life. L70.

8. Standby Battery Pack – Remote standby battery pack with integral test switch. 90 minute run time, provides 750 lm with 10W.

9. MicroBinning™ – Beyond the finer quarter-binning we have already applied to most of our standard LED product lines, we define an even finer color binning (~ 2-step MacAdam) in our LIGHTFIELDS™ LED product by using the MicroBin™ technique from Zumtobel US. We use the LEDs with color coordinates located in diagonal directions within a quarter-bin and mix them on the board level with our own formula. The result is a fine-tuned, tighter overall color output from the luminaire that is much closer to exactly the specified color temperature such as 3500K, 3000K, or 4000K. This technique has been proven to work for all different luminaire sizes such as 2x2, 1x4, and 1x1. Both the color uniformity within a single fixture and the color consistency from fixture to fixture are dramatically increased to a level that the output white light is visually non-discernable from the light coming from a single bin located at the center of a particular color temperature white light.

10. Weight – 6 lbs. with EM 11 lbs.

NOTE: For non-dimming installations, simply cap off the two control wires and connect the hot/neutral and ground as normal.

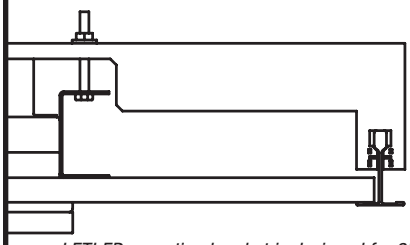


Mounting

Mounting with common ceiling types

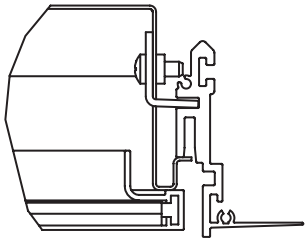
Ceiling (Grid or Block) cannot exceed heights shown in the drawings below.

Grid Installation (LFTLED)

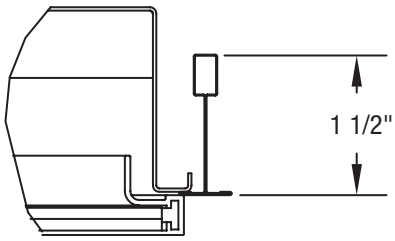


LFTLED mounting bracket is designed for 2' ceiling tiles only.

Plaster Frame Kit (LFULED)



9/16" Lay-In Ceilings (LFFLED)



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Photometric Data

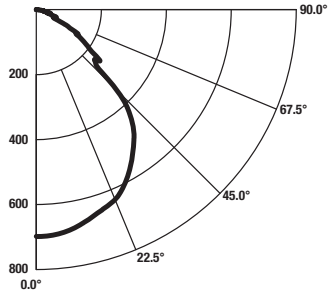
LIGHT FIELDS™ LED, 1x1, 20W, 4000K

Efficacy = 68.3lm/W

Luminance Data (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45°	6772	7301	6774
55°	4485	3101	4504
65°	1877	2253	1898
75°	2160	1447	2177
85°	787	647	938

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	698	698	698	
5°	694	695	695	61.6
15°	660	660	662	186.4
25°	615	603	617	279.6
35°	518	519	520	322.5
45°	349	377	349	268.1
55°	188	130	188	132.0
65°	58	69	58	68.5
75°	41	27	41	31.2
85°	5	4	6	6.6
90°	0	0	1	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	111	107	104	101	109	105	102	99	101	99	96	97	95	93
2	103	97	91	86	101	95	90	85	91	87	83	88	85	82
3	96	87	80	75	93	85	79	74	83	77	73	80	75	72
4	89	79	71	65	87	77	70	65	75	69	64	73	68	63
5	82	71	64	58	81	70	63	58	68	62	57	66	61	56
6	77	65	57	52	75	64	57	51	63	56	51	61	55	51
7	72	60	52	46	70	59	52	46	57	51	46	56	50	46
8	67	55	47	42	66	54	47	42	53	46	42	52	46	41
9	63	51	43	38	62	50	43	38	49	43	38	48	42	38
10	59	47	40	35	58	47	40	35	46	39	35	45	39	35

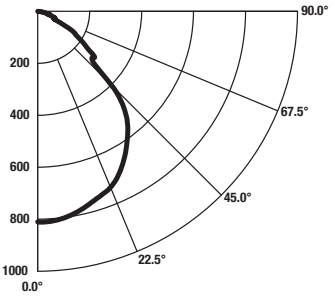
LIGHT FIELDS™ LED, 1x1, 24W, 4000K

Efficacy = 67lm/W

Luminance Data (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45°	7617	8437	7782
55°	5214	3650	5219
65°	2321	2635	2305
75°	2339	1682	2390
85°	988	710	913

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	810	810	810	
5°	805	807	808	71.6
15°	767	767	768	216.5
25°	714	700	714	324.4
35°	602	602	602	373.8
45°	393	435	401	310.8
55°	218	153	218	153.6
65°	72	81	71	79.9
75°	44	32	45	36.3
85°	6	5	6	7.3
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	111	107	104	101	109	105	102	99	101	99	96	97	95	93
2	103	97	91	86	101	95	90	85	91	87	83	88	85	82
3	96	87	80	75	93	85	79	74	83	77	73	80	76	72
4	89	79	71	66	87	77	70	65	75	69	64	73	68	63
5	82	71	64	58	81	70	63	58	68	62	57	67	61	57
6	77	65	57	52	75	64	57	51	63	56	51	61	55	51
7	72	60	52	46	70	59	52	46	57	51	46	56	50	46
8	67	55	47	42	66	54	47	42	53	46	42	52	46	41
9	63	51	43	38	62	50	43	38	49	43	38	48	42	38
10	59	47	40	35	58	47	40	35	46	39	35	45	39	35

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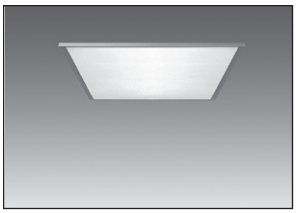
RL3B

LIGHT FIELDS™ LED

LED
3000K, 3500K or 4000K

Recessed **1' x 1'**



Applications: LIGHT FIELDS™ LED offers flexibility in innovative office lighting. The Micro-Pyramidal Optic (MPO) produces an unusually brilliant lighting quality without glare or reflections on computer screens. Use not just in offices but for healthcare, retail, conference rooms, corridors and reception areas.

online
Find it Fast 1052

Type: _____ **Quantity:** _____ **Project:** _____

LED

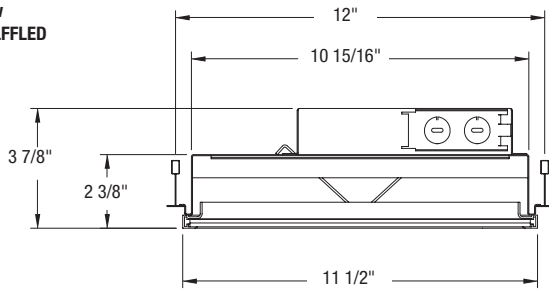
LFULED-11-24-K40-MP-DH2-WF

FIXTURE/CEILING TYPE	LENGTH	WATTAGE	CCT (K)	OPTIC	DRIVER	OPTIONS
LFULED LIGHT FIELDS™ LED 15/16" Lay-In, Flush 9/16" Slot-Grid, Flush 9/16" Lay-In, Tegular **LFFLED** LIGHT FIELDS™ LED 9/16" Lay-In, Flush **LFTLED** LIGHT FIELDS™ LED Center of Tile Mounting White LED **Typical Ra / R9 Values** 85CRI 10.7R9	**11** 1' x 1'	**20W** 20W 1300lm +/- 5% **24W** 24W 1600lm +/- 5% **CCT Multiplier for Lumen Output** 3000K 0.97 3500K 1.00 4000K 1.08	**K30** 3000K **K35** 3500K **K40*** 4000K * 4000K requires longer lead time 3.5-step MacAdam, +126K/-50K @ 3000K,+75K/-168K @ 3500K, +110K/-165K @ 4000K initial color binning	**MP** Micro-Pyramidal Diffuser	**DU** Standard 0-10V Universal Dimming Driver 120/277V **DH_*** Lutron HiLume A Series ** Specify " 1" for 120V or " 2" for 277V.*	**WF** Whip Flex 3/8" X 6' 14 AWG **WN_*** Whip Flex 3/8" X 6' 14 AWG (NYC) **CP**** Chicago Plenum **F** Fusing **PF** Concealed Ceiling Plaster Frame Kit, Flangeless Appearance *(can only be ordered with LFU fixtures)* **EM_*** Standby Battery Pack, 750 lm, 10W **WS105_*** WattStopper Super High Frequency Sensor FM-105 ** Specify " 1" for 120V or " 2" for 277V.* *** Chicago Plenum option not available for Sheetrock Ceiling*

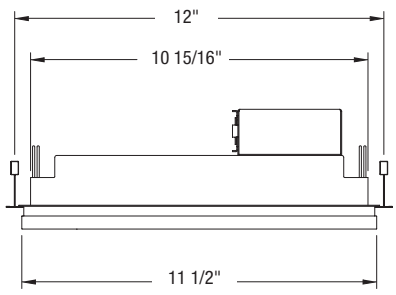
To order Plaster Frame Kit for sheetrock ceilings, select "PF" in the fixture options, along with the following:

LF11PF1 Concealed Ceiling Plaster Frame Kit, Flangeless Appearance, 1 Luminaire

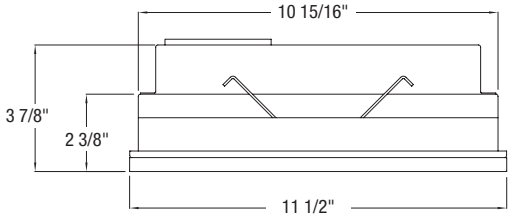
Side View
LFULED/LFFLED



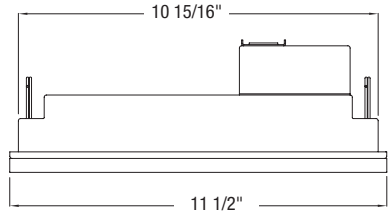
End View
LFULED/LFFLED



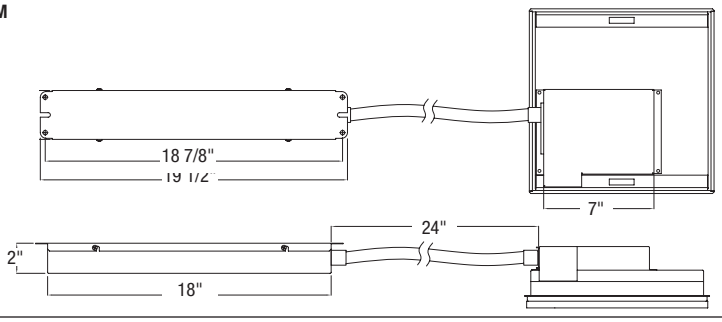
Side View
LFTLED



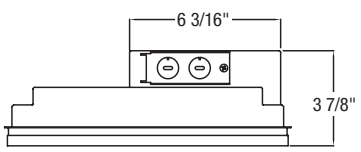
End View
LFTLED



Side View with EM



Top View with EM



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COMPANION LUMINAIRE OPTIONS	FIF #
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C US

IC-Rated

IBEW Union Made

Suitable for damp locations
NYC Approved

RoHS

ALL COMPONENTS REACH COMPLIANT
Registration, Evaluation and Authorisation of Chemicals

1. Housing – 20 gauge cold-rolled steel housing. Finish is powder-coated white. Post painted.

2. Wattage and CCT – 20W or 24W. Available in 3000K, 3500K or 4000K color temperatures. Initial color binning for LEDs is +126K/-50K @ 3000K, +75K/-168K @ 3500K, +110K/-165K @ 4000K, and potential color shift over the life of the LEDs is +/-50K @ 50,000 hrs.

3. Optics – MPO Micro-Pyramidal optic with seamless look and defined light emission for glare-free light distribution. Frame is extruded aluminum, painted Zumtobel Silver.

4. Driver – Universal voltage 120/277V with integral 0-10V dimming. For non-dimming requirements, order DU driver but do not connect to dimming control during installation. Also available with Lutron A-Series driver.

5. Mounting – Lay-in mounting for typical grid ceilings (LFULED). LFTLED mounting requires grid to be cutout. Fixture is supported by mounting bar attached to housing brackets with screws (by others). LFTLED mounting bracket is designed for 2' ceiling tiles only. Use PF (Plaster Frame kit) with LFULED fixture for sheetrock ceiling installation.

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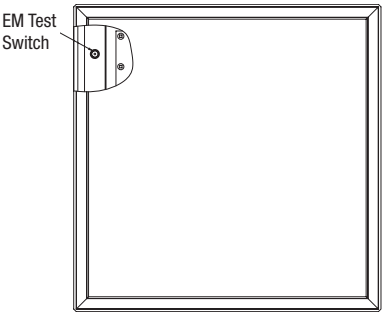
10. Weight – 6 lbs. with EM 11 lbs.

NOTE: For non-dimming installations, simply cap off the two control wires and connect the hot/neutral and ground as normal.



Mounting

Mounting with common ceiling types

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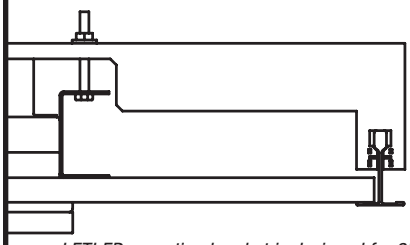
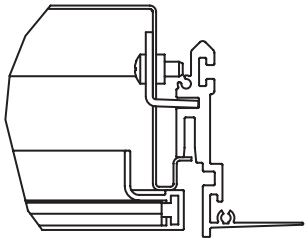
Grid Installation (LFTLED)

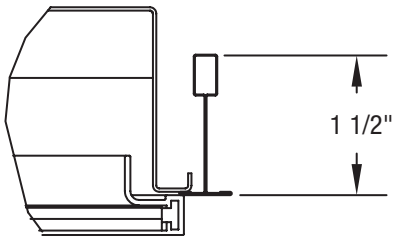


LFTLED mounting bracket is designed for 2' ceiling tiles only.

Plaster Frame Kit (LFULED)



9/16" Lay-In Ceilings (LFFLED)



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D00579TS 09/08/14

ZUMTOBEL

Photometric Data

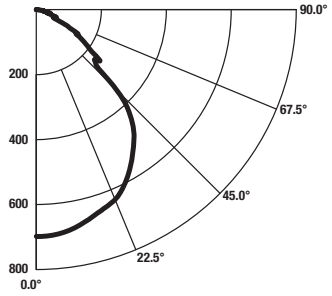
LIGHT FIELDS™ LED, 1x1, 20W, 4000K

Efficacy = 68.3lm/W

Luminance Data (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45°	6772	7301	6774
55°	4485	3101	4504
65°	1877	2253	1898
75°	2160	1447	2177
85°	787	647	938

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	698	698	698	
5°	694	695	695	61.6
15°	660	660	662	186.4
25°	615	603	617	279.6
35°	518	519	520	322.5
45°	349	377	349	268.1
55°	188	130	188	132.0
65°	58	69	58	68.5
75°	41	27	41	31.2
85°	5	4	6	6.6
90°	0	0	1	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	111	107	104	101	109	105	102	99	101	99	96	97	95	93
2	103	97	91	86	101	95	90	85	91	87	83	88	85	82
3	96	87	80	75	93	85	79	74	83	77	73	80	75	72
4	89	79	71	65	87	77	70	65	75	69	64	73	68	63
5	82	71	64	58	81	70	63	58	68	62	57	66	61	56
6	77	65	57	52	75	64	57	51	63	56	51	61	55	51
7	72	60	52	46	70	59	52	46	57	51	46	56	50	46
8	67	55	47	42	66	54	47	42	53	46	42	52	46	41
9	63	51	43	38	62	50	43	38	49	43	38	48	42	38
10	59	47	40	35	58	47	40	35	46	39	35	45	39	35

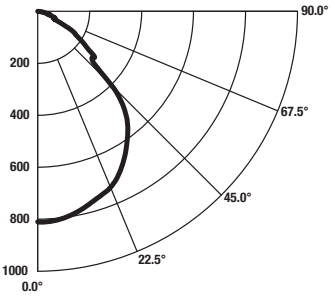
LIGHT FIELDS™ LED, 1x1, 24W, 4000K

Efficacy = 67lm/W

Luminance Data (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45°	7617	8437	7782
55°	5214	3650	5219
65°	2321	2635	2305
75°	2339	1682	2390
85°	988	710	913

Candela Distribution



Vertical Angle	Horizontal Angle 0°	45°	90°	Zonal Lumens
0°	810	810	810	
5°	805	807	808	71.6
15°	767	767	768	216.5
25°	714	700	714	324.4
35°	602	602	602	373.8
45°	393	435	401	310.8
55°	218	153	218	153.6
65°	72	81	71	79.9
75°	44	32	45	36.3
85°	6	5	6	7.3
90°	0	0	0	

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30		
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106
1	111	107	104	101	109	105	102	99	101	99	96	97	95	93
2	103	97	91	86	101	95	90	85	91	87	83	88	85	82
3	96	87	80	75	93	85	79	74	83	77	73	80	76	72
4	89	79	71	66	87	77	70	65	75	69	64	73	68	63
5	82	71	64	58	81	70	63	58	68	62	57	67	61	57
6	77	65	57	52	75	64	57	51	63	56	51	61	55	51
7	72	60	52	46	70	59	52	46	57	51	46	56	50	46
8	67	55	47	42	66	54	47	42	53	46	42	52	46	41
9	63	51	43	38	62	50	43	38	49	43	38	48	42	38
10	59	47	40	35	58	47	40	35	46	39	35	45	39	35

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RL4

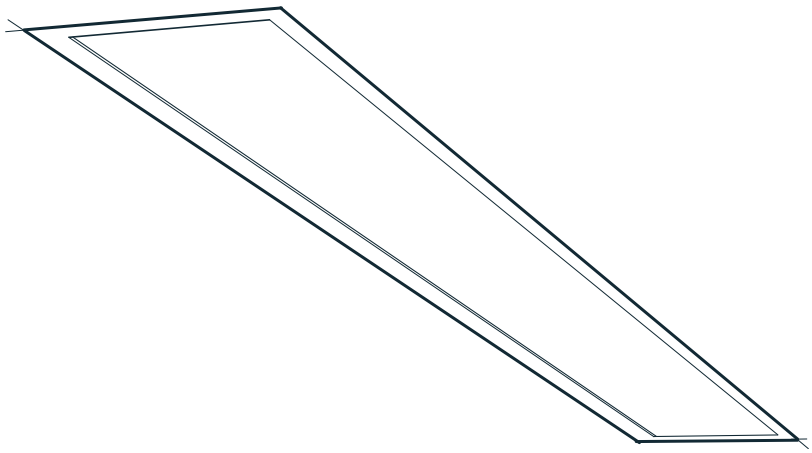
Type

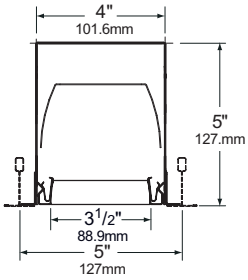
Job Name

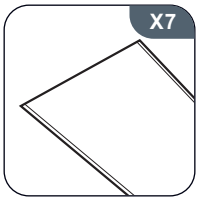
Catalog Number

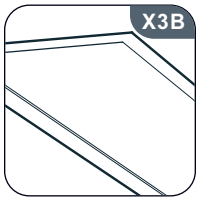
Made in USA

P43 LED Recessed









ordering - Standard System

lamp series/rows	nominal length	shielding	color/finish*	distribution	circuiting	voltage	ceiling system	controls/options
P43LED4SO-R08-SAL-YPE-D1-SC-UNV-X3B-DM01								
LED3 LO, SO, HO* 3000K LED35 LO, SO, HO* 3500K LED4 LO, SO, HO* 4000K *LO-Low Output, SO-Standard Output HO-High Output	02' 03' 04' 06' 08' R_* *row length	SAL satin acrylic extruded lens OPL opal frost acrylic lens SPL-OL* silver parabolic louver BLA-OL* blade louver-anodized BLW-OL* blade louver white *thin acrylic overlay masks LED's	TMW† textured matte white YGW gloss white YPE pewter Y__ premium color CC custom color *indicates color of flange -x1 and x3B ceiling systems only †standard	D1 direct	SC single circuit	UNV* *120-277	X1* exposed T-bar X3B hard ceiling (overhead mounting brackets) X7 hard ceiling (concealed flange) *standard	ND non-dimming standard DM10 0-10v 10% dimming DM01 0-10v 1% dimming STEP step dimming 100-50-off DML 1% Lutron dimming DMD 1% DALI dimming EML* emergency battery (350-600 lumens) EMH* emergency battery (1100-1200 lumens) FH fixture fusing (slow blow) C2 90° 2-way corner CX special connector (consult factory) INTCW integrates with Sense™ System wireless switches as whiteboard luminaire *4' minimum length

Features A narrow 4" wide recessed LED lighting system that provides continuous lighting without socket shadows along the entire row length. See also Wall Wash & Permeter.

Construction The housing, available in 2-, 3-, 4-, 6- or 8-foot standard lengths, is made of die-formed 20-gauge steel. Snap-in satin acrylic lens is clear frost extruded acrylic with a matte finish for soft, even light transmission.

Finish The standard housing and flange color is textured matte white (TMW) using polyester powder paint.

Electrical Must specify LED dimming controls. LED fixtures have constant current driver(s) with less than 20% THD when loaded to a minimum of 60%. Drivers sink a maximum of 6mA per driver. DM10 and DM01 LED drivers are 0-10V dimmable and are compatible with most 0-10V wall slide dimmers and direct 0-10V analog signal dimmers. Recommended wall dimmer is Leviton IP710 or equivalent. See data sheet to confirm all specified dimmers meet require specifictions. Fixtures are ETL Damp labeled and I.B.E.W. manufactured. Maximum driver size is 1.625" width by 1.25" height.

Mounting Fixture is to be recessed-mounted into exposed T-bar or hard ceiling applications.

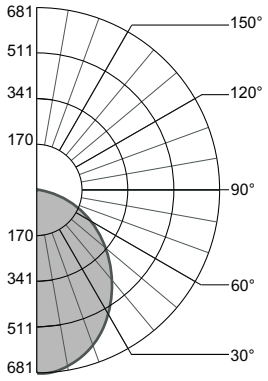
photometric data

P-43-LED35LO-SAL-D1

Report #L041411802 D=100% I=0.0%
Spacing Criteria: Along 1.16; Across 1.08

Delivered Lumens: 1566
Input Watts: 19.16
Lumens/Watt: 82

Calculated L70 ≥ 100,000 hours
Reported L70 (6k) ≥ 36,000 hours
5 year LED warranty - see prulite.com



Zonal Lumen Summary

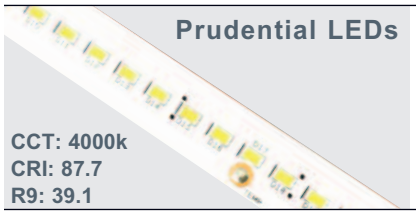
Zone	Lumens	%Luminaire
0-90	1566	100.00
90-180	0.00	0.00

Candlepower Summary

Vertical Angle	Horizontal Angle 0°	25°	45°	65°	90°
0	681	681	681	681	681
5	673	673	674	672	673
10	658	658	659	653	653
15	636	637	629	623	621
20	608	600	596	585	580
25	566	561	550	537	531
30	523	519	504	488	480
35	476	473	453	436	427
40	427	423	400	384	375
45	380	370	349	333	325
50	326	317	299	284	277
55	278	271	252	238	232
60	234	226	211	199	194
65	185	179	168	158	154
70	140	134	128	119	116
75	96	93	87	83	81
80	57	56	53	51	50
85	26	26	25	25	25
90	0	0	0	0	0

Coefficients of Utilization (%)

Floor	effective floor cavity reflectance =.20										
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
0	119	119	119	119	116	116	116	116	111	111	111
1	109	105	101	97	107	102	99	95	98	95	92
2	100	92	85	80	97	90	84	79	86	81	77
3	91	81	73	67	89	80	72	67	77	70	65
4	84	72	64	57	82	71	63	57	69	62	56
5	78	65	56	50	75	64	56	50	62	55	49
6	72	59	50	44	70	58	50	44	56	49	43
7	67	54	45	39	65	53	45	39	51	44	39
8	62	49	41	35	61	48	41	35	47	40	35
9	58	45	37	32	57	45	37	32	44	37	32
10	55	42	34	29	54	41	34	29	40	34	29



PruBin™ is Prudential Lighting's exclusive 'job binning' method that ensures color temperature consistency across all luminaires on a project. Meticulously testing and labeling EVERY LED board to +/- 25 lumens, +/- 50k CCT and +/- .004 Duv — while also separating positive from negative — allows us to match color, hue and intensity throughout a project and provides a consistent color temperature within a 2-step MacAdam ellipse.

LED Delivered Lumens and Watts

P43	LED LO	LED SO	LED HO
Lumens	375 lm/ft	750 lm/ft	800 lm/ft
Watts	5 w/ft	10 w/ft	12 w/ft

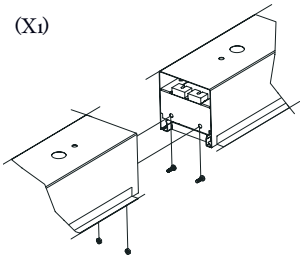
Lumen output and wattages are nominal for all 3 color changes and may vary +/- 5%.

P43 LED Recessed

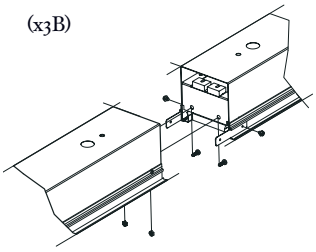
installation

Adjoining Detail

(X1)

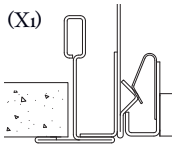


(x3B)

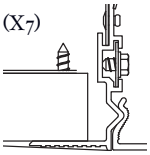


Ceiling Systems

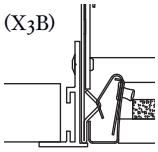
(X1)



(X7)

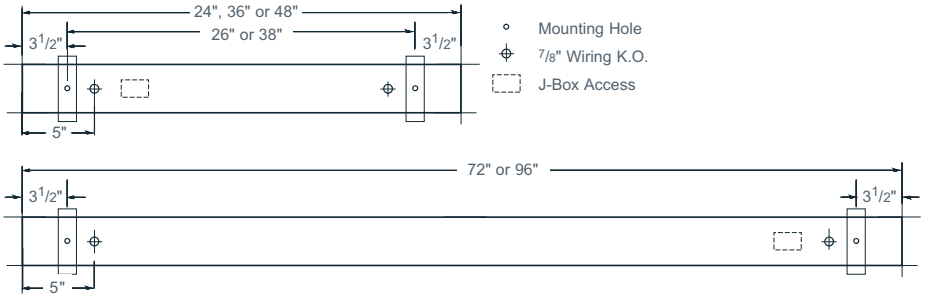


(X3B)



Framing Dimensions X3B & X7
Add 1/2" in fixture **width**, Add 5/8" in fixture **length**,

Mounting Locations

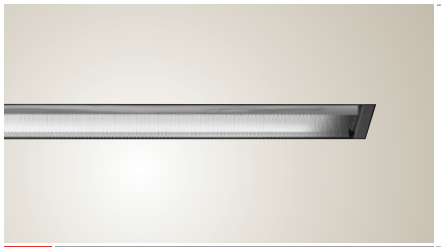


Frosted

Prudential reserves the right to change design specifications or materials without notice.

WW1

Peerless®



Lightline® Recessed Wall-Wash

Direct T5/T5HO

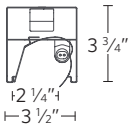
Type:

Project:

SPECIFICATIONS Recessed **LWR9**

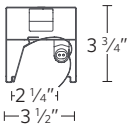
LAMPING OPTIONS

☐ **LWR9 - 1 2′**



2′

☐ **LWR9 - 1 4′**



4′

SPECIFICATIONS

Construction
Housing is formed, pre-finished steel. Four-stage, iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Painted parts are finished with low-gloss baked enamel.

Reflectors
Specular asymmetric reflector system. Black perforated metal diffuser with round holes.

Electrical
Specify 120V, 277V, or 347V. For special circuits, consult factory. UL and C-UL listed (non-IC).

Luminaire Size
Nominal 2 ½″ aperture. 2′ and 4′ lengths available.

CATALOG NUMBER

LWR9-G-1-14T5-LDL-U4-277-DMHL3D-LP841-C200

Examples: LWR9 G 1 54T5HO HOL U4 120 GEB10 L/LP C200 — LWR9 G 1 14T5 HOL U2 277 GEB10 LP835 C201

Luminaire	Ceiling Type	# of Lamps in Cross Section	Lamp Type	Shielding	Luminaire Row Length	Voltage	Ballast Type
LWR9	**G** Lay in grid	**1**	**24T5HO** 2′ 24W T5HO **54T5HO** 4′ 54W T5HO **14T5** 2′ 14W T5 **28T5** 4′ 28W T5	**HOL** Black metal diffuser with round holes	**U2** 2′ **U4** 4′	**120** **277** **347**	**GEB10** <10% THD Electronic **ADEZ**[1,2] Advance Mark 10 dim **DMHL3D**[1,3] Lutron Hi-Lume dim **ADZT**[1,3] Advance Mark 7 0-10V dim **OSDIM**[1,2] Osram 0-10V dim *Reference Ballast Wizard on website or consult factory for other options.*

Emergency Type	Lamp Color	Finish	Options
EL[1,3] Emergency battery pack	**L/LP** No lamp **LP830** 3000K 80+ CRI **LP835** 3500K 80+ CRI **LP841** 4100K 80+ CRI **Available with 28T5 only:** **LP830P** 3000K 80+ CRI Premier **LP835P** 3500K 80+ CRI Premier **LP841P** 4100K 80+ CRI Premier *Reference Lamp Chart on website or consult factory for other options.*	**C200** White (low gloss) **C201** Black (low gloss)	**CP** Chicago plenum **FLNGW** Flange kit (dry wall only) white **FLNGB** Flange kit (dry wall only) black **GLR** Fusing (fast blow) **GMF** Fusing (slow blow) **NYC** New York City code

Notes:
1 Not available in 347V
2 Only available with 54T5HO
3 Only available with 28T5 and 54T5HO

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Peerless®

Lightline® Recessed Wall-Wash
Direct T5/T5HO

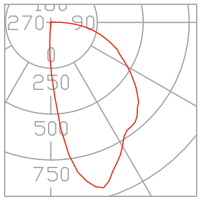
Type:

Project:

Recessed **LWR9**

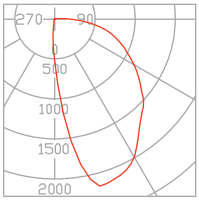
PHOTOMETRICS

Actual performance may differ as a result of end-user environment and application.



1-LAMP 24W T5HO
59.2% efficiency
1303 delivered lumens

0.0% up / 100.0% down



1-LAMP 54W T5HO
62.8% efficiency
3138 delivered lumens

0.0% up / 100.0% down

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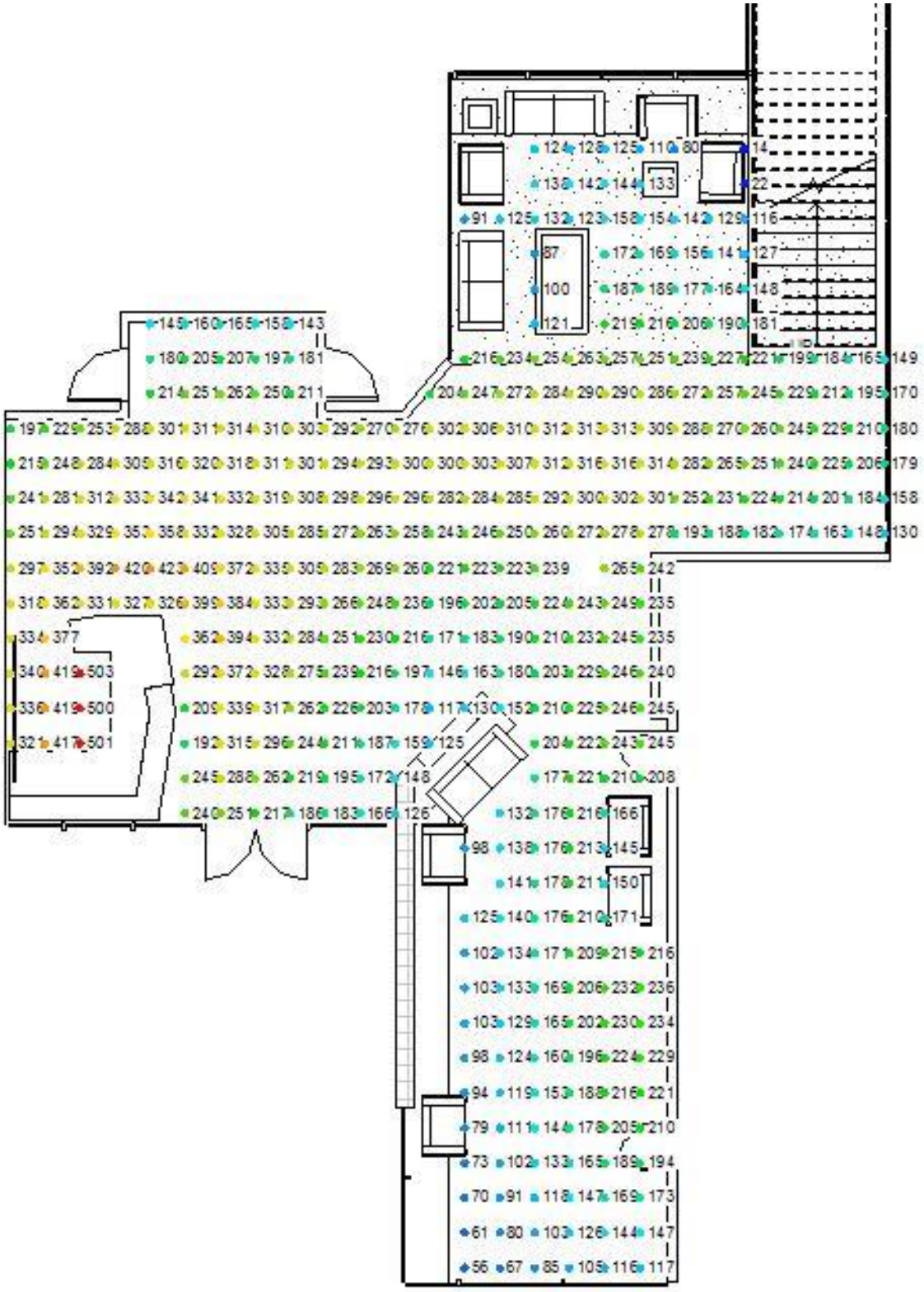
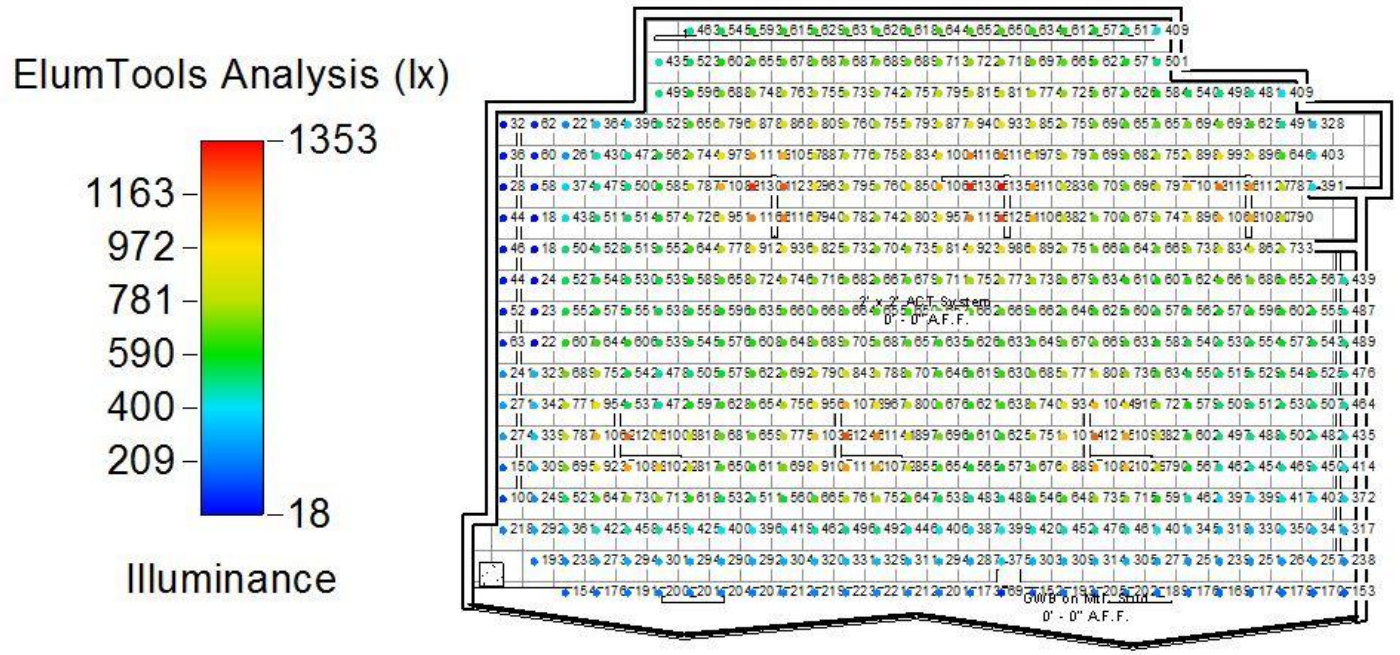
Appendix B - Photometric Calculations

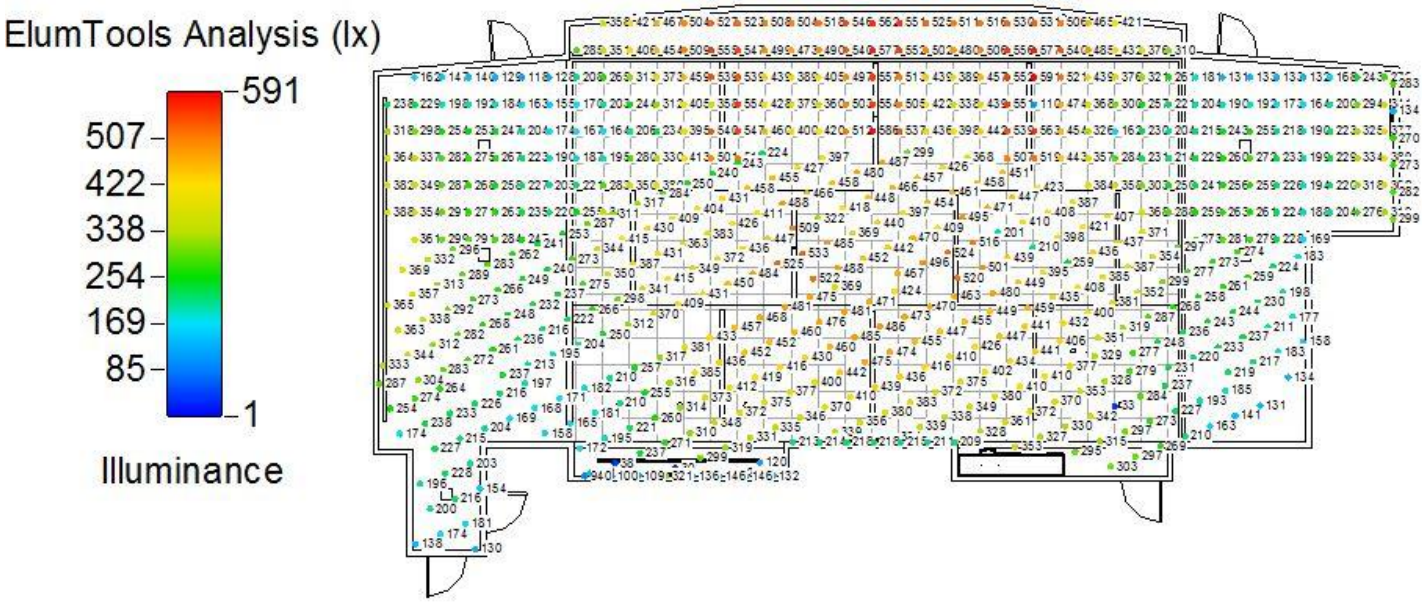
Lobby



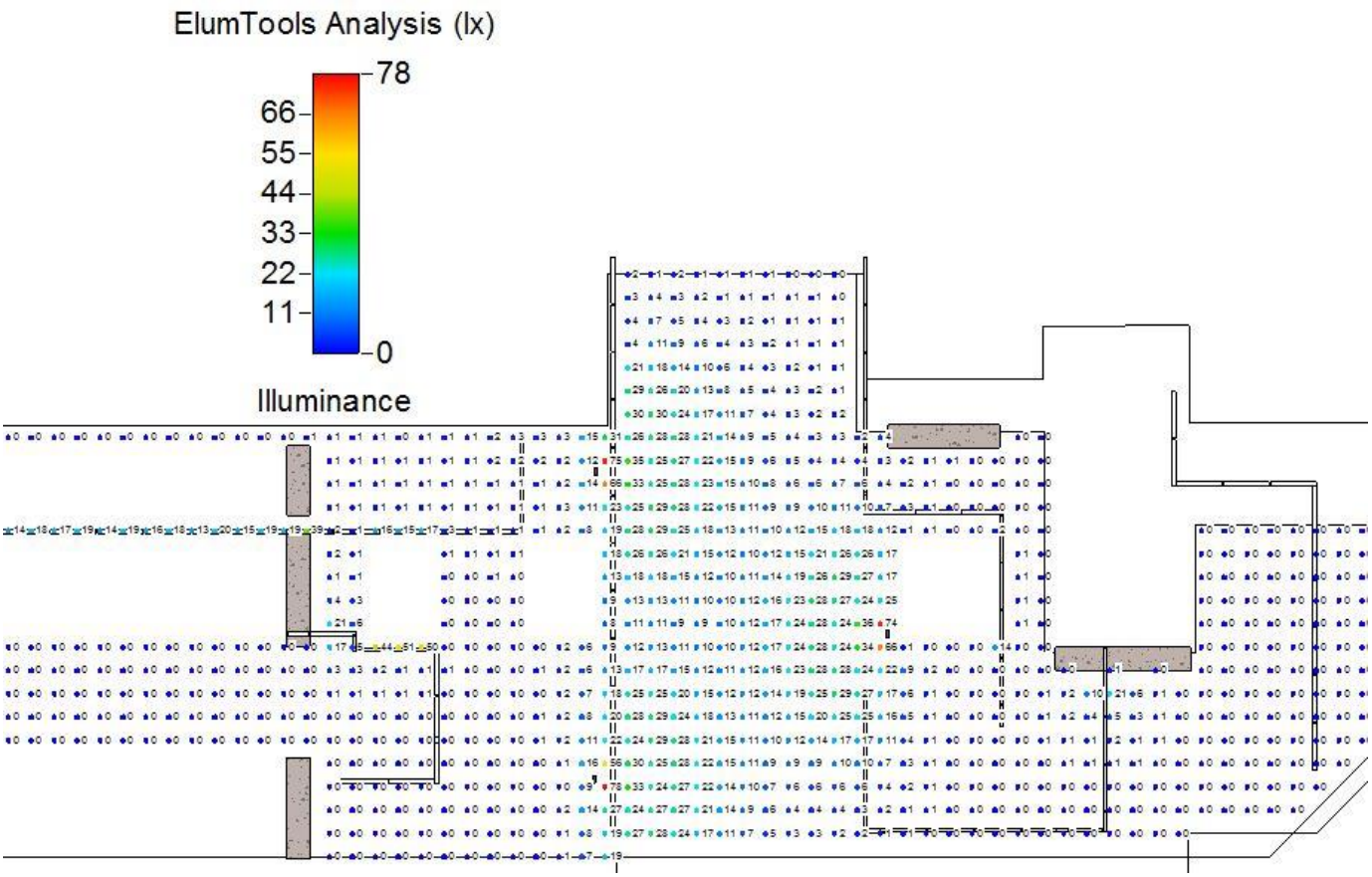
Main DNA Lab



Multipurpose Room



South Plaza



Appendix C - Lamps, Ballasts, Drivers, and Sensors

Lamps

Fixtures PF1, RF1, RF2

PENTRON® T5 FLUORESCENT LAMPS

PENTRON® T5 lamps are designed to operate on dedicated electronic programmed rapid start (also know as programmed start) ballasts only. These lamps are globally standardized and are designed to operate with their peak light output at 35°C (95°F) ambient temperature. For comparison purposes and to accommodate existing lamp measurement standards, ratings are given at both 25°C (77°F) and 35°C (95°F). The new lamp dimensions allow for innovative fixture designs and improved fixture performance

PENTRON® High Performance T5 Lamps

Nominal Wattage	Bulb	Nominal Length (in)	MOL (in)	Base	Product Number	Ordering Abbreviation	Pkg Qty	Avg Rated Life @3hrs/start (@12hrs/start)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F (@35°C/95°F)	Mean @25°C/77°F (@35°C/95°F)	Symbols & Footnotes
28	T5	48	45.8	Mini Bipin	20868	FP28/830/ECO	40	20000	3000	85	2600 2900	2418 2697	31,33,38,48,74,76
					20901	FP28/835/ECO	40	20000	3500	85	2600 2900	2418 2697	31,33,38,48,74,76
					20902	FP28/841/ECO	40	20000	4100	85	2600 2900	2418 2697	31,33,38,48,74,76
					22203	FP28/850/ECO	40	20000	5000	85	2545 2840	2367 2641	31,33,38,48,74,76
					20990	FP28/865/ECO	40	20000	6500	85	2400 2750	2232 2558	31,33,38,48,74,76
					20977	FP28RED 40/CS 1/SKU	40	20000			2100		15,31,33,38,48,74
					20978	FP28GREEN 40/CS 1/SKU	40	20000			3500		15,31,33,38,48,74
					20986	FP28BLUE 40/CS 1/SKU	40	20000			700		15,31,33,38,48,74

Fixture PF2

PENTRON® T5 FLUORESCENT LAMPS

PENTRON® High Output, High Performance T5 Lamps

Nominal Wattage	Bulb	Nominal Length (in)	MOL (in)	Base	Product Number	Ordering Abbreviation	Pkg Qty	Avg Rated Life @3hrs/start (@12hrs/start)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F (@35°C/95°F)	Mean @25°C/77°F (@35°C/95°F)	Symbols & Footnotes
54	T5	48	45.8	Mini Bipin	20903	FP54/830/HO/ECO	40	25000 (35000)	3000	85	4450 5000	4138 4650	31,33,38,48,74,76
					20904	FP54/835/HO/ECO	40	25000 (35000)	3500	85	4450 5000	4138 4650	31,33,38,48,74,76
					21020	FP54/835/HO/ECO/SL	40	25000 (35000)	3500	85	4316 4850	4014 4510	31,33,38,48,74,76,96,98
					20906	FP54/841/HO/ECO	40	25000 (35000)	4100	85	4450 5000	4138 4650	31,33,38,48,74,76
					21021	FP54/841/HO/ECO/SL	40	25000 (35000)	4100	85	4316 4850	4014 4510	31,33,48,74,76,96,98
					20949	FP54/850/HO/ECO	40	25000 (35000)	5000	85	4375 4900	4069 4557	31,33,38,48,74,76
					21022	FP54/850/HO/ECO/SL	40	25000 (35000)	5000	85	4243 4753	3946 4420	31,33,48,74,76,96,98
					20862	FP54/865/HO/ECO	40	25000 (35000)	6500	85	4050 4750	3766 4418	31,33,38,48,74,76
					20997	FP54/RED/HO	40	20000				3300	15,31,33,38,48,74
					20998	FP54/GREEN/HO	40	20000				5550	15,31,33,38,48,74
					20999	FP54/BLUE/HO	40	20000				1150	15,31,33,38,48,74

Lamps

Fixture WW1

PENTRON® T5 FLUORESCENT LAMPS

PENTRON® T5 lamps are designed to operate on dedicated electronic programmed rapid start (also know as programmed start) ballasts only. These lamps are globally standardized and are designed to operate with their peak light output at 35°C (95°F) ambient temperature. For comparison purposes and to accommodate existing lamp measurement standards, ratings are given at both 25°C (77°F) and 35°C (95°F). The new lamp dimensions allow for innovative fixture designs and improved fixture performance

PENTRON® High Performance T5 Lamps

Nominal Wattage	Bulb	Nominal Length (in)	MOL (in)	Base	Product Number	Ordering Abbreviation	Pkg Qty	Avg Rated Life @3hrs/start (@12hrs/start)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F (@35°C/95°F)	Approx Lumens Mean @25°C/77°F (@35°C/95°F)	Symbols & Footnotes
28	T5	48	45.8	Mini Bipin	20868	FP28/830/ECO	40	20000	3000	85	2600 2900	2418 2697	31,33,38,48, 74,76
					20901	FP28/835/ECO	40	20000	3500	85	2600 2900	2418 2697	31,33,38,48, 74,76
					20902	FP28/841/ECO	40	20000	4100	85	2600 2900	2418 2697	31,33,38,48, 74,76
					22203	FP28/850/ECO	40	20000	5000	85	2545 2840	2367 2641	31,33,38,48, 74,76
					20990	FP28/865/ECO	40	20000	6500	85	2400 2750	2232 2558	31,33,38,48, 74,76
					20977	FP28RED 40/CS 1/SKU	40	20000			2100		15,31,33,38,48,74
					20978	FP28GREEN 40/CS 1/SKU	40	20000			3500		15,31,33,38,48,74
					20986	FP28BLUE 40/CS 1/SKU	40	20000			700		15,31,33,38,48,74
14	T5	24	22.2	Mini Bipin	20907	FP14/830/ECO	40	20000	3000	85	1200 1350	1116 1256	31,33,38,48, 74,76
					20908	FP14/835/ECO	40	20000	3500	85	1200 1350	1116 1256	31,33,38,48, 74,76
					20914	FP14/841/ECO	40	20000	4100	85	1200 1350	1116 1256	31,33,38,48, 74,76
					20988	FP14/865/ECO	40	20000	6500	85	1100 1300	1045 1209	31,33,38,48, 74,76

Ballasts

Fixtures RF1, RF2

QUICKTRONIC *PROFESSIONAL* T5 PROStart PSN UNIVERSAL VOLTAGE SYSTEMS

NORMAL BALLAST FACTOR³

49181 *(49180)♦*	QTP 2x28T5/UNV PSN NL	120-277	0.55/0.23	FP28T5	2900	2 1	1.00 1.00	5800 2900	65/63 32	89/92 90

PROStart® QTP PSN models above also operate these lamps: FP14, FP21 & FP35
♦ (Item Number) = Item Number/NAED in parentheses are models with leads/wires.

Fixture PF2

QUICKTRONIC *PROFESSIONAL* HELIOS 54 T5 HO DIMMING SYSTEMS³ - A list of controllers is available from OSRAM SYLVANIA

(0-10Vdc control) - 100-1% Dimming Range - <10% THD

49671	QT1x54/120PHO-DIM	120	0.54	FP54T5HO	5000	1	1.00 0.01	5000 50	62 8	81
49672	QT1x54/277PHO-DIM	277	0.23	FP54T5HO	5000	1	1.00 0.01	5000 50	61 8	82
49673	QT2x54/120PHO-DIM	120	1.07	FP54T5HO	5000	2	1.00 0.01	10000 100	120 18	83
49674	QT2x54/277PHO-DIM	277	0.45	FP54T5HO	5000	2	1.00 0.01	10000 100	117 18	85

QUICKTRONIC® POWERSENSE® T5 Dimming UNV Systems

RoHS compliant

Fluorescent Controllable Lighting Systems

High Efficiency Series

POWERSENSE T5 DIM

Lamp / Ballast Guide

28W T5 - PENTRON® lamps
Primary Lamp Type
Also operates:

Key System Features

- Industry's first ballast that combines dimming inputs from 0-10V and/or two-wire AC dimming providing maximum flexibility
- POWERSENSE compatibility with low voltage and power line fluorescent dimmers
- High Efficiency
- Lamp Detection Technology
- Universal voltage (120-277V)
- 100-1% Dimming Range
- PROStart® programmed rapid start
- Anti-flash circuitry – turns on in dimmed mode
- Lightweight and low profile
- Operates at >42 kHz
- QUICKSENSE ballast technology (end-of-lamp-life sensing)
- QUICK 60+ ballast and lamp warranty
- RoHS compliant
- Lead-free solder and manufacturing process

Application Information

SYLVANIA QUICKTRONIC POWERSENSE ballasts are ideally suited for:

- Occupancy sensors
- Daylight harvesting
- Energy management
- Load shedding
- Commercial
- Retail
- Hospitality
- Institutional
- Schools
- New construction
- Retrofit

SYLVANIA QUICKTRONIC High Efficiency POWERSENSE T5 electronic ballasts offer several advantages:

- **Wide Dimming Range:** operate linear fluorescent T5 PENTRON lamps over a 100-1% dimming range and provide true versatility in controls selection.
- **Industry's Most Adaptable Dimming Ballast:** ballasts feature micro-controller technology for compatibility with:
  - low voltage controls
  - power line fluorescent dimmers
  - any line voltage from 120V to 277V
- **Unmatched Performance with Patented Lamp Detection Technology:**
  - Eliminates variations in brightness from lamp-to-lamp
  - Provides uniform lighting throughout the dimming range
  - Eases installation and troubleshooting by recognizing failed lamps, faulty wiring or loose connections and shutting down.

When the problem is corrected, the system restarts automatically.

RoHS Compliant: QUICKTRONIC POWERSENSE T5 ballasts are RoHS compliant and feature lead-free solder and manufacturing process.

QUICK 60+® Warranty: Setting the standard for quality, QUICKTRONIC POWERSENSE T5 ballasts are covered by a QUICK 60+® warranty, the first comprehensive system warranty in the industry.

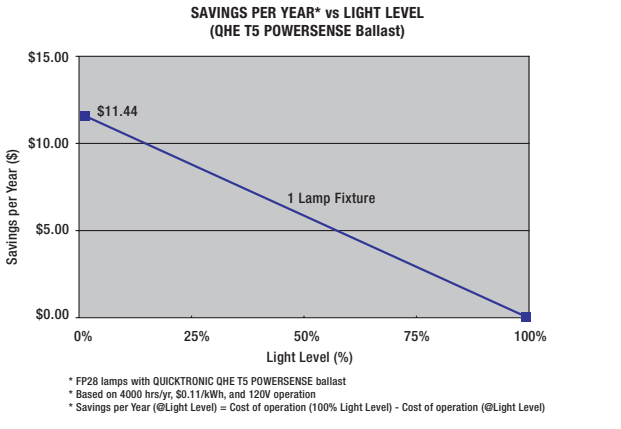
System Information

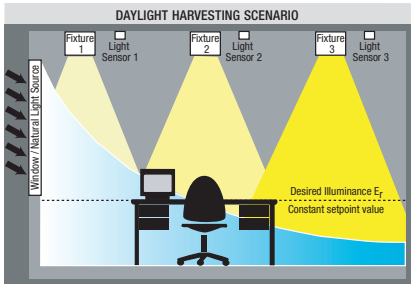
QUICKTRONIC POWERSENSE ballasts operate from standard low voltage (0-10VDC) fluorescent controllers or compatible 2-wire power line fluorescent dimmers, making them ideal for individual office lighting or automated building applications, both in new construction and retrofit projects.

For the individual office or conference room, installation can be streamlined by using a 2-wire power line dimmer; eliminating the need for additional control wires.

For more advanced systems, such as daylight harvesting or building automation applications, standard low voltage devices (0-10VDC, Class 1 or 2) are used to control the lighting system. In this daylight harvesting example, each lighting fixture (or fixture row) is controlled by it's own photosensor; regulating the light output to compensate for changes in natural daylight. Depending upon the specific application, energy savings of up to 60% compared to fixed output electronic systems can be realized.

All QUICKTRONIC POWERSENSE ballasts include a line voltage protection circuit, which protects the ballast in the event that line voltage is inadvertently applied to the low voltage control inputs.





SPECIFICATION DATA

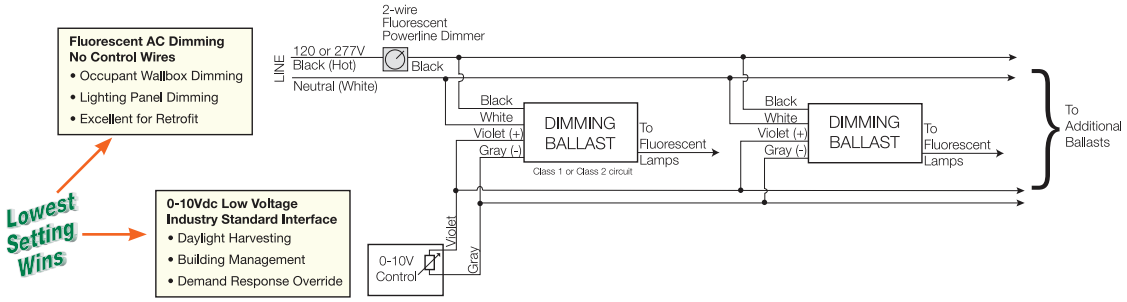
Catalog #	Date	Type
Project	Prepared by	
Comments		

POWERSENSE
High Efficiency

QUICKTRONIC® POWERSENSE® Dimming UNV – Dimming Control Wiring Examples

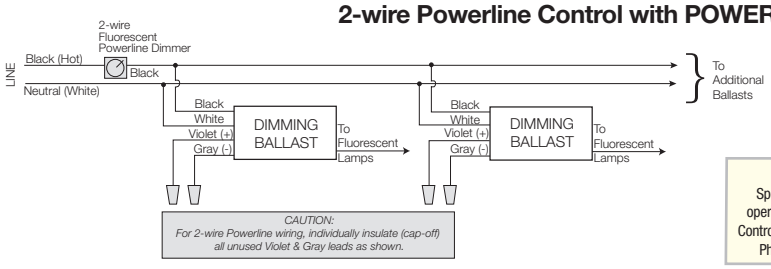
Industry's 1st Ballast That Allows POWERLINE Fluorescent Control *AND* 0-10Vdc Control Input Simultaneously

2-wire Powerline *AND* 0-10Vdc Control with POWERSENSE Ballasts



Wallbox Style 2-wire Powerline Control Wiring Example

2-wire Powerline Control with POWERSENSE Ballasts



Powerline Control Specs:
Specification-grade controls are available for 120V or 277V operation of controllable analog electronic fluorescent ballasts. Controls must be suitably rated for both the type (e.g. Fluorescent Phase-control) and size (e.g. 600W of the connected load.

Examples: Leviton IPX series operate as single pole or 3-way models. Available in 120V and 277V models. Leviton 6668-1W (white) 120V single pole fluorescent dimmer.

Wallbox Style 0-10V Control with Power Switch Wiring Example

0-10V DC Control with POWERSENSE Ballasts

Examples: Lithonia model ISD BC or Leviton IP 710 Series (These 0-10V dc, 120/277V models can be wired for single pole application (shown); these models can also be wired for 3-way applications.)

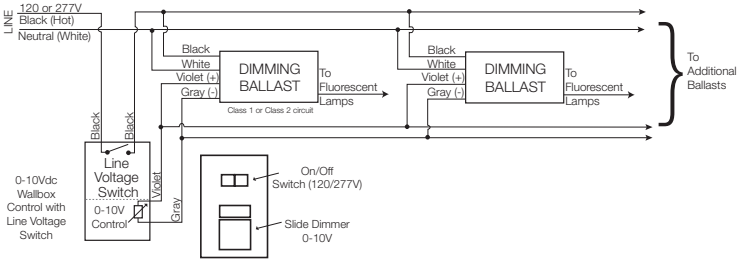
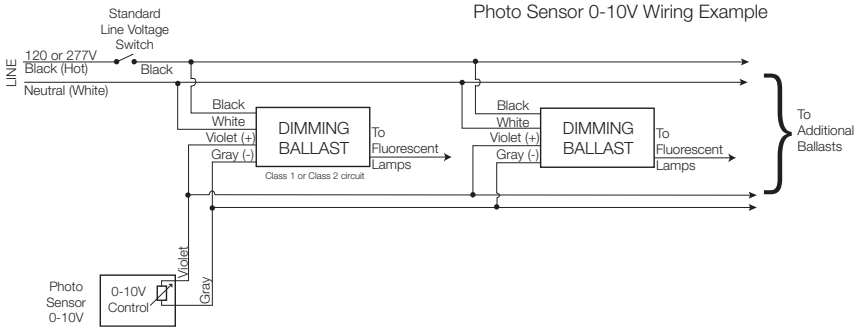


Photo Sensor 0-10V Wiring Example

0-10V DC Control with POWERSENSE Ballasts

Photo Sensor 0-10V Wiring Example



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SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

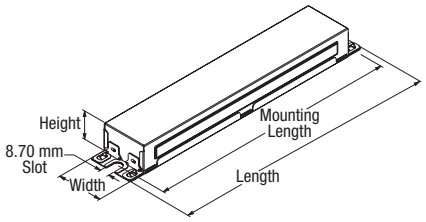
QUICKTRONIC® POWERSENSE® Controls Information

Controls Manufacturer	Fluorescent Powerline Controllers	0-10 VDC Controllers	Photo Cells	Occupancy Sensors	Building Management Systems
Acuity Brand Controls www.acuitybrandscontrols.com	X	X	X	X	X
Blue Ridge Technologies www.brtint.com	X	X	X	X	X
Cooper Greengate http://greengate.coopercontrol.com		X	X	X	X
Hunt Dimming www.huntdimming.com	X	X			X
Lehigh Electric Products www.lehighdim.com	X	X			X
Leviton www.leviton.com	X	X	X	X	
Sensor Switch www.sensorswitch.com			X	X	
Siemens Building Technology http://sbt.siemens.com					X
Starfield Controls www.starfieldcorp.com		X	X	X	X
Watt Stopper www.wattstopper.com	X	X	X	X	X

Please contact controls manfacturer to order/specify controls. For the latest controls list go to www.sylvania.com
Also, for more information, refer to the LCA (Lighting Controls Association) site: http://lightingcontrolsassociation.org

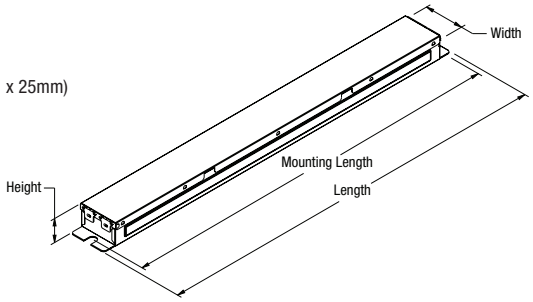
Dimensions:
TC enclosure
Overall: 9.5" L x 1.68" W x 1.0" H (241 x 43 x 25 mm)
Mounting: 8.90" (226 mm)
Weight: 1.1 lbs each (500 g)

Wiring:
Leads Only



Dimensions:
TCL enclosure
Overall: 16.7" L x 1.68" W x 1.0" H (425mm x 43mm x 25mm)
Mounting:16.2" (411 mm)
Weight: 2.1 lbs each (950 g)

Wiring:
Leads Only



Control Specifications/model numbers may change.
Please consult manufacturers listed for their latest control models and to order their controls.

POWERSENSE

High Efficiency

Controls Guide

Contact the companies listed for their 2-wire Fluorescent/Powerline controls and/or 0-10V controls information.

T8 POWERSENSE Dimming Ballast*
50705 QHE 1x32T8/UNV DIM-TC
50707 QHE 2x32T8/UNV DIM-TC
50714 QHE 3x32T8/UNV DIM-TCL
50716 QHE 4x32T8/UNV DIM-TCL

T5 POWERSENSE Dimming Ballast
50725 QHE 1x28T5/UNV DIM-TC
50726 QHE 2x28T5/UNV DIM-TCL*

T5HO POWERSENSE Dimming Ballast
51468 QHE 1x54T5HO/UNV DIM-TC
51467 QHE 2x54T5HO/UNV DIM-TCL

* QHE formerly QTP models

POWERSENSE CONTROLS

WARNING:
Install and wire these ballast and controls in accordance with the National Electrical Code (NEC), all applicable Federal, State and local electrical codes, as well as the specific instructions provided with the compatible control that you purchased. Installation should be performed by qualified personnel only.

These instructions are guidelines only. Installation may vary for different controls/fixtures/applications. Be sure to follow the control instructions and all applicable codes and standards when installing dimming systems.

Please contact controls manufacturer listed in the OSRAM SYLVANIA Inc. controls cross reference for compatible controls and instruction wiring

NOTES: 1. Dimming ballasts source <0.5mA (0-10VDC control input).

2. Powerline controls must be rated for the type (e.g. Fluorescent Phase-control) and size (e.g. 600W, 1000W, 1500W & 2000W etc.) of the connected load. Do NOT use incandescent powerline controls; incandescent dimmers are not rated for fluorescent loads and are NOT compatible with POWERSENSE ballasts.

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SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

High Efficiency Electronic T5 Fluorescent Controllable Lighting Systems

RoHS compliant

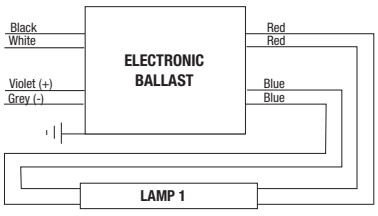
Item Number	OSRAM SYLVANIA Description	Input Current (AMPS)	Lamp Type	Rated[1] Lumens (lm)	No. of Lamps	Ballast Factor (BF)	System Lumens	Input[2] Power (W) 120V 277V	System Efficacy (lm/W)	BEF[3]
50725 ✪	QHE1x28T5/UNV DIM-TC	0.27/0.12	FP28T5	2900	1	1.00 0.01	2900 29	32 31 6 6	94	3.23
		0.34/0.14	FP35T5	3650	1	1.00 0.01	3650 37	41 40 6 6	91	2.50
		0.21/0.09	FP21T5	2100	1	1.00 0.01	2100 21	25 25 6 6	84	4.00
		0.14/0.06	FP14T5	1350	1	1.00 0.01	1350 14	17 17 5 5	79	5.88
50726 ✪	QHE2x28T5/UNV DIM-TCL*	0.53/0.23	FP28	2900	2	1.00 0.01	5800 58	64 62 10	91/93	1.61
		0.67/0.29	FP35	3650	2	1.00 0.01	7300 73	81 79 10	90/92	1.27
		0.40/0.18	FP21	2100	2	1.00 0.01	4200 42	49 9	86	2.04
		0.29/0.13	FP14	1350	2	1.00 0.01	2700 27	34 8	79	2.94

1 At 35°C lamp ambient temperature.
2 System Efficacy calculation based on lowest input power.
3 Ballast Efficiency Factor (BEF) shown = (Ballast Factor x 100) divided by Input Power (note: calculation based on lowest wattage value)
✪ Preliminary specifications. Please contact OSRAM SYLVANIA for additional information.
**Please note, item number 50726 was formerly QTP 2x28T5/UNV DIM-TCL*

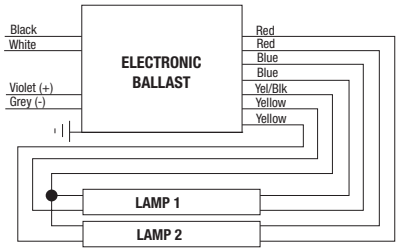
Installation Notes

Output Wiring: Lamp wiring for dimming ballasts can differ significantly from non-dimming ballasts and from other manufacturers dimming ballasts. Take care to connect lamp lead wires as shown on the applicable ballast diagram. **Lamp Seasoning:** For optimal performance, fluorescent lamps may require seasoning for up to 12 hours prior to low temperature starting & low level dimming. Refer to NEMA LSD 23-2002 Lighting Systems Division: Recommended Practice - Lamp Seasoning for Fluorescent Dimming Systems

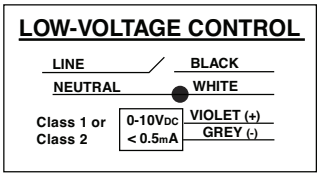
1 lamp

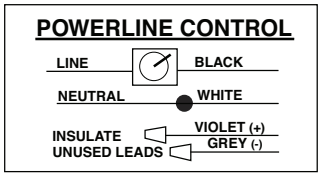


2 lamp



Input & Control Wiring Options:





Item Number — **50726 QHE 2 x 28T5 / UNV DIM-TCL** — System Type - DIMMING/Case Size
QUICKTRONIC High Efficiency — Line Voltage (120-277V)
Number of Lamps (2) — Primary Lamp Wattage

T5 POWERSENSE®

High Efficiency

Performance Guide

Data shown based upon SYLVANIA PENTRON® lamp(s). QUICKTRONIC® POWERSENSE ballasts are also compatible with other lamp manufacturers equivalent lamp types that meet ANSI specifications.

Specifications

Data based on FP28

Starting Method: Programmed Rapid Start
Circuit Type: Series
Lamp Frequency: >42 kHz
Lamp CCF: Less than 1.7
Starting Temp: 50°F/10°C minimum[5]
Input Voltage: 120-277V, ±10%
Input Frequency: 50/60 Hz
THD: <10% @ Full Output
Power Factor: >98% @ Full Output

UL Listed Class P, Type 1 Outdoor
CSA or C/UL Certified
70°C Max Case Temperature
FCC 47CFR Part 18 Non-Consumer
Class A Sound Rating
RoHS Compliant[4]
ANSI C62.41 Cat. A Transient Protection
No Remote or Tandem Wiring

4 Complies with European Union Restriction of Hazardous Substances Directive.

5 FP14 lamp starting temperature 60°F (16°C)

Control Information

QUICKTRONIC POWERSENSE ballasts are compatible with a wide range of low voltage (0-10VDC) and power line fluorescent controllers available from various manufacturers.

Low Voltage Control Specs: Ballast will source up to 0.5mA for 0-10VDC control purposes. May be wired as a Class 1 or Class 2 circuit-consult Local and National Electrical Codes.

Power Line Control Specs: Specification-grade fluorescent controls are available for 120V or 277V operation of controllable analog electronic fluorescent ballasts. Controls must be suitably rated for both the type (e.g. Fluorescent Phase-control) and size (e.g. 600W) of the connected load.

System Life / Warranty

QUICKTRONIC products are covered by the QUICK 60+® warranty, a comprehensive lamp and ballast system warranty. For additional details, refer to the QUICK 60+ warranty bulletin.

OSRAM SYLVANIA
National Customer
Service and Sales Center
1-800-LIGHTBULB
(1-800-544-4828)
www.sylvania.com

Specifications subject to change without notice.

POWERSENSE T5 DIM

the system solution®

Highest performance dimming to 1%

3-wire controlled

Shown above: Hi-lume ballast, A-case

Model numbers are organized by lamp type, refer to pg. 349 for additional information.

Experience the benefits of full-range, 100% to 1% fluorescent dimming. Designed to meet the most demanding lighting requirements, Hi-lume ballasts enable you to provide the ideal visual environment for any application. The Hi-lume family is extensive, featuring the world's only 100% to 1% dimming ballasts for T4 compact fluorescent lamps. Integrating Hi-lume 1% technology into your designs affords you full control over the lighting in any space.

Operating voltage

- 120 V or 277 V @ 60 Hz

Lamp types and wattages

- T5 HO: 24 W, 39 W, 54 W
- T4 4-pin triple-tube CFL: 26 W, 32 W

Control options

- 3-wire control

Available case types

- A-case
- C-case

Key standards

- California Energy Commission Listed
- UL Listed (evaluated to the requirements of UL 935)
- CSA certified (evaluated to the requirements of C22.2 No. 74)
- MIL Std. 461E compliant (meets the requirements of CE101, RE101 and RE102)
- Meets FCC Part 18 Non-Consumer requirements for EMI/RFI emissions

Download specification submittal

Features

- Continuous, flicker-free dimming from 100% to 1%
- Ballasts maintain consistent light output for different lamp lengths, ensuring fixture-to-fixture uniformity
- 3-wire line voltage control for consistent fixture-to-fixture dimming
- Sensors cannot connect directly to Hi-lume ballasts
- Line-voltage miswire protection
- Slim-profile design
- Lamps turn on at any dimmed level without going to full brightness
- 100% performance-tested, including burn-in at the factory

Specifications

- Total Harmonic Distortion (THD): less than 10%
- Power factor greater than 0.95
- Ballast factor equal to 0.95 for T4 lamps
- Ballast factor equal to 1.0 for T5 HO lamps

Environment

- Sound rating: Class A
- Minimum lamp starting temperature 10°C (50°F)
- Maximum ballast case temperature 75°C (167°F)

Mounting

- Ballast mounts using two screws (or sheet metal feature and one screw) within a fluorescent fixture
- Ballast is grounded via a mounting screw to the fixture
- Lutron® and NEMA® recommend sockets complying with IEC 60400. Sockets must have a UL mark as well. Use rapid start sockets, not instant start sockets.
- Terminals accept 16-18 AWG (0.75 to 1.5 mm^2) solid copper or tinned stranded wire

Wiring

- Hi-lume ballasts require three wires plus Ground (Dimmed Hot, Switched Hot and Neutral); one 16-18 AWG solid copper Class 1 wire per terminal
- Maximum ballast-to-lamp-socket lead length is 7 ft (2 m) for T5 HO linear lamps, and 3ft (1m) for T4 compact lamps
- Ballast is grounded via case

QUICKTRONIC® POWERSENSE® T5HO UNV Dimming Systems

RoHS compliant

Fluorescent Controllable Lighting Systems

High Efficiency Series

POWERSENSE T5HO DIM

Lamp / Ballast Guide

54W T5HO - PENTRON® lamps*
1-lamp QHE1x54T5HO/UNV DIM TC
2-lamp QHE2x54T5HO/UNV DIM TCL

Also operates:
FT55DL, FPC55 and L58T8

* Not to be used with Energy Saving T5HO lamps

Key System Features

- Industry's first ballast that combines dimming inputs from 0-10V and/or two-wire AC dimming providing maximum flexibility
- POWERSENSE compatibility with low voltage and power line fluorescent dimmers
- High Efficiency
- Lamp Detection Technology
- Universal voltage (120-277V)
- 100-1% Dimming Range
- PROStart® programmed rapid start
- Anti-flash circuitry – turns on in dimmed mode
- Operates at >42kHz
- QUICKSENSE ballast technology (end-of-lamp-life sensing)
- QUICK 60+ ballast and lamp warranty
- RoHS compliant
- Lead-free solder and manufacturing process

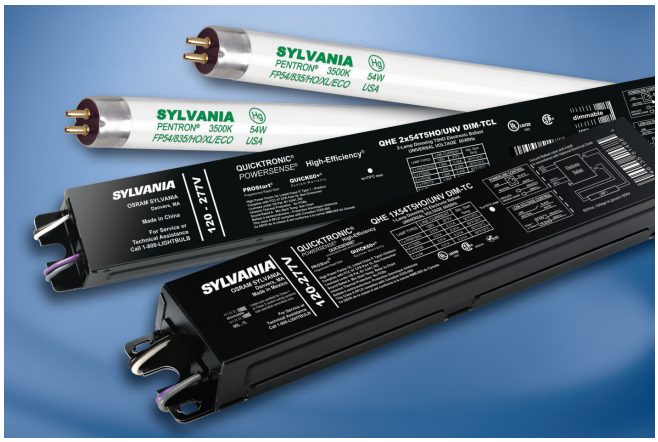
Application Information

SYLVANIA QUICKTRONIC POWERSENSE ballasts
are ideally suited for:

- Occupancy sensors
- Daylight harvesting
- Energy management
- Load shedding
- Commercial
- Retail
- Hospitality
- Institutional
- Schools
- New construction
- Retrofit

SYLVANIA QUICKTRONIC High Efficiency POWERSENSE T5HO electronic ballasts offer several advantages:

- **Wide Dimming Range:** operate linear fluorescent PENTRON HO, PENTRON HO Circline, and DULUX LT5 lamps over a 100-1% dimming range and provide true versatility in controls selection.
- **Industry's Most Adaptable Dimming Ballast:** ballasts feature micro-controller technology for compatibility with:
  - low voltage controls
  - power line fluorescent dimmers
  - any line voltage from 120V to 277V
- **Unmatched Performance:** patented lamp detection technology that virtually eliminates variations in brightness from lamp-to-lamp and provides uniform lighting throughout the dimming range. This technology also eases installation and troubleshooting by recognizing failed lamps, faulty wiring or loose connections, and shutting down.



When the problem is corrected, the system restarts automatically.

RoHS Compliant: QUICKTRONIC POWERSENSE T5HO ballasts are RoHS compliant and feature lead-free solder and manufacturing process

QUICK60+® Warranty: Setting the standard for quality, QUICKTRONIC POWERSENSE T5HO ballasts are covered by a QUICK60+® warranty, the first comprehensive system warranty in the industry

System Information

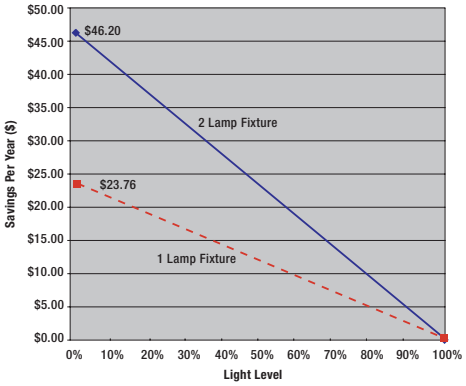
QUICKTRONIC POWERSENSE ballasts operate from standard low voltage (0-10VDC) controllers or compatible 2-wire power line fluorescent dimmers, making them ideal for individual office lighting or automated building applications, both in new construction and retrofit projects.

For the individual office or conference room, installation can be streamlined by using a 2-wire power line fluorescent dimmer; eliminating the need for additional control wires.

For more advanced systems, such as daylight harvesting or building automation applications, standard low voltage devices (0-10VDC, Class 1 or 2) are used to control the lighting system. In this daylight harvesting example, each lighting fixture (or fixture row) is controlled by it's own photosensor; regulating the light output to compensate for changes in natural daylight. Depending upon the specific application, energy savings of up to 60% compared to fixed output electronic systems can be realized.

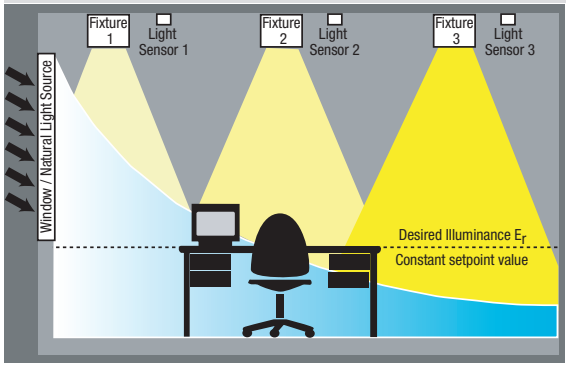
All QUICKTRONIC POWERSENSE ballasts include a line voltage protection circuit, which protects the ballast in the event that line voltage is inadvertently applied to the low voltage control inputs.

SAVINGS PER YEAR* vs LIGHT LEVEL
(54W T5HO Lamps, QUICKTRONIC QHE POWERSENSE T5HO Ballast)



*Based on 4000 hrs/yr, $0.11/kWh, and 120V operation
*Savings per Year (@Light Level) = Cost of operation (100% Light Level) – Cost of operation (@Light Level)

DAYLIGHT HARVESTING SCENARIO



POWERSENSE CONTROLS

SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

QUICKTRONIC® POWERSENSE® Controls Information

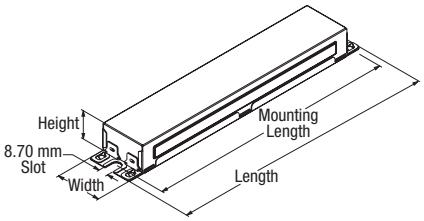
RoHS compliant

Controls Manufacturer	Fluorescent Powerline Controllers	0-10 VDC Controllers	Photo Cells	Occupancy Sensors	Building Management Systems
SYLVANIA www.sylvania.com/controls	X	X	X	X	X
Acuity Brand Controls www.acuitybrandscontrols.com	X	X	X	X	X
Blue Ridge Technologies www.brtint.com	X	X	X	X	X
Cooper Greengate http://greengate.coopercontrol.com		X	X	X	X
Hunt Dimming www.huntdimming.com	X	X			X
Lehigh Electric Products www.lehighdim.com	X	X			X
Leviton www.leviton.com	X	X	X	X	
Sensor Switch www.sensorswitch.com			X	X	
Siemens Building Technology http://sbt.siemens.com					X
Starfield Controls www.starfieldcorp.com		X	X	X	X
Watt Stopper www.wattstopper.com	X	X	X	X	X

Please contact controls manfacturer to order/specify controls. For the latest controls list go to www.sylvania.com
Also, for more information, refer to the LCA (Lighting Controls Association) site: http://lightingcontrolsassociation.org

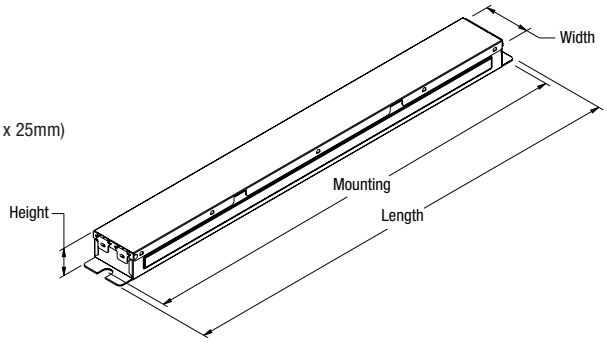
Dimensions:
1 lamp enclosure
Overall: 9.5" L x 1.68" W x 1.0" H (241 x 43 x 25 mm)
Mounting: 8.90" (226 mm)
Weight: 1.1 lbs each (500 g)

Wiring:
Leads Only



Dimensions:
2 lamp enclosure
Overall: 16.7" L x 1.68" W x 1.0" H (425mm x 43mm x 25mm)
Mounting:16.2" (411 mm)
Weight: 2.1 lbs each (950 g)

Wiring:
Leads Only



Control Specifications/model numbers may change.
Please consult manufacturers listed for their latest control models and to order their controls.

T5HO POWERSENSE
High Efficiency
Controls Guide

Contact the companies listed for their 2-wire Fluorescent/Powerline controls and/or 0-10V controls information.

T5HO POWERSENSE Dimming Ballast
51468 QHE 1x54T5HO/UNV DIM-TC
51467 QHE 2x54T5HO/UNV DIM-TCL

WARNING:
Install and wire these ballast and controls in accordance with the National Electrical Code (NEC), all applicable Federal, State and local electrical codes, as well as the specific instructions provided with the compatible control that you purchased. Installation should be performed by qualified personnel only.

These instructions are guidelines only. Installation may vary for different controls/ fixtures/applications. Be sure to follow the control instructions and all applicable codes and standards when installing dimming systems.

Please contact controls manufacturer listed in the OSRAM SYLVANIA Inc. controls cross reference for compatible controls and instruction wiring

NOTES: 1. Dimming ballasts source <0.5mA (0-10VDC control input).

2. Powerline controls must be rated for the type (e.g. Fluorescent Phase-control) and size (e.g. 600W, 1000W, 1500W & 2000W etc.) of the connected load. Do NOT use incandescent powerline controls; incandescent dimmers are not rated for fluorescent loads and are NOT compatible with POWERSENSE ballasts.

OSRAM SYLVANIA
National Customer
Service and Sales Center
1-800-LIGHTBULB
(1-800-544-4828)
www.sylvania.com

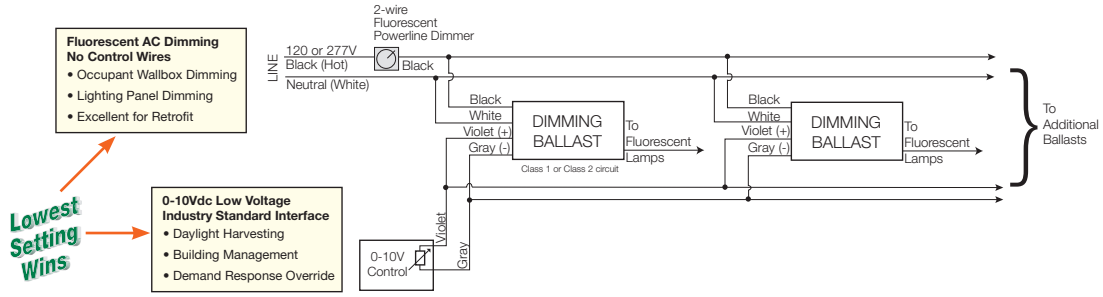
Specifications subject to change without notice.

QUICKTRONIC® POWERSENSE® T5HO Dimming UNV - Dimming Control Wiring Examples

RoHS compliant

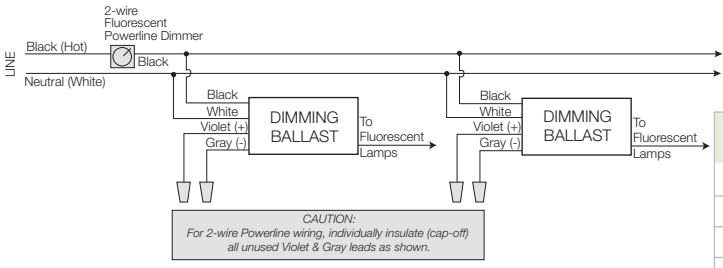
Industry's 1st Ballast That Allows POWERLINE Fluorescent Control *AND* 0-10Vdc Control Input Simultaneously

2-wire Powerline *AND* 0-10Vdc Control with POWERSENSE Ballasts



Wallbox Style 2-wire Powerline Control Wiring Example

2-wire Powerline Control with POWERSENSE Ballasts



Powerline Control Specs:
Specification-grade controls are available for 120V or 277V operation of controllable analog electronic fluorescent ballasts. Controls must be suitably rated for both the type (e.g. Fluorescent Phase-control) and size (e.g. 600W of the connected load.

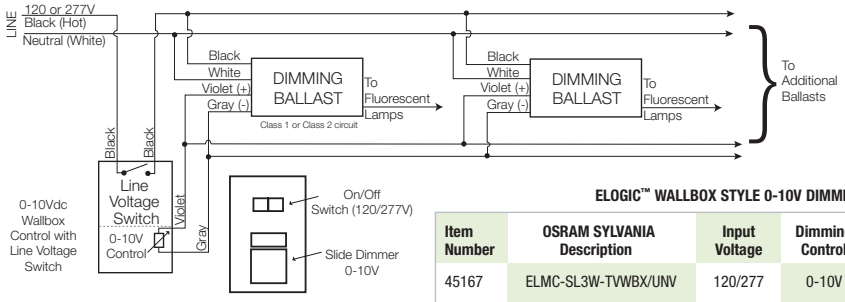
ELOGIC™ MANUAL CONTROL SLIDE FLUORESCENT PHASE CUT DIMMER

Item Number	OSRAM SYLVANIA Description	Voltage Rating	Rating	Type	Wiring
45165	ELMC-SL3WHP-FLPCWBX120	120 VAC	1000VA	Fluorescent Phase cut	Single Pole or 3-way
45166	ELMC-SL3WHP-FLPCWBX277	277 VAC	1200VA		
45163	ELMC-SL3WSP-FLPCWBX120	120 VAC	600VA		
45164	ELMC-SL3WSP-FLPCWBX277	277 VAC	600VA		

**For additional information refer to ELOGIC™ Lighting Controls product information bulletins LMS068.*

Wallbox Style 0-10V Control with Power Switch Wiring Example

0-10V DC Control with POWERSENSE Ballasts



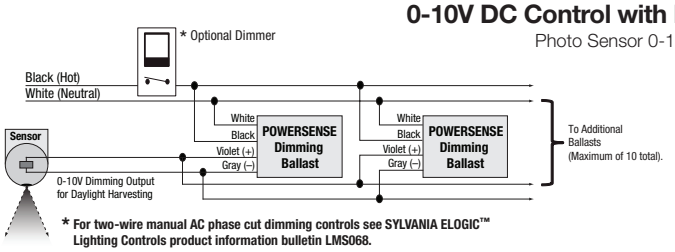
ELOGIC™ WALLBOX STYLE 0-10V DIMMER WITH POWER SWITCH

Item Number	OSRAM SYLVANIA Description	Input Voltage	Dimming Control	Maximum Power Rating	Wiring	Color
45167	ELMC-SL3W-TVWBX/UNV	120/277	0-10V	1200VA @120V 1500VA @277V	Single Pole or 3-way	White

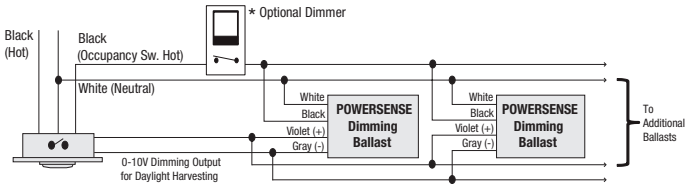
Daylight Harvesting and Occupancy Control Wiring Example

0-10V DC Control with POWERSENSE Ballasts

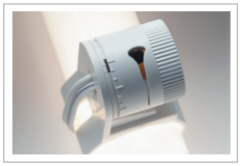
Photo Sensor 0-10V Wiring Example



*** For two-wire manual AC phase cut dimming controls see SYLVANIA ELOGIC™ Lighting Controls product information bulletin LMS068.**



*** For two-wire manual AC phase cut dimming controls see SYLVANIA ELOGIC™ Lighting Controls product information bulletin LMS068.**



ELOGIC™ DAYLIGHT HARVESTING AND OCCUPANCY CONTROLS ORDERING INFORMATION

Item Number	OSRAM SYLVANIA Description	Function	Occupancy Sensing Method	Control Method	Sensor Power	Mounting Method
45030	ELSC-DLH-TVLAMP/BUS	Daylight Harvesting	N/A	0-10V	From Ballast	To Lamp
45032	ELSC-DLOCIRM-TV1RCEIL/UNV	Daylight Harvesting + Occupancy Sensing	Passive Infrared + Microphonics™	0-10V + Power ON/OFF switch	Line voltage 120/277AC	Ceiling
45033	ELSC-DLOCIR-TV1RCEIL/UNV		Passive Infrared			
45034	ELSC-DLOCIRM-TV1RREC/UNV		Passive Infrared + Microphonics™		No power pack required	Recessed
45035	ELSC-DLOCIR-TV1RREC/UNV		Passive Infrared			

**For additional information refer to ELOGIC™ Lighting Controls product information bulletins ECS101 and ECS106.*

POWERSENSE WIRING & CONTROLS

POWERSENSE T5HO DIM

SPECIFICATION DATA

Catalog #	Date	Type
Project	Prepared by	
Comments		

High Efficiency, T5HO Controllable Lighting Systems, Universal Voltage (120-277V)

RoHS compliant

Item Number	OSRAM SYLVANIA Description	Input Current (AMPS)	Lamp[1] Type	Rated[1] Lumens (lm)	No. of Lamps	Ballast[1] Factor (BF)	System[1] Lumens	Mean[1] Lumens	Input[1] Power (W) 120V	Input[1] Power (W) 277V	System[3] Efficacy (lm/W)	BEF[2]
51468	QHE1x54T5HO/UNV DIM-TC *10-pack*	0.51/0.21	FP54T5HO	5000	1	1.00 0.01	5000 50	4650 45	62 8	60 8	83	1.67
		0.51/0.21	FT55DL	4800	1	1.00 0.01	4800 45	4465 40	62 8	60 8	80	1.67
		0.51/0.21	L58	5200	1	1.00 0.01	5200 50	4835 45	62 8	60 8	87	1.67
		0.51/0.21	FPC55	4000	1	1.00 0.01	4000 40	3725 35	62 8	60 8	67	1.67
51467	QHE2x54T5HO/UNV DIM-TCL *10-pack*	1.00/0.42	FP54T5HO	5000	2	1.00 0.01	10,000 100	9300 95	120 15	116 15	86	0.86
		1.00/0.42	FT55DL	4800	2	1.00 0.01	9600 95	8930 90	120 15	116 15	83	0.86
		1.00/0.42	L58	5200	2	1.00 0.01	10,400 105	9670 95	120 15	116 15	90	0.86
		1.00/0.42	FPC55	4000	2	1.00 0.01	8000 80	7440 75	120 15	116 15	69	0.86

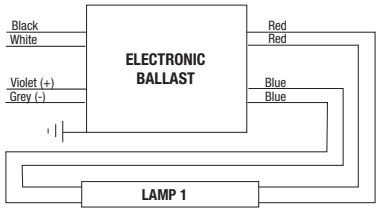
1: At 35°C lamp ambient temperature.
2: Ballast Efficiency Factor (BEF) shown = (Ballast Factor x 100) divided by Input Power (Note: calculation based on lowest wattage value).
3: System Efficacy calculation based on lowest input power value.

Installation Notes

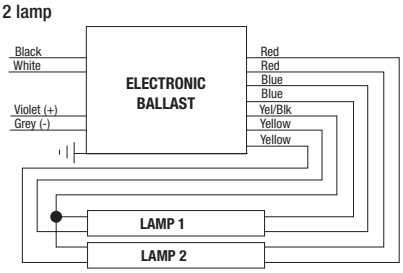
Output Wiring: Lamp wiring for dimming ballasts can differ significantly from non-dimming ballasts and from other manufacturers dimming ballasts. Take care to connect lamp lead wires as shown on the applicable ballast diagram.

Lamp Seasoning: For optimal performance, fluorescent lamps may require seasoning for up to 12 hours prior to low temperature starting & low level dimming. Refer to NEMA LSD 23-2002 Lighting Systems Division: Recommended Practice — Lamp Seasoning for Fluorescent Dimming Systems

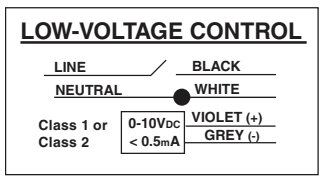
1 lamp

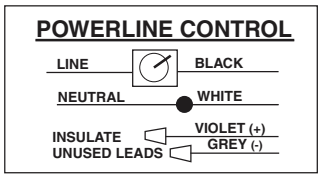


2 lamp



Input & Control Wiring Options:





Item Number — **51467 QHE 2 x 54T5HO / UNV DIM-TCL** — System Type - DIMMING/Case Size
QUICKTRONIC High Efficiency — Line Voltage (120-277V)
Number of Lamps (2) — Primary Lamp Wattage

T5HO POWERSENSE®

High Efficiency

Performance Guide

Data shown based upon SYLVANIA PENTRON® lamp(s). QUICKTRONIC® POWERSENSE ballasts are also compatible with other lamp manufacturers equivalent lamp types that meet ANSI specifications. **Not to be used with Energy Saving T5HO lamps.**

Specifications

Data based on FP28

Starting Method: Programmed Rapid Start
Circuit Type: Series
Lamp Frequency: >40kHz
Lamp CCF: Less than 1.7
Starting Temp: 50°F/10°C minimum[5]
Input Voltage: 120-277V, ±10%
Input Frequency: 50/60 Hz
THD: <10% @ Full Output
Power Factor: >98% @ Full Output

UL Listed Class P, Type 1 Outdoor
CSA or C/UL Certified
70°C Max Case Temperature
FCC 47CFR Part 18 Non-Consumer
Class A Sound Rating
RoHS Compliant[4]
ANSI C62.41 Cat. A Transient Protection
Remote Mounting (Max. wire length from ballast case to lampholder): up to 4ft

4 Complies with European Union Restriction of Hazardous Substances Directive. (Directive 2002/95/EC)

5 FT55DL starting Temperature 60°F/16°C

Control Information

QUICKTRONIC POWERSENSE ballasts are compatible with a wide range of low voltage (0-10VDC) and power line fluorescent controllers available from various manufacturers.

Low Voltage Control Specs: Ballast will source up to 0.5mA for 0-10VDC control purposes. May be wired as a Class 1 or Class 2 circuit-consult Local and National Electrical Codes.

Power Line Control Specs: Specification-grade fluorescent controls are available for 120V or 277V operation of controllable analog electronic fluorescent ballasts. Controls must be suitably rated for both the type (e.g. Fluorescent Phase-control) and size (e.g. 600W) of the connected load.

System Life / Warranty

QUICKTRONIC products are covered by the QUICK 60+® warranty, a comprehensive lamp and ballast system warranty. For additional details, refer to the QUICK 60+ warranty bulletin.

OSRAM SYLVANIA
National Customer
Service and Sales Center
1-800-LIGHTBULB
(1-800-544-4828)
www.sylvania.com

Specifications subject to change without notice.

the system solution®

369325h 1 01.19.15

Hi-lume® A-Series Driver Overview EcoSystem® or 3-wire control

Hi-lume® A-Series Driver is a high-performance LED driver that provides smooth, continuous 1% dimming for virtually any LED fixture, whether it requires constant-current or constant-voltage. It is the most versatile LED driver offered today due to its compatibility with a wide variety of LED arrays, multiple form factors, and numerous control options.

Features

- Continuous, flicker-free dimming from 100% to 1%.
- Compatible with Energi Savr Node™ unit with EcoSystem®, GRAFIK Eye® QS control unit, PowPak® dimming module with EcoSystem®, and Quantum® systems, allowing for integration into a planned or existing EcoSystem® lighting control solution. Please see **Compatible Controls** chart or contact Lutron for details regarding compatible controls.
- Standard 3-wire, line-voltage phase-control technology for consistent dimming performance and compatibility with all Lutron® 3-wire fluorescent controls.
- QwikFig™ compatible. For more information please refer to Lutron® P/N 041473 (K and M case only).
- Line voltage miswire protection on EcoSystem® control inputs.
- 100% performance tested at factory.
- A rated lifetime of 50,000 hours @:
  - t_c = 149 °F (65 °C) for 40 W drivers
  - t_c = 158 °F (70 °C) for 50 W drivers
- UL® recognized for United States and Canada.
- Type TL Rated.
- FCC Part 15 compliant for commercial applications at 120 V~ or 277 V~.
- Pulse Width Modulation (PWM) or Constant-Current Reduction (CCR) dimming methods available. See Application Note #360 for details.
- RoHS Compliant.
- For more information please go to: www.lutron.com/HilumeLED

Hi-lume® A-Series, case type K

3.00 in (76 mm) W x 1.00 in (25 mm) H x 4.90 in (124 mm) L

Hi-lume® A-Series, case type M

1.18 in (30 mm) W x 1.00 in (25 mm) H x 14.25 in (362 mm) L

Hi-lume® A-Series, case type KL

K-case mounted on a 4.00 in (102 mm) W x 1.50 in (38 mm) H x 4.00 in (102 mm) L junction box to provide UL® listed wiring compartment

The Hi-lume® A-Series family of drivers includes models which operate at a maximum power of 40 W or less as well as models which can operate up to 50 W.

- 40 W or less models - output ranges A-M and X-Z
- 50 W models - output ranges N and W (K-case only)

For a description of the output ranges please see following pages.

LUTRON® SPECIFICATION SUBMITTAL

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory Approvals

- Meets ANSI C62.41 category A surge protection standards up to and including 4 kV.
- FCC Part 15 compliant for commercial applications at 120 V~ or 277 V~.
- Manufacturing facilities employ ESD reduction practices that comply with the requirements of ANSI/ESD S20.20.
- Lutron® Quality Systems registered to ISO 9001.2008.
- UL® 8750 recognized.
- UL® 8750 listed form factor available.
- Class 2 output available.
- Models available to meet LED Driver requirements for Energy Star 1.1.
- Type TL Rated.

UL® 8750 Listed Option

- cULus® for United States and Canada available for certain operating regions.
- Pre-wired and installation ready.
- See **KL Enclosure** page for more specific details regarding UL® listed option.

Environmental

- Sound Rating: Inaudible in 27 dB ambient.
- Relative Humidity: Maximum 90% non-condensing.
- Minimum operating ambient temperature t_a = 32 °F (0 °C).

Performance

- Dimming Range: 100% to 1%.
- Operating Voltage: 120–277 V~ at 50/60 Hz.
- Lifetime: 50,000 hours @:
  - t_c = 149 °F (65 °C)[1] for 40 W drivers.
  - t_c = 158 °F (70 °C)[1] for 50 W drivers.
  - For rated warranty, t_c not to exceed the maximum rated temperatures listed here.[1]
- Patented thermal foldback protection.
- LEDs turn on to any dimmed level without going to full brightness.
- Non-volatile memory restores all driver settings after power failure.
- Power Factor: >0.90 for loads greater than 25 W
- Standby Power Consumption: <1.0 W
- Total Harmonic Distortion (THD): <20% for loads greater than 25 W.
- Inrush Current: <2 A.
- Inrush Current Limiting Circuitry: eliminates circuit breaker tripping, switch arcing and relay failure.
- Open circuit protected.
- Short circuit protected.
- Turn-on time: ≤1.5 seconds.[2]
- PWM Dimming Frequency: 550 Hz.

Driver Wiring & Mounting

- Driver is grounded by a mounting screw to the grounded fixture (or by terminal connection on the K-case).
- Terminal blocks on the driver accept one solid wire per terminal from 18 AWG to 16 AWG (0.75 mm^2 to 1.5 mm^2).
- Fixture must be grounded in accordance with local and national electrical codes.
- For maximum driver to LED light engine wire lengths see **Driver Leads** section at end of document.

[1] Installer is responsible for ensuring that the driver case temperature does not exceed the maximum rated temperature.

[2] Models available with turn-on time ≤ 1 second.

Job Name:	Model Numbers:	
Job Number:		

How to Build a Model Number: Hi-lume® A-Series

L3DA _ U1U _ _ - _ _ ___

Example: L3DA4U1UKS-HC070
For further assistance selecting your model number, contact our LED Center of Excellence at 1.877.346.5338 or LEDs@lutron.com

Maximum Power:
4 = 40 W maximum
5 = 50 W maximum (K-case only)

Case Size:
K = Compact
M = Stick

Case Style:
S = Studded (K case only)
N = Non-Studded
L = UL® Listed (K case only)

Current Level (for Constant-Current):
020 = 0.20 A; 021 = 0.21 A . . . 070 = 0.70 A . . . 210 = 2.10 A

Voltage Level (for Constant-Voltage):
100 = 10.0 V; 105 = 10.5 V . . . 600 = 60.0 V

Driver Output:
C = Constant-current driver with pulse width modulation (PWM) dimming
A = Constant-current driver with constant-current reduction (CCR) dimming
V = Constant-voltage driver with pulse width modulation (PWM) dimming

LED Load Output Range (see the following pages for more detail):

40 W Drivers

Class 2 Constant-Voltage
A = 10.0 V–12.0 V
B = 12.5 V–20.0 V*
C = 20.5 V–24.0 V*
D = 24.5 V–38.0 V*

Isolated Non-Class 2 Constant-Voltage
X = 38.5 V–60.0 V*

Class 2 Constant-Current
E = 0.20 A–0.50 A 30 V–54 V
F = 0.51 A–1.00 A 30 V–54 V*
G = 0.20 A–0.70 A 8 V–20 V
H = 0.20 A–0.70 A 15 V–38 V
I = 0.71 A–1.05 A 8 V–20 V
J = 0.71 A–1.05 A 15 V–38 V
K = 1.06 A–1.50 A 8 V–20 V
L = 1.06 A–1.50 A 15 V–38 V*
M = 1.51 A–2.10 A 8 V–19.9 V*

Isolated Non-Class 2 Constant-Current
Y = 0.20 A–0.50 A 30 V–60 V
Z = 0.51 A–1.00 A 30 V–60 V*

50 W Drivers

Class 2 Constant-Current
N = 0.71 A–1.05 A 35 V–54 V*

Isolated Non-Class 2 Constant-Current
W = 0.71 A–1.05 A 35 V–60 V*

* Output parameter is power-limited for these output ranges. Consult detailed specifications on the following pages for each range.

Job Name:	Model Numbers:	
Job Number:		

How to Build a Bulk Model Number (For use with Lutron® QwikFig™ technology): Hi-lume® A-Series

40 W Drivers

L3DA4U1U _ _ - _ _ BLK

Case Size:
K = Compact
M = Stick

Case Style:[1]
S = Studded (K-case only)
N = Non-Studded (All M-case models)

Bulk Models:

Coverage based on "LED Load Output Range" from standard non-configurable models shown in the **How to Build a Model Number** section.
Example Standard model number: L3DA4U1UKS-**H**C070 has LED load output range = H

K-case and M-case

1A = Covers "LED Load Output Range" Y and Z
2A = Covers "LED Load Output Range" M
3A = Covers "LED Load Output Range" E and F (CCR dimming only)

K-case only

2G = Covers "LED Load Output Range" G
2H = Covers "LED Load Output Range" H
2R= Covers "LED Load Output Range" I and K
2S= Covers "LED Load Output Range" J and L

M-case only

2B = Covers "LED Load Output Range" H, J, and L
2C = Covers "LED Load Output Range" G, I, and K

50 W Drivers

L3DA5U1UK _ - _ _ BLK

Case Style:
S = Studded
N = Non-Studded

1B = Covers "LED Load Output Range" W
3B = Covers "LED Load Output Range" N (CCR dimming only)

Note: Only the model numbers falling into the structure listed above can be configured with QwikFig™. Standard model numbers configured at Lutron will not be capable of being reconfigured at another facility.

[1] QwikFig™ bulk drivers are only available as UL® recognized.

Job Name:	Model Numbers:	
Job Number:		

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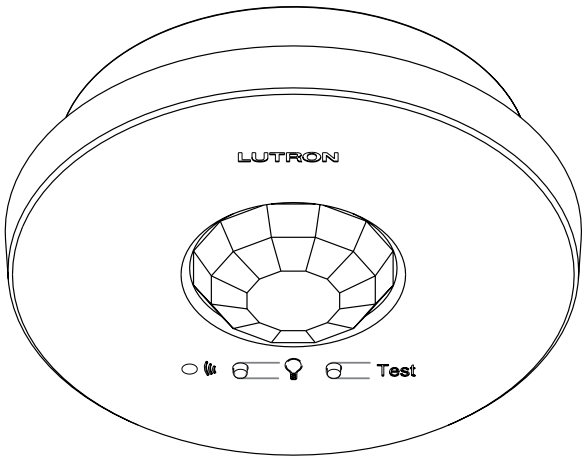
Radio Powr Savr™ Wireless Occupancy/Vacancy Ceiling Sensor

Lutron® Radio Powr Savr™ occupancy/vacancy sensors are wireless, battery-powered, passive infrared (PIR) sensors that automatically control lights via RF communication to compatible dimming and switching devices. These sensors detect the heat (IR radiation of 9.5 µm) from people moving within an area to determine when the space is occupied. The sensors then wirelessly transmit the appropriate commands to the associated dimming and switching devices to turn the lights on or off automatically. They combine both convenience and exceptional energy savings potential along with ease of installation.



Features

- Wireless occupancy sensor has 3 settings available: Auto-On/Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
- Auto-On Low-Light feature will turn lights on automatically only if there is less than approximately 10 Lux (1 fc) of ambient light
- Vacancy-only model available to meet California (U.S.A.) Title 24 requirements
- Uses Clear Connect® technology
- Passive infrared motion detection with exclusive Lutron® XCT™ Technology for fine motion detection
- 360˚ coverage ranges from 324 ft^2 (30.2 m^2) to 676 ft^2 (62.4 m^2), depending on mounting height
- Simple and intuitive adjustments available for Timeout, Auto-On, and Activity settings
- Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
- Multiple sensors can be added for extended coverage. Refer to product specification submittal of receiving device to determine system limits
- Lens illuminates during test mode to verify ideal locations
- Multiple ceiling-mount methods available for different ceiling materials
- Front accessible test buttons make programming easy
- 10-year battery life design
- RoHS compliant

Models Available

- LRF__-OCR2B-P-WH
  - Color Code
  - Occupancy and Vacancy
  - Frequency/Channel Code
- LRF2-VCR2B-P-WH
  - Vacancy Only
  - Available for Channel Code 2 Only

Frequency/Channel Codes

Available

2 = 431.0–437.0 MHz (U.S.A., Canada, Mexico, Brazil)
3 = 868.125–869.850 MHz (Europe, U.A.E.)
4 = 868.125–868.4755 MHz (China, Singapore)
5 = 865.5–866.5 MHz (India)
6 = 312.3–314.8 MHz (Japan)
7 = 433.05–434.79 MHz (Hong Kong, Macau)

Color Code

WH = White

Compatible RF Devices

- For use with Lutron® products only
- Communicates to various wireless Lutron® systems*

* Contact Lutron® Customer Service at www.lutron.com for frequency/channel code compatibility with your particular geographic region, and for integrating with other Lutron® lighting and shading products.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory

- Lutron® Quality Systems Registered to ISO 9001:2008

Standards Approved

LRF2- (USA and Canada)

- cULus Listed
- FCC certified
- IC certified
- Meets CA (U.S.A.) Energy Commission Title 24 requirements
- COFETEL
- ANATEL
- SUTEL

LRF3-

- CE marked (European Union)
- TRA type approval (United Arab Emirates)
- CITC type approval (Saudi Arabia)

LRF4-

- SRRC type approval (Mainland China)
- iDA registered (Singpore)

LRF5-

- WPC Type (India)

LRF6-

- ㊣ 007YUUL0689

LRF7-

- FCC

Power/Performance

- Operating voltage: 3 V⎓
- Operating current: 14 µA nominal
- Requires one CR 123 lithium battery
- 10-year battery life
- Non-volatile memory (saved changes are stored during power loss)

Environment

- Temperature: 32 ˚F to 104 ˚F (0 ˚C to 40 ˚C)
- For indoor use only

Range

LRF2-, LRF3-, LRF4-, LRF5-, LRF7-

Local load controls must be located within 60 ft (18 m) line-of-sight, or 30 ft (9 m) through walls, of a sensor.

LRF6-

Local load controls must be located within 40 ft (12.2 m) line-of-sight, or 23 ft (7 m) through walls, of a sensor.

Sensor Coverage Test

- Front accessible test button
- Lens illuminates orange in response to motion during test mode and is visible from 60 ft (18 m)

Wireless Communication Test

- Front accessible test button
- Turn associated loads on and off

Timeout Options

- 1 minute*
- 5 minutes
- 15 minutes (default setting)
- 30 minutes

Auto-On Options (Occupancy Versions Only)

- *Enabled*: Sensor turns lights ON and OFF automatically (default setting).
- *Low Light*: Sensor turns lights ON automatically only in low ambient light conditions; sensor turns lights OFF automatically.
- *Disabled***: Lights must be turned ON manually from dimming or switching device; sensor turns lights OFF automatically.

Activity Options

- *Low Activity*: (default setting)
- *Medium Activity*:
- *High Activity*:

* Intended for use in high-activity, briefly occupied areas only.

** During the 15-second grace period that begins when the lights are automatically turned off, the lights will automatically turn back on in response to motion. This grace period is provided as a safety and convenience feature in the event the lights turn off while the room is still occupied, so that the user does not need to manually turn the lights back on. After 15 seconds, the grace period expires and the lights must be manually turned on.

Job Name:	Model Numbers:	
Job Number:		

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Installation Overview

Sensor Setup

- Sensor setup is available as a service by Lutron. For more information see the Sensor Layout and Tuning service document (Lutron® P/N 3601235).

Sensor Placement

- To detect motion, the sensor requires line-of-sight of room occupants. The sensor must have an unobstructed view of the room. DO NOT mount behind or near tall cabinets, shelves, hanging fixtures, ceiling fans, etc. The sensor cannot see through glass objects such as patio- or shower doors.
- Hot objects and moving air currents can affect the performance of the sensor. To ensure proper operation, the sensor should be mounted at least 4 ft (1.2 m) away from HVAC vents and light bulbs that are below the ceiling line.
- The performance of the sensor depends on a temperature differential between the ambient room temperature and that of room occupants. Warmer rooms may reduce the ability of the sensor to detect occupants.

Mounting

Temporary mounting is optional to test sensor coverage and wireless communication before permanently installing the sensor.

Drop Ceiling (Compressed Fiber Ceiling Tile)

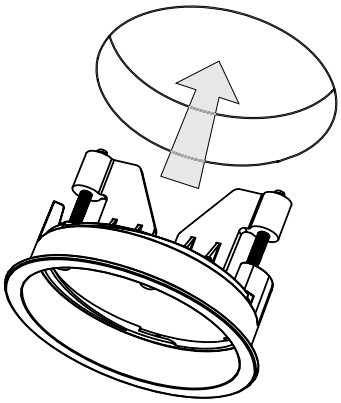
The mounting wire is provided for both temporary and permanent mounting of the sensor to ceiling tiles. It is designed to allow temporary mounting, testing, and repositioning (if necessary) of the sensor without damaging a ceiling tile. Once the final position of the sensor has been chosen, the mounting wire should be twisted together to permanently secure the sensor in place.

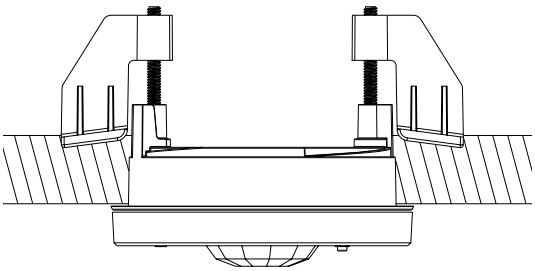
Solid Ceiling (Drywall, Plaster, Concrete, or Wood)

- Temporary mounting: Ten (10) temporary mounting strips can be purchased in the kit, L-CMDPIRKIT, for temporarily mounting and testing the sensor.
- Permanent mounting: Screws and anchors (for drywall or plaster) provided to mount the sensor.

Recess-Mount

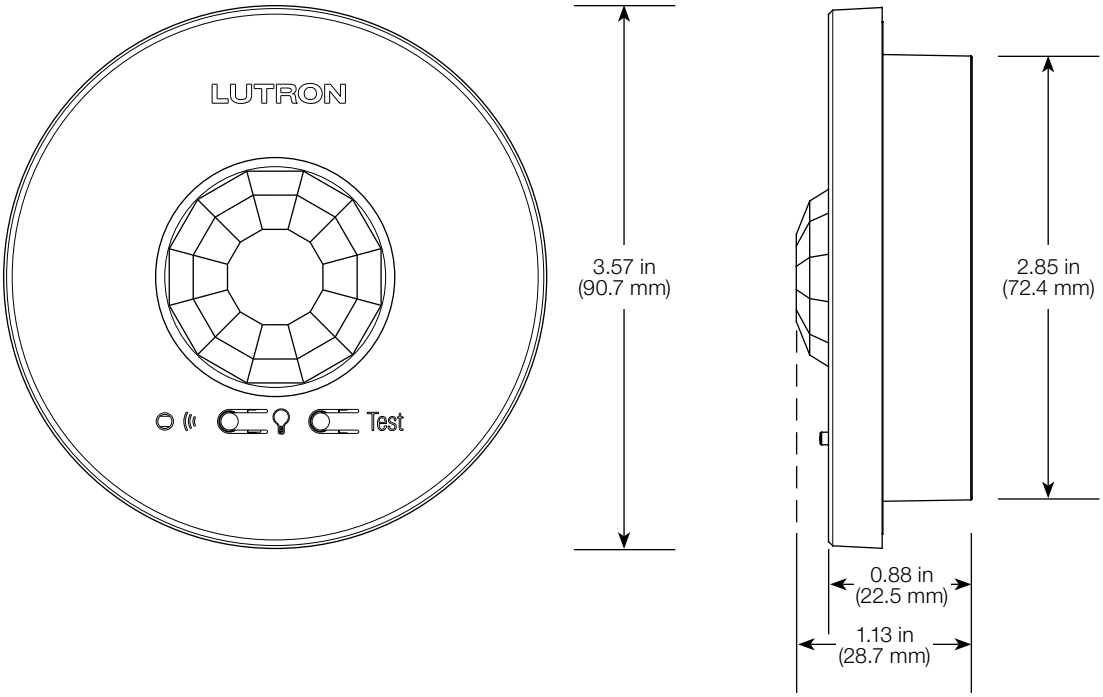
- Do not recess-mount sensor in a metal surface.
- Recess-mounting ring requires an opening of 3 in (76 mm) in diameter.
- Recess-mounting ring secures internally to ceiling. Sensor twists into the recess mounting ring and sits flush with ceiling (see image below).
- Recess-mounting ring purchased as a separate kit: L-CRMK-WH.





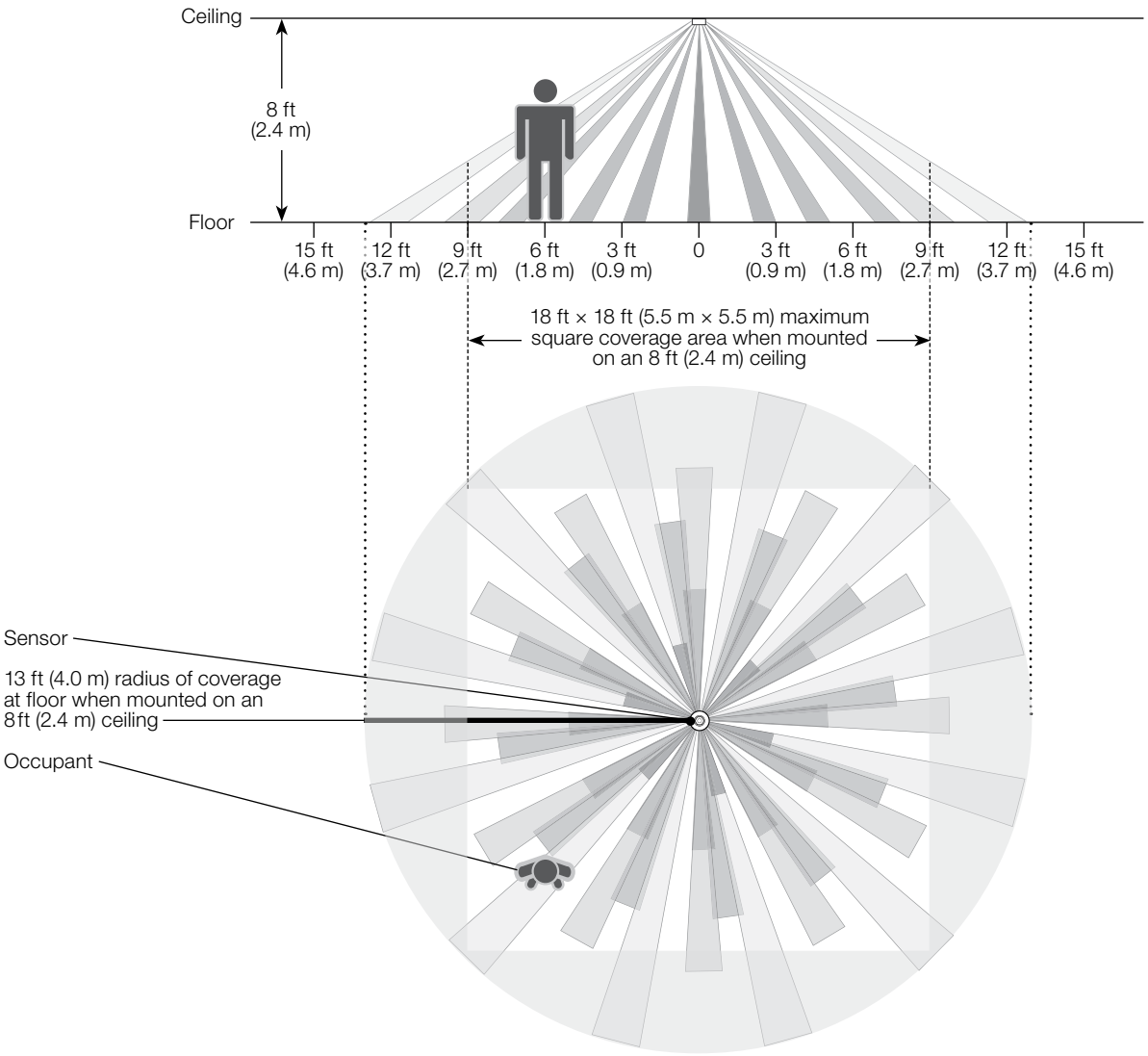
Job Name:	Model Numbers:	
Job Number:		

Dimensions



Job Name:	Model Numbers:	
Job Number:		

Range Diagrams



Sensor Coverage Chart (for sensor mounted in center of room)

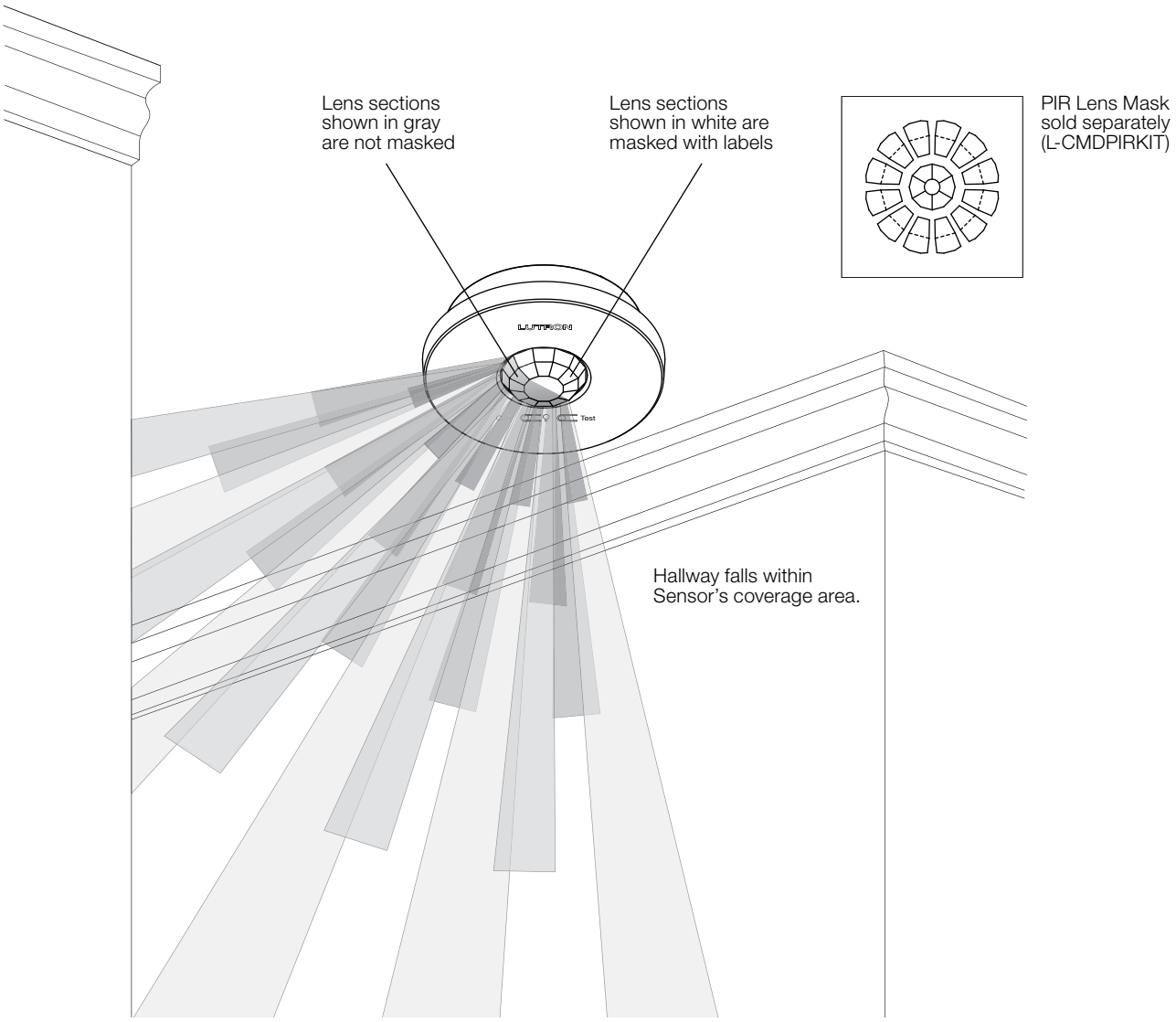
Ceiling Height	Maximum Square Coverage Area*	
8 ft (2.4 m)	18 ft × 18 ft (5.5 m × 5.5 m)	324 ft^2 (30.2 m^2)
9 ft (2.7 m)	20 ft × 20 ft (6.1 m × 6.1 m)	400 ft^2 (37.2 m^2)
10 ft (3.0 m)	22 ft × 22 ft (6.7 m × 6.7 m)	484 ft^2 (44.9 m^2)
12 ft (3.7 m)	26 ft × 26 ft (7.9 m × 7.9 m)	676 ft^2 (62.4 m^2)

* 12 ft (3.7 m) is the recommended maximum mounting height

Job Name:	Model Numbers:	
Job Number:		

Lens Masking

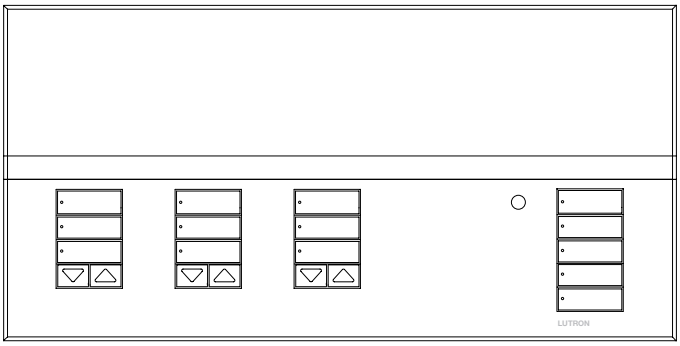
Whenever possible, the sensor should be installed in a location where it cannot view areas outside the intended space, such as hallways or adjacent rooms. If this situation cannot be avoided, portions of the lens may be masked to block the view of the sensor into undesired areas. Ten (10) PIR Lens Masks may be purchased in the kit, L-CMDPIRKIT.



Job Name:	Model Numbers:	
Job Number:		

QS Timeclock

QS Timeclock is the premier energy-saving astronomic timeclock, and direct shade control, which are seamlessly integrated with Lutron's Energi Savr Node™ components and system.



Features

- Allows setup of shade presets using buttons on the control unit.
- Built-in astronomic timeclock.
- Info screen shows programming.
- Lockout option prevents accidental changes.
- One contact closure 24 V⎓
- QS communication link for seamless integration of lights, motorized window treatments, wallstations, and integration interfaces.

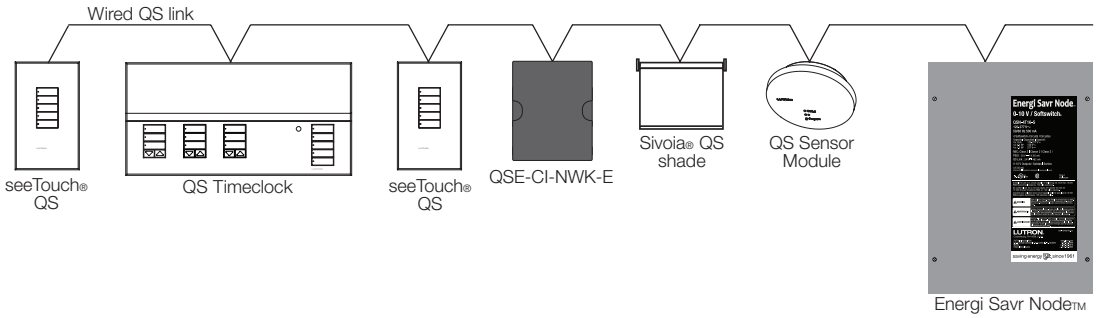
Model Numbers:

QSGR-TC-3S-WH-CPN5825	Timeclock with 3 shade columns

Note: All units ship with faceplate and buttons (white only)

System Topology

Example of Wired System



Job Name:	Model Numbers:	
Job Number:		

Specifications

Input Power
- 120 V~ 50/60 Hz 150 mA
- 240 V~ 50/60 Hz 75 mA

Key Design Features
- Tested to withstand 16 kV electrostatic discharge without damage or memory loss.
- Tested to withstand voltage surges of up to 6000 V~ and current surges of up to 3000 A. Lightning strike protection meets ANSI/IEEE 62.41-1980 standard.
- Power failure memory automatically restores Timeclock to the selection prior to power interruption.
- Faceplate is hinged at the top and bottom, and stays open at 180° for ease of access.

Environment
- 32 to 104 °F (0 to 40 °C)
- Relative humidity less than 90% non-condensing

Regulatory Requirements
- UL
- CSA
- CE

Info Screen
- OLED (organic LED) screen is viewable from all angles.
- Screen turns off when idle for 30 seconds.
- Programmable Timeclock schedules.
- Programmable shade labels.

System Communications and Capacities
- 24 V⎓ 150 mA IEC PELV/NEC® Class 2 wiring connects control units, wallstations, motorized shades, and control interfaces.
- A QS system can have up to 100 devices and 100 zones.
- The QS Timeclock counts as 1 device on the QS link.

Other Accessory Controls and Devices
- Energi Savr Node™ (ESN) unit
- QSE-IO
- QSE-CI-NWK-E
- GRAFIK Eye® QS
- QSPS (QS Link Power Supply - use if more than 3 devices are powered by the QS Timeclock)

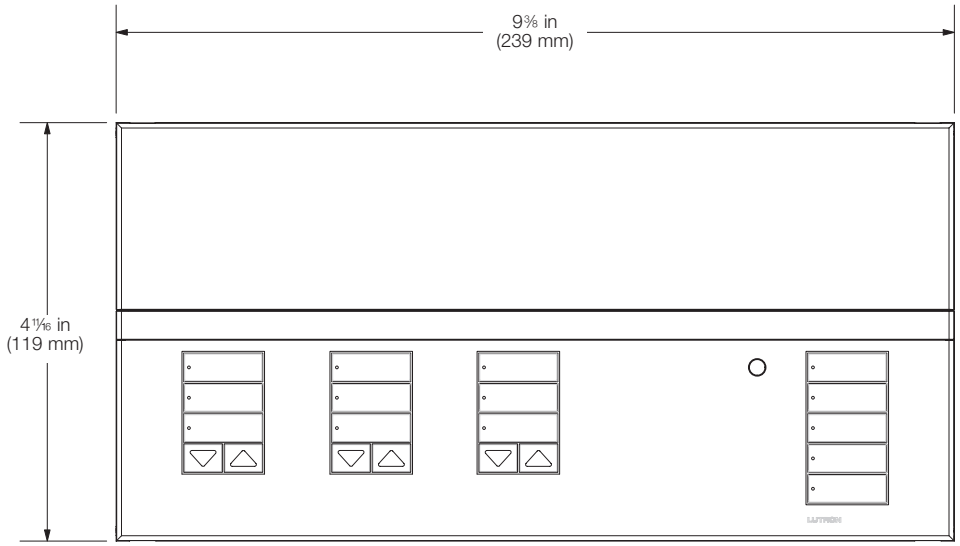
Astronomic Timeclock
- 7 daily schedules available.
- One available holiday schedule is programmable by date up to one year in advance.
- 25 events per day maximum.
- Astronomic times are programmable by integral city database or by entering latitude and longitude. Times automatically adjust throughout the year based on location.
- Automatically adjusts for Daylight Saving Time (DST), adjusted for the new dates; DST is programmable.
- Afterhours feature allows occupants to temporarily override Timeclock events.

Preset Shade Control
- 3 columns of shade controls.
- Open, preset, close, and raise/lower shade buttons.
- Each shade column can be programmed to operate one shade or a group of shades.

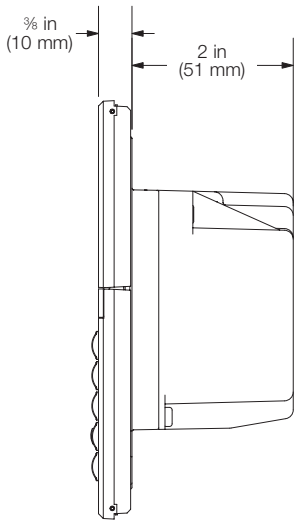
Contact Closure Input (CCI) with Power Supply Output
- 24 V⎓ 50mA
- Each QS Timeclock has one contact closure input (Terminal A).
  - The attached device must provide a dry contact closure or solid-state output.
  - Input is miswire-protected up to 36 V⎓.
- Each QS Timeclock can supply 50 mA maximum at 24 V⎓.
  - An auxiliary power supply must be used if the device requires more than 50 mA.
- The CCI is capable of operating in the following modes
  - Afterhours: Allows the CCI to start and end the afterhours mode.
  - Timeclock: Allows the CCI to enable and disable the Timeclock.
  - Disable CCI: The CCI will have no effect on the system and will not appear on the list of available sensors.
  - Security lockout via password for Timeclock settings.

Job Name:	Model Numbers:	
Job Number:		

Mechanical Dimensions

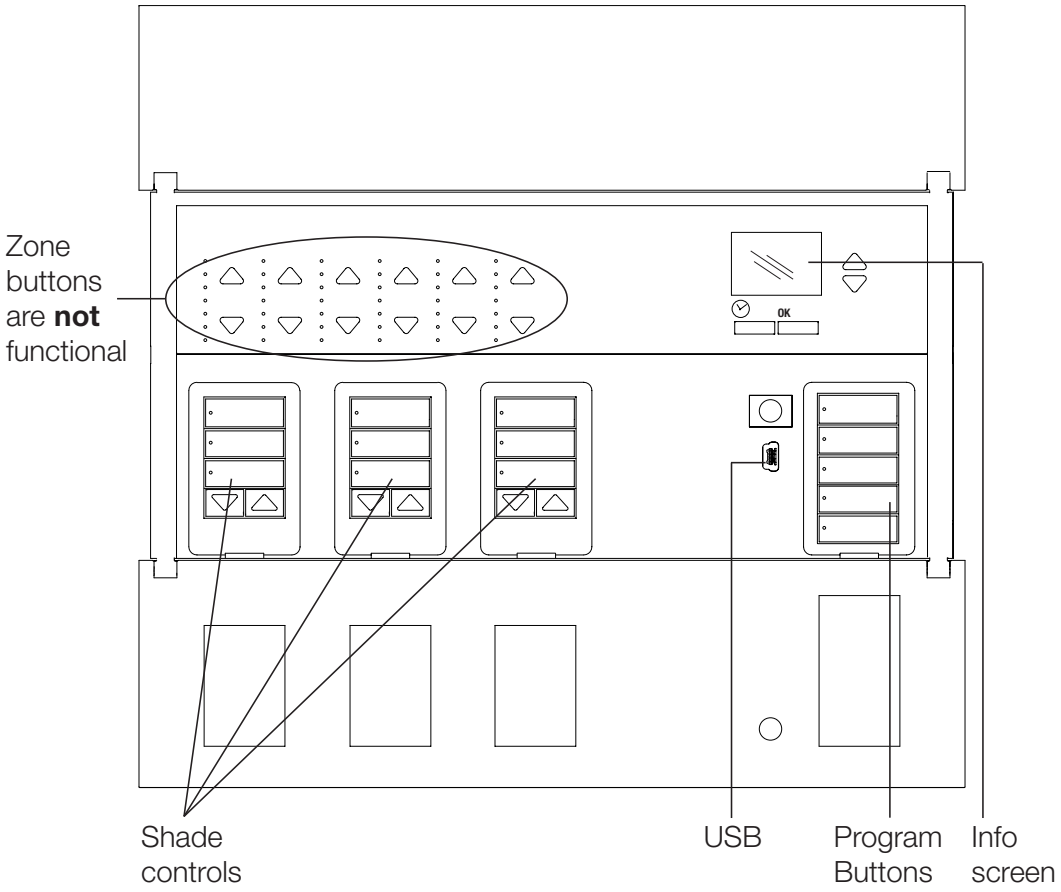


Front View



Side View

Fits into a 4-gang U.S. backbox, 3 ½ in (89 mm) deep; Optional Lutron® P/N 241-400

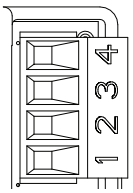


Job Name:	Model Numbers:	
Job Number:		

IEC PELV/NEC® Class 2 QS Communication Link Wiring

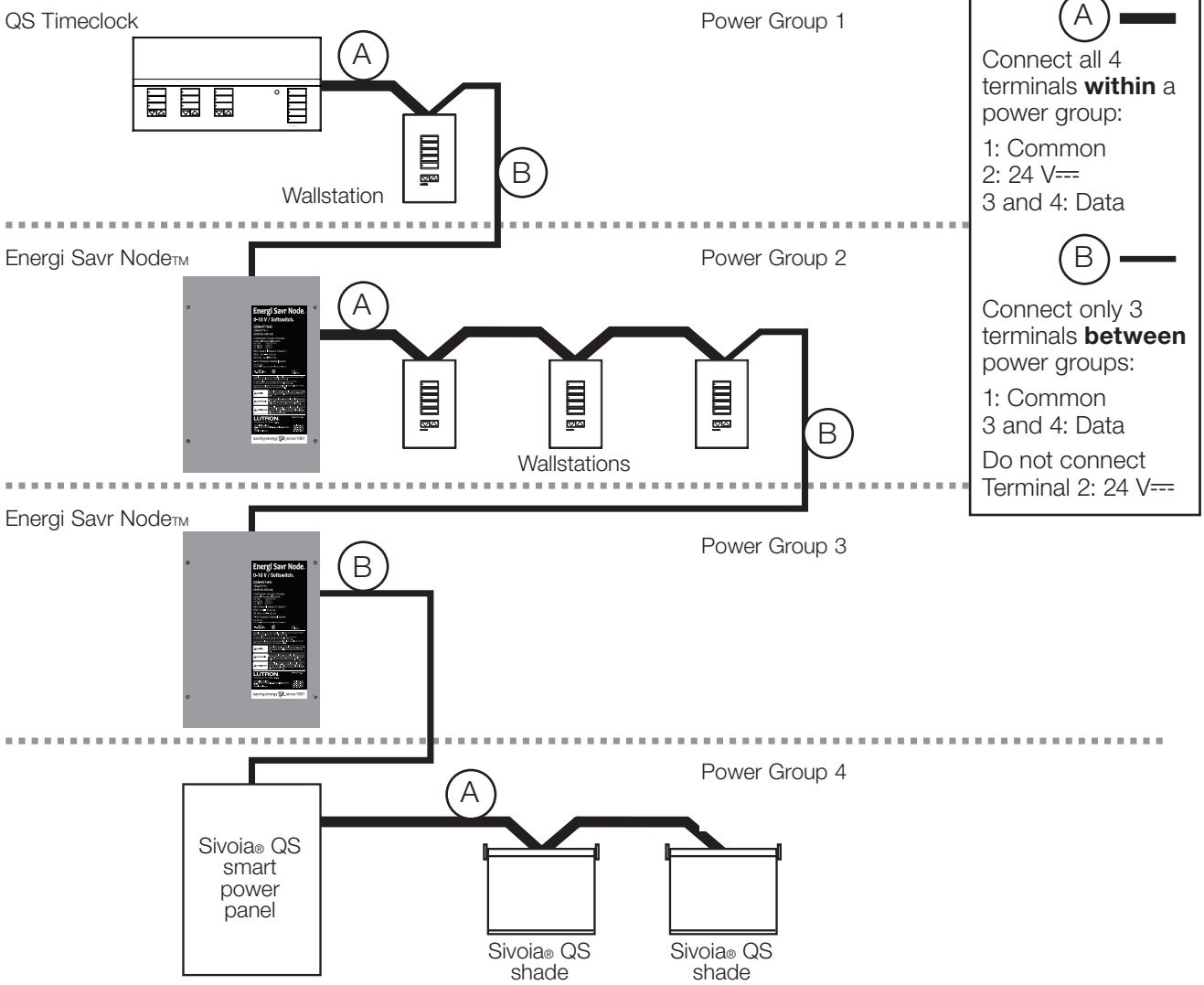
- Each IEC PELV/NEC® Class 2 terminal accepts up to two 1.0 mm² (18 AWG) wires.
- Connect the terminal 1, 3, and 4 connections to all control units, wallstations, and control interfaces.
- Each control unit has its own power supply. Terminate the terminal 2 connection (24 V⎓ power) so that each control unit supplies power to a maximum of three wallstations. Each wallstation should receive power from only one control unit.
- Total length of control link must not exceed 610 m (2000 ft).
- Do not allow IEC PELV/NEC® Class 2 wires to contact line/mains wires.
- QS Timeclock provide 3 PDUs (Power Draw Units) on the QS Link. For more information, see Lutron® P/N 369-405, "Power Draw Units on the QS Link."

QS Communication Link Terminal Detail



$\overline{\text{MUX}}$
MUX
24 V⎓
COM

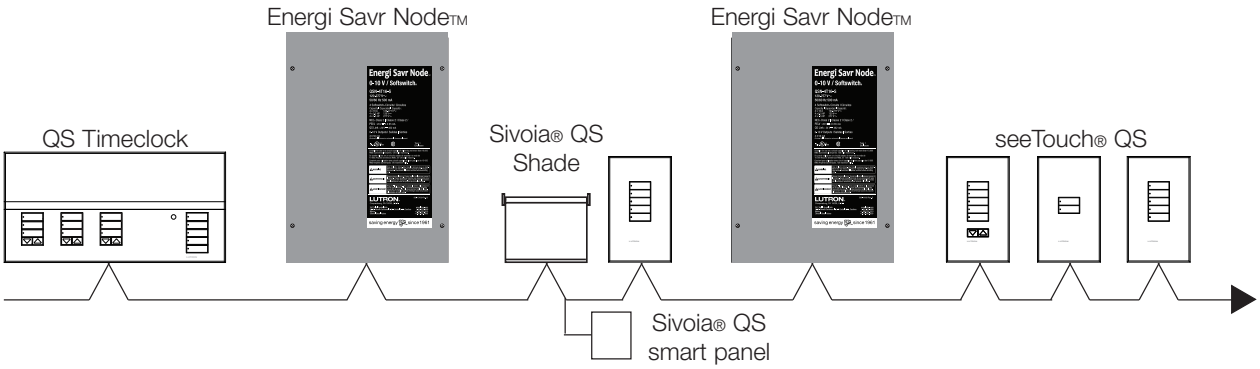
Wiring Example



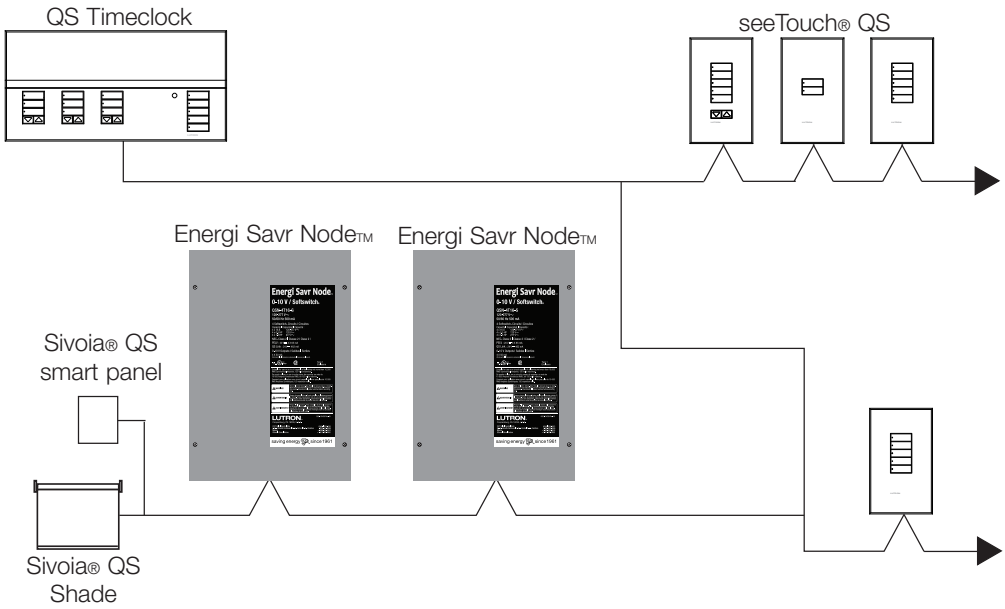
Job Name:	Model Numbers:	
Job Number:		

Wiring Examples

Daisy-Chain Wiring Example

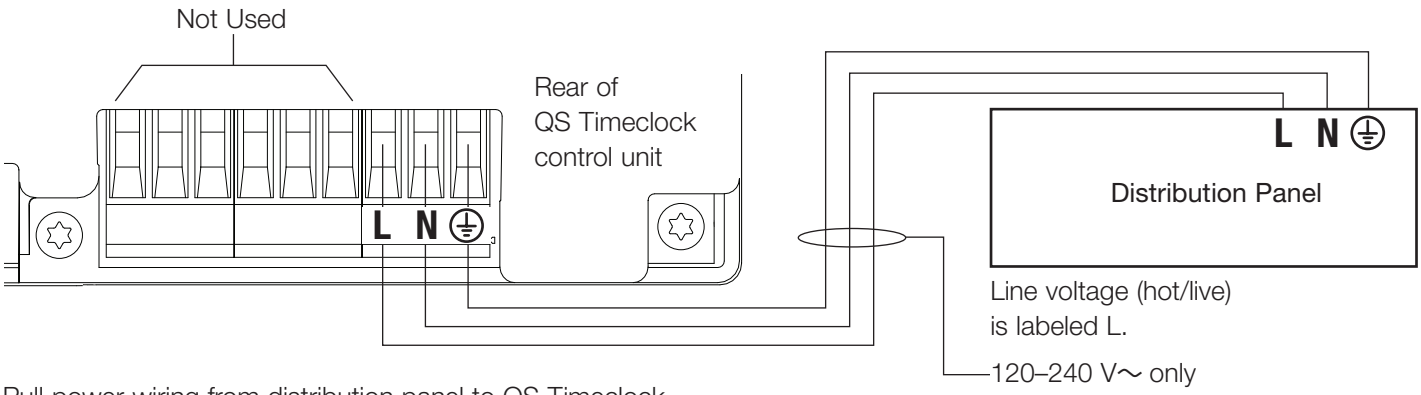


T-Tap Wiring Example



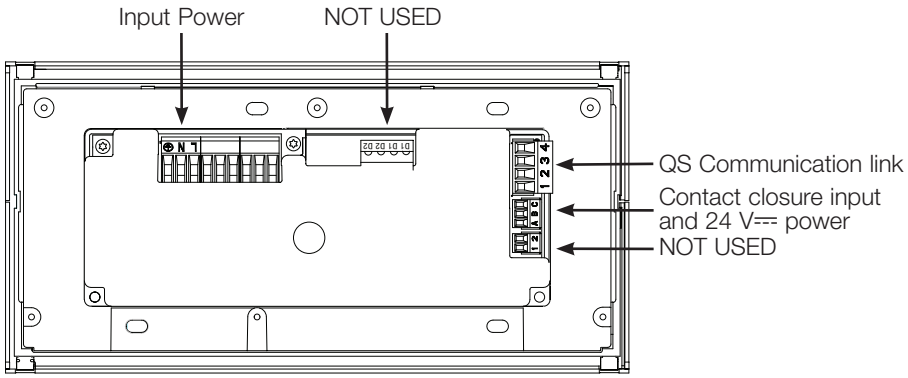
Job Name:	Model Numbers:	
Job Number:		

Line Voltage Wiring



- Pull power wiring from distribution panel to QS Timeclock.
- Each line voltage terminal can accept one 2.5 mm² (12 AWG) wire.

Terminations

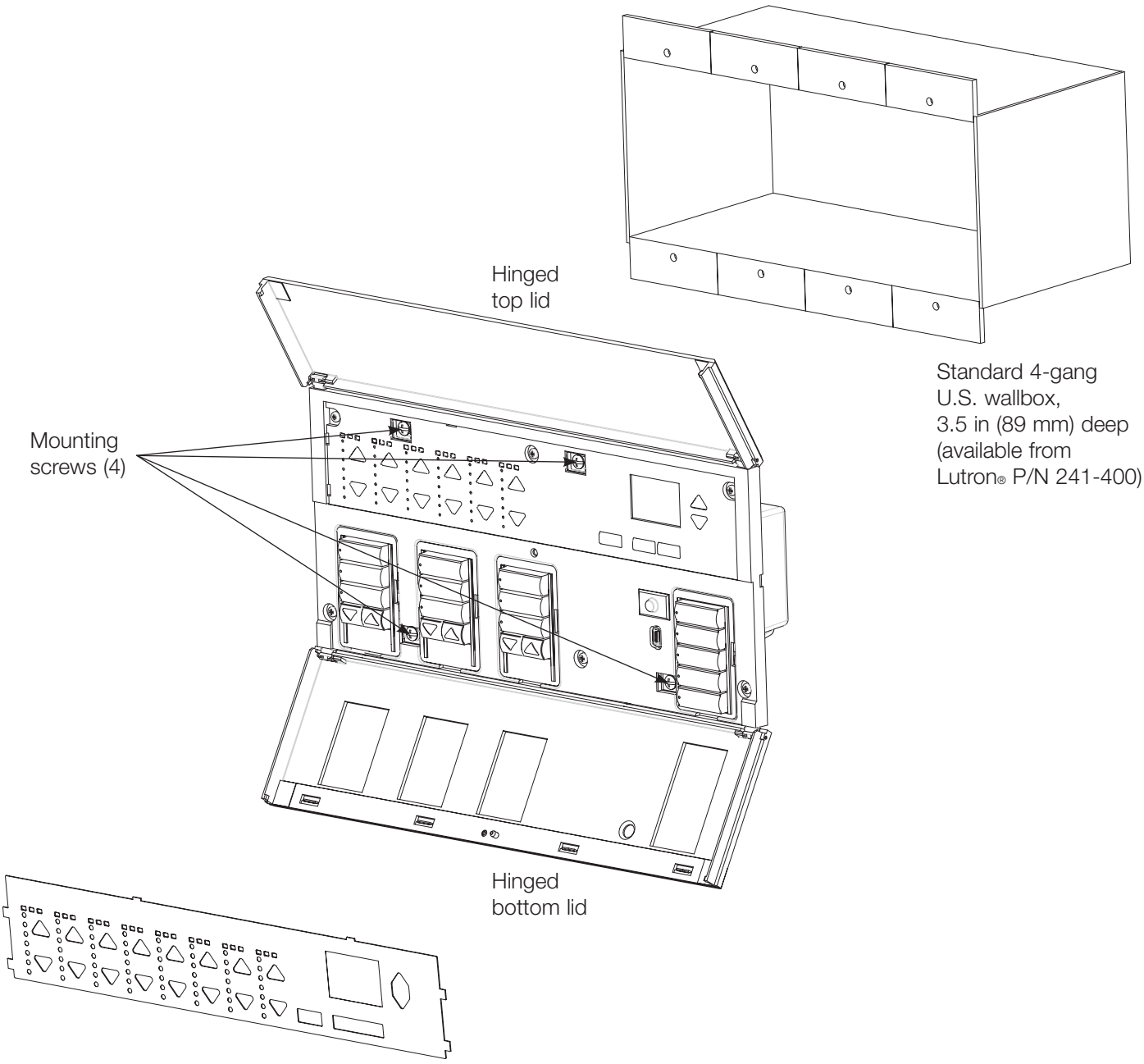


Wire Gauge

4.0 mm² (12 AWG)	1.5 mm² (16 AWG)
2.5 mm² (14 AWG)	1.0 mm² (18 AWG)

Job Name:	Model Numbers:	
Job Number:		

Mounting



Job Name:	Model Numbers:	
Job Number:		

Appendix D - Vulcraft Manual

NUCOR
VULCRAFT GROUP

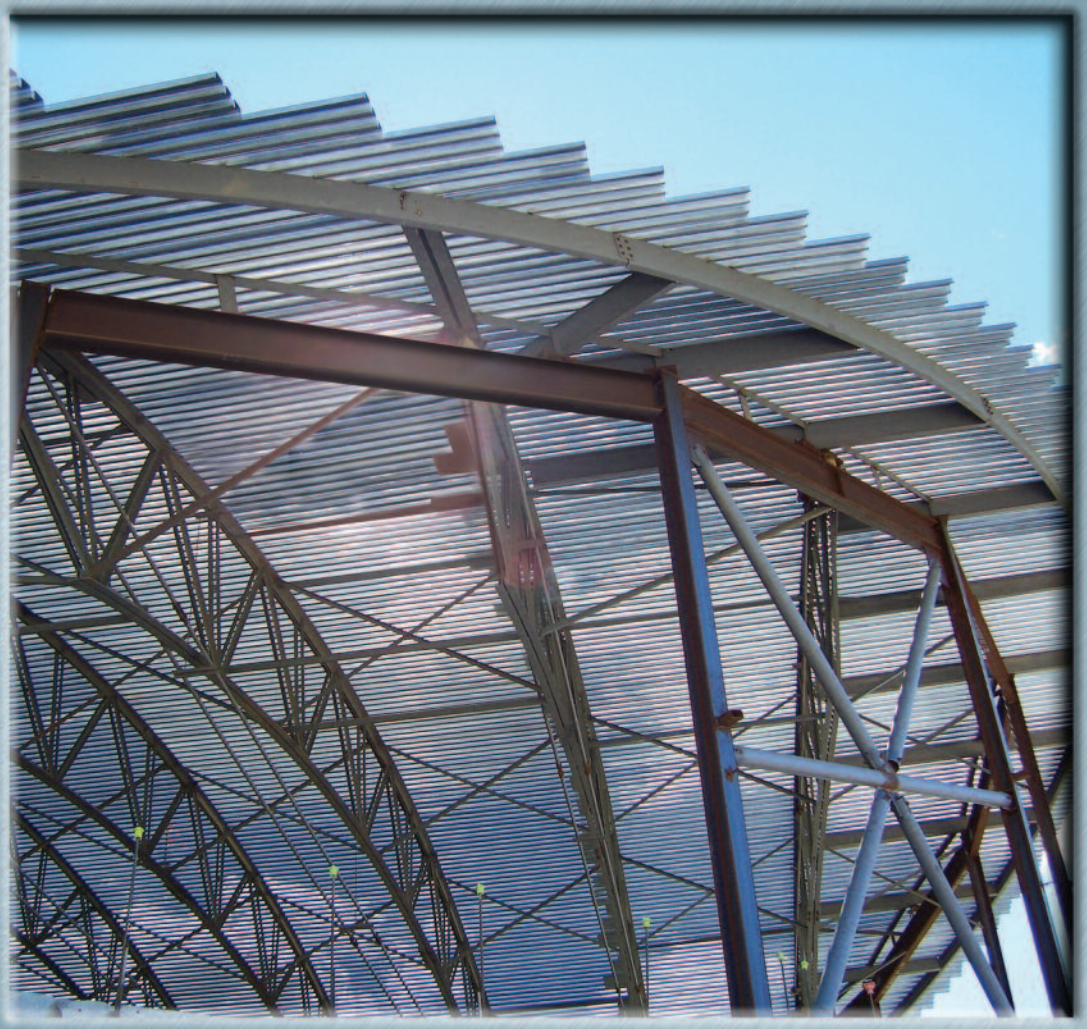
It's Our Nature.®

MEMBER

STEEL DECK INSTITUTE
sdi

VULCRAFT

Steel Roof & Floor Deck

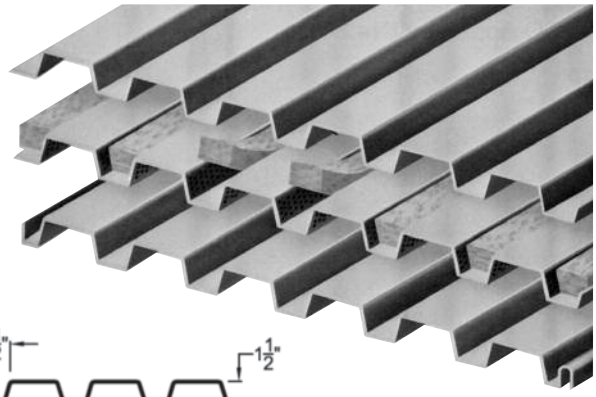


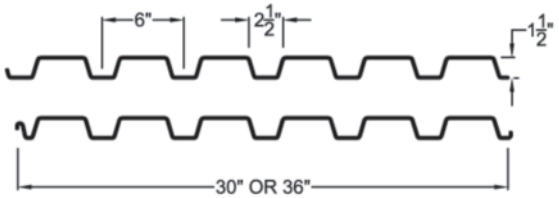
VULCRAFT 2008

8 5 STEEL DECK

1.5 B, BI, BA, BIA, BSV

Maximum Sheet Length 42'-0
Extra charge for lengths under 6'-0
ICC ER-3415
FM Global Approved[2]





Interlocking side lap is not drawn to show actual detail.

SECTION PROPERTIES

Deck type	Design thickness in.	W psf	Section Properties				V_a lbs/ft	F_y ksi
			I_p in^4/ft	S_p in^3/ft	I_n in^4/ft	S_n in^3/ft		
B24	0.0239	1.46	0.107	0.120	0.135	0.131	2634	60
B22	0.0295	1.78	0.155	0.186	0.183	0.192	1818	33
B20	0.0358	2.14	0.201	0.234	0.222	0.247	2193	33
B19	0.0418	2.49	0.246	0.277	0.260	0.289	2546	33
B18	0.0474	2.82	0.289	0.318	0.295	0.327	2870	33
B16	0.0598	3.54	0.373	0.408	0.373	0.411	3578	33

ACOUSTICAL INFORMATION

Deck Type	Absorption Coefficient						Noise Reduction Coefficient[1]
	125	250	500	1000	2000	4000	
1.5BA, 1.5BIA	.11	.18	.66	1.02	0.61	0.33	0.60

[1] Source: Riverbank Acoustical Laboratories.
Test was conducted with 1.50 pcf fiberglass batts and 2 inch polyisocyanurate foam insulation for the SDI.

Type B (wide rib) deck provides excellent structural load carrying capacity per pound of steel utilized, and its nestable design eliminates the need for die-set ends.

1" or more rigid insulation is required for Type B deck.

Acoustical deck (Type BA, BIA) is particularly suitable in structures such as auditoriums, schools, and theatres where sound control is desirable. Acoustic perforations are located in the vertical webs where the load carrying properties are negligibly affected (less than 5%).

Inert, non-organic glass fiber sound absorbing batts are placed in the rib openings to absorb up to 60% of the sound striking the deck.

Batts are field installed and may require separation.

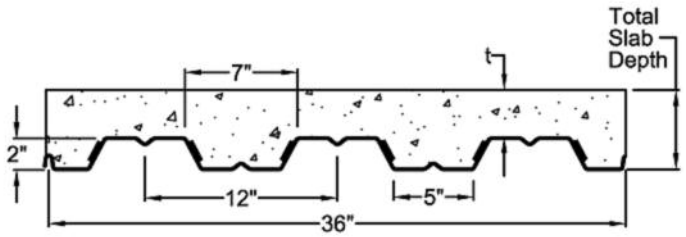
VERTICAL LOADS FOR TYPE 1.5B

No. of Spans	Deck Type	Max. SDI Const. Span	Allowable Total (PSF) / Load Causing Deflection of L/240 or 1 inch (PSF) Span (ft.-in.) ctr to ctr of supports										
			5-0	5-6	6-0	6-6	7-0	7-6	8-0	8-6	9-0	9-6	10-0
1	B24	4'-8	115 / 56	95 / 42	80 / 32	68 / 26	59 / 20	51 / 17	45 / 14	40 / 11	35 / 10	32 / 8	29 / 7
	B22	5'-7	98 / 81	81 / 61	68 / 47	58 / 37	50 / 30	44 / 24	38 / 20	34 / 17	30 / 14	27 / 12	25 / 10
	B20	6'-5	123 / 105	102 / 79	86 / 61	73 / 48	63 / 38	55 / 31	48 / 26	43 / 21	38 / 18	34 / 15	31 / 13
	B19	7'-1	146 / 129	121 / 97	101 / 75	86 / 59	74 / 47	65 / 38	57 / 31	51 / 26	45 / 22	40 / 19	36 / 16
	B18	7'-8	168 / 152	138 / 114	116 / 88	99 / 69	85 / 55	74 / 45	65 / 37	58 / 31	52 / 26	46 / 22	42 / 19
	B16	8'-8	215 / 196	178 / 147	149 / 113	127 / 89	110 / 71	96 / 58	84 / 48	74 / 40	66 / 34	60 / 29	54 / 24
2	B24	5'-10	124 / 153	103 / 115	86 / 88	74 / 70	64 / 56	56 / 45	49 / 37	43 / 31	39 / 26	35 / 22	31 / 19
	B22	6'-11	100 / 213	83 / 160	70 / 124	59 / 97	51 / 78	45 / 63	39 / 52	35 / 43	31 / 37	28 / 31	25 / 27
	B20	7'-9	128 / 267	106 / 201	89 / 155	76 / 122	66 / 97	57 / 79	51 / 65	45 / 54	40 / 46	36 / 39	32 / 33
	B19	8'-5	150 / 320	124 / 240	104 / 185	89 / 145	77 / 116	67 / 95	59 / 78	52 / 65	47 / 55	42 / 47	38 / 40
	B18	9'-1	169 / 369	140 / 277	118 / 213	101 / 168	87 / 134	76 / 109	67 / 90	59 / 75	53 / 63	48 / 54	43 / 46
	B16	10'-3	213 / 471	176 / 354	149 / 273	127 / 214	110 / 172	95 / 140	84 / 115	74 / 96	66 / 81	60 / 69	54 / 59
3	B24	5'-10	154 / 120	128 / 90	108 / 69	92 / 55	79 / 44	69 / 35	61 / 29	54 / 24	48 / 21	43 / 17	39 / 15
	B22	6'-11	124 / 167	103 / 126	87 / 97	74 / 76	64 / 61	56 / 50	49 / 41	43 / 34	39 / 29	35 / 24	31 / 21
	B20	7'-9	159 / 209	132 / 157	111 / 121	95 / 95	82 / 76	72 / 62	63 / 51	56 / 43	50 / 36	45 / 31	40 / 26
	B19	8'-5	186 / 250	154 / 188	130 / 145	111 / 114	96 / 91	84 / 74	74 / 61	65 / 51	58 / 43	52 / 37	47 / 31
	B18	9'-1	210 / 289	174 / 217	147 / 167	126 / 132	108 / 105	95 / 86	83 / 71	74 / 59	66 / 50	59 / 42	54 / 36
	B16	10'-3	264 / 369	219 / 277	185 / 214	158 / 168	136 / 135	119 / 109	105 / 90	93 / 75	83 / 63	74 / 54	67 / 46

Notes: 1. Minimum exterior bearing length required is 1.50 inches. Minimum interior bearing length required is 3.00 inches. If these minimum lengths are not provided, web crippling must be checked.
2. FM Global approved numbers and spans available on page 21.

2 VLI

Maximum Sheet Length 42'-0
Extra Charge for Lengths Under 6'-0
ICBO Approved (No. 3415)



Interlocking side lap is not drawn to show actual detail.

STEEL SECTION PROPERTIES

Deck Type	Design Thickness in	Deck Weight psf	Section Properties I_p in^4/ft	S_p in^3/ft	I_n in^4/ft	S_n in^3/ft	V_a lbs/ft	F_y ksi
2VLI22	0.0295	1.62	0.324	0.263	0.321	0.266	1832	50
2VLI20	0.0358	1.97	0.409	0.341	0.406	0.346	2698	50
2VLI19	0.0418	2.30	0.492	0.420	0.489	0.426	3190	50
2VLI18	0.0474	2.61	0.559	0.495	0.558	0.504	3608	50
2VLI16	0.0598	3.29	0.704	0.653	0.704	0.653	3618	40

(N=9.35) NORMAL WEIGHT CONCRETE (145 PCF)

TOTAL SLAB DEPTH	DECK TYPE	SDI Max. Unshored Clear Span			Superimposed Live Load, PSF Clear Span (ft.-in.)													
		1 SPAN	2 SPAN	3 SPAN	5'-6	6'-0	6'-6	7'-0	7'-6	8'-0	8'-6	9'-0	9'-6	10'-0	10'-6	11'-0	11'-6	12'-0	12'-6
	2VLI22	7'-4	9'-6	9'-9	274	239	211	188	145	129	115	104	94	85	78	71	65	59	54
4.00	2VLI20	8'-7	10'-10	11'-2	310	269	236	210	188	170	155	117	106	96	87	80	73	67	61
(t=2.00)	2VLI19	9'-9	11'-11	12'-4	344	298	261	231	207	186	169	155	142	106	97	88	81	74	68
39 PSF	2VLI18	10'-9	12'-9	12'-9	373	324	285	253	228	206	188	172	159	147	137	103	95	87	81
	2VLI16	11'-1	13'-2	13'-5	400	376	330	292	261	235	214	195	180	166	154	143	109	100	93
	2VLI22	6'-11	9'-0	9'-4	319	278	245	190	168	150	134	121	109	99	90	83	76	69	63
4.50	2VLI20	8'-2	10'-3	10'-7	361	313	275	244	219	198	152	136	123	112	102	93	85	78	72
(t=2.50)	2VLI19	9'-2	11'-5	11'-9	400	346	303	268	240	216	196	180	136	124	113	103	94	86	79
45 PSF	2VLI18	10'-2	12'-4	12'-4	400	376	331	295	264	239	218	200	184	171	130	119	110	102	94
	2VLI16	10'-5	12'-6	12'-11	400	400	383	339	303	274	248	227	209	193	150	137	126	117	108
	2VLI22	6'-7	8'-7	8'-11	364	317	279	217	192	171	153	138	125	113	103	94	86	79	72
5.00	2VLI20	7'-9	9'-10	10'-2	400	356	313	278	249	193	173	156	141	128	116	106	97	89	82
(t=3.00)	2VLI19	8'-9	10'-11	11'-3	400	394	345	306	273	247	224	172	156	141	128	117	107	99	91
51 PSF	2VLI18	9'-7	11'-10	11'-11	400	400	377	336	301	273	249	228	210	162	148	136	126	116	107
	2VLI16	9'-11	12'-0	12'-4	400	400	400	386	346	312	283	259	238	187	171	157	144	133	123
	2VLI22	6'-4	8'-0	8'-6	400	355	278	244	216	192	172	155	140	127	116	106	97	89	81
5.50	2VLI20	7'-5	9'-5	9'-9	400	400	351	312	244	217	194	175	158	143	131	119	109	100	92
(t=3.50)	2VLI19	8'-4	10'-5	10'-9	400	400	388	343	307	277	215	193	175	159	144	132	121	111	102
57 PSF	2VLI18	9'-2	11'-4	11'-7	400	400	400	377	338	306	279	256	199	182	167	153	141	130	121
	2VLI16	9'-5	11'-6	11'-10	400	400	400	400	388	350	318	290	230	210	192	176	162	150	138
	2VLI22	6'-1	7'-5	8'-2	400	394	308	270	239	213	191	172	156	141	129	118	108	99	90
6.00	2VLI20	7'-1	9'-1	9'-4	400	400	390	346	271	241	215	194	175	159	145	132	121	111	102
(t=4.00)	2VLI19	8'-0	10'-1	10'-5	400	400	400	381	340	307	239	215	194	176	160	146	134	123	113
63 PSF	2VLI18	8'-10	10'-11	11'-3	400	400	400	400	375	339	309	243	221	202	185	170	157	145	134
	2VLI16	9'-1	11'-1	11'-5	400	400	400	400	400	388	352	322	255	233	213	195	180	166	154
	2VLI22	5'-11	6'-11	7'-11	400	390	339	297	263	234	210	189	171	155	141	129	118	108	99
6.50	2VLI20	6'-11	8'-9	9'-0	400	400	400	337	297	264	237	213	193	175	159	145	133	122	112
(t=4.50)	2VLI19	7'-10	9'-8	10'-0	400	400	400	400	374	293	262	236	213	193	176	161	147	135	124
69 PSF	2VLI18	8'-7	10'-6	10'-11	400	400	400	400	400	373	340	268	243	222	203	187	172	159	147
	2VLI16	8'-10	10'-8	11'-0	400	400	400	400	400	400	387	309	280	256	234	215	198	183	169

Notes:
1. Minimum exterior bearing length required is 2.00 inches. Minimum interior bearing length required is 4.00 inches. If these minimum lengths are not provided, web crippling must be checked.
2. Always contact Vulcraft when using loads in excess of 200 psf. Such loads often result from concentrated, dynamic, or long term load cases for which reductions due to bond breakage, concrete creep, etc. should be evaluated.
3. All fire rated assemblies are subject to an upper live load limit of 250 psf.