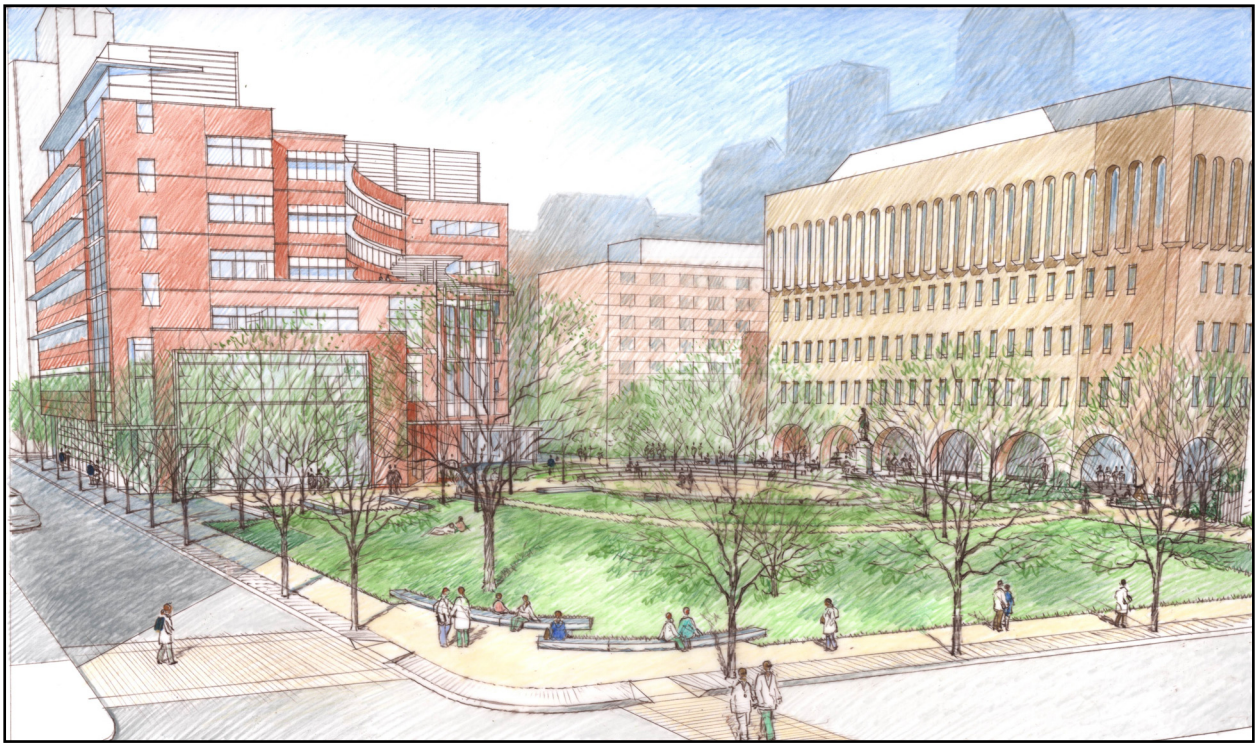
Joshua Kreutzberger
Lighting/Electrical
Spring 2007
Advisor: Dr. Mistrick
Final Report



Dorrance H. Hamilton Building
Philadelphia, PA

Dorrance H. Hamilton Building

Thomas Jefferson University

Philadelphia, PA

PROJECT TEAM

Owner:	Thomas Jefferson University
GC/CM:	P. Agnes Inc.
Architects/Engineers:	Burt Hill
Landscape Architect:	Andropogon Associates
Structural Engineer:	David Chou & Associates Inc.
Lighting Design:	The Lighting Practice
Civil Engineer:	Vollmer Associates LLP
Technology:	RJC Designs Inc.
Project Management:	Dan Bosin Associates LLC & TJU

ARCHITECTURE

- Dorrance H. Hamilton Building will transform the Thomas Jefferson University campus by developing an expansive grassy plaza which will become the new focal point of campus
- The building will house a technologically advanced auditorium, small and large group classrooms, and a two floor clinical skills center featuring virtual diagnostic and surgical suites
- The curved façade features large expanses of glass that will open onto the plaza
- The transparency of the façade carries through the entire ground floor, which allows people on the street to look into the lobby, through the building and out to the plaza

STRUCTURAL

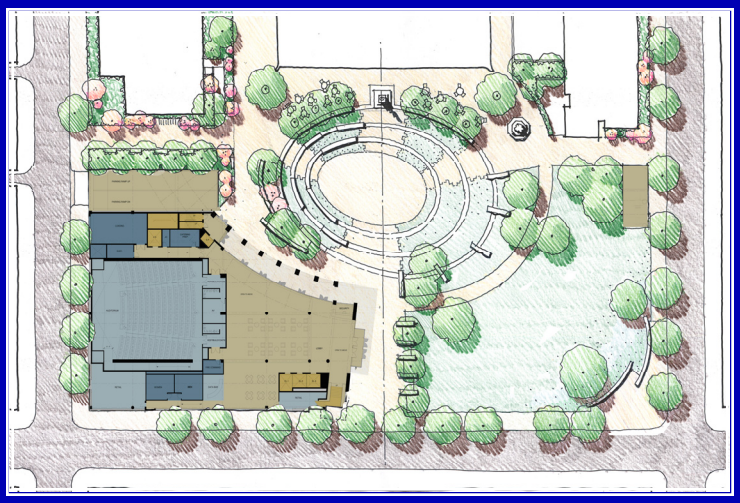
- Foundation consists of concrete footings placed on existing caissons
- 5” Slab-on-Grade for ground floor and parking garage
- Structural steel framing used for most of building

MECHANICAL

- (3) 40,000 cfm AHUs located on mechanical floor
- (1) 480 ton cross-flow cooling tower
- (6) air cooled AC units used for heat removal and environmental control
- (1) 750 cfm and (4) 350 cfm electric unit heaters

BUILDING STATISTICS

- Location:
  1001 Locust Street, Philadelphia, PA 19107
- Number of Floors:
  2 Parking Levels, 6 Floors, Mech. Room
- Square Feet:
  129,000 sq. ft. building w/60,000 sq. ft. plaza
- Occupancy:
  Medical Education
- Start/End Construction:
  October 2005/August 2007
- Project Delivery:
  Guaranteed Maximum Price (GMP)



ELECTRICAL

- 13.2 kV 3 PH parallel service entrance to switchgear
- Uses both 480/277V and 208/120V 3 PH
- 1000 kW, 480Y/277V diesel emergency generator
- 480Y/277V 3PH emergency distribution panel

LIGHTING

- Vast daylighting through building via curved front façade and ribbon windows
- Lobby and classrooms use recessed fluorescent luminaires with some MR16 accent lighting
- Clear Metal Halide for parking area
- Special considerations for emergency rooms

Joshua Kreutzberger

Lighting/Electrical

Table of Contents

Executive Summary

The Dorrance H. Hamilton Building is a 129,000 ft^2 medical education building, which is a portion of the Thomas Jefferson University (TJU) campus in Philadelphia, PA. The building is comprised of six stories above grade, plus a mechanical floor, and the roof. The 2 floors of the 215 space parking garage will be located underground.

The final report consists of the lighting depth, electrical depth, mechanical breadth, and the construction management breadth. The lighting depth is the lighting redesign of the following four spaces: plaza, lobby, auditorium, and 5^{th} floor classroom.

The lighting redesign met all of the design criteria, while incorporating an intriguing design into the medical education building. In order to accomplish this task, AGI32 software was utilized in order to analyze luminaire layout, uniformity ratios, and horizontal illuminance calculations.

The electrical depth is comprised of a variety of different tasks, which include the redesign of branch circuits for the four re-lighted spaces, analysis of a central transformer versus distributed transformers, analysis of feeders versus a bus duct spanning to the penthouse, the analysis of a motor control center, and a protective device coordination study. The redesign of the electrical system was compared to the existing system regarding cost analysis, efficiency, and power consumption. The cost analysis is a part of the construction management breadth work.

The mechanical system of the different electrical rooms was analyzed in accordance with the distributed and central transformers. A comparison was done in order to determine the best design alternative between the two. The distributed transformers were once again the obvious choice.

The second breadth area of study was a cost analysis of the existing electrical system versus the redesigned portions of the electrical system. The cost analysis includes the following: central transformer versus distributed transformers and feeders running to each floor versus a main bus duct to penthouse. The cost analysis of the feeder vs. busduct system showed that the busduct was cheaper than the individual feeders. Also, the distributed transformers were cheaper than the central transformer.

Building Information

Architecture

Burt Hill Kosar Rittelmann Associates will transform the Thomas Jefferson University campus with the Dorrance H. Hamilton Building. The medical education complex will include an expansive grassy plaza which will become the new focal point of campus. The building will house a technologically-advanced auditorium, small and large group classrooms and a two-floor clinical skills center featuring virtual diagnostic and surgical suites. The entrance faces the grassy plaza which provides an interaction area among students and professors. Other areas of interaction include common meeting areas on each floor and a rooftop terrace and lounge for special events. The curved façade features large expanses of glass that will open onto the plaza to highlight the "new heart of campus," the Thomas Jefferson University President Robert L. Barchi, M.D., PhD said. The transparency of the façade carries through the entire ground floor, which allows people on the street to look into the lobby, through the building and out to the plaza.

Electrical

The source of the electrical system for the Dorrance H. Hamilton Building starts with the existing 13.2 kV switchgear in the Jefferson Alumni Hall. Two 13.2 kV Philadelphia Electric Company (PECO) feeders supply six existing 13.2 kV feeders. Four of the feeders are to substations in Jefferson Alumni Hall, while the other two feeders will supply the Dorrance H. Hamilton Building. The electrical service is distributed to two 15 kV load interrupter switches integral for the unit substation. From the closed load interrupter switch, the 13.2 kV service is fed through a dry-type transformer rated at 480Y/277 volt, 3 phase, and 2500 kVA. After the 2500 kVA transformer, the service is supplied to the main bus system with TVSS located in Substation No. 1. A 4000 draw amp low voltage circuit breaker protects the main bus. The main distribution panels are located on the parking level P2 and fed up through the building into the electrical room of each floor into sub-distribution panels. From the sub-distribution panels, lighting and receptacle loads are distributed to each floor and served by 150 kVA dry-type transformers and 208Y/120V panelboards.

The emergency power is produced with a 1000 kW, 408Y/277V diesel generator. The generator provides emergency

power to the automatic transfer switches of the Life Safety, Elevator, and the Standby Distribution panels.

Lighting

The lighting of the Dorrance H. Hamilton Building mostly consists of recessed fluorescent light sources powered by 277 and 120 volt services. Linear and compact fluorescent recessed fixtures are specified in most of the classrooms and corridors. The main lobby includes vast daylighting via a curved glass façade, fluorescent fixtures and HID sources. Compact fluorescent downlights are utilized in the auditorium along with some of the higher end classrooms. Accent lighting with MR16 and wall wash luminaires provides a striking design and ample illuminance. The plaza area consists of LED strip lighting, HID, and fluorescent sources of light.

Mechanical

A 480-ton cross-flow cooling tower located in the penthouse of the building provides the building will cool air. Along with the cooling tower, six air cooled AC units are employed throughout the building to remove heat and provide environmental control. The building is heated by one 750 cfm and four 350 cfm electric unit heaters located throughout the building. The building also includes three 40,000 cfm air handling units located in the penthouse. Most of the mechanical load is provided with 480 volt, three phase power.

Fire Protection

The building will have manual fire alarm pull stations and an addressable automatic fire detecting device. Alarm signal devices will activate if system detects a fire. The system includes an automatic voice evacuation sequence, a manual voice paging sequence, a device to send an alarm to the University's on-site central monitoring station, sprinkler system tamper switch, smoke detectors in elevator lobbies, machine rooms, and hoist ways, addressable heat detectors, duct mounted smoke detectors, among other items. A supervised, two-way communication system between the fire command center/main fire alarm control panel and the emergency phones throughout the building is also included.

Transportation

There are two passenger elevators and one service elevator in the Dorrance H. Hamilton Building. The passenger

elevators serve the ground floor through the sixth floor, where as the service elevator serves the ground floor through the mechanical room on the seventh floor. The elevators run on a 480 volt, three phase system with an automatic transfer switch for switching to emergency power if the normal distribution system shuts down.

Telecommunications

The security system of the building has surveillance television systems, security door access control, and security intrusion detection devices. The security system will provide perimeter security of the areas around the building during off peak hours.

The building has various other communications systems that are to be issued at a later date. These include the nurses call system, sound system, audio visual equipment, and a clock system.

Lighting Depth

Space Introduction

The four spaces for the lighting redesign include the plaza, lobby, auditorium, and the 5th floor sixty-capacity classroom of the Dorrance H. Hamilton Building. The grassy plaza consists of a 60,000 ft^2 courtyard used as a circulation space for the Dorrance H. Hamilton Building, Martin Building, Scott Library & Administration Building, and Orlowitz Residence Hall. The plaza area will also provide students and faculty with an area to enjoy the outdoors.

Upon entering the building through the curved glass façade, one would find themselves in the lobby of the building, which is the second space to be redesigned. The lobby will be mainly used for a circulation space with elevators, stairways, and a small retail space. The lobby also includes the entrance to the third space of redesign, which is the auditorium.

The 300-seat capacity auditorium resides on the first floor of the building, adjacent to the lobby. The auditorium provides a challenging redesign with a 15' high raked ceiling and 4800 ft^2 of space.

The sixty-capacity classroom is located on the 5th floor of the Dorrance H. Hamilton Building. Some other spaces that accompany the classroom on the fifth floor includes other classrooms, lecture halls, two skills simulation labs, storage rooms, a small lobby, and a library/meeting room. The back wall of the classroom is a curved glass ribbon window, which will have dual/solar blackout shades provided by the owner of the building.

Lighting Design

The lighting design will provide the four spaces with an aesthetically pleasing atmosphere and ample light on the task plane. In order to accomplish this task, the IESNA Lighting Handbook and ASHRAE 90.1 were followed throughout the design process. The spaces were modeled in AutoCAD and exported into AGI32, where the lighting design was finished with various renderings and lighting calculations.

Plaza – Lighting Redesign

Description of Space

The main entrance to the Dorrance H. Hamilton Building faces a grassy plaza where students and faculty can meet and interact informally. The facilities curved façade will feature large expanses of glass that will open on the plaza outside. The transparency of the building carries through the entire ground floor, allowing people on the street to look into the lobby, through the building and out to the plaza. The plaza includes walkways, a statue, seating areas, and an open grass area. The plaza is approximately 60,000 ft^2.

Site Plan

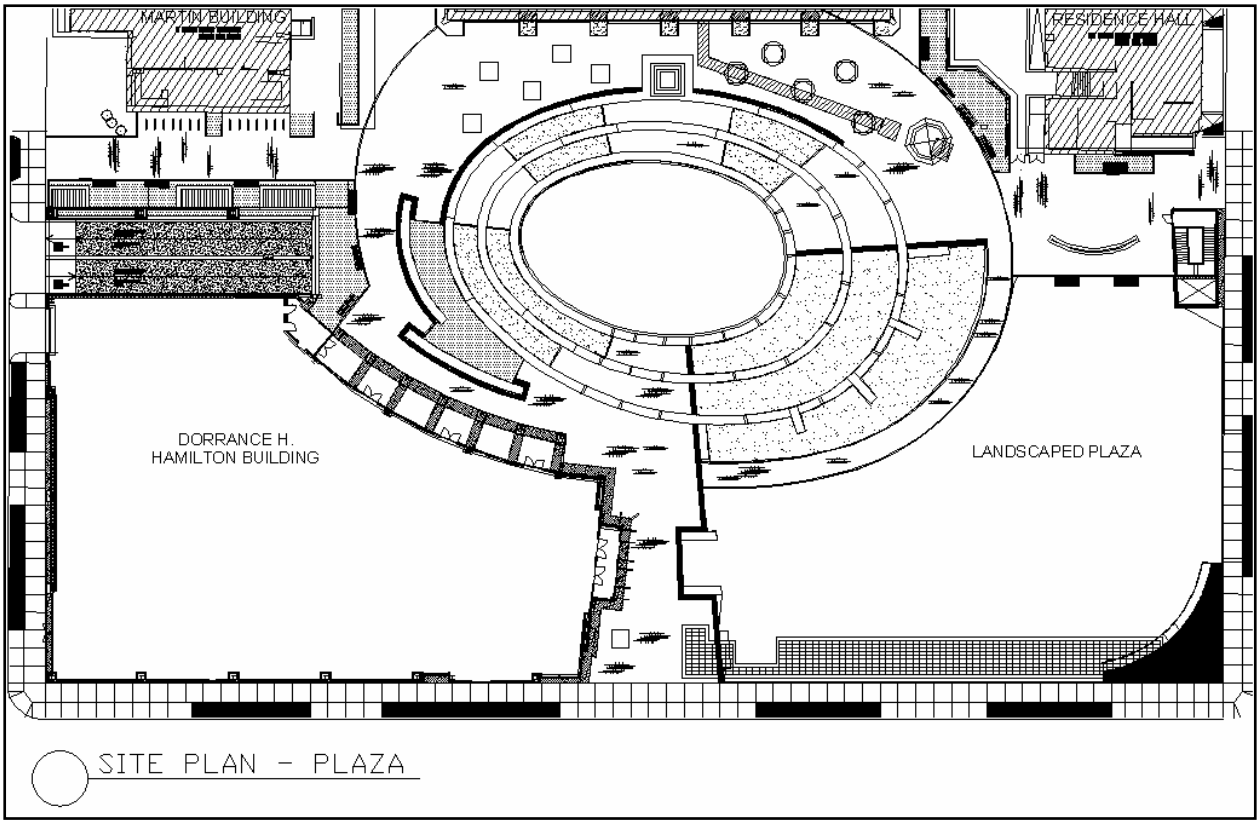


Figure 1: Plaza Site Plan

Design Concept

The design concept of the plaza is to provide sufficient illumination for circulation for buildings surrounding the Dorrance H. Hamilton Building. The main areas of interest are the walkways, stairways, the statue, and seating areas.

Design Criteria

Appearance of Space and Luminaires

The appearance of the space and luminaires is extremely important when lighting a plaza to this new "new heart of campus". The appearance of the space and luminaires has to be aesthetically appealing. The statue, walkways, and seating areas need to be lighted.

Point(s) of Interest

The points of interest in the space include the entrances and exits of buildings, walkways, statue, and grassy plaza. The points of interest will prosper with a higher illuminance due to the fact that they will stand out, such as the entrances and exits to the surrounding buildings, the statue, and walkways. The grassy area of the plaza does not need to be illuminated as high as the other points of interest. A number of luminaires surrounding the space may be a good idea instead of lighting the whole grassy area.

Illuminance (Horizontal)

The IESNA handbook calls for a horizontal illuminance of 5 lux (0.5 fc) for walkways distant from roadways and 6 lux (0.6 fc) for intermediate roadside sidewalks.

Illuminance (Vertical)

The IESNA handbook recommends a vertical illuminance of 1 lux (0.1 fc) for this space. The entrances and exits of the buildings should be at 30 lux (3 fc) for this space.

Power Allowances from ASHRAE 90.1 Standards

The power allowance in Table 9.4.5 of the ASHRAE 90.1 Standards is 0.2 W/ft^2 for the building grounds. The building grounds will include walkways 10 feet wide or greater and plaza areas. For walkways less than 10 feet wide, the power allowance is 1.0 W/ft^2. The main building entrance and exit has a power allowance of 30W/linear foot of door width.

Fixture Schedule

Label	Description	MH	Lamps	Ballast/ Transformer	Watts	Voltage	Mfr.	Catalogue No.
F-A1	18' High Pole Mounted Area Source 8-Sided Lantern Opal Text Lens with Black Finish	18'	1 – 175 Watt MH	IMH-175-C – Advance - e-Vision Electronic Ballast for MH Lamps	175	277	Allscape	AA-01-22-175MH-E-17-277-OA-BK-PCB
F-A2	6" Diameter Bollard with Spherical Variform Reflector with 42" Overall Height	3.5'	1 – 70 Watt MH	IMH-70-A-BLS-ID - Advance – e-Vision Electronic Ballast for MH Lamps	70	277	Allscape	LL-02-70MH-E-17-277-O-42-BK
F-A3	SP-108 Metric Series Cutoff Step Light Luminaire	2'	2 – 18 Watt CFL	ICF-2S18-H1-LD – Advance – Smartmate Electronic Ballast	36	277	Allscape	SP-108-2(18)CFL-277-BK-PL
F-A4	SL-50 Die-Cast Aluminum Floodlight	1'	1 – 50 Watt MR16	N/A	50	277	Allscape	Sl-50-50LV-MR-16-277-BK-UD
F-A5	BL-49 Cast Aluminum Wall Mount Black Fixture	6'	1 – 70 Watt MH	IMH-70-A-BLS-ID - Advance – e-Vision Electronic Ballast for MH Lamps	70	277	Allscape	BL-49-70MH-277-OP-BK-EMG

Table 1: Plaza Fixture Schedule

Light Loss Factors

The assumed space cleaning period for this space is 12 months and the space has a medium dirt condition. For fixture F-A4, a LLD of 0.80 was assumed for the MR-16 lamp.

Label	Maintenance Category	LLD	RSDD	LDD	BF	LLF
F-A1	V	0.75	-	0.82	1.00	0.62
F-A2	V	0.72	-	0.82	1.00	0.59
F-A3	V	0.85	-	0.82	1.05	0.73
F-A4	V	0.80	-	0.82	-	0.82
F-A5	V	0.72	-	0.82	1.00	0.59

Table 2: Plaza Light Loss Factors

Ballast Information

Label	Type	Ballast Watts	Ballast Factor	Voltage	Max THD %	Mfr.	Catalogue No.
B-A1	Electronic	191	1.00	277	15	Advance – e-Vision	IMH-175-C
B-A2	Electronic	84	1.00	277	18	Advance – e-Vision	IMH-70-A-BLS-ID
B-A3	Electronic - Programmed Start	39	1.05	277	10	Advance – Smartmate	ICF-2S18-H1-LDGE
B-A5	Electronic	84	1.00	277	18	Advance – e-Vision	IMH-70-A-BLS-ID

Table 3: Plaza Ballast Information

Lamp Information

Label	Type	CRI	CCT	Watts	Initial Lumens	Mean Lumens	Mfr.	Ballast
L-A1	GE Constant Color CMH ED17	90	4200	175	12000	9000	GE	IMH-175-C – e-Vision Electronic Ballast for MH Lamps
L-A2	GE Protected Constant Color PulseArc CMH ED17	80	3000	70	5700	4100	GE	IMH-70-A-BLS-ID – e-Vision Electronic Ballast for MH Lamps
L-A3	GE Ecolux Biax T4 CFL	82	4100	18	1200	1020	GE	ICF-2S18-H1-LD – Advance – Smartmate Electronic Ballast
L-A4	GE MR16 – Q50MR16/HI R/CG40	-	3000	50	2600	-	GE	N/A
L-A5	GE Protected Constant Color PulseArc CMH ED17	80	3000	70	5700	4100	GE	IMH-70-A-BLS-ID – e-Vision Electronic Ballast for MH Lamps

Table 4: Plaza Lamp Information

Power Density

Label	Ballast Watts	No. of Fixtures	Total Watts	
F-A1	191	6	1146	
F-A2	84	11	924	
F-A3	39	72	2808	
F-A4	50	28	1400	
F-A5	84	15	1260	
			7538	Watt Total
			41,500	Square Foot Total
			0.18 W/ft^2	

Table 5: Plaza Power Density

Therefore, the power density is slightly below the target IESNA value of 0.20 W/ft^2. The value is conservative because the building entrance and exit values and the walkways less than 10 feet wide are calculated into the total value. The space is at an appropriate illuminance level, so the power density is sufficient. Note: The square foot total of the plaza is 60,000 ft^2; however, the grassy of the plaza is 18,500 ft^2. Therefore, the total square foot total of the plaza is 41,500 ft^2.

Lighting Plan

The lighting site plan for the plaza is too large to view with one drawing. Therefore, the lighting site plan is cut into four sections: lower left, upper left, upper right, and lower right. All of the fixtures are labeled with their respected panelboard location on the drawing. The lights will be controlled by a timer during the year.

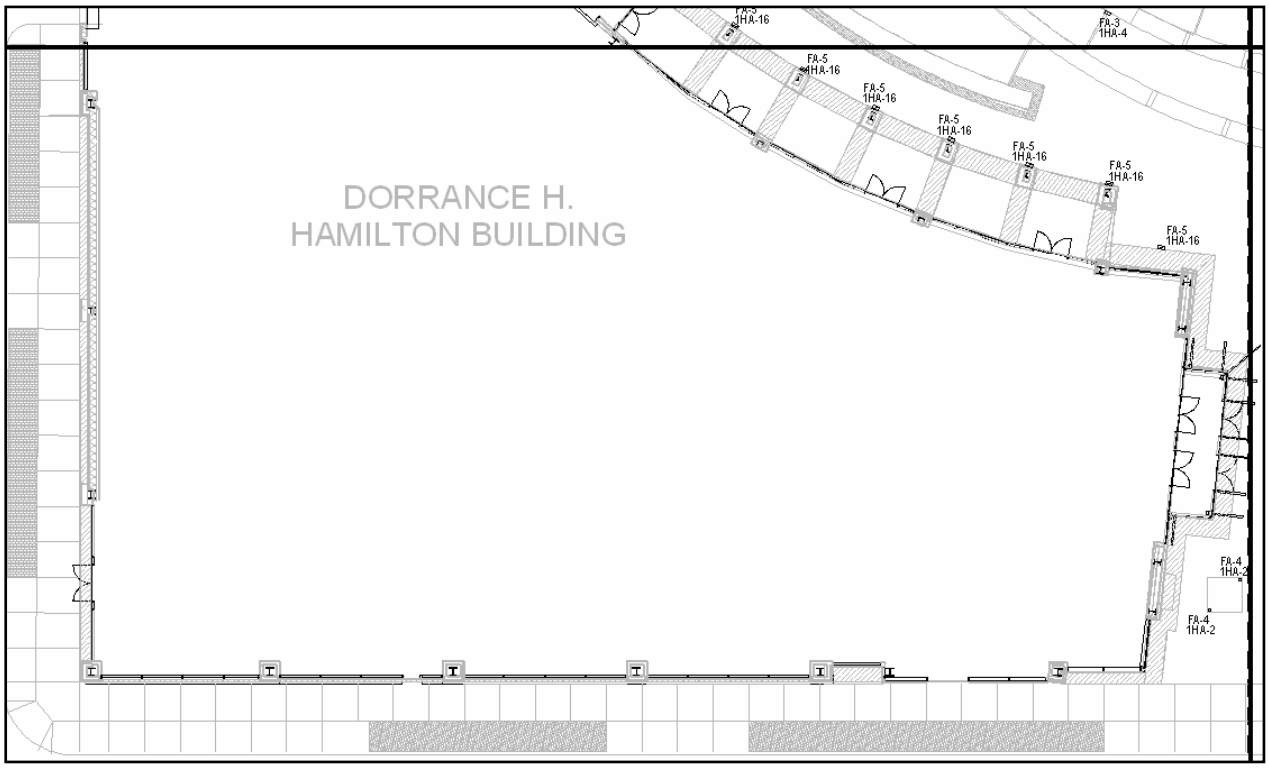


Figure 2: Plaza Lighting Plan (Lower Left)

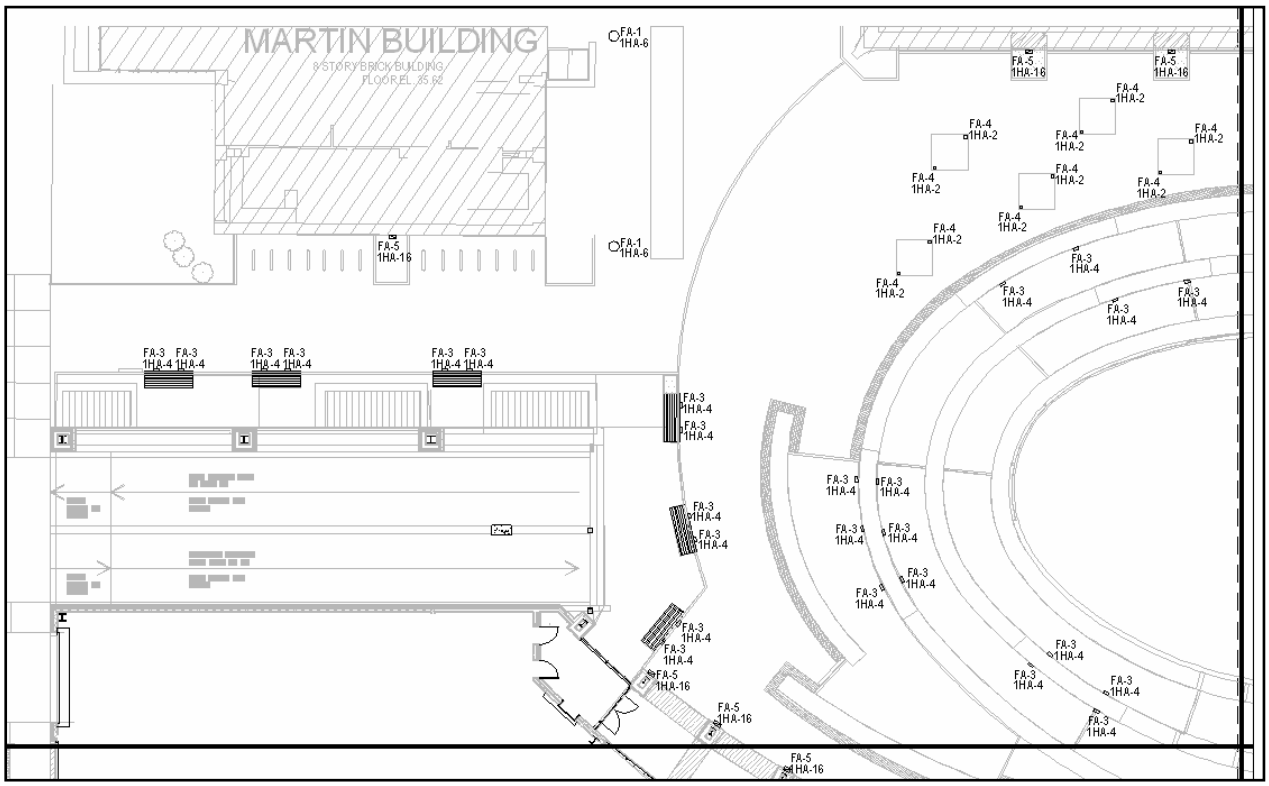


Figure 3: Plaza Lighting Plan (Upper Left)

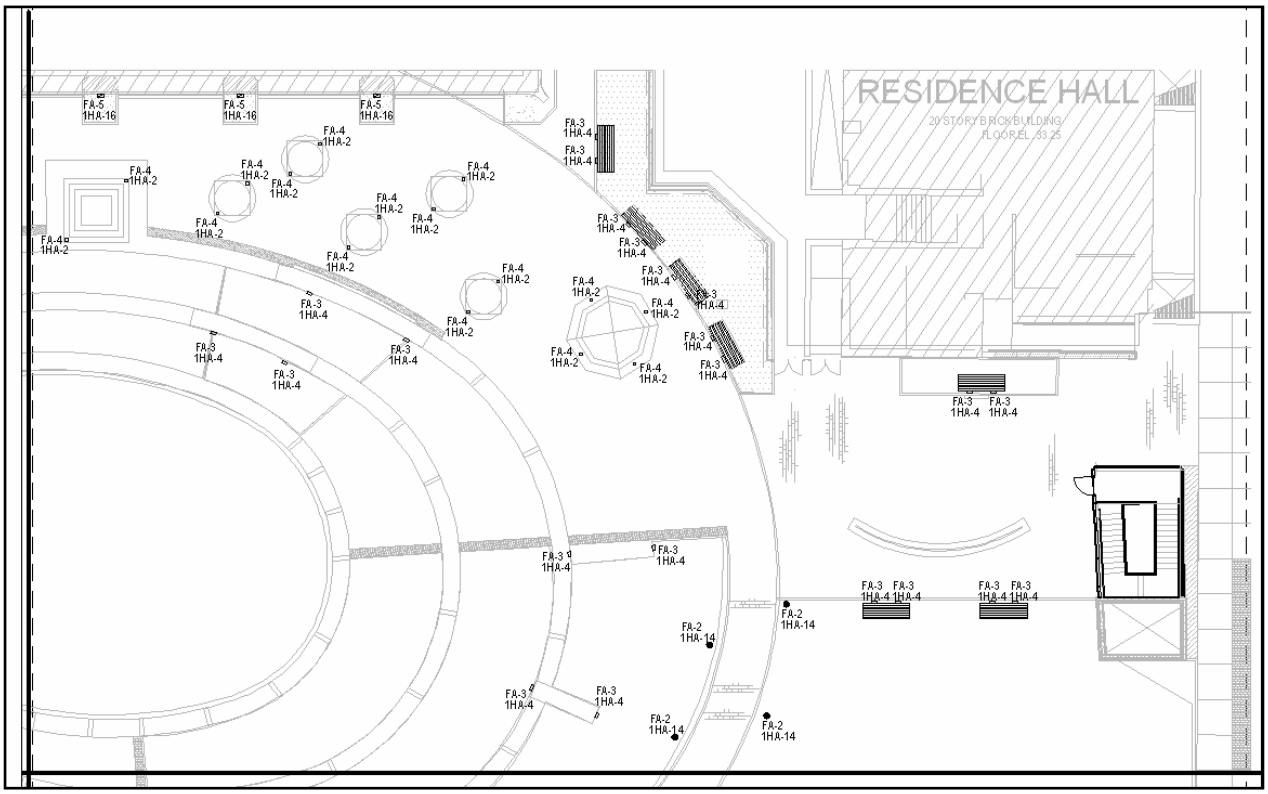


Figure 4: Plaza Lighting Plan (Upper Right)

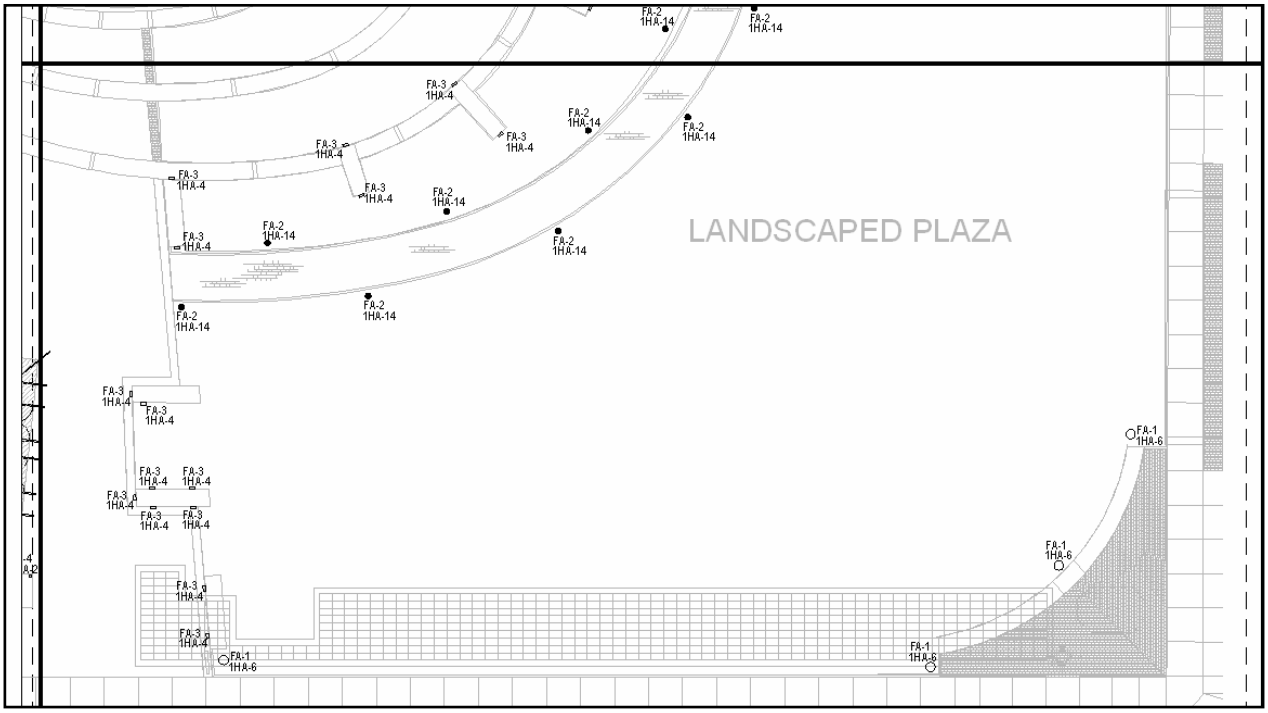
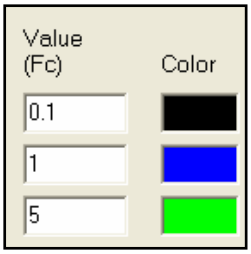


Figure 5: Plaza Lighting Plan (Lower Right)

Isometrics

The isolines from AGI32 were analyzed on the work plane height of 0.0'. The average illuminance throughout the walkways of the plaza was 0.99 fc.



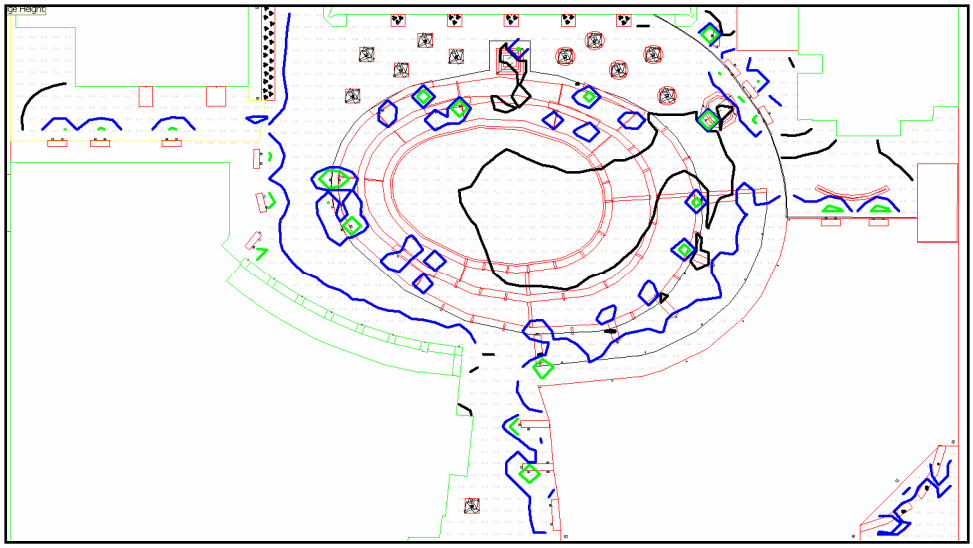


Figure 6: View of Isolines of Plaza

The isolines from AGI32 were analyzed on the work plane height of 0.0'. Figure 7 is a close-up view of the isolines of the center of the plaza.

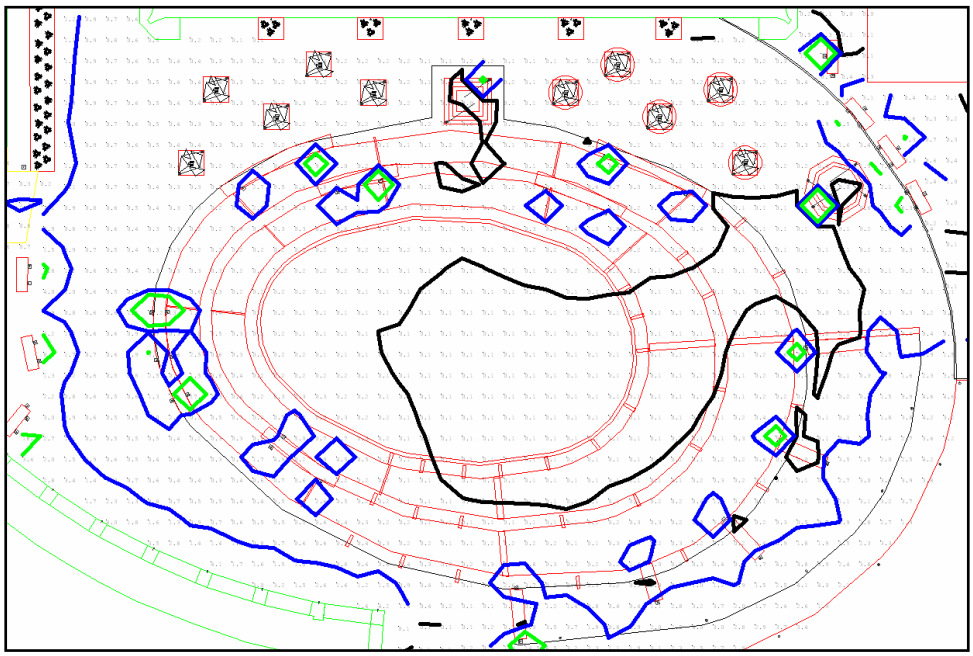


Figure 7: Close-up View of Isolines of Plaza

Conclusion

Overall, the lighting design achieved the space design goals. The step lights were inserted into the various benches around the plaza. The step lights provided the area with a luminaire source without cluttering the space. The middle of the plaza is used for a large tent, so fixtures were not permitted to be placed in the center of the ovals. The walkway closest to the grassy area was illuminated nicely by the bollard fixtures placed along the walkway. Outdoor wall sconces were placed on the columns of the DH Hamilton Building and above the planters of the Scott Library and Administrative Building. The trees, statue, and fountain outside of the Scott Library Building were accentuated by directional spotlights, which provided aesthetic appeal to the space. A few 18' high architectural area source luminaires were used at various places throughout the design.

The average illuminance on the work plane was 0.99 fc, which was high for the IESNA value for a plaza of 0.50 fc. The trees, statue, and fountain were accentuated; therefore, the average illuminance was higher. The power density was 0.16 W/ft^2, which was under the ASHRAE 90.1 Standards of 0.20 W/ft^2 for outdoor walkways/plaza.

Lobby – Lighting Redesign

Description of Space

The lobby is located on the first floor of the building. Upon entering the building through the curved façade that features large expanses of glass, one would find themselves in the lobby of the building. The auditorium entrance would then be straight ahead when in the lobby. The lobby will be mainly used for a circulation space although the space will have plasma screens in it. A small retail space is located in one corner of the lobby and is not included in the lighting redesign. The lobby is 70’ wide by 110’ long with the ends tapering out to a triangle. This equates to an area of 6,597 ft^2. The two-story height ceiling provides the space with a various options for the lighting design. The ceiling is 15’ high were the spaces are not two-stories high.

Floor Plan

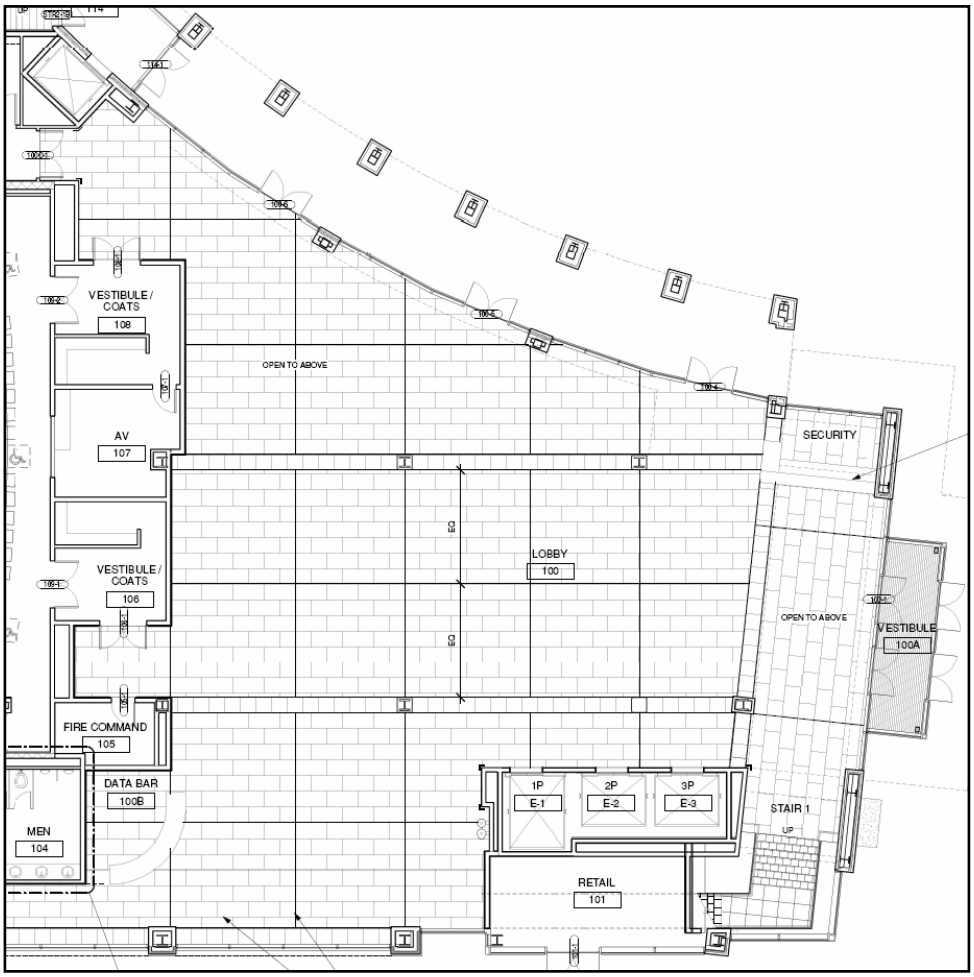


Figure 8: Lobby Floor Plan

Design Concept

The design concept of the lobby is to provide an inviting appeal to the space by adding sparkle and aesthetically pleasing fixtures. The large glass façade provides daylighting into the space, which will provide an opportunity to save on energy. The space is in the middle of the plaza and auditorium, so a smooth transition is necessary between the three spaces. The lighting design should accent the architecture and have a warm CCT for the wood panels used in the space. Attention to the plasma screens is also necessary in the lobby. Since the lobby is only used for circulation, the controls should be simple to use.

Design Criteria

Appearance of Space and Luminaires

The appearance of the space and luminaires is extremely important when lighting the lobby to this "new heart of campus". The appearance of the space and luminaires has to be aesthetically appealing. The architecture, such as the double height space, columns, and wood paneling, can be highlighted.

Color Appearance (and Color Contrast)

Color appearance can affect visibility and aesthetics. A color rendering index (CRI) of 70 or above is acceptable when dealing with educational facilities; however, a CRI greater than 80 may be needed in order to ensure a pleasant appearance of skin tones.

Daylighting Integration and Control

The space incorporates an expansive curved glass façade on the entire northeast wall. This will be an issue for the use of the VDT on the walls and may cause glare on the screen. The orientation of the plasma screens with respect to the daylighting is used in order to cut down on the directed glare. A daylighting system can be used to limit the amount of energy used in the room during the day. Controls such as a photo sensor and switching can be used to dim the luminaires in the room when daylighting is entering the room.

Luminances of Room Surfaces

User comfort and satisfaction is increased when spaces deliver both direct and diffuse light to the occupant and task. With the number of luminaires in the space and

daylighting, the luminances of the room surfaces are assumed to be from direct and diffused light. The special surfaces in the space include the doors of the space, the retail room, and the entrance to the lobby.

Modeling of Faces or Objects

The modeling of faces or objects is somewhat important to a lobby. A CRI of 80 or higher will provide a better skin tone color. Another consideration should be that light will hit the face at all angles. In this space with all the different light sources including daylight, the modeling of faces or objects should not be a problem.

Point(s) of Interest

The points of interest in the space include the entrances, exits, plasma screens, circulation paths, retail space, and security space. The points of interest will prosper with a slightly higher illuminance due to the fact that they will stand out, such as the entrances and exits.

Reflected Glare

The reflected glare in the space will be an issue with the VDT screens in the space. Caution should be used when placing luminaires around the area of the plasma screens.

Source/Task/Eye Geometry

The source/task/eye geometry is somewhat important to a lobby application. The angular relationships between the viewer, the task (VDTs), and the luminaire are frequently critical to task visibility. The luminaires should not be placed in the reflected view of the VDTs.

Sparkle/Desirable Reflected Highlights

The lobby is a good place to add sparkle because it enhances the look of the space. Sparkle should not create reflected glare, but may include some desirable reflected highlights, especially in the double height area of the lobby.

Surface Characteristics

The surface characteristics of the space are somewhat important due to the appearance of the space. The surfaces of the space should be a high gloss, grand

looking material. The space should appear to be high class.

Illuminance (Horizontal)

The IESNA handbook calls for a horizontal illuminance of 50 lux (5 fc) on the work plane for circulation.

Illuminance (Vertical)

The IESNA handbook recommends a vertical illuminance of 30 lux (3 fc) for this space. The entrances and exits should have a vertical illuminance of 50 lux (5 fc). Artwork and the directory should have an illuminance of 300 lux (30 fc).

Power Allowances from ASHRAE 90.1 Standards

The power allowance by the space by space method for a lobby is 1.3 W/ft^2.

Reflectances

Ceiling: Gypsum Wallboard Soffits/banding & Armstrong "Optima Vector" #3900, white acoustical ceiling tile

- Assume 90% ceiling reflectance

Walls: Wood Paneling/Painted Gypsum Wallboard

- Assume 50% wall reflectance

Floor: Cotto D'Este Porcelain Tile "Buxy", Cendre Natural Finish in 2'x2' and 2'x4' tiles

- Assume 40% floor reflectance

Fixture Schedule

Label	Description	MH	Lamps	Ballast/ Transformer	Watts	Voltage	Mfr.	Catalogue No.
F-B1	Campbell Pendant with Clear Glass and Sandblasted Stripes	18′	1 – 75 Watt R20	N/A	75	120	Louis Poulsen Lighting	CAM-1/75W/R20 Med-120V-Striped Glass
F-B2	Recessed Compact Fluorescent Downlight/Wallwasher with EvenTone Clear Flange	17′	2 – 26 Watt Triple Tube CFL	ICF-2S26-H1-LD - Advance Smartmate Electronic Programmed Start	52	277	Edison Price Lighting	TRPH 226/7–WW –277–VOL-PS
F-B3	Saturn Maxi Wall Sconce	6.5′	2 – 26 Watt Triple Tube CFL	ICF-2S26-H1-LD - Advance Smartmate Electronic Programmed Start	52	277	Louis Poulsen Lighting	SAW-MAX-2/26W/CF Gx24q-3/4-277V-NAT. PAINT ALUM.
F-B4	41″ Dia x 2″ Deep Semi-Indirect Area Source with Specular Segmented/White Reflector	12′	4 – 42 Watt CFL & 1 - 38	ICF-2S42-M2-BS – Advance – Smartmate Electronic Programmed Start	168	277	LAM	HR41-4/42-1/382D-HC-CN-62-SGW-SGW-277-ALB/3

Table 6: Lobby Fixture Schedule

Light Loss Factors

The assumed room cleaning period for this room is 6 months and the room is clean. The expected dirt depreciation was calculated at 8%.

RCR = [(5)*(H)*(L + W)] / (L)*(W)

RCR = [(5)*(16′-8″)*(88′ + 75′)] / (6597 ft^2) = 2.06 = 2.1

Label	Maintenance Category	LLD	RSDD	LDD	BF	LLF
F-B1	IV	0.88	0.98	0.92	1.00	0.79
F-B2	IV	0.92	0.98	0.92	1.00	0.83
F-B3	II	0.92	0.94	0.96	1.00	0.83
F-B4	VI	0.92	0.90	0.91	0.97	0.73

Table 7: Lobby Light Loss Factors

Ballast Information

Label	Type	Ballast Watts	Ballast Factor	Voltage	Max THD %	Mfr.	Catalogue No.
B-B2	Electronic – Programmed Start	54	1.00	277	10	Advance – Smartmate	ICF-2S26-H1-LD@277
B-B3	Electronic – Programmed Start	54	1.00	277	10	Advance – Smartmate	ICF-2S26-H1-LD@277
B-B4	Electronic – Programmed Start	2 @ 93	0.97	277	10	Advance – Smartmate	ICF-2S42-M2-BS@277

Table 8: Lobby Ballast Information

Lamp Information

Label	Type	CRI	CCT	Watts	Initial Lumens	Mean Lumens	Mfr.	Ballast
L-B1	DuraMax 75W Med 120V R20	80	3000	75	570	500	Philips	N/A
L-B2	ALTO PL-T 26W/830/GX2 4q-3/4P ALTO	82	3000	26	1800	1650	Philips	ICF-2S26-H1-LD - Advance Smartmate Electronic Programmed Start
L-B3	ALTO PL-T 26W/830/GX2 4q-3/4P ALTO	82	3000	26	1800	1650	Philips	ICF-2S26-H1-LD - Advance Smartmate Electronic Programmed Start
L-B4	ALTO PL-T 42W/830/GX2 4q-3/4P ALTO	82	3000	42	3200	2950	Philips	ICF-2S42-M2-BS – Advance – Smartmate Electronic Programmed Start

Table 9: Lobby Lamp Information

Power Density

The power density is slightly below the target IESNA value of 1.3 W/ft^2. The space is at an appropriate illuminance level, so the power density is sufficient.

Label	Ballast Watts	No. of Fixtures	Total Watts	
F-B1	75	22	1650	
F-B2	54	28	1512	
F-B3	54	12	648	
F-B4	224	14	3136	
			6946	Watt Total
			6597	Square Foot Total
			1.05 W/ft^2	

Table 10: Lobby Power Density

Lighting Plan

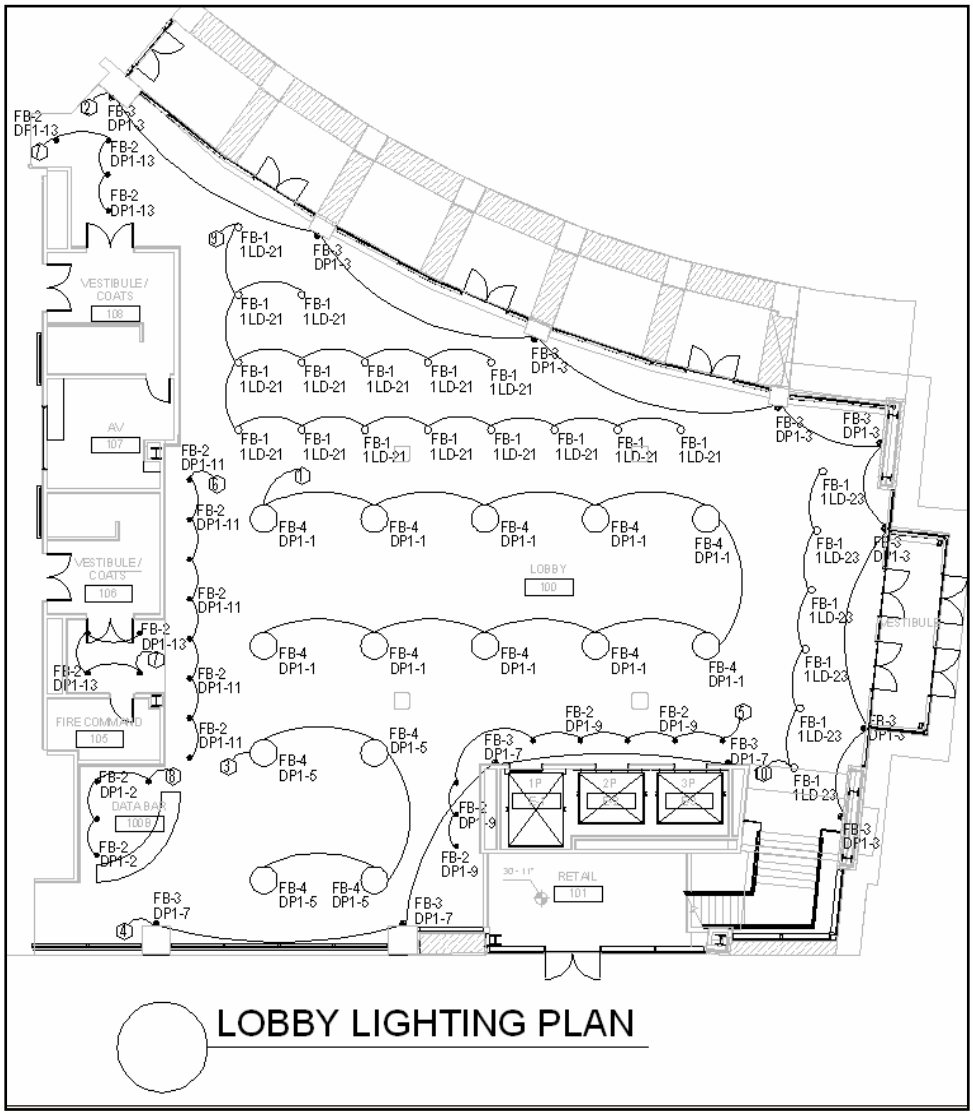


Figure 9: Lobby Lighting Plan

Isometrics

The Isolines from AGI32 were analyzed on the work plane height of 0.0'. The average illuminance throughout the lobby was 21.12 fc. The illuminance value is high for a circulation space, but the space needed a higher illuminance level.

Value (Fc)	Color	Value (Fc)	Color
5		20	
10		25	
15		30	

Figure 10: View of Isolines of Lobby

Renderings

Figure 11: Rendering of Lobby (Vestibule Entrance)

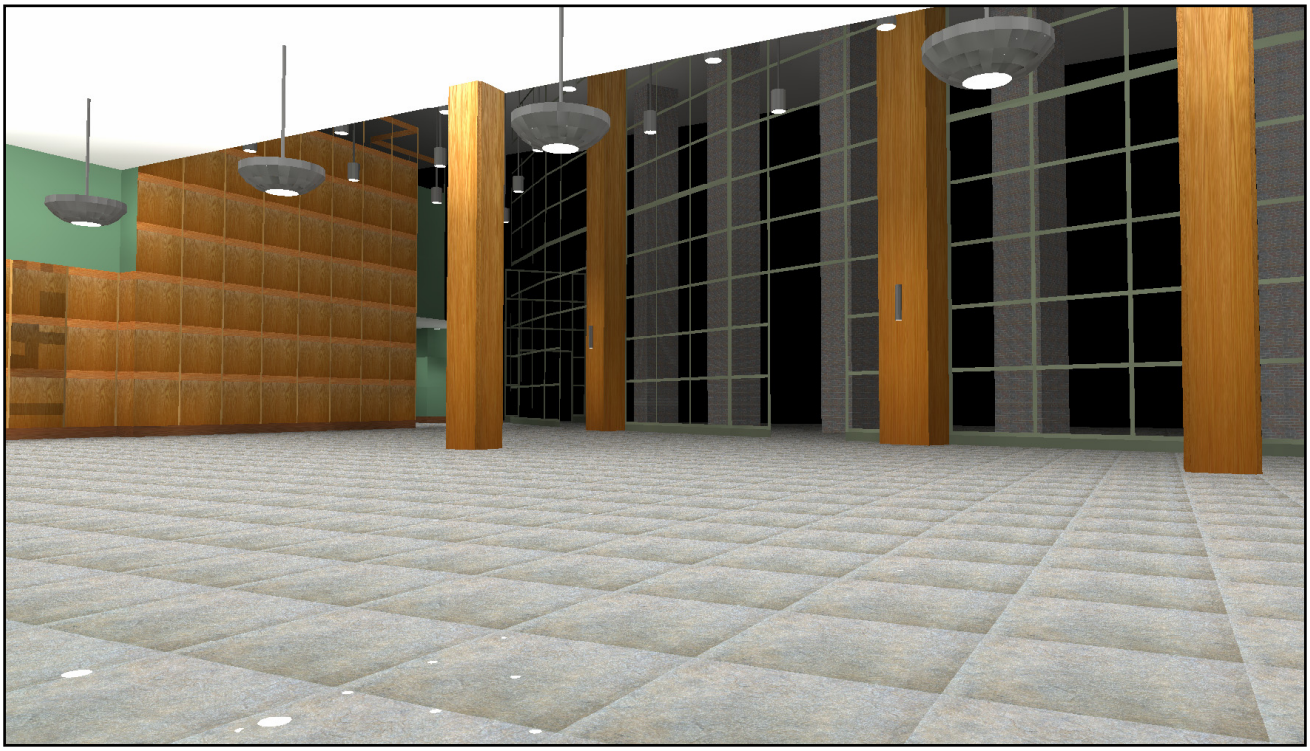


Figure 12: Rendering of Lobby (Elevator Entrance)

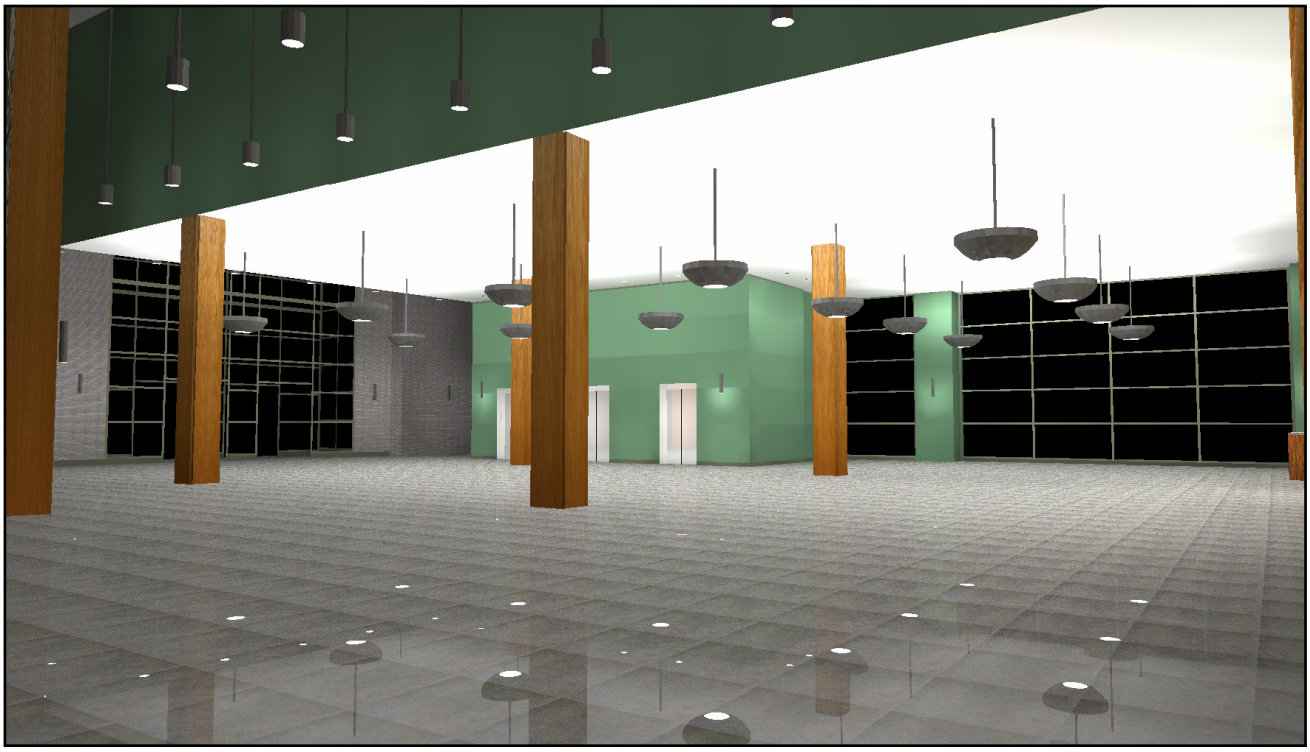


Figure 13: Rendering of Lobby (Glass Façade Entrance)

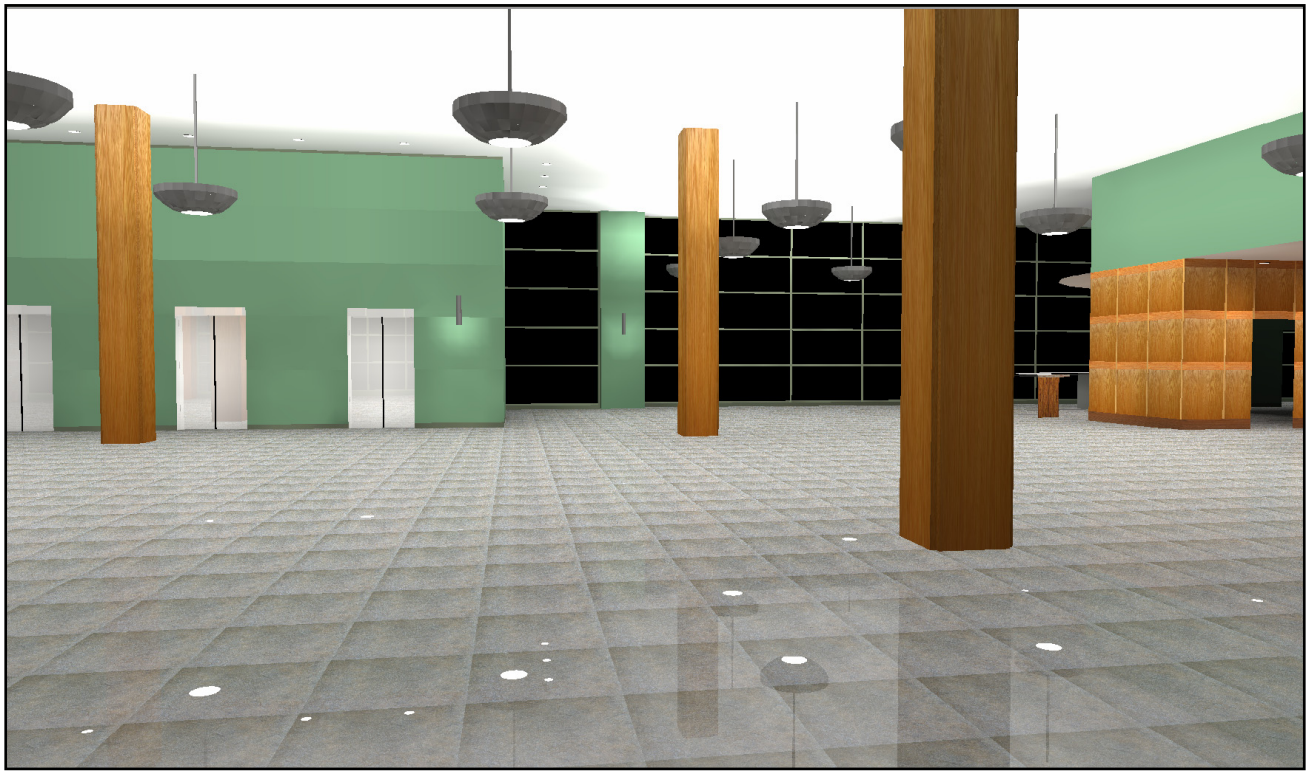


Figure 14: Rendering of Lobby (Glass Façade Entrance)

Pseudo Color Renderings

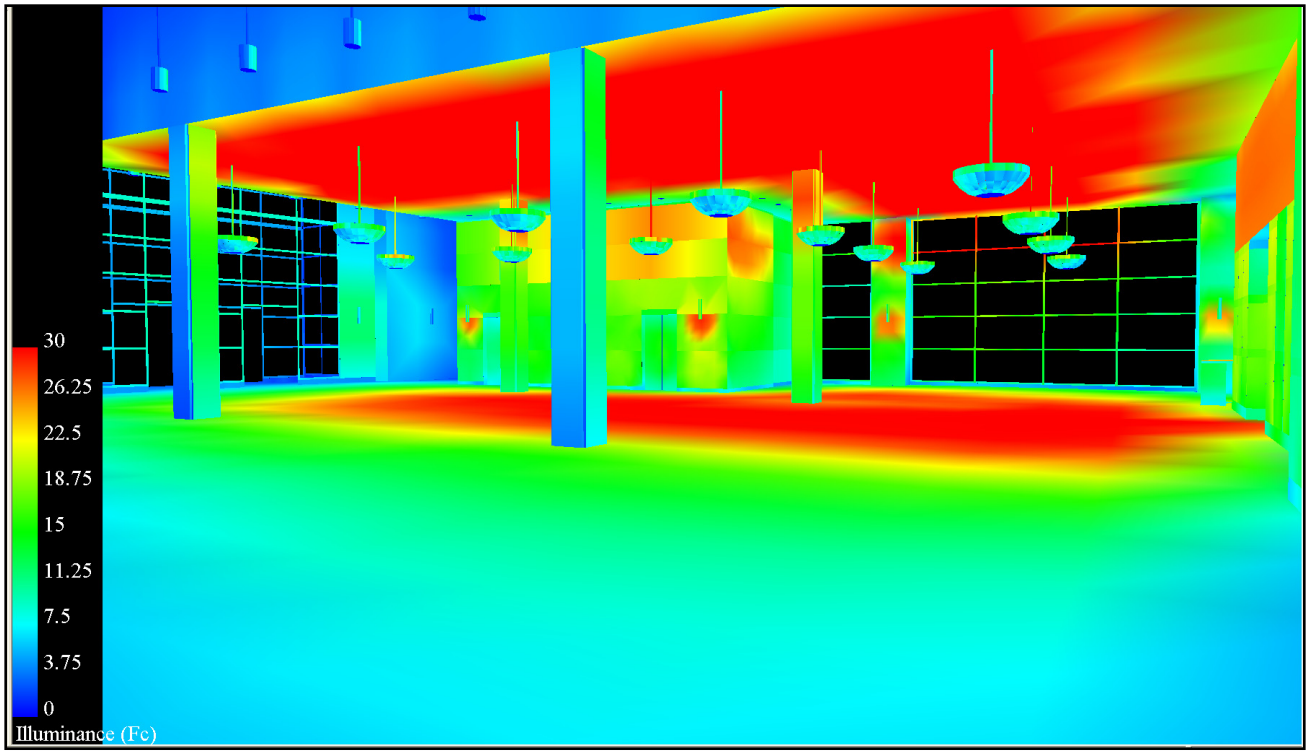


Figure 15: Pseudo Color of Lobby (Glass Façade Entrance)

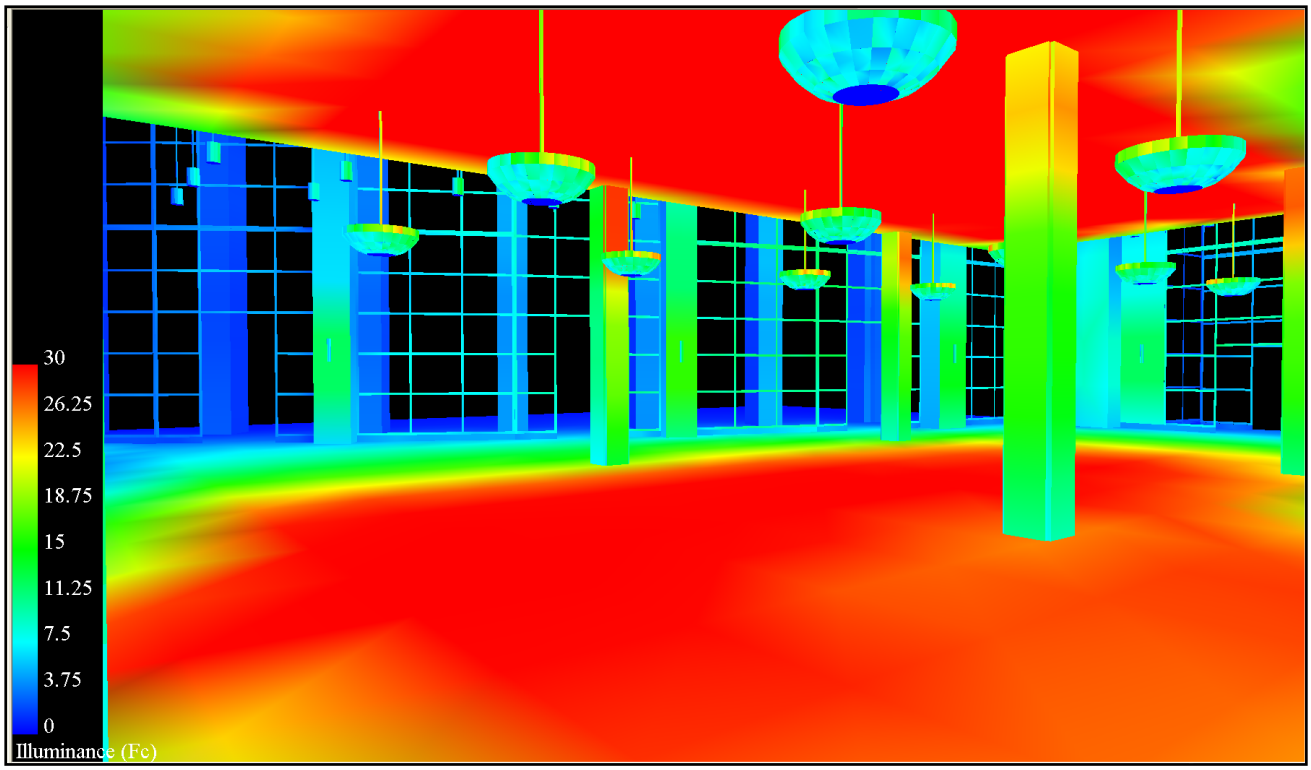


Figure 16: Pseudo Color of Lobby (@ Data Bar)

Conclusion

The lobby has an aesthetically pleasing look with the various high end construction materials and the lighting design. The space achieved all of the design goals by using pendants, recessed downlights, and wall sconces. The average illuminance on the work plane was 21.12 fc, which is above the IESNA value for a lobby/circulation space of 5 fc. However, the power density was 1.05 W/ft^2, which was under the ASHRAE 90.1 Standards of 1.30 W/ft^2 for a lobby.

Auditorium – Lighting Redesign

Description of Space

The 300-seat capacity auditorium resides on the first floor of the building. Upon entering the building through the curved façade that features large expanses of glass, one would find themselves in the lobby of the building. The auditorium entrance would then be straight ahead when in the lobby. The auditorium is used for lectures, demonstrations, film projects, and guest presentations. The tasks will be mainly note-taking, reading, and writing. The dimensions of the auditorium are 70' wide by 77' long by 15' high. This equates to a square footage of approximately 5,412 ft^2.

Floor Plan

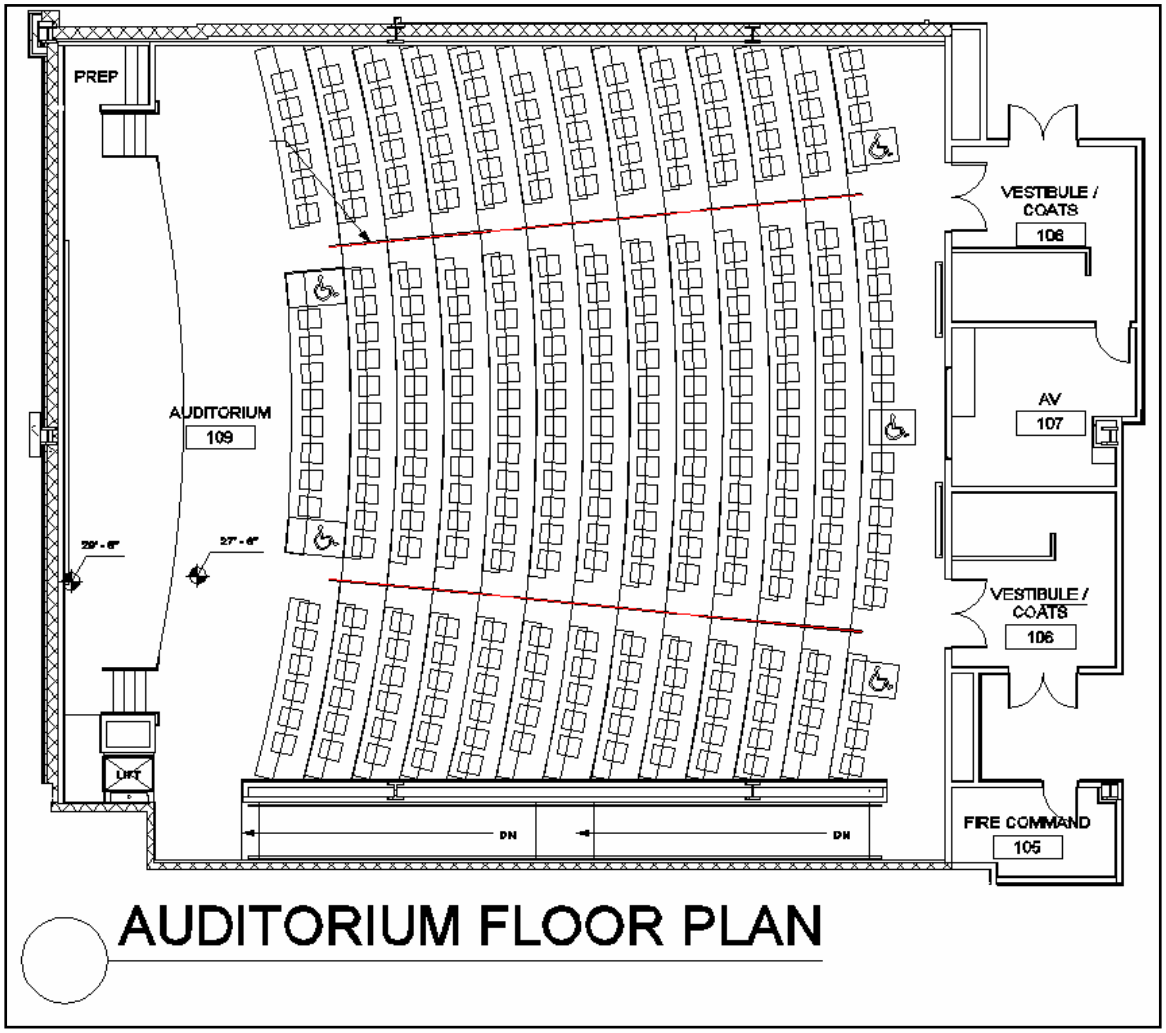


Figure 17: Auditorium Floor Plan

Design Concept

The design concept of the auditorium is to provide various scenes for the different tasks of the space, provide ample task lighting on the desks, and to accent the chalkboard/whiteboard. The space should provide a user friendly control system with the scene selection at the touch of a button. A smooth transition from the lobby will be incorporated into the design.

Design Criteria

Appearance of Space and Luminaires

The appearance of the space and luminaires is somewhat important in the auditorium. The auditorium will hold seminars with special speakers; therefore, the space and luminaires need to be aesthetically pleasing.

Color Appearance (and Color Contrast)

Color appearance can affect visibility and aesthetics. A color rendering index (CRI) of 70 or above is acceptable when dealing with educational facilities; however, a CRI greater than 80 may be needed in order to ensure a pleasant appearance of skin tones. Since the auditorium will have special speakers and guest lecturers, a CRI of 80 or greater will be beneficial. A CCT should be around 3500 K in order to provide a warmer feel to the space.

Light Distribution on Surfaces

Harsh striated patterns of excessive brightness or noticeable shadows should be avoided. Illuminance patterns should correspond with objects of the space. Ceiling and walls should have luminances within a 3:1 ratio. The current layout should not provide a harsh pattern on any surfaces in the space. The walls of the space can be uniform or non-uniform depending on the final design. Acoustical panels are on the upper portion of the wall. Depending on the appearance of the panels, a decision will be made on whether or not to make the light on the walls uniform or non-uniform.

Light Distribution on Task Plane (Uniformity)

Patterns of light on the task plane should be uniform. The desks in the room are used for reading and writing. A non-uniform pattern of light on the work plane would be distracting or confusing. The task illuminance should be higher than the immediate surroundings. With a work

plane illuminance that is 1.5 to 3 times higher than those in the surrounding areas will assist in directing the occupants' attention to the task, which is very important in educational facilities. The illuminance of the speaker should also be illuminated greater than the surrounding tasks (approximately 25-30 fc).

Point(s) of Interest

The points of interest in the space include the projection screen and the podium at the front of the space. The projection screen should be a lower illuminance and the podium will prosper with a slightly higher illuminance.

Source/Task/Eye Geometry

Extremely important to a lecture hall is the source/task/eye geometry. The angular relationships between the viewer, the task, and the luminaire are frequently critical to task visibility. This should not be an issue due to the height of the ceiling.

System Control and Flexibility

System control and flexibility is very important due to the different tasks in the space. A couple of different systems include a scene for a projection screen, a guest speaker, lectures, and general reading/writing tasks. Dimming ballasts will be required.

Illuminance (Horizontal)

The IESNA handbook calls for a horizontal illuminance of 50 lux (5 fc) on the work plane for auditoriums; however, the horizontal illuminance of a classroom is 500 lux (50 fc). When the projection screen is in use, a horizontal illuminance of 50 lux (5 fc) on the work plane is needed.

Illuminance (Vertical)

The IESNA handbook recommends a vertical illuminance of 30 lux (3 fc) when the projection screen is in use. The points of interest for vertical illuminance include the chalkboard, the speaker, and the projection screen. Note that the projection screen should be a lower illuminance than the surrounding space.

Power Allowances from ASHRAE 90.1 Standards

The power allowance by the space by space method for a classroom, lecture, or training space is 1.4 W/ft^2.

Reflectances

Ceiling: Sloped Gypsum Wallboard Planes with Fascias to Follow Radius of Seating Tiers

- Assume 90% ceiling reflectance

Walls: Fabric Covered Acoustical Panels/Wood Panels/Painted Gypsum Wallboard

- Assume 50% wall reflectance

Floor: Constantine Commercial Carpet, "Corporate Exchange" 12' W Broadloom; Color T.B.D.

- Assume 20% floor reflectance

Fixture Schedule

Label	Description	MH	Lamps	Ballast/ Transformer	Watts	Voltage	Mfr.	Catalogue No.
F-C1	Concealed Cove-30 System with High-Reflectance White Reflectors	16'	1 – T5HO	REZ-154 – Mark 10 Powerline Electronic Dimming/Programmed Start	54	120	Lite Control Corporation	CC-AI-3024-T5-CWM-TW-2CWQ-277
F-C2	Triples-H 232/7 Recessed CFL Downlight/Wallwasher with EvenTone Clear Reflector	16'	2 – 32 Watt CFL	IZT-2T42-M3-BS@277 – Mark 7 – Electronic Dimming/Programmed Start	64	277	Edison Price Lighting	TRPH 232/7-277-VOL-DM
F-C3	Strip LED Lights for the Stairs	4"	10 – LEDS	Packaged Unit	24	120	Color Kinetics Incorporated	501-000010-00 MEDIUM
F-C4	Obround Wall Mount Luminaire with Specular Aluminum Reflector	11'	2 – F40T8	B-D2 – Advance Electronic/Instant Start Optanium	80	277	LAM Lighting	OB70-2/T8-O-L-WN-8-SGW-277-GLR

Table 11: Auditorium Fixture Schedule

Light Loss Factors

The assumed room cleaning period for this room is 6 months and the room is clean. The expected dirt depreciation was calculated at 8%.

RCR = [(5)*(H)*(L + W)] / (L)*(W)

RCR = [(5)*(15')*(77' + 70')] / (5412 ft^2) = 2.04 = 2.0

Label	Maintenance Category	LLD	RSDD	LDD	BF	LLF
F-C1	VI	0.90	0.90	0.92	1.00	0.75
F-C2	IV	0.83	0.98	0.93	1.00	0.76
F-C3	II	0.70	0.94	0.97	1.00	0.64
F-C4	IV	0.93	0.98	0.93	1.03	0.87

Table 12: Auditorium Light Loss Factors

Ballast Information

Label	Type	Ballast Watts	Ballast Factor	Voltage	Max THD %	Mfr.	Catalogue No.
B-C1	Electronic Dimming/Programmed Start	63	1.00	120	10	Advance – Mark 10 Powerline	REZ-154
B-C2	Mark 7 – Electronic Dimming/Programmed Start	75	1.00	277	10	Advance	IZT-2T42-M3-BS@277
B-C4	Electronic/Instant Start/2-Lamp	81	1.03	277	10	Advance – Optanium	VOP-4P32-SC

Table 13: Auditorium Ballast Information

Lamp Information

Label	Type	CRI	CCT	Watts	Initial Lumens	Mean Lumens	Mfr.	Ballast
L-C1	F54T5/830 HO ALTO TG	85	3000	54	5000	4500	Philips	REZ-154 – Mark 10 Powerline Electronic Dimming/Programmed Start
L-C2	PL-T 32W/830 GX24Q-3/4P	82	3000	32	2400	2000	Philips	IZT-2T42-M3-BS@277 – Mark 7 – Electronic Dimming/Programmed Start
L-C4	F40T8 TL841 ALTO	86	4100	40	3775	3500	Philips	B-D2 – Advance Electronic/Instant Start Optanium

Table 14: Auditorium Lamp Information

Power Density

Label	Ballast Watts	No. of Fixtures	Total Watts	
F-C1	63	42	2646	
F-C2	75	48	3600	
F-C3	24	48	1152	
F-C4	81	7	567	
			7965	Watt Total
			5412	Square Foot Total
			1.47 W/ft^2	

Table 15: Auditorium Power Density

Therefore, the power density is slightly above the target IESNA value of 1.4 W/ft^2. If the power density must be lower than 1.4 W/ft2, then the amount of cove luminaires could be reduced in order to obtain the proper power density. The space is at an appropriate illuminance level of approximately 42.3 fc, so the power density is sufficient.

Lighting Plan

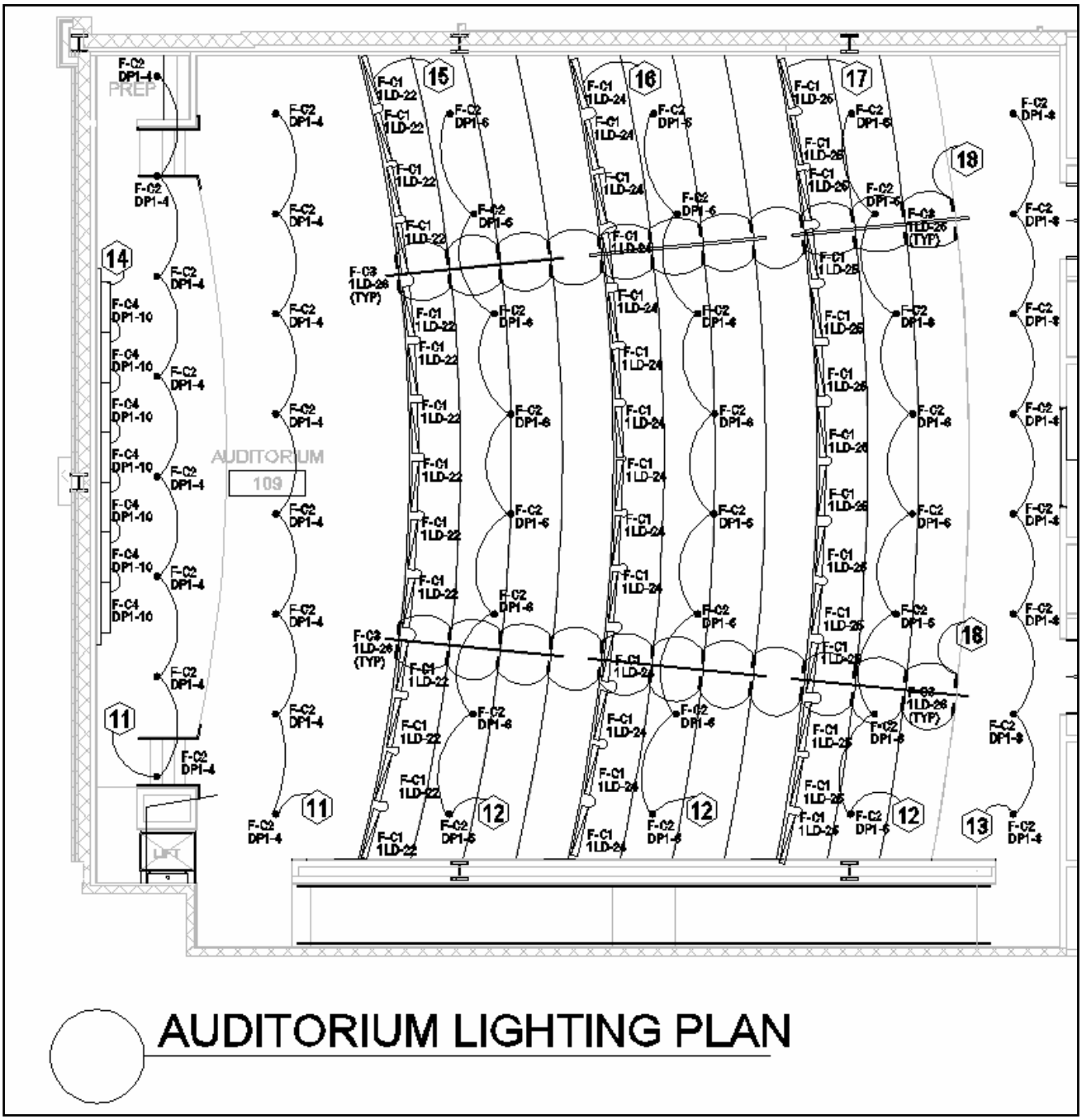


Figure 18: Auditorium Lighting Plan

Lighting Controls

The different zones represent different dimming areas. A Lutron 100 system is being utilized by the DH Hamilton Building. Occupancy sensors are being used as in the previous spaces.

Renderings

Figure 19: Rendering of Auditorium

Figure 20: Rendering of Auditorium

Renderings

Figure 21: Rendering of Auditorium

Figure 22: Rendering of Auditorium

Pseudo Color

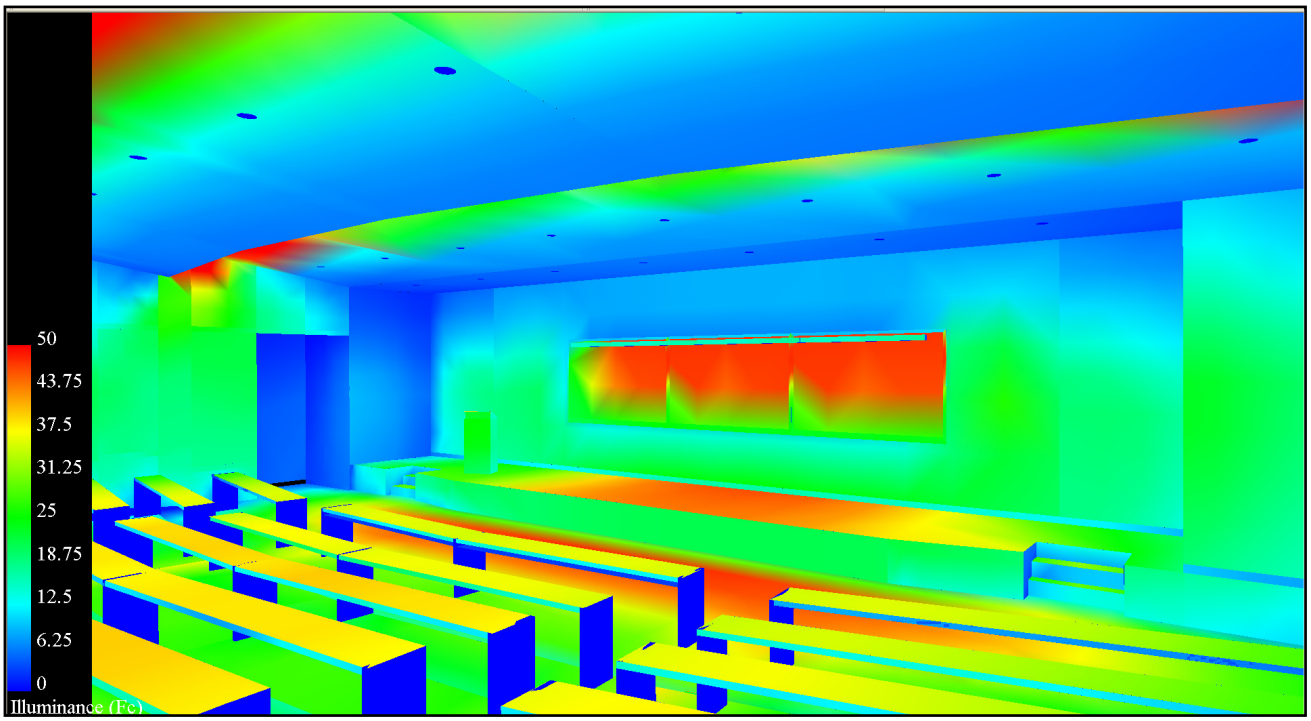


Figure 23: Pseudo Color of Auditorium

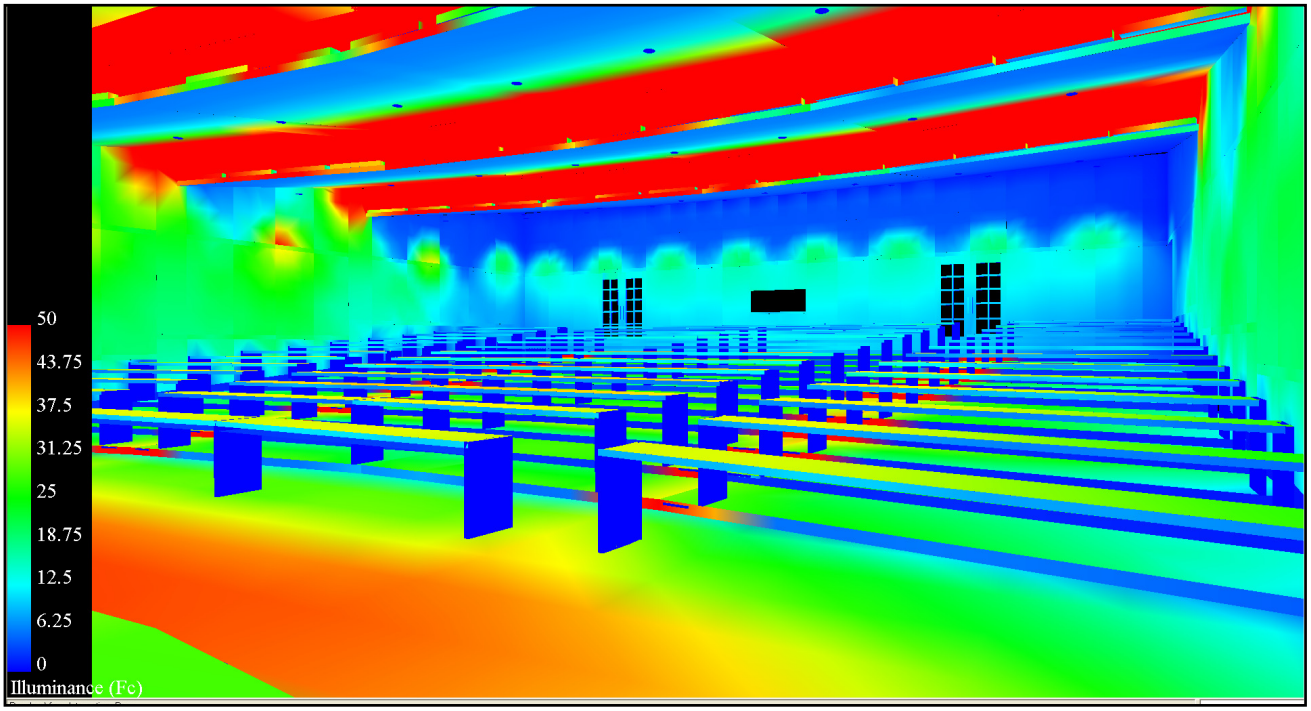


Figure 24: Pseudo Color of Auditorium

Conclusion

The auditorium was the hardest space to provide the lighting design for. The space had a curved ceiling with various heights across the whole ceiling. A curved cove was used throughout the space to achieve some area lighting. The rest of the ambient lighting was done through downlights. The steps have a built in LED strip. Overall, the lighting design achieved the space design goals. The average illuminance on the work plane was 42.3 fc, which is low for the IESNA value for a classroom/lecture space of 50 fc. The power density was 1.47 W/ft^2, which was slightly over the ASHRAE 90.1 Standards of 1.4 W/ft^2 for a classroom/lecture space.

Classroom (505) – Lighting Redesign

Description of Space

The 60-person classroom is located on the fifth floor of the building. The fifth floor of the Dorrance H. Hamilton Building also includes other classrooms, lecture halls, two skills simulation labs, storage rooms, a small lobby, and a library/meeting room. The back wall of the classroom is a curved glass ribbon window, which will have dual/solar blackout shades. The shades will provide the space with a visual display terminal (VDT) friendly environment. The space tasks include note-taking, reading, writing, chalkboard use, and VDT use. The classroom is 32' long by 54' wide by 10' high. This equates to an area of 1728 ft^2.

Floor Plan

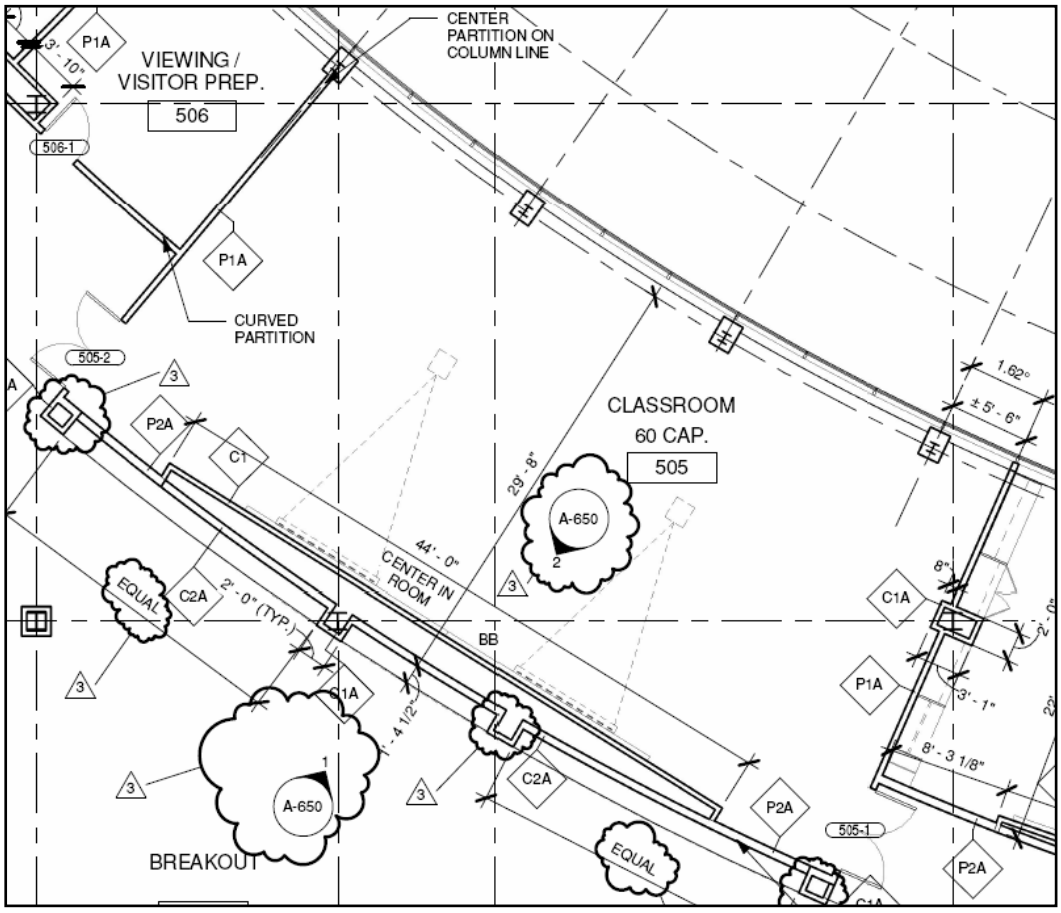


Figure 25: Classroom Floor Plan

Design Concept

The design concept of the classroom is to provide various scenes for the different tasks of the space, provide ample task lighting on the desks, and to accent the chalkboard/whiteboard. The space should be user friendly with only switching to turn the lights on and off. The front row of lights will be on a separate switch in order to provide sufficient lighting for the chalkboard/whiteboard. The 2x2 fixtures throughout the room will provide a sufficient area source of light. A fluorescent wall mounted light will be on top of the chalkboard to provide adequate illuminance.

Design Criteria

Daylighting Integration and Control

The space incorporates a curved ribbon window on the entire rear wall of the room. This will be a design issue during the use of the projector and screen and may even cause glare on the blackboard. Dual/Solar blackout blinds will remedy this potential problem; however, they will also limit the daylight in the space.

Light Distribution on Task Plane (Uniformity)

Patterns of light on the task plane should be uniform. The desks in the room are used for reading and writing, so a non-uniform pattern of light on the task plane would be distracting and/or confusing. In a learning environment, the task plane illuminance should be 1.5 to 3 times higher than those in the surrounding areas in order to assist occupant's attention on the task at hand.

System Control and Flexibility

System control and flexibility are of extreme importance in the space due to the various tasks provided in the classroom. A couple of different scenes of the space include the projection screen, blackboard/whiteboard applications, and general lecture talks. This will be accomplished by the front row of luminaires to be on a separate switch.

Illuminance (Horizontal)

The IESNA Handbook recommends a horizontal illuminance of 500 lux (50 fc) on the task plane for reading and writing tasks. When the projection screen is in use, a

horizontal illuminance of 30 lux (3 fc) on the task plane is needed.

Illuminance (Vertical)

The IESNA Handbook recommends a vertical illuminance of 30 lux (3 fc) when the projection screen is in use. The points of interest for vertical illuminance include the chalkboard, the speaker, and the projection screen. Note: The projection screen should be a lower illuminance than the surrounding space.

Power Allowances from ASHRAE 90.1 Standards

The power allowance by the space by space method for a classroom, lecture, or training space is 1.4 W/ft^2 – 1.6 W/ft^2.

Reflectances

Ceiling: Acoustical Ceiling Tile

- Assume 85% ceiling reflectance

Walls: To Be Determined

- Assume 50% wall reflectance

Floor: To Be Determined

- Assume 50% floor reflectance

Fixture Schedule

Label	Description	Lamps	Ballast/ Transformer	Watts	Voltage	Mfr.	Catalogue No.
F-B1	2x2 Parabolic Grid Troffer with Specular Louver Finish	3 – F17T8	B-D1 - Advance Electronic Dimming/Instant Start Mark 10 PowerLine	51	277	Holophane	1-HP-G-N-22-X-N-D33-023-EP-1-2
F-B2	Obround Wall Mount Luminaire with Specular Aluminum Reflector	2 – F40T8	B-D2 – Advance Electronic/Instant Start Optanium	80	277	LAM Lighting	OB70-2/T8-O-L-WN-8-SGW-277-GLR

Table 16: Classroom Fixture Schedule

Light Loss Factors

The assumed room cleaning period for this room is 6 months and the room is clean. The expected dirt depreciation was calculated at 8%.

RCR = [(5)*(H)*(L + W)] / (L)*(W)

RCR = [(5)*(10')*(32' + 54')] / (32')*(54') = 2.49 = 2.5

Label	Maintenance Category	LLD	RSDD	LDD	BF	LLF
F-D1	IV	0.95	0.98	0.93	1.05	0.91
F-D2	IV	0.93	0.98	0.93	1.03	0.87

Table 17: Classroom Light Loss Factors

Ballast Information

Label	Type	Ballast Watts	Ballast Factor	Voltage	Max THD %	Mfr.	Catalogue No.
B-D1	Electronic Dimming/ Instant Start/ 3-Lamp	56	1.05	277	10	Advance – Mark 10 PowerLine	VEZ-3S32-SC
B-D2	Electronic/Instant Start/2-Lamp	81	1.03	277	10	Advance – Optanium	VOP-4P32-SC

Table 18: Classroom Ballast Information

Lamp Information

Label	Type	CRI	CCT	Watts	Initial Lumens	Mean Lumens	Mfr.	Ballast
L-D1	F17T8 TL841 ALTO TG	85	4100	17	1400	1330	Philips	B-D1 - Advance Electronic Dimming/Instant Start Mark 10 PowerLine
L-D2	F40T8 TL841 ALTO	86	4100	40	3775	3500	Philips	B-D2 – Advance Electronic/Instant Start Optanium

Table 19: Classroom Lamp Information

Power Density

Label	Ballast Watts	No. of Fixtures	Total Watts	
F-D1	59	28	1652	
F-D2	81	4	324	
			1976	Watt Total
			1506	Square Foot Total
			1.31 W/ft^2	

Table 20: Classroom Power Density

Therefore, the power density is slightly below the target IESNA value of 1.4 W/ft^2 to 1.6 W/ft^2. The space is at an appropriate illuminance level, so the power density is sufficient.

Lighting Plan

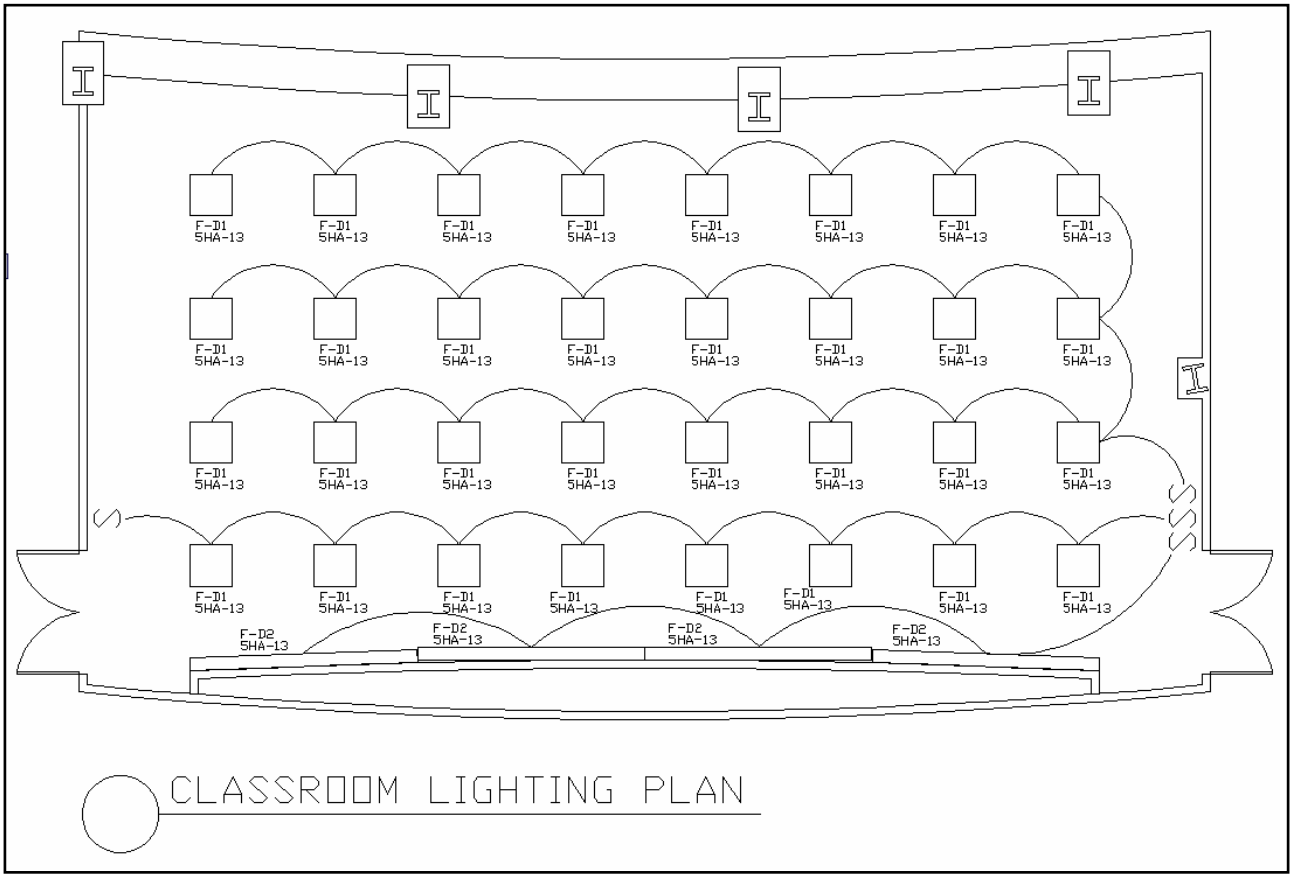


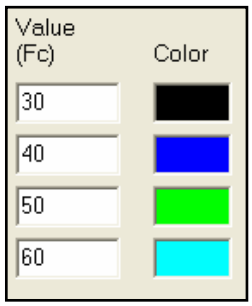
Figure 26: Classroom Lighting Plan

Lighting Controls

The classroom will use two dual technology occupancy sensors due to the size of the classroom. The sensors will be located in two rear corners of the classroom. The sensors can accommodate lower levels of activity without false triggers. Dimming ballasts are specified for use with these lighting controls.

Isometrics

The Isolines from AGI32 were analyzed on the work plane height of 2.5'. The average illuminance throughout the classroom was 49.66 fc.



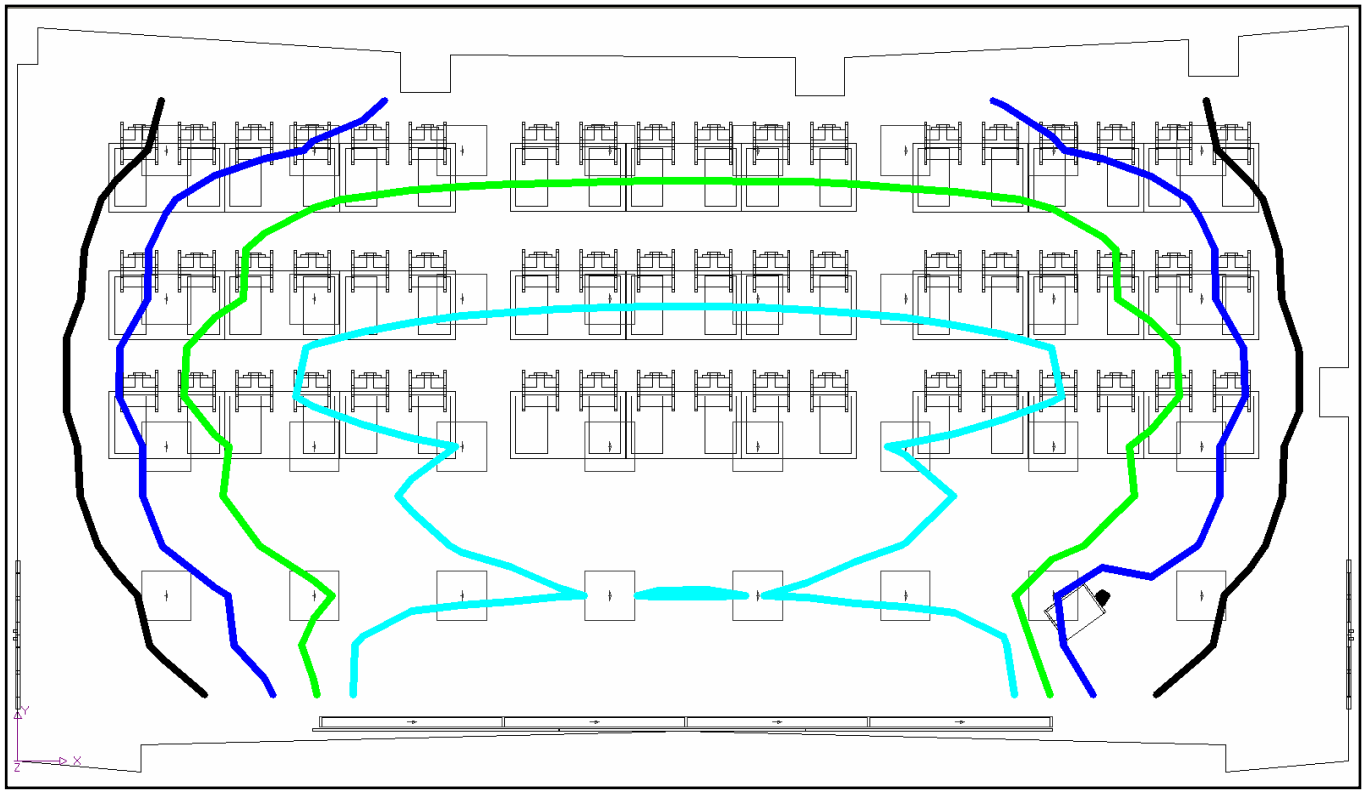


Figure 27: View of Isolines of Classroom

Renderings

Figure 28: Rendering of Classroom

Figure 29: Rendering of Classroom

Conclusion

Overall, the lighting design achieved the space design goals. The 2 by 2 fixtures worked well in accordance with the acoustical tile ceiling grid and provided sufficient light onto the workplane. The average illuminance on the work plane was 49.6 fc, which almost matched the IESNA value for a classroom of 50 fc. The power density was 1.31 W/ft^2, which was under the ASHRAE 90.1 Standards of 1.4 W/ft^2 for a classroom.

Electrical Depth

Electrical Introduction

The current power distribution system provides the building with power; however, an alternative design solution was analyzed. This analysis was done in order to compare the two different systems by cost analysis, efficiency, and power consumption.

The system redesign is comprised of a variety of different tasks, which include the redesign of branch circuits for the four re-lighted spaces, analysis of a central transformer versus distributed transformers, analysis of feeders versus a bus duct spanning to the penthouse, the analysis of a motor control center, and a protective device coordination study. The redesign of the power distribution system was compared to the existing system regarding cost analysis, efficiency, and power consumption. The cost analysis is a part of the construction management breadth work.

The power distribution system was redesigned following the 2005 NEC handbook. The branch circuits were recalculated along with feeders and panelboard schedules for all four areas of the redesign of the lighting systems. A central transformer was utilized instead of distributed transformers on each floor. The elimination of a variety of feeders in place of a bus duct spanning to the penthouse should be an advantageous change to the power distribution system. The installment of a mechanical equipment motor control center was analyzed by calculating the design loads for branch conductors, feeders, and protective devices. Also, a short circuit current calculation was investigated for a single-path through the distribution system.

Branch Circuit Redesign – Plaza

Original Panelboard 1LA - Plaza

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
1LA	VOLTAGE	120/208			BUSS			150A				FROM	1DPA
MOUNTING: SURFACE	PHASE	3			MAIN/MLO			MLO				TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING			10 kA				SIZE	SEE RISER ON E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS	LOCATION/ITEM	
RCPT 112	900	12		20A-1P	1	A----	2	20A-1P		12	500	RELAY PANEL LP-1	
RCPT 110	180	12		20A-1P	3	--B--	4	20A-1P		12	1080	RCPT 112B	
RCPT 110	540	12		20A-1P	5	---C	6	20A-1P		12	100	UH LOADING DOCK	
GFI WP	360	12		20A-1P	7	A----	8	20A-1P		12	1000	PLASMA SCREEN	
RCPT 100,100C,111	900	12		20A-1P	9	--B--	10	20A-1P				*SPARE*	
COLUMN RCPT 100	720	12		20A-1P	11	---C	12	20A-1P		12	360	EXTERIOR ANDOCUPS	
COLUMN RCPT 100	720	12		20A-1P	13	A----	14	20A-1P		12	200	EXTERIOR CAMERA	
ICE MACHINE	1000	12		20A-1P	15	--B--	16	20A-1P		12	500	COFFEE	
GARBAGE DISPOSAL	1000	12		20A-1P	17	---C	18	20A-1P		12	1500	FOOD CARTS	
REFRIGERATOR	1000	12		20A-1P	19	A----	20	20A-1P		12	1500	FOOD CARTS	
DISHWASHER, 110	6126	#3	1.25"	80A-2P	21	--B--	22	20A-1P				*SPARE*	
	6126				23	---C	24	20A-1P				*SPARE*	
RCPT METERS, 112A	500	12		20A-1P	25	A----	26	20A-1P				SPARE	
SPACE AND PROVISION					27	--B--	28					SPACE AND PROVISION	
SPACE AND PROVISION					29	---C	30					SPACE AND PROVISION	
SPACE AND PROVISION					31	A----	32					SPACE AND PROVISION	
SPACE AND PROVISION					33	--B--	34					SPACE AND PROVISION	
SPACE AND PROVISION					35	---C	36					SPACE AND PROVISION	
AUTO DOOR, 112	829	12		20A-3P	37	A----	38					SPACE AND PROVISION	
	829				39	--B--	40					SPACE AND PROVISION	
	829				41	---C	42					SPACE AND PROVISION	

NOTES:
1. PROVIDE 200% NEUTRAL

Figure 30: Original Panelboard – Plaza

New Panelboard 1LA – Plaza

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 150A
SIZE/TYPE MAIN: 150A/3P C/B

PANEL TAG: 1LA
PANEL LOCATION: Room 112B - Electrical Room
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1DPA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
RCPT	Room 112	900	20A/1P	1	*			2	20A/1P	500	-	RELAY PANEL LP-1
RCPT	Room 110	180	20A/1P	3		*		4	20A/1P	1080	Room 112B	RCPT
RCPT	Room 110	540	20A/1P	5			*	6	20A/1P	100	-	UH LOADING DOCK
GFI WP	-	360	20A/1P	7	*			8	20A/1P	1000	-	PLASMA SCREEN
RCPT	Rm 100, 111	900	20A/1P	9		*		10	20A/1P	0	-	SPARE
COLUMN RCPT	Room 100	720	20A/1P	11			*	12	20A/1P	0	-	SPARE
COLUMN RCPT	Room 100	720	20A/1P	13	*			14	20A/1P	200	-	EXT. CAMERA
ICE MACHINE	-	1000	20A/1P	15		*		16	20A/1P	500	-	COFFEE
GARBAGE DISPOSA	-	1000	20A/1P	17			*	18	20A/1P	1500	-	FOOD CARTS
REFRIGERATOR	-	1000	20A/1P	19	*			20	20A/1P	1500	-	FOOD CARTS
DISHWASHER	-	6126	80A/2P	21		*		22	20A/1P	0	-	SPARE
DISHWASHER	-	6126	80A/2P	23			*	24	20A/1P	0	-	SPARE
RCPT METERS	Room 112A	500	20A/1P	25	*			26	20A/1P	0	-	SPARE
SPACE & PROV.	-	0		27		*		28		0	-	SPACE & PROV.
SPACE & PROV.	-	0		29			*	30		0	-	SPACE & PROV.
SPACE & PROV.	-	0		31	*			32		0	-	SPACE & PROV.
SPACE & PROV.	-	0		33		*		34		0	-	SPACE & PROV.
SPACE & PROV.	-	0		35			*	36		0	-	SPACE & PROV.
AUTO DOOR	Room 112	829	20A/3P	37	*			38		0	-	SPACE & PROV.
AUTO DOOR	Room 112	829	20A/3P	39		*		40		0	-	SPACE & PROV.
AUTO DOOR	Room 112	829	20A/3P	41			*	42		0	-	SPACE & PROV.

CONNECTED LOAD (KW) - A	7.51	TOTAL DESIGN LOAD (KW)	24.55
CONNECTED LOAD (KW) - B	10.62	POWER FACTOR	0.88
CONNECTED LOAD (KW) - C	10.82	TOTAL DESIGN LOAD (AMPS)	77

Figure 31: New Panelboard – Plaza

Feeder Size – Plaza

Feeder Size – Panelboard 1LA	
Calculated Design Load	77.4 A
Feeder Protection Size	80 A
Sets	1
Wire Size	
Phase	#4 AWG
Neutral	2/0 AWG
Ground	#8 AWG
Wire Area	
Each Phase	0.0824"
All Phase	0.2472"
Neutral	0.2223"
Ground	0.0366"
Total Area	0.5061"
Conduit Size	1 ¼"
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 200% Neutral

Table 21: Feeder Size – Plaza

Original Panelboard 1HA - Plaza

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
1HA	VOLTAGE	277/480			BUSS			200A				FROM	BDPA
SURFACE	PHASE	3			MAIN/MLO			MLO W/SUBFEED LUGS				TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING			25 kA				SIZE	SEE RISER ON E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS	LOCATION/ITEM	
LIGHTING	2776	12		20A-1P	1	A----	2	20A-1P		#12	1300	SITE LGT. WEST PLAZA	
LIGHTING	2648	12		20A-1P	3	--B--	4	20A-1P		#12	800	TREE LGT. WEST PLAZA	
LIGHTING	2960	12		20A-1P	5	---C	6	20A-1P		#12	1295	SITE LGT. @ SCOTT	
LIGHTING	1824	12		20A-1P	7	A----	8				5466		
LIGHTING	1710	12		20A-1P	9	--B--	10	50A-3P	1"	#6	5466	PANEL DP1	
LIGHTING	3162	12		20A-1P	11	---C	12				5466		
VAV'S	2424	#12		20A-1P	13	A----	14	20A-1P		#12	1780	SITE LGT. EAST PLAZA	
VAV'S	1224	#12		20A-1P	15	--B--	16	20A-1P		#12	1300	TREE LGT. EAST PLAZA	
PARK SIGNS	*2200*	#12		20A-1P	17	---C	18	20A-1P				SPARE	
SPARE				20A-1P	19	A----	20	20A-1P				SPARE	
SPARE				20A-1P	21	--B--	22	20A-1P				SPARE	
SPARE				20A-1P	23	---C	24	20A-1P				SPARE	
SPARE				20A-1P	25	A----	26	20A-1P				SPARE	
SPARE				20A-1P	27	--B--	28	20A-1P				SPARE	
SPARE				20A-1P	29	---C	30	20A-1P				SPARE	
SPACE AND PROVISION					31	A----	32					SPACE AND PROVISION	
SPACE AND PROVISION					33	--B--	34					SPACE AND PROVISION	
SPACE AND PROVISION					35	---C	36					SPACE AND PROVISION	
SPACE AND PROVISION					37	A----	38					SPACE AND PROVISION	
SPACE AND PROVISION					39	--B--	40					SPACE AND PROVISION	
SPACE AND PROVISION					41	---C	42					SPACE AND PROVISION	
NOTES:													

Figure 32: Original Panelboard – Plaza

New Panelboard 1HA – Plaza

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W
SIZE/TYPE BUS: 200A
SIZE/TYPE MAIN: 200A/3P C/B

PANEL TAG: 1HA
PANEL LOCATION: Room 112B - Electrical Room
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 25K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD BDPA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
LIGHTING	-	2776	20A/1P	1	*			2	20A/1P	1400	Plaza	LIGHTING
LIGHTING	-	2648	20A/1P	3		*		4	20A/1P	2808	Plaza	LIGHTING
LIGHTING	-	2960	20A/1P	5			*	6	20A/1P	1146	Plaza	LIGHTING
LIGHTING	-	1824	20A/1P	7	*			8	50A/3P	5466	-	PANEL DP1
LIGHTING	-	1710	20A/1P	9		*		10	50A/3P	5466	-	PANEL DP1
LIGHTING	-	3162	20A/1P	11			*	12	50A/3P	5466	-	PANEL DP1
VAV'S	-	2424	20A/1P	13	*			14	20A/1P	924	Plaza	LIGHTING
VAV'S	-	1224	20A/1P	15		*		16	20A/1P	1260	Plaza	LIGHTING
PARK SIGNS	-	2200	20A/1P	17			*	18	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	19	*			20	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	21		*		22	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	23			*	24	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	25	*			26	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	27		*		28	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	29			*	30	20A/1P	0	-	SPARE
SPACE & PROV.	-	0		31	*			32		0	-	SPACE & PROV.
SPACE & PROV.	-	0		33		*		34		0	-	SPACE & PROV.
SPACE & PROV.	-	0		35			*	36		0	-	SPACE & PROV.
SPACE & PROV.	-	0		37	*			38		0	-	SPACE & PROV.
SPACE & PROV.	-	0		39		*		40		0	-	SPACE & PROV.
SPACE & PROV.	-	0		41			*	42		0	-	SPACE & PROV.

CONNECTED LOAD (KW) - A	14.81	TOTAL DESIGN LOAD (KW)	34.67
CONNECTED LOAD (KW) - B	15.12	POWER FACTOR	0.95
CONNECTED LOAD (KW) - C	14.93	TOTAL DESIGN LOAD (AMPS)	44

Figure 33: New Panelboard – Plaza

Feeder Size – Plaza

Feeder Size – Panelboard 1HA	
Calculated Design Load	44.1 A
Feeder Protection Size	45 A
Sets	1
Wire Size	
Phase	#8 AWG
Neutral	#8 AWG
Ground	#10 AWG
Wire Area	
Each Phase	0.0366"
All Phase	0.1098"
Neutral	0.0366"
Ground	0.0211"
Total Area	0.1675"
Conduit Size	¾"
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral

Table 22: Feeder Size – Plaza

Branch Circuit Redesign – Lobby

Original Panelboard - Lobby

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION						FEEDER INFORMATION	
DP1	VOLTAGE	277/480			BUSS			125A			FROM	1HA
MOUNTING: SURFACE	PHASE	3			MAIN/MLO			MLO W/SUBFEED LUGS			TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING			14 kA			SIZE	SEE RISER E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS	LOCATION/ITEM
LOBBY ZONE 1	420	#12		20A-1P	1	A----	2	20A-1P		#12	240	LOBBY ZONE 9
LOBBY ZONE 2	2760	#12		20A-1P	3	--B--	4	20A-1P		#12	240	LOBBY ZONE 10
LOBBY ZONE 3	480	#12		20A-1P	5	---C	6	20A-1P		#12	2240	AUDITORIUM ZONE 11
LOBBY ZONE 4	1200	#12		20A-1P	7	A----	8	20A-1P		#12	1088	AUDITORIUM ZONE 12
LOBBY ZONE 5	450	#12		20A-1P	9	--B--	10	20A-1P		#12	1500	AUDITORIUM ZONE 13
LOBBY ZONE 6	810	#12		20A-1P	11	---C	12	20A-1P		#12	900	AUDITORIUM ZONE 14
LOBBY ZONE 7	400	#12		20A-1P	13	A----	14	20A-1P		#12	300	AUDITORIUM ZONE 15
LOBBY ZONE 8	660	#12		20A-1P	15	--B--	16	20A-1P		#12	300	AUDITORIUM ZONE 16

NOTES:
1. DIMMING PANEL PROVIDED WITH DIMMING SYSTEM.

Figure 34: Original Panelboard – Lobby

New Panelboard – Lobby

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W	PANEL TAG: DP1	MIN. C/B AIC: 14 K
SIZE/TYPE BUS: 125A	PANEL LOCATION: ROOM 112B - ELECTRICAL	OPTIONS: PROVIDE FEED THROUGH LUGS
SIZE/TYPE MAIN: 125A/3P C/B	PANEL MOUNTING: SURFACE	FOR PANELBOARD 1HA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
LIGHTING ZONE 1	Lobby	2240	20A/1P	1	*			2	20A/1P	216	Lobby	LIGHTING ZONE 8
LIGHTING ZONE 2	Lobby	432	20A/1P	3		*		4	20A/1P	2240	Auditorium	LIGHTING ZONE 11
LIGHTING ZONE 3	Lobby	896	20A/1P	5			*	6	20A/1P	1088	Auditorium	LIGHTING ZONE 12
LIGHTING ZONE 4	Lobby	216	20A/1P	7	*			8	20A/1P	1500	Auditorium	LIGHTING ZONE 13
LIGHTING ZONE 5	Lobby	432	20A/1P	9		*		10	20A/1P	900	Auditorium	LIGHTING ZONE 14
LIGHTING ZONE 6	Lobby	432	20A/1P	11			*	12	20A/1P	300	Auditorium	LIGHTING ZONE 15
LIGHTING ZONE 7	Lobby	432	20A/1P	13	*			14	20A/1P	300	Auditorium	LIGHTING ZONE 16
		0		15		*		16		0		
		0		17			*	18		0		
		0		19	*			20		0		
		0		21		*		22		0		
		0		23			*	24		0		
		0		25	*			26		0		
		0		27		*		28		0		
		0		29			*	30		0		
		0		31	*			32		0		
		0		33		*		34		0		
		0		35			*	36		0		
		0		37	*			38		0		
		0		39		*		40		0		
		0		41			*	42		0		

CONNECTED LOAD (KW) - A	4.90	TOTAL DESIGN LOAD (KW)	13.95
CONNECTED LOAD (KW) - B	4.00	POWER FACTOR	0.96
CONNECTED LOAD (KW) - C	2.72	TOTAL DESIGN LOAD (AMPS)	18

Figure 35: New Panelboard – Lobby

Feeder Size – Lobby

Feeder Size – Panelboard DP1	
Calculated Design Load	17.6 A
Feeder Protection Size	20 A
Sets	1
Wire Size	
Phase	#12 AWG
Neutral	#12 AWG
Ground	#12 AWG
Wire Area	
Each Phase	0.0133"
All Phase	0.0399"
Neutral	0.0133"
Ground	0.0133"
Total Area	0.0665"
Conduit Size	¾"
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral

Table 23: Feeder Size Lobby

Original Panelboard – Lobby

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
1LD	VOLTAGE	120/208			BUSS			100A				FROM	1DPA
MOUNTING: SURFACE	PHASE	3			MAIN/MLO			MLO				TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING			10 kA				SIZE	SEE RISER ON E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS		LOCATION/ITEM
COLUMN RECEPTS	1440	12		20A-1P	1	A----	2	20A-1P		12	900		WIREWAY: LOBBY
COLUMN RECEPTS	1440	12		20A-1P	3	--B--	4	20A-1P		12	720		WIREWAY: LOBBY
PROJECTOR: LOBBY	1000	12		20A-1P	5	---C	6	20A-1P		12	540		RECEPTS
MOTORIZED SCREEN	500	12		20A-1P	7	A----	8	20A-1P		12	500		SENSORS: RESTROOM
A V EQUIPMENT	1000	12		20A-1P	9	--B--	10	20A-1P		12	500		SENSORS: RESTROOM
PLASMA SCREEN	*1000*	12		20A-1P	11	---C	12	20A-1P		12	540		RESTROOM GFI
PLASMA SCREEN	1000	12		20A-1P	13	A----	14	20A-1P		12	250		LUTRON SYSTEM, 100
EWC GFI	500	12		20A-1P	15	--B--	16	20A-1P		12	1395		FCU'S, 100A
EWC GFI	500	12		20A-1P	17	---C	18	20A-1P		12	540		RCPT, 101
ELEVATOR PIT	540	12		20A-1P	19	A----	20	20A-1P		*12*	*1000*		*PLASMA SCREEN*
SPARE				20A-1P	21	--B--	22						SPACE AND PROVISION
SPARE				20A-1P	23	---C	24						SPACE AND PROVISION
SPARE				20A-1P	25	A----	26						SPACE AND PROVISION
SPACE AND PROVISION					27	--B--	28						SPACE AND PROVISION
SPACE AND PROVISION					29	---C	30						SPACE AND PROVISION
SPACE AND PROVISION					31	A----	32						SPACE AND PROVISION
SPACE AND PROVISION					33	--B--	34						SPACE AND PROVISION
SPACE AND PROVISION					35	---C	36						SPACE AND PROVISION
SPACE AND PROVISION					37	A----	38						SPACE AND PROVISION
SPACE AND PROVISION					39	--B--	40						SPACE AND PROVISION
SPACE AND PROVISION					41	---C	42						SPACE AND PROVISION

NOTES:
1. PROVIDE 200% NEUTRAL

Figure 36: Original Panelboard – Lobby

New Panelboard – Lobby

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 100A
SIZE/TYPE MAIN: 100A/3P C/B

PANEL TAG: 1LD
PANEL LOCATION: ROOM 112B - ELECTRICAL
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1DPA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
COLUMN RCPTS	LOBBY	1440	20A/1P	1	*			2	20A/1P	900	LOBBY	WIREWAY: LOBBY
COLUMN RCPTS	LOBBY	1440	20A/1P	3		*		4	20A/1P	720	LOBBY	WIREWAY: LOBBY
ROJECTOR: LOBBY	LOBBY	1000	20A/1P	5			*	6	20A/1P	540	-	RECEPTS
OTORIZED SCREE	LOBBY	500	20A/1P	7	*			8	20A/1P	500	-	SENSORS: RR
AV EQUIPMENT	LOBBY	1000	20A/1P	9		*		10	20A/1P	500	-	SENSORS: RR
PLASMA SCREEN	LOBBY	1000	20A/1P	11			*	12	20A/1P	540	-	RESTROOM GFI
PLASMA SCREEN	LOBBY	1000	20A/1P	13	*			14	20A/1P	250	100	LUTRON SYSTEM
EWC GFI	LOBBY	500	20A/1P	15		*		16	20A/1P	1395	100A	FCU'S
EWC GFI	LOBBY	500	20A/1P	17			*	18	20A/1P	540	100	RCPT
ELEVATOR PIT	LOBBY	540	20A/1P	19	*			20	20A/1P	1000	LOBBY	PLASMA SCREEN
LIGHTING ZONE 9	LOBBY	1200	20A/1P	21		*		22	20A/1P	0	-	SPACE & PROV
LIGHTING ZONE 10	LOBBY	450	20A/1P	23			*	24	20A/1P	0	-	SPACE & PROV
SPARE	-	0	20A/1P	25	*			26	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	27		*		28	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	29			*	30	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	31	*			32	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	33		*		34	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	35			*	36	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	37	*			38	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	39		*		40	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	41			*	42	20A/1P	0	-	SPACE & PROV

CONNECTED LOAD (KW) - A	6.13	TOTAL DESIGN LOAD (KW)	19.40
CONNECTED LOAD (KW) - B	6.76	POWER FACTOR	0.90
CONNECTED LOAD (KW) - C	4.57	TOTAL DESIGN LOAD (AMPS)	60

Figure 37: New Panelboard – Lobby

Feeder Size – Lobby

Feeder Size – Panelboard 1LD	
Calculated Design Load	59.8 A
Feeder Protection Size	60 A
Sets	1
Wire Size	
Phase	#6 AWG
Neutral	#6 AWG
Ground	#10 AWG
Wire Area	
Each Phase	0.0507"
All Phase	0.1521"
Neutral	0.0507"
Ground	0.0211"
Total Area	0.2239"
Conduit Size	¾"
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral

Table 24: Feeder Size Lobby

Branch Circuit Redesign – Auditorium

Original Panelboard - Auditorium

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION						FEEDER INFORMATION	
DP1	VOLTAGE	277/480			BUSS			125A			FROM	1HA
MOUNTING: SURFACE	PHASE	3			MAIN/MLO			MLO W/SUBFEED LUGS			TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING			14 kA			SIZE	SEE RISER E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS	LOCATION/ITEM
LOBBY ZONE 1	420	#12		20A-1P	1	A----	2	20A-1P		#12	240	LOBBY ZONE 9
LOBBY ZONE 2	2760	#12		20A-1P	3	--B--	4	20A-1P		#12	240	LOBBY ZONE 10
LOBBY ZONE 3	480	#12		20A-1P	5	---C	6	20A-1P		#12	2240	AUDITORIUM ZONE 11
LOBBY ZONE 4	1200	#12		20A-1P	7	A----	8	20A-1P		#12	1088	AUDITORIUM ZONE 12
LOBBY ZONE 5	450	#12		20A-1P	9	--B--	10	20A-1P		#12	1500	AUDITORIUM ZONE 13
LOBBY ZONE 6	810	#12		20A-1P	11	---C	12	20A-1P		#12	900	AUDITORIUM ZONE 14
LOBBY ZONE 7	400	#12		20A-1P	13	A----	14	20A-1P		#12	300	AUDITORIUM ZONE 15
LOBBY ZONE 8	660	#12		20A-1P	15	--B--	16	20A-1P		#12	300	AUDITORIUM ZONE 16

NOTES:
1. DIMMING PANEL PROVIDED WITH DIMMING SYSTEM.

Figure 38: Original Panelboard – Auditorium

New Panelboard – Auditorium

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W	PANEL TAG: DP1	MIN. C/B AIC: 14 K
SIZE/TYPE BUS: 125A	PANEL LOCATION: Room 112B - Electrical	OPTIONS: PROVIDE FEED THROUGH LUGS
SIZE/TYPE MAIN: 125A/3P C/B	PANEL MOUNTING: SURFACE	FOR PANELBOARD 1HA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
LIGHTING ZONE 1	Lobby	2240	20A/1P	1	*			2	20A/1P	216	Lobby	LIGHTING ZONE 8
LIGHTING ZONE 2	Lobby	432	20A/1P	3		*		4	20A/1P	1200	Auditorium	LIGHTING ZONE 11
LIGHTING ZONE 3	Lobby	896	20A/1P	5			*	6	20A/1P	1800	Auditorium	LIGHTING ZONE 12
LIGHTING ZONE 4	Lobby	216	20A/1P	7	*			8	20A/1P	500	Auditorium	LIGHTING ZONE 13
LIGHTING ZONE 5	Lobby	432	20A/1P	9		*		10	20A/1P	567	Auditorium	LIGHTING ZONE 14
LIGHTING ZONE 6	Lobby	432	20A/1P	11			*	12	20A/1P	0	-	SPARE
LIGHTING ZONE 7	Lobby	432	20A/1P	13	*			14	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	15		*		16	20A/1P	0	-	SPARE
	-	0		17			*	18		0	-	
	-	0		19	*			20		0	-	
	-	0		21		*		22		0	-	
	-	0		23			*	24		0	-	
	-	0		25	*			26		0	-	
	-	0		27		*		28		0	-	
	-	0		29			*	30		0	-	
	-	0		31	*			32		0	-	
	-	0		33		*		34		0	-	
	-	0		35			*	36		0	-	
	-	0		37	*			38		0	-	
	-	0		39		*		40		0	-	
	-	0		41			*	42		0	-	

CONNECTED LOAD (KW) - A	3.60	TOTAL DESIGN LOAD (KW)	11.24
CONNECTED LOAD (KW) - B	2.63	POWER FACTOR	0.95
CONNECTED LOAD (KW) - C	3.13	TOTAL DESIGN LOAD (AMPS)	14

Figure 39: New Panelboard – Auditorium

Feeder Size – Auditorium

Feeder Size – Panelboard DP1	
Calculated Design Load	14.3 A
Feeder Protection Size	15 A
Sets	1
Wire Size	
Phase	#12 AWG
Neutral	#12 AWG
Ground	#12 AWG
Wire Area	
Each Phase	0.0133"
All Phase	0.0399"
Neutral	0.0133"
Ground	0.0133"
Total Area	0.0665"
Conduit Size	¾"
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral

Table 25: Feeder Size Auditorium

Original Panelboard - Auditorium

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
DP2	VOLTAGE	277/480			BUSS		125A					FROM	DP1
MOUNTING: SURFACE	PHASE	3			MAIN/MLO		MLO					TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING		14 kA					SIZE	SEE RISER E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS		LOCATION/ITEM
AUDITORIUM ZONE 17	300	#12		20A-1P	1	A----	2	20A-1P		#12	150		AUDITORIUM ZONE 21
AUDITORIUM ZONE 18	960	#12		20A-1P	3	--B--	4	20A-1P		#12	150		AUDITORIUM ZONE 22
AUDITORIUM ZONE 19	300	#12		20A-1P	5	---C	6	20A-1P					SPARE
AUDITORIUM ZONE 20	550	#12		20A-1P	7	A----	8	20A-1P					SPARE

NOTES:
1. DIMMING PANEL PROVIDED WITH DIMMING SYSTEM.

Figure 40: Original Panelboard – Auditorium

New Panelboard – Auditorium

Some of the fixtures used in the auditorium were 208/120; therefore, the panelboard 1LD was utilized. The panelboard DP2 is unnecessary and will not be used.

Original Panelboard - Auditorium

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
1LD	VOLTAGE	120/208			BUSS		100A					FROM	1DPA
MOUNTING: SURFACE	PHASE	3			MAIN/MLO		MLO					TYPE	NORMAL
LOCATION: 1ST FLOOR	WIRE	4			AIC RATING		10 kA					SIZE	SEE RISER ON E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS	LOCATION/ITEM	
COLUMN RECEPTS	1440	12		20A-1P	1	A----	2	20A-1P		12	900	WIREWAY: LOBBY	
COLUMN RECEPTS	1440	12		20A-1P	3	--B--	4	20A-1P		12	720	WIREWAY: LOBBY	
PROJECTOR: LOBBY	1000	12		20A-1P	5	---C	6	20A-1P		12	540	RECEPTS	
MOTORIZED SCREEN	500	12		20A-1P	7	A----	8	20A-1P		12	500	SENSORS: RESTROOM	
A V EQUIPMENT	1000	12		20A-1P	9	--B--	10	20A-1P		12	500	SENSORS: RESTROOM	
PLASMA SCREEN	*1000*	12		20A-1P	11	---C	12	20A-1P		12	540	RESTROOM GFI	
PLASMA SCREEN	1000	12		20A-1P	13	A----	14	20A-1P		12	250	LUTRON SYSTEM, 100	
EWC GFI	500	12		20A-1P	15	--B--	16	20A-1P		12	1395	FCU'S, 100A	
EWC GFI	500	12		20A-1P	17	---C	18	20A-1P		12	540	RCPT, 101	
ELEVATOR PIT	540	12		20A-1P	19	A----	20	20A-1P		*12*	*1000*	*PLASMA SCREEN*	
SPARE				20A-1P	21	--B--	22					SPACE AND PROVISION	
SPARE				20A-1P	23	---C	24					SPACE AND PROVISION	
SPARE				20A-1P	25	A----	26					SPACE AND PROVISION	
SPACE AND PROVISION					27	--B--	28					SPACE AND PROVISION	
SPACE AND PROVISION					29	---C	30					SPACE AND PROVISION	
SPACE AND PROVISION					31	A----	32					SPACE AND PROVISION	
SPACE AND PROVISION					33	--B--	34					SPACE AND PROVISION	
SPACE AND PROVISION					35	---C	36					SPACE AND PROVISION	
SPACE AND PROVISION					37	A----	38					SPACE AND PROVISION	
SPACE AND PROVISION					39	--B--	40					SPACE AND PROVISION	
SPACE AND PROVISION					41	---C	42					SPACE AND PROVISION	

NOTES:
1. PROVIDE 200% NEUTRAL

Figure 41: Original Panelboard – Auditorium

New Panelboard – Auditorium

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W	PANEL TAG: 1LD	MIN. C/B AIC: 10K
SIZE/TYPE BUS: 100A	PANEL LOCATION: ROOM 112B - ELECTRICAL	OPTIONS: SEE RISER ON E602
SIZE/TYPE MAIN: 100A/3P C/B	PANEL MOUNTING: SURFACE	

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
COLUMN RCPTS	LOBBY	1440	20A/1P	1	*			2	20A/1P	900	LOBBY	WIREWAY: LOBBY
COLUMN RCPTS	LOBBY	1440	20A/1P	3		*		4	20A/1P	720	LOBBY	WIREWAY: LOBBY
ROJECTOR: LOBB	LOBBY	1000	20A/1P	5			*	6	20A/1P	540	-	RECEPTS
OTORIZED SCREE	LOBBY	500	20A/1P	7	*			8	20A/1P	500	-	SENSORS: RR
AV EQUIPMENT	LOBBY	1000	20A/1P	9		*		10	20A/1P	500	-	SENSORS: RR
PLASMA SCREEN	LOBBY	1000	20A/1P	11			*	12	20A/1P	540	-	RESTROOM GFI
PLASMA SCREEN	LOBBY	1000	20A/1P	13	*			14	20A/1P	250	100	LUTRON SYSTEM
EWC GFI	LOBBY	500	20A/1P	15		*		16	20A/1P	1395	100A	FCU'S
EWC GFI	LOBBY	500	20A/1P	17			*	18	20A/1P	540	100	RCPT
ELEVATOR PIT	LOBBY	540	20A/1P	19	*			20	20A/1P	1000	LOBBY	PLASMA SCREEN
LIGHTING ZONE 9	LOBBY	1200	20A/1P	21		*		22	20A/1P	756	AUDITORIUM	LIGHTING ZONE 15
LIGHTING ZONE 10	LOBBY	450	20A/1P	23			*	24	20A/1P	756	AUDITORIUM	LIGHTING ZONE 16
LIGHTING ZONE 17	AUDITORIUM	756	20A/1P	25	*			26	20A/1P	1152	AUDITORIUM	LIGHTING ZONE 18
SPACE & PROV	-	0	20A/1P	27		*		28	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	29			*	30	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	31	*			32	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	33		*		34	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	35			*	36	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	37	*			38	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	39		*		40	20A/1P	0	-	SPACE & PROV
SPACE & PROV	-	0	20A/1P	41			*	42	20A/1P	0	-	SPACE & PROV

CONNECTED LOAD (KW) - A	8.04	TOTAL DESIGN LOAD (KW)	23.67
CONNECTED LOAD (KW) - B	7.51	POWER FACTOR	0.91
CONNECTED LOAD (KW) - C	5.33	TOTAL DESIGN LOAD (AMPS)	72

Figure 42: New Panelboard – Auditorium

Feeder Size – Auditorium

Feeder Size – Panelboard 1LD	
Calculated Design Load	72.3 A
Feeder Protection Size	80 A
Sets	1
Wire Size	
Phase	#4 AWG
Neutral	#4 AWG
Ground	#8 AWG
Wire Area	
Each Phase	0.0824”
All Phase	0.2472”
Neutral	0.0824”
Ground	0.0366”
Total Area	0.3662”
Conduit Size	1”
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾” conduit 100% Neutral

Table 26: Feeder Size Auditorium

Branch Circuit Redesign – Classroom

Original Panelboard - Classroom

PANEL NAME	VOLTAGE INFORMATION				PANEL INFORMATION							FEEDER INFORMATION	
5HA	VOLTAGE	277/480			BUSS			200A				FROM	4HA
SURFACE	PHASE	3			MAIN/MLO			MLO W/SUBFEED LUGS				TYPE	NORMAL
LOCATION OF PANEL	WIRE	4			AIC RATING			25 kA				SIZE	SEE RISER ON E602
LOCATION/ITEM	LOAD WATTS	WIRE	COND	BREAKER	CKT	PHS	CKT	BREAKER	COND	WIRE	LOAD WATTS		LOCATION/ITEM
LIGHTING	2430	12		20-1P	1	A----	2	20A-1P		12	4008		VAV'S
LIGHTING	2750	12		20-1P	3	--B--	4	20A-1P		12	2616		VAV'S
LIGHTING	1650	12		20-1P	5	---C	6	20A-1P		12	2000		CORRIDOR LIGHTING
LIGHTING	2462	12		20-1P	7	A----	8	20A-1P		12	2000		CORRIDOR LIGHTING
LIGHTING	1884	12		20-1P	9	--B--	10	20A-1P					SPARE
LIGHTING	2288	12		20-1P	11	---C	12	20A-1P					SPARE
LIGHTING	1706	12		20-1P	13	A----	14	20A-1P					SPARE
LIGHTING	2336	12		20-1P	15	--B--	16	20A-1P					SPARE
SPARE				20A-1P	17	---C	18	20A-1P					SPARE
SPARE				20A-1P	19	A----	20	20A-1P					SPARE
SPARE				20A-1P	21	--B--	22	20A-1P					SPARE
SPARE				20A-1P	23	---C	24	20A-1P					SPARE
SPARE				20A-1P	25	A----	26	20A-1P					SPARE
SPARE				20A-1P	27	--B--	28	20A-1P					SPARE
SPARE				20A-1P	29	---C	30	20A-1P					SPARE
SPACE AND PROVISION					31	A----	32						SPACE AND PROVISION
SPACE AND PROVISION					33	--B--	34						SPACE AND PROVISION
SPACE AND PROVISION					35	---C	36						SPACE AND PROVISION
SPACE AND PROVISION					37	A----	38						SPACE AND PROVISION
SPACE AND PROVISION					39	--B--	40						SPACE AND PROVISION
SPACE AND PROVISION					41	---C	42						SPACE AND PROVISION
NOTES:													

Figure 43: Original Panelboard – Classroom

New Panelboard – Classroom

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W	PANEL TAG: 5HA	MIN. C/B AIC: 25 K
SIZE/TYPE BUS: 200A	PANEL LOCATION: Room 513A - Electrical	OPTIONS: PROVIDE FEED THROUGH LUGS
SIZE/TYPE MAIN: 200A/3P C/B	PANEL MOUNTING: SURFACE	FOR PANELBOARD 4HA

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
LIGHTING	Room 514	2430	20A/1P	1	*			2	20A/1P	4008	-	VAV'S
LIGHTING	Room 515	2750	20A/1P	3		*		4	20A/1P	2616	-	VAV'S
LIGHTING	Room 512	1650	20A/1P	5			*	6	20A/1P	2000	Corridor	CORRIDOR LIGHT
LIGHTING	Room 509	2462	20A/1P	7	*			8	20A/1P	2000	Corridor	CORRIDOR LIGHTS
LIGHTING	Room 508	1884	20A/1P	9		*		10	20A/1P	0	-	SPARE
LIGHTING	Room 504/511	2288	20A/1P	11			*	12	20A/1P	0	-	SPARE
LIGHTING	Room 505	1976	20A/1P	13	*			14	20A/1P	0	-	SPARE
LIGHTING	Lobby (5th Floor	2336	20A/1P	15		*		16	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	17			*	18	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	19	*			20	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	21		*		22	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	23			*	24	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	25	*			26	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	27		*		28	20A/1P	0	-	SPARE
SPARE	-	0	20A/1P	29			*	30	20A/1P	0	-	SPARE
SPACE & PROV.	-	0		31	*			32		0	-	SPACE & PROV.
SPACE & PROV.	-	0		33		*		34		0	-	SPACE & PROV.
SPACE & PROV.	-	0		35			*	36		0	-	SPACE & PROV.
SPACE & PROV.	-	0		37	*			38		0	-	SPACE & PROV.
SPACE & PROV.	-	0		39		*		40		0	-	SPACE & PROV.
SPACE & PROV.	-	0		41			*	42		0	-	SPACE & PROV.

CONNECTED LOAD (KW) - A	12.88	TOTAL DESIGN LOAD (KW)	33.84
CONNECTED LOAD (KW) - B	9.59	POWER FACTOR	0.95
CONNECTED LOAD (KW) - C	5.94	TOTAL DESIGN LOAD (AMPS)	43

Figure 44: New Panelboard – Classroom

Feeder Size – Classroom

Feeder Size – Panelboard 5HA	
Calculated Design Load	43.0 A
Feeder Protection Size	45 A
Sets	1
Wire Size	
Phase	#8 AWG
Neutral	#8 AWG
Ground	#10 AWG
Wire Area	
Each Phase	0.0366”
All Phase	0.1098”
Neutral	0.0366”
Ground	0.0211”
Total Area	0.1675”
Conduit Size	¾ ”
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾” conduit 100% Neutral

Table 27: Feeder Size - Classroom

Branch Circuit Redesign – Conclusion

Throughout the redesign of the branch circuits, all of the panelboards either stayed the same size or were smaller. I eliminated panelboard DP2 from the auditorium because the fixtures that were used in the auditorium were only found on 208/120 volt panelboards. The 2005 National Electric Code and the ASHRAE 90.1 Standards were used throughout the lighting and electrical branch circuit redesign. Please see attached CD for spreadsheets of all panelboards mentioned above.

Central Transformer vs. Distributed Transformers

Introduction

The DH Hamilton Building is serviced from the Philadelphia Electric Company (PECO). The 13.2 kV service is fed through a dry-type transformer rated at 480Y/277 volt, 3 phase, and 2500 kVA. After the 2500 kVA transformer, the service is supplied to the main bus system with TVSS located in Substation No. 1. A 4000 draw amp low voltage circuit breaker protects the main bus. The main distribution panels are located on the parking level P2 and fed up through the building into the electrical room of each floor into sub-distribution panels. From the sub-distribution panels, lighting and receptacle loads are distributed to each floor and served by 150 kVA dry-type transformers and 208Y/120V panelboards.

These 150 kVA dry-type transformers are the distributed transformers. The DH Hamilton Building has five distributed transformers throughout the building. The following analysis will provide the original design power riser diagram and single line diagram along with the new design. Note the drawings are only partial drawings. I have also included the original transformer schedule and the new transformer schedule. A cost analysis is done in the construction management breadth.

Central Transformer Size

A conservative power factor of 0.85 and a demand factor of 1.00 were assumed for panelboards 1DPA, 2DPA, 3DPA, 4DPA, and 5DPA. The total calculated design load was calculated using the panelboard schedule spreadsheet. The distribution panelboard for the secondary side of the transformer is 3000A with room for growth with the sixth floor of the DH Hamilton Building. The conduit size and wire size were found on the feeder schedule on the original drawings. The sizes were not changed due to the redesign of the lighting. The wire size was found by using the table for the DH Hamilton Building. This table is the feeder schedule for the building, but it goes by the protection size.

Calculated Design Load	
Panelboard 1DPA	570.6 A
Panelboard 2DPA	495.1 A
Panelboard 3DPA	418.6 A
Panelboard 4DPA	426.1 A
Panelboard 5DPA	516.4 A
Total Calculated Design Load	2426.8 A

Table 28: Calculated Design Load

Central Transformer Size	
Calculated Design Load	2426.8 A
Feeder Protection Size	2500 A
Wire Size (From DH Hamilton Feeder Schedule)	(5) 4" Conduit each with (3) 500 kCmil & (1) #4/0 Ground
Transformer	
kVA	874.29 kVA
Size	1000 kVA
Secondary Protection	2500 A
Primary Protection	1600 A
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral Dry type transformers with primary and secondary feeders exceeding 25 feet

Table 29: Central Transformer Size

Original Electrical Single-Line Diagram – Partial

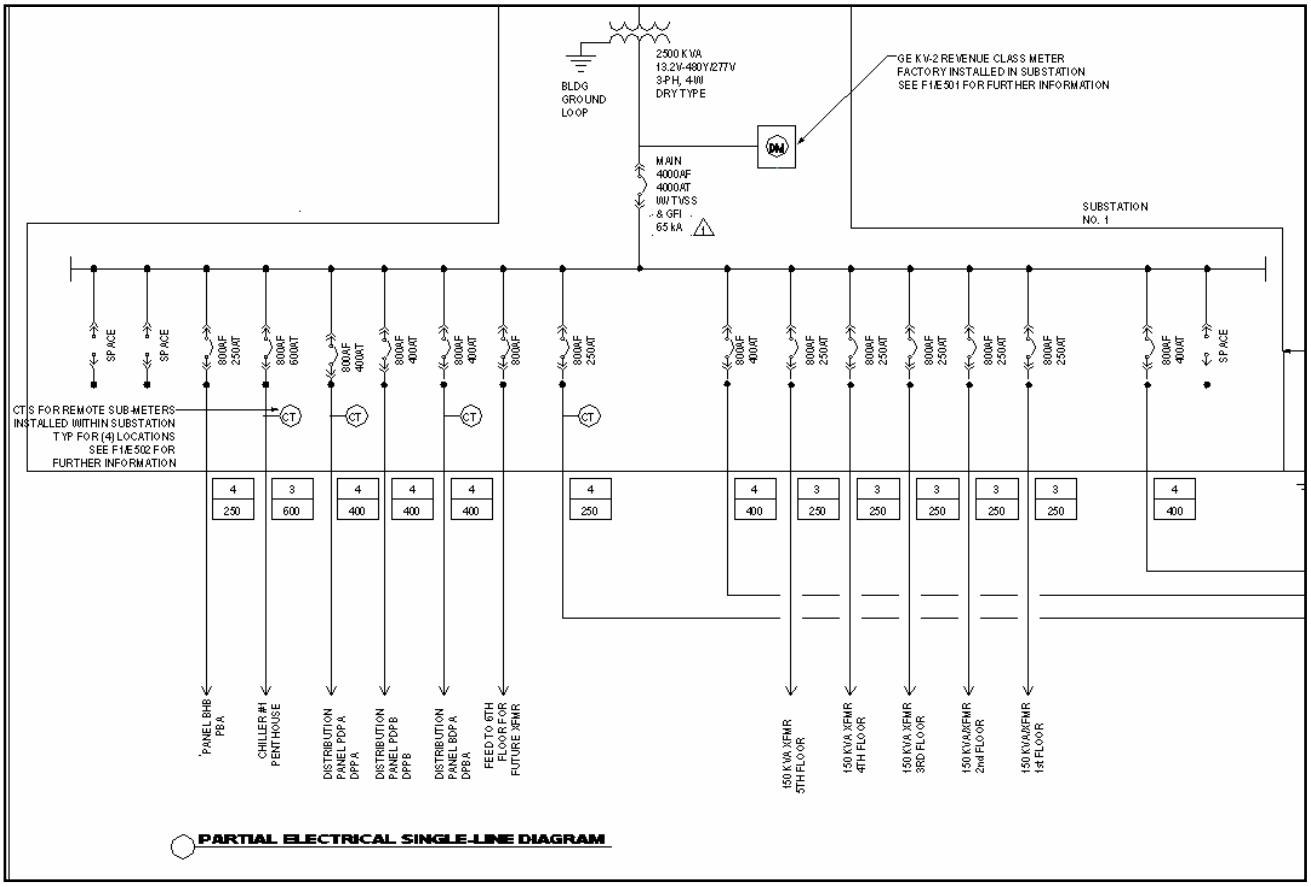


Figure 45: Original Electrical Single-Line Diagram - Partial

New Electrical Single-Line Diagram - Partial

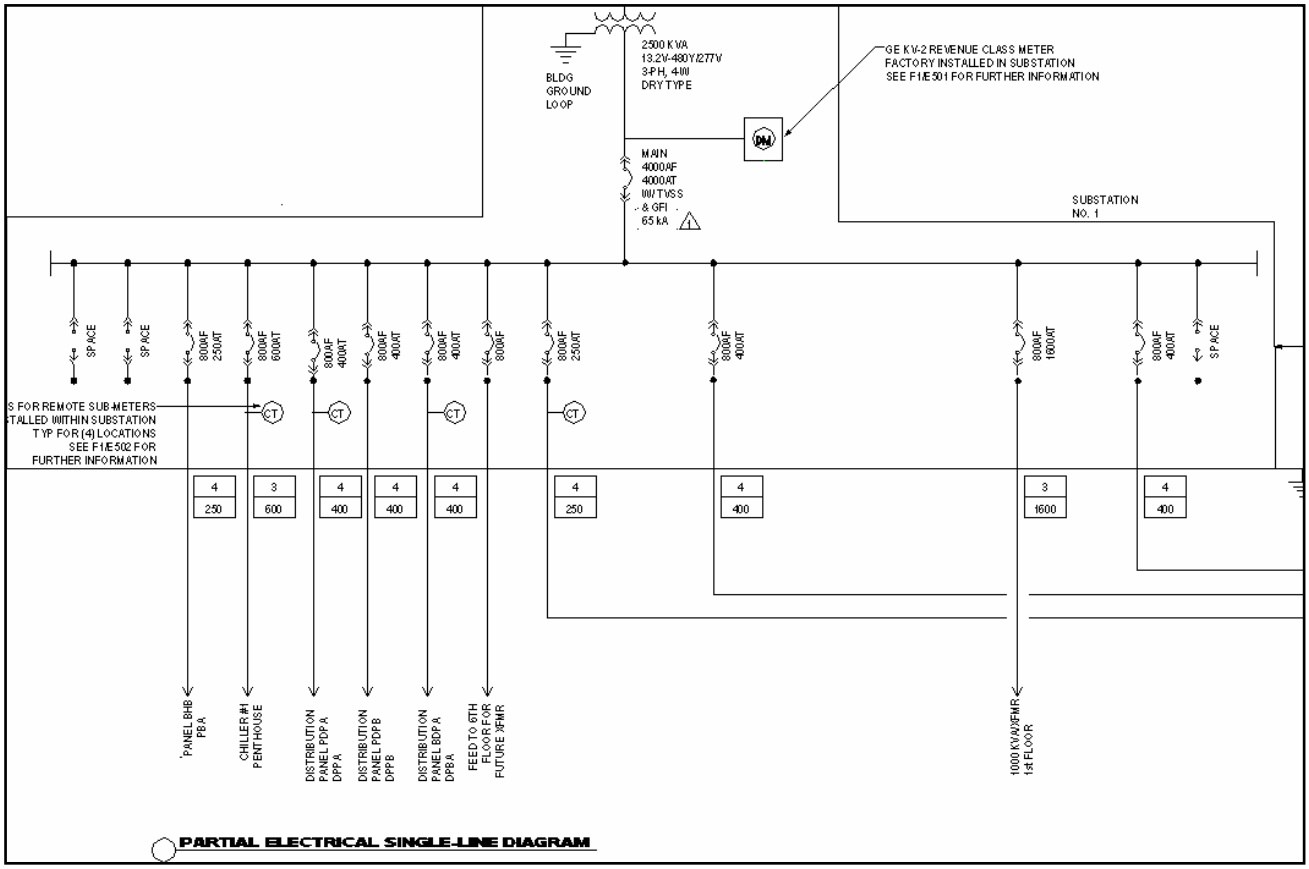


Figure 46: New Electrical Single-Line Diagram - Partial

Original Electrical Riser Diagram – Partial

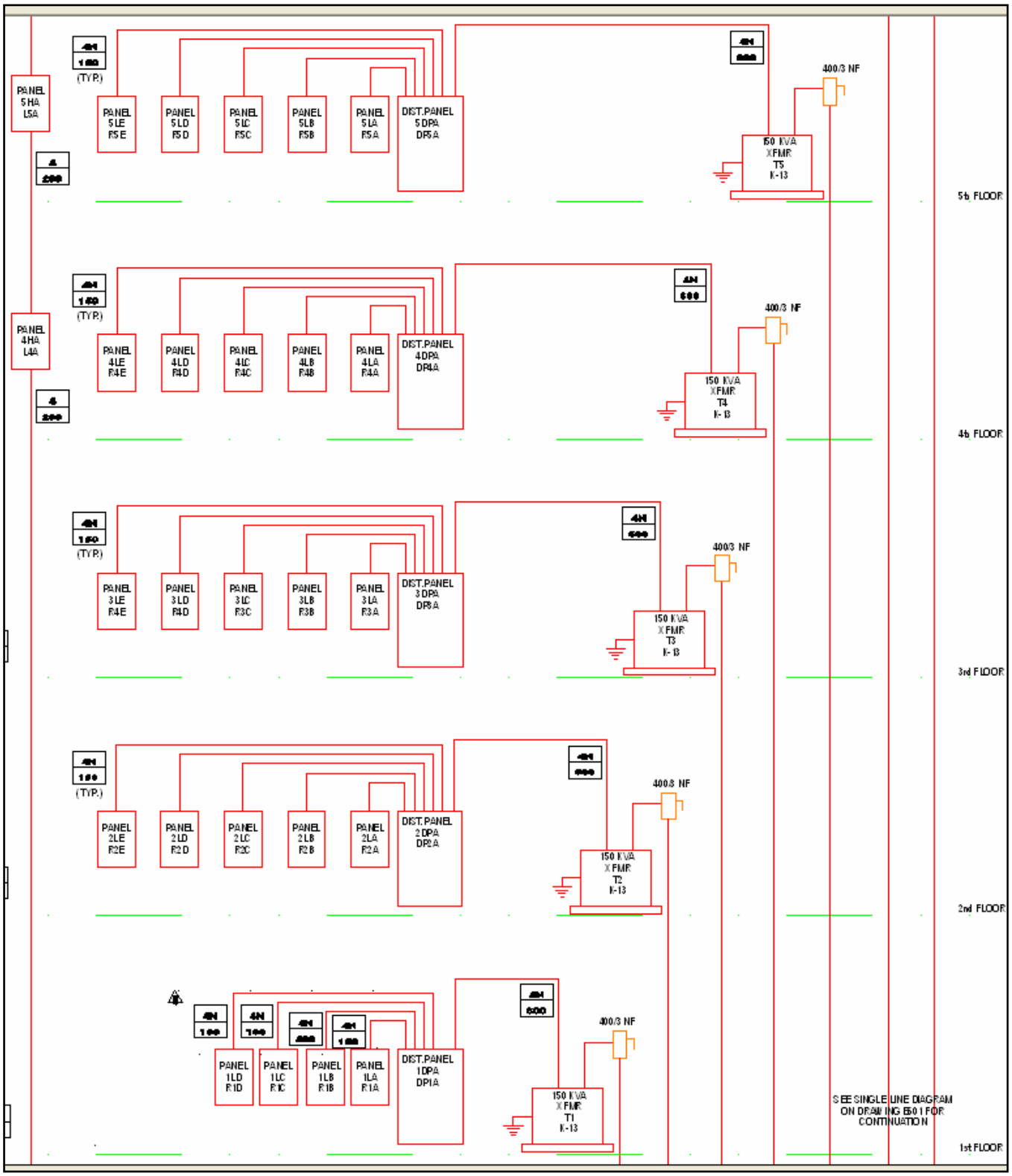


Figure 47: Original Electrical Riser Diagram - Partial

New Electrical Riser Diagram – Partial

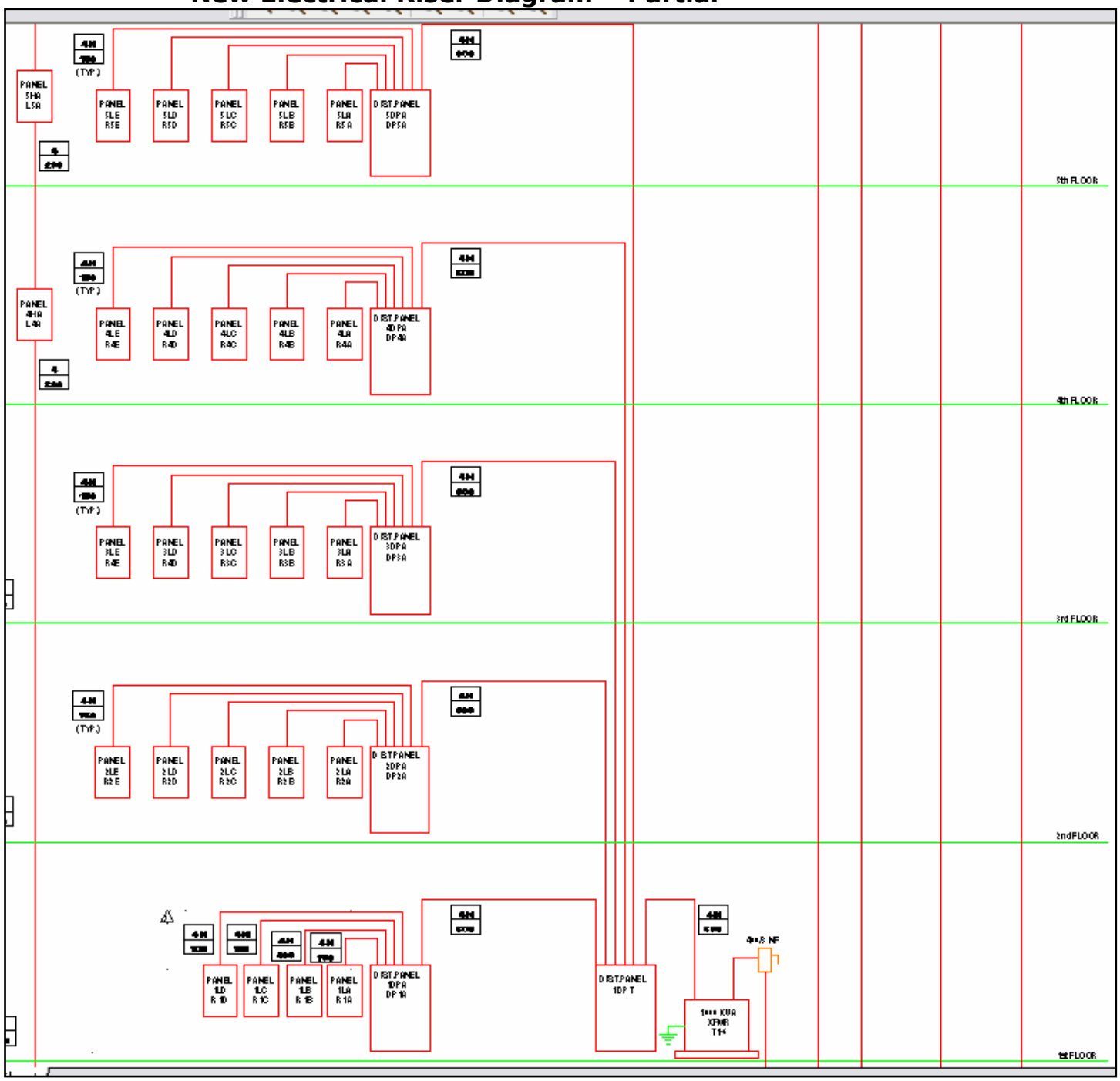


Figure 48: New Electrical Riser Diagram - Partial

Original Transformer Schedule

TRANSFORMER SCHEDULE								
Tag	**Primary Voltage**	**Secondary Voltage**	**Size (kVA)**	**Type**	**Temp. Rise**	**Taps**	**Mounting**	**Remarks**
MAIN	13,200V,3PH,3W	480Y/277V,3PH,4W	2500	DRY TYPE	115°C	N/A	PAD MOUNTED TO FLOOR	N/A
TBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
T1	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**150**	**DRY TYPE**	**150°C**	**(4) 2.5%**	**PAD MOUNTED TO FLOOR**	**K-13 RATED**
T2	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**150**	**DRY TYPE**	**150°C**	**(4) 2.5%**	**PAD MOUNTED TO FLOOR**	**K-13 RATED**
T3	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**150**	**DRY TYPE**	**150°C**	**(4) 2.5%**	**PAD MOUNTED TO FLOOR**	**K-13 RATED**
T4	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**150**	**DRY TYPE**	**150°C**	**(4) 2.5%**	**PAD MOUNTED TO FLOOR**	**K-13 RATED**
T5	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**150**	**DRY TYPE**	**150°C**	**(4) 2.5%**	**PAD MOUNTED TO FLOOR**	**K-13 RATED**
T6	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TP	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LTBA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	K-13 RATED
STBB	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TL1A	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
ST4	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LPA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STPA	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A

NOTES:

1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. TRANSFORMERS 45 KVA AND SMALLER MAY BE FLOOR, WALL, OR TRAPEZE MOUNT AT THE OPTION OF THE CONTRACTOR.

KEY: A/N = AS NOTED

Table 30: Original Transformer Schedule

New Transformer Schedule

TRANSFORMER SCHEDULE

Tag	Primary Voltage	Secondary Voltage	Size (kVA)	Type	Temp. Rise	Taps	Mounting	Remarks
MAIN	13,200V,3PH,3W	480Y/277V,3PH,4W	2500	DRY TYPE	115°C	N/A	PAD MOUNTED TO FLOOR	N/A
TBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
T1-61	**480V,3PH,3W**	**208Y/120V,3PH,4W**	**1000**	**DRY TYPE**	**150°C**	**(1) - 3.5%**	**PAD MOUNTED TO FLOOR**	**N/A**
T6	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	() 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TP	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LTBA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STBA	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	K-13 RATED
STBB	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
TL1A	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
ST4	480V,3PH,3W	208Y/120V,3PH,4W	45	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
LPA	480V,3PH,3W	208Y/120V,3PH,4W	15	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A
STPA	480V,3PH,3W	208Y/120V,3PH,4W	30	DRY TYPE	150°C	(4) 2.5%	FLOOR, WALL, OR TRAPEZE MOUNT	N/A

NOTES:

1. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. TRANSFORMERS 45 KVA AND SMALLER MAY BE FLOOR, WALL, OR TRAPEZE MOUNT AT THE OPTION OF THE CONTRACTOR.

KEY: A/N = AS NOTED

Table 31: New Transformer Schedule

Cost Analysis

The cost analysis is part of the construction management breadth; however, it is included in the tables below. The cost analysis is based on THWN copper wire rated at 75°C, IMC conduit, a maximum of 500 kCmil Wire, and a minimum of ¾" conduit. As you can see by the tables below, the cost of the distributed transformer system is $215,987, while the central transformer system is $240,107.

Distributed Transformer Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Transformers				
150 kVA D-Type, K-13 Rated	5.0	EA	16900.00	84,500.00
Copper Feeders (THWN)				
#4 AWG, Stranded	10.3	CLF	229.00	2,347.25
Size 1/0, Stranded	5.5	CLF	450.00	2,466.00
250 kCmil, Stranded	30.8	CLF	925.00	28,443.75
500 kCmil, Stranded	27.4	CLF	1625.00	44,525.00
Conduit (IMC)				
2-1/2"	1025.0	LF	27.00	27,675.00
4"	548.0	LF	47.50	26,030.00
TOTAL				**$215,987.00**
Remarks	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 32: Distributed Transformer Estimate

Central Transformer Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Transformers				
1000 kVA D-Type Transformer	1.0	EA	43200.00	43,200.00
Copper Feeders (THWN)				
#4 AWG, Stranded	0.9	CLF	229.00	201.52
Size 1/0, Stranded	13.4	CLF	450.00	6,021.00
250 kCmil, Stranded	2.6	CLF	925.00	2,442.00
500 kCmil, Stranded	66.9	CLF	1625.00	108,712.50
Distribution Panelboards 4-Wire, 120/208V, 3000 Amp	1.0	EA	15975.00	15,975.00
Conduit (IMC)				
2-1/2"	88.0	LF	27.00	
4"	1338.0	LF	47.50	63,555.00
TOTAL				**$240,107.02**
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 33: Central Transformer Estimate

Conclusion

Overall, the central transformer system is not recommended due to the overall cost. The central transformer is 109% the cost of the five distributed transformers. The central transformer will save on square footage for the space, but the transformer cost is higher than the five distributed transformers. The recommendation is to keep the original design with the distributed transformers.

Feeders vs. BusDuct

Introduction

The DH Hamilton Building is serviced from the Philadelphia Electric Company (PECO). The main distribution panels are located on the parking level P2 and fed up through the building into the electrical room of each floor into sub-distribution panels with feeders. From the sub-distribution panels, lighting and receptacle loads are distributed to each floor and served by 150 kVA dry-type transformers and 208Y/120V panelboards.

The feeders running from the parking level P2 to the penthouse are going to be replaced by a busduct. The following analysis will provide the original design power riser diagram and single line diagram along with the new design. Note the drawings are only partial drawings. The original full drawings are located on the CPEP website. A cost analysis is done in the construction management breadth.

Calculated Design Load

A conservative power factor of 0.85 and a demand factor of 1.00 were assumed for panelboards 1DPA, 2DPA, 3DPA, 4DPA, and 5DPA. An additional 20% growth was assumed for the future of floor six. Currently, floor six is an empty space and a future load will be placed on the floor. The total calculated design load was calculated using the panelboard schedule spreadsheet. The conduit size and wire size were found on the feeder schedule on the original drawings. The sizes were not changed due to the redesign of the lighting. The wire size was found by using the table for the DH Hamilton Building. This table is the feeder schedule for the building, but it goes by the protection size.

Calculated Design Load	
Panelboard 1DPA	570.6 A
Panelboard 2DPA	495.1 A
Panelboard 3DPA	418.6 A
Panelboard 4DPA	426.1 A
Panelboard 5DPA	516.4 A
Panelboard 6DPA (Future)	485.4 A
Total Calculated Design Load	2912.2 A
Busduct Design Load	600 A

Table 34: Calculated Design Load

Original Electrical Single-Line Diagram - Partial

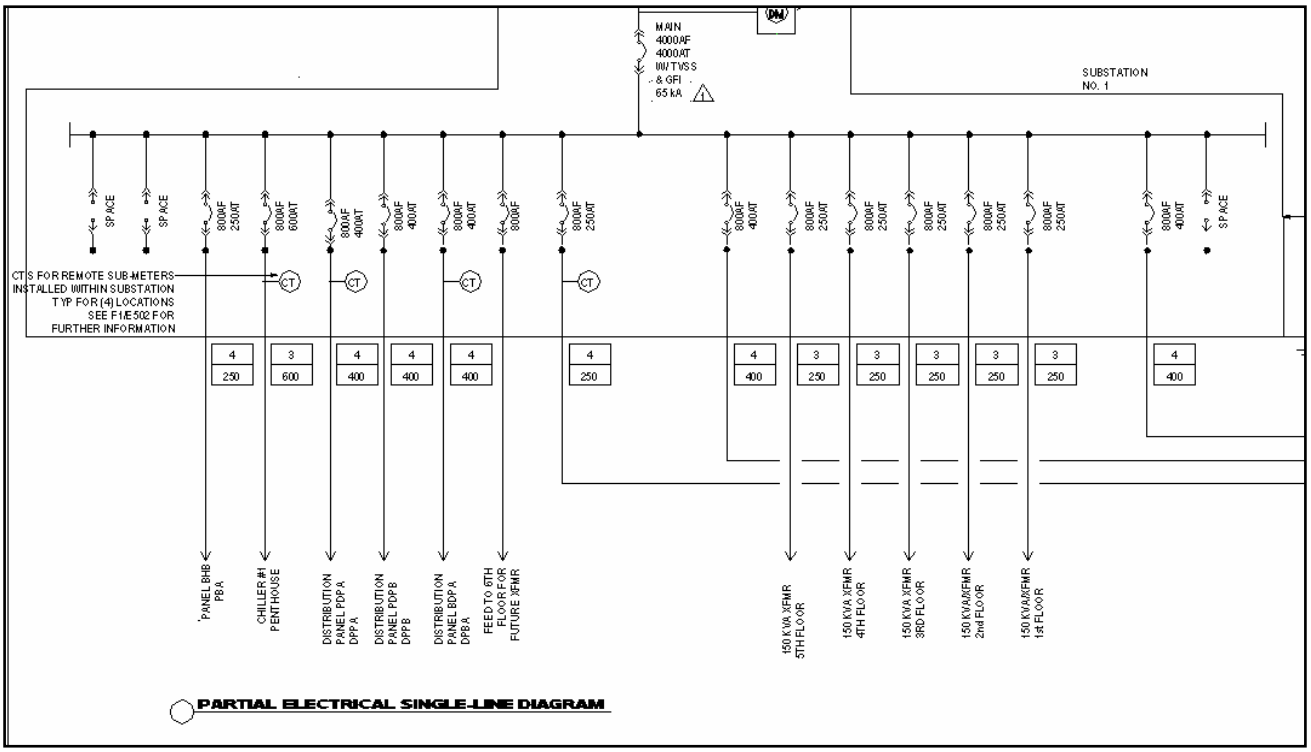


Figure 49: Original Electrical Single-Line Diagram - Partial

New Electrical Single-Line Diagram - Partial

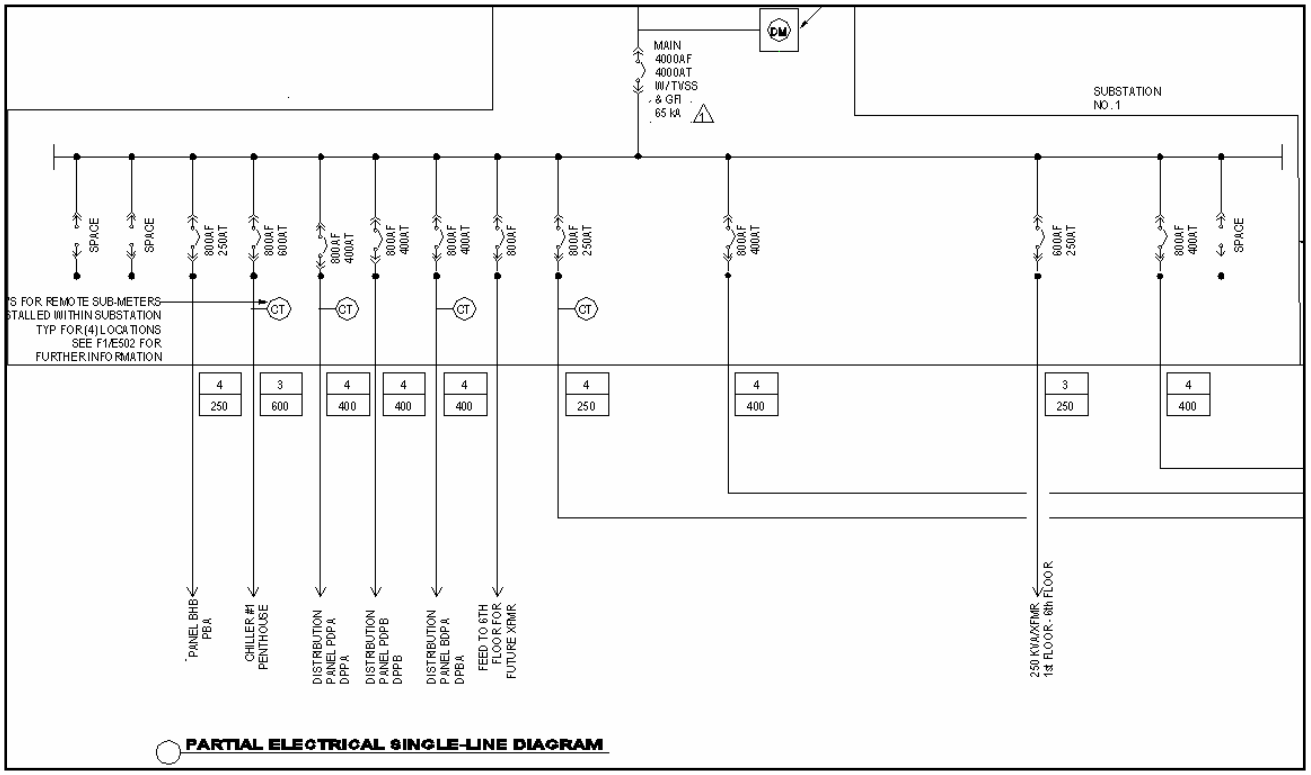


Figure 50: New Electrical Single-Line Diagram - Partial

Original Electrical Riser Diagram – Partial

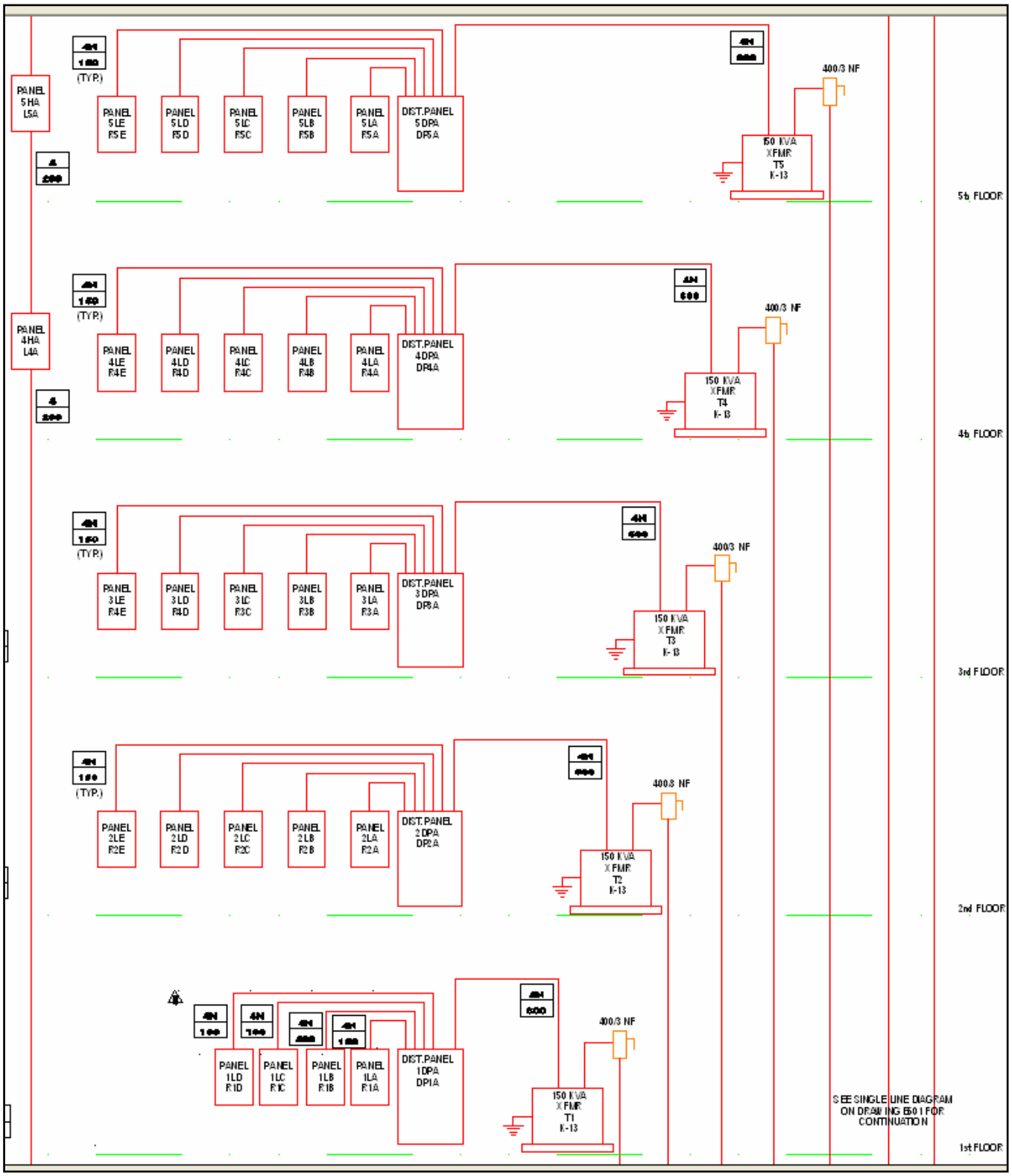


Figure 51: Original Electrical Riser Diagram - Partial

New Electrical Riser Diagram – Partial

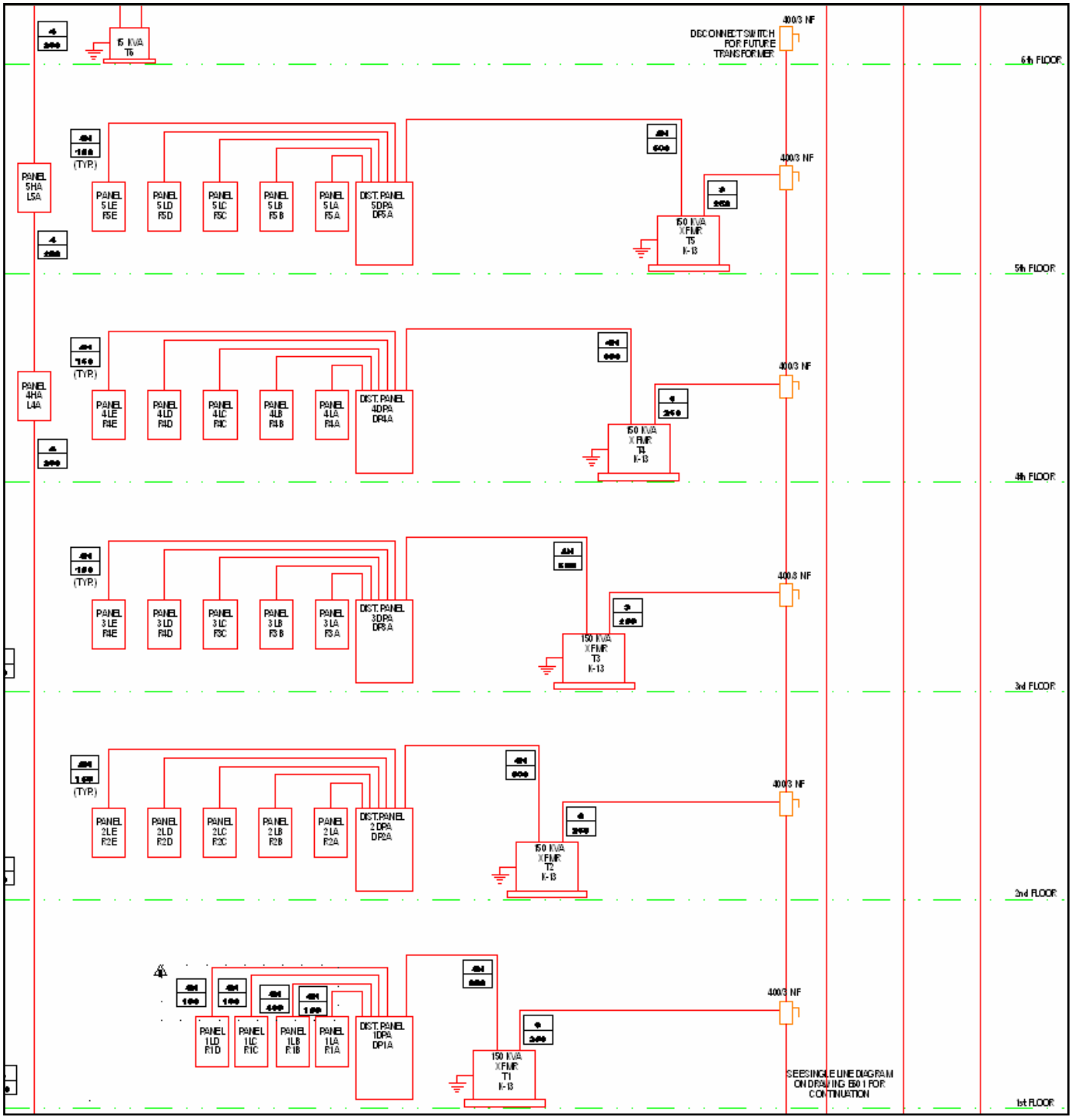


Figure 52: New Electrical Riser Diagram - Partial

Cost Analysis

The cost analysis is part of the construction management breadth; however, it is included in the tables below. The cost analysis is based on THWN copper wire rated at 75°C, IMC conduit, a maximum of 500 kCmil Wire, and a minimum of ¾" conduit. As you can see by the tables below, the cost of the system with only feeders is $59,606, while the cost of the system with the busduct is $55,098.

Feeder Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Copper Feeders (THWN)				
#4 AWG, Stranded	10.5	CLF	229.00	2,393.05
250 kCmil, Stranded	31.4	CLF	925.00	28,998.75
Conduit (IMC)				
2-1/2"	1045.0	LF	27.00	28,215.00
TOTAL				**$59,606.80**
Remarks	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 35: Feeder Estimate

Busway Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Indoor/Plug-in Busduct				
Copper Busduct - 600A	220.0	LF	210.00	46,200.00
Feeders				
#4 AWG	1.6	CLF	229.00	357.24
250 kCmil	4.7	CLF	925.00	4,329.00
Conduit (IMC)				
2-1/2"	156.00	LF	27.00	4,212.00
TOTAL				**$55,098.24**
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 36: Busway Estimate

Conclusion

Overall, the busduct is recommended due to the overall cost. The busduct is 92% the cost of the individual feeders. The feeder system used 1045’ of (3) 250 kCmil & (1) #4G in 2-1/2” conduit. This equates to $59,606 for the system. The busduct system used 220’ of vertical copper 600 A busduct and 156’ of (3) 250 kCmil & (1) #4G in 2-1/2” conduit. This equates to $55,098 for the system. The recommendation is to switch to the busduct instead of the individual feeders.

Motor Control Center

Introduction

The motor control center design consists of the analysis and design of one major mechanical equipment motor control center and associated feeder. A schedule will be provided along with the calculation tables of design loads for branch conductors, feeders, and protective devices. The DH Hamilton Building motor control center will consist of the three AHU motors, the two AHU return fans, two roof supply fans, two garage exhaust fans, the chiller pump, spare chiller pump, and the cooling tower pump.

Motor Control Center Loads

Tag	Equipment Type	Voltage	Phase	Power	Full Load Amps	Power Factor	Load (kVA)
AHU-1	AHU	460 V	3	75 HP	96 A	0.90	71.83
AHU-2	AHU	460 V	3	75 HP	96 A	0.90	71.83
AHU-3	AHU	460 V	3	75 HP	96 A	0.90	71.83
RF-1	AHU Return Fan	460 V	3	50 HP	65 A	0.90	48.64
RF-2	AHU Return Fan	460 V	3	50 HP	65 A	0.90	48.64
SF-3	Stairwell Pressure Fan	460 V	3	20 HP	27 A	0.90	20.20
SF-4	Stairwell Pressure Fan	460 V	3	20 HP	27 A	0.90	20.20
EF-7	Garage Exhaust Fan	460 V	3	30 HP	40 A	0.90	29.93
EF-8	Garage Exhaust Fan	460 V	3	30 HP	40 A	0.90	29.93
P-1	Chiller Pump	460 V	3	40 HP	52 A	0.90	38.91
P-2	Spare Pump	460 V	3	40 HP	52 A	0.90	38.91
P-3	Cooling Tower Pump	460 V	3	40 HP	52 A	0.90	38.91

Table 37: Motor Control Center Loads

The table above states the motor control center schedule. The loads and the NEMA starter sizes are all shown in the above table. The types of fans are variable frequency drive (VFD) and full voltage, non-reversing (FVNR).

Motor Control Center Schedule

Equipment	Motor Type	Power	NEMA Starter Size	# X Spaces	Type of VFD	FLA	Demand Factor	Total Amps
AHU-1	VFD	75 HP	4	12X	SVX9000	71.83	1.25	89.79
AHU-2	VFD	75 HP	4	12X	SVX9000	71.83		71.83
AHU-3	VFD	75 HP	4	12X	SVX9000	71.83		71.83
RF-1	VFD	50 HP	3	12X	SVX9000	48.64		48.64
RF-2	VFD	50 HP	3	12X	SVX9000	48.64		48.64
SF-3	FVNR	20 HP	2	1X	N/A	20.20		20.20
SF-4	FVNR	20 HP	2	1X	N/A	20.20	1.00	20.20
EF-7	FVNR	30 HP	3	2X	N/A	29.23		29.23
EF-8	FVNR	30 HP	3	2X	N/A	29.23		29.23
P-1	VFD	40 HP	3	7X	SVX9000	38.91		38.91
P-2	VFD	40 HP	3	7X	SVX9000	38.91		38.91
P-3	VFD	40 HP	3	7X	SVX9000	38.91		38.91
Total Design Load								546.32

Table 38: Motor Control Center Schedule

Since the design load is 546 Amps, 600 amp busduct is needed to supply the motor control center. A 600-amp busduct will need 6X number of spaces for a bottom cable entry with four cables per phase.

Therefore, I need a total of 93 X number of spaces. Since there are 12X spaces per section, I will need 8 sections. Since this is a rather large motor control center, a spare section is going to be added, which makes the total to be 9 sections. The final dimensions of the motor control center are 16” deep, 90” high, and 180” long. The penthouse will have enough room to house this huge motor control center.

Motor Control Center Size

Motor Control Center	
Calculated Design Load	546.32 A
Feeder Protection Size	600 A
Wire	(2) sets of 250 kCmil & (1) #1 Ground
Conduit	3 ½"
Secondary Protection	600 A
Primary Protection	700 A
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kcmil wire Minimum ¾" conduit 100% Neutral Dry type transformers with primary and secondary feeders exceeding 25 feet

Table 39: Motor Control Center Size

Motor Control Center Layout

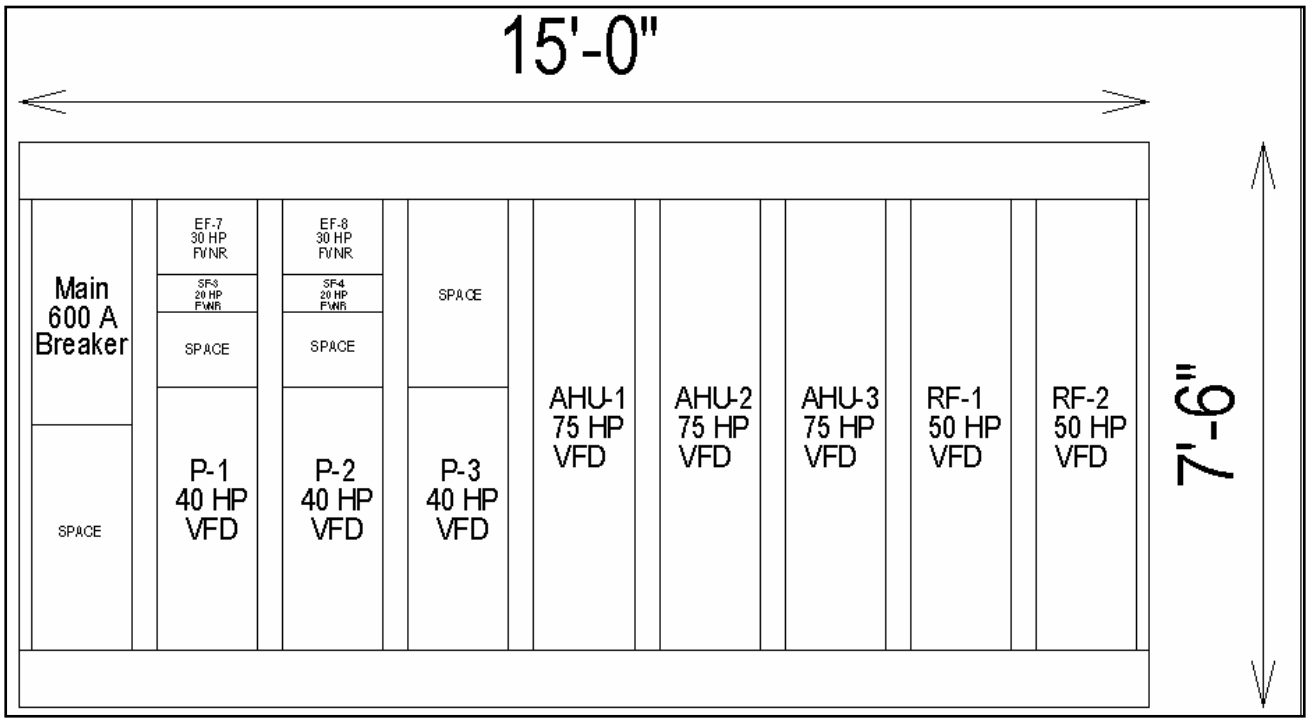


Figure 53: Motor Control Center Layout

Conclusion

The motor control center will provide an adequate space saver in the mechanical room of the DH Hamilton Building. All motors over 20 HP were put into the motor control center. This should provide the motor starters with the correct amperage to start and also the variable frequency drive system for the air handling unit motors, the return fan motors, and the pumps. The motor control center would be an addition to the DH Hamilton Building that would be recommended.

Short Circuit Analysis

Introduction

The short circuit analysis will conduct a brief protective device study that addresses a single-path through the distribution system.

Protective Device Coordination

The protective device coordination was performed on the 100 amp circuit breaker of panelboard 1LD, the 600 amp main distribution panelboard 1DPA, and the 800 amp circuit breaker off of the main buss. The circuit breaker time/current curves are on the pages following the conclusion.

Short Circuit Calculations

The short circuit calculations cannot be completed because the utility information is unattainable from the Thomas Jefferson University.

Conclusion

All of the systems were coordinated by overlaying the devices upstream of the device before itself. Therefore, the single-path through the distribution system is coordinated.

Panelboard 1LD - 100 Amp Trip Curve

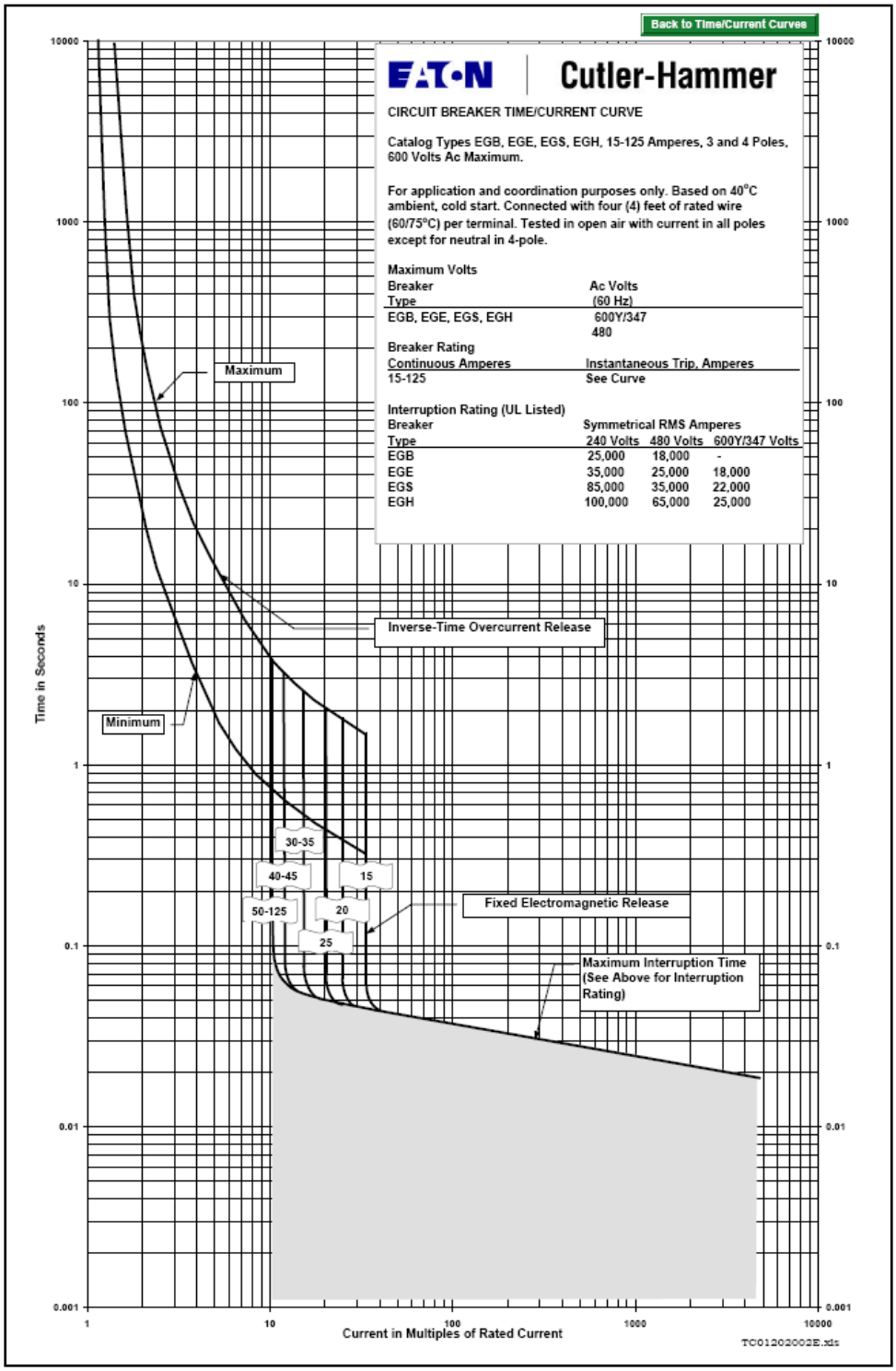


Figure 54: 100 Amp Trip Curve

Panelboard 1DPA – 400 Amp Trip Curve

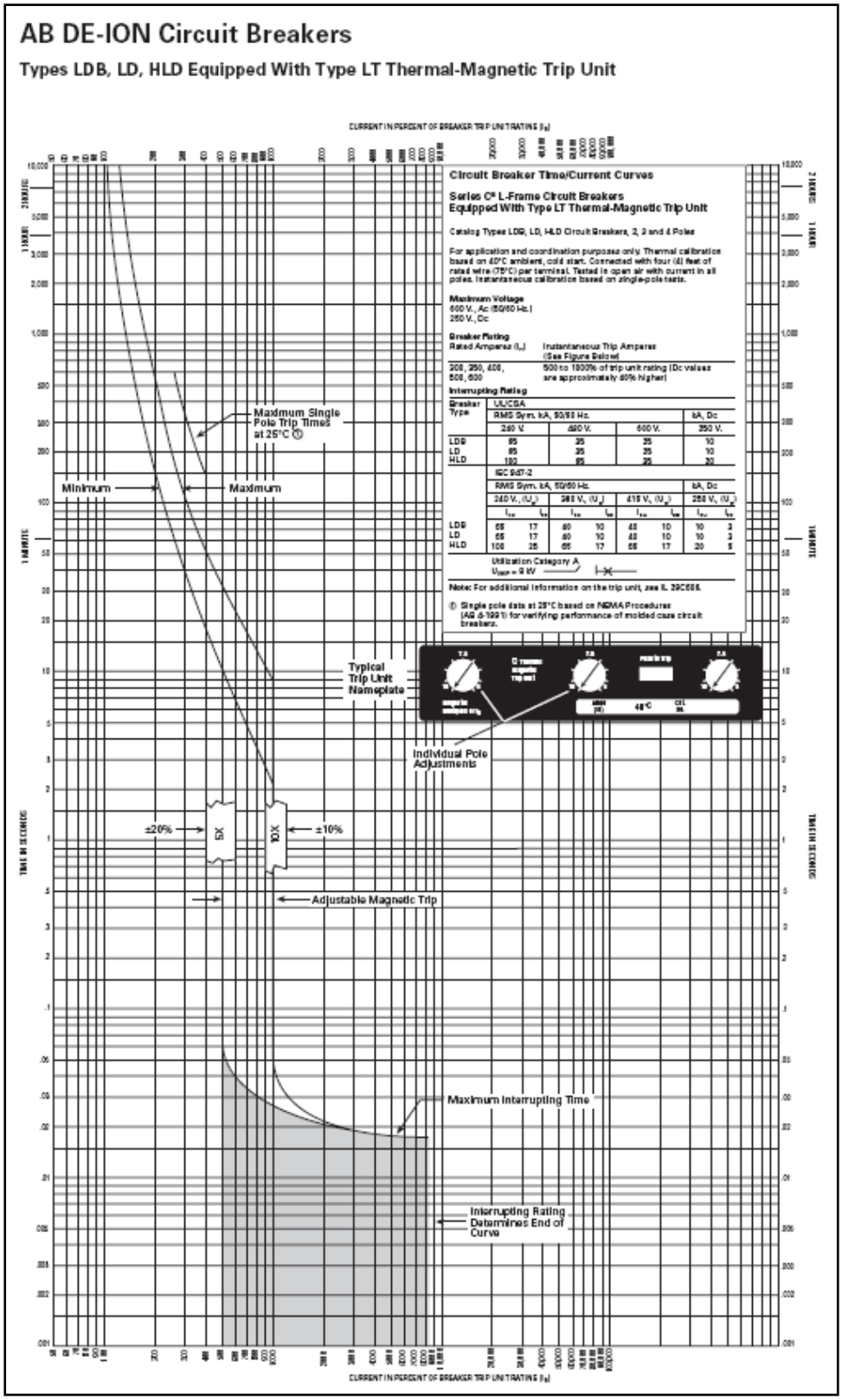


Figure 55: 400 Amp Trip Curve

Feeder - 800 Amp Trip Curve

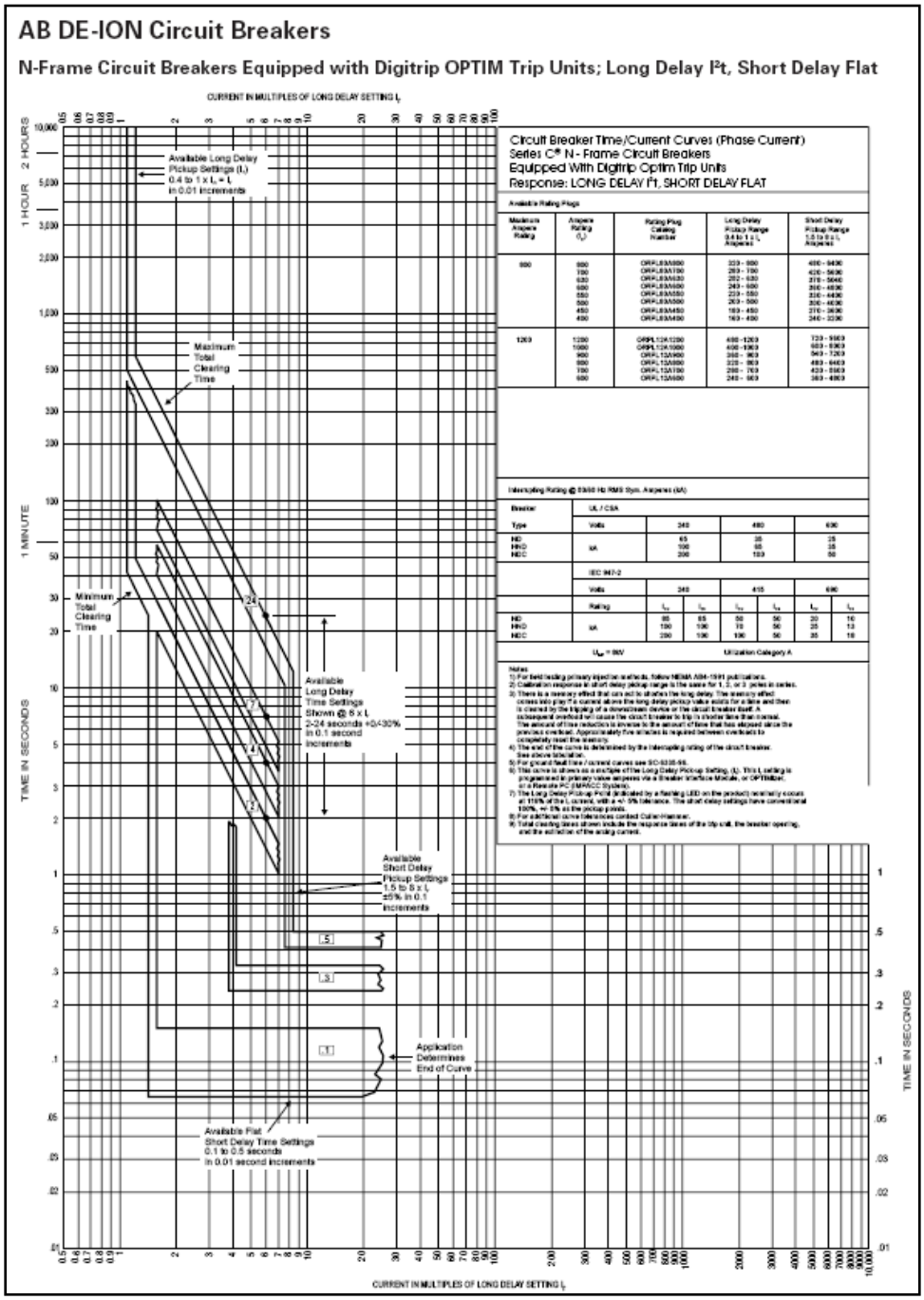


Figure 56: 800 Amp Trip Curve

Construction Management Breadth

Introduction

The construction management breadth is a cost analysis of the existing electrical system versus the redesigned portions of the electrical system. The cost analysis will include the following: central transformer versus distributed transformers and feeders running to each floor versus a main bus duct to the penthouse.

Cost Analysis – Distributed vs. Central Transformers

The cost analysis is part of the construction management breadth; however, it is included in the tables below. The cost analysis is based on THWN copper wire rated at 75°C, IMC conduit, a maximum of 500 kCmil Wire, and a minimum of ¾" conduit. As you can see by the tables below, the cost of the distributed transformer system is $215,987, while the central transformer system is $240,107.

Distributed Transformer Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Transformers				
150 kVA D-Type, K-13 Rated	5.0	EA	16900.00	84,500.00
Copper Feeders (THWN)				
#4 AWG, Stranded	10.3	CLF	229.00	2,347.25
Size 1/0, Stranded	5.5	CLF	450.00	2,466.00
250 kCmil, Stranded	30.8	CLF	925.00	28,443.75
500 kCmil, Stranded	27.4	CLF	1625.00	44,525.00
Conduit (IMC)				
2-1/2"	1025.0	LF	27.00	27,675.00
4"	548.0	LF	47.50	26,030.00
TOTAL				**$215,987.00**
Remarks	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 40: Distributed Transformer Estimate

Central Transformer Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Transformers				
1000 kVA D-Type Transformer	1.0	EA	43200.00	43,200.00
Copper Feeders (THWN)				
#4 AWG, Stranded	0.9	CLF	229.00	201.52
Size 1/0, Stranded	13.4	CLF	450.00	6,021.00
250 kCmil, Stranded	2.6	CLF	925.00	2,442.00
500 kCmil, Stranded	66.9	CLF	1625.00	108,712.50
Distribution Panelboards 4-Wire, 120/208V, 3000 Amp	1.0	EA	15975.00	15,975.00
Conduit (IMC)				
2-1/2"	88.0	LF	27.00	
4"	1338.0	LF	47.50	63,555.00
TOTAL				**$240,107.02**
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 41: Central Transformer Estimate

Conclusion

Overall, the central transformer system is not recommended due to the overall cost. The central transformer is 106% the cost of the five distributed transformers. The central transformer will save on square footage for the space, but the transformer cost is higher than the five distributed transformers. The recommendation is to keep the original design with the distributed transformers.

Cost Analysis – Feeders vs. Busduct

The cost analysis is part of the construction management breadth; however, it is included in the tables below. The cost analysis is based on THWN copper wire rated at 75°C, IMC conduit, a maximum of 500 kCmil Wire, and a minimum of ¾" conduit. As you can see by the tables below, the cost of the system with only feeders is $59,606, while the cost of the system with the busduct is $55,098.

Feeder Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Copper Feeders (THWN)				
#4 AWG, Stranded	10.5	CLF	229.00	2,393.05
250 kCmil, Stranded	31.4	CLF	925.00	28,998.75
Conduit (IMC)				
2-1/2"	1045.0	LF	27.00	28,215.00
TOTAL				**$59,606.80**
Remarks	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 42: Feeder Estimate

Busway Estimate				
Item	Quantity	Units	Cost (Inc. O&P)	Total Cost
Indoor/Plug-in Busduct				
Copper Busduct - 600A	220.0	LF	210.00	46,200.00
Feeders				
#4 AWG	1.6	CLF	229.00	357.24
250 kCmil	4.7	CLF	925.00	4,329.00
Conduit (IMC)				
2-1/2"	156.00	LF	27.00	4,212.00
TOTAL				**$55,098.24**
Remarks:	Based on Copper Wire, 75°C, THWN insulation IMC Conduit Maximum 500kCmil Wire Miniumum 3/4" Conduit 100% Neutral			

Table 43: Central Transformer Estimate

Conclusion

Overall, the busduct is recommended due to the overall cost. The busduct is 92% the cost of the individual feeders. The feeder system used 1045’ of (3) 250 kCmil & (1) #4G in 2-1/2” conduit. This equates to $59,606 for the system. The busduct system used 220’ of vertical copper 600 A busduct and 156’ of (3) 250 kCmil & (1) #4G in 2-1/2” conduit. This equates to $55,098 for the system. The recommendation is to switch to the busduct system instead of the individual feeders.

Mechanical Breadth

Introduction

The mechanical breadth is an analysis of the required cfm in the electrical rooms on floors one through five. This analysis is based on the distributed and central transformers. I will size the cfm for the distributed transformers and the central transformers. This will show the amount of cfm is needed with and without a 150 kVA transformer in the electrical room.

Heat Gain for Transformers

Tag	Floor	kVA	Heat Gain (Btu/hr)	CFM
T-1	1	150	2700	125
T-2	2	150	2700	125
T-3	3	150	2700	125
T-4	4	150	2700	125
T-5	5	150	2700	125
T1-6	**1**	**1000**	**18000**	**833**
NOTE:	Assume power factor = 0.90 Q = 1.08*CFM*Delta T Assume Delta T = 20 degrees			

Table 44: Heat Gain for Transformers

Conclusion

Therefore, the total CFM added to the electrical rooms by the distributed transformers is 625 cfm. The central transformer adds 833 cfm to the space. This only proves once again that the distributed transformers are the best possible solution to the DH Hamilton Building design.

References

Lighting/Electrical

National Electric Code 2005

The IESNA Lighting Handbook

ASHRAE 90.1 Standards

Eaton's Conprehensive Consultant Resource

Electrical Systems in Buildings, S. David Hughes

Acknowledgments

Design Firms

The Lighting Practice – especially Julie Panassow and Emad Hasan, for sponsoring my senior thesis by providing the building information, construction documents, and specifications.

Burt Hill – especially Chris Miller and Sean Williams for providing building information and design assistance.

Penn State AE Faculty

Dr. Mistrick for his help over the past couple of years with lighting and electrical design.

Professor Dannerth for his guidance with the electrical portion of my senior thesis project.

Professor Parfitt and *Professor Holland* for their help with the career fair, resume advice, and CPEP maintenance.

Friends and Family

Thank you for the support over the past couple of months while I worked on my thesis project. I truly appreciate each and every one of you. Thanks to my girlfriend, *Amanda Nickol*, for being there for me.

Again, thank you to everyone that helped me on this project.

Appendix – Lighting and Electrical Cutsheets

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

Walkways

Building Entrances

Parking Lots

Shopping Malls

Specifications

Certifications The fixture shall be ETL and CETL listed for wet location.

Light Distribution The luminaire shall meet the specified light distribution and footcandle levels with an internal optical system.

Assembly Field assembly to pole or bracket shall be accomplished without having to remove or disassemble any components. Fixture shall be ETL listed "suitable for wet locations."

Ballast Ballast shall be readily accessible, removable and insulated. The fixture is to be pre-wired, completely assembled and electronically tested prior to shipment. Quick disconnects are standard.

Optical Assembly The optical assembly shall be of all non-ferrous components. Lens panels shall be of impact resistant acrylic, and fixture shall be fully gasketed to prevent entry of moisture, dust and insects.

Finish BK-BZ-WH-GR-GY-NA baked enamel standard, other colors available.

Mounting Detail Standard fitter is for 3" O.D. pole top. If tenon is required, specify exact tenon dimension and dimensions of round or square pole tops to ensure compatibility.

PROJECT
FIXTURE TYPE
CATALOG#

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

AA-01

Product Order Guide

Series	Size	Max Watts	Lamp Type	Lamp Voltage[1]	Optics	Finish[1]		Options	
AA-01	22 (up to 175 W)	175 MH	E-17[2]	120	TOA	BZ	Bronze	HSS	House Side Shield
	24 (up to 175 W)	250 MH	ED-28	208	TCA	BK	Black	PCB	Button Photo Control
	30 (up to 250 W)	175 HPS	E-17[2]	240	OA	WH	White	F	Fusing
	42 (up to 250 W)	250HPS	ED-18	277	OP	GR	Green	FF	Double Fusing
					CLF	NA	Natural Aluminum	WM	Wall Mount
					CLL	GY	Gray	DL	Downlight[3]
						CC	Custom Color	UL	Uplight[3]

1 Consult factory for other colors and voltages
2 Lamps 175 W and below are medium base.
3 30" head size only

Example: AA-01-22-150HPS-E17-120-OA-BK-PCB

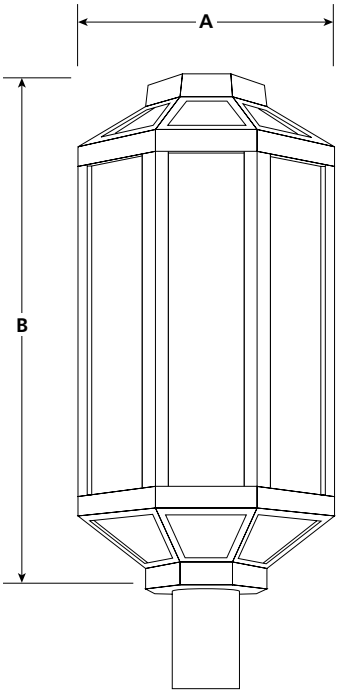
Optics

TOA	Textured Opal Acrylic
TCA	Textured Clear Acrylic
OA	Opal Acrylic
OP	Opal Polycarbonate
CLF	Type 5 Refractor W/Clear Lens
CLL	Louver Assembly W/Clear Lens

AA

Luminaire Dimensions

Luminaire	A	B	Weight	EPA
AA-01-22	10-1/8"	22"	40#	2.2
AA-01-24	15"	24"	44#	2.4
AA-01-30	15"	30"	50#	2.9
AA-01-42	15"	42"	62#	4



NOTE:
AA-01-30 Shown
with Windows

Due to a program of continuous improvement, Architectural Landscape Lighting reserves the right to make any variation in design or construction to the equipment described.

GE Consumer & Industrial
Lighting

ConstantColor® CMH® 150 Watt Open-Rated Elliptical Lamps

Uniform, Consistent Color

GE ConstantColor CMH ceramic metal halide lamps provide lamp-to-lamp color uniformity, consistent excellent color over life... plus high operating efficiencies.

Color uniformity lamp-to-lamp

Ceilings will look clean and bright, with minimal color variation lamp-to-lamp. ConstantColor CMH provides a consistent "white look", critical for interior applications.

Consistent color over life

GE ConstantColor CMH lamps provide stable color over life. So walls, ceilings, displays and furnishings look their natural best always.

Excellent color rendering

Warm white light (3000K) and exceptional color rendering (>80 CRI) make ConstantColor CMH an ideal source for indoor applications.

Ease of use

Protective shroud allows for use of product in open-fixtures.

Highly efficient

Up to 85 lumens per watt
- 10-20% more efficient than standard metal halide.

12,000 to 15,000 hour rated life

Fits standard metal halide sockets

No new wiring or fixtures needed.

GE - Innovative, Energy-Saving Lighting

imagination at work

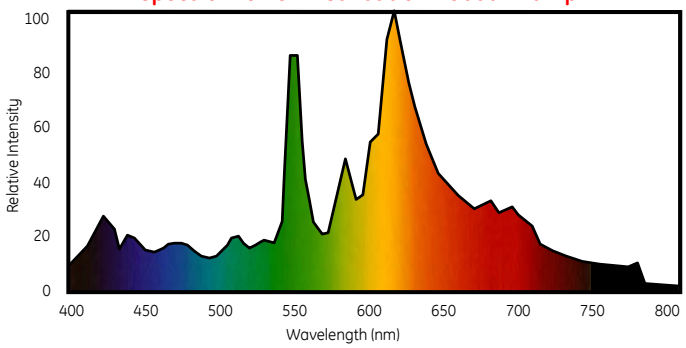
ConstantColor® CMH® 150 Watt Open-Rated Elliptical Lamps

Product Information*	Clear 150-Watt 3K	Coated 150-Watt 3K	Clear 150-Watt 4K	Coated 150-Watt 4K
Product Code	31065	31066	31067	31068
Refer to ANSI Code	M102	M102	M102	M102
Description	CMH150/U/MED/830/O	CMH150/C/U/MED/830/O	CMH150/U/MED/942/O	CMH150/C/U/MED/942/O
Physical Characteristics				
Burn Position	Universal	Universal	Universal	Universal
Bulb Designation	ED17	ED17	ED17	ED17
Bulb Material	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass
Bulb Nominal Diameter, mm (inches)	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")
Base Type	Medium Screw	Medium Screw	Medium Screw	Medium Screw
Light Center Length, mm (inches)	86 (3 3/8")	86 3 (3/8")	86 (3 3/8")	86 3 (3/8")
Max. Overall Length, mm (inches)	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")
Effective Arc Length, mm (inches)	8 (5/16")	8 (5/16")	8 (5/16")	8 (5/16")
Max. Bulb Temp C°	400	400	400	400
Max. Base Temp C°	190	190	190	190
Eccentricity: Base-to-Bulb	3°	3°	3°	3°
Eccentricity: Base-to-Arc Axis	3°	3°	3°	3°
Luminaire Characteristics	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture
Electrical/Photometric Characteristics				
Nominal Lamp Watts	150	150	150	150
Nominal Lamp Volts	95	95	95	95
Nominal Lamp Amps-Starting	2.4	2.4	2.4	2.4
Nominal Lamp Amps-Operating	1.8	1.8	1.8	1.8
Max. Current Crest Factor	1.8	1.8	1.8	1.8
Initial Lumens	12900	11900	12000	11000
Mean Lumens (40% Rated Life)	9545	8805	9000	8250
Rated Life (Hrs.) 10 Hrs./Start	12000	12000	15000	15000
Color Rendering Index (Ra) CRI@K	>80 3000K	>80 3000K	>90 4200K	>90 4200K
Warm-up time (Minutes) to 90%	3 Max	3 Max	5 Max	5 Max
Hot Restart Time (Minutes) to 90%	19 Max	19 Max	18 Max	18 Max
Chromaticity Coordinates: X	.438	.438	.372	.372
Chromaticity Coordinates: Y	.397	.397	.372	.372

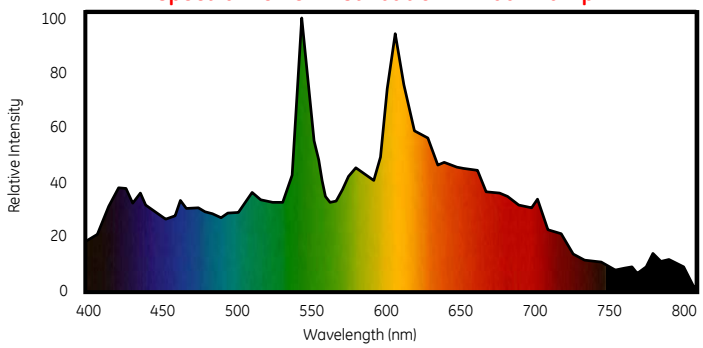
*All data are engineering estimates

WARNING - These lamps can cause serious skin burn and eye inflammation from short wave ultraviolet radiation if outer envelope of the lamp is broken or punctured and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available from the General Electric Company. If the outer envelope breaks or is punctured and the lamp continues to operate, immediately turn power off and remove lamp after it has cooled. These lamps are certified to comply with FDA radiation performance standards, 21 CFR Subchapter J.

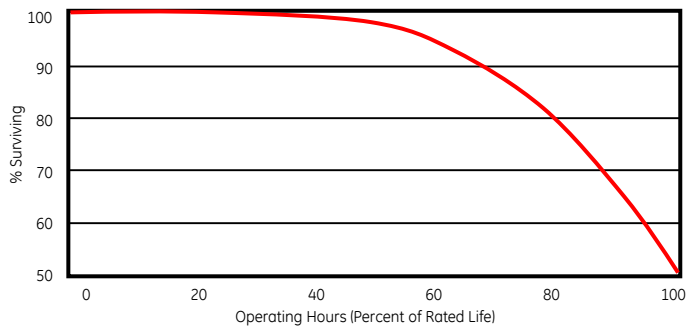
Spectral Power Distribution - 3000K Lamp



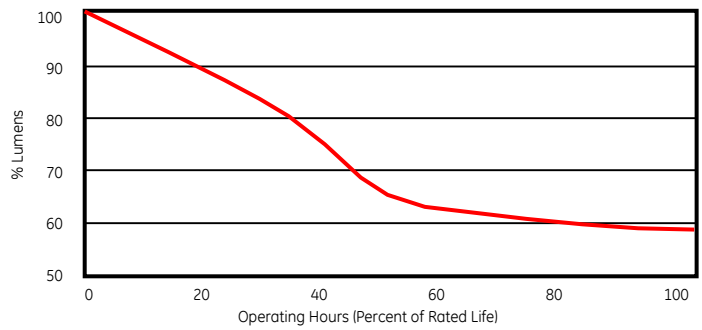
Spectral Power Distribution - 4200K Lamp



Lamp Mortality



Lumen Maintenance



28333-2004 Printed in USA

For additional product and application information, please consult GE's Website: **www.gelighting.com**

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

Round Aluminum Straight Poles

Catalog Number	Pole Dimensions	Bolt Circle	Anchor Bolt Size	Max. EPA
RAS-4011-8	4″ O.D. x 8′	7 1/2″	(4) 5/8″ x 18″	6.8
RAS-4011-10	4″ O.D. x 10′	7 1/2″	(4) 5/8″ x 18″	4.7
RAS-4011-12	4″ O.D. x 12′	7 1/2″	(4) 5/8″ x 18″	3.2
RAS-4011-14	4″ O.D. x 14′	7 1/2″	(4) 5/8″ x 18″	1.9
RAS-5011-12	5″ O.D. x 12′	8 3/8″	(4) 3/4″ x 30″	8.9
RAS-5011-14	5″ O.D. x 14′	8 3/8″	(4) 3/4″ x 30″	6.8
RAS-5011-16	5″ O.D. x 16′	8 3/8″	(4) 3/4″ x 30″	5.3
RAS-5011-18	5″ O.D. x 18′	8 3/8″	(4) 3/4″ x 30″	2.4

Tenon Options

2-3/8" O.D.	T2
2-7/8" O.D.	T3
3-1/2" O.D.	T3.5
4" O.D.	T4

Options

GFI GFI Provision Only

Drill Mount Options

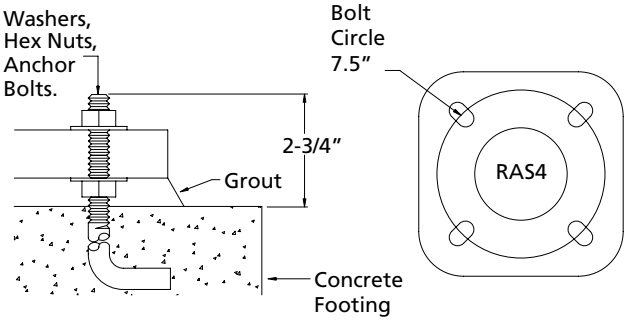
DM 10	Single
DM 2180	Double at 180 Deg
DM 2090	Double at 90 Deg
DM 3090	Triple at 90 Deg
DM 4090	Quad at 90 Deg

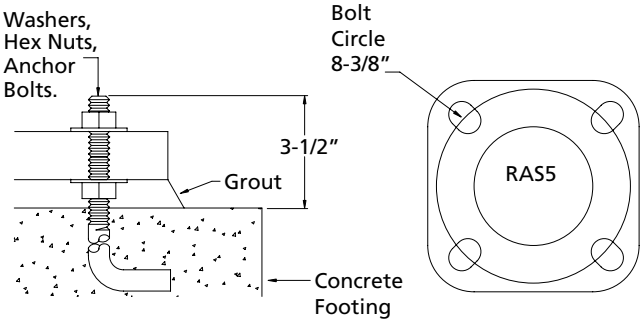
Hand Hole

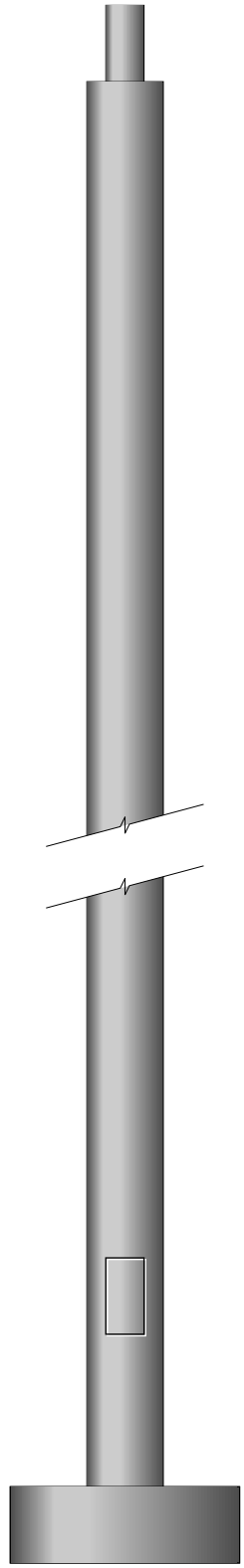
12" to center from base approx.

Note:

EPA calculation is with 100 mph wind and 1.3 gust factor. Base cover, anchor bolts, and hand hole cover included







PROJECT
FIXTURE TYPE
CATALOG#

P&B

Due to a program of continuous improvement, Architectural Landscape Lighting reserves the right to make any variation in design or construction to the equipment described.

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

LL-02

Low Level Lighting

6" Round Aluminum Bollard

Landscape Accent

Walkways

Building Entrances

Planter Areas

Parks

Parking Lots

Specifications

Certifications The fixture shall be ETL and CETL listed for wet location.

Light Distribution The LL-02 luminaire shall meet the specified light distribution and footcandle levels with an internal optical system.

Assembly The fixture shall be factory pre-wired, with high temperature wire completely assembled and tested prior to shipment. Field installation to mounting base shall be accomplished without having to remove or disassemble any fixture components. Fixture shall be ETL listed "suitable for wet locations."

Housing The housing shall be constructed from 6" diameter one piece extruded 6063 alloy aluminum tube.

Ballast Ballast shall be readily accessible, removable and insulated. Quick disconnects are standard.

Lens Clear or opal 1/4" thick polycarbonate.

Optical Assembly The specified optical system shall be of all non-ferrous components, mounted and removable as a one-piece self-contained unit.

Finish BK-BZ-WH-GR-GY-NA baked enamel standard, other colors available. Anodized finish also available.

PROJECT
FIXTURE TYPE
CATALOG#

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

LL-02

Product Order Guide

Series	Max Watts	Lamp Type	Voltage[1]	Optical System	Overall Height
LL-02	70 MH	E-17	120	O	30″
	70 HPS	E-17	208	CLF	36″
	26 CFQ	CFQ[2]	240	CLR[3]	42″
	42 CFT	CFT[2]	277		
	13 CF	CF[2]			

Finish[1]	
BZ	Bronze
BK	Black
GR	Green
GY	Gray
WH	White
CC	Custom Color
NA	Natural aluminum
BAA	Clear Anodized
BZA	Bronze Anodized
BKA	Black Anodized

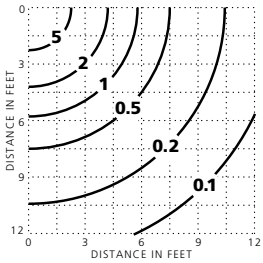
Options	
F	Fusing
FF	Double Fusing
HSS	House Side Shield
EMG	Emergency Battery Backup
HDBP	Heavy Duty Base Plate

1 Consult factory for other colors and voltages
2 CF = single biax, CFQ = double biax, CFT = triple biax
3 CLR 26CFT max

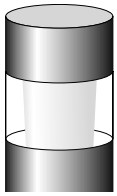
LL

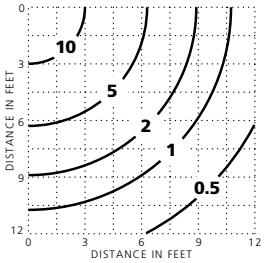
Example: LL-02-70HPS-E17-120-CLR-42-BZ-PL

Photometric Data

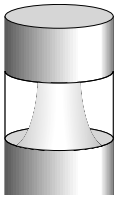


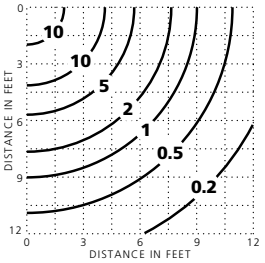
LL-02-70HPS-O-36
Clear Lamp
5,800 Lumens
36" Mounting Height
ISOLUX Curves—value in initial footcandles





LL-02-70HPS-CLF-36
Clear Lamp
5,800 Lumens
36" Mounting Height
ISOLUX Curves—value in initial footcandles

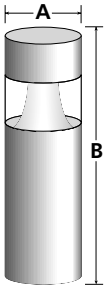


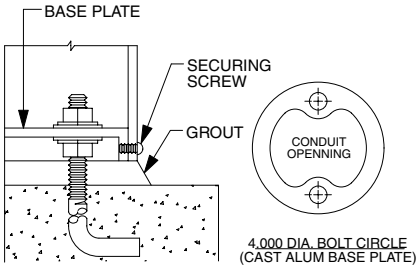


LL-02-70HPS-CLR-36
Clear Lamp
5,800 Lumens
36" Mounting Height
ISOLUX Curves—value in initial footcandles

Luminaire Dimensions

Luminaire	A	B	Weight
LL-02	6″	30″	20#
	6″	36″	24#
	6″	42″	26#





Anchor Bolt Size
(2) 1/2" x 12" x 3"

Due to a program of continuous improvement, Architectural Landscape Lighting reserves the right to make any variation in design or construction to the equipment described.

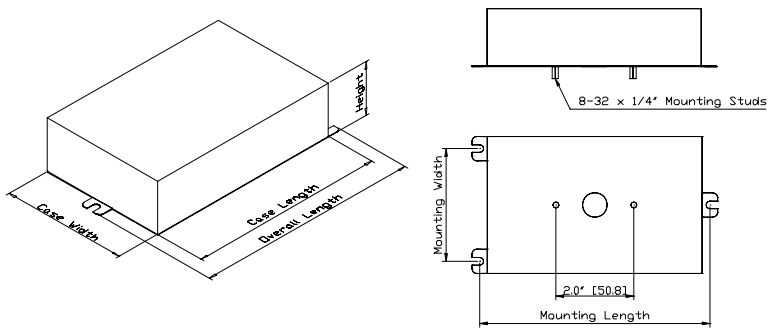
e-Vision® Electronic Ballast for Metal Halide Lamps

Catalog Number IMH-70-A-BLS-ID
For 70W Metal Halide Lamps
ANSI M98, M143 or M139
120-277V 50/60Hz Electronic
Status: Released

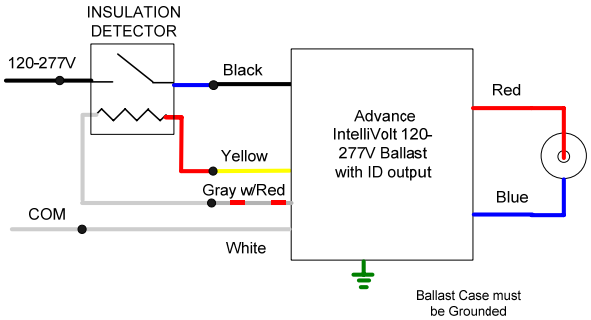
DIMENSIONS AND DATA

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											
70W Watt Lamp, ANSI Code M98, M143 or M139 Minimum Starting Temp -30°C/-20°F												
1	70	120	IMH-70-A-xxx-ID	0.72	86	1.0	18%	0.9	8	A	1.5	5
		277		0.31	84							

Figure A

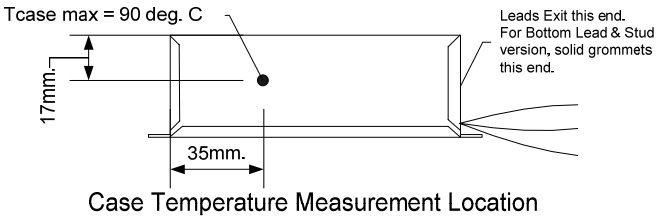


CASE LENGTH = 4.72" [120mm]
MOUNTING LENGTH = 5.20" [132mm]
MOUNTING WIDTH = 2.87" [73mm]
OVERALL LENGTH = 5.51" [140mm]
CASE WIDTH = 3.62" [92mm]
HEIGHT = 1.50" [38mm]



Wiring Diagram 8

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



Case Temperature Measurement Location

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

GE Consumer & Industrial
Lighting

ConstantColor® CMH® 70 Watt Open-Rated Elliptical Lamps

Uniform, Consistent Color

GE ConstantColor® CMH® ceramic metal halide lamps provide lamp-to-lamp color uniformity, consistent excellent color over life... plus high operating efficiencies.

Color uniformity lamp-to-lamp

Ceilings will look clean and bright, with minimal color variation lamp-to-lamp. ConstantColor® CMH® provides a consistent "white look", critical for interior applications.

Consistent color over life

GE ConstantColor® CMH® lamps provide stable color over life. So walls, ceilings, displays and furnishings look their natural best always.

Excellent color rendering

Warm white light (3000K) and exceptional color rendering (>80 CRI) make ConstantColor® CMH® an ideal source for indoor applications.

Ease of Use

Protective shroud allows for use of product in open-fixtures.

Highly efficient

Up to 75 lumens per watt - 10-20% more efficient than standard metal halide.

Up to 16,000 hour life

Fits standard metal halide sockets

No new wiring or fixtures need.

GE - Innovative, Energy-Saving Lighting

GE imagination at work

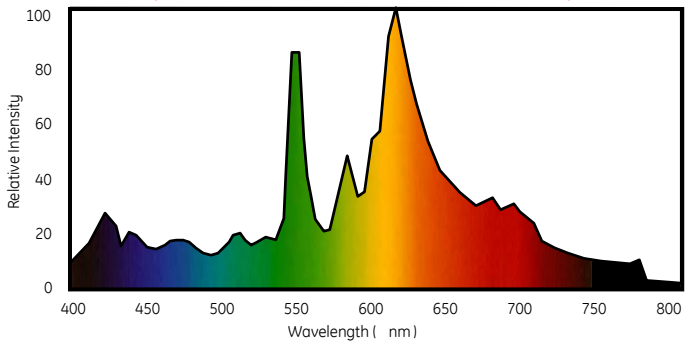
ConstantColor® CMH® 70 Watt Open-Rated Elliptical Lamps

Product Information*	Clear 70-Watt 3K	Coated 70-Watt 3K	Clear 70-Watt 4K	Coated 70-Watt 4K
Product Code	31069	31070	31073	31074
Refer to ANSI Code	M98	M98	M98	M98
Description	CMH70/U/MED/830/O	CMH70/C/U/MED/830/O	CMH70/U/MED/942/O	CMH70/C/U/MED/942/O
Physical Characteristics				
Burn Position	Universal	Universal	Universal	Universal
Bulb Designation	ED17	ED17	ED17	ED17
Bulb Material	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass
Bulb Nominal Diameter, mm (inches)	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")
Base Type	Medium Screw	Medium Screw	Medium Screw	Medium Screw
Light Center Length, mm (inches)	86 (3 3/8")	86 (3 3/8")	86 (3 3/8")	86 (3 3/8")
Max. Overall Length, mm (inches)	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")
Effective Arc Length, mm (inches)	7 (9/32")	7 (9/32")	7 (9/32")	7 (9/32")
Max. Bulb Temp °C	400	400	400	400
Max Base Temp °C	190	190	190	190
Eccentricity: Base-to-Bulb	3°	3°	3°	3°
Eccentricity: Base-to-Arc Axis	3°	3°	3°	3°
Luminaire Characteristics	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture
Electrical/Photometric Characteristics				
Nominal Lamp Watts	70	70	70	70
Nominal Lamp Volts	90	90	90	90
Nominal Lamp Amps-Starting	1.2	1.2	1.2	1.2
Nominal Lamp Amps-Operating	.9	.9	.9	.9
Max. Current Crest Factor	1.8	1.8	1.8	1.8
Initial Lumens	5800	5300	5200	4600
Mean Lumens (40% Rated Life)	4000	3900	3700	3600
Average Rated Life (Hrs.) 10 Hrs./Start	16000	16000	16000	16000
Color Rendering Index (Ra) CRI@K	>80 3000K	>80 3000K	>90 4200K	>90 4200K
Warm-up time (Minutes) to 90%	3 Max	3 Max	3 Max	3 Max
Hot Restart Time (Minutes) to 90%	15 Max	15 Max	15 Max	15 Max
Chromaticity Coordinates: X	.438	.438	.372	.372
Chromaticity Coordinates: Y	.397	.397	.372	.372

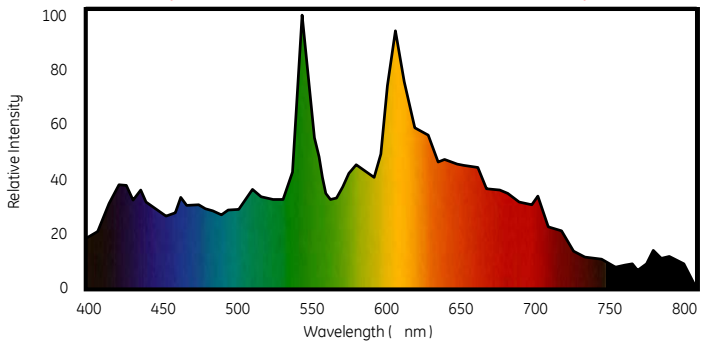
*All data are engineering estimates

WARNING - These lamps can cause serious skin burn and eye inflammation from short wave ultraviolet radiation if outer envelope of the lamp is broken or punctured and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available from the General Electric Company. If the outer envelope breaks or is punctured and the lamp continues to operate, immediately turn power off and remove lamp after it has cooled. These lamps are certified to comply with FDA radiation performance standards, 21 CFR Subchapter J.

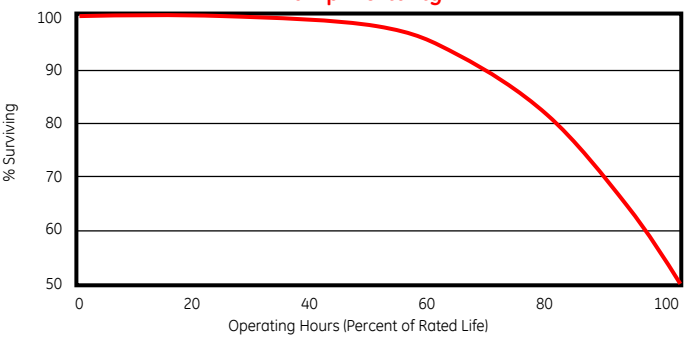
Spectral Power Distribution - 3000K Lamp



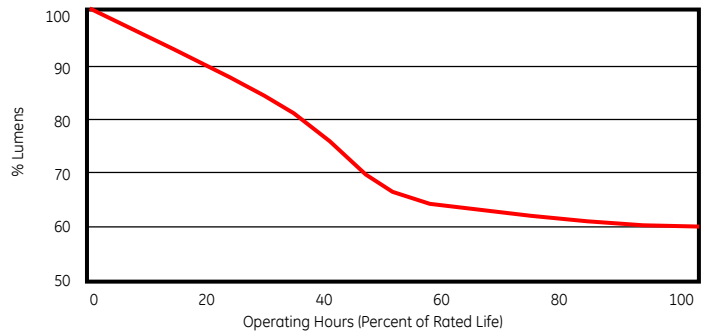
Spectral Power Distribution - 4200K Lamp



Lamp Mortality



Lumen Maintenance



28328-2004 Printed in USA

For additional product and application information, please consult GE's Website: **www.gelighting.com**

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

SP-108/109/110

METRIC

SP

Corridors

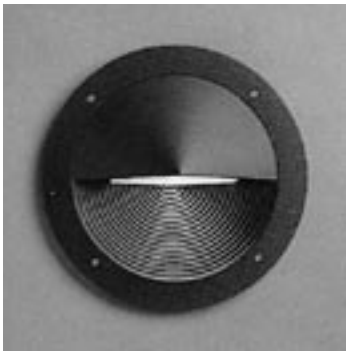
Walkways

Accent and

General Lighting

SP-108

SP-109



SP-110

Specifications

ADA **IP65**

Certifications The fixture shall be ETL and CETL listed for wet location and concrete pour with a protection rating of IP65, dust-tight and jet-water proof. The fixture shall meet ADA requirements.

Housing The housing shall be constructed of die cast aluminum with two 1/2" NPT conduit entrances for through-wiring capability.

Ballast The ballast shall be readily accessible, removable and insulated. The fixture is to be pre-wired and electronically tested before shipment.

Lens The lens shall be prismatic frosted glass or opal polycarbonate (SP-108 and SP-109). The lens shall be clear glass (SP-110).

Hardware All exposed hardware shall be stainless steel.

Finish BK-BZ-WH-GR-GY-NA baked enamel standard, other colors available.

PROJECT
FIXTURE TYPE
CATALOG#

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

SP-108/109/110

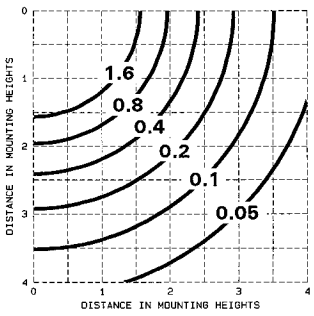
Product Order Guide

Series	Max Watts	Lamp Type	Voltage[1]	Finish[1]	Option
SP-108 / SP-109	60 Halogen[3]	BT15	120	BK Black	GL Prismatic Frosted Lens
	60 INC	T10	208	BZ Bronze	PL Polycarbonate Lens
	13 CF	CF[2]	240	WH White	
	2(13) CF	CF[2]	277	GR Green	
	26 CFQ	CFQ[2]		NA Natural Aluminum	
	42 CFT	CFT[2]		GY Gray	
				CC Custom Color	
SP-110	75 Halogen	T3mini			
	13 CF	CF[2]			
	26 CFQ	CFQ[2]			
	26 CFT	CFT[2]			

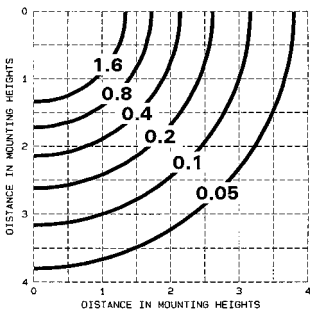
1 Consult factory for other colors and voltages
2 CF = single biax, CFQ = double biax, CFT = triple biax
3 GL option only

Example: SP-108-13CF-120-BK-PL

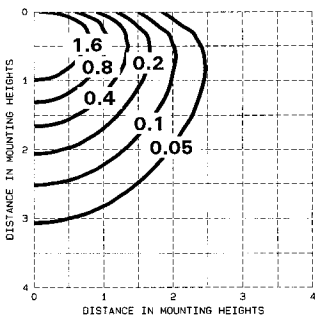
Photometric Data



SP-108-(2)13CF-GL
1,720 Lumens
3.0 ft Mounting Height
ISOLUX Curves - value in initial footcandles



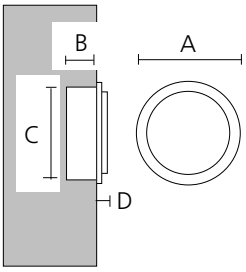
SP-109-60INC-GL
890 Lumens
3.0 ft Mounting Height
ISOLUX Curves - value in initial footcandles



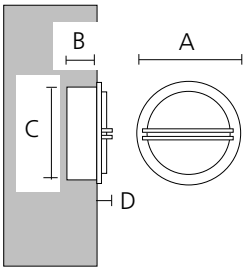
SP-110-13CF-BK
860 Lumens
3.0 ft Mounting Height
ISOLUX Curves - value in initial footcandles

Luminaire Dimensions

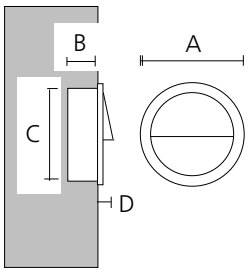
Luminaire	A		B		C		D		Weight	
	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lbs.	kg
SP-108	10.63	270	3.94	100	9.72	247	1.18	30	7.1	3.2
SP-109	10.63	270	3.94	100	9.72	247	1.57	40	7.1	3.2
SP-110	10.63	270	3.94	100	9.72	247	1.97	50	6.7	3.0



SP-108



SP-109



SP-110

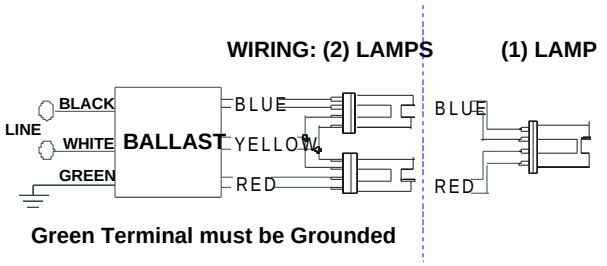
ICF-2S18-H1-LD@120

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.
CFM18W/GX24Q	1	18	0/-18	0.17	20	1.05	10	0.97	1.5	5.25
* CFM18W/GX24q	2	18	0/-18	0.33	39	1.05	10	0.99	1.5	2.69
CFQ18W/G24Q	1	18	0/-18	0.16	19	1.00	10	0.97	1.5	5.26
CFQ18W/G24q	2	18	0/-18	0.30	35	0.95	10	0.99	1.5	2.71
CFS16W/GR10q	2	16	0/-18	0.31	37	1.00	09	0.99	1.5	2.70
CFS21W/GR10Q	1	21	0/-18	0.16	20	0.90	15	0.97	1.5	4.50
CFS21W/GR10Q	2	21	0/-18	0.33	40	0.91	10	0.99	1.5	2.28

Wiring Diagram



Green Terminal must be Grounded

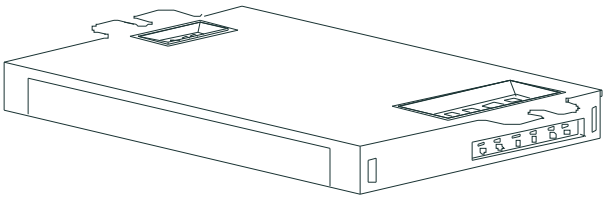
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0.0	
White	0.0	
Blue	0.0	
Red	0.0	
Yellow	0	
Gray		
Violet		

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

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 08/15/2006

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

ICF-2S18-H1-LD@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 Underwriters Laboratories (UL) 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) except for RCF models which shall be Consumer (Class B).

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.

4.4 Ballast shall be Advance part # _____ or approved equal.

Revised 08/15/2006

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

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

GE Consumer & Industrial
Lighting

Fast Warm-Up, Plug-In CFL Triple Biax® Lamps

GE – bringing incandescent features to compact fluorescent lamps

GE provides faster warm-up times on the fast growing, very popular line of 4-pin plug-in CFL Triple Biax® Lamps

50% faster warm up
GE's new 4-pin plug-in Triple Biax lamps warm up to full brightness 50% faster and provide immediate flicker-free light.

Outstanding energy efficiencies
As much as 77% energy cost savings vs. incandescent lamps. The 42-watt delivers 3200 lumens, 12% more than a standard 150-watt incandescent bulb!

TCLP Compliant
All GE 4-pin plug-in Triple Biax lamps feature low mercury and are TCLP compliant in both the U.S. and Canada.

Long Life – 12,000 hours
GE Biax Lamps last up to 16 times longer than standard incandescent bulbs. Longer life means lower lamp replacement and maintenance costs.

Excellent Color – 82 CRI
GE's SPX color provides excellent color rendering. Available in a choice of color temperatures: 2700K, 300K, 3500K and 4100K.

Dimmable
GE 4-pin plug-in Triple Biax lamps can be operated on dimming circuits for greater application and design flexibility.

GE - Innovative, Energy-Saving Lighting

imagination at work

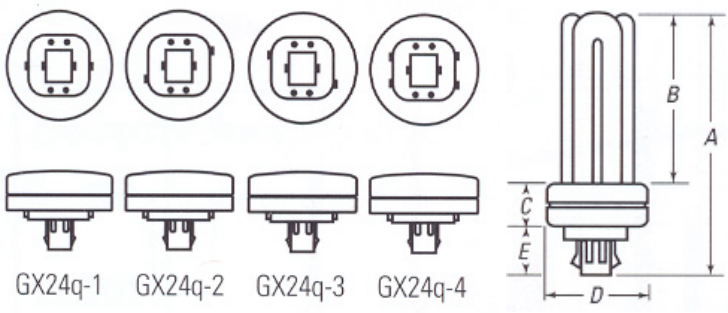
Fast Warm-Up, Plug-In CFL Triple Biax® Lamps

Watts	Color Temperature	Lamp Description	P/C	Initial Lumens	CRI	Rated Life	TCLP Compliant
13	2700K	F13TBX/SPX27/A/4P	34391	900	82	12,000	Yes
	3000K	F13TBX/SPX30/A/4P	34395	900	82	12,000	Yes
	3500K	F13TBX/SPX35/A/4P	34400	900	82	12,000	Yes
	4100K	F13TBX/SPX41/A/4P	34387	900	82	12,000	Yes
18	2700K	F18TBX/SPX27/A/4P	34392	1200	82	12,000	Yes
	3000K	F18TBX/SPX30/A/4P	34396	1200	82	12,000	Yes
	3500K	F18TBX/SPX35/A/4P	34405	1200	82	12,000	Yes
	4100K	F18TBX/SPX41/A/4P	34385	1200	82	12,000	Yes
26	2700K	F26TBX/SPX27/A/4P	34393	1710	82	12,000	Yes
	3000K	F26TBX/SPX30/A/4P	34397	1710	82	12,000	Yes
	3500K	F26T8X/SPX3S/A/4P	34406	1710	82	12,000	Yes
	4100K	F26TBX/SPX41/A/4P	34381	1710	82	12,000	Yes
32	2700K	F32TBX/SPX27/A/4P	39377	2200	82	12,000	Yes
	3000K	F32TBX/SPX30/A/4P	39378	2200	82	12,000	Yes
	3500K	F32TBX/SPX35/A/4P	39379	2200	82	12,000	Yes
	4100K	F32TBX/SPX41/A/4P	39380	2200	82	12,000	Yes
42	2700K	F42TBX/827/A/4P/EOL	46312	3200	82	12,000	Yes
	3000K	F42TBX/830/A/4P/EOL	46313	3200	82	12,000	Yes
	3500K	F42TBX/835/A/4P/EOL	46314	3200	82	12,000	Yes
	4100K	F42TBX/841/A/4P/EOL	46315	3200	82	12,000	Yes

Nominal Lamp Dimension - Inches (mm)

Lamp Type	A	B	C	D	E
F13TBX/08	4.25 (108)	2.60 (66)	.80 (19)	1.93 (49)	.59 (15)
F18TBX/23	4.84 (123)	3.19 (81)	.80 (19)	1.93 (49)	.59 (15)
F26TBX/33	5.24 (133)	3.58 (91)	.80 (19)	1.93 (49)	.59 (15)
F32TBX/48	5.83 (148)	4.17 (106)	.80 (19)	1.93 (49)	.59 (15)
F42TBX/54	6.06 (154)	4.37 (111)	.79 (20)	2.28 (58)	.59 (15)

For additional product and application information, please consult GE's Website:
www.gelighting.com



49713 – 3/2005 Printed in USA

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

SL-50

SL

Landscape Areas

Building Accent

Pedestrian Areas

Tree Lighting

Low Voltage

CIELLO

CA - Curved Arm

UD - Up/Down

SP - Straight Post

Specifications

Certifications ETL and CETL listed for wet location. Also meets IP55 standard.

Lamp Housing Die-cast aluminum with die cast aluminum swivel that allows a 75˚ vertical tilt adjustment on the Up/Down, wall mount and Spike mount housings and 165˚ vertical tilt adjustment on Curved pole and Straight pole housings.

Lens Ring Die cast aluminum mounted to lamp housing with three stainless steel cap screws. Clear flat tempered glass is standard.

Lampholder Porcelain 2-pin GX5.3.

Transformer Housing Transformer is integral with all versions when 120 or 277 is specified. Standard transformer is electronic with 120 or 277 volt primary and 12 volt secondary.

Options The following options are available: Wall mount curved arm (CA); Wall mount up/down dual head (UD), ground mount mini straight post (SP) and (SM) Spike mount.

Finish BK-BZ-WH-GR-GY-NA baked enamel standard, other colors available.

Safety Caution: Care should be taken when specifying fixtures for use in pedestrian areas to avoid problems that may be caused by high lens temperatures. Consult factory for more information.

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

SL-50

PROJECT
FIXTURE TYPE
CATALOG#

SL

Consult Ciello Application Brochure For More Options

Product Order Guide

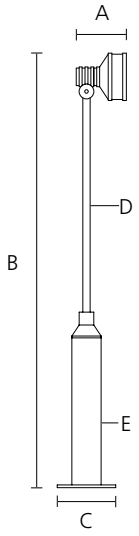
Series	Max Watts	Lamp Type	Voltage	Finish	Options
SL-50	50LV	MR-16	12	BK Black	UD[2] Up/Down Mount
			120[1]	BZ Bronze	SP Straight Post
			277[1]	WH White	CA[6] Curved Arm
				GR Green	SA[6] Straight Arm
				NA Natural Alum.	CP Curved Post
				GY Gray	SP[2] Straight Post
				CC Custom Color	JBRS[3] Surface Mount Junction Box
					JBRC Conduit Mount Junction Box
					JBRTM Tree Mount Junction Box
					STNM Stanchion Mount
					LP Low Post (Plastic)
					PTB[5] Portable 120/12v
					SM[4] Spike Mount
					HSL Horizontal Spread Lens
					VSL Vertical Spread Lens

[1] Note 120/277 uses transformer
[2] The U/D option requires a single gang 2" x 4" junction box.
[3] The JBRS option requires a 4" octagonal junction box.
[4] The SM option is available for LV (12V) and PTB applications only.
[5] The PTB option is available for 120V portable applications only and must be connected to a GFI outlet.
[6] Specify Junction Box Mounting or Surface Conduit Connection

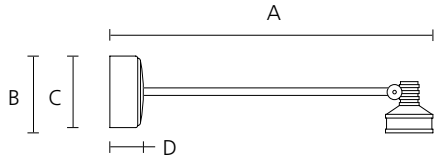
Example: SL-50-120-BK-UD

Luminaire Dimensions

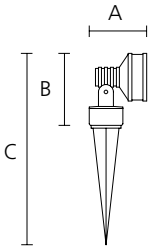
Luminaire	A		B		C		D		E		Weight	
	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	lbs	kg
SL-50-SP	3.5"	89	29.5"	750	4"SQ	102	0.5"OD	13	2"OD	51	2.5	1.1
SL-50-SA	20"	508	5.125"	130	4.750"	120	2.250"	57	n/a	n/a	2.5	1.1
SL-50-CA	22"	559	13"	330	4.750"	120	2.250"	57	n/a	n/a	2.5	1.1
SL-50-SM	3.875"	98	4.875"	124	12.875"	327	n/a	n/a	n/a	n/a	1.25	.5
SL-50-PTB	5.125"	130	5.875"	149	13.875"	352	n/a	n/a	n/a	n/a	1.75	.8
SL-50-JBRS	5.125"	130	5.875"	149	3.250"	82	4.750"	120	n/a	n/a	1.5	.7
SL-50-UD	5.250"	133	3.250"	82	7"	178	1.625"	41	8"	203	3.0	1.4



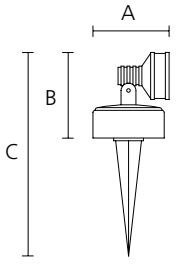
SL-50-SP



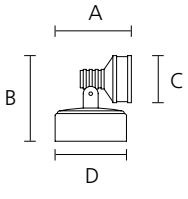
SL-50-SA-JBRS



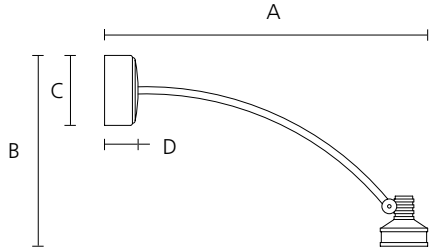
SL-50-12-SM



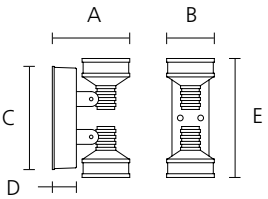
SL-50-PTB



SL-50-JBRS



SL-50-CA-JBRS



SL-50-UD

Due to a program of continuous improvement, Architectural Landscape Lighting reserves the right to make any variation in design or construction to the equipment described.

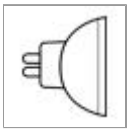
16720 – Q50MR16/HIR/CG40

GE MR16

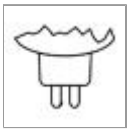
PRINT

Energy Savings

Bulb



Base



View Larger

GENERAL CHARACTERISTICS

Lamp type	Halogen - MR
Bulb	MR16
Base	2-Pin (GU5.3)
Filament	C-8
Wattage	50
Voltage	12
Voltage (MIN)	50
Rated Life	4000 hrs
Rated Life (Vert)	4000 hrs

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	2600
Initial Lumens (Hor)	2600
Initial Lumens (Vert)	2600
Center Beam Candlepower (CBCP)	2600
Color Temperature	3000 K
Nominal Initial Lumens per Watt	52

DIMENSIONS

Maximum Overall Length (MOL)	1.8000 in (45.7 mm)

PRODUCT INFORMATION

Product Code	16720
Description	Q50MR16/HIR/CG40
Standard Package	Case
Standard Package GTIN	10043168167205
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168167208

⚠ CAUTIONS & WARNINGS

See list of cautions & warnings.

ADDITIONAL RESOURCES

Catalogs

Testimonials

Sell Sheets

- Precise™ IR Energy Saving MR16 Halogen Lamp

MSDS (Material Safety Data Sheets)

Disposal Policies & Recycling Information

Return To Top

ALLSCAPE®
ARCHITECTURAL LANDSCAPE LIGHTING

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

BL-44/45/47 48/49

Building Mount

Corridor

Walkways

Accent

Building Entrances

BL-44

BL-45

BL-47

BL-48

BL-49

BL

Specifications

Certifications The fixture shall be ETL and CETL listed for wet location. Also meets IP65 standard.

Ballast Housing Cast aluminum with a minimum thickness of 1/8". Mounting plate welded to ballast housing for J-box mounting. Conduit mounting available, consult factory. Housing is fully gasketed with 3/16" extruded EDPM cord gasket.

Lens Frame Cast aluminum mounted to ballast housing with 1/4-20 stainless steel allen cap screws.

Lens Opal UV-stabilized polycarbonate (OP) is standard. Lens supplied with one-piece extruded silicone gasket.

Ballast Maximum HID-70 watts with polycarbonate lens. Fluorescent ballast for 42CFT lamp is electronic (minus 20° C). Other fluorescent 13- through 26-watt quad tube is core & coil (0° C).

Finish BK-BZ-WH-GR-GY-NA baked enamel standard, other colors available.

PROJECT
FIXTURE TYPE
CATALOG#

2930 South Fairview Street
Santa Ana, CA 92704
Phone: 714 668 3660
Fax: 714 668 1107
alllighting@earthlink.net
http://www.alllighting.com

BL-44/45/47 48/49

Product Order Guide

Series	Max Watts	Lamp Type	Voltage[1]	Lens	Finish[1]	Options
BL-44	(2)26 CFQ	CFQ[2]	120	OP Opal Polycarbonate	BK Black	EMG Emergency Battery Backup
BL-45	26 CFQ	CFQ[2]	208		BZ Bronze	
BL-47	42 CFT	CFT[2]	240		WH White	
BL-48	70 MH	E-17	277		GR Green	
BL-49	70 HPS	E-17			NA Natural Aluminum	
					GY Gray	
					CC Custom Color	

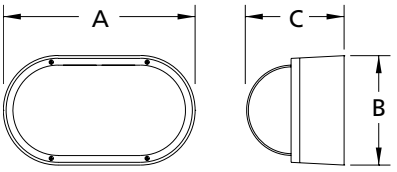
1 Consult factory for other colors and voltages
2 CF = single biax, CFQ = double biax, CFT = triple biax

Example: BL-48-70MH-E17-277-OP-WH

BL

Luminaire Dimensions

Luminaire	A	B	C
BL-44	14″	8″	7-1/2″
BL-45	14″	8″	7-1/2″
BL-47	14″	8″	7-1/2″
BL-48	14″	8″	7-1/2″
BL-49	14″	8″	7-1/2″



Due to a program of continuous improvement, Architectural Landscape Lighting reserves the right to make any variation in design or construction to the equipment described.

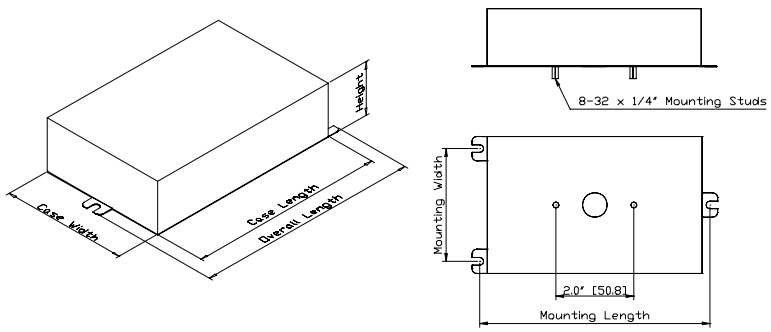
e-Vision® Electronic Ballast for Metal Halide Lamps

Catalog Number IMH-70-A-BLS-ID
For 70W Metal Halide Lamps
ANSI M98, M143 or M139
120-277V 50/60Hz Electronic
Status: Released

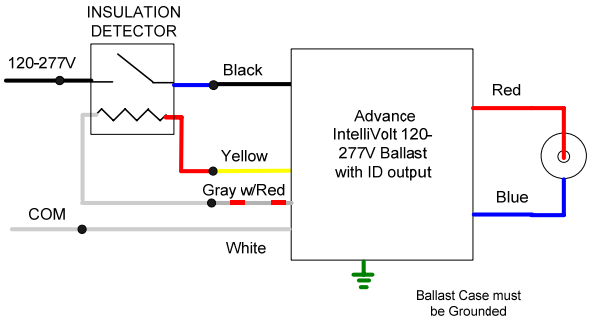
DIMENSIONS AND DATA

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											
70W Watt Lamp, ANSI Code M98, M143 or M139 Minimum Starting Temp -30°C/-20°F												
1	70	120	IMH-70-A-xxx-ID	0.72	86	1.0	18%	0.9	8	A	1.5	5
		277		0.31	84							

Figure A

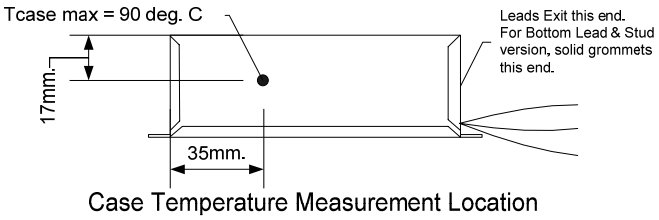


CASE LENGTH = 4.72" [120mm]
MOUNTING LENGTH = 5.20" [132mm]
MOUNTING WIDTH = 2.87" [73mm]
OVERALL LENGTH = 5.51" [140mm]
CASE WIDTH = 3.62" [92mm]
HEIGHT = 1.50" [38mm]



Wiring Diagram 8

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



Case Temperature Measurement Location

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

GE Consumer & Industrial
Lighting

ConstantColor® CMH® 70 Watt Open-Rated Elliptical Lamps

Uniform, Consistent Color

GE ConstantColor® CMH® ceramic metal halide lamps provide lamp-to-lamp color uniformity, consistent excellent color over life... plus high operating efficiencies.

Color uniformity lamp-to-lamp

Ceilings will look clean and bright, with minimal color variation lamp-to-lamp. ConstantColor® CMH® provides a consistent "white look", critical for interior applications.

Consistent color over life

GE ConstantColor® CMH® lamps provide stable color over life. So walls, ceilings, displays and furnishings look their natural best always.

Excellent color rendering

Warm white light (3000K) and exceptional color rendering (>80 CRI) make ConstantColor® CMH® an ideal source for indoor applications.

Ease of Use

Protective shroud allows for use of product in open-fixtures.

Highly efficient

Up to 75 lumens per watt - 10-20% more efficient than standard metal halide.

Up to 16,000 hour life

Fits standard metal halide sockets

No new wiring or fixtures need.

GE - Innovative, Energy-Saving Lighting

GE imagination at work

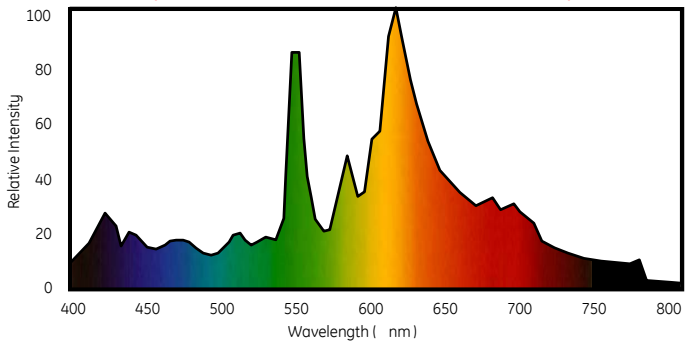
ConstantColor® CMH® 70 Watt Open-Rated Elliptical Lamps

Product Information*	Clear 70-Watt 3K	Coated 70-Watt 3K	Clear 70-Watt 4K	Coated 70-Watt 4K
Product Code	31069	31070	31073	31074
Refer to ANSI Code	M98	M98	M98	M98
Description	CMH70/U/MED/830/O	CMH70/C/U/MED/830/O	CMH70/U/MED/942/O	CMH70/C/U/MED/942/O
Physical Characteristics				
Burn Position	Universal	Universal	Universal	Universal
Bulb Designation	ED17	ED17	ED17	ED17
Bulb Material	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass	Heat Resistant Glass
Bulb Nominal Diameter, mm (inches)	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")	54 (2 1/8")
Base Type	Medium Screw	Medium Screw	Medium Screw	Medium Screw
Light Center Length, mm (inches)	86 (3 3/8")	86 (3 3/8")	86 (3 3/8")	86 (3 3/8")
Max. Overall Length, mm (inches)	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")	138 (5 7/16")
Effective Arc Length, mm (inches)	7 (9/32")	7 (9/32")	7 (9/32")	7 (9/32")
Max. Bulb Temp °C	400	400	400	400
Max Base Temp °C	190	190	190	190
Eccentricity: Base-to-Bulb	3°	3°	3°	3°
Eccentricity: Base-to-Arc Axis	3°	3°	3°	3°
Luminaire Characteristics	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture	Open or Enclosed Fixture
Electrical/Photometric Characteristics				
Nominal Lamp Watts	70	70	70	70
Nominal Lamp Volts	90	90	90	90
Nominal Lamp Amps-Starting	1.2	1.2	1.2	1.2
Nominal Lamp Amps-Operating	.9	.9	.9	.9
Max. Current Crest Factor	1.8	1.8	1.8	1.8
Initial Lumens	5800	5300	5200	4600
Mean Lumens (40% Rated Life)	4000	3900	3700	3600
Average Rated Life (Hrs.) 10 Hrs./Start	16000	16000	16000	16000
Color Rendering Index (Ra) CRI@K	>80 3000K	>80 3000K	>90 4200K	>90 4200K
Warm-up time (Minutes) to 90%	3 Max	3 Max	3 Max	3 Max
Hot Restart Time (Minutes) to 90%	15 Max	15 Max	15 Max	15 Max
Chromaticity Coordinates: X	.438	.438	.372	.372
Chromaticity Coordinates: Y	.397	.397	.372	.372

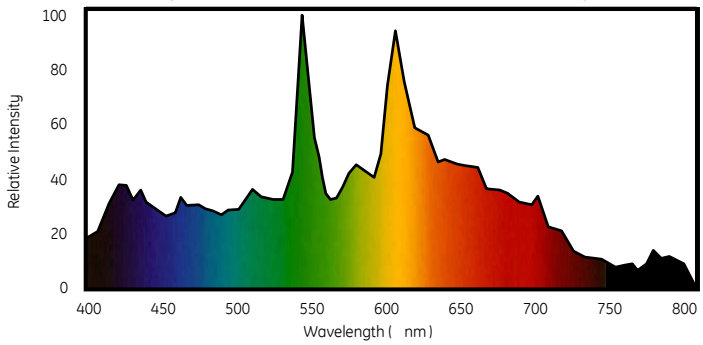
*All data are engineering estimates

WARNING - These lamps can cause serious skin burn and eye inflammation from short wave ultraviolet radiation if outer envelope of the lamp is broken or punctured and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Certain types of lamps that will automatically extinguish when the outer envelope is broken or punctured are commercially available from the General Electric Company. If the outer envelope breaks or is punctured and the lamp continues to operate, immediately turn power off and remove lamp after it has cooled. These lamps are certified to comply with FDA radiation performance standards, 21 CFR Subchapter J.

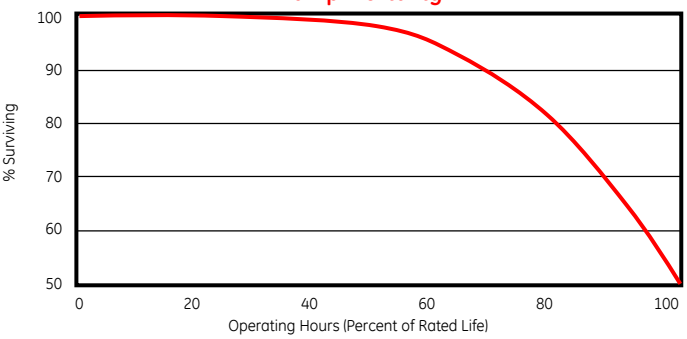
Spectral Power Distribution - 3000K Lamp



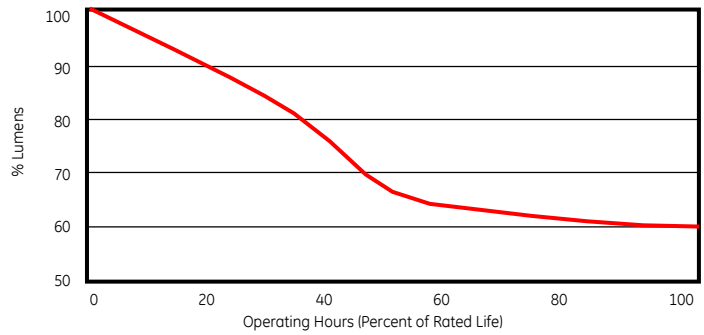
Spectral Power Distribution - 4200K Lamp



Lamp Mortality



Lumen Maintenance



28328-2004 Printed in USA

For additional product and application information, please consult GE's Website: **www.gelighting.com**

Campbell

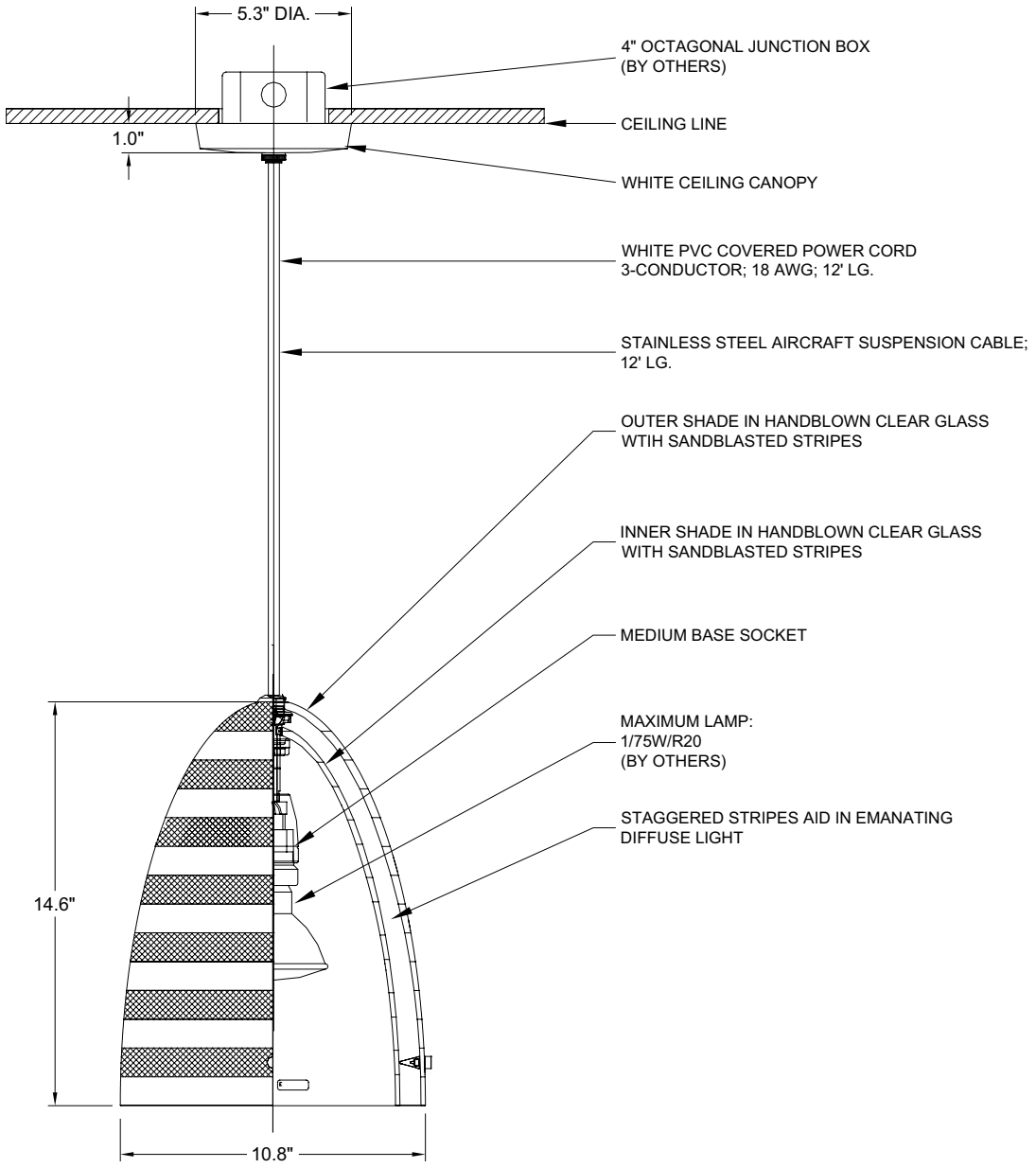
incandescent

Design: Louise Campbell

Type:

Project:

Catalog Number:



louis poulsen

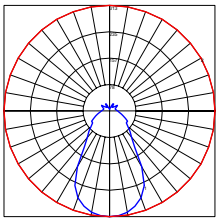
Louis Poulsen Lighting, Inc., 3260 Meridian Parkway, Fort Lauderdale, FL 33331 Telephone: (954) 349-2525 Fax: (954) 349-2550

www.louispoulsen.com

Campbell

pendants

incandescent



Photometric Report: CAM 1/75W/R20 MEDIUM. IES
Report No.: L5634
Poulsen Report No.: CAM 1/75W/R20 MEDIUM. IES
Luminaire: 1/75W/R20 medium
Lamp: 1/75W/R20 medium
Efficiency: 92.7 %
Description: All data shown are per 730 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	313.34
5	311.34
10	304.88
25	243.57
40	102.64
55	61.15
70	43.4
85	27.53
90	24.06
120	23.69
145	13.14
180	4.58

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0-30	220.94	30.3	32.6
0-40	307.26	42.1	45.4
0-60	431.32	59.1	63.7
0-90	553.11	75.8	81.7
90-120	64	8.8	9.5
90-130	86.77	11.9	12.8
90-150	109.66	15	12.8
90-180	123.72	16.9	18.3
0-180	676.82	92.7	100

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	106	106	106	106	102	102	102	102	94	94	94	86	86	86	79	79	79	76
1	97	92	88	84	92	88	85	82	81	78	76	75	73	71	69	67	66	63
2	89	81	75	70	85	78	73	68	72	68	64	67	63	60	61	59	56	53
3	81	72	65	60	78	70	63	58	64	59	55	60	55	52	55	52	49	46
4	75	65	57	52	72	63	56	50	58	52	48	54	49	46	50	46	43	41
5	70	59	51	46	67	57	50	44	53	47	43	49	44	41	46	42	39	36
6	65	54	46	41	62	52	45	40	49	43	38	45	40	36	43	38	35	33
7	61	49	42	37	58	48	41	36	45	39	34	42	37	33	40	35	32	30
8	57	45	38	33	55	44	37	33	41	36	31	39	34	30	37	32	29	27
9	53	42	35	30	51	41	34	30	39	33	29	36	31	28	34	30	27	25
10	50	39	32	28	48	38	32	27	36	30	27	34	29	26	32	28	25	23

Design
Louise Campbell

Concept
Campbell pendant creates direct and diffuse illumination. The design is inspired by light refraction in nature. The pendant consists of two separate layers of glass. Light passes through two separate glass shades, and the frosted stripes create a three-dimensional experience when viewing the fixture and shields from direct glare. The staggered sandblasted stripes aid in emanating diffuse light.

Finish
Clear glass with sandblasted stripes.

Material
Inner shade: Handblown clear glass with sandblasted stripes. Outer shade: Handblown clear glass with sandblasted stripes.

Mounting
Suspension type: 1x stainless steel aircraft cable. Suspension length: 12'. Canopy: White. Cord type: 3-conductor, 18 AWG white PVC power cord. Cord length: 12'.

Weight
Max. 17 lbs.

Label
cUL, Dry location. IBEW.

Product code	Light source	Voltage	Finish
CAM	1/75W/R20 medium	120V	STRIPED GLASS

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

DuraMax 75W Med 120V R20 FR TP 1CT

Product family description
DuraMax reflector incandescent flood light bulbs.

Features/Benefits

- Lasts 1.5 years.
- Wide beam of light is perfect for kitchens and family rooms.

Applications

- Ideal for recessed, track and downlights.

Notes

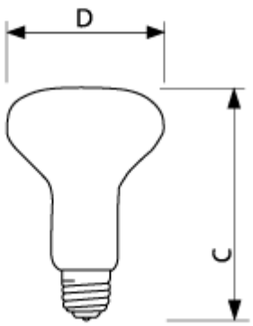
- Rated average life is the length of operation (in hours) at which point an average of 50% of the lamps will still be operational and 50% will not.

Product data	
Product Number	167635
Full product name	DuraMax 75W Med 120V R20 FR TP 1CT
Ordering Code	75R20/LL 120V TP
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677167639
EAN2US	
Case Bar Code	50046677167634
Successor Product number	
Base	Medium [Single Contact Medium Screw]
Base Information	Aluminum [Aluminum Base]
Bulb	R-20
Bulb Finish	Frosted
Filament Shape	CC6 [Straight]
Operating Position	Universal [Any or Universal (U)]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12

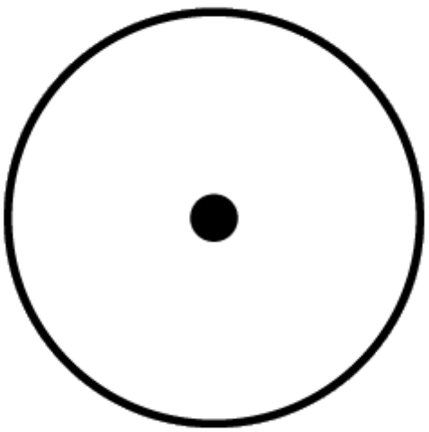
Product data	
Atmosphere	Gas
Rated Avg. Life	2500 hr
Ordering Code	75R20/LL 120V TP
Pack UPC	046677167639
Case Bar Code	50046677167634
Watts	75W
Voltage	120V
Initial Lumens	570 Lm
Max Overall Length (MOL) - C	3.94 in
Special packing	TP [Tray Pack]
Product Number	167635

DuraMax R20 FR

Base Medium



DuraMax R20



Operating Position Universal

TRIPLES-H 226/7

recessed compact fluorescent downlight/wallwasher

Spec Sheet

COMPACT FLUORESCENT
1-378

FEATURES

Triples-H 226/7 is an efficient 7" aperture low brightness downlight, for use with two 26-watt, 4-pin, triple tube compact fluorescent lamps by GE, Sylvania or Philips. Triples-H 226/7 provides shielding angles of 40° parallel to and 40° perpendicular to the lamps. Recess depth is only 7 ¼".

One housing allows interchangeable use of downlight and wallwash reflectors, permitting housings to be installed first and reflectors to be installed or changed at any time.

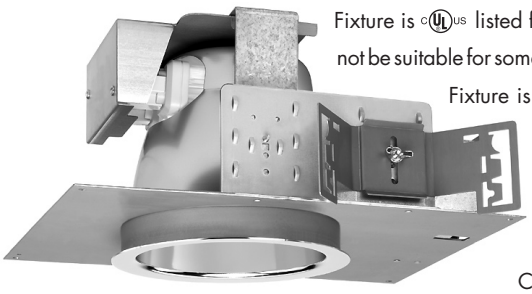
Triples-H 226/7 uses two 26-watt, 4-pin, triple tube lamps providing 3600 lumens (more than a 150-watt incandescent), a 10,000-hour life, a color rendering index (CRI) of 82, and color temperatures as warm as 2700°K (nearly duplicating the color qualities of incandescent).

Reflectors are available in clear, natural aluminum in three finishes: **EvenTone**, our standard clear finish, partially diffuse, anti-iridescent and gently luminous in appearance; **OptiTone**, specular and anti-iridescent, with minimum brightness and maximum efficiency; and **EasyTone**, diffuse and luminous. Additionally, reflectors are available in champagne gold, wheat, pewter, and bronze. Wallwash (120°) and double wallwash (2x120°) reflectors are also available.

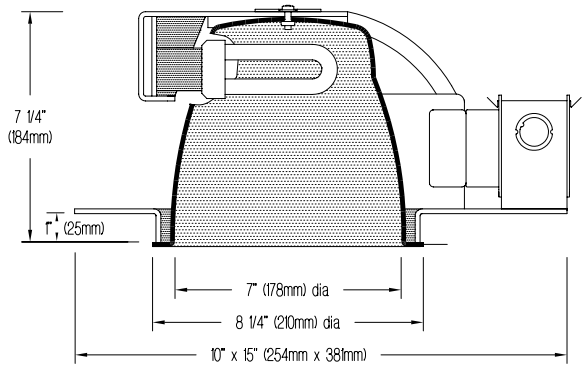
Triples-H 226/7 includes a pair of mounting bars (¾" x 27" C channel). Specialty bars for wood joist and T-bar installations are available as accessories.

APPLICATIONS

Fixture is recommended for downlighting or wallwashing in offices, stores, banks, schools, auditoriums, hospitals and airports, as well as lobbies and public areas. The shallow recess depth allows mounting in constricted plenum situations.



Fixture is c UL us listed for Damp Location (may not be suitable for some outdoor environments). Fixture is in compliance with the component based efficiency standards of the 1995 New York State Energy Conservation Code. Fixture is prewired with high power factor Class P electronic ballast, suitable for use in a fire rated ceiling and approved for eight #12 wire 75°C branch circuit pull-through wiring. Removal of the reflector allows access to the ballast and junction box.



Requires ceiling opening of 7 15/16" (202mm)

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit	TRPH 226/7

Reflector Type	
Downlight	no suffix
Wallwash	WW
Double Wallwash	DWW

Voltage			
120 volt service	120	277 volt service	277

Reflector and Flange Color	*Overlap*	*Flush*
EvenTone Clear	VOL	VFL
OptiTone Clear	COL	CFL
EasyTone Clear	ECOL	ECFL
Champagne Gold	GOL	GFL
Wheat	WHOL	WHFL
Pewter	POL	PFL
Bronze	ZOL	ZFL

Other reflector finishes are available on special order.

Standard reflector flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).

OPTIONS

Specify by adding to the basic unit.

Dimmable 3-wire ballast; not for outdoor application ..... – DM

Emergency battery pack operates one lamp in event of power outage. Fixture footprint increases to 10 x 17 ¾" (254 x 451mm). Additional 1" (25mm) is required to remove EM pack through aperture. Not for outdoor application or double wallwasher (DWW) ..... – EM

⅛" (3mm) thick **clear acrylic shield**, spring-mounted within reflector ..... – PS

- For combinations of the Options above, contact factory or Edison Price Lighting representative.
- A modified fixture suitable for 2" maximum ceiling thickness is available on special order. Contact factory.
- A modified fixture suitable for 347-volt service is available on special order. Contact factory.
- An install-from-below version of this fixture, suitable for installation outside North America, is also available. Contact factory.
- Decorative reflector rings are available on special order. Contact factory.

EDISON PRICE LIGHTING

41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

TRIPLES-H 226/7

PHOTOMETRIC REPORT

Report No. 50243. Original Independent Testing Laboratories, Inc. (ITL) test report furnished upon request.

Luminaire ..... recessed compact fluorescent downlight with spun aluminum reflector
Lamp ..... two Philips 26-watt triple-tube compact fluorescent, 4-pin, GX24q-3 base, 1800 lumens each
Efficiency 50.4%
Spacing Criteria.... 0°- 1.1, 90°-1.5, 180°-1.5
Axis orientation.... 0° plane is parallel to lamps, opposite sockets

BALLAST INFORMATION

Voltage	*120*	*277*
Input Watts	56	56
Line Current (A)	.49	.21
Power Factor (%)	>98	>98
THD (%)	<10	<10
Min. Starting Temp* (°F)	0	0

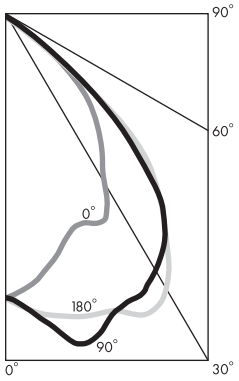
**Consult lamp manufacturers for specific temperatures.*

ZONAL LUMEN SUMMARY

Zone	*Lumens*	*% Lamp*	*% Fixture*
0 - 30°	847	23.5	46.7
0 - 40°	1384	38.5	76.3
0 - 60°	1813	50.4	99.9
0 - 90°	1815	50.4	100.0
90 -180°	0	0.0	0.0
0 -180°	1815	50.4	100.0

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle*				
	0.0	*45.0*	*90.0*	*135.0*	*180.0*
0	957	957	957	957	957
5	914	947	1006	1016	998
15	780	928	1130	1150	1048
25	768	868	1053	1143	1112
35	570	771	925	1005	936
45	380	477	576	641	638
55	6	7	8	9	8
65	2	2	2	2	2
75	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0



LUMINANCE DATA *(Candela/m²)*

Vertical Angle	*Average 0° Longitude*	*Average 90° Longitude*	*Average 180° Longitude*
45	20880	31650	35057
55	406	542	542
65	184	184	184
75	0	0	0
85	0	0	0

To convert cd/m² to footlamberts, multiply by 0.2919.

COEFFICIENTS OF UTILIZATION – ZONAL CAVITY METHOD

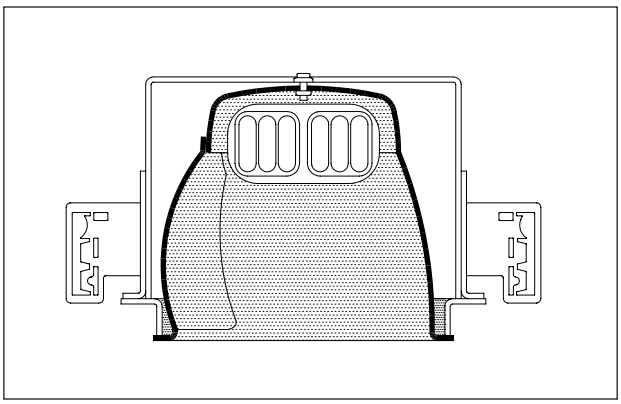
Effective Floor Cavity Reflectance 20%

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	60	60	60	60	59	59	59	59	56	56	56	54	54	54	51	51	51	50
1	57	55	54	53	56	54	53	52	52	51	50	50	49	49	48	48	47	46
2	53	51	48	46	52	50	48	46	48	46	45	46	45	44	45	44	43	42
3	50	46	43	41	49	46	43	41	44	42	40	43	41	39	42	40	39	38
4	47	42	39	37	46	42	39	36	41	38	36	40	37	36	39	37	35	34
5	44	39	35	33	43	38	35	33	37	35	32	37	34	32	36	34	32	31
6	41	36	32	30	40	35	32	30	35	32	29	34	31	29	33	31	29	28
7	38	33	29	27	38	33	29	27	32	29	27	31	29	27	31	28	26	26
8	36	30	27	25	35	30	27	24	30	27	24	29	26	24	28	26	24	23
9	34	28	25	22	33	28	25	22	27	24	22	27	24	22	26	24	22	21
10	32	26	23	21	31	26	23	21	26	23	20	25	22	20	25	22	20	20

TRIPLES-H 226/7 WW

WALLWASH INFORMATION

Distance From Ceiling (Feet)	*3' From Wall; 3' O.C.*		*3'6" From Wall; 3'6" O.C.*	
	Below Fixture	*Between Fixtures*	*Below Fixture*	*Between Fixtures*
1	8	6	4	4
2	14	12	9	8
3	21	18	13	10
4	24	23	17	16
5	22	22	18	17
6	19	18	16	16
7	15	15	14	14
8	13	12	12	11
9	10	10	10	10
10	8	8	8	8
11	7	7	7	7
12	5	5	6	6



All vertical footcandles are initial values with no contribution from ceiling or floor reflectances. Computation performed with at least five wallwashers.

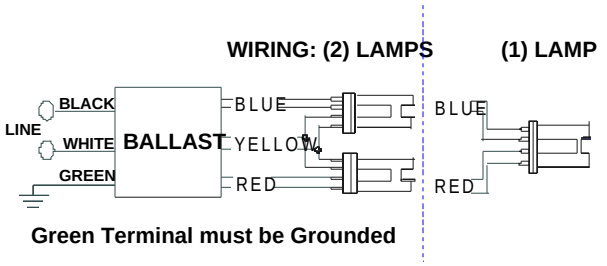
ICF-2S26-H1-LD@277

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.
CFM26W/GX24Q	1	26	0/-18	0.11	29	1.10	10	0.98	1.5	3.79
* CFM26W/GX24q	2	26	0/-18	0.20	54	1.00	10	0.99	1.5	1.85
CFM32W/GX24q	1	32	0/-18	0.13	36	0.98	10	0.98	1.5	2.72
CFM42W/GX24q	1	42	0/-18	0.17	46	0.98	10	0.98	1.5	2.13
CFQ26W/G24q	1	26	0/-18	0.10	27	1.00	10	0.98	1.5	3.70
CFQ26W/G24q	2	26	0/-18	0.19	51	1.00	10	0.99	1.5	1.96
CFS21W/GR10q	2	21	0/-18	0.18	51	1.12	10	0.99	1.5	2.20
FT24W/2G11	2	24	0/-18	0.18	48	0.93	10	0.99	1.5	1.94

Wiring Diagram



Green Terminal must be Grounded

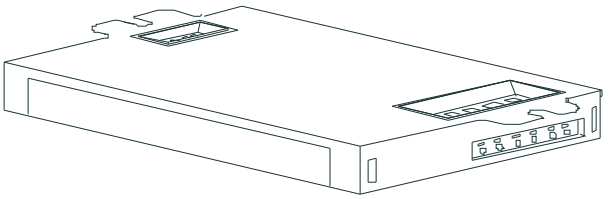
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0.0	
White	0.0	
Blue	0.0	
Red	0.0	
Yellow	0	
Gray		
Violet		

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

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 09/02/2004

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

ICF-2S26-H1-LD@277	
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 Underwriters Laboratories (UL) 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) except for RCF models which shall be Consumer (Class B).

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.

4.4 Ballast shall be Advance part # _____ or approved equal.

Revised 09/02/2004

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

PL-T 26W/830 GX24q-3 /4P ALTO 1CT

Product family description
PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

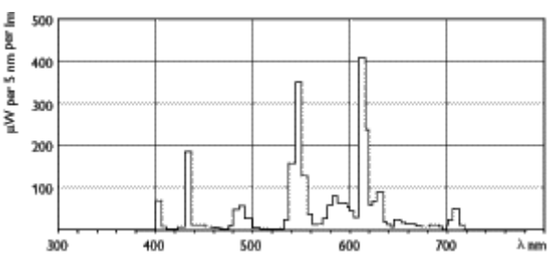
- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

Product data	
Product Number	268235
Full product name	PL-T 26W/830 GX24q-3 /4P ALTO 1CT
Ordering Code	PL-T 26W/830/4P/ALTO
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268237

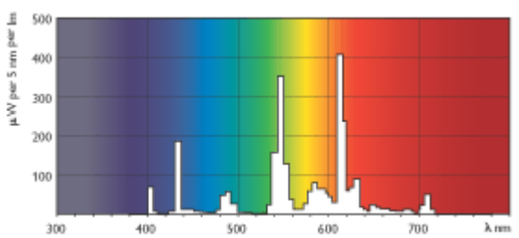
PHILIPS

Product data	
EAN2US	
Case Bar Code	50046677268232
Successor Product number	
Base	GX24q-3
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	12000 hr
Ordering Code	PL-T 26W/830/4P/ALTO
Pack UPC	046677268237
Case Bar Code	50046677268232
Watts	26W
Lamp Voltage	105 V
Dimmable	Yes
Color Code	830 [CCT of 3000K]
Color Rendering Index	82 Ra8
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature	3000 K
Initial Lumens	1800 Lm
Initial Lumens	1800 Lm
Overall Length C	126.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Special packing	ALTO
Product Number	268235

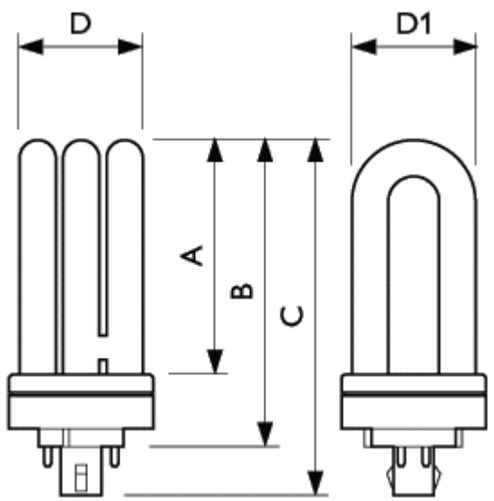
PL-T 26W



PL-T/830



PL-T/830



PL-T

	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 26W/ 830 GX24q -3 /4P ALTO 1CT	87	111.5	126.4	39.85	39.65

Saturn Maxi Wall

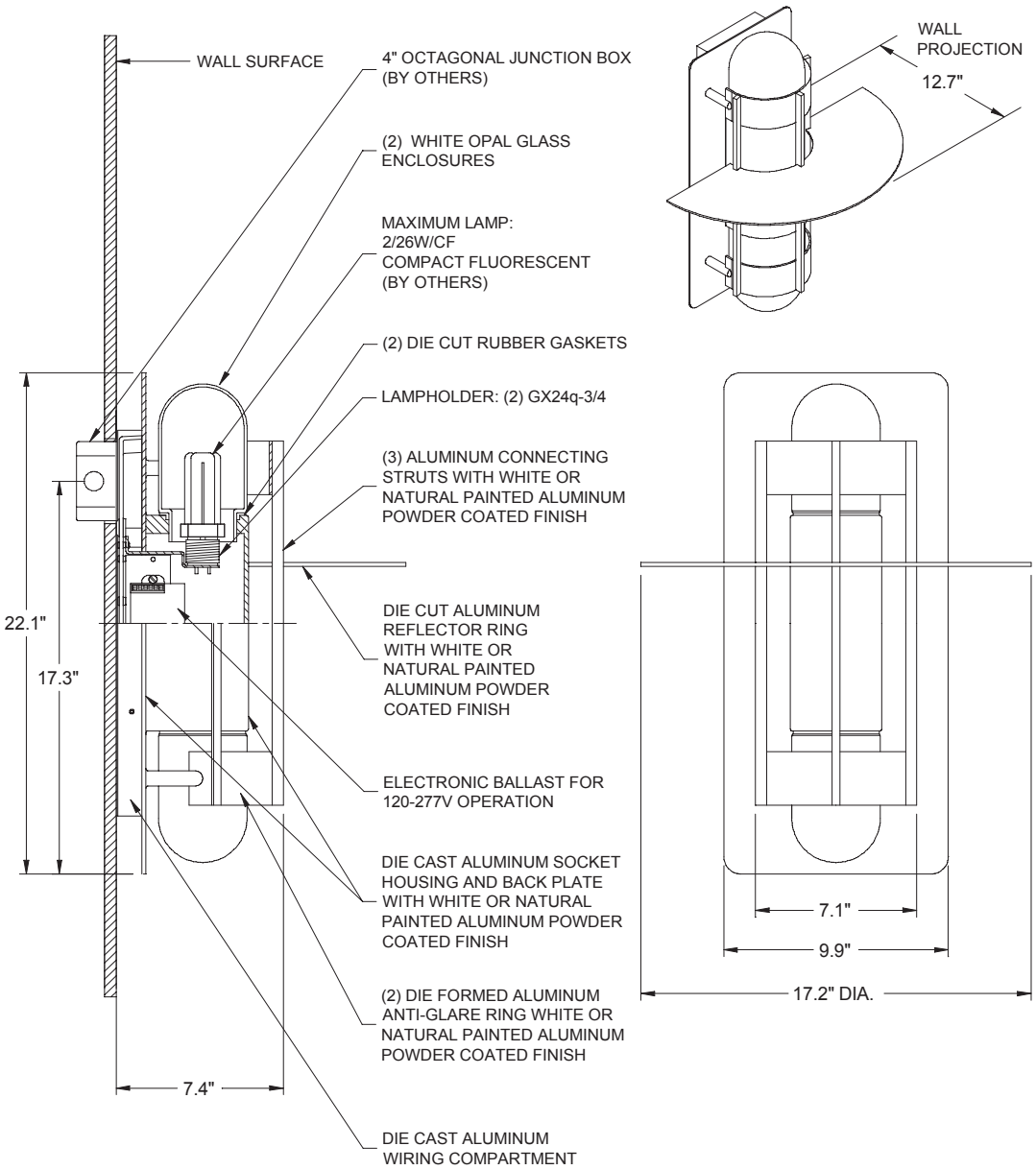
compact fluorescent

Design: Joachim Lepper

Type:

Project:

Catalog Number:



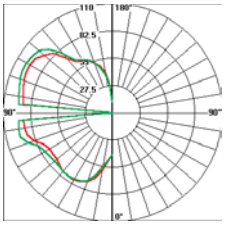
louis poulsen

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

www.louispoulsen.com

Saturn Maxi Wall

compact fluorescent



Photometric Report:	SAW-MAX-2-26W-GX24q-3/4.IES
Report No.:	L5518
Poulsen Report No.:	SAW-MAX-2-26W-G X24q-3/4.IES
Luminaire:	Saturn Maxi Wall, White
Lamp:	2/26W/GX24q-3/4
Efficiency:	51.2%
Description:	All data shown are per 1800 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	98.4
5	116.4
10	138.6
25	201.2
40	196.2
55	188.4
70	225.5
85	241.7
90	239
120	268.3
150	178.2
180	28.3

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0-30	121.07	3.4	6.6
0-40	214.83	6	11.7
0-60	439.53	12.2	23.9
0-90	888.9	24.7	48.2
90-120	488.11	13.6	26.5
90-130	638.38	13.6	26.5
90-150	850.08	23.6	46.1
90-180	953.72	26.5	51.8
0-180	1842.63	51.2	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	55	55	55	55	50	50	50	50	42	42	42	35	35	35	28	28	28	25
1	48	45	42	39	44	41	38	36	34	32	30	27	26	25	21	20	19	16
2	48	38	34	30	39	35	31	28	28	26	23	23	21	19	18	16	15	12
3	38	33	28	25	35	30	26	23	25	21	19	20	17	15	15	13	12	10
4	35	29	24	20	32	26	22	19	21	18	16	17	15	13	13	11	10	8
5	32	35	20	17	29	23	19	16	19	16	13	15	13	11	12	10	8	6
6	29	22	18	15	27	21	16	13	17	14	11	14	11	9	10	9	7	5
7	27	20	16	13	25	18	14	12	15	12	10	12	10	8	9	8	6	5
8	25	18	14	11	23	17	13	10	14	11	9	11	9	7	9	7	5	4
9	23	17	12	10	21	15	11	9	13	10	8	10	8	6	8	6	5	4
10	22	15	11	9	20	14	10	8	12	9	7	9	7	5	7	6	4	3

Saturn Maxi Wall provides general as well as accent illumination. Both anti-glare rings shield the lamps from view and the Saturn ring reflects the light into the space. Depending on the glass enclosure, the illumination is either soft or distinct.

Finish
White or natural painted aluminum, powder coated.

Material
Enclosure: Clear or white opal glass.
Saturn ring: Die cut aluminum. Anti-glare ring: Die formed aluminum.
Back plate: Die cast aluminum.

Mounting
Surface: Mounted directly to finished surface over a recessed 4" octagonal junction box.

Weight
Max. 20 lbs.

Label
cUL, Damp location. IBEW.

specification

Ordering example:

1	2	3	4
Prod.code	Light source	Volt.	Finish
SAW-MAX	**2/26W/CF Gx24q-3/4**	**120-277V**	**NAT. PAINT. ALU.**

1 **Product code**
SAW-MAX

2 **Light source**
2/26W/CF Gx24q-3/4[a,c]
2/150W/A-21/CL medium[b,d]

3 **Voltage**
120-277V
120V

4 **Finish**
NAT. PAINT ALU.
WHT

Specification notes:
a. CF variant is provided with white opal glass enclosure.
b. Incandescent variant is provided with clear glass enclosure.
c. CF variant is provided with one 120-277V integral electronic ballast.
d. Incandescent variant is only available in 120V.

Info notes:
I. The comparable EU version has the following classification: Ingress Protection Code: IP44.

Spare parts:
Orbiter/Saturn clear glass
Orbiter/Saturn white opal glass

louis poulsen

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

www.louispoulsen.com

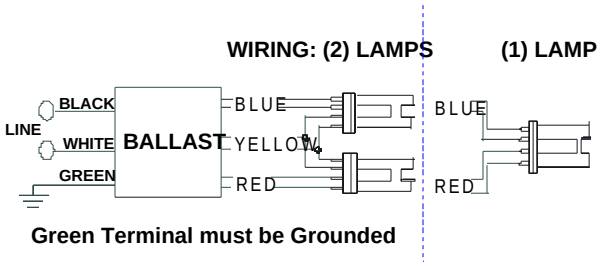
ICF-2S26-H1-LD@277

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.
CFM26W/GX24Q	1	26	0/-18	0.11	29	1.10	10	0.98	1.5	3.79
* CFM26W/GX24q	2	26	0/-18	0.20	54	1.00	10	0.99	1.5	1.85
CFM32W/GX24q	1	32	0/-18	0.13	36	0.98	10	0.98	1.5	2.72
CFM42W/GX24q	1	42	0/-18	0.17	46	0.98	10	0.98	1.5	2.13
CFQ26W/G24q	1	26	0/-18	0.10	27	1.00	10	0.98	1.5	3.70
CFQ26W/G24q	2	26	0/-18	0.19	51	1.00	10	0.99	1.5	1.96
CFS21W/GR10q	2	21	0/-18	0.18	51	1.12	10	0.99	1.5	2.20
FT24W/2G11	2	24	0/-18	0.18	48	0.93	10	0.99	1.5	1.94

Wiring Diagram



Green Terminal must be Grounded

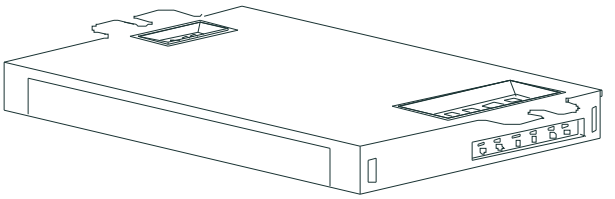
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0.0	
White	0.0	
Blue	0.0	
Red	0.0	
Yellow	0	
Gray		
Violet		

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

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 09/02/2004

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

ICF-2S26-H1-LD@277	
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 Underwriters Laboratories (UL) 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) except for RCF models which shall be Consumer (Class B).

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.

4.4 Ballast shall be Advance part # _____ or approved equal.

Revised 09/02/2004

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

PL-T 26W/830 GX24q-3 /4P ALTO 1CT

Product family description
PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

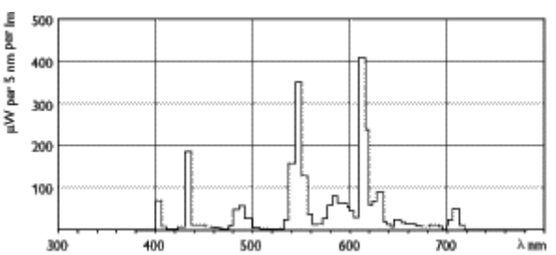
- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

Product data	
Product Number	268235
Full product name	PL-T 26W/830 GX24q-3 /4P ALTO 1CT
Ordering Code	PL-T 26W/830/4P/ALTO
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268237

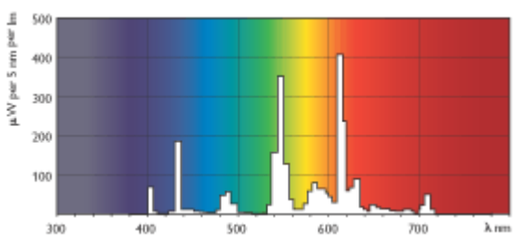
PHILIPS

Product data	
EAN2US	
Case Bar Code	50046677268232
Successor Product number	
Base	GX24q-3
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	12000 hr
Ordering Code	PL-T 26W/830/4P/ALTO
Pack UPC	046677268237
Case Bar Code	50046677268232
Watts	26W
Lamp Voltage	105 V
Dimmable	Yes
Color Code	830 [CCT of 3000K]
Color Rendering Index	82 Ra8
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature	3000 K
Initial Lumens	1800 Lm
Initial Lumens	1800 Lm
Overall Length C	126.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Special packing	ALTO
Product Number	268235

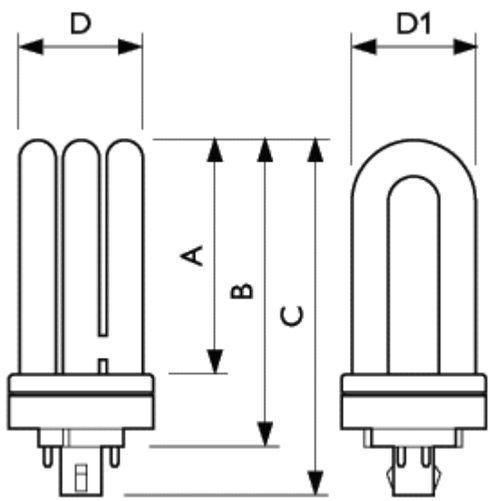
PL-T 26W



PL-T/830



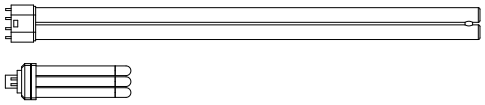
PL-T/830



PL-T

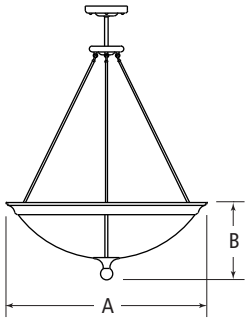
	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 26W/ 830 GX24q -3 /4P ALTO 1CT	87	111.5	126.4	39.85	39.65

HERITAGE PENDANT



SPECIFICATIONS

Trim: Trim ring is 20-gauge spun steel and attaches to luminous bowl with no visible hardware.
Luminous Bowl: Bowl is formed white opal acrylic standard with the option of three faux alabaster choices. Lamp housing has no open holes to minimize the collection of dust and debris in bowl. Dust cover is optional. New England style features a bell shaped bowl.
Reflector: Biaxial fluorescent reflector is a combination of high reflectance specular aluminum and high reflectance white powder coat paint. CFL reflector is high reflectance white powder coat paint.
Optics: Maximum candlepower at 135 degrees or below to minimize brightness on ceiling above fixture and maximize fixture spacing. Recommended suspension is 24" or more.
Suspension: 5/8" OD stem with 30 degree swivel at canopy for single pendant units and 1" stem for chandelier units. Stem and canopy finish to be specified. Minimum suspension length for RDS option is 18". Consult factory for non-swivel flat ceiling applications.
Electrical: Fluorescent ballasts are instant start, normal light output, high power factor, and sound rated A. Ballast factor varies between 0.86 and 0.90 depending on lamp wattage, number of lamps, and voltage. Consult factory for specific ballast factor.
Finish: Standard colors are available from color chart. Plated finishes and custom colors are available. Specify finish of trim ring, and suspension with canopy.
Certification: UL and CUL listed and IBEW labeled.



DIMENSIONAL DATA TABLE

Diameter	A	B
20"	20 3/4"	8 5/8"
	527	219
29"	28 5/8"	11"
	727	279
35"	34 5/8"	12 1/4"
	879	311
41"	40 5/8"	13 1/4"
	1031	337

Note: consult factory for larger diameters.

EXAMPLE

fixture series	lamps up	lamps down	bowl style	suspension style	suspension length	trim finish	suspension finish	voltage	options
HR35	6/39	1/382D	A	SO	XX"	SGW	SGW	120	ALB/3
HR20	**4/26CFL** **2/27BX**	**N/A**	**HT**-Traditional **HC**-Colonial **HN**-New England	**SO**-stem only **RDS**-stem with fluted rods **CN**-stem with chains **DBSO**-double chandelier, stem only **TRSO**-triple chandelier, stem only **QDSO**-quad chandelier, stem only **DBRDS**-double chandelier, stem with fluted rods **TRRDS**-triple chandelier, stem with fluted rods **QDRDS**-quad chandelier, stem with fluted rods **DBCN**-double chandelier, stem with chains **TRCN**-triple chandelier, stem with chains **QDCN**-triple chandelier, stem with chains **DBSH**-double hook chandelier **TRSH**-triple hook chandelier **QDSH**-quad hook chandelier	Ceiling to top of fixture in inches	**SGW**-semi-gloss white (refer to color chart in Product Selection Guide for other standard colors) **SCH**-satin chrome **CH**-polished chrome **BR**-polished brass **AB**-antique brass **SBN**-satin brushed nickel **PN**-polished nickel **CC**-custom color (trim finish includes trim, finial and straps)	**SGW**-semi-gloss white (refer to color chart in Product Selection Guide for other standard colors) **SCH**-satin chrome **CH**-polished chrome **BR**-polished brass **AB**-antique brass **SBN**-satin brushed nickel **PN**-polished nickel **CC**-custom color	**120** **277** **347** (40W only)	**GLR**-GLR fuse and HLR holder **GMF**-GMF slow blow fuse and holder **DC**-Dust cover **ALB/#**-Faux alabaster bowl (see color chart for #) **EM1**-B70A or equal **EM2**-B50 or equal **EM3**-B100 or equal **EM4**-B60 or equal **DIM1**-Advance Mark VII dimming **DIM2**-Advance Mark X dimming **DIM3**-Lutron ECO-10 dimming ballast **DIM4**-Lutron Hi-Lume dimming ballast **DIM5**-Lutron ECO-10 TVE dimming ballast
HR29	**4/42CFL** **3/39BX**	**1/282D** **2/39BX** **3/39BX**							
HR35	**4/42CFL** **4/39BX** **6/39BX**	**1/382D** **4/39BX**							
HR41	**4/42CFL** **4/40BX** **6/40BX** **4/50BX** **6/50BX** **4/55BX** **6/55BX**	**1/382D** **2/40BX** **4/40BX** **2/50BX** **4/50BX** **2/55BX** **4/55BX**							

Due to a program of continuous improvement, LAM Lighting reserves the right to make any variation in design or construction to the equipment described.

ORDER

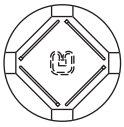
project name: _____ type: _____ quantity: _____

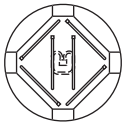
	–		–		–		–		–		–		–		–	

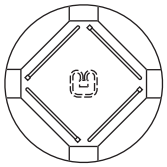
LAMP CONFIGURATIONS

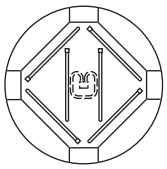

HR20-2

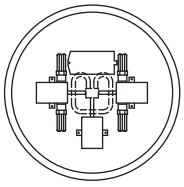

HR29-3


HR35-4

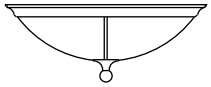

HR35-6

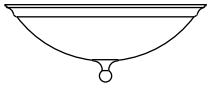

HR41-4

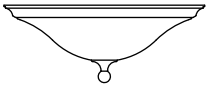

HR41-6


HR-CFL

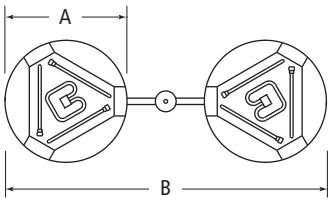
STYLES

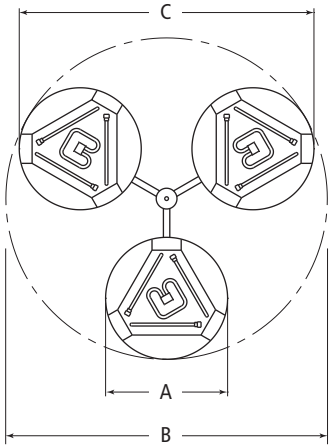

Traditional

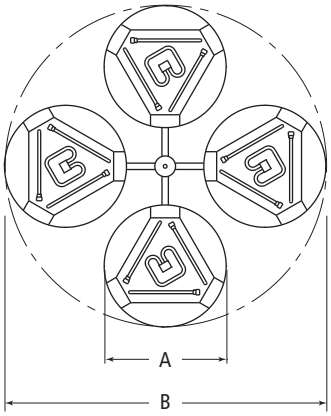

Colonial

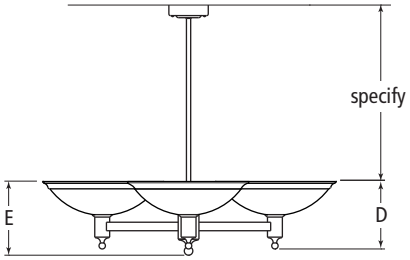

New England

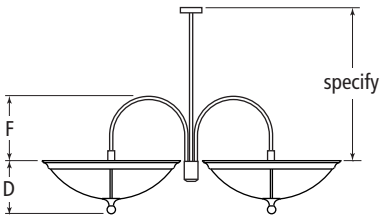
CHANDELIERS











ARM CHANDELIER DIMENSION DATA

Diameter	A	B	C	D	E
20″	20 3/4″ 527	54″ 1372	49 1/2″ 1257	14 1/8″ 359	15 5/8″ 397
29″	28 5/8″ 727	75 1/2″ 1918	69 1/4″ 1759	16″ 406	17 1/2″ 445
35″	34 5/8″ 879	91 3/8″ 2321	83 13/16″ 2129	17 3/8″ 441	18 7/8″ 479
41″	40 5/8″ 1032	107 1/4″ 2724	98 5/8″ 2505	18 3/4″ 476	20 1/4″ 514

HOOK CHANDELIER DIMENSION DATA

Diameter	A	B	C	D	F
20″	20 3/4″ 527	50 13/16″ 1291	46 13/16″ 1189	8 9/16″ 217	18 5/8″ 473
29″	28 5/8″ 727	78 7/8″ 2003	72 1/8″ 1832	11″ 278	22″ 559
35″	34 5/8″ 879	84 7/8″ 2156	78 1/8″ 1984	12 1/4″ 311	22″ 559
41″	40 5/8″ 1032	90 7/8″ 2308	84 1/8″ 2139	13 1/4″ 337	22″ 559

EMERGENCY POWER

Fixture Diameter	Uplight lamps	Battery Location	Limitations
20	4/26	Remote	3-feet maximum remote distance
20	2/27	Remote	3-feet maximum remote distance
29	4/42	Integral	2 circuit (2 ballasts) uplight maximum
29	3/39	Integral	1 circuit (1 ballast) uplight
35	4/42	Integral	2 circuit (2 ballasts) uplight maximum
35	6/39	Integral	2 circuit (2 ballasts) uplight maximum
35	4/40	Integral	2 circuit (2 ballasts) uplight maximum
41	4/42	Integral	2 circuit (2 ballasts) uplight maximum
41	4/40	Integral	2 circuit (2 ballasts) uplight maximum
41	4/50	Integral	2 circuit (2 ballasts) uplight maximum
41	4/55	Integral	2 circuit (2 ballasts) uplight maximum
41	6/40	Integral	2 circuit (2 ballasts) uplight maximum
41	6/50	NA	Not Available
41	6/55	NA	Not Available

DIMMING

Fixture Diameter	Uplight lamps	DIM1	DIM2	DIM3	DIM4	DIM5
20	4/26	Yes	Yes	No	Yes	No
20	2/27	No	No	No	No	No
29	4/42	Yes	Yes	No	Yes	No
29	3/39	Yes	Yes	Yes	Yes	No
35	4/42	Yes	Yes	No	Yes	No
35	6/39	Yes	Yes	Yes	Yes	No
35	4/40	No	No	Yes	Yes	No
41	4/42	Yes	Yes	No	Yes	No
41	4/40	Yes	Yes	Yes	Yes	Yes
41	4/50	No	No	Yes	Yes	No
41	4/55	Yes	Yes	No	No	No
41	6/40	Yes	Yes	Yes	Yes	Yes
41	6/50	No	No	Yes	Yes	No
41	6/55	Yes	Yes	No	No	No

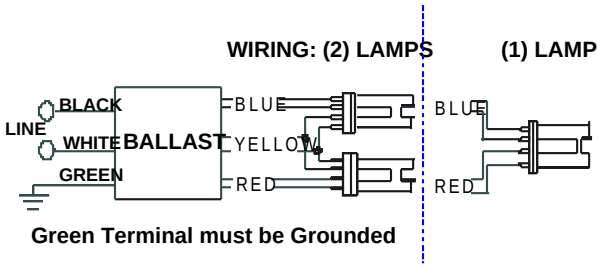
ICF-2S42-M2-BS@277

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.
* CFM42W/GX24q	2	42	0/-18	0.33	93	0.97	10	0.99	1.5	1.04

Wiring Diagram



Green Terminal must be Grounded

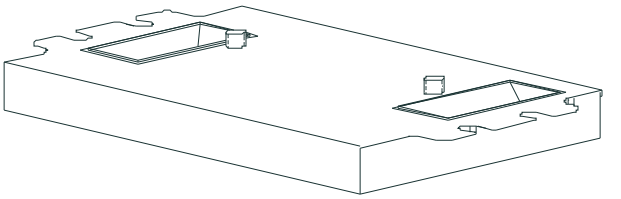
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0.0	
White	0.0	
Blue	0.0	
Red	0.0	
Yellow	0	
Gray		
Violet		

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

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 09/02/2004

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

ICF-2S42-M2-BS@277	
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 Underwriters Laboratories (UL) 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) except for RCF models which shall be Consumer (Class B).

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.

4.4 Ballast shall be Advance part # _____ or approved equal.

Revised 09/02/2004

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

PL-T 42W/830 GX24q-4 /4P ALTO 1CT

Product family description
PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

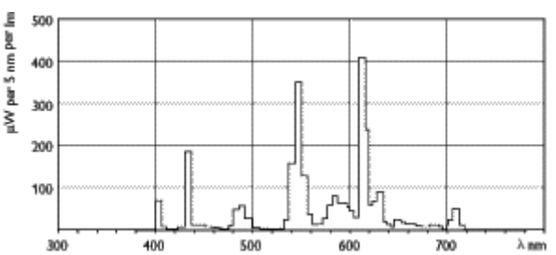
- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

Product data	
Product Number	268730
Full product name	PL-T 42W/830 GX24q-4 /4P ALTO 1CT
Ordering Code	PL-T 42W/830/4P/ALTO
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268732

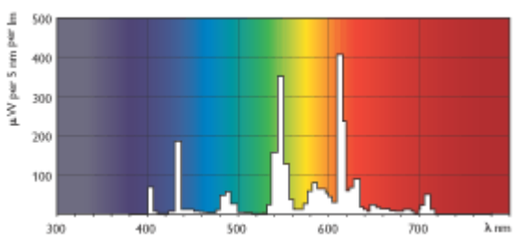
PHILIPS

Product data	
EAN2US	
Case Bar Code	50046677268737
Successor Product number	
Base	GX24q-4
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	12000 hr
Ordering Code	PL-T 42W/830/4P/ALTO
Pack UPC	046677268732
Case Bar Code	50046677268737
Watts	42W
Lamp Voltage	- V
Dimmable	Yes
Color Code	830 [CCT of 3000K]
Color Rendering Index	82 Ra8
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature	3000 K
Initial Lumens	- Lm
Initial Lumens	3200 Lm
Overall Length C	158.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Special packing	ALTO
Product Number	268730

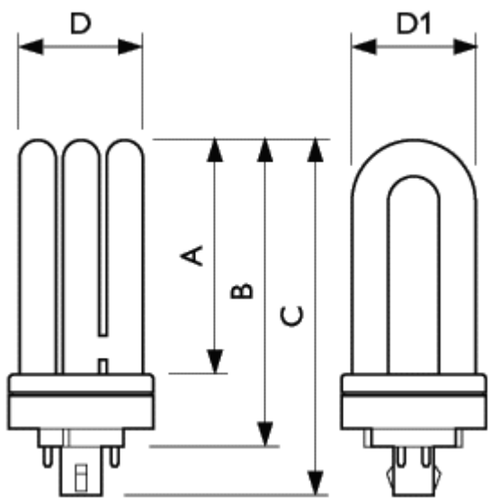
PL-T 42W



PL-T/830



PL-T/830



PL-T

	A	B	C	D	D1
Full product name	Max	Max	Max	Max	Max
PL-T 42W/ 830 GX24q -4 /4P ALTO 1CT	119	143.5	158.4	39.85	39.65

LITECONTROL

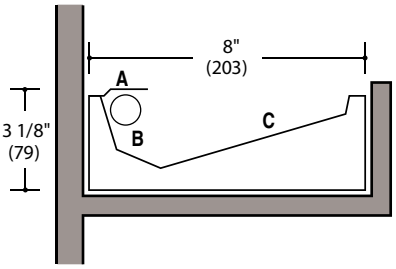
Type:
Project:

Cove-30™

CC-AI-3000

Concealed Cove System

Specifications



A Luminance Control Deflector™ minimizes socket shadows.

B High-reflectance aluminum for maximum horizontal light projection.

C High-reflectance white reflector for efficient indirect distribution.

HOUSING. Die-formed steel. Paint finish is baked white enamel. Ends provided with a 7/8" hole to accommodate pre-wiring.

REFLECTORS. Die-formed steel, finished in high-reflectance white, precisely shaped for maximum horizontal light projection. Configuration with four reflector surfaces includes a high-reflectance specular aluminum insert. Luminance Control Deflector™ (**LCD**), finished in high-reflectance white, reduces wall brightness directly above fixture and minimizes socket shadows between fixtures.

LAMPING. Available in one- and two-lamp T5, T5HO or T8; one-lamp 39-, 40-, or 50-watt twin-tube compact fluorescent cross-sections .

BALLAST. Electronic Ballast (**ELB** - for T8 lamping) or Low-profile Electronic Ballast (**LP/ELB** - for T5 or T5HO lamping), high power factor, thermally protected Class P, Sound Rated A, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.

TANDEM WIRING. When selected from Ordering guide below, fixtures wired to switch in-line lamps separately, providing two (two-lamp cross-section fixtures only) levels of light.

PRE-WIRING. Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory-installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-wiring Information for details.

MOUNTING. Fixtures are installed in cove provided by others. See Planning for installation for detailed information.

CERTIFICATION. Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., A.F. of L. label.

Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Ordering guide

Product, lamping, & length

CC -	AI -	30	2	4	T8 -
Mounting	Distribution	Series	Lamp Count	Nominal Length(ft)	Lamp Type
CC Concealed Cove	**AI** Asymmetric indirect	**30**	**1*, 2 →**	**2 →**	**T8**
			1*, 2 →	**3 →**	**T5HO**
			1*, 2 →	**4 →**	**T5**
			2, 4 →	**6 →**	
			2, 4 →	**8 →**	
			1 →	**2 →**	**BX40**
			2 →	**4 →**	**BX50**
			4 →	**8 →**	
			2 →	**3 →**	**BX39**
			4 →	**6 →**	
			see **notes**		

Options

CWM -	TW -	ELB -	2CWQ -	LP/EF -	120
Finish	Tandem Wiring	Ballast options	Pre-wiring	Other options	Volts
CWM (Matte White) is standard	**--** →		**1CWQ**	**LP/EF**	**120**
	TW →		**2CWQ**	**F**	**277**
	see **notes**	**ELB** is std. for T8 or BX **LP/ELB** is std. for T5 or T5HO **DA/ELB** **HEL/ELB** **ECO/ELB** see **Ballast options**		**WKC/WP** **WKC/NP** **AMA5** **AMA10** see **Other options**	

notes:

Lamp Count = total number of lamps in the fixture

* For applications using 1-lamp T5 or T5HO see Cove-25.

Tandem Wiring not available for one-lamp cross-section fixtures

For Ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.

Cross-section lamping

1-T8 | **2-T8** | **2-T5 or T5HO** | **1-BX39, 40 or 50**

CC-AI-3024T8-CWM-TW-ELB-2CWQ-EF-120 is a typical catalog number for a 2-lamp (2 lamps in cross-section), 4-foot long T8 fixture, Matte White finish, tandem-wired electronic ballast, pre-wired with two-circuit branch wiring, emergency fluorescent ballast, 120 volts.

Questions to Ask

1. 120 or 277 volt? **2.** Row information, including desired fixture lengths?

3. Other options?

Ballast options

Specify in place of **ELB** or **LP/ELB**, contact factory for availability/compatibility with lamping:

DA/ELB Advance Mark VII Dimming Ballast.
HEL/ELB Osram Sylvania Helios Dimming Ballast.
ECO/ELB Lutron ECO-10 Dimming Ballast.

Other options

LP/EF Low-profile Emergency Fluorescent Ballast. Battery-powered ballast from a UL Listed manufacturer will operate one T5 or T5HO lamp for 1 1/2 hours.
F Fuse. Slow or fast blow, determined by Litecontrol.
WKC/WP Corner Wiring Kit. With quick-connects.
WKC/NP Corner Wiring Kit. Without quick-connects.
AMA Adjustable Mounting Angle. Quick attach component to tilt housing either **5°** or **10°**.

Planning for installation

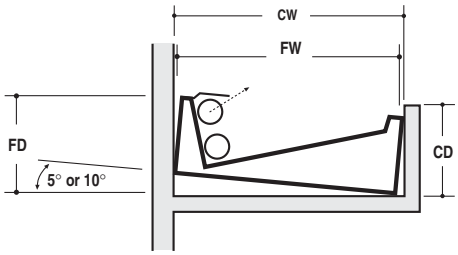
Cove provided by others. Interior cove dimensions should allow for 3 1/8" x 8" fixture cross-section to fit within cove, taking into consideration as-built tolerances. For maximum efficiency, wall and ceiling above cove should have matte surfaces with high reflectances. See design guidelines below. Maximum fixture weight per foot is four pounds.

Corner Wiring Kit

Provides the advantages of pre-wiring around corners. Make connections at each end of the flexible whip, push wires into fixtures, then snap onto headers. Specify **WKC/WP** (with push-in quick-connects).

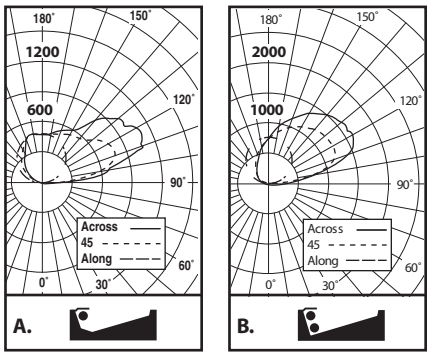
Adjustable Mounting Angle (AMA) Option

When room geometry allows, fixture may be tilted, thereby lowering the beam and resulting in a more effective distribution of light into the room. **AMA** (Adjustable Mounting Angle) quick attach component snaps onto housing to raise back of fixture 5° or 10°. Recommended cove sizes are shown.



Angle of Tilt	Ordering Option	Fixture Depth (**FD**)	Fixture Width (**FW**)	Recommended Cove Depth (**CD**)	Recommended Cove Width (**CW**)
0	**(standard)**	3 1/8"	8"	3 1/4"	8 1/4"
5°	**AMA**	3 3/4"	8 1/4"	3 1/4"	8 5/8"
10°	**AMA**	4 1/4"	8 3/8"	3 1/4"	8 5/8"

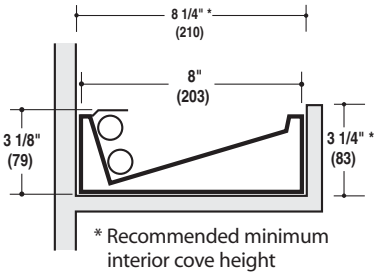
Photometric data



A. CC-AI-3014T8-LP/ELB 79.5% Efficiency
Litecontrol Certified Test Report #29611000

B. CC-AI-3024T8-LP/ELB 63.2% Efficiency
Litecontrol Certified Test Report #29521000

For complete photometric information, see website.



* Recommended minimum interior cove height

Design guidelines

For maximum illumination level flexibility, five lamp combinations are available. For a one-lamp T5 or T5HO fixture in a 2 1/16" deep x 6" wide housing refer to Cove-25 (CC-AI-2500).

As the distance from fixture to ceiling is increased, light distribution becomes more uniform. To avoid excessive brightness on ceiling, maximize the distance from the fixture to the ceiling. A fixture with less output (i.e., one-lamp T8) may be tolerated closer to ceiling than one with higher output. To best evaluate an acceptable mounting position, a mock-up is recommended.

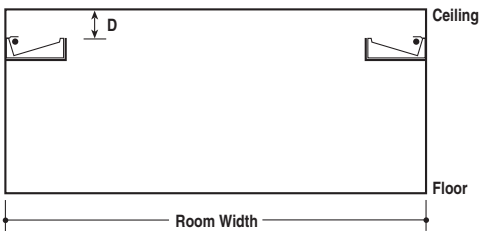
Position fixtures along walls as desired to satisfy visual design goals. To avoid excess corner brightness, stop fixtures 9-15" short of end walls; 0-6" from outside corner.

If using high-output T5 lamps, be advised that lamp lumens per foot for each of the lamp lengths are different. Caution is advised when mixing fixture lengths in rows.

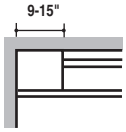
For even lower beam throw and better distribution, consider the Adjustable Mounting Angle (**AMA**) option. This lowers the beam throw by 5° or 10°. Size the cove to hide lamps and fixture. This should only be considered if viewing angles prevent a direct view of the raised portion of the fixture, or if a cut-off angle below horizontal is deemed acceptable.

If the zonal cavity method is used to calculate an average illumination, it is advised in a perimeter layout to derate the illuminance by 10%.

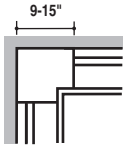
If uniformity of light levels is desired, room width should not exceed the following:
Fixtures along one wall: 6xD
Fixtures on opposite walls: 12xD



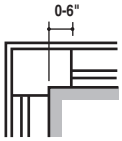
Single row end clearance



Inside corner positioning



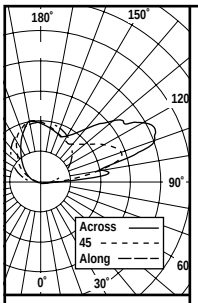
Outside corner positioning

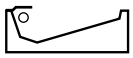


Click on **Quick Find** **30**
litecontrol.com

LITECONTROL . . . an employee owned company
100 Hawks Avenue Hanson MA 02341 781 294 0100 FAX 781 293 2849 info@litecontrol.com litecontrol.com

PHOTOMETRIC DATA





1-T5HO

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	950	950	950	950	950	
175	977	964	957	928	923	91
170	991	976	949	903	890	
165	949	976	932	873	854	260
160	851	933	910	830	820	
155	758	854	881	802	816	387
150	671	768	847	751	898	
145	591	687	803	758	1001	485
140	510	602	756	805	1164	
135	439	517	698	864	1365	579
130	370	441	639	957	1563	
125	304	366	576	1091	1657	675
120	256	301	506	1217	1922	
115	209	237	431	1308	2006	750
110	169	183	350	1365	1913	
105	135	135	260	1246	1313	614
100	105	97	164	815	1020	
95	51	66	68	707	908	315
90	3	3	10	149	212	

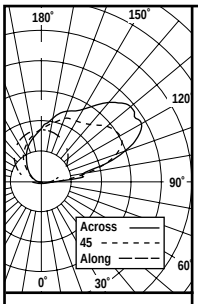
CC-AI-3014T5HO-LP/ELB 83.0 % Efficiency
Litecontrol Certified Test Report #29616000

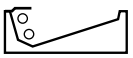
RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.79	.79	.79	.79	.68	.68	.68	.68	.46	.46	.46	.26	.26	.26	.08	.08	.08	.00
1	.72	.69	.66	.63	.61	.59	.56	.53	.40	.39	.37	.23	.22	.22	.07	.07	.07	.00
2	.65	.60	.55	.51	.56	.51	.47	.44	.35	.33	.31	.20	.19	.18	.06	.06	.06	.00
3	.60	.52	.47	.43	.51	.45	.41	.37	.31	.28	.26	.18	.17	.15	.06	.05	.05	.00
4	.54	.46	.40	.36	.46	.40	.35	.31	.27	.24	.22	.16	.14	.13	.05	.05	.04	.00
5	.50	.40	.35	.30	.42	.35	.30	.26	.24	.21	.19	.14	.12	.11	.04	.04	.04	.00
6	.46	.36	.30	.26	.39	.31	.26	.23	.22	.18	.16	.13	.11	.09	.04	.03	.03	.00
7	.42	.32	.26	.22	.36	.28	.23	.19	.19	.16	.14	.11	.09	.08	.04	.03	.03	.00
8	.39	.29	.23	.19	.33	.25	.20	.17	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
9	.36	.26	.21	.17	.30	.23	.18	.15	.16	.13	.10	.09	.07	.06	.03	.02	.02	.00
10	.33	.24	.18	.15	.28	.21	.16	.13	.14	.11	.09	.08	.07	.05	.03	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	4151	83.03	100.00
90-0°	0	.00	.00
180-0°	4151	83.03	100.00





2-T5HO

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	1682	1682	1682	1682	1682	
175	1610	1616	1684	1781	1872	163
170	1485	1545	1669	1909	2080	
165	1345	1435	1646	2048	2306	494
160	1214	1315	1601	2185	2439	
155	1086	1210	1556	2247	2537	793
150	954	1090	1496	2266	2770	
145	846	966	1422	2324	3055	1062
140	733	847	1339	2454	3345	
135	624	744	1223	2623	3604	1302
130	532	626	1135	2760	3762	
125	433	520	1025	2892	3636	1449
120	365	425	907	2933	3671	
115	297	338	773	2818	3416	1422
110	248	263	625	2559	2834	
105	192	190	465	2006	1886	998
100	154	141	295	1195	1297	
95	64	98	120	910	1013	421
90	8	2	9	186	265	

CC-AI-3024T5HO-LP/ELB 81.0 % Efficiency
Litecontrol Certified Test Report #29626000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.77	.77	.77	.77	.66	.66	.66	.66	.45	.45	.45	.26	.26	.26	.08	.08	.08	.00
1	.70	.67	.64	.61	.60	.57	.55	.52	.39	.38	.37	.23	.22	.21	.07	.07	.07	.00
2	.64	.58	.54	.50	.54	.50	.46	.43	.34	.32	.30	.20	.19	.18	.06	.06	.06	.00
3	.58	.51	.46	.42	.49	.44	.40	.36	.30	.27	.25	.17	.16	.15	.06	.05	.05	.00
4	.53	.45	.39	.35	.45	.39	.34	.30	.27	.24	.21	.15	.14	.13	.05	.05	.04	.00
5	.48	.39	.34	.29	.41	.34	.29	.26	.24	.20	.18	.14	.12	.11	.04	.04	.04	.00
6	.44	.35	.29	.25	.38	.30	.26	.22	.21	.18	.16	.12	.11	.09	.04	.03	.03	.00
7	.41	.32	.26	.22	.35	.27	.22	.19	.19	.16	.13	.11	.09	.08	.04	.03	.03	.00
8	.38	.29	.23	.19	.32	.24	.20	.16	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
9	.35	.26	.20	.16	.30	.22	.17	.14	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
10	.32	.23	.18	.14	.28	.20	.16	.13	.14	.11	.09	.08	.06	.05	.03	.02	.02	.00

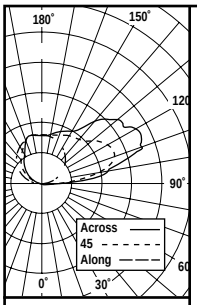
Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	8099	81.00	100.00
90-0°	0	.00	.00
180-0°	8099	81.00	100.00

LITECONTROL . . . an employee owned company
100 HAWKS AVENUE HANSON MA 02341 781 294 0100 FAX 781 293 2849 info@litecontrol.com www.litecontrol.com

PHOTOMETRIC DATA



1-T8

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	467	467	467	467	467	
175	470	469	467	469	475	45
170	474	473	463	481	494	
165	464	474	454	489	510	135
160	419	456	442	494	529	
155	378	419	430	500	559	212
150	336	378	408	504	595	
145	297	338	392	509	690	276
140	258	299	367	533	795	
135	224	257	339	589	885	340
130	189	221	309	659	955	
125	156	186	278	709	954	386
120	134	153	243	741	1048	
115	108	120	205	753	1056	408
110	89	88	165	744	1016	
105	69	69	125	674	775	337
100	56	48	80	489	627	
95	31	34	36	360	439	171
90	1	3	4	98	128	

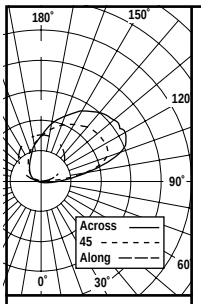
CC-AI-3014T8-LP/ELB 79.5 % Efficiency
Litecontrol Certified Test Report #29611000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.76	.76	.76	.76	.65	.65	.65	.65	.44	.44	.44	.25	.25	.25	.08	.08	.08	.00
1	.69	.66	.63	.60	.59	.56	.54	.51	.38	.37	.36	.22	.21	.21	.07	.07	.07	.00
2	.62	.57	.53	.49	.53	.49	.45	.42	.34	.31	.29	.19	.18	.17	.06	.06	.06	.00
3	.57	.50	.45	.41	.49	.43	.39	.35	.30	.27	.25	.17	.16	.15	.05	.05	.05	.00
4	.52	.44	.38	.34	.44	.38	.33	.30	.26	.23	.21	.15	.14	.12	.05	.04	.04	.00
5	.48	.38	.33	.29	.40	.34	.29	.25	.23	.20	.18	.13	.12	.11	.04	.04	.03	.00
6	.44	.35	.29	.25	.37	.30	.25	.22	.21	.18	.15	.12	.10	.09	.04	.03	.03	.00
7	.40	.31	.25	.21	.34	.27	.22	.19	.18	.15	.13	.11	.09	.08	.03	.03	.03	.00
8	.37	.28	.22	.18	.31	.24	.19	.16	.17	.14	.11	.10	.08	.07	.03	.03	.02	.00
9	.34	.25	.20	.16	.29	.22	.17	.14	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
10	.32	.23	.18	.14	.27	.20	.15	.12	.14	.11	.09	.08	.06	.05	.03	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	2305	79.51	100.00
90-0°	0	.00	.00
180-0°	2305	79.51	100.00



2-T8

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	776	776	776	776	776	
175	685	711	770	837	879	74
170	599	648	766	896	970	
165	546	588	749	958	1068	220
160	493	539	732	1009	1168	
155	445	491	709	1058	1252	360
150	400	446	678	1099	1348	
145	353	403	642	1146	1424	483
140	307	356	601	1182	1501	
135	270	310	554	1211	1549	579
130	231	265	503	1226	1600	
125	191	224	451	1243	1577	633
120	164	185	392	1245	1611	
115	136	148	330	1215	1549	629
110	113	118	265	1142	1347	
105	92	88	194	958	1044	485
100	75	67	122	674	747	
95	38	48	51	366	430	206
90	3	1	5	97	139	

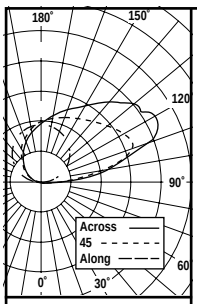
CC-AI-3024T8-LP/ELB 63.2 % Efficiency
Litecontrol Certified Test Report #29521000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.60	.60	.60	.60	.51	.51	.51	.51	.35	.35	.35	.20	.20	.20	.06	.06	.06	.00
1	.55	.52	.50	.48	.47	.45	.43	.41	.31	.30	.28	.18	.17	.17	.06	.05	.05	.00
2	.50	.45	.42	.39	.42	.39	.36	.33	.27	.25	.23	.15	.14	.14	.05	.05	.04	.00
3	.45	.40	.36	.32	.39	.34	.31	.28	.24	.21	.20	.14	.13	.12	.04	.04	.04	.00
4	.41	.35	.31	.27	.35	.30	.26	.24	.21	.18	.17	.12	.11	.10	.04	.04	.03	.00
5	.38	.30	.26	.23	.32	.27	.23	.20	.18	.16	.14	.11	.09	.08	.03	.03	.03	.00
6	.35	.28	.23	.20	.29	.24	.20	.17	.16	.14	.12	.10	.08	.07	.03	.03	.02	.00
7	.32	.25	.20	.17	.27	.21	.17	.15	.15	.12	.10	.09	.07	.06	.03	.02	.02	.00
8	.29	.22	.18	.15	.25	.19	.15	.13	.13	.11	.09	.08	.06	.05	.02	.02	.02	.00
9	.27	.20	.16	.13	.23	.17	.14	.11	.12	.10	.08	.07	.06	.05	.02	.02	.02	.00
10	.25	.18	.14	.11	.21	.16	.12	.10	.11	.09	.07	.06	.05	.04	.02	.02	.01	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	3664	63.18	100.00
90-0°	0	.00	.00
180-0°	3664	63.18	100.00



2-BX

CANDLEPOWER SUMMARY

0° PLANE PERPENDICULAR TO LAMPS

ANGLE	0	45	90	135	180	OUTPUT LUMENS
180	963	963	963	963	963	
175	898	916	961	1006	1046	93
170	827	862	954	1061	1127	
165	776	811	935	1117	1219	274
160	701	766	907	1156	1309	
155	631	705	882	1204	1394	440
150	565	638	843	1253	1477	
145	500	572	802	1289	1604	585
140	440	506	754	1331	1745	
135	383	440	694	1382	1879	711
130	326	376	633	1469	2015	
125	267	321	567	1540	2044	807
120	229	264	497	1617	2194	
115	188	209	416	1649	2168	843
110	154	164	339	1598	1956	
105	116	121	247	1395	1377	660
100	100	91	153	929	1092	
95	45	63	62	587	635	289
90	1	1	5	118	158	

CC-AI-3024BX-ELB 74.5 % Efficiency
Litecontrol Certified Test Report #29620000

RCC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	.71	.71	.71	.71	.61	.61	.61	.61	.41	.41	.41	.24	.24	.24	.08	.08	.08	.00
1	.65	.62	.59	.57	.55	.53	.51	.48	.36	.35	.34	.21	.20	.20	.07	.06	.06	.00
2	.59	.54	.49	.46	.50	.46	.42	.40	.31	.29	.28	.18	.17	.16	.06	.06	.05	.00
3	.54	.47	.42	.38	.46	.40	.36	.33	.28	.25	.23	.16	.15	.14	.05	.05	.04	.00
4	.49	.41	.36	.32	.41	.36	.31	.28	.24	.22	.20	.14	.13	.12	.05	.04	.04	.00
5	.45	.36	.31	.27	.38	.32	.27	.24	.22	.19	.17	.13	.11	.10	.04	.04	.03	.00
6	.41	.33	.27	.23	.35	.28	.23	.20	.19	.16	.14	.11	.10	.08	.04	.03	.03	.00
7	.38	.29	.24	.20	.32	.25	.21	.17	.17	.14	.12	.10	.08	.07	.03	.03	.02	.00
8	.35	.26	.21	.17	.29	.23	.18	.15	.16	.13	.11	.09	.08	.06	.03	.02	.02	.00
9	.32	.24	.18	.15	.27	.20	.16	.13	.14	.11	.09	.08	.07	.06	.03	.02	.02	.00
10	.30	.21	.17	.13	.25	.18	.14	.12	.13	.10	.08	.08	.06	.05	.02	.02	.02	.00

Floor Cavity Reflectance .20

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% LUMINAIRE
180-90°	4696	74.54	100.00
90-0°	0	.00	.00
180-0°	4696	74.54	100.00

PRE-WIRING INFORMATION

Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory-installed push-in quick-connects. The other end will be stripped bacck 1/2" for quick connection in field. Each quick-connect joins two leads with each lead pushed into the device for a secure, positive connection.

Single-circuit option (1CWQ) will contain:

- (1) black lead wired to ballast(s) black lead for connection to "HOT" feed.
- (1) white lead wired to ballast(s) white lead for connection to "COMMON" feed.
- (1) green lead bonded to fixture for connection to "GROUND" feed.

Two-circuit option (2CWQ) will contain:

- (1) black lead wired to ballast(s) black lead for connection to "HOT" feed of one switch leg of circuit.
- (1) red lead wired to ballast(s) black lead for connection to "HOT" feed of other switch leg of circuit.
- (1) white lead wired to ballast(s) white lead for connection to "COMMON" feed.
- (1) green lead bonded to fixture for connection to "GROUND" feed.

Pigtails for feed points or ends of rows are not furnished by Litecontrol. NOTE: All unused leads must be capped off.

Rated ampacity of feed cords provided by Litecontrol (if applicable) shall be the limiting factor in the number of fixtures that can be fed from a single cord.

These standard options do not provide for those installations where special circuits within the fixtures are involved, such as night/emergency, dimming controls, light level sensors, or Master/Slave fixtures. The installing electrical contractor will furnish and install the branch circuit wiring for those fixtures required by the specific situation.

LITECONTROL . . . an employee owned company
100 HAWKS AVENUE HANSON MA 02341 781 294 0100 FAX 781 293 2849 info@litecontrol.com www.litecontrol.com

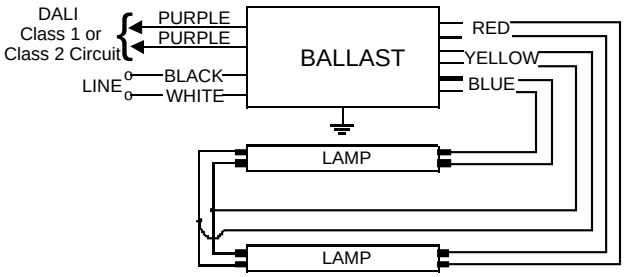
IDA-2S54@120

Brand Name	ROVR
Ballast Type	Electronic Dimming
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 (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
* F54T5/HO	2	54	50/10	1.05	24/125	0.03/1.00	10	0.98	1.7	0.80
FC12T5/HO	2	55	50/10	0.96	24/114	0.03/1.00	10	0.98	1.7	0.88
FT55W/2G11	2	55	50/10	0.96	24/114	0.03/1.00	10	0.98	0.0	0.88

Wiring Diagram



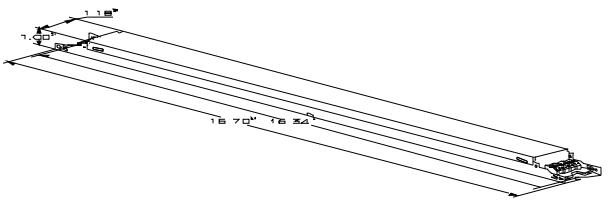
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

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)
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 01/16/2004

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

IDA-2S54@120	
Brand Name	ROVR
Ballast Type	Electronic Dimming
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 or integral leads color coded per ANSI C82.11.

Section II - Performance Requirements

2.1 Ballast shall be Programmed Start.

2.2 Ballast shall be provided with integral protection circuitry to withstand connection of low voltage control leads to mains power supply. In this event, ballast shall default to maximum light output.

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

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

2.5 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.

2.6 Ballast shall have a Power Factor greater than 0.98 at full light output and greater than 0.90 throughout the dimming range for primary lamp.

2.7 Ballast shall have a minimum ballast factor of 1.00 at maximum light output and 0.03 at minimum light output for primary lamp application.

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

2.9 Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.

2.10 Ballast shall have a Class A sound rating.

2.11 Ballast shall have a minimum starting temperature of 10C (50F) for primary lamp.

2.12 Ballast shall provide Lamp EOL Protection Circuit for all T5, T5/HO, CFL lamps, and T8 lamps operating on 4-lamp ballast.

2.13 Ballast shall control lamp light output from 100% - 3% relative light output for T8 and CFL lamps and 100% - 1% relative light output for T5/HO lamps.

2.14 Ballast shall ignite the lamps at any light output setting without first going to another output setting.

2.15 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.

4.4 Ballast shall be controlled by a Class 1 or Class 2 low voltage DALI controller.

4.5 Ballast shall be Advance part # _____ or approved equal.

Revised 01/16/2004

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

F54T5/830 HO ALTO TG

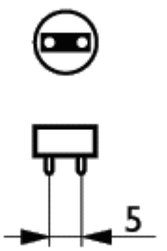
Product family description

Product data	
Product Number	168617
Full product name	F54T5/830 HO ALTO TG
Ordering Code	F54T5/830/HO/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	40
Pack UPC	046677168612
EAN2US	
Case Bar Code	50046677168617
Successor Product number	
System Description	High Output
Base	Miniature Bipin
Base Information	Green [Green Base]
Bulb	T5 [16mm]
Packing Type	1LP [1 Lamp]
Packing Configuration	40
Rated Avg. Life	24000 hr
Name Type	F54T5
Feature	ALTO®
Ordering Code	F54T5/830/HO/ALTO TG
Pack UPC	046677168612
Case Bar Code	50046677168617
Watts	54W
Dimmable	Yes
Mercury (Hg) Content	1.4 mg
Color Code	830 [CCT of 3000K]
Color Rendering Index	85 Ra8

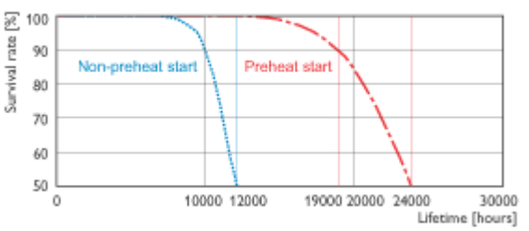
PHILIPS

Product data	
Color Designation	830
Color Description	na [-]
Color Temperature	3000 K
Initial Lumens	- Lm
Overall Length C	1163.2 mm
Diameter D	17 mm
Product Number	168617

TL5

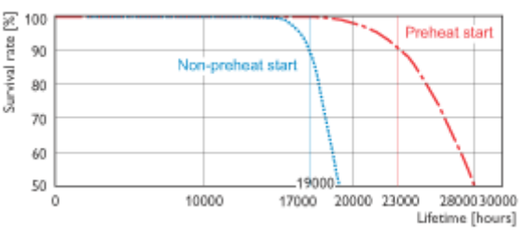


Base Miniature Bipin



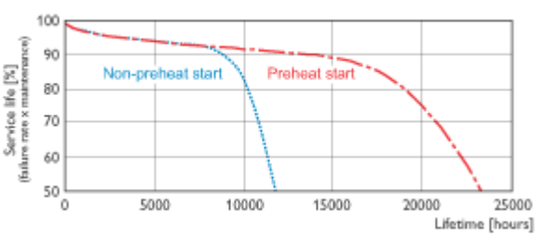
Life Expectancy 3h cycle

TL5



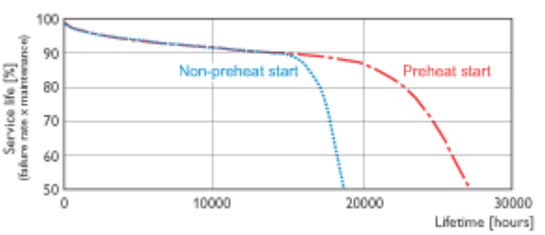
Life Expectancy 12h cycle

TL5



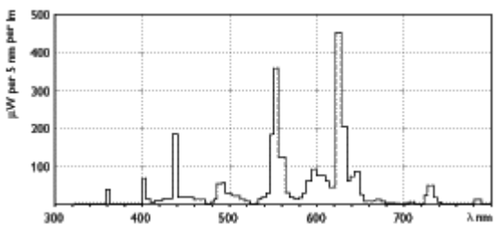
Service Life 3h cycle

TL5

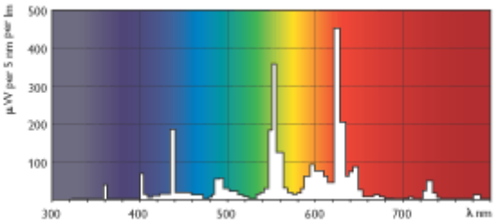


Service Life 12h cycle

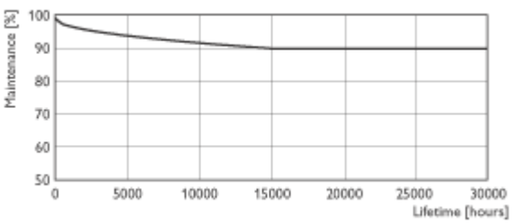
TL5



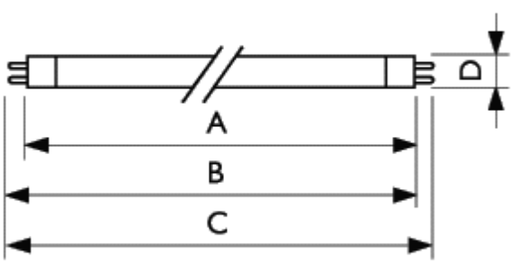
TL5/830



TL5/830



TL5



TL5

	A	B	B	C	D
Full product name	Max	Min	Max	Max	Max
F54T5/830 HO ALTO TG	1149.0	1153.7	1156.1	1163.2	17

TRIPLES-H 232/7

recessed compact fluorescent downlight/wallwasher

Spec Sheet

COMPACT FLUORESCENT
1-382

FEATURES

Triples-H 232/7 is an efficient 7" aperture low brightness downlight, for use with two 32-watt, 4-pin, triple tube compact fluorescent lamps by GE, Sylvania or Philips. Triples-H 232/7 provides shielding angles of 40° parallel to and 40° perpendicular to the lamps. Recess depth is only 7 ¼".

One housing allows interchangeable use of downlight and wallwash reflectors, permitting housings to be installed first and reflectors to be installed or changed at any time.

Triples-H 232/7 uses two 32-watt, 4-pin, triple tube lamps providing 4800 lumens (more than a 250-watt incandescent), a 10,000-hour life, a color rendering index (CRI) of 82, and color temperatures as warm as 2700°K (nearly duplicating the color qualities of incandescent).

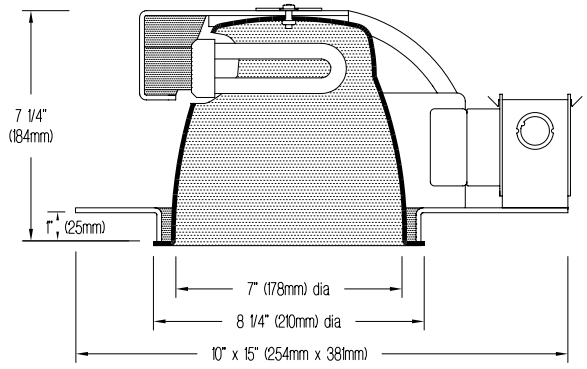
Reflectors are available in clear, natural aluminum in three finishes: **EvenTone**, our standard clear finish, partially diffuse, anti-iridescent and gently luminous in appearance; **OptiTone**, specular and anti-iridescent, with minimum brightness and maximum efficiency; and **EasyTone**, diffuse and luminous. Additionally, reflectors are available in champagne gold, wheat, pewter, and bronze. Wallwash (120°) and double wallwash (2x120°) reflectors are also available.

Triples-H 232/7 includes a pair of mounting bars (¾" x 27" C channel). Specialty bars for wood joist and T-bar installations are available as accessories.

APPLICATIONS

Fixture is recommended for downlighting or wallwashing in offices, stores, banks, schools, auditoriums, hospitals and airports, as well as lobbies and public areas.

Fixture is c UL us listed for Damp Location (may not be suitable for some outdoor environments). Fixture is in compliance with the component based efficiency standards of the 1995 New York State Energy Conservation Code. Fixture is prewired with high power factor Class P electronic ballast, suitable for use in a fire rated ceiling and approved for eight #12 wire 75°C branch circuit pull-through wiring. Removal of the reflector allows access to the ballast and junction box.



Requires ceiling opening of 7 15/16" (202mm)

PRODUCT CODE

For complete product code, list basic unit and select one item from each following box.

Basic Unit	TRPH 232/7

Reflector Type	
Downlight	no suffix
Wallwash	WW
Double Wallwash	DWW

Voltage			
120 volt service	120	277 volt service	277

Reflector and Flange Color	*Overlap*	*Flush*
EvenTone Clear	VOL	VFL
OptiTone Clear	COL	CFL
EasyTone Clear	ECOL	ECFL
Champagne Gold	GOL	GFL
Wheat	WHOL	WHFL
Pewter	POL	PFL
Bronze	ZOL	ZFL

Other reflector finishes are available on special order.

Standard reflector flange continues reflector finish. White painted flanges and custom painted flanges are available on special order. Add WF (white flange) or CCF (custom color flange).

OPTIONS

Specify by adding to the basic unit.

Dimmable 3-wire ballast; not for outdoor application ..... – DM

Emergency battery pack operates one lamp in event of power outage. Fixture footprint increases to 10 x 17 ¾" (254 x 451mm). Additional 1" (25mm) is required to remove EM pack through aperture. Not for outdoor application or double wallwasher (DWW) ..... – EM

⅛" (3mm) thick **clear acrylic shield**, spring-mounted within reflector ..... – PS

- For combinations of the Options above, contact factory or Edison Price Lighting representative.
- A modified fixture suitable for 2" maximum ceiling thickness is available on special order. Contact factory.
- A modified fixture suitable for 347-volt service is available on special order. Contact factory.
- An install-from-below version of this fixture, suitable for installation outside North America, is also available. Contact factory.
- Decorative reflector rings are available on special order. Contact factory.

EDISON PRICE LIGHTING
41-50 22ND STREET, LIC NY 11101 TEL 718.685.0700 FAX 718.786.8530 www.epl.com

TRIPLES-H 232/7

PHOTOMETRIC REPORT

Report No. 50244. Original Independent Testing Laboratories, Inc. (ITL) test report furnished upon request.

Luminaire .....recessed compact fluorescent downlight with spun aluminum reflector
Lamp .....two Philips 32-watt triple-tube compact fluorescent, 4-pin, GX24q-3 base, 2400 lumens each
Efficiency 52.1%
Spacing Criteria...0°- 1.3, 90°-1.4, 180°-1.4
Axis orientation...0° plane is parallel to lamps, opposite sockets

BALLAST INFORMATION

Voltage	*120*	*277*
Input Watts	69	67
Line Current (A)	.58	.26
Power Factor (%)	>98	>98
THD (%)	<10	<10
Min. Starting Temp* (°F)	0	0

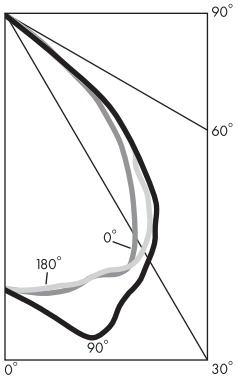
**Consult lamp manufacturers for specific temperatures.*

ZONAL LUMEN SUMMARY

Zone	*Lumens*	*% Lamp*	*% Fixture*
0 - 30°	1143	23.8	45.7
0 - 40°	1860	38.7	74.4
0 - 60°	2496	52.9	99.8
0 - 90°	2500	52.1	100.0
90 -180°	0	0.0	0.0
0 -180°	2500	52.1	100.0

CANDLEPOWER DISTRIBUTION *(Candela)*

Vertical Angle	*Horizontal Angle*				
	0.0	*45.0*	*90.0*	*135.0*	*180.0*
0	1263	1263	1263	1263	1263
5	1274	1304	1326	1307	1263
15	1280	1403	1536	1434	1272
25	1292	1348	1379	1372	1282
35	1007	1167	1171	1180	1130
45	633	726	769	812	783
55	8	14	20	21	23
65	4	4	4	4	4
75	1	1	1	1	2
85	0	0	0	0	0
90	0	0	0	0	0



LUMINANCE DATA *(Candela/m²)*

Vertical Angle	*Average 0° Longitude*	*Average 90° Longitude*	*Average 180° Longitude*
45	34788	42262	43032
55	542	1355	1558
65	368	368	368
75	150	150	300
85	0	0	0

To convert cd/m² to footlamberts, multiply by 0.2919.

COEFFICIENTS OF UTILIZATION – ZONAL CAVITY METHOD

Effective Floor Cavity Reflectance 20%

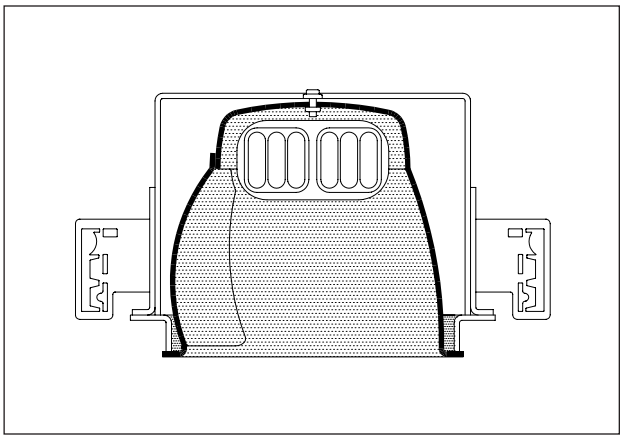
Ceiling Reflectance (%)	*80*				*70*				*50*			*30*			*10*			*0*
Wall Reflectance (%)	*70*	*50*	*30*	*10*	*70*	*50*	*30*	*10*	*50*	*30*	*10*	*50*	*30*	*10*	*50*	*30*	*10*	*0*
Room Cavity Ratio																		
0	61	61	61	61	60	60	60	60	57	57	57	55	55	55	53	53	53	52
1	58	56	55	54	57	55	54	53	53	52	51	51	50	50	48	48	48	47
2	55	52	49	47	53	51	49	47	49	47	46	48	46	45	43	43	43	43
3	51	47	44	42	50	47	44	42	45	43	41	44	42	40	39	39	39	39
4	48	43	40	37	47	43	40	37	42	39	37	41	38	36	35	35	35	35
5	45	40	36	34	44	39	36	33	38	35	33	37	35	33	32	32	32	32
6	42	37	33	30	41	36	33	30	35	32	30	35	32	30	29	29	29	29
7	39	34	30	27	39	33	30	27	33	29	27	32	29	27	26	26	26	26
8	37	31	27	25	36	31	27	25	30	27	25	30	27	25	24	24	24	24
9	35	29	25	23	34	29	25	23	28	25	23	28	25	23	22	22	22	22
10	33	27	23	21	32	27	23	21	26	23	21	26	23	21	20	20	20	20

TRIPLES-H 232/7 WW

WALLWASH INFORMATION

Distance From Ceiling (Feet)	*3' From Wall; 3' O.C.*		*3'6" From Wall; 3'6" O.C.*		*4' From Wall; 4' O.C.*	
	Below Fixture	*Between Fixtures*	*Below Fixture*	*Between Fixtures*	*Below Fixture*	*Between Fixtures*
1	10	9	6	5	4	3
2	18	17	12	11	8	8
3	25	24	16	15	11	10
4	30	30	21	21	14	14
5	28	28	22	22	17	17
6	24	24	20	21	17	17
7	20	20	18	18	16	16
8	17	16	15	15	14	14
9	13	13	13	13	12	12
10	11	11	11	11	10	10
11	9	9	9	9	9	9
12	7	7	8	7	8	8

All vertical footcandles are initial values with no contribution from ceiling or floor reflectances. Computation performed with at least five wallwashers.



IZT-2T42-M3-BS@277

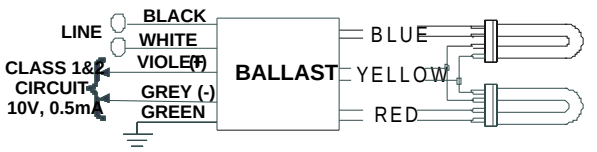
Brand Name	MARK 7 0-10V
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120-277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
* CFM32W/GX24Q	2	32	50/10	0.27	19/75	0.05/1.00	10	0.98	1.4	1.33
CFM42W/GX24Q	2	42	50/10	0.35	18/96	0.05/1.00	10	0.99	1.4	1.04
CFTR57W/GX24Q	1	57	50/10	0.24	18/66	0.05/1.00	10	0.99	1.6	1.52
CFTR70W/GX24Q	1	70	50/10	0.29	18/80	0.05/1.00	10	0.99	1.6	1.25

Wiring Diagram

WIRING: (2) TRIPLE LAMPS



Green Terminal must be Grounded

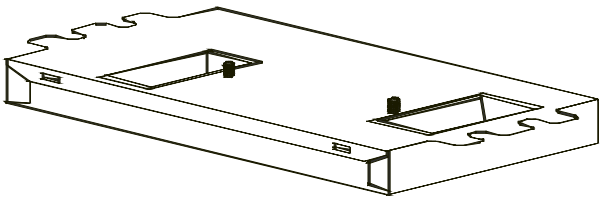
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	0	0
White	0	0
Blue	0	0
Red	0	0
Yellow	0	0
Gray	0	0
Violet	0	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)
6.28 "	3.00 "	1.29 "	2.00 "
6 7/25	3	1 29/100	2
16 cm	7.6 cm	3.3 cm	5.1 cm

Revised 08/27/2003

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

PL-T 32W/830 GX24q-3 /4P 1CT

Product family description
PL-T Triple 4pin Fluorescent Lamp with Amalgam.

Features/Benefits

- ALTO® Lamp Technology - Passes EPA's TCLP test for non-hazardous waste.
- Utilizes amalgam technology to provide > 90% of rated lumens in ambient temperatures from 23F to 130F.
- Triple tube design available in 18, 26, 32, and 42W.
- Excellent Color Rendering - 82 Color Rendering Index (CRI).
- Broad Range of Color Temperature - Available in 2700, 3000, 3500 and 4100K.
- Dimmable - PL-T 4-pin lamps may be used with electronic dimming ballasts.
- Long Life - 12,000 hours.
- Energy Saving - Designed for use with electronic ballasts for lower operating costs and flicker-free starting.

Applications

- Ideal for downlights and medium bay multi-lamp fixtures for general lighting.

Notes

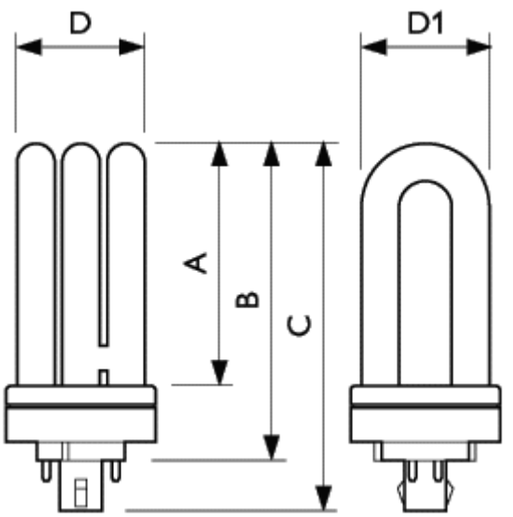
- Rated average life under specified test conditions with lamps turned off and restarted no more frequently than once every 3 operating hours. Lamp life is appreciably longer if lamps are started less frequently. (202)
- Approximate Initial Lumens. The lamp lumen output is based upon lamp performance after 100 hours of operating life, when the output is measured during operation on a reference ballast under standard laboratory conditions. (203)
- Design Lumens are the approximate lamp lumen output at 40% of the lamp's Rated Average Life. This output is based upon measurements obtained during lamp operation on a reference ballast under standard laboratory conditions. (208)

Product data	
Product Number	268326
Full product name	PL-T 32W/830 GX24q-3 /4P 1CT
Ordering Code	PL-T 32W/830/4P/ALTO
Pack type	1 Lamp in a Folding Carton
Pieces per Sku	1
Skus/Case	12
Pack UPC	046677268329

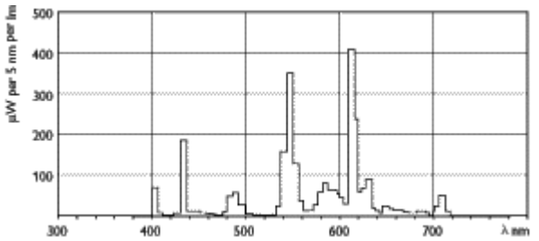
PHILIPS

Product data	
EAN2US	
Case Bar Code	50046677268324
Successor Product number	
Base	GX24q-3
Base Information	4P
Execution	/4P [4 Pins]
Packing Type	1CT [1 Lamp in a Folding Carton]
Packing Configuration	12
Avg. Hrs. Life	12000 hr
Ordering Code	PL-T 32W/830/4P/ALTO
Pack UPC	046677268329
Case Bar Code	50046677268324
Watts	32W
Lamp Voltage	- V
Dimmable	Yes
Color Code	830 [CCT of 3000K]
Color Rendering Index	82 Ra8
Color Designation	Warm White
Color Description	830 Warm White
Color Temperature	3000 K
Initial Lumens	- Lm
Initial Lumens	2400 Lm
Overall Length C	141.4 mm
Diameter D	39.85 mm
Diameter D1	39.65 mm
Product Number	268326

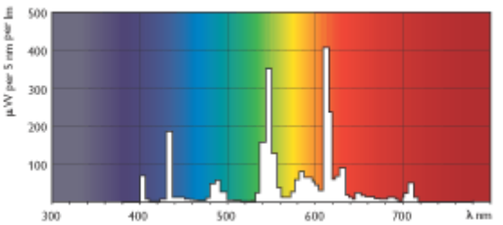
PL-T 32W



PL-T



PL-T/830



PL-T/830

iW PROFILE g2

An INTELLIWHITE™ Product

The iW Profile g2 fixture is a low-profile, linear 12" (30.2 cm) system that features higher light output and enhanced light quality with new optics and advanced LEDs (as compared to the previous generation). The linear design and fixture-to-fixture color consistency of this high-quality white light is well suited for display, museum, exhibit, retail, hospitality and architectural applications.
iW Profile g2 provides flexible color temperature and brightness control through Chromacore® technology, the proven approach that underlies Color Kinetics' existing intelligent solid-state lighting systems. When applied to IntelliWhite™ products, Chromacore controls channels of warm white and cool white LEDs to produce color temperatures within the range of 3000–6500 Kelvin from within a single fixture. iW Profile g2 allows the adjustment of light intensity while providing the option to either maintain or vary the color temperature.

iW Profile g2 is available with three different beam angles to meet diverse application demands: narrow, medium, and forward-throw asymmetric. iW Profile g2 is rated for indoor and damp location installations. The end-to-end locking connectors, capable of making 180° turns, make iW Profile g2 extremely versatile and easily adaptable to even the most challenging mounting environments.

iW Profile g2 is track mounted using the provided eight inch long 0°/60° track or 45° track for forward-throw asymmetric fixtures. This track allows for a light aim perpendicular to the mounting surface, angled at 60° from center, or angled at 45° from center. Optional 5 1/2 foot tracks are available for long, linear runs of 0°/45°/60° mounting angles.

iW PROFILE g2 SPECIFICATIONS

COLOR TEMP RANGE	3000K to 6500K
SOURCE	High intensity LEDs
BEAM ANGLE	Narrow, Medium, Forward-Throw Asymmetric
HOUSING	Aluminum with enamel finish
LENS	Clear tempered UV resistant lens
CONNECTORS	Unified power and data cable
LISTINGS	UL/cUL, CE

COMMUNICATIONS SPECIFICATIONS

DATA INTERFACE	Color Kinetics iW PDS-150 or iW PDS-60
CONTROL	Color Kinetics Line of Controllers, including iW Scene Controller, or LSM*

ELECTRICAL SPECIFICATIONS

POWER REQUIREMENT	24VDC
POWER CONSUMPTION	15W

ENVIRONMENTAL SPECIFICATIONS

TEMPERATURE RANGE	-4°F to 122°F (-20°C to 50°C) based on testing of specific product
PROTECTION RATING	IP60 (top of housing); IP50 (bottom of housing)

* For large or complex installations, consider controlling iW Profile g2 with Light System Manager (LSM). Refer to the LSM data sheets or contact support@colorkinetics.com for more information.

CHROMACORE® BY COLOR KINETICS

OPTIBIN® BY COLOR KINETICS

DRY

DAMP

c UL us LISTED 78GF

ITEM# 501-000010-00 (Medium)
501-000010-01 (Narrow)
501-000010-02 (Forward-Throw Asymmetric)

BRO185 Rev 04

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 70% of original light output. When the fixture is running on warm or cool, at room temperature, the LED lifetime is in the range of 50,000 – 70,000 hours. This is based on LED manufacturers' test data. High output is defined as any LED device that is 1/2 watt or above. For more detailed information on source life, please see www.colorkinetics.com/lifetime.

COLOR KINETICS INCORPORATED • 10 MILK STREET, SUITE 1100 • BOSTON, MA 02108 • USA
TEL 888 FULL RGB • TEL 617 423 9999 • FAX 617 423 9998 • INFO@COLORKINETICS.COM • WWW.COLORKINETICS.COM

iW PROFILE g2 - NARROW

PHOTOMETRIC PERFORMANCE

SOURCE SPECIFICATIONS

Lens:	UV-resistant soft-focus polycarbonate lens
Source:	10 LEDs (5 warm white, 5 cool white)
Beam Angle:	10° X 110° (at 50% of peak illuminance)
Distribution:	Symmetric direct illumination
CRI:	79 All, 73 Warm, 83 Cool

ILLUMINANCE DISTRIBUTION

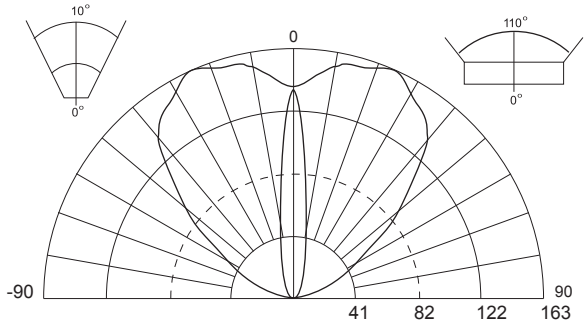
0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	1.0′/0.3m
0.5 / 5.4	3.9 / 42.0	6.9 / 74.3	3.9 / 42.0	0.6 / 6.5	0.2 / 2.2	2.0′/0.6m
0.9 / 9.7	7.7 / 82.9	17.1 / 184.1	14.0 / 150.7	4.5 / 48.4	0.6 / 6.5	3.0′/1.0m
0.6 / 6.5	4.5 / 48.4	14.0 / 150.7	17.1 / 184.1	7.7 / 82.9	0.9 / 9.7	4.0′/1.2m
0.2 / 2.2	0.6 / 6.5	3.9 / 42.0	6.9 / 74.3	3.9 / 42.0	0.5 / 5.4	5.0′/1.5m
0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	6.0′/2.0m

3.0′/1.0m 0′/0m 3.0′/1.0m

Units: Footcandles (top)/Lux (bottom)
10.8 lux = 1 fc

Location: Centered 1′/0.3m from, and perpendicular to, surface
Measured on: All, Reflectance 50%

CANDLE POWER DISTRIBUTION



Measured on: All
Beam peak: 163 cd
Thin dashed line: Indicates 50% of peak

ILLUMINANCE

	3′ / 1m	6′ / 2m	9′ / 3m	15′ / 5m
ALL	19.7 / 212.1	4.3 / 46.3	1.8 / 19.4	0.6 / 6.5

Measured in Footcandles (top)/Lux (bottom).
Measured on all, reflectance 0.

LIGHT OUTPUT

	TOTAL OUTPUT (lumems)	POWER (Watts)	EFFICACY (lm/W)
ALL	118	12.0	9.8
WARM	107	11.8	9.1
COOL	118	11.8	10.0

Note: Efficacy figures are for a complete tested fixture not simply a lamp source.

CRI

It is common practice in the lighting industry to use color rendering index (CRI) to compare the properties of various light sources. There are known deficiencies and limitations associated with CRI and as a result, it is not always an accurate indicator of good object color appearance. This is especially true for LED-based sources. Until a better method for measuring color rendering in LEDs is accepted, Color Kinetics measures CRI in accordance with the current CIE 13.3-1995 standard using the Ra calculation. The reference illuminants employed are the Planckian locus below 5000K and CIE Daylight reference above 5000K. All measurements for Color Kinetics products are performed by third party laboratories using NIST-traceable instruments.

iW PROFILE g2 - MEDIUM

PHOTOMETRIC PERFORMANCE

SOURCE SPECIFICATIONS

Lens:	UV-resistant soft-focus polycarbonate lens
Source:	10 LEDs (5 warm white, 5 cool white)
Beam Angle:	50° X 50°
Distribution:	Symmetric direct illumination
CRI:	79 All, 73 Warm, 83 Cool

ILLUMINANCE DISTRIBUTION

0.2 / 2.2	0.3 / 3.2	0.3 / 3.2	0.3 / 3.2	0.3 / 3.2	0.2 / 2.2	1.0′/0.3m
0.3 / 3.2	3.9 / 42.0	7.4 / 79.7	4.0 / 43.1	0.4 / 4.3	0.2 / 2.2	2.0′/0.6m
0.3 / 3.2	7.4 / 79.7	17.9 / 192.7	14.5 / 156.1	4.0 / 43.1	0.3 / 3.2	3.0′/1.0m
0.3 / 3.2	4.0 / 43.1	14.5 / 156.1	17.9 / 192.7	7.4 / 79.7	0.3 / 3.2	4.0′/1.2m
0.2 / 2.2	0.4 / 4.3	4.0 / 43.1	7.4 / 79.7	3.9 / 42.0	0.3 / 3.2	5.0′/1.5m
0.2 / 2.2	0.2 / 2.2	0.3 / 3.2	0.3 / 3.2	0.3 / 3.2	0.2 / 2.2	6.0′/2.0m

3.0′/1.0m 0′/0m 3.0′/1.0m

Units: Footcandles (top)/Lux (bottom)
10.8 lux = 1 fc

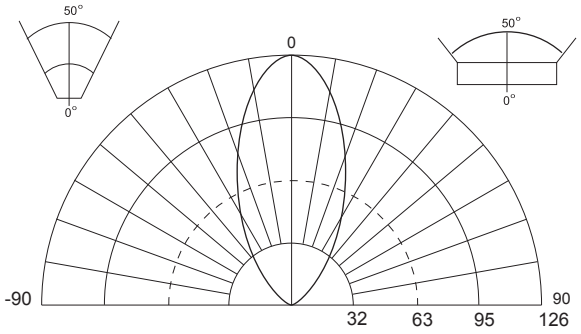
Location: Centered 1′/0.3m from, and perpendicular to, surface
Measured on: All, Reflectance 50%

ILLUMINANCE

	3′ / 1m	6′ / 2m	9′ / 3m	15′ / 5m
ALL	18.3 / 197.0	4.0 / 43.1	1.7 / 18.3	0.6 / 6.5

Measured in Footcandles (top)/Lux (bottom).
Measured on all, reflectance 0.

CANDLE POWER DISTRIBUTION



Measured on: All
Beam peak: 126 cd
Thin dashed line: Indicates 50% of peak

LIGHT OUTPUT

	TOTAL OUTPUT (lumems)	POWER (Watts)	EFFICACY (lm/W)
ALL	120	12.0	10.0
WARM	102	11.8	8.6
COOL	127	11.8	10.8

Note: Efficacy figures are for a complete tested fixture not simply a lamp source.

CRI

It is common practice in the lighting industry to use color rendering index (CRI) to compare the properties of various light sources. There are known deficiencies and limitations associated with CRI and as a result, it is not always an accurate indicator of good object color appearance. This is especially true for LED-based sources. Until a better method for measuring color rendering in LEDs is accepted, Color Kinetics measures CRI in accordance with the current CIE 13.3-1995 standard using the Ra calculation. The reference illuminants employed are the Planckian locus below 5000K and CIE Daylight reference above 5000K. All measurements for Color Kinetics products are performed by third party laboratories using NIST-traceable instruments.

COLOR KINETICS INCORPORATED • 10 MILK STREET, SUITE 1100 • BOSTON, MA 02108 • USA
TEL 888 FULL RGB • TEL 617 423 9999 • FAX 617 423 9998 • INFO@COLORKINETICS.COM • WWW.COLORKINETICS.COM

iW PROFILE g2 - ASYMMETRIC

PHOTOMETRIC PERFORMANCE

SOURCE SPECIFICATIONS

Lens:	UV-resistant soft-focus polycarbonate lens
Source:	10 LEDs (5 warm white, 5 cool white)
Beam Angle:	20° X 40° X 100°
Distribution:	Asymmetric direct illumination
CRI:	79 All, 73 Warm, 84 Cool

ILLUMINANCE DISTRIBUTION

0.2 / 2.2	0.3 / 3.2	0.4 / 4.3	0.3 / 3.2	0.2 / 2.2	0.2 / 2.2	1.0′/0.3m
0.3 / 3.2	2.4 / 25.8	4.4 / 47.4	2.6 / 28.0	0.5 / 5.4	0.2 / 2.2	2.0′/0.6m
0.5 / 5.4	6.2 / 66.7	13.4 / 144.2	10.1 / 108.7	2.7 / 29.1	0.4 / 4.3	3.0′/1.0m
0.4 / 4.3	4.3 / 46.3	13.2 / 142.1	15.0 / 161.5	6.2 / 66.7	0.5 / 5.4	4.0′/1.2m
0.2 / 2.2	0.5 / 5.4	4.0 / 43.1	7.4 / 79.7	4.0 / 43.1	0.4 / 4.3	5.0′/1.5m
0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	0.2 / 2.2	6.0′/2.0m
3.0′/1.0m		0′/0m		3.0′/1.0m		

Units: Footcandles (top)/Lux (bottom)
10.8 lux = 1 fc

Location: Centered 1′/0.3m from, and perpendicular to, surface

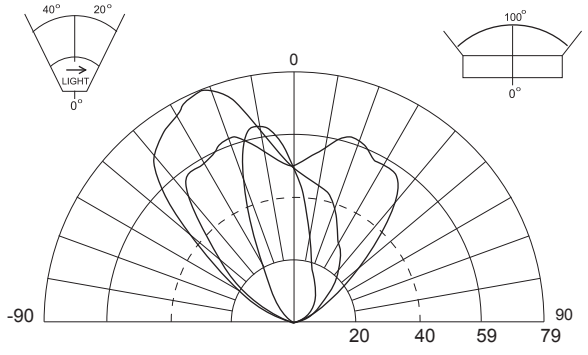
Measured on: All, reflectance model 50/%

ILLUMINANCE

	3′ / 1m	6′ / 2m	9′ / 3m	15′ / 5m
ALL	7.1 / 76.4	1.5 / 16.1	0.7 / 7.5	0.2 / 2.2

Measured in Footcandles (top)/Lux (bottom).
Measured on all, reflectance 0.

CANDLE POWER DISTRIBUTION



Measured on: All
Beam center: 79 cd
Thin dashed line: Indicates 50% of peak

LIGHT OUTPUT

	TOTAL OUTPUT (lumens)	POWER (Watts)	EFFICACY (Lm/W)
ALL	100	12.0	8.3
WARM	90	11.8	7.6
COOL	101	11.8	8.6

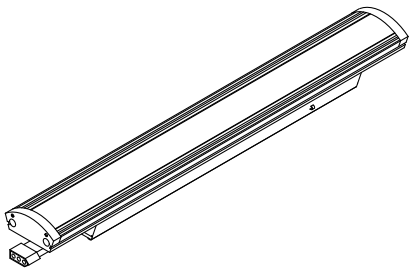
Note: Efficacy figures are for a complete tested fixture not simply a lamp source.

CRI

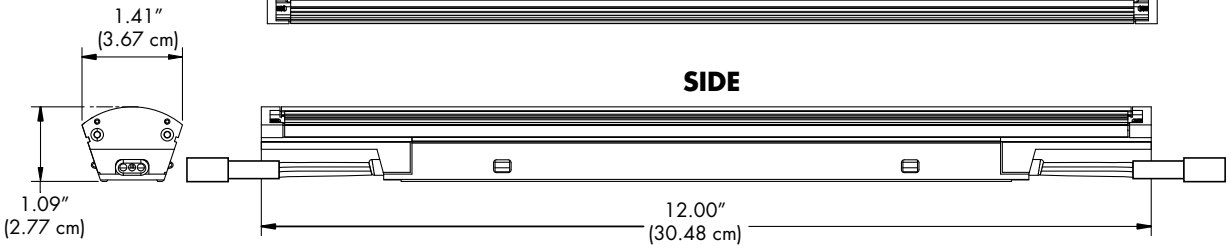
It is common practice in the lighting industry to use color rendering index (CRI) to compare the properties of various light sources. There are known deficiencies and limitations associated with CRI and as a result, it is not always an accurate indicator of good object color appearance. This is especially true for LED-based sources. Until a better method for measuring color rendering in LEDs is accepted, Color Kinetics measures CRI in accordance with the current CIE 13.3-1995 standard using the Ra calculation. The reference illuminants employed are the Planckian locus below 5000K and CIE Daylight reference above 5000K. All measurements for Color Kinetics products are performed by third party laboratories using NIST-traceable instruments.

iW Profile g2

PHYSICAL DIMENSIONS

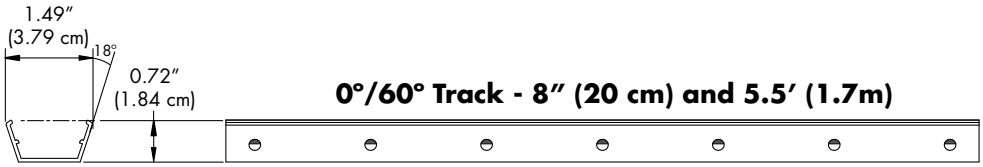


TOP

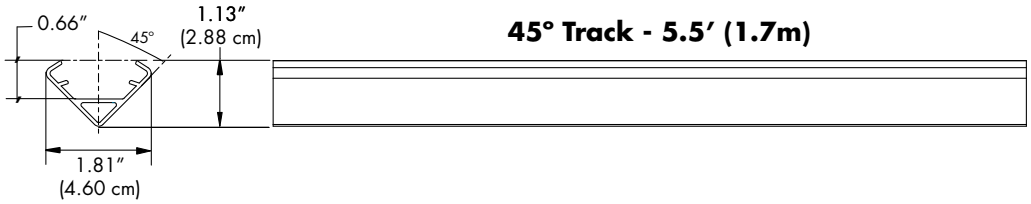


SIDE

BOTTOM



0°/60° Track - 8″ (20 cm) and 5.5′ (1.7m)



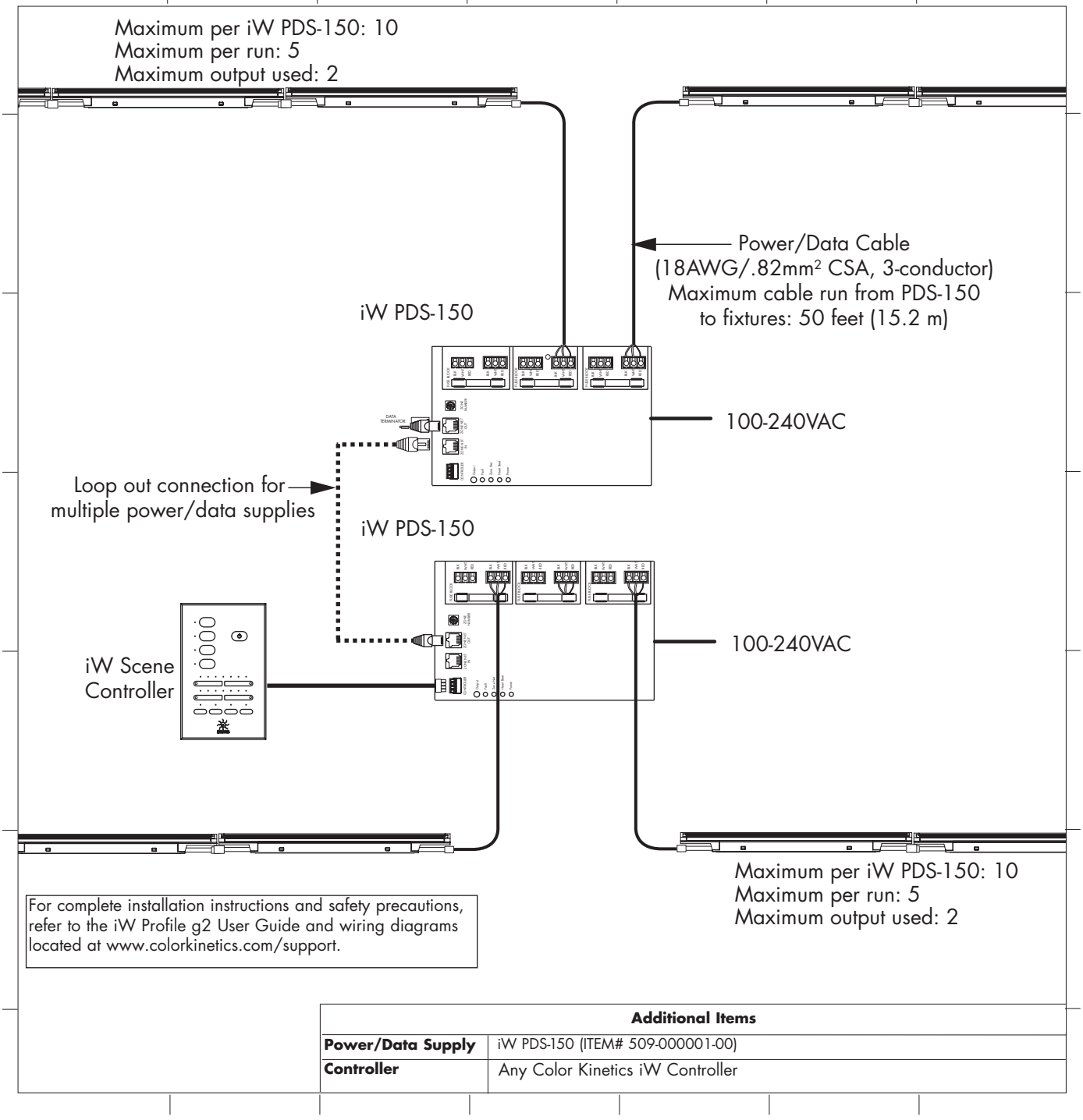
45° Track - 5.5′ (1.7m)

iW Profile g2 ITEM# 501-000010-00/01/02	
POWER CONNECTOR	Unified power and data cable
POWER REQUIREMENT	24VDC (15W)
WEIGHT	11 oz (0.3 kg)

Color Kinetics Incorporated • 10 Milk Street, Suite 1100 • Boston, MA 02108 • USA
Tel 888 FULL RGB • Tel 617 423 9999 • Fax 617 423 9998 • info@colorkinetics.com • www.colorkinetics.com

iW Profile g2

FUNCTIONAL FLOW DIAGRAM (iW PDS-150)

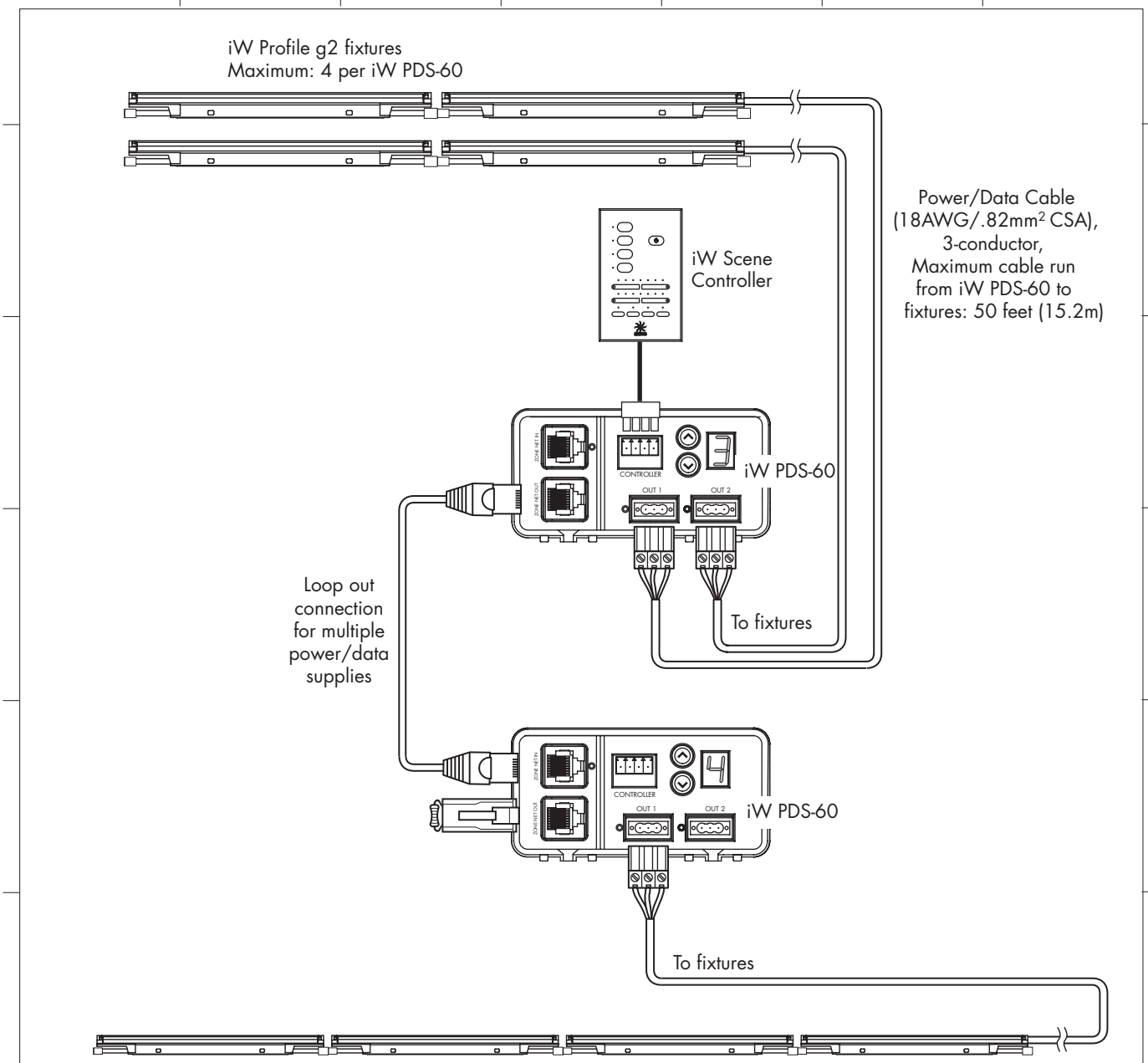


For complete installation instructions and safety precautions, refer to the iW Profile g2 User Guide and wiring diagrams located at www.colorkinetics.com/support.

Additional Items	
Power/Data Supply	iW PDS-150 (ITEM# 509-000001-00)
Controller	Any Color Kinetics iW Controller

iW Profile g2

FUNCTIONAL FLOW DIAGRAM (iW PDS-60)



For complete installation instructions and safety precautions, refer to the iW Profile g2 User Guide and wiring diagrams located at www.colorkinetics.com/support.

Additional Items	
Power/Data Supply	iW PDS-60 (ITEM# 509-000002-00)
Controller	Any Color Kinetics iW Controller

OPTIBIN®

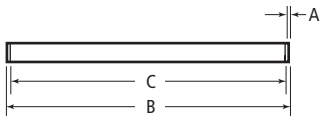
There are inherent variations in the fabrication processes of all semiconductor materials. For LEDs, this variance results in differences in the color and intensity of light output as well as electrical characteristics. Due to these differences, LED manufacturers sort production into "bins," but insuring 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 you the most consistent control of color and intensity from product to product.

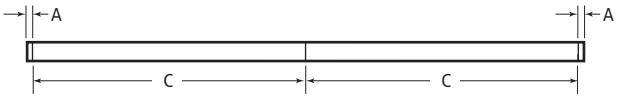
Color Kinetics Incorporated • 10 Milk Street, Suite 1100 • Boston, MA 02108 • USA
Tel 888 FULL RGB • Tel 617 423 9999 • Fax 617 423 9998 • info@colorkinetics.com • www.colorkinetics.com

OBROUND WALL MOUNT

SPECIFICATIONS

Housing: Extruded aluminum in lengths up to 8 feet. Rows of more than 8 feet are joined internally with no visible fasteners. OB70 series is 100% direct and OB72 series is direct/indirect.
Reflector: Specular aluminum.
Shielding: Choice of acrylic prismatic lens, white blade baffle, or semi-specular parabolic baffle for all series. For OB72 series, uplight can be open or shielded by clear acrylic lens.
Mounting: Wall mount only
Electrical: Instant start, normal light output, high power factor, sound rated A electronic ballast is standard. One-lamp ballast is 0.90 ballast factor, two, three and four-lamp ballasts are 0.88 ballast factor for 120 and 277 volt. One-lamp ballast is 1.17 ballast factor, two-lamp is 0.92, three-lamp is 0.97, and four-lamp is 0.85 for 347 volt.
Finish: Semi-gloss white powder coat paint is standard. Choose from a variety of standard colors on our color chart. Custom colors are available.
Certification: UL and CUL listed. IBEW labeled.

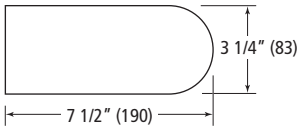




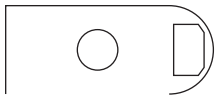
Obround Wall Mount

	A	B	C
4′	1/4″ 6	49 3/32″ 1246	48 19/32″ 1233
8′	1/4″ 6	97 3/4″ 2481	97 3/16″ 2467

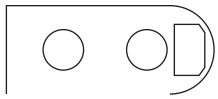
DIMENSIONS



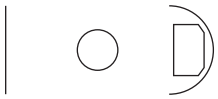
LAMP CONFIGURATIONS



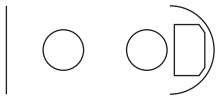
OB701-T8



OB702-T8



OB721-T8



OB722-T8

EXAMPLE

series	lamp configuration	shielding up	shielding down	mounting	length	finish	voltage	options
OB70	**2/T8**	**O**	**L**	**WM**	**4**	**SGW**	**120**	**GLR**
OB70 (100% direct) **OB72** (direct/indirect)	**1/T8** **2/T8**	**O**-open **L**-clear acrylic lens	**L**-lens **WB**-white baffle **PB**-parabolic baffle	**WM**-wall mount	**4′** **8′**	**SGW**-semi-gloss white (refer to color chart in Product Selection Guide for other standard colors) **CC**-custom color	**120** **277** **Dual** **347**	**GLR**-GLR fuse and HLR holder **GMF**-GMF slow blow fuse and holder **EM1**-B70A or equal **EM2**-B50 or equal **EM3**-B100 or equal **EM4**-B60 or equal **DIM1**-Advance Mark VII dimming **DIM2**-Advance Mark X dimming **DIM3**-Lutron ECO-10 dimming ballast **DIM4**-Lutron Hi-Lume dimming ballast **DIM5**-Lutron ECO-10 TVE dimming ballast **DIM6**-Lutron Tu-Wire dimming ballast (for T8, 32W, 120-volt only)

Due to a program of continuous improvement, LAM Lighting reserves the right to make any variation in design or construction to the equipment described.

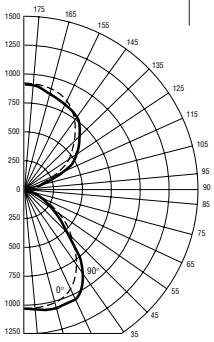
ORDER

project name: _____ type: _____ quantity: _____

	–		–		–		–		–		–		–		–	

PHOTOMETRICS

OB72-2-WB



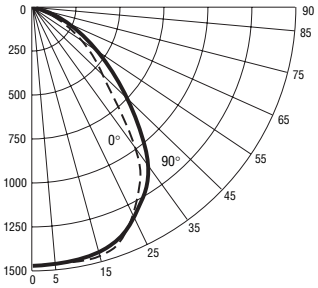
CANDELA DISTRIBUTION

	0	22	45	67	90
180°	907	907	907	907	907
175°	908	904	907	901	902
165°	895	888	880	870	860
155°	832	820	813	815	816
145°	745	734	744	765	773
135°	597	594	622	677	685
125°	479	484	546	581	584
115°	306	338	370	362	357
105°	152	190	187	179	172
95°	30	36	19	15	14
90°	0	0	0	0	0
85°	21	26	29	34	42
75°	80	90	97	108	84
65°	144	156	177	232	267
55°	236	245	300	467	548
45°	321	358	474	672	767
35°	515	577	688	850	925
25°	683	729	834	939	980
15°	829	846	908	973	987
5°	907	905	913	911	910
0°	910	910	910	910	910

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2210	44.8	35.1
90-180°	2720	55.2	43.2
0-180°	4930	100.0	78.3

OB70-2-L



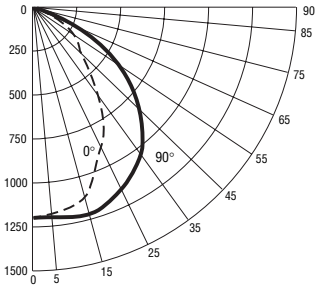
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	39	38	40	33	31
75°	111	109	88	99	106
65°	224	168	122	149	198
55°	443	395	332	343	360
45°	754	713	656	611	570
35°	1117	1118	1088	1049	1025
25°	1336	1341	1346	1343	1337
15°	1463	1463	1472	1470	1454
5°	1490	1485	1491	1484	1487
0°	1489	1489	1489	1489	148

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	3010	100.0	47.8
90-180°	0	0.0	0.0
0-180°	3010	100.0	47.8

OB70-2-WB



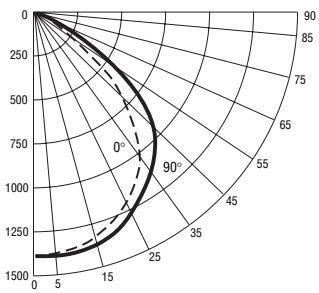
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	17	19	24	28	36
75°	89	93	102	113	81
65°	166	172	194	246	273
55°	269	275	325	487	562
45°	379	418	533	715	809
35°	637	701	808	957	1034
25°	867	920	1015	1119	1162
15°	1113	1140	1155	1218	1226
5°	1172	1173	1183	1183	1188
0°	1181	1181	1181	1181	1181

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2548	100.0	40.4
90-180°	0	0.0	0.0
0-180°	2548	100.0	40.4

OB70-2-PB



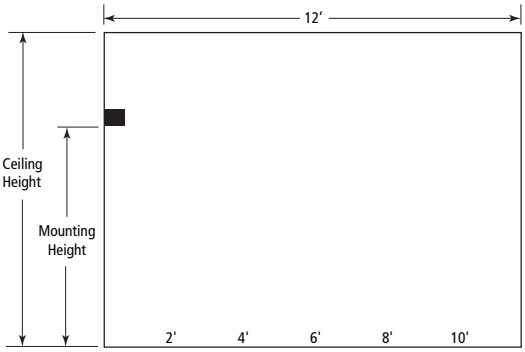
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	0	0	0	1	1
75°	8	8	10	12	14
65°	32	38	75	121	126
55°	330	391	497	546	568
45°	730	757	798	894	941
35°	1018	1044	1056	1089	1115
25°	1194	1219	1224	1246	1256
15°	1323	1336	1361	1371	1356
5°	1377	1374	1384	1381	1384
0°	1378	1378	1378	1378	1378

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2910	100.0	46.2
90-180°	0	0.0	0.0
0-180°	2910	100.0	46.2

APPLICATION DATA



OB721-T8-O-PB-4, 1-Lamp, F32T8, 2950 lumens per lamp, 0.77 LLF, 0.90 Ballast Factor

POWER DENSITY IS 0.4 WATTS PER SQUARE FOOT Fixture Spacing: 6'

Ceiling Height	Mounting Height	Distance from Wall 2'	4'	6'	8'	10'	Floor Average	Adjacent Wall Average
9'	8'	9	8	6	4	2	6	5
10'	8'	8	7	5	3	2	6	5
10'	9'	8	7	6	4	3	6	4

Reflectance: 80/50/20

Light Loss Factor - 0.95 room depreciation, 0.95 fixture depreciation, 0.95 lamp depreciation, 0.90 ballast factor =.77 total LLF

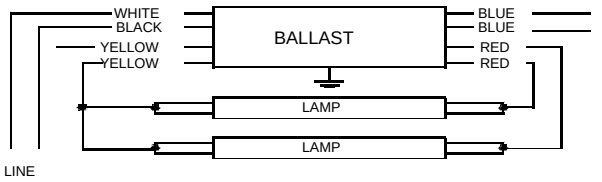
VOP-4P32-SC

Brand Name	OPTANIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* F40T8	2	40	32/00	0.30	81	1.03	10	0.98	1.7	1.27
F40T8	3	40	32/00	0.38	108	0.93	10	0.98	1.7	0.86

Wiring Diagram



Diag. 71A

Insulate unused lead for 1000V

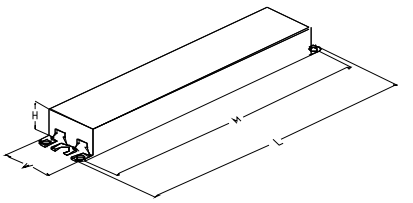
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	31R	78.7
Yellow	39L	99.1
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 04/28/2005

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

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

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

Section II - Performance Requirements

2.1 Ballast shall be Instant Start.

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

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

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

2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 42 kHz and 52 kHz to avoid interference with infrared devices, eliminate visible flicker and avoid Article Surveillance System, such as anti-theft devices.

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

2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 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 10% when operated at nominal line voltage with primary lamp.

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

2.11 Ballast shall have a minimum starting temperature of 0F (-18C) and 60F (16C) for energy-saving T8 lamps.

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

Section III - Regulatory Requirements

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

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

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

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

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

3.6 Ballast shall meet NEMA/CEE High Performance T8 Lighting System Specifications.

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 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 maximum case temperature of 90C.

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

4.4 Ballast shall be Advance part # _____ or approved equal.

NOTE: The use of Optanium 2.0 (IOP) 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 2.0 (IOP) models.

Revised 04/28/2005

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

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

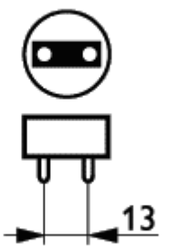
F40T8 TL841 ALTO TG

Product family description

Product data	
Product Number	164392
Full product name	F40T8 TL841 ALTO TG
Ordering Code	F40T8/TL841/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	25
Pack UPC	046677164393
EAN2US	
Case Bar Code	50046677164398
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
Name Type	F40T8
Feature	ALTO®
Rated Avg. Life [3 hr Start]	20000 hr
Ordering Code	F40T8/TL841/ALTO TG
Pack UPC	046677164393
Case Bar Code	50046677164398
Energy Saving Product	Energy Saving
Watts	40W
Mercury (Hg) Content	3.5 mg
Color Code	TL841 [CCT of 4100K]
Color Rendering Index	86 Ra8
Color Designation	TL841

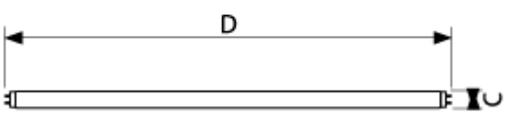
Product data	
Color Temperature	4100 K
Initial Lumens	3775 Lm
Design Mean Lumens	3500 Lm
Nominal Length [inch]	60
Special Note	TuffGuard™ [TuffGuard Coated]
Product Number	164392

F-T8-RS Med Bipin/GB



Base Medium Bi-Pin

Energy Saving Product Energy Saving



F-T8-RS Med Bipin

HOLOPHANE
LEADER IN LIGHTING SOLUTIONS

HP

2x2 Parabolic Grid Troffer

APPLICATIONS

Designed to provide high efficiency general lighting for low-glare environments, the HP parabolic, grid troffer is typically used in offices, classrooms, and auditoriums.

FEATURES

This efficient, parabolic, grid troffer is available with static and air-handling options. The HP fixture series comes in 2x2 and 2x4 nominal sizes with a 5.2" fixture depth.

Deep cell, premium-grade aluminum louvers in choice of low-iridescent diffuse or specular louver finishes.

Black reveal provides floating louver appearance, conceals optional air-supply slots.

Integral T-bar safety clips are standard.

Flange option available.

SPECIFICATIONS

HOUSING: Cold rolled, pre-painted steel housing is rigid and fully assembled with rivets.

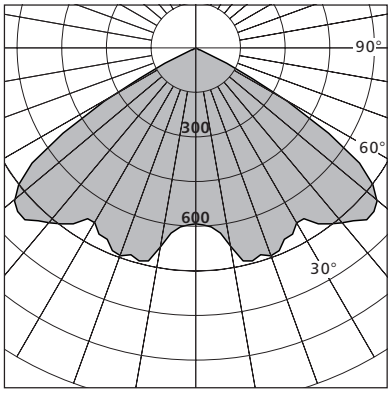
REFLECTOR: Material is Miro® enhanced specular aluminum with a total reflectivity of 95%.

DIFFUSER: Louvers formed from premium-grade aluminum lighting sheet.

MOUNTING: The HP series fixture is suitable for mounting in NEMA type G ceiling systems. Flange option available for non-grid ceiling types.

LAMPHOLDERS: T8 lamps are secured with locking lampholders.

PHOTOMETRY

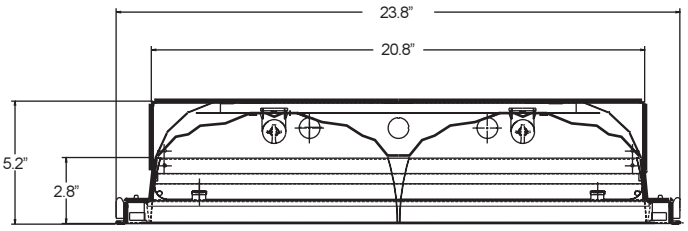


HPGS22XBD33O22
Test #200180
Fixture Efficiency: 71.4%
SC Across: 2.0, SC Along: 1.2

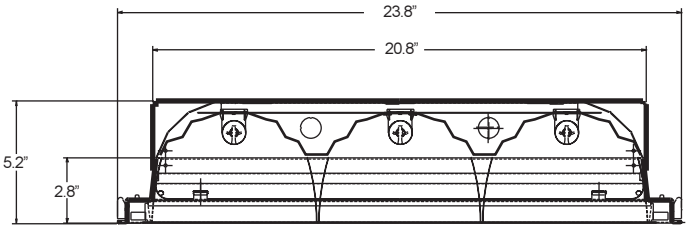
c UL US

CROSS SECTIONS

2 Lamp



3 Lamp



Drawings for dimensional detail only. Subject to change without notice.

MODELS AVAILABLE

Fixture Schedule | **Fixture ID#**

	HP	G		22								
Tandem Option	**Fixture Series**		**Housing**		**Reflector Material**	**Photometry**	**Diffuser**	**Lamp Configuration**	**Ballast Type**	**Ballast Quantity**	**Ballast Voltage**	
2 - Tandem of 2			A - Air-handling		W - White ballast cover	B - Broad	D23 - Semi-specular 6 cell louver	O22 - 2 F17T8	EP - Standard electronic	1	1 - 120V	
			N - Static		X - Miro® enhanced aluminum	N - Normal	D33 - Semi-specular 9 cell louver	O23 - 3 F17T8	LP - Low-power electronic	2	2 - 277V	
						S - Spread		O24 - 4 F17T8	MP - Medium-power electronic	3	3 - 347V	
									YP - High-power electronic		U - 120V/277V	

Not all photometry and diffuser options available with every lamp configuration.
Not all ballast types and quantities available with every lamp configuration.
For additional ballast options please contact your local Holophane sales representative.

HOLOPHANE
LEADER IN LIGHTING SOLUTIONS
An AcuityBrands Company

Holophane. Acuity Lighting Group, Inc. 214 Oakwood Ave., Newark, OH 43055 / Holophane Canada, Inc. 9040 Leslie Street, Units 8 and 9, Richmond Hill, ON L4B 3M4 / Holophane Europe Limited, Bond Ave., Milton Keynes MK1 1JG, England / Holophane, S.A. de C.V., Apartado Postal No. 986, Naucalpan de Juarez, 53000 Edo. de Mexico

Contact your local Holophane sales representative for application assistance, computer-aided design and cost studies. For information on other Holophane products and systems, call the Inside Sales Service Department at 740-345-9631. In Canada, call 905-707-5830 or fax 905-707-5695.

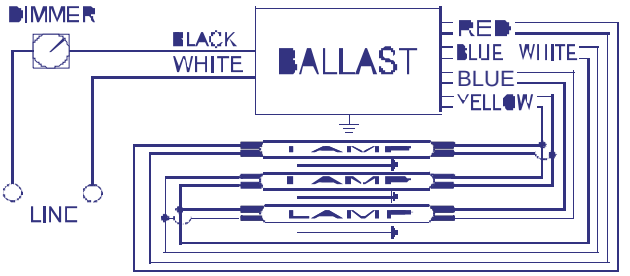
VEZ-3S32-SC

Brand Name	MARK 10 POWERLINE
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
* F17T8	3	17	50/10	0.21	18/56	0.05/1.05	10	0.99	1.6	1.88
F25T8	3	25	50/10	0.29	19/79	0.05/1.05	10	0.99	1.6	1.33
F32T8	3	32	50/10	0.37	20/102	0.05/1.00	10	0.99	1.6	0.98

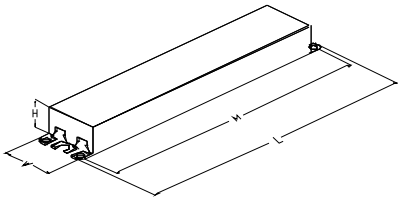
Wiring Diagram



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

Standard Lead Length (inches)

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 10/28/2005

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

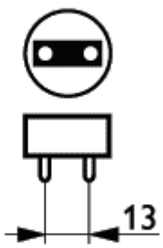
F17T8 TL841 ALTO TG

Product family description

Product data	
Product Number	168989
Full product name	F17T8 TL841 ALTO TG
Ordering Code	F17T8/TL841/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	25
Pack UPC	046677168988
EAN2US	
Case Bar Code	50046677168983
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
Name Type	F17T8
Feature	ALTO®
Ordering Code	F17T8/TL841/ALTO TG
Pack UPC	046677168988
Case Bar Code	50046677168983
Energy Saving Product	Energy Saving
Watts	17W
Mercury (Hg) Content	3.5 mg
Color Code	TL841 [CCT of 4100K]
Color Rendering Index	85 Ra8
Color Designation	TL841
Color Temperature	4100 K

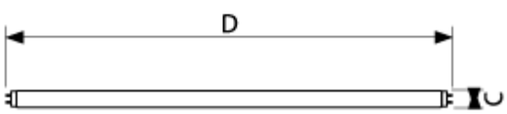
Product data	
Initial Lumens	1400 Lm
Design Mean Lumens	1330 Lm
Nominal Length [inch]	24
Special Note	TuffGuard™ [TuffGuard Coated]
Product Number	168989

F-T8-Unv Med Bipin/GB



Base Medium Bi-Pin

Energy Saving Product Energy Saving

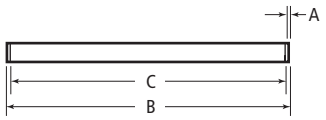


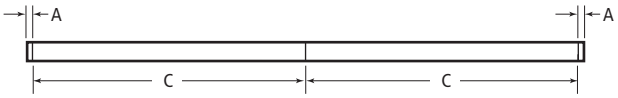
F-T8-Unv Med Bipin

OBROUND WALL MOUNT

SPECIFICATIONS

Housing: Extruded aluminum in lengths up to 8 feet. Rows of more than 8 feet are joined internally with no visible fasteners. OB70 series is 100% direct and OB72 series is direct/indirect.
Reflector: Specular aluminum.
Shielding: Choice of acrylic prismatic lens, white blade baffle, or semi-specular parabolic baffle for all series. For OB72 series, uplight can be open or shielded by clear acrylic lens.
Mounting: Wall mount only
Electrical: Instant start, normal light output, high power factor, sound rated A electronic ballast is standard. One-lamp ballast is 0.90 ballast factor, two, three and four-lamp ballasts are 0.88 ballast factor for 120 and 277 volt. One-lamp ballast is 1.17 ballast factor, two-lamp is 0.92, three-lamp is 0.97, and four-lamp is 0.85 for 347 volt.
Finish: Semi-gloss white powder coat paint is standard. Choose from a variety of standard colors on our color chart. Custom colors are available.
Certification: UL and CUL listed. IBEW labeled.

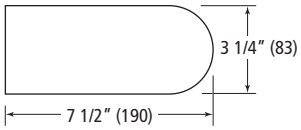




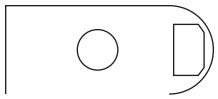
Obround Wall Mount

	A	B	C
4′	1/4″ 6	49 3/32″ 1246	48 19/32″ 1233
8′	1/4″ 6	97 3/4″ 2481	97 3/16″ 2467

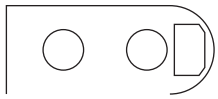
DIMENSIONS



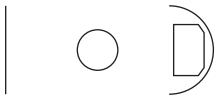
LAMP CONFIGURATIONS



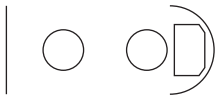
OB701-T8



OB702-T8



OB721-T8



OB722-T8

EXAMPLE

series	lamp configuration	shielding up	shielding down	mounting	length	finish	voltage	options
OB70	**2/T8**	**O**	**L**	**WM**	**4**	**SGW**	**120**	**GLR**
OB70 (100% direct) **OB72** (direct/indirect)	**1/T8** **2/T8**	**O**-open **L**-clear acrylic lens	**L**-lens **WB**-white baffle **PB**-parabolic baffle	**WM**-wall mount	**4′** **8′**	**SGW**-semi-gloss white (refer to color chart in Product Selection Guide for other standard colors) **CC**-custom color	**120** **277** **Dual** **347**	**GLR**-GLR fuse and HLR holder **GMF**-GMF slow blow fuse and holder **EM1**-B70A or equal **EM2**-B50 or equal **EM3**-B100 or equal **EM4**-B60 or equal **DIM1**-Advance Mark VII dimming **DIM2**-Advance Mark X dimming **DIM3**-Lutron ECO-10 dimming ballast **DIM4**-Lutron Hi-Lume dimming ballast **DIM5**-Lutron ECO-10 TVE dimming ballast **DIM6**-Lutron Tu-Wire dimming ballast (for T8, 32W, 120-volt only)

Due to a program of continuous improvement, LAM Lighting reserves the right to make any variation in design or construction to the equipment described.

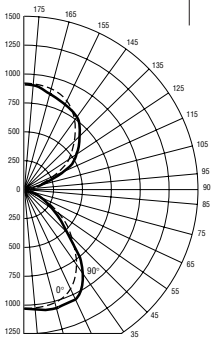
ORDER

project name: _____ type: _____ quantity: _____

	–		–		–		–		–		–		–		–	

PHOTOMETRICS

OB72-2-WB



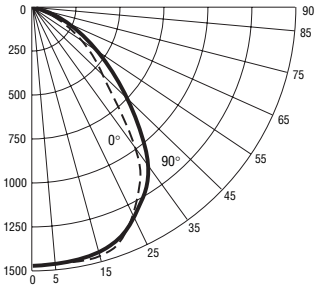
CANDELA DISTRIBUTION

	0	22	45	67	90
180°	907	907	907	907	907
175°	908	904	907	901	902
165°	895	888	880	870	860
155°	832	820	813	815	816
145°	745	734	744	765	773
135°	597	594	622	677	685
125°	479	484	546	581	584
115°	306	338	370	362	357
105°	152	190	187	179	172
95°	30	36	19	15	14
90°	0	0	0	0	0
85°	21	26	29	34	42
75°	80	90	97	108	84
65°	144	156	177	232	267
55°	236	245	300	467	548
45°	321	358	474	672	767
35°	515	577	688	850	925
25°	683	729	834	939	980
15°	829	846	908	973	987
5°	907	905	913	911	910
0°	910	910	910	910	910

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2210	44.8	35.1
90-180°	2720	55.2	43.2
0-180°	4930	100.0	78.3

OB70-2-L



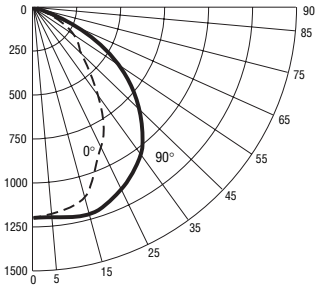
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	39	38	40	33	31
75°	111	109	88	99	106
65°	224	168	122	149	198
55°	443	395	332	343	360
45°	754	713	656	611	570
35°	1117	1118	1088	1049	1025
25°	1336	1341	1346	1343	1337
15°	1463	1463	1472	1470	1454
5°	1490	1485	1491	1484	1487
0°	1489	1489	1489	1489	148

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	3010	100.0	47.8
90-180°	0	0.0	0.0
0-180°	3010	100.0	47.8

OB70-2-WB



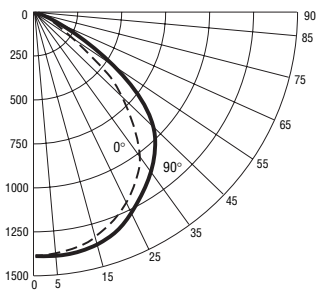
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	17	19	24	28	36
75°	89	93	102	113	81
65°	166	172	194	246	273
55°	269	275	325	487	562
45°	379	418	533	715	809
35°	637	701	808	957	1034
25°	867	920	1015	1119	1162
15°	1113	1140	1155	1218	1226
5°	1172	1173	1183	1183	1188
0°	1181	1181	1181	1181	1181

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2548	100.0	40.4
90-180°	0	0.0	0.0
0-180°	2548	100.0	40.4

OB70-2-PB



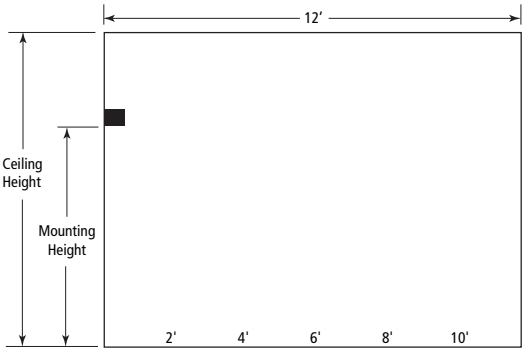
CANDELA DISTRIBUTION

	0	22	45	67	90
90°	0	0	0	0	0
85°	0	0	0	1	1
75°	8	8	10	12	14
65°	32	38	75	121	126
55°	330	391	497	546	568
45°	730	757	798	894	941
35°	1018	1044	1056	1089	1115
25°	1194	1219	1224	1246	1256
15°	1323	1336	1361	1371	1356
5°	1377	1374	1384	1381	1384
0°	1378	1378	1378	1378	1378

ZONAL LUMEN SUMMARY

Zone	Lumens	% Fixture Output	% Lamp Output
0-90°	2910	100.0	46.2
90-180°	0	0.0	0.0
0-180°	2910	100.0	46.2

APPLICATION DATA



OB721-T8-O-PB-4, 1-Lamp, F32T8, 2950 lumens per lamp, 0.77 LLF, 0.90 Ballast Factor

POWER DENSITY IS 0.4 WATTS PER SQUARE FOOT Fixture Spacing: 6'

Ceiling Height	Mounting Height	Distance from Wall 2'	4'	6'	8'	10'	Floor Average	Adjacent Wall Average
9'	8'	9	8	6	4	2	6	5
10'	8'	8	7	5	3	2	6	5
10'	9'	8	7	6	4	3	6	4

Reflectance: 80/50/20

Light Loss Factor - 0.95 room depreciation, 0.95 fixture depreciation, 0.95 lamp depreciation, 0.90 ballast factor =.77 total LLF

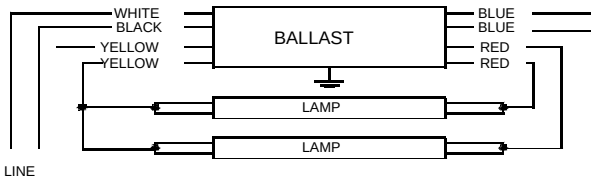
VOP-4P32-SC

Brand Name	OPTANIUM
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	277
Input Frequency	50/60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* F40T8	2	40	32/00	0.30	81	1.03	10	0.98	1.7	1.27
F40T8	3	40	32/00	0.38	108	0.93	10	0.98	1.7	0.86

Wiring Diagram



Diag. 71A

Insulate unused lead for 1000V

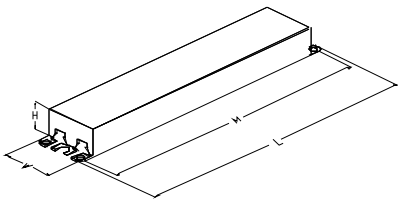
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

	in.	cm.
Black	25L	63.5
White	25L	63.5
Blue	31R	78.7
Red	31R	78.7
Yellow	39L	99.1
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 04/28/2005

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

ADVANCE
O'HARE INTERNATIONAL CENTER · 10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Customer Support/Technical Service: Phone: 800-372-3331 · Fax: 630-307-3071
Corporate Offices: Phone: 800-322-2086

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

Electrical Specifications

Notes:

Section I - Physical Characteristics

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

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

Section II - Performance Requirements

2.1 Ballast shall be Instant Start.

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

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

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

2.5 Ballast shall be high frequency electronic type and operate lamps at a frequency between 42 kHz and 52 kHz to avoid interference with infrared devices, eliminate visible flicker and avoid Article Surveillance System, such as anti-theft devices.

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

2.7 Ballast shall have a minimum ballast factor for primary lamp application as follows: 0.75 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 10% when operated at nominal line voltage with primary lamp.

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

2.11 Ballast shall have a minimum starting temperature of 0F (-18C) and 60F (16C) for energy-saving T8 lamps.

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

Section III - Regulatory Requirements

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

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

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

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

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

3.6 Ballast shall meet NEMA/CEE High Performance T8 Lighting System Specifications.

Section IV - Other

4.1 Ballast shall be manufactured in a factory certified to ISO 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 maximum case temperature of 90C.

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

4.4 Ballast shall be Advance part # _____ or approved equal.

NOTE: The use of Optanium 2.0 (IOP) 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 2.0 (IOP) models.

Revised 04/28/2005

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

ADVANCE TRANSFORMER CO.
O'HARE INTERNATIONAL CENTER - 10275 WEST HIGGINS ROAD
ROSEMONT, ILLINOIS 60018
TELEPHONE: (847) 390-5000 FAX: (847) 390-5109

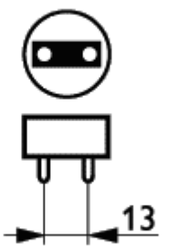
F40T8 TL841 ALTO TG

Product family description

Product data	
Product Number	164392
Full product name	F40T8 TL841 ALTO TG
Ordering Code	F40T8/TL841/ALTO TG
Pack type	1 Lamp
Pieces per Sku	1
Skus/Case	25
Pack UPC	046677164393
EAN2US	
Case Bar Code	50046677164398
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
Name Type	F40T8
Feature	ALTO®
Rated Avg. Life [3 hr Start]	20000 hr
Ordering Code	F40T8/TL841/ALTO TG
Pack UPC	046677164393
Case Bar Code	50046677164398
Energy Saving Product	Energy Saving
Watts	40W
Mercury (Hg) Content	3.5 mg
Color Code	TL841 [CCT of 4100K]
Color Rendering Index	86 Ra8
Color Designation	TL841

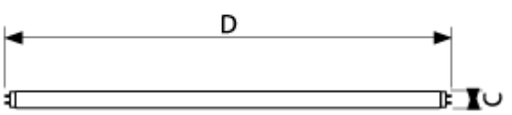
Product data	
Color Temperature	4100 K
Initial Lumens	3775 Lm
Design Mean Lumens	3500 Lm
Nominal Length [inch]	60
Special Note	TuffGuard™ [TuffGuard Coated]
Product Number	164392

F-T8-RS Med Bipin/GB



Base Medium Bi-Pin

Energy Saving Product Energy Saving



F-T8-RS Med Bipin

DT-200 Dual Technology Sensor

Combines passive infrared and ultrasonic technologies

Built-in light level sensor

Accepts low voltage switch input for manual-on operation

SmartSet™ automatically selects optimal settings for each space

Walk-through mode increases savings potential

PROJECT

LOCATION/TYPE

Product Overview

Description

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

Operation

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

SmartSet

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

Application

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

Features

- Advanced control logic based on RISC 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 3 minutes after the area is initially occupied – ideal for brief visits such as mail delivery
  - Available with built-in light level sensor featuring simple, one-step setup
- Sensors work with low voltage momentary switches to provide manual control
- LEDs indicate occupancy detection
- 8 occupancy logic options give users the ability to customize control to meet application needs
- Available with isolated relay for integration with BAS or HVAC
- Swivel mounting bracket for convenient corner mounting to wall or ceiling

WattStopper
legrand
www.wattstopper.com
800.879.8585

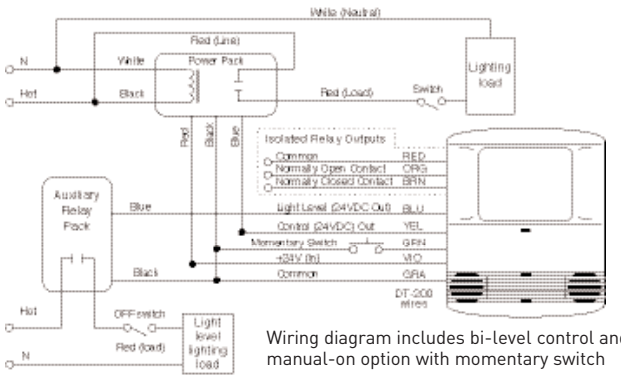
DT-200 Technical Information

Specifications

- 24 VDC/VAC and halfwave rectified AC
- 40 kHz frequency ultrasonic transmission
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), walk-through, test-mode
- Sensitivity adjustment: SmartSet (automatic) or reduced sensitivity (for PIR sensitivity); ultrasonic sensitivity is variable with trimpot
- Built-in light level sensor (DT-200) – works from 2 to 200 footcandles (21 to 2,152 lux)
- Low voltage, momentary switch input for manual operation
- DT-200 contains an isolated relay with N/O and N/C outputs; rated for 1 Amp at 24 VDC/VAC
- 2000 ft² of walking motion mounted at 10 ft; 1000 ft² of desktop motion
- Units per power pack: DT-200: up to 2 (B), up to 3 (BZ); DT-205: up to 3 (B), up to 4 (BZ)
- Dimensions: 4.4" x 3.4" x 2" (110.3mm x 85.9mm x 49.6mm) LxWxD
- UL and CUL listed; Five year warranty

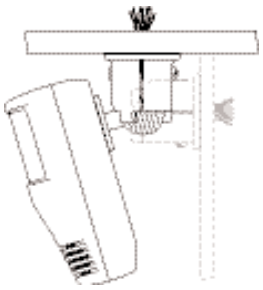
Wiring & Mounting

Wiring Diagram



Wiring diagram includes bi-level control and manual-on option with momentary switch

Mounting

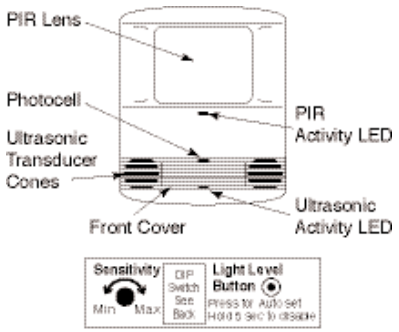


A swivel mounting bracket, attached to the sensor, allows the sensor to be angled for wall or ceiling mounting.

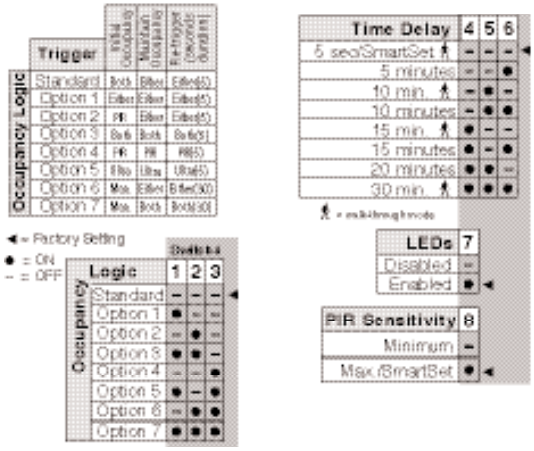
Grooves on the bracket help to achieve desired angle for coverage.

Controls & Settings

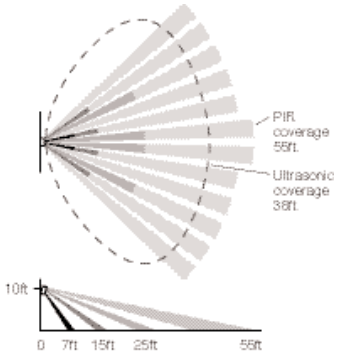
Product Controls



DIP Switch Settings



Coverage



Coverages shown are maximum and represent half-step walking motion. Under ideal conditions, with no barriers or obstacles, coverage for half-step walking motion can reach up to 2000 ft² while coverage for typical desktop activity can reach up to 1000 ft².

Ordering Information

Catalog No.	Voltage	Current	Coverage	Features
☐ DT-200	24 VDC	43 mA	2000 ft² (185.8 m²)	light level, isolated relay
☐ DT-205	24 VDC	35 mA	2000 ft² (185.8 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.

Watt Stopper/Legrand®
Pub. No. 6204