MICHAEL P. GARDNER

lighting/electrical

FINAL SUMMARY BOOK

APRIL 21, 2009

MISTRICK/DANNERTH/HOLLAND

a mixed-use project in the

EASTERN UNITED STATES

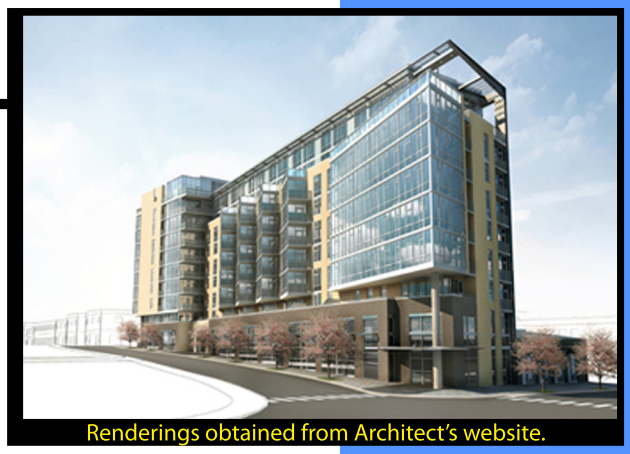
MICHAEL P. GARDNER

lighting/electrical

Owning Entity
Design Firms
General Contractor

Withheld at Owner's request.

Architecture



Renderings obtained from Architect's website.

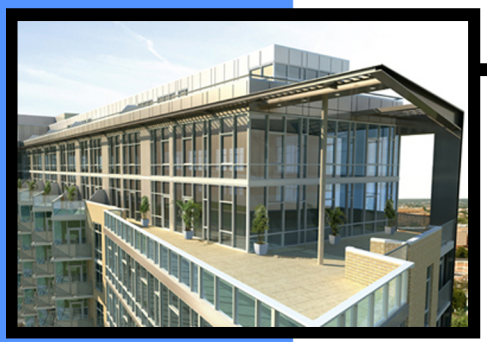
This 280,000 square foot mixed-use project contains retail spaces on the ground floor and luxurious apartment units on the floors above. The apartments consist of studios, 1-bedroom, and 2-bedroom options. The unique footprint utilizes exterior curtain walls to strengthen surrounding views. Other exterior walls include are finished with brick or stone.

This project also includes sustainable features such as a green roof, which is meant to reduce the cooling load in the summer time and decrease heat loss in the winter. The green roof also improves the aesthetic appeal when viewed from surrounding buildings.

This thesis project can be viewed at http://www.engr.psu.edu/ae/thesis/portfolios/2009/mpg5001/

Lighting/Electrical

The lighting systems vary by space throughout the building. In apartment units, incandescent sources are mostly utilized to provide warm, comfortable tones to the room. In the residential lobby and other larger, common areas, fluorescent sources are used to save energy. The electrical system steps the incoming voltage down to 208Y/120 and operates three elevators.



Structural/M & P

The building's foundation consists of a concrete slab resting on caissons. In some areas, the thickness of the slab is 52 inches. The mechanical system includes two cooling towers and plumbing provides domestic hot and cold water for 28 apartment units as high as 9 stories above grade.

a mixed-use project in the EASTERN UNITED STATES

Table of Contents

Executive Summary

This AE Senior Thesis Project combines lighting and electrical disciplines in a two semester course of study. The focus is on re-designing the lighting systems for four spaces in a building based on IESNA design criteria and aesthetic concepts. Allowable power density and illuminance criteria were also included in this redesign. A recalculation of the branch circuits and panelboards involved in this redesign took place, as well as two electrical depth studies. These studies were comparisons between bus duct and conduit and wires, and energy efficient transformers vs. standard transformers. In the electrical portion, a protective device coordination study was also performed, which included hand calculations of short circuit currents.

Two breadths were also done outside of the lighting/electrical discipline. These were in the areas of architectural and mechanical study. The architectural breadth consisted of a tenant fit-out of a retail space. The mechanical breadth also took place in the retail area and was a calculation of its peak cooling load. The main goal was to size the appropriate duct for the space to deliver the proper air flow rate.

Credits and Acknowledgements

Many thanks go to those who supported this AE Senior Thesis Project with their time and efforts.

Special thanks to:

Project Owner	Jeff Blum of Level 2 Development
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Thesis Practioner	Billy Hodges
Thesis Course Instructor	Prof. Bob Holland
Thesis Course Instructor	Prof. M. Kevin Parfitt

Many thanks also go to my fellow colleagues who gave personal insight and advice during the course of this project.

I thank my parents as well for their love and support.

Project Background and Information

This building is a mixed-use development located in a metropolitan area in the eastern United States. It is approximately 280,000 square feet in total area and has nine stories above grade. It is primarily a residential development, housing about 185 apartment units on floors 1 through 9. The lower floors also contain some office space, retail stores, and a fitness center. There are four underground levels containing mostly parking for residents and employees and mechanical/electrical rooms. This project is currently under construction and expected to be completed in the Fall of 2009. The estimated cost of this project is $48 million.

The building has a long footprint and uses angled bays in many apartment units to capture large amounts of daylight and spectacular views of the surrounding downtown area, which are enhanced by residential balconies and terraces. The building façade is mostly made of brick or stone and curtain wall.

The power distribution system of this mixed-use development allows the voltage to step down to 208Y/120 at three transformer vault locations on the northern side of the building. Power lines supply electricity to the main electrical room on the first floor garage. There could be as many as five transformers serving the loads in the building (though these specifications could not be released in time for this project). Three meter stacks are located in the building's electrical rooms and serve the many apartment units. There is emergency system provided by a 230 kW generator through two automatic transfer switches. Lighting loads for all corridors, three elevators, and a fire pump are backed-up by this system.

Lighting systems in the building use virtually all types of sources. Incandescents are mainly used in apartment units, providing warm tones and a comfortable atmosphere to the rooms, while fluorescent and HID sources are used in larger areas to help save energy.

The building's heating and cooling systems use two cooling towers at a total flow of 1,800 gpm to supply condenser water to heat pumps located in each space above the ground floor. The heat pumps provide conditioned air to the rooms. Heating capacities range from 19,800 Btu/hr to 143,000 Btu/hr.

The foundation of the building consists of a mat slab with thicknesses ranging from 42" to 52". Columns transfer loads through the slab to caissons underground. At the top of the caissons, their thickness is 30" and at their deepest portion, it is 60" thick. On the upper floors, the slab system is a two-way flat slab with drop panels located near columns. Slab thickness varies from 8" to 12".

Walls that separate apartment units have a fire-rating of one hour. Stair and elevator walls have a two-hour fire-rating. Sprinklers are also used throughout the building to stop the spread of fire. The system is powered by a 75 horsepower fire pump located in the fire pump room on the first floor garage level.

Fitness Room

Spatial Description

The fitness areas are made up of three separate sections of one large room. In two rooms will be cardio equipment for the occupants to use, and in the last room, will be weight benches and other weight equipment. The east-facing wall is angled and made of floor-to-ceiling glass. This allows the users to look out into the courtyard immediately outside of the fitness area. Each room is about 24 feet long by 20 feet wide, with additional area by the angled glazing walls. There is also a small mechanical closet in each of the fitness rooms. The height of the ceiling is at eight feet above the finished floor. The ceiling height against the windows is at 9'-4" above the finished floor.

Space Materials

The walls and ceiling of the fitness room are finished with gypsum wall board. The walls are painted an orange tone with a reflectance of 0.65. The ceiling is painted an eggshell color with a reflectance of 0.78. The floor is covered with a resilient floor tile that has a reflectance of 0.2. Mirrors are placed along the western walls in the 2nd and 3rd exercise areas. They are seven feet high and take up the entire length of those areas. See table below for details. The mullions on the curtain wall have a reflectance of 20% while the glazing has a transmittance of 0.7.

Fitness Area Materials

Surface	Location	Type	Brand	Product	Color	Reflectance	Photo
Floor	Fitness Areas	Resilient Floor Tile	Johnsonite	Inertia Rubber Sports Tile	Fawn 80	0.2	 80 Fawn CB
Wall	Reception Area, others	Paint	ICI Paints		40YY 65/601	0.65	
Ceiling	All	Paint	ICI Paints		43YY 78/053	0.78	

Design Criteria

Every space in this project has an overall theme of luxury or a high-end atmosphere. This was taken into account due to the type of residences in the building (high-end condos) as well as the kinds of amenities granted to all residents.

Design criteria important to this space are the appearance and space of luminaires, color appearance and contrast, direct glare, light distribution on surfaces, light distribution on task plane, luminances of room surfaces, system control, and horizontal and vertical illuminances.

The *appearance and space of luminaires* is important due to the high-end nature of the space. It is therefore paramount to choose luminaires that will be recessed or pose a sleek image.

Color appearance and contrast is deemed important because the wall paint is a warm tone and when working out, often occupants tend to look into mirrors so that skin tones should be rendered well. A warm CCT of 3000 K was chosen with a CRI of 85 to achieve this.

Direct glare is an issue to consider due to the fact that occupants will at times be lying down to perform certain exercises (i.e. weight bench exercises) and looking up directly at the ceiling. The luminaire must have some sort of diffuse lens or other way of hiding the source directly. The luminaire chosen, as can be seen in the fitness room's luminaire schedule, is a recessed staggered-lamp linear fluorescent fixture with a diffuse lens.

Since the room will have two long walls with mirrors on them, it is important to keep the *light distribution* off of walls to reduce the reflection of light in these mirrors so that occupants will be able to view the outdoor courtyard at night. With the direct distribution of the selected luminaire, this is dramatically reduced as opposed to using a wall-wash type fixture.

The *light distribution on the task plane* is considered to be very important so that the tasks of operating exercise equipment can properly take place. The work-out area should be overall uniformly lighted.

Luminances of room surfaces are significant for this space so that during evening hours the occupant can view the courtyard through the curtain wall. The outdoor luminance must be higher than the interior wall luminances so that this can occur. See the outdoor courtyard section for further coordination.

The *control of the lighting system* is important because of occupancy requirements. Because this room may indeed be open to the residents 24 hours a day, it is imperative for the lights to be shut-off automatically when no one is in the room. Therefore, an occupancy sensor will be placed in the room so that this energy can be saved. The system will also allow occupants to turn the three separate rows on or off depending on their visual needs between the daytime and nighttime.

Illuminance values for a fitness room, as recommended by the IESNA Handbook states that the horizontal illuminance should be 30 footcandles. The recommendation for vertical illuminance is at 5 footcandles.

The *allowable power density* for an exercise room according to ASHRAE Standard 90.1 is 0.9 W/ft^2. With a total room area of 1,863 ft^2, the allowance becomes 1676.7 W.

Summary of Results

Overall, the criteria have been met to ensure a visually comfortable space. The actual illuminance value at the floor level was 29.88 which is very close to the target of 30 footcandles. The overall distribution on the task plane is generally uniform, with higher illuminance values in the 40's in the centers of each exercise area. Near the perimeter of the space, the illuminance values are less, but this is a typical occurrence and not an issue because little to no activity occurs where the floor meets the walls.

Calculation Summary from AGI 32.

As can be seen in pseudo-color renderings that follow, light levels were kept off of the walls as much as possible to reduce direct reflection off of mirrors and to allow occupants to view the outdoor courtyard with the interior lights on.

The power density criterion has also been met. The total allowable power was 1,676.7 W and the actual power consumed by the system was 1,185 W. This results in a power density of 0.64 W/ft^2.

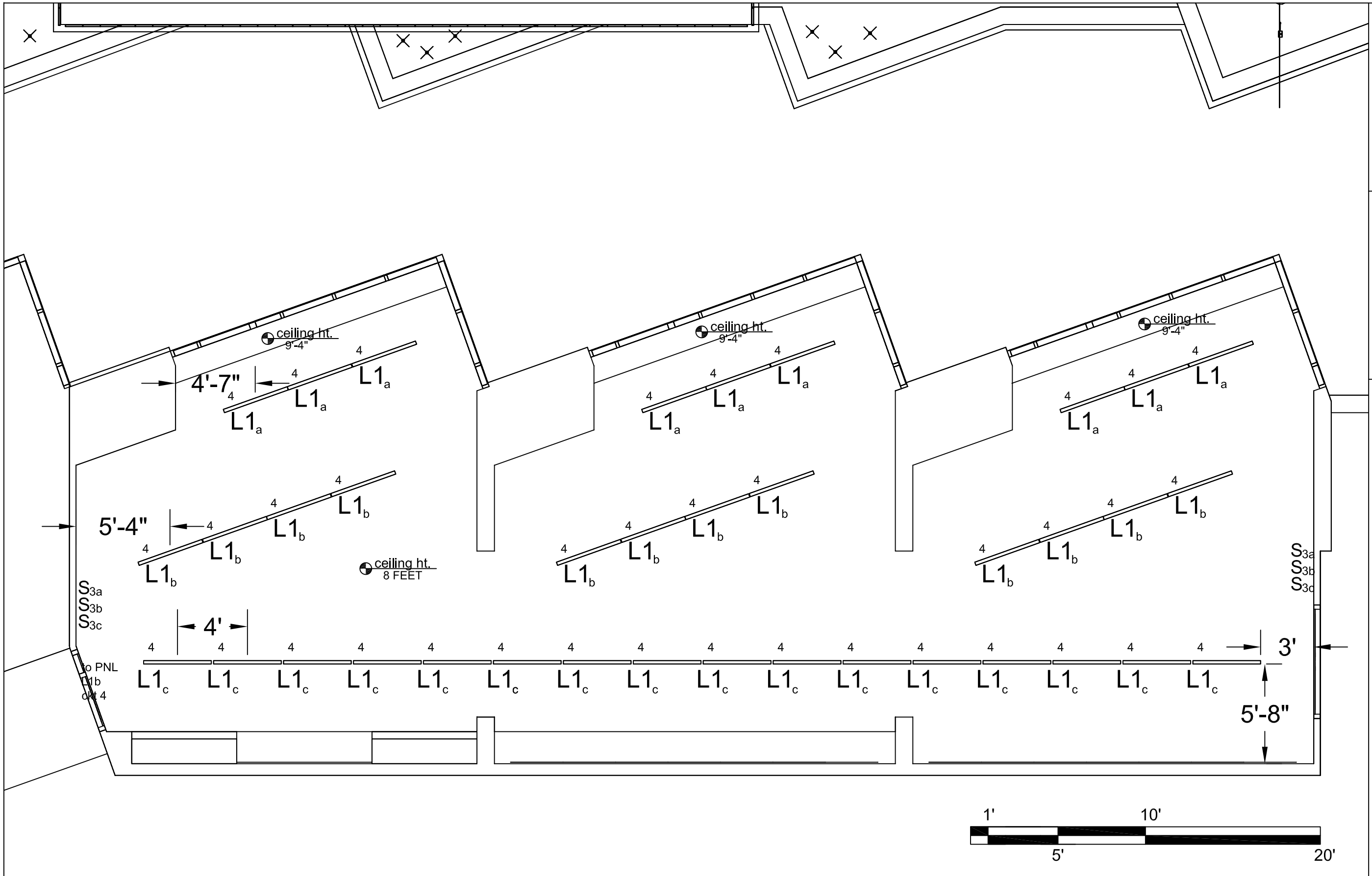
Below is a summary of the light loss factors used in calculating illuminance values and light levels in AGI 32.

Light Loss Factors for Fitness Rm						
Dirt Condition: Very Clean						
Cleaning Cycle: 18 Months						
Luminaire Tag	Luminaire Maintenance Category	LDD	BF	RSDD	LLD	
L1	V	0.91	1.03	0.98	1	- mean lumens value of 2418 used

Please see the following pages for the luminaire schedule, reflected ceiling plan, and renderings of the space.

Luminaire Schedule for Fitness

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	L1	SE'LUX	DIRECT	M60 - Recessed Staggered Linear Fluorescent Downlight with diffuse lens	M6R1S-1T5-OD-RC-008	(1) 28 W T5 LINEAR FLUORESCENT	SYLVANIA - FP28/830/ECO	64	120	(2) LAMP - CENTIUM T5 ELECTRONIC PROGRAMMED START	ICN-2S28@120	1.03	0.55	0.99
								33	120	(1) LAMP - CENTIUM T5 ELECTRONIC PROGRAMMED START	SAME AS ABOVE	1.04	0.28	0.98



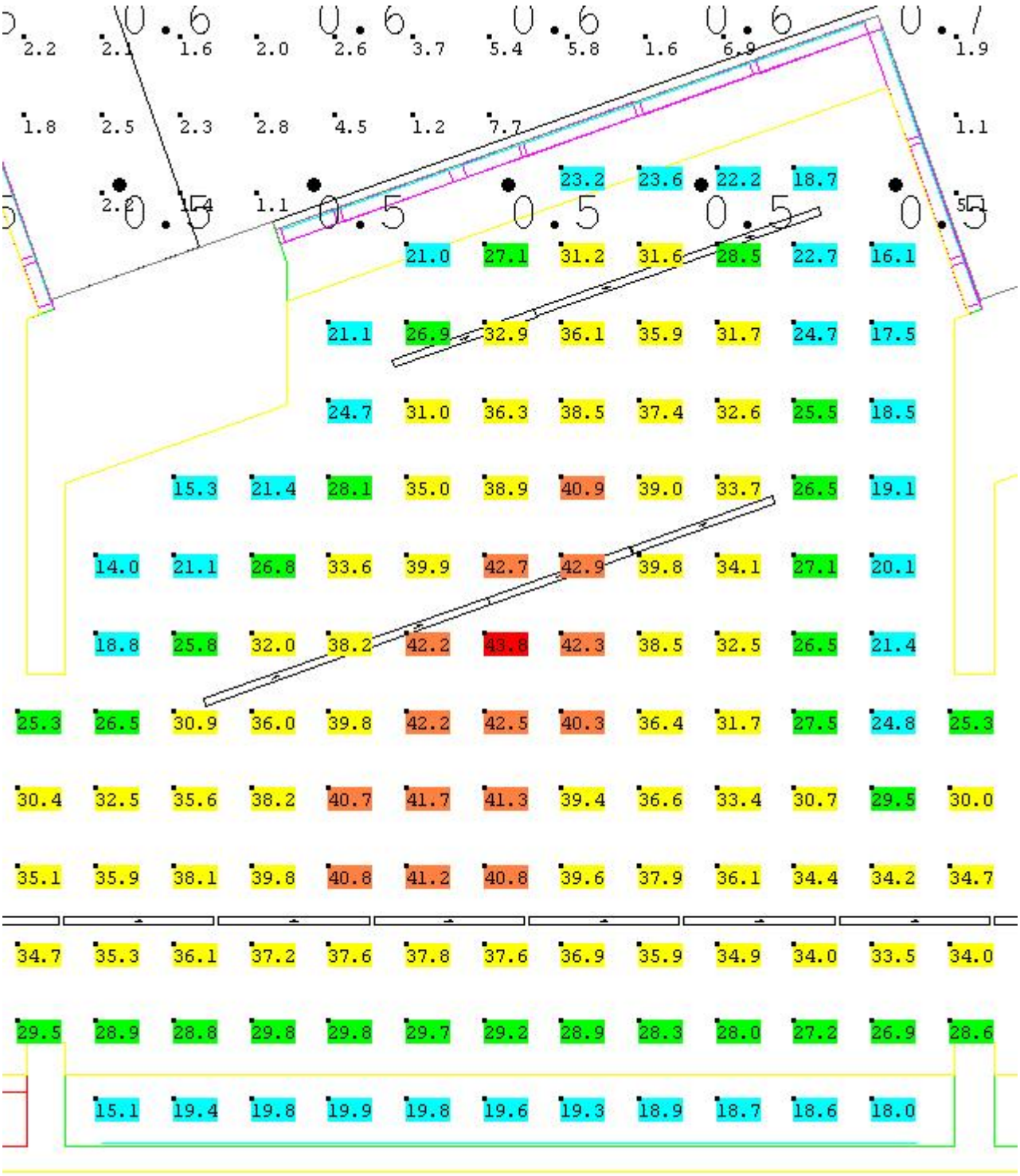
AE Senior Thesis Project

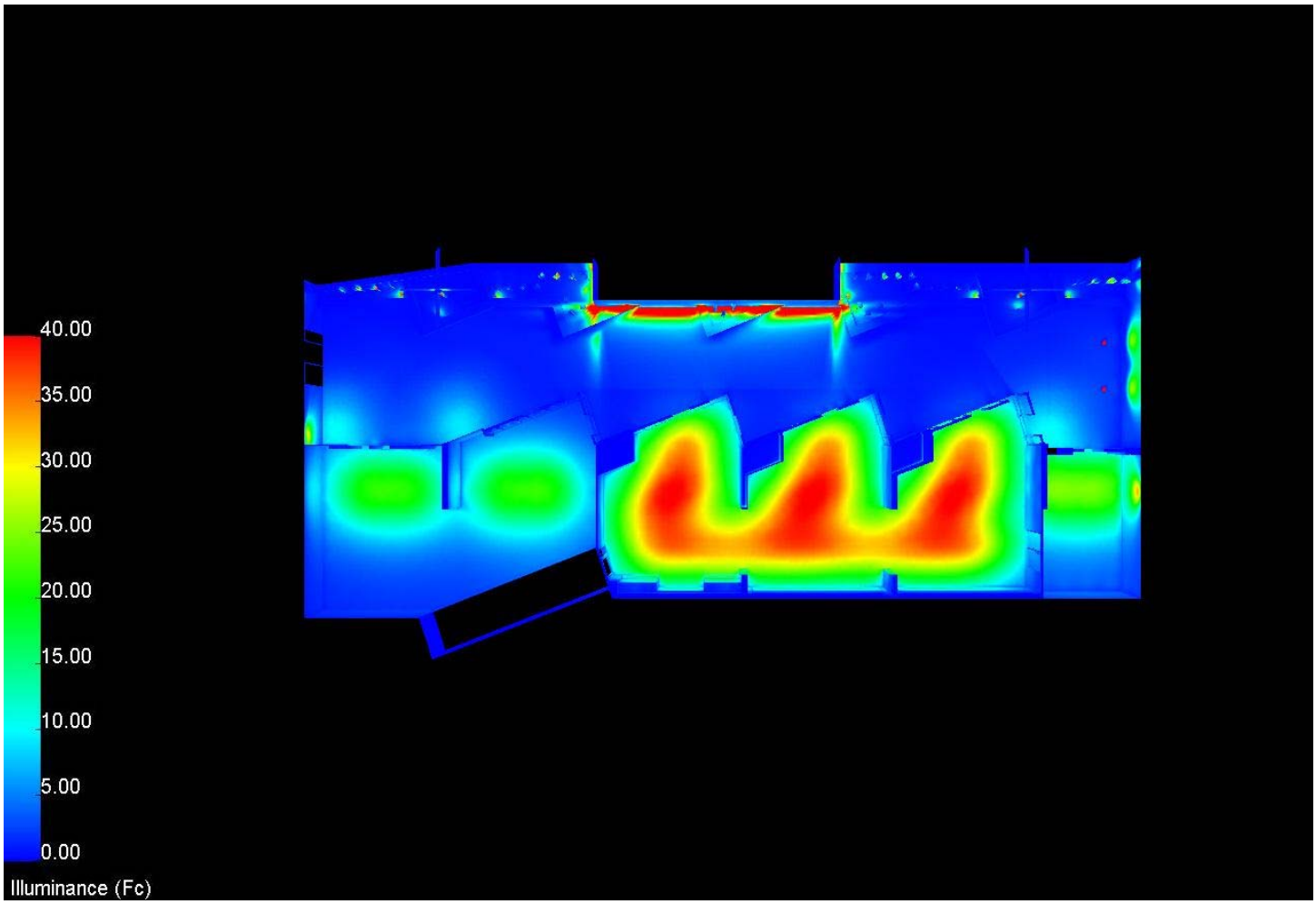
Fitness Lighting Plan

L.1

DRAWN BY:
Michael Gardner

Below is an image displaying calculation points of a typical section of floor in the fitness room. An overall average of 29.88 fc was obtained on the floor with the highest values in the lower 40's at the center of the spaces.





Above is a pseudo-color rendering of the floor distribution at a peak of 40 footcandles (in red). The three identical spaces shown at the lower right make up the entire fitness room. The peak illuminance values are located at points of highest occupant use/traffic.

Above is a rendered view from inside the fitness room, looking out into the courtyard. Coordination between light levels in the courtyard and those in the fitness room had to be taken into account for the proper view to be rendered. In AGI 32, a specularity value of 0.13 was used to simulate reflection in the curtain wall. See the courtyard section for more views between these two spaces.

Outdoor Courtyard

Spatial Description

Located immediately outside of the fitness room is the courtyard. This can be accessed through the game room and lounge adjacent to the fitness rooms. The courtyard is an open space where residents can go out and spend time in a relaxing environment. This space is approximately 135’ in length and has a minimum width of 9’ where the glazing of the fitness rooms protrudes into the space. There is landscaping against the side opposite of the fitness room. Planters that contain this landscaping are at an elevated height of 1’-9”.

Space Materials

The ground to the courtyard is covered in washed river stones. The garage exhaust wall opposite the fitness curtain wall is made of brick as well as the planters that house the landscaping materials. The façade on the building is mostly made up of stone, perforated metal, and curtain wall. AGI 32 textures were used from its library and have the reflectances that follow.

Reflectance of Brick = 0.26
Reflectance of Planter Tops = 0.9
Reflectance of Ground = 0.5
Reflectance of Stone Wall = 0.36
Reflectance of Perforated Metal = 0.27
Reflectance of Gravel in Planters = 0.23

Types of Vegetation

There are three kinds of vegetation in the outdoor courtyard. They are two Japanese maple trees, and two different kinds of bamboo. One is a black-stemmed hale bamboo, and the other a dwarf bisset bamboo as shown below.


Japanese Maple Tree


Hale Black Bamboo


Dwarf Bisset Bamboo

Design Criteria

Every space in this project has an overall theme of luxury or a high-end atmosphere. This was taken into account due to the type of residences in the building (high-end condos) as well as the kinds of amenities granted to all residents.

Design criteria important to this space are the appearance and space of luminaires, color appearance and contrast, direct glare, light distribution on surfaces, points of interest, surface characteristics, and horizontal and vertical illuminances.

The *appearance and space of luminaires* is important so that the appropriate setting can be achieved. It is important to conceal the fixtures and keep them from view where possible. This will be done by having small sources highlighting the plants from the ground and also having a cove that hides the grazing luminaires on the garage exhaust structure.

Color appearance and contrast is important to consider for color rendering effects. Since there is colorful vegetation present, a good CRI and warm CCT should be chosen. This will be accomplished by having a tungsten halogen MR16 lamp present which are naturally warm in color (3000 K) and excellent in color rendering.

Direct glare is a consideration to be aware of because it could make the occupant uncomfortable to be able to see the source in the luminaire. Downlighting sconces and hidden fixtures will reduce the amount of direct glare. Glare does happen in the in-ground metal halide fixtures highlighting the stone wall, but it is only straining on the eye if the occupant is directly over top the luminaire.

Uniformity is not necessarily desired in this space to allow for the proper aesthetic to be present. Accenting the landscape will be the main concern for the courtyard.

Luminances of room surfaces are very important especially when considering the coordination between the courtyard and fitness room. It is important to make the necessary surfaces in the courtyard appear brighter so that these surfaces can be viewed from within the fitness room. The outdoor luminance must be higher than the interior wall luminances so that this can occur. This is accomplished in part by providing a powerful graze effect on the garage exhaust structure so that the brick is highlighted enough for proper viewing through glazing.

There are several *points of interest* in this space which are mainly vegetation.

Illuminance values for inactive building exteriors, as this space would have little pedestrian “traffic,” as recommended by the IESNA Handbook is 3 fc.

The *allowable power density* for this space according to ASHRAE Standard 90.1 is 0.2 W/ft^2. With a total area of 2,675 ft^2, the allowance becomes 535 W.

The *control scheme* for this space is set to an astronomical time clock. This will allow the lights to turn on at dusk and turn off again at dawn or some time before sunrise. The lights do not have to be on all night as this space may not be able to be used during very late night/early morning hours.

Summary of Results

The illuminance criteria have been met, however, the power density was significantly over the allowable for the courtyard. The actual average illuminance value at the ground level was 3.3 footcandles which is just over the recommended value of 3 fc. The ground distribution cannot be described as uniform, which was intended however, very low illuminances are by the planters which can be both good and bad. It provides contrast between the highlighted focal points (the bamboo and trees) and the subdued ground boundary.

Calculation Summary from AGI 32.

The lighting system uses a few different methods to achieve these goals. Sconces are used by entryways to provide clear vision through entering and exiting the space. MR16 halogen landscape fixtures highlight the bamboo and Japanese maple trees in the planters along the eastern side. LED grazing fixtures from Color Kinetics graze the brick face of the garage exhaust wall structure to provide bright luminances for viewing through the fitness room. Two metal halide in-ground fixtures highlight the stone wall to the south. This could not be duplicated to the northern wall due to private residence windows there. A goal was to not over-light areas near residences as this may intrude on their privacy.

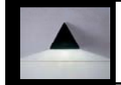
The actual power density happened to be well over the allowable amount. The allowable value after multiplying the power density by the area of 2,675 ft^2 was 535 W. The actual amount came out to be 1,358.5 W, surpassing the allowance by 823.5 W. Savings in other spaces will be attempted to make up for this short-coming. Although a possible solution could be to remove the wall graze and place additional sconces on the garage exhaust structure wall. This will increase the illuminance on the floor plane while also maintaining a high luminance on the brick wall.

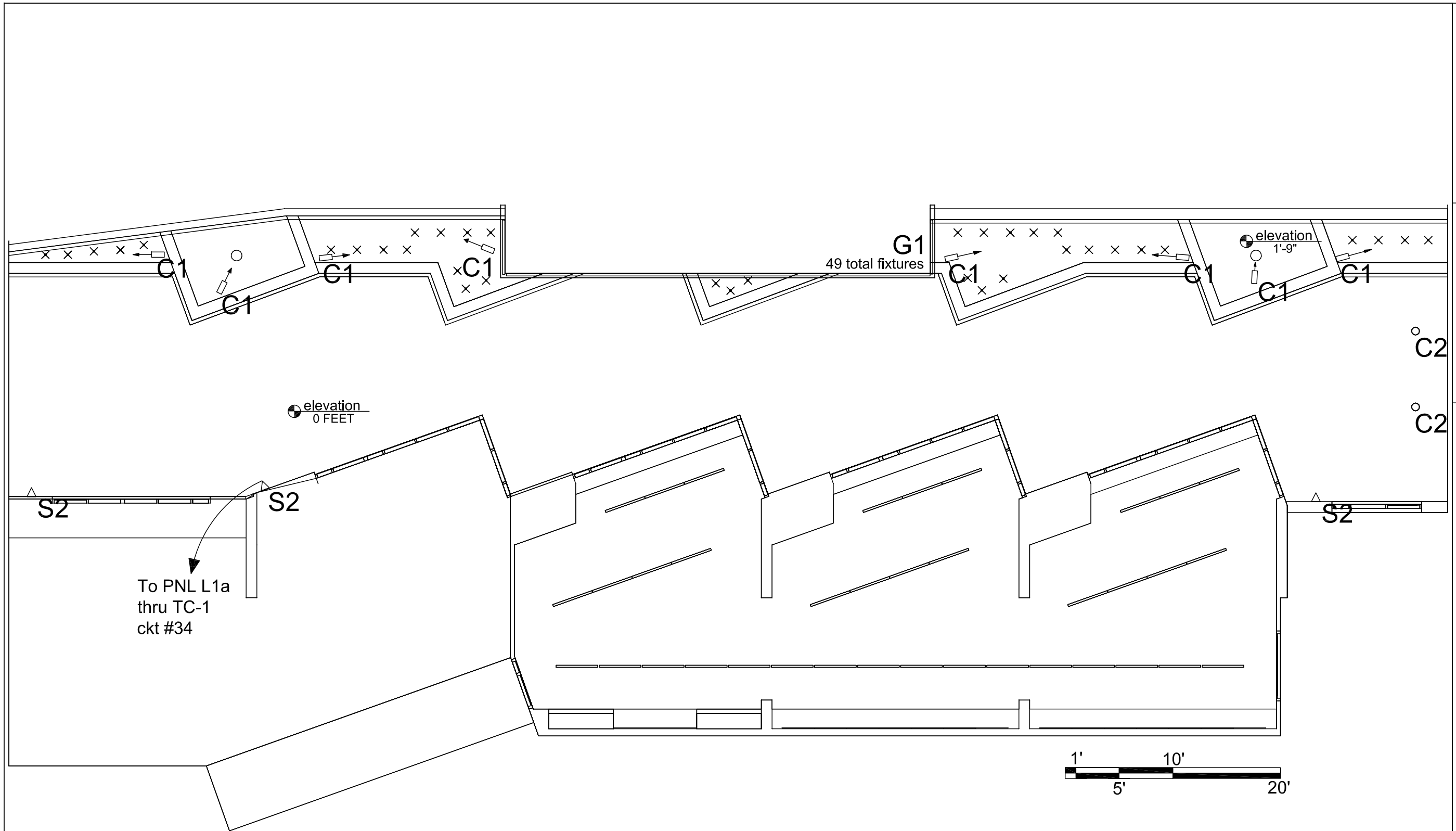
Below is a summary of the light loss factors used in calculating illuminance values and light levels in AGI 32.

Light Loss Factors for Outdoor Courtyard						
Dirt Condition:	Medium					
Cleaning Cycle:	24 Months					
Luminaire Tag	Luminaire Maintenance Category	LDD	BF	RSDD	LLD	
G1	V	0.77	1	1	1	
C1	V	0.77	1	1	1	
S2	V	0.77	0.98	1	1	
C2	VI	0.66	1	1	1	- mean lumens value of 5994 used

Please see the following pages for the luminaire schedule, lighting plan, and renderings of the space.

Luminaire Schedule for Courtyard

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	G1	COLOR KINETICS	DIRECT	eW Graze Powercore - Linear, white LED surface light for wall washing and grazing	523-000030-00	WHITE LEDs 2700K	N/A	14.5	120	N/A				
	C1	B-K LIGHTING	SPOT/FLOOD	DELTA STAR - MR 16 Landscape accent with cut-off option	DS-4-BLW	(1) 35 W 23° NARROW FLOOD MR-16	SYLVANIA - 35MR16/T/NFL25/C	35	12	Electronic Transformer LET 303 AC (12V/300W)			2.5	0.985
	S2	ARCHITECTURAL AREA LIGHTING	DIRECT	MITRE M3 - Outdoor wall sconce with forward throw reflector and full cut-off	M3-42 CF-MTB	(1) 42 W TRIPLE COMPACT FLUORESCENT	SYLVANIA - CF42DT/E/IN/830/ECO	46	120	ABMISTAR-HPF ELECTRONIC	RCF-2S26-H1-LD-QS	0.98	0.38	0.98
	C2	B-K LIGHTING	INDIRECT	TENAYA2 Series - In-ground mounted uplight with black paint finish and clear flat glass lens	TY2-EH100-WF-115-BLW	(1) 100 W E-17 METAL HALIDE PHOSPHOR COATED	SYLVANIA - MCP100/C/U/MED/830 PB	115	120	e-Vision ELECTRONIC	IMH-100-A-BLS-ID	1	0.96	0.9



AE Senior Thesis Project

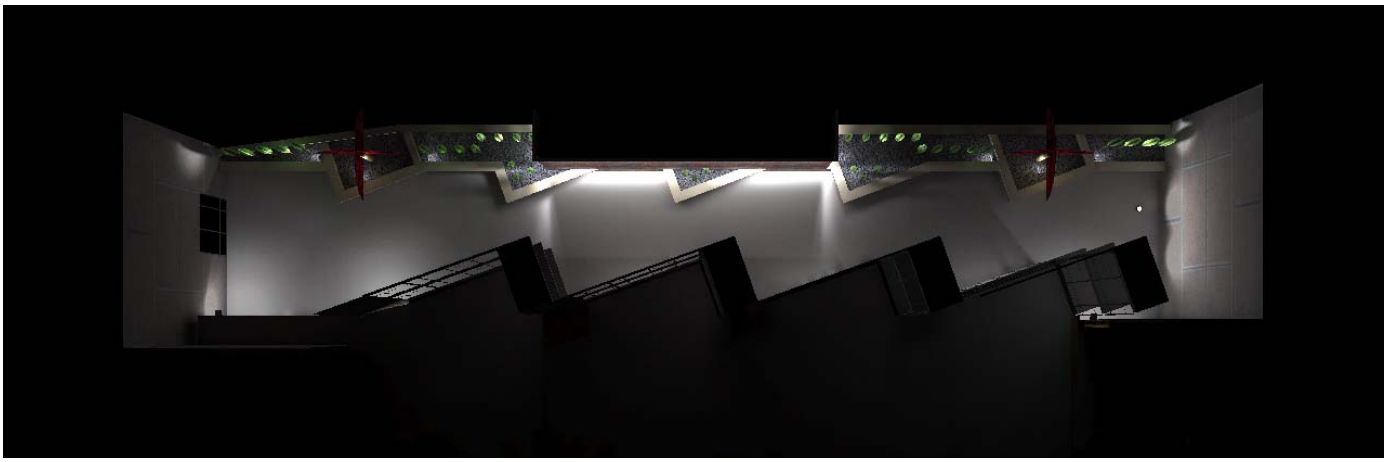
Courtyard Lighting Plan

L.3

DRAWN BY:
Michael Gardner

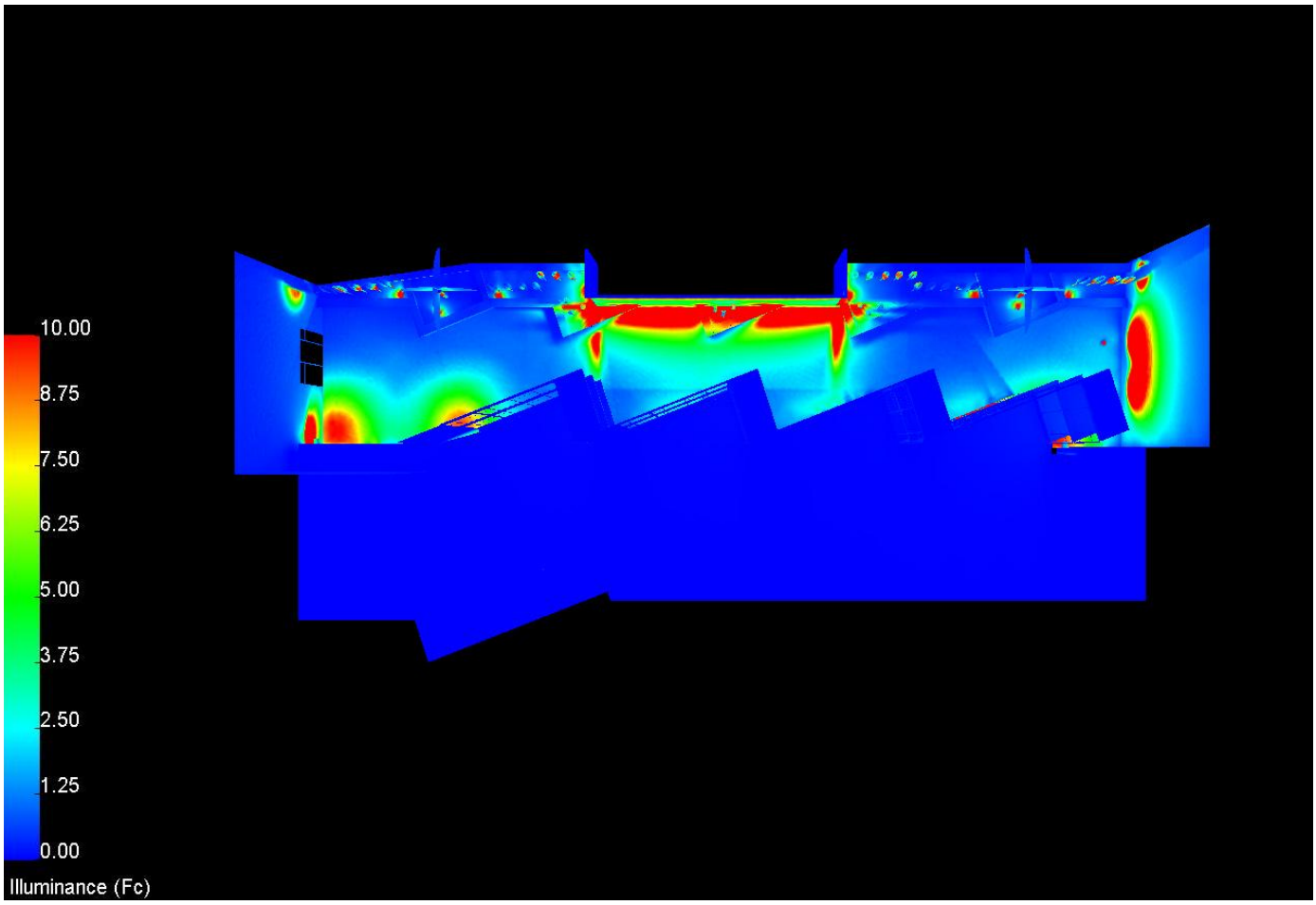
For orientation purposes, a section view of the courtyard wall is shown below.

The main goal of this design was to highlight the landscape materials along the wall shown above. MR16 landscape fixtures are mainly used to do this. The LED Powergraze by Color Kinetics rests in a cove in the garage exhaust, providing luminance on the front and side faces.

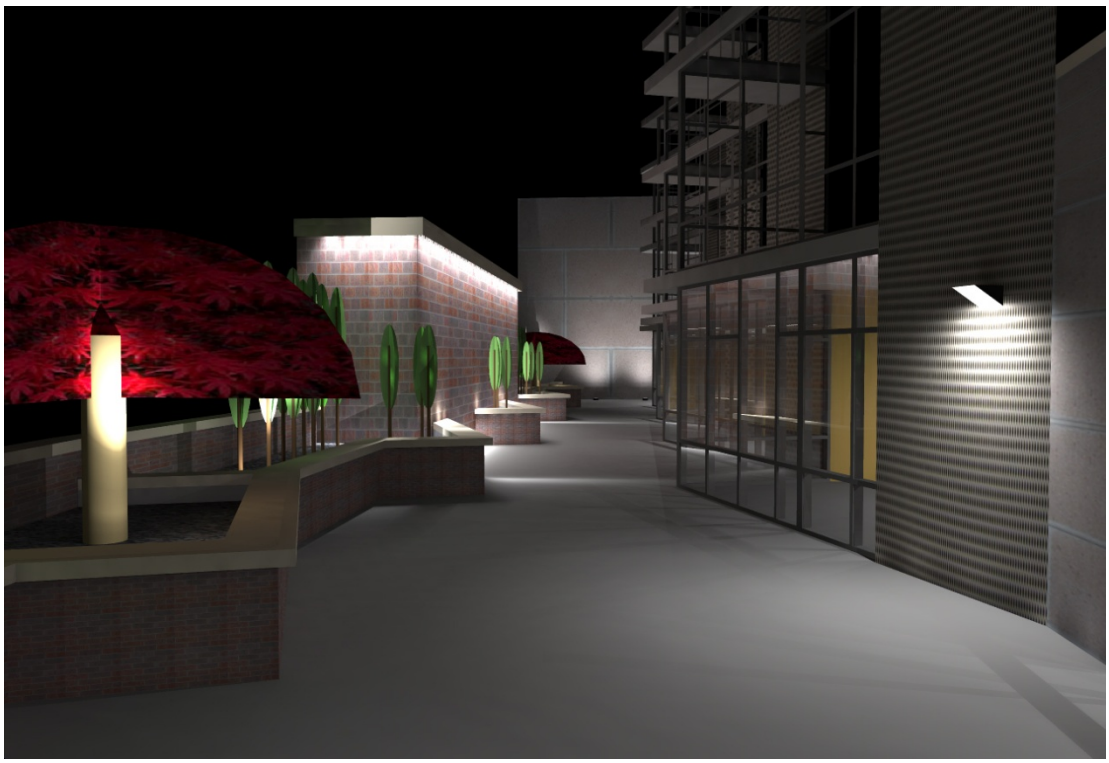


Located above is an RGB rendering of the courtyard from above. The distribution of light on the floor plane can be viewed in this way. On the following page is a pseudo-color rendering of this view scaled to 10 footcandles.

Below is a pseudo-color rendering of the ground floor of the courtyard.



Most of the floor is between 3 and 10 footcandles or greater. The darker spots on the courtyard floor are nearest to the planters. Wall illumination can also be seen from this perspective. The two metal halide fixtures wash the wall to the south while sconces illuminate the ground on the north by the entrance.



Above are two renderings of the views from the courtyard. The fitness room can be viewed from one angle, while the other perspective views the highlighted landscape.

Retail Space

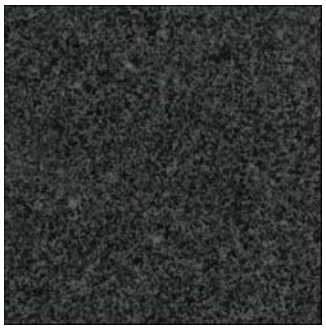
Spatial Description

Originally, the retail space was an open shell that had not undergone a tenant fit-out. As part of the architectural breadth of this thesis, the shopping area has been laid out with a cash wrap area, fine merchandise displays, clothing displays, and also two window displays. The entrance to the retail space is on street level. The customer enters and walks up a small set of stairs to the cash wrap area. The retail space has an area of 2,120 square feet. The dimensions of the room are 62 feet by 58 feet. The ceiling was originally about 15 feet high, though it has been reduced to 11 feet in the main shopping areas and remains at 14'-7" at the entryway. Maintaining the theme of luxury throughout this space, and it is probably the most recognizable space as high-end, the company occupying the store is assumed to be Dolce & Gabbanna, especially their young, energetic line of D&G.

Space Materials

The entry way and cash wrap area provoke a warm feeling due to its wood flooring. The rest of the floor is polished black granite tile. The walls and ceiling are gypsum wall board painted white. The clothing displays are also painted the same color as the walls and ceiling to blend in with the body of the store. The window displays have floor to ceiling partitions of a blue-toned frosted glass to enclose the window display areas but also to serve as a decorative element. There is also a three piece mirror past the fine merchandise so that shoppers can see how things look before they go into the fitting room, or get a second opinion. Reflectance values are shown below.

Reflectance of Wood Flooring = 0.24
Reflectance of Granite Flooring = 0.03
Reflectance of Gypsum Wall Board = 0.81
Reflectance of Window Mullions = 0.34
Transmittance of Glazing = 0.88
Reflectance of Glass Partitions = 0.65
Transmittance of Glass Partitions = 0.25


Padang Black Granite

Design Criteria

No other space promotes a high-end feel as much as the retail space does. Because it is a fashion designer boutique shop, it needs to be visually interesting, while maintaining the focus on the merchandise. There are several important IESNA design criteria that need to be addressed for this space. They are: *Appearance and Space of Luminaires, Color Appearance and Contrast, Direct Glare, Light Distribution on Task Plane, Luminances of Room Surfaces, Modeling of Faces/Objects, Points of Interest, Sparkle, and Illuminance values.*

To promote this high-end atmosphere, the luminaires must be attractive and recessed where possible to provide a clean look. This is accomplished by using recessed pinhole MR16 downlights with a very small aperture, and also LED fixtures to provide some colorful accent to fine merchandise. Track fixtures also provide added punch to the clothing that they highlight and give a kind of theatrical vibe to the space.

Color appearance and contrast is a large issue here because the clothing and the store itself need to be color-rendered well. Warm CCTs are chosen to manage this and halogen fixtures are mostly used to illuminate clothing and bring out colors well.

Direct glare is a consideration when the shopper finds it difficult to view merchandise with a bright source in their line of sight. With a high ceiling in the space and aimable fixtures, direct glare can be combated.

The task plane should be well illuminated and mostly uniform on the cash wrap counter and on the display walls. This is to provide ease of function within the store.

Since the focus is primarily on the clothing in this application, *luminances of room surfaces* should follow suit. This being that the dark floor would have low luminance throughout and would leave a greater contrast between the clothing and the rest of the store, highlighting the displays even more.

Modeling of Faces/Objects is a very important consideration in this space due to the fact that the store would sell more if people think they look good in the mirror. A vertical calculation grid was placed in front of the mirror for this evaluation.

There are a few points of interest in this space. The primary ones are the window display areas. They will draw the attention of the customer and get them into the store. The next is the cash wrap where the customer is greeted by the sales people. The other points of interest are the clothing displays and fine merchandise displays throughout the area.

Sparkle was considered to be important just to add a neat visual effect to the space. This attained by having a dark and specular floor with Louis Poulsen downlights in the fine merchandise hallway. A reflection, but not glaring, can be seen in the floor when the shopper strolls through.

Illuminance values were very important in this space so that the customer can properly view merchandise and make purchasing decisions. Illuminance recommendations by area are as follows:

Circulation Area:	10 fc horizontal
Sales Transaction:	30 fc horizontal
Display:	50 – 100 fc horizontal, 10 – 30 fc vertical
Show Windows:	300 – 1000 fc horizontal, 50 fc vertical

The power density allowance for the retail space is a bit more complicated than the others, because of certain retail-specific allowances. According to Section 9.2.2.3 Exceptions (h), in the ASHRAE Standard 90.1, “Lighting in retail display windows, provided the display area is enclosed by ceiling height partitions,” shall not be

considered when determining the interior lighting power allowance as long as it is controlled by an independent control device.

There is also an allowance for additional interior lighting power for retail applications. Section 9.6.2 (b) states that "lighting equipment installed in sales areas and specifically designed and directed to highlight merchandise, calculate the additional lighting power as follows:

Additional Interior Lighting Power Allowance =

$$\begin{aligned} &1000 \text{ watts} + (\text{Retail Area } 1 \times 1.0 \text{ W/ft}^2) \\ &+ (\text{Retail Area } 2 \times 1.7 \text{ W/ft}^2) \\ &+ (\text{Retail Area } 3 \times 2.6 \text{ W/ft}^2) \\ &+ (\text{Retail Area } 4 \times 4.2 \text{ W/ft}^2) \end{aligned}$$

Retail Areas 3 and 4 are the only ones that apply to this space because they are for clothing, and jewelry, respectively. Retail Area 3 totals 600 square feet while Retail Area 4 totals 357 square feet. Multiplying these areas by their respective allowances and using the remainder of area for general sales area multiplied by the standard allowance of 1.7 W/ft^2, allots a total of 5036.5 W.

Summary of Results

Overall, illuminance values were achieved in desired areas.

In the retail display windows, an average of 387.94 footcandles was achieved on the highest platform with an average vertical illuminance of 116.05 fc. The cash wrap counter had an average of 29.71 footcandles which was under by 0.29 footcandles. Men's and women's clothing displays each had horizontal illuminance values above 60 footcandles, and their vertical illuminances were well above 30 fc. In front of the mirror, a vertical illuminance of 7.3 footcandles was achieved which is also higher than the recommended value of 5 footcandles, for a simple looking over of the product. As can be seen in a rendering that follows, the circulation areas are covered with a low level 10 footcandle illuminance, which is ideal for a retail space so that attention is drawn to store items and that customers can still safely navigate through the store.

Calculation Summary from AGI 32.

Project_1
Calc Pts

Mirror
Illuminance Values(Fc)
Average=7.30 Maximum=16.5
Minimum=3.1 Avg/Min=2.35
Max/Min=5.32

WindowDisplay_1
Illuminance Values(Fc)
Average=116.05 Maximum=207
Minimum=6.5 Avg/Min=17.85
Max/Min=31.82 Coeff.Variance=
0.33 Uniform.Grad.=31.82

Retail Window Display_2_Window
Display
Illuminance Values(Fc)
Average=156.71 Maximum=494
Minimum=27.4 Avg/Min=5.72
Max/Min=18.03

Retail Window Display_2_Window
Display_1
Illuminance Values(Fc)
Average=238.21 Maximum=447
Minimum=40.4 Avg/Min=5.90
Max/Min=11.06

Retail Window Display_2
_WindowDisplay
Illuminance Values(Fc)
Average=387.94 Maximum=670
Minimum=165 Avg/Min=2.35
Max/Min=4.05

Retail Displays_8_CashWrap
Illuminance Values(Fc)
Average=29.71 Maximum=53.7
Minimum=10.2 Avg/Min=2.91
Max/Min=5.26

Retail Displays_6
_Women'sClothesHorizontal
Illuminance Values(Fc)
Average=66.70 Maximum=96.8
Minimum=35.1 Avg/Min=1.90
Max/Min=2.76

Mirror Floor
Illuminance Values(Fc)
Average=15.54 Maximum=17.2
Minimum=13.2 Avg/Min=1.18
Max/Min=1.30

Retail Displays_6
_Women'sClothesVertical_1
Illuminance Values(Fc)
Average=54.86 Maximum=131
Minimum=6.8 Avg/Min=8.07
Max/Min=19.28

Glass Shelf_7_Glass Shelves
Illuminance Values(Fc)
Average=49.25 Maximum=82.4
Minimum=26.5 Avg/Min=1.86
Max/Min=3.11

Retail Displays_1
_Men'sClothesHorizontal
Illuminance Values(Fc)
Average=68.21 Maximum=74.0
Minimum=60.2 Avg/Min=1.13
Max/Min=1.23

Retail Displays_1
_Men'sClothesVertical
Illuminance Values(Fc)
Average=49.39 Maximum=121
Minimum=7.4 Avg/Min=6.67
Max/Min=16.35

Retail Displays_7_Fine Merchandise
Illuminance Values(Fc)
Average=77.12 Maximum=178
Minimum=30.0 Avg/Min=2.57
Max/Min=5.93

The allowable power density with the additional allowances and exemptions was 5036.5 W. The actual calculated wattage was 5,048.6 W, just 12.1 W over the allowable value. This can easily be solved by removing one luminaire from any track. The preferred location would be on a clothing display area because some of the target light levels (particularly vertical) were over-designed for.

Below is a summary of the light loss factors used in calculating illuminance values and light levels in AGI 32.

Light Loss Factors for Retail Space						
Dirt Condition:	Very Clean					
Cleaning Cycle:	12 Months					
Luminaire Tag	Luminaire Maintenance Category	LDD	BF	RSDD	LLD	
R1, R2*	V	0.93	1	0.98	1	
R3	V	0.93	1	0.98	1	
R4	V	0.93	1	0.98	1	
R5	V	0.93	1	0.98	1	- mean lumens value of 11000 used
R6	IV	0.94	1.05	0.97	1	- mean lumens value of 1001 used
R7	V	0.93	1	0.98	1	
R8	V	0.93	1	0.98	0.92	- reduced 71w MR16 to 35w (initial lumens as 780)
R9	VI	0.92	1.1	0.9	1	- mean lumens value of 2800 used
R10	IV	0.94	1.05	0.97	1	- mean lumens value of 1001 used

*Additional factors were taken into account for this fixture based on the Spectral Radiant Emittance value in AGI32.

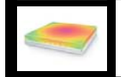
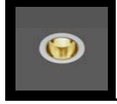
Values used to either increase or decrease the lumen output were based on relative lumen output information found in the iColor Cove cutsheet.

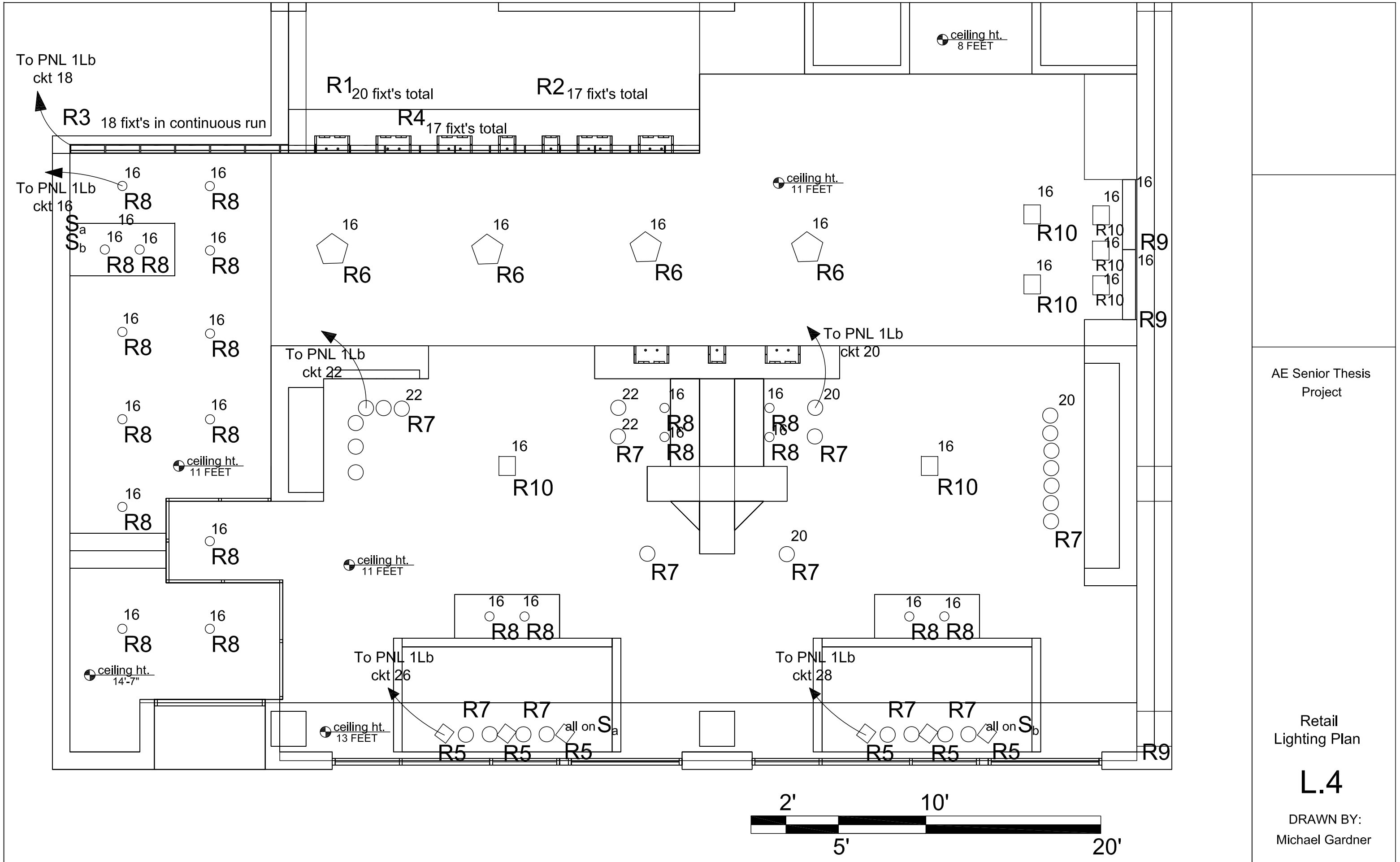
Control Scheme

The window displays are required to be on a separate control from the rest of the system. They are on two switches located near the cash wrap. The Color Kinetics color tile and color changing LED displays will be on their own control system using Light System Manager. The rest of the system will be on a relay system with override switches for working overtime.

Please see the following pages for the luminaire schedule, lighting plan, and renderings of the space.

Luminaire Schedule for Retail

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST/CONTROL	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	R1	COLOR KINETICS	DIRECT	iColor Cove EC - 1' linear RGB LED strip with color changing ability	101-000022-00	5 sets of RGB LEDs	N/A	12.5 @ full on	120	CK - sPDS-60ca 24v Power/Data Supply	N/A	N/A	1.5	
	R2	COLOR KINETICS	DIRECT	iColor Cove EC - 7" linear RGB LED strip with color changing ability	101-000022-01	3 sets of RGB LEDs	N/A	12.6 @ full on	120	CK - sPDS-60ca 24v Power/Data Supply	N/A	N/A	1.5	
	R3	COLOR KINETICS	DIRECT	iColor Tile FX 2:2 - 2' by 2' LED light panel, programmable color patterns	101-000019-00	144 nodes of RGB LEDs	N/A	62 @ full on	7.5	CK - Light System Manager				
	R4	LUCIFER LIGHTING	DIRECT	PUKLED - LED downlight with 1.23" aperture, recessed mount w/o visible fasteners, matte white finish	LPK-ALED-W-CGL-5	3 white LEDs	N/A	3.2	12	Electronic Transformer LET 60 Class 2 (12V/60W)				0.95
	R5	LIGHTING SERVICES, INC.	SPOT/FLOOD	MT615 SERIES - Ceramic metal halide surface mounted accent	MT615-5A	(1) 150 W T6 CERAMIC METAL HALIDE with G12 BASE	PHILIPS - MASTERCOLOR CDM-T 150W/830 T6 1CT	169	120	e-Vision ELECTRONIC	IMH-175-C	1	1.4	0.9
	R6	LOUIS POULSEN	DIRECT/INDIRECT	BALLERUP - Compact fluorescent decorative downlight with white opal glass cylinder	BAL-1/18W/CF GX24q-2-120-277V-WHT	(1) 18 W COMPACT FLUORESCENT 4-pin	SYLVANIA - CF18DT/E/IN/830/ECO	39	120	(2) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.33	0.98
	R7	ERCO	SPOT/FLOOD	TM SPOTLIGHT - PAR 38 spot accent 30° beam with black powder-coated aluminum	77460.000	(1) 120 W PAR 38 HALOGEN	SYLVANIA - 120PAR38/HAL/FL30	120	120	N/A				
	R8	FOCAL POINT	DIRECT	DOWNLIGHT PINHOLE - Halogen downlight/direct accent with 1-1/8" aperture	FD4-MR-E1-RF-T-D1	(1) 35 W MR16 HALOGEN	PHILIPS - 35MRC16/IRC/SP8	35	12	Electronic Transformer LET 303 AC (12V/300W)			2.5	0.985
	R9	PRUDENTIAL LIGHTING	INDIRECT	P-59 SERIES - One-lamp prefabricated cove system with matte white finish	P-59-1T8-R4-W-120-X3B	(1) 32 W T8 LINEAR FLUORESCENT	PHILIPS - F32T8/TL830 ALTO TG 1LP	58	120	(2) LAMP - STANDARD ELECTRIC INSTANT START	REL-2P32-SC	0.88	0.49	0.99
	R10	LUCIFER LIGHTING	DIRECT	DL51XM Series- Round Fixed Deep Cone CFL without Return	DL51XM-W-CR-CFL	(1) 18 W COMPACT FLUORESCENT 4-pin	SYLVANIA - CF18DT/E/IN/830/ECO	39	120	(2) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.33	0.98
								20	120	(1) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.17	0.98



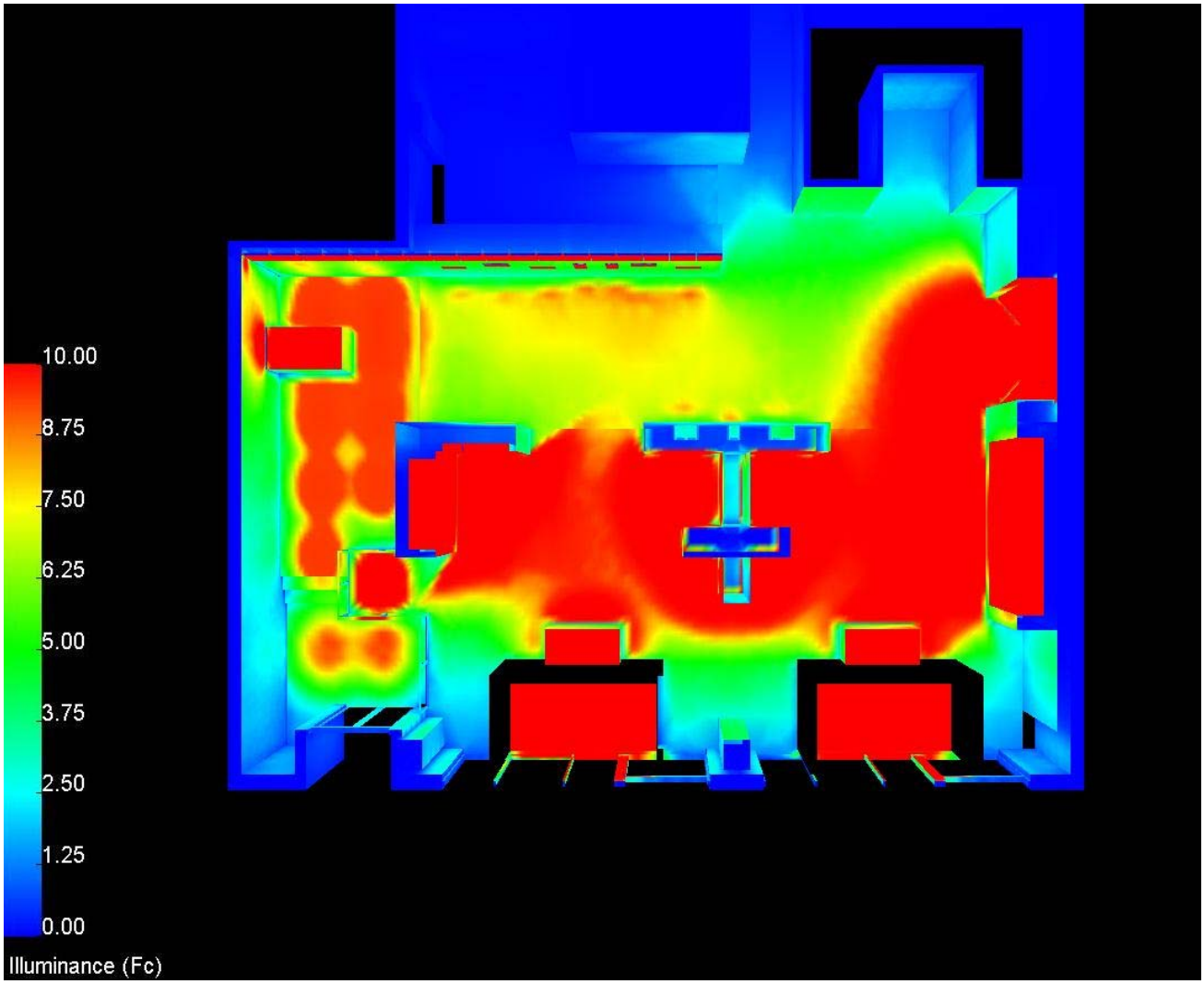
AE Senior Thesis Project

Retail
Lighting Plan

L.4

DRAWN BY:
Michael Gardner

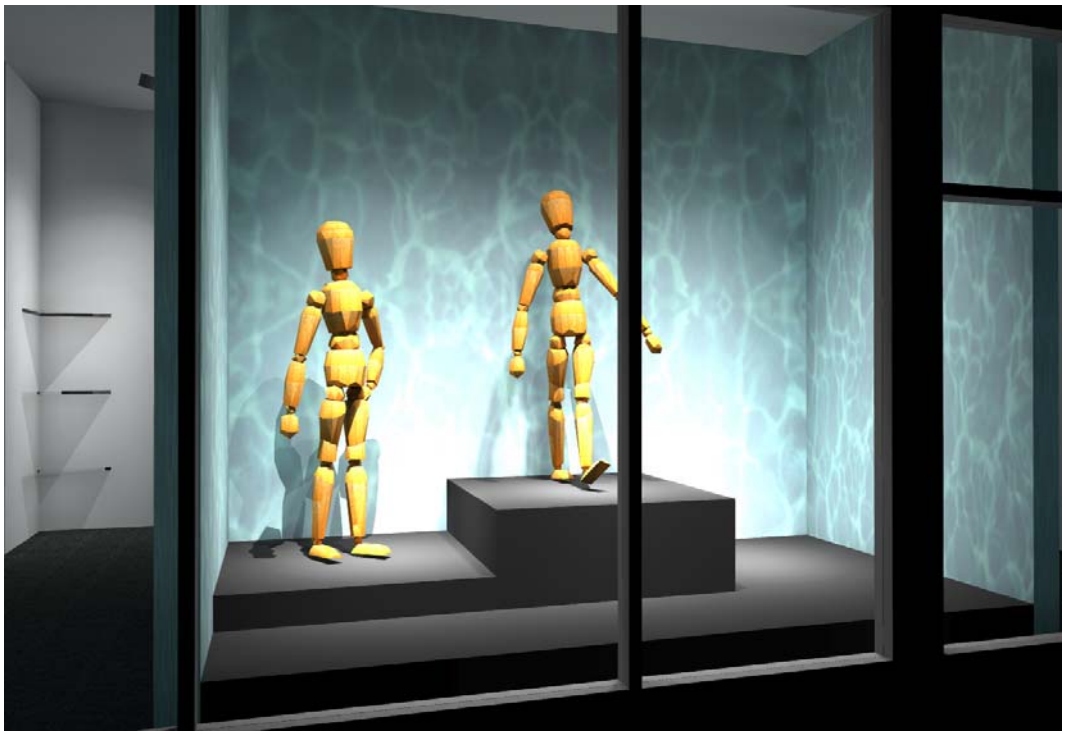
Below is a pseudo-color rendering of the floor in the retail space.



In this image it can be seen that the majority of the circulation area is at or above ten footcandles. The flooring in the fine merchandise hall is a little lower but adds to the focus of the fine merchandise cubes. Much of the circulatory lighting depends on spill light from the clothing display fixtures. This is to keep the merchandise highlighted compared to the rest of the space.

The top image is a view in the retail space from the fine merchandise hall, looking towards the mirror and a hanging clothing display. A perimeter wall slot fixture rests above the mirror to reflect light off of the wall and onto the customer in front of the mirror. Supplemental downlights are also there to add vertical illuminance onto the person. The image at the bottom views a different clothing display at the opposite angle. Light is aimed onto the clothing hanging on racks for the customer's perusal. Also in this view are the Louis Poulsen decorative downlights in the fine merchandise hallway.

A rendered view of the entrance from the Cash Wrap.



Looking into the Window Display Area.

Residential Lobby

Spatial Description

The lobby of this mixed-use project is intended for the circulation of residents in and out of the building. One enters the space from the street level through glass doors into the vestibule. There is a waiting space in one area so that guests and residents can relax as they wait for the other to arrive. There is a reception desk with an attendant to serve as the concierge and security clerk. Cabinets are located behind the reception desk for storage and other purposes. At the boundary of the lobby are stairs leading the occupant to the elevators at the left, the lounge and game-room straight ahead, and the fitness area to the right. The steps also travel down to other amenities. The lobby is approximately 1,300 ft^2 in area. The ceiling heights vary depending on the area type. The lounge/waiting area has a ceiling height of eight feet, the open circulation space has a height of thirteen feet, and the concierge area has a ceiling height of eleven feet.

Space Materials

The materials in the lobby stick with the high-end, clean nature of the space. The floor is a type of limestone tile, the carpet in the lounge area is of a brown and green striped design, and the waiting area has a beige toned wall covering. The walls and ceiling are the same as in the fitness room. See the table below for specific material information.

Lobby Materials

Surface	Location	Type	Brand	Product	Color	Reflectance	Photo
Floor	Main Lobby	Stone Tile	Stone Source	Limestone Tile	Azul Argento	0.38	
Floor	Waiting Area	Carpet	Masland Contract	Moki	54370	0.15	
Wall	Waiting Area	Wall Covering	Knoll Textiles	Scene Change	Scrim	0.56	
Wall	Reception Area, others	Paint	ICI Paints		40YY 65/601	0.65	
Ceiling	All	Paint	ICI Paints		43YY 78/053	0.78	

Design Criteria

To maintain the high-end theme of all spaces, the lobby needs to look the part. It also needs to provoke a public feeling because it is a public space. This will be done by maintaining high illuminances and also illuminating the surfaces of the room. Key design criteria for this space are: appearance and space of luminaires, color appearance and contrast, light distribution on surfaces, light distribution on task plane, luminances of room surfaces, target illuminance values.

To make the space look attractive, the luminaires themselves must be attractive as well. This will enhance the style of the room and make the residents feel comfortable, as if they've made the right choice in choosing to live there. This was accomplished by choosing sleek and stylish fixtures, as well as some decorative ones. The Focal Point fixtures hanging from the ceiling in the open space appear trim and sleek, while the Louis Poulsen fixtures are something interesting to view.

Color appearance and contrast is virtually always important in spaces like these. A warm CCT and good CRI were chosen for most lamps.

The light distribution on surfaces should be generally uniform to brighten the space. It should not be completely uniform, however, so that the space can still seem interesting and not overly bland.

The light distribution on the task plane is important for the concierge and the circulatory space. It should be generally uniform. For the concierge desk, the use of task lighting will help to increase illuminance on this plane, but will keep the brightest spots nearest to the luminaire.

The luminances of room surfaces, to keep the space visually interesting, should definitely be bright on the peripherals. Indirect lighting on the ceiling and walls achieves this criterion.

The target illuminance values for the lobby, according to the IESNA Handbook, are as follows:

Illuminance on floor = 10 fc horizontal
Illuminance on reception desk = 50 fc horizontal
Illuminance on lounge task plane = 30 fc horizontal

The power density allowance for the lobby is 1.3 W/ft^2. With a total area of 1,340 square feet, the total allowance is 1742 W.

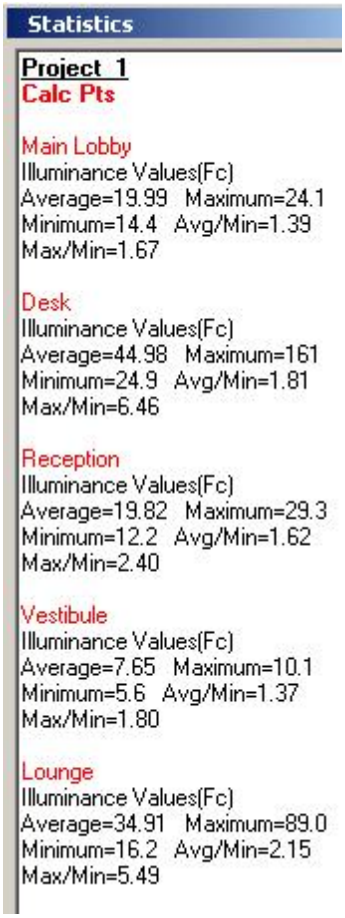
Summary of Lighting System

The lighting system can be broken down into three different areas – the lounge, the main circulation space, and the concierge area. The lighting system in the lounge is predominantly indirect light in the form of a wall wash, with supplemental downlighting. Task lighting provides added light to couches and tables in the form of floor lamps by Louis Poulsen. In the main circulation space, indirect/direct fixtures provide light to the ceiling which bounces off and illuminates the floor below. In the concierge desk area, some downlighting helps to brighten up the desk as well as task lighting in the form of Louis Poulsen table lamps of the same shade design. Wall wash luminaires also light the wood finished cabinetry and hidden door access to the retail space.

Summary of Results

Most of the illuminance criteria were achieved and the space has an interesting look. On the lobby floor, an average of 19.99 fc was obtained surpassing the required 10 fc. Even though this is higher by about 10 fc, it is appropriate because of the public setting trying to be displayed. The desk has an illuminance of 44.98 fc, which is lower than the target of 50 fc, but with a maximum of 161 present, the desk will have adequate light levels, just not uniformly. Doing written work and reading will still be able to be comfortably done. The task plane in the lounge has an illuminance of 34.91 fc on average, which is higher than the recommended 30 fc. All of the illuminance criteria have been met.

Calculation Summary from AGI 32.



The power density was not met. The actual wattage of the system was 1,918 watts, and the allowable was 1,742 W. This gave a total power density of 1.43 W/ft^2. The solution to this, however, is simple – the task lighting wattages can be reduced. Currently the floor lamps and table lamps use 100 W incandescent lamps. Replacement compact fluorescent or lower wattage light sources could be used to reduce their impact on the power allowance.

Below is a summary of the light loss factors used in calculating illuminance values and light levels in AGI 32.

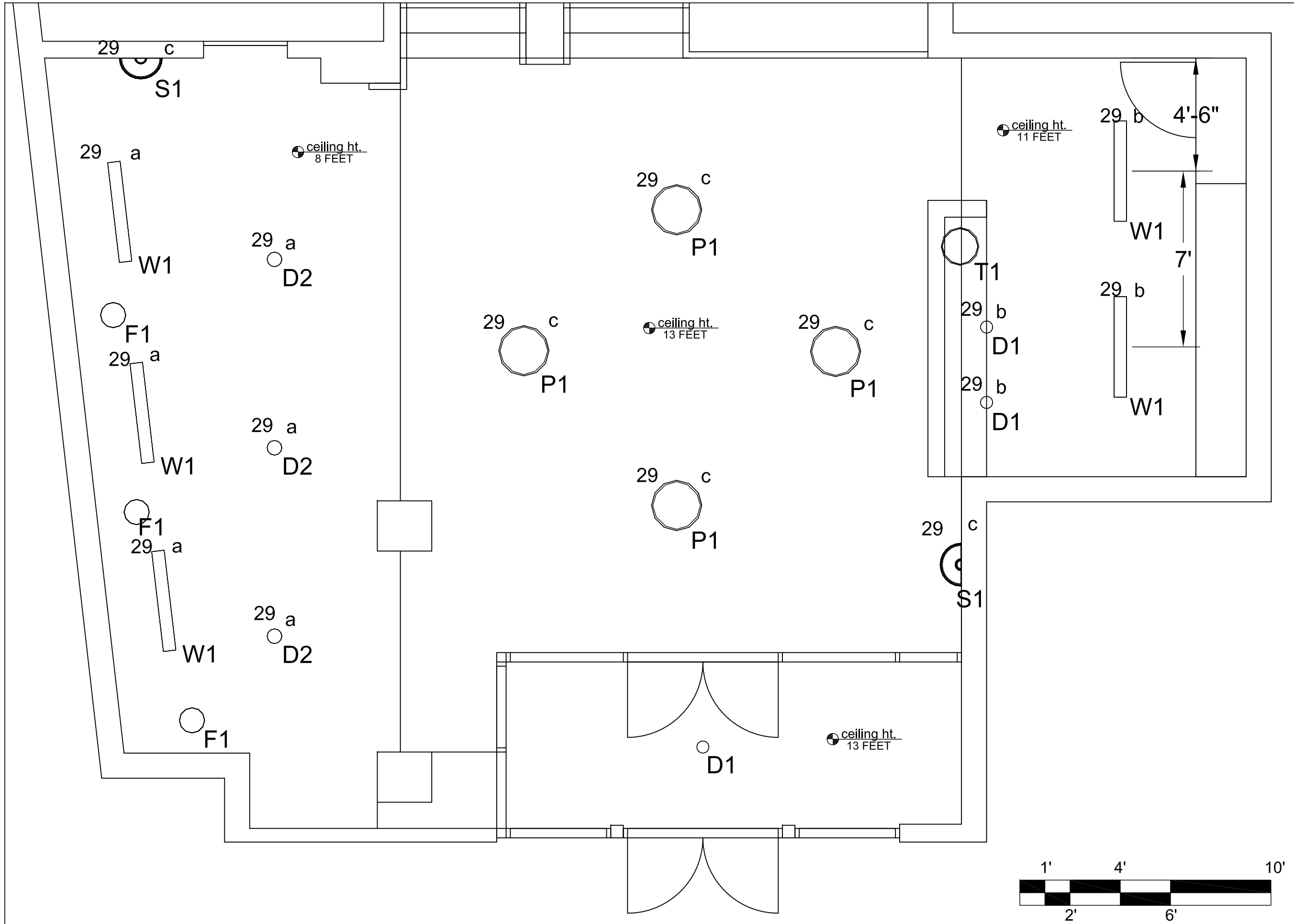
Light Loss Factors for Residential Lobby						
Dirt Condition: Very Clean						
Cleaning Cycle: 18 Months						
Luminaire Tag	Luminaire Maintenance Category	LDD	BF	RSDD	LLD	
P1	VI	0.89	0.97	0.98	1	- mean lumens value of 2670 used
W1	IV	0.91	0.98	0.98	1	- mean lumens value of 7310 used for two F50 biax lamps
D1	IV	0.91	0.91	0.98	1	- mean lumens value of 671 used
D2	IV	0.91	0.98	0.98	1	- mean lumens value of 2670 used
S1	IV	0.91	1.1	0.98	1	- mean lumens value of 1501 used
T1	IV	0.91	1	0.98	1	- mean lumens value of 1260 used
F1	IV	0.91	1	0.98	1	- mean lumens value of 1260 used

As can be seen from the renderings that follow, the room has a lively, public atmosphere with interesting visual tones generated by indirect lighting.

Please see the following pages for the luminaire schedule, lighting plan, and renderings of the space.

Luminaire Schedule for Lobby

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	P1	FOCAL POINT	INDIRECT/DIRECT	METRO 26 - Circular pendant with steel housing, with acrylic diffuser in bottom opening	FMEP-26-PA-442TT	(4) 42 W COMPACT FLUORESCENT TRIPLE TUBE	SYLVANIA - CF42DT/E/IN/830	93	120-277	(2) LAMP - SMARTMATE ELECTRONIC - PROGRAMMED START	ICF-2S42-M2-BS@120	0.97	0.78	0.99
	W1	PRUDENTIAL LIGHTING	DIRECT	P-5900 - 4' linear fluorescent wall wash with specular reflector, steel housing	P-5900-1BX50W-R04-120-X3B	(2) 50 W BIAX COMPACT FLUORESCENT	SYLVANIA - FT50DL/830/RS/ECO	106	120	(2) LAMP - STANDARD ELEC - ELECTRONIC RAPID START	REL-2TTS50	0.98	0.9	0.98
	D1	PRESCOLITE	DIRECT	Architecktur CFQ13	CFQ613 (120v)	(1) 13 W QUAD TUBE COMPACT FLUORESCENT	SYLVANIA - CF13DD/830/ECO	16	120	COMPACT - HPF - MAGNETIC - PRE-HEAT	H-1B13-TP-BLS	0.91	0.14	0.91
	D2	COOPER LIGHTING	DIRECT	Portfolio - 7 3/8" aperture, compact fluorescent downlight, aluminum housing	C7042-7400-LI	(1) 42 W TRIPLE 4-PIN COMPACT FLUORESCENT	SYLVANIA - CF42DT/E/IN/830	46	120	ABMISTAR-HPF ELECTRONIC	RCF-2S26-H1-LD-QS	0.98	0.38	0.98
	S1	LOUIS POULSEN	INDIRECT/DIRECT	OSLO WALL - Decorative wall sconce with frosted acrylic diffusers and aluminum shades	OSW-1/26W/CF GX24q-3-120-277V-WHT	(1) 26 W TRIPLE TUBE COMPACT FLUORESCENT	SYLVANIA - CF26DT/E/IN/830/ECO	29	120	AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S26-H1-LD-QS	1.1	0.24	0.98
	T1	LOUIS POULSEN	DIRECT/INDIRECT	PH 4 1/2 - 3 1/2 SERIES - Incandescent table lamp with handblown white opal glass shades, chrome finish base and pole	PH4 1/2-3 1/2-T	(1) 100 W A-19 INCANDESCENT	SYLVANIA - 100A/RS/RP/1	100	120	N/A				
	F1	LOUIS POULSEN	DIRECT/INDIRECT	PH 3 1/2 - 2 1/2 FLOOR - Incadescent floor lamp with handblown white opal glass shades, chrome finish base and pole	PH3 1/2-2 1/2-F	(1) 100 W A-19 INCANDESCENT	SYLVANIA - 100A/RS/RP/1	100	120	N/A				



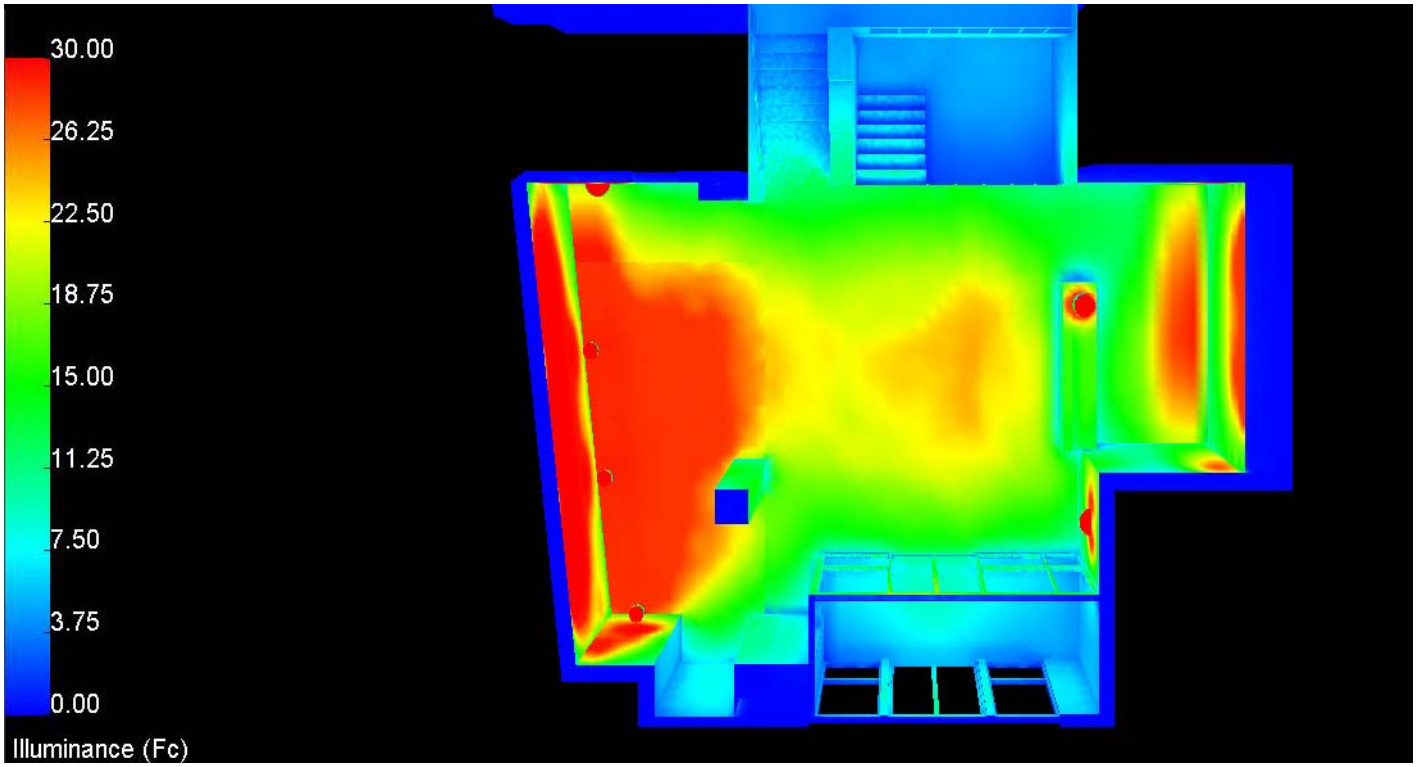
AE Senior Thesis Project

Lobby Lighting Plan

L1

DRAWN BY:
Michael Gardner

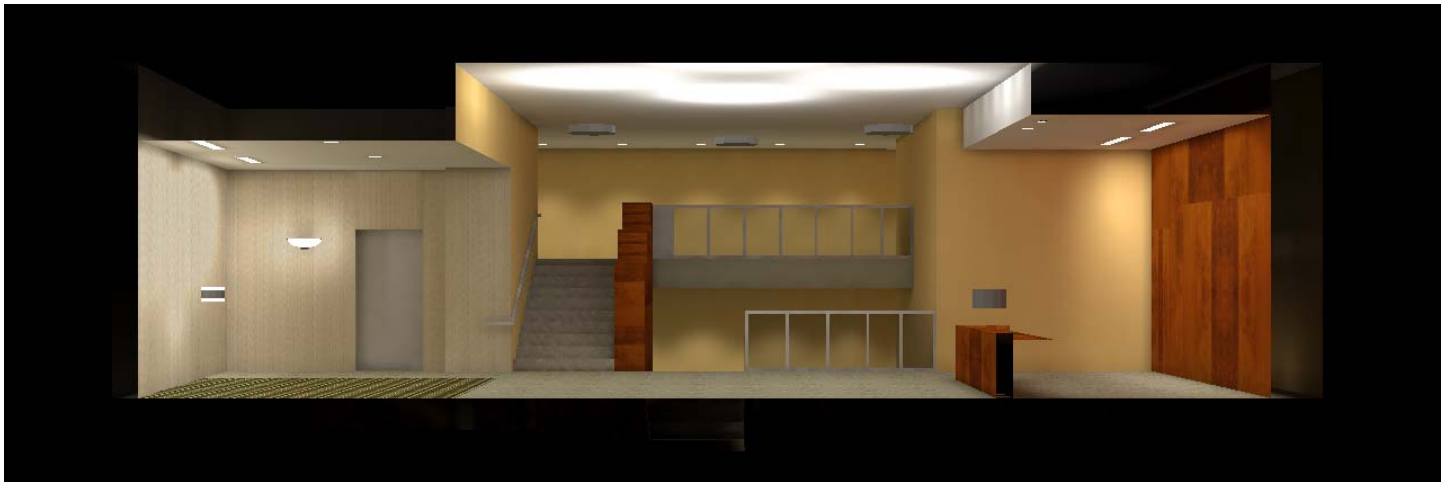
Below is a pseudo-color rendering of the lobby, from above, scaled to 30 footcandles.



Below is a RGB image of the lobby from the same angle.

In these two images, it can be seen that higher illuminances are achieved at the task plane of the lounge area (the green/brown striped carpet area on the left). This was to allow occupants of this area to read leisurely. The higher illuminances are in the center of the main lobby area thanks to the indirect pendants hanging from the ceiling.

These two images provide sectional views of the lobby looking from the staircase (top) and from the vestibule (bottom). These RGB images show the light distribution on the walls and ceiling. This was done to brighten up the space and promote a public setting. A sconce serves as an indicator to the elevator and the vestibule entrance and both brighten up the walls they are affixed to. The wallwashers provide luminance to the wooden concierge cabinetry wall and the lounge area wall covering.



In the renderings displayed here, a better sense of materials and space can be made.
In the bottom rendering, the wallwashers highlight the woodwork, bringing out warm tones.
The texture of the carpet can also be seen.

Fitness Room

Spatial Description

The fitness areas are made up of three separate sections of one large room. The east-facing wall is angled and made of floor-to-ceiling glass. This allows the users to look out into the courtyard immediately outside of the fitness area. Each room is about 24 feet long by 20 feet wide, with additional area by the angled curtain walls. There is also a small mechanical closet in each of the fitness rooms.

Lighting Design

The lighting system in the fitness room uses one type of direct recessed linear fluorescent luminaire by SE'LUX in continuous runs. Each fixture houses a 28 watt T5 lamp in a staggered configuration. There are a total of thirty-seven of these fixtures tagged as L1 in the electrical plan. A design goal was to reduce material costs and energy by utilizing multiple-lamp ballasts where possible. Eighteen two-lamp electronic ballasts were chosen to power the system leaving one one-lamp ballast to power the remaining fixture. The two-lamp ballasts consume 64 watts while the one-lamp ballast consumes 33 watts, giving the total lighting load in the room to be 1185 watts.

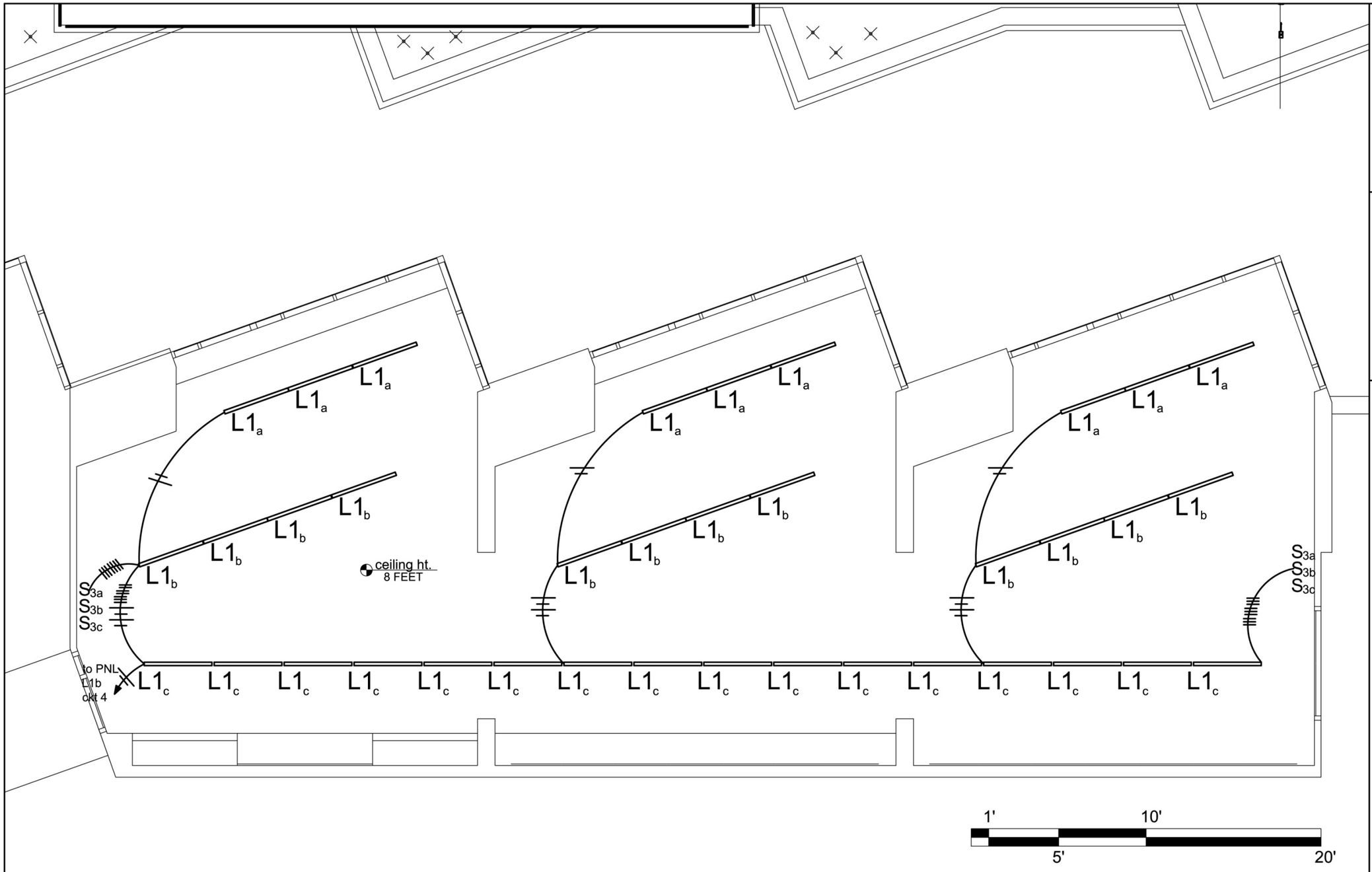
Control

Three-way switching controls were used to provide two switching points in the room next to both entrances. Three switching zones divide the room so that a flexible lighting solution can be maintained. Luminaires nearest to the curtain wall will be able to be switched completely off during early morning hours when sun penetration is at its peak. As the day progresses, occupants will be able to switch these luminaires on to provide sufficient light levels to perform necessary tasks of operating exercise equipment.

For added energy savings and to comply with energy code requirements set by ASHRAE Standard 90.1, a Wattstopper occupancy sensor has been prescribed so that lights turn off automatically when the space is unoccupied for more than 30 minutes. This will reduce energy use especially during the night when less people are using the facility.

Documentation

See the following pages for the electrical plan, luminaire schedule, panelboard worksheet and sizing information.



AE Senior Thesis Project

Fitness Electrical Plan

E.1

DRAWN BY:
Michael Gardner

Luminaire Schedule for Fitness

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	L1	SE'LUX	DIRECT	M60 - Recessed Staggered Linear Fluorescent Downlight with diffuse lens	M6R1S-1T5-OD-RC-008	(1) 28 W T5 LINEAR FLUORESCENT	SYLVANIA - FP28/830/ECO	64	120	(2) LAMP - CENTIUM T5 ELECTRONIC PROGRAMMED START	ICN-2S28@120	1.03	0.55	0.99
								33	120	(1) LAMP - CENTIUM T5 ELECTRONIC PROGRAMMED START	SAME AS ABOVE	1.04	0.28	0.98

Panelboard Sizing

The original panelboard schedule for panel 1Lb with the changed branch circuits can be found below.

ORIGINAL PANEL SCHEDULE

VOLTAGE	208/120			Panel L1b					TYPE PANEL			
MOUNTING	SURFACE								C/B MIN = 20A 10K AIC		TOP FEED	
SIZE/TYPE BUS	400 A			Ground Floor Meter Room					OPTIONS/ACCESSRS			
SIZE/TYPE MAINS	MLO								REMARKS			
LOAD DESCRIPTION	LOCATION	LOAD VA	C/B SIZE	POS NO	A PH	B PH	C PH	POS NO	C/B SIZE	LOAD VA	LOCATION	LOAD DESCRIPTION
Receptacles	Kitchen	1224.0	20A-1P	1	*			2	20A-1P	280.0	Fitness Rm	Lighting
Receptacles	Kitchen	1920.0	20A-1P	3		*		4	20A-1P	275.0	Screening Rm	Lighting
Receptacles	Kitchen	1920.0	20A-1P	5			*	6	20A-1P	540.0	Fitness Rm	Receptacles
Receptacles	Screening Room	1080.0	20A-1P	7	*			8	20A-1P	1500.0	Fitness Rm	Equipment
Receptacles	Bathroom	360.0	20A-1P	9		*		10	20A-1P	580.0	Fitness/Mech.	Receptacles
Receptacles	Bath/Mop Rm	620.0	20A-1P	11			*	12	20A-1P	900.0	Fitness Rm	Receptacles
Receptacles	Elec. & Tel.	360.0	20A-1P	13	*			14	20A-1P	825.0	Ground Floor	Entry
Spare C/B			20A-1P	15		*		16	20A-1P			Spare C/B
Spare C/B			20A-1P	17			*	18	20A-1P			Spare C/B
Spare C/B			20A-1P	19	*			20	20A-1P			Spare C/B
Spare C/B			20A-1P	21		*		22	20A-1P			Spare C/B
Trash Compactor		1272.0	20A-3P	23			*	24	20A-1P	1200.0	Garage	Garage Door
		1272.0		25	*			26	20A-1P			Spare C/B
		1272.0		27		*		28	20A-1P			Spare C/B
*				29			*	30				*
*				31	*			32				*
*				33		*		34				*
*				35			*	36				*
*				37	*			38				*
*				39		*		40				*
*				41			*	42				*
SUB-TOTAL	A PHASE	6541.0		B PHASE						4407.0	C PHASE	6452.0
TOTAL CONNECTED LOAD (VA)		17400.0									DEMAND LOAD	15660.0

Branch circuits #2 and #4 were changed (highlighted in yellow). The fitness load on circuit #2 was increased to 1247 VA and was moved to the #4 position. The screening room load on circuit #4 was moved into the #2 position. This was done to increase the load on the B phase to better balance the three phases.

Six spare circuit breakers (highlighted in orange) will be filled with loads from the retail space. The retail space's former loads were on a mechanical load panel prior to the fit-out performed for the architectural breadth. Explanation of the lighting and electrical design can be found in the next section.

The panelboard worksheet can be found on the next page.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->					1Lb	Panel Location:			Ground Floor Meter Room			
Nominal Phase to Neutral Voltage------->					120	Phase:			3			
Nominal Phase to Phase Voltage-------->					208	Wires:			4			
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks		
1	A	Receptacles	1	Kitchen	1224	va	0.85	1040	1224			
2	A	Lighting	3	Screening	275	va	0.95	261	275			
3	B	Receptacles	1	Kitchen	1920	va	0.85	1632	1920			
4	B	Lighting	3	Fitness	1185	w	0.95	1185	1247			
5	C	Receptacles	1	Kitchen	1920	va	0.85	1632	1920			
6	C	Receptacles	1	Fitness	540	va	0.85	459	540			
7	A	Receptacles	1	Screening	1080	va	0.85	918	1080			
8	A	Receptacles	1	Fitness	1500	va	0.85	1275	1500			
9	B	Receptacles	1	Bathroom	360	va	0.85	306	360			
10	B	Receptacles	1	Fitness/Mech	580	va	0.85	493	580			
11	C	Lighting	3	Bath/Mop Rm	620	va	0.95	589	620			
12	C	Receptacles	1	Fitness	900	va	0.85	765	900			
13	A	Receptacles	1	Elec & Tel	360	va	0.85	306	360			
14	A	Receptacles	1	Grnd Entry	825	va	0.85	701	825			
15	B	spare			1560	va	1.00	1560	1560			
16	B	General Lighting	3	Retail	1008	w	0.95	1008	1061			
17	C	spare			1560	va	1.00	1560	1560			
18	C	LED Display Lighting	3	Retail	1761	w	0.95	1761	1854			
19	A	spare			1560	va	1.00	1560	1560			
20	A	Clothing Display Lighting	5	Retail	1200	w	0.95	1200	1263			
21	B	spare			1560	va	1.00	1560	1560			
22	B	Clothing Display Lighting	5	Retail	1080	w	0.95	1080	1137			
23	C	Trash Compactor Motor	6		1272	va	0.80	1018	1272			
24	C	Garage Door Opener	6	Garage	1200	va	0.80	960	1200			
25	A	Trash Compactor Motor	6		1272	va	0.80	1018	1272			
26	A	Window Display Lighting	4	Retail	987	w	0.95	987	1039			
27	B	Trash Compactor Motor	6		1272	va	0.80	1018	1272			
28	B	Window Display Lighting	4	Retail	987	w	0.95	987	1039			
29	C	space				va	1.00	0	0			
30	C	space				va	1.00	0	0			
31	A	space			0	va	1.00	0	0			
32	A	space			0	va	1.00	0	0			
33	B	space			0	va	1.00	0	0			
34	B	space			0	va	1.00	0	0			
35	C	space			0	va	1.00	0	0			
36	C	space			0	va	1.00	0	0			
37	A	space			0	va	1.00	0	0			
38	A	space			0	va	1.00	0	0			
39	B	space			0	va	1.00	0	0			
40	B	space			0	va	1.00	0	0			
41	C	space			0	va	1.00	0	0			
42	C	space			0	va	1.00	0	0			
PANEL TOTAL								28.8	32.0	Amps=	88.9	

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					9.3	10.4	32%	86.7
PHASE TOTAL	B					10.8	11.7	37%	97.8
PHASE TOTAL	C					8.7	9.9	31%	82.2

LOAD CATAGORIES			Connected			Demand				Ver. 1.03
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		9.5	11.2	0.70	6.7	7.8	0.85		
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		4.8	5.1	1.00	4.8	5.1	0.95		
4	HID lighting		2.0	2.1	1.00	2.0	2.1	0.95		
5	incandescent lighting		2.3	2.4	1.00	2.3	2.4	0.95		
6	HVAC fans		4.0	5.0	0.80	3.2	4.0	0.80		
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		6.2	6.2		6.2	6.2	1.00		
Total Demand Loads						25.2	27.6			
Spare Capacity			20%			5.0	5.5			
Total Design Loads						30.2	33.2	0.91	Amps=	92.1

Panelboard Size

The load for spare circuit breakers was added to be 65% of each of their capacities. A 20% spare capacity was also taken into consideration to account for the remaining spaces in the panel.

The total design load was calculated to be 92.1 amps which would require a 100 A circuit breaker and a 225 A bus rating (due to the feeder ampacity of 120 A).

This new sizing would produce the schedule that follows:

PANEL SCHEDULE

VOLTAGE	208/120		Panel L1b						TYPE PANEL			
MOUNTING	SURFACE								C/B MIN = 20A 10K AIC		TOP FEED	
SIZE/TYPE BUS	225 A		Ground Floor Meter Room						OPTIONS/ACCESSRS			
SIZE/TYPE MAINS	100 A								REMARKS			
LOAD DESCRIPTION	LOCATION	LOAD VA	C/B SIZE	POS NO	A PH	B PH	C PH	POS NO	C/B SIZE	LOAD VA	LOCATION	LOAD DESCRIPTION
Receptacles	Kitchen	1224.0	20A-1P	1	*			2	20A-1P	275.0	Screening Rm	Lighting
Receptacles	Kitchen	1920.0	20A-1P	3		*		4	20A-1P	1247.0	Fitness Rm	Lighting
Receptacles	Kitchen	1920.0	20A-1P	5			*	6	20A-1P	540.0	Fitness Rm	Receptacles
Receptacles	Screening Room	1080.0	20A-1P	7	*			8	20A-1P	1500.0	Fitness Rm	Equipment
Receptacles	Bathroom	360.0	20A-1P	9		*		10	20A-1P	580.0	Fitness/Mech.	Receptacles
Receptacles	Bath/Mop Rm	620.0	20A-1P	11			*	12	20A-1P	900.0	Fitness Rm	Receptacles
Receptacles	Elec. & Tel.	360.0	20A-1P	13	*			14	20A-1P	825.0	Ground Floor	Entry
Spare C/B			20A-1P	15		*		16	20A-1P	1061.0	Retail Gen. Light	Lighting
Spare C/B			20A-1P	17			*	18	20A-1P	1854.0	Retail LED Displa	Lighting
Spare C/B			20A-1P	19	*			20	20A-1P	1263.0	Retail Display	Lighting
Spare C/B			20A-1P	21		*		22	20A-1P	1137.0	Retail Display	Lighting
Trash Compactor		1272.0	20A-3P	23			*	24	20A-1P	1200.0	Garage	Garage Door
		1272.0		25	*			26	20A-1P	987.0	Retail Window	Lighting
		1272.0		27		*		28	20A-1P	987.0	Retail Window	Lighting
*				29			*	30				*
*				31	*			32				*
*				33		*		34				*
*				35			*	36				*
*				37	*			38				*
*				39		*		40				*
*				41			*	42				*
SUB-TOTAL	A PHASE	8786.0		B PHASE						8564.0	C PHASE	8306.0
TOTAL CONNECTED LOAD (VA)		25656.0									DEMAND LOAD	23090.4

Feeder Sizing

Since this panel supplies branch circuits dedicated to receptacles for cord-and-plug connected portable loads, the feeders supplying the panel need to be at least the next size above the rating of the circuit breaker [Section 240.4 (B)]. According to Table 310.16 of the NEC, the next highest ampacity above 100 A is 115 A for copper conductors, giving a size of feeders at #2 AWG. If the feeders are aluminum, then the next highest ampacity is 120 A, giving a size of 1/0 wire. These values were based on a 75° C temperature rating.

The table below (left) outlines the values in Table 310.16 for sizing feeders.
The table below (right) outlines the values in Table 250.122 for sizing grounding conductors.

Allowable Ampacities of Insulated Conductors…, Not More Than Three Current-Carrying Conductors in Raceway,…		
Size AWG or kcmil	Temperature rating of conductor	
	75° C (167° F)	
	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	
	Copper	Aluminum or Copper-Clad Al.
2	115	90
1/0	150	120

Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment		
Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size (AWG or kcmil)	
	Copper	Aluminum or Copper-Clad Al.
100	8	6

Grounding Conductors Sizing

Based on values in Table 250.122 of the NEC, a 100 A rating calls for a #8 AWG copper conductor, or a #6 AWG aluminum or copper-clad aluminum conductor instead.

Conduit Sizing

Using a #2 AWG conductor size (copper) and a total of five conductors in the conduit, the size of the conduit becomes 2“. For an aluminum conductor size of 1/0 and five conductors, the conduit size increases to 2 ½ “.

Retail Space

Spatial Description

The retail space has undergone a tenant fit-out as part of the architectural breadth for this thesis project. The area re-designed is divided up between fine merchandise display, clothing displays, and a general sales area. The space has a total area of about 2,000 sq. ft. Two 20-ft long window fronts are located on the west wall of the space.

Lighting Design

The lighting system in the retail space, because of its intended high-end image, proves to be the most complicated out of all the spaces. A variety of fixture types and light sources were used including halogen, ceramic metal halide, fluorescent, and light-emitting diodes. For general lighting, MR16 halogen and compact fluorescent downlights were used. Halogen and ceramic metal halide track fixtures were used to highlight the window display areas, clothing racks, and shelving. Diffuse LED panels and color-changing LED strips, both by Color Kinetics, were used for decorative and accenting purposes. Small LED downlights were used to illuminate jewelry and other fine merchandise in small cube display boxes.

Electrical Design Criteria

Since the initial retail space was not designed with a tenant in mind, the small lighting loads were placed on Panel L1c which is made up primarily of HVAC loads. The re-design loads will be added to Panel L1b taking the place of spare circuits. Electrical goals for this space will be to abide by control requirements given in ASHRAE Standard 90.1.

Control requirements pertaining to this lighting system based on ASHRAE Standard 90.1 are as follows:

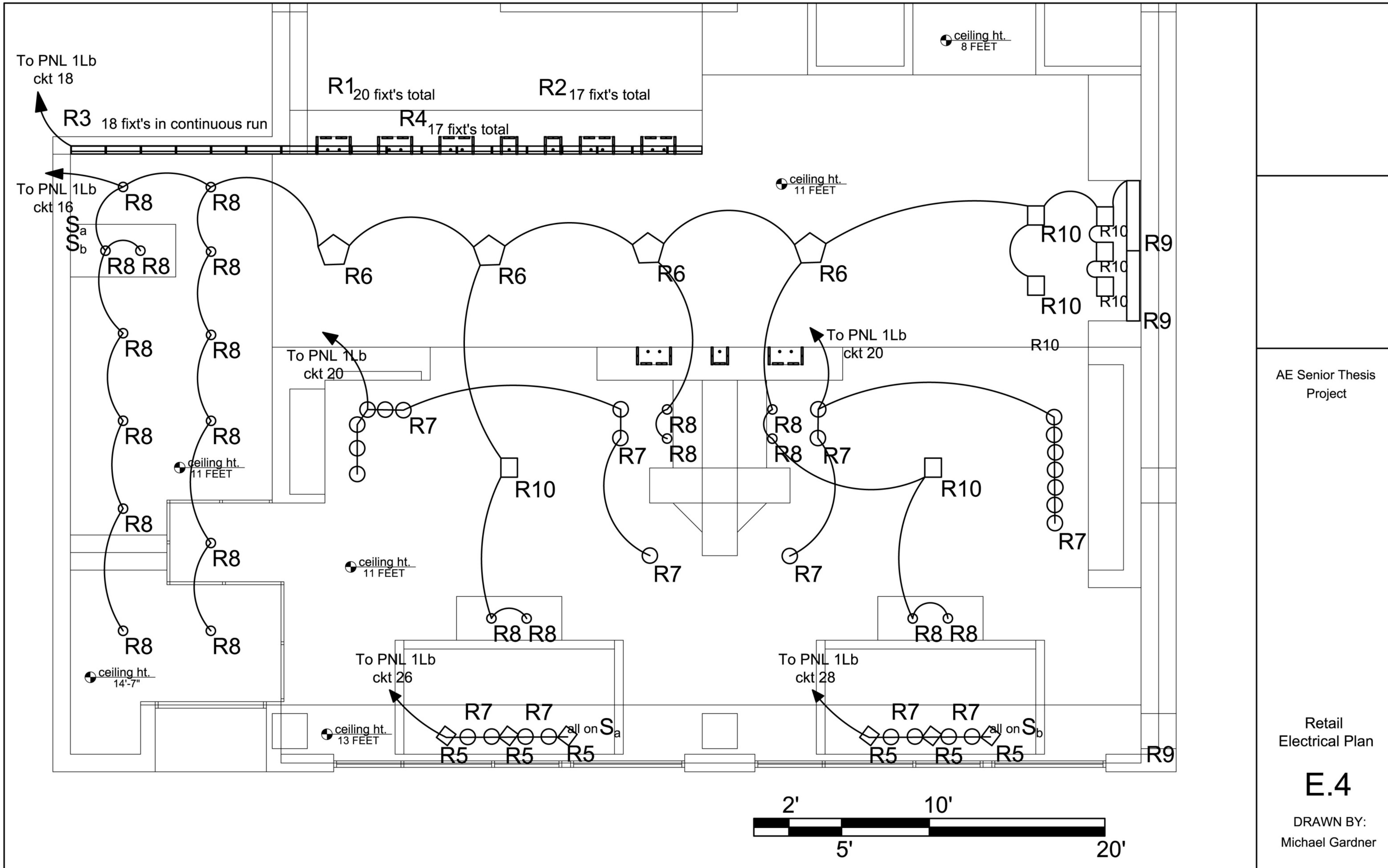
Section 9.2.2.3 (Exception h) states that, “lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions” can be exempt from the interior lighting power allowance if it is controlled by an independent control device. Since the window display spaces are enclosed by ceiling-height partitions, they will be on a separate control from the rest of the lighting. Separate controls will also be needed for the remaining clothing displays and fine merchandise. A third control will be required for the remaining general lighting in the space.

Control Scheme

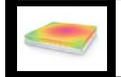
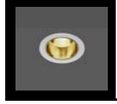
There will be separate control circuits. The window display lighting is on independent switches located in the cash wrap area. The LED systems are controlled by a Color Kinetics Light System Manager. The rest of the space will be on a relay system with override switches so that employees will be able to work late hours if needed.

Documentation

Refer to the previous section for panel sizing information regarding the retail space. See the following pages for the electrical plan and luminaire schedule.


To PNL 1Lb
ckt 18
R3 18 fixt's in continuous run
R1 20 fixt's total
R2 17 fixt's total
R4 17 fixt's total
ceiling ht.
8 FEET
ceiling ht.
11 FEET
To PNL 1Lb
ckt 16
S_a
S_b
R8
R6
R10
R9
To PNL 1Lb
ckt 20
R7
ceiling ht.
11 FEET
ceiling ht.
14'-7"
ceiling ht.
13 FEET
To PNL 1Lb
ckt 26
To PNL 1Lb
ckt 28
R5
all on S_a
all on S_b
2'
5'
10'
20'
AE Senior Thesis
Project
Retail
Electrical Plan
E.4
DRAWN BY:
Michael Gardner

Luminaire Schedule for Retail

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST/CONTROL	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	R1	COLOR KINETICS	DIRECT	iColor Cove EC - 1' linear RGB LED strip with color changing ability	101-000022-00	5 sets of RGB LEDs	N/A	12.5 @ full on	120	CK - sPDS-60ca 24v Power/Data Supply	N/A	N/A	1.5	
	R2	COLOR KINETICS	DIRECT	iColor Cove EC - 7" linear RGB LED strip with color changing ability	101-000022-01	3 sets of RGB LEDs	N/A	12.6 @ full on	120	CK - sPDS-60ca 24v Power/Data Supply	N/A	N/A	1.5	
	R3	COLOR KINETICS	DIRECT	iColor Tile FX 2:2 - 2' by 2' LED light panel, programmable color patterns	101-000019-00	144 nodes of RGB LEDs	N/A	62 @ full on	7.5	CK - Light System Manager				
	R4	LUCIFER LIGHTING	DIRECT	PUKLED - LED downlight with 1.23" aperture, recessed mount w/o visible fasteners, matte white finish	LPK-ALED-W-CGL-5	3 white LEDs	N/A	3.2	12	Electronic Transformer LET 60 Class 2 (12V/60W)				0.95
	R5	LIGHTING SERVICES, INC.	SPOT/FLOOD	MT615 SERIES - Ceramic metal halide surface mounted accent	MT615-5A	(1) 150 W T6 CERAMIC METAL HALIDE with G12 BASE	PHILIPS - MASTERCOLOR CDM-T 150W/830 T6 1CT	169	120	e-Vision ELECTRONIC	IMH-175-C	1	1.4	0.9
	R6	LOUIS POULSEN	DIRECT/INDIRECT	BALLERUP - Compact fluorescent decorative downlight with white opal glass cylinder	BAL-1/18W/CF GX24q-2-120-277V-WHT	(1) 18 W COMPACT FLUORESCENT 4-pin	SYLVANIA - CF18DT/E/IN/830/ECO	39	120	(2) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.33	0.98
	R7	ERCO	SPOT/FLOOD	TM SPOTLIGHT - PAR 38 spot accent 30° beam with black powder-coated aluminum	77460.000	(1) 120 W PAR 38 HALOGEN	SYLVANIA - 120PAR38/HAL/FL30	120	120	N/A				
	R8	FOCAL POINT	DIRECT	DOWNLIGHT PINHOLE - Halogen downlight/direct accent with 1-1/8" aperture	FD4-MR-E1-RF-T-D1	(1) 35 W MR16 HALOGEN	PHILIPS - 35MRC16/IRC/SP8	35	12	Electronic Transformer LET 303 AC (12V/300W)			2.5	0.985
	R9	PRUDENTIAL LIGHTING	INDIRECT	P-59 SERIES - One-lamp prefabricated cove system with matte white finish	P-59-1T8-R4-W-120-X3B	(1) 32 W T8 LINEAR FLUORESCENT	PHILIPS - F32T8/TL830 ALTO TG 1LP	58	120	(2) LAMP - STANDARD ELECTRIC INSTANT START	REL-2P32-SC	0.88	0.49	0.99
	R10	LUCIFER LIGHTING	DIRECT	DL51XM Series- Round Fixed Deep Cone CFL without Return	DL51XM-W-CR-CFL	(1) 18 W COMPACT FLUORESCENT 4-pin	SYLVANIA - CF18DT/E/IN/830/ECO	39	120	(2) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.33	0.98
								20	120	(1) LAMP - AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S18-H1-LD-QS	1.05	0.17	0.98

Residential Lobby

Spatial Description

The lobby of this mixed-use project is intended for the circulation of residents in and out of the building. One enters the space from the street level through glass doors into the vestibule. The lobby is rectangular in shape and is approximately 1,300 ft^2 in area. The ceiling height differs in three separate areas of the space. In the reception desk area the height is eleven feet, while in the main space the height is thirteen feet. The ceiling height in the lounge/waiting area is eight feet above the finished floor.

Lighting Design

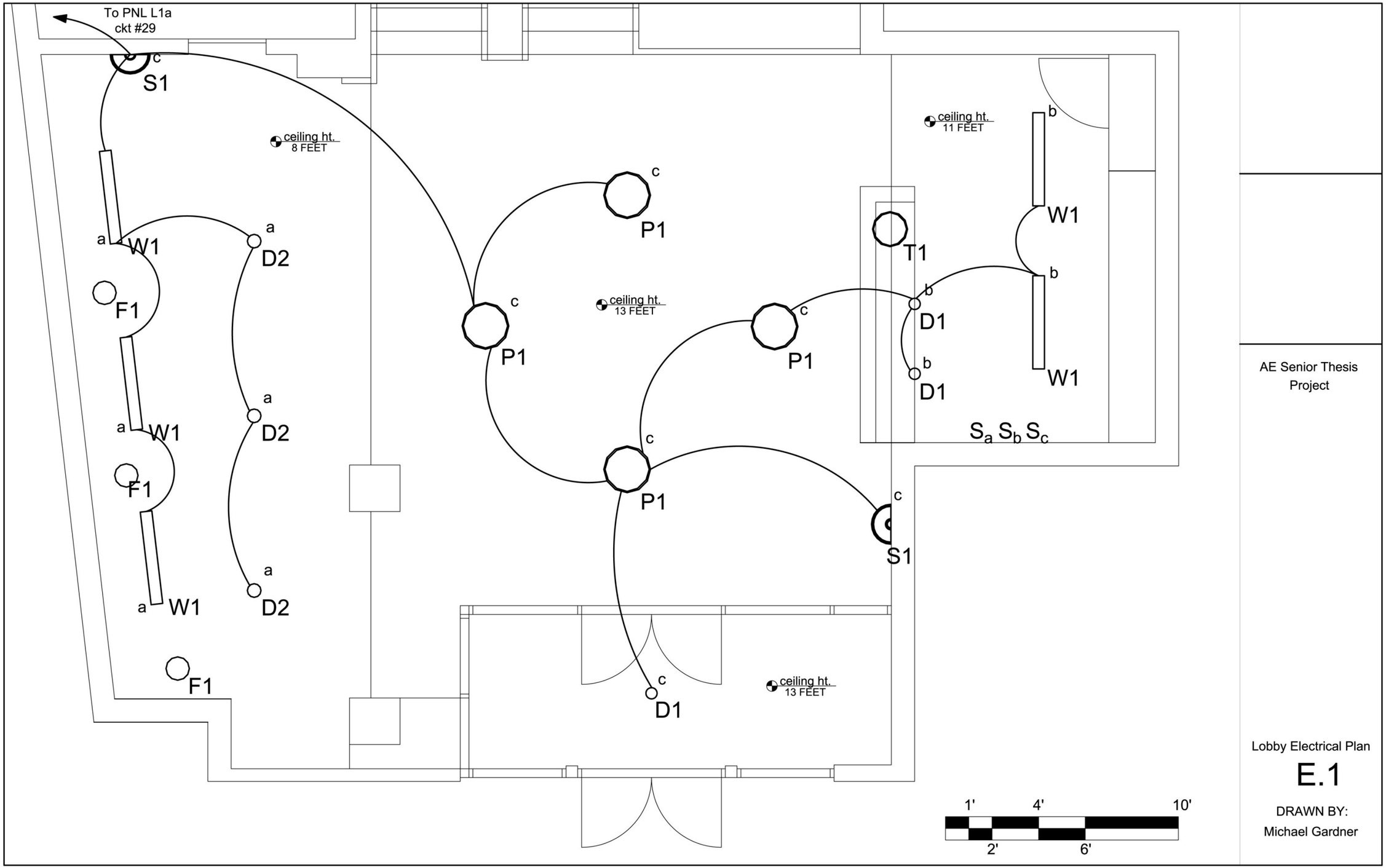
Lighting in the lobby is primarily indirect and fluorescent. There are seven different types of fixtures mostly using compact fluorescent lamps. The total power consumption for the lobby came out to be 1,483 watts (not including the floor and table lamp fixtures, for these loads will be carried by receptacles.) With this amount of wattage and the proposed switching scheme, one circuit was sufficient.

Electrical Design Criteria

A design goal for the lobby was to implement the use of indirect lighting to provide a more diffuse, public setting, while using energy efficient light sources. Because this space will have 24-hour lighting, three switching zones will be used to allow the concierge or security attendant to turn off lounge and accent lights to reduce energy spent during late night/early morning hours when occupant traffic is at its minimum.

Documentation

See the following pages for the electrical plan, luminaire schedule, panelboard worksheet and sizing information.



AE Senior Thesis Project

Lobby Electrical Plan

E.1

DRAWN BY:
Michael Gardner

Luminaire Schedule for Lobby

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	P1	FOCAL POINT	INDIRECT/DIRECT	METRO 26 - Circular pendant with steel housing, with acrylic diffuser in bottom opening	FMEP-26-PA-442TT	(4) 42 W COMPACT FLUORESCENT TRIPLE TUBE	SYLVANIA - CF42DT/E/IN/830	93	120-277	(2) LAMP - SMARTMATE ELECTRONIC - PROGRAMMED START	ICF-2S42-M2-BS@120	0.97	0.78	0.99
	W1	PRUDENTIAL LIGHTING	DIRECT	P-5900 - 4' linear fluorescent wall wash with specular reflector, steel housing	P-5900-1BX50W-R04-120-X3B	(2) 50 W BIAX COMPACT FLUORESCENT	SYLVANIA - FT50DL/830/RS/ECO	106	120	(2) LAMP - STANDARD ELEC - ELECTRONIC RAPID START	REL-2TTS50	0.98	0.9	0.98
	D1	PRESCOLITE	DIRECT	Architecktur CFQ13	CFQ613 (120v)	(1) 13 W QUAD TUBE COMPACT FLUORESCENT	SYLVANIA - CF13DD/830/ECO	16	120	COMPACT - HPF - MAGNETIC - PRE-HEAT	H-1B13-TP-BLS	0.91	0.14	0.91
	D2	COOPER LIGHTING	DIRECT	Portfolio - 7 3/8" aperture, compact fluorescent downlight, aluminum housing	C7042-7400-LI	(1) 42 W TRIPLE 4-PIN COMPACT FLUORESCENT	SYLVANIA - CF42DT/E/IN/830	46	120	ABMISTAR-HPF ELECTRONIC	RCF-2S26-H1-LD-QS	0.98	0.38	0.98
	S1	LOUIS POULSEN	INDIRECT/DIRECT	OSLO WALL - Decorative wall sconce with frosted acrylic diffusers and aluminum shades	OSW-1/26W/CF GX24q-3-120-277V-WHT	(1) 26 W TRIPLE TUBE COMPACT FLUORESCENT	SYLVANIA - CF26DT/E/IN/830/ECO	29	120	AMBISTAR-HPF ELECTRONIC RAPID START	RCF-2S26-H1-LD-QS	1.1	0.24	0.98
	T1	LOUIS POULSEN	DIRECT/INDIRECT	PH 4 1/2 - 3 1/2 SERIES - Incandescent table lamp with handblown white opal glass shades, chrome finish base and pole	PH4 1/2-3 1/2-T	(1) 100 W A-19 INCANDESCENT	SYLVANIA - 100A/RS/RP/1	100	120	N/A				
	F1	LOUIS POULSEN	DIRECT/INDIRECT	PH 3 1/2 - 2 1/2 FLOOR - Incadescent floor lamp with handblown white opal glass shades, chrome finish base and pole	PH3 1/2-2 1/2-F	(1) 100 W A-19 INCANDESCENT	SYLVANIA - 100A/RS/RP/1	100	120	N/A				

Panelboard Sizing

The original panelboard schedule for panel 1La with the changed branch circuits can be found below.

ORIGINAL PANEL SCHEDULE

VOLTAGE	208/120		Panel L1a						TYPE PANEL		
MOUNTING	SURFACE								C/B MIN = 20A 10K AIC		TOP FEED
SIZE/TYPE BUS	400 A		1st Floor Telecom Room						OPTIONS/ACCESSRS		
SIZE/TYPE MAINS	MLO								REMARKS		
LOAD DESCRIPTION	LOCATION	LOAD VA	C/B SIZE	POS NO	A PH	B PH	C PH	POS NO	C/B SIZE	LOAD VA	LOCATION	LOAD DESCRIPTION
Lighting	Corr. 1st floor	1500.0	20A-1P	1	*			2	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 2nd floor	1500.0	20A-1P	3		*		4	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 3rd floor	1500.0	20A-1P	5			*	6	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 4th floor	1500.0	20A-1P	7	*			8	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 5th floor	1500.0	20A-1P	9		*		10	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 6th floor	1500.0	20A-1P	11			*	12	30A-2P	2832.0		Spare C/B
Lighting	Corr. 7th floor	1500.0	20A-1P	13	*			14	30A-2P	2832.0		Spare C/B
Lighting	Corr. 8th floor	1500.0	20A-1P	15		*		16	20A-1P			Spare C/B
Lighting	Corr. 9th floor	1500.0	20A-1P	17			*	18	20A-1P			Spare C/B
Receptacles	Leasing Kitchen	360.0	20A-1P	19	*			20	20A-1P	1440.0	Leasing Office	Receptacles
Dishwasher	Leasing Kitchen	1440.0	20A-1P	21		*		22	20A-1P	1080.0	Leasing Office	Receptacles
Garbage Disposer	Leasing Kitchen	900.0	20A-1P	23			*	24	20A-1P	1620.0	Amenities	Receptacles
Receptacles	Leasing Kitchen	360.0	20A-1P	25	*			26	20A-1P	1440.0	Lounge	Receptacles
Lighting	Amenities	1690.0	20A-1P	27		*		28	20A-1P	1680.0	Lounge	Lighting
Lighting	Lobby	1618.0	20A-1P	29			*	30	20A-1P	180.0	Lobby	Receptacles
Spare C/B			20A-1P	31	*			32	20A-1P			Spare C/B
Spare C/B			20A-1P	33		*		34	20A-1P			Spare C/B
Site Lighting	Main Entrance	1250.0	20A-1P	35			*	36	20A-1P	1250.0	Courtyard	Site Lighting
HVAC fan	Leasing Office	1836.0	20A-3P	37	*			38	15A-3P	960.0	1st floor Mail Rm	HVAC fan
		1836.0		39		*		40		960.0		
		1836.0		41			*	42		960.0		
SUB-TOTAL	A PHASE	15888.0		B PHASE						15346.0	C PHASE	18026.0
TOTAL CONNECTED LOAD (VA)		49260.0									DEMAND LOAD	44334.0

The load on branch circuit #29 was recalculated for the re-designed lobby and circuit #36 was changed as well. Circuits #34 and #36 were switched so that a better phase balance could occur.

The panelboard worksheet can be found on the next page.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->					1La	Panel Location:			1st Floor Telecom Rm.		
Nominal Phase to Neutral Voltage------->					120	Phase:			3		
Nominal Phase to Phase Voltage-------->					208	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks	
1	A	Lighting	3	Corridor	1500	va	0.95	1425	1500		
2	A	Receptacles	1	Corridor	1080	va	0.85	918	1080		
3	B	Lighting	3	Corridor	1500	va	0.95	1425	1500		
4	B	Receptacles	1	Corridor	1080	va	0.85	918	1080		
5	C	Lighting	3	Corridor	1500	va	0.95	1425	1500		
6	C	Receptacles	1	Corridor	1080	va	0.85	918	1080		
7	A	Lighting	3	Corridor	1500	va	0.95	1425	1500		
8	A	Receptacles	1	Corridor	1080	va	0.85	918	1080		
9	B	Lighting	3	Corridor	1500	va	0.95	1425	1500		
10	B	Receptacles	1	Corridor	1080	va	0.85	918	1080		
11	C	Lighting	3	Corridor	1500	va	0.95	1425	1500		
12	C	Spare C/B			2832	va	1.00	2832	2832		
13	A	Lighting	3	Corridor	1500	va	0.95	1425	1500		
14	A	Spare C/B			2832	va	1.00	2832	2832		
15	B	Lighting	3	Corridor	1500	va	0.95	1425	1500		
16	B	Spare C/B			1560	va	1.00	1560	1560		
17	C	Lighting	3	Corridor	1500	va	0.95	1425	1500		
18	C	Spare C/B			1560	va	1.00	1560	1560		
19	A	Receptacles	1	Leasing Kitchen	360	va	0.85	306	360		
20	A	Receptacles	1	Leasing Office	1440	va	0.85	1224	1440		
21	B	Dishwasher	8	Leasing Kitchen	1440	va	1.00	1440	1440		
22	B	Receptacles	1	Leasing Office	1080	va	1.00	1080	1080		
23	C	Garbage Disposer	8	Leasing Kitchen	900	va	0.80	720	900		
24	C	Receptacles	1	Amenities	1620	va	0.85	1377	1620		
25	A	Receptacles	1	Leasing Kitchen	360	va	0.85	306	360		
26	A	Receptacles	1	Lounge	1440	va	0.85	1224	1440		
27	B	Lighting	3	Amenities	1690	va	0.95	1606	1690		
28	B	Lighting	3	Lounge	1680	va	0.95	1596	1680		
29	C	Lighting	3	Lobby	1483	w	0.95	1483	1561		
30	C	Receptacles	1	Lobby	180	va	0.85	153	180		
31	A	Spare C/B			1560	va	1.00	1560	1560		
32	A	Spare C/B			1560	va	1.00	1560	1560		
33	B	Spare C/B			1560	va	1.00	1560	1560		
34	B	Spare C/B			1560	va	1.00	1560	1560		
35	C	Lighting	4	Main Entrance	1250	va	0.95	1188	1250		
36	C	Lighting	4	Courtyard	1358.5	w	0.95	1359	1430		
37	A	HVAC fan	6	Leasing Office	1836	va	1.00	1836	1836		
38	A	HVAC fan	6	Mail Room	960	va	1.00	960	960		
39	B	HVAC fan	6	Leasing Office	1836	va	1.00	1836	1836		
40	B	HVAC fan	6	Mail Room	960	va	1.00	960	960		
41	C	HVAC fan	6	Leasing Office	1836	va	1.00	1836	1836		
42	C	HVAC fan	6	Mail Room	960	va	1.00	960	960		
PANEL TOTAL								55.9	58.7	Amps=	163.2

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					17.9	19.0	32%	158.4
PHASE TOTAL	B					19.3	20.0	34%	166.9
PHASE TOTAL	C					18.7	19.7	34%	164.2

LOAD CATAGORIES			Connected			Demand				Ver. 1.03
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		10.3	11.9	0.70	7.2	8.3	0.86		
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		17.5	18.4	1.00	17.5	18.4	0.95		
4	HID lighting		2.5	2.7	1.00	2.5	2.7	0.95		
5	incandescent lighting		0.0	0.0	1.00	0.0	0.0			
6	HVAC fans		8.4	8.4	0.80	6.7	6.7	1.00		
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		2.2	2.3	0.80	1.7	1.9	0.92		
9	unassigned		15.0	15.0		15.0	15.0	1.00		
Total Demand Loads						50.7	53.0			
Spare Capacity			20%			10.1	10.6			
Total Design Loads						60.8	63.6	0.96	Amps=	176.8

Panelboard Size

The load for spare circuit breakers was added to be 65% of each of their capacities. A 20% spare capacity was also taken into consideration to account for the remaining spaces in the panel.

The total design load was calculated to be 176.8 amps which would require a 200 A circuit breaker and a 200 A bus rating.

This new sizing would produce the schedule that follows:

NEW PANEL SCHEDULE

VOLTAGE	208/120		Panel L1a						TYPE PANEL		
MOUNTING	SURFACE								C/B MIN = 20A 10K AIC		TOP FEED
SIZE/TYPE BUS	200 A		1st Floor Telecom Room						OPTIONS/ACCESSRS		
SIZE/TYPE MAINS	200 A								REMARKS		
LOAD DESCRIPTION	LOCATION	LOAD VA	C/B SIZE	POS NO	A PH	B PH	C PH	POS NO	C/B SIZE	LOAD VA	LOCATION	LOAD DESCRIPTION
Lighting	Corr. 1st floor	1500.0	20A-1P	1	*			2	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 2nd floor	1500.0	20A-1P	3		*		4	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 3rd floor	1500.0	20A-1P	5			*	6	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 4th floor	1500.0	20A-1P	7	*			8	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 5th floor	1500.0	20A-1P	9		*		10	20A-1P	1080.0	Corridor	Receptacles
Lighting	Corr. 6th floor	1500.0	20A-1P	11			*	12	30A-2P	2832.0		Spare C/B
Lighting	Corr. 7th floor	1500.0	20A-1P	13	*			14	30A-2P	2832.0		Spare C/B
Lighting	Corr. 8th floor	1500.0	20A-1P	15		*		16	20A-1P			Spare C/B
Lighting	Corr. 9th floor	1500.0	20A-1P	17			*	18	20A-1P			Spare C/B
Receptacles	Leasing Kitchen	360.0	20A-1P	19	*			20	20A-1P	1440.0	Leasing Office	Receptacles
Dishwasher	Leasing Kitchen	1440.0	20A-1P	21		*		22	20A-1P	1080.0	Leasing Office	Receptacles
Garbage Disposer	Leasing Kitchen	900.0	20A-1P	23			*	24	20A-1P	1620.0	Amenities	Receptacles
Receptacles	Leasing Kitchen	360.0	20A-1P	25	*			26	20A-1P	1440.0	Lounge	Receptacles
Lighting	Amenities	1690.0	20A-1P	27		*		28	20A-1P	1680.0	Lounge	Lighting
Lighting	Lobby	1561.0	20A-1P	29			*	30	20A-1P	180.0	Lobby	Receptacles
Spare C/B			20A-1P	31	*			32	20A-1P			Spare C/B
Spare C/B			20A-1P	33		*		34	20A-1P	1430.0	Courtyard	Site Lighting
Site Lighting	Main Entrance	1250.0	20A-1P	35			*	36	20A-1P			Spare C/B
		1836.0		37	*			38		960.0		
HVAC fan	Leasing Office	1836.0	20A-3P	39		*		40	15A-3P	960.0	1st floor Mail Rm	HVAC fan
		1836.0		41			*	42		960.0		
SUB-TOTAL	A PHASE	15888.0		B PHASE						16776.0	C PHASE	16719.0
TOTAL CONNECTED LOAD (VA)		49383.0									DEMAND LOAD	44444.7

Feeder Sizing

Since this panel supplies branch circuits dedicated to receptacles for cord-and-plug connected portable loads, the feeders supplying the panel need to be at least the next size above the rating of the circuit breaker [Section 240.4 (B)]. According to Table 310.16 of the NEC, the next highest ampacity above 200 A is 230 A for copper and 205 A for aluminum. If the feeders are copper, then the size would be 4/0 AWG. If aluminum or copper-clad aluminum feeders are used, then 250 kcmil conductors would have to be used. These values were based on a 75° C temperature rating.

The table below (left) outlines the values in Table 310.16 for sizing feeders.
The table below (right) outlines the values in Table 250.122 for sizing grounding conductors.

Allowable Ampacities of Insulated Conductors…, Not More Than Three Current-Carrying Conductors in Raceway,…		
Size AWG or kcmil	Temperature rating of conductor	
	75° C (167° F)	
	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	
	Copper	Aluminum or Copper-Clad Al.
4/0	230	180
250	255	205

Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment		
Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size (AWG or kcmil)	
	Copper	Aluminum or Copper-Clad Al.
200	6	4

Grounding Conductors Sizing

Based on values in Table 250.122 of the NEC, a 200 A rating would grant the use of a #6 copper grounding conductor or a #4 aluminum conductor.

Conduit Sizing

Using a 4/0 conductor size (copper) and a total of five conductors in the conduit, the size of the conduit becomes 2 ½ “. For an aluminum conductor size of 250 kcmil and five conductors, the conduit size increases to 3”.

Outdoor Courtyard

Spatial Description

The courtyard is just immediately outside of the fitness area. Access to the courtyard is through the lounge and billiard room. It is a long and narrow space with landscaping materials on its eastern side facing the alley, and the curtain wall to the fitness room on its western side.

Lighting Design

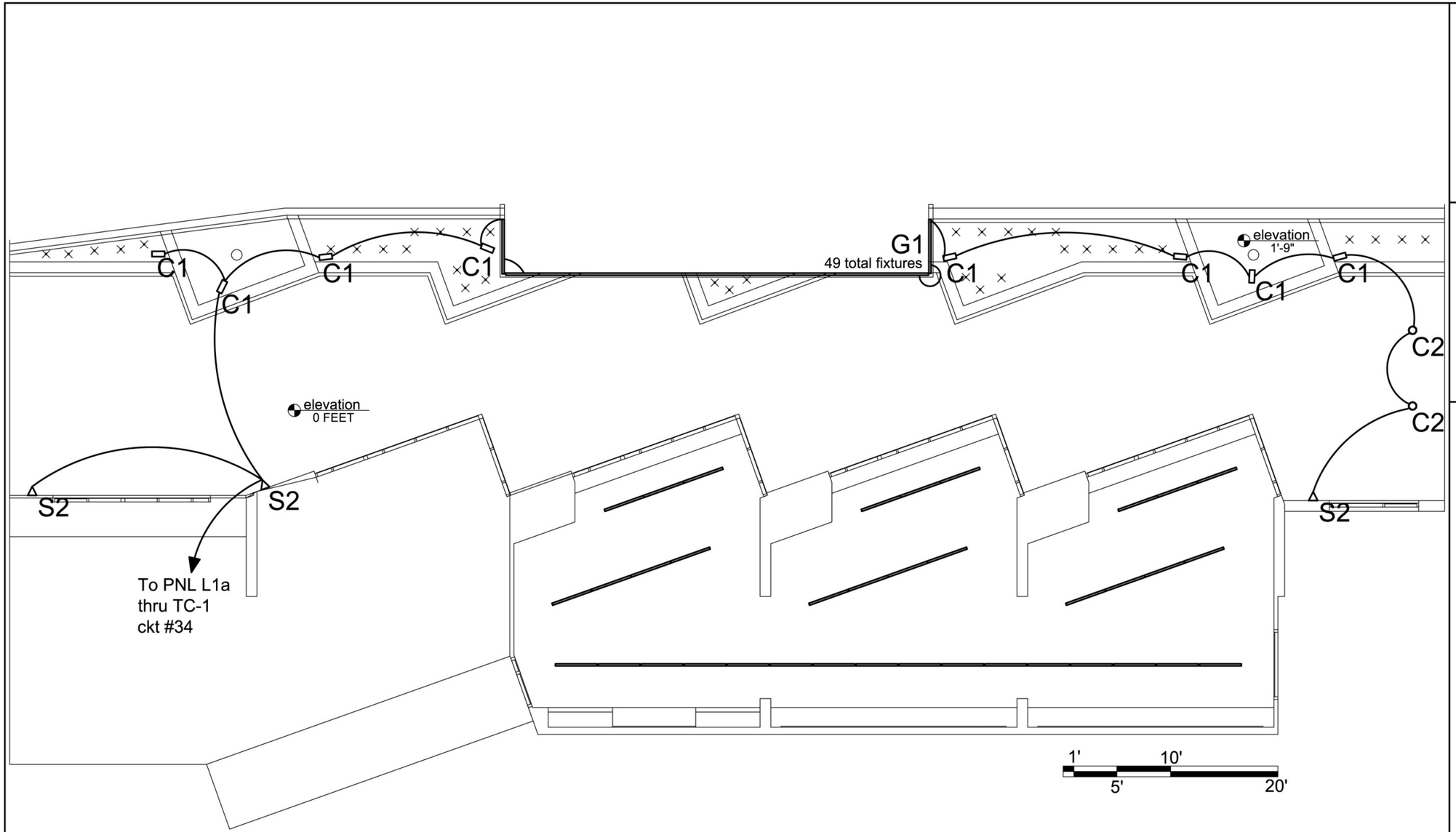
The lighting design of the courtyard employs just four types of fixtures. One is an LED grazing luminaire by Color Kinetics which grazes the brick wall of the garage exhaust housing structure. Another type is a landscape accent with an MR16 halogen lamp that accents Japanese maple trees and bamboo plants. Sconces are also used to provide illumination near the entrances to the courtyard. Two metal halide in-ground fixtures are used to highlight the stone wall to the south.

Electrical Design Criteria

The criterion for the courtyard is to control the system with an astronomical timeclock to turn the system on at dusk and off at early morning. This will ensure that the lights are on at the appropriate times.

Documentation

Refer to panel L1a in the previous section for panel schedules and worksheet. The electrical plan and luminaire schedule are located on the following pages.



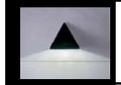
AE Senior Thesis Project

Courtyard Electrical Plan

E.3

DRAWN BY:
Michael Gardner

Luminaire Schedule for Courtyard

PHOTO	TAG	MANUFACTURER	DISTRIBUTION TYPE	DESCRIPTION	CATALOG NUMBER	LAMPING	LAMP CATALOG NO.	INPUT WATTAGE	VOLTAGE	BALLAST	BALLAST CATALOG NO.	BALLAST FACTOR	INPUT CURRENT	PF
	G1	COLOR KINETICS	DIRECT	eW Graze Powercore - Linear, white LED surface light for wall washing and grazing	523-000030-00	WHITE LEDs 2700K	N/A	14.5	120	N/A				
	C1	B-K LIGHTING	SPOT/FLOOD	DELTA STAR - MR 16 Landscape accent with cut-off option	DS-4-BLW	(1) 35 W 23° NARROW FLOOD MR-16	SYLVANIA - 35MR16/T/NFL25/C	35	12	Electronic Transformer LET 303 AC (12V/300W)			2.5	0.985
	S2	ARCHITECTURAL AREA LIGHTING	DIRECT	MITRE M3 - Outdoor wall sconce with forward throw reflector and full cut-off	M3-42 CF-MTB	(1) 42 W TRIPLE COMPACT FLUORESCENT	SYLVANIA - CF42DT/E/IN/830/ECO	46	120	ABMISTAR-HPF ELECTRONIC	RCF-2S26-H1-LD-QS	0.98	0.38	0.98
	C2	B-K LIGHTING	INDIRECT	TENAYA2 Series - In-ground mounted uplight with black paint finish and clear flat glass lens	TY2-EH100-WF-115-BLW	(1) 100 W E-17 METAL HALIDE PHOSPHOR COATED	SYLVANIA - MCP100/C/U/MED/830 PB	115	120	e-Vision ELECTRONIC	IMH-100-A-BLS-ID	1	0.96	0.9

Electrical Depth

Bus Duct vs. Conduit & Wire Study

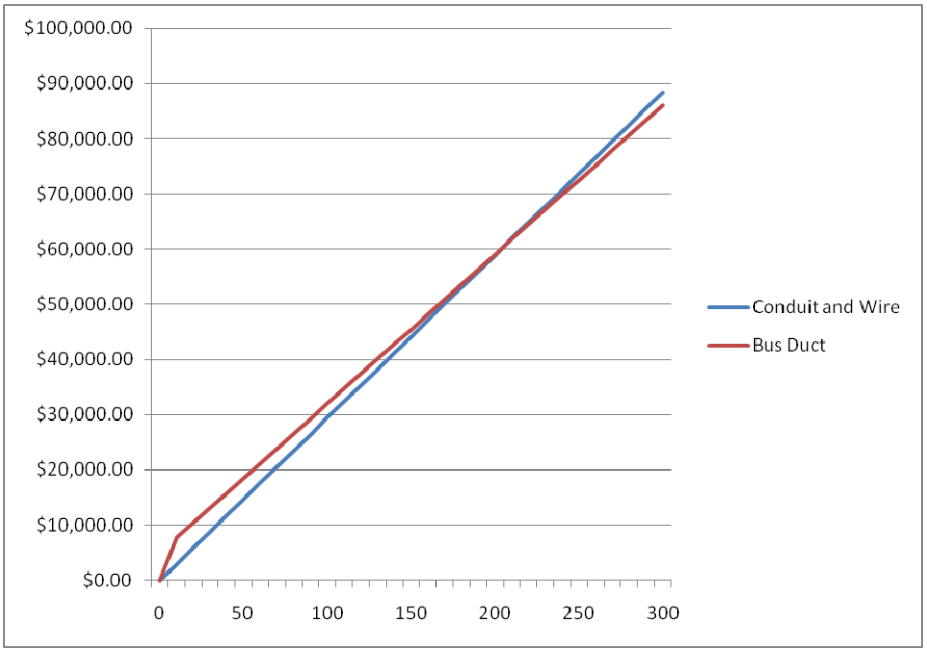
For this analysis, the run between the Main #5 Disconnect Switch (located in the main electrical room on Garage Level 1) and the MDP-P panel in the Penthouse level electrical room was used. The length of the run consisted of two major horizontal runs totaling 128 feet and vertical rises of 137 feet, for a total run length of 265 feet.

The comparison is between the existing four sets of four wires sized at 500 kcmil aluminum. The cost data in RS Means Electrical Cost Data gives a cost of $655 per one hundred linear feet. Multiplying the run length by this value gives a price of $1,735.75. Multiplying this by four for the four wires gives $6,943.00. Multiplying by four again to obtain the total cost of wire (since there are four sets present) gives a price of $27,772.00.

The wire is in flexible metallic conduit and sizing this conduit from Table C.3 in the NEC gives a size of 4" FMC. RS Means cost data for 4" FMC gives $47.50 per linear foot. Multiplying this by the run length gives a price of $12,587.50. Multiplying this price by four for the amount of sets of wires gives a price of $50,350.00. After combining the costs of conduit and wire to get $78,122.00, the location factor for Washington, D.C. has to be taken into account. Multiplying the cost by 0.997 gives a complete cost of $77,887.64.

The aluminum bus duct needs to be sized at a rating of 1200 amps. RS Means' cost information for this rating is $270 per linear foot. Multiplying this by the run length gives a price of $71550.00. There are also two tap boxes required, one at each end of the run. The price for a tap box also rated at 1200 amps is $2,525 each. Multiplying this value by two gives a price of $5,050. Combining the two costs gives a combined cost for the aluminum bus duct option to be $76,600.00. After multiplying this by the location factor, a complete cost of $76,370.20 is obtained.

See the chart below for an analysis of the costs of the two options vs run lengths.

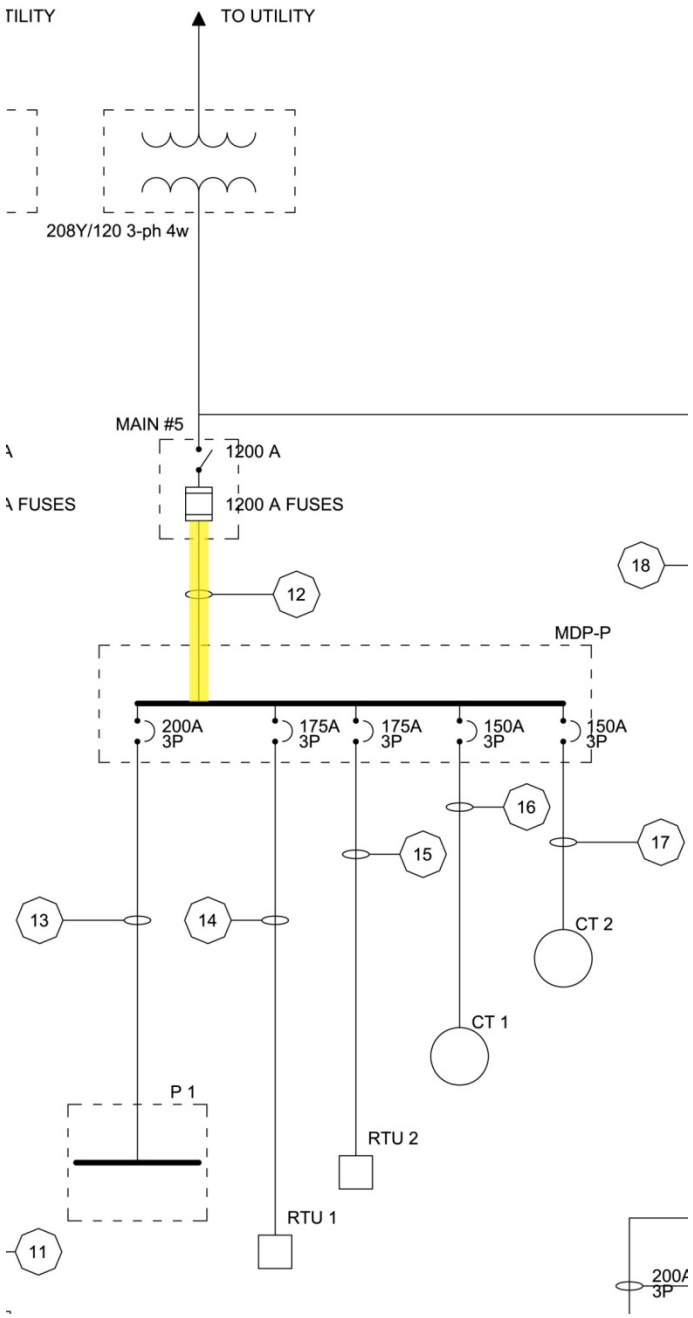


As it can be seen from the previous chart, using conduit and wire would be more cost effective until a run length between 200 and 205 feet. After that point, bus duct becomes less costly. This is mostly because the initial cost of the tap boxes drastically drives up the total cost in short run lengths. This remains true for this case only, as other types of wire and busway were not compared.

The analysis did not account for fittings, joints, and other connectors that would be necessary to install these runs. RS Means prices were Total Prices Including Overhead & Profit with an additional location factor for Washington, D.C. of 0.997.

Overall, the recommendation is to use bus duct for this run between Main #5 and MDP-P. An estimated savings of $1,517.44 could be made if bus duct was used here.

To the right is an image of the run (highlighted in yellow) taken from the single line drawing.



Electrial Depth

Transformer Comparison Study

The basis of this study was to compare standard transformers to high efficiency transformers. This included using a Powersmiths Energy Savings Payback Calculator to project potential savings in the high efficiency transformers. Some assumptions were also made in performing this study. These included the sizes of service entrance transformers connecting power from the utility to the building. These sizes were estimated based on the sizes of the main disconnect switches that are fed by them. From this estimation, the sizes of the transformers to be used were one 75 kVA, one 150 kVA, one 300 kVA, and 4 500 kVA transformers. Assumptions were also made based on operating durations, one for hours per day and another for days per year. It was assumed that the equipment would be operating 19 hours per day and for 205 days per year.

The kilowatt-hour rate also had to computed. This was done by adding up the rates and taxes specific to kWh from the service provider's (PEPCO) rate schedule. The total kilowatt-hour rate was found to be $0.138 per kWh.

Cost data also had to found for the cost of standard transformers. This information was found in RS Means Electrical Cost Data. The transformers were assumed to be K-13 rated, ventilated, dry-type with a 3-phase secondary voltage of 120/208 V. The total cost of the seven transformers listed above was found to be $307,699.13. This is a price including Overhead and Profit and includes the location factor for Washington, D.C. (0.997). The cost data for energy efficient Powersmiths transformers was assumed to be twice the costs of standard transformers. Therefore, the total estimated cost of Powersmiths came out to be $615,398.

The ESP Calculator estimated the reduction of the annual electrical bill to be at 5%. The standard transformers had an estimated electrical bill of $861,768, while the Powersmiths electrical bill was $818,123. This is a savings of $43,645. The estimated payback is 7.05 years.

The recommendation for this study is to use energy efficient transformers in place of standard transformers. With a life time of the system of about 30 to 40 years, it would be very beneficial. Not only will it pay for itself in about 20% of its lifetime, but will continue to save money and reduce energy consumption for the remaining 80% of its life.

Please see the following sheets for the ESP Calculator print-out.

POWERSMITHS

Toll Free : 1-800-747-9627 or (905) 791-1493

ESP for LEED Calculator™

Energy Savings Payback Calculator

Project Description **Mixed-Use Project**

Date **21-Apr-09**

Data Entry

Transformers on Project

QTY	kVA
	15
	30
	45
1	75
	112.5
1	150
	225
1	300
4	500
	750
	1000
	1500
	2000
	7.5

		Calc Load kW	Calc Annual kWh
Available Full Load kW	**2525**		
Average kVA (calc)	**361**		
equipment operating hrs/ day	**19**		
equipment operating days/yr	**205**		
Load during normal operating hours	**30%**	758	2,950,463
Load outside operating hours	**18%**	455	2,211,143
		Total Annual Load kWh:	**5,161,605**

Annual Cost to Operate Load Only

kWh rate	**$ 0.138**	Annual Consumption:	$	712,301
demand rate ($/kW/mo) ex. $10.00	**$10.00**	Annual Demand:	$	90,900
		Total Cost to run load	**$**	**803,201**

Annual Cost of Status Quo Transformer Losses & Associated Air Conditioning (A/C) burden

Nameplate Linear efficiency (normal op hrs)	**96.5%**	% electronics or current THD	**30.0%**
Calculated operating efficiency	95.5%		
Transformer kW Losses (Normal Operation)	36.1 kW		
Status quo Efficiency (Outside op. hrs)	**94.0%**		
Transformer kW Losses (Outside op. hrs)	29.0 kW		
Annual addititional kWh from transformers	281,782 kWh		
Annual Cost of Transformer Losses	$ 43,219		
A/C System Performance (kW/ton)	**1.25**		
Additional Tons of Cooling (on peak)	10.26 tons		
Annual addititional kWh from A/C	100,065 kWh		
Annual Cost of Associated A/C	$ 15,348		

Summary with Status Quo Transformer

Annual Cost of feeding Building Load	$	803,201
Annual Cost of Transformer Losses	$	43,219
Annual Cost of Associated A/C	$	15,348
Electrical Bill (Status Quo Transformer)	**$**	**861,768**

Using Powersmiths instead of status quo transformers

Powersmiths Efficiency (Normal Operation)	98.8%	
Powersmiths kW Losses (Normal Operation)	9.2	kW
Powersmiths Efficiency (Outside op. hrs)	98.4%	
Transformer kW Losses (Outside op. hrs)	7.4	kW
Annual addititional kWh from transformers	71,789	kWh
Annual Cost of Powersmiths Losses	$ 11,011	
Additional Tons of Cooling (on peak)	2.61	tons
Annual addititional kWh from A/C	25,493	kWh
Annual Cost of Associated A/C	$ 3,910	

Comparing Status Quo & Powersmiths

	Status Quo	Powersmiths	
Annual Cost of feeding Building Load	$ 803,201	$ 803,201	
Annual Cost of Transformer Losses	$ 43,219	$ 11,011	
Annual Cost of Associated A/C	$ 15,348	$ 3,910	**Reduction**
Annual estimated Electrical Bill	$ 861,768	$ 818,123	**5%**

Peak kW reduction (normal op hours)	**36.5**	**kW**
Annual kWh reduction	**284,564**	**kWh**
Reduction in Air Conditioning Load (on peak)	**7.64**	**tons**

Cost Analysis (calc)

Energy Cost Escalation (above inflation)	3.0%
Annual Power Quality Benefit	$ -

	Annual Operating Cost	Life Cycle Operating Cost & Savings	
		20 years	32 years
Status Quo Transformers	$58,567	$2,115,560	$4,826,053
Powersmiths Transformers	$14,921	$538,983	$1,229,537
Savings with Powersmiths	**$43,646**	**$1,576,577**	**$3,596,516**

Cost

	Cost
Powersmiths Transformers	$615,398
Status Quo Transformers	$307,699

Payback on total cost

	7.05 years		current kWh rate:
Cost of Energy Savings	$ 0.034	**/kWh**	**$0.138**
Cost - Benefit Ratio	4.1	**times less to save a kWh than to buy a kWh**	

Leasing Option

	60 Month Term	48 Month Term	36 Month Term
Total Annual Leasing Payments	**$155,597**	**$189,789**	**$241,482**
Net Annual Cost with savings	$111,952	$146,143	$197,837

Summary of Environmental Benefits

Annual Reduction in Greenhouse Gases (per EPA)	Equivalence
210 tons of CO2	39 Acres trees planted
680 tons of Coal	28 Car Emissions
1,646 kgs of SO2	29 homes heated
709 kgs of NOx	

Status Quo Transformer (Normal Operation)

Enter the average efficiency of the transformers. While NEMA TP1 is legislated minimum efficiency, it only applies at a single 35% load point, and under ideal linear load profile. Since most transformers are much less loaded than 35%, be sure to use lower efficiency to reflect load level.

Status Quo Transformer (Outside Op. hours)

Transformer efficiency is typically lower than normal when lightly loaded (86-89% when 10-15% loaded for most sizes)

% electronics or Current THD

IEEE Std 1100 and other industry references document transformer losses can more than double when feeding electronics when installled compared to ideal linear load in a manufacturer's factory test.

Transformer Operating Losses

Transformer Losses = kW load/net efficiency - kW load.

A/C Performance (kW/ton)

Varies widely depending on age and technology of cooling system. As low as 0.5 to over 2kW/ton (1.25-1.5 is often tp)

Unlike most substation transformers that are vented to the exterior, most building distribution transformers are ventilated within the building, and their heat losses therefore add to the cooling load.

Powersmiths Efficiency (Normal Operation) & (Outside Op. hours)

Available on Powersmiths product data sheet

Energy Cost escalation (above inflation)

It is well recognized that energy rates are increasing much faster than inflation. Enter the % over inflation

Annual Power Quality Benefit

Savings attributable to reduced downtime, equipment locks & failures associated with poor power quality

Cost

Cost of transformers. Enter dollar figure for transformers under consideration. If the interest is to look at the justification for replacing existing transformers, enter $0 in the conventional transformer cost field.

Energy Operating Cost

Energy OPERATING COST (normal op) = (transformer + cooling) kW losses x kWh rate x hrs/day x days/yr + demand charge
Demand charge is not included in the calculation of losses outside normal hours to be conservative.

Return on Investment (ROI)

ROI on Incremental Cost is based on dividing the Incremental Investment in Powersmiths by the Annual Savings
ROI on Total Transformer Cost is based on dividing the Total Transformer Cost by the Annual Savings

Cost of Energy Savings

In its simplest form, the cost of energy savings represents the cost to save a kWh as opposed to paying for it according to the prevailing kWh rate.
The equation is: Cost of Energy Savings = (Incremental Product Cost / Lifetime kWh saved)

Leasing

Powersmiths Leasing has many benefits, including avoiding the use of capital, offsetting monthly leasing payment with the reduction in monthly energy bill from using Powersmiths

Environmental Benefits

Conversion rates from kWh to emission reduction and equivalent benefits are published by the EPA, and reflect environmental benefits derived from reduced emissions associated with reduced power generation.

TERMS OF USE

Power Quality Institute has used its best efforts in developing the ESP Calculator ™ with the intent of providing an easy to use and useful calculation tool. However, data entered and assumptions made may not accurately reflect all variables that apply in a given facility. The results are therefore estimates only and may differ from actual measurements.
The user is responsible for evaluating the suitability and accuracy of the ESP Calculator ™. The Power Quality Institute and Powersmiths International Corp. make no representations or warranties with respect to the accuracy or completeness of the estimates generated by the ESP Calculator ™ and specifically disclaim any implied warranties of merchantability or fitness for any particular purpose and shall in no event be liable for any loss of profit or any other commercial damage, including, but not limited to special, incidental, consequential or other damages.

Protective Device Coordination

An Overcurrent Protective Device Study and Short Circuit Analysis

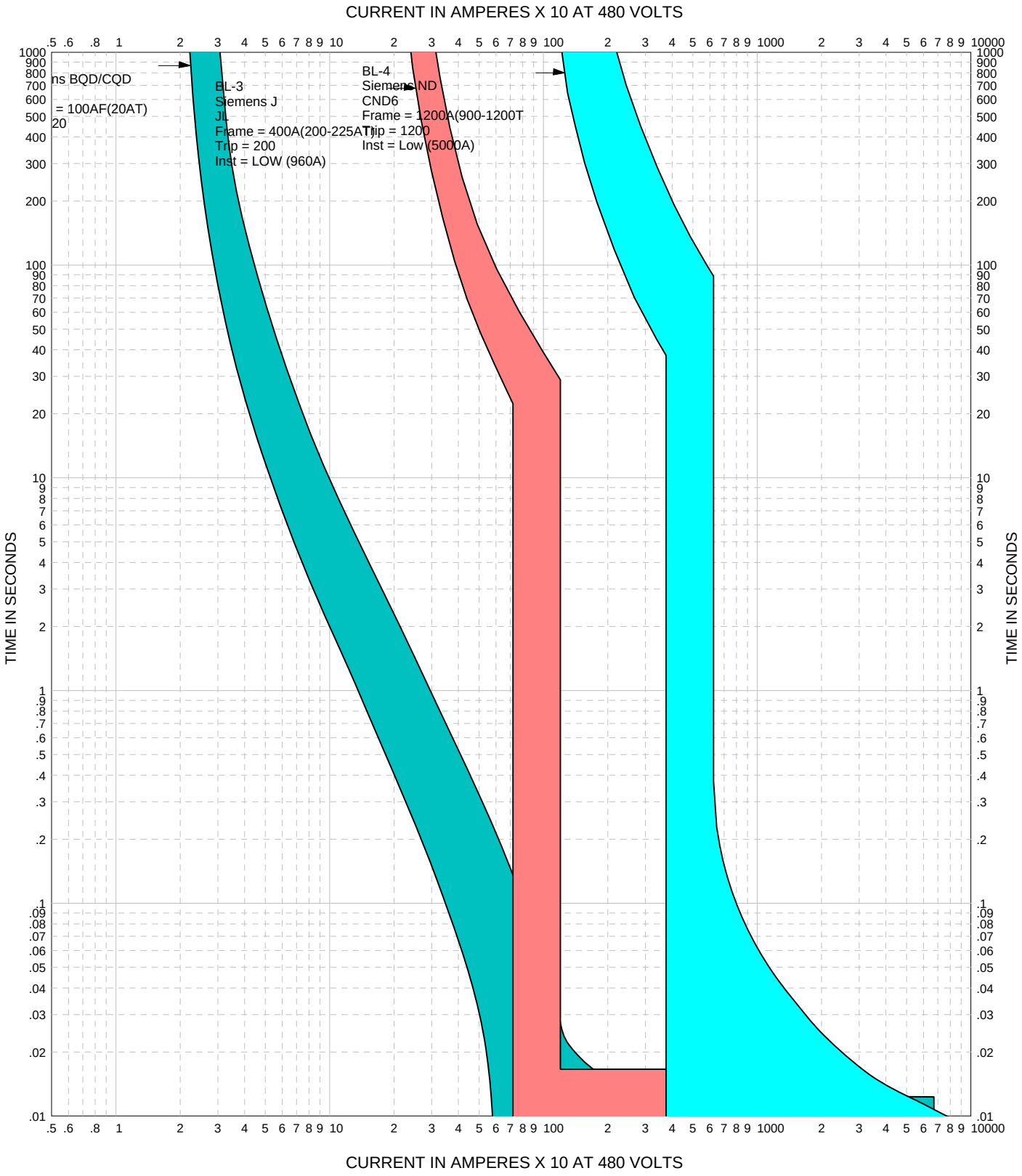
For this portion of the thesis project, a run in the power distribution system was analyzed. This run was from main disconnect switch (Main #5) through a main distribution panel (MDP-P), continuing through a load panel (PNL P-1) and to a branch circuit's (circuit #3) overcurrent protection device.

The study began by choosing overcurrent protection devices and analyzing their time-current curves. This was done to show that the system is successfully coordinated which will ensure that the device nearest to the short will open the circuit first. If this does not occur, it is very difficult to pinpoint the location of the short and can cause an entire system to blackout.

The devices that needed to be selected were a 1200 A fuse, a 3-pole 200 A circuit breaker, and a single pole 20 A circuit breaker. Cut sheets of models of circuit breakers approximately equal to these models can be found in the appendix.

In the graphical analysis on the following page, perfect coordination is not achieved. This may be due to improper settings on the breaker. It could also be due to a difficulty in choosing proper frame sizes and trip settings as required by the electrical documents. It seemed that the manufacturer did not have the desired settings that the documents called for. The 200 A breaker seems to trip before the 20 A breaker has completely opened the circuit.

See the following page for a print-out of the aligned time-current curves for this equipment.



SIEMENS

EasyTCC ™

TIME-CURRENT CURVES

FAULT:

DATE: Apr 20, 2009

BY:

REVISION: 1

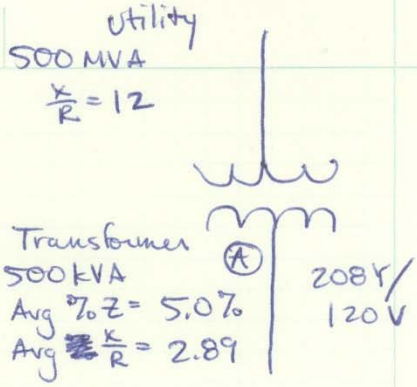
For the short circuit analysis, the same run was analyzed to determine the maximum short circuit currents available at certain locations in the run. Involved in these calculations were the impedances of the utility transformer and the runs of feeders.

Assumptions made in performing these calculations were based on information needed from the utility. An assumed X/R ratio of 12 was used to find the utility company's impedance. The utility was also assumed to provide 500 MVA to the building. The transformer was estimated to be a size of 500 kVA. Consulting Table 4 in the notes gave an average %Z value of 5.0% and an average X/R ratio of 2.89.

Length of runs for feeders were calculated from the electrical set of construction documents.

Calculations can be found on the pages that follow. Below is a summary of results for this analysis.

Summary of Results of Fault Analysis			
Point	Location	Available Fault	Standard Breaker Rating
A	Utility Trans. Secondary	27,205 A	30,000 A
B	Main Disconnect Switch #5	23,392 A	25,000 A
C	MDP-P	14,104 A	25,000 A
D	PNL P-1	13,311 A	14,000 A



Short Circuit Calculations

$$Z_{util} = \frac{1000 \cdot kV/\sqrt{3}}{I_{sc}}\ \Omega = \frac{10^6 \cdot kV^2}{kVA}\ m\Omega$$

$$Z_{util} = \frac{10^6 \cdot (.208)^2}{500{,}000\ kVA} = 0.087\ m\Omega$$

$$R_{util} = Z_{util} \cos\left[\tan^{-1}\left(\frac{X}{R}\right)\right]\ m\Omega$$

$$X_{util} = Z_{util} \sin\left[\tan^{-1}\left(\frac{X}{R}\right)\right]\ m\Omega$$

$$R_{util} = 0.087 \cos\left[\tan^{-1}\left(\frac{12}{[redacted]}\right)\right] = 0.007\ m\Omega$$

$$X_{util} = 0.087 \sin\left[\tan^{-1}(12)\right] = 0.087\ m\Omega$$

$$R_{xfmr} = \frac{kV^2 \cdot \%Z \cdot 10^4 \cdot \cos\left[\tan^{-1}\left(\frac{X}{R}\right)\right]}{kVA_{xfmr}} = \frac{(.208)^2 \cdot 5 \cdot 10^4 \cdot \cos\left[\tan^{-1}(2.89)\right]}{500}$$

$$R_{xfmr} = 1.415\ m\Omega$$

$$X_{xfmr} = \frac{kV^2 \cdot \%Z \cdot 10^4 \cdot \sin\left[\tan^{-1}\left(\frac{X}{R}\right)\right]}{kVA_{xfmr}} = \frac{(.208)^2 \cdot 5 \cdot 10^4 \cdot \sin\left[\tan^{-1}(2.89)\right]}{500}$$

$$X_{xfmr} = 4.089\ m\Omega$$

Total Impedance

$$Z_{total} = Z_{util} + Z_{xfmr} = (0.007 + j0.087) + (1.415 + j4.089)$$

$$Z_{total} = 1.422 + j4.176\ m\Omega$$

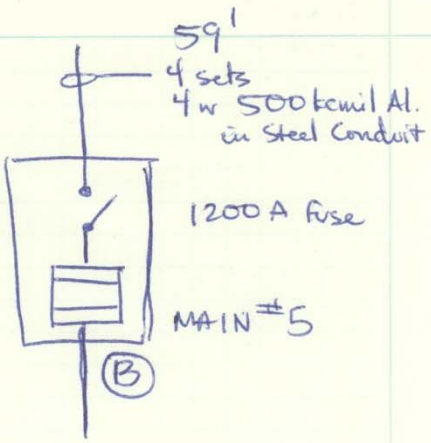
Short Circuit I @ (A)

$$I_{sc} = \frac{V_{l-n} \cdot 1000}{|Z_{total}|} = \frac{120V \cdot 1000}{\sqrt{(1.422)^2 + (4.176)^2}} = \frac{120V \cdot 1000}{4.411\ m\Omega}$$

$$I_{sc}\ @\ (A) = 27{,}205\ A$$

pg. 1 of 4

Short Circuit Calculations (cont'd)



Feeder Contribution

Table 2: R = 3.75
X = 3.79

$$R_{cond} = \frac{L}{100} \cdot R_{per100ft} \cdot \frac{1}{N} \text{ m}\Omega$$

$$X_{cond} = \frac{L}{100} \cdot X_{per100ft} \cdot \frac{1}{N} \text{ m}\Omega$$

$$R_{cond} = \frac{59'}{100} \cdot 3.75 \cdot \frac{1}{4} \text{ m}\Omega$$

$$R_{cond} = 0.553 \text{ m}\Omega$$

$$X_{cond} = \frac{59'}{100} \cdot 3.79 \cdot \frac{1}{4} \text{ m}\Omega$$

$$X_{cond} = 0.559 \text{ m}\Omega$$

$$\text{Feeder } Z = 0.553 + j0.559 \text{ m}\Omega$$

$$Z_{MAINS} = Z_{sys} + Z_{feeder}$$

$$= (1.422 + j4.176) + (0.553 + j0.559) \text{ m}\Omega$$

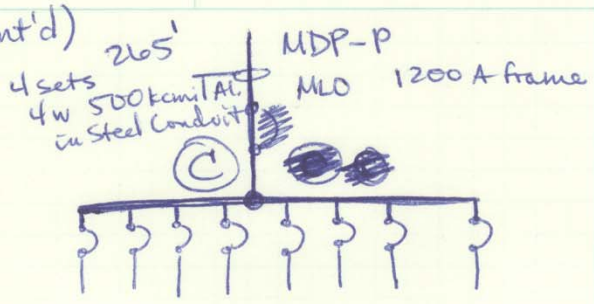
$$Z_{MAINS} = 1.975 + j4.735 \text{ m}\Omega$$

$$I_{sc} = \frac{V_{l-n} \cdot 1000}{Z_{MAINS}} = \frac{120V \cdot 1000}{\sqrt{(1.975)^2 + (4.735)^2}} = \frac{120V \cdot 1000}{5.13}$$

$$I_{sc} @ (B) = 23,392 \text{ A}$$

pg. 2 of 4

Short Circuit Calculations (cont'd)



Feeder Contribution
same values
as previous

$$R_{cond} = \frac{265'}{100} \cdot 3.75 \cdot \frac{1}{4}\ m\Omega$$

$$R_{cond} = 2.484\ m\Omega$$

$$X_{cond} = \frac{265'}{100} \cdot 3.79 \cdot \frac{1}{4}\ m\Omega$$

$$X_{cond} = 2.511\ m\Omega$$

Feeder $Z = 2.484 + j\,2.511\ m\Omega$

$$Z_{MDP\text{-}P} = Z_{sys} + Z_{Feeder}$$

$$= (1.975 + j\,4.735) + (2.484 + j\,2.511)\ m\Omega$$

$$Z_{MDP\text{-}P} = 4.459 + j\,7.246\ m\Omega$$

$$I_{sc} = \frac{V_{l\text{-}n} \cdot 1000}{Z_{MDP\text{-}P}} = \frac{120V \cdot 1000}{\sqrt{(4.459)^2 + (7.246)^2}} =$$

$$I_{sc} @ \text{Ⓒ} = 14{,}104\ A$$

pg. 3 of 4

INTRODUCTION to PROBLEM:

The architectural breadth for this thesis project can be described as a tenant "fit-out" of the retail space. Originally, the retail space was a concrete shell with bare necessities in it. For this breadth, a design of the space layout took place so that it would become a fully functional area requiring a lighting system. Following the theme of "luxury" throughout the building, the company assumed to lease the space was Dolce & Gabbana. This store is thought to be their younger, more energetic and less classical line of D&G Dolce & Gabbana stores. Many young celebrities wear their apparel and help drive the young fashion market. It is hard to go into a major city, whether American or European and not find vendors selling knock-off items claiming to be from this company.

SOLUTION:

First, to successfully lay out a retail space, some research needs to be done on the company itself and what the goals of retail stores are. Since this store's atmosphere is more like a boutique shop than an American-ized retail space, the area had to be taken into consideration. The original space had an area of about 3,000 square feet. Since boutique shops tend to be a little smaller than this, the selling area was reduced to about 2,000 square feet. This also left room available for restrooms, individual fitting rooms, and storage space. Another consideration was to hide the existing columns in display structures or walls. This adds form to the space and makes the displays appear solid and not just out in open space.

Another consideration was the image of the company. Since D&G is a high-fashion clothing and accessories designer, the look of the space must reflect this image. The store must look sharp, clean, and rid of clutter so that more focus will be on the clothing and other merchandise. A warm feeling upon entry was desired, yet a cool image must be seen from the outside. The window displays were built of simple, cubicle platforms housing mannequins posed in the latest fashions. These displays were enclosed by light blue frosted glass partitions to provide a cool background (the lamps, however, were chosen to have warm CCTs to better render clothing). The floor in the retail area was chosen to be a black granite tile to promote a classy atmosphere and uphold the image of D&G. The entrance has a wood floor so that upon approaching the cashwrap and being greeted by the shopkeepers, a welcoming attitude is achieved. The customer then enters the store area and is immediately blown away by the contrast of feelings and colorful, yet sparkling images of fine merchandise (watches, sunglasses, jewelry). They meander through it and peruse beautiful displays of clothing in brilliant light while they learn about the products from shopkeepers accompanying them.

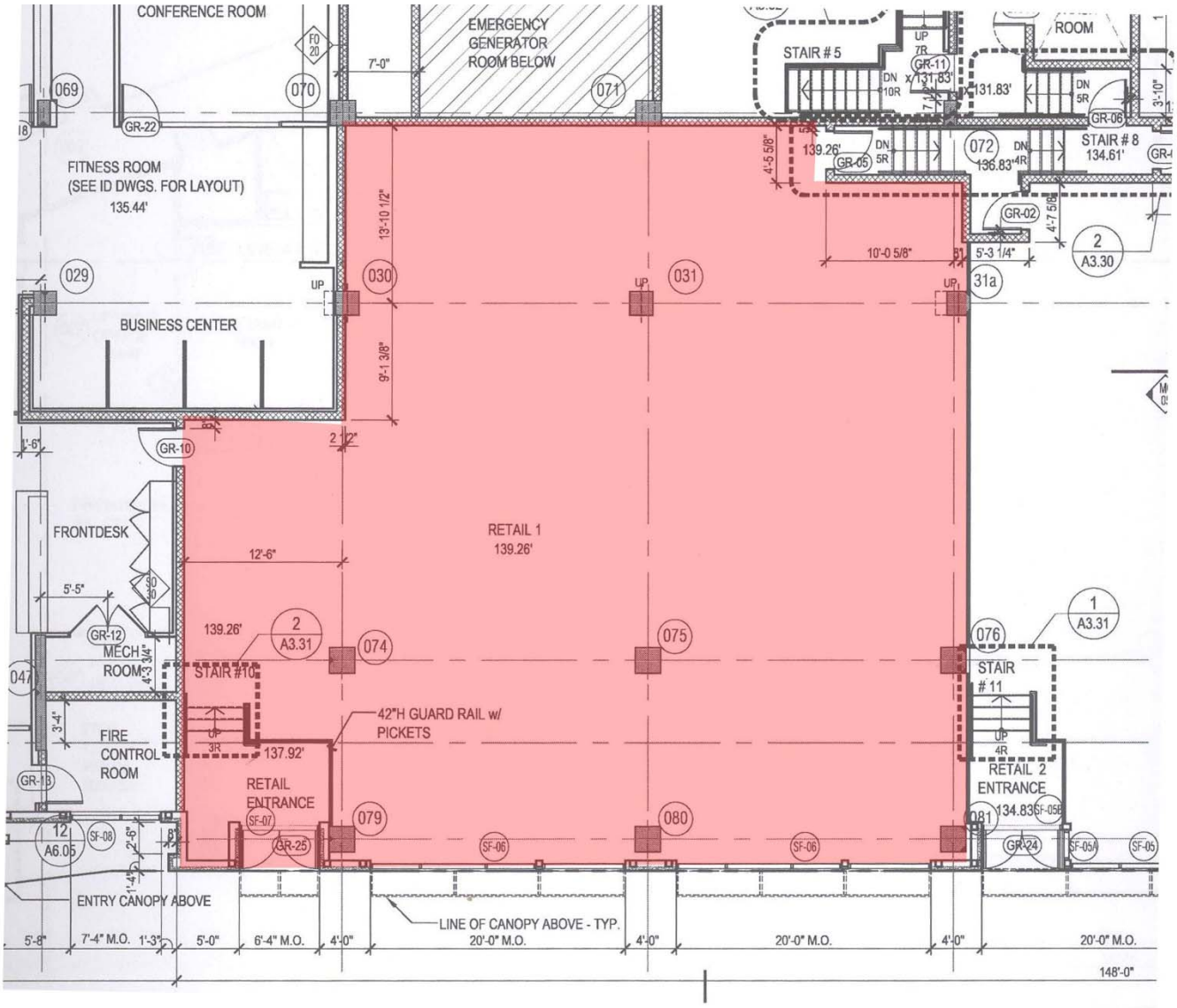
To brighten up the displays, the display walls and surrounding walls were painted a white tone (reflectance of 81%) so that light would bounce off these surfaces and spill into surrounding areas. A key factor in the lighting design was to provide just enough light in the circulation areas for the customer to properly move throughout the space and keep high light levels on clothing displays.

CONCLUSION:

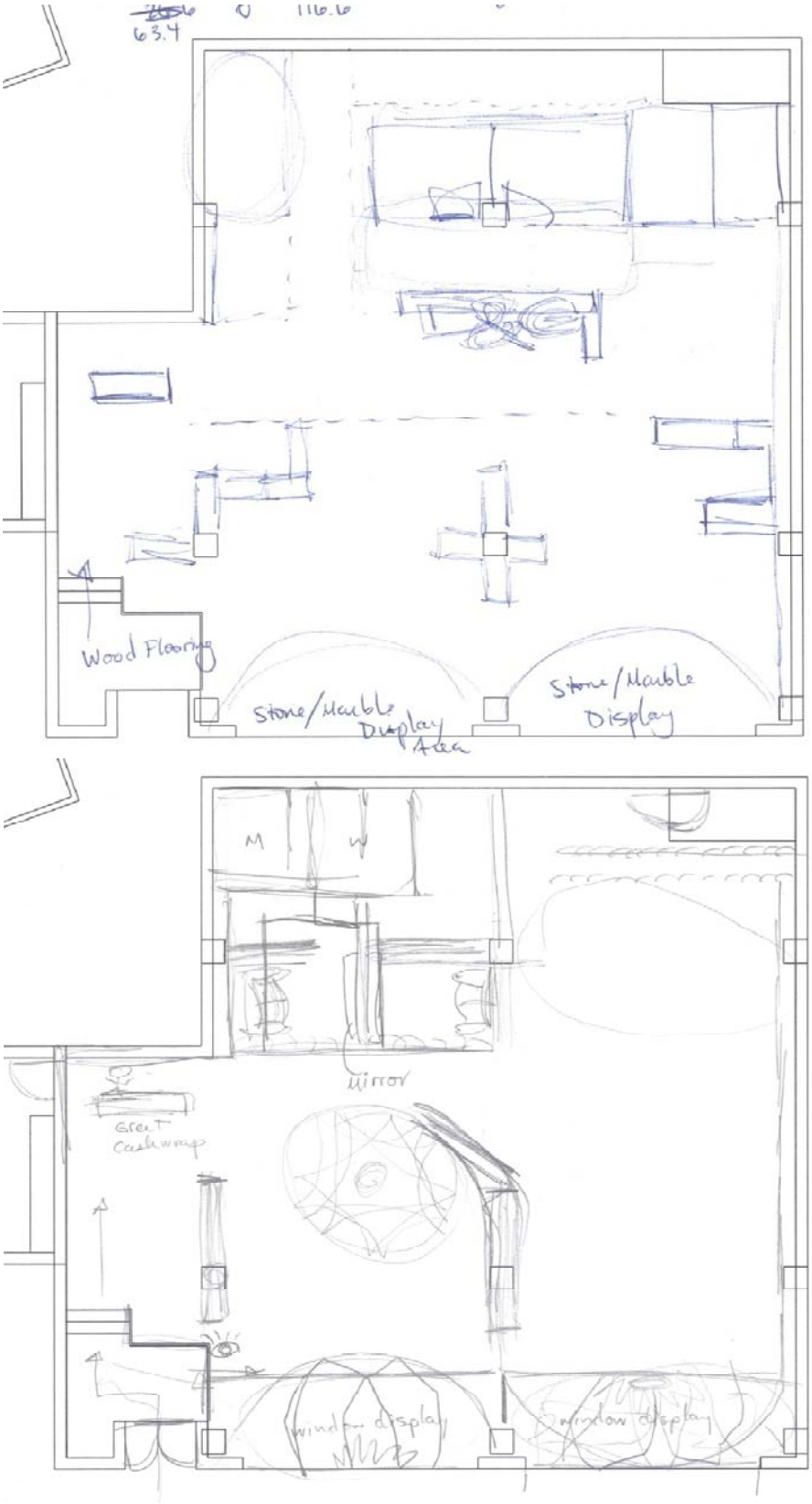
The store has a unique vibe in contrasting feelings between the entrance and the shopping experience. The layout is simple but is also tailored to the specific space type and function of a new-age fashion designer boutique.

Please see the following pages for layouts and renderings of the space.

An image of the original retail space layout, before the tenant fit-out.



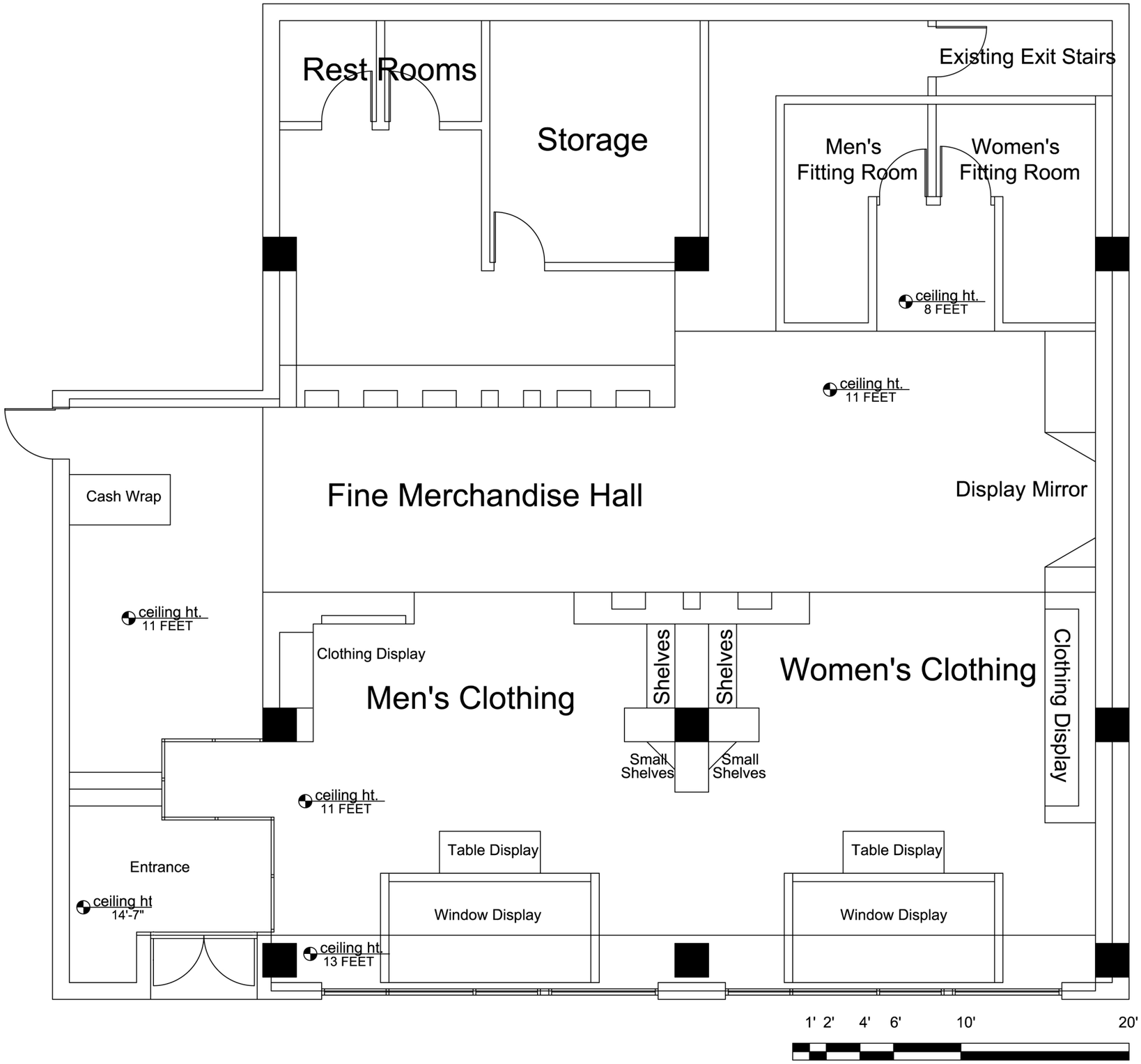
Retail 1 Layout - Sheet A2.04



The images here are preliminary sketches of layouts to the retail space. One key idea was to have the cashwrap area near the entrance so that the shopkeepers could greet customers as they enter. Another key idea was to absorb the columns into the architecture, whether it was to encase them within clothing displays or within surrounding walls.

Two distinct areas needed to be created, one – an exciting and sparkling display of jewelry, watches, and sunglasses; two – a neat, clean display of clothing articles.

It was decided to keep the fine merchandise in view of the cashwrap, for security reasons, but also to impress the customer at the very beginning of their shopping experience.



AE Senior Thesis
Project

Retail
Floor Plan

DRAWN BY:
Michael Gardner

Below are some rendered views of the sales area from AGI 32.

Viewing the Cash Wrap from the Entrance

Viewing Fine Merchandise

View of the Display Mirror and Women's Clothing Display

View of Men's Clothing Shelves

INTRODUCTION to PROBLEM:

The mechanical breadth for this thesis project relates to work done in the retail space. Since there was not a tenant fit-out for the space, there was also no ductwork supplying cooling to the space. For this study, calculations were performed to find the peak demand cooling load of the retail space. These calculations were based on loads from human occupancy, lighting, miscellaneous equipment, and the thermal load from the door and two large storefront windows.

SOLUTION:

Typically, an occupancy calculation may be assumed to be based on one person per multiple square feet, but for this calculation, and seeing that the type of space will not allow a very large number of people to occupy it, the peak load was assumed to be 100 people. This was based on the assumption that there would be at least 5 storekeepers in the space and up to 95 customers at a time (which is a generous estimate). Multiplying 100 people by 250 Btu/hr per person allots 25,000 Btu/hr for the occupancy load.

The lighting load was derived from the re-designed lighting in the space. The total wattage of all luminaires in the space came out to be 7,022.6 W. Multiplying this by a conversion factor of 3.41 Btu/hr per watt totaled 23,947.07 watts for the total lighting load.

A design factor of 0.2 W/ft^2 was also taken into account for miscellaneous equipment such as computers and other items. Multiplying this quantity by the total room area of 2,932 square feet gave a load of approximately 2,000 Btu/hr after the conversion from watts.

The load from the glazing that faces the street was obtained from the equation $Q = UA\Delta T$. The U-value for this type of glazing was 38.62 $^{Btu/hr}/_{ft^2 - ^\circ\mathrm{F}}$. The area had previously been calculated to be 2,932 ft^2. The design temperature for Washington, D.C. was found to be 91 °F. For a space temperature of 74 °F, the change was therefore 17 °F. These terms multiplied together provided a total load from the glazing of 388,671.7 Btu/hr.

CONCLUSION:

All of the above calculated loads were combined for a total cooling load of 439,619 Btu/hr. After this was done, the next step was to calculate the supply rate in cubic feet per minute. From the equation, $Q = 1.08 \times cfm \times \Delta T$, the supply rate can be determined. Since the desired room temperature is 74 °F, and the supply temperature is 55 °F, the change in these temperatures was 19 °F. This left the cfm to be 21,423.9. From Figure 9-2 on page 258 of the *Heating, Ventilating, and Air Conditioning: Analysis and Design* textbook, a rate of about 21,500 cfm would allow the use of a 36" duct size. Since the ceiling space is 48", this is deemed feasible.

See the following pages for hand calculations.

Mechanical Breadth: Size Duct for Peak Cooling Demand

Retail Room Area =

833 sf
560 sf
1192 sf
239 sf
98 sf
10 sf

2,932 sf

Occupancy

Assume max 100 people @ peak

100 people × 250 Btu/hr/person = 25,000 Btu/hr

Lighting Load

Assume all on @ peak

by ckt 1008 W
1760.6 W
1200 W
+ 1080 W
987 W
987 W

Total Lighting Load

7022.6 W
× 3.41 Btu/hr / watts

23947.07 Btu/hr

Design Factor
for computers and/or other equipment

$0.2\ ^{W}/_{ft^2} \times 2{,}932\ sf = 586.4\ W$

$586.4\ W \times 3.41\ \frac{Btu/hr}{watts} \approx 2{,}000\ Btu/hr$

Total Store Front Window Area

88 sf - door
2 x 252 - ~~window~~ storefront window

88
+504
592 sf

window load

$\dot{Q} = UA\Delta T$

$\Delta T = 91^{\circ}F - 74^{\circ}F$

$\Delta T = 17$

$U = 6.57\ \frac{W}{m^2 \cdot K}$ 6.933

$U = 38.62\ \frac{Btu/hr}{ft^2 \cdot F}$

$\dot{Q} = (38.62)(592\ ft^2)(17^{\circ}F)$

$\dot{Q} = 388{,}671.7\ Btu/hr$

Total Design Cooling Load

Occupancy = 25,000 Btu/hr
Lighting = 23,947.07 Btu/hr
Computers/Equip. = 2,000 Btu/hr
Store Front Windows = 388,671.7 Btu/hr

439,619 Btu/hr

Room? Supply?
$\Delta T = 74 - 55°F$

Find cfm:

$$\dot{Q} = 1.08 \times cfm \times \Delta T$$

$$439,619 \text{ Btu/hr} = 1.08 \times cfm \times 19°F$$

$$cfm = 21,423.9$$

Using chart pg. 258, Fig. 9-2

21,500 cfm would use 36" duct.

Since the ceiling space is 4', this would be feasible.

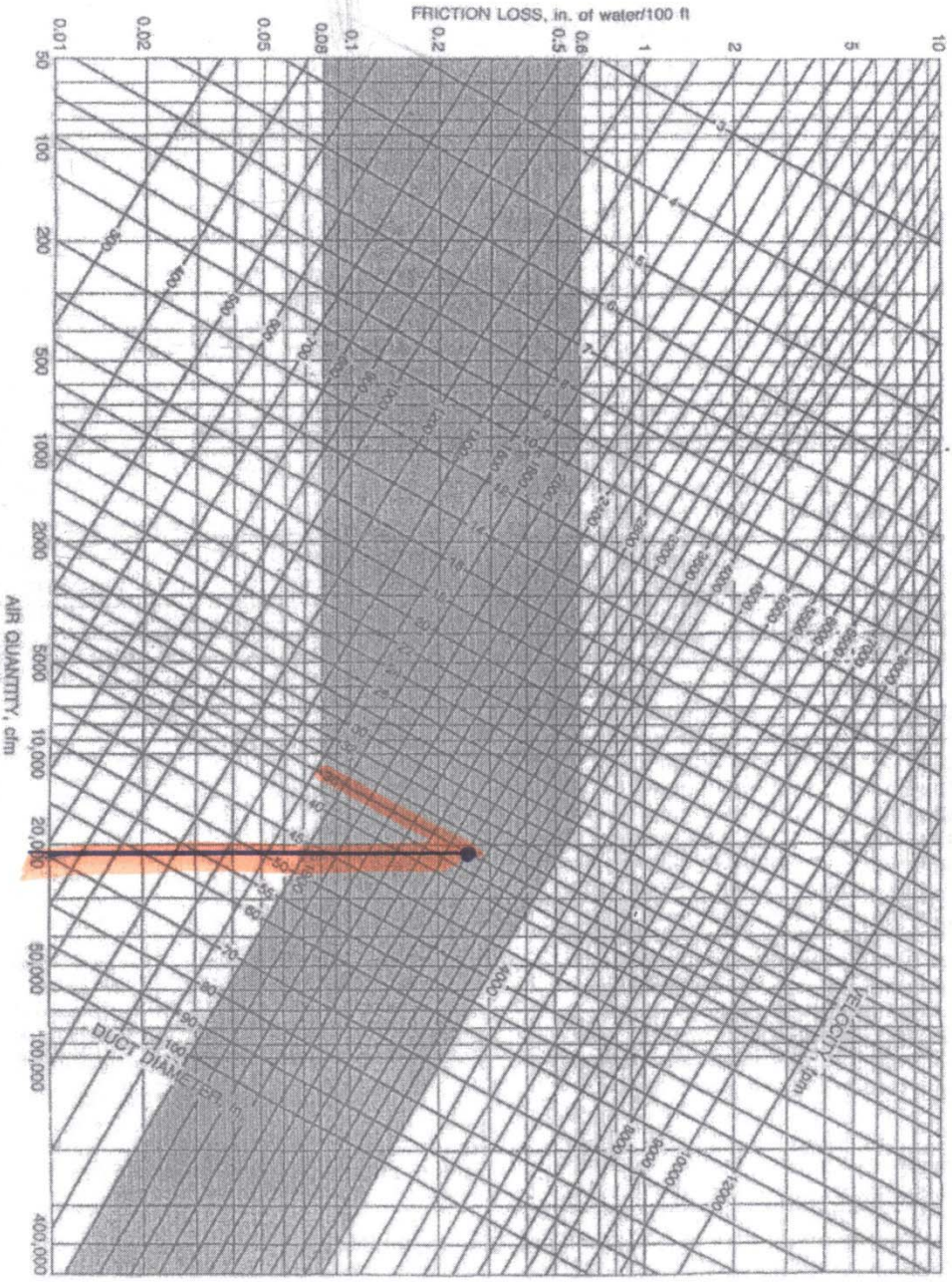


Fig. 9-2 Friction Chart for Round Duct ($\rho = 0.075\ lb_m/ft^3$ and $\varepsilon = 0.0003\ ft$)

Lighting

The lighting designs proposed in this thesis attempt to evoke a luxurious feel in each space. The measures taken to assure that sufficient light levels were reaching their respective task planes were followed as closely to standards set by the IESNA Lighting Handbook. In certain spaces, some items could be improved, but overall, clean and warm atmospheres were enhanced through the re-design of each space. Power could have been saved in some spaces, and with the proposed solutions this would not be too difficult of a task.

Electrical

The original panels seemed to be oversized in both cases according to procedures taken in the electrical portion of this thesis project. By reducing sizes of these panelboards according to the design loads obtained, a reduction in project cost could also take place. Money could also be saved in certain cases like using bus duct instead of conduit and wire, or using more energy efficient transformers.

Architectural

The layout of the tenant fit-out in the architectural breadth portion of this thesis is purely focused on the actual sales area of the retail space. More thought was placed in this area because this is where the customer sees the merchandise for the first time. First impressions are crucial in a retail environment and the lighting, as well as the architectural features make these items stand out.

Mechanical

The duct sizing study for the retail space was a success considering that there was enough space in the ceiling to house a 36” duct. Cooling this area would then be easier considering the architectural aspects would not have to be redesigned unless there was another issue at hand.

References

Cerver, Francisco Asensio. Commercial Space: Boutiques. Hove, East Sussex, England. Arco Editorial SA, 1996.

The IESNA Lighting Handbook: Reference and Application Ninth Edition. USA: The Illuminating Engineering Society of North America, 2000.

McQuiston, Faye, Parker, Jearld, and Jeffrey Spitler. Heating Ventilating and Air Conditioning: Analysis and Design. USA: John Wiley & Sons, 2005.

National Electrical Code 2008. Quincy, Massachusetts: National Fire Protection Association, 2007.

Web Resources:

www.dolceandgabbana.com/dg

LIGHTING EQUIPMENT APPENDIX

The following pages contain cutsheets of luminaires, lamps, ballasts, and control devices that pertain to this project. For electrical equipment information, consult the Electrical Equipment Appendix .

M60 Recessed Linear Fluorescent Flanged Extrusion - STAGGERED LAMPS

se'lux®

Project: _____ **Type:** _____ **Qty:** _____

Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage

Options (refer to separate data sheets for ordering codes and details)

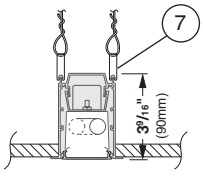
Fixture Series	Lamp Type	Shielding	Mounting	Nominal Length	Finish	Voltage	Options
M6R1S M60 Recessed Continuous Flange (Flanged Extrusion/ Flanged Endcaps) Staggered Lamps **M6R2S** M60 Recessed Flush End (Flanged Extrusion/ Flangeless Endcaps) Staggered Lamps	**1T5** F28T5 **1T5HO** F54T5HO	**OD** Extra Diffuse Lens **SD** Satine Lens	**SH** Suspension Clips **TS** 1" Studs (factory installed) **RC** Rotating Crossbars **PM** Perimeter Mount	**008** 8 foot **012** 12 foot For actual lengths see following page. For other lengths, configurations indicate nominal length rounded to the next highest foot. Factory will supply layout drawings. Individual fixtures cannot be field joined.	**WH** White **BK** Black **SV** Silver **SP** Specify RAL#	**120** **277** **347**	**TB** Lengths to Fit 2' Grid T-Bar Ceiling System (M6R1S only) (*qty.*)**EM** Stand-by Battery Pack[1] (prefix quantity, i.e. - **5EM**) **FS** Single Fusing **DM** Dimming[1] (specify system) **DMA** Digital Addressable Dimming[1] **FW** Flex Whip (standard) **FW1** Flex Whip (dimming) **Track** Eutrac Standard[2] **DL** Suitable for Damp Locations **Downlights** (See MR11 spec sheet, pp.98)

[1]Must be low profile ballasts (1 3/8" W x 1 3/16" H); consult factory for details. [2]Consult factory for details.

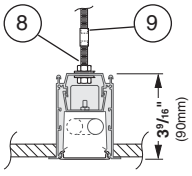
Mounting Diagrams

Scale = 1 : 8

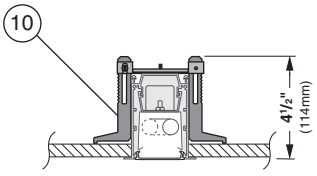
Suspension Clips (SH)



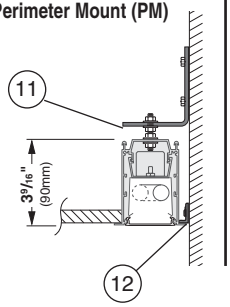
Pre-installed Rod (TS)



Rotating Crossbars (RC)

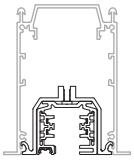


Perimeter Mount (PM)



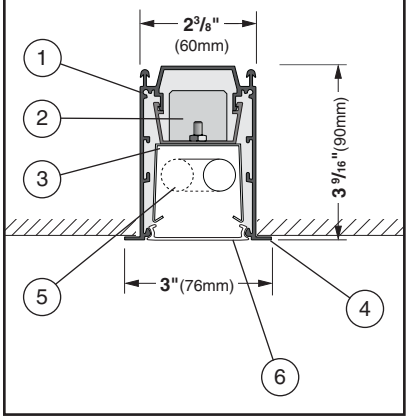
Track

Track insert including track available for all configurations, consult factory for details.



M6R1S
M6R2S

Scale = 1 : 4



1. Housing - Continuous, 6063-T5 extruded aluminum profile up to 16 feet long.

2. Ballast - Electronic, high power factor, class "P", type "A" sound rating. Specify 120v, 277v, or 347v. Ballast is factory pre-wired with leads to one end of fixture. Consult factory for ballast options.

3. Gear Tray - Die formed gear tray with integral factory preset sliding covers to fill extrusion with light, with a matt white finish for even illumination. Geartray installs as complete electrical unit and is held in place with knurled dress nuts. It is fully accessible from below ceiling.

4. Flange - 5/16" (8mm) wide flange is part of the main extruded body. Specify flush (M6R2) or flanged end plates (M6R1).

5. Lamps - As noted (by others). Other lamp lengths or wattages available, consult factory.

6. Shielding - Choose between Extra Diffuse Lens and Satine Lens. See page 8 for more details.

7. Spring steel suspension clips - Supplied two places, located nominally every 4 feet. Support wires supplied and installed by others.

8. Pre-installed 1" 1/4-20 Stud - Attached to fixture every nominal 4 feet.

9. Coupling and Threaded Rod to Structure - Supplied and installed by others.

10 Rotating Crossbar - For inaccessible ceilings, adjustable for ceiling thicknesses from **1/4"** to **2".** Support required nominally every 4'.

11. Steel Wall Bracket and 1/4-20 Rod - Supplied nominally every 4 ft. (Fasteners to wall and wall anchors by others.)

12. Aluminum Wall Bracket - Secured to wall (fasteners and wall anchors by others) and runs entire length of fixture. Also supplied for width of M6R1 continuous flange fixtures. Allows for 1/8" gap between flange and wall to create shadow line.

Interior Luminaire Finish - Standard interior colors are White (WH), Black (BK) and Silver (SV). RAL Classic colors (SP) are available, please specify RAL#.

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FAX: (845) 691-6749
www.selux.com/usa
M6R1S-01 (v5.0)

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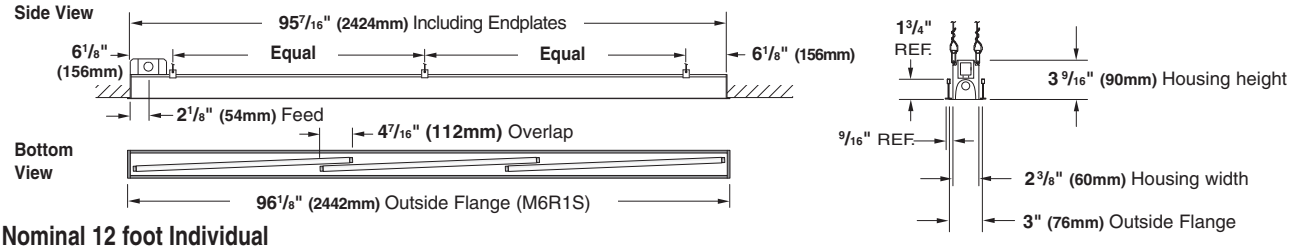
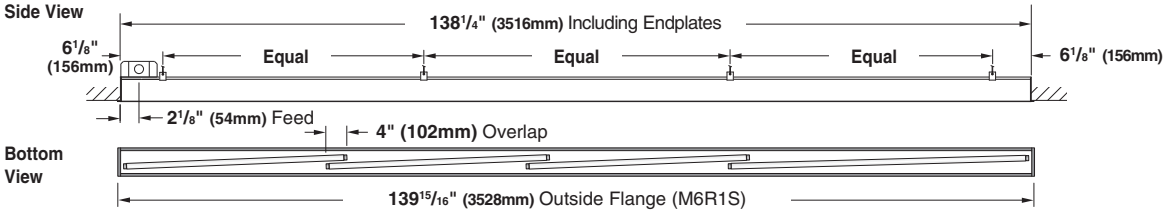
Union Made Affiliated with **IBEW** *Local 363*

M6R1S/M6R2S (Single Staggered Lamps) Standard Layout Dimensions

Nominal 8 foot Individual

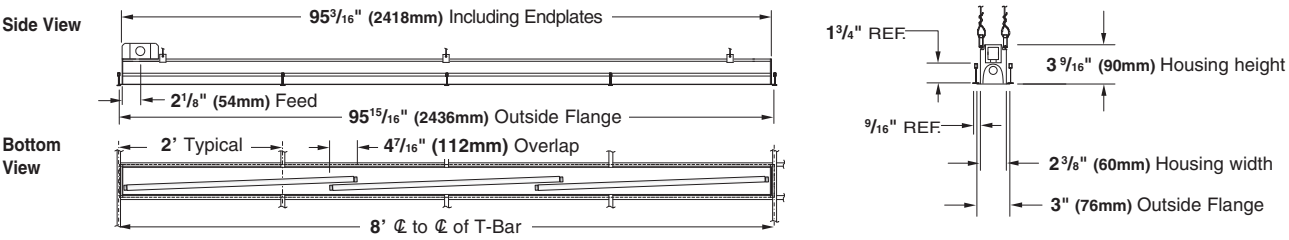


Nominal 12 foot Individual

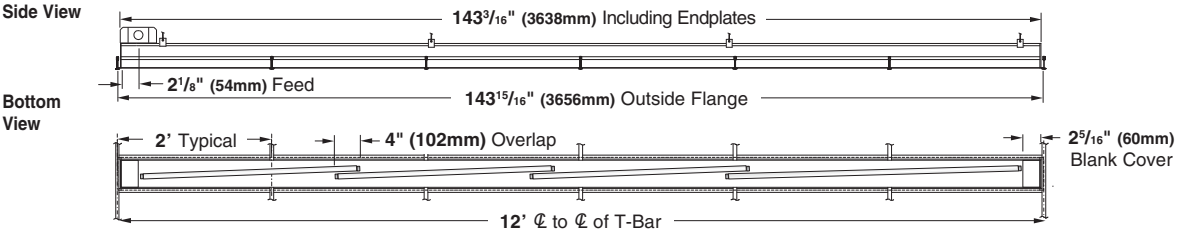


M6R1S (Single Staggered Lamps) T-Bar Layout Dimensions (option - TB)

Nominal 8 foot Individual



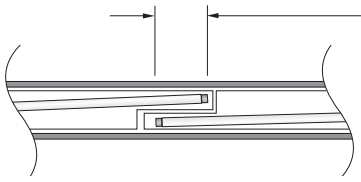
Nominal 12 foot Individual



Fixture supplied with 7/8 knockout located 2 1/8" from end in top of fixture.

For other lengths, lamping, continuous runs or configurations please specify overall length (in feet), accessories desired and sketch/drawing of configuration. SELUX will detail project drawings upon order and supply submittal drawings for approval. Individual fixtures cannot be field joined. If you have any questions please contact SELUX customer service or applications engineering for assistance (1-800-SELUX-CS).

Staggered Lamps Principle



Lamps are spaced with 4" to 6" overlap to completely illuminate luminaire and eliminate socket shadows. Factory will supply approval drawings for other lengths using combinations of 21W & 28W T5 lamps or 39W & 54W T5HO lamps.

Minimal socket shadows may be visible at certain angles. Refer to pages 6 and 8 for more information.

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	Approx Lumens Mean @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	CRI 31,33,38,48, 74,76
					20901	**FP28/835/ECO**	40	20000	3500	85	2600 2900	2418 2697	CRI 31,33,38,48, 74,76
					20902	**FP28/841/ECO**	40	20000	4100	85	2600 2900	2418 2697	CRI 31,33,38,48, 74,76
					22203	**FP28/850/ECO**	40	20000	5000	85	2545 2840	2367 2641	CRI 31,33,38,48, 74,76
					20990	**FP28/865/ECO**	40	20000	6500	85	2400 2750	2232 2558	CRI 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	CRI 31,33,38,48, 74,76
					20908	**FP14/835/ECO**	40	20000	3500	85	1200 1350	1116 1256	CRI 31,33,38,48, 74,76
					20914	**FP14/841/ECO**	40	20000	4100	85	1200 1350	1116 1256	CRI 31,33,38,48, 74,76
					20988	**FP14/865/ECO**	40	20000	6500	85	1100 1300	1045 1209	CRI 31,33,38,48, 74,76
21	T5	36	34	Mini Bipin	20919	**FP21/830/ECO**	40	20000	3000	85	1900 2100	1767 1953	CRI 31,33,38,48, 74,76
					20921	**FP21/835/ECO**	40	20000	3500	85	1900 2100	1767 1953	CRI 31,33,38,48, 74,76
					20924	**FP21/841/ECO**	40	20000	4100	85	1900 2100	1767 1953	CRI 31,33,38,48, 74,76
					20989	**FP21/865/ECO**	40	20000	6500	85	1750 2000	1662 1860	CRI 31,33,38,48, 74,76
35	T5	60	57.6	Mini Bipin	20925	**FP35/830/ECO**	40	20000	3000	85	3300 3650	3069 3394	CRI 31,33,38,48, 74,76
					20926	**FP35/835/ECO**	40	20000	3500	85	3300 3650	3069 3394	CRI 31,33,38,48, 74,76
					20927	**FP35/841/ECO**	40	20000	4100	85	3300 3650	3069 3394	CRI 31,33,38,48, 74,76

PENTRON® PREMIER™ 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	Approx Lumens Mean @35°C/95°F	Symbols & Footnotes
28	T5	48	45.8	Mini Bipin	20948	**FP28/830PM/ECO**	40	20000	3000	85	2730 3050	2594 2898	CRI 31,33,38,48, 74,76
					20943	**FP28/835PM/ECO**	40	20000	3500	85	2730 3050	2594 2898	CRI 31,33,38,48, 74,76
					20944	**FP28/841PM/ECO**	40	20000	4100	85	2730 3050	2594 2898	CRI 31,33,38,48, 74,76

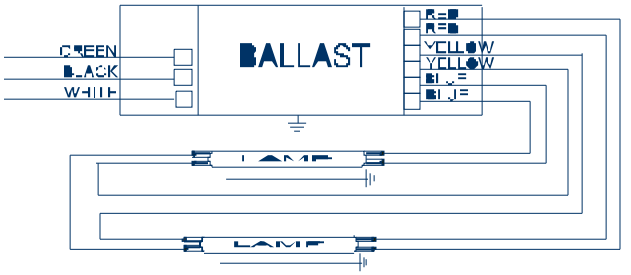
PHILIPS ADVANCE

ICN-2S28@120	
Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F14T5	1	14	0/-18	0.16	19	1.07	20	0.98	1.7	5.63
F14T5	2	14	0/-18	0.29	34	1.06	10	0.98	1.7	3.12
F21T5	1	21	0/-18	0.21	26	1.03	15	0.99	1.7	3.96
F21T5	2	21	0/-18	0.40	48	1.02	10	0.98	1.7	2.13
F28T5	1	28	0/-18	0.28	33	1.04	10	0.98	1.7	3.15
* F28T5	2	28	0/-18	0.55	64	1.03	10	0.99	1.7	1.61
F35T5	1	35	0/-18	0.34	41	1.01	10	0.98	1.7	2.46
F35T5	2	35	0/-18	0.67	80	1.00	10	0.99	1.7	1.25

Wiring Diagram



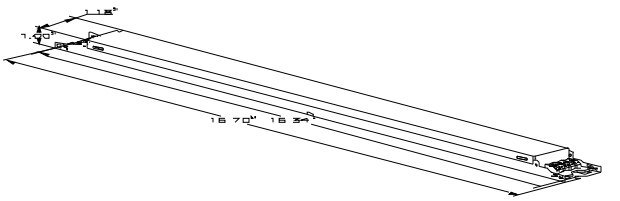
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray	0	0
Violet	0	0

	in.	cm.
Yellow/Blue	0	0
Blue/White	0	0
Brown	0	0
Orange	0	0
Orange/Black	0	0
Black/White	0	0
Red/White	0	0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
16.70 "	1.18 "	1.00 "	16.34 "
16 7/10	1 9/50	1	16 17/50
42.4 cm	3 cm	2.5 cm	41.5 cm

Revised 08/21/2006

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

ICN-2S28@120	
Brand Name	CENTIUM T5
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color-coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Programmed Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.3 Ballast shall operate from 50/60 Hz input source of _____ (120V through 277V or 347V through 480V) with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature of _____ {-18C (0F) or -29C (-20F)} for primary lamp. Consult lamp manufacturer for temperature versus light output characteristics.

2.11 Ballast shall provide Lamp EOL Protection Circuit.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

2.13 Ballast shall have a hi-low switching option when operating (4) F54T5/HO lamps to allow switching from 4-2 lamps, 3-2 lamps or 3-1 lamp.

2.14 Four-lamp ballast shall have semi-independent lamp operation.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.4 Ballast shall comply with ANSI C82.11 where applicable.

3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

3.6 Ballast shall comply with UL Type CC rating.

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C. Ballasts with a "90C" designation in their catalog number shall also carry a three-year warranty at a maximum case temperature of 90C.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 08/21/2006

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

DT-300 Series Dual Technology Ceiling Sensors

PROJECT

LOCATION/TYPE

Product Overview

Description

The DT-300 Series Dual Technology Ceiling Sensors combine the benefits of passive infrared (PIR) and ultrasonic technologies to detect occupancy. Sensors have a flat, unobtrusive appearance and provide 360 degrees of coverage.

Operation

Low voltage DT-300 Series sensors utilize a Watt Stopper/Legrand power pack to turn lights on when both PIR and ultrasonic technologies detect occupancy. They can also work with a low voltage switch for manual-on operation. PIR technology senses motion via a change in infrared energy within the controlled area, whereas ultrasonic uses the Doppler Principle and 40KHz high frequency ultrasound. Once lights are on, detection by either technology holds them on. When no occupancy is detected for the length of the time delay, lights turns off. DT-300 Series Sensors can also be set to trigger lights on when either technology or both detect occupancy, or to require both technologies to hold lighting on.

SmartSet™

DT-300 Series Sensors require no adjustment at installation, as SmartSet technology continuously monitors the controlled space to identify usage patterns. Based on these patterns, the unit automatically adjusts time delay and sensitivity settings for optimal performance and energy efficiency. Sensors assigns short delays (as low as five minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times.

Application

DT-300 Series Dual Technology Sensors have the flexibility to work in a variety of applications, where one technology alone could cause false triggers. Ideal applications include classrooms, open office spaces, large offices and computer rooms. The DT-300 Series mounting system makes them easy to install in ceiling tiles or to junction boxes, providing the flexibility to be used in a wide range of spaces.

Features

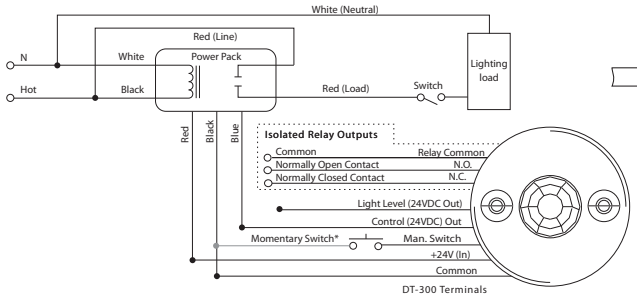
- Advanced control logic based on RISC microcontroller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
  - Walk-through mode turns lights off three minutes after the area is initially occupied – ideal for brief visits such as mail delivery
- Available with built-in light level sensor featuring simple, one-step setup
- Sensors work with low-voltage momentary switches to provide manual control
- Patented ultrasonic diffusion technology spreads coverage to a wider area
- LEDs indicate occupancy detection
- Uses plug terminal wiring system for quick and easy installation
- Eight occupancy logic options provide the ability to customize control to meet application needs
- Available with isolated relay for integration with BAS or HVAC

Specifications

- 24 VDC/VAC
- Ultrasonic frequency: 40kHz
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), Walk-through/Test Modes
- Sensitivity adjustment: SmartSet (automatic); reduced sensitivity (PIR); variable with trim pot (ultrasonic)
- Built-in light level sensor: 10 to 300 footcandles (107.6 to 3,229.2 lux)
- Low-voltage, momentary switch input for manual on or off operation
- DT-300 contains an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC
- Multilevel Fresnel lens provides 360° coverage for superior occupancy detection
- Mounting options: ceiling tile; 4" square junction box with double-gang mud ring
- Max DT-300s per power pack: B=2 , BZ=3
  Max DT-305s per power pack: B=3, BZ=4
- Dimensions: 4.50" diameter x 1.02" deep (114.3mm x 25.9mm)
- UL and CUL listed; five-year warranty

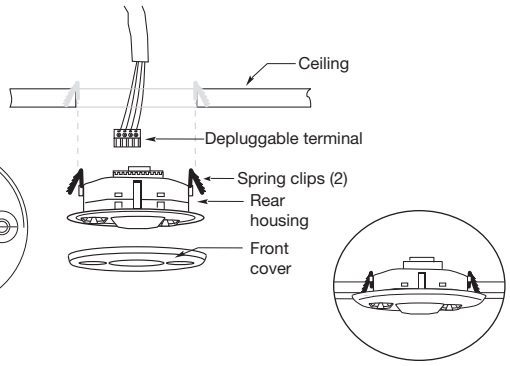
Wiring & Mounting

Wiring Diagram



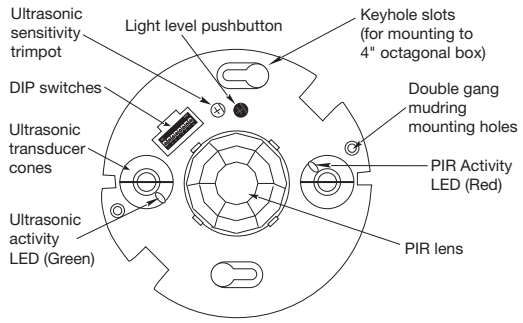
*Momentary switch connection is optional.
Connect only when momentary switch is installed.

Ceiling Mounting



Controls & Settings

Product Controls



DIP Switch Settings

◂ = Factory Setting
● = ON
– = OFF

Occupancy Logic	Switch# 1	2	3
Standard ◂	–	–	–
Option 1	●	–	–
Option 2	–	●	–
Option 3	●	●	–
Option 4	–	–	●
Option 5	●	–	●
Option 6	–	●	●
Option 7	●	●	●

Time Delay	4	5	6
5 sec/SmartSet ◂	–	–	–
5 minutes	–	–	●
10 min. 🚶	–	●	–
10 minutes	–	●	●
15 min. 🚶	●	–	–
15 minutes	●	–	●
20 minutes ◂	●	●	–
30 min. 🚶	●	●	●

🚶 = walk-through mode

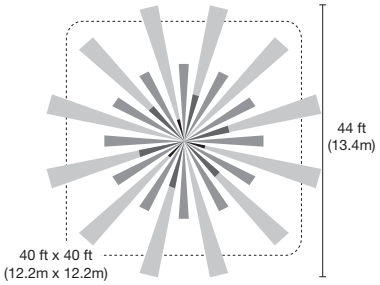
Occupancy Logic	Trigger	Initial Occupancy	Maintain Occupancy	Re-trigger (seconds duration)
Standard ◂	Both	Either	Either(5)
Option 1	Either	Either	Either(5)
Option 2	PIR	Either	Either(5)
Option 3	Both	Both	Both(5)
Option 4	PIR	PIR	PIR(5)
Option 5	Ultra	Ultra	Ultra(5)
Option 6	Man.	Either	Either(30)
Option 7	Man.	Both	Both(30)

LEDs	7
Disabled	–
Enabled ◂	●

PIR Sensitivity	8
Minimum	–
Max./SmartSet ◂	●

The technology control (occupancy logic) options are adjustable by user. The standard setting recommended for most applications requires both technologies to trigger on, either to hold on.

Coverage



Coverage shown is maximum and represents half-step walking motion. Under ideal conditions, coverage for half-step walking motion can reach up to 1000 ft^2.

Ordering Information

Catalog No.	Voltage	Current	Coverage	Features
☐ DT-300	24 VDC/VAC	43 mA	up to 1000 ft² (92.9 m²)	Isolated relay, light level
☐ DT-305	24 VDC/VAC	35 mA	up to 1000 ft² (92.9 m²)	

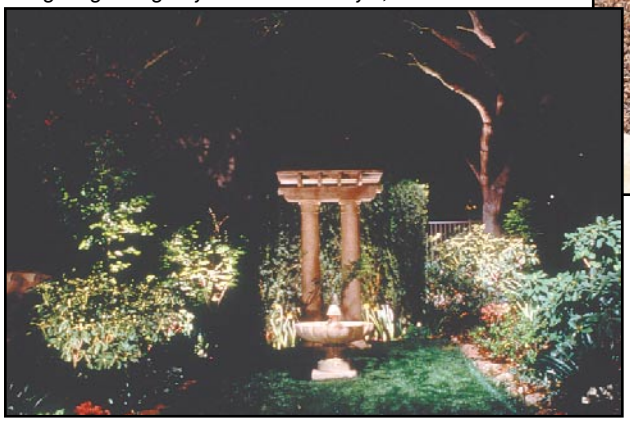
Sensors are white and use Watt Stopper power packs. Current consumption can be slightly higher when only one sensor per power pack is used.

Pub. No. 14906

Delta Star™

Delta Star™ gives the lighting designer two choices of deep cutoff options. When the design requires the highest degree of brightness control of the MR16 lamp, Delta Star is the answer. Its precision, machined aluminum construction and deep cutoff design combine to make Delta Star a very economical low-brightness, low-voltage lighting instrument.

Lighting Design by Jan Lennox-Moyer, MSH Visual Planner



Features

- Tamper proof design.
- Completely sealed optical compartment.
- Clear, tempered glass lens, factory sealed.
- Enclosed wireway mounting knuckle.
- Machined aluminum construction with stainless steel hardware.
- & Listed with MR16 lamps to 50 watts.
- For use with remote transformers, see pages 92, 94, and 97.

CATALOG NUMBER LOGIC

Example: **DS - 8 - BZP - 9 - 11 - A**

Series

Lamp Type

0 - By others	16 - EYS(42W), 25° N. Flood
1 - ESX(20W), 12° Spot	17 - EYP(42W), 40° Flood
2 - BAB(20W), 40° Flood	6 - EXT(50W), 13° Spot
3 - FRB(35W), 12° Spot	7 - EXZ(50W), 26° N. Flood
4 - FRA(35W), 23° N. Flood	8 - EXN(50W), 40° Flood
5 - FMW(35W), 40° Flood	9 - FNV(50W), 60° W. Flood
15 - EYR(42W), 12° Spot	

Finish

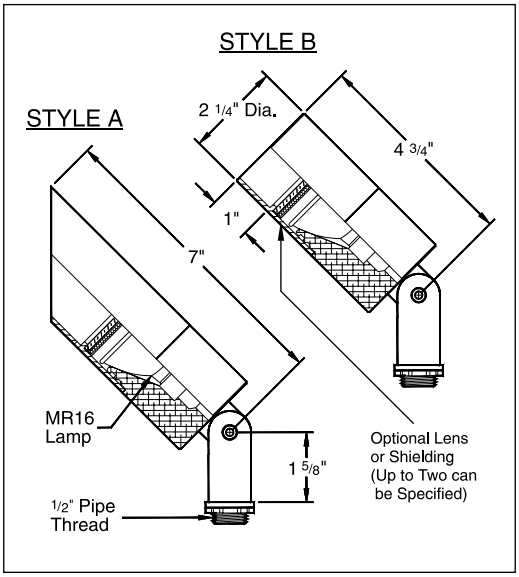
Powder Coat Color	Satin	Wrinkle
Bronze	BZP	BZW
Black	BLP	BLW
White(Gloss)	WHP	WHW
Aluminum	SAP	——
Verde	——	VER

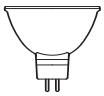
Lens Type
9 - Clear (Standard), 10 - Spread, 12 - Soft Focus, 13 - Rectilinear

Shielding
11 - Honeycomb Baffle

Cap Style
A - 45°, B - 90°

Available in Brass, see page 90.




MR16

TRU-AIM IR® MR16 LAMPS

UV Filter capsule with axial filament in covered constant color, hard coated dichroic reflector and infrared reflective coating on the lamp capsule.

Watts	Bulb	Base	Product Number	Symbols & Footnotes	Ordering Abbreviation	Volts	Pkg Qty	Beam Type	Class & Filament	Avg Rated Life(hrs)	Lumens CCT	CBCP	Beam Angle	MOL (in)
20	MR16	GU5.3 Bipin	58531	47,62,66, 91,93	**20MR16/IR/SP10/C**	12	20	SP	C,AXIAL	5000	3000	6000	10	1.75
			58532	47,62,66, 91,93	**20MR16/IR/NFL25/C**	12	20	NFL	C,AXIAL	5000	3000	2300	25	1.75
			58533	47,62,66, 91,93	**20MR16/IR/FL35/C**	12	20	FL	C,AXIAL	5000	3000	1000	35	1.75
			58838	47,62,66, 91,93	**20MR16/IR/WFL60/C**	12	20	WFL	C, AXIAL	5000	3000	450	60	1.75
37	MR16	GU5.3 Bipin	58641	37,47,62, 92,93	**37MR16/IR/SP10/C**	12	20	SP	C, AXIAL	5000	3000	12500	10	1.75
			58634	37,47,62, 92,93	**37MR16/IR/NFL25/C**	12	20	NFL	C, AXIAL	5000	3000	4400	25	1.75
			58633	37,47,62, 92,93	**37MR16/IR/FL35/C**	12	20	FL	C, AXIAL	5000	3000	2200	35	1.75
			58837	47,62,66, 92,93	**37MR16/IR/WFL60/C**	12	20	WFL	C, AXIAL	5000	3000	1100	60	1.75
50	MR16	GU5.3 Bipin	54175	37,47,62, 92,93	**50MR16/IR/SP10/C**	12	20	SP	C, AXIAL	5000	3000	15000	10	1.75
			54174	37,47,62, 92,93	**50MR16/IR/NFL25/C**	12	20	NFL	C, AXIAL	5000	3000	5700	25	1.75
			54173	37,47,62, 92,93	**50MR16/IR/FL35/C**	12	20	FL	C, AXIAL	5000	3000	2850	35	1.75
			54237	47,62,66, 92,93	**50MR16/IR/WFL60/C**	12	20	WFL	C, AXIAL	5000	3000	1430	60	1.75

TRU-AIM TITAN® MR16 LAMPS

UV Filter capsule with axial filament in covered constant color, hard coated dichroic reflector.

Watts	Bulb	Base	Product Number	Symbols & Footnotes	Ordering Abbreviation	Volts	Pkg Qty	Beam Type	Class & Filament	Avg Rated Life(hrs)	Lumens CCT	CBCP	Beam Angle	MOL (in)
20	MR16	GU5.3 Bipin	58300	62,65,91, 145	**20MR16/T/SP10/C(ESX)**	12	20	SP	C, AXIAL	4000	3000	5000	10	1.75
			58301	62,65,91, 93,145	**20MR16/T/FL35/C(BAB)**	12	20	FL	C, AXIAL	4000	3000	780	35	1.75
			58302	62,65,91, 93,145	**20MR16/T/WFL60/C**	12	20	WFL	C, AXIAL	4000	3000	350	60	1.75
35	MR16	GU5.3 Bipin	58303	62,65,91, 93,145	**35MR16/T/SP10/C(FRB)**	12	20	SP	C, AXIAL	4000	3000	9100	10	1.75
			58304	62,65,91, 93,145	**35MR16/T/NFL25/C**	12	20	NFL	C, AXIAL	4000	3000	3100	25	1.75
			58305	62,65,91, 93,145	**35MR16/T/FL35/C(FMW)**	12	20	FL	C, AXIAL	4000	3000	1500	35	1.75
			58306	62,65,91, 93,145	**35MR16/T/WFL60/C**	12	20	WFL	C, AXIAL	4000	3000	700	60	1.75
50	MR16	GU5.3 Bipin	58307	62,65,91, 93,145	**50MR16/T/SP10/C(EXT)**	12	20	SP	C, AXIAL	4000	3000	11500	10	1.75
			58308	62,65,91, 93,145	**50MR16/T/NFL25/C(EXZ)**	12	20	NFL	C, AXIAL	4000	3000	4400	25	1.75
			58309	62,65,91, 93,145	**50MR16/T/FL35/C(EXN)**	12	20	FL	C, AXIAL	4000	3000	2200	35	1.75

E-17 Metal Halide

Polished Brass Finish (POL)
Shown with Flood Reflector,
Accessory Holder and Honeycomb Baffle

Catalog Number Logic

Material	Faceplate	OptiLock™	Reflector	Lamp	Finish	Accessory	Ballast Type	Input Voltage	Option
S	TY2	EH70	NS	110	POL	11	H70E	120	AH/IC

Material
Blank - Aluminum
B - Brass
S - Stainless Steel

Faceplate
TY2 - Flush (Integral Concrete Pour Cover)

OptiLock™
EH50 - E-17 Metal Halide (50W)
EH70 - E-17 Metal Halide (70W)
EH100 - E-17 Metal Halide (100W)
EH150 - E-17 Metal Halide (150W)

NS - Narrow Spot
SP - Spot
FL - Flood
WF - Wide Flood
WW - Wall Wash

Lamp
0 - By Others
106 - 50W/E-17/MH/MED/Clear
107 - 50W/E-17/MH/MED/Diffuse
110 - 70W/E-17/MH/MED/Clear
111 - 70W/E-17/MH/MED/Diffuse
114 - 100W/E-17/MH/MED/Clear
115 - 100W/E-17/MH/MED/Diffuse
116 - 150W/E-17/MH/MED/Clear
117 - 150W/E-17/MH/MED/Diffuse

Finish
Aluminum & Brass Faceplates

Powder Coat Color	Satin	Wrinkle
Bronze	BZP	BZW
Black	BLP	BLW
White (Gloss)	WHP	WHW
Aluminum	SAP	--
Verde	--	VER

Brass Faceplates

Machined	MAC
Polished	POL
Mitique™	MIT

Stainless Faceplates

Machined	MAC
Polished	POL
Brushed	BRU

See Pages 38-39 for Additional Finish choices

Accessory
Select up to 2. Requires Accessory Holder.
10 - Spread Lens*
11 - Honeycomb Baffle*
13 - Rectilinear Lens*
** Not available with Wall Wash Reflector.*

Ballast Type
H50E - 50W Electronic
H70E - 70W Electronic
H100E - 100W Electronic
H150E - 150W Electronic

Input Voltage
MT - 120/208/240/277 Multi Volt Ballast

Option
AH - Accessory Holder *(Accommodates up to 2 Media)*
DG - Dome Glass Lens *(Replaces Flat Glass. Not Driveover Rated)*
GM-R - Round Grout Mask
GM-S - Square Grout Mask
GS - Glare Shield*
HD - Half Dome*
IC - Internal Cutoff Louver
ICEE - ICEE™ Lens *(Faceplate standard aluminum only. Concrete Pour Collar included.)*** See pages 34-35 for details.*
RG - Rock Guard*
RO - Rock Guard with Optical Opening*
TC - Traction Control Lens™ *(Replaces Flat Glass.) See page 58 for details.*
XL - Extra Load Lens *(Rated for 55,000 lb. GVW driveover load)*

** Material and Finish to Match Faceplate. Dome lens included. See pages 32 for Option details.*

***Options DG, GS, HD, RG, RO and XL not available with ICEE lens option*

Specifications

Fixture Housing
Corrosion-free housing made from high strength, injection molded composite compound. Glass reinforced, flame retardant and UV stabilized. Integrated walk-over cover provides closure of housing during rough-in and serves as concrete pour cover. Integral bubble level simplifies level housing installation.

Junction Box
Top mounted with dual access for wire connection and inspection. (2) bottom-entry, ¾" NPT female conduit entries with knockout plugs and (3) side flats for ½" or ¾" conduit adapters.

Patented Stability Flange
Molded collar projects into installation sub-strate to reinforce housing stability. Integral REBAR saddles simplify installation onto concrete form. (4) Orthogonal bosses permit use of ½" PCV conduit or EMT to simplify vertical position and leveling of housing. Pre-set self-tapping screws anchor housing at proper elevation.

Faceplate
5/8" thick machined A356 aluminum with (4) black oxided, captive, stainless steel mounting screws. Spring loaded hardware facilitates faceplate removal. 30° horizontal rotation provides for linear screw alignment. Also available in machined brass or machined stainless steel.

Patented Adjustable Leveling Collar
Machined collar provides biaxial 4° tilt and 1" elevation adjustment (total travel) for correction of uneven housing installation. Threaded, stainless steel adjustment posts. Collar material and finish match faceplate.

Lens
Shock resistant, tempered 3/8" borosilicate flat glass. Suitable for walk-over and drive-over applications to 35,000 lbs. GVW. Optional Extra Load Lens (XL) suitable for use in heavier load installations to 55,000 lbs. GVW.

ICEE™ Lens Option (Patent Pending)
ICEE™, or Interstice Cooling Evacuated Enclosure, is a significant advancement in the science of temperature management. It effectively reduces surface lens temperatures without compromising lumen output or optical control. Increases depth of Tenaya2® by 3". Faceplate available in Aluminum only.

Aiming & Control
OptiLock™ mechanism provides biaxial source control with 360° horizontal rotation and vertical adjustment up to 20° from nadir. Wall Wash OptiLock™ rotates 360.° Positive lock action and keyed collar ensure optical alignment after lamp servicing. Optional accessory holder accommodates up to two lens or louver media.

Socket
Specification grade ceramic body lamp holder rated for 4kV starting pulse. Medium base, nickel-plated copper alloy lamp grip and screw shell. Corrosion resistant coil spring under center contact.

Ballast Enclosure
IP-68 rated enclosure. 16AWG, direct burial electrical cables with watertight, molded electrical quick disconnects. Corrosion free polyamide strain relief connectors. High Power factor, electronic multi-volt ballast.

Wiring / Connectors
Teflon® coated wire, 18AWG, 600V, 250°C rated and certified to UL1659 standard. (3) silicone filled connectors supplied for line connection. Maximum (2) #10 & (1) #18. Minimum (1) #12 & (1) #18.

Patented Water Management Features
Self Evacuating Airtight Lamp Module (S.E.A.L.™). IP-68 rated, vacuum sealed enclosure. Molded, solid silicone faceplate gasket. Patented Anti-Condensation Valve (ACV™) eliminates condensation from optical chamber and transformer enclosure. Watertight male receptacle. Toolless entry for lamp service.

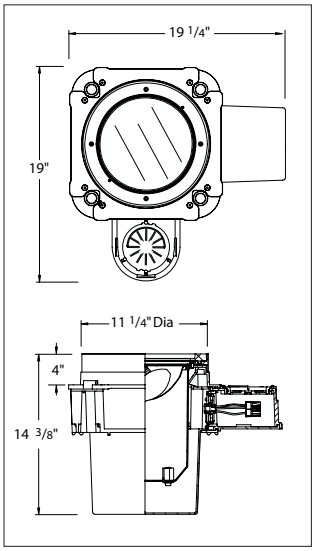
Patented HydroLock™ technology provides fail safe water barrier between junction box and interior components. Anti-Siphon Valve (ASV™) prevents "wicking" through conductor insulation.

Finish
StarGuard® (Pat. Pend), a 15 stage, chromate-free process cleans and conversion coats aluminum components prior to application of Class 'A' TGIC polyester powder coating. Brass components are available in powder coat or handcrafted metal finish. Stainless steel components are available in handcrafted metal finish.

Warranty
5 year limited warranty.

Listings
IP-68 Rated, ARL and CSA Listed.

®Teflon is a registered trademark of DuPont Corporation



For lamp information, see page 52-53.

* Tenaya2® is covered in whole or in part by U.S. Patent No. 7,175,297; U.S. Patent No. 7,033,038; U.S. Patent No. 6,254,258 B1


PAR30 LN


PAR38


E17

POWERBALL® CERAMIC METALARC® PAR
High CRI, Pulse Start, UV Stop – Open or Enclosed Fixtures

Watts	Bulb	Base	Product Number	Ordering Abbreviation	ANSI Code	Pkg Qty	Beam Type	Beam Angle	Operating Position	Fix Req	Avg Rated Life (hrs)	MBCP	Approx Lumens (initial)	CRI	CCT (K)	Symbols & Footnotes
39	PAR30LN	E26 Med	64885	**MCP39PAR30LN/U/830/VWFL/ECOPB**	M130/O	6	VWFL	46°	Universal	0	12000	3500	2300	85	3000	1,4,7,17,24,25,30,48
70	PAR30LN	E26 Med	64201	**MCP70PAR30LN/U/930/SP/ECOPB**	M139/O, M98/O	6	SP	12°	Universal	0	12000	42000	3600	95	3000	1,4,7,17,25,26,30,48
			64202	**MCP70PAR30LN/U/930/FL/ECOPB**	M139/O, M98/O	6	FL	30°	Universal	0	12000	12000	3600	95	3000	1,4,7,17,25,26,30,48
	PAR38	E26 Med Skt	64749	**MCP70PAR38/U/830/SP/ECOPB**	M139/O, M98/O	6	SP	15°	Universal	0	12000	40000	4300	88	3000	1,4,7,17,26,30,38,48
			64750	**MCP70PAR38/U/830/FL/ECOPB**	M139/O, M98/O	6	FL	25°	Universal	0	12000	16000	4300	88	3000	1,4,7,17,26,30,38,48
			64751	**MCP70PAR38/U/VWFL/830/ECOPB**	M139/O, M98/O	6	VWFL	65°	Universal	0	12000	3500	4300	88	3000	1,4,7,17,26,30,38,48
100	PAR38	E26 Med Skt	64752	**MCP100PAR38/U/830/SP/ECOPB**	M90/O, M140/O	6	SP	15°	Universal	0	12000	58000	6500	88	3000	1,4,7,17,27,30,38,48
			64753	**MCP100PAR38/U/830/FL/ECOPB**	M90/O, M140/O	6	FL	25°	Universal	0	12000	25000	6500	88	3000	1,4,7,17,27,30,38,48
			64754	**MCP100PAR38/U/830/VWFL/ECOPB**	M90/O, M140/O	6	VWFL	60°	Universal	0	12000	6000	6500	88	3000	1,4,7,17,27,30,38,48
150	PAR38	E26 Med Skt	64841	**MCP150/PAR38/U/830/SP/ECOPB**	M102/O, M142/O	6	SP	15°	Universal	0	12000	50000	9100	88	3000	1,4,7,17,31,38,48
			64842	**MCP150/PAR38/U/830/FL/ECOPB**	M102/O, M142/O	6	FL	25°	Universal	0	12000	28000	9100	88	3000	1,4,7,17,31,38,48
			64843	**MCP150/PAR38/U/830/VWFL/ECOPB**	M102/O, M142/O	6	VWFL	65°	Universal	0	12000	6500	9100	88	3000	1,4,7,17,31,38,48

POWERBALL® CERAMIC METALARC® E17 & HIGH WATTAGE
High CRI, Pulse Start – Open or Enclosed Fixtures

Watts	Bulb	Base	Product Number	Ordering Abbreviation	ANSI Code	Pkg Qty	Lamp Finish	Operating Position	Fix Req	Avg Rated Life (hrs)	Approx Lumens (initial)	Approx Lumens (mean)	CRI	CCT (K)	Symbols & Footnotes
50	E17	E26 Med	64840	**MCP50/U/MED/830PB**	M110/O, M148/O	12	Clear	Universal	0	12000	4100	2850	88	3000	1,4,17,30,48
			64849	**MCP50/C/U/MED/830PB**	M110/O, M148/O	12	Coated	Universal	0	12000	3800	2640	88	2900	1,4,17,30,48
70	E17	E26 Med	64739	**MCP70/U/MED/830PB**	M139/O, M98/O	12	Clear	Universal	0	16000	5900	4365	88	3000	I/O 1,4,17,26,30,48
			64740	**MCP70/C/U/MED/830PB**	M139/O, M98/O	12	Coated	Universal	0	16000	5500	3900	88	3000	I/O 1,4,17,26,30,48
			64193	**MCP70/U/MED/940PB**	M139/O, M98/O	12	Clear	Universal	0	12000	6000	4800	93	4000	I/O 1,4,17,26,30,48
			64194	**MCP70/C/U/MED/940PB**	M139/O, M98/O	12	Coated	Universal	0	12000	5600	4480	93	3800	I/O 1,4,17,26,30,48
100	E17	E26 Med	64743	**MCP100/U/MED/830PB**	M90/O, M140/O	12	Clear	Universal	0	16000	9000	6660	88	3000	1,4,17,27,30,48
			64744	**MCP100/C/U/MED/830PB**	M90/O, M140/O	12	Coated	Universal	0	16000	8100	5994	88	3000	1,4,17,27,30,48
			64322	**MCP100/U/MED/940PB**	M90/O, M140/O	12	Clear	Universal	0	20000	8200	6150	93	4000	1,4,17,27,30,48
			64315	**MCP100/C/U/MED/940PB**	M90/O, M140/O	12	Clear	Universal	0	20000	7500	5625	90	4000	I/O 1,4,17,27,48

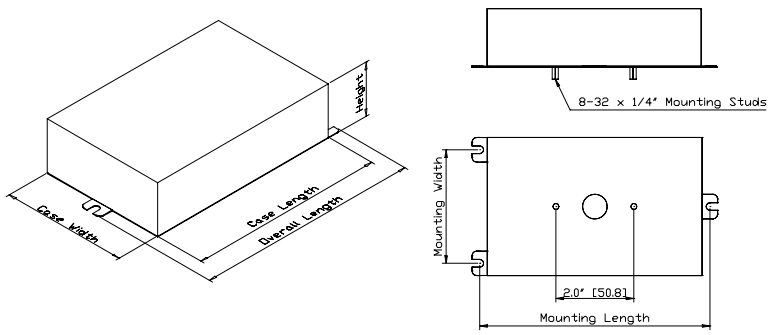
e-Vision® Electronic Ballast for Metal Halide Lamps

Catalog Number IMH-100-A-BLS-ID
For 100W Metal Halide Lamps
ANSI M90, M140
120-277V 50/60Hz Electronic
Status: Released

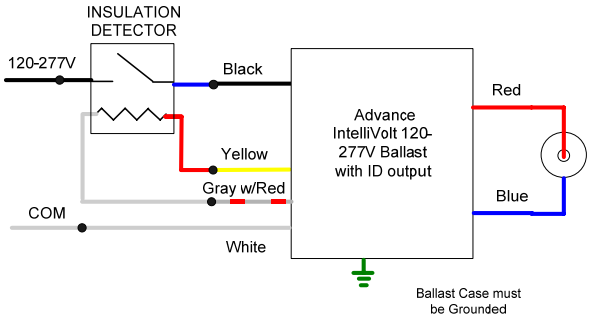
DIMENSIONS AND DATA

Lamp Data		Input Volts	Catalog Number*	Line Current (Amps)	Input Power (W)	Ballast Factor	Max THD (%)	Min Power Factor	Wiring Dia	Figure	Weight (lb)	Max Distance to Lamp (ft)
Number	Watts											
100W Watt Lamp, ANSI Code M90, M140 Minimum Starting Temp -30°C/-20°F												
1	100	120	IMH100-A-xxx-ID	0.96	115	1.0	15	0.9	8	A	1.5	5
		277		0.42	113							

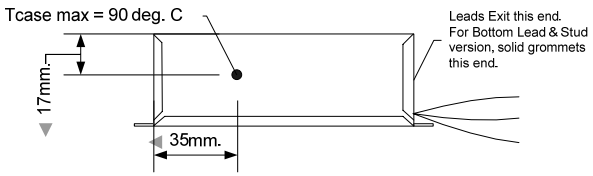
Figure A



CASE LENGTH = 4.72" [120mm]
MOUNTING LENGTH = 5.20" [132mm]
MOUNTING WIDTH = 2.87" [73mm]
OVERALL LENGTH = 5.51" [140mm]
CASE WIDTH = 3.62" [92mm]
HEIGHT = 1.50" [38mm]



Wiring Diagram 8



Case Temperature Measurement Location

Ballast will not operate if Insulation Detector is Absent, Shorted or Failed Open

INSTALLATION & APPLICATION NOTES:

1. Use with any Thermal Protector having equivalent resistive value 5k to 25k ohm (4 wire versions only)
2. Open Circuit voltage across ID output approx 270VDC
3. Maximum allowable case temperature is 90°C. See figure above for measurement location
4. Ignition pulse is 4 kV max
5. All leads are 12 inches long
6. Ballast output will shutdown after 20 minutes if lamp fails to ignite
7. Power must be cycled off – then on, after replacing lamp

***Ordering Information**

Order Suffix	Description
-BLS	Ballast with bottom exit leads and mounting studs

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

Advance • 10275 West Higgins Road • Rosemont, Illinois 60018-5603 • (847) 390-5000 • fax: 847-390-5109 • www.advancetransformer.com

A DIVISION OF PHILIPS ELECTRONICS NORTH AMERICA CORPORATION

9/29/06

Date: _____ Type: _____

Firm Name: _____

Project: _____

eW Graze Powercore

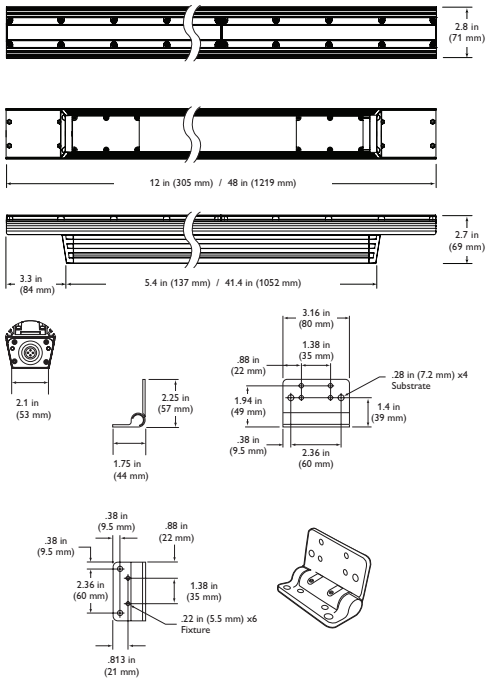
2700 K, 10° x 60° Lens

Linear, white LED surface light for wall washing and grazing

eW® Graze Powercore is a linear lighting fixture optimized for surface grazing and wall-washing applications requiring high-quality white light. Featuring Powercore® technology, eW Graze Powercore processes power directly from line voltage, eliminating the need for low-voltage, external power supplies. Available in 2700 K or 4000 K color temperatures, eW Graze Powercore offers superior illumination quality and dramatic energy savings for new installations and retrofit upgrades. Combining a space-efficient, low-profile aluminum housing and flexible mounting options allows for discrete placement within a wide range of compact architectural details

.• Tailor light output to specific applications — eW Graze Powercore is available in 1 ft and 4 ft exterior-rated housings, with 10° x 60° and 30° x 60° beam angle options.

- High-performance illumination and beam quality — eW Graze Powercore offers superior beam quality for striation-free saturation as close as 6 in (152 mm) from fixture placement. With a 60° horizontal beam angle, eW Graze Powercore accommodates end-to-end or incremental placement without visible light scalloping between fixtures.
- Supports new applications for white light— Long-life LEDs (50,000 hours at 50% lumen maintenance) significantly reduce or eliminate maintenance problems, allowing the use of white lighting in spaces where bulb maintenance may be limited or unfeasible.
- Universal power input range — eW Graze Powercore accepts line voltage input of 100, 120, 220 – 240, and 277 VAC.
- Versatile installation options — Constant torque, locking hinges offer simple position control from various angles, without special tools. The low-profile extruded aluminum housing accommodates installation within wide-ranging architectural niches.
- "Cool lighting" functionality — eW Graze Powercore fixtures do not heat illuminated surfaces, discharge infrared radiation or emit ultraviolet light.
- Dimming capable — Patented DIMand™ technology offers smooth dimming capability with standard ELV-type dimmers.
- Trouble-free, code-compliant installation — IP66, UL wet location ratings. UL / cUL, FCC, CE, RoHS, WEEE certified.



For detailed product information, please refer to the eW Blast Powercore Product Guide at www.colorkinetics.com/ls/essentialwhite/ewgraze/

PHILIPS

Specifications

Due to continuous improvements and innovations, specifications may change without notice.

Item	Specification	1 ft	4 ft
Output	Beam Angle	10° x 60°	
	Color Temperature	2700 K (+375 / -300)	
	Lumens†	404	1616
	Efficacy (Lm/W)	27.9	
	Mixing Distance	6 in (152 mm) to uniform beam saturation	
	Lumen Maintenance‡	100,000+ hours L_{70} @ 25° C 50,000 hours L_{70} @ 50° C	
Electrical	Input Voltage	100 / 120 / 220 – 240 / 277 VAC	
	Power Consumption	14.5 W maximum at full output, steady state	58.0 W maximum at full output, steady state
Control		Commercially available ELV control dimmers	
Physical	Dimensions *(Height x Width x Depth)*	2.7 x 12 x 2.8 in (69 x 305 x 71 mm)	2.7 x 48 x 2.8 in (69 x 1219 x 71 mm)
	Weight	2.7 lb (1.2 kg)	10.8 lb (4.9 kg)
	Housing	Extruded anodized aluminum	
	Lens	Clear polycarbonate	
	Fixture Connectors	Integral male / female waterproof connectors	
	Mounting	Multi-positional, constant torque locking hinges	
	Temperature	-40° – 122° F (-40° – 50° C) Operating -4° – 122° F (-20° – 50° C) Startup	
	Humidity	0 – 95%, non-condensing	
	Fixture Run Lengths*	88 – 110 VAC 97 – 120 VAC 180 – 220 VAC 197 – 240 VAC	*Configuration:* *1 ft (305 mm) fixtures installed end-to-end, 20 A circuit, standard 50 ft (15.2 m) Leader Cable*
Certification and Safety	Certification	UL / cUL, FCC Class A, CE, RoHS, WEEE	
	LED Class	Class 2 LED product	
	Environment	Dry / Damp / Wet Location, IP66	

† Lumen measurement complies with IES LM-79-08.

‡ L_{70} = 70% maintenance of lumen output. (When light output drops below 70% of initial output.)

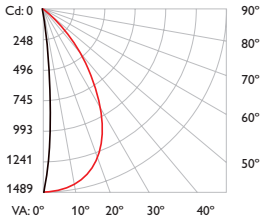
*These figures, provided as a guideline, are accurate for this configuration only. Changing the configuration can affect the fixture run lengths.

OPTIBIN® CKTECHNOLOGY | POWERCORE® CKTECHNOLOGY | DIMAND® CKTECHNOLOGY

Photometrics

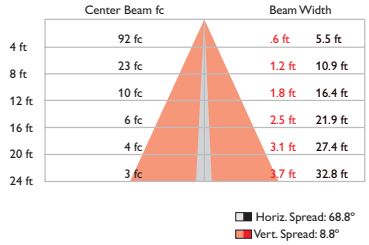
2700 K, 1 ft, 10° x 60° lens

Polar Candela Distribution



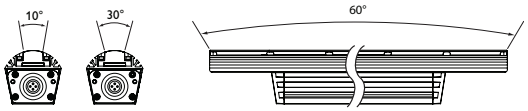
	0	22.5	44	67.5	90
0	1478	1478	1478	1478	1478
5	617	679	880	1235	1478
15	80	88	131	460	1384
25	37	43	61	139	1140
35	22	25	36	67	715
45	11	12	23	43	271
55	4	5	12	27	70
65	1	2	6	13	25
75	1	1	1	5	9
85	1	0	0	1	1
90	0	0	0	0	0

Illuminance at Distance



For lux multiply fc by 10.7

Power Consumption	14.5 W
Lumens	404
Efficacy	27.9 Lm/W



Fixtures

Item	Beam Angle	Voltage	Size	Item Number	Philips 12NC
eW Graze Powercore, 2700 K	10° x 60°	120 VAC	1 ft	523-000030-00	910503700276
			4 ft	523-000030-02	910503700278
		277 VAC	1 ft	523-000030-08	910503700284
			4 ft	523-000030-10	910503700286
		220 – 240 VAC	1 ft	523-000030-16	910503700292
			4 ft	523-000030-18	910503700294
		100 VAC	1 ft	523-000030-24	910503700300
			4 ft	523-000030-26	910503700302

Use Item Number when ordering in North America.

Accessories

Item	Type	Size	Item Number	Philips 12NC
Leader Cable	UL / cUL	50 ft (15.2 m)	108-000041-00	910503700320
	CE		108-000041-01	910503700320
Jumper Cable	UL / cUL	End-to-End	108-000039-00	910503700314
		1 ft (305 mm)	108-000039-01	910503700315
		5 ft (1.5 m)	108-000039-02	910503700316
	CE	End-to-End	108-000040-00	910503700317
		1 ft (305 mm)	108-000040-01	910503700318
		5 ft (1.5 m)	108-000040-02	910503700319

Philips Color Kinetics
3 Burlington Woods Drive
Burlington, Massachusetts 01803 USA
Tel 888.Full.RGB
Tel 617.423.9999
Fax 617.423.9998
www.colorkinetics.com

DAS-000009-01 R01 02-09

Mitre – M3

 DATE TYPE

Wall Sconce

Updated: 01/2009

- Full cutoff.
- Forward throw reflector.
- Egress applications.
- Cast 356 aluminum construction.
- Molded memory retentive silicone gaskets.
- Vandal resistant
- EISA compliant
- IP65 rated
- Powder coat finish in 13 standard colors with a polymer primer sealer

Architectural Area Lighting
14249 Artesia Blvd | La Mirada | CA 90638
P 714.994.2700 | F 714.994.0522 | aal.net

EISA compliant fixtures
architectural arealighting
EFFICIENT EFFECTIVE ECO-FRIENDLY

Fixture	Options	Color
1	2	3

1. FIXTURE

❑ **M3-CF** Wall sconce with 120 thru 277 volt electronic ballast for use with a 26, 32, or 42 watt 4 pin compact fluorescent lamp. Specify wattage.

2. OPTIONS

❑ BBU Battery backup powers a compact fluorescent lamp for up to 90 minutes during a power failure. Output of the 26 watt lamp will be 450 lumens. Output of the 32 watt lamp will be 575 lumens. Output of the 42 watt lamp will be 750 lumens.

3. COLOR

❑ AWT	Arctic White
❑ BLK	Black
❑ MTB	Matte Black
❑ DGN	Dark Green
❑ DBZ	Dark Bronze
❑ WRZ	Weathered Bronze
❑ BRM	Metallic Bronze
❑ VBL	Verde Blue
❑ CRT	Corten
❑ MAL	Matte Aluminum
❑ MDG	Medium Grey
❑ ATG	Antique Green
❑ LGY	Light Grey
❑ RAL/PREMIUM COLOR	Provide a RAL 4 digit color number
❑ CUSTOM COLOR	Please provide a color chip for matching

SOLD TO	PO #	JOB NAME	Approvals

Architectural Area Lighting
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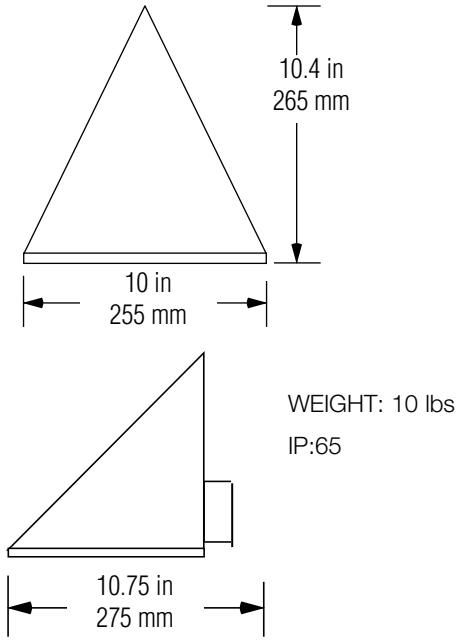
Specifications



HOUSING

The fixture shall be one-piece cast 356 aluminum with a minimum wall thickness of .188 inch. The housing shall mount over a 3 ¾ inch octagonal wall box. The lens is clear DR acrylic, sealed to the housing with a silicone gasket. The fixture is relamped by loosening four captive stainless steel fasteners.

The optical assembly shall consist of a die formed, specular Alzak® reflector with forward throw optics. The reflector is easily removed for easy access to the ballast.

The ballast shall be electronic, rated for -18°C starting with a 4 pin, 26, 32 or 42 watt lamp socket. The ballast is factory mounted and wired in the housing.

The fixture is attached with two stainless steel screws to an adapter ring that mounts to a 3 3/4 inch octagonal wall box. Adapter ring and hardware are included. Fixture is available in the down position only.

FINISH

Fixture finish consists of a five stage pretreatment regimen with a polymer primer sealer, oven dry off and top coated with a thermoset super TGIC polyester powder coat finish. The finish shall meet the AAMA 605.2 performance specification which includes passing a 3000 hour salt spray test for corrosion resistance.

EISA COMPLIANCE

AAL is 100% committed to complying with EISA requirements. All applicable products manufactured for sale in the United States after January 1, 2009, will meet EISA requirements.

ENVIRONMENTAL COMMITMENT

AAL has always provided efficient, effective and environmentally sound outdoor lighting fixtures. In addition to our every day environmental practices, AAL is the first lighting manufacturer to become CARBON NEUTRAL. Becoming CARBON NEUTRAL is just another step we have taken to promote environmental responsibility within our culture.

CERTIFICATION

The fixture is listed with ETL for outdoor, wet location use, UL1598 and Canadian CSA Std. C22.2 NO.250. IP=65

WARRANTY

Fixture is warranted for three years. Ballast components carry the ballast manufacturer's limited warranty.

Architectural Area Lighting
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DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

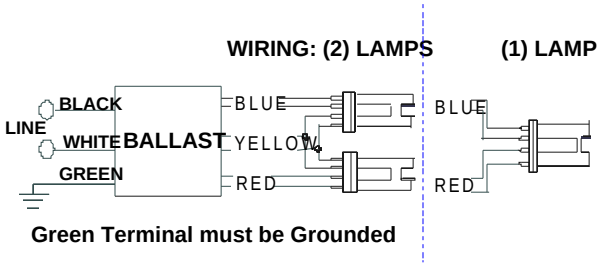
PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ26W/G24Q	1	26	0/-18	0.23	27	1.00	10	0.98	1.7	3.70
CFQ26W/G24Q	2	26	0/-18	0.43	51	1.00	10	0.98	1.7	1.96
* CFTR26W/GX24Q	1	26	0/-18	0.24	29	1.10	10	0.98	1.7	3.79
CFTR26W/GX24Q	2	26	0/-18	0.45	54	1.00	10	0.98	1.7	1.85
CFTR32W/GX24Q	1	32	0/-18	0.31	36	0.98	10	0.98	1.7	2.72
CFTR42W/GX24Q	1	42	0/-18	0.38	46	0.98	10	0.98	1.7	2.13

Wiring Diagram



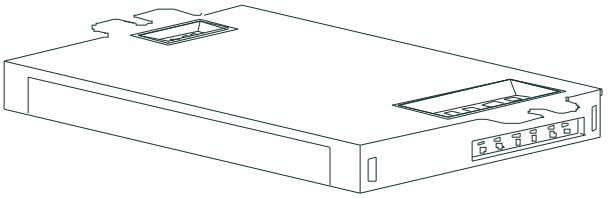
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/10/2007

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance

Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power

2.3 Ballast shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor for primary lamp as follows: 0.85 for linear lamps or 1.0 for CFL lamps.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature for primary lamp as follows: 0°F/-18°C for CFL lamps or 50°F/10°C for standard T12 lamps and 60°F/16°C for energy-saving T12 lamps.

2.11 Ballast shall provide Lamp EOL Protection Circuit for CFL lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast for CFL lamps shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Consumer (Class B) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a three-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70°C for RELB models or 85°C for RCF models.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 09/10/2007

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iLIGHT
INTELLIGENT CONTROLS

TC-1

Astronomical Time Clock

Features

- Astronomical time clock including day, date, sunrise, sunset functions
- Scene selection and programming
- Channel level raise and lower
- Task / sequence programming
- Scene and channel naming
- Designed and manufactured to IS09001:2000 standards

Overview

Surface mounting electronic time clock with astronomical facility and LCD display. Fully programmable using iCANtools™ for daily or date specific events. Connects to iCAN™ network. Keyboard allows scene selection and event functions to be enabled / disabled.

The iCAN TimeClock enables the user to have the following functions; astronomical time clock, scene programming and scene selection into one simple control panel.

www.coopercontrol.com
203 Cooper Circle,
Peachtree City, GA 30269
P: 800-553-3879
F: 800-954-7016

Catalog#	Project
Prepared by	Date

COOPER Controls

iLIGHT
INTELLIGENT CONTROLS

TC-1

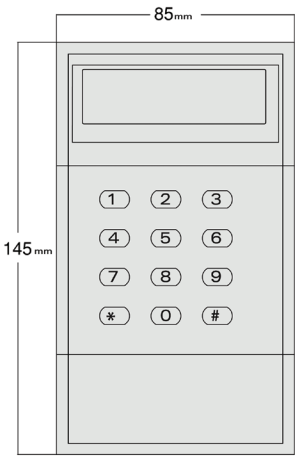
Astronomical Time Clock

Technical Specification

Mechanical

Weight: 1 kg
Operating temperature: +2ºC to +40ºC
Note: All enclosures must be adequately ventilated
Max storage temperature: +60ºC
Humidity: +5 to 95% non-condensing
Environmental protection: IP20

Dimensions



Electrical

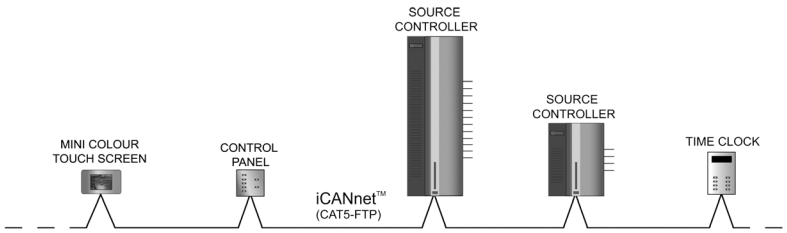
Supply:
+12VDC (via iCANnet™ cable)

Termination:
iCANnet CAT5: Screw terminals within two part connectors, able to accept 1.5mm2 stranded and solid wire.
Programming and configuration
Programming via iCANtools.

Functionality
Select scenes
Scene programming
Channel level raise and lower
Scene and channel naming
Task / sequence programming
Time clock
Date range - recurring events
One shot events
Leap year
Daylight saving setting
Astronomical timeclock with offset facility
Date / day omission
Photocell / motion sensor interaction
Diagnostics - network

Memory:
FLASH memory to be able to upgrade firmware
EEPROM for 128 scene memory

Typical Schematic



Voltage		Standards
	PELV ☑	
	Limited current/ Limited voltage ☑	
	(wire as Class 2 wiring)	

This product conforms to one of more of the above standards. Please contact your local Cooper Controls representative for further information

www.coopercontrol.com
203 Cooper Circle,
Peachtree City, GA 30269
P: 800-553-3879
F: 800-954-7016

COOPER Controls

COLOR KINETICS

PHILIPS

iCOLOR COVE EC

The iColor® Cove EC fixture is a Chromasic-driven, low-profile light in the iColor Series, and is designed for accent, perimeter, or cove lighting where lower light intensity and lower costs are desired. iColor Cove EC offers an economical way to bring subtle color-changing light and lighting effects to alcoves, task areas, accent areas, and other tight spaces.

iColor Cove EC is driven by the Color Kinetics® Chromasic® chip. Chromasic is a microchip that integrates power, communication, and control that enables the iColor Cove EC system to lower the cost of digital LED control, making it an affordable alternative for edge and alcove lighting.

The sleek, low-profile design of the iColor Cove EC allows for mounting in small areas, and the easy through-hole mounting feature and in-line power and data connection reduces the installation time. A mounting track is available for linear installations. Each fixture projects a soft-edge strip of light at a 120° by 120° beam angle and comes in fixed lengths of seven (7) and twelve (12) inches.

Power and data are daisy chained from fixture to fixture simplifying installation and making curves and complicated geometry easy to install. Power and data are supplied by PDS-60ca 24V and sPDS-60ca 24V. Both are dedicated Color Kinetics power/data supplies which is available with Ethernet control and DMX512 control. The PDS-60ca 24V is also available with pre-programmed effects. Each power/data supply supports thirty 7-inch or 12-inch fixtures and the compact size allows for discrete installations.

iCOLOR COVE EC SPECIFICATIONS

COLOR RANGE	64 billion (32-bit) additive RGB colors; continuously variable intensity output range
BEAM ANGLE	120° by 120°
SOURCE	15 LEDs (12-inch), 9 LEDs (7-inch) Red, Green, and Blue
HOUSING	Rigid plastic housing
LISTINGS	UL/cUL, CE certified, pending

COMMUNICATION SPECIFICATIONS

DATA INTERFACE	Color Kinetics Chromasic data interface system
CONTROL	Ethernet, DMX512 or stand-alone

ELECTRICAL SPECIFICATIONS (LIGHTS)

POWER REQUIREMENTS	24VDC
POWER CONSUMPTION	2W Max. at full intensity (full RGB)
POWER SUPPLY	Color Kinetics PDS-60ca 24V (Item # 109-000016-00/01/02) and sPDS-60ca 24V DMX/Ethernet (Item # 109-000021-02)

ENVIRONMENTAL SPECIFICATIONS

TEMPERATURE RANGE	-4°F to 122°F (-20°C to 50°C) based on testing of specific product

LED SOURCE LIFE

In traditional lamp sources, lifetime is defined as the point at which 50% of the lamps fail. This is also termed Mean Time Between Failure [MTBF]. LEDs are semiconductor devices and have a much longer MTBF than conventional sources. However, MTBF is not the only consideration in determining useful life. Color Kinetics uses the concept of useful light output for rating source lifetimes. Like traditional sources, LED output degrades over time (lumen depreciation) and this is the metric for SSL lifetime.

LED lumen depreciation is affected by numerous environmental conditions such as ambient temperature, humidity, and ventilation. Lumen depreciation is also affected by means of control, thermal management, current levels, and a host of other electrical design considerations. Color Kinetics systems are expertly engineered to optimize LED life when used under normal operating conditions. Lumen depreciation information is based on LED manufacturers' source life data as well as other third party testing. Low temperatures and controlled effects have a beneficial effect on lumen depreciation. Overall system lifetime could vary substantially based on usage and the environment in which the system is installed.

Temperature and effects will affect lifetime. Color Kinetics rates product lifetime using lumen depreciation to 50% of original light output. When the fixture is running at room temperature using a color wash effect, the lifetime is in the range of 30,000-50,000 hours. This is based on LED manufacturers' test data. For more detailed information on source life, please see www.colorkinetics.com/lifetime.

OPTIBIN®

There are inherent variations in the fabrication processes of all semiconductor materials. For LEDs, this variance results in differences in the color and intensity of light output as well as electrical characteristics. Due to these differences, LED manufacturers sort production into "bins," but insuring the availability of a single bin is very difficult. To minimize this issue and achieve optimal color consistency in its products, Color Kinetics has developed and uses a proprietary technology called Optibin. Optibin is an advanced production binning optimization process that minimizes the effects of LED variance for the best possible output uniformity in the final product. Color Kinetics Optibin technology gives the most consistent control of color and intensity from product to product.

CHROMACORE® BY COLOR KINETICS

CHROMASIC® BY COLOR KINETICS

OPTIBIN® BY COLOR KINETICS

DRY

CE c UL us LISTED 78GF

ITEM# 101-000022-00 (12-inch)
101-000022-01 (7-inch)

BRO126 Rev 06

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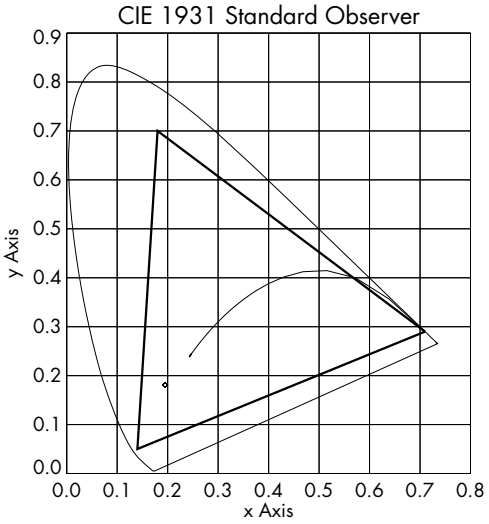
iCOLOR COVE EC — 7”

PHOTOMETRIC PERFORMANCE

SOURCE SPECIFICATIONS

Optics:	Clear polycarbonate
Source:	9 LEDs (3 Red, 3 Green, 3 Blue)
Beam Angle:	120° x 120° (at 50% of peak illuminance)
Distribution:	Symmetric direct illumination
CCT:	Adjustable 1,000–10,000K
CRI:	Not measurable (CIE 13.3-1995)

GAMUT



White point shown by diamond.

ILLUMINANCE DISTRIBUTION

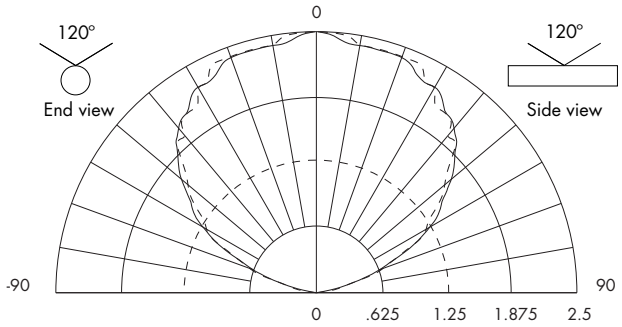
0.2 / 2.2	0.3 / 3.2	0.4 / 4.3	0.4 / 4.3	0.3 / 3.2	0.2 / 2.2
0.3 / 3.2	0.6 / 6.5	0.9 / 9.7	0.9 / 0.9	0.6 / 3.2	0.3 / 3.2
0.4 / 4.3	0.9 / 9.7	1.6 / 17.2	1.6 / 17.2	0.9 / 9.7	0.4 / 4.3
0.4 / 4.3	0.9 / 9.7	1.6 / 17.2	1.6 / 17.2	0.9 / 9.7	0.4 / 4.3
0.3 / 3.2	0.6 / 6.5	0.9 / 9.7	0.9 / 0.9	0.6 / 3.2	0.3 / 3.2
0.2 / 2.2	0.3 / 3.2	0.4 / 4.3	0.4 / 4.3	0.3 / 3.2	0.2 / 2.2

1.5’/0.5m (top) 0’/0m (middle) 1.5’/0.5m (bottom)

1.5’/0.5m 0’/0m 1.5’/0.5m

Units:	Footcandles/Lux
Measured on:	White
Distance from surface:	1’/.3m (from center of grid)
Multipliers:	0.41 Red, 0.23 Green, 0.36 Blue

CANDLE POWER DISTRIBUTION



End View (solid line) and side view (dashed line) (Candelas)

Measured on:	White
Beam center:	2.5 cd
Thin dashed lined:	Indicates 50% of peak
Multipliers:	0.41 Red, 0.23 Green, 0.36 Blue

ILLUMINANCE

COLOR	3’ / 1m	6’ / 2m	9’ / 3m	15’ / 5m
WHITE	0.3 / 3.0	0.1 / 0.7	0.0 / 0.3	0.0 / 0.1
RED	0.1 / 1.2	0.0 / 0.3	0.0 / 0.1	0.0 / 0.0
GREEN	0.1 / 0.7	0.0 / 0.2	0.0 / 0.1	0.0 / 0.0
BLUE	0.1 / 1.1	0.0 / 0.3	0.0 / 0.1	0.0 / 0.0

Measured in Footcandles/Lux on axis.

TYPICAL LIGHT OUTPUT

COLOR	TOTAL OUTPUT (LUMENS)	POWER (WATTS)	EFFICACY (lm/W)
WHITE	7.0	2.0	3.5
RED	2.8	0.8	3.7
GREEN	1.6	0.8	2.1
BLUE	2.5	0.8	3.3

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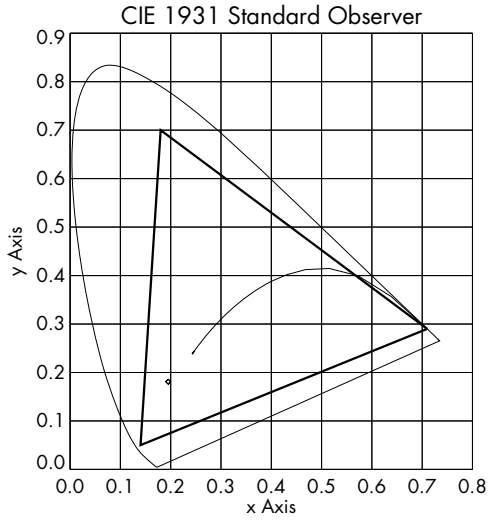
iCOLOR COVE EC — 12”

PHOTOMETRIC PERFORMANCE

SOURCE SPECIFICATIONS

Optics:	Clear polycarbonate
Source:	15 LEDs (5 Red, 5 Green, 5 Blue)
Beam Angle:	120° x 120° (at 50% of peak illuminance)
Distribution:	Symmetric direct illumination
CCT:	Adjustable 1,000–10,000K
CRI:	Not measurable (CIE 13.3-1995)

GAMUT



White point shown by diamond.

ILLUMINANCE DISTRIBUTION

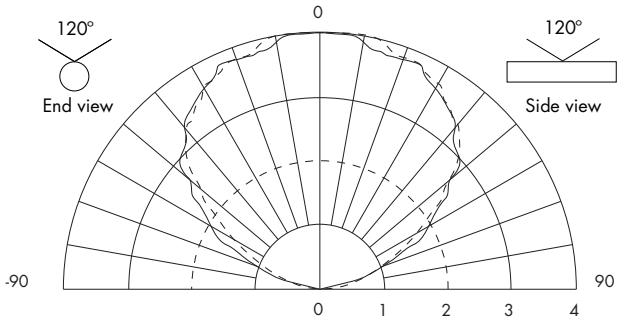
0.2 / 2.2	0.4 / 4.3	0.6 / 6.5	0.6 / 6.5	0.4 / 4.3	0.2 / 2.2
0.4 / 4.3	0.9 / 9.7	1.4 / 15.1	1.4 / 15.1	0.9 / 9.7	0.4 / 4.3
0.6 / 6.5	1.4 / 15.1	2.4 / 25.8	2.4 / 25.8	1.4 / 15.1	0.6 / 4.3
0.6 / 6.5	1.4 / 15.1	2.4 / 25.8	2.4 / 25.8	1.4 / 15.1	0.6 / 4.3
0.4 / 4.3	0.9 / 9.7	1.4 / 15.1	1.4 / 15.1	0.9 / 9.7	0.4 / 4.3
0.2 / 2.2	0.4 / 4.3	0.6 / 6.5	0.6 / 6.5	0.4 / 4.3	0.2 / 2.2

1.5′/0.5m (top) 0′/0m (middle) 1.5′/0.5m (bottom)

1.5′/0.5m 0′/0m 1.5′/0.5m

Units:	Footcandles/Lux
Measured on:	White
Distance from surface:	1′/.3m (from center of grid)
Multipliers:	0.44 Red, 0.19 Green, 0.38 Blue

CANDLE POWER DISTRIBUTION



End View (solid line) and side view (dashed line) (Candelas)

Measured on:	White
Beam center:	3.8 cd
Thin dashed line:	Indicates 50% of peak
Multipliers:	0.44 Red, 0.19 Green, 0.38 Blue

ILLUMINANCE

COLOR	3′ / 1m	6′ / 2m	9′ / 3m	15′ / 5m
WHITE	0.4 / 4.5	0.1 / 1.1	0.0 / 0.5	0.0 / 0.2
RED	0.2 / 2.0	0.0 / 0.5	0.0 / 0.2	0.0 / 0.1
GREEN	0.1 / 0.9	0.0 / 0.2	0.0 / 0.1	0.0 / 0.0
BLUE	0.2 / 1.7	0.0 / 0.4	0.0 / 0.2	0.0 / 0.1

Measured in Footcandles/Lux on axis.

TYPICAL LIGHT OUTPUT

COLOR	TOTAL OUTPUT (LUMENS)	POWER (WATTS)	EFFICACY (lm/W)
WHITE	11.0	2.0	5.6
RED	4.8	0.8	6.2
GREEN	2.1	0.8	2.7
BLUE	4.1	0.8	5.4

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COLOR KINETICS

PHILIPS

sPDS-60ca 24V

Color Kinetics® sPDS-60ca 24V intelligent, indoor, power/data supply is specifically designed for Color Kinetics 24 volt Chromasic® fixtures. sPDS-60ca 24V is a robust 62W power source with a DMX interface. It is used for installations using a DMX controller such as iPlayer 2, ColorDial, or a third party DMX controller. The DMX data driver conditions the supplied data to a format compatible with the fixtures. The integration of power and data simplifies wiring installation, and the selection of control configurations expands the versatility of the applications.

Push buttons on the front panel of sPDS-60ca 24V allow you to select the base address for each power supply, thus eliminating the need for additional addressing tools. After the base address has been selected, each light can be sequentially addressed or all lights can be set to a single address. All functions can be monitored from the LED display located on the front panel.

sPDS-60ca 24V is housed in a compact enclosure designed for use in dry locations and complies with National Electrical Code (NEC) requirements. The data drive circuitry has been specifically designed with short circuit protection to prevent failures due to incorrect wiring or installation.

sPDS-60ca 24V automatically accommodates supply voltages ranging from 100VAC to 240VAC using a standard IEC cable. All product and data connections are made to the external panels to shorten installation time. sPDS-60ca 24V allows the DMX data to be daisy-chained through the RJ45 terminals from one supply to the next.

FEATURES

- Economical
- Compact size
- Ease of installation
- DMX ready
- Robust 62W power source
- Indoor rated

sPDS-60ca 24V SPECIFICATIONS

POWER INPUT	100VAC to 240VAC auto ranging (50Hz–60Hz),
MAX CURRENT	1.7A at 100V, 1.5A at 120V, .75A at 240V Power factor correction (PFC)
POWER OUTPUT	24VDC (62W Max.)
HEAT DISSIPATION	25 percent of total power input
AMBIENT OPERATING TEMP	14°F to 122°F (-10°C to 50°C)
HOUSING	Overall dimensions: 8.8" (22.4 cm) X 4" (10.2 cm) X 2" (5.1 cm) Weight: 2.0 lbs (907 g)
CONNECTORS	Data: RJ45 input and output connectors Power: 4-pin output connectors, IES power connector
DATA INPUT INTERFACE	Color Kinetics DMX controllers or DMX512 compatible
DATA OUTPUT INTERFACE	Chromasic 24V
LISTINGS	UL/C-UL, CE

DRY

CE c UL us LISTED 78GF

ITEM# 109-000021-00 (DMX)

BR0167 Rev 00

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iColor Tile FX 2:2

Lens sold separately

iColor® Tile FX 2:2 is a Chromacore®-powered colored light panel that can be individually or collectively controlled to create stunning light art or accent lighting in a variety of surface mounted or recessed applications. iColor Tile FX 2:2 is a base unit for indoor applications and is ideal for wall and ceiling installations. Use iColor Tile FX 2:2 with an iColor Tile FX 2:2 Lens (sold separately) for an elegant, finished appearance, or install the base unit behind a custom panel. The iColor Tile 2:2 Lens is an impact-resistant, translucent white diffuser that provides seamless, uniform optical effects across its entire surface.

Each iColor Tile FX 2:2 panel has 144 individually addressable nodes, each driven by Chromasic® technology that integrates power, communication, and control to enable an infinite variety of effects. The ability to address each node individually provides a level of fine-grained control and intricacy never before available for show authoring. Each iColor Tile FX 2:2 has a 20 ft (6 m) leader cable from the power / data supply to the panel.

iColor Tile FX 2:2 receives power and data from a PDS-60ca 7.5V or sPDS-480ca 7.5V power / data supply. The PDS-60ca 7.5V is available with Ethernet / DMX512 control or a pre-programmed effects version. The sPDS-480ca 7.5V is an Ethernet-only power / data supply.

SPECIFICATIONS

COLOR RANGE	64 billion additive RGB colors; continuously variable intensity output range
SOURCE	432 LEDs packaged in 144 tri-color Red, Green, and Blue nodes
SOURCE LIFE	50,000 hours L_{50} @ 50°C*
HOUSING	Sheet metal
DIMENSIONS	23.5 x 23.5 x 4.125 in (597 x 597 x 105 mm) with lens
WEIGHT	22.5 lb (10.2 kg) Tile 5 lb (2.3 kg) Lens
TEMPERATURE	-4° – 122° F (-20° – 50° C)
HUMIDITY	0 – 95%, non-condensing
ENVIRONMENT	Indoor / Dry Location
LENS	Impact resistant copolyester with carbon steel mounting hardware.
CERTIFICATION	UL / cUL, CE
DATA INTERFACE	Philips full-line of controllers
CONTROL	Ethernet, DMX512, or Preprogrammed
CONNECTOR	3-wire, 18 AWG power / data cable
INPUT VOLTAGE	7.5 VDC
POWER USAGE	62 W maximum at full intensity

** L50 = 50% maintenance of Lumen Output (when light output drops below 50% of initial output). Complies with LM-79-08.*

iColor Tile FX 2:2 Item # 101-000019-00

iColor Tile FX 2:2 Lens Item # 101-000044-00

POWER / DATA SUPPLY	PDS-60ca 7.5V	Item # 109-000015-00 (pre-programmed) Item # 109-000015-03 (DMX / Ethernet)
	sPDS-480ca 7.5V	Item # 109-000022-00 (Ethernet)

BRO-000125 Rev 07

Specifications subject to change without notice.
Refer to www.colorkinetics.com for the most recent version.

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Tel 888.Full.RGB
Tel 617.423.9999
Fax 617.423.9998
www.colorkinetics.com

PHILIPS

iCOLOR TILE FX 2:2

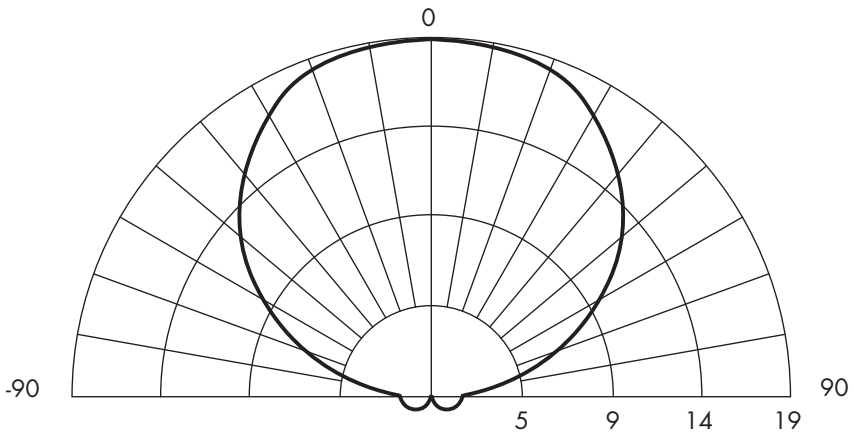
PHOTOMETRIC PERFORMANCE

Photometric data is based on test results from an independent testing lab.

SOURCE SPECIFICATIONS

Lens:	White copolyester diffuser
Source:	144 Tri-color LED nodes
Beam Angle:	120° (50% maximum)
Distribution:	Symmetric direct illumination
CCT:	Adjustable 1,000–10,000K
CRI:	Not measurable (CIE 13.3-1995)

CANDELA DISTRIBUTION



LUMINANCE DATA IN CANDELA/SQ METER

Angle in Vertical	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	51	50	51
55	49	48	49
65	47	47	47
75	40	40	40
85	33	33	33

Note: iColor Tile FX is a direct view product. As a result, the measurements are luminance-based. Units are candela/meters^2 (nits).

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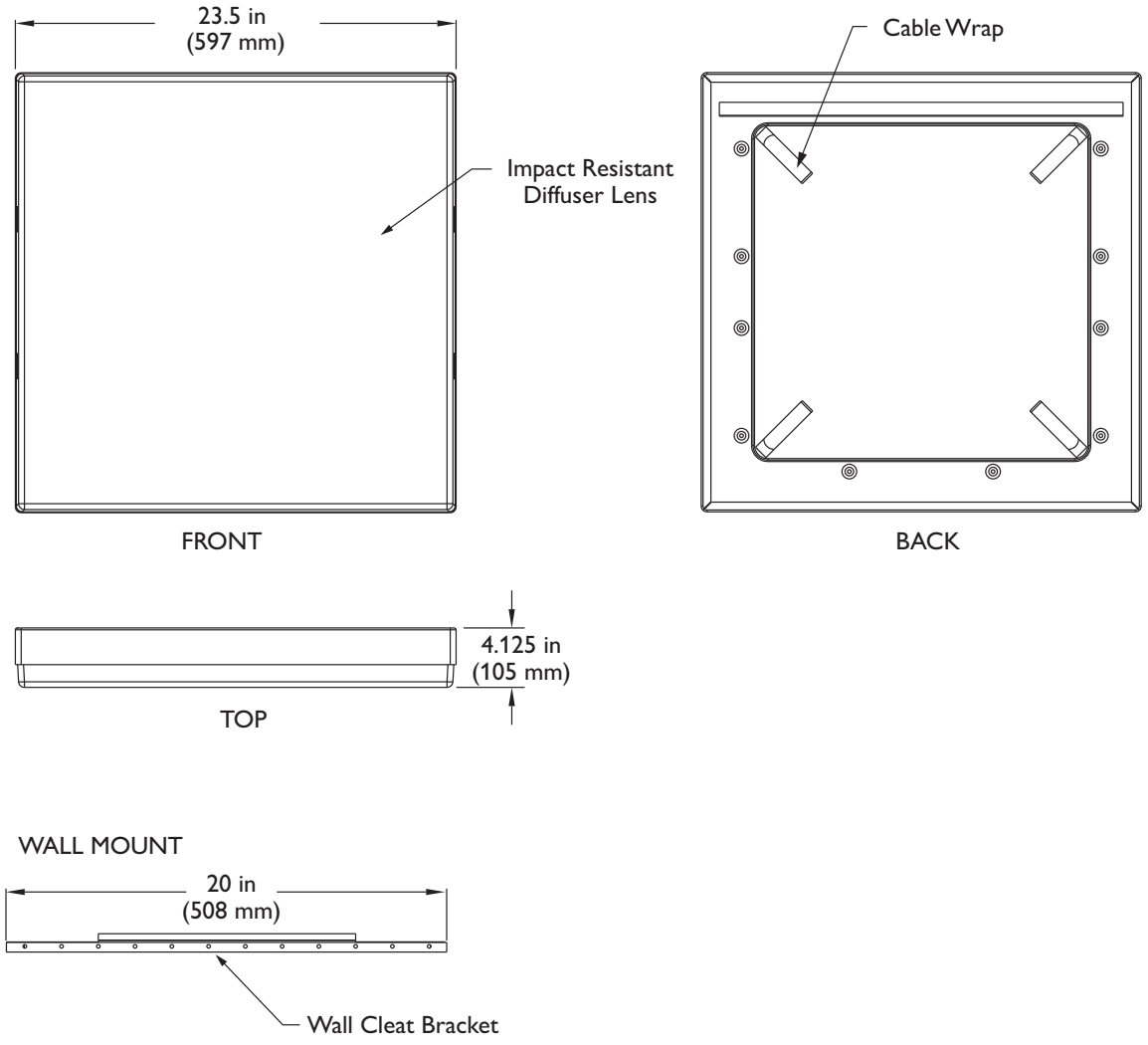
iCOLOR TILE FX 2:2

Physical Dimensions



iColor Tile FX 2:2
Item # 101-000019-00

OPTIBIN®

There are inherent variations in the fabrication processes of all semiconductor materials. For LEDs, this variance results in differences in the color and intensity of light output as well as electrical characteristics. Due to these differences, LED manufacturers sort production into "bins," but insuring the availability of a single bin is very difficult. To minimize this issue and achieve optimal color consistency in its products, Philips Solid-State Lighting Solutions has developed and uses a proprietary technology called Optibin. Optibin is an advanced production binning optimization process that minimizes the effects of LED variance for the best possible output uniformity in the final product. Optibin technology gives the most consistent control of color and intensity from product to product.

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Date: _____ Type: _____

Firm Name: _____

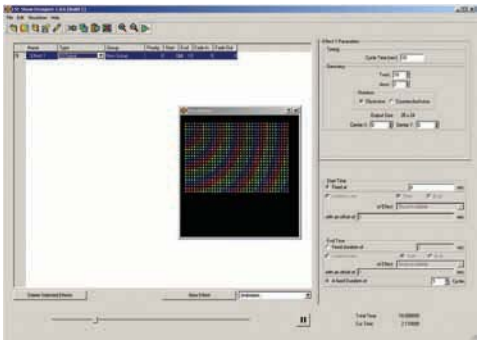
Project: _____

Light System Manager

Versatile control and authoring for large-scale lighting installations

Optimized for medium and large-scale LED lighting installations, Light System Manager controller (LSM) is an integrated hardware and software solution comprising Light System Engine (LSE) controller hardware and Light System Composer (LSC) creative design software. With support for intricately designed installations containing thousands of LED nodes, Light System Manager offers the versatility to manage wide-ranging architectural, entertainment, and retail lighting environments.

- Easy to use — Featuring Ethernet-based control and automatic lighting system discovery, Light System Manager dramatically simplifies installation.
- Hardware support for medium and large environments — The Light System Engine controller processes light output data for up to 10,000 LED nodes, or 5,000 individual fixtures.



- Packaged with Light System Composer — Light System Composer software allows you to create and manage dynamic light shows with fully customizable effects, multi-layer editing, and unique color palettes. You can design shows with single or multiple color-changing effects, animated images, geometric patterns, and more.
- Versatile zone usage — Configure and control multiple playback zones, each with up to unique light show assignments. Light System Manager allows zone control of both indoor and outdoor fixtures within a single installation.
- Simplified control access — Designed for use with LSM, Ethernet Controller Keypad is a wall-mounted triggering device that controls light shows and fixture brightness at the touch of a button. LSM supports up to 10 keypads within a single lighting installation.
- Automatic playback control — Configure show scheduling based on a specific date, a day of the week, weekdays, weekends, or an astronomical event, such as sunrise or sunset.
- Support for IntelliWhite® lighting fixtures — Light System Manager offers visual effects with color temperature and intensity settings designed specifically for IntelliWhite white light fixtures.
- Supports the optional AuxBox expansion device — AuxBox automatically triggers up to eight light shows using any remote triggering device with a dry-contact closure. Via the AuxBox, you can trigger light shows by motion sensors, 3rd party control or sensor systems, and more.

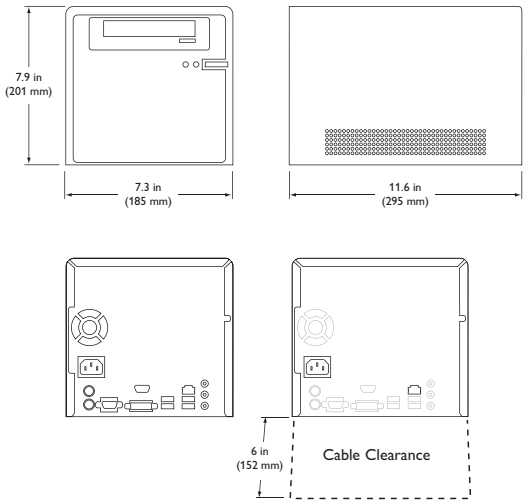
For detailed product information, please refer to the Light System Manager Product Guide at: www.colorkinetics.com/ls/controllers/lsm/

PHILIPS

Specifications

Due to continuous improvements and innovations, specifications may change without notice

Item	Specification	Details
Electrical	Input Voltage	100 – 220 VAC, auto-switching
Capability	Supported LED nodes or fixtures	Up to 10,000 LED nodes, or 5,000 individual fixtures*
	Network Data	KiNET™ Ethernet protocol via standard Ethernet switch**
	Playback Output	Light shows containing one or more visual effects
Physical	Dimensions (Height x Width x Depth)	7.9 x 7.3 x 11.6 in (201 x 185 x 295 mm)
	Weight	9.3 lb (4.2 kg)
	Operating Temperature	32 – 95° F (0° – 35° C)
	Operating Humidity	0 – 90%, relative humidity, non-condensing
Certification and Safety	Certification	FCC, CE, ETL, TUV, C-Tick, BSMI
	Environment	Indoor / Dry location



* LSE supports up to 10,000 Chromasic® nodes, or up to 5,000 individual Chromacore® fixtures.

** Use PoE (Power over Ethernet) compatible Ethernet switches, or PoE injectors, when installing a lighting system containing one or more Ethernet Controller Keypads.

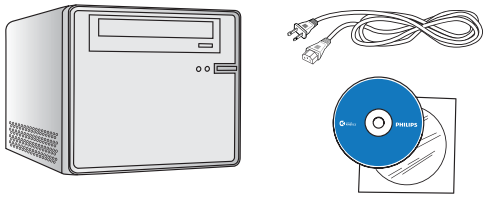
Software Requirements

System Requirements	Specification	PC	Mac
OS		Windows® XP / Vista	Mac OS X 10.4.9 or greater
Hardware	Optical Drive	CD-ROM or DVD drive	CD-ROM or DVD drive
	Memory	256 MB RAM	256 MB RAM
	Disk space	10 MB free disk space	10 MB free disk space

Light System Manager and Accessories

Item	Item Number	Philips 12NC
Light System Manager	103-000015-02	910503700221
Ethernet Controller Keypad	103-000023-00	910503700326
PoE Injector (North America Power Cord)	109-000029-00	910503700383
PoE Injector (Europe Power Cord)	109-000029-01	910503700384
AuxBox	103-000021-00	910503700224

Use Item Number when ordering in North America.



Included in the Box

Light System Manager
Power cable
Software CD

For detailed product information, please refer to the Light System Manager Product Guide at: www.colorkinetics.com/ls/controllers/lsm/

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Tel 617.423.9999
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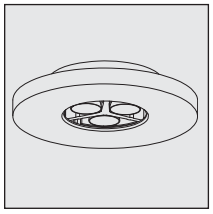
DAS-000035-01 R00 03-09

PUKLED™

LPK-ALED *WITH HIDDEN FASTENERS*

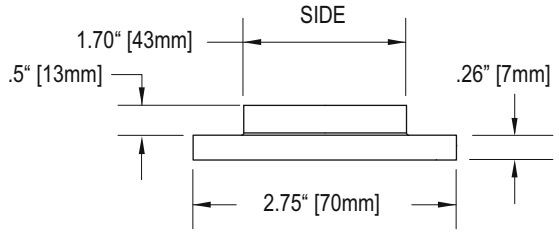


PROVISIONAL PRODUCT SPECIFICATION

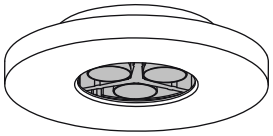
Cat. No.	Description
LPK-ALED-*	12VAC PukLED with hidden fasteners
LPK-ALED-SM-*	12VAC PukLED with hidden fasteners for surface mount
LPK-ALED-WET-*	12VAC PukLED with hidden fasteners for wet location

* - *Specify* A *(Clear Anodized Aluminum);* B *(Black Anodized Aluminum);* W *(Matte White)*

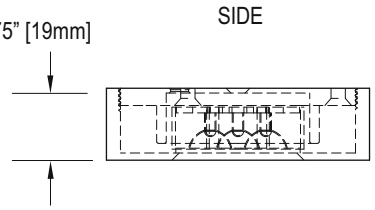
RECESSED



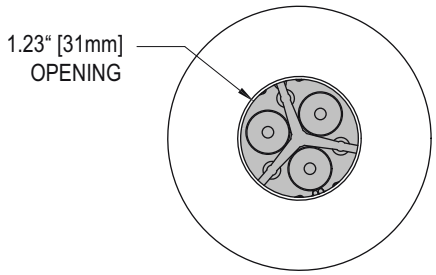
ASYMMETRICAL



SURFACE MOUNT



BOTTOM



GENERAL DESCRIPTION

Low voltage, small scale, white light LED luminaire *without visible fasteners for concealed mounting* suitable for interior and exterior dry and damp locations. 3300°K standard color temperature, optional cool white 4700°K available .Will accept one effects element in addition to a color gel with a soft focus lens standard.

*Lens is sealed on wet location fixtures.

MOUNTING

May be recessed into a 1.750” (44.45mm) diameter hole in a .75” (19mm) thick panel. #4 Phillips flathead wood screws provided. Surface Mount version available for non-recess applications.

MATERIAL

Fixture body in machined from aluminum alloy.

FINISH

Matte White, Clear Anodized, or Black Anodized.

LABEL

ETL Listed
IP65
CE

ELECTRICAL

350ma, 3.2w fixture is prewired with 18 AWG 10’ (3m) lead. Maximum recommended run length is 30 feet with 18 AWG wire (consult factory for custom lengths).

To be powered by PSA-60-12H Hardwire (Dimmable) or PSA-60-12P Plug-In or any class II 12VAC power supply. (*Power supply must be ordered separately*). Up to 18 fixtures may be powered by PSA-60-12H, PSA-60-12P in conjuction with optional PSA-DB distribution box, or any 60w Class II 12VAC power supply in conjunction with optional PSA-DB distribution box.

ACCESSORIES

Trim may be accessorized with one effects device: Clear Glass Lens (CGL-5), Soft Focus Lens (SFL-5), Warm Tone Lens (WTL-5), Spread Glass Lens (SGL-5), and Honeycomb Louvre (HCL-5). Optional color gels can be used in combination with other effects devices.

WARRANTY

Manufacturer’s one year warranty of product is conditional upon use of manufacturer supplied power supply.

LUCIFER LIGHTING COMPANY
3750 IH35 North
San Antonio, TX 78219
Phone: 210 227-7329
Fax: 210 227-4967
luciferlighting.com

Job Name Here	Fixture Type Here	Ordering Information Here

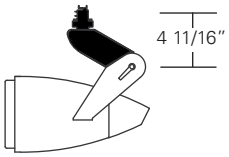
MT615 SERIES • 120/277V • T6

This breakthrough design delivers focused, intense light over exceptionally long distances, making it ideal for large spaces requiring long, focused throws.

- Designed for the extremely efficient 150 watt T6 Ceramic Metal Halide lamp with G12 base
- Can be configured for use on 120V or 277V systems
- High strength die cast aluminum construction
- Ratchet handle for vertical focusing and self-locking swivel for horizontal focusing
- On/off safety switch (on most mounting types)
- Accessory cartridge front holds up to three size-C LSI filters and accessories while controlling spill light and glare
- Computer designed specular reflector
- Rear relamping for accurate focus maintenance
- Integral Pyrex safety shield
- Extruded aluminum ballast housing with integral 120V or 277V thermally protected electronic ballast for 150 watt Metal Halide lamp. (9 1/16"H x 5 3/4"W x 2 5/8"D)
- Finishes: LSI Black, White, Silver and Graphite
- Fixture weight: 8.5 LB
- c UL us IBEW

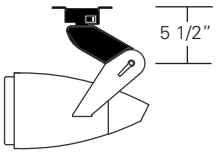
MOUNTING OPTIONS

MT615-00
Lexan Fitting for 1 and 2 circuit LSI Track. With on/off switch.

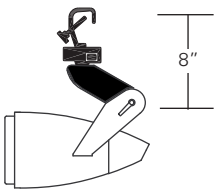


MT615-00F
Same as above, with fuse.

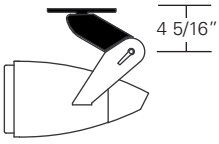
MT615-2G
Universal fitting for Unistrut Systems and any screw or bolt-up applications. With switch, 6-foot 3-wire grounding cord and plug.



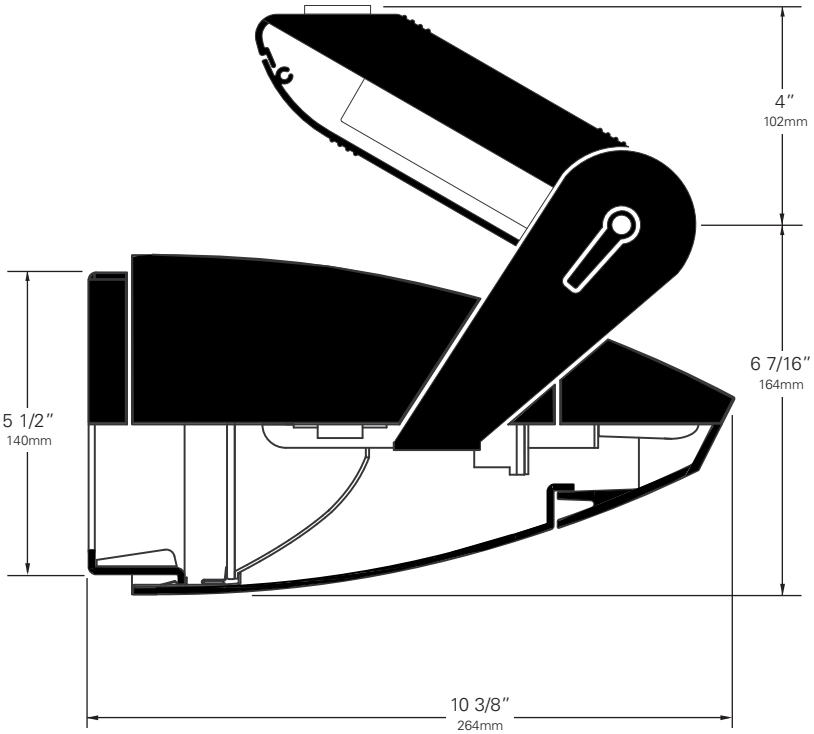
MT615-3G
C-clamp for pipes from 5/8" to 2" O.D. With switch, 6-foot 3-wire grounding cord and plug.



MT615-5A
Canopy for permanent mounting on standard 4" octagonal outlet box.



Other Options (Consult Factory):
- Stems, specify length
- Custom color, RAL palette



ORDERING INFORMATION

1. Select your **Mounting Option.**
2. If a 277V unit is required, add **V** before the unit number.
3. Choose other fixture **Options** (add suffix):
   - For Coiled Cord, add **CC**

   Coiled Cord is 18/3 105ºC, 18" retracted, 6 foot extended. White fixtures are supplied with white cord, all other finishes are supplied with black cord. Available only with **2G**, **3G** and **4G** mounting options. (When a coiled cord is not specified, a straight cord is provided.)
4. Choose a **Finish** for your fixture:
   Black (**B**) White (**W**) Silver (**S**) Graphite (**G**)

   Example: V (277 VOLT) MT615 (FIXTURE) — 2G (FITTING) CC (COILED CORD) B (FINISH)

   Blue fields are optional. Leave blank if not required.
5. Don't forget your **Accessories!**
   LSI features the widest range of accessories in the industry to help you modify the light's intensity, color, texture and pattern.

T6 LAMPS

Watts	Initial Lumens	
150	14000	CDM150/T6/830
150	14000	CMH150/T/U/830/G12

Click for detailed photometrics

BALLAST TYPE (Electronic)

ANSI Specification	M142
Maximum Input Current	120/1.14A, 277/.61A
Input Power	120/168W, 277/168W
Power Factor	>95%
THD	<10%, Nominal 6%

ACCESSORIES

Glass Color Filters C
Selection of 95 permanent rimmed dichroic, and rimmed and slotted standard colors.

Other accessories:

- **Louver C**
- **Hood CMT**
- **Hood Sparkle CMT**
- **Cross Baffle CMT**
- **Delta Baffle CMT**
- **Spread Lenses C990, C992, C995, C996**
- **Beam Softener C998**
- **Light Blocking Screens C801S, C802S, C803S**
- **OPTIVEX™ UV Filter C962**

Click for complete accessories and descriptions

MasterColor CDM-T 150W/830 T6 1CT

Product family description
Range of single-ended T6 high-efficiency ceramic metal halide lamps with a stable color over lifetime and a crisp, sparkling light.

Features / Benefits

- Excellent color rendering.
- Superior color stability over life within +- 200K.
- Lamp to lamp color consistency over life.
- Higher lumen maintenance than standard metal halide.
- Warm (3K) or fresh white (4K) color impression.
- High lamp efficacy (up to 93 lumens per watt) for energy saving and low heat.
- Universal operating position.
- Compact lamp dimensions for high beam intensities.
- FadeBlock for reduced fading risks.
- No shut off required in 24-hour-a-day/7-day-a-week operations (relamp fixtures at or before the end of rated life).
- Long lamp life compared to incandescent and halogen lamps.

Applications

- Accent and General lighting in retail, offices and public buildings. Decorative outdoor: floodlighting and pedestrian areas.

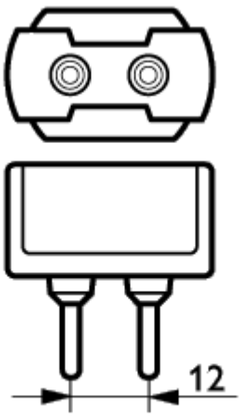
Notes

- Requires a ballast specified or approved for Philips Metal Halide lamp or one designed to the indicated ANSI Standard. A pulse ignitor is required. Sockets and wiring must withstand starting pulse. (391)
- Supply volts must be +/- 5% of rated ballast line volts for reactor type and +/- 10% for CWA or electronic ballasts. (392)
- UV filtered design (FadeBlock™). (396)
- Operate only on thermally protected ballasts (397)
- MasterColor® Metal Halide Lamps are not recommended for use on dimmers and are not warranted if used on dimmer systems. (401)
- Rated average life is the life obtained, on the average, from large representative groups of lamps in laboratory tests under controlled conditions at 10 or more operating hours per start. It is based on survival of at least 50% of the lamps and allows for individual lamps or groups of lamps to vary considerably from the average. For lamps with a rated average life of 24,000 hours, life is based on survival of 67% of the lamps. (351)
- Approximate lumen values listed are for vertical operation of the lamp. (352)
- Means Lumens is the approximate lumen output at 40% of lamp rated average life. (353)
- Heat resisting glass bulb.

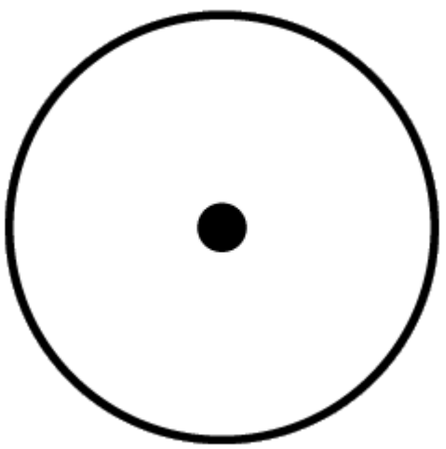
PHILIPS

Product data	
Product Number	232728
Full product name	MasterColor CDM-T 150W/830 T6 1CT
Ordering Code	232728
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677232726
EAN2US	
Case Bar Code	50046677232721
Successor Product number	
Base	G12
Bulb	T6 [Diameter: 6/8 inch /19mm]
Bulb Finish	Clear
Operating Position	Universal [Any or Universal (U)]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Ordering Code	CDM150/T6/830
Pack UPC	046677232726
Case Bar Code	50046677232721
ANSI Code HID	M142/E
System Power EL	167 W
Watts	150W
Lamp Wattage EL	150 W
Lamp Voltage	96 V
Dimmable	No
Color Code	830 [CCT of 3000K]
Color Rendering Index	85 Ra8
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature	2950 K
Initial Lumens	14000 Lm
Initial Lumens	14000 Lm
Design Mean Lumens	- Lm
Overall Length C	110 mm
Diameter D	20 mm
Light Center Length L	2.21875 in
Max Overall Length (MOL) - C	4.34375 in
Diameter D	0.75 in
Product Number	232728

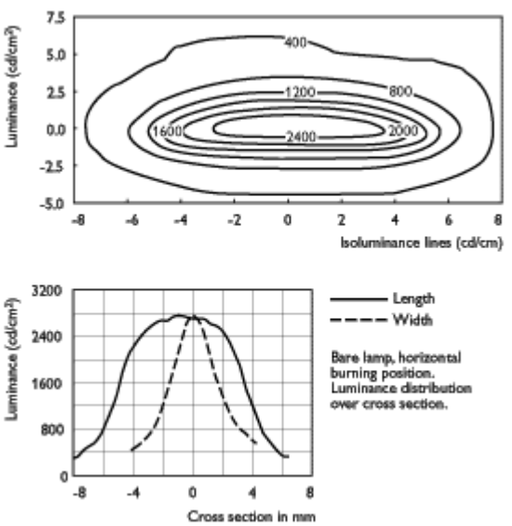
CDM-T 150W/830/942 G12



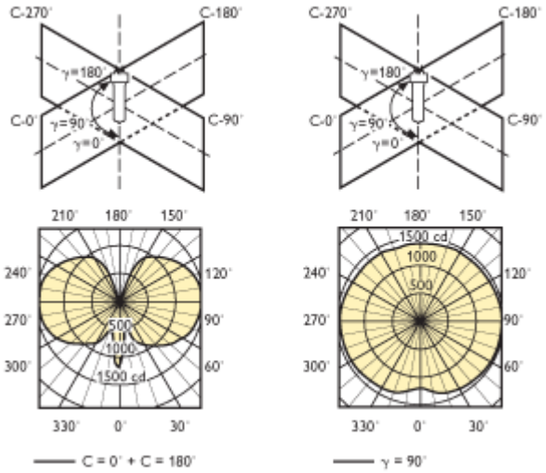
Base G12



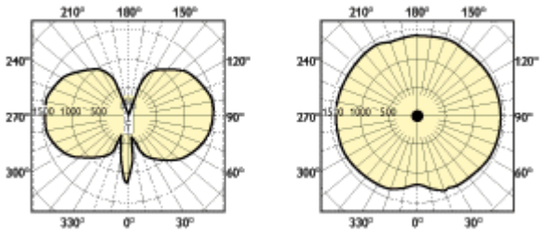
Operating Position Universal



CDM-T 150W



CDM-T 150W/830



CDM-T 150W

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on electronic & electromagnetic gear

CDM-T 150W/830

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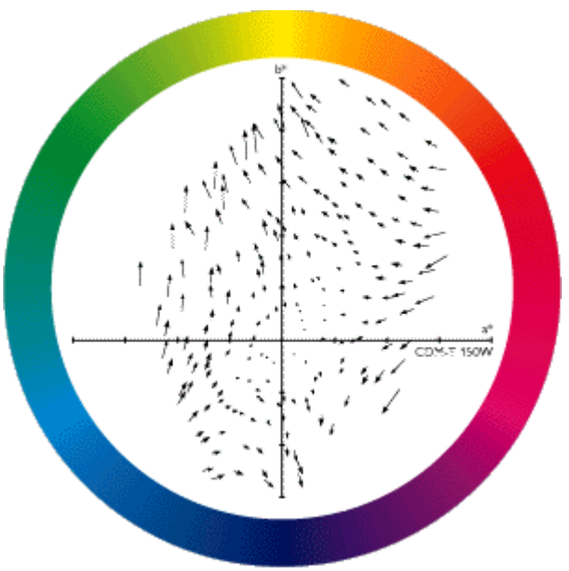
on electronic & electromagnetic gear

CDM-T 150W/830



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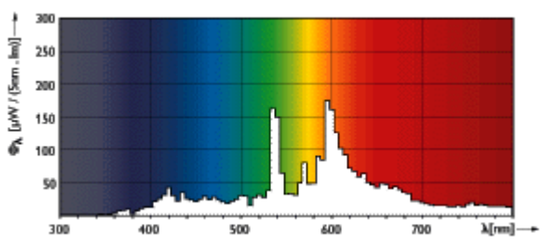
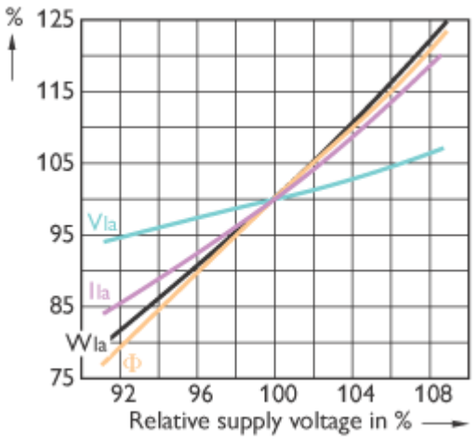


CDM-T/830



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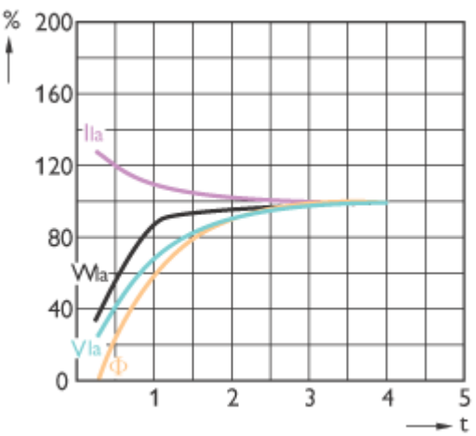
on electronic & electromagnetic gear

CDM-T 150W/830

CDM-T/830



CDM-T/830/842/942

	C	C	D	D	L	L
Full product name	Max	Max	Max	Max	Min	Min
MASTERColour CDM-T 150W/830 G12 CL	110	110	20	20	55	55

	L	L	L	L	O	O
Full product name	Nom	Nom	Max	Max	Min	Min
MASTERColour CDM-T 150W/830 G12 CL	56	56	57	57	8.67	8.67

Ballerup

compact fluorescent

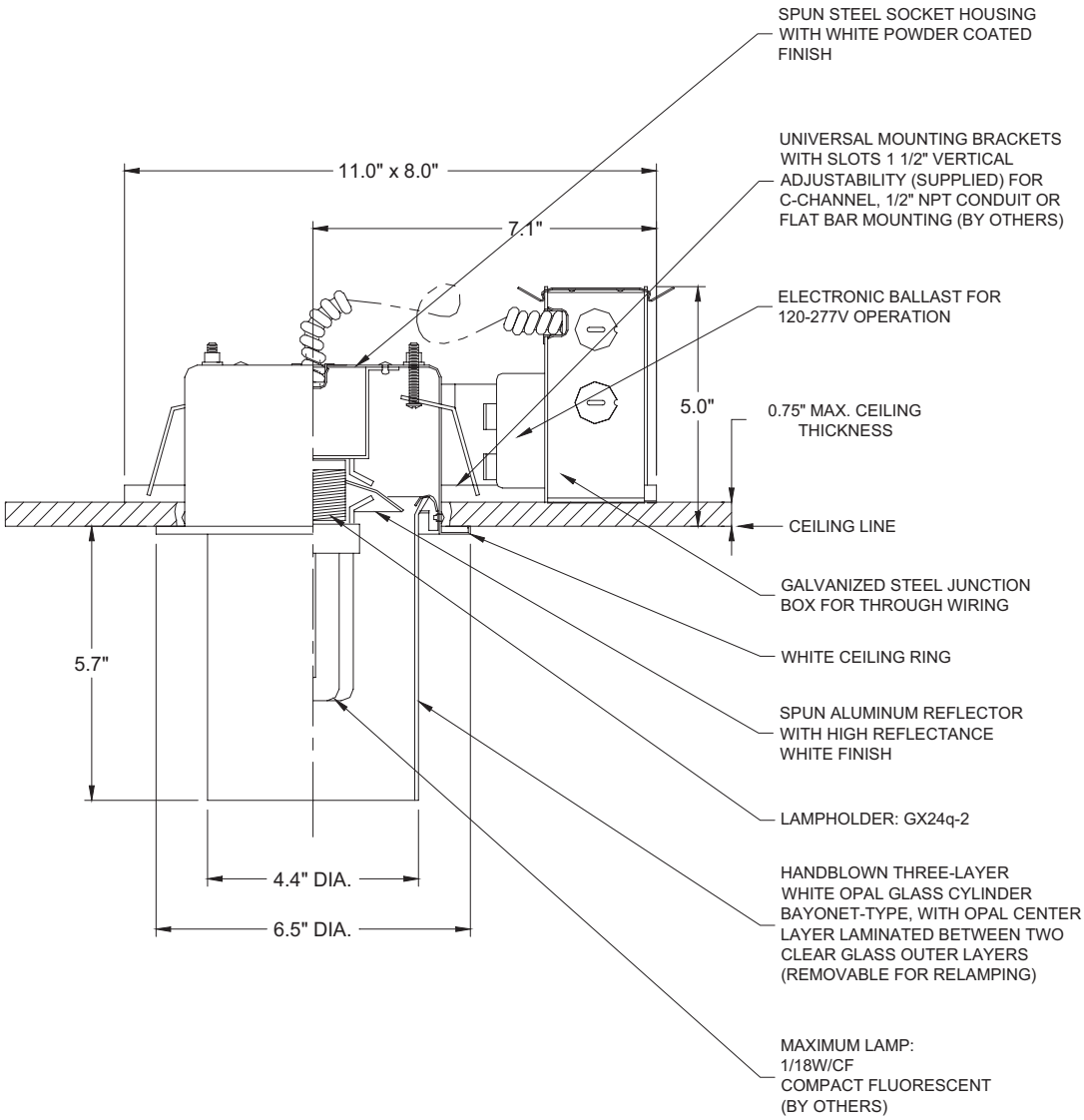
Design: C. J. Nørgaard Pedersen
and P. Hougaard Nielsen

Type:

Project:

Catalog Number:

NOTES:
1. SUITABLE FOR ACCESSIBLE NON-ACCESSIBLE CEILING TYPES
2. CEILING CUTOUT = 5.5" DIAMETER



louis poulsen

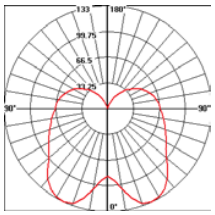
Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com

Ballerup

semi-recessed & surface

compact fluorescent



Photometric Report: BAL-1-18W-GX24Q-2.IES
Report No.: L3453
Poulsen Report No.: BAL-1-18W-GX24Q-2.IES
Luminaire: Ballerup Ceiling, Opal, Compact Fluorescent
Lamp: 1/18W/GX24Q-2
Efficiency: 86.6%
Description: All data shown are per 1000 lumens. This report can be used for calculation on all versions listed below. Use only actual lumen data when calculating.

Candlepower Distribution

Vertical Angle	Candela
0	88
5	93
10	105
25	133
40	120
55	92
70	79
85	70
90	67
120	50
150	16
180	0.1

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0-30	104	10.4	12
0-40	184	18.4	21.2
0-60	351	35.1	50.4
0-90	590	59	68.1
90-120	190	19	21.9
90-130	230	23	26.6
90-150	271	27.1	31.3
90-180	276	27.6	31.9
0-180	866	86.6	100.0

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Cavity Reflectance 20%

Ceiling Reflectance (%)	80				70				50			30			10			0
Wall Reflectance (%)	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio																		
0	97	97	97	97	91	91	91	91	81	81	81	72	72	72	63	63	63	59
1	85	79	75	70	79	75	70	66	66	62	59	58	55	53	50	48	46	42
2	76	68	61	55	71	63	57	52	56	51	47	49	45	41	42	39	37	33
3	68	58	51	44	64	55	48	42	48	43	38	42	38	34	37	33	30	27
4	62	51	43	37	58	48	41	35	42	36	32	37	32	28	32	28	25	22
5	57	45	37	31	53	43	35	30	38	31	27	33	28	24	29	25	21	19
6	52	40	32	27	49	38	31	25	34	28	23	30	25	21	26	22	18	16
7	48	36	29	23	45	34	27	22	30	24	20	27	22	18	23	19	16	14
8	45	33	25	20	42	31	24	19	28	22	18	24	19	16	21	17	14	12
9	42	30	23	18	39	28	22	17	25	20	16	22	18	14	20	16	13	11
10	39	27	21	16	36	26	20	15	23	18	14	21	16	13	18	14	11	10

Design
C. J. Nørgaard Pedersen & P. Hougaard Nielsen

Concept
Ballerup creates symmetrical down light illumination. The vertical three layer opal glass cylinder provides both the ceiling and the rest of the space with soft, diffuse illumination, with the majority of light directed downward.

Finish
White, powder coated. White opal glass.

Material
Diffuser: Handblown white opal glass. Housing: Spun steel.

Mounting
Semi-recessed: Mounting frame with two vertically adjustable brackets spaced equally at 180° to be installed prior to closing the ceiling. Ceiling types: Accessible and non-accessible ceilings. Ceiling cutout: 5.5" diameter.

Weight
Max. 10 lbs.

Label
cUL, Damp location. IBEW.

Product code	Light source	Voltage	Finish	Options
BAL	1/18W/CF GX24q-2 1/100W/A-19/CL medium	120-277V 120/277V 120V 277V	WHT	EMPK LUTRON DIMMING

Specification notes:
a. CF variants provided with one 120-277V electronic ballast.
b. Incandescent variants only available in 120V.
c. EMPK (emergency power pack) is available in dual tap 120/277V with remote mounted test switch.
d. LUTRON dimming 120V or 277V is digital dimming.

Info notes:
I. The comparable EU version has the following classification: Ingress Protection Code: IP20.

louis poulsen

Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com

DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

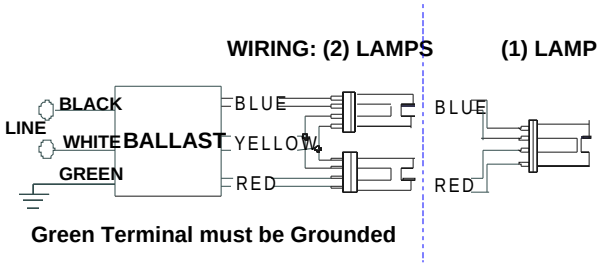
PHILIPS
ADVANCE

RCF-2S18-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ18W/G24Q	1	18	0/-18	0.16	19	1.00	10	0.98	1.7	5.26
CFQ18W/G24Q	2	18	0/-18	0.30	35	0.95	10	0.98	1.7	2.71
CFTR18W/GX24Q	1	18	0/-18	0.17	20	1.05	10	0.98	1.7	5.25
* CFTR18W/GX24Q	2	18	0/-18	0.33	39	1.05	10	0.98	1.7	2.69

Wiring Diagram



Green Terminal must be Grounded

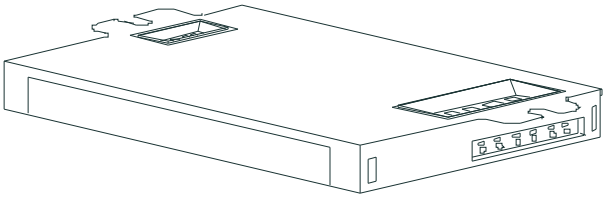
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/10/2007

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance

Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

RCF-2S18-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power

2.3 Ballast shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor for primary lamp as follows: 0.85 for linear lamps or 1.0 for CFL lamps.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature for primary lamp as follows: 0°F/-18°C for CFL lamps or 50°F/10°C for standard T12 lamps and 60°F/16°C for energy-saving T12 lamps.

2.11 Ballast shall provide Lamp EOL Protection Circuit for CFL lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast for CFL lamps shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Consumer (Class B) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a three-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70°C for RELB models or 85°C for RCF models.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 09/10/2007

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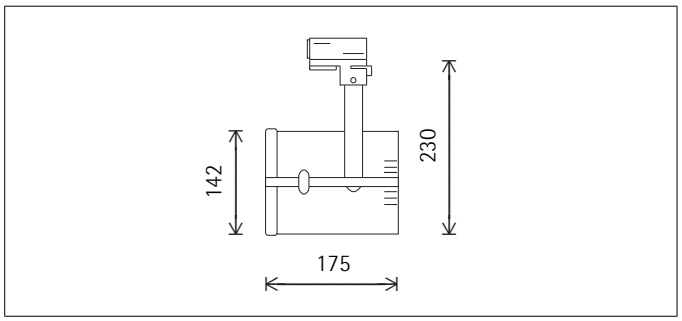
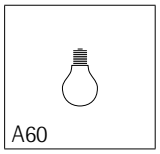
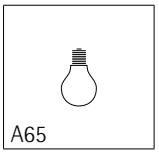
ERCO

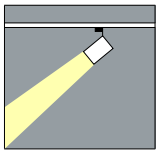
TM Spotlight

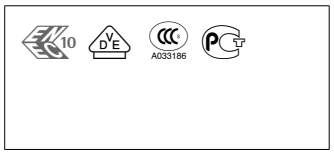
for PAR lamps and general service lamps





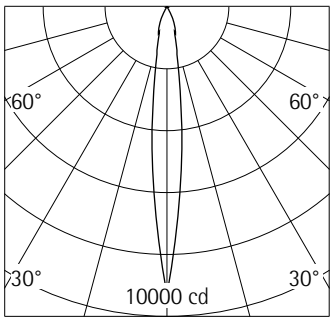






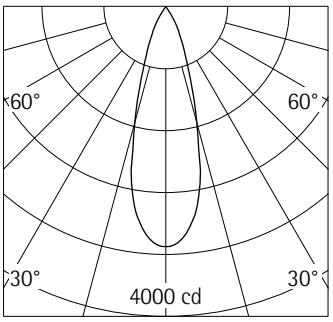
77460.000 Black
PAR38 120W 230V E27 12°
PAR38 120W 230V E27 30°
A60 100W 230V E27 1380lm
A65 150W/m 230V E27 2220lm

Product description
Housing: cast aluminium, powder-coated. 0°-90° tilt. Lateral guides for accessories. Bracket on 3-circuit adapter rotatable through 360°. ERCO 3-circuit adapter: plastic. A60 100W/m or A65 150W/m with reflector 70555.000.
Weight 1.50kg



PAR38 120W 230V E27 12°

h(m)	E(lx)	D(m) 12°
1	9300	0.21
2	2325	0.42
3	1033	0.63
4	581	0.84
5	372	1.05



PAR38 120W 230V E27 30°

h(m)	E(lx)	D(m) 30°
1	3100	0.54
2	775	1.07
3	344	1.61
4	194	2.14
5	124	2.68

Mounting
ERCO 3-circuit track
Hi-trac 3-circuit track
Monopoll 3-circuit track
1-circuit singlet

ERCO GmbH
Postfach 2460
58505 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 05.12.2008
Please download the current version from
www.erco.com/77460.000

ERCO

TM Spotlight

Planning data

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.96	0.94	0.90	0.86	0.93	0.91	0.86	0.81	0.92	0.90	0.84	0.79
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

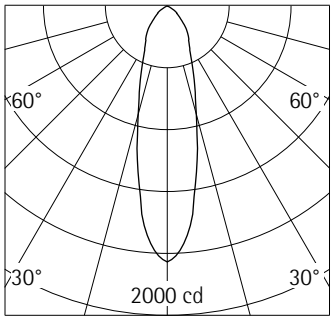
Hours of operation (h)	1000
LLMF	0.93
LSF	1

MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Lumiaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

TM Spotlight

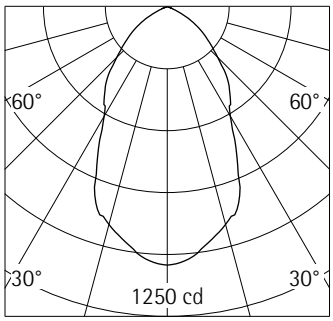
Accessories

70555.000
Reflector
for A60 100W or A65 150W.
Aluminium, silver anodised.



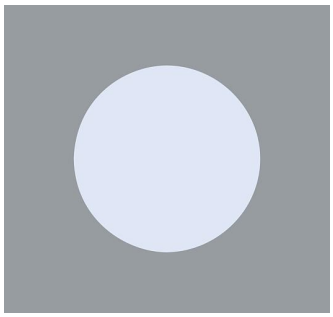
A60 100W 230V E27 1380lm

h(m)	E(lx)	D(m) 27°
1	1655	0.48
2	414	0.96
3	184	1.44
4	103	1.92
5	66	2.40

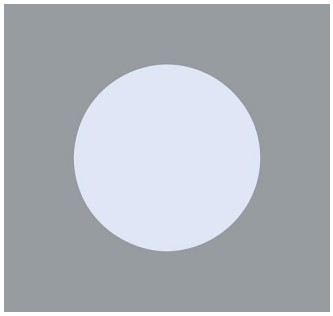


A65 150W/m 230V E27 2220lm

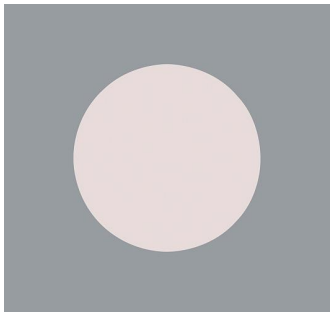
h(m)	E(lx)	D(m) 59°
1	1043	1.13
2	261	2.26
3	116	3.39
4	65	4.53
5	42	5.66



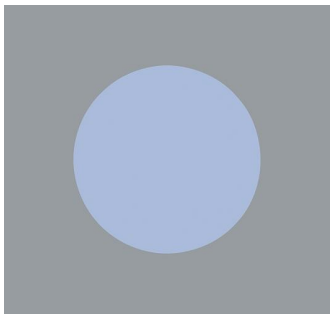
70688.000
UV filter
Only in conjunction with:
70525.000
70530.000



70689.000
IR filter
Only in conjunction with:
70525.000
70530.000

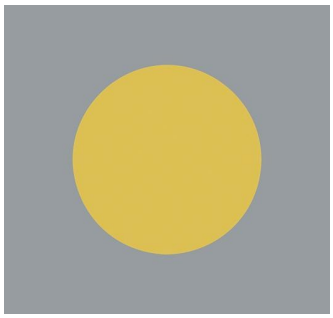


74488.000
Skintone filter
Only in conjunction with:
70525.000
70530.000

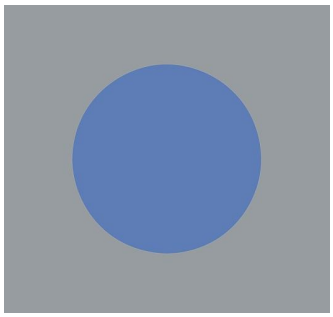


74489.000
Daylight conversion filter
Only in conjunction with:
70525.000
70530.000

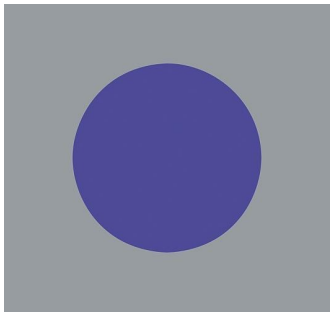
74455.000
Interference colour filter
Magenta
Only in conjunction with:
70525.000
70530.000



74456.000
Interference colour filter
Amber
Only in conjunction with:
70525.000
70530.000



74457.000
Interference colour filter
Sky blue
Only in conjunction with:
70525.000
70530.000

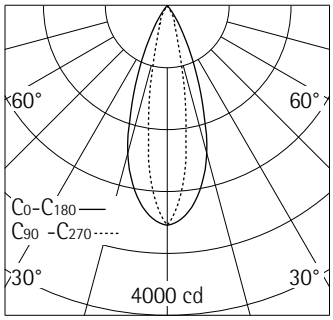


74458.000
Interference colour filter
Night blue
Only in conjunction with:
70525.000
70530.000

TM Spotlight

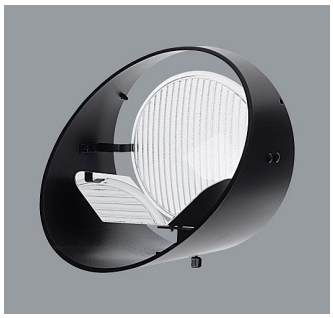
Accessories

70515.000
Sculpture attachment
Black
Metal/cast aluminium, powder-coated. Sculpture lens. Only with PAR38 Spot.



PAR38 120W 230V E27 12°

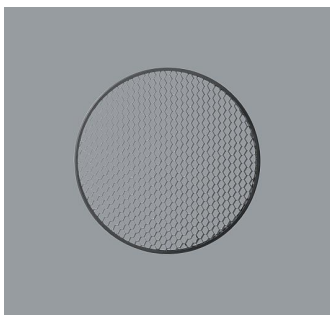
h(m)	E(lx)	D(m) C0 38°	C90 19°
1	2837	0.69	0.33
2	709	1.38	0.67
3	315	2.07	1.00
4	177	2.75	1.34
5	113	3.44	1.67



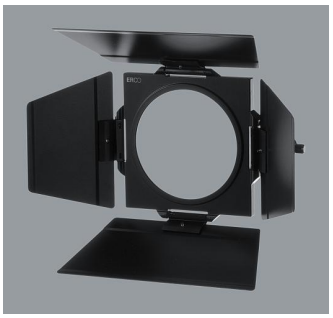
70500.000
Lens wallwasher attachment
Black
Metal/cast aluminium, powder-coated. Spread lens with reflector, aluminium, silver anodised. Only with PAR38 Flood.

70505.000
Multigroove baffle
Black
Cast aluminium, powder-coated.

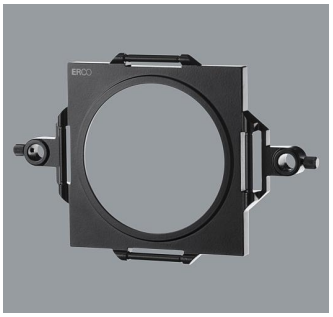
70520.000
Anti-dazzle screen
Black
Metal/cast aluminium, powder-coated.



70557.000
Honeycomb anti-dazzle screen
Metal, black.
Only in conjunction with:
70525.000
70530.000



70525.000
Filter holder
Black
with barn doors. Metal/cast aluminium, powder-coated.



70530.000
Filter holder
Black
Metal/cast aluminium, powder-coated.


PAR38


PAR38 Med Side Prong

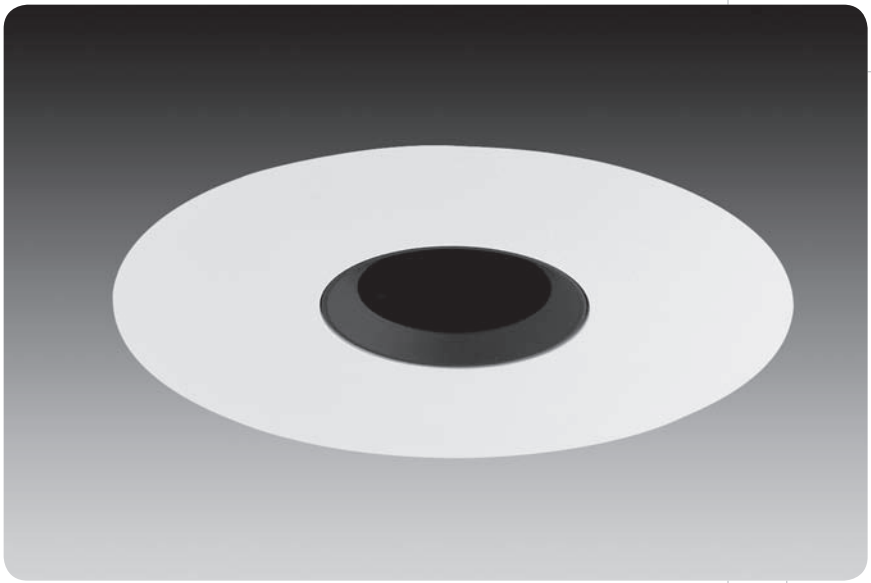
CAPSYLITE® PAR38

Suitable for use in unshielded fixtures.

Watts	Bulb	Base	Product Number	Symbols & Footnotes	Ordering Abbreviation	Volts	Pkg Qty	Beam Type	Class & Filament	Avg Rated Life(hrs)	Lumens CCT	CBCP	Beam Angle	MOL (in)
75	PAR38	E26 Med Skt	14517	★ I/O Ⓔ 43,72,118,137,181	**75PAR38/HAL/WFL50**	130	15	WFL	C,CC-8	2500	1060 2900	1300	50	5.31
			@ 120 volts, approximate 66 watts, 805 lumens, 5000 hours											
90	PAR38	E26 Med Skt	14586	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/SP9**	120	15	SP	C,CC-8	2500	1310 2925	19000	9	5.31
			15539	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/SP**	120	6	SP	C,CC-8	2500	1310 2925	19000	9	5.31
			14587	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/SP9**	130	15	SP	C,CC-8	2500	1310 2925	19000	9	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
			14580	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/WSP12**	120	15	WSP	C,CC-8	2500	1310 2925	14300	12	5.31
			14578	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/WSP12**	130	15	WSP	C,CC-8	2500	1310 2925	14300	12	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
			14601	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/NFL25**	130	15	NFL	C,CC-8	2500	1310 2925	4700	25	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
			14579	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/FL30**	120	15	FL	C,CC-8	2500	1310 2925	3500	30	5.31
			15545	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/FL**	120	6	FL	C,CC-8	2500	1310 2925	3500	30	5.31
			14577	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/FL30**	130	15	FL	C,CC-8	2500	1310 2925	3500	30	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
			14647	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/FL/CVP**	130	6	FL	C,CC-8	2500	1310 2925	3500	30	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
			14602	★ I/O Ⓔ 43,72,118,137,187	**90PAR38/HAL/WFL50**	130	15	WFL	C,CC-8	2500	1310 2925	1600	50	5.31
			@ 120 volts, approximate 79 watts, 1000 lumens, 5000 hours											
		Med Side Prong	14630	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/3WSP12**	120	15	WSP	C,CC-8	2500	1310 2925	14300	12	5.31
			14632	★ I/O Ⓔ 43,72,118	**90PAR38/HAL/3FL30**	120	15	FL	C,CC-8	2500	1310 2925	3500	30	5.31
100	PAR38	E26 Med Skt	15522	★ I/O Ⓔ 43,72,118	**100PAR38/HAL/SP9**	120	6	SP	C,CC-8	2500	1500 2950	22000	9	5.31
			15585	★ I/O Ⓔ 43,72,118	**100PAR38/HAL/FL30**	120	6	FL	C,CC-8	2500	1500 2950	4000	30	5.31
106	PAR38	E26 Med Skt	15003	★ I/O Ⓔ 43,72,118	**106PAR38/HAL/SP10**	120	15	SP	C,CC-8	2000	1800 2975	22500	10	5.31
			15001	★ I/O Ⓔ 43,72,118	**106PAR38/HAL/WFL50**	120	15	WFL	C,CC-8	2000	1800 2975	2000	50	5.31
120	PAR38	E26 Med Skt	14856	★ I/O Ⓔ 43,72,118	**120PAR38/HAL/SP10**	120	15	SP	C,CC-8	3000	1800 2950	22500	10	5.31
			14873	★ I/O Ⓔ 43,72,118	**120PAR38/HAL/SP**	120	6	SP	C,CC-8	3000	1800 2950	22500	10	5.31
			14874	★ I/O Ⓔ 43,72,118,137,197	**120PAR38/HAL/SP10**	130	15	SP	C,CC-8	3000	1800 2950	22500	10	5.31
			@ 120 volts, approximate 105 watts, 1370 lumens, 6000 hours											
			14855	★ I/O Ⓔ 43,72,118	**120PAR38/HAL/FL30**	120	15	FL	C,CC-8	3000	1800 2950	4600	30	5.31

downlight – pinhole
id®

HAL



Patent Pending

The Intelligent Downlight®

FOCAL POINT®

features

Downlight pinhole offers a parabolic 50 degree cutoff in a simple straight down aiming position.

Perfect Fit™ installation process provides seamless integration in plaster, drywall and acoustical tiles, while maintaining optics in any ceiling thickness.

Trim provides for easy relamping.

Smart Lock™ ring allows quick removal and re–assembly of trim components for field painting.

Standard white finish is field paintable.

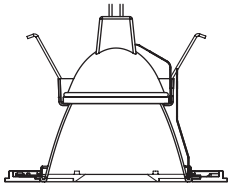
Interchangeable lamp and trim mechanisms allow for maximum flexibility, even after luminaire is installed.

trim option

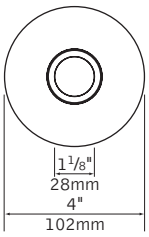
trim without black bevel

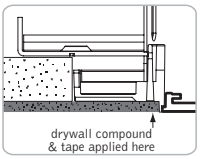
trim assembly

trim



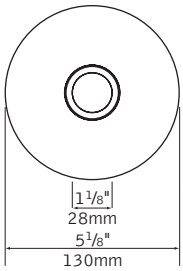
flush trim
(drywall only)

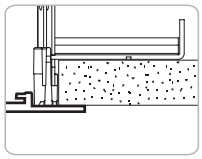




ceiling cutout dimensions:
6 3/16"

overlap trim

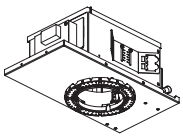




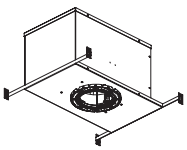
ceiling cutout dimensions:
4 11/16"

housing types

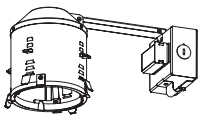
T
14" x 7.625" x 5"h



IC (air-tight)
16.5" x 10" x 9"h



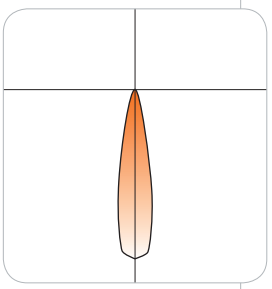
RT
11.64" x 6.59" x 5.58"h



overlap faceplate only

performance

Downlight Pinhole with Black Bevel
Q71MR16/C/NSP15
4027 cd @ 0° (0° tilt)



Visit focalpointlights.com for complete photometric data.

december 2008

fixture:

project:

housing specifications

lamp

Halogen MR16 lamp provides numerous beam options from 10° to 40°.

construction

(T) Thermally protected housing for new construction applications without direct contact with insulation. Insulation to be kept 3" away from housing. Unit is enclosed in 20ga. black painted CRS housing, which eliminates stray light into the plenum, on a 20ga. CRS frame. Housing ships standard with butterfly brackets which mount to ½ emt or channel and vertically adjust 2". Bar hangers are an option and must be specified when ordering T-rated housing. Transformer is accessible from below ceiling. Unit maybe relamped from above. Fixture will not exceed 7.5lbs.

(IC) Insulated ceiling housing for new construction applications with direct insulation contact. Unit is constructed of double wall 18ga. aluminum housing on a 20ga. CRS frame. Housing ships standard with locking bar hangers. Transformers and thermal protectors are accessible from below ceiling. Housing is gasketed and complies with ASTM E-283, air-tight energy codes. Fixture will not exceed 11lbs.

(RT) Remodel, thermally protected housing for remodel construction applications without direct contact with insulation. Insulation to be kept 3" away from housing. Unit is 20ga. black painted CRS with contoured top and hinging J-box arm. Housing locks into finished ceiling via 4 removable spring clips. J-box and transformers are accessible by removing housing from ceiling. Fixture will not exceed 4.5lbs.

electrical

Porcelain bi-pin socket with quick connection.

Acoustically isolated transformer, replaceable from below, mounted outside of housing to ensure cool operation and minimize hum. Transformers available in either electronic or magnetic 120V or 277V. For residential dimming applications, toroidal magnetic transformer is available. Large junction box with pryouts. UL listed for thru branch wiring, four #12 90°C conductors for T housing and two #14 90°C conductors for RT and IC housing.

installation

Adjustable throat allows infinite adjustment for ½" to 1⅝" thick ceilings. Shipped in ½" ceiling position. For thicker ceilings consult factory.

Ceiling thickness adjustment sleeve locks with supplied ⅝₄" hex driver.

Sleeve allows fine tuning of the housing for a perfect fit. Comes with laser/string alignment guides.

Housing ships with dust cover.

trim specifications

aesthetics

Diminutive black knife edge baffle minimizes brightness. Truncated Specular black reflector cone above ensures glare free optics. Reflector is .040" spun aluminum. Matte white finish may be used as a primer coat for field painting. Smart Lock™ ring allows disassembly for custom field painting.

optics

50° cutoff to the lamp and the lamp image.

construction

Torsion springs pull trim tight to the ceiling.

Auto Memory for relamping, keeps lamp in a straight down aiming position.

Trim stays captive to housing during relamping via torsion springs.

Tempered soft focus lens supplied as standard.

Lamp tray can hold up to two accessories, up to ¼" thick.

No visible fasteners within the trim.

Mechanical light traps eliminate light leaks.

Warp free die–cast aluminum faceplate, .040" thick flange on overlap versions.

Installation clip allows Downlight Pinhole to be used in basic housing. Removable clips slide and lock into place to dedicate fixture to downlight use only.

labels

UL listed, Damp label standard.
No visible labels when trim is installed.

housing ordering

housing series		FD4
Halogen Housing	FD4	
lamp		MR
MR16 Lamp	MR	
transformer type		_____
Electronic Dimming 120V, 11.7V	E1	
Electronic Dimming 277V, 11.7V	E2	
Magnetic Dimming 120V, 11.7V (T housing only)	M1	
Magnetic Dimming 277V, 11.7V (T housing only)	M2	
Toroidal Dimming 120V (IC & RT housings only)	M1T	
faceplate type		_____
Round Flush (T & IC housings only)	RF	
Round Overlap	RO	
housing type		_____
New Construction T Rated (71W max)	T	
New Construction IC Rated (50W max)	IC	
Remodel T Rated (50W max, overlap faceplate only)	RT	
factory options		
Bar Hangers (T housing only)	BH	_____
Wattage Restriction Label (XX=wattage)	WRXX	_____
Chicago Plenum (T housing only)	CP	_____

trim ordering

trim aperture		D1
1⅛" Aperture	D1	
faceplate type		_____
Round Flush (T & IC housing only) (drywall only)	RF	
Round Overlap	RO	
optic		_____
Pinhole with Black Bevel	PINF	
Pinhole without Black Bevel	PINXF	
faceplate finish		_____
White	WH	
Black	BK	
Titanium Silver	TS	
Aluminum Raw	AL	
lens accessories (soft focus lens supplied as standard)		
Hex Louver	HL	_____
Linear Spread Lens	LSL	_____
Prismatic Spread Lens	PSL	_____
Sand Blasted Lens	SBL	_____
Clear Lens	CL	_____
UV Lens	UVL	_____

a complete unit consists of two line items, housing and trim

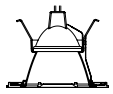
example: FD4-MR-E1-RF-IC
D1-RF-PINF-WH

Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | T: 773.247.9494 | F: 773.247.8484 | info@focalpointlights.com | www.focalpointlights.com.

rnd downlight – pinhole

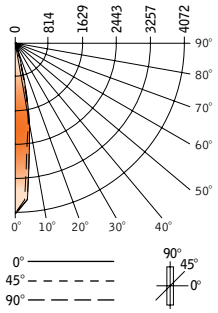
id®

HAL



Luminaire:	71W MR16 accent pinhole, narrow spot distribution with microprismatic lens
Filename:	D1RXPINHA71NS15_0.ies
Catalog #:	D1-RX-PINF-WH
Efficiency:	48% (0° tilt) , 37% (30° tilt)
Photometric Report #:	13547.0

CANDLEPOWER DISTRIBUTION - 0° TILT



Vertical Angle	Horizontal Angle 0°	22.5°	45°	67.5°	90°
0°	4072	4072	4072	4072	4072
5°	3691	3702	3744	3698	3670
15°	645	770	797	792	636
25°	81	112	107	77	47
35°	10	14	13	8	6
45°	2	3	2	0	0
55°	0	0	0	0	0
65°	0	0	0	0	0
75°	0	0	0	0	0
85°	0	0	0	0	0
90°	0	0	0	0	0

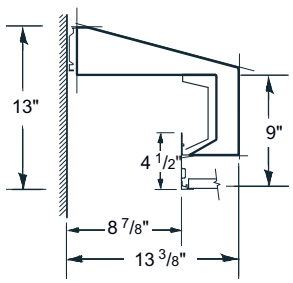
FOOTCANDLE VALUES

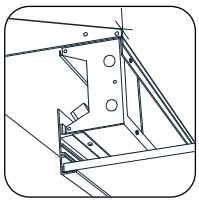
0° aiming angle - horizonal surface

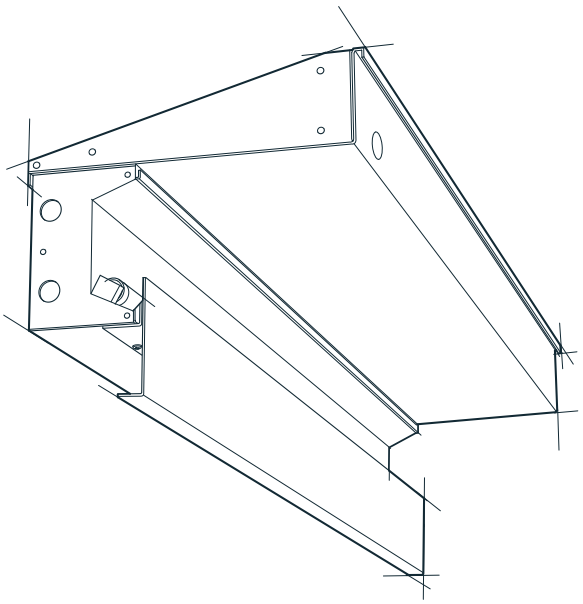
D	C	FC	L	W
6'	0	114	1.6'	1.6'
8'	0	64	2.1'	2.1'
10'	0	41	2.6'	2.6'
12'	0	28	3.2'	3.2'
14'	0	21	3.7'	3.7'

Footcandle results based on AGI32; off the shelf lamp in fixture, with soft focus lens; Reflectances=0/0/0; LLF=1

Go to www.focalpointlights.com for additional photometric data.







series	lamp rows	nominal length	reflector system	voltage	ceiling system	options
P-59						
	1T8	R__*	W* white	120	X1 exposed T-bar	EML
		* row length - advise factory of row and pattern dimensions	PR parabolic reflector	277	X3B* hard ceiling	EMH
			* standard	347	* standard	DM
				120-277		RSE
						10THD
						B__
						FH
						QC
						C2
						CX

Applications Retail, lobbies, corridors, hospitality, bathrooms.

Features A one-lamp prefabricated cove system offering an indirect wall wash effect to help eliminate socket shadows. Using no louvers, the fixture illuminates walls while giving the ceiling the appearance of floating.

Construction The housing, available in 2-, 3-, 4-, 6- or 8-foot standard lengths, is made of 20-gauge steel. Trim flange is 1/16"-thick extruded aluminum.

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

Electrical T8 fixtures have instant-start electronic ballasts with less than 20% THD. Fixtures are U.L. Damp labeled (non-emergency) and I.B.E.W. manufactured. Maximum ballast size available: 2 5/8" width x 1 1/2" height.

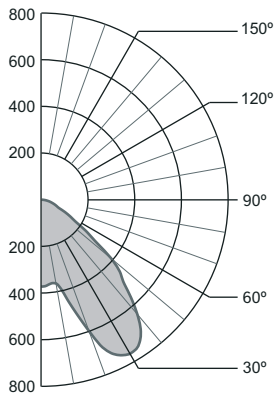
Mounting Fixture is to be recess-mounted in either exposed T-bar or hard ceiling application(s).

Options **EML**: emergency battery (T8=600-700 lumens); **EMH**: emergency battery (T8=1100-1400 lumens); **DM**: dimming (consult factory); **RSE**: rapid- start electronic; **10THD**: ballast with < 10% total harmonic distortion; **B_**: specific ballast, specify manufacturer and catalog number (consult factory); **FH**: fixture fusing (slow blow); **QC**:quick-connect circuit assemblies; **C2**: 90° corner; **CX**: special connectors (consult factory).

photometric data

P-59-1T8-04-W

Report # LSI17285 D=100.0% I=0.0%
Lamp Lumens: 3000 Input Watts: 32



Candlepower Summary

Vertical Angle	Horizontal Angle 0°	22.5°	45°	67.5°	90°	Output Lumens
0	372	372	372	372	372	
5	371	367	368	362	364	18
10	368	360	360	370	364	
15	361	352	374	475	452	59
20	352	349	456	617	601	
25	339	361	558	730	729	126
30	324	399	666	759	761	
35	306	436	690	729	737	184
40	285	474	673	633	638	
45	261	490	609	491	496	189
50	235	460	498	389	388	
55	207	419	375	235	232	140
60	177	349	269	139	141	
65	145	253	146	79	80	77
70	114	173	85	59	61	
75	81	76	49	40	43	31
80	49	32	31	24	27	
85	18	12	15	9	12	8
90	0	0	0	0	0	

Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	43.24	100.00
90-180	0.00	0.00

Efficiency = 43.2%

Luminance Summary (cd/m²)

Angle	0°	45°	90°
45	1342	3142	2558
55	1312	2386	1475
65	1247	1263	694
75	1138	690	604
85	751	607	520

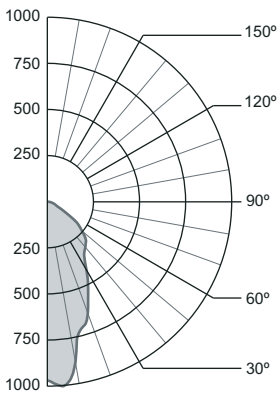
Coefficients of Utilization (%)

Floor	effective floor cavity reflectance = .20										
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
RCR 0	51	51	51	51	50	50	50	50	48	48	48
1	48	46	44	43	46	45	43	42	43	42	41
2	44	40	38	36	43	40	37	35	38	36	34
3	40	36	33	30	39	35	32	30	34	31	29
4	37	32	28	26	36	31	28	25	30	27	25
5	34	28	24	22	33	28	24	22	27	24	21
6	31	25	21	19	30	25	21	19	24	21	18
7	28	22	19	16	28	22	19	16	21	18	16
8	26	20	16	14	25	20	16	14	19	16	14
9	24	18	14	12	23	18	14	12	17	14	12
10	22	16	13	10	21	16	13	10	15	12	10

photometric data

P-59-1T8-04-PR

Report # LSI17286 D=100.0% I=0.0%
Lamp Lumens: 3000 Input Watts: 32



Candlepower Summary

Vertical Angle	Horizontal Angle 0°	22.5°	45°	67.5°	90°	Output Lumens
0	968	968	968	968	968	
5	968	997	1011	993	1003	47
10	960	989	958	848	880	
15	943	934	777	711	712	115
20	909	827	703	640	641	
25	862	690	639	525	523	146
30	803	632	534	430	422	
35	733	582	445	349	347	149
40	655	488	351	317	320	
45	570	402	301	293	296	137
50	483	324	271	242	243	
55	396	240	236	192	192	106
60	312	196	179	107	107	
65	228	159	109	56	59	60
70	150	110	52	44	45	
75	75	52	36	30	32	24
80	35	22	22	17	20	
85	14	8	10	5	9	5
90	0	0	0	0	0	

Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	40.54	100.00
90-180	0.00	0.00

Efficiency = 40.5%

Luminance Summary (cd/m²)

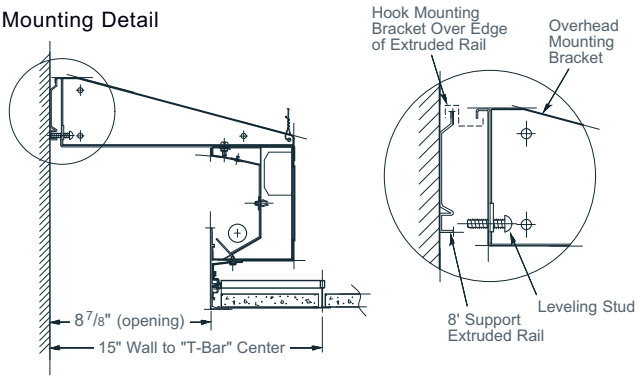
Angle	0°	45°	90°
45	2931	1552	1527
55	2510	1500	1222
65	1961	937	510
75	1053	503	452
85	584	398	366

Coefficients of Utilization (%)

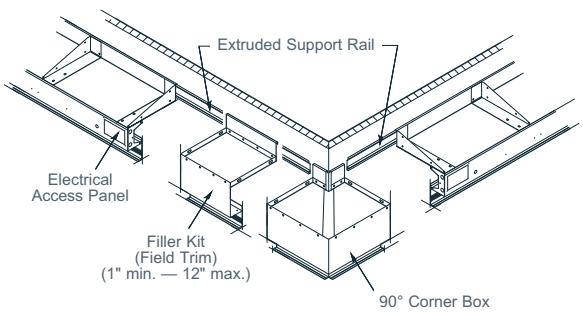
Floor	effective floor cavity reflectance = .20										
Ceiling	80				70				50		
Wall	70	50	30	10	70	50	30	10	50	30	10
RCR 0	48	48	48	48	47	47	47	47	45	45	45
1	45	44	42	41	44	43	41	40	41	40	39
2	42	39	37	35	41	38	36	35	37	35	34
3	39	35	33	31	38	35	32	30	34	32	30
4	36	32	29	27	35	32	29	27	31	28	26
5	33	29	26	23	33	29	26	23	28	25	23
6	31	26	23	21	30	26	23	21	25	23	21
7	29	24	21	19	28	24	21	19	23	21	19
8	27	22	19	17	26	22	19	17	21	19	17
9	25	20	17	15	25	20	17	15	19	17	15
10	23	19	16	14	23	18	16	14	18	15	14

installation

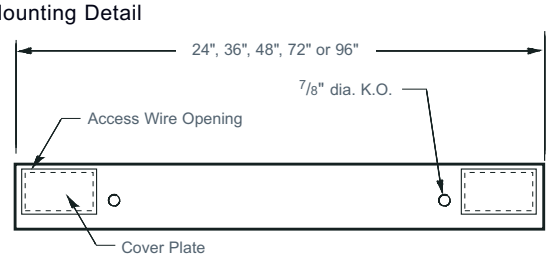
Mounting Detail



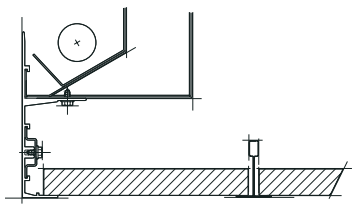
Corner Detail



Mounting Detail



Ceiling System (x1)

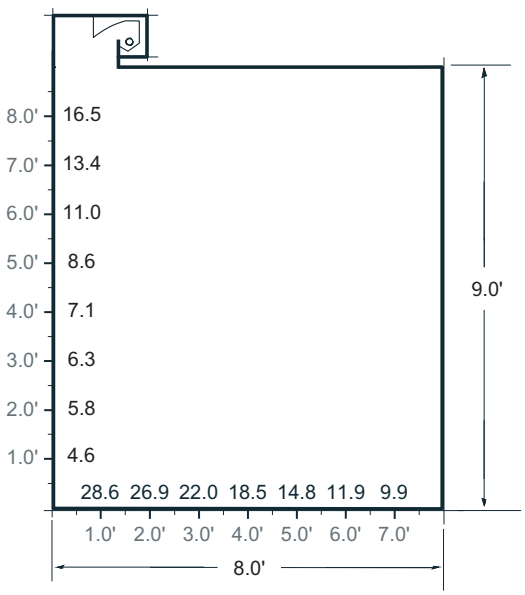


In an effort to continually provide the highest quality products, Prudential reserves the right to change design specifications and/or materials, without notice.

perimeter application

8' x 20' x 9' corridor layout

Reflectances used: 80/50/20
Average Illuminance/Horizontal Grid (0" A.F.F.)
Average Illuminance/Vertical Grid (Wall Surface)



20' Single Fixture – P-59-1T8-PR		Vertical Footcandles	
Average Illuminance maintained (LLF = .70)	Max FC	Max : Min	1' A.F.F.
9.9 FC	19.4	4.2 : 1	4.6

20' Single Fixture – P-59-1T8-W		Vertical Footcandles	
Average Illuminance maintained (LLF = .70)	Max FC	Max : Min	1' A.F.F.
12.1 FC	50.1	12.5 : 1	4.0

20' Single Fixture – P-59-1T8-PR		Horizontal Footcandles	
Average Illuminance maintained (LLF = .70) (0" A.F.F.)	Max FC	Max : Min (0" A.F.F.)	Watts/ Square Foot
15.7 FC	28.6	2.9 : 1	.92

20' Single Fixture – P-59-1T8-W		Horizontal Footcandles	
Average Illuminance maintained (LLF = .70) (0" A.F.F.)	Max FC	Max : Min (0" A.F.F.)	Watts/ Square Foot
11.5 FC	14.0	2.2 : 1	.92

F32T8/TL830 ALTO TG 1LP

Product family description
Outstanding performance and reliability.

Features/Benefits

- Keeps broken glass contained
- Coating will not yellow, crack,or flake
- Better for the environment
- Low mercury
- Energy efficient
- Long life
- Coating guaranteed to last the average rated life of the lamp.

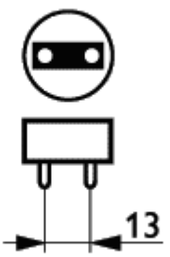
Applications

- Food service and food processing

Product data	
Product Number	165415
Full product name	F32T8/TL830 ALTO TG 1LP
Ordering Code	F32T8/TL830/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	25
Pack UPC	046677165413
EAN2US	
Case Bar Code	50046677165418
Successor Product number	
Base	Medium Bi-Pin [Medium Bi-Pin Fluorescent]
Base Information	Green Base
Bulb	T8
Packing Type	1LP [1 Lamp]
Packing Configuration	25
Life with 3h/day use [years]	7an

Product data	
Type	F32T8
Feature	ALTO®
Ordering Code	F32T8/TL830/ALTO TG
Pack UPC	046677165413
Case Bar Code	50046677165418
Energy Saving	Energy Saving
Rated Avg Life [12-Hr Prog St]	36000 hr
Rated Avg Life [12-Hr Inst St]	30000 hr
Rated Avg Life [3-Hr Prog St]	30000 hr
Rated Avg Life [3-Hr Inst St]	24000 hr
Watts	32W
Mercury (Hg) Content	3.5 mg
Color Code	TL830 [CCT of 3000K]
Color Rendering Index	85 Ra8
Color Designation	TL830
Color Description	Soft White
Color Temperature	3000 K
Initial Lumens	2950 Lm
Design Mean Lumens	2800 Lm
Nominal Length [inch]	48
Special Note	TuffGuard™ [TuffGuard Coated]
Product Number	165415

F-T8-Unv Med Bipin/GB



Base Medium Bi-Pin

PHILIPS ADVANCE

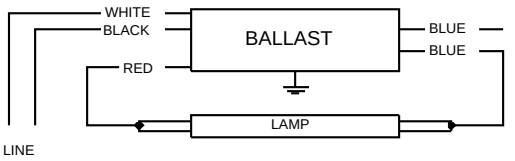
REL-2P32-SC

Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	2	17	0/-18	0.31	34	0.92	30	0.91	1.7	2.71
F25T8	1	25	0/-18	0.29	30	1.04	30	0.90	1.7	3.47
F25T8	2	25	0/-18	0.40	46	0.90	25	0.98	1.7	1.96
* F32T8	1	32	0/-18	0.34	38	1.10	25	0.98	1.5	2.89
F32T8	2	32	0/-18	0.49	58	0.88	20	0.99	1.7	1.52
F32T8/ES (30W)	1	30	60/16	0.31	35	1.10	25	0.93	1.7	3.14
F32T8/ES (30W)	2	30	60/16	0.46	54	0.87	20	0.98	1.7	1.61

Wiring Diagram



Diag. 68

Insulate unused blue lead for 1000V

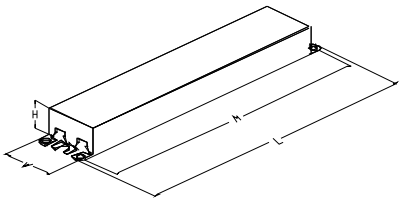
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	37L	94
Yellow		0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

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

Revised 08/21/2002

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

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10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

REL-2P32-SC	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads color-coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be _____ (Instant or Rapid) Start.

2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail.

2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 20 kHz and 30 kHz or above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 for Low Watt, 0.85 for Normal Light Output, and 1.20 for High Light.

2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models (with the exception of the VEL-3P32-HL-SC which has a THD of <10%) and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.

2.10 Ballast shall have a Class A sound rating for all 4-foot lamps and smaller.

2.11 Ballast shall have a minimum starting temperature of _____ [-18C (0F) for standard T8 lamps, 10C (50F) for T8/HO, standard T12, Slimline T12 and Long Twin Tube lamps, 0C (32F) for Slimline T8, -29C (-20F) for T12/HO lamps,] for primary lamp application. Ballast shall have a minimum starting temperature of 60F (16C) for energy-saving T8 and T12 lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.4 Ballast shall comply with ANSI C82.11 where applicable.

3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

NOTE: The use of Optanium (IOP) and ICN-2P32-N models is recommended to reduce striation in energy-saving T8 lamps (25W, 28W or 30W).

Remote or tandem wiring of energy-saving T8 lamps (25W, 28W or 30W) is only recommended for Optanium (IOP) models.

Revised 08/21/2002

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DL51XM

RECESSED DOWNLIGHT
ROUND FIXED DEEP CONE CFL

Online Quick Product Page Reference: **DLCAT51XM**

DESCRIPTION

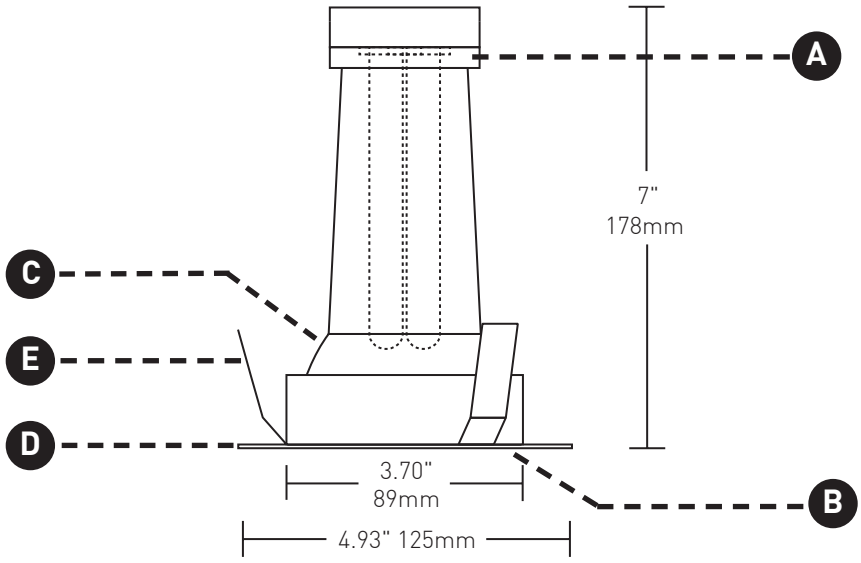
A Aiming
Fixed vertical lampholder

B Special Features
47% fixture efficiency with clear specular reflector; for use with CFL; deeply regressed lamp; rolled-edge baffle minimizes glare; aluminum deep cone reflector with 50° cut-off angle

C Effects Devices
Reflector may be finished in clear stippled, clear specular or black specular

D Trim Plate
Thickness measures 0.055"; install as flange overlay

E Retention
Torsion spring clips accomodate varying ceiling thicknesses and ensure snug fit of trim against ceiling



TECHNICAL

CONSTRUCTION

Trim: Steel and aluminum; painted finishes are granulated powdercoat

LAMP

18W Compact fluorescent **(CFL)**

To ensure optimal results, it is recommended to specify lamps supplied by Lucifer Lighting* (see page 2)

HOUSING

See housing specifications (page 2)

LISTING

ETL listed for dry/damp locations

WARRANTY

Manufacturer's one year warranty guarantees product(s) listed to be free from defects in material workmanship under normal use and service. Warranty is conditional upon use of manufacturer supplied transformer or ballast.

ORDERING INFORMATION (downlight)

Example: DL51XM-W-CR-CFL

DL51XM	–		–		–	
SERIES		TRIM PLATE FINISH		REFLECTOR FINISH		LIGHT SOURCE
DL51XM		**W** Matte White **B** Matte Black **C** Polished Chrome **IG** Industrial Gray **SS** Brushed Stainless Steel		**SR** Clear Stippled **CR** Clear Specular **BR** Black Specular		**CFL** Compact Fluorescent

Example: 120-18-CF-27

*	
	LAMP

******Optional* **(see page 2)**

LUCIFER LIGHTING COMPANY

luciferlighting.com

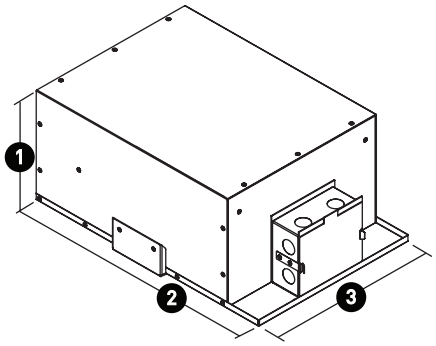
3750 IH35 North
San Antonio, Texas 78219
[PH] +1-210-227-7329
[FAX] +1-210-227-4967

[012609]

UNIVERSAL HOUSINGS

IC

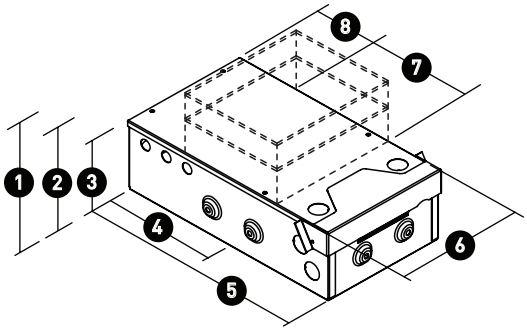
For use with recessed downlights in IC accessible and non-accessible ceilings up to 1" thick. Transformer compartment and all splice connections may be serviced from room side. Certified Chicago Plenum and ASTM E283 Airtight. Hanging bars are included and can be fitted to all sides of the housing.



1. 7" / 177mm
2. 16.3" / 413mm
3. 10.9" / 276mm

NON-IC

For use with recessed downlights in non-IC, non-accessible ceilings up to 1" thick. Transformer compartment and all splice connections serviceable from room side. Hanging bars are included and can be fitted to all sides of the housing for installation in spaces as narrow as 9".



1. 7" / 177mm (CFL)
2. 5.04" / 128mm (HID)
3. 3.7" / 94mm (HAL)
4. 6.25" / 159mm
5. 12" / 305mm
6. 6.8" / 172mm
7. 6.3" / 160mm
8. 3.25" / 83mm

ORDERING INFORMATION (housing)

Example: DH-IC-XF-CFL-18-UNI

DH	–		–		–		–		–	
HOUSING		RATING		SERIES		LIGHT SOURCE		MAX WATTS		POWER SUPPLY (primary)
DH		**IC** IC, Airtight, CCEA **NIC** Non-IC		**XF** X Series Flange Overlay		**CFL** Compact Fluorescent		**18** W		**UNI** Universal

ORDERING INFORMATION (lamps)*

120-18-CF-27 18W 2700° Compact Fluorescent

LUCIFER LIGHTING COMPANY

luciferlighting.com

3750 IH35 North
San Antonio, Texas 78219
[PH] +1-210-227-7329
[FAX] +1-210-227-4967

[012609]

DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

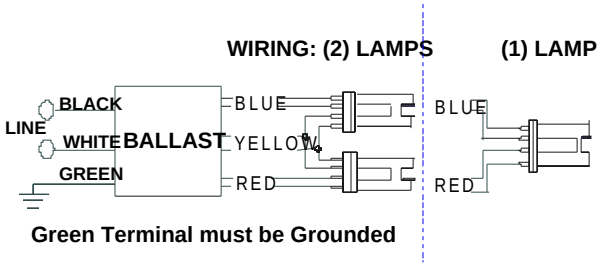
PHILIPS
ADVANCE

RCF-2S18-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ18W/G24Q	1	18	0/-18	0.16	19	1.00	10	0.98	1.7	5.26
CFQ18W/G24Q	2	18	0/-18	0.30	35	0.95	10	0.98	1.7	2.71
CFTR18W/GX24Q	1	18	0/-18	0.17	20	1.05	10	0.98	1.7	5.25
* CFTR18W/GX24Q	2	18	0/-18	0.33	39	1.05	10	0.98	1.7	2.69

Wiring Diagram



Green Terminal must be Grounded

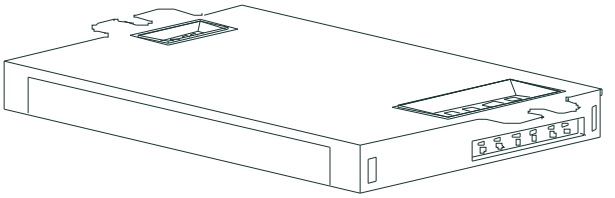
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/10/2007

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PHILIPS
ADVANCE

RCF-2S18-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power

2.3 Ballast shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor for primary lamp as follows: 0.85 for linear lamps or 1.0 for CFL lamps.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature for primary lamp as follows: 0°F/-18°C for CFL lamps or 50°F/10°C for standard T12 lamps and 60°F/16°C for energy-saving T12 lamps.

2.11 Ballast shall provide Lamp EOL Protection Circuit for CFL lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast for CFL lamps shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Consumer (Class B) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a three-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70°C for RELB models or 85°C for RCF models.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 09/10/2007

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

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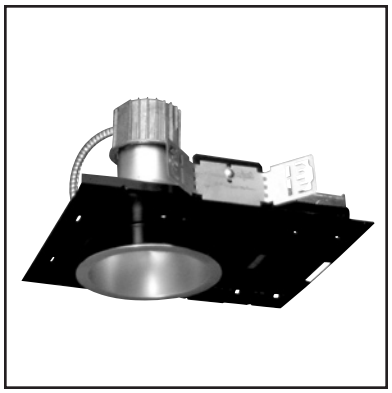


Featuring VirtualS•urce® Reflectors

6" Vertical Quad Open & Wall Wash Downlights

CFQ613
CFQ618
CFQ626

One 13W,18W, 26W Quad Tube
2-Pin Lamp
Non-IC Rated
120V, 277V or 347V

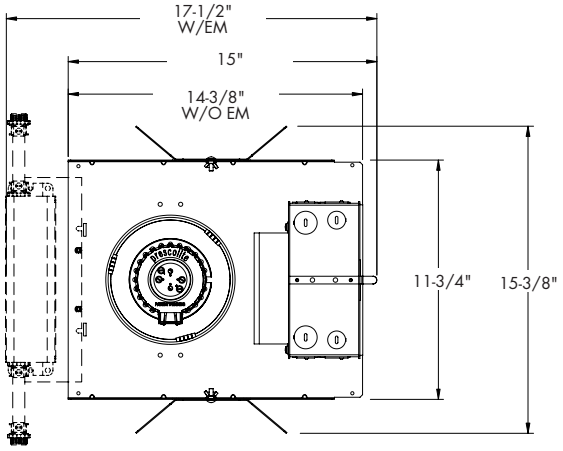
DATE: TYPE:

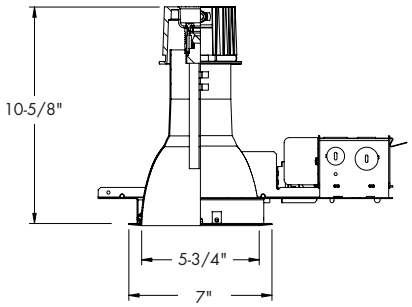
FIRM NAME:

PROJECT:

Architektūr

Ceiling Cutout: $6^1/_4$"
Maximum Ceiling Thickness: $1^1/_4$"
For conversion to millimeters, multiply inches by 25.4
Not to Scale





APPLICATIONS:
The CFQ6 series offers vertical lamped compact fluorescent downlight and wall wash fixtures that provide superior brightness and glare control. This series is ideal for a wide variety of low to medium height ceiling applications including commercial, retail, and hospitality. The CFQ6 series is compatible with the Signos6 family of architectural elements.

HOUSING:
One-piece painted 18-gauge cold rolled steel platform. Prewired J-box with snap-on cover for easy access. Ballast and socket wire connections made with Mate-N-Lock connectors. Vented at lamp tip and socket for maximum light output. Same housing accommodates downlight and wall wash downlight reflectors. Diecast aluminum heat sink with patented twist and lock mechanism that ensures accurate and stable lamp location.

REFLECTOR:
High purity aluminum Alzak Virtual Source® iridescence suppressed reflector. Self-trim standard. Painted white self-trim available. Baffled units standard with painted white self-trim. Optical system provides excellent glare and brightness control for visual comfort.

BALLAST:
One (1) 13W, 18W, or 26W compact fluorescent encased and potted Class 'P' magnetic ballast. HPF standard. 120V or 277V. Contact factory for 347V. Accessible from below ceiling.

LAMP:
One (1) 13W (GX23-2 base), 18W (G24d-2 base), or 26W (G24d-3 base) 2-pin quad tube compact fluorescent lamp. Lamp furnished by others.

SOCKET:
One (1) injection molded socket (vented). Adjusts to three positions, accommodating various lamp sizes and ensuring proper lamp position.

INSTALLATION:
Universal adjustable mounting brackets accommodate $1^1/_2$" or $^3/_4$" lathing channel or $^1/_2$" EMT (by others), or Prescolite 24" bar hangers (B24 or B6).

LABELS:
UL, CSA listed for damp locations
Approved for through wiring
Non-type I.C.

CATALOG NUMBER: EXAMPLE: CFQ613120V STF602MFC B6

HOUSINGS

- ❑ **CFQ613 (120V, 277V)** 6", (1) 13W Quad tube, HPF magnetic ballast
- ❑ **CFQ618 (120V, 277V)** 6", (1) 18W Quad tube, HPF magnetic ballast
- ❑ **CFQ626 (120V, 277V)** 6", (1) 26W Quad tube, HPF magnetic ballast

HOUSING OPTIONS

- ❑ **347V** (Contact factory)
- ❑ **CP** Chicago Plenum. Fixture construction and/or specifications may vary. Refer to Chicago Plenum specification sheets on www.prescolite.com for details.

HOUSING OPTIONS

- ❑ **EM** Emergency battery pack with integral switch and indicator light
- ❑ **FSDFA** Fuse kit installed at factory
- ❑ **RIF1** Radio interference filter (single circuit)

REFLECTORS

- ❑ **STF602** 6" Alzak reflector

REFLECTOR FINISH

- ❑ **Blank** Specular
- ❑ **SS** Semi-Specular
- ❑ **MFC** American Matte™

REFLECTOR COLOR

- ❑ **Blank** Clear Alzak
- ❑ **CG** Champagne Gold Alzak
- ❑ **BL** Black Alzak
- ❑ **WE** Wheat Alzak
- ❑ **LW** Light Wheat Alzak
- ❑ **PW** Pewter Alzak

REFLECTOR OPTIONS

- ❑ **WT** Painted white self-flange
- ❑ **BC** [1] Painted black cone
- ❑ **WC** [1] Painted white cone
- ❑ **BB** Painted black baffle
- ❑ **WB** Painted white baffle
- ❑ **WW** Wall wash reflector
- ❑ **TRG** Trim Ring Gasket (factory installed)

ACCESSORIES

- ❑ **B24** Set of two (2) 24" bar hangers for T-bar ceilings
- ❑ **B6** Set of two (2) bar hangers for ceiling joists up to 24" centers
- ❑ **FSDFI** Fuse kit for field installation
- ❑ **SCA6D_** Sloped ceiling adapter (see note on back page)
- ❑ **Signos6** Architectural glass elements
  Refer to specification sheets ARCH-SIG-001 through -004

[1]Not avaiable with MFC or Semi-specular finish.

prescolite
A Division of Hubbell Lighting, Inc.

PHOTOMETRIC DATA

Architektūr - 6" Vertical Quad Open & Wall Wash Downlights - CFQ Series

BALLAST DATA	13W Quad		18W Quad		26W Quad	
	120V	***277V***	***120V***	***277V***	***120V***	***277V***
Total System Watts	17W	19W	24W	22W	32W	30W
Input Current (Amps)	0.32	0.16	0.42	0.17	0.56	0.23
Power Factor	95%	96%	95%	96%	95%	94%

LUMINANCE DATA IN CANDELA/SQ. METER

Angle in Vertical	Average 0°
45°	20748
55°	17009
65°	10433
75°	18
85°	0

LAMP DATA

	13W Quad	18W Quad	26W Quad
Rated Watts			
Rated Lumens	860	1250	1800
Efficacy (LPW)	67	69	69
Rated Life	10,000 hours	10,000 hours	10,000 hours
CRI	82	82	82
Minimum Starting Temp.	32° F	15° F	15° F

AVERAGE INITIAL FOOTCANDLES

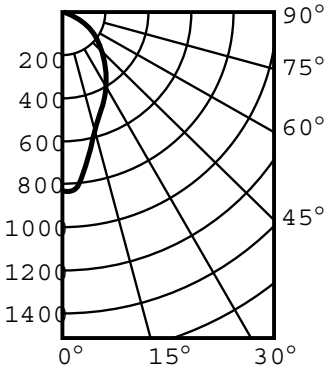
Multiple Units (Square Array)
Ceiling 80% Wall 50% Floor 20%

26W Quad

SPACING	RCR1	RCR3	RCR7
7.0	24	19	13
8.0	18	15	10
9.0	14	11	8
10.0	11	9	6
11.0	9	8	5

CFQ626-STF602 with Clear Alzak Reflector
Lower Position
Lamp: One 26W Quad
Spacing Criteria: .7
Efficiency: 61.1%

CANDLEPOWER DISTRIBUTION



Test No. PL4999

CANDLEPOWER SUMMARY

Angle	Mean CP	Lumens
0	835	
5	825	76
15	592	170
25	462	214
35	357	223
45	245	192
55	163	145
65	74	72
75	0	7
85	0	0

COEFFICIENTS OF UTILIZATION Zonal Cavity Method

Room Cavity Ratio	% Effective Floor Cavity Reflectance															
	80%				**70%**				**50%**			**30%**			**10%**	
	20% Effective Floor Cavity Reflectance															
	% Wall Reflectance															
	70	**50**	**30**	**10**	**70**	**50**	**30**	**10**	**50**	**30**	**10**	**50**	**30**	**10**	**50**	**30**	**10**
1	.69	.67	.65	.63	.67	.65	.64	.62	.63	.61	.60	.60	.59	.58	.58	.57	.57
2	.64	.61	.58	.55	.63	.60	.57	.55	.58	.56	.54	.56	.54	.52	.54	.53	.51
3	.60	.55	.52	.49	.59	.55	.51	.49	.53	.50	.48	.51	.49	.47	.50	.48	.46
4	.56	.51	.47	.44	.55	.50	.47	.43	.49	.45	.43	.47	.45	.42	.46	.44	.42
5	.53	.47	.42	.39	.51	.46	.42	.39	.45	.41	.38	.44	.40	.38	.43	.40	.38
6	.49	.43	.38	.35	.48	.42	.38	.35	.41	.37	.35	.40	.37	.34	.39	.36	.34
7	.46	.39	.34	.31	.45	.38	.34	.31	.38	.34	.31	.37	.33	.31	.36	.33	.31
8	.43	.36	.31	.28	.42	.35	.31	.28	.35	.31	.28	.34	.30	.28	.33	.30	.28
9	.40	.33	.29	.26	.39	.33	.29	.26	.32	.28	.25	.31	.28	.25	.31	.28	.25
10	.38	.31	.26	.23	.37	.30	.26	.23	.30	.26	.23	.29	.26	.23	.29	.25	.23

CFQ626-STF602 Test No. PL4999

NOTES

Ⓥ Denotes a Virtual Source reflector.

Refer to www.prescolite.com for additional photometric tests (IES Files).

When ordering a sloped ceiling adapter, specify the degree of slope in 5° increments, max. of 35°. For a more precise degree or wet ceiling applications, please contact factory. Sloped ceiling adapter and housing must be installed at the same time.

prescolite

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701 Millennium Blvd. • Greenville, SC 29607 U.S.A. • Phone (864) 678-1000

DULUX® S/E

DULUX® D

DULUX S/E 4-PIN COMPACT FLUORESCENT LAMPS

for Dimming and Electronic Ballast. Lamps have End-of-lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
5	S (T4)	3.4	85	2G7	20311	**CF5DS/E/827**	CFT5W/2G7/827	50	10000	2700	82	230	198	CRI 1,2,5,12,16,20
					20315	**CF5DS/E/841**	CFT5W/2G7/841	50	10000	4100	82	230	198	CRI 1,2,5,12,16,20
7	S (T4)	4.5	115	2G7	20312	**CF7DS/E/827**	CFT7W/2G7/827	50	10000	2700	82	400	344	CRI 1,2,5,12,16,20
					20316	**CF7DS/E/841**	CFT7W/2G7/841	50	10000	4100	82	400	344	CRI 1,2,5,12,16,20
9	S (T4)	5.7	145	2G7	20313	**CF9DS/E/827**	CFT9W/2G7/827	50	10000	2700	82	580	499	CRI 1,2,5,12,20
					20317	**CF9DS/E/841**	CFT9W/2G7/841	50	10000	4100	82	580	499	CRI 1,2,5,12,20
13	S (T4)	6.2	157	2GX7	20314	**CF13DS/E/827**	CFT13W/2GX7/827	50	10000	2700	82	800	688	CRI 1,2,5,12,20
					20284	**CF13DS/E/830**	CFT13W/2GX7/830	50	10000	3000	82	800	688	CRI 1,2,5,12,20
					20318	**CF13DS/E/841**	CFT13W/2GX7/841	50	10000	4100	82	800	688	CRI 1,2,5,12,20

DULUX D PREHEAT 2-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

With starter in Lamp Base for Magnetic Ballast

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
9	D (T4)	4.3	110	G23-2	20537	**CF9DD/827/RP/ECO**	CFQ9W/G23/827	10	10000	2700	82	525	452	CRI 1,4,6,11, 12,20,22
					20689	**CF9DD/827/ECO**	CFQ9W/G23/827	50	10000	2700	82	525	452	CRI 1,4,6,11, 12,20,22
					20783	**CF9DD/830/ECO**	CFQ9W/G23/830	50	10000	3000	82	525	452	CRI 1,4,6,11, 12,20,22
					20690	**CF9DD/835/ECO**	CFQ9W/G23/835	50	10000	3500	82	525	452	CRI 1,4,6,11, 12,20,22
13	D (T4)	4.6	118	GX23-2	20691	**CF13DD/827/ECO**	CFQ13W/GX23/827	50	10000	2700	82	780	671	CRI 1,4,6,11, 12,20,22
					20705	**CF13DD/830/ECO**	CFQ13W/GX23/830	50	10000	3000	82	780	671	CRI 1,4,6,11, 12,20,22
					20692	**CF13DD/835/ECO**	CFQ13W/GX23/835	50	10000	3500	82	780	671	CRI 1,4,6,11, 12,20,22
					20708	**CF13DD/841/ECO**	CFQ13W/GX23/841	50	10000	4100	82	780	671	CRI 1,4,6,11, 12,20,22
18	D (T4)	6.0	153	G24D-2	20676	**CF18DD/827/ECO**	CFQ18W/G24D/827	50	10000	2700	82	1150	989	CRI 1,4,6,11, 12,20,22
					20709	**CF18DD/830/ECO**	CFQ18W/G24D/830	50	10000	3000	82	1150	989	CRI 1,4,6,11, 12,20,22
					20677	**CF18DD/835/ECO**	CFQ18W/G24D/835	50	10000	3500	82	1150	989	CRI 1,4,6,11, 12,20,22
					20678	**CF18DD/841/ECO**	CFQ18W/G24D/841	50	10000	4100	82	1150	989	CRI 1,4,6,11, 12,20,22
26	D (T4)	6.8	173	G24D-3	20679	**CF26DD/827/ECO**	CFQ26W/G24D/827	50	10000	2700	82	1710	1470	CRI 1,4,6,11, 12,20,22
					20710	**CF26DD/830/ECO**	CFQ26W/G24D/830	50	10000	3000	82	1710	1470	CRI 1,4,6,11, 12,20,22
					20680	**CF26DD/835/ECO**	CFQ26W/G24D/835	50	10000	3500	82	1710	1470	CRI 1,4,6,11, 12,20,22
					20681	**CF26DD/841/ECO**	CFQ26W/G24D/841	50	10000	4100	82	1710	1470	CRI 1,4,6,11, 12,20,22

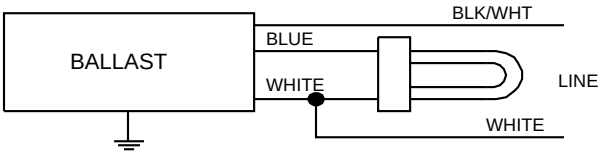
PHILIPS ADVANCE

H-1B13-TP-BLS	
Brand Name	COMPACT-HPF
Ballast Type	Magnetic
Starting Method	Pre-Heat
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Starting Current (Amps)	Open Circuit (Amps)	Input Power (Watts)	Ballast Factor	MAX THD %	Power Factor
* CFQ13W/GX23	1	13	32/00	0.14	0.36	0.22	16	0.91	25	0.95
CFT13W/GX23	1	13	32/00	0.13	0.36	0.22	16	0.89	25	1.01

Wiring Diagram



Diag. 47

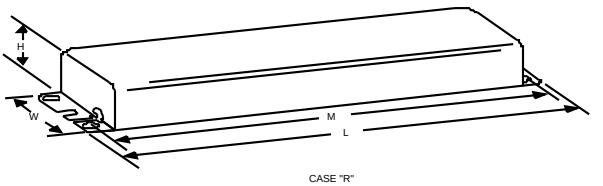
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black		
White	7	
Blue	7	
Red		
Yellow		
Gray		
Violet		

	in.	cm.
Yellow/Blue		
Blue/White		
Brown		
Orange		
Orange/Black		
Black/White	7	
Red/White		

Enclosure



Enclosure Dimensions

OverAll (L)	Width (std)/(TP)	Height (H)	Mounting (M)
4.25 "	2.00 "	1.4375 "	3.5625 "
4 1/4	2	1 7/16	3 9/16
10.8 cm	5.1 cm / 0 cm	3.7 cm	9 cm

Revised 09/21/1999

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10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

TYPE:

CATALOG#:

PORTFOLIO

DESCRIPTION

Low brightness 7 3/8" aperture reflector for use with 42W Triple tube 4-pin lamps. The precisely formed non-imaging reflector ensures 45° cutoff to lamp and lamp image and the one piece design eliminates light leaks at the ceiling. Standard features include low iridescent finish on all reflector colors (to eliminate "rainbowing") and one electronic preheat rapid start ballast. Venting ensures maximum lamp life and lumen output. Optics offer unparalleled performance in glare free lighting with a smooth beam devoid of hot spots; its performance rivals that of larger aperture twin tube and quad tube units. Medium beam, wide beam reflectors and open wall wash trims are interchangeable within the same housing.

SPECIFICATION FEATURES

A ···Reflector

Low iridescent Alzak® finishes in specular clear, haze, straw and wheat, .050" thick aluminum, in a one piece spun macrofocal parabolic contour. Positive reflector mounting pulls trim tight to ceiling. Other finish options available upon request.

B ···Trim Ring Options

High impact polymer with satin white finish, metal trim, rimless trim or self flanged reflector.

C ···Socket Cap

One piece vented and finned die cast aluminum cap for maximum thermal performance.

D ···Housing Mounting Frame

One piece precision die cast aluminum 1 1/2" deep collar accommodates varying dimensions of ceiling materials.

E ···Universal Mounting Bracket

Accepts 1/2" EMT, C Channel, T bar fasteners, and bar hangers. Adjusts 5" vertically from above or below ceiling.

F ···Conduit Fittings

Die cast screw tight connectors.

G ···Junction Box

Listed for eight #12AWG (four in, four out) 90°C conductors feed through branch wiring. 1/2" and two 3/4" pry outs. Positioned to allow straight conduit runs. Access to junction box by removing reflector.

H ···Socket

4 pin G24q4 base with fatigue free stainless steel lamp spring ensures positive lamp retention.

I ···Electronic Ballast

Thermally protected, fused, encased and potted electronic ballast provides full light output and rated lamp life. Provides flicker free and noise free operation and starting.

Labels

U.L. listed, C.S.A. certified, standard damp label, IBEW union made.

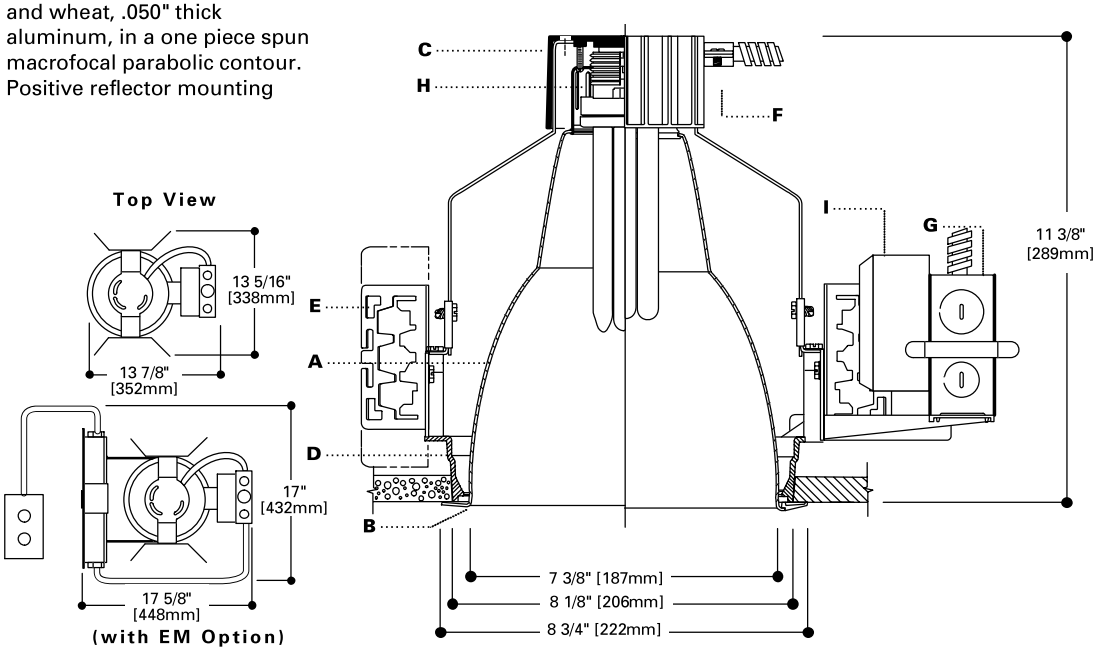
Options & Accessories

TRM=Metal Trim Rings to replace polymer trim ring
TRR=Rimless Trim Rings for minimal flange appearance in plaster ceilings

C7042-7400

42W Triple
Compact
Fluorescent

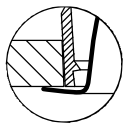
7 3/8" MEDIUM BEAM OPEN REFLECTOR

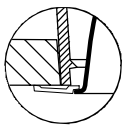


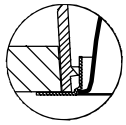
42W Triple 4-pin
Ballast: Electronic
120V Input Watts: 51
Line Amps: 0.30
277 Input Watts: 51
Line Amps: 0.13
Power Factor: >.99
THD: <10%
Min. Starting Temp: -10°C (15°F)
Sound Rating: A

Luminaire Efficacy Rating:
C7042-7400=32.63

NOTES:
Accessories should be ordered separately.
For additional options please consult your Cooper Lighting Representative.
Alzak is a registered trademark of Aluminum Company of America.


Self Flanged Reflector


Polymer Trim Ring


Metal Trim Ring


Rimless Trim Ring

ORDERING INFORMATION

SAMPLE NUMBER: C7042E-7400LI

Complete unit consists of housing, ballast and trim.

Housing

C7042

C7042
C7042CP
*Chicago Plenum (supplied with gasketed wiring enclosure to comply with Chicago electrical code for air return plenums)

Ballast

E, EEM*, ECP*=120V through 277V Electronic
3E=347V Electronic
1D, 1DCP*=120V Dimming
2D, 2DCP*=277V Dimming
DLS1=120V to 277V Digital Lighting System (See DLS Section for details)

***EM**=Emergency Module Option
***CP**=Chicago Plenum Option

D=Lutron Hi-Lume® (or 100% compatible) ballast.

Trims

7400=Reflector with Polymer Trim
7401=Self Flanged Reflector

Color

LI=Specular Clear, Low Iridescent
H=Haze
S=Straw
WH=Wheat

Accessories

Trim Rings
TRM8-P=White
TRM8-MB=Black
TRR8=Rimless

Slope Ceiling Adapter
HSA-7-XX=Specify Slope

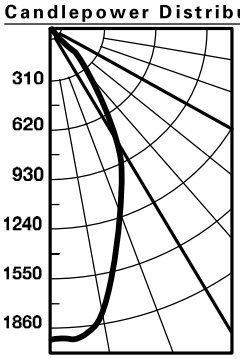
1 1/2" C-Channel Bar Hangers
HB26=26" Long
HB50=50" Long

COOPER LIGHTING

ADP012068
(Supersedes ADV985021)

PHOTOMETRICS

Candlepower Distribution



Test No. H23274
C7042-7000LI
Medium Beam Reflector
Lamp=42W TTT
Lumens=3200
Spacing Criterion=0.8
Efficiency=48.9%

Candlepower

Deg.	CD
0	1876
5	1902
15	1418
25	975
35	630
45	130
55	7
65	0
75	0
85	0
90	0

Average Luminance

Deg.	CD/SQ M
45	6668
55	443
65	86
75	0
85	0

Cone of Light

Distance to Illuminated Plane	Initial Nadir Footcandles	Beam Diameter
5'6"	62	4'0"
6'6"	44	5'0"
8'0"	29	6'0"
10'0"	19	7'6"
12'0"	13	9'0"
14'0"	10	10'6"

Beam diameter is to 50% of maximum footcandles, rounded to the nearest half-foot.

Footcandle values are initial, apply appropriate light loss factors where necessary.

Reflector Multiplier:
Haze=.95
Straw=.9
Wheat=.9

EM Multiplier (in emergency mode)
EM=.27

Zonal Lumen Summary

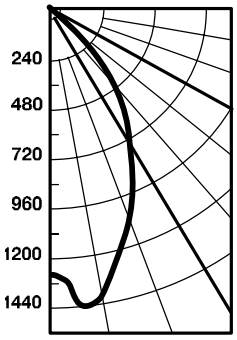
Zone	Lumens	%Lamp	%Luminaire
0-30	1023	32.0	65.4
0-40	1421	44.4	90.8
0-60	1562	48.8	99.8
0-90	1565	48.9	100.0
90-180	0	0.0	0.0
0-180	1565	48.9	100.0

Coefficient of Utilization

rc	80%				70%			50%		30%		10%		0%
rw	70	50	30	10	50	30	10	50	10	50	10	50	10	0
RCR														
0	58	58	58	58	57	57	57	54	54	52	52	50	50	49
1	56	55	54	53	54	53	52	52	50	50	49	48	47	46
2	54	51	50	48	51	49	48	49	47	48	46	46	45	44
3	51	49	46	45	48	46	44	47	44	46	43	44	42	42
4	49	46	44	42	45	43	42	44	41	43	41	43	40	39
5	47	43	41	39	43	41	39	42	38	41	38	41	38	37
6	45	41	38	37	41	38	37	40	36	39	36	39	36	35
7	43	39	36	34	38	36	34	38	34	37	34	37	34	33
8	41	36	34	32	36	34	32	36	32	35	32	35	32	31
9	39	34	32	30	34	32	30	34	30	33	30	33	29	29
10	37	32	30	28	32	30	28	32	28	31	28	31	28	27

rc=Ceiling reflectance, rw=Wall reflectance, RCR=Room cavity ratio
CU Data Based on 20% Effective Floor Cavity Reflectance.

Candlepower Distribution



Test No. H23275
C7042-7000LI
Medium Beam Reflector
Lamp=42W PLT
Lumens=3200
Spacing Criterion=1.0
Efficiency=41.8%

Candlepower

Deg.	CD
0	1296
5	1443
15	1283
25	917
35	574
45	40
55	6
65	1
75	0
85	0
90	0

Average Luminance

Deg.	CD/SQ M
45	2052
55	379
65	89
75	0
85	0

Cone of Light

Distance to Illuminated Plane	Initial Nadir Footcandles	Beam Diameter
5'6"	43	5'6"
6'6"	31	6'6"
8'0"	20	8'0"
10'0"	13	9'6"
12'0"	9	11'6"
14'0"	7	13'6"

Beam diameter is to 50% of maximum footcandles, rounded to the nearest half-foot.

Footcandle values are initial, apply appropriate light loss factors where necessary.

Reflector Multiplier:
Haze=.95
Straw=.9
Wheat=.9

EM Multiplier (in emergency mode)
EM=.27

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Luminaire
0-30	920	28.7	68.7
0-40	1270	39.7	94.8
0-60	1336	41.7	99.7
0-90	1339	41.8	100.0
90-180	0	0.0	0.0
0-180	1339	41.8	100.0

Coefficient of Utilization

rc	80%				70%			50%		30%		10%		0%
rw	70	50	30	10	50	30	10	50	10	50	10	50	10	0
RCR														
0	50	50	50	50	49	49	49	46	46	45	45	43	43	42
1	48	47	46	45	46	45	44	44	43	43	42	41	41	40
2	46	44	43	42	44	42	41	42	40	41	39	40	39	38
3	44	42	40	39	41	40	38	40	38	39	37	38	37	36
4	42	40	38	36	39	37	36	38	36	38	35	37	35	34
5	40	37	35	34	37	35	34	36	33	36	33	35	33	32
6	39	36	34	32	35	33	32	35	32	34	31	34	31	31
7	37	34	31	30	33	31	30	33	30	32	30	32	29	29
8	35	32	30	28	32	30	28	31	28	31	28	30	28	27
9	34	30	28	26	30	28	26	29	26	29	26	29	26	26
10	32	28	26	25	28	26	25	28	25	28	25	27	25	24

rc=Ceiling reflectance, rw=Wall reflectance, RCR=Room cavity ratio
CU Data Based on 20% Effective Floor Cavity Reflectance.

Note: Specifications and Dimensions subject to change without notice.

Visit our website at www.cooperlighting.com

COOPER Lighting

Customer First Center 1121 Highway 74 South Peachtree City, GA 30269 770.486.4800 FAX 770 468.4801
Cooper Lighting 5925 McLaughlin Rd. Mississauga, Ontario, Canada L5R 1B8 905.507.4000 FAX 905.568.7049
(Supersedes ADV985021) ADP012068

DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

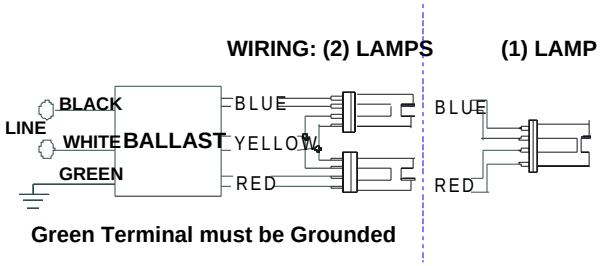
PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ26W/G24Q	1	26	0/-18	0.23	27	1.00	10	0.98	1.7	3.70
CFQ26W/G24Q	2	26	0/-18	0.43	51	1.00	10	0.98	1.7	1.96
* CFTR26W/GX24Q	1	26	0/-18	0.24	29	1.10	10	0.98	1.7	3.79
CFTR26W/GX24Q	2	26	0/-18	0.45	54	1.00	10	0.98	1.7	1.85
CFTR32W/GX24Q	1	32	0/-18	0.31	36	0.98	10	0.98	1.7	2.72
CFTR42W/GX24Q	1	42	0/-18	0.38	46	0.98	10	0.98	1.7	2.13

Wiring Diagram



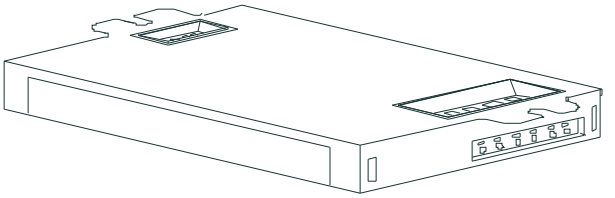
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/10/2007

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power

2.3 Ballast shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor for primary lamp as follows: 0.85 for linear lamps or 1.0 for CFL lamps.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature for primary lamp as follows: 0°F/-18°C for CFL lamps or 50°F/10°C for standard T12 lamps and 60°F/16°C for energy-saving T12 lamps.

2.11 Ballast shall provide Lamp EOL Protection Circuit for CFL lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast for CFL lamps shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Consumer (Class B) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a three-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70°C for RELB models or 85°C for RCF models.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 09/10/2007

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PH 3½-2½ Floor

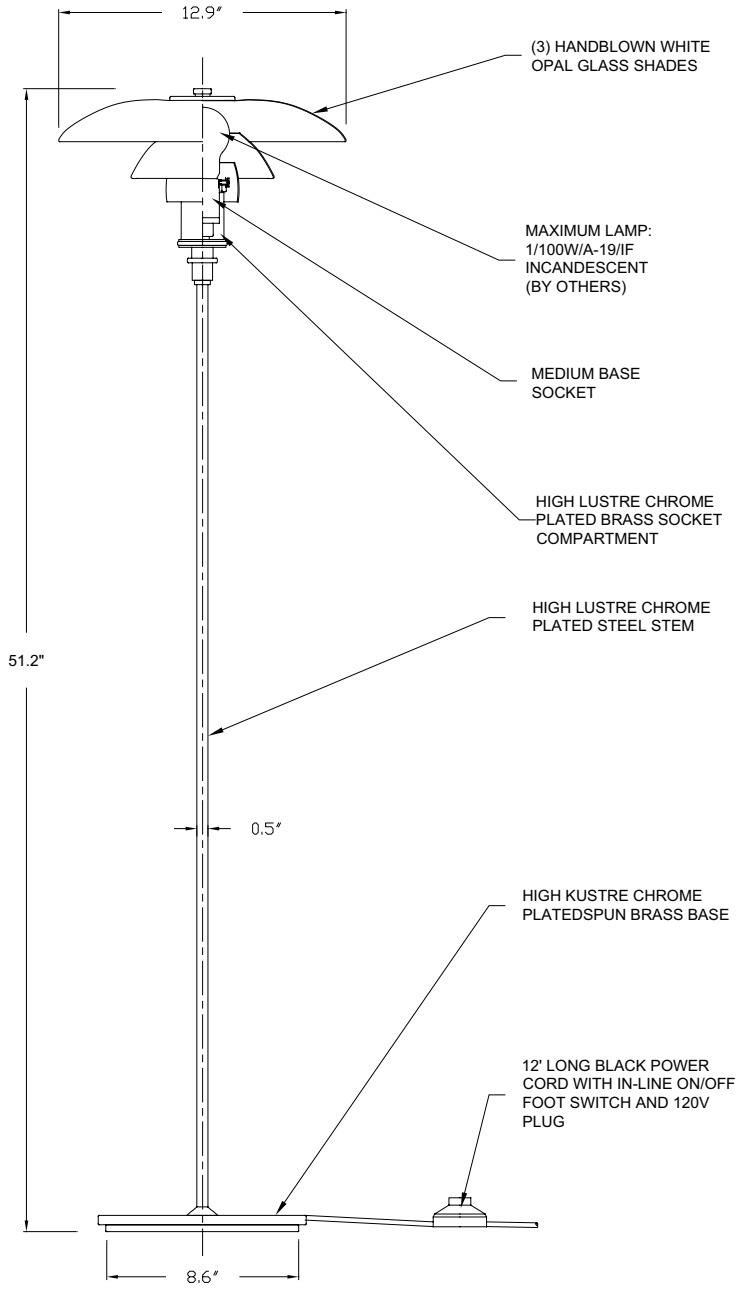
incandescent

Design: Poul Henningsen

Type:

Project:

Catalog Number:



louis poulsen

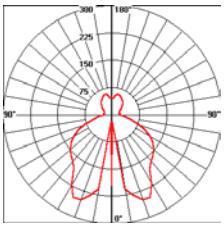
Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com

PH 3½-2½ Floor

incandescent

table & floor



Photometric Report: PH31/2-21/2-F-1-100W-A19-IF.IES
Report No.: LP0380
Poulsen Report No.: PH31/2-21/2-F-1-100W-A19-IF.IES
Luminaire: PH 31/2-21/2 Floor
Lamp: 1/100W/A19/IF
Efficiency: 55.1%
Description: All data shown are per 1750 lumens. This report can be used for calculation on all versions. Use only actual lumen data when calculating.

Candlepower Distribution

Vertical Angle	Candela
0	196
5	20
10	208
25	252
35	183
45	159
55	138
65	102
75	57
90	24
120	28
150	53
180	44

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0-30	197	11.3	20.4
0-40	315	18.0	32.6
0-60	561	32.1	58.1
0-90	758	43.3	78.5
90-120	69	3.9	7.2
90-130	98	5.6	10.2
90-150	161	9.2	16.7
90-180	207	11.8	21.5
0-180	965	55.1	100.0

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Cavity Reflectance 20%

Ceiling Reflectance (%)	80				70				50			30			10			0
Wall Reflectance (%)	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio																		
0	63	63	63	63	60	60	60	60	55	55	55	50	50	50	45	45	45	43
1	57	54	51	49	54	52	49	47	47	45	44	43	41	40	39	38	37	35
2	51	47	43	40	49	45	41	38	41	38	36	37	35	33	34	32	31	29
3	47	41	36	33	44	39	35	32	36	32	30	33	30	28	30	28	26	24
4	43	26	31	27	40	34	20	27	32	28	25	29	26	23	26	24	22	20
5	39	32	27	23	37	30	26	23	28	24	21	26	23	20	24	21	19	17
6	36	29	24	20	34	28	23	20	25	22	19	23	20	18	21	19	17	15
7	33	26	21	18	32	25	21	17	23	19	16	21	18	16	20	17	15	13
8	31	24	19	16	29	23	18	15	21	17	15	19	16	14	20	17	15	12
9	29	22	17	14	27	21	17	14	19	16	13	18	15	12	17	14	14	11
10	27	20	16	13	26	19	15	12	18	14	12	17	13	11	15	13	11	10

Design
Poul Henningsen

Concept
PH 3½-2½ Floor provides soft illumination. The PH 3½-2½ Floor is based on the principle of a reflecting multi-shade system, producing a harmonious and glare free illumination. The shades are drawn over a logarithmic spiral, with the center of the light source placed in the spiral's focal point.

Finish
White opal glass. High lustre chrome plated.

Material
Base: High lustre chrome plated, spun brass. Shades: Handblown white opal glass. Top plate: High lustre chrome plated, spun brass. Stem: High lustre chrome plated, steel.

Mounting
Cord type: Black. Cord length: 12'. Switch: In-line on/off foot switch provided.

Weight
Max. 16.5 lbs.

Label
cUL, Dry location. IBEW.

Product code	Light source	Voltage	Finish
PH3½-2½-F	1/100W/A-19/IF medium	120V	GLASS

Info notes:
I. All handblown opal glass shades are sandblasted on the underside for uniform light distribution.
II. The comparable EU version has the following classification: Ingress Protection Code: IP20.


K19


PAR38 Side Prong


R20


A19

GENERAL PURPOSE LAMPS

Watts	Bulb	Base	Product Number	Symbols & Footnotes	Ordering Abbreviation	Volts	Pkg Qty	Description	Class & Filament	Avg Rated Life(hrs)	Lumens Beam Angle CBCP	LCL (in)	MOL (in)
75	K19	Med	12583	●	**75K19/DR**	120	24	Inside Frost Directional Reflector	C, CC-6	1150	855lm		4.13
	PAR38	Med Side Prong	13850	★ I/O	**75PAR/3FL**	120	12	Compact Flood	C, CC-6	2000	1040lm 1800 cd 30˚		4.31
	R20	Med	14840	● 68,107,118	**75R20/RP**	120	6	Reflector Flood	C, CC-9	2000	500lm 500 cd 45˚		3.94
	R30	Med	15146	●	**75R30/BLACKLIGHT/RP**	120	6	Blacklight	C, CC-6	1000			6.50
90	A19	Med	11396	●	**100A/90/W/ES/4PK**	120	48	Soft White Energy Saver	C, CC-8	750	1450	3.13	4.44
			11378	●	**100A/90/SS**	120	48	Standard Frost SuperSaver	C, CC-8	750	1480	3.13	4.44
			11382	● 136,189	**100A/90/SS**	130	48	Standard Frost SuperSaver	C, CC-8	750	1480	3.13	4.44
			@ 120 _volts, approximate 79 watts, 1130 lumens, 1875 hours										
		Med Brass	11386	108	**100A/90/SSXL**	120	48	Standard Frost SuperSaver XL	C, CC-8	2500	1220	3.13	4.44
			11390	108,136,186	**100A/90/SSXL**	130	48	Standard Frost SuperSaver XL	C, CC-8	2500	1230	3.13	4.44
			@ 120 _volts, approximate 79 watts, 940 lumens, 6250 hours										
100	A19	Med	12948	●	**100A/DAY/4/160/RP**	120	160	Daylight	C, CC-8	750	1270	3.13	4.44
			12587	●	**100A/DAY/RP/4/48**	120	48	Daylight	C, CC-8	750	1270	3.13	4.44
			12952	●	**100A/DAY/RP/2/24**	120	24	Daylight	C, CC-8	750	1270	3.13	4.44
			12538	● 103,136	**100A/DAY/RP/4/48**	130	48	Daylight	C, CC-8	750	1270	3.13	4.44
			@ 120 _volts, approximate 88 watts, 970 lumens, 1875 hours.										
			16868	●	**100A/DL/SW/PLUS/4PK/RP/160**	120	160	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			16864	●	**100A/DL/SW/PLUS/4PK/RP**	120	48	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			11332	● 108	**100A/DL/SW/4PK/RP**	120	48	Soft White Double Life	C, CC-8	1500	1530	3.13	4.44
			12480	●	**100A/DL/SW/PLUS/2PK/RP**	120	24	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			12805	● 108	**100A/DL/SW/2PK/RP**	120	24	Soft White Double Life	C, CC-8	1500	1530	3.13	4.44
			11660	●	**100A/CL/DL/PLUS/2PK/RP**	120	24	Clear Double Life	C, CC-8	1500	1590	3.13	4.44
			11176	● 108	**100A/CL/DL/RP**	120	24	Clear Double Life	C, CC-8	1500	1550	3.13	4.44
			13002	●	**100A/RS/2/RP**	120	24	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			12997	●	**100A/RS/RP/1**	120	12	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			12998	● 136,190	**100A/RS/2/RP**	130	24	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			@ 120 _volts, approximate 88 watts, 960 lumens, 2500 hours										
			12770	●	**100A/W/4/RP**	120	48	Soft White	C, CC-8	750	1690	3.13	4.44
			12752	●	**100A/W/RP**	120	24	Soft White	C, CC-8	750	1690	3.13	4.44
			12529	●	**100A/CL**	120	120	Clear	C, CC-8	750	1720	3.13	4.44
			11226	●	**100A/CL/RP**	120	24	Clear	C, CC-8	750	1720	3.13	4.44
			12531	● 136,193	**100A/CL**	130	120	Clear	C, CC-8	750	1700	3.13	4.44
			@ 120 _volts, approximate 88 watts, 1290 lumens, 1875 hours										
			12750	●	**100A/4/RP**	120	48	Standard Frost	C, CC-8	750	1710	3.13	4.44
			12735	●	**100A/RP**	120	24	Standard Frost	C, CC-8	750	1710	3.13	4.44
			11375	● 136,193	**100A**	130	48	Standard Frost	C, CC-8	750	1700	3.13	4.44
			@ 120 _volts, approximate 88 watts, 1290 lumens, 1875 hours										

metro™ 26

FOCAL POINT®

features

Low profile pendant mount fluorescent indirect with luminous acrylic diffuser.

Suspension options include 3-point aircraft cable or single point stem with 45° swivel.

Metro™ makes an exceptional aesthetic statement in conference rooms, cafeterias, private or open offices, reception areas or other high-end applications.

diffuser options

patterned | white | solid

color options

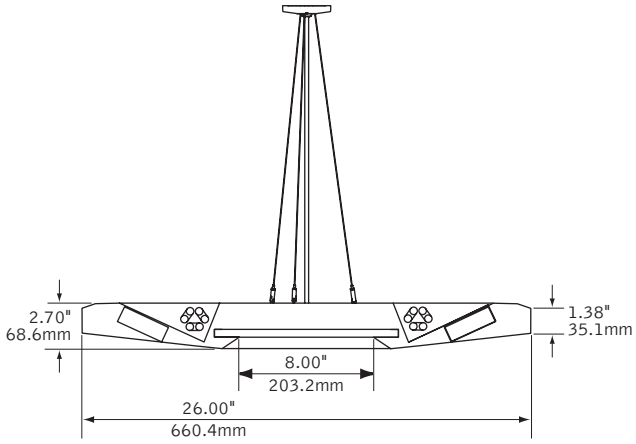
cherry red | kelly green | sky blue

companion luminaire

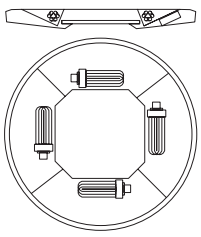
linear | wall mount | sconce

august 2005

dimensional data



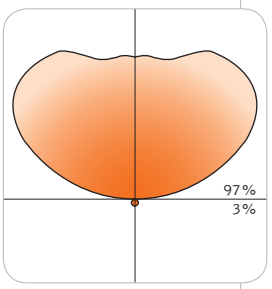
lamping options



26, 32 & 42W TRIPLE TUBE

performance

4–Lamp 42W Triple Tube
65% Efficiency
1917 cd @ 145°



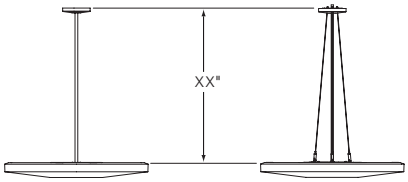
Visit focalpointlights.com for complete photometric data.

fixture:

project:

suspension information

suspension length is determined from ceiling to top of luminaire.



45˚ Swivel Stem "B"

Aircraft Cable with
Metal Braided SJT cord "C"

specifications

construction

20 Ga. spun steel housing .036" min. thickness.
8" Dia. opening reveals luminous acrylic diffuser.
Canopy: 5" Dia. x .875"H, spun steel.
Wiring compartment fabricated of 18Ga. C.R.S.
Ballast is accessible by removing reflectors.

weight: 18 lbs.

optic

Four piece 24 Ga. Hammertone aluminum reflectors.
8" Dia. x .375" thick luminous diffuser constructed of optical grade acrylic available as frosted white or with sunburst pattern.
Solid housing option may also be specified.
Optional red, green or blue color gel may be specified.

electrical

Luminaires are pre-wired for single circuit with thermally protected Class "P" electronic ballast.
Factory installed decorative metal braided power cord is included.
White SJT power cord supplied for 347V.
Optional dimming ballasts available.
Consult factory for dimming specifications and availability.
UL and cUL listed.

Lamp:
Triple tube compact fluorescent, 4-pin, 26W/32W/42W (GX24q-3/4).

finish

Polyester powder coat applied over a 5-stage pre–treatment.

ordering

		FMEP
luminaire series		
Metro	FMEP	
profile		26
26" Diameter	26	
shielding		
Patterned Acrylic	PA	
Frosted White Acrylic	WA	
Solid Housing	SD	
optional color gel (Available on PA or WA option)		
Cherry Red Gel	R	
Kelly Green Gel	G	
Sky Blue Gel (Leave blank for no color)	B	
lamping		
4 Lamp 26W Triple Tube, GX24q-3/4	426TT	
4 Lamp 32W Triple Tube, GX24q-3/4	432TT	
4 Lamp 42W Triple Tube, GX24q-3/4	442TT	
circuit		
Single Circuit	1C	
Dual Circuit	2C	
voltage		
120 Volt	120	
277 Volt	277	
347 Volt	347	
ballast		
Electronic Program start <10% THD	S	
Electronic Dimming Ballast* (Consult factory for dimming availability on 42w. Triple Tube)	D	
suspension		
24" Aircraft Cable	C24	
48" Aircraft Cable	C48	
96" Aircraft Cable	C96	
6" 45° Swivel Stem	B6	
12" 45° Swivel Stem	B12	
18" 45° Swivel Stem	B18	
24" 45° Swivel Stem	B24	
36" 45° Swivel Stem	B36	
48" 45° Swivel Stem (consult factory for other lengths)	B48	
factory options		
Emergency Battery Pack* (EM option not available with swivel stem.)	EM	
HLR/GLR Fuse	FU	
Include 3000K Lamp	L830	
Include 3500K Lamp	L835	
Include 4100K Lamp	L841	
finish		
Titanium Silver	TS	
Matte Satin White	WH	

* for more information see Reference section.

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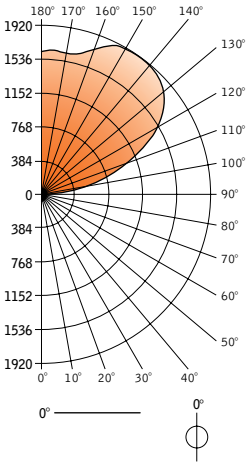
metro™ 26

Filename: FMEP26442TT.IES
Catalog #: FMEP-26-442TT-1C-120-S-C24-TS
Efficiency: 65%
Test #: 11885.1

CANDLEPOWER DISTRIBUTION



Spacing 1.4
Criterion: 1.4

Vertical Angle	Horizontal Angle 0°	Zonal Lumens
0°	75	
5°	79	8
15°	77	22
25°	72	33
35°	66	41
45°	61	47
55°	50	44
65°	31	30
75°	13	13
85°	3	4
90°	30	
95°	236	258
105°	823	870
115°	1324	1315
125°	1684	1511
135°	1866	1445
145°	1917	1204
155°	1896	878
165°	1656	469
175°	1644	157
180°	1612	

LUMEN SUMMARY

	Zone	Lumens	% Lamp	% Fixt
	0°-30°	63	0.5	0.7
	0°-90°	243	1.9	2.9
	90°-130°	3953	30.9	47.3
	90°-180°	8107	63.3	97.1
Total Luminaire	0°-180°			

LUMINANCE DATA (CD/M²)

Vertical Angle	0°
45°	281
55°	282
65°	235
75°	159
85°	126

CO-EFFICIENTS OF UTILIZATION

Floor		80				70			20					
Ceiling									50		30		10	00
Wall	70	50	30	10	70	50	10	50	10	50	10	50	10	00
RCR 0	63	63	63	63	54	54	54	37	37	22	22	08	08	02
1	57	54	52	50	49	47	43	52	30	29	18	07	07	02
2	52	47	43	40	44	41	35	28	25	17	15	06	06	01
3	47	41	37	33	40	36	29	25	21	15	13	06	05	01
4	43	36	32	28	37	31	25	22	18	13	11	05	04	01
5	39	32	28	24	34	28	21	20	15	12	09	05	04	01
6	36	29	24	21	31	25	18	18	13	11	08	04	03	01
7	33	26	21	18	29	23	16	16	11	10	07	04	03	01
8	31	24	19	16	26	20	14	14	10	09	06	03	02	01
9	29	22	17	14	25	19	12	13	09	08	06	03	02	00
10	27	20	15	13	23	17	11	12	08	07	05	03	02	00

Numbers indicate percentage values of

Go to www.focalpointlights.com for additional photometric data.

DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

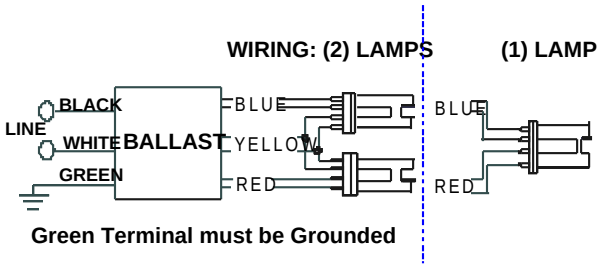
PHILIPS
ADVANCE

ICF-2S42-M2-BS@120	
Brand Name	SMARTMATE
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* CFTR42W/GX24Q	2	42	0/-18	0.78	93	0.97	10	0.99	1.5	1.04

Wiring Diagram



Green Terminal must be Grounded

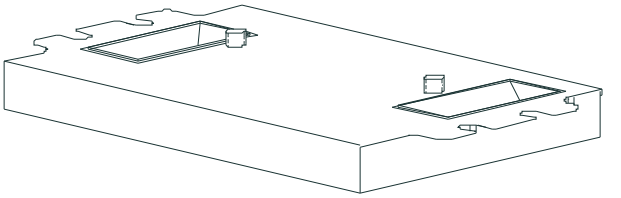
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	3.00 "	1.29 "	2.00 "
4 49/50	3	1 29/100	2
12.6 cm	7.6 cm	3.3 cm	5.1 cm

Revised 02/12/2008

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

ICF-2S42-M2-BS@120	
Brand Name	SMARTMATE
Ballast Type	Electronic
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.

1.3 Ballast shall be provided with poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Programmed Start except for ballasts with -QS suffix, which shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.3 Ballast shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the IntelliVolt ballast. RCF models shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor of 1.00 for primary lamp application.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature of -18C (0F) for primary lamp. Ballasts for PL-H lamps shall have a minimum starting temperature of -30C (-20F) for primary lamp.

2.11 Ballast shall provide Lamp EOL Protection Circuit.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 75C and three-years for a maximum case temperature of 85C (90C 3year warranty for ICF1H120-M4-XX, ICF2S42-90C-M2-XX and ICF2S70-M4-XX modesls).

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

Revised 02/12/2008

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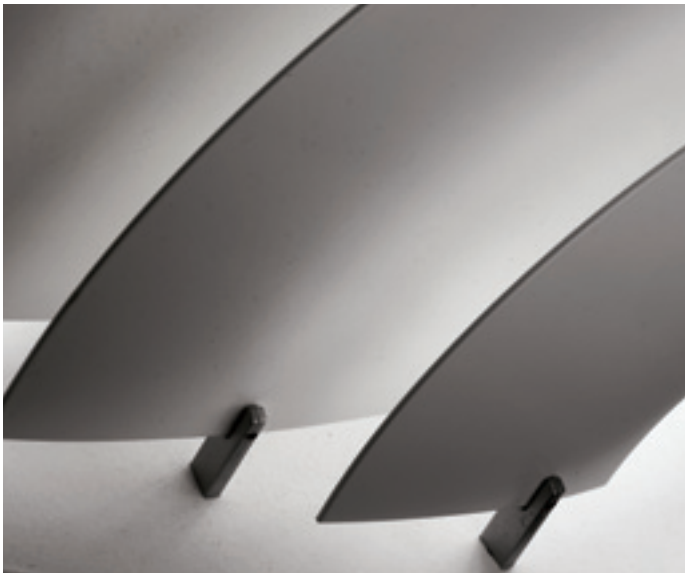
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

Oslo Wall

wall



Weblink
132

Project page
370

Design
Kurt Nørregaard

Concept
Oslo Wall creates indirect illumination and produces a visually comfortable ambience as a result of light being emitted between the shades. The lighting characteristics make it ideal for accent illumination.

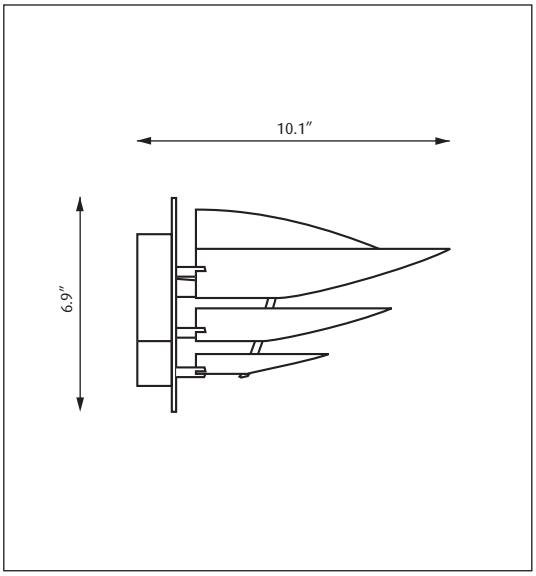
Finish
Aluminum, brushed and lacquered. White, wet painted.

Material
Shades: Spun aluminum. Diffuser: Frosted, vacuum formed acrylic. Back plate: Die cut steel. Legs: Die cast aluminum.

Mounting
Surface: Mounted directly to finished surface over a recessed 4″ octagonal junction box.

Weight
Max. 7 lbs.

Label
cUL, Dry location. IBEW.



Product code	Light source	Voltage	Finish
OSW	1/26W/32W/42W/CF GX24q-3/4	120-277V	BR ALU WHT

Specification notes:
a. Provided with a universal wattage socket and 120-277V integral electronic ballast.

Info notes:
I. The comparable EU version has the following classification: Ingress Protection Code: IP20.


56


53


54


88

Excalibur Hotel & Spa
Las Vegas, Nevada, USA
Architect
Klai Juba Architects
Lighting Designer
Klai Juba Architects
Photo
Jacob Termansen

DULUX® D/E 4-PIN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
26	T (T4)	5.2	124	GX24Q-3	20767	**CF26DT/E/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1800	1548	1,2,5,6, 7,12,20
					20995	**CF26DT/E/835/ECO/BL/1**	CFTR26W/GX24Q/835	50	12000	3500	82	1800	1548	1,2,5,6, 7,12,20
32	T (T4)	5.8	147	GX24Q-3	20768	**CF32DT/E/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2400	2064	1,2,5,6, 7,12,18,20

DULUX T/E/IN AMALGAM, 4-PIN ECOLOGIC COMPACT FLUORESCENT LAMPS

For electronic ballast for high and low temperature applications. Lamps have End-of-Lamp Life (EOL) Protection

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	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
18	T (T4)	4.4	111	GX24Q-2	20875	**CF18DT/E/IN/827/ECO**	CFTR18W/GX24Q/827	50	12000	2700	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20876	**CF18DT/E/IN/830/ECO**	CFTR18W/GX24Q/830	50	12000	3000	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20877	**CF18DT/E/IN/835/ECO**	CFTR18W/GX24Q/835	50	12000	3500	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
					20878	**CF18DT/E/IN/841/ECO**	CFTR18W/GX24Q/841	50	12000	4100	82	1164 1200	1001 1032	1,2,5,6, 7,12,20,21
26	T (T4)	5.0	126	GX24Q-3	20879	**CF26DT/E/IN/827/ECO**	CFTR26W/GX24Q/827	50	12000	2700	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20880	**CF26DT/E/IN/830/ECO**	CFTR26W/GX24Q/830	50	12000	3000	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20881	**CF26DT/E/IN/835/ECO**	CFTR26W/GX24Q/835	50	12000	3500	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
					20882	**CF26DT/E/IN/841/ECO**	CFTR26W/GX24Q/841	50	12000	4100	82	1746 1800	1501 1548	1,2,5,6, 7,12,20,21
32	T (T4)	5.6	142	GX24Q-3	20883	**CF32DT/E/IN/827/ECO**	CFTR32W/GX24Q/827	50	12000	2700	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20884	**CF32DT/E/IN/830/ECO**	CFTR32W/GX24Q/830	50	12000	3000	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20885	**CF32DT/E/IN/835/ECO**	CFTR32W/GX24Q/835	50	12000	3500	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
					20886	**CF32DT/E/IN/841/ECO**	CFTR32W/GX24Q/841	50	12000	4100	82	2328 2400	2002 2064	1,2,5,6, 7,12,18,20,21
42	T (T4)	6.5	163	GX24Q-4	20887	**CF42DT/E/IN/827/ECO**	CFTR42W/GX24Q/827	50	12000	2700	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20888	**CF42DT/E/IN/830/ECO**	CFTR42W/GX24Q/830	50	12000	3000	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20871	**CF42DT/E/IN/835/ECO**	CFTR42W/GX24Q/835	50	12000	3500	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
					20890	**CF42DT/E/IN/841/ECO**	CFTR42W/GX24Q/841	50	12000	4100	82	3104 3200	2670 2752	1,2,5,6, 7,12,18,20,21
57	T (T4)	7.76	197	GX24Q-5	20895	**CF57DT/E/IN/827/ECO**	CFTR57W/GX24Q/827	50	12000	2700	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20896	**CF57DT/E/IN/830/ECO**	CFTR57W/GX24Q/830	50	12000	3000	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21
					20897	**CF57DT/E/IN/835/ECO**	CFTR57W/GX24Q/835	50	12000	3500	82	4171 4300	3587 3698	1,2,5,6, 12,18,20,21

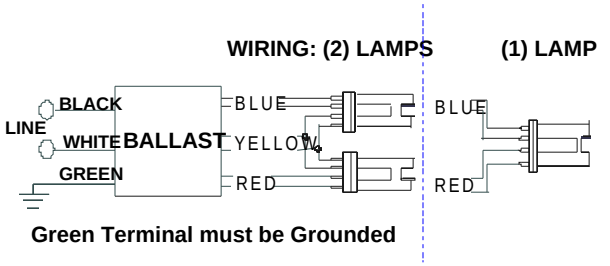
PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
CFQ26W/G24Q	1	26	0/-18	0.23	27	1.00	10	0.98	1.7	3.70
CFQ26W/G24Q	2	26	0/-18	0.43	51	1.00	10	0.98	1.7	1.96
* CFTR26W/GX24Q	1	26	0/-18	0.24	29	1.10	10	0.98	1.7	3.79
CFTR26W/GX24Q	2	26	0/-18	0.45	54	1.00	10	0.98	1.7	1.85
CFTR32W/GX24Q	1	32	0/-18	0.31	36	0.98	10	0.98	1.7	2.72
CFTR42W/GX24Q	1	42	0/-18	0.38	46	0.98	10	0.98	1.7	2.13

Wiring Diagram



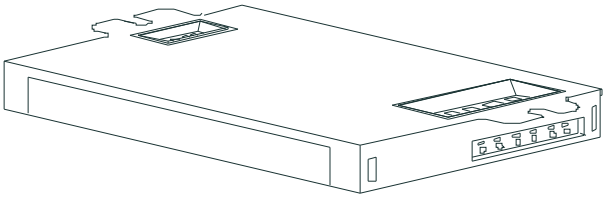
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White		0
Red/White		0

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
4.98 "	2.4 "	1.0 "	4.6 "
4 49/50	2 2/5	1	4 3/5
12.6 cm	6.1 cm	2.5 cm	11.7 cm

Revised 09/10/2007

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

PHILIPS LIGHTING ELECTRONICS N.A.

10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018

Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance

Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PHILIPS
ADVANCE

RCF-2S26-H1-LD-QS	
Brand Name	AMBISTAR - HPF
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads or poke-in wire trap connectors color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Rapid Start.

2.2 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power

2.3 Ballast shall operate from 60 Hz input source of 120V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.4 Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.5 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.6 Ballast shall have a minimum ballast factor for primary lamp as follows: 0.85 for linear lamps or 1.0 for CFL lamps.

2.7 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.8 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% when operated at nominal line voltage with primary lamp.

2.9 Ballast shall have a Class A sound rating.

2.10 Ballast shall have a minimum starting temperature for primary lamp as follows: 0°F/-18°C for CFL lamps or 50°F/10°C for standard T12 lamps and 60°F/16°C for energy-saving T12 lamps.

2.11 Ballast shall provide Lamp EOL Protection Circuit for CFL lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast for CFL lamps shall be rated for use in air-handling spaces.

3.4 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.5 Ballast shall comply with ANSI C82.11 where applicable.

3.6 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Consumer (Class B) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a three-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70°C for RELB models or 85°C for RCF models.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

4.4 Ballast shall meet the ballast-controlled performance requirements in the ENERGY STAR Program Requirements for Residential Lite Fixtures.

Revised 09/10/2007

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Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

PH 4½-3½ Glass Table

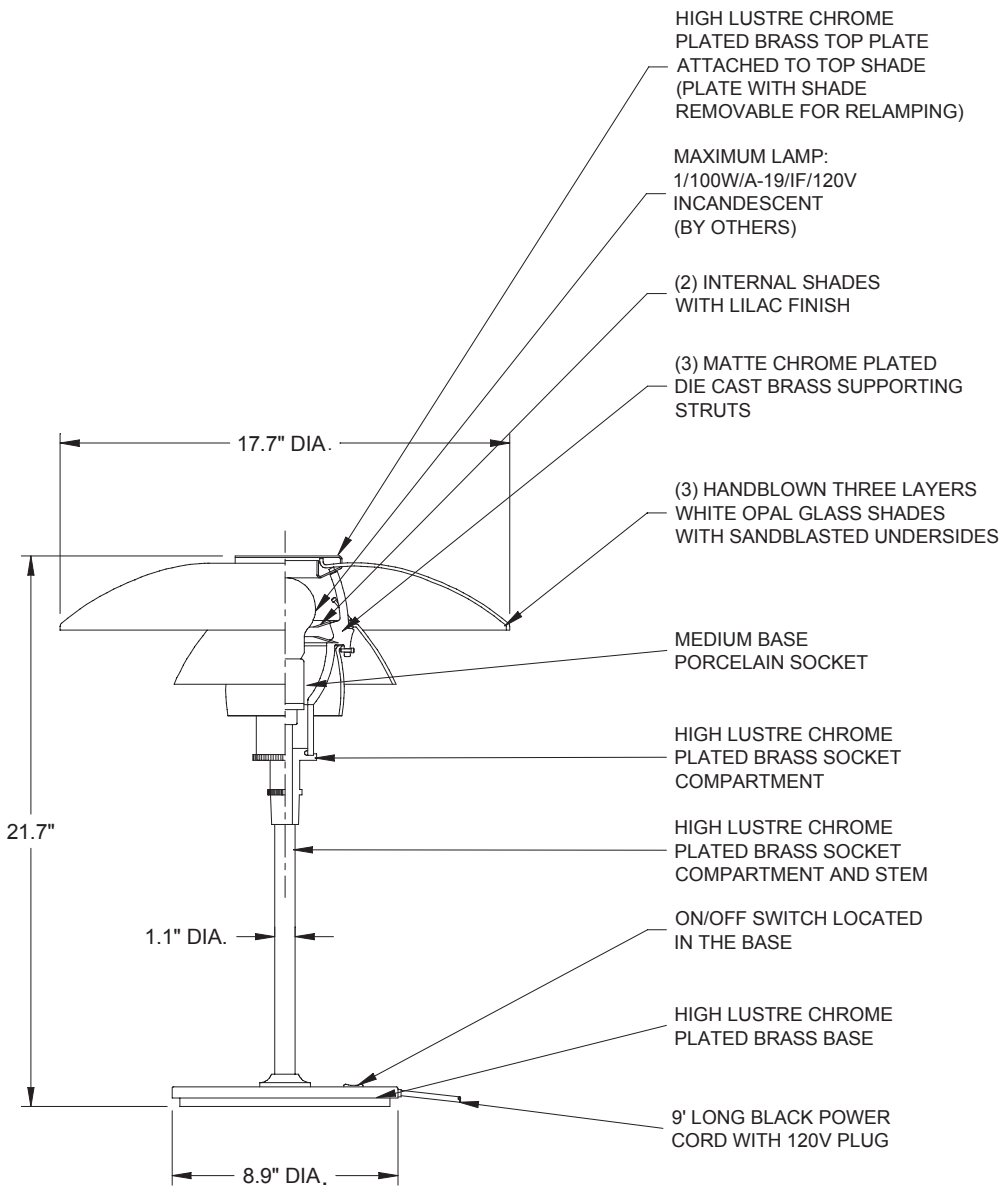
incandescent

Design: Poul Henningsen

Type:

Project:

Catalog Number:



louis poulsen

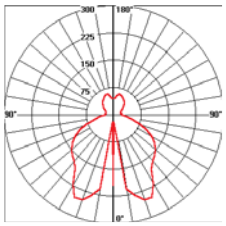
Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com

PH 4½-3½ Glass Table

table & floor

incandescent



Photometric Report:	PH41/2-31/2-T-1-100W-A19-IF.IES
Report No.:	LP0380
Poulsen Report No.:	PH41/2-31/2-T-1-100W-A19-IF.IES
Luminaire:	PH 4 Glass Table and Floor
Lamp:	1/100W/A19/IF
Efficiency:	55.1%
Description:	All data shown are per 1750 lumens. This report can be used for calculation on all versions. Use only actual lumen data when calculating.

Candlepower Distribution

Vertical Angle	Candela
0	196
5	20
10	208
25	252
35	183
45	159
55	138
65	102
75	57
90	24
120	28
150	53
180	44

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0-30	197	11.3	20.4
0-40	315	18.0	32.6
0-60	561	32.1	58.1
0-90	758	43.3	78.5
90-120	69	3.9	7.2
90-130	98	5.6	10.2
90-150	161	9.2	16.7
90-180	207	11.8	21.5
0-180	965	55.1	100.0

Coefficients of Utilization - Zonal Cavity Method
Effective Floor Cavity Reflectance 20%

Ceiling Reflectance (%)	80				70				50			30			10			0
Wall Reflectance (%)	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio																		
0	63	63	63	63	60	60	60	60	55	55	55	50	50	50	45	45	45	43
1	57	54	51	49	54	52	49	47	47	45	44	43	41	40	39	38	37	35
2	51	47	43	40	49	45	41	38	41	38	36	37	35	33	34	32	31	29
3	47	41	36	33	44	39	35	32	36	32	30	33	30	28	30	28	26	24
4	43	26	31	27	40	34	20	27	32	28	25	29	26	23	26	24	22	20
5	39	32	27	23	37	30	26	23	28	24	21	26	23	20	24	21	19	17
6	36	29	24	20	34	28	23	20	25	22	19	23	20	18	21	19	17	15
7	33	26	21	18	32	25	21	17	23	19	16	21	18	16	20	17	15	13
8	31	24	19	16	29	23	18	15	21	17	15	19	16	14	20	17	15	12
9	29	22	17	14	27	21	17	14	19	16	13	18	15	12	17	14	14	11
10	27	20	16	13	26	19	15	12	18	14	12	17	13	11	15	13	11	10

Design
Poul Henningsen

Concept
PH 4½-3½ Glass Table (1927) provides soft illumination. The PH 4½ family is based on the principle of a reflecting multi-shade system, producing a harmonious and glare free illumination. The shades are drawn over a logarithmic spiral, with the center of the light source placed in the spiral's focal point.

Finish
White opal glass. High lustre chrome plated.

Material
Base: High lustre chrome plated, spun brass. Shades: Handblown white opal glass. Anti-glare ring: Purple, spun aluminum. Top plate: High lustre chrome plated, spun brass. Stem: High lustre chrome plated, steel.

Mounting
Cord type: Black. Cord length: 9'. Switch: On/off switch located in the base.

Weight
Max. 22 lbs.

Label
cUL, Dry location. IBEW.

Product code	Light source	Voltage	Finish
PH4½-3½-T	1/100W/A-19/IF medium	120V	GLASS

Info notes:
I. All handblown opal glass shades are sandblasted on the undersides for uniform light distribution.
II. The comparable EU version has the following classification: Ingress Protection Code: IP20.

louis poulsen

Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com


K19

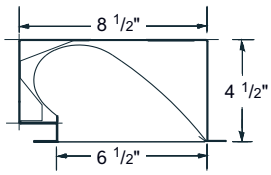

PAR38 Side Prong

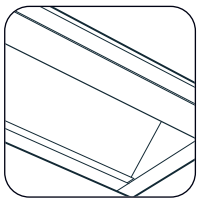

R20

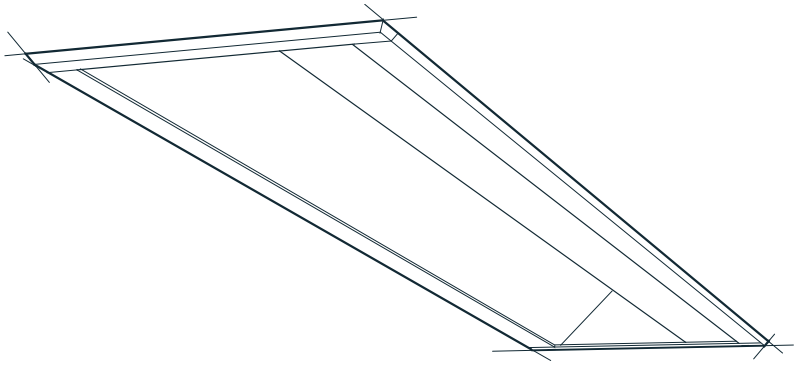

A19

GENERAL PURPOSE LAMPS

Watts	Bulb	Base	Product Number	Symbols & Footnotes	Ordering Abbreviation	Volts	Pkg Qty	Description	Class & Filament	Avg Rated Life(hrs)	Lumens Beam Angle CBCP	LCL (in)	MOL (in)
75	K19	Med	12583	●	**75K19/DR**	120	24	Inside Frost Directional Reflector	C, CC-6	1150	855lm		4.13
	PAR38	Med Side Prong	13850	★ I/O	**75PAR/3FL**	120	12	Compact Flood	C, CC-6	2000	1040lm 1800 cd 30˚		4.31
	R20	Med	14840	● 68,107,118	**75R20/RP**	120	6	Reflector Flood	C, CC-9	2000	500lm 500 cd 45˚		3.94
	R30	Med	15146	●	**75R30/BLACKLIGHT/RP**	120	6	Blacklight	C, CC-6	1000			6.50
90	A19	Med	11396	●	**100A/90/W/ES/4PK**	120	48	Soft White Energy Saver	C, CC-8	750	1450	3.13	4.44
			11378	●	**100A/90/SS**	120	48	Standard Frost SuperSaver	C, CC-8	750	1480	3.13	4.44
			11382	● 136,189	**100A/90/SS**	130	48	Standard Frost SuperSaver	C, CC-8	750	1480	3.13	4.44
			@ 120 _volts, approximate 79 watts, 1130 lumens, 1875 hours										
		Med Brass	11386	108	**100A/90/SSXL**	120	48	Standard Frost SuperSaver XL	C, CC-8	2500	1220	3.13	4.44
			11390	108,136,186	**100A/90/SSXL**	130	48	Standard Frost SuperSaver XL	C, CC-8	2500	1230	3.13	4.44
			@ 120 _volts, approximate 79 watts, 940 lumens, 6250 hours										
100	A19	Med	12948	●	**100A/DAY/4/160/RP**	120	160	Daylight	C, CC-8	750	1270	3.13	4.44
			12587	●	**100A/DAY/RP/4/48**	120	48	Daylight	C, CC-8	750	1270	3.13	4.44
			12952	●	**100A/DAY/RP/2/24**	120	24	Daylight	C, CC-8	750	1270	3.13	4.44
			12538	● 103,136	**100A/DAY/RP/4/48**	130	48	Daylight	C, CC-8	750	1270	3.13	4.44
			@ 120 _volts, approximate 88 watts, 970 lumens, 1875 hours.										
			16868	●	**100A/DL/SW/PLUS/4PK/RP/160**	120	160	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			16864	●	**100A/DL/SW/PLUS/4PK/RP**	120	48	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			11332	● 108	**100A/DL/SW/4PK/RP**	120	48	Soft White Double Life	C, CC-8	1500	1530	3.13	4.44
			12480	●	**100A/DL/SW/PLUS/2PK/RP**	120	24	Soft White Double Life	C, CC-8	1500	1560	3.13	4.44
			12805	● 108	**100A/DL/SW/2PK/RP**	120	24	Soft White Double Life	C, CC-8	1500	1530	3.13	4.44
			11660	●	**100A/CL/DL/PLUS/2PK/RP**	120	24	Clear Double Life	C, CC-8	1500	1590	3.13	4.44
			11176	● 108	**100A/CL/DL/RP**	120	24	Clear Double Life	C, CC-8	1500	1550	3.13	4.44
			13002	●	**100A/RS/2/RP**	120	24	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			12997	●	**100A/RS/RP/1**	120	12	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			12998	● 136,190	**100A/RS/2/RP**	130	24	Inside Frost Rough Service	C, C-9	1000	1260	2.88	4.44
			@ 120 _volts, approximate 88 watts, 960 lumens, 2500 hours										
			12770	●	**100A/W/4/RP**	120	48	Soft White	C, CC-8	750	1690	3.13	4.44
			12752	●	**100A/W/RP**	120	24	Soft White	C, CC-8	750	1690	3.13	4.44
			12529	●	**100A/CL**	120	120	Clear	C, CC-8	750	1720	3.13	4.44
			11226	●	**100A/CL/RP**	120	24	Clear	C, CC-8	750	1720	3.13	4.44
			12531	● 136,193	**100A/CL**	130	120	Clear	C, CC-8	750	1700	3.13	4.44
			@ 120 _volts, approximate 88 watts, 1290 lumens, 1875 hours										
			12750	●	**100A/4/RP**	120	48	Standard Frost	C, CC-8	750	1710	3.13	4.44
			12735	●	**100A/RP**	120	24	Standard Frost	C, CC-8	750	1710	3.13	4.44
			11375	● 136,193	**100A**	130	48	Standard Frost	C, CC-8	750	1700	3.13	4.44
			@ 120 _volts, approximate 88 watts, 1290 lumens, 1875 hours										







ordering

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

Applications Retail displays, art galleries, corridors.

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

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

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

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

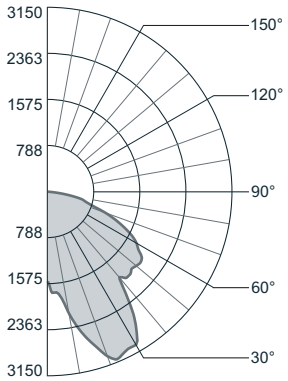
Mounting Fixture is recess-mounted in either exposed T-bar or hard ceiling application(s).

Options **EML**: emergency battery (T5/HO=600-700; T8=600-700 lumens; BX=600-700 lumens); **EMH**: emergency battery (T5/HO=1100-1400 lumens; T8=1100-1400 lumens; BX=1100-1200 lumens); **DM**: dimming (consult factory); **RSE**: rapid-start electronic (T8 & biax only); **10THD**: ballast with < 10% total harmonic distortion (T8 & biax only); **B_**; specific ballasts, specify manufacturer and catalog number (consult factory); **FH**: fixture fusing (slow blow).

photometric data

P-5900-1BX50W-04

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



Candlepower Summary

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

Zonal Lumen Summary

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

Efficiency = 56.4%

Luminance Summary (cd/m²)

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

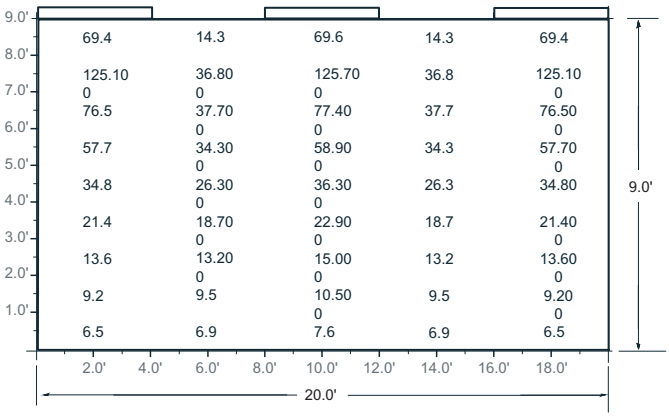
Coefficients of Utilization (%)

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

wall wash application

20' x 9' wall wash layout

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

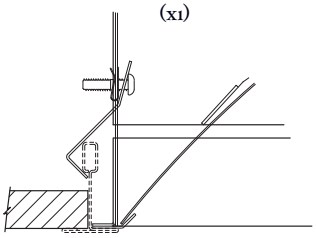


Individual Fixtures on 8' Centers – P-5900-1BX50W-04 Vertical Footcandles

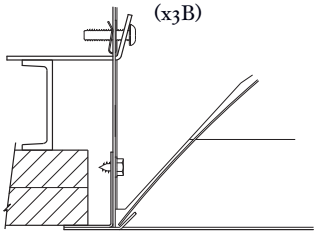
Average Illuminance maintained (LLF = .70)	Max FC	Max : Min	FC's 1'A.F.F.
35.7 FC	125.7	19.2 : 1	8.8

Ceiling Systems

(x1)

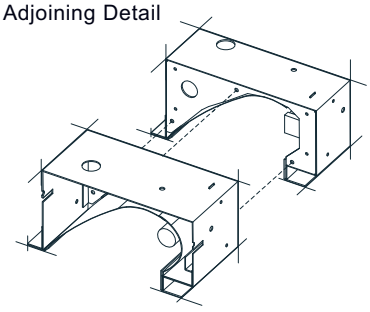


(x3B)

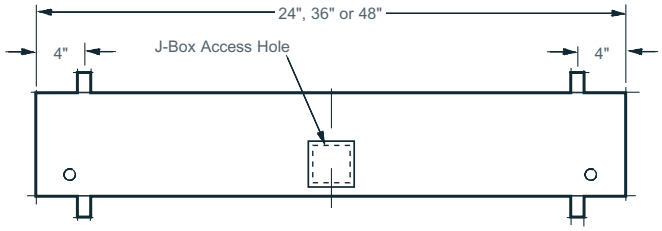


installation

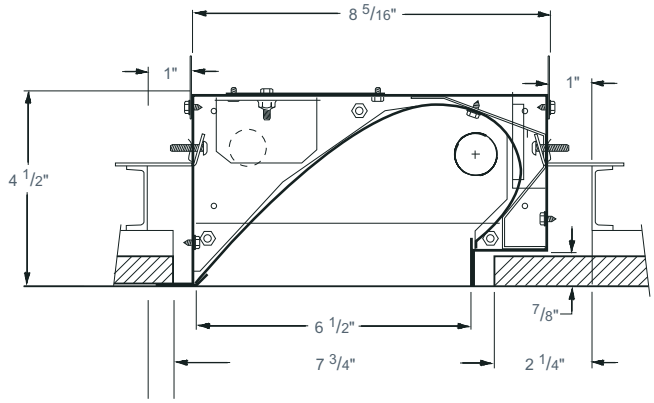
Adjoining Detail



Mounting Locations



Ceiling Detail (x3B)



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

DULUX® L


DULUX® F


DULUX® EL Twist

DULUX® L HIGH LUMEN ECOLOGIC® COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
50	L (T5)	22.6	573	2G11	20280	**FT50DL/830/RS/ECO**	FT50W/2G11/RS/830	10	14000	3000	82	4300	3655	1,2,5,12, 20
55	L (T5)	21.1	535	2G11	20590	**FT55DL/830/ECO**	FT55W/2G11/830	10	12000	3000	82	4800	4128	1,2,5,12, 17,20
					20726	**FT55DL/930/ECO**	FT55W/2G11/30	10	12000	3000	90	4800	4128	1,2,5,12,17,20
					20591	**FT55DL/835/ECO**	FT55W/2G11/835	10	12000	3500	82	4800	4128	1,2,5,12, 17,20
					20592	**FT55DL/841/ECO**	FT55W/2G11/841	10	12000	4100	82	4800	4128	1,2,5,12, 17,20
					20725	**FT55DL/954/ECO**	FT55W/2G11/50	10	12000	5400	90	4800	4128	1,2,5,12,17,20
80	L (T5)	22.6	4.5	2G11	20572	**FT80DL/830/ECO**	FT80W/2G11/830	10	12000	3000	82	6000	5160	1,2,5,12, 17,20
			573	2G11	20622	**FT80DL/835/ECO**	FT80W/2G11/835	10	12000	3500	82	6000	5160	1,2,5,12, 17,20
			4.5	2G11	20624	**FT80DL/841/ECO**	FT80W/2G11/841	10	12000	4100	82	6000	5160	1,2,5,12, 17,20

DULUX F FLAT COMPACT FLUORESCENT LAMPS

Nominal Wattage	Bulb	MOL (in)	MOL (mm)	Base	Product Number	Ordering Abbreviation	NEMA Generic Designation	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
18	F (T5)	4.8	122	2G10	20551	**CF18DF/830**	CFM18W/2G10/830	10	10000	3000	82	1100	946	1,2,5,12,19,20
					20552	**CF18DF/841**	CFM18W/2G10/841	10	10000	4100	82	1100	946	1,2,5,12,19,20
24	F (T5)	6.7	171	2G10	20553	**CF24DF/830**	CFM24W/2G10/830	10	10000	3000	82	1700	1462	1,2,5,12,19,20
					20558	**CF24DF/841**	CFM24W/2G10/841	10	10000	4100	82	1700	1462	1,2,5,12,19,20
36	F (T5)	8.5	217	2G10	20559	**CF36DF/830**	CFM36W/2G10/830	10	10000	3000	82	2800	2408	1,2,5,12,19,20
					20560	**CF36DF/841**	CFM36W/2G10/841	10	10000	4100	82	2800	2408	1,2,5,12,19,20

DULUX EL SELF-BALLASTED COMPACT FLUORESCENT LAMPS

Mini Twist Compact Fluorescent Lamps

Nominal Wattage	Bulb	MOL (in)	Base	Product Number	Ordering Abbreviation	Voltage	Pkg Qty	Avg Rated Life (hrs)	CCT (K)	CRI	Approx Lumens Initial @25°C/77°F	Approx Lumens Mean @25°C/77°F	Symbols & Footnotes
7	MINITWIST	4.4	Medium	29451	**CF7EL/MINI/827**	120	6	8000	2700	82	375	300	1,3,8, 9,12,14,20
				29379	**CF7EL/MINI/830**	120	6	8000	3000	82	375	300	1,3,8, 9,12,14,20
				29371	**CF7EL/MINI/830/BL**	120	6	8000	3000	82	375	300	1,3,8, 9,12,14,20
		4.2	Medium	29697	**CF7EL/SUPER/830/BL**	120	6	10000	3000	82	375	300	1,3,8, 9,12,14,20
11	MINITWIST	4.2	Medium	29766	**CF11EL/SUPER/830/BL**	120	6	10000	3000	82	600	480	1,3,8, 9,12,14,20
		4.5	Medium	29378	**CF11EL/MINI/830**	120	6	8000	3000	82	600	480	1,3,8, 9,12,14,20
				29364	**CF11EL/MINI/830/BL**	120	6	8000	3000	82	600	480	1,3,8, 9,12,14,20
13	MINITWIST	4.6	Medium	29409	**CF13EL/MINI/827**	120	6	10000	2700	82	800	640	1,3,8, 9,12,14,20

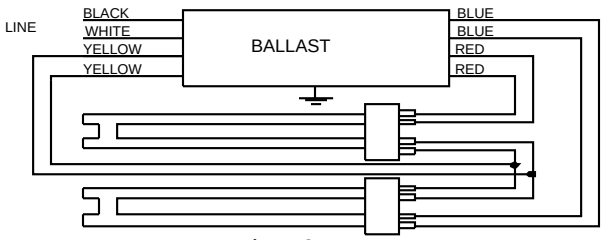
PHILIPS ADVANCE

REL-2TTS50	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* FT50W/2G11/RS	2	50	50/10	0.90	106	0.98	20	0.98	1.7	0.92
FT55W/2G11	2	55	50/10	0.83	99	0.84	20	0.99	1.6	0.85

Wiring Diagram



Diag. 94

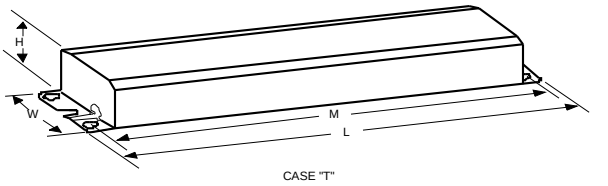
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	12	
White	12	
Blue	24	
Red	24	
Yellow	24	
Gray		
Violet		

	in.	cm.
Yellow/Blue		
Blue/White		
Brown		
Orange		
Orange/Black		
Black/White		
Red/White		

Enclosure



CASE "T"

Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	2.375 "	1.5 "	8.90625 "
9 1/2	2 3/8	1 1/2	8 29/32
24.1 cm	6 cm	3.8 cm	22.6 cm

Revised 08/17/2006

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

PHILIPS LIGHTING ELECTRONICS N.A.

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PHILIPS
ADVANCE

REL-2TTS50	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Notes:

Section I - Physical Characteristics

1.1 Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.

1.2 Ballast shall be provided with integral leads color-coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be _____ (Instant or Rapid) Start.

2.2 Ballast shall provide Independent Lamp Operation (ILO) for Instant Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail.

2.3 Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.

2.4 Ballast shall operate from 60 Hz input source of 120V, 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast.

2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 20 kHz and 30 kHz or above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.

2.6 Ballast shall have a Power Factor greater than 0.98 for primary lamp.

2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 for Low Watt, 0.85 for Normal Light Output, and 1.20 for High Light.

2.8 Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less in accordance with lamp manufacturer recommendations.

2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 20% for Standard models (with the exception of the VEL-3P32-HL-SC which has a THD of <10%) and THD of less than 10% for Centium models when operated at nominal line voltage with primary lamp.

2.10 Ballast shall have a Class A sound rating for all 4-foot lamps and smaller.

2.11 Ballast shall have a minimum starting temperature of _____ [-18C (0F) for standard T8 lamps, 10C (50F) for T8/HO, standard T12, Slimline T12 and Long Twin Tube lamps, 0C (32F) for Slimline T8, -29C (-20F) for T12/HO lamps,] for primary lamp application. Ballast shall have a minimum starting temperature of 60F (16C) for energy-saving T8 and T12 lamps.

2.12 Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.

Section III - Regulatory Requirements

3.1 Ballast shall not contain any Polychlorinated Biphenyl (PCB).

3.2 Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.

3.3 Ballast shall comply with ANSI C62.41 Category A for Transient protection.

3.4 Ballast shall comply with ANSI C82.11 where applicable.

3.5 Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.

4.2 Ballast shall carry a five-year warranty from date of manufacture against defects in material or workmanship, including replacement, for operation at a maximum case temperature of 70C.

4.3 Manufacturer shall have a fifteen-year history of producing electronic ballasts for the North American market.

NOTE: The use of Optanium (IOP) and ICN-2P32-N models is recommended to reduce striation in energy-saving T8 lamps (25W, 28W or 30W). Remote or tandem wiring of energy-saving T8 lamps (25W, 28W or 30W) is only recommended for Optanium (IOP) models.

Revised 08/17/2006

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ELECTRICAL EQUIPMENT APPENDIX

The following pages contain cutsheets of control devices and overcurrent protection devices that pertain to this project. For luminaire, lamp, and ballast information, consult the Lighting Equipment Appendix .

DT-300 Series Dual Technology Ceiling Sensors

PROJECT

LOCATION/TYPE

Product Overview

Description

The DT-300 Series Dual Technology Ceiling Sensors combine the benefits of passive infrared (PIR) and ultrasonic technologies to detect occupancy. Sensors have a flat, unobtrusive appearance and provide 360 degrees of coverage.

Operation

Low voltage DT-300 Series sensors utilize a Watt Stopper/Legrand power pack to turn lights on when both PIR and ultrasonic technologies detect occupancy. They can also work with a low voltage switch for manual-on operation. PIR technology senses motion via a change in infrared energy within the controlled area, whereas ultrasonic uses the Doppler Principle and 40KHz high frequency ultrasound. Once lights are on, detection by either technology holds them on. When no occupancy is detected for the length of the time delay, lights turns off. DT-300 Series Sensors can also be set to trigger lights on when either technology or both detect occupancy, or to require both technologies to hold lighting on.

SmartSet™

DT-300 Series Sensors require no adjustment at installation, as SmartSet technology continuously monitors the controlled space to identify usage patterns. Based on these patterns, the unit automatically adjusts time delay and sensitivity settings for optimal performance and energy efficiency. Sensors assigns short delays (as low as five minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times.

Application

DT-300 Series Dual Technology Sensors have the flexibility to work in a variety of applications, where one technology alone could cause false triggers. Ideal applications include classrooms, open office spaces, large offices and computer rooms. The DT-300 Series mounting system makes them easy to install in ceiling tiles or to junction boxes, providing the flexibility to be used in a wide range of spaces.

Features

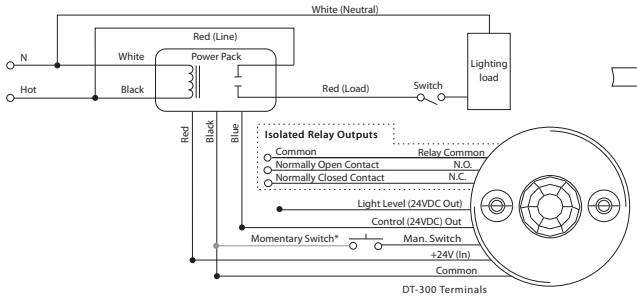
- Advanced control logic based on RISC microcontroller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
  - Walk-through mode turns lights off three minutes after the area is initially occupied – ideal for brief visits such as mail delivery
- Available with built-in light level sensor featuring simple, one-step setup
- Sensors work with low-voltage momentary switches to provide manual control
- Patented ultrasonic diffusion technology spreads coverage to a wider area
- LEDs indicate occupancy detection
- Uses plug terminal wiring system for quick and easy installation
- Eight occupancy logic options provide the ability to customize control to meet application needs
- Available with isolated relay for integration with BAS or HVAC

Specifications

- 24 VDC/VAC
- Ultrasonic frequency: 40kHz
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), Walk-through/Test Modes
- Sensitivity adjustment: SmartSet (automatic); reduced sensitivity (PIR); variable with trim pot (ultrasonic)
- Built-in light level sensor: 10 to 300 footcandles (107.6 to 3,229.2 lux)
- Low-voltage, momentary switch input for manual on or off operation
- DT-300 contains an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC
- Multilevel Fresnel lens provides 360° coverage for superior occupancy detection
- Mounting options: ceiling tile; 4" square junction box with double-gang mud ring
- Max DT-300s per power pack: B=2 , BZ=3
  Max DT-305s per power pack: B=3, BZ=4
- Dimensions: 4.50" diameter x 1.02" deep (114.3mm x 25.9mm)
- UL and CUL listed; five-year warranty

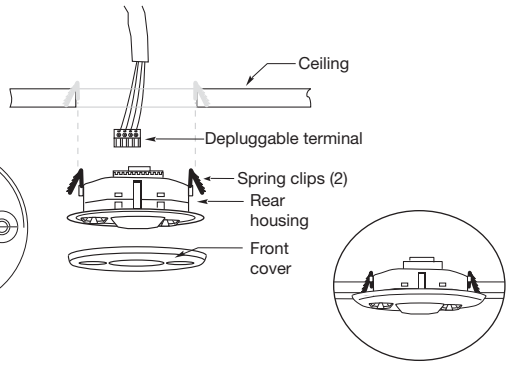
Wiring & Mounting

Wiring Diagram



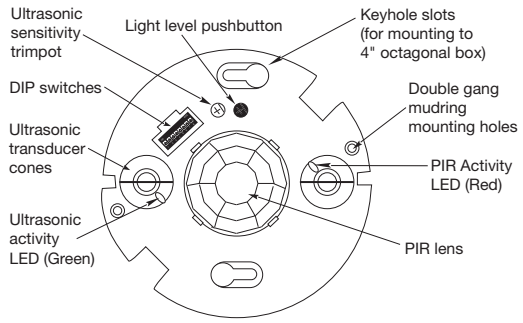
*Momentary switch connection is optional.
Connect only when momentary switch is installed.

Ceiling Mounting



Controls & Settings

Product Controls



DIP Switch Settings

◂ = Factory Setting
● = ON
– = OFF

Occupancy Logic	Switch# 1	2	3
Standard ◂	–	–	–
Option 1	●	–	–
Option 2	–	●	–
Option 3	●	●	–
Option 4	–	–	●
Option 5	●	–	●
Option 6	–	●	●
Option 7	●	●	●

Time Delay	4	5	6
5 sec/SmartSet ◂	–	–	–
5 minutes	–	–	●
10 min. 🚶	–	●	–
10 minutes	–	●	●
15 min. 🚶	●	–	–
15 minutes	●	–	●
20 minutes ◂	●	●	–
30 min. 🚶	●	●	●

🚶 = walk-through mode

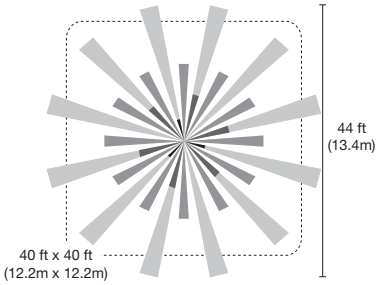
Occupancy Logic	Trigger	Initial Occupancy	Maintain Occupancy	Re-trigger (seconds duration)
Standard ◂	Both	Either	Either(5)
Option 1	Either	Either	Either(5)
Option 2	PIR	Either	Either(5)
Option 3	Both	Both	Both(5)
Option 4	PIR	PIR	PIR(5)
Option 5	Ultra	Ultra	Ultra(5)
Option 6	Man.	Either	Either(30)
Option 7	Man.	Both	Both(30)

LEDs	7
Disabled	–
Enabled ◂	●

PIR Sensitivity	8
Minimum	–
Max./SmartSet ◂	●

The technology control (occupancy logic) options are adjustable by user. The standard setting recommended for most applications requires both technologies to trigger on, either to hold on.

Coverage



Coverage shown is maximum and represents half-step walking motion. Under ideal conditions, coverage for half-step walking motion can reach up to 1000 ft^2.

Ordering Information

Catalog No.	Voltage	Current	Coverage	Features
☐ DT-300	24 VDC/VAC	43 mA	up to 1000 ft² (92.9 m²)	Isolated relay, light level
☐ DT-305	24 VDC/VAC	35 mA	up to 1000 ft² (92.9 m²)	

Sensors are white and use Watt Stopper power packs. Current consumption can be slightly higher when only one sensor per power pack is used.

Pub. No. 14906

COLOR KINETICS

PHILIPS

sPDS-60ca 24V

Color Kinetics® sPDS-60ca 24V intelligent, indoor, power/data supply is specifically designed for Color Kinetics 24 volt Chromasic® fixtures. sPDS-60ca 24V is a robust 62W power source with a DMX interface. It is used for installations using a DMX controller such as iPlayer 2, ColorDial, or a third party DMX controller. The DMX data driver conditions the supplied data to a format compatible with the fixtures. The integration of power and data simplifies wiring installation, and the selection of control configurations expands the versatility of the applications.

Push buttons on the front panel of sPDS-60ca 24V allow you to select the base address for each power supply, thus eliminating the need for additional addressing tools. After the base address has been selected, each light can be sequentially addressed or all lights can be set to a single address. All functions can be monitored from the LED display located on the front panel.

sPDS-60ca 24V is housed in a compact enclosure designed for use in dry locations and complies with National Electrical Code (NEC) requirements. The data drive circuitry has been specifically designed with short circuit protection to prevent failures due to incorrect wiring or installation.

sPDS-60ca 24V automatically accommodates supply voltages ranging from 100VAC to 240VAC using a standard IEC cable. All product and data connections are made to the external panels to shorten installation time. sPDS-60ca 24V allows the DMX data to be daisy-chained through the RJ45 terminals from one supply to the next.

FEATURES

- Economical
- Compact size
- Ease of installation
- DMX ready
- Robust 62W power source
- Indoor rated

sPDS-60ca 24V SPECIFICATIONS

POWER INPUT	100VAC to 240VAC auto ranging (50Hz–60Hz),
MAX CURRENT	1.7A at 100V, 1.5A at 120V, .75A at 240V Power factor correction (PFC)
POWER OUTPUT	24VDC (62W Max.)
HEAT DISSIPATION	25 percent of total power input
AMBIENT OPERATING TEMP	14°F to 122°F (-10°C to 50°C)
HOUSING	Overall dimensions: 8.8" (22.4 cm) X 4" (10.2 cm) X 2" (5.1 cm) Weight: 2.0 lbs (907 g)
CONNECTORS	Data: RJ45 input and output connectors Power: 4-pin output connectors, IES power connector
DATA INPUT INTERFACE	Color Kinetics DMX controllers or DMX512 compatible
DATA OUTPUT INTERFACE	Chromasic 24V
LISTINGS	UL/C-UL, CE

DRY

CE c UL us LISTED 78GF

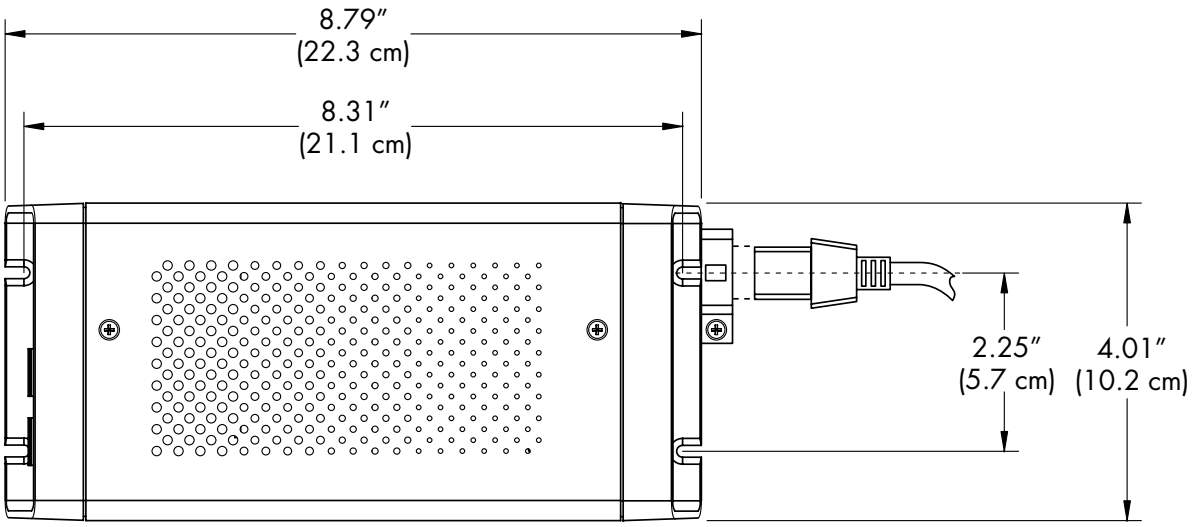
ITEM# 109-000021-00 (DMX)

BR0167 Rev 00

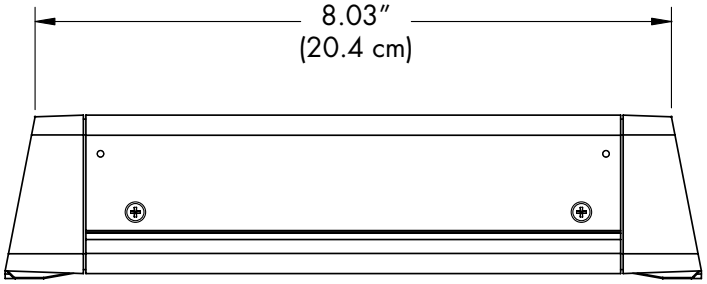
PHILIPS SOLID-STATE LIGHTING SOLUTIONS • 3 BURLINGTON WOODS DRIVE • BURLINGTON, MA 01803 • USA
TEL 888 FULL RGB • TEL 617 423 9999 • FAX 617 423 9998 • INFO@COLORKINETICS.COM • WWW.COLORKINETICS.COM

PHYSICAL DIMENSIONS

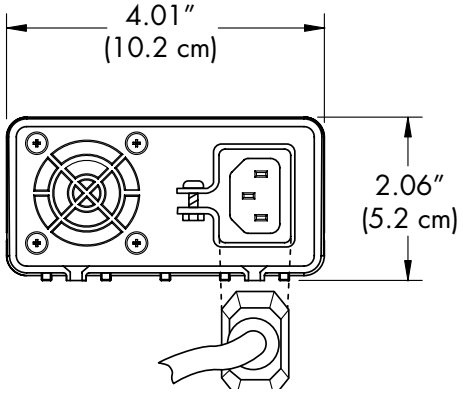
TOP



SIDE



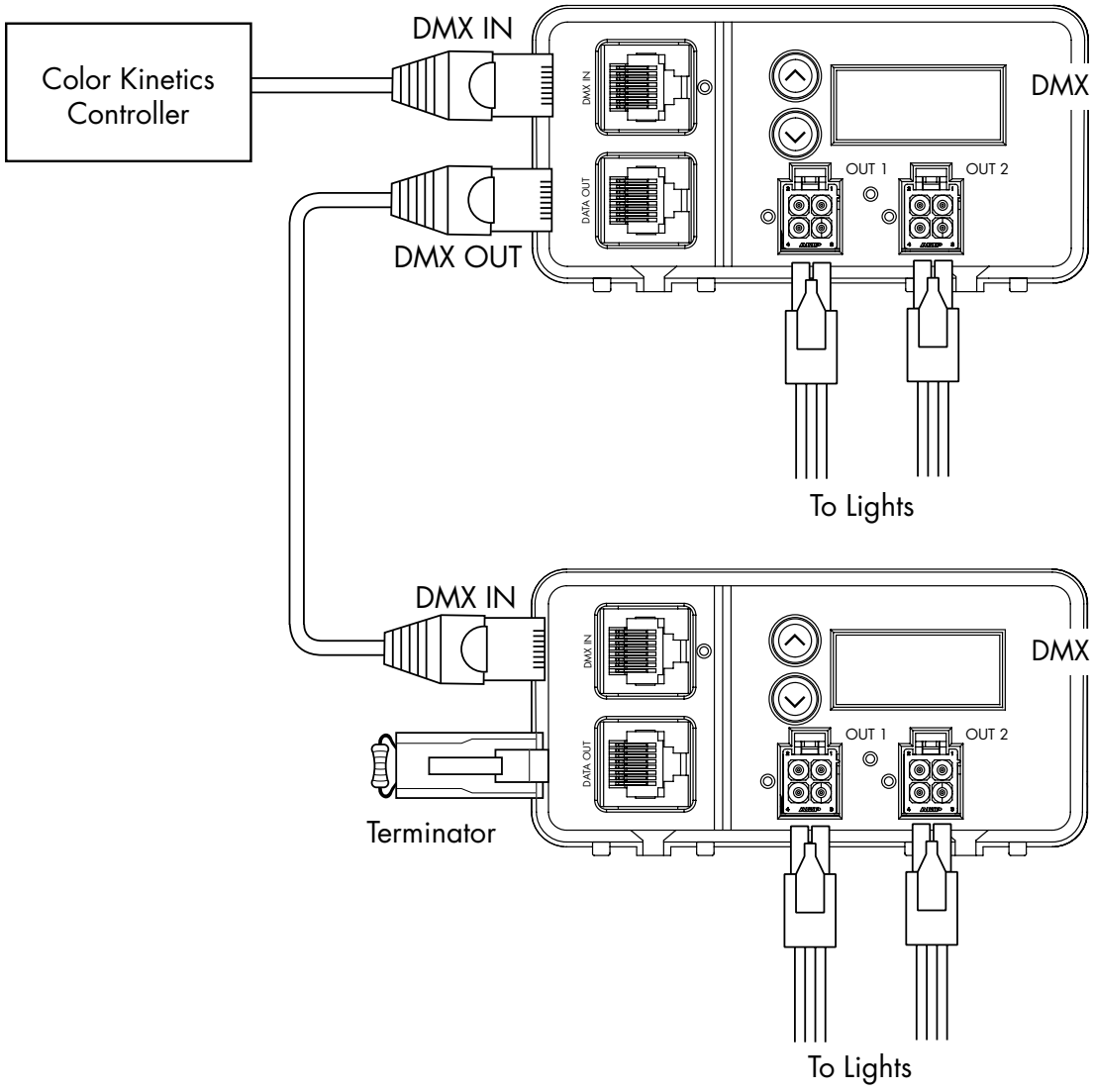
BACK



sPDS-60ca 24V ITEM# 109-000021-00/01	
DATA CONNECTOR	Input and output: RJ45
OUTPUT CONNECTOR	4-pin
SUPPLY CONNECTOR	IEC Inlet
WEIGHT	2 lbs. (907 kg)

FUNCTIONAL FLOW DIAGRAM

DMX



For complete installation instructions and safety precautions, refer to the sPDS-60ca 24V User Guide and wiring diagrams located at www.colorkinetics.com/support.

Date: _____ Type: _____

Firm Name: _____

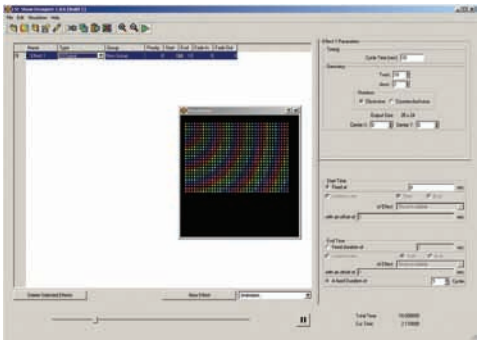
Project: _____

Light System Manager

Versatile control and authoring for large-scale lighting installations

Optimized for medium and large-scale LED lighting installations, Light System Manager controller (LSM) is an integrated hardware and software solution comprising Light System Engine (LSE) controller hardware and Light System Composer (LSC) creative design software. With support for intricately designed installations containing thousands of LED nodes, Light System Manager offers the versatility to manage wide-ranging architectural, entertainment, and retail lighting environments.

- Easy to use — Featuring Ethernet-based control and automatic lighting system discovery, Light System Manager dramatically simplifies installation.
- Hardware support for medium and large environments — The Light System Engine controller processes light output data for up to 10,000 LED nodes, or 5,000 individual fixtures.



- Packaged with Light System Composer — Light System Composer software allows you to create and manage dynamic light shows with fully customizable effects, multi-layer editing, and unique color palettes. You can design shows with single or multiple color-changing effects, animated images, geometric patterns, and more.
- Versatile zone usage — Configure and control multiple playback zones, each with up to unique light show assignments. Light System Manager allows zone control of both indoor and outdoor fixtures within a single installation.
- Simplified control access — Designed for use with LSM, Ethernet Controller Keypad is a wall-mounted triggering device that controls light shows and fixture brightness at the touch of a button. LSM supports up to 10 keypads within a single lighting installation.
- Automatic playback control — Configure show scheduling based on a specific date, a day of the week, weekdays, weekends, or an astronomical event, such as sunrise or sunset.
- Support for IntelliWhite® lighting fixtures — Light System Manager offers visual effects with color temperature and intensity settings designed specifically for IntelliWhite white light fixtures.
- Supports the optional AuxBox expansion device — AuxBox automatically triggers up to eight light shows using any remote triggering device with a dry-contact closure. Via the AuxBox, you can trigger light shows by motion sensors, 3rd party control or sensor systems, and more.

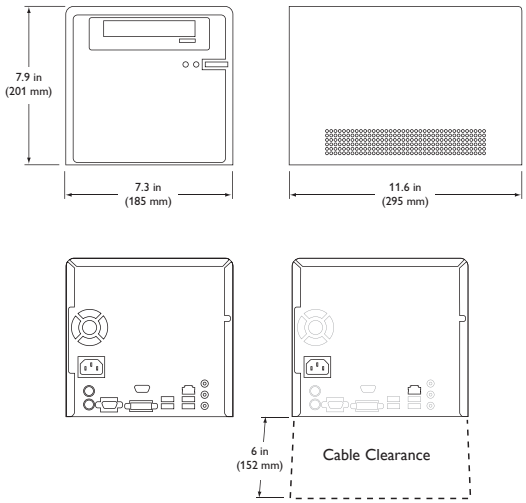
For detailed product information, please refer to the Light System Manager Product Guide at: www.colorkinetics.com/ls/controllers/lsm/

PHILIPS

Specifications

Due to continuous improvements and innovations, specifications may change without notice

Item	Specification	Details
Electrical	Input Voltage	100 – 220 VAC, auto-switching
Capability	Supported LED nodes or fixtures	Up to 10,000 LED nodes, or 5,000 individual fixtures*
	Network Data	KiNET™ Ethernet protocol via standard Ethernet switch**
	Playback Output	Light shows containing one or more visual effects
Physical	Dimensions (Height x Width x Depth)	7.9 x 7.3 x 11.6 in (201 x 185 x 295 mm)
	Weight	9.3 lb (4.2 kg)
	Operating Temperature	32 – 95° F (0° – 35° C)
	Operating Humidity	0 – 90%, relative humidity, non-condensing
Certification and Safety	Certification	FCC, CE, ETL, TUV, C-Tick, BSMI
	Environment	Indoor / Dry location



* LSE supports up to 10,000 Chromasic® nodes, or up to 5,000 individual Chromacore® fixtures.

** Use PoE (Power over Ethernet) compatible Ethernet switches, or PoE injectors, when installing a lighting system containing one or more Ethernet Controller Keypads.

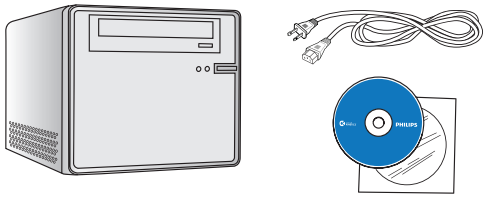
Software Requirements

System Requirements	Specification	PC	Mac
OS		Windows® XP / Vista	Mac OS X 10.4.9 or greater
Hardware	Optical Drive	CD-ROM or DVD drive	CD-ROM or DVD drive
	Memory	256 MB RAM	256 MB RAM
	Disk space	10 MB free disk space	10 MB free disk space

Light System Manager and Accessories

Item	Item Number	Philips 12NC
Light System Manager	103-000015-02	910503700221
Ethernet Controller Keypad	103-000023-00	910503700326
PoE Injector (North America Power Cord)	109-000029-00	910503700383
PoE Injector (Europe Power Cord)	109-000029-01	910503700384
AuxBox	103-000021-00	910503700224

Use Item Number when ordering in North America.



Included in the Box

- Light System Manager
- Power cable
- Software CD

For detailed product information, please refer to the Light System Manager Product Guide at: www.colorkinetics.com/ls/controllers/lsm/

Philips Color Kinetics
3 Burlington Woods Drive
Burlington, Massachusetts 01803 USA
Tel 888.Full.RGB
Tel 617.423.9999
Fax 617.423.9998
www.colorkinetics.com

DAS-000035-01 R00 03-09

iLIGHT
INTELLIGENT CONTROLS

TC-1

Astronomical Time Clock

Features

- Astronomical time clock including day, date, sunrise, sunset functions
- Scene selection and programming
- Channel level raise and lower
- Task / sequence programming
- Scene and channel naming
- Designed and manufactured to IS09001:2000 standards

Overview

Surface mounting electronic time clock with astronomical facility and LCD display. Fully programmable using iCANtools™ for daily or date specific events. Connects to iCAN™ network. Keyboard allows scene selection and event functions to be enabled / disabled.

The iCAN TimeClock enables the user to have the following functions; astronomical time clock, scene programming and scene selection into one simple control panel.

www.coopercontrol.com
203 Cooper Circle,
Peachtree City, GA 30269
P: 800-553-3879
F: 800-954-7016

Catalog#	Project
Prepared by	Date

COOPER Controls

iLIGHT
INTELLIGENT CONTROLS

TC-1

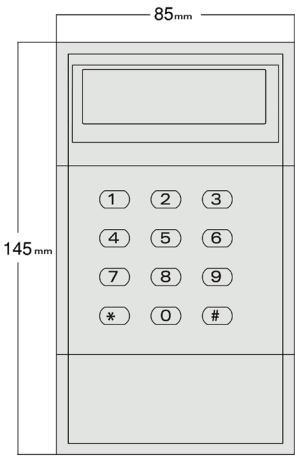
Astronomical Time Clock

Technical Specification

Mechanical

Weight: 1 kg
Operating temperature: +2ºC to +40ºC
Note: All enclosures must be adequately ventilated
Max storage temperature: +60ºC
Humidity: +5 to 95% non-condensing
Environmental protection: IP20

Dimensions



Electrical

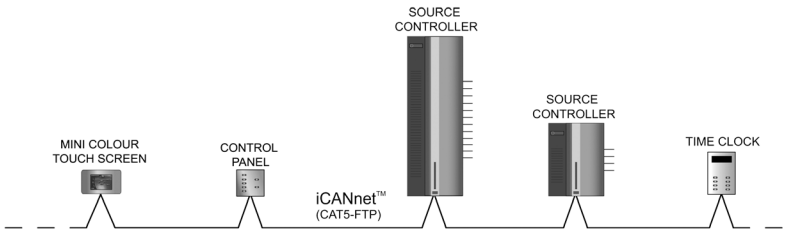
Supply:
+12VDC (via iCANnet™ cable)

Termination:
iCANnet CAT5: Screw terminals within two part connectors, able to accept 1.5mm2 stranded and solid wire.
Programming and configuration
Programming via iCANtools.

Functionality
Select scenes
Scene programming
Channel level raise and lower
Scene and channel naming
Task / sequence programming
Time clock
Date range - recurring events
One shot events
Leap year
Daylight saving setting
Astronomical timeclock with offset facility
Date / day omission
Photocell / motion sensor interaction
Diagnostics - network

Memory:
FLASH memory to be able to upgrade firmware
EEPROM for 128 scene memory

Typical Schematic



Voltage		Standards
	PELV ☑	
	Limited current/ Limited voltage ☑	
	(wire as Class 2 wiring)	

This product conforms to one of more of the above standards. Please contact your local Cooper Controls representative for further information

www.coopercontrol.com
203 Cooper Circle,
Peachtree City, GA 30269
P: 800-553-3879
F: 800-954-7016

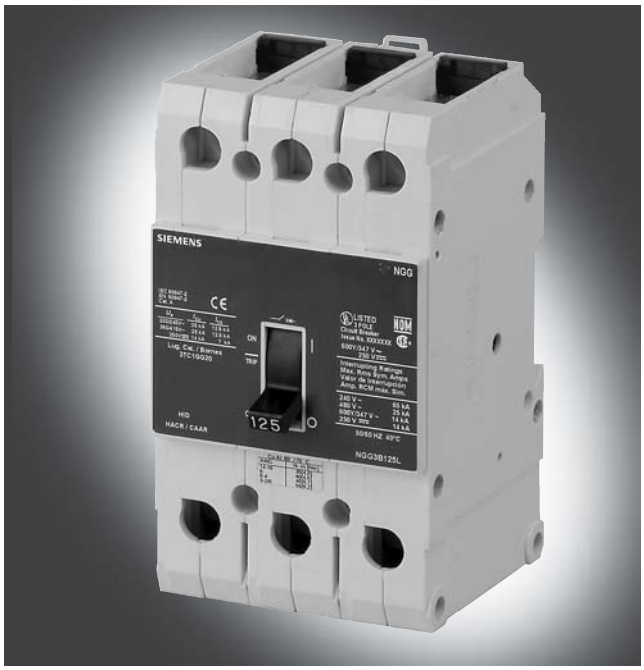
COOPER Controls

Ratings and Markings

Type	Current Range (A)	HACR Rated	SWD Marked	HID Marked
1 pole	15 - 125	15 - 125	15 - 20	15 - 50
2 pole	15 - 125	15 - 125	—	15 - 50
3-pole	15 - 125	15 - 125	—	15 - 50

Shipping Weight:

0.9 lbs. / 0.4 kgs.	1 Pole
1.9 lb. / 0.9 kgs.	2 Poles
2.9 lbs. / 1.2 kgs.	3 Poles



Terminal Connectors

Lug Information

Breaker Amp Rating (A)	Wire Size (AWG)	Torque Inch-lb. (NM)	Lug Catalog No.
15 – 30	#14 – #10 Al	35 (4.0)	3TC1Q1 (pkg. of 3)
	#8 Al	40 (4.5)	
35 – 125	#8 Al or Cu	40 (4.5)	3TC1GG20 (pkg. of 3)
	#3 – 1/0 Cu	55 (6.2)	
	#6 – #4 Al or Cu	45 (5.1)	
	#3 – 2/0 Al	55 (6.2)	

60/75° C wire

Includes retainer clips

Interrupting Ratings (max. RMS symmetrical amperes kA)

Breaker Type	Poles	UL489 Volts AC 120	240	277	347	480	600Y/347	Volts DC 125	125/250	IEC 60947-2 (Ics = 50% Icu) Volts AC 240	415	Volts DC 125/250
NGG/NGB	1	65	—	25	14	—	—	14	—	25	—	—
	2, 3	—	65	—	—	25	14	—	14 ①	65	25	14

40°C, 50/60Hz

① 2-pole only

Ordering Information

Type NGG/NGB 1, 2 and 3 Poles

Ampere Rating In	NGG Catalog Number (Cable In - Cable Out)	NGB Catalog Number (Panelboard Mounting)
15	NGG __ B015L	NGB __ B015B
20	NGG __ B020L	NGB __ B020B
25	NGG __ B025L	NGB __ B025B
30	NGG __ B030L	NGB __ B030B
35	NGG __ B035L	NGB __ B035B
40	NGG __ B040L	NGB __ B040B
45	NGG __ B045L	NGB __ B045B
50	NGG __ B050L	NGB __ B050B
60	NGG __ B060L	NGB __ B060B
70	NGG __ B070L	NGB __ B070B
80	NGG __ B080L	NGB __ B080B
90	NGG __ B090L	NGB __ B090B
100	NGG __ B100L	NGB __ B100B
110	NGG __ B110L	NGB __ B110B
125	NGG __ B125L	NGB __ B125B
	1 = 1 pole, 2 = 2 pole, 3 = 3 pole; L = Line & Load side lugs ②	1 = 1 pole, 2 = 2 pole, 3 = 3 pole; B = Load side lugs ③

② This "L" indicates Line Side and Load Side lugs are supplied as standard. To order an NGG without lugs, remove the L suffix.
③ This "B" indicates Load Side lugs are supplied as standard. To order an NGB without lugs, remove the B suffix.

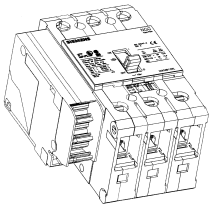
Shunt Trip — Contains (1) shunt trip device. A combination includes a shunt trip device and an auxiliary switch with 1A-1B contacts.

Control Voltage			Shunt Trip	Shunt Trip and Auxiliary Switch Combination
AC	DC	Current Draw	Catalog Number	Catalog Number
120	—	0.09A	CQDST120	CQDST120AAS
240	—	0.50A	CQDST240	CQDST240AAS
277	—	0.55A	CQDST277	CQDST277AAS
380-415	—		STRGT415 ①	ASTGT415 ①
480	—	0.45A	CQDST480	CQDST480AAS
600	—	0.50A	CQDST600	CQDST600AAS
—	12	1.20A	CQDST12	CQDST12DAS
—	24	0.80A	CQDST24	CQDST24DAS
—	48	0.80A	CQDST48	CQDST48DAS
—	125	0.35A	CQDST125	CQDST125DAS

① This is an IEC only rating

Auxiliary Switch — Contains (1) or (2) sets of "A" contacts and "B" contacts.

Maximum Control Supply Voltage U_S		Single Auxiliary Switch 1A-1B Contact		Double Auxiliary 2A-2B Switch Contacts	
AC	DC	Catalog Number	Max. Operational Current	Catalog Number	Maximum Operational Current
240	125	CQDA1	@240C AC – 15A @125V DC – 0.5A	CQDA2	@240V AC – 15A @125V DC – 0.5A



Mounted left side only, not available on single pole breakers

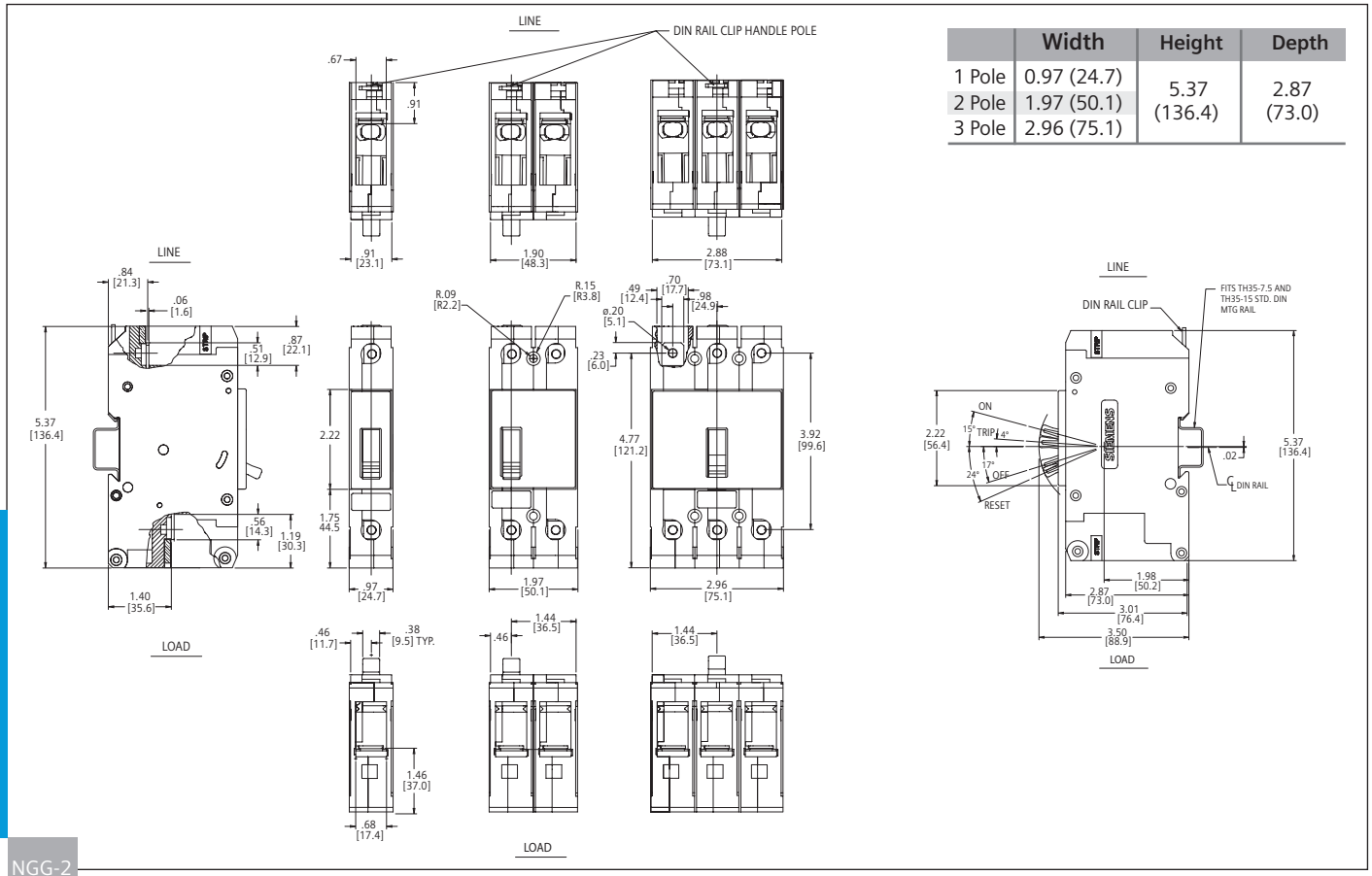
Alarm Switch — Contains (1) sets of "A" contacts and "B" contacts.

Maximum Control Supply Voltage U_S		Single Alarm Switch Catalog Number	Auxiliary and Alarm Switch Catalog Number	Maximum Operational Current
AC	DC			
240	125	CQDBA	CQDA1BA	@240V AC – 15A @125V DC – 0.5A

Available Accessory Combinations

Shunt Trip	Aux. Switch	Alarm Contact
1	0	0
0	1	0
0	2	0
1	1	0
0	0	1
0	1	1

UL NGG Frame Outline Drawing – 1, 2, 3 Pole



	Width	Height	Depth
1 Pole	0.97 (24.7)	5.37 (136.4)	2.87 (73.0)
2 Pole	1.97 (50.1)		
3 Pole	2.96 (75.1)		

VL Information Guide
VL Circuit Breaker – FG 250A Frame

Breaker Type
Defined by the 3rd character of the catalog number
G – Global (UL, IEC, CE)
H – Global, 100% Rated
X – Global, Non-interchangeable
Y – Global, 100% Rated, Non-interchangeable

Trip Unit Type
Defined by the 5th character of the catalog number
B – Thermal-Magnetic, Model 525
N – LI, Electronic, Model 545
P – LSI, Electronic, Model 545
X – LIG, Electronic, Model 545
U – LSIG, Electronic, Model 545
D – LSI, Electronic with LCD, Model 576
E – LSIG, Electronic with LCD, Model 576

Interrupting Ratings

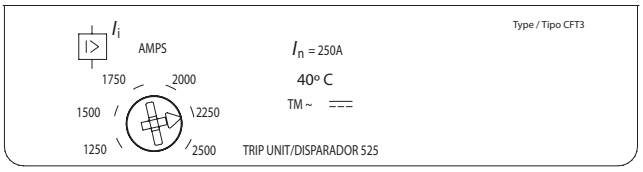
	RMS Symmetrical Amperes (kA)							
	UL 489			IEC 60947-2			UL or IEC	
	Volts AC			Volts AC			Volts DC*	
Breaker Type	240	480	600	240 I_{cu} / I_{cs}	415 I_{cu} / I_{cs}	690 I_{cu} / I_{cs}	250	500
NFG	65	35	18	65 / 65	40 / 40	12 / 6	30	18
HFG	100	65	20	100 / 75	70 / 70	12 / 6	30	25
LFG	200	100	25	200 / 150	100 / 75	12 / 6	30	30

UL / CSA / NOM 40°C 50/60Hz IEC 40°C 50/60Hz
*DC applications: For 250VDC, use a 2-pole breaker. For 500-600VDC, wire as shown in Figure 1.

Trip Unit Settings

Thermal Magnetic Trip Units, Model 525

I_n – Trip Unit Rating (Amps)	I_i – Nominal Instantaneous Trip Adjustable Range (Amps)					
100	625	750	875	1000	1125	1250
110	800	960	1120	1280	1440	1600
125	800	960	1120	1280	1440	1600
150	800	960	1120	1280	1440	1600
175	1000	1200	1400	1600	1800	2000
200	1000	1200	1400	1600	1800	2000
225	1250	1500	1750	2000	2250	2500
250	1250	1500	1750	2000	2250	2500



Trip Unit Model 525

Trip Unit Settings

Electronic Trip Units, Model 545 with LI, LIN, LIG, or LIGN Trip Functions

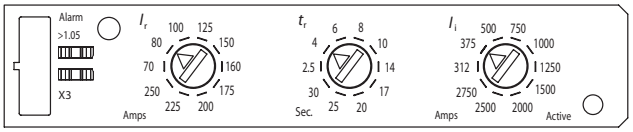
I_n – Trip Unit Rating (Amps)	I_r – Continuous Amp Settings (Amps)									
100	40	40	45	50	60	63	70	80	90	100
150	60	60	63	70	80	90	100	110	125	150
250	70	80	100	125	150	160	175	200	225	250

I_n – Trip Unit Rating (Amps)	t_r – Long Time Delay Settings (Seconds) I^2t @ 6 x I_r									
100, 150, 200	2.5	4	6	8	10	14	17	20	25	30

I_n – Trip Unit Rating (Amps)	I_i – Nominal Instantaneous Trip Settings (Amps)									
100	125	150	200	300	400	500	600	800	1000	1100
150	187	225	300	450	600	750	900	1200	1500	1650
250	312	375	500	750	1000	1250	1500	2000	2500	2750

Fixed Settings

I_n – Trip Unit Rating	I_g – Ground Fault Pickup (Amps)	t_g – Ground Fault Delay	I_N – Neutral Protection Pick-up
100	80	.07 sec	100 A
150	120	.07 sec	75 A
250	200	.07 sec	125 A



Trip Unit Model 545, with LI Trip Functions

VL Information Guide
VL Circuit Breaker – FG 250A Frame

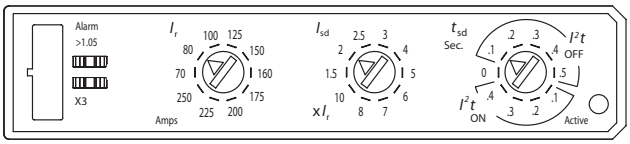
Trip Unit Settings

Electronic Trip Units, Model 545 with LSI, LSIN, LSIG, or LSIGN Trip Functions

I_n – Trip Unit Rating (Amps)	I_r – Continuous Amp Settings (Amps)									
100	40	40	45	50	60	63	70	80	90	100
150	60	60	63	70	80	90	100	110	125	150
250	70	80	10	125	150	160	175	200	225	250

I_n – Trip Unit Rating (Amps)	I_{sd} – Short Time Pick-up Settings (Amps) x I_r								
100, 150, 250	1.5	2	2.5	3	4	5	6	7	8	10

I_n – Trip Unit Rating (Amps)	t_{sd} – Short Time Delay Settings (Seconds) @ 8xI_r							
100, 150, 250	0	.1, I^2t OFF	.2, I^2t OFF	.3, I^2t OFF	.4, I^2t OFF	.5, I^2t OFF	.1, I^2t ON	.2, I^2t ON	.3, I^2t ON	.4, I^2t ON



Trip Unit Model 545, with LSIG Trip Functions

Fixed Settings

I_n – Trip Unit Rating (Amps)	t_r – Long Time Delay	I_i – Nominal Instantaneous Trip	I_g – Ground Fault Pick-up	t_g – Ground Fault Delay	I_N – Neutral Protection Pick-up
100	10 sec (I^2t @ 6 x I_r)	1100 A	80 A	.07 sec	100% I_N
150		1650 A	120 A	.07 sec	100% I_N
250		2750 A	200 A	.07 sec	50% I_N

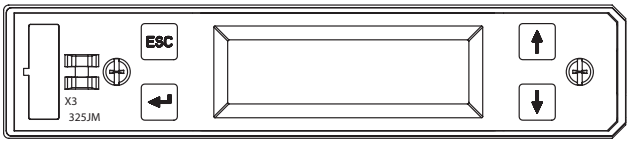
Trip Unit Settings

Electronic Trip Units with LCD, Model 576

I_n – Trip Unit Rating (Amps)	I_r – Continuous Amps Range	t_r – Long Time Delay Settings (I^2t @ 6 x I_r)	I_{sd} – Short Time Pick-up Range	t_{sd} – Short Time Delay Settings	I_i – Nominal Instantaneous Trip Range
100	40 – 100 A	2.5, 4, 6, 8, 10, 14, 17, 20, 25, 30 sec.	1.25 - 10 x I_r	.1, .2, .3, .4, .5 sec. or I^2t @ 8 x I_r	125 – 1100 A
150	60 – 150 A				187 – 1650 A
250	100 – 250 A				313 – 2750 A

I_n – Trip Unit Rating (Amps)	I_g – Ground Fault Pick-up Range	t_g – Ground Fault Delay Settings	I_N – Neutral Protection Pick-up	Pre-Alarm Indication
100	40 – 100 A	.1, .2, .3, .4, .5 sec. or I^2t @ .5 x I_n	0 - 100% x I_r (Amps)	0 - 100% x I_r (Amps)
150	60 – 150 A			
250	100 – 250 A			

Current settings are adjustable in 1-amp increments except Neutral Protection which is adjustable in increments of 5%.



Trip Unit Model 576

Motor Circuit Protectors

Amp Rating	I_i – Nominal Instantaneous Trip Adjustable Range (Amps)
250	600 – 1200
250	1000 – 2000
250	1750 – 3500

Molded Case Switch

Amp Rating	Self-protective Instantaneous Override
250	3500A

VL Information Guide
VL Circuit Breaker – FG 250A Frame

Terminal Connectors

Wire Range	Cables per Connectors	Torque	lb-in. (Nm)	Catalog Number ①
#4 – 350 kcmil	1 (Cu only)	#14 – 350	150 (16.95)	**3TW1FG350**
#4 – 350 kcmil	1 (Cu / Al)	#6 – #4 #3 – #1 #1/0 – 350	150 (16.95) 200 (22.60) 275 (31.07)	**3TAW1FG350** ②
#4 – 350 kcmil	1 (Cu only)	#8 – #4 #3 – #1 #1/0 – 350	150 (16.95) 200 (22.60) 275 (31.07)	**3TCW1FG350**
Compression Connector Kits				
#4 – 350 kcmil	1 (Cu / Al)			**3CLF350**
Distribution Connector Kits				
#14 – 2/0	3 (Cu only)	#14 – #8 #6 – #2/0	40 (4.52) 120 (13.5)	**3TA3FG20**
#14 – #4	6 (Cu only)	#14 – #4	35 (3.95)	**3TA6FG04**

① Packaged as 3 connectors.
② Standard connectors when an "L" suffix is used on an assembled breaker catalog number.

Internal Accessories

Auxiliary and Alarm Switch Kits

Description	Mounting Pocket	Catalog Number
1 Alarm Switch 1A/B ① Bases AMBL2 and AMBL3	Left, Right ②	**ASKL1**
2 Aux. Switches 1A + 1B Base AMBL1	Left, Right, Neutral	**ASKL2**
2 Aux. + 1 Alarm Switch 1A + 1B, 1A/B Bases ① AMBL2 and AMBL3	Left, Right ②	**ASKL3**

① Includes 1A and 1B contact for alarm purposes, only one of which may be installed at any time.
② Kit includes 2 bases. One for mounting switches in left pocket and another for mounting in the right.

Auxiliary and Alarm Switch Mounting Base only

Description	Mounting Pocket	Catalog Number
For 2 Aux + 1 Alarm	Left	**AMBL2**
For 2 Aux + 1 Alarm	Right	**AMBL3**
For 3 Aux	Left, Right, Neutral	**AMBL1**

Shunt Trip

Control Voltage	Catalog Number
48 – 60 VAC	**STRLM60**
110 – 127 VAC	**STRLN120**
208 – 277 VAC	**STRLS277**
380 – 600 VAC	**STRLV600**
24 VDC	**STRLB24DC**
48 – 60 VDC	**STRLC60DC**
110 – 127 VDC	**STRLD125DC**
220 – 250 VDC	**STRLE250DC**

Shunt trips or UVR's may be mounted in the Right Pocket only.

Internal Accessory Locations

4th Pole Accessory Pocket	Left Accessory Pocket	Right Accessory Pocket
Up to 3 Auxiliary Switches	Up to 3 Auxiliary Switches	Shunt Trip **or** UVR **or** Up to 3 Auxiliary Switches
Up to 3 Auxiliary Switches	Up to 2 Auxiliary Switches + 1 Alarm Switch	Shunt Trip **or** UVR **or** Up to 2 Auxiliary Switches + 1 Alarm Switch

Maximum Accessories: Maximum of 9 switches total.
Maximum of 2 alarm switches, 1 Left + 1 Right Pocket.
Maximum of 6 switches in Left and 4th Pockets combined.

Auxiliary / Alarm Switches only (requires a base)

Description	Catalog Number
1 NO (normally open contact) 1A	**ASWPA**
1 NC (normally closed contact) 1B	**ASWPB**

(A) Normally open contacts are open when the breaker contacts are open.
(B) Normally closed contacts are closed when the breaker contacts are open.

Undervoltage Release

Control Voltage	Catalog Number
110 – 127 VAC	**UVRLN120**
220 – 250 VAC	**UVRLR240**
208 VAC	**UVRLP208**
277 VAC	**UVRLS277**
380 – 425 VAC	**UVRLT415**
440 – 480 VAC	**UVRLU480**
600 VAC	**UVRLV600**
12 VDC	**UVRLA12DC**
24 VDC	**UVRLB24DC**
48 VDC	**UVRLC48DC**
60 VDC	**UVRLG60DC**
110 – 127 VDC	**UVRLD125DC**
220 – 250 VDC	**UVRLE250DC**

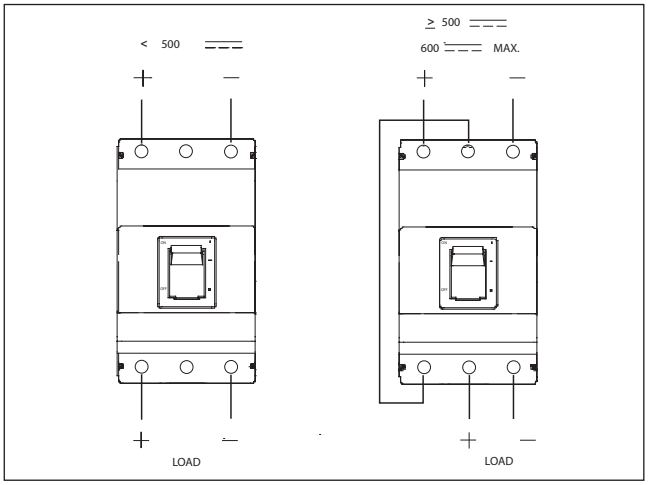
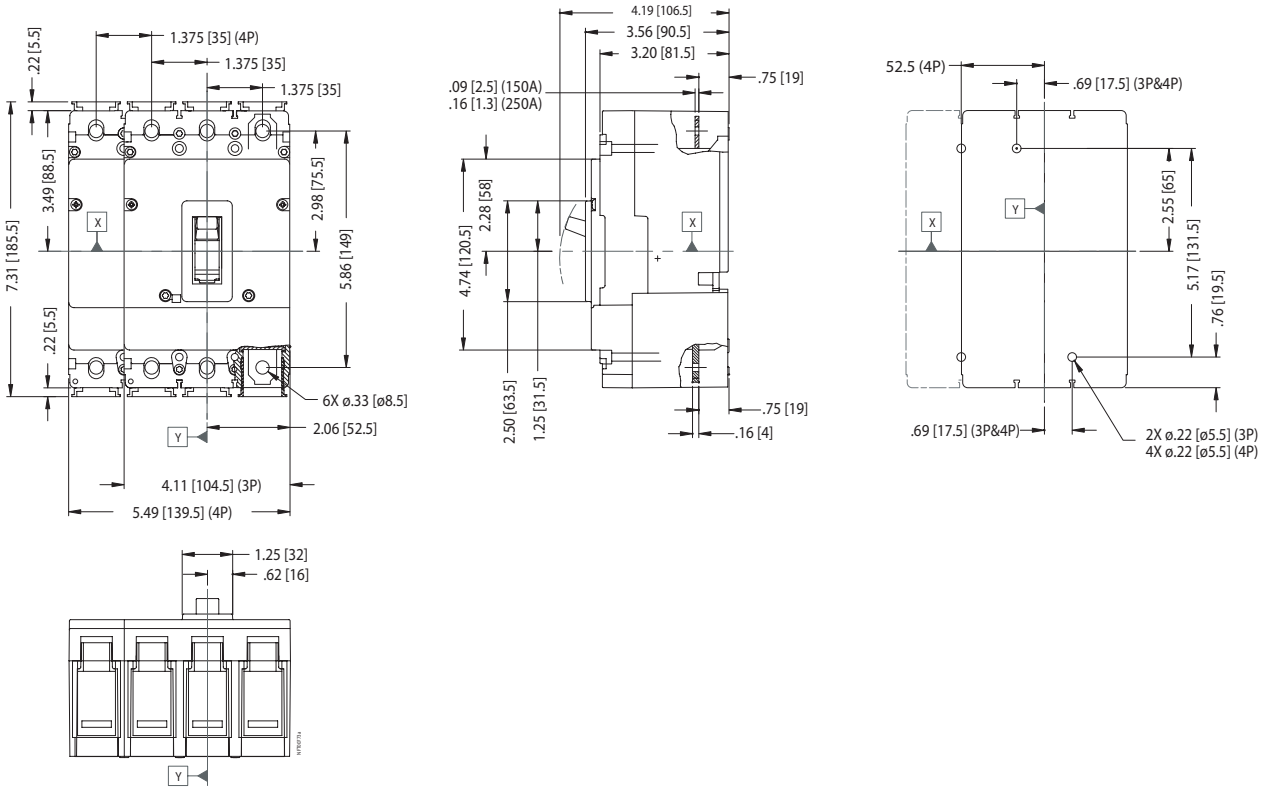


Figure 1

VL Information Guide
VL Circuit Breaker – FG 250A Frame

Dimensions

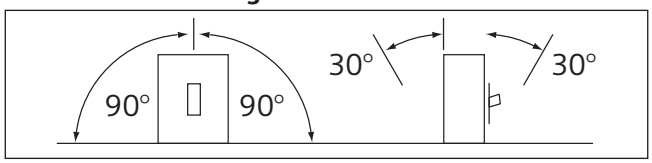
(complete breaker)



Shipping Weight, lbs. (kg)

Poles	Frame Only	Trip Unit		Complete Breaker
		Thermal-mag	Electronic	
2,3	3.45 (1.56)	1.35 (.62)	1.60 (.72)	6.2 (2.8)
4	4.40 (2.0)	1.8 (.82)	2.05 (.93)	7.9 (3.6)

Permissible Mounting Positions



VL Information Guide
VL Circuit Breaker – NG 1200A Frame

Breaker Type
Defined by the 3rd character of the catalog number
G – Global (UL, IEC, CE)
H – Global, 100% Rated
X – Global, Non-interchangeable
Y – Global, 100% Rated, Non-interchangeable

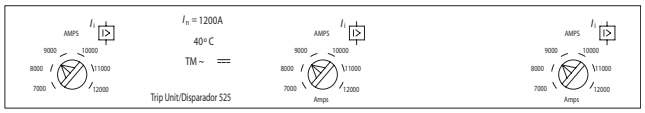
Trip Unit Type
Defined by the 5th character of the catalog number
B – Thermal-Magnetic, Model 525
N – LI, Electronic, Model 545
P – LSI, Electronic, Model 545
X – LIG, Electronic, Model 545
U – LSIG, Electronic, Model 545
D – LSI, Electronic with LCD, Model 576
E – LSIG, Electronic with LCD, Model 576

Interrupting Ratings

	RMS Symmetrical Amperes (kA)							
	UL 489			IEC 60947-2			UL or IEC	
	Volts AC			Volts AC			Volts DC*	
Breaker Type	240	480	600	240 I_{cu} / I_{cs}	415 I_{cu} / I_{cs}	690 I_{cu} / I_{cs}	250	500
NNG	65	35	25	65 / 35	50 / 25	20 / 10	22	35
HNG	100	65	35	100 / 50	70 / 35	30 / 15	25	50
LNG	200	100	65	200 / 100	100 / 50	35 / 17	42	65

UL / CSA / NOM 40°C 50/60Hz IEC 40°C 50/60Hz
*DC applications: For 250VDC, use a 2-pole breaker. For 500-600VDC, wire as shown in Figure 1.

Thermal Magnetic Trip Units, Model 525	
I_n – Trip Unit Rating (Amps)	I_i – Nominal Instantaneous Trip Adjustable Range (Amps)
800	4000 – 8000
900	6000 – 10000
1000	6000 – 10000
1200	7000 – 12000



Trip Unit Model 525

Trip Unit Settings

Electronic Trip Units, Model 545 with LI, LIN, LIG, or LIGN Trip Functions ① (Ground fault setting is non-adjustable.)										
I_n – Trip Unit Rating (Amps)	I_r – Continuous Amp Settings (Amps)									
800	300	300	315	350	400	500	600	630	700	800
1000	400	400	400	500	600	630	700	800	900	1000
1200	400	400	500	600	630	700	800	900	1000	1200

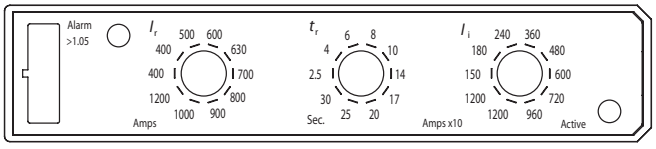
I_n – Trip Unit Rating (Amps)	t_r – Long Time Delay Settings (Seconds) I^2t @ 6 x I_r									
800, 1000, 1200	2.5	4	6	8	10	14	17	20	25	30

I_n – Trip Unit Rating (Amps)	I_i – Nominal Instantaneous Trip Settings (Amps)									
800	1000	1200	1600	2400	3200	4000	4800	6400	8000	8800
1000	1250	1500	2000	3000	4000	5000	6000	8000	10000	11000
1200	1500	1800	2400	3600	4800	6000	7200	9600	12000	12000

Fixed Settings

I_n – Trip Unit Rating	I_g – Ground Fault Pickup (Amps)	t_g – Ground Fault Delay	I_N – Neutral ① Protection Pick-up
800	480 A	.25 sec	400 A
1000	600 A	.32 sec	500 A
1200	720 A	.32 sec	600 A

① The neutral phase is only protected on a 4-pole breaker.



Trip Unit Model 545, with LI Trip Functions

VL Information Guide
VL Circuit Breaker – NG 1200A Frame

Trip Unit Settings

Electronic Trip Units, Model 545 with LSI, LSIN, LSIG, or LSIGN Trip Functions ① (Instantaneous setting is non-adjustable.)

I_n – Trip Unit Rating (Amps)	I_r – Continuous Amp Settings (Amps)									
800	300	300	315	350	400	500	600	630	700	800
1000	400	400	400	500	600	630	700	800	900	1000
1200	400	400	500	600	630	700	800	900	1000	1200

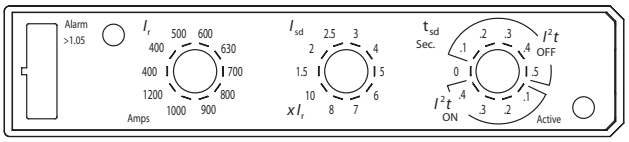
I_n – Trip Unit Rating (Amps)	I_{sd} – Short Time Pick-up Settings (Amps) x I_r								
800, 1000, 1200	1.5	2	2.5	3	4	5	6	7	8	10

I_n – Trip Unit Rating (Amps)	t_{sd} – Short Time Delay Settings (Seconds) @ 8xI_r								
800, 1000, 1200	0	.1, I^2t OFF	.2, I^2t OFF	.3, I^2t OFF	.4, I^2t OFF	.5, I^2t OFF	.1, I^2t ON	.2, I^2t ON	.3, I^2t ON	.4, I^2t ON

Fixed Settings

I_n – Trip Unit Rating (Amps)	t_r – Long Time Delay	I_i – Nominal Instantaneous Trip	I_g – Ground Fault Pick-up	t_g – Ground Fault Delay	I_N – Neutral ① Protection Pick-up
800	10 sec (I^2t @ 6 x I_r)	8800 A	480 A	.25 sec	400 A
1000		11000 A	600 A	.32 sec	500 A
1200		12000 A	720 A	.32 sec	600 A

① Neutral phase is only protected on a 4-pole breaker.



Trip Unit Model 545, with LSI Trip Functions

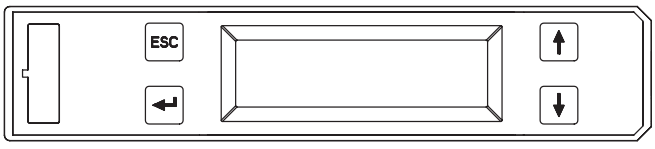
Trip Unit Settings

Electronic Trip Units with LCD, Model 576 with LSI or LSIG Trip Functions

I_n – Trip Unit Rating (Amps)	I_r – Continuous Amps Range	t_r – Long Time Delay Settings (I^2t @ 6 x I_r)	I_{sd} – Short Time Pick-up Range	t_{sd} – Short Time Delay Settings	I_i – Nominal Instantaneous Trip Range
800	300 – 800 A	2.5, 4, 6, 8, 10, 14, 17, 20, 25, 30 sec	1.25 - 10 x I_r (8,000 A max.)	.1, .2, .3, .4, .5 sec. (I^2t off) or I^2t @ 8 x I_r (I^2t on)	1000 – 8800 A
1000	400 – 1000 A		1.25 - 10 x I_r (10,000 A max.)		1250 – 11000 A
1250	400 – 1200A		1.25 - 10 x I_r (10,800 A max.)		1500 – 12000 A

I_n – Trip Unit Rating (Amps)	I_g – Ground Fault Pick-up Range	t_g – Ground Fault Delay Settings	Pre-Alarm Indication
800	320 – 800 A	.1, .2, .3, .4, .5 sec. (I^2t off) or I^2t @ .5 x I_n (I^2t on)	80 - 100% x I_r (Amps)
1000	400 – 1000 A		
1200	400 – 1200 A		

Current settings are adjustable in 1-amp increments except Neutral Protection which is adjustable in increments of 5%.



Trip Unit Model 576

Motor Circuit Protectors

Amp Rating	I_i – Nominal Instantaneous Trip Adjustable Range (Amps)
1200	7000 – 12000

Molded Case Switch

Amp Rating	Self-protective Instantaneous Override
1200	12000A

VL Information Guide
VL Circuit Breaker – NG 1200A Frame

Terminal Connectors

Wire Range	Cables per Lug	Torque lb-in.	(Nm)	Catalog Number
1/0 - 500 kcmil	4 (Cu / Al)	375	(42.4)	**3TA4NG500** ① ②
500 - 750 kcmil	3 (Cu / Al)	375	(42.4)	**3TA3NG750** ②
1/0 - 500 kcmil	4 (Cu / Al)	375	(42.4)	**3TA4NG500H** ②
1/0 - 500 kcmil	4 (Cu) {90°C, 100% breakers}	375	(42.4)	**3TC4NG500** ②
Compression Connector Kits				
1/0 - 500 kcmil	4 (Cu / Al)			**12CLN500**

① Standard connector when an "L" suffix is used on an assembled breaker catalog number.
② Package of 3 connectors.

Internal Accessories

Auxiliary and Alarm Switch Kits

Description	Mounting Pocket	Catalog Number
2 Aux + 2 Alarm Switches (2NO + 2NC + 1 base)	Left	**ASKP3**
4 Aux. Switches (2NO + 2NC + 1 base)	Left, Right	**ASKP4**

Auxiliary and Alarm Switch Mounting Base only

Description	Mounting Pocket	Catalog Number
For 2 Aux + 2 Alarm	Left	**AMBP2**
For 4 Aux	Left, Right	**AMBP1**

Shunt Trip

Control Voltage	Catalog Number
48 – 60 VAC	**STRPM60**
110 – 127 VAC	**STRPN120**
208 – 277 VAC	**STRPS277**
380 – 600 VAC	**STRPV600**
24 VDC	**STRPB24DC**
48 – 60 VDC	**STRPC60DC**
110 – 127 VDC	**STRPD125DC**
220 – 250 VDC	**STRPE250DC**

Shunt trips or UVR's may be mounted in the Right Pocket only.

Internal Accessory Locations

Left Accessory Pocket	Right Accessory Pocket
Up to 4 Auxiliary Switches ①	Shunt Trip **or** UVR **or** Up to 4 Auxiliary Switches ①
Up to 2 Auxiliary Switches ② + 2 Alarm Switches	Shunt Trip **or** UVR **or** Up to 4 Auxiliary Switches ①

Maximum Accessories: Maximum of 8 switches total.
Maximum of 2 alarm switches, Left Pocket only.
Maximum of 4 switches in Left and 4th Pockets combined.

① Max load is 5A per switch when 4 switches are mounted.
② Max load is 10A per switch.

Auxiliary / Alarm Switches only (requires a base)

Description	Catalog Number
1 NO (normally open contact)	**ASWPA**
1 NC (normally closed contact)	**ASWPB**

Normally open contacts are open when the breaker contacts are open.
Normally closed contacts are closed when the breaker contacts are open.

Undervoltage Release

Control Voltage	Catalog Number
110 – 127 VAC	**UVRPN120**
220 – 250 VAC	**UVRPR240**
208 VAC	**UVRPP208**
277 VAC	**UVRPS277**
380 – 425 VAC	**UVRPT415**
440 – 480 VAC	**UVRPU480**
600 VAC	**UVRPV600**
12 VDC	**UVRPA12DC**
24 VDC	**UVRPB24DC**
48 VDC	**UVRPC48DC**
60 VDC	**UVRPG60DC**
110 – 127 VDC	**UVRPD125DC**
220 – 250 VDC	**UVRPE250DC**

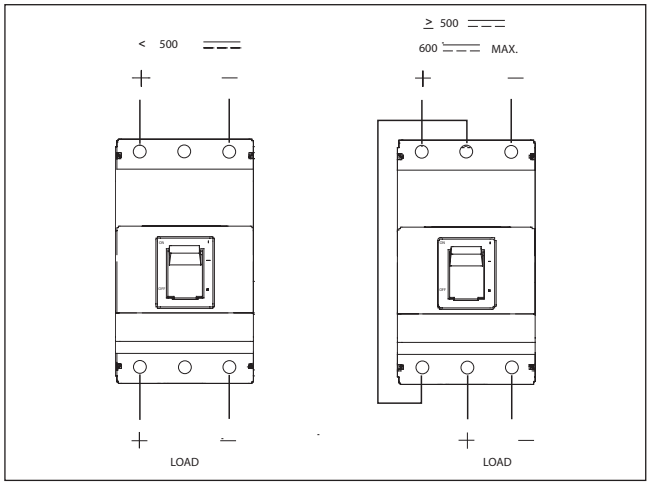
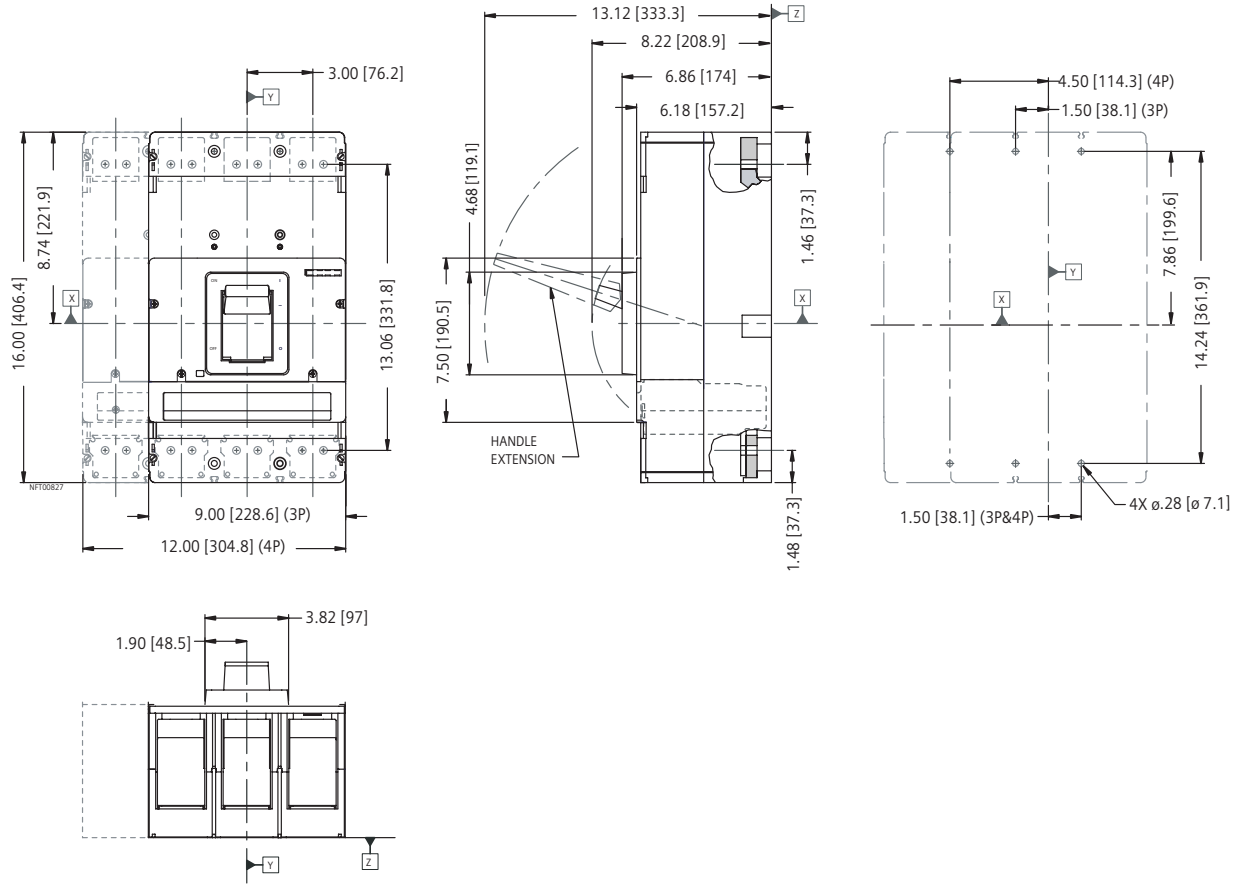


Figure 1

VL Information Guide
VL Circuit Breaker – NG 1200A Frame

Dimensions

(complete breaker)



Shipping Weight, lbs. (kg)

Poles	Frame	Trip Unit	Complete Breaker
2,3	46.3 (21.0)	8.8 (4.0)	55.1 (25.0)
4	60.6 (27.5)	13.2 (6.0)	73.8 (33.5)

Permissible Mounting Positions