

# FRANKLIN CARE CENTER

FRANKLIN PARK, NJ

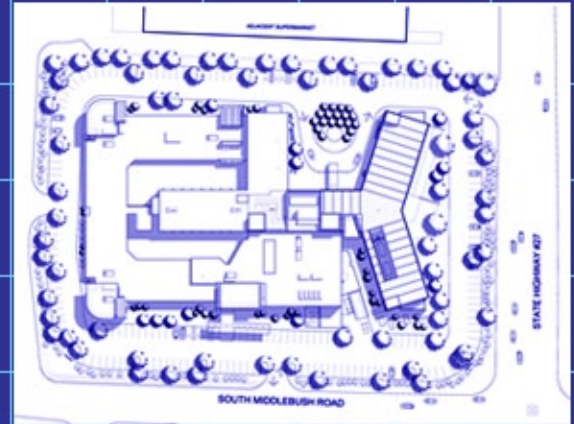
<http://www.arche.psu.edu/thesis/eportfolio/current/portfolios/jpc135/>

JENNIFER CURLEY

LIGHTING/ELECTRICAL OPTION

## PROJECT INFORMATION

**Building Name:** Franklin Care Center  
**Location:** Franklin Park, NJ  
**Occupancy type:** Nursing Home/Elderly Care Facility  
**Size:** Two stories above grade and cellar at approximately 150,000sqft  
**Project Delivery Method:** Design-Bid-Build  
**Construction:** Renovation to existing facility and addition



## PRIMARY PROJECT TEAM

**Owner:** Tuschak-Jacobson Inc.  
**Architect:** BeckhardRichlandSzerbaty + Associates  
**Structural Engineer:** Weidlinger Associates  
**MEP Engineers:** Edwards and Zuck  
**Site/Civil Engineers:** The Reynolds Group Inc.  
**Landscape Architect:** Zion Breen & Richardson Associates  
**Lighting Consultant:** Horton Lees Brogden Lighting Design

## LIGHTING SYSTEM

- DALI control system – based on 120/277 V lighting
- Predominately recessed fluorescent and compact fluorescent lighting
- Decorative fixtures provided in social spaces
- 100% to 1% dimming flexibility provided by digital ballasts
- Skylights provided in adult day care and patient lounges
- Clerestories supply daylight to lounges and adult day care
- Semi-cut off exterior fixtures used to limit light pollution



## SPECIAL FEATURES

- Provides a comfortable home for the elderly while receiving medical treatment and rehabilitation
- Features lobby, lounges, therapy suites, therapy pool, cathedral, greenhouse and courtyard
- LEED Silver Certification Anticipated

## ELECTRICAL SYSTEM

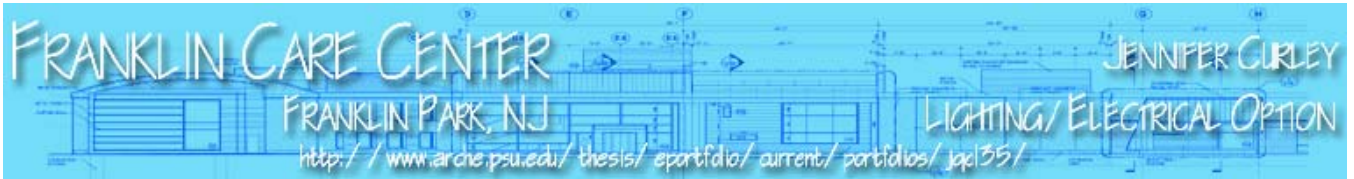
- New 500KW outdoor generator will provide power to fire pump and emergency distribution panels
- Transformer will provide 277/480V incoming secondary service to building
- 3000 switch Main Distribution Panel provides power

## MECHANICAL SYSTEM

- Three gas boilers with dual fuel burners using natural gas and #2 fuel oil located in cellar
- Two chillers located in cellar – 25 tons each
- Two cooling towers located on roof – 250 tons each
- Conventional ductwork and 20 air handling units used to circulate air

## STRUCTURAL SYSTEM

- Majority of existing structural system will remain
- Addition will use similar materials
- Steel frame structure
- Load bearing concrete walls
- Envelope includes: stone base, precast concrete wall panels, brick, glass and



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## Executive Summary

The following report contains an in depth discussion and redesign for the lighting and electrical systems in the Franklin Care Center. The feasibility of the new electrical system was determined in a cost analysis that served as a Construction Management Breadth work. An additional breadth study includes calculations and a design to earn LEED Indoor Environmental Quality Credits 6.1 and 6.2, credits the future LEED rated building was not anticipating achievement of.

The lighting redesign concentrated on the Main Entrance Lobby, Chapel, Physical Therapy Suite and Exterior Courtyard. The variation in the types of spaces chosen made for an interesting discussion of separate design criteria and goals for each space. The goals set for each space had to be met while adhering to the design criteria, making the space appropriate for the challenges of the elderly eye, and meeting energy codes set by ASHRAE 90.1. Special consideration needed to be given to daylight, dimming controls and optimization of energy since this will be a LEED rated building. Daylighting studies were performed where appropriate, and a control system was designed.

The electric depth focused on the two 277/120V distribution panelboards in the Franklin Care Center. The two existing transformers that serve each distribution panelboard were relocated from the utility room in the cellar, to the rooms where each panel is located. Additional transformers were added so a transformer is located directly before each panelboard, rather than having one transformer serves several panelboards. This allowed for the use of smaller conductors, conduits and circuit breakers, but at the expense of the addition of many smaller sized transformers. To analyze the feasibility of the redesigned electrical system a cost analysis was done comparing the cost of the equipment that would be changed in the redesign. The cost of equipment was determined using *RS Means 2006, Electrical Construction Data*.

An additional breadth work was performed to redesign elements of the Franklin Care Center to earn another LEED credit. A perimeter and non-perimeter control system was designed for regularly occupied spaces to obtain LEED Indoor Environmental Quality Credits 6.1 and 6.2. By earning these credits the Franklin Care Center has a better chance at receiving LEED gold certification.

In conclusion, the depth and breadth studies were carefully thought out and designed to optimize energy and cut the operation cost of the Franklin Care Center.



## Background

### **Overview:**

The Franklin Care Center is an inpatient rehabilitation facility for the elderly located in Franklin Lakes New Jersey. It serves as a mediator between a hospital and a private home during a patient's recovery. The primary purpose of the Franklin Care Center is to provide medical attention to the patients; however the building also serves as a home to its occupants.

The Franklin Care Center is an existing two story building that is undergoing design for a renovation as well as a large addition. The architect for the addition is BeckhardRichlandSzerbaty + Associates and the delivery method is design-build-build. Each engineering system is also being redesigned to enhance the performance of the building both as a home and as a medical facility. New electrical service is being added, the majority of the lighting is being replaced, and the mechanical, telecommunications, and fire protection systems are being redesigned.

I chose the Franklin Care Center renovation and addition for my thesis because of the variety of types of spaces and the challenges of designing a lighting system for the elderly. Special needs of the elderly presented specific design criteria for certain spaces, including minimizing glare and contrast. In my design I had to incorporate this design criteria with the residential atmosphere of the building as well as the needs of each space. Lighting control was also a factor that led me to choose the Franklin Care Center. A DALI lighting control system for the entire building was requested by the owner for lighting control. By choosing the Franklin Care Center I got the opportunity to learn more about DALI lighting controls while taking its features into account in my design.

### **Architecture:**

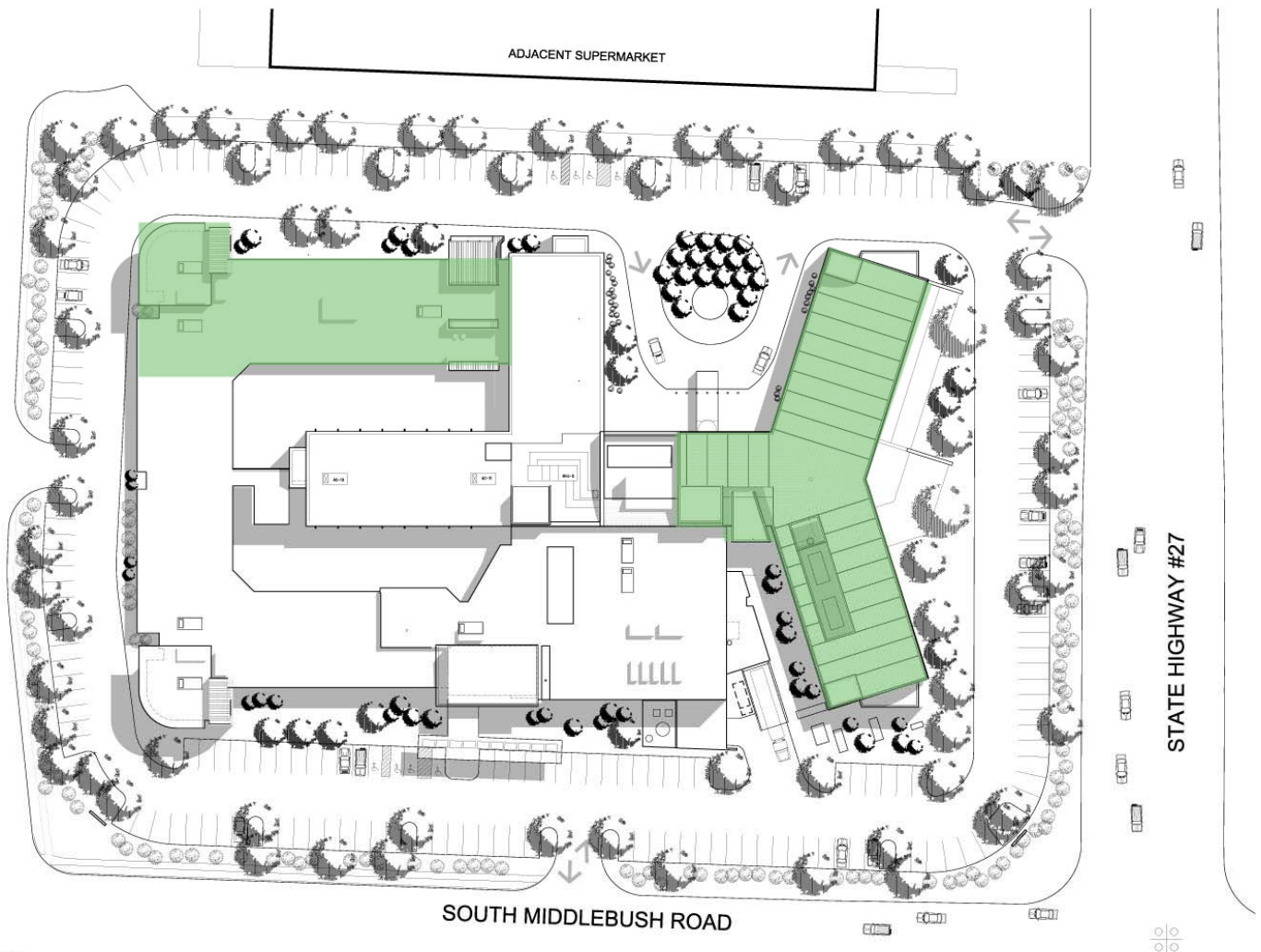
The goal of the new Franklin Care Center is to provide a comfortable home for elderly patients while they are receiving medical treatment. A good portion of the building will be composed of patient rooms. A small section of the building will be used for administration purposes, including, offices, conference rooms, telecommunication rooms, and a reception area. Patient medical services will be located on the first floor, and will include exam rooms, a surgical suite, x-ray room, therapy areas, and a pool for aqua therapy. However, the Franklin Care Center is not just a medical institution; it will serve as a home for the occupants of the patient rooms. To create a better living environment various social areas are provided in the

building. There are a number of lounges, a dining room, café, cathedral, beauty shop, gift shop, greenhouse and courtyard, all provided on site. With a variety of areas, the Franklin Care Center can provide medical services while offering the elderly a comfortable home to live in.

The Franklin Care Facility is being designed to earn LEED certification. LEED stands for Leadership in Energy and Environmental Design, meaning that the Center will be built in an environmentally friendly manner. The constructed building will be rewarded LEED points based on specific requirements.

**Site Plan:**

Addition shown in green



## Lighting Introduction

Lighting is essential to both the aesthetic appeal and performance of the Franklin Care Center. Patients living in the Franklin Care Center will be elderly, and may not be leaving the Center on a daily basis. It is crucial to design a space that will maintain a comfortable, residential atmosphere. Special needs of the eyes arise with age, consequently these needs must be taken into consideration when designing the lighting. Adequate light levels must be achieved with a residential, aesthetically pleasing design, while also maintaining a low power density.

Four spaces will be the focus of this lighting redesign: the Main Entrance Lobby, Chapel, Physical Therapy Suite and Exterior Courtyard. Each of these spaces presents its own lighting challenges which were addressed in the design criteria for that space.

### Problem:

Generally, the elderly suffer from reduced acuity and contrast sensitivity. To compensate for these eye problems increased illumination may be necessary, contrast should be used in hazardous areas, but avoided in general lighting, adjacent spaces should have relatively consistent illumination values, glare should be avoided and daylight should be taken advantage of. Since this will be a LEED certified building, it is imperative that the lighting design be as energy efficient as possible.

### Solution:

Luminaires were chosen based on the application, potential for glare, aesthetics, and efficiency. Layout and spacing options were explored and finalized using AGI32 lighting calculation software. Daylighting was taken into account where appropriate based on daylight analysis. The power density for each space was calculated and compared to ASHRAE 90.1. LEED Optimizing Energy points are awarded based on the percentage that the actual power density is below ASHRAE's value. While this is energy in general and not just energy used for lighting, it is essential to design each space as energy efficiently as possible.

# Main Entrance Lobby

## Overview:

The Main Entrance Lobby provides the entrance to the home of the occupants of the Franklin Care Center. Entrance to the building is provided by a revolving glass door, which leads to a reception area. Once you enter the lobby, the main staircase will be on your left hand side, and elevators straight ahead. The main entrance also includes a visitor's lounge where visitors can sit and read while waiting to see a patient.

## Design Criteria

**Main Goal:** To combine daylight and energy efficient electric light to create a welcoming entrance to the Franklin Care Center that also serves as a transition space allowing for adjustment of the elderly' eyes.

### Very Important Design Factors:

#### ***Appearance (Typically Important):***

Although appearance is typically considered an important factor for the lighting design of the entrance to a health care facility, I believe that appearance is a very important design factor for the Franklin Care Center. The main lobby serves as the entrance to the home of the residents of the Center, and therefore should appear inviting and impressive. It is very important for the main entrance to portray a welcoming feeling rather than an institutional one. Part of the space is open to the second floor with a vaulted wood slot ceiling. This architecture of the space should be enhanced through the lighting of the lobby.

#### ***Daylighting Integration and Control:***

Daylight is particularly important to the entrance of an elderly care center. As the eye ages it has a more difficult time adjusting to different light levels. So an elderly person may have difficulty entering a dark lobby from the bright outdoors. Instead, the lobby must be used as a transition space. Integrated daylight is the easiest way to balance the light levels inside the lobby with the light levels outside. Integrating daylight into the lobby can also save energy. The lobby is a large space that daylight can penetrate far into. The open space with vaulted ceiling will also allow daylight to enter the second floor lobby and corridor lowering the demand for electric light.

#### ***Horizontal Illuminance:***

The illuminance in the lobby must be flexible to allow for the adjustment of occupant's eyes as they enter from the outdoors. During the day the horizontal illuminance of the main entrance should be 100fc. This is much higher than a typical

lobby because it takes into account the slower adjustment of elderly people's eyes. At night the horizontal illuminance should be only 10 fc to match the low illuminance levels outdoors.

The reception area requires an illuminance of 30fc on the workplane to allow for administrative tasks and VDT use.

The visitor lounge should have a horizontal illuminance of 30fc at the workplane to allow for reading tasks.

***Vertical Illuminance:***

To provide good facial rendering, the vertical illuminance for the lobby and waiting area should be a minimum of 5fc.

***Luminance of room surfaces:***

Since the lobby will be used as a transition space from the bright outdoors into the building, the surfaces should be light to create a bright atmosphere.

***Facial Modeling:***

The main entrance is a very social space where people will be constantly interacting. Special attention should be given to facial modeling. The use of daylight and indirect lighting techniques should be used to create good facial modeling.

***Color Contrast:***

Since aesthetics are important to the entry space, so is the color contrast. A good CRI lamp should be used to get true color, and enhance the materials of the space.

***Light distribution on surfaces:***

Light should be uniformly distributed on surfaces. Patterns, or contrast changes can be extremely distracting to the elderly. In the lobby contrast can be used to orient occupants, but should not be present unnecessarily.

**Important Design Criteria:**

***Glare:***

Direct glare should be avoided in the lobby since it can be distracting. Lighting in the lobby should be used to enhance the architecture, and glare would take away from that goal.

***Source/Task/Eye geometry:***

Source/task/eye geometry is more important in the visitors lounge and reception than in the main lobby area. Task lighting should be provided for a VDT at the reception desk, and adequate lighting should be provided for reading in the visitors lounge.

**ASHRAE 90.1 Power Density:** Using the space by space power density method, a lobby should have a maximum power density of 1.3 W/sqft.



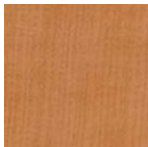
## Design Concept

Since the lobby is a transition space from outside to indoors it should be brighter during the daytime and dimmer at night. The architectural design of the lobby allows for this to happen naturally through the use of daylight. The east facing façade of the lobby is a glass curtain wall, so when it is light outside the daylight will penetrate into the lobby and make it a comfortable transition space. The electric lighting in the lobby was designed for night time, and dimmed when appropriate during the day based on daylight conditions.

The goal of the lighting design for the lobby is to enhance the architecture of the space and create a residential atmosphere. The main architectural feature of the lobby is a grand vaulted wood ceiling; this needed to be emphasized in the lighting design. In order to enhance the beauty of the wood, the ceiling was illuminated from the higher side using a row of metal halide fixtures. Metal halide was chosen as the source because fluorescent luminaires did not provide enough illumination on the wood to reflect adequate light down towards the floor. The row of metal halide fixtures was concealed in a cove to preserve the clean architecture of the space. Even using the metal halide luminaires, uplighting the wood ceiling did not provide the recommended 10fc in the lobby corridors on the floor. To provide additional illumination decorative bowl pendants were chosen. These pendants increase the floor illumination to an adequate level while creating a residential atmosphere in the lobby. Safety on the stairs was an additional concern in the lobby since these stairs will be used by residents as well as guests. To provide increased illumination on each stair a step light was placed just above each tread on both sides of the step. This fixture will supply extra light on the tread, and provided contrast between each tread and each riser. To increase illumination levels in the receptionist area linear indirect pendants were chosen. In addition to these the receptionist has a task light at her desk that she can use when she feels it is necessary.

In the visitors area glare free lighting was chosen to make the space more comfortable. Decorative louvered downlights were chosen for general illumination. The louvered design of these fixtures reduces glare, making a more comfortable environment for the elderly. Matching sconces using the same glare free louvered design were also used to mark the elevators in the lobby. Table and floor lamps provide additional illumination for reading in the visitor's area as well as continued the residential atmosphere. Art work on the wall was illuminated by halogen lamps

## Finishes



Wood ceiling  
Wood ceiling  
P=29%



Walls: Peach  
P=75%



Floor: White  
Marble  
P=76%

## Equipment Luminaire Schedule

Fixture	Description	Fixture	Lamp	Lamp	Ballast	Ballast	Lamps	Fixture			
Label		Cat No.	#	Type	Cat. No.	CRI	CCT	Type	Cat. No.	per ballast	Quantity
F1	Wall mounted metal halide uplight	P2-LS-M150-LS1-SGW	1	ED 17	MCG150/U/M3K ALTO	85	3000	Electronic	Advanced Transformer 71A5437BP	1	19
F2	Compact fluorescent decorative pendant	American Glass Light 6118-U	2	Quad	CFQ18W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x18CF/UNV DALI	2	8
F4	Surface mounted decorative downlight	Magic-1/32W/CF GX24Q3 277 GLASS	2	Triple Tube	CFTR32W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/UNV DALI	2	4
F5	Incandescent table lamp	Louis Poulsen PH4 1/2-T-1/100W/A19/IF MED/120 GLASS	1	A19	100A/CL/DL/RP	100	n/a	n/a	n/a	n/a	1
F5a	Incandescent floor lamp	Louis Poulsen PH4 1/2-F-1/100W/A19/IF MED/120 GLASS	1	A19	100A/CL/DL/RP	100	n/a	n/a	n/a	n/a	1
F6	Recessed wall mounted LED steplight	Erco 33730.000	1	LED	n/a	n/a	n/a	n/a	n/a	n/a	48
F8	Wall mounted compact fluorescent decorative sconce	OSW-1/18W/CF GX24Q-3/4-277-WHT	1	Quad	CFQ18W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x18CF/UNV DALI	2	2
F12	Recessed halogen accent light	Lucifer DL2G	1	MR16	20MR16/T/NSP10	100	n/a	n/a	n/a	n/a	2
F17	Suspended indirect fluorescent pendant	Lightolier 48228ALU	2	T5	FP28/830/ECO	82	3000	DALI dimming	Sylvania QTP2x28T5/UNV DALI	2	3
F18	Desk task light	Erco 33170.000	1	Capsul	50T4Q/CL/AX	100	n/a	n/a	n/a	n/a	1

### Visible Luminaires



F2



F4



F5



F5a



F6



F8



F17



F18

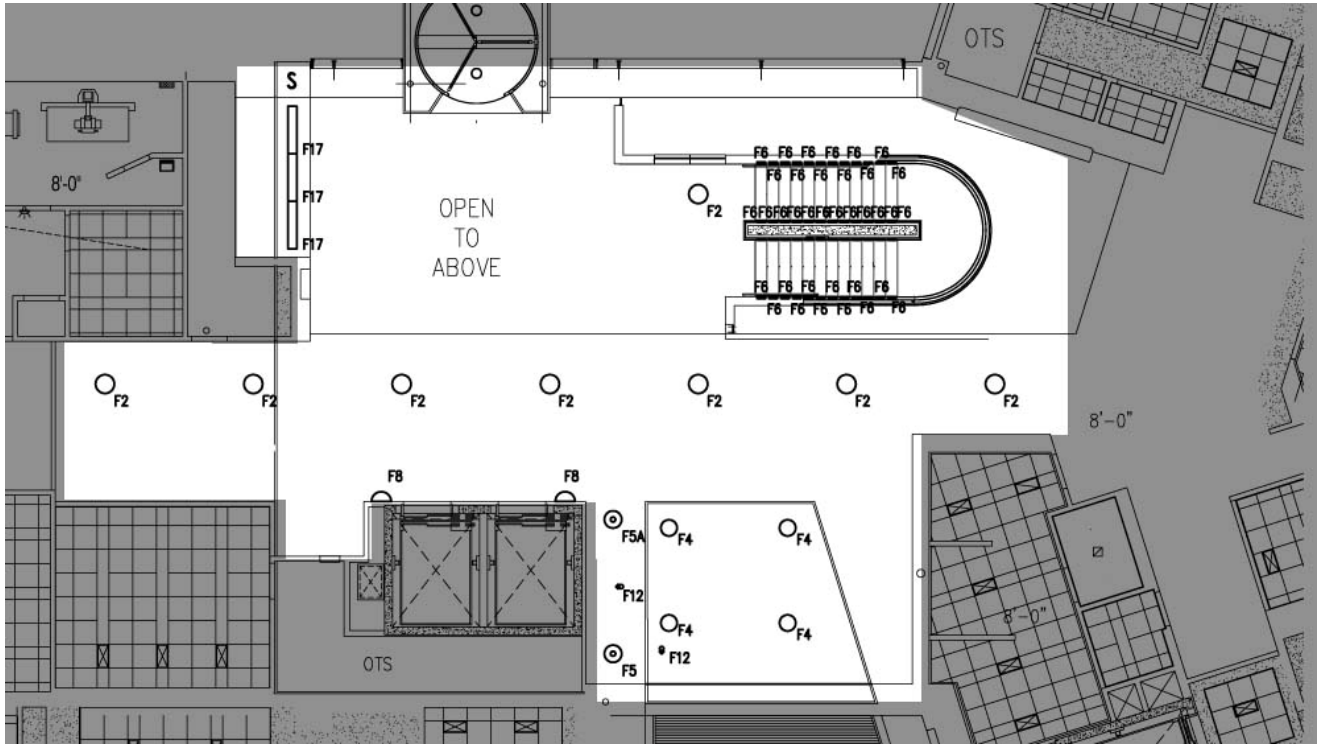
## Light Loss Factors

Luminaire Label	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Mean Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
F1	VI	Clean - 12 months	14000	10500	0.75	0.88	0.98	1	0.65
F2	V	Clean - 12 months	2300	2150	0.934783	0.89	0.98	1	0.82
F3	II	Clean - 12 months	4800	4128	0.86	0.94	0.98	1	0.79
F4	II	Clean - 12 months	4800	4128	0.86	0.94	0.98	1	0.79
F5/F5a	III	Clean - 12 months	1550	1472.5	0.95	0.9	0.96	1	0.82
F6	VI	Clean - 12 months	-	-	1.00	0.88	0.98	1	0.86
F8	II	Clean - 12 months	1150	1075	0.93	0.94	0.98	1	0.86
F11	III	Clean - 12 months	320	304	0.95	0.9	0.96	1	0.82
F17	II	Clean - 12 months	2900	2697	0.93	0.94	0.98	1	0.86
F18	III	Clean - 12 months	910	864.5	0.95	0.9	0.96	1	0.82

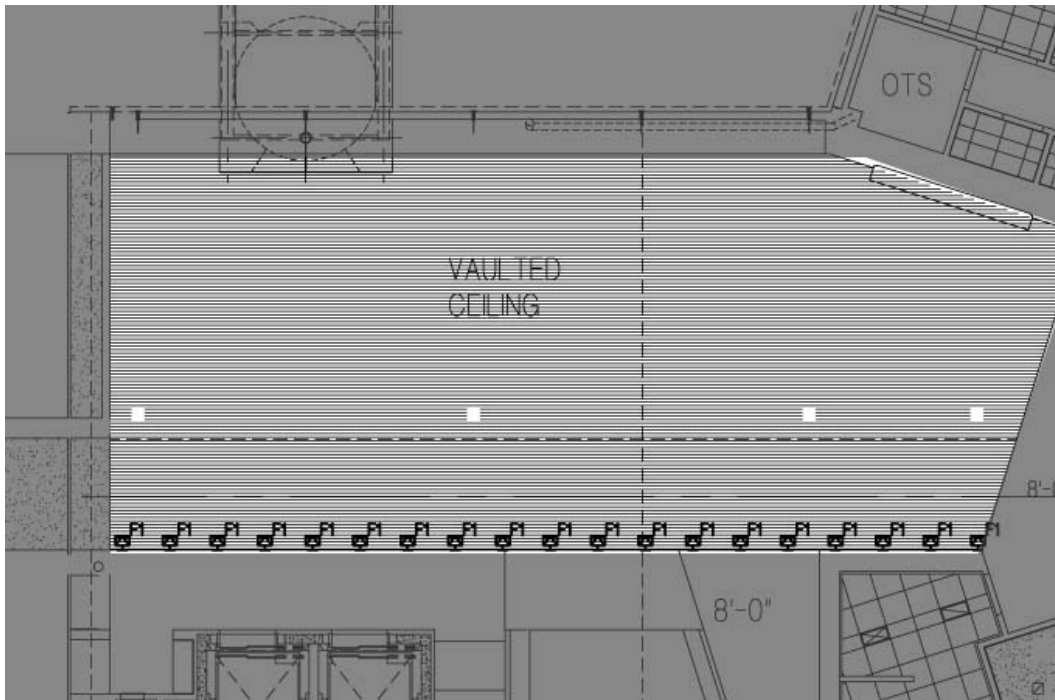
## DALI Equipment

	Description	Cat. No.	Quantity
<b>Power Supply</b>	Wattstopper ezDALI Power Supply	DPS150-2	1
<b>Wall Control</b>	Wattstopper ezDALI Group and Scene Control	DLCSS4-2	1
<b>Photosensor</b>	Wattstopper Photosensor	LS-301	2

## Luminaire Layout



First Floor



Second Floor Note: 2<sup>nd</sup> floor lobby lighting not in scope

## Control Zones

Fluorescent and compact fluorescent lighting in the lobby will be controlled by a Wattstopper ezDALI group controller. This wall box controller allows each DALI group to be dimmed individually. In addition to the group controller there will be a relay module that will control the halogen accent fixtures that illuminate artwork in the visitors lounge. Whenever the downlights in the visitor's area (DALI group 3 as shown below) are on, the relay module will turn on the accent lights.

Three photosensors will help integrate the electric light with daylight. A daylighting study was conducted to determine the amount of light that would enter the lobby during different seasons. The conditions studied were as follows:

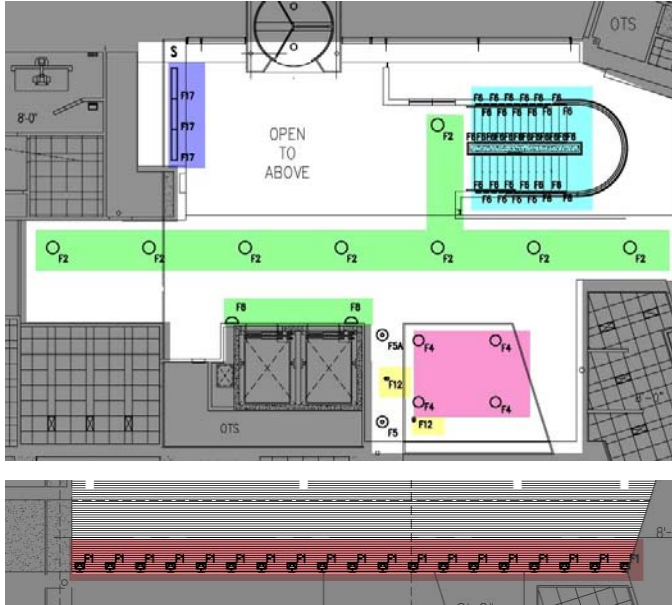
Date	Sky condition	Time
21-Mar	Clear sky	10am, 12pm, 2pm, 4pm
	Overcast sky	10am, 12pm, 2pm, 4pm
21-Jun	Clear sky	10am, 12pm, 2pm, 4pm
	Overcast sky	10am, 12pm, 2pm, 4pm
21-Dec	Clear sky	10am, 12pm, 2pm, 4pm
	Overcast sky	10am, 12pm, 2pm, 4pm

The results of this study showed a large variation in the amount of daylight entering the lobby. This led to the selection of photosensors to control the fluorescent lighting in the main lobby and visitor's lounge. On a clear day in March or June very little if any of the fluorescent lighting is needed. However on December 21 with an overcast sky the least amount of daylight enters the lobby and these fixtures can only be dimmed between 80% and 90% of their full output. A photosensor will work best to control the fluorescent fixtures to the appropriate dimming level. The metal halide uplights (F1) were found to be unnecessary under any of the studied conditions. These fixtures will be put on a timer so that they turn off at 9:30am and turn back on at 4:30pm each day. Switching these fixtures off for seven hours each day will conserve a decent amount of energy.

## Location Critical Points

The critical points were chosen based on the values obtained from the daylighting study. Each point was chosen because it was a consistently low value based on daylight alone and not too close to the corner of the room.

## DALI Control Groups



<b>Dali Group 1</b>	<b>F2 CFL Pendants and F8 CFL Sconces</b>
<b>Dali Group 2</b>	<b>F17 Fluorescent Pendants</b>
<b>Dali Group 3</b>	<b>F4 Downlights</b>
<b>Relay Module 1</b>	<b>F 11 Halogen Accent</b>
<b>Control Group 5</b>	<b>F1 Metal Halide Uplights</b>

\*F5 and F5a are controlled by switches on the fixtures

## DALI Settings

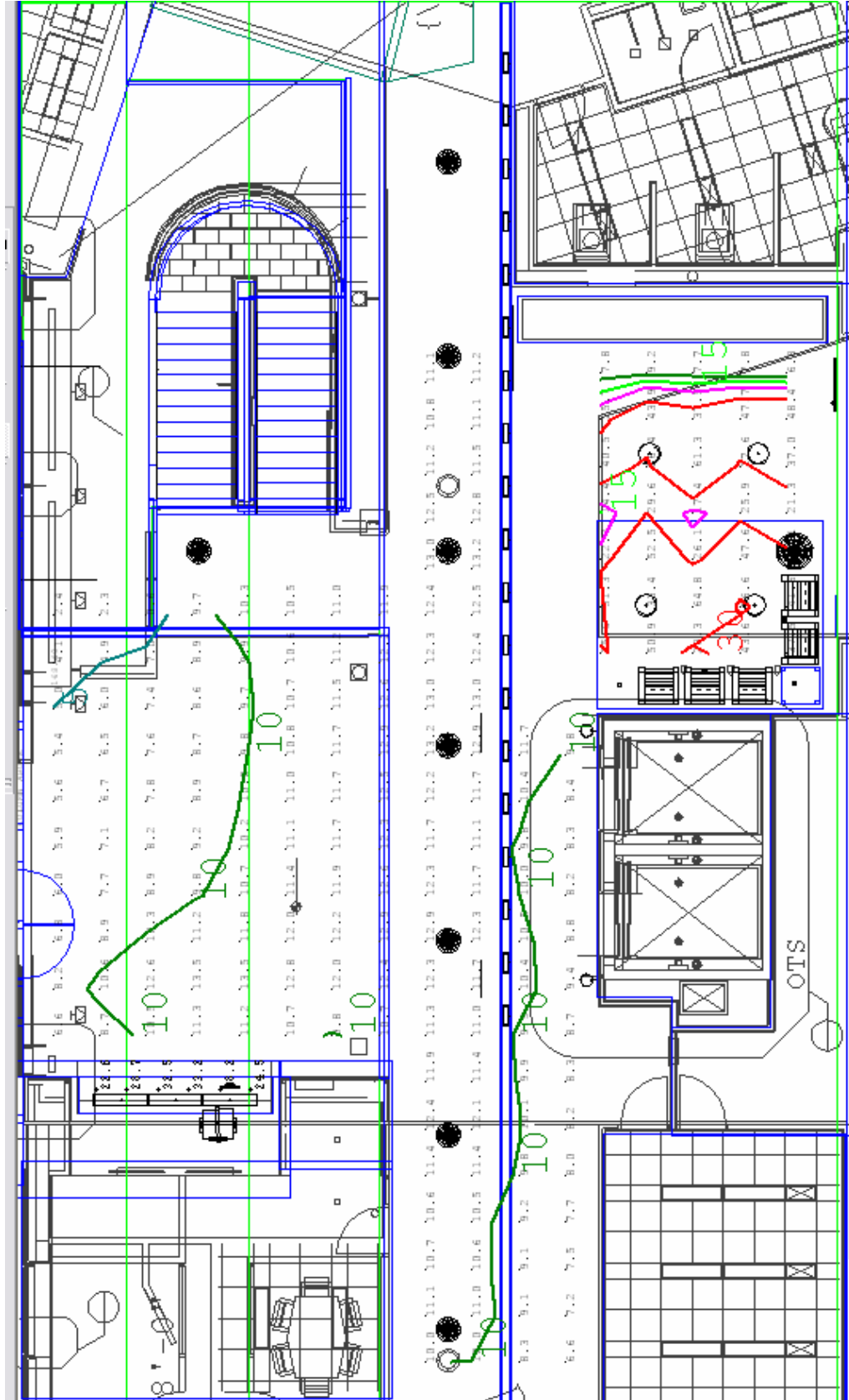
<b>Dali Group 1</b>	Photosensor 1 Control - maintain 10fc at critical point
<b>Dali Group 2</b>	Controlled by wallbox group controller
<b>Dali Group 3</b>	Photosensor 2 Control - maintain 30fc at critical point
<b>Relay Module 1</b>	On when Dali Group 3 is on, off when Dali Group 3 is off
<b>Control Group 5</b>	Timer - off 9am - 5pm
<b>LED steplights</b>	Remain on at all times

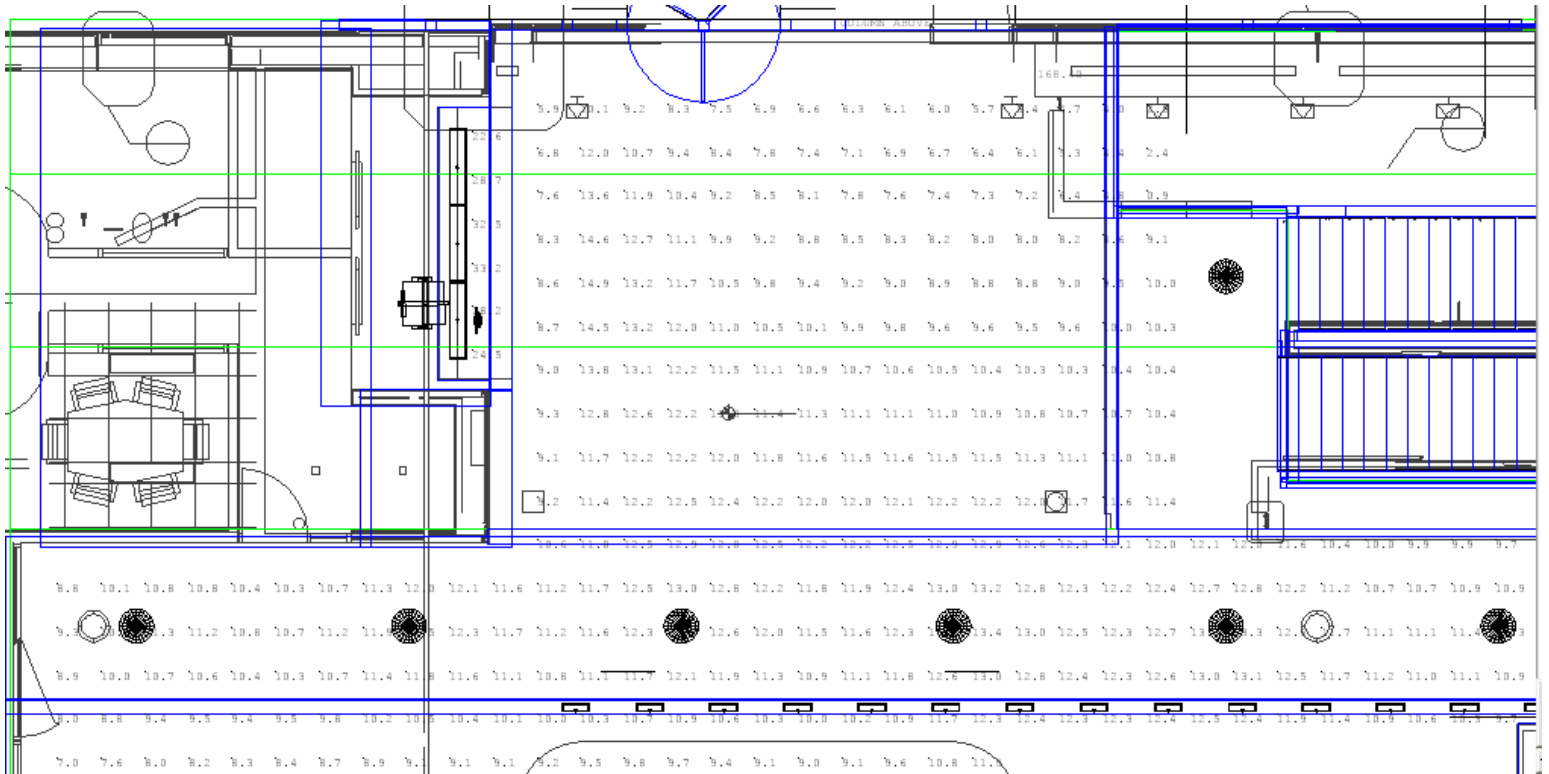
## Circuiting

Luminaire	input watts	# used	volts	amps per ballast	total VA load
F1	173	19	277	n/a	3287
F2	40	8	277	0.33	731.28
F4	70	4	277	0.6	664.8
F5	100	1	120	n/a	100
F5a	100	1	120	n/a	100
F6	2.6	48	277	n/a	124.8
F8	40	1	277	0.33	91.41
F12	20	2	120	n/a	40
F17	64	3	277	0.31	257.61
F18	50	1	120	n/a	50
<b>Power supply</b>	1.5	1	277	n/a	1.5
<b>TOTAL VA</b>					<b>5448.4</b>

Circuit	Load (VA)	Wire Size	Conduit	Breaker Size
L-1	4018.28	2#12 AGW, 1#12 GRD	3/4"	20A
L-2	1015.32	2#12 AGW, 1#12 GRD	3/4"	20A
L-3	290	2#12 AGW, 1#12 GRD	3/4"	20A

### Illuminance Values of Electric Lighting





Illuminance Values of Reception area and Lobby floor

Lobby floor

Goal: 10fc

Achieved: 10.36fc

Reception Desk

Goal: 30fc without task light

Achieved: 28.28

\*adjustable task light on desk  
for when necessary

Visitor's Lounge at 2.5'

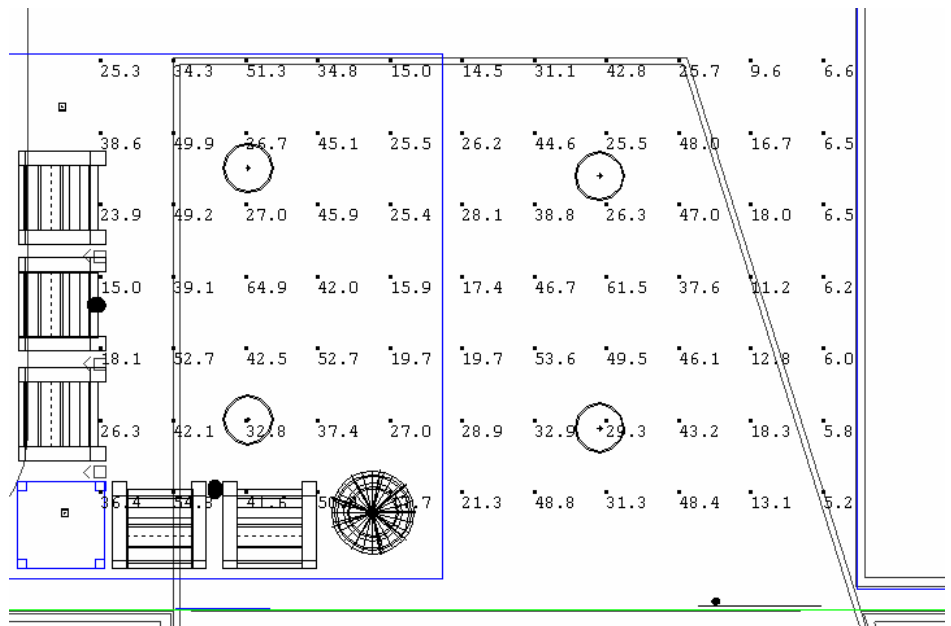
Goal: 30fc

Achieved: 31.23fc

Stairs

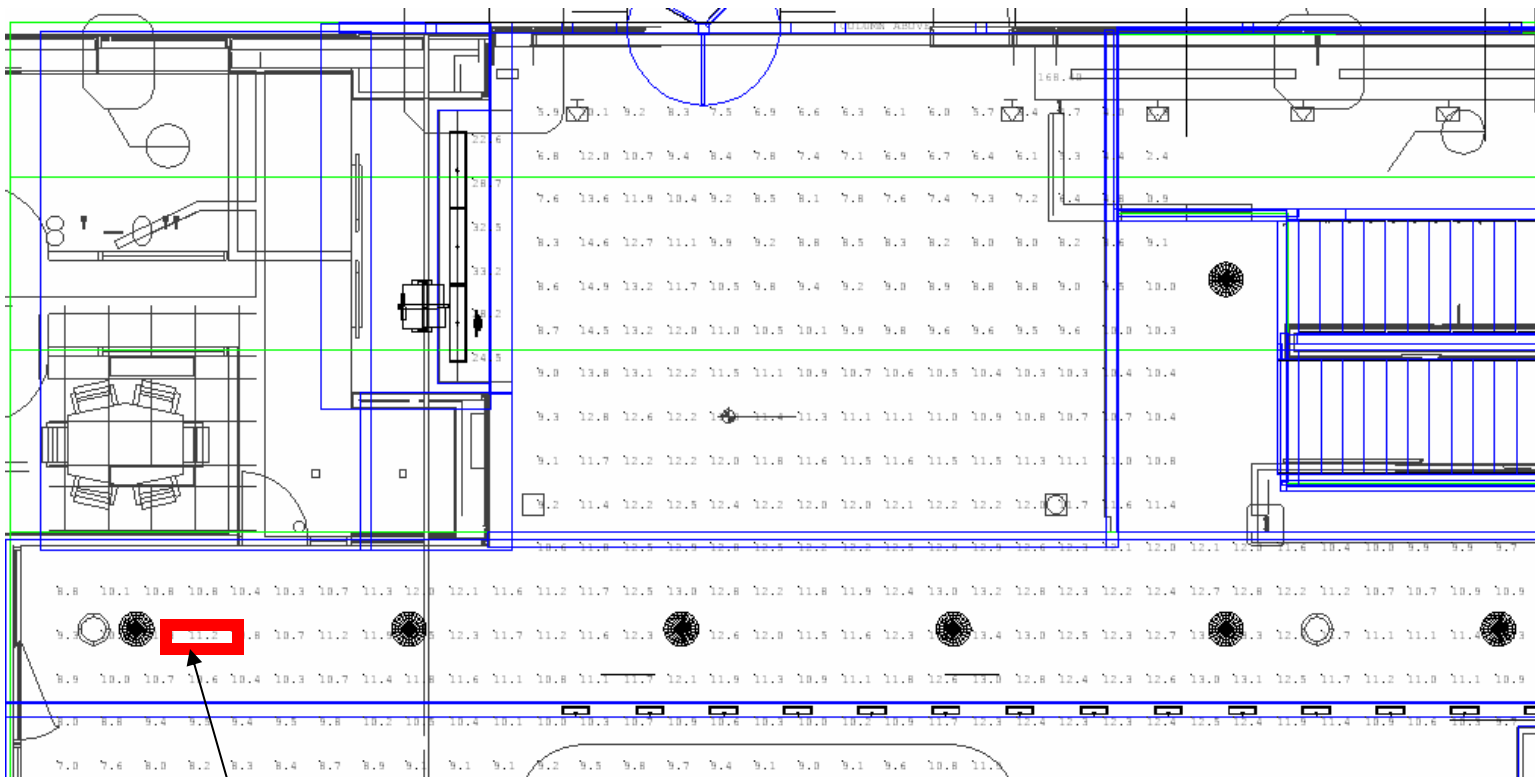
Goal: 10fc

Achieved: 11fc

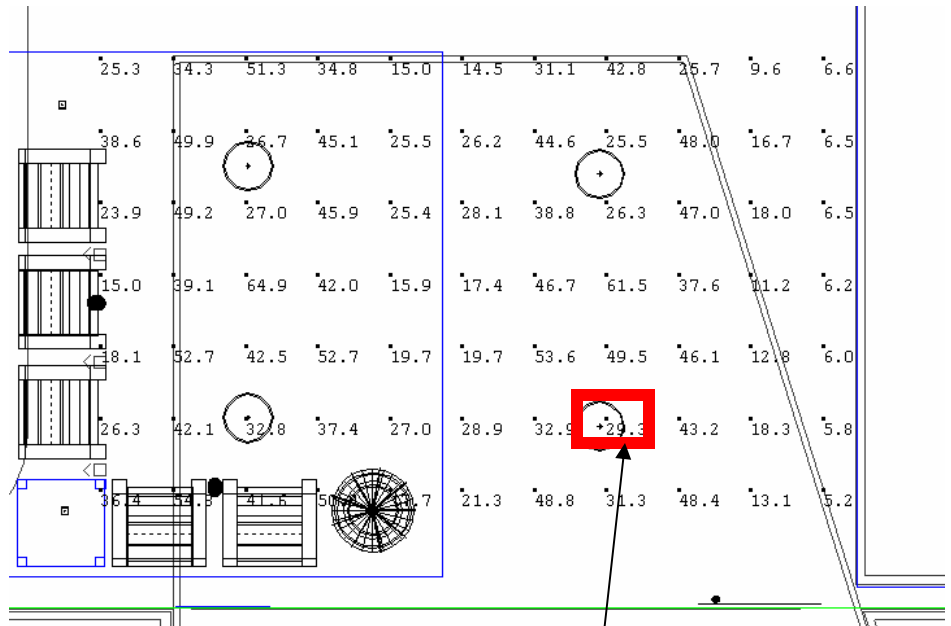


Visitors area illuminance Values at 2.5'





Photosensor 1 critical point  
 Goal Illuminance = 10fc



Photosensor 2 critical point  
 Goal Illuminance = 29.3fc

## Power Density

Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power
F1	Wall mounted metal halide uplight	1	ED 17	Electronic	1	19	173	3287
F2	Compact fluorescent decorative pendant	2	Quad	DALI dimming	2	8	40	320
F4	Surface mounted decorative downlight	2	Triple Tube	DALI dimming	2	4	70	280
F5	Incandescent table lamp	1	A19	n/a	n/a	1	100	100
F5a	Incandescent floor lamp	1	A19	n/a	n/a	1	100	100
F6	Recessed wall mounted LED steplight	1	LED	n/a	n/a	48	2.6	124.8
F8	Wall mounted compact fluorescent decorative sconce	1	Quad	DALI dimming	2	2	40	40
F12	Recessed halogen accent light	1	MR16	n/a	n/a	2	20	40
F17	Suspended indirect fluorescent pendant	2	T5	DALI dimming	2	3	64	192
F18	Desk task light	1	Capsul	n/a	n/a	1	50	50
							<b>Total Watts</b>	4533.80
							<b>Square footage</b>	3200.00
							<b>Total Power Density W/sqft</b>	1.42
							<b>VDT Power Density W/sqft</b>	<b>0.08</b>
							<b>Decorative Power Density W/sqft</b>	<b>0.09</b>
							<b>Physical Therapy Power Density</b>	<b>1.25</b>

Allowable power density = 1.3 W/sqft  
 1 W/sqft addition for decorative  
 0.35 W/sqft additional for VDT usage  
 Achieved power density = 1.25 W/sqft  
 0.09 additional for decorative  
 0.08 additional for VDT

The power density for the lobby is 4% below ASHRAE90.1

## Renderings



Lobby and Visitor's Lounge





Reception Desk



Visitor's Lounge



View from Visitor's Lounge



View from Reception Desk



Entry and Staircase

## Conclusions

A combination of architecture, materials and lighting create an enjoyable, residential atmosphere for the entrance to the Franklin Care Center. The high vaulted wood ceiling is illuminated by daylight or electric light depending on the time of day, creating a spacious, open lobby. The wood is a light color of a high enough reflectance to provide ambient illumination at the first floor of the lobby. All visible lighting fixtures were carefully chosen decorative fixtures to enforce a residential atmosphere. These fixtures are either indirect or louvered to prevent undesirable glare that can be particularly distracting to the elderly eye. The integration of architecture, materials and lighting portray a residential atmosphere that makes one feel as if they are entering a home rather than a medical institution.

Easy daylight integration is provided by DALI control. During the day the open lobby space will be bright from the penetrating daylight, when additional light is necessary in the corridors or visitor's lounge the photosensors will signal for DALI to provide more illumination. Although the power density for the lobby is only 4% below ASHRAE's value, dimming will conserve additional energy throughout the day. The group control switch is located adjacent to the receptionist's desk to allow these settings to be overridden when necessary.

# Chapel

## **Overview:**

A small chapel is located on the second floor of the Franklin Care Center. It has seating for 19 people as well as handicapped access and seating for wheelchairs. The leadership area is located in the front of the church and includes a projection screen. There is only one small window in the chapel, located behind the projection screen wall in the front. Daylighting will not have a great impact on the space; this window will only provide a nice daylighting effect from behind that wall.

## Design Criteria

### **Main Goal:**

To provide a flexible lighting system that enhances the architecture of the chapel and creates a spiritual atmosphere.

### **Very Important Design Criteria:**

#### **Congregational area**

##### ***Horizontal Illuminance:***

Horizontal illuminance of 10fc is the minimum acceptable for the congregational area. 30fc is a better illuminance level for the task of reading. A flexible system that allows the illuminance level in the congregational area to change throughout the ceremony would be ideal.

##### ***Vertical Illuminance:***

A high level of vertical illuminance is not needed in the congregational area. 3fc is adequate.

#### **Leadership area**

##### ***Appearance:***

The leadership area is the focus of the chapel. The lighting should be laid out orienting visitors towards the leadership area during services.

##### ***Color Contrast:***

Color rendering in the leadership area is important to separate the task of reading from the background. It is also important for the congregations to easily distinguish the leader from his background.

##### ***Luminance of surfaces:***

The surfaces in the leadership area should direct the congregation's attention towards that direction. While the surfaces should be uniform, they should be brighter than the other surfaces in the chapel.



**Shadows:**

Task lighting should be used to provide illuminance on the leaders reading material and eliminate shadows that may make the task of reading difficult.

**Source/task/eye geometry:**

The leadership area will be the brightest area of the church, but the placement of the fixtures that the light is coming from must be carefully planned. The geometry should be used to enhance visual interest.

**ASHRAE 90.1 Power Density:** Using the space by space power density method, a worship space should have a maximum power density of 2.4 W/sqft.

## Design Concept

The main goal of this design was to enhance the architecture of the chapel and create a spiritual atmosphere. To achieve this, the side walls were moved out about six inches to make room for a cove, indirect lighting was used in the cove to uplight the wood panels on the upper part of the walls as well as the wood ceiling. Along the front wall where the window is located (behind the projection screen wall in the leadership area), a cove is also located. At night the cove light will provide a similar effect that the daylight will provide during the day, having the curved part of the ceiling glow around the leadership wall. Uplighting the wood alone does not provide adequate light levels for reading, so small downlights were provided to increase light levels when needed. Halogen lamps were placed randomly to create a starry sky effect and allow for a full range of dimming so that the light levels can be adjusted as necessary. The use of small downlight sources and indirect lighting provide a glare free environment for the elderly. In order to highlight the speaker and draw attention toward the front of the chapel halogen spots were used. Narrow spotlight distributions were chosen to avoid lighting from spilling onto the projection screen.

## Finishes



Wood panels on wall:  
Wood ceiling  
p=29%



Walls: Colonial  
White  
p=80%



Floor: White  
Marble  
p=76%

## Equipment Luminaire Schedule

Fixture Label	Description	Fixture Cat No.	Lamp #	Lamp Type	Lamp Cat. No.	CRI	CCT	Ballast Type	Ballast Cat. No.	Lamps per ballast	Fixture Quantity
F9	CFL surface mounted downlight	Lightolier 3040PB218U	2	Quad	Sylvania CFQ18W/G 24Q/830	82	3000	Dali Dimming	Sylvania QTP2x18CF/ UNV DALI	1	1
F10	Cove mounted fluorescent striplight	Prudentail PT8W-SS-STD-1T8-04-BWE-SC	1	T5	Sylvania FP28/830/E CO	82	3000	Dali Dimming	Sylvania QTP2x28T5/ UNV DALI	2	19
F11	Recessed halogen downlight	Lucifer DL1G	1	MR16	Sylvania 20MR16/T/F L40	100	3000	n/a	n/a	1	26
F12	Recessed halogen spotlight	Lucifer DL2G	1	MR16	Sylvania 20MR16/T/N SP10	100	n/a	n/a	n/a	1	1
F12a	Recessed halogen spotlight	Lucifer DL2G	1	MR16	Sylvania 50MR16/T/N SP10	100	n/a	n/a	n/a	1	1
F16	Wall mounted compact fluorescent sconce	Manning PS44-12-PLC-W	1	Quad	Sylvania CFQ13W/G 24Q/830	82	3000	Dali Dimming	Sylvania QTP1x13CF/ UNV DALI	1	4

### Visible Luminaires



F9



F11/F12/F12a



F16

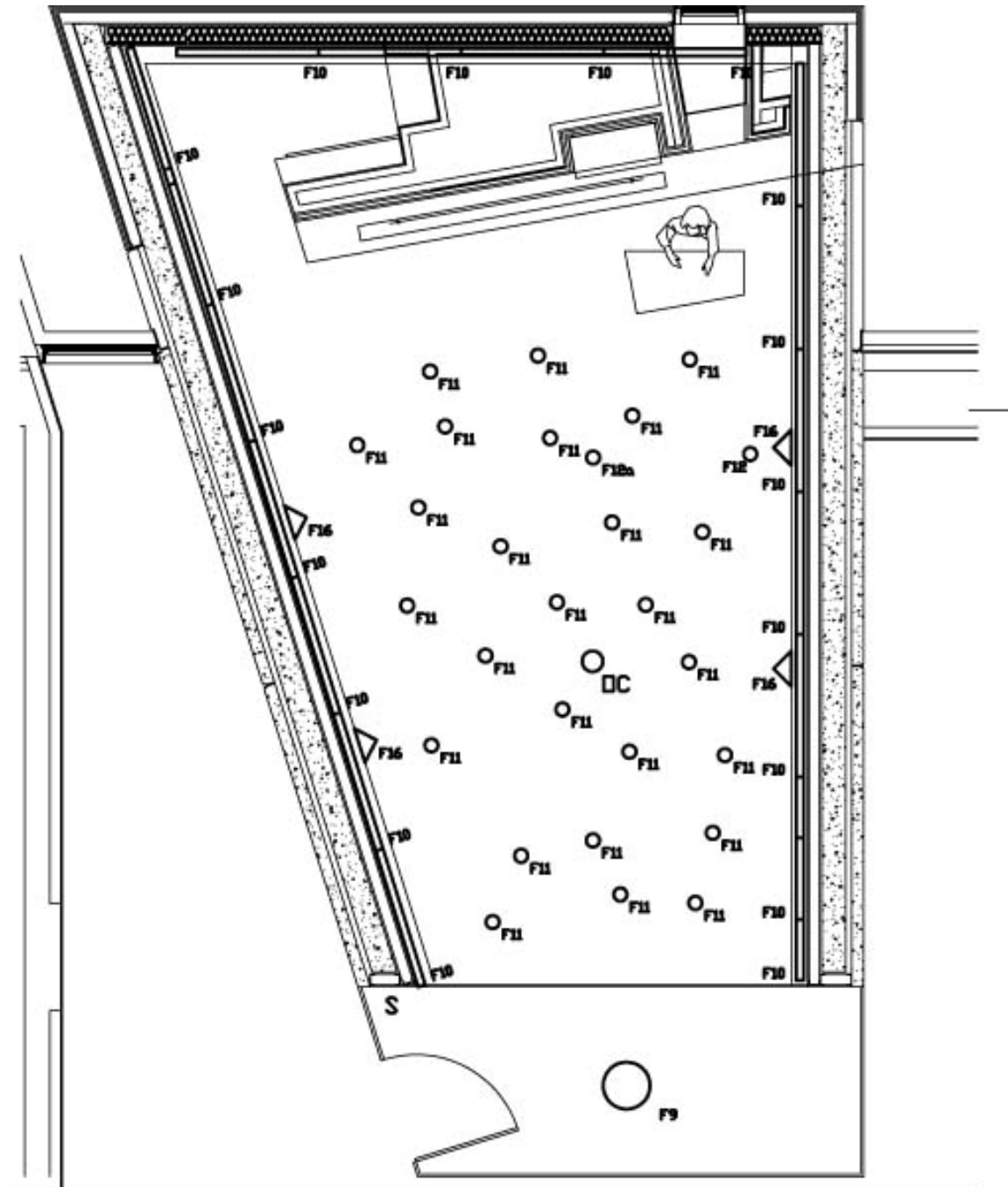
### Light Loss Factors

Luminaire Label	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Mean Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
F9	III	Very Clean - 12 months	1150	1075	0.93	0.9	0.98	1	0.82
F10	VI	Very Clean - 12 months	2900	2697	0.93	0.92	0.9	1	0.77
F11	III	Very Clean - 12 months	240	228	0.95	0.9	0.98	1	0.84
F12	III	Very Clean - 12 months	320	304	0.95	0.9	0.98	1	0.84
F12a	III	Very Clean - 12 months	900	855	0.95	0.9	0.98	1	0.84
F16	II	Very Clean - 12 months	900	774	0.86	0.98	0.98	1	0.83

### DALI Equipment

	Description	Cat. No.	Quantity
<b>Power Supply</b>	Wattstopper ezDALI Power Supply	DPS150-2	1
<b>Wall Control</b>	Wattstopper ezDALI Group and Scene Control	DLCSS4-2	1
<b>Transformer</b>	B+L Technologies DALI Star	DS98100-S	10
<b>Occupancy Sensor</b>	Wattstopper Ultrasonic Occupancy Sensor	UT-305-2	1

## Luminaire Layout



## Lighting Control

Lighting in the chapel will be dimmed and controlled using a Wattstopper ezDALI Group and Scene Controller. B+L Technologies DALI star transformers will be added to this installation, allowing DALI to control the halogen fixtures. Each transformer controls a maximum of 75W, so nine transformers will be needed to control the F11 downlights, and one will be needed to control the spotlights (F12 and F12a). The transformers will allow the halogen fixtures to be dimmed 0-100% and be controlled by the DALI group and scene controller. The compact fluorescent loads will be placed on a relay since it is unnecessary to dim these fixtures. The relay will work with the group and scene controller and switch the compact fluorescent fixtures on or off. The group element of the controller will allow each group of luminaires (up to 4 groups maximum) to be controlled and dimmed manually, and the scene selection control will allow these groups to function with the halogen loads to create 4 preset scenes. One Wattstopper ezDALI power supply is needed to provide power to the chapel.

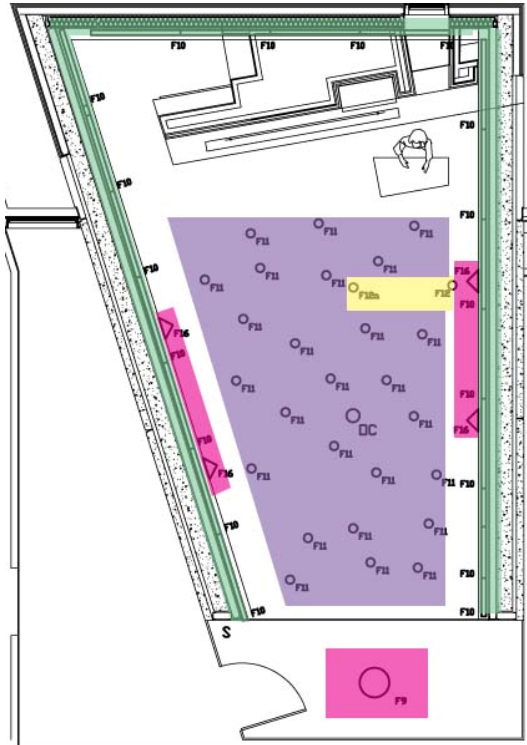
A Wattstopper ultrasonic low voltage occupancy sensor will also be installed to conserve energy by switching off all lights when the chapel is not occupied. This occupancy sensor was chosen because the chapel is a small space with a clear line of sight and the sensor is compatible with the selected power supply. The ezDALI controller will work with the occupancy sensor so that when the controller turns the lights on, the most recently used scene will be resumed. This will be especially useful during visiting hours when the chapel will be used for individual prayer. For example, during visiting hours the lighting will be set to the correct scene, if no one is present in the chapel the lighting will dim to 10% of that scene for 5 minutes. If someone enters the chapel during those 5 minutes the scene will be resumed; if not the lighting will switch off until someone enters, when the visiting hour scene will then be resumed.

## DALI Control Groups

Group 1	F10 Fluorescent Cove
Group 2	F11 Halogen downlights
Group 3	F12 and F12a spotlights
Relay Module 1	Compact Fluorescent sconces and downlight

## Scenes

	Service	Before and after service	Visiting Hours	Sermon
Group 1	100%	100%	100%	100%
Group 2	100%	35%	25%	10%
Group 3	100%	Off	Off	100%
Relay Module 1	100%	100%	100%	100%



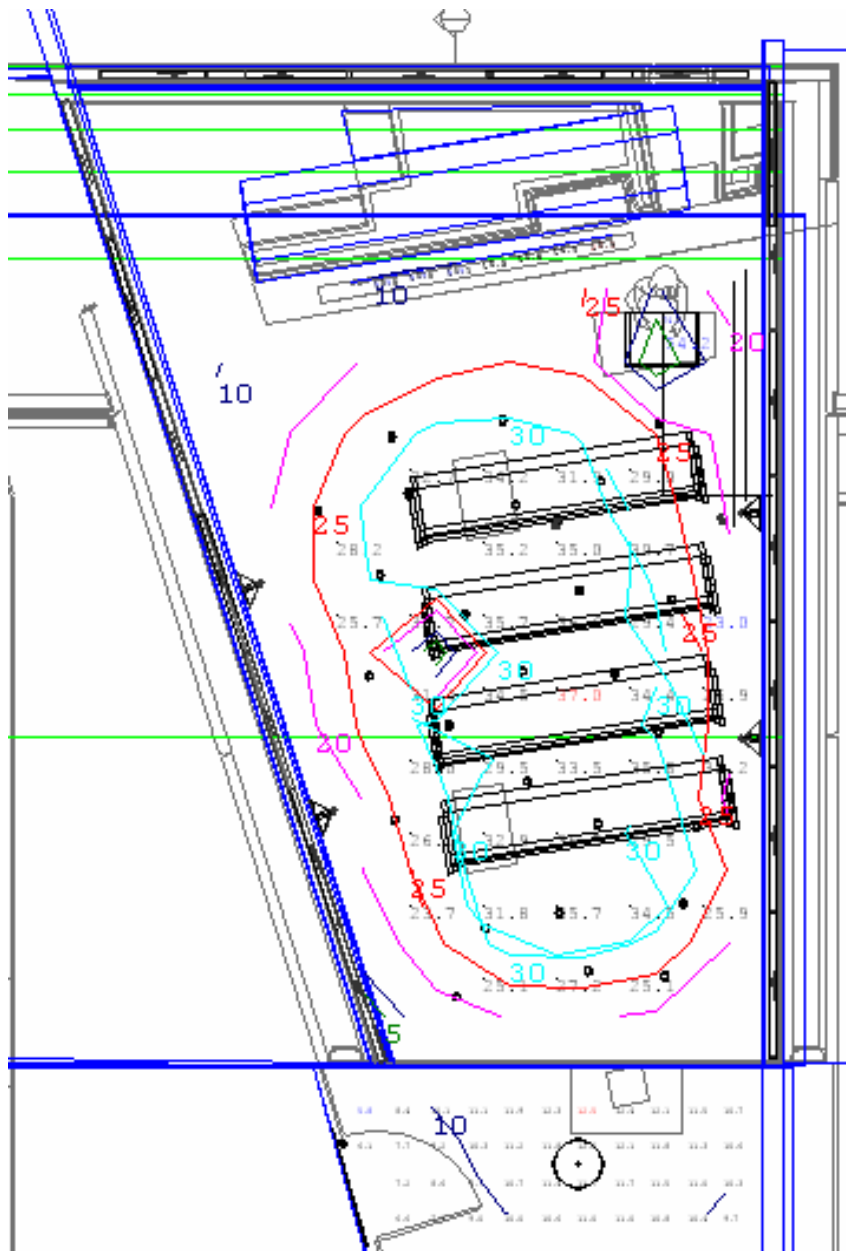
## Circuiting

Luminaire	input watts	# used	volts	amps per ballast	total VA load
F9	40	1	277	0.33	91.41
F10	64	10	277	0.31	858.7
F11	20	26	12	1.67	520
F12	20	1	12	1.67	20
F12a	50	1	12	4.17	50
F16	16	4	277	0.18	199.44
Power supply 1	1.5	1	277	n/a	1.5
Power supply 2	1.5	1	120	n/a	1.5
Transformers		10	120	0.6	720
<b>TOTAL VA</b>					<b>2462.55</b>
Circuit	Load (VA)	Wire Size	Conduit	Breaker Size	
CH-1	1151.05	2#12 AGW, 1#12 GRD	3/4"	20A	
CH-2	1311.5	2#12 AGW, 1#12 GRD	3/4"	20A	

## Illuminance Values

### During Service Scene

During the service enough light should be provided for reading. Since this chapel will be used by the elderly, 30fc should be provided to allow for comfortable reading. Adequate lighting should also be provided on the podium for the speaker to read. The speaker should be highlighted with 50-75fc on his or her face. Light on the projection screen should be kept to a minimum to reduce glare.



Seating Area at 2.5'  
Goal: 30fc  
Avg. Achieved: 30.84fc

Entrance Area at floor  
Goal: 10fc  
Avg. Achieved: 10.29fc

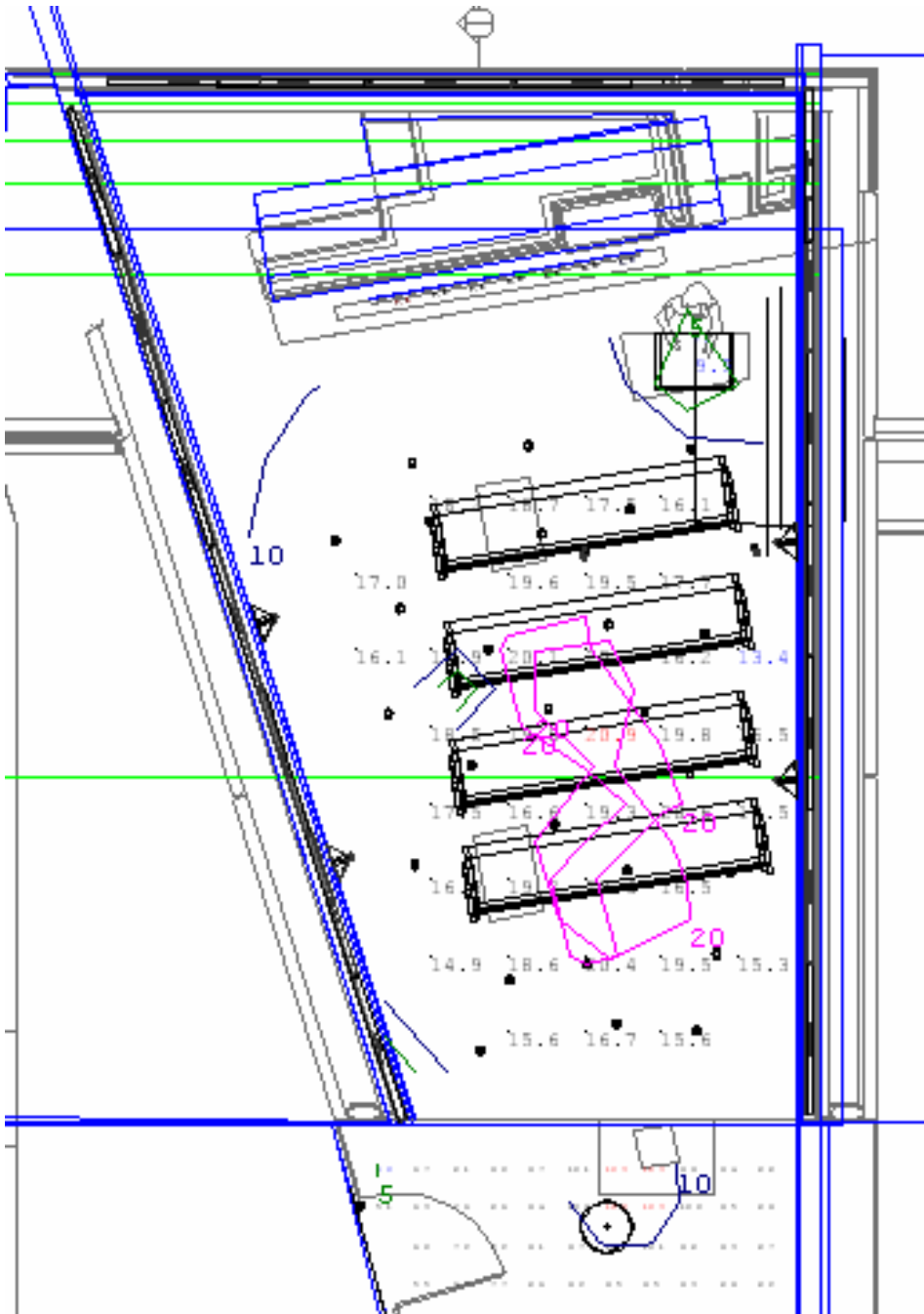
Podium at 3'  
Goal: Minimum of 30fc  
Avg. Achieved: 54.2fc

Face  
Goal: 50-75fc  
Avg. Achieved: 74fc

Projection Screen  
Goal: Minimize light  
Actual: 10fc

### Before and After Service Scene

Before and after services enough light should be provided for people to mingle and enter or exit the chapel. More lighting should be supplied than during visiting hours to signal that a service is about to start or has just ended. At least 10fc should be provided to mark the entrance and exit area. Spotlights can be turned off since the focus will not be on the front on the chapel.



Seating Area at 2.5'

Goal: 20fc

Avg. Achieved: 18fc

Entrance Area at floor

Goal: 10fc

Avg. Achieved: 8.68 fc

Podium at 3'

Goal: N/A

Avg. Achieved: 9.5c

Face

Goal: N/A

Avg. Achieved: 7.1fc

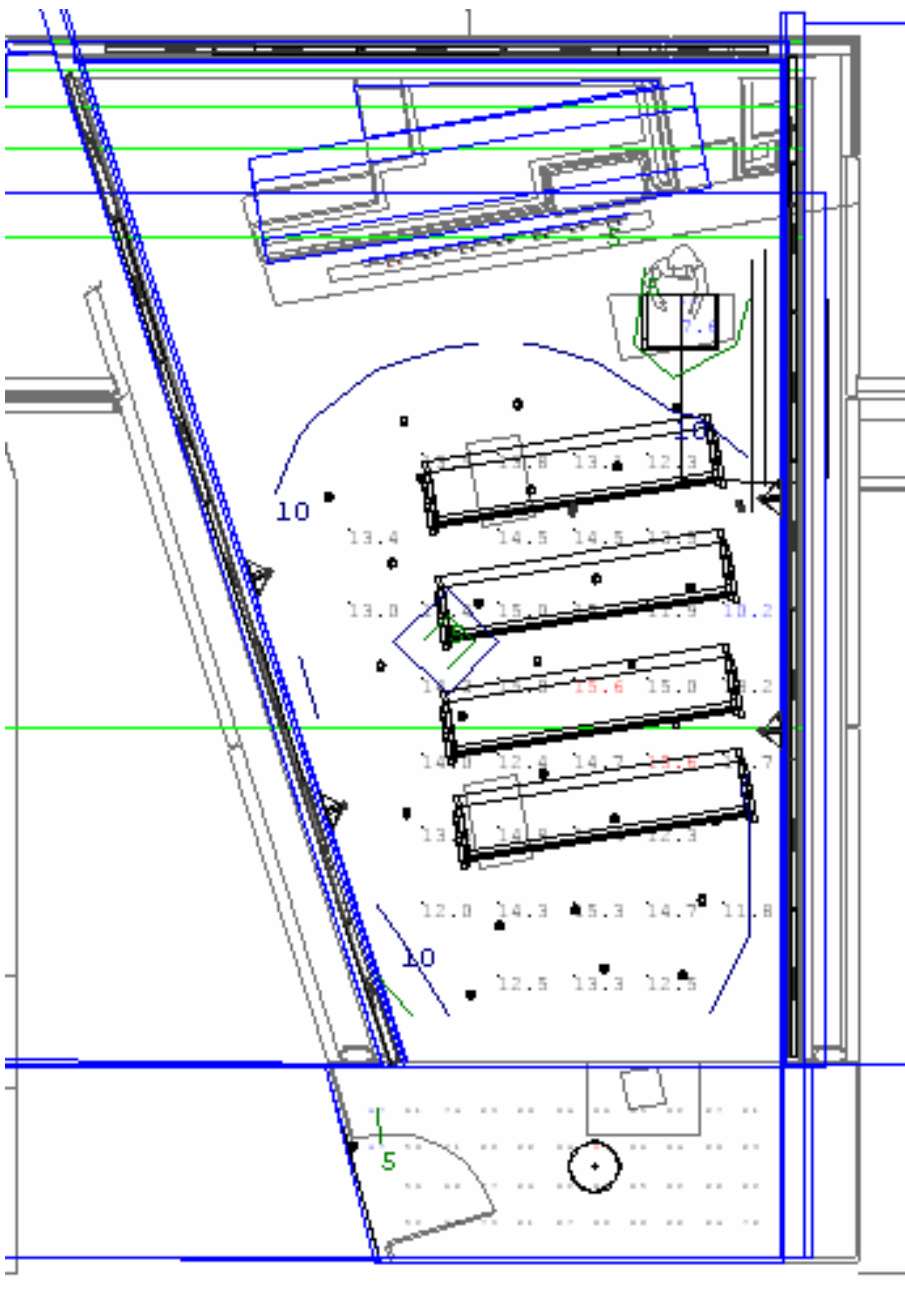
Projection Screen

Goal: Minimize light

Actual: 6.84fc

### Visiting Hours Scene

The goal of the visiting hours scene is to provide enough light in the seating area for circulation and prayer. 15fc was the goal in the seating area because it provides more than enough light for safe circulation throughout the chapel. The entrance area goal remained at 10fc, to provide enough light to enter the chapel without creating a distraction from behind those seated in the chapel. Since there will be no speaker during visiting hours the spotlights will be off, and the illuminance values at the podium and on the face of the speaker are not applicable.



#### Seating Area at 2.5'

Goal: 15fc

Avg. Achieved: 14fc

#### Entrance Area at floor

Goal: 10fc

Avg. Achieved: 8.5fc

#### Podium at 3'

Goal: N/A

Avg. Achieved: 7.6fc

#### Face

Goal: N/A

Avg. Achieved: 6fc

#### Projection Screen

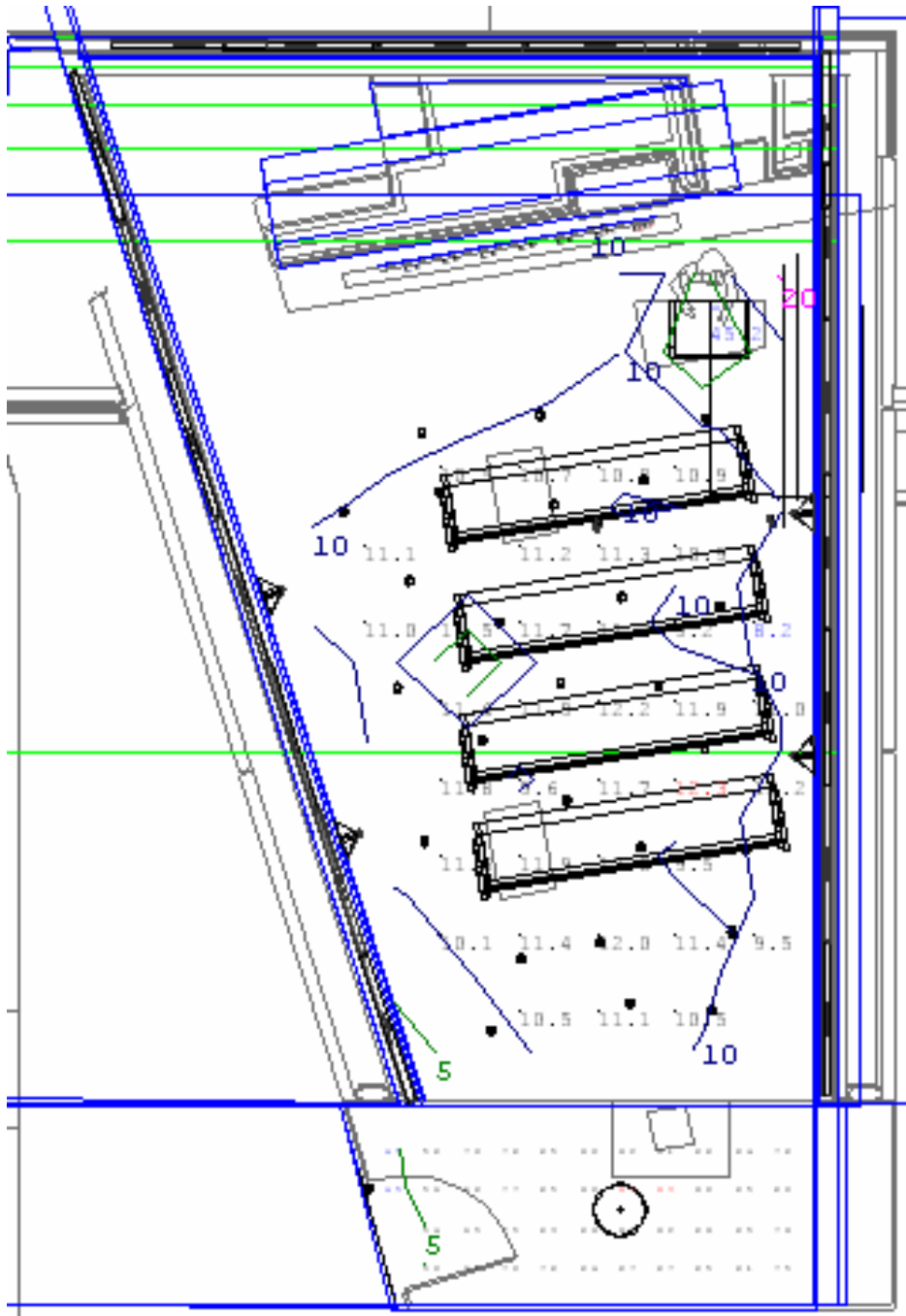
Goal: Minimize light

Actual: 5.97fc



### Sermon Scene

During the sermon the congregation will not be reading, so lighting in the seating area can be dimmed to a minimum of 10fc. The focus will be on the speaker at the podium, so he or she should still be illuminated and the podium should be illuminated for the speaker to read.



Seating Area at 2.5'  
Goal: 10fc  
Avg. Achieved: 11.06fc

Entrance Area at floor  
Goal: 5fc  
Avg. Achieved: 7.81fc

Podium at 3'  
Goal: min 30fc  
Avg. Achieved: 45.2fc

Face  
Goal: 50-75  
Avg. Achieved: 69.5fc

Projection Screen  
Goal: Minimize light  
Actual: 7.37fc

## Power Density

Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power		
F9	CFL surface mounted downlight	2	Quad	Dali Dimming	2	1	40	40		
F10	Cove mounted fluorescent striplight	1	T5	Dali Dimming	2	19	64	608		
F11	Recessed halogen downlight	1	MR16	n/a	1	26	20	520		
F12	Recessed halogen spotlight	1	MR16	n/a	1	1	20	20		
F12a	Recessed halogen spotlight	1	MR16	n/a	1	1	50	50		
F16	Wall mounted compact fluorescent sconce	1	Quad	Dali Dimming	1	4	16	64		
								1302	Total Watts	
								590	sqft	
								<b>Power Density=</b>	<b>2.21 Watts per sqft</b>	

Allowable power density = 2.4 W/sqft

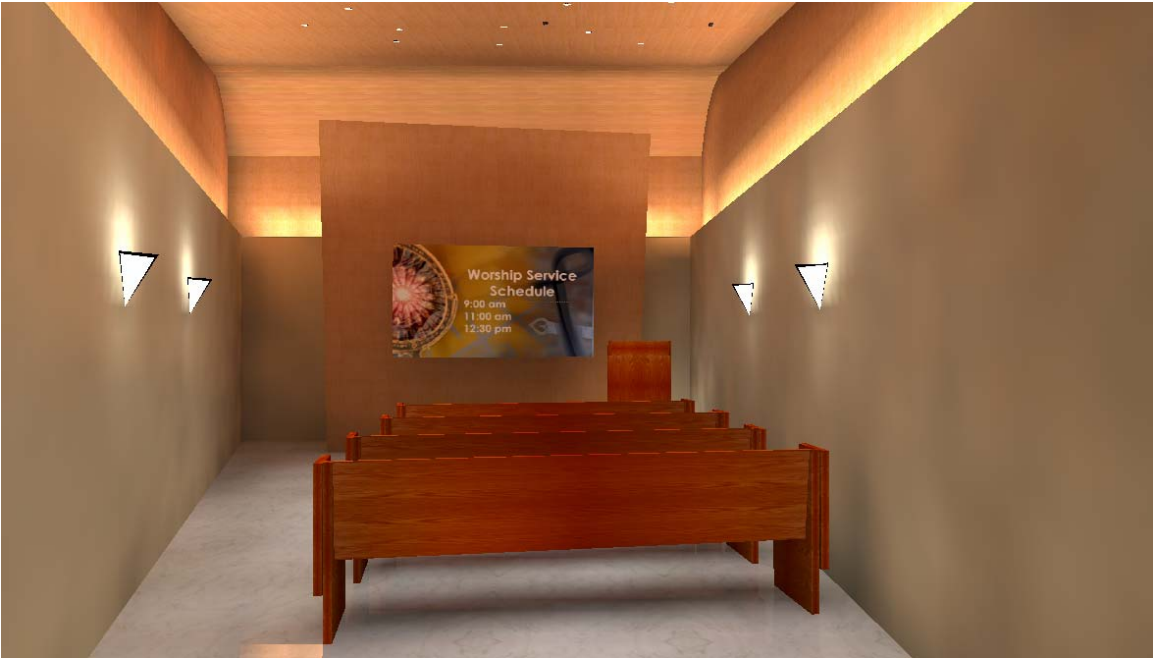
Achieved power density = 2.21 W/sqft

The achieved power density is 8.6% below ASHRAE 90.1.

# Renderings



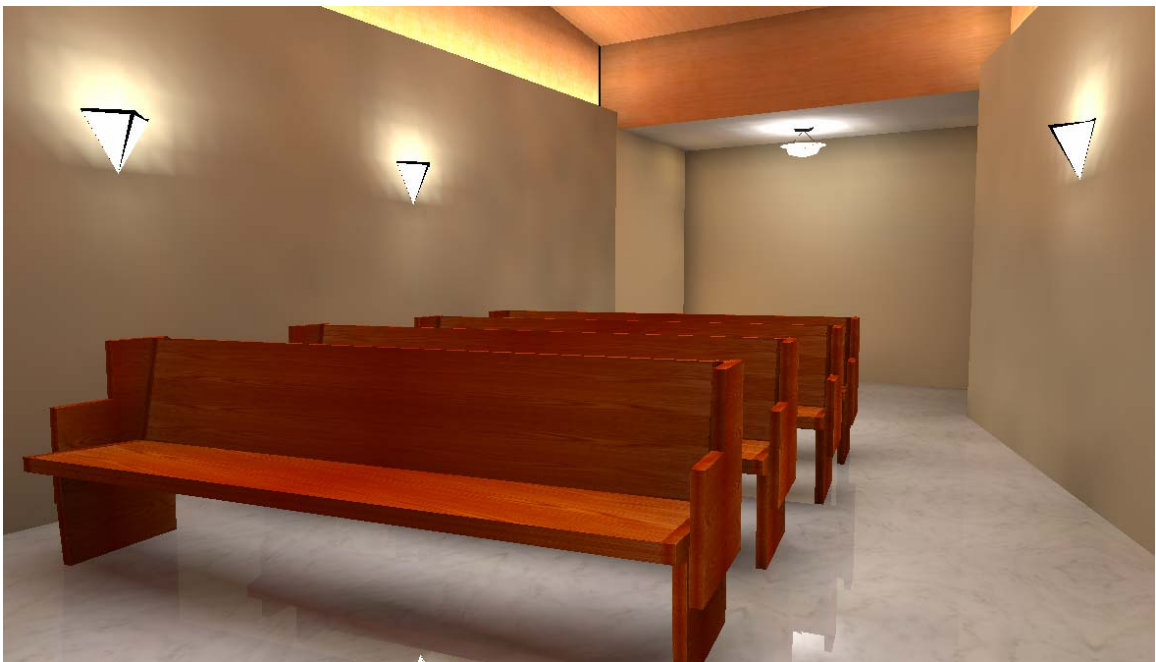
View from entrance



View from back of chapel



View from podium



View from front of chapel

## Conclusions

The architecture and shape of the chapel is enhanced while a meaningful atmosphere is created through uplighting the wood panels. Small downlights provide enough illumination for the elderly to read while keeping glare at a minimum. The random placement of the downlights prevents a structured feeling and provides continuity of a spiritual atmosphere. Spotlights are integrated with the layout for the downlights and will draw attention to the front of the chapel when switched on. Additional sparkle is provided by the decorative wall sconces along the two side walls of the chapel. Flexibility of the lighting system allows for the adjustment of illuminance levels as necessary. Scenes have been determined to supply appropriate illuminance values for the typical needs of the chapel, while the manual group control can also be used for any custom settings. An occupancy sensor integrated with the control system will help conserve energy by switching the lighting off when the chapel is not in use. In addition to the design goals being met for this space, the power density is about 8.6% below the allowable value set by ASHRAE 90.1.

# Physical Therapy Suite

## **Overview:**

The physical therapy suite will be used by the patients for physical rehabilitation. It is similar to a small gym with exercise mats, bikes, a treadmill, stairs, parallel bars and a cable column. There is also a small sink and two closets in the therapy room. A small waiting area is located adjacent to the gym for patients to sit while waiting for their doctor.

## Design Criteria

### **Main Goal**

To create a design that utilizes daylight and provides energy efficient electrical light to create a comfortable, motivational environment for elderly patients to undergo physically rehabilitation.

### **Very important design factors:**

#### ***Appearance:***

The physical therapy area should provide visual cues to assist the occupant's orientation. From the entrance of the suite, the luminaries should assist the occupant on the path to either the gym or waiting area. In the gym there should be clear access to the exercise equipment.

#### ***Daylight integration and control:***

The physical therapy suite is an interior room with no windows. However, for energy conservation as well as physiological well being, it is important to integrate daylight into this space. Daylight varies throughout the year in New Jersey, so a control system should be used to balance out the light levels during anytime of the year.

#### ***Luminance of room surfaces:***

The surfaces in the physical therapy suite should result in a bright atmosphere to match with the daylight that will be integrated into the space. Uniform room surfaces are important since the elderly are sensitive to contrast.

#### ***Horizontal Illuminance:***

The horizontal illuminance for a physical therapy area should be 50fc at the task plane. In this case there are several floor mats for exercise for which the floor can be considered the task plane. In the waiting area 10 fc should be provided.

#### ***Vertical Illuminance:***

Vertical illuminance is necessary to illuminate vertical elements of gym equipment. The vertical illuminance should be a minimum of 5fc.

**Important design factors:**

***Direct glare:***

Although the physical therapy suite does not need to be designed for a visually intensive task, luminaries should be carefully chosen and placed to prevent glare. Since the elderly are particularly sensitive to glare, large direct light sources such as 2x4 parabolic fixtures should not be used. It is important for the physical therapy suite to be a comfortable space free from glare to make the patients rehabilitation more enjoyable.

***Light Distribution on surfaces:***

The gym equipment in the physical therapy suite causes risk of injury. Lighting should be uniformly distributed on the surfaces of the equipment to make it easily seen. Patterns, or contrast changes can cause confusion.

***Facial Modeling:***

While the physical therapy suite is for rehabilitation, it is also a social place. People will be meeting and working together, so facial modeling should be good. Inter-reflection of light from room surfaces can help create adequate facial modeling, especially with the use of daylighting.

**ASHRAE 90.1 Power Density:** Using the space by space power density method, a physical therapy area in a health care facility should have a maximum power density of 0.9 W/sqft.

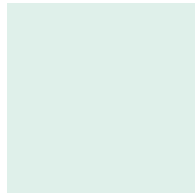
## Design Concept

The physical therapy suite should be a comfortable, motivational space for the occupants of the Franklin Care Center to receive therapy. The walls in this space were beige fabric, but were changed in this redesign to buttermilk color paint, and one wall in the gym to light blue in order to create a brighter, more motivational atmosphere. Cove lighting was chosen to provide comfortable indirect light to the physical therapy suite. Part of the walls in the waiting area and corridor were lowered by one foot to create space for cove fixtures. These fixtures are concealed by a fascia. The cove runs down the corridor to the suite, guiding patients to other therapy areas. Adequate illumination is provided in the corridor area from the cove lighting. The cove also wraps around into the waiting area where table lamps were added in to maintain the residential theme of the building. From the table lamps and the cove lighting, sufficient illumination is provided for reading in the waiting area. Cove lighting was also chosen to provide ambient light the gym area since there was a change in ceiling height, an easy place to locate cove fixtures. The indirect lighting from the cove will provide the gym area with glare free illumination. However the cove lighting alone did not provide enough illumination for safety in the gym area. Glare reducing louvered recessed linear fixtures were added to the gym area with the 11 foot ceiling. These fixtures were chosen because they are glare reducing and energy efficient. The smaller part of the gym area with the lower ceiling needed additional illumination since it receives little light from the cove. Here compact fluorescent downlights were used. The downlights chosen are louvered to conceal the lamp and reduce glare.

## Finishes



Walls: visitor's area  
And corridor area  
Buttermilk  
P=76%



Gym wall:  
Clear day  
P=81%



Floor: Brown carpet  
P=24%



Ceiling:  
Acoustical ceiling  
tile  
P=86%



## Equipment Luminaire Schedule

Fixture Label	Description	Fixture Cat No.	#	Lamp Type	Lamp Cat. No.	CRI	CCT	Ballast Type	Ballast Cat. No.	Lamps per ballast	Fixture Quantity
F3	CFL recessed mounted circular downlight	Erco 22151	2	Triple Tube	Sylvania CFTR32W/G X24Q/830	82	3000	DALI dimming	Sylvania GTP2x32CF/ UNV DALI	2	4
F5	CFL table lamp	Louis Poulsen P4 1/2	1	A19	Sylvania 100A/CL/DL/ RP	100	n/a	n/a	n/a	1	2
F7	Cove mounted fluorescent covelight	Prudentail SC-1T5-04	1	T5	Sylvania FP28/830/E CO	82	3000	DALI dimming	Sylvania QTP1x28T5/ UNV DALI	1	25
F15	Recessed fluorescent linear downlight	Focal Point FAVB-PL-1T5	1	T5	Sylvania FP28/830/E CO	82	3000	DALI dimming	Sylvania QTP1x28T5/ UNV DALI	1	8

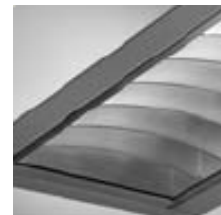
### Visible Luminaires



F3



F5



F15

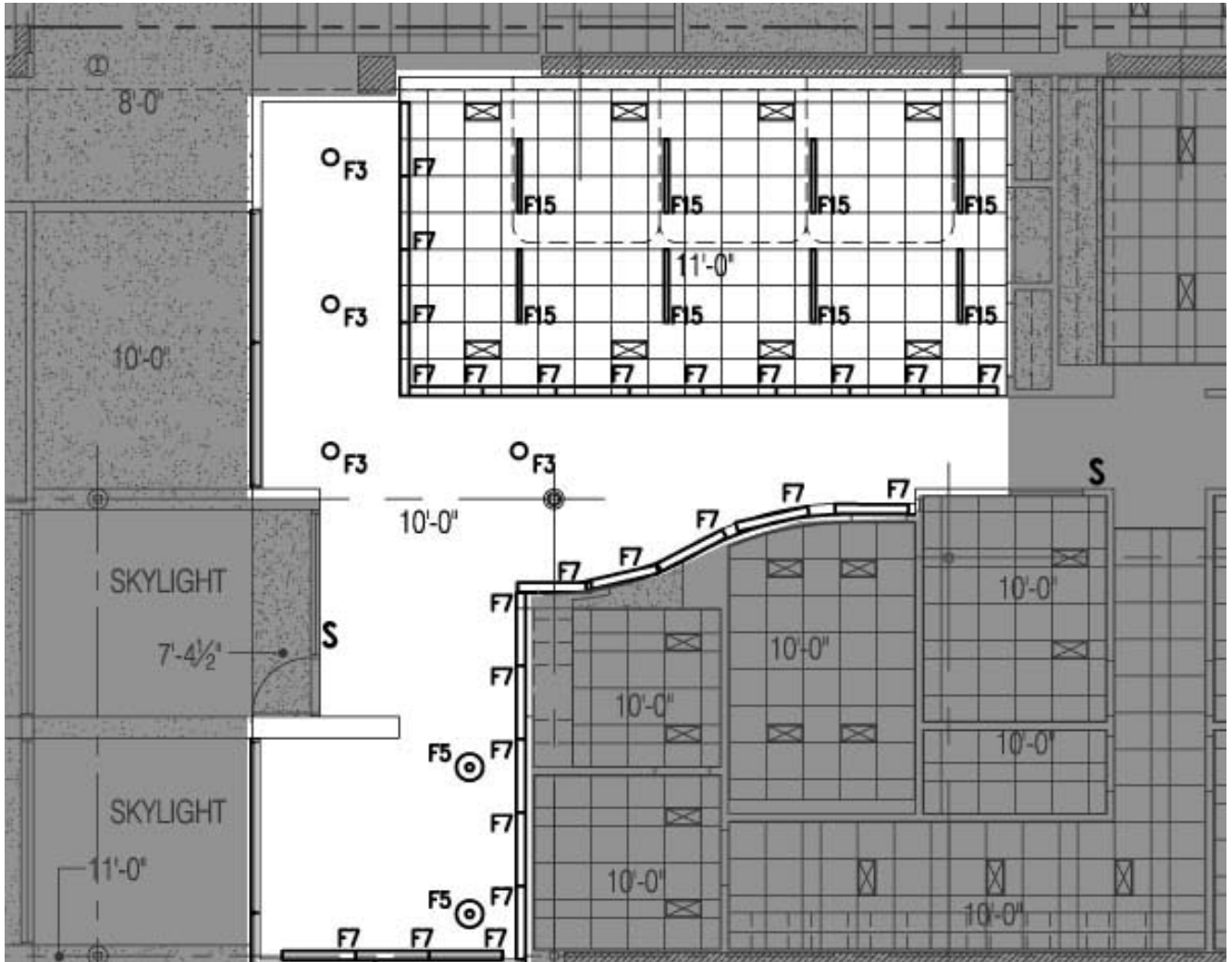
### Light Loss Factors

Luminaire Label	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Mean Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
F7	VI	Clean - 6 months	2900	2697	0.93	0.91	0.91	1	0.77
F3	II	Clean - 6 months	4800	4128	0.86	0.97	0.98	1	0.82
F15	II	Clean - 6 months	2900	2697	0.93	0.97	0.98	1	0.88
F5	III	Clean - 6 months	1550	1472.5	0.95	0.95	0.96	1	0.87

### DALI Equipment

	Description	Cat. No.	Quantity
<b>Power Supply</b>	Wattstopper ezDALI Power Supply	DPS150-2	1
<b>Wall Control</b>	Wattstopper ezDALI Group and Scene Control	DLCSS4-2	2
<b>Photosensor</b>	Wattstopper Photosensor	LS-301	2

## Luminaire Layout



## Control Zones

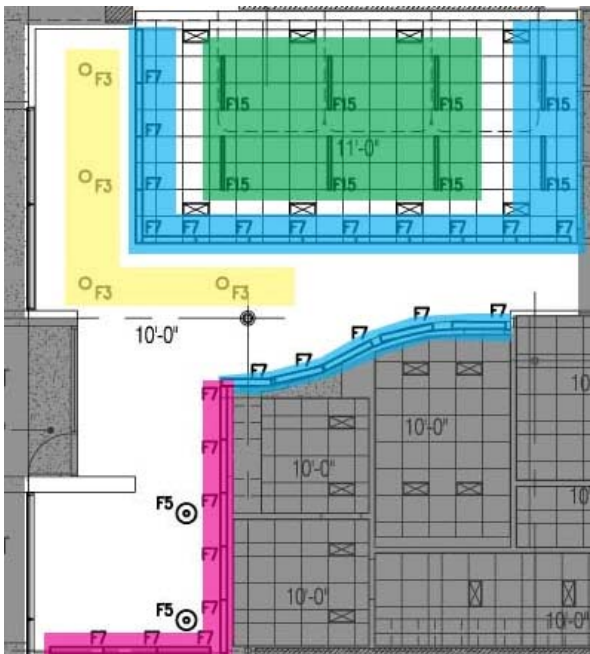
Two skylights are located in the corridor outside of the physical therapy suite. The glass entrance wall to the suite allows some of this light to penetrate into the physical therapy area. A daylight study was conducted under the following sky conditions to determine the amount of light entering the physical therapy area:

Date	Sky condition	Time
21-Mar	Clear sky	10am, 12pm, 2pm, 4pm
	Overcast sky	10am, 12pm, 2pm, 4pm
21-Jun	Clear sky	10am, 12pm, 2pm, 4pm
	Overcast sky	10am, 12pm, 2pm, 4pm
21-Dec	Clear sky	10am, 12pm, 2pm
	Overcast sky	10am, 12pm, 2pm

It was observed that a sufficient amount of illumination was often provided in the waiting area and front of the gym area (where the ceiling height is 10'), but a decent amount of illumination was never provided in the gym area with an 11' ceiling height. To integrate daylight efficiently, the cove fixtures in the waiting area and the downlights in the front area of the gym will be put on two separate Wattstopper photosensors. Two Wattstopper ezDALI Group and Scene Controllers will be used to manually control the fixtures. These will be placed at each entrance to the physical therapy suite, one by the door and one in the suite's corridor. Each group will be able to be dimmed separately using the group control function. Two scenes will be set, one for daytime and one for nighttime.

The fluorescent fixtures in the gym area (DALI group 2 as seen below), will be dimmed to 85% output during the day. This was based on the amount of illumination needed on the day with the least amount of daylight entering the physical therapy suite. Photosensors will control the lighting nearest the windows since those areas will receive large amounts of daylight at certain times and electric lighting will be necessary at varying levels, or not at all. Dali group 4's photosensor will be set to maintain 44fc because the goal of 50fc is not achieved at that point with electric lighting only. At night these photosensors will output their zones at 100% since no daylight will be present.

## DALI Control Groups



- Dali Group 1** Selected F7 and F15 fluorescent fixtures
- Dali Group 2** F7 fixtures in waiting area
- Dali Group 3** Selected F15 fixtures for dimming
- Dali Group 4** F3 compact fluorescent downlights

\*F5 table lamps are controlled by switches on the fixtures

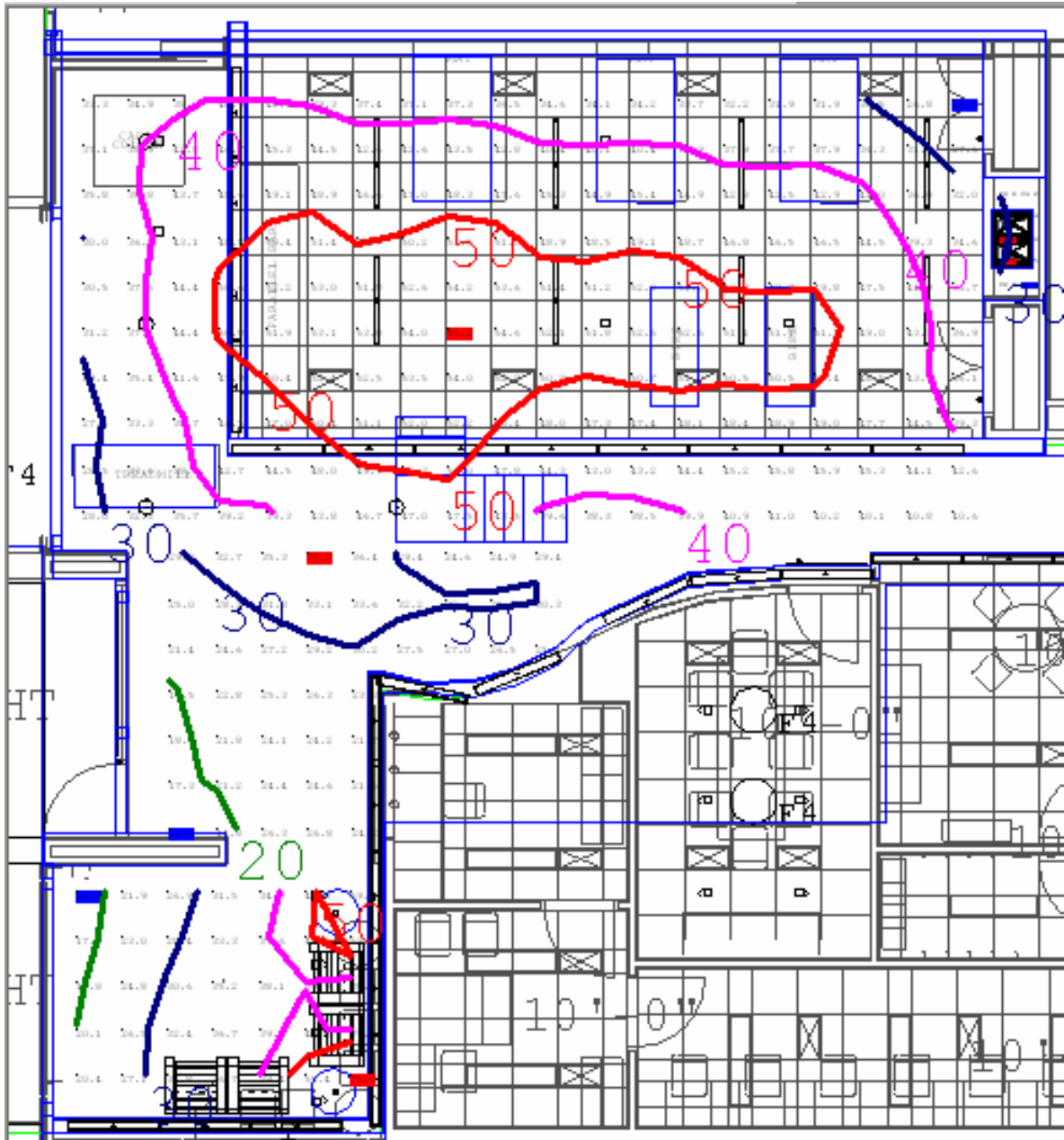
## DALI Scenes

	Day time	Night time
<b>Dali Group 1</b>	100%	100%
<b>Dali Group 2</b>	85%	100%
<b>Dali Group 3</b>	Photosensor control to maintain 30fc	Photosensor = 100%
<b>Dali Group 4</b>	Photosensor control to maintain 41fc	Photosensor = 100%

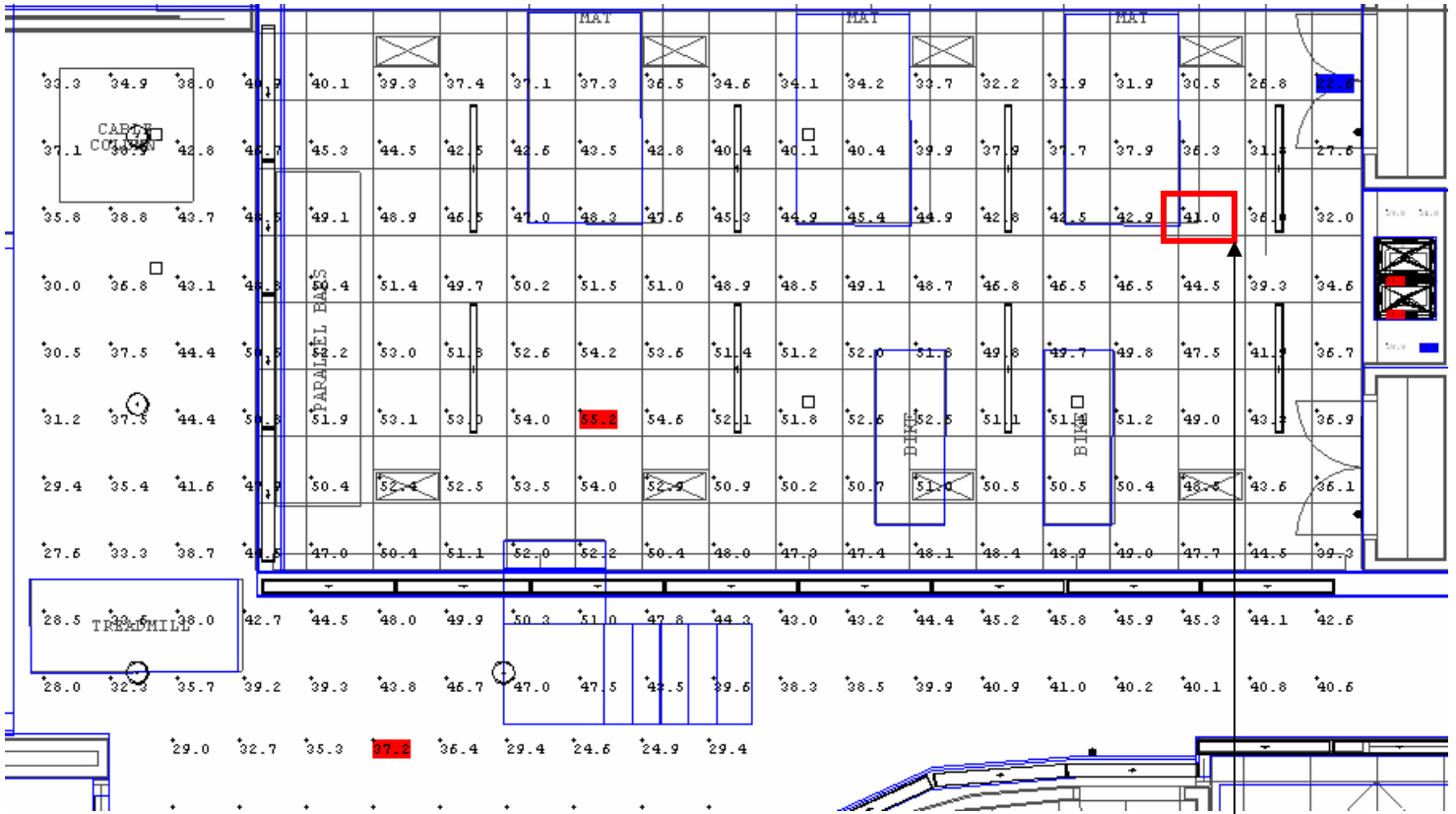
## Circuiting

Luminaire	input watts	# used	volts	amps per ballast	total VA load
F3	70	4	277	0.6	664.8
F5	100	2	120	n/a	200
F7	32	25	277	0.31	2146.75
F15	32	8	277	0.31	686.96
Power supply	1.5	1	277	n/a	1.5
<b>TOTAL VA</b>					<b>3700.01</b>
Circuit	Load (VA)	Wire Size	Conduit	Breaker Size	
PT-1	3500.01	2#12 AGW, 1#12 GRD	3/4"	20A	
PT-2	200	2#12 AGW, 1#12 GRD	3/4"	20A	

## Illuminance Values Electric Light Only



Lighting Depth: Physical Therapy Suite  
Franklin Care Center, Franklin Lakes, NJ



Gym Area

Goal: 50fc  
Achieved: 45.1fc

Critical point



Waiting Area  
Goal: 30fc  
Achieved: 35.23

Critical point

## Power Density

Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Input Watts	power
F3	CFL recessed mounted circular downlight	2	Triple Tube	DALI dimming	2	4	70	280
F5	CFL table lamp	1	A19	n/a	1	2	100	200
F7	Cove mounted fluorescent strip	1	T5	DALI dimming	1	25	32	800
F15	Recessed fluorescent linear downlight	1	T5	DALI dimming	1	8	32	256
							<b>Total Watts</b>	1536
							<b>Square footage</b>	1500
							<b>Total Power Density W/sqft</b>	1.02
							<b>Decorative Power Density W/sqft</b>	0.13
							<b>Physical Therapy Power Density</b>	0.89

Allowable power density = 0.9 W/sqft

Achieved power density = 0.89 W/sqft

0.13 W/sqft decorative

The achieved power density is 1.1% below the value set by ASHRAE 90.1.



Basic Rendering

## Conclusions

The lighting in the physical therapy suite meets all light level requirements, providing adequate illumination for safety. The use of indirect lighting and louvered fixtures will avoid undesirable glare in both in the gym area and waiting lounge. Through the use of indirect lighting and new, lighter colored materials a more motivational space was created for exercise. Table lamps in the waiting area enforce the residential atmosphere in the physical therapy suite.

DALI control with the use of photosensors integrates daylight effectively into the space. Although the power density is only 1.1% below the ASHRAE value, there will be additional energy savings from dimming. A preset scene is available for day, which uses the photosensors, and another scene is available for night which does not use the photosensors. The group control boxes also provide a manual override for when necessary.



# Courtyard

## **Overview:**

The perimeter buildings of the Franklin Care Center wrap around the central two story building creating two courtyard areas. The courtyard is entered through doors either in the corridors or patient lounges; walkways guide pedestrians through the courtyard which serves as the shortest route between two sides of the Franklin Care Center. Terraces with tables and chairs, park benches, trees, a koi pond and child play area are all features located in the courtyard. While the courtyard will rarely be used by patients at night, enough illumination should be provided for safety and an aesthetically pleasing atmosphere should be created for patients to view through their windows.

## Design Criteria

### **Main Goal:**

To provide a comfortable, safe outdoor space for the elderly while limiting light pollution and reducing spill light into patient's rooms that look out onto the courtyard.

### **Very Important Design Criteria:**

#### ***Illuminance Levels:***

The courtyard will rarely be used by patients at night so only 1fc is necessary for safety. It is important to provide a minimum of 1fc on the walkway, while limiting light spilling into patient's windows that look out onto the courtyard.

#### ***Light Pollution:***

To achieve a green building, light pollution and trespass should be minimal. For the courtyard, light trespass is not an issue because the building surrounds the space and blocks the light from crossing the property line. However, the lighting should be designed so that no excess light spills into the sky. To minimized light pollution, semi-cut off or cut off exterior fixtures should be used.

#### ***Direct Glare:***

Exterior lighting must always be designed for safety. A safe environment must be free of glare to prevent accidents at night.

#### ***Color Appearance and Color Contrast:***

Color rendering can be difficult at night; however it is essential for a courtyard. Color rendering will help ensure safety in the courtyard and make it a more enjoyable social area. HID lighting should be avoided because of its poor color rendering ability.

#### ***Peripheral Detection:***

Enough vertical illumination should be provided in the courtyard to allow a person to detect nearby movement or a person getting close.

***Shadows:***

Shadows cast by outdoor lighting should not interfere with the safety of the space. If a shadow is cast across the walkway where a stick or stone is laying, it can cause a patient to trip. The walkway should be uniformly illuminated to reduce any hazards.

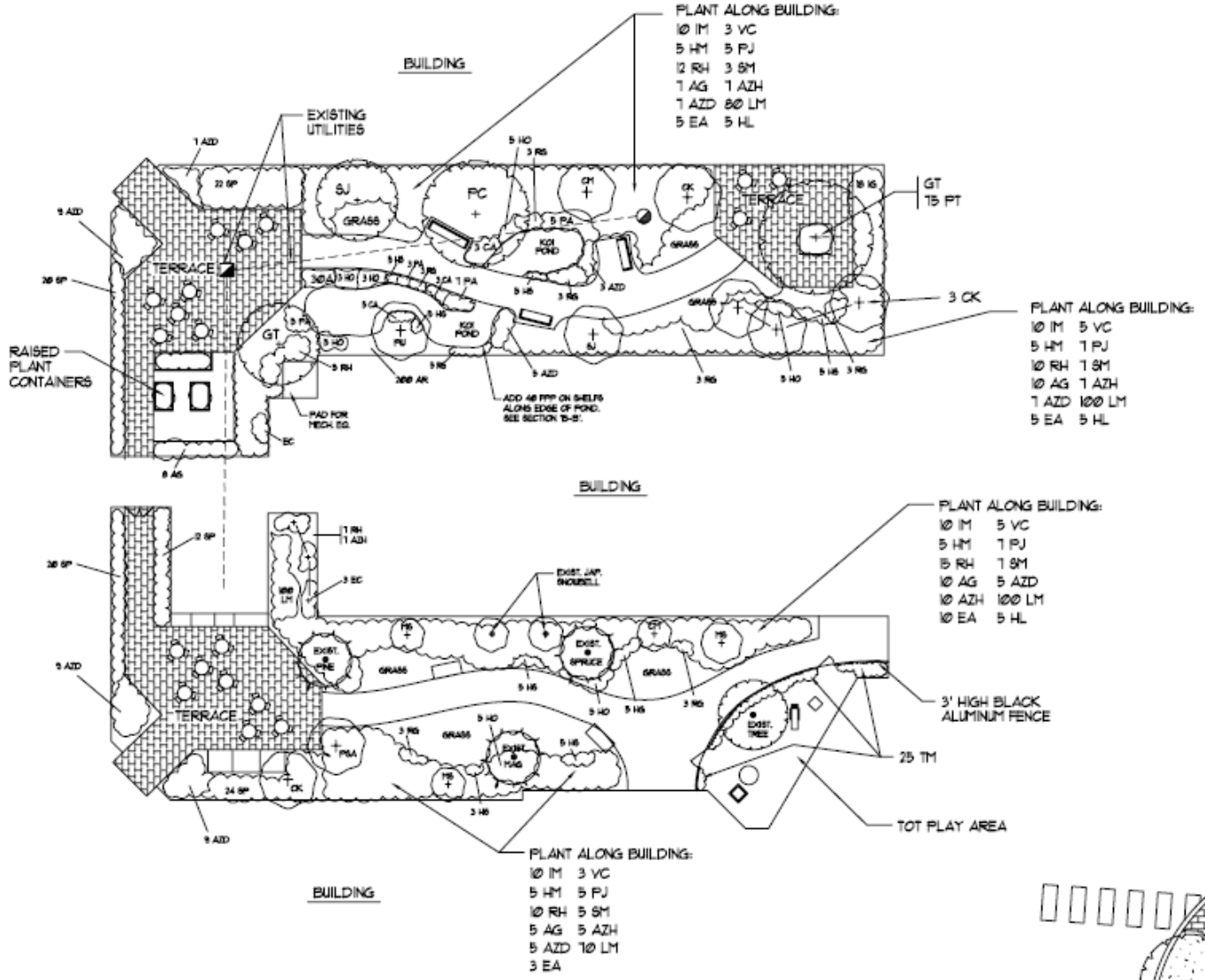
***Source/Task/Eye Geometry:***

Patients will be walking or traveling through the courtyard in wheelchairs or motorized chairs. Source/task/eye geometry should be provided so these tasks can be carried out with ease.

**ASHRAE 90.1 Power Density:** Using the space by space power density method, an exterior building walkway less than 10 feet wide should have a maximum power density of 1W/linear ft of walkway. A walkway or plaza area greater than 10 feet wide should have a maximum power density of 0.2 W/sqft. For each linear foot of building entrance an additional 20W.

## Landscape Drawing

The landscape drawing below is a .pdf file received by the architect to show the landscape features of the courtyard.



## Design Concept

The lighting for the courtyard was designed around LEED Sustainable Site Credit 8: Limiting light pollution. According to LEED criteria all luminaries with greater than 1000 lumens must be shielded and all luminaries with greater than 3500 lumens must be full cutoff fixtures. The use of lighting to highlight architectural and landscape elements should be either minimized or eliminated. Uplighting should be eliminated to avoid light trespass into the sky. Since the courtyard is surrounded by the buildings of the Franklin Care Center light trespass over the property line is not as issue, however light spilling into patient rooms should be minimized.

Luminaires were chosen to meet the LEED criteria. The majority of light distribution for each compact fluorescent fixture is downlight, and the LED orientation luminaries have so few lumens that light pollution will not be an issue. Pole fixtures and bollards were used to provide uniformity on the terraces and walkways. Pole fixtures were chosen on the terraces, in the play area, and near benches to provide a wider distribution of light. Sconces were used to mark each entrance to the courtyard. The small LED orientation luminaries were used to mark the perimeter of the pond as well as add sparkle to the design. These luminaries are color changing so they can change continuously or be set to one color.

## Equipment Luminaire Schedule

Fixture Label	Description	Fixture Cat No.	#	Lamp Type	Lamp Cat. No.	CRI	CCT	Ballast Type	Ballast Cat. No.	Lamps per ballast	Fixture Quantity
F13	Semi direct CFL bollard	Louis Poulsen SAB/1/32/CF/GX24q-3	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/UNV DALI	1	8
F14	Semi direct CFL sconce	Louis Poulsen ORW-MAX 1/32/CF GX24-q-3/4	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/UNV DALI	1	13
F19	Semi direct CFL pole mounted fixture	Louis Poulsen SATT-MAX1/32W/CF/GX24q-3/4	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/UNV DALI	1	16
F20	In grade LED orientation luminaire	Erco 38782.000	1	Dynamic Color changing LED	n/a	n/a	n/a	n/a	n/a	n/a	134

### Visible Luminaires



F13



F14



F19



F20

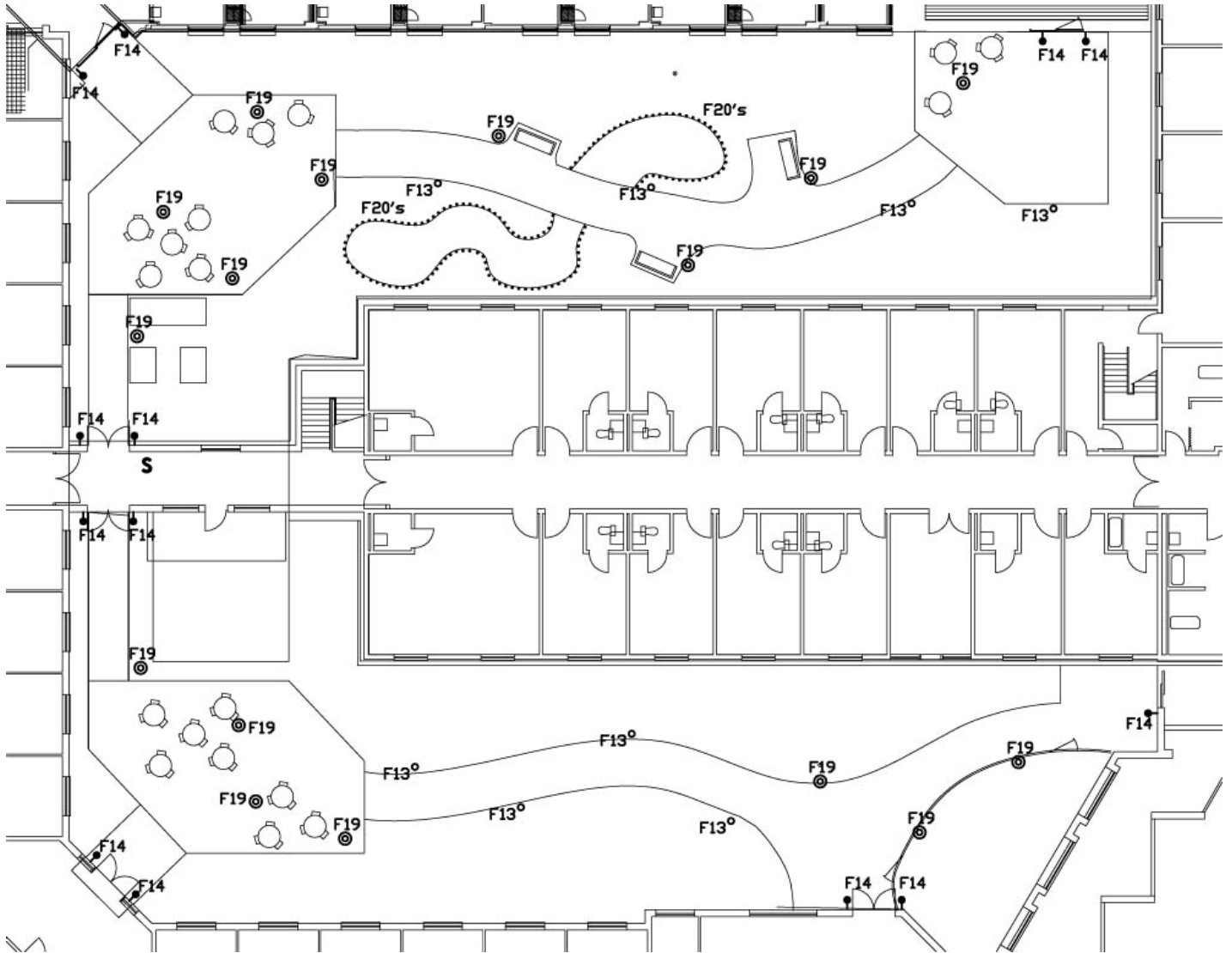
### Light Loss Factors

Luminaire Label	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Mean Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
F13	III	Dirty-12 months	2400	2064	0.86	0.84	1	1	0.72
F14	III	Dirty-12 months	2400	2064	0.86	0.84	1	1	0.72
F19	III	Dirty-12 months	2400	2064	0.86	0.84	1	1	0.72
F20	II	Dirty-12 months	n/a	n/a	1	0.87	1	1	0.72

### DALI Equipment

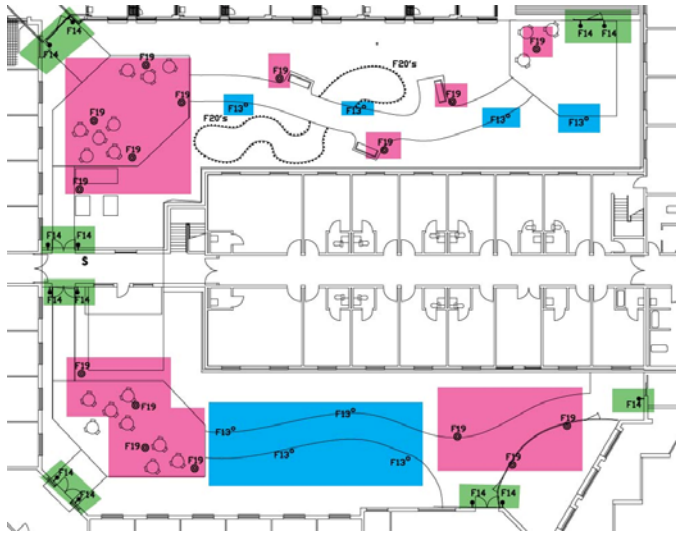
	Description	Cat. No.	Quantity
<b>Power Supply</b>	Wattstopper ezDALI Power Supply	DPS150-2	1
<b>Wall Control</b>	Wattstopper ezDALI Group Control	DLCSS4-2	1
<b>Photosensor</b>	Wattstopper Photosensor	LS-301	1

## Luminaire Layout



## Lighting Control

All of the fixtures in the courtyard will be controlled by a photosensor. When the illuminance at the critical point falls below 10fc all of the fixtures will be turned on at full output. By turning the fixtures on at 10fc the electric light will combine with daylight to maintain a safer illuminance value for a longer period of time, making the courtyard usable for the elderly longer into the evening. A Wattstopper ezDALI Group control switch will be located inside, where the doors to each side of the courtyard meet. This switch will provide manual control for each group that will override the photosensor.

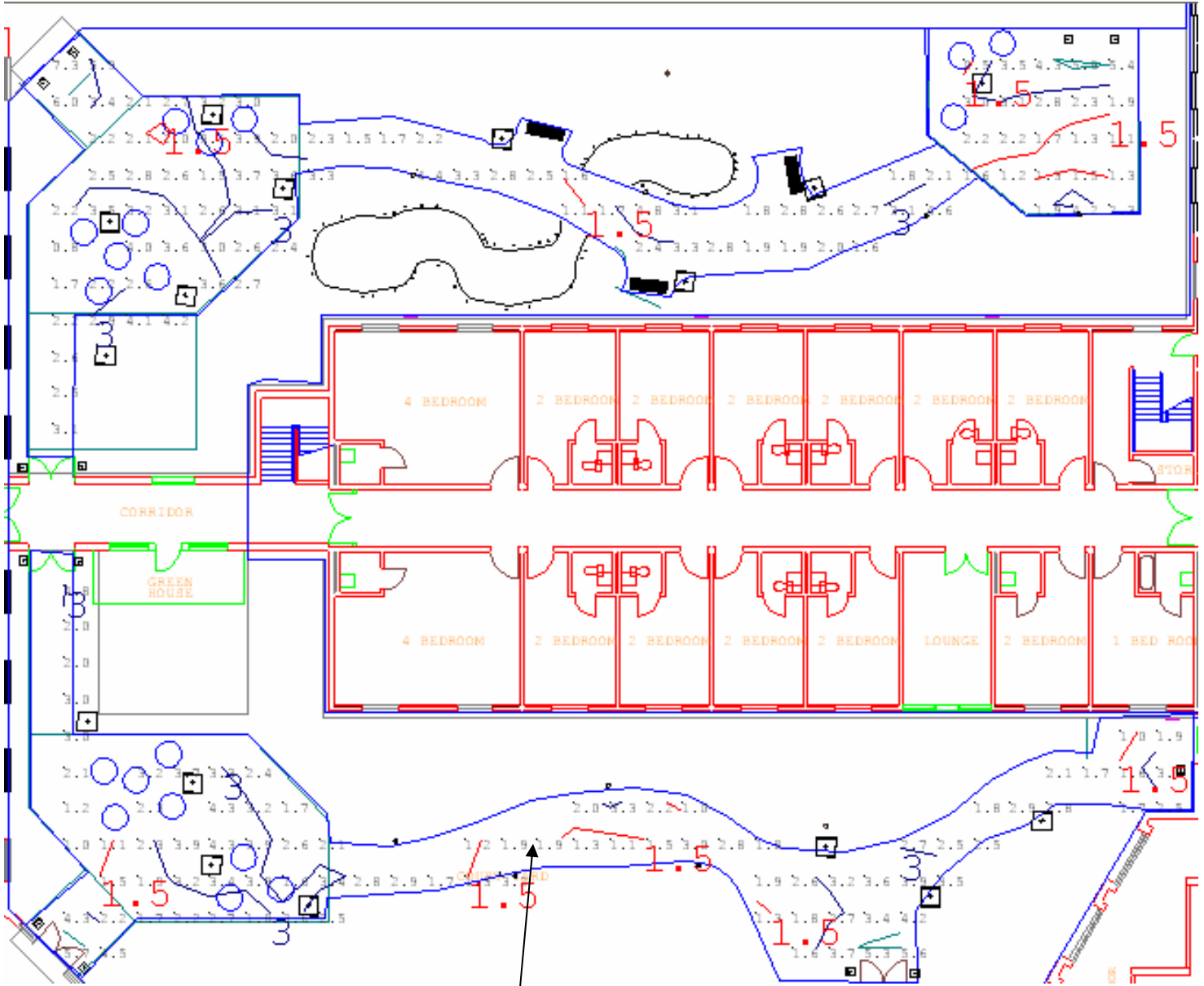


- Dali Group 1 F13 Bollards**
  - Dali Group 2 F14 Sconces**
  - Dali Group 3 F19 Poles**
- \*LEDs will remain on at all times

## Circuiting

Luminaire	input watts	# used	volts	amps per ballast	total VA load
F13	35	8	277	0.3	664.8
F14	35	13	277	0.3	1080.3
F19	35	16	277	0.3	1329.6
F20	0.3	134	277	n/a	40.2
<b>TOTAL VA</b>					<b>3114.9</b>
Circuit	Load (VA)	Wire Size	Conduit	Breaker Size	
CY-1	3114.9	2#12 AGW, 1#12 GRD	3/4"	20A	

## Illuminance Values



Walkway:  
Goal: Min 1fc  
Avg. Achieved: 2.75fc  
Max/min: 6.33

Critical Point  
The critical point was chosen as a point that would not be blocked by shadowing or shading. It is a point in the middle of the walkway, not affected by any trees or shrubs.



## Power Density

Below is the calculation for the allowable number of total lighting watts in the courtyard based on ASHRAE 90.1 power density for exterior building walkways.

Power density = 1 W/linear ft for walkway under 10' wide  
 0.2W/sqft for walkway greater than 10' wide  
 20 W/linear ft for length of each entrance

Allowable Power Density			
Exterior element	Measure	Allowable power per unit	Watts
Linear path <10ft (ft)	301	1	301
Path >10ft (sqft)	2660	0.2	532
Linear ft of entrances (ft)	36	20	720
<b>Total Allowable Watts</b>			<b>1553</b>

Below is the calculation of actual lighting watts used in the courtyard.

Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power
F13	Semi direct CFL bollard	1	Triple Tube	DALI dimming	1	8	35	280
F14	Semi direct CFL sconce	1	Triple Tube	DALI dimming	1	13	35	455
F19	Semi direct CFL pole mounted fixture	1	Triple Tube	DALI dimming	1	16	35	560
F20	In grade LED orientation luminaire	1	Dynamic Color changing LED	n/a	n/a	134	0.3	40.2
							Total Watts	1335.2

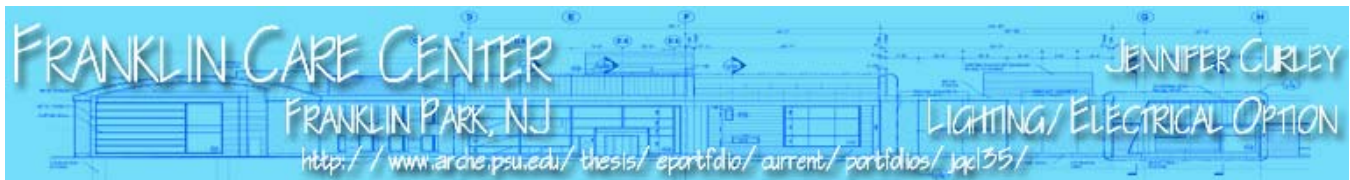
Allowable power = 1553 Watts

Achieved power = 1335.2 Watts

Actual power density is approximately 14% below ASHRAE90.1

## Conclusions

The lighting design for the courtyard of the Franklin Care Center meets the criteria to earn LEED Sustainable Site Credit 8: Limiting Light Pollution, while providing a safe environment at night. The compact fluorescent fixtures used are all shielded fixtures with less than 3500 lumens. Uplighting was avoided and the LED orientation luminaires used to highlight the koi pond are the only fixtures used to enhance a landscape feature. While the courtyard will rarely be used after dark, more than the 1fc of illumination necessary for safety is provided. However the lighting will make the courtyard usable for the elderly later into the evening, and create an aesthetically pleasing atmosphere for the patients to view through their windows.



## Electrical Depth

### Overview:

Electrical service is provided to the Franklin Care Center at 480/277V and 208/120V. The 480/277 voltage serves most of the lighting and mechanical equipment, however the voltage must be stepped down to 208/120V to serve the equipment on the emergency critical distribution panelboard as well as on the receptacle distribution panelboard. One step down transformer is located directly before each of these distribution boards to step the voltage down for all of the panel boards served by that distribution board.

### Problem Statement:

By using one transformer per distribution panel, all conductors that run from that distribution panelboard to the panels carries load at 208/120V. This makes the ampere rating of the circuits larger than if it were fed with 480/277V load.

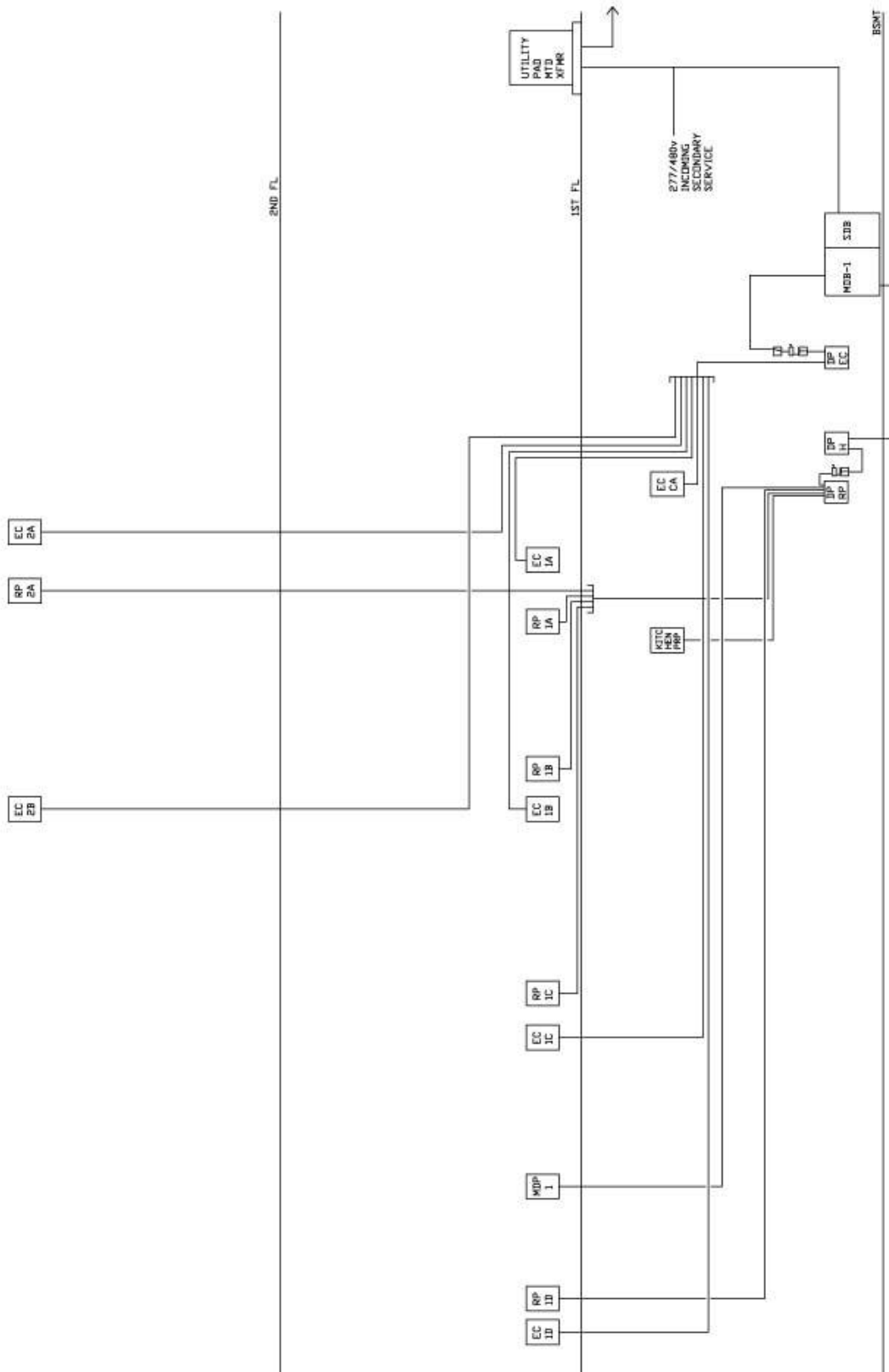
### Solution Overview:

Many of the feeders running from the distribution panels to each panelboard are fairly long in length. Reducing the size of these feeders may save money on the electrical system. To allow the reduction of conductors, conduit, and circuit breakers, the existing transformer that serves the each distribution panel will be removed. Instead smaller transformers will be added directly before each panelboard. The cost of the new feeders will be less since smaller wires and conduit will be used, each circuit breaker will also be smaller and therefore less costly. However, the total savings will only be substantial if the money saved on the feeders and circuit breakers outweighs the increased price of additional transformers.

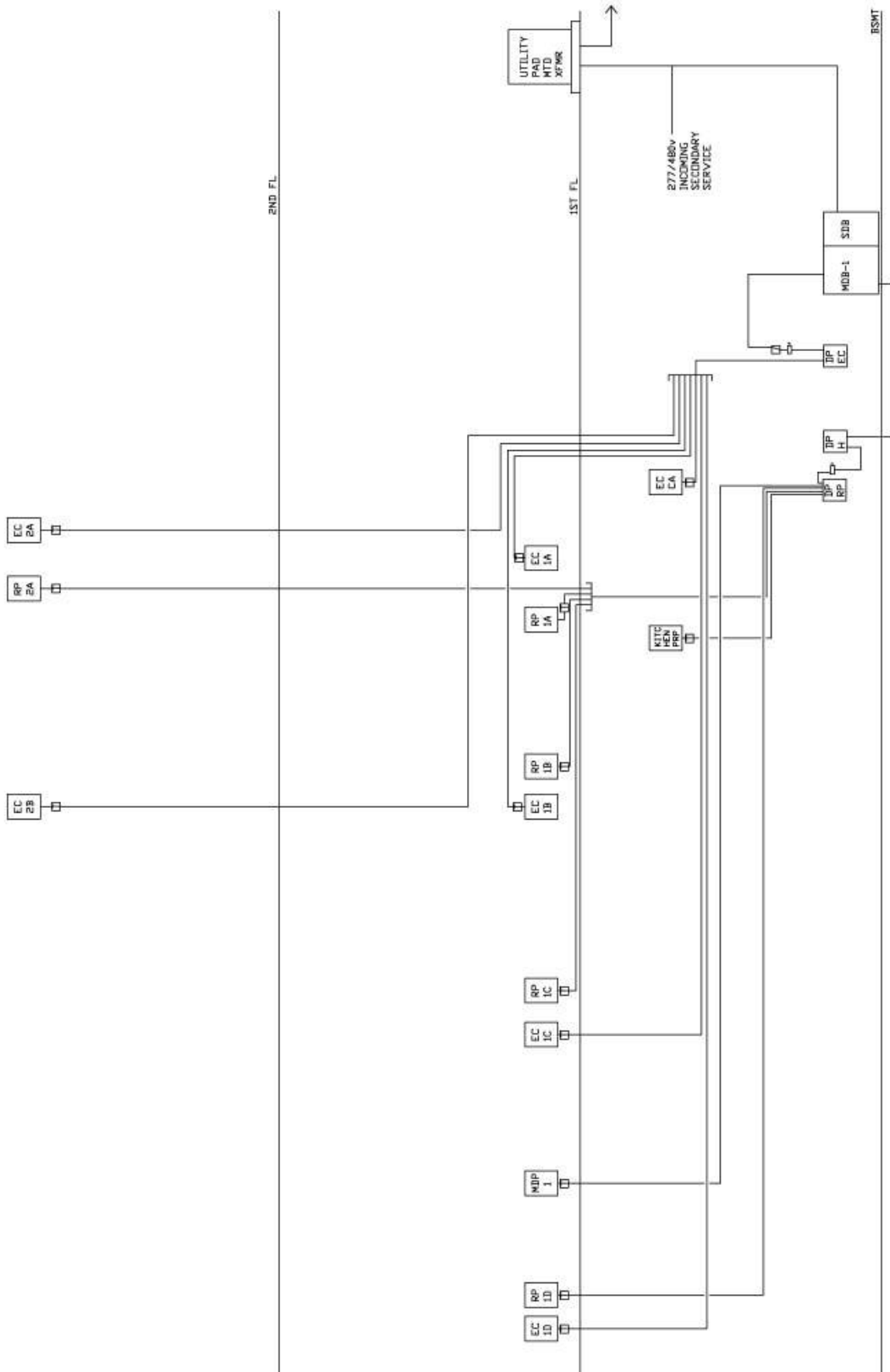
### Design Goals:

The main goal of this redesign is to see if money can be saved by using several smaller transformers and smaller conductors, conduits and circuit breakers. The cost of the old system and new system will be compared at the end of the design in the construction management breadth to determine if this would be a feasible alternative to the current electrical system.

# Riser Diagram for Existing System



# Riser Diagram for Redesign



## Existing Load

The electrical drawings that are available for the Franklin Care Center are not complete, so additional work must be done to determine the load on each of the panelboards. The drawings do not show circuiting from equipment and loads to each panelboard, so the load needs to be determined by using the wire size that was shown on the electrical drawings. It is typical that a feeder is sized for 125% of the actual peak continuous load that it carries. It must be confirmed that this was how the feeders were designed in the Franklin Care Center.

Five panelboards serve the receptacle loads in the Franklin Care Center. Each panel board serves 148 receptacles via 4#2 THWN 70degree C conductors in 1 ¼ " conduit. According to the National Electric Code, each general use duplex receptacle shall have a load of 180VA, however according to a practicing electrical engineer they typically assume a higher load of 200 watts each. The feeder must also be de-rated by 80% for continuous load, so the actual load must be multiplied by 125% to get the design load for the feeder. In my design it will be assumed that each duplex receptacle is 200 watts, the feeder is de-rated by 80%, and the power factor for the load is .90.

Load per duplex receptacle:  $200 \text{ Watts} / .9 = 222.22\text{VA}$

Load per receptacle panelboard:  $222.22 \text{ VA} * 148 \text{ receptacles} = 32889\text{VA}$

Ampere rating:  $32889\text{VA} / (208\text{V} * 1.73) = 91.29 \text{ A}$

Continuous load multiplier:  $91.29 \text{ A} * 125\% = 114\text{A}$

Using my assumptions, the feeders would be 4#2, which is what was actually used. This shows that the assumption that the feeder carries 125% of the typical load is valid and can be used to calculate the actual load of each panelboard and use that load to resize each feeder.

## DP-RP

The following table is a summary of the equipment used in the existing electrical system to connect the receptacle distribution board to each receptacle panelboard.

Existing From DP-RP					
Panelboard	Feeder length in feet	Conductor	Conduit	Circuit Breaker	Transformer Size
Kitchen	220	4#2, 1#2 ground	1 1/4"	100A	n/a
RP-1A	316	4#2, 1#2 ground	1 1/4"	100A	n/a
RP-1B	542	4#2, 1#2 ground	1 1/4"	100A	n/a
RP-1C	954	4#2, 1#2 ground	1 1/4"	100A	n/a
RP-1D	888	4#2, 1#2 ground	1 1/4"	100A	n/a
RP-2A	868	4#2, 1#2 ground	1 1/4"	100A	n/a
MDP-1	327	4#3/0, 1#3/0 ground	2"	200A	n/a
					300KVA

### Re-sized feeders

#### **For Kitchen panel, RP-1A, RP-1B, RP-1C, RP-1D, RP-2A**

The loads on these panelboards were determined by assuming an equal number of receptacles on each panelboard and a load of 200w/receptacle with a power factor of 0.9.

Load per panelboard:  $222.22 \text{ VA} * 148 \text{ receptacles} = 32889\text{VA}$

Ampere rating:  $32889\text{VA} / (480\text{V} * 1.73) = 39.5\text{A}$

Continuous load multiplier =  $39.5 \text{ A} * 125\% = 49.45\text{A}$

\*Use 4#8 with 1#8 ground in 3/4" conduit with 50A circuit breaker for each panelboard

#### **For MDP-1**

The load on the MDP was determined by assuming that the existing feeder is sized for 125% of the actual load.

Load per panelboard:  $200\text{A} / 1.25 = 160 \text{ A}$  actual load \*  $208\text{V} * 1.73 = 57642.65\text{VA}$

Ampere rating:  $57642.65 \text{ VA} / (480\text{V} * 1.73) = 69.33\text{A}$

Continuous load multiplier:  $69.33\text{A} * 125\% = 86.67\text{A}$

\*Use 4#3 with 1#3 ground in 1 ¼" conduit with 90A circuit breaker

### Transformer sizing

#### **Assumed size of current transformer**

32889VA \* 6 panels = 197334VA + 57642.65VA = 254.98KVA

Transformer size = 300 KVA

#### **For Kitchen panel, RP-1A, RP-1B, RP-1C, RP-1D, RP-2A**

32.889KVA

Transformers sizes = 45 KVA

#### **For MDP-1**

57.6427KVA

Transformer size = 75 KVA

### Transformer Locations

The existing step down transformer for the receptacle distribution is currently located in the basement. For the redesign each step down transformer will need to be located near the panel board that it is serving. This requires more space for transformers, and space in closets of utility rooms where the transformers can be located.

#### Kitchen panel transformer:

Will be located in the cellar adjacent to the kitchen area in the paper room.

#### RP-1A transformer:

Will be located in the electrical closet on the first floor where the panels are located.

#### RP-1B transformer:

Will be located on the first floor in the closet where panels RP-1B and LP-1B are located.

#### RP-1C transformer:

Will be located on the first floor in the chart room where panels RP-1C is located.

#### RP-1D transformer:

Will be located on the first floor in the closet where panels RP-1D, EC-1D, EES-1D, LP-B, and PP-1 are located.

#### MDP-1 transformer:

Will be located on the first floor in the mechanical room where the MDP, EC-101, EES-1F, and ELS-2D1 panels are located.

#### RP-2A transformer:



Will be located on the second floor in the closet where the panels RP-2A, LP-2, EC-2A, ELS-2A, and EES-2A are located.

### Summary of Redesign

The following table summarizes the equipment that will be used in the redesign to connect the RP distribution board to each RP panelboard.

Redesign From DP-RP					
Panelboard	Feeder length in feet	Conductor	Conduit	Circuit Breaker	Transformer Size
Kitchen	220	4#8, 1#8 ground	3/4"	40A	45 KVA
RP-1A	316	4#8, 1#8 ground	3/4"	40A	45 KVA
RP-1B	542	4#8, 1#8 ground	3/4"	40A	45 KVA
RP-1C	954	4#8, 1#8 ground	3/4"	40A	45 KVA
RP-1D	888	4#8, 1#8 ground	3/4"	40A	45 KVA
RP-2A	868	4#8, 1#8 ground	3/4"	40A	45 KVA
MDP-1	327	4#8, 1#8 ground	1 1/4"	70A	75 KVA

## DP-EC

The following table is a summary of the equipment used in the existing electrical system to connect the emergency critical distribution board to each emergency critical panelboard.

Existing From DP-EC					
Panelboard	Feeder length in feet	Conductor	Conduit	Circuit Breaker	Transformer Size
EC-CA	395	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-1A	224	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-1B	542	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-1C	934	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-1D	870	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-1D1	758	4#6, 1#6 ground, 1#6ig	1 1/2"	70A	n/a
EC-2A	417	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
EC-2B	546	4#2, 1#2 ground, 1#2ig	1 1/2"	100A	n/a
					300 KVA

### Re-sized feeders

**For EC-CA, EC-1A, EC-1B, EC-1C, EC-1D, EC-2A, EC-2B**

The load on these panelboards was determined by assuming that the existing feeder is sized for 125% of the actual load.

Load per panelboard:  $115A/125\% = 92A$  actual load \* 208 \* 1.73= 33144.5 VA

Ampere rating:  $33144.5VA / (480 * 1.73) = 39.9 A$

Continuous multiplier:  $39.9A * 125\% = 49.8A$

\* Use 4#8, 1#8 ground and 1#8 IG in

### **For EC-1D1**

The load on this panelboard was determined by assuming that the existing feeder is sized for 125% of the actual load.

Load for panelboard:  $65A / 125\% = 52A$  actual load \* 208 \* 1.73 = 18733.86 VA

Ampere rating:  $18733.86 VA / (480 * 1.73) = 22.53 A$

Continuous multiplier:  $22.53 A * 125\% = 28.17A$

\* Use 4#10, 1#10 ground, 1#10 IG in

### Transformer sizing

**Assumed size of current transformer:**

$33144.5VA * 7$  panels = 232011.5 VA + 18733.86 VA = 250.75 KVA

Transformer size = 300 KVA

**For panels EC-CA, EC-1A, EC-1B, EC-1C, EC-1D, EC-2A, EC-2B**

33144.5 VA

Transformer size = 45 KVA

**For panel EC-1D1**

18733.86 VA

Transformer size = 30 KVA

### Transformer Locations

The existing step down transformer for the emergency critical distribution panel is currently located in the basement. For the redesign each step down transformer will need to be located near the panel board that it is lowering the voltage for. This requires more space for transformers, and space in closets of utility rooms where the transformers can be located.

#### EC-CA:

The transformer will be located near the wall adjacent to the exam room where panels ELS-CA, EC-CA and EES-CA are located.

#### EC-1A:

Will be located in the electrical closet on the first floor where the panels RP-1A, EC-1A, ELS-1A, and LP are located.

#### EC-1B:

The transformer will be located on the first floor in the office where panels EC-1B, EES-1B, ELS-1B are located.

#### EC-1C:

The transformer will be located on the first floor in the soiled linen room where panels EC-1C, EES-1C, and ELS-1C are located.

#### EC-1D:

Will be located on the first floor in the closet where panels RP-1D, EC-1D, EES-1D, LP-B, and PP-1 are located

EC-1D1:

Will be located on the first floor in mechanical room where panels EC-1D1, EES-1F, ELS1D1.

EC-2A:

Will be located on the second floor in the closet where the panels RP-2A, LP-2, EC-2A, ELS-2A, and EES-2A are located.

EC-2B:

Will be located on the second floor in the closet where panels EES-2B, ELS-2B, and EC-2B are located.

**Distribution board sizing**

The existing EC distribution board is 208/120, after the redesign the distribution board will be 480/208. Since this board will be at a different voltage and being served directly from the MDB it must be resized. DP-RP did not need to be resized since it is served from another distribution board.

The existing DP-EC was 208/120 V, 3 phase, 4 wire 800A.

The redesigned DP-EC will be 480/277 V, 3 phase, 4wire, 400 A

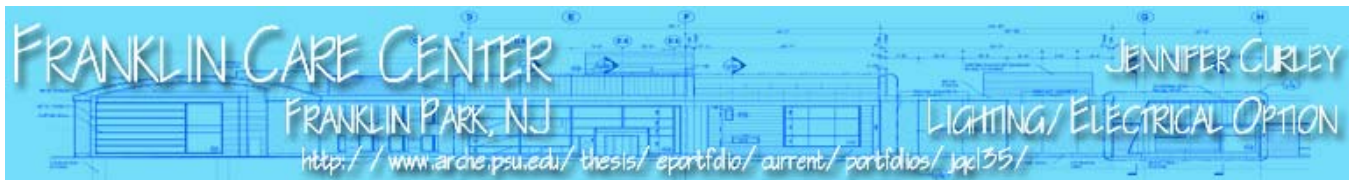
## Summary of Redesign

The following table summarizes the equipment that will be used in the redesign to connect the EC distribution board to each EC panelboard.

Redesign For DP-EC					
Panelboard	Feeder length in feet	Conductor	Conduit	Circuit Breaker	Transformer Size
EC-CA	395	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-1A	224	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-1B	542	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-1C	934	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-1D	870	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-1D1	758	4#10, 1#10 ground, 1#10ig	3/4"	30A	30 KVA
EC-2A	417	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA
EC-2B	546	4#8, 1#8 ground, 1#8ig	1"	40A	45 KVA

## Conclusions

Placing the transformers directly before each panel rather than using only one for the entire distribution board allows all feeders to be smaller. There will be seven smaller transformers as opposed to one larger transformer. Using smaller feeders will save space in the ceiling plenum; however room near each panelboard will be needed to allow each transformer to be placed there. There is enough room to fit a transformer in each of these spaces, so no architectural redesign will be necessary. An in-depth cost analysis of both systems can be found in the Construction Management Breadth.



## Construction Management Breadth

### Introduction:

To determine the feasibility of the redesigned electrical system, an in depth cost analysis is necessary. It was difficult to determine the cost of the entire electrical system since many components have not been sized at this time, so only the cost of equipment that was changed in the redesign were considered. The existing design price and redesign price of this equipment were compared to determine the total cost difference between the two electrical systems. R.S. Means Electrical Construction Data 2006 served as the pricing guide for the electrical equipment.

### Design Goals:

The main goal of this cost analysis is to determine the feasibility of the redesigned electrical system based on price. The cost of the smaller feeders and numerous step down transformers used in the redesign will be compared to the cost the existing design which specifies larger feeders and two larger transformers. Cost of the distribution panelboard will also be taken into account if it differs in the two systems.

### Cost Analysis:

The table bellows shows a summary of the cost analysis performed. Please see Appendix B for a detailed documentation including the cost of each item that has been resized. These items include conductors, conduits, circuit breakers, transformers, and distribution panels. All feeder costs were based on a take off that was performed to determine the length of each feeder. Time and location factors were not taken into account since this analysis determines savings and not actual cost.

### Cost Analysis:

	Existing System	Redesign
<b>Conductor</b>	\$95,518.08	\$41,289.63
<b>Conduit</b>	\$53,041.10	\$30,345.17
<b>Circuit breakers</b>	\$4,778.00	\$2,759.00
<b>Transformers</b>	\$26,000.00	\$54,500.00
<b>Resized distribution panel EC</b>	\$3,225.00	\$2,475.00
<b>Total Cost</b>	<b>\$182,562.18</b>	<b>\$131,368.80</b>

**Conclusions:**

If the redesigned electrical system had been installed in place of the existing system, \$51,193.38 would have been saved. The cost of the transformers for the redesigned system was much higher than for the existing system as expected, however the smaller, less costly conductors, conduits, circuit breakers, and distribution panel amounted in savings beyond the expense of the transformers. Extra storage space will be used to house the additional transformers; however it appears that this space is available. By using smaller wire, less space in the ceiling plenum will be crowded with wires. The redesigned system is a feasible alternative since a great deal of money is saved only at the expense of storage space.



## LEED Breadth

### **Introduction:**

The Franklin Care Center is currently in the design phase and anticipated to achieve LEED certification. Currently, 39 LEED points have been identified by the architect as "likely" to achieve. 39 is the minimum number of points for a gold certified building, so if everything does not go according to plan during the remaining design or construction phases and a point is not obtained, the building will only receive silver certification. 11 LEED points are currently identified as "possible" to achieve. By creating a design to achieve one of these points there is a better chance that the Franklin Care Center will be rewarded LEED Gold Certification.

A perimeter and non perimeter control system will be designed for the Franklin Care Center. An average of one operable window and one lighting control zone per 200 sqft for every regularly occupied area within 15' of the perimeter wall will be provided. A non perimeter system will also be designed ensuring that there is adequate controls for air flow, temperature and lighting in regularly occupied spaces that are not within 15' of the perimeter of the building. The addition of these control systems will earn LEED Indoor Environmental Quality Credits 6.1 and 6.2 Controllability of Perimeter and Non-Perimeter Systems. The addition of this point will amount in 40 likely LEED points, and help contribute towards a LEED gold building.

### **Design Goals:**

The main goal of this breadth work is to earn LEED Indoor Environmental Quality Credits 6.1 and 6.2. The minimum number of windows and controls for each area will be determined, if there is an existing design it will be taken into analyzed, and the system will be designed to earn Indoor Environmental Quality Credit 6.



### **Perimeter Space:**

There are separate LEED criteria that need to be met for perimeter spaces, perimeter group or multi occupancy spaces, non-perimeter spaces, and non perimeter group or multi occupancy spaces. For all of these types of spaces, only spaces that are regularly occupied are relevant in this calculation. Spaces such as lobbies, corridors, storage areas or specialty rooms do not need to be accounted for. To determine the types of spaces in the Franklin Care Center a 15' line was drawn from the perimeter of the building. Since the Franklin Care Center has a courtyard in the center of the building another 15' line was taken from there. Each regularly occupied space that has at least 75% of its area fall within the line counts as a perimeter space. If a space has less than 75% in the perimeter of the building, then only the portion in the perimeter counts as perimeter space and the remaining area counts as a non-perimeter space. Group or multi occupancy spaces fall into their own categories. A group or multi occupancy space with at least 75% of its area within the 15' line is counted as a group perimeter space. A group space with less than 75% of its area in the perimeter counts as a non perimeter space, but must still meet the window requirement for the amount of perimeter area in that space. If any space within the perimeter of the building has no connection with the building exterior it will not be counted as a perimeter space, but may be counted as a non perimeter space if it is regularly occupied.

A list of perimeter, non perimeter, group perimeter and group non perimeter spaces as well as the calculations in this report can be found in Appendix C.

### **Requirements:**

The requirements for each type of space are listed below:

Perimeter spaces: Must have 1 operable window and 1 lighting control on average every 200sqft

Group perimeter spaces: Must have 1 operable window on average every 200sqft. For spaces less than 10,000sqft, 3 lighting controls must be provided for every 2,500sqft. There are no group areas greater than 10,000sqft in the Franklin Care Center.

Non-perimeter spaces: Must provided lighting controls, air flow controls and temperature controls each equal to 50% of the number of occupants. The number of occupants is determined from ASHRAE 62.

Non-perimeter group space: For spaces less than 10,000 sqft, 3 lighting controls, 1 air flow control and 1 temperature control must be provided for every 2,500sqft.

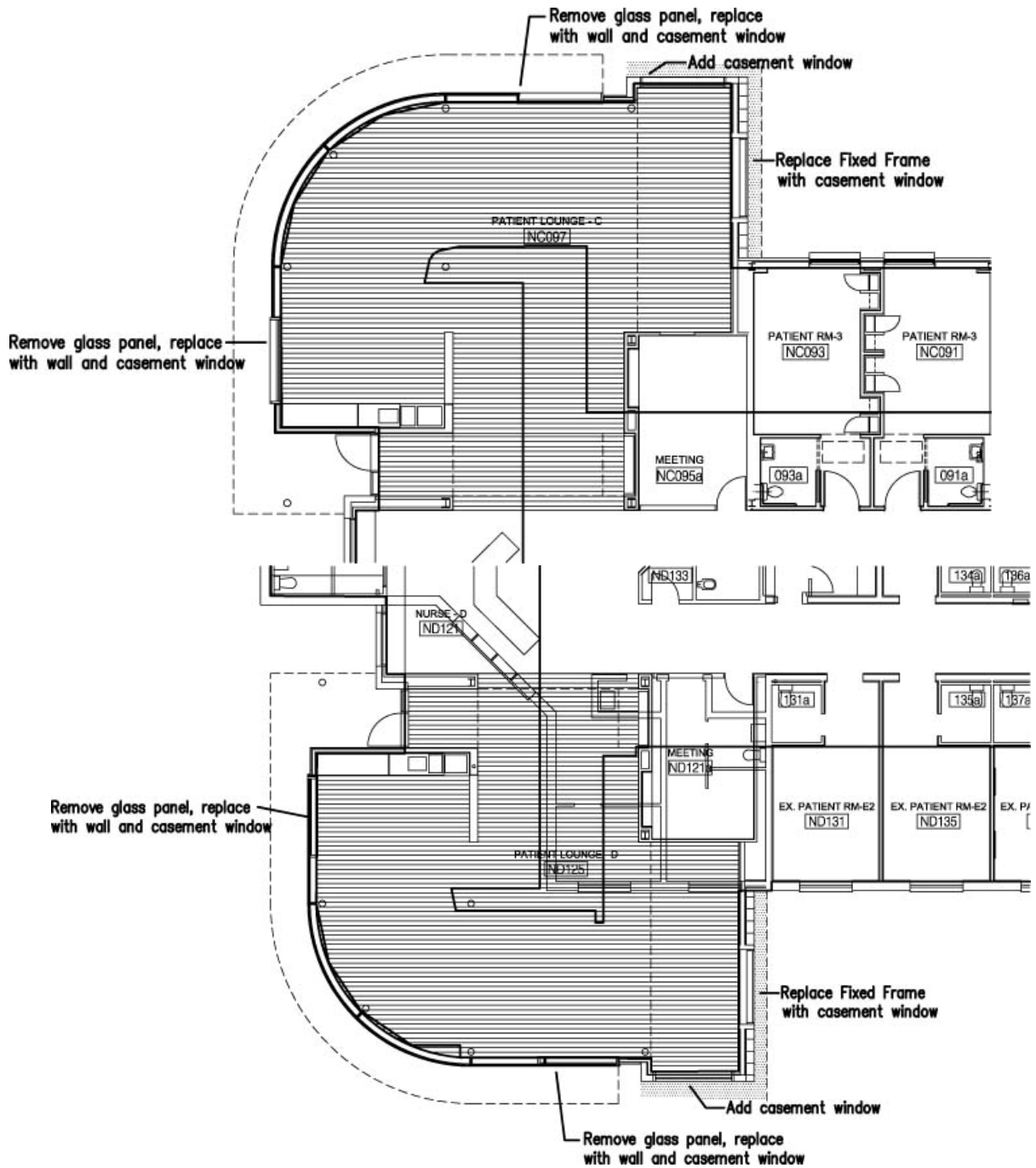
**Windows:**

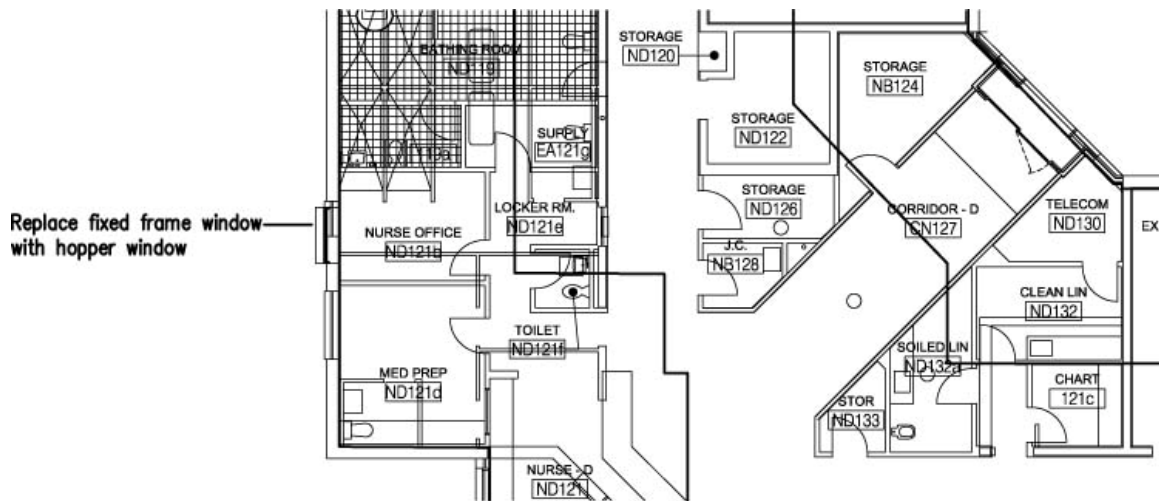
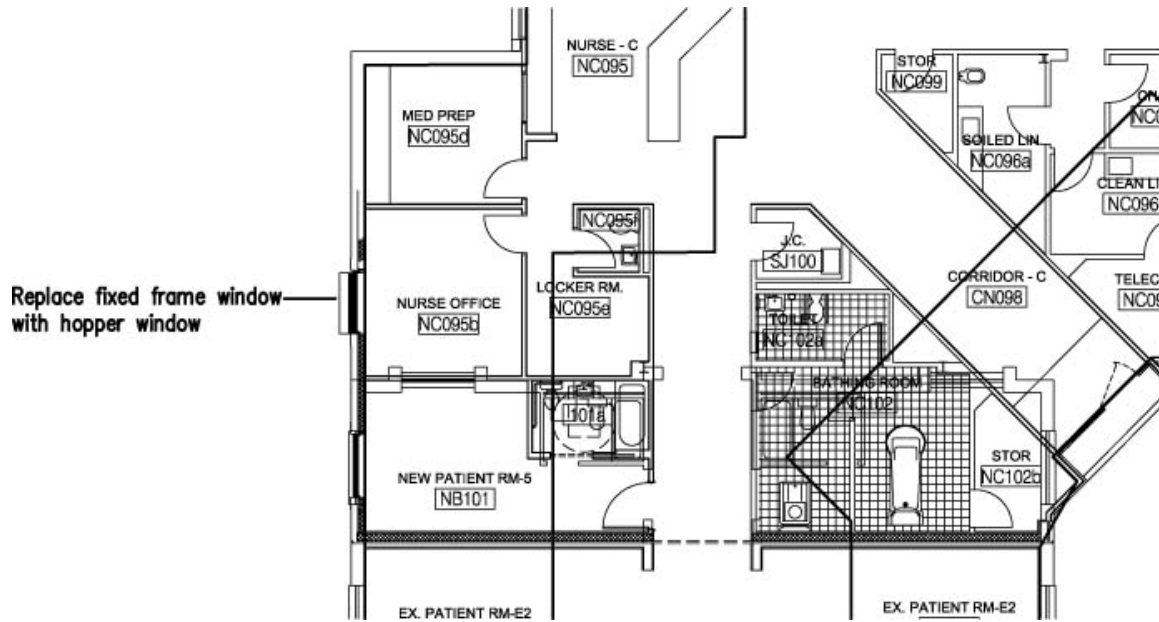
The architecture of the building has already been designed, although it can be altered, it would be easier to work around the existing design and avoid any major changes that may affect the layout or structure of the building. The following tables show the number of existing operable windows per type of space as well as the number of windows that will be required to earn LEED credit 6.1.

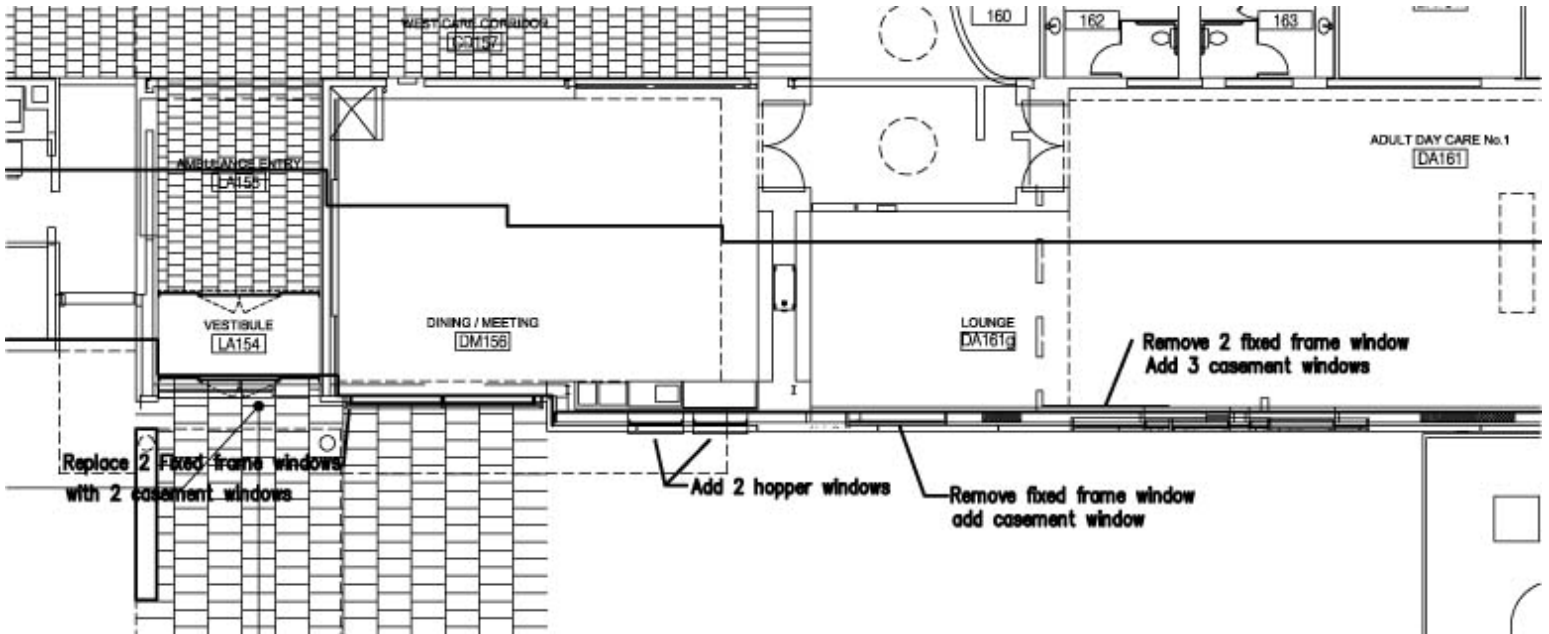
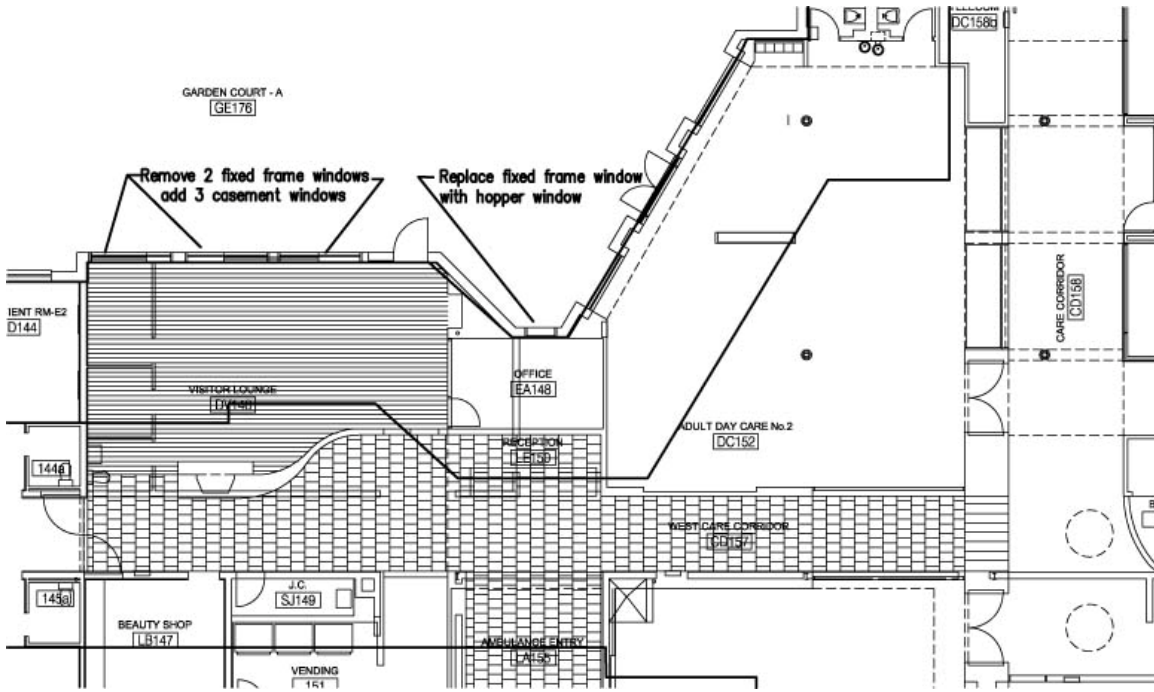
<b>Perimeter Area (When 75% or more of a room is within the 15' offset line)</b>						
<b>Perimeter Area</b>		<b>Operable Windows</b>		<b># of operable</b>	<b># of operable</b>	
<b>sqft</b>		<b>qty</b>	<b>pass</b>	<b>windows needed</b>	<b>windows to add</b>	
34827		139	NO	174	35	
<b>Group or Multi-occupancy Perimeter Area (When 75% or more of a room is within the 15' offset line)</b>						
<b>Perimeter Area</b>		<b>Operable Windows</b>		<b># of operable</b>	<b># of operable</b>	
<b>sqft</b>		<b>qty</b>	<b>pass</b>	<b>windows needed</b>	<b>windows to add</b>	
6553		17	NO	33	16	
<b>Group or Multi-occupancy Non Perimeter Area (When less than 75% of a room is within the 15' offset line)</b>						
<b>Perimeter Area</b>		<b>Operable Windows</b>		<b># of operable</b>	<b># of operable</b>	
<b>sqft</b>		<b>qty</b>	<b>pass</b>	<b>windows needed</b>	<b>windows to add</b>	
5240		0	NO	27	27	

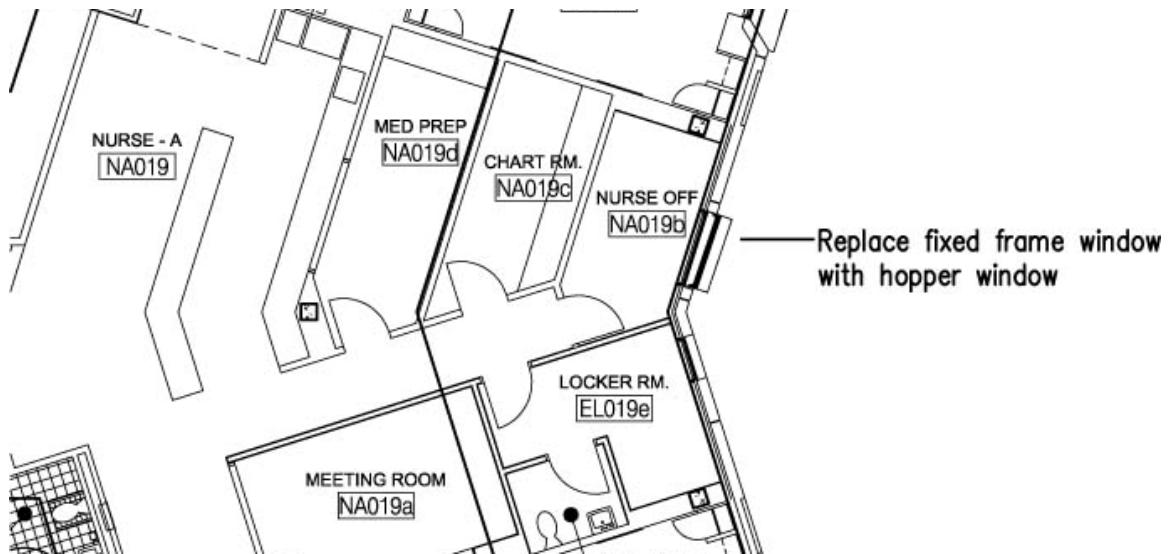
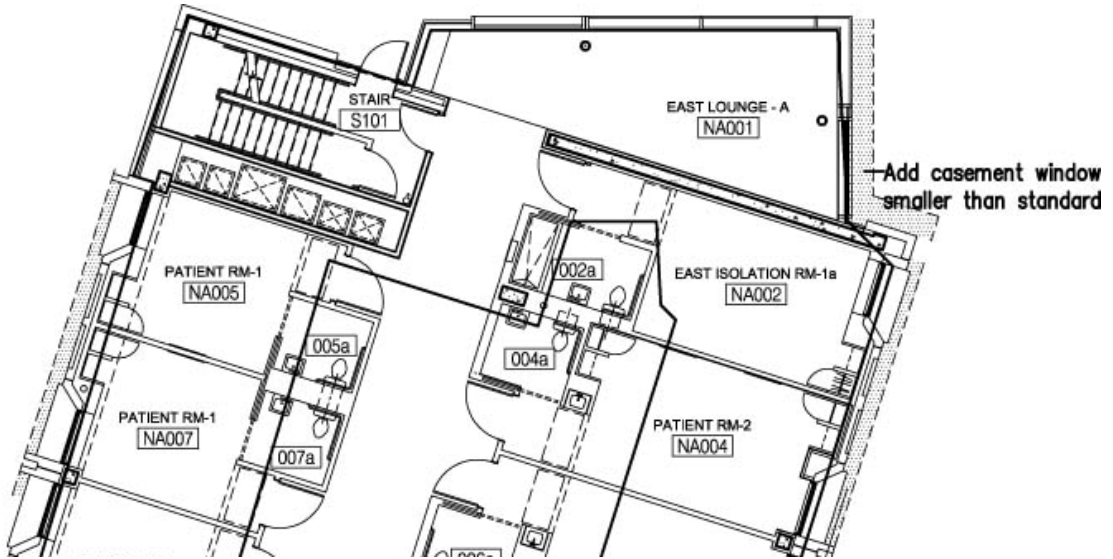
Many of these spaces had several fixed frame windows, however fixed frame windows do not operate and therefore do not count for this calculation. In spaces where this was the case, unless there was a specific need for a non operable window, many of these windows were changed to operable windows based on the size of the window. The Franklin Care Center's existing design uses smaller hopper windows, and slightly larger casement windows where operable windows are used. If an existing fixed frame window was close in size to either of these windows it was changed to that type of operable window. The fixed frame windows in the Medical Prep areas were not changed to operable windows since those rooms should be kept sterile.

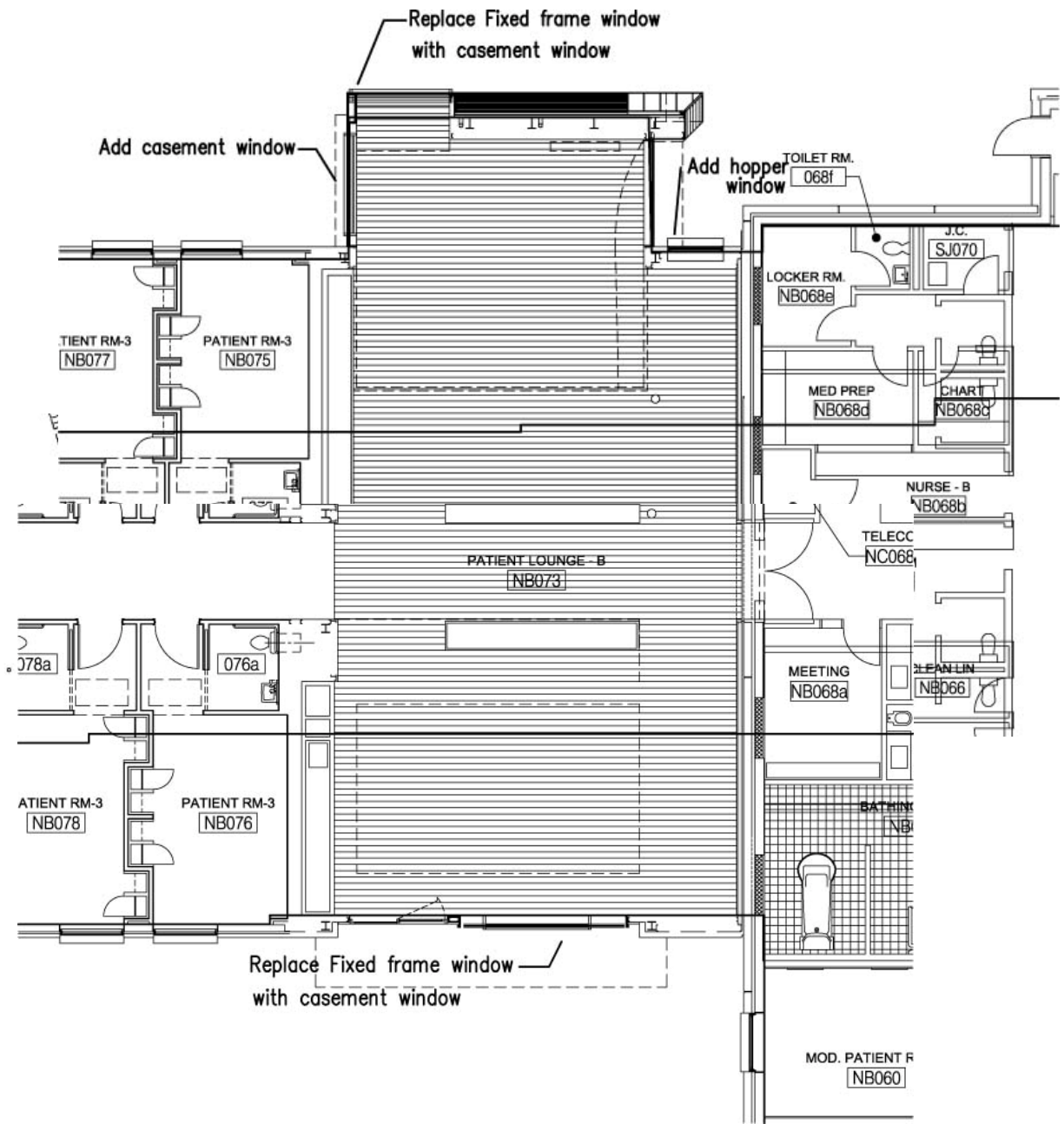
The following pages show images of the floor plans where non-operable windows were changed to operable windows, or operable windows were added. A list of types of windows in each room in the existing and new design can be found in Appendix C.

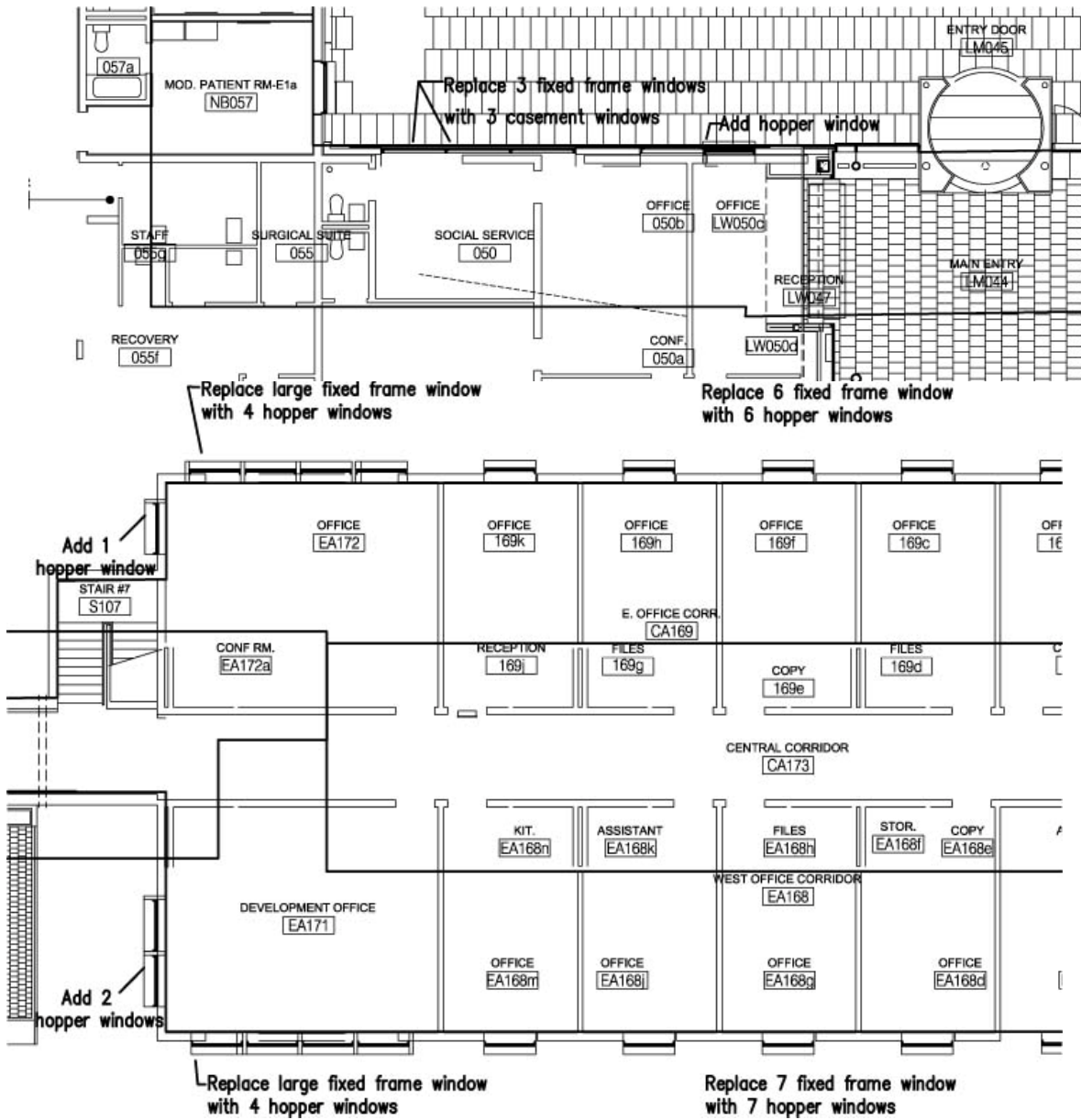














The following tables show the number of operable windows per type of space for the new perimeter system.

<b>Perimeter Area</b> <b>(When 75% or more of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Operable Windows</b> <b>qty pass</b>		<b># of operable</b> <b>windows needed</b>	<b># of operable</b> <b>windows to add</b>	
34827	174	YES	174	0	
<b>Group or Multi-occupancy Perimeter Area</b> <b>(When 75% or more of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Operable Windows</b> <b>qty pass</b>		<b># of operable</b> <b>windows needed</b>	<b># of operable</b> <b>windows to add</b>	
6553	33	YES	33	0	
<b>Group or Multi-occupancy Non-Perimeter Area</b> <b>(When less than 75% of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Operable Windows</b> <b>qty pass</b>		<b># of operable</b> <b>windows needed</b>	<b># of operable</b> <b>windows to add</b>	
5240	27	YES	26	0	

### Lighting Control:

Since the Franklin Care Center is still in the design phase, the lighting control has not been finalized yet. The entire building will be controlled by a DALI system. Wattstopper ezDALI equipment was specified for the lighting design breadth, so it will continue to be used throughout the building. Wattstopper equipment used in the following design can be found in appendix A.

According to LEED criteria for Indoor Environmental Quality credit 6, the following lighting controls can each be counted as two separate controls: occupancy sensor, daylight control, dimming control and manual on/off switch. All other lighting controls count as one.

Perimeter Area: The perimeter spaces that are not group spaces include patient rooms, various types of offices and medical prep rooms. To obtain 1 lighting control per 200sqft for these spaces 1 Wattstopper ez DALI group control was placed in each room. This group control allows each group of luminaries in that space to be dimmed separately. Although this alone exceeded the number of lighting controls needed for LEED credit, a Wattstopper ultrasonic occupancy sensor was added to each office to conserve energy while the office is not in use.

The following partial floor plans show the layout of typical perimeter rooms:

LEGEND

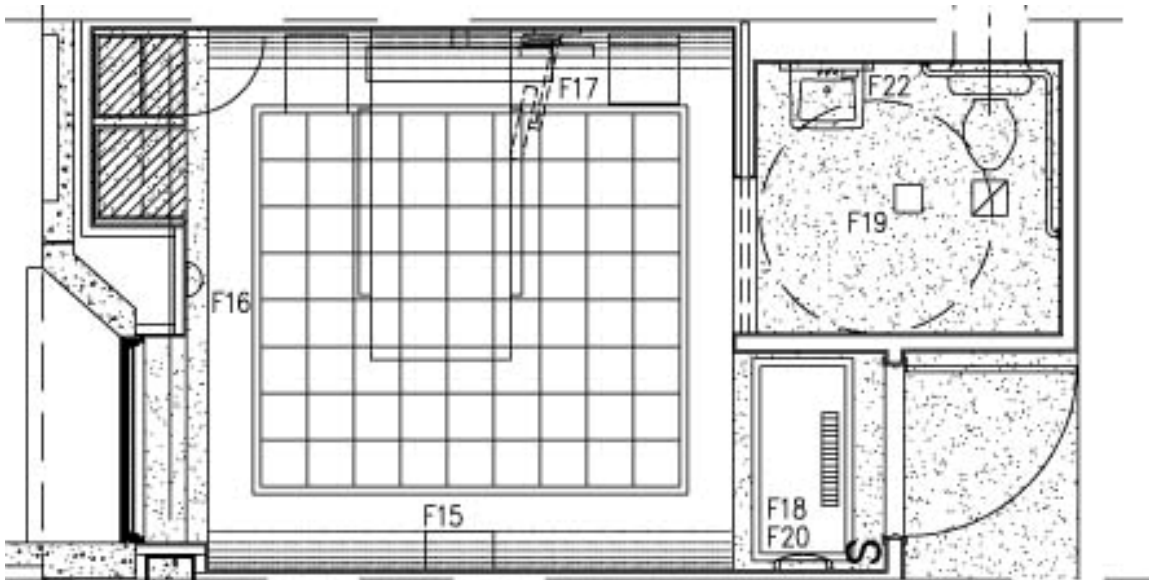
S – Wattstopper ezDALI group control

OC – Wattstopper ultrasonic occupancy sensor

Patient Rooms

In each patient room a Wattstopper ezDALI group control will be located adjacent to the doorway as shown in the plan below.

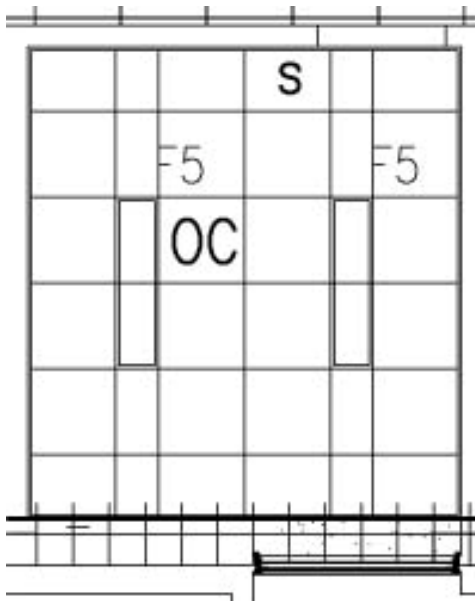
\*Note: Additional lighting controls will be used for the bathroom spaces, however are not shown here since that is not a regularly occupied space.



Office and medical prep rooms

In each office a Wattstopper ezDALI group control will be located adjacent to the doorway, an ultrasonic occupancy sensor will be located about halfway into the room provided there is a clear line of sight. The occupancy sensor should not be located

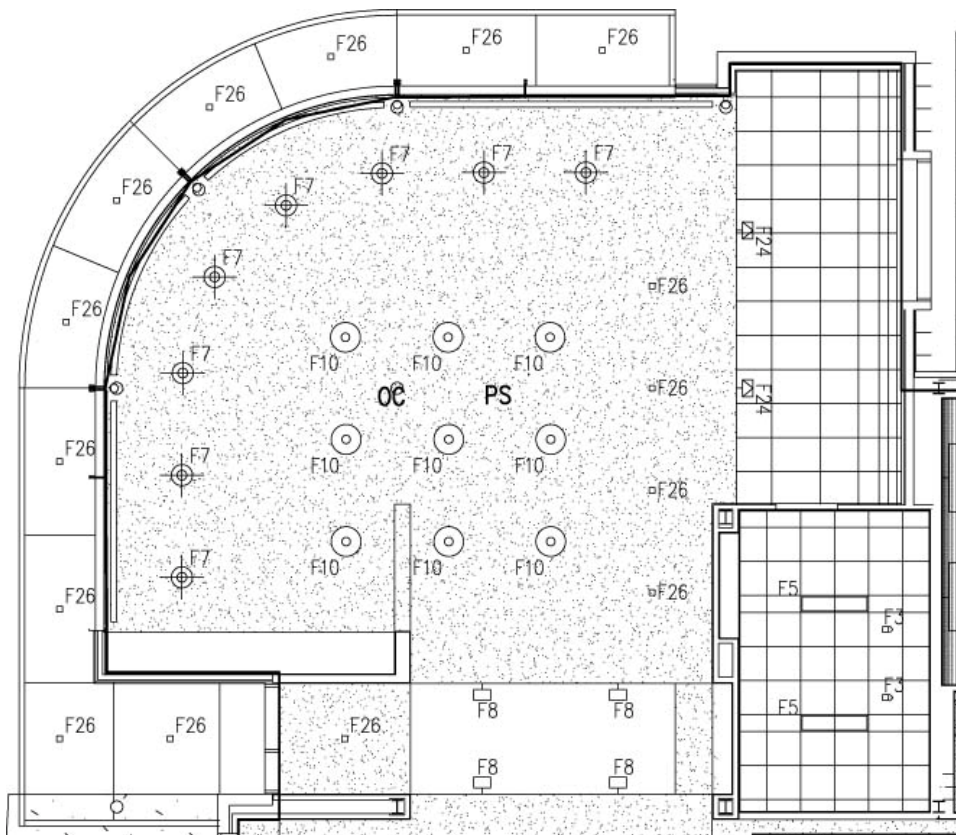
directly in front of the door to prevent misreadings from people walking by.



Perimeter Group or Multi-occupancy Area: The group occupancy areas include lounges and a beauty shop. Each space must have 3 lighting controls per every 2,500sqft, however none of the rooms are over 2,500 sqft, so no more than 3 lighting controls is necessary per room. 1 Wattstopper ez DALI group control was placed in each room, giving each room two controls according to LEED criteria. Every lounge will also have an occupancy sensor to conserve energy while it is not being occupied. Lounges that have glass curtain walls will have an additional control for daylight. A photosensor will be used to dim the electric lighting based on the amount of light entering through the façade. The beauty shop will have one group control and one automatic on/off switch since it will be open for specific hours every day.

### Lounges

In each lounge one group control will be located near the entrance. An occupancy sensor will be located about halfway into the room and should not face directly out any doors. If the lounge also has a photosensor, the photosensor should be placed about 2/3's back from the window near the center of the room.



### Beauty Shop

The DALI group control in the beauty shop will be located near the entrance. All fixtures will also be connected to the automatic on/off switch which will shut the lights off after the shop closes.

### Non-perimeter Area:

The non-perimeter rooms are all part of the therapy suite. The physical therapy space falls in this area, while the rest of the rooms are different types of offices. The number of lighting controls for each of these spaces is determined by the number of occupants per space. The number of occupants per space was found in ASHRAE 62. Overall the non perimeter spaces had 22 occupants, making a minimum of 11 lighting controls necessary. In the 5 different offices one DALI group control and one occupancy sensor was placed in the same manner as for the perimeter spaces. The reception area only has a DALI group control, but no occupancy sensor since it should appear inviting at all times. The physical therapy area has one DALI group control and 2 photosensors as designed in the lighting design breadth.

### Non-perimeter Group or Multi-occupancy Area:

The non-perimeter group spaces include lounges, a dining room, adult day care, conference room, and meeting rooms. Each space must have 3 lighting controls per every 2,500sqft, however none of the rooms are over 2,500 sqft, so no more than 3 lighting controls is necessary per room. 1 Wattstopper ez DALI group control was placed in each room, giving each room two controls according to LEED criteria. A DALI group and scene control was used in each conference room since it will be beneficial to have the option of preset scenes for different types of meetings and presentations. The lighting in the adult daycare rooms will also be connected to an automatic on/off switch since the daycare will be open during specific hours every day. All other rooms will have an occupancy sensor to conserve energy when the room is not in use. The occupancy sensors should be placed about halfway into the room while avoiding the direct line of sight out the door, as shown in the typical lounge above.

The following table shows the lighting controls per type of space for the newly designed system:

<b>Perimeter Area</b> <b>(When 75% or more of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Lighting Control</b>		<b># of lighting</b> <b>controls needed</b>	<b># of controls</b> <b>to add</b>	
	<b>qty</b>	<b>pass</b>			
34827	381	YES	174		0
<b>Non-Perimeter Area</b> <b>(When less than 75% of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Lighting Control</b>		<b># of lighting</b> <b>controls needed</b>	<b># of controls</b> <b>to add</b>	
	<b>qty</b>	<b>pass</b>			
2421	27	YES	11		0
<b>Group or Multi-occupancy Perimeter Area</b> <b>(When 75% or more of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Lighting Control</b>		<b># of lighting</b> <b>controls needed</b>	<b># of controls</b> <b>windows to add</b>	
	<b>qty</b>	<b>pass</b>			
6553	52	YES	30		0
<b>Group or Multi-occupancy Non-Perimeter Area</b> <b>(When less than 75% of a room is within the 15' offset line)</b>					
<b>Perimeter Area</b> <b>sqft</b>	<b>Lighting Control</b>		<b># of lighting</b> <b>controls needed</b>	<b># of controls</b> <b>windows to add</b>	
	<b>qty</b>	<b>pass</b>			
5240	36	YES	27		0

### Temperature and Airflow:

There are additional requirements for temperature and airflow control of non-perimeter spaces. It is difficult to determine the placement of these controls at this time since the drawings are still in the design phase. Only one of each control is necessary in each group space to satisfy LEED criteria. However a calculation was done to determine the number of each type of control in the remaining non-perimeter spaces. The number of each type of control needed was determined for these spaces and is shown in the chart below:

Room Name	Room Number	Area sqft	Lighting Control Type	# Occupants	Airflow controls	Temperature Controls
Med. Prep	NA019d	131	One DALI group control	1	1	1
Physical Therapy	DT159a	1500	One DALI group control and 2 photosensors	15	4	5
Occupational Therapy	DT159b	340	One DALI group control and one occupancy sensor	2	2	1
Reception	DT159s	100	One DALI group control	3	1	1
Director	DT159r	100	One DALI group control and one occupancy sensor	1	1	1
Speech	DT159n	125	One DALI group control and one occupancy sensor	1	1	1
Phycatrist	DT159k	125	One DALI group control and one occupancy sensor	1	1	1
				Total Controls	11	11

As long as the above number of airflow and temperature controls are provided in each space, credit 6.2 Non-perimeter Control System, will be earned.

## Conclusions

By adding windows and a lighting control system to the existing design for the Franklin Care Center LEED Indoor Environmental Quality Credit 6.1, Controllability of Perimeter Systems, will be earned. By also meeting the number of airflow and temperature controls calculated above credit 6.2 Controllability of Non-perimeter Systems can also be earned. By earning LEED credit 6, there is a better chance that the Franklin Care Center will be awarded LEED gold certification after construction.

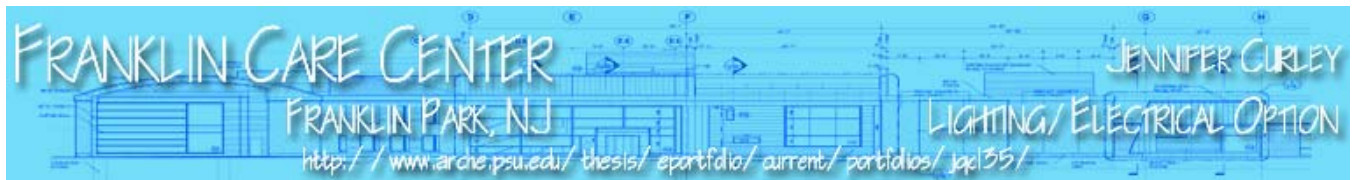
## Final Conclusions

The redesign of architectural engineering elements in the Franklin Care Center provide an environmentally friendly building while creating a comfortable home and functional medical institution. Redesigned lighting for the Main Entrance Lobby, Chapel, Physical Therapy Suite and Exterior Courtyard meet the design criteria set for each separate space while maintaining power densities below ASHRAE 90.1. On average the power density for each space was 7% below ASHRAE. Considering the increased illumination levels required in these spaces and the conditions limiting the use of direct lighting, this is a significant energy savings. Since the Franklin Care Center is an existing building this energy savings will help to earn at least 1 Point for LEED Energy and Atmosphere Credit 1, Optimizing Energy. Additional energy savings will be obtained through the use of the building's DALI control system, dimming, photosensors and occupancy sensors. The design for this control system was further explored in the LEED breadth. The addition of operable windows also performed in the LEED breadth will give more flexibility to the perimeter of the building and make the occupants more comfortable. An increased number of air controls will reduce wasting energy by overheating or overcooling a space. As a result, LEED Indoor Environmental Quality Credits 6.1 and 6.2 will also be earned.

While the redesigned electrical system does not result in direct energy savings, the use of smaller wires and conduits will reduce the amount of materials needed for the system. The new system also saves a notable amount of money at the expense of space that is already available.

In conclusion, redesigning the architectural engineering systems in the Franklin Care Center presented many challenges. Each space included in the lighting redesign presented individual challenges that were confronted with comprehensive solutions. By redesigning systems for a LEED certified building environmental concerns were a priority throughout the various designs and influenced various decisions. The redesigned systems provide an energy efficient building that will still be awarded with LEED certification.





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## Aknowledgements

Many people helped me complete my senior thesis....I would like to thank.....

Heather Lion and HLB for suggesting the building, getting me in touch with the architect, and responding to my many many emails

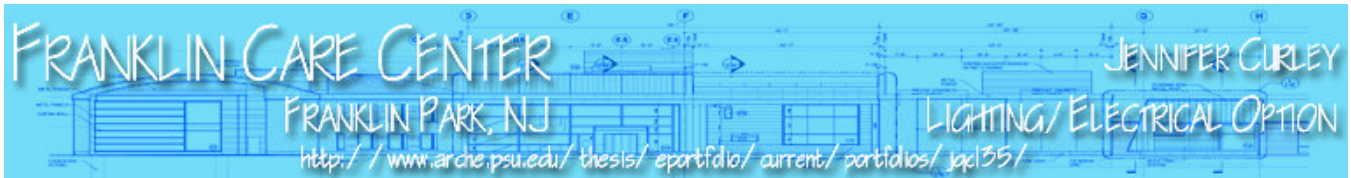
BeckhardRichlandSzerbaty + Associates for providing me with a full set of drawings to use for my senior thesis as well as answering all my questions

Dr. Moeck, Dr. Mistrick and Ted Dannerth for their very helpful consultations and feedback throughout the year

The AE class of 2006 for all their help throughout the last 5 years.

My mom and dad for supporting me throughout my academic career and helping me achieve my goals.

## Thanks!!



# Appendix A :

# Lighting Equipment

# Appendix A: Lighting Equipment

Fixture Label	Description	Fixture Cat No.	#	Lamp Type	Lamp Cat. No.	CRI	CCT	Ballast Type	Ballast Cat. No.	Lamps per ballast
F1	Wall mounted metal halide uplight	P2-LS-M150-LS1-SGW	1	ED 17	MCG150/U/M3K ALTO	85	3000	Electronic	Advanced Transformer 71A5437BP	1
F2	Compact fluorescent decorative pendant	American Glass Light 6118-U	2	Quad	CFQ18W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x18CF/ UNV DALI	2
F3	CFL recessed mounted circular downlight	Erco 22151	2	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/ UNV DALI	2
F4	Surface mounted decorative downlight	Magic-1/32W/CF GX24Q3 277 GLASS	2	Triple Tube	CFTR32W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/ UNV DALI	2
F5	Incandescent table lamp	Louis Poulsen PH4 1/2-T-1/100W/A19/IF MED/120 GLASS	1	A19	100A/CL/DL/RP	100	n/a	n/a	n/a	n/a
F5a	Incandescent floor lamp	Louis Poulsen PH4 1/2-F-1/100W/A19/IF MED/120 GLASS	1	A19	100A/CL/DL/RP	100	n/a	n/a	n/a	n/a
F6	Recessed wall mounted LED steplight	Erco 33730.000	1	LED	n/a	n/a	n/a	n/a	n/a	n/a
F7	Cove mounted fluorescent covelight	Prudentail SC-1T5-04	1	T5	Sylvania FP28/830/ECO	82	3000	DALI dimming	Sylvania QTP1x28T5/ UNV DALI	1
F8	Wall mounted compact fluorescent decorative sconce	OSW-1/18W/CF GX24Q-3/4-277-WHT	1	Quad	CFQ18W/G24Q/830	82	3000	DALI dimming	Sylvania QTP2x18CF/ UNV DALI	2
F9	CFL surface mounted downlight	Lightolier 3040PB218U	2	Quad	Sylvania CFQ18W/G24Q/830	82	3000	Dali Dimming	Sylvania QTP2x18CF/ UNV DALI	1
F10	Cove mounted fluorescent striplight	Prudentail PT8W-SS-STD-1T8-04-BWE-SC	1	T5	Sylvania FP28/830/ECO	82	3000	Dali Dimming	Sylvania QTP2x28T5/ UNV DALI	2
F11	Recessed halogen downlight	Lucifer DL1G	1	MR16	Sylvania 20MR16/T/FL40	100	3000	n/a	n/a	1
F12	Recessed halogen spotlight	Lucifer DL2G	1	MR16	Sylvania 20MR16/T/NSP10	100	n/a	n/a	n/a	1
F12a	Recessed halogen spotlight	Lucifer DL2G	1	MR16	Sylvania 50MR16/T/NSP10	100	n/a	n/a	n/a	1
F13	Semi direct CFL bollard	Louis Poulsen SAB/1/32/CF/ GX24q-3	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/ UNV DALI	1
F14	Semi direct CFL sconce	Louis Poulsen ORW-MAX 1/32/CF GX24-q-3/4	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/ UNV DALI	1
F15	Recessed fluorescent linear downlight	Focal Point FAVB-PL-1T5	1	T5	Sylvania FP28/830/ECO	82	3000	DALI dimming	Sylvania QTP1x28T5/ UNV DALI	1
F16	Wall mounted compact fluorescent sconce	Manning PS44-12-PLC-W	1	Quad	Sylvania CFQ13W/G24Q/830	82	3000	Dali Dimming	Sylvania QTP1x13CF/ UNV DALI	1
F17	Suspended indirect fluorescent pendant	Lightolier 48228ALU	2	T5	FP28/830/ECO	82	3000	DALI dimming	Sylvania QTP2x28T5/ UNV DALI	2
F18	Desk task light	Erco 33170.000	1	Capsul	50T4Q/CL/AX	100	n/a	n/a	n/a	n/a
F19	Semi direct CFL pole mounted fixture	Louis Poulsen SATT-MAX/1/32W/CF/G X24q-3/4	1	Triple Tube	Sylvania CFTR32W/GX24Q/830	82	3000	DALI dimming	Sylvania QTP2x32CF/ UNV DALI	1
F20	In grade LED orientation luminaire	Erco 38782.000	1	Dynamic Color changing LED	n/a	n/a	n/a	n/a	n/a	n/a

Project: The Franklin Care Center  
 Jennifer Curley  
 April 5, 2006

Luminaire  
 Schedule

# HID Large Wall Mount

**WINDIRECT™**

LAMP	SIZE	APPLICATION	TYPE
------	------	-------------	------

INDOOR | OUTDOOR

- SURFACE WALL
- SURFACE CEILING
- SEMI-RECESSED
- SURFACE LINEAR
- COVE
- PENDANT
- CANTILEVER
- BASE MOUNT
- TRUSS
- MODIFIED STANDARD
- FINISHES
- OPTIONS
- TECHNICAL



P1 - LS - M175 - 120V - LS1 - SGW - X - STD

**Profile** - P1 (basic): Anodized, extruded aluminum specular reflector with solid aluminum endcaps and stainless steel hardware. Extruded aluminum visors are combined with P1 basic profile to create P2, P3, P4 & \*P5 profiles.

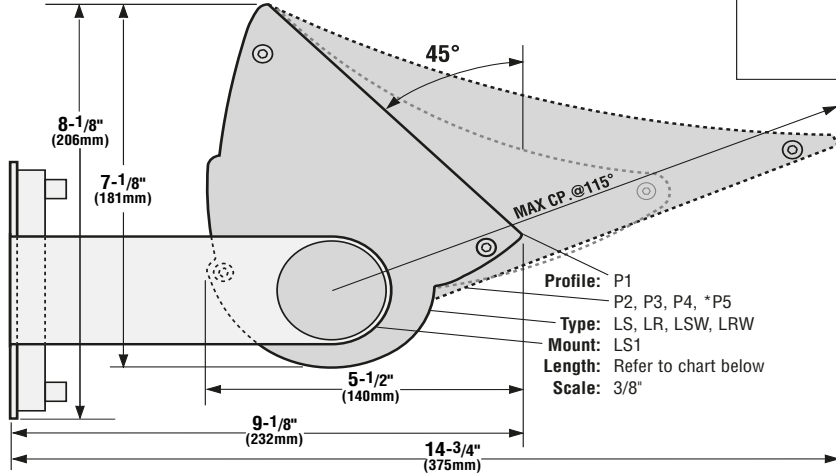
**Type** - Large profile with smooth or ribbed detail.

**Indoor:** captive, extruded alum. hinge with non-gasketed regressed lens.

**Outdoor:** captive, extruded alum. door with window cut-out for regressed lens and silicone gasket.

**Lens:** micro prismatic tempered glass lens standard.

**Mounting** - Three standard mounts are fully adjustable and lockable. Designed for remote or integral ballast.



**Performance** - Asymmetric distribution provides a concentration of light on target surface for smooth illumination. Maximum candle-power aimed 115° above nadir has less than 15% spill light within the 0-115° zone and less than 3% spill light within the 180-270° zone.

**Electrical** - HX-HPF ballast for medium base 100W and 150W lamps. CWA ballast for 175W medium base lamp, 250W and 400W mogul base lamps. Ballasts are thermally protected, dual-voltage for 120/277V operation, and offered as remote or integral. Provide 90° C supply wire. See Technical section for ballast data.

**Finishes** - An electrostatically applied wet paint system utilizes a multi-stage process to provide a durable acrylic enamel finish. Suitable for indoor and outdoor applications.

**Options** - For complete list and detailed descriptions, refer to Options Section.

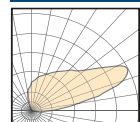


## SPECIFICATIONS

PROFILE	TYPE	LAMPING	VOLTAGE	MOUNTING	FINISH	OPTIONS	CLASS
P2	LS	M400	120V or 277V	LS1	SGW	X	STD
	<b>Indoor Location</b> (damp label)	<b>Code</b> <b>Description</b> <b>Length</b> <b>Weight</b>		<b>Remote Ballast</b>	<b>SGW:</b> Semi-Gloss White <b>SGB:</b> Semi-Gloss Black	<b>X:</b> No Options <b>SB:</b> Straight Blade Baffle (external mount)	<b>STD:</b> Indicate only when specifying a standard.
	<b>LS:</b> Large Smooth <b>LR:</b> Large Ribbed	<b>M100</b> (1) 100W ED-17 MH 12" 8 lbs. <b>M150</b> (1) 150W ED-17 MH 12" 8 lbs. <b>M175</b> (1) 175W ED-17 MH 12" 8 lbs. <b>M250</b> (1) 250W T-15 or ET-18 MH16" 10 lbs. <b>M400</b> (1) 400W T-15 or ET-18 MH16" 10 lbs. <b>M800</b> (2) 400W T-15 or ET-18 MH25" 16 lbs.		<b>LD1:</b> Deco Yoke <b>LD1:</b> Deco Yoke	<b>ALP:</b> Aluminum Paint (matte finish) <b>LGP:</b> Light Gold Iridescent (gloss finish)	<b>PG:</b> Patterned Glass Lens (wide distribution) <b>QR:</b> Quartz Restrike	<b>MOD:</b> Indicate when specifying any modification.
	<b>Outdoor Location</b> (wet label)	<b>Integral Ballast</b>		<b>LD1:</b> Deco Yoke <b>LD1:</b> Deco Yoke	<b>NT:</b> Natatorium Construction		
	<b>LSW:</b> Large Smooth Wet <b>LRW:</b> Large Ribbed Wet	<b>M100</b> (1) 100W ED-17 MH 16" 27 lbs. <b>M150</b> (1) 150W ED-17 MH 16" 29 lbs. <b>M175</b> (1) 175W ED-17 MH 16" 30 lbs. <b>M250</b> (1) 250W T-15 or ET-18 MH20" 37 lbs. <b>M400</b> (1) 400W T-15 or ET-18 MH20" 43 lbs. <b>M800</b> (2) 800W T-15 or ET-18 MH25" 60 lbs.		<b>Integral Ballast</b>	<b>PBP:</b> Pale Bronze Paint (gloss finish) <b>SPF:</b> (STD) Standard Painted Finish to be determined	<b>NT:</b> Natatorium Construction <b>SO:</b> (MOD) Special Option	
	<b>LRW:</b> Large Ribbed Wet			<b>LS4:</b> Simple Yoke <b>LS6:</b> Simple Yoke <b>LD4:</b> Deco Yoke	<b>CPF:</b> (MOD) Custom Painted Finish	<b>Options</b> - For complete list and detailed descriptions, refer to Options Section.	

**Note:** \*P5 (short visor) does not provide the same sightline shielding as the P2, P3 or P4 visors (see options section for details). Ballast ANSI codes: M90, M102, M57, M58, M59

### PHOTOMETRY



M400 Refer to Technical Section for detailed Photometry Reports. Report #11232

**winona**

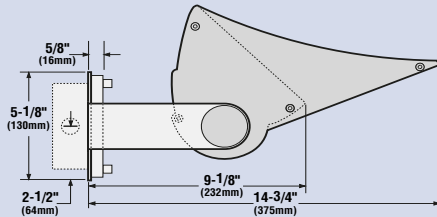
l i g h t i n g

This catalog page is available online.

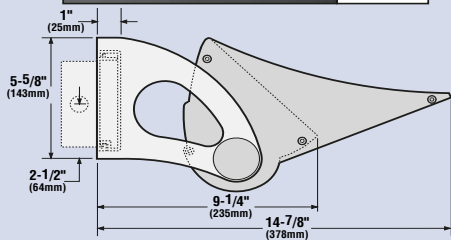
- All fixtures U.L. listed, (USA & Canada). © Copyright 2004 Winona Lighting • 3760 West Fourth Street • P.O. Box 1205 • Winona, MN 55987-7205 1-800-328-5291 • 507-454-5113 (MN) • FAX 507-452-8528 • www.winonalighting.com

**MOUNTING STYLES\***

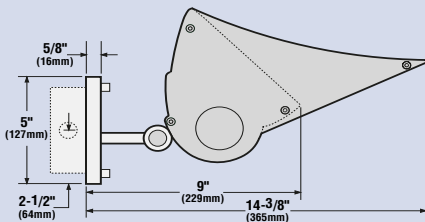
**Remote Ballast**



**P2**  
(solid)  
**Ribbed**  
**Simple Yoke LS1**

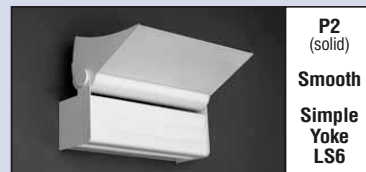
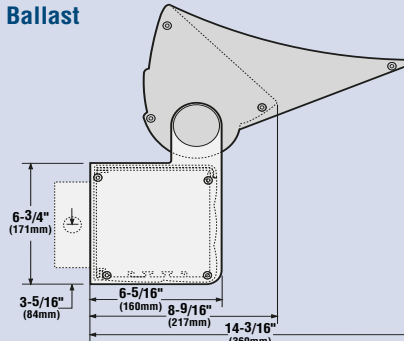


**P3**  
(perforated)  
**Smooth**  
**Deco Yoke LD1**

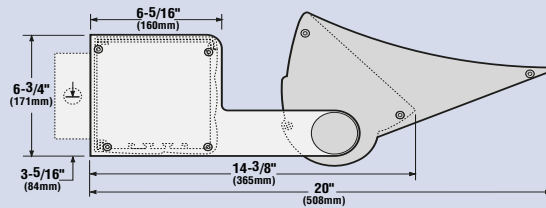


**P3**  
(perforated)  
**Ribbed**  
**Knuckle Mount LK1**

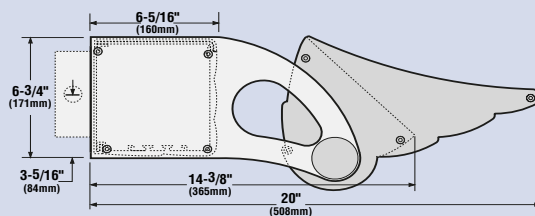
**Integral Ballast**



**P2**  
(solid)  
**Smooth**  
**Simple Yoke LS6**



**P3**  
(perforated)  
**Ribbed**  
**Simple Yoke LS4**



**P4**  
(scalloped)  
**Ribbed**  
**Deco Yoke LD4**

\* All profiles can be combined with the mounting styles shown.

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PAGE: 23

- SURFACE WALL
- SURFACE CEILING
- SEMI-RECESSED
- SURFACE LINEAR
- COVE
- PENDANT
- CANTILEVER
- BASE MOUNT
- TRUSS
- MODIFIED STANDARD
- FINISHES
- OPTIONS
- TECHNICAL

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
**F1**

# Appendix A: Lighting Equipment

Product Spec Sheet for Jimmy B. Uplight

<http://www.americanglasslight.com/SpecSheet.asp>

## American Glass Light Product Spec Sheet:

**Fixture Name:** Jimmy B. Uplight



**Catalog #:** 6118-U

**Selected Width:** 19"

**Selected Height:** 14"

**Selected Lamping:** (2) 18W Quad Tube Compact Fluorescent

**Selected Glass/Panel:** White Sandblasted Glass

**Selected Finish:** Polished brass

**Additional Details:** Weight for standard lamping 19" width: 10 Lbs. Weight for standard lamping 23" width: 12 Lbs. Weight for standard lamping for 35" width: 33 Lbs. 54" diameter available by special order. 6123-U also available with 16" overall height using (3) 60W A lamps. Metal Halide lamping uses Phillips P100 CDM/C/U/M (or equal). Metal Halide lamp suitable for use in an unshielded fixture. Each lamp is provided with one autotransformer, dual voltage (120/277V), magnetic, encased and potted, 100W M-90 ballast for remoting a maximum of 15 feet from lamp. A wiring compartment is provided on one end for splicing lamp and ballast leads. For 32" diameter (or larger) fixtures, (3) lamps are standard unless (4) lamps are ordered. Dimensions, finishes, and lamping ship standard as listed unless special order options are requested.

120 volts is standard unless other voltage is ordered.

**Your Notes:**

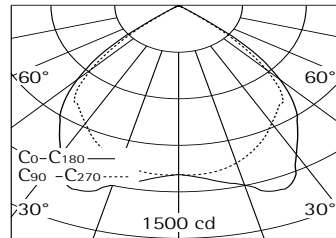
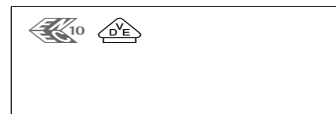
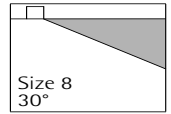
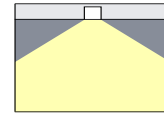
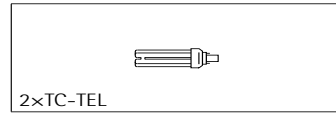
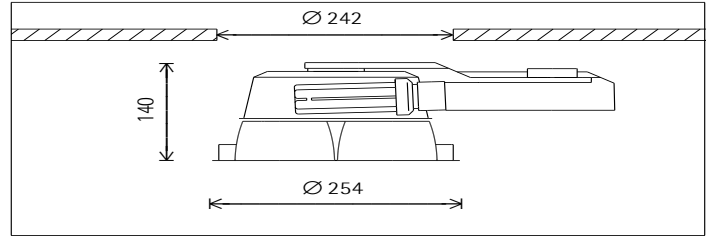
**When specifying this product, please indicate all selected options so we have complete information when an order is placed.**

# Appendix A: Lighting Equipment

**ERCO**

## CL downlight

for TC-T lamps



2xTC-TEL 32W GX24q-3 2400lm

LOR	0.45
UGR C0	20.9
UGR C90	19.8
65° <	200 cd/m <sup>2</sup>

**22151.000** Reflector silver  
2xTC-TEL 32W GX24q-3 2400lm  
ECG DALI

**Product description**

Housing: Cast aluminium, designed as heat sink.  
Mounting ring: cast aluminium, white (RAL9002) powder-coated. Tools not required for mounting with 4-point support and screw fixing.  
Junction box for through-wiring, 5-pole terminal block, integral cable clamp. Electronic control gear.  
Upper reflector: Aluminium, silver anodised.  
4-cell Darklight reflector: Plastic, mirror-finish aluminium vaporised. Scratch-resistant special coating. Cut-off angle 30°. Weight 2.40kg

ERCO Leuchten GmbH  
Postfach 24 60  
58505 Lüdenscheid  
Germany  
Tel.: +49 2351 551-0  
Fax.: +49 2351 551-300  
info@erco.com

Technical Region: 230V/50Hz  
Edition: December 16, 2005  
Please download the current version from  
www.erco.com/22151.000



# Appendix A: Lighting Equipment

## ERCO

## CL downlight

### Planning data

22151.000 TC-TEL 32W GX24q-3 2400lm  
 Connected load P: 66 W  
 Connected load per 100lx P\*: 3.0 W/m<sup>2</sup>  
 Number of luminaires per 100lx n\*: 4.6 1/100m<sup>2</sup>

22151.000 TC-TEL 32W GX24q-3 2400lm  
 Number of luminaires per 100m<sup>2</sup> for  
 100lx 200lx 300lx 500lx  
 5 10 14 23

22151.000 TC-TEL 32W GX24q-3 2400lm  
 Module (m) 1.2x1.8 1.8x1.8 1.8x2.4 2.4x2.4  
 Illuminance E<sub>n</sub> (lx) 1013 676 507 380

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.89	0.81	0.72	0.88	0.80	0.69	0.59	0.84	0.74	0.61	0.52
RSMF	0.99	0.98	0.96	0.95	0.97	0.96	0.95	0.94	0.97	0.96	0.95	0.94

Hours of operation (h)	1000	2000	4000	6000	8000	10000
LLMF	0.97	0.92	0.88	0.85	0.83	0.83
LSF	1	1	1	1	1	1

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

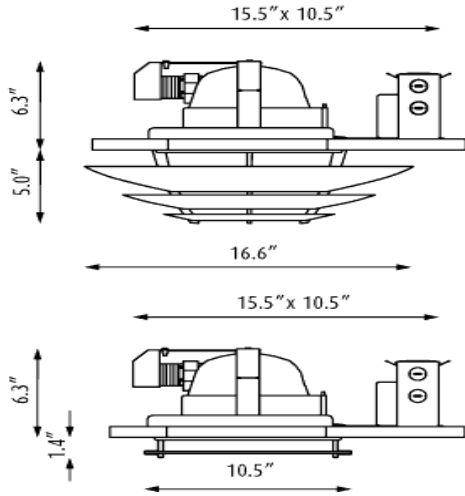
### Correction table

Ceiling	0.70	0.70	0.70	0.50	0
Wall	0.70	0.50	0.20	0.20	0
Floor	0.50	0.20	0.20	0.10	0

k	0.6	77	58	49	48	45
k	1.0	100	77	69	67	63
k	1.5	116	91	84	80	77
k	2.5	129	100	95	90	86
k	3.0	134	103	99	93	89

# Magic Glass/ Oslo

Design : Kurt Nørregaard and Louis Poulsen



## Specification

Magic series consist of two different lighting characteristics, depending on the chosen trim. The Glass trim provides a mainly direct downward illumination, adding a soft green tone of light to the ceiling. The Oslo trim provides indirect and distinct general illumination and produces a visually comfortable ambience as a result of light being emitted between the shades.

**Finish**  
Partly silk-screened, soda lime glass.  
White, wet painted.

**Material**  
Shades: Spun aluminum. Glass: Partly silk-screened, soda lime glass. Reflector: Spun aluminum, matte anodized or spun dad aluminum, polished. Trim ring: Die cast satin matte aluminum.

**Mounting**  
Semi-recessed: Mounting frame with two vertically adjustable brackets spaced equally at 180° to be installed prior to dosing the ceiling. Ceiling types: Accessible and non-accessible ceilings. Ceiling cutout: 8.3" dia.

**Weight**  
Max. 9 lbs.

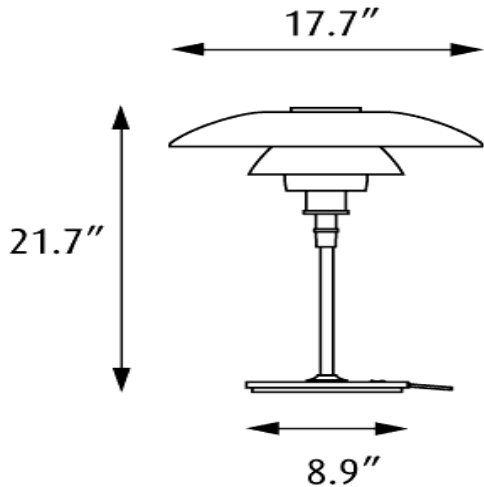
**Label**  
cJL, Dry location. IBEW.

- |   |  |
|---|--|
| 1 | Product code<br>MAGIC  |
| 2 | Light source<br>1/ 18W/ CF G24q-2<br>1/ 200W/A-23/ IF medium<br>1/ 26W/ CF GX24q-3<br>1/ 26W/ CF GX24q-3<br>1/ 32W/ CF GX24q-3<br>2/ 18W/ CF G24q-2<br>2/ 26W/ 32W/ CF GX24q-3<br>2/ 26W/ CF GX24q-3<br>2/ 32W/ CF GX24q-3 |
| 3 | Voltage<br>120-277V<br>120/ 277V<br>120V<br>277V   |
| 4 | Finish<br>GLASS<br>WHT   |
| 5 | Distribution/ Trim<br>GLASS<br>OSLO  |
| 6 | Reflector<br>MATTE<br>POLISHED   |
| 7 | Options<br>NOT APPLICABLE<br>EMPK<br>LUTRON HI-LUME  |

Specification notes:  
a. Provided with one 120-277V integral electronic ballast. b. Incandescent variant is only available in 120V. c. EMPK (emergency power pack) is available in dual tap 120/ 277V. d. DIM-D ESI 120-277V is digital dimming. e. LUTRON HI-LUME 120V or 277V is digital dimming.

# PH 4½-3½ Glass Table

Design: Poul Henningsen



## Specification

- 1 | Product code  
PH4½-3½-T
- 2 | Light source  
1/100W/A-19/IF medium
- 3 | Voltage  
120V
- 4 | Finish  
GLASS

Info notes  
I. On / off switch located in the base. II. All handblown opal glass shades are sandblasted on the undersides for uniform light distribution. III. The comparable EU version has the following classification: Ingress Protection Code: IP20.

PH 4½-3½ Glass Table (1927) provides soft illumination. The PH 4½ family is based on the principle of a reflecting multi-shade system, producing a harmonious and glare free illumination. The shades are drawn over a logarithmic spiral, with the center of the light source placed in the spiral's focal point.

### Finish

White opal glass. High lustre chrome plated.

### Material

Shades: Handblown white opal glass. Base: High lustre chrome plated, spun brass. Top plate: High lustre chrome plated, spun brass. Stem: High lustre chrome plated, steel.

### Mounting

Cord type: Black. Cord length: 9'. Plug: 120V.

### Weight

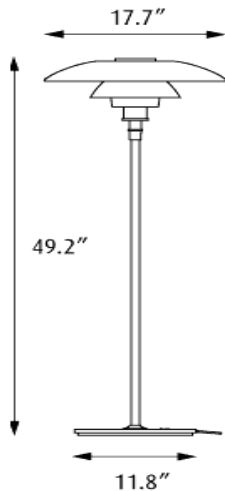
Max. 22 lbs.

### Label

dJL, Dry location. IBEW.

# PH 4½-3½ Glass Floor

Design: Poul Henningsen



## Specification

- 1 | Product code  
PH4½-3½-F
- 2 | Light source  
1/100W/A-19/IF medium
- 3 | Voltage  
120V
- 4 | Finish  
GLASS

Info notes  
I. In-line on/ off foot switch provided. II. All handblown opal glass shades are sandblasted on the undersides for uniform light distribution. III. The comparable EU version has the following classification: Ingress Protection Code: IP20.

PH 4½-3½ Glass Floor (1927) provides soft illumination. The PH 4½ family is based on the principle of a reflecting multi-shade system, producing a harmonious and glare free illumination. The shades are drawn over a logarithmic spiral, with the center of the light source placed in the spiral's focal point.

### Finish

White opal glass. High lustre chrome plated.

### Material

Shades: Handblown white opal glass. Base: High lustre chrome plated, spun brass. Top plate: High lustre chrome plated, spun brass. Stem: High lustre chrome plated, steel.

### Mounting

Cord type: Black. Cord length: 9'. Plug: 120V.

### Weight

Max. 34 lbs.

### Label

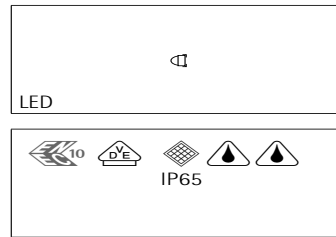
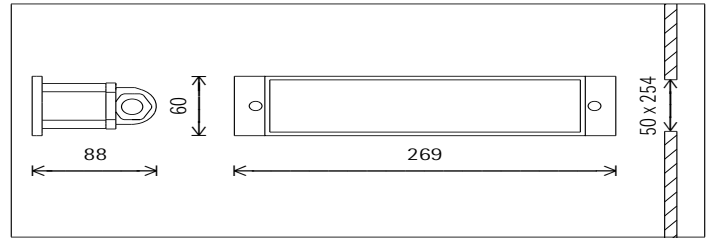
dJL, Dry location. IBEW.

# Appendix A: Lighting Equipment

**ERCO**

## Axis Walklight

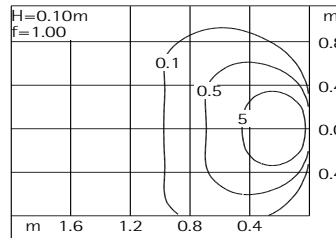
with LED



**33730.000** Graphit m LED White  
LED 1.7W 230V AC 20lm

**Product description**

Housing: corrosion-resistant cast aluminium, No-rinse surface treatment. Graphit m double powder-coated. Mounting bracket: metal. 2 cable entries. Through-wiring possible. 3-pole terminal block. Asymmetric reflector lens system: aluminium, silver anodised. Optimised screening for the LEDs ensures no direct light emission. Replaceable LED module. Cover frame with Softec lens: corrosion-resistant cast aluminium, graphit m double powder-coated. Protection mode IP65: dust-proof and water jet-proof. On site protection must be provided using a residual current circuit breaker, FI<30mA. Weight 0.85kg



Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.98	0.94	0.90	0.86	0.95	0.91	0.86	0.81	0.94	0.90	0.84	0.79
RSMF	0.99	0.98	0.96	0.95	0.97	0.96	0.95	0.94	0.97	0.96	0.95	0.94

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

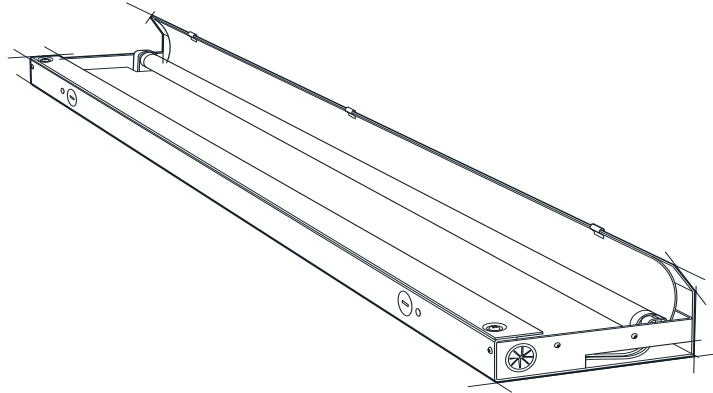
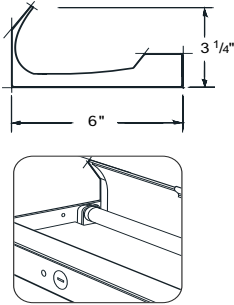
ERCO Leuchten GmbH  
Postfach 24 60  
58505 Lüdenscheid  
Germany  
Tel.: +49 2351 551-0  
Fax.: +49 2351 551-300  
info@erco.com

Technical Region: 230V/50Hz  
Edition: December 16, 2005  
Please download the current version from  
www.erco.com/33730.000

# Appendix A: Lighting Equipment

Type  
Job Name  
Catalog Number

Cove & Perimeter **■ SUPER COVE**



## ordering

series	lamp rows	nominal length	voltage	options
SC				
	1T8	02'	120	PAF
	1T5	03'	277	EML*
	1T5HO	04'	347*	EMH*
		06'	*T8 & T5HO only	DM
		08'		RSE**
		R__*		10THD†
		*row length		B__
				FH
				QC
				*consult factory for fixture lengths < 4'
				†T8 only

**Applications** Coves, retail, lobbies, small offices, conference rooms.

**Features** A low-profile cove lighting system designed for T5/HO or T8 lamps with a unique 3-piece optical system. Formed 95 percent reflective specular aluminum reflector throws light at low angles. Galvanized steel bottom reflector directs and diffuses light on ceiling to eliminate striations while limiting uplight. White backlight reflector fills the cove cavity with light, limiting socket shadow.

**Construction** The housing, available in 2-, 3-, 4-, 6- or 8-foot standard lengths, and end plates are made of die-formed, 20-gauge steel. The three part reflector system is die-formed from 95 percent reflective specular aluminum, 20-gauge steel and galvanized steel.

**Finish** The standard exterior body color is white enamel.

**Electrical** T8 fixtures have instant-start electronic ballasts with less than 20% THD. T5/HO fixtures have programmed-start electronic ballasts with less than 10% THD. Fixtures are U.L. Damp labeled (non-emergency) and I.B.E.W. manufactured. Maximum ballasts size available: 1 5/8" width x 1 1/4" height.

**Mounting** Fixture is to be surface-mounted within concealed coves.

**Options** **PAF:** painted after fabrication; **EML:** emergency battery (T5/HO=700 lumens; T8=600 lumens); **EMH:** emergency battery (T5/HO=1200 lumens; T8=1200 lumens); **DM:** dimming (consult factory); **RSE:** rapid-start electronic (T8 only); **10THD:** ballast with < 10% total harmonic distortion; (T8 only); **B\_:** specific ballast, specify manufacturer and catalog number (consult factory); **FH:** fixture fusing (slow blow); **QC:** quick-connect circuit assemblies.

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0301

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
**F7**

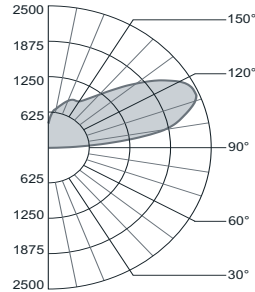
# Appendix A: Lighting Equipment

## SUPER COVE Cove & Perimeter

### photometric data

#### SC-1T5HO-04

Report # LSI16391 D=0.0% I=100.0%  
Lamp Lumens: 4500 Input Watts: 58



#### Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
90	0	48	35	79	39	385
95	10	584	840	1069	911	
100	37	821	1350	1858	1802	
105	74	753	1615	2064	2149	723
110	111	633	1686	2253	2400	
115	147	567	1557	2225	2455	694
120	183	543	1356	2027	2335	
125	222	564	1154	1759	2076	519
130	256	616	1001	1492	1764	
135	290	646	892	1257	1473	359
140	323	660	835	1082	1230	
145	349	652	838	938	1056	249
150	374	652	848	916	946	
155	395	644	810	905	933	174
160	413	646	761	838	881	
165	427	616	707	756	788	96
170	439	564	671	690	701	
175	446	499	564	575	603	28
180	429	429	429	429	429	

#### Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	0.00	0.00
0-180	75.74	100.00

Efficiency = 75.7%

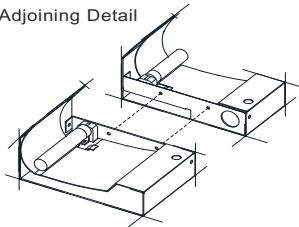
Peak Candela = 2458 @ 112.5°  
Peak : Zenith Ratio = 5.7 : 1

#### Coefficients of Utilization (%)

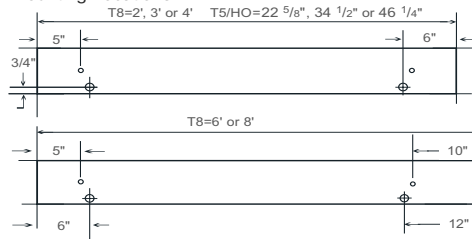
Floor	effective floor cavity reflectance = .20								
	Ceiling	80	70	50	50				
Wall	70	50	30	10	50				
RCR 0	72	72	72	62	62	62	42	42	42
1	66	63	60	57	56	53	51	49	37
2	60	54	50	47	51	47	43	40	32
3	54	48	43	39	46	41	37	34	28
4	50	42	37	33	42	36	32	28	25
5	45	37	32	28	39	32	27	24	22
6	42	33	28	24	35	28	24	21	20
7	38	30	24	20	32	25	21	18	15
8	35	27	21	18	30	23	18	15	13
9	32	24	19	15	28	21	16	13	12

### installation

#### Adjoining Detail



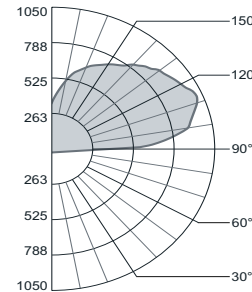
#### Mounting Locations



### photometric data

#### SC-1T8-04

Report # LSI16088 D=0.0% I=100.0%  
Lamp Lumens: 2950 Input Watts: 31



#### Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
90	2	138	316	518	556	
95	17	258	493	704	757	248
100	44	360	605	855	917	
105	81	373	695	903	974	328
110	118	382	717	959	1042	
115	156	399	699	934	1044	325
120	192	422	685	887	986	
125	227	451	672	852	937	287
130	260	481	669	820	897	
135	292	509	653	798	857	245
140	319	530	660	756	827	
145	349	547	663	739	778	197
150	373	545	664	725	759	
155	393	536	652	709	734	142
160	410	520	637	679	703	
165	424	502	592	635	660	90
170	434	483	538	560	584	
175	440	460	485	486	500	24
180	430	430	430	430	430	

#### Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	0.00	0.00
0-180	71.58	100.00

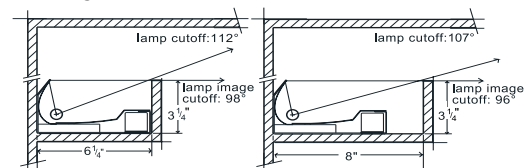
Efficiency = 71.6%

Peak Candela = 1053 @ 112.5°  
Peak : Zenith Ratio = 2.4 : 1

#### Coefficients of Utilization (%)

Floor	effective floor cavity reflectance = .20								
	Ceiling	80	70	50	50				
Wall	70	50	30	10	50				
RCR 0	68	68	68	58	58	58	40	40	40
1	62	59	57	54	53	51	49	46	35
2	56	51	47	44	48	44	41	38	30
3	51	45	41	37	44	39	35	32	27
4	47	40	35	31	41	34	30	27	23
5	43	35	30	26	36	30	26	23	21
6	39	31	26	22	33	27	23	19	16
7	36	28	23	19	31	24	20	17	14
8	33	25	20	17	28	22	17	14	12
9	31	23	18	14	26	20	15	13	11

#### Mounting Details



#### Distance from wall along ceiling

cove to ceiling	Peak Candela @ 112.5°	6 1/4" cove		8" cove	
		lamp	lamp image	lamp	lamp image
12"	27"	27"	70"	37"	91"
18"	42"	42"	112"	57"	148"
24"	57"	57"	155"	77"	205"

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

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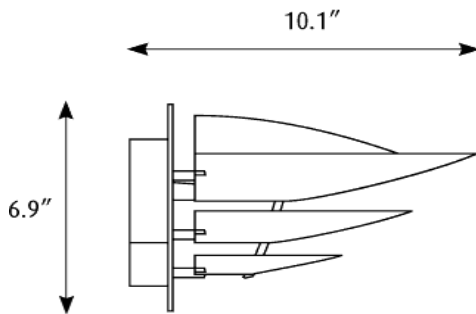
Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
F7

# Appendix A: Lighting Equipment

## Oslo Wall

Design : Kurt Nørregaard



### Specification

- |   |   |
|---|---|
| 1   Product code<br>OSW                             | Specification notes:<br>a. Provided with one 120-277V electronic ballast                                    |
| 2   Light source<br>1/ 26W/ 32W/ 42W/ CF GX24q-3/ 4 | Info notes:<br>1. The comparable EU version has the following classification: Ingress Protection Code: IP20 |
| 3   Voltage<br>120-277V                             |   |
| 4   Finish<br>ALU<br>WHT                            |   |

Oslo Wall creates indirect illumination and produces a visually comfortable ambience as a result of light being emitted between the shades. The lighting characteristics make it ideal for accent illumination.

**Finish**  
Aluminum, brushed & lacquered. White, wet painted.

**Material**  
Shades: Brushed aluminum or spun aluminum. Diffuser: . Back plate: Die cut steel.

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

**Weight**  
Max. 7 lbs.

**Label**



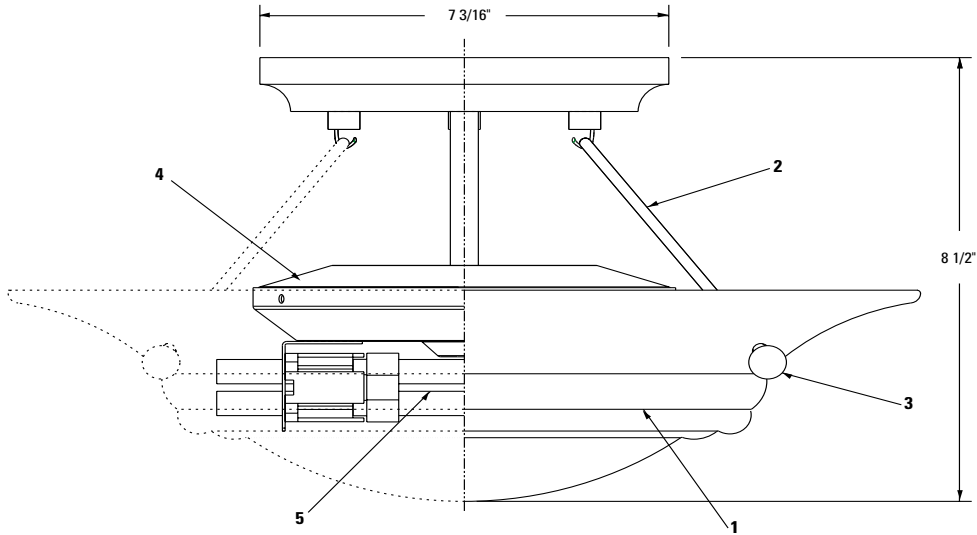
# Appendix A: Lighting Equipment



## Decorative Provence® 3040

Page 1 of 1

Suspended Indirect Close-To-Ceiling



### Information

Catalog Number	Finish	Diffuser Dia. x Ht.	Mounting Rod Length	Ballast	Lamp
3040PB	Polished Brass	15 3/4" x 4"	5 1/2"	N/A	(2) A19 60W max.
3040PB218U		15 3/4" x 4"	5 1/2"	Univ. Electronic 120/277V	(2) 18W Quad 4-Pin

### Features

1. **Diffuser:** Satin etched opal glass.
2. **Mounting Rod:** Cast steel.
4. **Mounting Knob:** Drilled and tapped steel ball.
5. **Electrical Chassis:** Die-formed 20 ga. steel, gloss white finish.
6. **Lamps:** Compact Fluorescent or Incandescent (by others).

### Labels

UL listed suitable for damp locations.

### Lamping

**Incandescent:** (2) A19 60W Max.

**Compact fluorescent:** (2) 18W Quad tube

	General Electric	Osram/Sylvania	Philips
4-Pin	F18DBX/SPX*/4P	CF 18DD/E/*	PL-C18W*/4P

\* Manufacturers' color temperature designation.

### Electrical

**Lampholders:** Incandescent: Medium base, porcelain, nickel-plate screw shell  
Compact Fluorescent: 4-pin, G24q-2 base

Ballast:	Electronic 120/277V
Total Input Watts	42
Max. Line Current (Amps)	.35 / .15
Power Factor	> .98
Ballast Factor	1.05
THD	< 10%
Min. Starting Temps.	-20°C (-4°F)

### Job Information

### Type:

**Job Name:**

**Cat. No.:**

**Lamp(s):**

**Notes:**

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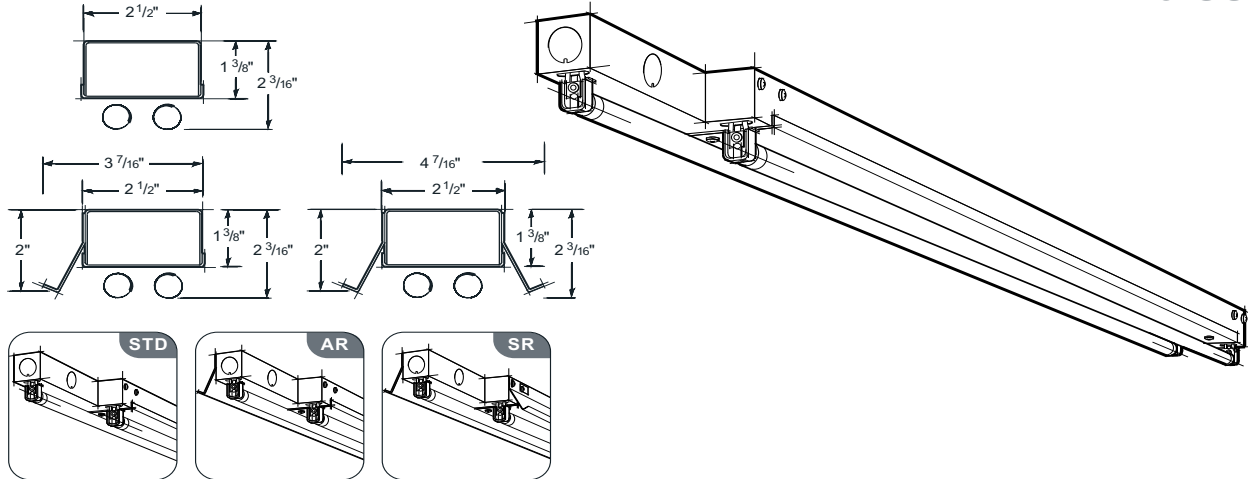
Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
F9

# Appendix A: Lighting Equipment

Type  
 Job Name  
 Catalog Number

Strips & Industrials **P-T5-SS**



## ordering

series	body style	lamp rows	nominal length	color/finish	circuiting	voltage	options	
<b>P-T5-</b>								
SS	staggered	STD standard	1T5	02'	BWE* white enamel	SC single circuit	120	AL
SS-TEL	staggered telescoping	AR asymmetric reflector	2T5	03'	YGW gloss white	DC* dual circuit (in-line)	277	EML*
		ARP asymmetric reflector perforated	1T5HO	04'	Y__ premium color	*2 lamp only	347*	EMH*
		SR symmetric reflector	2T5HO	06'	CC custom color		*T <sub>5</sub> /HO only	DM
		SRP symmetric reflector perforated		08'	GLV galvanized			B__
			R__*		*standard			FH
			*row length When specifying row length, telescoping end modules are used.					*consult factory for fixture lengths < 4'

**Applications** Concealed coves, perimeter systems, retail, schools.

**Features** A low-profile staggered T5 strip light with a 6" overlapping system. It also includes an innovative telescoping end module for greater dimensional flexibility. Choice of either perforated or solid, asymmetric or symmetric reflectors. Dimming ballasts and emergency batteries are also available.

**Construction** The housing, available in 2-, 3-, 4-, 6- or 8-foot standard lengths, is made of die-formed, 20-gauge steel.

**Finish** The standard exterior body color is white enamel (BWE) or optional gloss white (YGW) using polyester powder paint. Refer to ordering matrix for optional metal finishes or refer to **Defining Section** for optional paint colors. Optional reflectors are painted gloss white (YGW) unless other finish specified.

**Electrical** T5/HO fixtures have programmed-start electronic ballasts with less than 10%THD. Fixtures are U.L. Damp labeled and I.B.E.W. manufactured. Maximum ballast size available 1 5/8" width x 1 1/4" height.

**Mounting** Fixture is to be surface-mounted.

**Options** **AL**: aluminum body; **EML**: emergency battery (T5/HO=600-700 lumens); **EMH**: emergency battery (T5/HO=1100-1400 lumens); **DM**: dimming (consult factory); **B\_**: specific ballast, specify manufacturer and catalog number (consult factory); **FH**: fixture fusing (slow blow).

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0815

Project: The Franklin Care Center  
 Jennifer Curley  
 April 5, 2006

Fixture Type  
**F10**

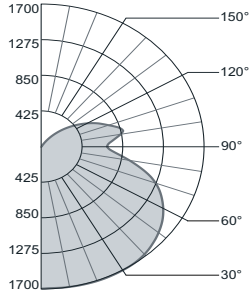
# Appendix A: Lighting Equipment

## P-T5-SS Strips & Industrials

### photometric data

#### P-T5-SS-STD-2T5HO-04-BWE

Report # LSI19352 D=81.7% I=18.3%  
Lamp Lumens: 4500 Input Watts: 122



#### Candlepower Summary

Vertical Angle	Horizontal Angle					Output Lumens
	0°	22.5°	45°	67.5°	90°	
0	1693	1693	1693	1693	1693	164
5	1688	1683	1703	1695	1691	164
15	1624	1635	1680	1693	1701	471
25	1502	1538	1625	1679	1703	743
35	1326	1397	1539	1648	1692	953
45	1105	1219	1431	1581	1637	1080
55	849	1018	1289	1470	1537	1110
65	566	812	1115	1304	1374	1038
75	282	599	874	1045	1103	840
85	53	281	524	695	757	536
90	0	193	441	617	682	
95	0	256	509	676	736	488
105	0	152	489	748	844	474
115	0	63	339	564	650	320
125	0	1	191	373	446	179
135	0	0	59	191	245	74
145	0	0	0	35	68	13
155	0	0	0	0	0	0
165	0	0	0	0	0	0
175	0	0	0	0	0	0
180	0	0	0	0	0	0

#### Zonal Lumen Summary

Zone	% Lamp	% Luminaire
0-90	77.06	81.74
90-180	17.22	18.26

Efficiency = 94.3%

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

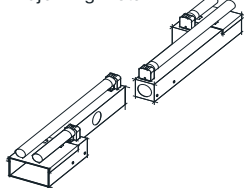
Angle	0°	45°	90°
45	26332	26142	27235
55	24932	26354	27893
65	22563	26817	28369
75	18383	26438	27370
85	10303	22386	24492

#### Coefficients of Utilization (%)

Floor Ceiling Wall	effective floor cavity reflectance = .20										
	80	70	70	50	50						
RCR 0	100	100	100	100	100	95	95	95			
1	97	92	87	83	92	88	83	79	80	77	74
2	87	78	71	65	83	75	69	63	69	64	59
3	79	68	60	54	75	65	58	52	60	54	49
4	72	60	51	45	68	58	50	43	53	46	41
5	65	52	44	37	62	50	42	36	46	39	34
6	60	47	38	32	57	45	37	31	41	34	29
7	55	42	33	27	52	40	32	26	37	30	25
8	51	37	29	23	48	36	28	23	33	26	22
9	47	34	25	20	44	32	25	19	30	23	18
10	43	30	23	18	41	29	22	17	27	21	16

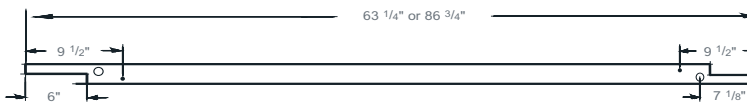
### installation

#### Adjoining Detail

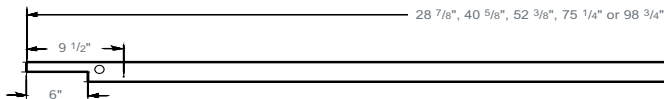


#### Mounting Locations

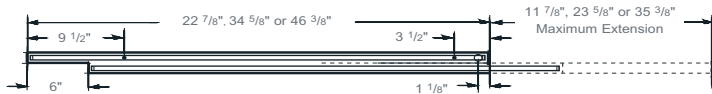
#### 1 Lamp Fixtures



#### 2 Lamp Fixtures



#### Telescoping Modules



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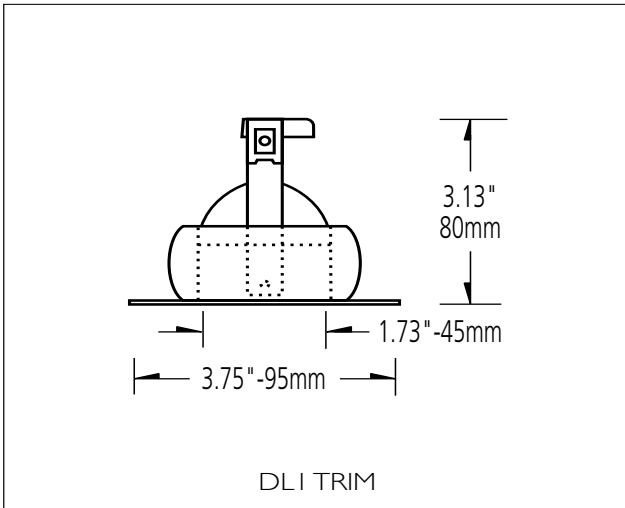
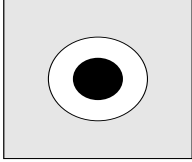
08 **15** Prudential Lighting 1737 E. 22nd St. Los Angeles, CA 90058 phone 213.746.0360 fax 213.741.8590 www.prulite.com

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Jennifer Curley  
April 5, 2006

Fixture Type  
**F10**

# Appendix A: Lighting Equipment

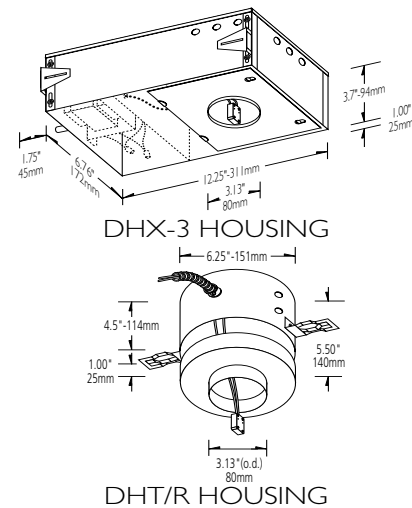
## DLI - Fixed Compact RECESSED DOWNLIGHT



## PRODUCT SPECIFICATION

Cat. No.    Finish

DLIW	Matte White
DLIB	Matte Black
DLIC	Polished Chrome
DLIG	Polished Brass



### GENERAL DESCRIPTION

Lucifer recessed downlight is a fixed low voltage fixture with **flush trim plate**. Round opening. Uses a quartz halogen lamp for superior color rendition and beam control. Clear glass lens is supplied with fixture.

### MOUNTING

Use with **DHX-3** housing with integral magnetic or electronic transformer for non-IC, accessible ceilings only. Use with **DHT/R** housing and remote transformer for non-IC, accessible ceilings only. DHT/R housing includes 5 foot conduit with leads and pre-wired mating connectors for quick trim connection. Hanging bars and brackets are included.

### MATERIAL

Trim is constructed of steel. Fixture housing is riveted aluminum.

### ACCESSORIES

Trim may be accessorized with Frosted Glass Lens (FGL-2), Linear Spread Lens (LSL-2), MR-11 Lamp Adapter (LA), Honeycomb Louvre (HCL-2), Spread Glass Lens (SGL-2) and Ultra Violet Glass Lens (UVL-2).

### LABEL

U.L. listed trim and housings for dry and damp, non-IC locations. Accessible ceilings only. File No. E115025.

### ELECTRICAL

Trim is pre-wired for use in housing assembly.

### TRANSFORMER

DHX-3 housing is supplied with an integral 120v or 277v primary, 12v secondary magnetic transformer or 120v primary, 12v secondary electronic transformer. DHT/R housing is powered by remote transformer sized to load (order separately). Standard 120v primary, 12v secondary. All transformers are fully dimmable.

### LAMP

12v MR-16 halogen lamp, 50w maximum (order separately). Specify lamp beam spread. Manufacturer recommends use of Osram Sylvania's energy saving 37w Tru-Aim® IR halogen lamps which convert more energy into light than conventional 50w MR-16 lamps. Tru-Aim® IR halogen lamps can be ordered from Lucifer Lighting for use in fixture. See luciferlighting.com for lamp specification logic.

### ENERGY CONSERVATION

Manufacturer recommends use of Osram Sylvania's energy saving 37w Tru-Aim® IR halogen lamps which convert more energy into light than conventional 50w MR-16 lamps. Tru-Aim® IR halogen lamps can be ordered from Lucifer Lighting for use in fixture. See luciferlighting.com for lamp specification guide.

### WARRANTY

Manufacturer's one year warranty of product is conditioned on use of manufacturer supplied transformers.

**LUCIFER**  
LIGHTING COMPANY  
414 Live Oak Street  
San Antonio, Texas 78202  
Phone 210 227-7329  
FAX 210 227-4967  
www.luciferlighting.com

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As part of its policy of continuous research and product development, the Company reserves the right to change or withdraw specifications without prior notice.

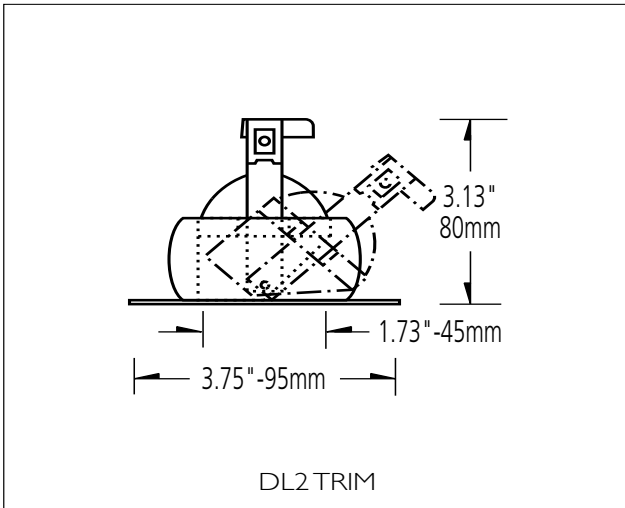
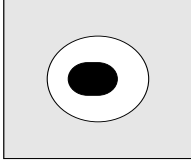
0925-1004

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
**F11**

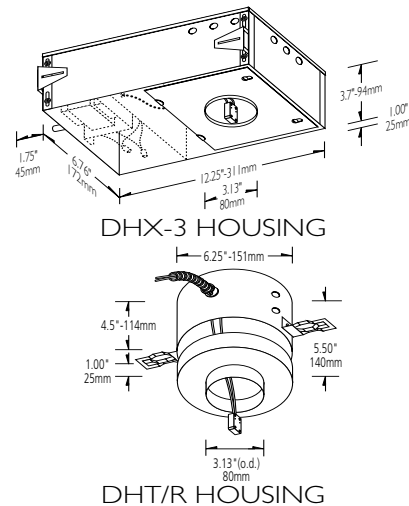
# Appendix A: Lighting Equipment

## DL2 - Adjustable Oval Compact RECESSED DOWNLIGHT



## PRODUCT SPECIFICATION

Cat. No.	Finish
DL2W	Matte White
DL2B	Matte Black
DL2C	Polished Chrome
DL2G	Polished Brass



### GENERAL DESCRIPTION

Lucifer recessed downlight is an adjustable low voltage fixture with **flush trim plate**. Oval opening offers 45° aiming from vertical and is lockable from below. Lamp holder features registered yoke to allow secure placement of up to three lenses/louvers and includes internal collar to prevent light leaks. Uses a halogen lamp for superior color rendition and beam control. Clear glass lens is supplied with fixture.

### MOUNTING

Use with **DHX-3** housing with integral magnetic or electronic transformer for non-IC, accessible ceilings only. Use with **DHT/R** housing and remote transformer for non-IC, accessible ceilings only. DHT/R housing includes 5 foot conduit with leads and pre-wired mating connectors for quick trim connection. Hanging bars and brackets are included.

### MATERIAL

Trim is constructed of steel. Fixture housing is riveted aluminum.

### ACCESSORIES

Trim may be accessorized with Frosted Glass Lens (FGL-2), Linear Spread Lens (LSL-2), MR-11 Lamp Adapter (LA), Honeycomb Louvre (HCL-2), Spread Glass Lens (SGL-2) and Ultra Violet Glass Lens (UVL-2).

### LABEL

U.L. listed trim and housings for dry and damp, non-IC locations. Accessible ceilings only. File No. E115025.

### ELECTRICAL

Trim is pre-wired for use in housing assembly.

### TRANSFORMER

DHX-3 housing is supplied with an integral 120v or 277v primary, 12v secondary magnetic transformer or 120v primary, 12v secondary electronic transformer. DHT/R housing is powered by remote transformer sized to load (order separately). Standard 120v primary, 12v secondary. All transformers are fully dimmable.

### LAMP

12v MR-16 halogen lamp, 50w maximum (order separately). Specify lamp beam spread.

### ENERGY CONSERVATION

Manufacturer recommends use of Osram Sylvania's energy saving 37w Tru-Aim® IR halogen lamps which convert more energy into light than conventional 50w MR-16 lamps. Tru-Aim® IR halogen lamps can be ordered from Lucifer Lighting for use in fixture. See [luciferlighting.com](http://luciferlighting.com) for lamp specification guide.

### WARRANTY

Manufacturer's one year warranty of product is conditioned on use of manufacturer supplied transformers.

**LUCIFER**  
LIGHTING COMPANY  
414 Live Oak Street  
San Antonio, Texas 78202  
Phone 210 227-7329  
FAX 210 227-4967  
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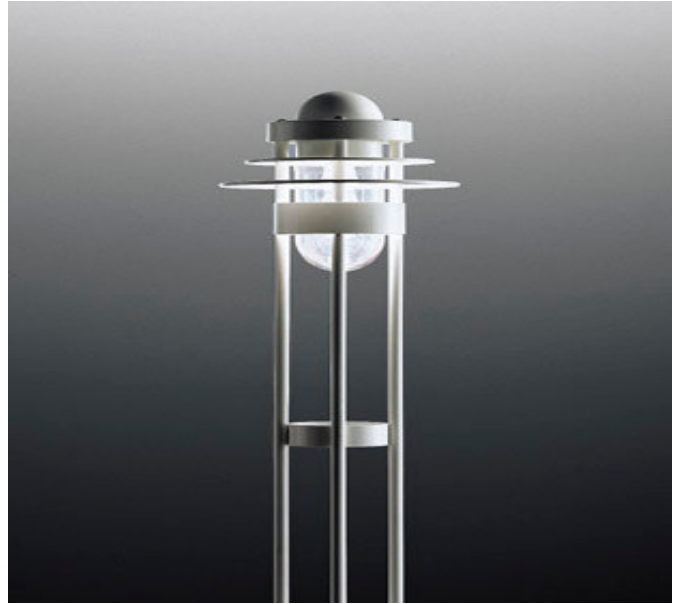
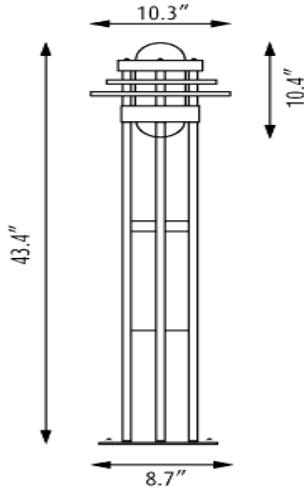
0927-1004

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
**F12**

# Saturn Bollard

Design: Jens Møller-Jensen



## Specification

- |   |   |
|---|---|
| 1 | Product code<br>SAB   |
| 2 | Light source<br>1/ 100W/ A-19/ CL medium<br>1/ 32W/ CF GX24q-3<br>1/ 50W/ HPS/ ED-17 medium<br>1/ 50W/ MH/ ED-17 medium |
| 3 | Voltage<br>120-277V<br>120/ 277V<br>120V  |
| 4 | Finish<br>GALV  |

Specification notes:  
a. CF variant is provided with white opal glass lamp enclosure. b. HID and incandescent variants are provided with clear glass lamp enclosures. c. CF variant is provided with one 120-277V electronic ballast.  
d. HID variants are provided with one 120/ 277V F-can style ballast. e. Incandescent variant is only available in 120V.

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

Saturn Bollard provides symmetrical downward illumination. The design of the reflector rings ensures the majority of the light is directed downward. An anti-glare ring and the reflector rings shield the light source from direct view.

### Finish

Galvanized, hot dipped. White or natural painted aluminum, powder coated.

### Material

Shades: Spun steel. Endosure: Clear glass or white opal painted glass. Anti-glare ring: Extruded steel. Post: Extruded steel. Base plate: Spun steel.

### Mounting

Base plate: Mounted to a concrete base with 4 anchor bolts. Base plate dimension: 8.7" dia.

### Weight

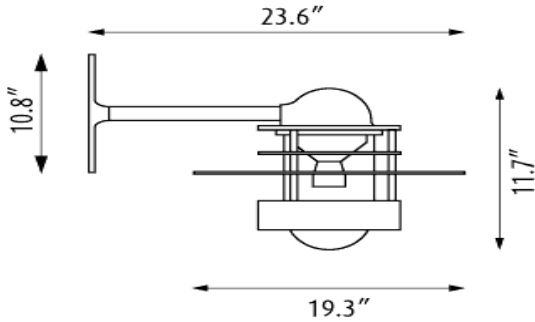
Max. 40 lbs.

### Label

cJL, Wet location. IBEW.

# Orbiter Maxi Wall

Design: Jens Møller-Jensen



## Specification

Orbiter Maxi Wall provides general illumination. The design of the two reflector rings ensures the majority of the light is being directed downwards. The anti-glare ring shields the lamp from direct view.

### Finish

White or natural painted aluminum, powder coated. Natural aluminum, shot-peened.

### Material

Enclosure: Injection molded clear polycarbonate, injection molded partly frosted polycarbonate or injection molded white opal polycarbonate. Saturn ring: Die cut aluminum. Anti-glare ring: Spun aluminum. Top: Die cast aluminum. Mounting plate: Die cast aluminum. Arm: Extruded aluminum.

### Mounting

Surface: Mounted directly to a recessed ballast box (10.7" dia. x 3.6"D) provided or mounted directly to finished surface over a recessed 4" octagonal junction box.

**Weight**  
Max. 24 lbs.

**Label**  
cUL, Wet location. IBEW.

- |   |   |
|---|---|
| 1 | Product code<br>ORW-MAX   |
| 2 | Light source<br>1/100W/HPS/ED-17 medium<br>1/100W/MH/ED-17 medium<br>1/150W/A-21/CL medium<br>1/26W/32W/42W/CF GX24q-3/4<br>1/70W/CMH/T-6 G12 |
| 3 | Voltage<br>120/ 208/ 240/ 277V<br>120-277V<br>120V<br>277V  |
| 4 | Finish<br>NAT. PAINT. ALU.<br>NAT. RAW ALU.<br>WHT  |

### Specification notes:

a. CMH variant is provided with a partly frosted enclosure. b. CF variant is provided with an opal enclosure. c. HID and incandescent variants are provided with clear enclosures. d. CMH variant is provided with a recessed ballast box containing one 120V or 277V electronic ballast. e. CF variant is provided with a universal wattage socket and 120-277V integral electronic ballast. f. HID variants are provided with a recessed ballast box containing one 120/ 208/ 240/ 277V open core and coil ballast. g. Incandescent variant is only available in 120V.

### Info notes:

I. Natural shot peened aluminum is untreated and is designed to change color over time depending on environmental conditions. II. All enclosures are U.V. stabilized polycarbonate. III. The comparable EU version has the following classification: Ingress Protection Code: IP44.

# Appendix A: Lighting Equipment

new in '05

## avenue® b



### FEATURES

Narrow 3" slot T5 fluorescent with opaque satin lens.

Shielding options include corrugated, solid regressed trim, concave louver as well as flush lens.

Universal mounting allows compatibility for multiple grid types.

Drywall installation is available, which allows for both individual or continuous row mount capability.

Avenue® B is a great solution for general illumination in a narrow aperture.

### shielding options



corrugated regress trim

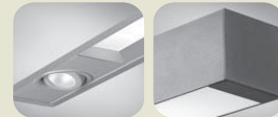
solid regress trim

concave louver



flush lens

### companion luminaire

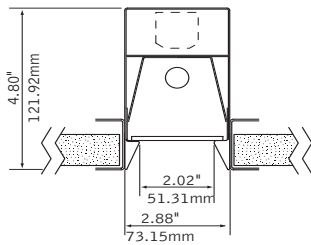


mr16

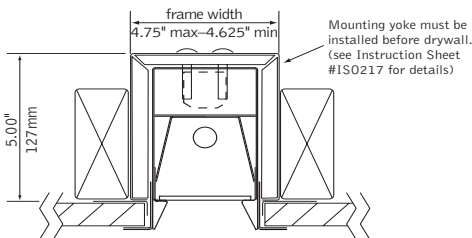
linear

### DIMENSIONAL DATA

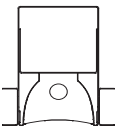
#### Grid Mount (Regress Trim Shown)



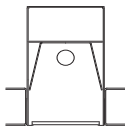
#### Drywall Flange (Regress Trim Shown)



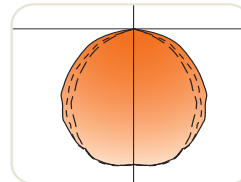
Louver



Flush Lens



### PERFORMANCE



1-Lamp T5  
60% Efficiency  
709 cd @ 5°

See **Photometric** section for additional performance data.

november 2005



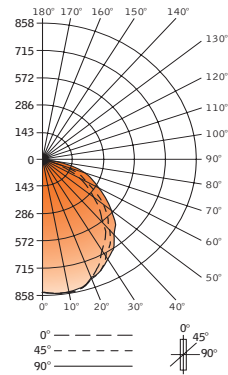
# Appendix A: Lighting Equipment

## regress with lens avenue® b



Filename: FAVBSR1T5.IES  
 Catalog #: FAVB-SR-1T5-1C-120-S-G1-WH-4'  
 Efficiency: 60%  
 Test #: 12373.0

### CANDLEPOWER DISTRIBUTION



Spacing 1.3  
 Criterion: 1.2

Vertical Angle	0°	22.5°	45°	67.5°	90°	Zonal Lumens
0°	703	703	703	703	703	703
5°	706	707	707	707	709	68
15°	705	705	703	702	702	199
25°	646	646	640	623	614	294
35°	573	572	541	511	503	340
45°	482	470	420	385	372	330
55°	365	340	285	250	238	264
65°	253	216	163	128	112	171
75°	136	97	43	39	37	70
85°	32	11	11	11	15	15
90°	0	0	0	0	0	0
95°	0	0	0	0	0	0
105°	0	0	0	0	0	0
115°	0	0	0	0	0	0
125°	0	0	0	0	0	0
135°	0	0	0	0	0	0
145°	0	0	0	0	0	0
155°	0	0	0	0	0	0
165°	0	0	0	0	0	0
175°	0	0	0	0	0	0
180°	0	0	0	0	0	0

### LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixt
0°-30°	561	19.3	32.0
0°-40°	900	31.0	51.4
0°-60°	1494	51.5	85.4
0°-90°	1750	60.3	100.0
<b>Total Luminaire</b>	<b>0°-180° 1750</b>	<b>60.3</b>	<b>100.0</b>

### LUMINANCE DATA (CD/M<sup>2</sup>)

Vertical Angle	0°	45°	90°
45°	8112	7068	6261
55°	7573	5913	4938
65°	7124	4590	3154
75°	6253	1977	1701
85°	4369	1502	1502

### CO-EFFICIENTS OF UTILIZATION

Floor Ceiling	80				70				20				50				30				10				00			
	70	50	30	10	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	50	10	50	10				
RCR 0	72	72	72	72	70	70	70	70	67	67	64	64	64	64	64	64	64	64	64	64	64	64	64	64				
1	67	64	62	60	65	63	59	61	57	58	56	56	54	53	56	54	54	53	53	53	53	53	53	53				
2	62	57	54	51	60	56	50	54	49	52	48	48	46	46	46	46	46	46	46	46	46	46	46	46				
3	57	51	47	44	56	51	43	49	43	47	42	42	42	42	42	42	42	42	42	42	42	42	42	42				
4	53	46	41	38	51	45	37	44	37	42	36	41	36	35	35	35	35	35	35	35	35	35	35	35				
5	48	41	36	32	47	40	32	39	32	38	32	37	31	30	30	30	30	30	30	30	30	30	30	30				
6	44	37	32	28	43	36	28	35	28	34	28	33	28	26	26	26	26	26	26	26	26	26	26	26				
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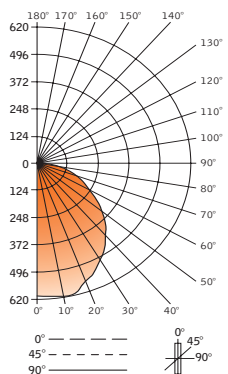
Numbers indicate percentage values of reflectivity.

## flush lens avenue® b



Filename: FAVBFL1T5.IES  
 Catalog #: FAVB-FL-1T5-1C-120-S-G1-WH-4'  
 Efficiency: 59%  
 Test #: 12397.0

### CANDLEPOWER DISTRIBUTION



Spacing 1.3  
 Criterion: 1.3

Vertical Angle	0°	22.5°	45°	67.5°	90°	Zonal Lumens
0°	610	610	610	610	610	610
5°	613	613	613	613	611	59
15°	616	616	616	615	615	175
25°	559	558	556	553	553	257
35°	490	489	487	484	483	306
45°	405	403	402	399	399	311
55°	304	302	299	299	298	269
65°	206	204	201	200	198	200
75°	110	108	108	107	108	114
85°	29	29	25	22	21	28
90°	0	0	0	0	0	0
95°	0	0	0	0	0	0
105°	0	0	0	0	0	0
115°	0	0	0	0	0	0
125°	0	0	0	0	0	0
135°	0	0	0	0	0	0
145°	0	0	0	0	0	0
155°	0	0	0	0	0	0
165°	0	0	0	0	0	0
175°	0	0	0	0	0	0
180°	0	0	0	0	0	0

### LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixt
0°-30°	490	16.9	28.5
0°-40°	796	27.4	46.3
0°-60°	1376	47.5	80.1
0°-90°	1718	59.3	100.0
<b>Total Luminaire</b>	<b>0°-180° 1718</b>	<b>59.3</b>	<b>100.0</b>

### LUMINANCE DATA (CD/M<sup>2</sup>)

Vertical Angle	0°	45°	90°
45°	7474	7418	7363
55°	6916	6802	6779
65°	6360	6206	6113
75°	5546	5445	5445
85°	4342	3743	3144

### CO-EFFICIENTS OF UTILIZATION

Floor Ceiling	80				70				20				50				30				10				00			
	70	50	30	10	70	50	30	10	50	10	50	10	50	10	50	10	50	10	50	10	50	10	50	10				
RCR 0	71	71	71	71	69	69	69	66	66	63	63	60	60	59	59	59	59	59	59	59	59	59	59	59				
1	65	62	60	58	63	61	57	59	55	56	54	54	52	51	54	52	52	51	51	51	51	51	51	51				
2	60	55	51	48	58	54	48	52	46	50	45	48	44	43	46	44	44	44	43	43	43	43	43	43				
3	55	49	44	41	53	48	40	46	40	45	39	43	38	37	40	38	38	37	37	37	37	37	37	37				
4	50	44	39	35	49	43	35	41	34	40	34	39	33	32	36	34	34	33	33	33	33	33	33	33				
5	46	39	33	30	45	38	29	37	29	35	29	34	28	27	32	29	29	28	28	28	28	28	28	28				
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10	31	23	18	15	30	22	15	22	15	21	15	21	15	14	20	15	15	14	14	14	14	14	14	14				

Numbers indicate percentage values of reflectivity.

Go to [www.focalpointlights.com](http://www.focalpointlights.com) for additional photometric data.

Project: The Franklin Care Center  
 Jennifer Curley  
 April 5, 2006

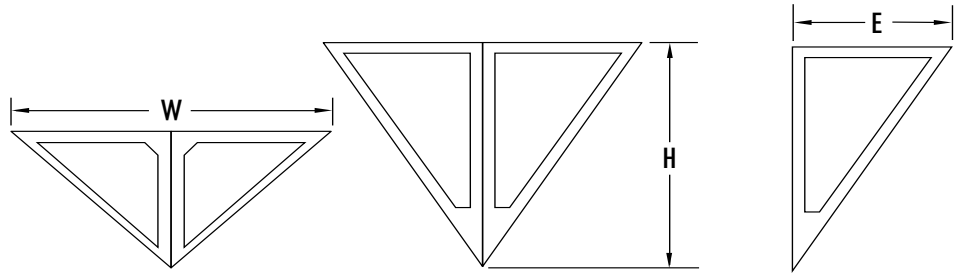
# Fixture Type F15

# Appendix A: Lighting Equipment



## DS-44

A triangular metal frame and acrylic panels provide an even glow from incandescent or fluorescent sources.



Fixture No.	W	H	E	Material	Lamping	Acrylic
DS-44-12	12 <sup>3</sup> / <sub>4</sub> "	10 <sup>1</sup> / <sub>2</sub> "	6 <sup>3</sup> / <sub>8</sub> "	A, B or C	IN(1-100W)	PLC(1-13W) W, X, V
DS-44-14	14"	11 <sup>1</sup> / <sub>2</sub> "	7"	A, B or C	IN(1-200W)	PLC(1-13W) W, X, V

### Sample Specification

DS - 44 - 12 B - PLC - W - 120  
 Fixture Number      Material      Lamping      Acrylic      Voltage

### SPECIFICATIONS

#### Material/Finishes

- A Convection oven baked painted finish on aluminum and steel material.
- B Polished solid brass
- C Polished chrome plated over solid brass

#### Acrylic

- W Virgin white acrylic
  - X Faux alabaster acrylic
  - V White swirl acrylic
- All acrylics have .125" minimum starting thickness.

#### Ballasts and Housings

- Fluorescent fixtures
- Supplied with magnetic integral high power factor (HPF) ballasts that are "A" sound rated and "P" type thermally protected. Low THD. All fluorescent ballasts are contained in the fixture.
- Lamps not included.

#### Mounting

Designed for permanent mounting to recessed four-inch octagon outlet box.

#### Warranty

Manning Lighting guarantees its products against defects in materials and workmanship for three years from the date of shipment. See catalog for details.

#### UL

Underwriters Laboratories listed. All fixtures are wired complete and short tested before packing.

IBEW union made in the USA

#### Lamp information:

13W dbl. twin tube 2-pin base

Manning Lighting, P.O. Box 1063, 1810 North Ave., Sheboygan, WI 53082 USA Phone: (920) 458-2184 Fax (920) 458-2491 Email: Info@ManningLtg.com

Project: The Franklin Care Center  
 Jennifer Curley  
 April 5, 2006

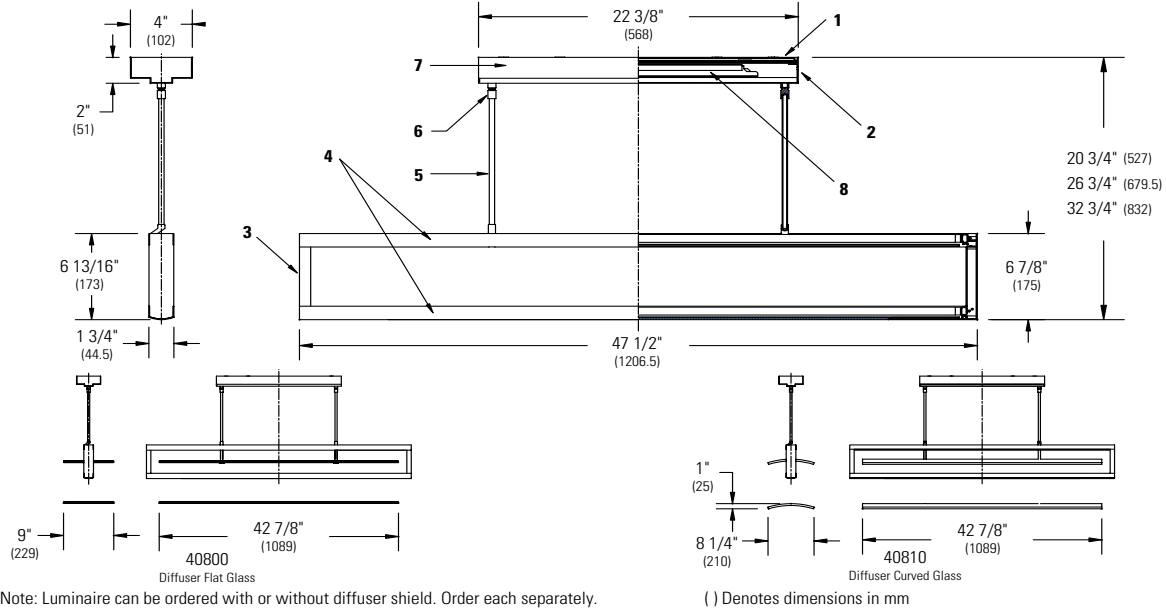
Fixture Type  
**F16**



## Architectural Decorative Soli Zontio **48228ALU**

Page 1 of 3

2 Light, T-5 Pendant



### Fixture Ordering Information

Catalog No.	Finish	Wattage	Voltage	Lamping
48228ALU	Metallic Aluminum Powder Coated	2 x 28W	120/277V	T-5, Mini-Bipin
48254ALU	Metallic Aluminum Powder Coated	2 x 54W	120/277V	T-5 HO, Mini-Bipin High Output

### Diffuser Ordering Information (Order diffuser separately)

Catalog No.	Description	Dimensions	Finish
40800	Flat Glass Diffuser (3/8" Thick)	9" W x 42 7/8" L	White ceramic coated top, etched bottom. Clear polished edges.
40810	Curved Glass Diffuser (3/8" Thick)	8 1/4" W x 42 7/8" L	Etched top and bottom. Clear polished edges.

### Features

- Mounting Plate:** 18 GA. (.048) Galvanized steel for direct mounting to most junction boxes. Secondary mounting holes provided to mount directly to ceiling.
- End Cap:** (2) Die cast aluminum. See above for finish.
- End Cover:** (2) Die cast aluminum. See above for finish.
- Lamp Enclosure:** (2) Extruded aluminum. See above for finish.
- Support Stem:** (2) 3/8" diameter steel tubing. Luminaire provided with three lengths (10", 16" and 22"). See above for overall heights. Stems can not be added together.
- Swivel:** (2) Meets California Earthquake codes.
- Housing:** Extruded aluminum. See above for finish.
- Ballast:** See below for details.

### Lamping (by others)

Linear Fluorescent: 28W T5 or 54W T5 HO, Mini Bipin

### Electrical

Lampholders: G5 (Mini-Bipin) base with rotor for securing lamp. cULus Listed.  
Ballast: Electronic, HPF, Universal voltage 120V-277V.

	28 Watt		54 Watt	
	120V	277V	120V	277V
Total Input Watts	64	63	120	117
Max. Line Current (Amps)	0.55	0.23	1.0	0.43
Ballast Factor	1.03	1.03	1.0	1.0

Min. Starting Temp: 0°F/-18°C  
THD<10%

### Options

- Dimming:** (Voltage Specific/54W HO lamps)  
Add MX1 suffix code (for 120V) to Cat. No.  
Add MX2 suffix code (for 277V) to Cat. No.  
example: 48254ALMX1
- Emergency:** Integral Bodine LP550 emergency battery pack, test switch and light, add E suffix code to Cat. No.
- DALI:** Digital Dimming System ballast 120/277V. Add DA suffix code to Cat. No.

### Labels

cULus Listed. Suitable for Damp Locations

Job Information	Type:
<b>Job Name:</b>	
<b>Cat. No.:</b>	
<b>Lamp(s):</b>	
<b>Notes:</b>	

Lightolier a Genlyte company  
631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710  
We reserve the right to change details of design, materials and finish.  
© 2004 Genlyte Group LLC • A0904

**LIGHTOLIER®**

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

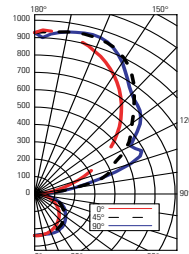
Fixture Type  
**F17**

# Appendix A: Lighting Equipment



## Architectural Decorative Soli Zontio **48228ALU**

### Flat Glass Diffuser Cat. No. 40800/48254ALU 2-54W T-5 Lamps, 4400 Lumens



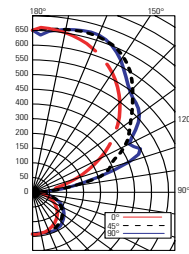
Report No. 2670FR  
SC (Along) = 1.3  
SC (Across) = 1.5

Candlepower Summary				Zonal Lumens and Percentages			
Angle	Along	Across	Output Lumens	Zone	Lumens	% Lamp	% Luminaire
0	239	239	239	0-30	197	2.25	4.80
5	241	240	239	0-40	335	3.82	8.16
15	235	235	238	0-60	643	7.32	15.63
25	220	224	233	0-90	925	10.52	22.48
35	199	208	224	40-90	589	6.70	14.32
45	173	186	204	60-90	282	3.21	6.85
55	141	160	177	90-180	3192	36.27	77.52
65	106	129	144	0-180	4117	46.79	100.00
75	66	91	101	** Efficiency = 46.8% **			
85	27	40	41				
90	14	25	29				
95	37	90	89				
105	155	249	347				
115	305	387	448				
125	461	547	583				
135	607	697	700				
145	735	805	843				
155	837	879	933				
165	906	914	953				
175	941	928	936				
180	929	929	929				

Coefficients of Utilization															
Zonal Cavity Method															
Effective Floor Cavity Reflectance = .20															
Ceiling	80			70			50			30			10		
Wall	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10
RCR															
0	.47	.47	.47	.42	.42	.42	.32	.32	.32	.23	.23	.23	.14	.14	.14
1	.41	.39	.37	.36	.35	.33	.28	.27	.26	.20	.19	.19	.12	.12	.12
2	.35	.33	.30	.31	.29	.27	.24	.22	.21	.17	.16	.15	.11	.10	.10
3	.31	.28	.25	.28	.25	.23	.21	.19	.18	.15	.14	.13	.10	.09	.08
4	.27	.24	.21	.24	.21	.19	.19	.16	.15	.13	.12	.11	.08	.08	.07
5	.24	.20	.18	.21	.18	.16	.16	.14	.12	.12	.10	.09	.07	.07	.06
6	.21	.18	.15	.19	.16	.14	.15	.12	.11	.11	.09	.08	.07	.06	.05
7	.19	.16	.13	.17	.14	.12	.13	.11	.09	.09	.08	.07	.06	.05	.04
8	.17	.14	.11	.15	.12	.10	.12	.10	.08	.09	.07	.06	.05	.04	.03
9	.15	.12	.10	.14	.11	.09	.11	.08	.07	.08	.06	.05	.05	.04	.03
10	.14	.11	.09	.13	.10	.08	.10	.08	.06	.07	.05	.04	.04	.03	.02

Determined In Accordance With Current IES Published Procedures  
Luminaire Input Watts = 120.0

### Flat Glass Diffuser Cat. No. 40800/48228ALU 2-28W T-5 Lamps, 2610 Lumens



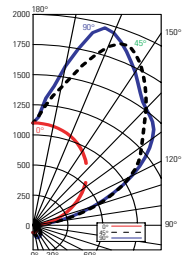
Report No. 2676FR  
SC (Along) = 1.3  
SC (Across) = 1.5

Candlepower Summary				Zonal Lumens and Percentages			
Angle	Along	Across	Output Lumens	Zone	Lumens	% Lamp	% Luminaire
0	142	142	142	0-30	117	2.25	4.80
5	144	143	142	0-40	199	3.83	8.17
15	140	140	141	0-60	383	7.34	15.66
25	131	134	139	0-90	552	10.58	22.55
35	118	124	133	40-90	352	6.75	14.38
45	103	111	122	60-90	168	3.23	6.89
55	65	63	77	90-180	1896	36.33	77.45
65	40	55	60	0-180	2448	46.91	100.00
75	16	24	25	** Efficiency = 46.9% **			
85	9	16	18				
90	5	11	13				
95	22	54	53				
105	92	148	207				
115	181	230	266				
125	274	325	346				
135	361	414	416				
145	436	478	501				
155	497	522	554				
165	538	543	566				
175	559	551	556				
180	551	551	551				

Coefficients of Utilization															
Zonal Cavity Method															
Effective Floor Cavity Reflectance = .20															
Ceiling	80			70			50			30			10		
Wall	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10
RCR															
0	.47	.47	.47	.42	.42	.42	.32	.32	.32	.23	.23	.23	.14	.14	.14
1	.41	.39	.37	.36	.35	.33	.28	.27	.26	.20	.19	.19	.13	.12	.12
2	.35	.33	.30	.31	.29	.27	.24	.22	.21	.17	.16	.15	.11	.10	.10
3	.31	.28	.25	.28	.25	.23	.21	.19	.18	.15	.14	.13	.10	.09	.08
4	.27	.24	.21	.24	.21	.19	.19	.17	.15	.13	.12	.11	.08	.08	.07
5	.24	.20	.18	.22	.18	.16	.16	.14	.13	.12	.10	.09	.07	.07	.06
6	.21	.18	.15	.19	.16	.14	.15	.12	.11	.11	.09	.08	.07	.06	.05
7	.19	.16	.13	.17	.14	.12	.13	.11	.09	.09	.08	.07	.06	.05	.04
8	.17	.14	.11	.15	.12	.10	.12	.10	.08	.09	.07	.06	.05	.04	.03
9	.16	.12	.10	.14	.11	.09	.11	.08	.07	.08	.06	.05	.05	.04	.03
10	.14	.11	.09	.13	.10	.08	.10	.08	.06	.07	.06	.04	.04	.03	.02

Determined In Accordance With Current IES Published Procedures  
Luminaire Input Watts = 65

### Cat. No. 48254ALU 2-54W T-5 Lamps, 4400 Lumens



Report No. 2671FR  
SC (Along) = 1.2  
SC (Across) = 1.9

Candlepower Summary				Zonal Lumens and Percentages			
Angle	Along	Across	Output Lumens	Zone	Lumens	% Lamp	% Luminaire
0	60	60	60	0-30	72	.83	1.52
5	61	63	64	0-40	125	1.43	2.62
15	58	69	92	0-60	225	2.56	4.70
25	53	80	103	0-90	294	3.35	6.14
35	46	84	94	40-90	168	1.92	3.52
45	38	73	75	60-90	69	.79	1.44
55	30	58	56	90-180	4498	51.12	93.86
65	25	41	36	0-180	4792	54.46	100.00
75	17	25	20	** Efficiency = 54.5% **			
85	8	11	9				
90	9	16	16				
95	39	74	58				
105	147	335	322				
115	275	580	651				
125	409	866	927				
135	541	1179	1124				
145	658	1324	1405				
155	751	1212	1641				
165	814	1052	1375				
175	845	879	992				
180	849	849	849				

Coefficients of Utilization															
Zonal Cavity Method															
Effective Floor Cavity Reflectance = .20															
Ceiling	80			70			50			30			10		
Wall	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10
RCR															
0	.53	.53	.53	.45	.45	.45	.32	.32	.32	.20	.20	.20	.09	.09	.09
1	.46	.44	.42	.40	.38	.36	.28	.27	.26	.17	.17	.16	.08	.07	.07
2	.40	.37	.34	.34	.32	.30	.24	.23	.21	.15	.14	.14	.07	.06	.06
3	.35	.31	.28	.30	.27	.25	.22	.20	.18	.13	.12	.12	.06	.05	.05
4	.31	.27	.24	.27	.23	.21	.19	.17	.15	.12	.11	.10	.05	.04	.04
5	.27	.23	.20	.24	.20	.18	.17	.15	.13	.11	.09	.08	.05	.04	.04
6	.24	.20	.17	.21	.18	.15	.15	.13	.11	.09	.08	.07	.04	.04	.03
7	.22	.18	.15	.19	.15	.13	.13	.11	.09	.07	.06	.06	.04	.03	.03
8	.19	.16	.13	.17	.14	.11	.12	.10	.08	.06	.05	.05	.03	.02	.02
9	.18	.14	.11	.15	.12	.10	.11	.09	.07	.06	.05	.05	.03	.02	.02
10	.16	.12	.10	.14	.11	.09	.10	.08	.06	.05	.04	.04	.03	.02	.02

Determined In Accordance With Current IES Published Procedures  
Luminaire Input Watts = 120.0

**LIGHTOLIER®**

**Job Information** **Type:**

Lightolier a Genlyte company [www.lightolier.com](http://www.lightolier.com)  
631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710  
We reserve the right to change details of design, materials and finish.  
© 2004 Genlyte Group LLC • A0904

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

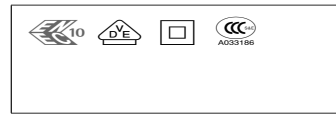
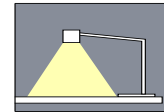
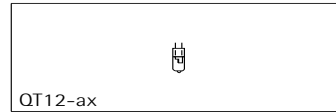
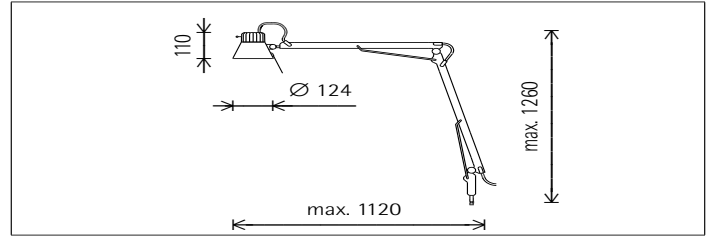
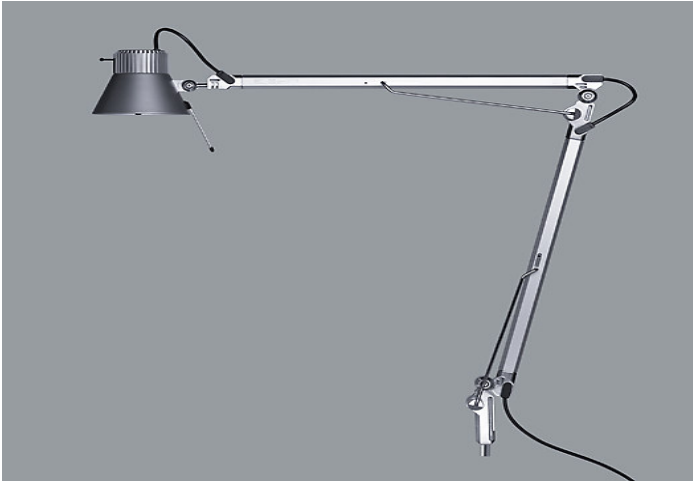
Fixture Type  
**F17**

# Appendix A: Lighting Equipment

**ERCO**

## Lucy Task light

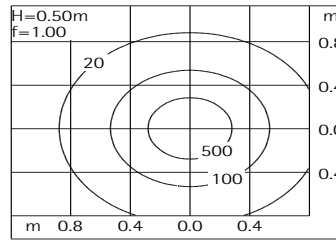
for low-voltage halogen lamps



**33170.000** Silver  
QT12-ax 50W 12V GY6.35 950lm

**Product description**

Light head: aluminium, anodised.  
Switch. Cast aluminium lampholder carrier, designed as heat sink.  
Articulated arm: aluminium profile, anodised. Stabilising of forces by means of visible steel connecting struts with internal springs.  
Hinges: cast aluminium. Plastics elements for optimum conductor routing visible within range of joints, however otherwise concealed.  
Mounting stud with mounting and safety ring for mounting to base, to be ordered separately.  
Cable with 3-pin plug and transformer, L 2,500mm.  
Reflector: aluminium, silver anodised, mirror-finish. Frosted spread lens.  
Weight 1.90kg

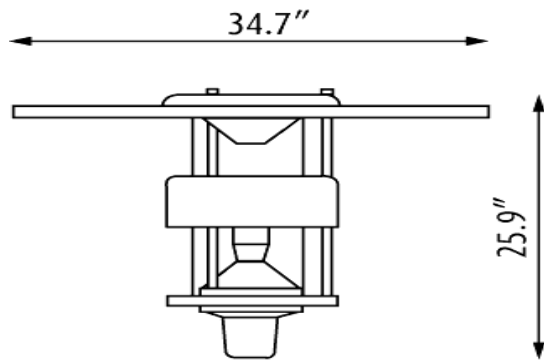


ERCO Leuchten GmbH  
Postfach 24 60  
58505 Lüdenscheid  
Germany  
Tel.: +49 2351 551-0  
Fax.: +49 2351 551-300  
info@erco.com

Technical Region: 230V/50Hz  
Edition: December 16, 2005  
Please download the current version from  
[www.erco.com/33170.000](http://www.erco.com/33170.000)

## Satellit Maxi

Design: Jens Møller-Jensen



Satellit Maxi provides glare free and symmetrical illumination. The design of the top shade ensures the majority of the light is directed downward. The anti-glare ring shields the lamp from direct view.

**Finish**  
White, grey or graphite grey, powder coated.

**Material**  
Top shade: High pressure molded fiber glass.  
Enclosure: Injection molded clear polycarbonate.  
Anti-glare ring: Injection molded polycarbonate.  
Base: Die cast aluminum.

**Mounting**  
Post Top: Mounted on dual round aluminum (DRA) or round straight aluminum (RSA) pole.

**Weight**  
Max. 32 lbs.

**Label**  
dJL, Wet location. IBEW.

## Specification

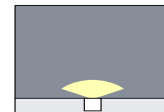
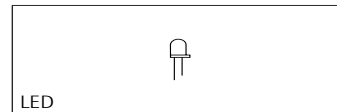
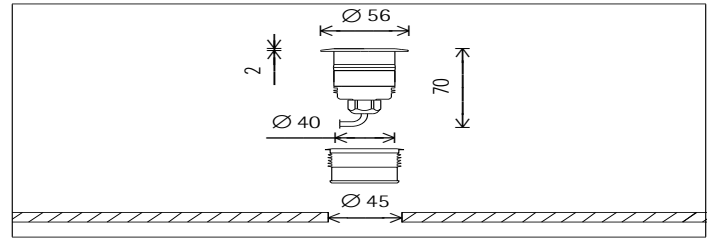
- |   |  |   |
|---|--|---|
| 1 | Product code<br>SATT-MAX   | Specification notes:<br>a. CF variant is provided with a universal wattage socket and a 120-277V integral electronic ballast.<br>b. HID variants are provided with one 120/ 277V F-can style ballast to be mounted in RSA-4.5" or DRA- 5" -3" poles.<br>c. Grey top shade is provided with grey and graphite grey finishes. d. Opaque anti-glare rings for grey variants are painted to match grey finishes. e. White top shade is provided with white finish. f. White opal anti-glare ring is provided with white finish. |
| 2 | Light source<br>1/ 150W/ HPS/ ED-23 ½ mogul<br>1/ 175W/ MH/ ED-28 mogul<br>1/ 250W/ MH/ ED-28 mogul<br>1/ 26W/ 32W/ 42W/ CF GX24q-3/ 4 |   |
| 3 | Voltage<br>120-277V<br>120/ 277V   | Info notes:<br>I. Enclosure is U.V. stabilized polycarbonate. II. For pole selection, refer to Pole Guide.<br>III. The comparable EU version has the following classification: Ingress Protection Code: IP44.   |
| 4 | Finish<br>GRAPHITE<br>GREY<br>WHT  |   |
| 5 | Transition to pole<br>T-DRA-5"-3"<br>T-RSA-4.5"  |   |

# Appendix A: Lighting Equipment

## ERCO

## LED orientation luminaire

with dynamic colour change



**33782.000** Silver LED Blue/Green  
LED 0.9W 30V DC

### Product description

Housing with gasket: stainless steel.  
Installation bush with ribs: plastic.  
Cable 4x0.75mm<sup>2</sup>, L 500mm.  
Clear prismatic diffuser with circular light aperture.  
Cover ring: corrosion resistant stainless steel, with 6mm safety glass. Load 5kN.  
Control gear to be ordered separately.  
Protection mode IP68 3m: protection against dust ingress, and continuous immersion up to 3m deep.  
Weight 0.16kg

ERCO Leuchten GmbH  
Postfach 24 60  
58505 Lüdenscheid  
Germany  
Tel.: +49 2351 551-0  
Fax.: +49 2351 551-300  
info@erco.com

Technical Region: 230V/50Hz  
Edition: December 16, 2005  
Please download the current version from  
[www.erco.com/33782.000](http://www.erco.com/33782.000)

1/3

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

Fixture Type  
**F20**

# Appendix A: Lighting Equipment

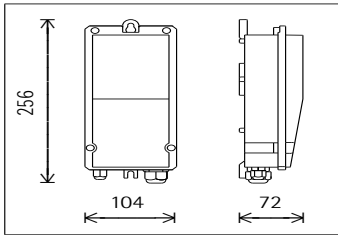
**ERCO**

## LED orientation luminaire

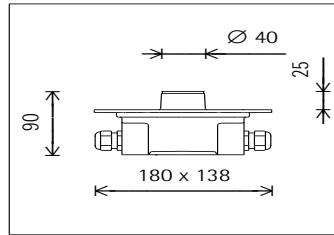
### Accessories



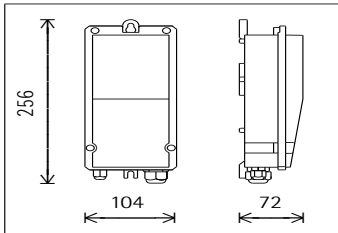
**33858.000**  
Control gear  
For max. 10 orientation luminaires.  
Input voltage 100V-240V AC,  
120V-250V DC.  
Output voltage 30V DC.  
Adjustable functions: switching  
and dimming. Gradual flashing and  
flashing at three speeds.  
Protection mode IP65: dust-proof  
and water-jet proof.  
Weight 0.60kg  
☞ ☞ ☞ ☞ ☞ SELV  
IP65



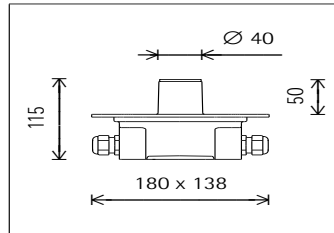
**33893.000**  
Recessed housing IP67  
For installation in concrete floors  
or compressed natural ground with  
25mm floor covering.  
Cast aluminium, black double-  
powder-coated.  
2 cable entries with IP67 threads.  
Through-wiring possible. 4-pole  
terminal block. Cable, L 300mm.  
Protection mode IP67: dust-proof  
and protected against immersion  
damage.  
Weight 0.70kg



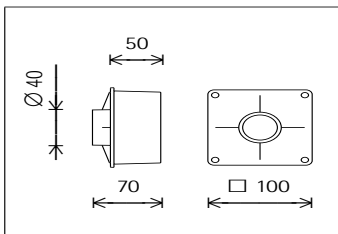
**33859.000**  
Control gear  
For max. 10 orientation luminaires.  
Input voltage 100V-240V AC,  
120V-250V DC.  
Output voltage 30V DC.  
Additional 24V DC input.  
Adjustable functions: switching  
and dimming. Gradual flashing and  
flashing at three speeds.  
Protection mode IP65: dust-proof  
and water-jet proof.  
Weight 0.60kg  
☞ ☞ ☞ ☞ ☞ SELV  
IP65



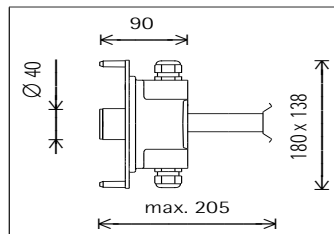
**33894.000**  
Recessed housing IP67  
For installation in concrete floors  
or compressed natural ground with  
50mm floor covering.  
Cast aluminium, black double-  
powder-coated.  
2 cable entries with IP67 threads.  
Through-wiring possible. 4-pole  
terminal block. Cable, L 300mm.  
Protection mode IP67: dust-proof  
and protected against immersion  
damage.  
Weight 0.70kg



**33873.000**  
Recessed housing  
For mounting in plaster.



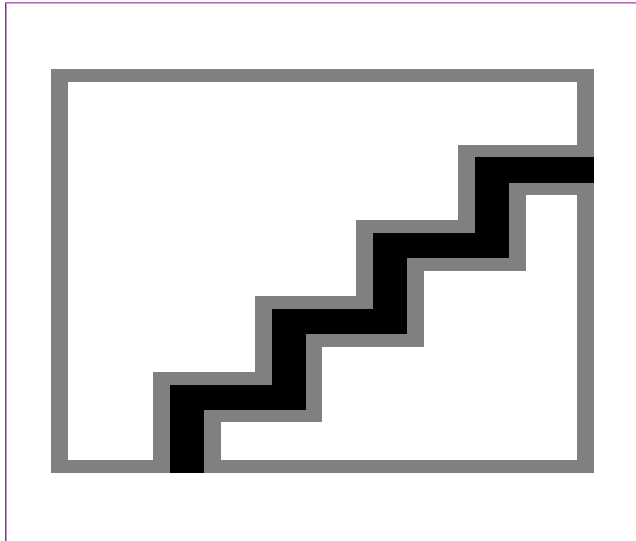
**33896.000**  
Recessed housing IP67  
For installation in concrete wall.  
Cast aluminium, black double-  
powder-coated.  
2 cable entries with IP67 threads.  
Through-wiring possible. 4-pole  
terminal block. Cable, L 300mm.  
Protection mode IP67: dust-proof  
and protected against immersion  
damage.  
Weight 0.75kg



LED orientation luminaire  
33782.000

2/3





## MasterColor CDM 150W/830 Med ED17 CL ALTO

Product family description  
Range of high-efficiency long life ceramic metal halide lamps with a stable color over life time and a crisp, sparkling light.

### Features/Benefits

- Excellent color rendering.
- Superior color stability over life within  $\pm 200K$ .
- Lamp to lamp color consistency over life.
- Higher lumen maintenance than standard metal halide.
- Warm (3K) or fresh white (4K) color impression.
- High lamp efficacy (up to 93 lumens per watt) for energy saving and low heat.
- Universal operating position.
- No shut off required in 24-hour-a-day/7-day-a-week operations (relamp fixtures at or before the end of rated life).
- Retrofit in existing ED-17 sockets.
- Long lamp life compared to quartz metal halide lamps.

### Applications

- Ideal for general lighting, downlighting and flood lighting.

### Notes

- Requires a ballast specified or approved for Philips Metal Halide lamp or one designed to the indicated ANSI Standard. A pulse ignitor is required. Sockets and wiring must withstand starting pulse. (391)

- Supply volts must be  $\pm 5\%$  of rated ballast line volts for reactor type and  $\pm 10\%$  for CWA or electronic ballasts. (392)
- This product utilizes ALTO® Lamp Technology. ALTO products pass the US EPA's Toxicity Characteristic Leaching Procedure (TCLP) for non-hazardous waste status. (399)
- MasterColor® Metal Halide Lamps are not recommended for use on dimmers and are not warranted if used on dimmer systems. (401)
- Rated average life is the life obtained, on the average, from large representative groups of lamps in laboratory tests under controlled conditions at 10 or more operating hours per start. It is based on survival of at least 50% of the lamps and allows for individual lamps or groups of lamps to vary considerably from the average. For lamps with a rated average life of 24,000 hours, life is based on survival of 67% of the lamps. (351)
- Approximate lumen values listed are for vertical operation of the lamp. (352)
- Means Lumens is the approximate lumen output at 40% of lamp rated average life. (353)
- Heat resisting glass bulb.

### Product data

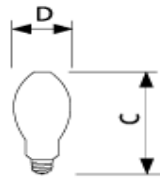
Product Number	130229
Full product name	MasterColor CDM 150W/830 Med ED17 CL ALTO
Ordering Code	MHC150/U/M/3K ALTO
Pack type	1 Sleeve Open End
Pieces per pack	1
Packs per case	12
Pack UPC	046677130220
EAN2US	
Case Bar Code	50046677130225

# PHILIPS

# Appendix A: Lighting Equipment

31/3

Product data	
Successor Product number	
Wattage[W ]	1 50W
Color Code	830 [CCT of 3000K]
Base	Med [Medium]
Bulb	ED17 [Diameter: 2.125 inch]
Bulb Finish	CL [Clear]
Feature	ALTO [ALTO®]
Base Information	Brass[Brass Base]
Bulb Material	Hard Glass
Operating Position	Universal[Any or Universal (U)]
Packing Type	1SL[1 Sleeve Open End]
Packing Configuration	12
Rated Avg. Life[hr ]	16000
ANSI Code HID	M142/M102/E
Lamp Voltage[V ]	95
Mercury (Hg) Content[mg ]	15
Color Rendering Index[Ra8 ]	85
Color Designation	White
Color Temperature[K ]	3000
Initial Lumens[Lm ]	14000
Design Mean Lumens[Lm ]	10500
Light Center Length L[in ]	3.348
Max Overall Length (MOL) – C[in ]	5.438
Diameter D[in ]	2.125


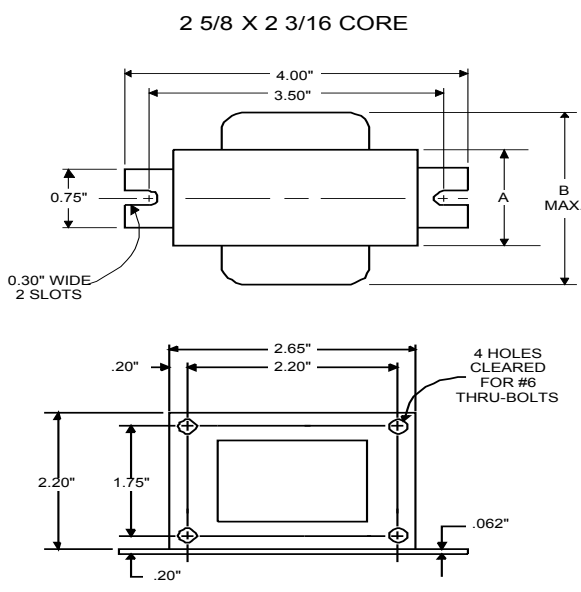

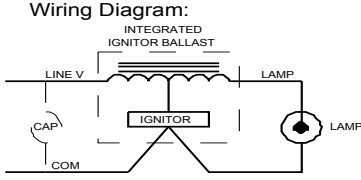


Data not (yet) available

CDM ED17



# Appendix A: Lighting Equipment

	<b>Metal Halide Lamp Ballast</b>	<b>Catalog Number 71A5437BP</b> <b>For 150W M102</b> <b>60 Hz R-HPF</b> <b>Status: Active</b>																																																																																																																																																																																																																								
<b>DIMENSIONS AND DATA</b>																																																																																																																																																																																																																										
<p style="text-align: center;">2 5/8 X 2 3/16 CORE</p> 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>INPUT VOLTS</td> <td style="text-align: right;">277</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CIRCUIT TYPE</td> <td style="text-align: right;">R-HPF</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>POWER FACTOR (min)</td> <td style="text-align: right;">90%</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>REGULATION</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Line Volts</td> <td style="text-align: right;">±5%</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Lamp Watts</td> <td style="text-align: right;">±10%</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>LINE CURRENT (Amps)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Operating.....</td> <td style="text-align: right;">0.63</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Open Circuit.....</td> <td style="text-align: right;">1.50</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Starting.....</td> <td style="text-align: right;">0.70</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>UL TEMPERATURE RATINGS</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Insulation Class</td> <td style="text-align: right;">H(180°C)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Coil Temperature Code</td> <td style="text-align: right;">1029</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>MIN. AMBIENT STARTING TEMP.</td> <td style="text-align: right;">-20°F or -30°C</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>NOM. 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## ADVANCE TRANSFORMER CO.

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

05/15/03

Project: The Franklin Care Center  
 Jennifer Curley  
 April 5, 2006

# Lamps and Ballasts

# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.do>

[Return to: DULUX D/E \(double, 4-Pin\)](#)

[Print Page](#)



**Product Number:** 20721  
**Order Abbreviation:** CF13DD/E/830  
**General Description:** DULUX 13W double compact fluorescent lamp with 4-pin base, integral EOL, 3000K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

## Product Information

Abbrev. With Packaging Info.	CF13DDE830 91V 50/CS 1/SKU
Average Rated Life (hr)	12000
Base	G24Q-1
Bulb	T4
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3000
Family Brand Name	Dulux® D/E
Industry Standards	IEC 60901- 2513
Initial Lumens at 25C	900
Mean Lumens at 25C	774
Maximum Overall Length - MOL (in)	5.2
Maximum Overall Length - MOL (mm)	131
NEMA Generic Designation (current)	CFQ26W/G24Q/830
Nominal Wattage (W)	13.00

## Additional Product Information

### [Product Documents, Graphs, and Images](#)

### [Compatible Ballast](#)

### [Packaging Information](#)



## Footnotes

- Approximate initial lumens after 100 hours operation.
- The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.
- Rule of Thumb for Compact Fluorescent Lamps: Divide wattage of incandescent lamp by 4 to determine approximate wattage of compact fluorescent lamp that will provide similar light output.
- Minimum starting temperature is a function of the ballast; consult the ballast manufacturer.
- There is a NEMA supported, industry issue where T2, T4, and T5 fluorescent and compact fluorescent lamps operated on high frequency ballasts may experience an abnormal end-of-life phenomenon. This end-of-life phenomenon can result in one or both of the following: 1. Bulb wall cracking near the lamp base. 2. The lamp can overheat in the base area and possibly melt the

# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.do>

[Return to: DULUX D/E \(double, 4-Pin\)](#)

[Print Page](#)



**Product Number:** 20724  
**Order Abbreviation:** CF18DD/E/830  
**General Description:** DULUX 18W double compact fluorescent lamp with 4-pin base, integral EOL, 3000K color temperature, 82 CRI, for use with electronic and dimming ballasts, ECOLOGIC

### Product Information

Abbrev. With Packaging Info.	CF18DDE830 100V 50/CS 1/SKU
Average Rated Life (hr)	12000
Base	G24Q-2
Bulb	T4
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3000
Family Brand Name	Dulux® D/E
Industry Standards	IEC 60901- 2518
Initial Lumens at 25C	1150
Mean Lumens at 25C	989
Maximum Overall Length - MOL (in)	5.8
Maximum Overall Length - MOL (mm)	147
NEMA Generic Designation (current)	CFQ18W/G24Q/830
Nominal Wattage (W)	18.00

### Additional Product Information

#### Product Documents, Graphs, and Images

#### Compatible Ballast

#### Packaging Information



### Footnotes

- Approximate initial lumens after 100 hours operation.
- The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.
- Rule of Thumb for Compact Fluorescent Lamps: Divide wattage of incandescent lamp by 4 to determine approximate wattage of compact fluorescent lamp that will provide similar light output.
- Minimum starting temperature is a function of the ballast; consult the ballast manufacturer.
- There is a NEMA supported, industry issue where T2, T4, and T5 fluorescent and compact fluorescent lamps operated on high frequency ballasts may experience an abnormal end-of-life phenomenon. This end-of-life phenomenon can result in one or both of the following: 1. Bulb wall cracking near the lamp base. 2. The lamp can overheat in the base area and possibly melt the

# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.do>

[Return to: DULUX T/E/IN \(amalgam, triple, 4-Pin\)](#)

[Print Page](#)



**Product Number:** 20884  
**Order Abbreviation:** CF32DT/E/IN/830  
**General Description:** DULUX 32W triple compact fluorescent amalgam lamp with 4-pin base, integral EOL, 3000K color temperature, 82 CRI, for use with electronic and dimming ballasts

## Product Information

Abbrev. With Packaging Info.	CF32DTEIN830 50/CS 1/SKU
Average Rated Life (hr)	12000
Base	GX24Q-3
Bulb	T4
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3000
Family Brand Name	Dulux® T/E
Industry Standards	IEC 60901- 7432
Initial Lumens at 25C	2400
Mean Lumens at 25C	2064
Maximum Overall Length - MOL (in)	5.6
Maximum Overall Length - MOL (mm)	142
NEMA Generic Designation (current)	CFR32W/GX24Q/830
NEMA Generic Designation (old)	CFM32W/GX24Q/830
Nominal Wattage (W)	32.00

## Additional Product Information

### Product Documents, Graphs, and Images

### Compatible Ballast

### Packaging Information



## Footnotes

- Approximate initial lumens after 100 hours operation.
- The life ratings of fluorescent lamps are based on 3 hr. burning cycles under specified conditions and with ballast meeting ANSI specifications. If burning cycle is increased, there will be a corresponding increase in the average hours life.
- Lumen output and life rated on high frequency operation.
- Rule of Thumb for Compact Fluorescent Lamps: Divide wattage of incandescent lamp by 4 to determine approximate wattage of compact fluorescent lamp that will provide similar light

## Electronic Compact Fluorescent Digital Dimming Systems

### QUICKTRONIC® CF DALI

#### Professional Series

##### Lamp/Ballast Guide

- 18W T4 – DULUX D/E, T/E**  
 1-lamp QTP1x18CF/UNV DALI  
 2-lamp QTP2x18CF/UNV DALI
- 26W T4 – DULUX D/E, T/E**  
 1-lamp QTP1x26CF/UNV DALI  
 2-lamp QTP2x26CF/UNV DALI
- 32W T4 – DULUX D/E, T/E**  
 1-lamp QTP1x32CF/UNV DALI  
 2-lamp QTP2x32CF/UNV DALI
- 42W T4 – DULUX T/E**  
 1-lamp QTP1x42CF/UNV DALI  
 2-lamp QTP2x42CF/UNV DALI
- 40W TT5 – DULUX L**  
 1-lamp QTP1x40TT5/UNV DALI  
 2-lamp QTP2x40TT5/UNV DALI

##### Key System Features

- Digital Addressable Control
- Individual control of fixtures
- Up to 16 groups and scenes
- 100 – 3% Dimming Range
- Programmable fade rates
- Universal voltage (120-277)
- Programmed rapid start
- Anti-flash circuitry
- End-Of-Lamp-Life Sensing
- Wiretrap connectors
- Control may be wired for Class 1 or Class 2 applications
- UL, cUL, FCC
- QUICK 60+® ballast and lamp warranty

##### Application Information

#### SYLVANIA QUICKTRONIC DALI is ideally suited for:

- Energy Management
- Load Shedding
- Daylight Harvesting
- Occupancy sensors
- Conference rooms
- All size offices
- Creative lighting designs

For optimal dimming performance, fluorescent lamps may require seasoning up to 100 hours prior to dimming to the lowest light levels.

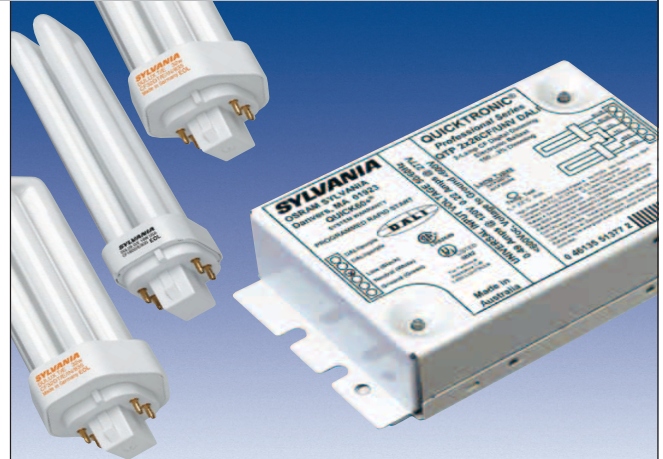
**SYLVANIA QUICKTRONIC DALI** Dimming combines digital control technology with full-range continuous dimming to provide a new level of lighting system performance. This allows for greater flexibility and control of the lighting environment than can be achieved with traditional 0-10VDC dimming systems. The communications protocol is “DALI”, an acronym for “Digital Addressable Lighting Interface”. This is a worldwide standard for digital lighting control that has been accepted by all the leading lighting suppliers.

SYSTEM CF-DALI controls DULUX® L, D/E and T/E 4-pin Compact Lamps over a wide range of light level settings, from 100 – 3% (ballast factor 1.0 – .03). Control wiring is simplified by two polarity-free connections that can be routed in the same raceway as power wires.

##### System Information

Programmed rapid start ballasts provide optimum starting conditions to provide up to 100,000 switching cycles for use on occupancy sensor and building control system applications. Individual addressability allows the user to dim any particular fixture or groups of fixtures at one time. Simple controller programming steps allow for:

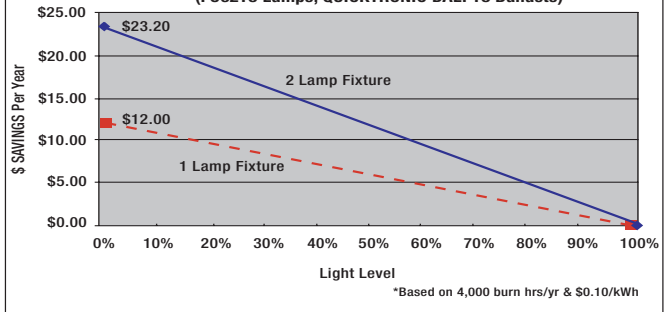
1. Fade rates, dim levels, time of day, groups and scenes to be customized.
2. Flexibility in grouping fixtures; no need to re-wire fixtures when groups need to be changed.
3. Systems are scalable and can be expanded anytime user needs change, without the need for costly re-wiring. Additional fixtures are added to groupings simply by means of software.



SYSTEM CF-DALI is available in one and two lamp models that operate from 120V through 277V, eliminating “wrong voltage” wiring errors and reducing the number of models in inventory by half.

Setting the standard for quality, SYSTEM CF-DALI is also covered by our QUICK 60+, warranty, the first and most comprehensive system warranty in the industry.

**\$ SAVINGS PER YEAR\* vs LIGHT LEVEL (F032T8 Lamps, QUICKTRONIC DALI T8 Ballasts)**



QUICKTRONIC DALI systems can be integrated with Building Management Systems (BMS) by installing gateways that translate between the DALI and BMS systems.

When used in conjunction with appropriate controls, feedback can be obtained on operating conditions, such as operating hours, light-level or failed lamps.

This lamp fault-reporting feature can save significant cost by quickly identifying the location, especially in large facilities or in applications where lamps are concealed by lenses.

Specification of DALI compatible gateways, controls and ballasts ensure flawless operation of the lighting system.

# Appendix A: Lighting Equipment

## Electronic DALI CF/DL40 (40TT5) Fluorescent Controllable Lighting Systems

### CF/DL40 DALI UNV VOLTAGE

Item Number	Description	Input Voltage (VAC)	Input Current (AMPS)	Lamp Type	Rated Lumens (lm)	No. of Lamps	Ballast Factor (BF)	System Lumens	Input Power (Watts)	System Efficacy (lm/W)
51370	QTP 1x18CF/UNV DALI	120-277	0.18/0.08	18W DD/E, T/E	1200	1	1.00 0.03	1200 35	20	60
51372	QTP 2x18CF/UNV DALI	120-277	0.33/0.14	18W DD/E, T/E	1200	2	1.00 0.03	2400 70	39/38	61/63
51375	QTP 1x26CF/UNV DALI	120-277	0.24/0.10	26W DD/E, T/E	1800	1	1.00 0.03	1800 55	28	64
51377	QTP 2x26CF/UNV DALI	120-277	0.49/0.22	26W DD/E, T/E	1800	2	1.00 0.03	3600 110	55/54	65/67
51380	QTP 1x32CF/UNV DALI	120-277	0.34/0.15	32W DT/E	2400	1	1.00 0.03	2400 70	38	63
51382	QTP 2x32CF/UNV DALI	120-277	0.60/0.26	32W DT/E	2400	2	1.00 0.03	4800 140	71/70	68/69
51384	QTP 1x42CF/UNV DALI	120-277	0.43/0.19	42W DT/E	3200	1	1.00 0.03	3200 95	49	65
51386	QTP 2x42CF/UNV DALI	120-277	0.82/0.36	42W DT/E	3200	2	1.00 0.03	6400 190	92/91	69/70
51390	QTP 1x40TT5/UNV DALI	120-277	0.41/0.17	40W DL	3150	1	1.00 0.03	3150 95	45/44	70/72
51392	QTP 2x40TT5/UNV DALI	120-277	0.83/0.37	40W DL	3150	2	1.00 0.03	6300 190	97/94	65/67

#### Performance Guide

Data shown based upon SYLVANIA DULUX lamp(s). QUICKTRONIC DALI ballasts are also compatible with other lamp manufacturers equivalent lamp types that meet ANSI specifications.

#### Specifications

**Starting Method:** Programmed Rapid-Start  
**Circuit Type:** Series  
**Lamp Frequency:** >40kHz  
**Lamp CCF:** <1.7  
**Starting Temp:** 50°F min.  
**Voltage Range:** 108-305V  
**Input Frequency:** 50/60 Hz  
**THD:** <10% @ full output  
**Power Factor:** >95% @ full output

UL Listed Class P, Indoor  
 cUL or CSA Certified  
 Temp. Test Point (Tc) on ballast label:  
 All CF models: 75°C max  
 1 lamp DL model: 70°C max  
 2 lamp DL model: 75°C max.  
 FCC 47CFR Part 18 Non-Consumer  
 Class A Sound Rating  
 ANSI C62.41 Cat. A  
 Transient Protection

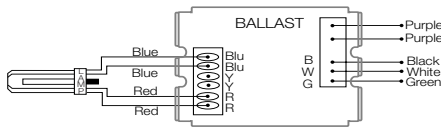
#### CF Dimensions, Packaging & Wiring:

Units	L	ML	W	H
inches	4.95	4.57	2.93	1.35
mm	125.7	116.1	74.4	34.3

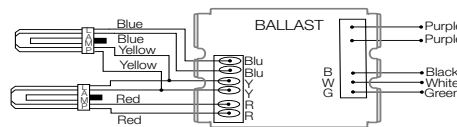
#### Packaging:

Quantity: 10 pieces/case  
 Weight: 1.1 lbs each (approx.)

#### Metal Case 1 Lamp



#### Metal Case 2 Lamp

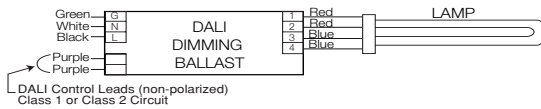


#### DL Dimensions, Packaging & Wiring:

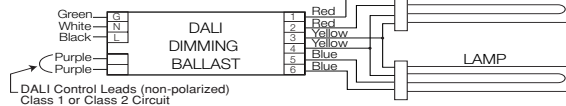
Units	L	ML	W	H
inches	18.05	17.70	1.18	1.18
mm	458.5	449.6	30.0	30.0

#### Packaging:

Quantity: 25 pieces/case  
 Weight: 1.2 lbs each (approx.)



DL40 1-Lamp DALI



DL40 2-Lamp DALI

#### Control Information

QUICKTRONIC DALI ballasts are compatible with DALI digital controllers available from various manufacturers. For a list of DALI control manufacturers, please contact OSRAM SYLVANIA.

Refer to pages 74 & 75 for controls information.

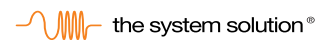
**Control Specifications:**  
 Two wire non-polarized control. May be wired as a Class 1 or Class 2 circuit, consult Local and National Electrical Codes.

#### Ordering Guide

Item Number: 51377 QTP 2 x 26CF / UNV DALI  
 QUICKTRONIC PROFESSIONAL  
 Number of Lamps: \_\_\_\_\_  
 System Type - DALI  
 Line Voltage (120-277V)  
 Primary Lamp Wattage

Specifications subject to change without notice.

OSRAM SYLVANIA National Customer Service and Sales Center  
 1-800-LIGHTBULB (1-800-544-4828)  
 www.sylvania.com





# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: Pentron Standard](#)

[Print Page](#)



**Product Number:** 20868  
**Order Abbreviation:** FP28/830/ECO  
**General Description:** 28W, T5 PENTRON fluorescent lamp, 3000K color temperature, rare earth phosphor, 82 CRI, ECOLOGIC

## Product Information

Abbrev. With Packaging Info.	FP28830ECO 40/CS 1/SKU
Actual Length (in)	45.8
Actual Length (mm)	1163.2
Average Rated Life (hr)	20000
Base	Miniature Bipin
Bulb	T5
Color Rendering Index (CRI)	82
Color Temperature/CCT (K)	3000
Diameter (in)	0.67
Diameter (mm)	17.0
Family Brand Name	PENTRON® ECO®
Initial Lumens at 25C	2600
Initial Lumens at 35C	2900
Mean Lumens at 25C	2418
Mean Lumens at 35C	2697
Nominal Length (in)	48
Nominal Wattage (W)	28.00

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: T5 Linear Fluorescent](#)

[Print Page](#)



**Product Number:** 51356  
**Order Abbreviation:** QTP1X28T5/UNV DALI  
**General Description:** 1-lamp Universal Voltage <10%THD 100-1% electronic DALI digital dimming ballast for 28W T5 lamp

### Product Information

Abbrev. With Packaging Info.	QTP1X28T5UNVDALI
Ballast Factor	1.00
Ballast Height H (in)	1.1800
Ballast Length L (in)	1.1800
Ballast Width W (in)	18.0500
Circuit Type	SERIES
Family Brand Name	QUICKTRONIC Professional
Input Wattage (W)	32.00
Input Current (Amps)	0.27/0.11
Nominal Voltage (V)	UNIVERSAL 120-277
Number of Lamps	1
Open Circuit Voltage (V)	<600
Power Factor	>0.98
Primary Lamp Type	FP28T5
Sound Rating	A
Starting Method	PROGRAMMED RAPID-START
Starting Temperature - Fahrenheit	50
Starting Temperature - Celsius	10
Total Harmonic Distortion (THD)	<10%
Wiring Method	WIRETRAP CONNECTORS

### Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



### Footnotes

- Data based on primary lamp types. See OSRAM SYLVANIA System Performance Guide for data on other lamp combinations.
- 75C Max Case Temperature
- Install in accordance with National Electric Codes
- Complies with FCC 47 CFR Part 18, Non-Consumer

# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: TRU-AIM® MR16](#)

[Print Page](#)



**Product Number:** 54200  
**Order Abbreviation:** 20MR16/FL40(BAB) 12V  
**General Description:** Tungsten Halogen Tru-Aim MR16 STANDARD UV-Stop Capsule With Axial Filament, Dichroic Reflector GU5.3 Bi-Pin Base 20Watt 12Volt Flood Beam (BAB)

## Product Information

Abbrev. With Packaging Info.	20MR16FL40BAB 12V 20/CS 1/SKU
ANSI Code	BAB
Average Rated Life (hr)	4000
Base	GU5.3 Bipin
Beam Angle (deg)	40
Beam Type	FL
Bulb	MR16
Centerbeam Candlepower (cp)	700
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	2
Diameter (mm)	50.8
Ecologic	YES
Family Brand Name	TRU-AIM Standard
Filament	AXIAL
Horizontal Beam Angle (deg)	40
Maximum Overall Length - MOL (in)	1.75
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	20.00
Vertical Beam Angle (deg)	40

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: TRU-AIM® MR16](#)

[Print Page](#)



**Product Number:** 58576  
**Order Abbreviation:** 20MR16/NSP/RP(ESX) 12V  
**General Description:** Tungsten Halogen Tru-Aim MR16 STANDARD UV-Stop Capsule With Axial Filament, Dichroic Reflector GU5.3 Bi-Pin Base 20Watt 12Volt Narrow Spot Beam (ESX) Retail Pack

## Product Information

Abbrev. With Packaging Info.	20MR16NSRPESX 12V 6/CS 1/SKU
ANSI Code	ESX
Average Rated Life (hr)	4000
Base	GU5.3 Bipin
Beam Angle (deg)	8
Beam Type	NSP
Bulb	MR16
Centerbeam Candlepower (cp)	6000
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	2
Diameter (mm)	50.8
Ecologic	YES
Family Brand Name	TRU-AIM Standard
Filament	AXIAL
Horizontal Beam Angle (deg)	8
Maximum Overall Length - MOL (in)	1.75
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	20.00
Vertical Beam Angle (deg)	8

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: TRU-AIM® MR16](#)

[Print Page](#)



**Product Number:** 54208  
**Order Abbreviation:** 50MR16/NSP12(EXT) 12V  
**General Description:** Tungsten Halogen Tru-Aim MR16 STANDARD UV-Stop Capsule With Axial Filament, Dichroic Reflector GU5.3 Bi-Pin Base 50Watt 12Volt Narrow Spot Beam (EXT)

## Product Information

Abbrev. With Packaging Info.	50MR16NSP12EXT 12V 20/CS 1/SKU
ANSI Code	EXT
Average Rated Life (hr)	4000
Base	GU5.3 Bipin
Beam Angle (deg)	12
Beam Type	NSP
Bulb	MR16
Centerbeam Candlepower (cp)	11000
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	2
Diameter (mm)	50.8
Ecologic	YES
Family Brand Name	TRU-AIM Standard
Filament	AXIAL
Horizontal Beam Angle (deg)	12
Maximum Overall Length - MOL (in)	1.75
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	50.00
Vertical Beam Angle (deg)	12

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: STARLITE® Bi-Pin](#)

[Print Page](#)



**Product Number:** 58676  
**Order Abbreviation:** 50T4Q/CL/AX 12V  
**General Description:** Tungsten Halogen Quartz Bi-Pin STARLITE Low Pressure Clear Finish UV-Stop With Axial Filament GY6.35 Bi-Pin Base 50Watt 12Volt 4000Hr Lamp Life

## Product Information

Abbrev. With Packaging Info.	50T4QCLAX 12V 40/CS 1/SKU
Approx. Lumens	910
Average Rated Life (hr)	4000
Base	GY6.35 Bipin
Bulb	T4
Class	C (gas)
Color Rendering Index (CRI)	100
Color Temperature/CCT (K)	3000
Diameter (in)	0.5
Diameter (mm)	12.7
Ecologic	YES
Family Brand Name	STARLITE® Bi-Pin
Filament	AXIAL
Lamp Finish	Clear
Light Center Length - LCL (in)	1.125
Light Center Length - LCL (mm)	28.575
Maximum Overall Length - MOL (in)	1.75
Maximum Overall Length - MOL (mm)	44.45
Nominal Voltage (V)	12.00
Nominal Wattage (W)	50.00

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)

## Footnotes

- Starlite Low Pressure - UV Filter Quartz
- Suitable for use in unshielded fixtures. Consult most recent luminaire standards for your area to determine luminaire requirements.

[Print Page](#)

# Appendix A: Lighting Equipment

Product Details

<http://ecom.mysylvania.com/sylvaniab2c/catalog/updateItems.c>

[Return to: Double Life Soft White](#)

[Print Page](#)



**Product Number:** 11176  
**Order Abbreviation:** 100A/CL/DL/RP 120V  
**General Description:**

## Product Information

Abbrev. With Packaging Info.	100ACLDLRP 120V 24/CS 2/SKU
Approx. Lumens	1550
Average Rated Life (hr)	1500
Base	Medium
Bulb	A19
Class	C (gas)
Color Temperature/CCT (K)	2850
Diameter (in)	2 3/8
Diameter (mm)	60.325
Family Brand Name	Double Life Clear
Filament	CC-8
Lamp Finish	Clear
Light Center Length - LCL (in)	3 1/8
Light Center Length - LCL (mm)	79
Maximum Overall Length - MOL (in)	4 7/16
Maximum Overall Length - MOL (mm)	112.7125
Nominal Voltage (V)	120.00
Nominal Wattage (W)	100.00

## Additional Product Information

[Product Documents, Graphs, and Images](#)

[Packaging Information](#)



[Print Page](#)

# Appendix A: Lighting Equipment

D A L I   D i m m i n g   C o n t r o l s

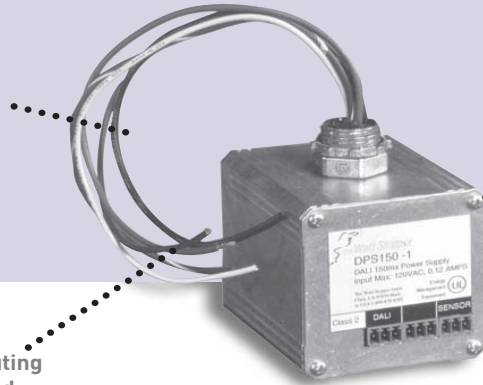


## ezDALI Power Supply

Power supply for DALI ballast communications

Supports DALI bus and fixture power wiring in same conduit

Automatic message routing among DALI ballasts and controls



Powers and isolates both Class 1 and Class 2 DALI buses

No programming or adjustments required

Compatible with all Watt Stopper 24 VDC ceiling occupancy sensors

PROJECT
LOCATION/TYPE

### Product Overview

#### Description

The ezDALI Power Supply (DPS150) supplies power and communications for the ezDALI system.

#### Operation

The ezDALI Power Supply contains two transformers with associated power conditioning. The first provides 150 mA at 16 VDC to the Class 1 bus. The second provides 150 mA to the Class 2 ezDALI bus (16 VDC) and to any other control devices (i.e., occupancy sensors) at 24 VDC. For instance, when an occupancy sensor detects motion, it signals the power supply, which initiates a command to an ezDALI controller over the Class 2 data bus. In addition, the power supply provides mechanical and electrical isolation between the two buses to prevent accidental contact of line and low voltage wiring. Furthermore, the power supply routes signals between the Class 1 and Class 2 buses automatically.

#### Easy Installation

The ezDALI Power Supply enables ezDALI bus and fixture power wiring to be run in the same conduit, simplifying installation. It also features plug-in connectors for easy installation of low voltage control devices, such as occupancy sensors, or for the DALI Class 2 bus. It connects to any standard junction box and is normally mounted in an accessible ceiling space.

#### Applications

The Power Supply is an integral component of any ezDALI application. One is required for each room or controlled space. The primary applications for ezDALI controls are spaces that have changing lighting needs, such as classrooms, conference rooms, lecture rooms, and executive offices. The energy savings potential from ezDALI use also makes open offices ideal candidates as well.

### Features

- 150 mA power supply for Class 1 DALI bus, allowing control of DALI ballasts and relay modules
- 150 mA power supply for Class 2 peripherals, providing power for ezDALI controllers and occupancy sensors
- Two electrically isolated buses, one for Class 1 ballasts, the other for Class 2 devices for communication with ezDALI controllers
- Bus LED status indication: Green steady= OK, flashing Red = Class 1 bus shorted, flashing Green = Class 2 bus shorted
- No set-up or commissioning required
- Plug-in connectors for low voltage control devices for simplified wiring
- Supports DALI bus and fixture power wiring in same conduit



legrand

www.wattstopper.com  
800.879.8585

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

# DALI equipment Power Supply





### Power Supply Technical Information

#### Specifications

- Input voltage: DPS150-1 = 120 VAC, 60 Hz; DPS150-2 = 277 VAC, 60 Hz, 1.5 watts max. consumption
- Output current/voltage: DALI Class 1 bus = 150 mA, 16VDC; ezDALI Class 2 bus total = 150 mA (16 VDC for ezDALI bus, 24VDC for occupancy sensors)
- Temperature: 0 to 140° F, Rel. Humidity 10 to 95% RH, non-condensing; Atmosphere non-explosive, non-corrosive; Stationary applications, NEMA Level A
- Dimensions: 2.5" x 2.5" x 3.12" (W x H x D) with .5" nipple (63.5 mm x 63.5 mm x 79.25 mm with 12.7 mm nipple)
- UL and CUL listed 916 Energy Management equipment
- FCC approved for use in commercial and industrial applications
- Five year warranty

#### Power Ratings

##### DALI Class 1 bus (power for DALI ballasts, relay modules, and remote scene switches)

- Available power: 150 mA @ 16 VDC
- Power requirements: ballast = 2 mA; relay module = 7 mA, remote scene switch = 5 mA

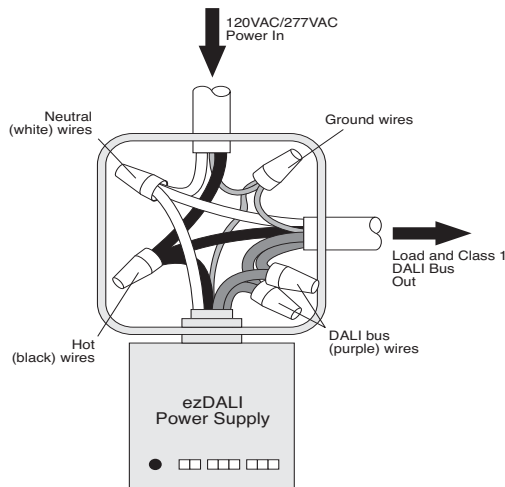
##### ezDALI Class 2 bus (power for ezDALI controllers and occupancy sensors)

- Available power: 150 mA @ 16 & 24 VDC
- Power requirements: 4-group controller = 40 mA; Group & Scene controller = 40 mA; relay module = 7 mA, occupancy sensors\*

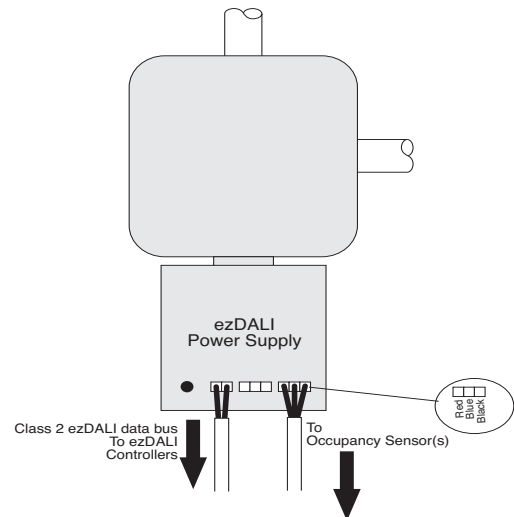
\*Power requirements for occupancy sensors vary depending on sensor model and individual requirements. Refer to individual product specifications for complete details.

#### Wiring & Installation

##### Class 1 Wiring Diagram



##### Class 2 Wiring Diagram



#### Ordering Information

Catalog No.	Voltage
□ DPS150-1	120 VAC
□ DPS150-2	277 VAC

Watt Stopper/Legrand®  
Pub. No. 16302

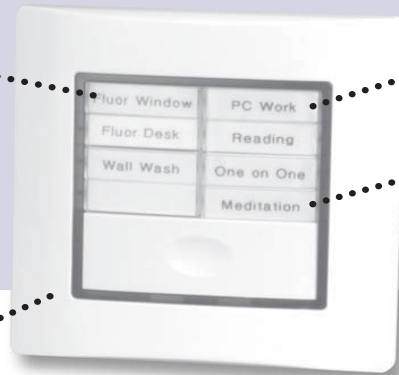


### ezDALI Group and Scene Controller

Compatible with DALI ballasts for stand-alone dimming, ON/OFF, and scene control of up to four lighting groups

Controls up to 64 DALI ballasts individually

Integrates with occupancy sensor for automatic shut off via Power Supply



Four preset lighting scenes

Pushbutton programming without a computer

Contractor-friendly installation and commissioning

PROJECT
LOCATION/TYPE

#### Product Overview

#### Description

The ezDALI Group and Scene Controller (DLCSS4) is a component of a Watt Stopper ezDALI dimming system, which provides stand-alone fluorescent dimming with DALI ballasts. It allows DALI ballasts to be assigned to up to four different lighting groups, and enables the user to dim these lighting groups to create up to four preset lighting scenes (presets).

#### Operation

DALI ballasts are assigned to a desired lighting group using the controller's four labeled group buttons. The user then raises or lowers the group's light level by pressing and holding the respective group button. This creates a preferred lighting scene; to memorize it, the occupant simply presses and holds the desired scene button. The Master button toggles between the last setting and OFF for normal daily operation. An occupancy sensor option provides occupant-sensitive automatic shut-off via the ezDALI Power Supply.

#### Scene Control

Scenes are created and memorized using the controller. When a user presses a scene button, the switch signals the controlled ballasts to recall that scene. The ballasts fade to the level programmed in ballast memory for that scene, and the scene LED lights on the controller. Additional Remote Scene Switches may be used to provide scene control from multiple locations within a room.

#### Applications

The Group and Scene Controller is well-suited for executive offices, conference rooms, classrooms, and lecture halls. It is particularly effective in multi-use spaces that require different lighting configurations. In each of these applications, the Group and Scene Controller allows lighting to be adjusted to accommodate occupants' needs while also providing enhanced energy savings. Since the controller requires no special tools or commissioning software, it can be easily installed and commissioned by an electrical contractor in any building.

#### Features

- Four lighting groups with independent dimming capability and LED status indication
- Four scene control buttons with LED status indication and recall of user-defined scenes
- Locator light bar for finding controller in darkened room
- Architecturally attractive wall switch also used to configure ezDALI network
- Master OFF/Restore button provides simple recall of last lighting scene
- Designer appearance with screwless wallplate and removable lens cap for labeling
- Impact-resistant Lexan protects against damage
- Max level setting limits light level for increased energy savings



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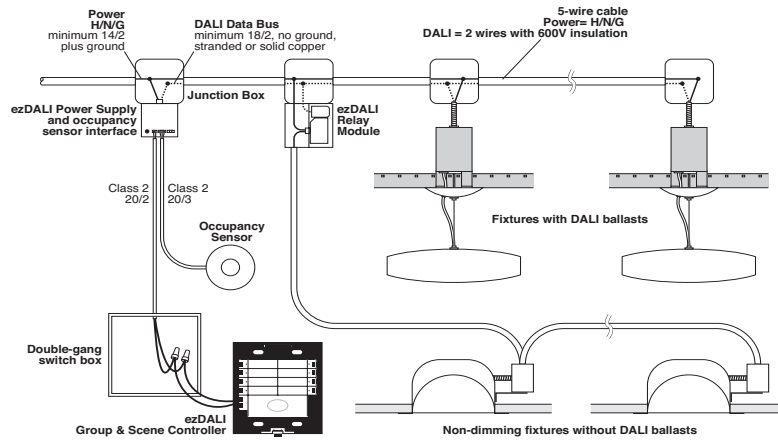
### Controller Technical Information

#### Specifications

- Input Power: 40 mA max @16 VDC
- ezDALI Class 2, low voltage communications
- 1% dimming for linear fluorescent, 3% for compact fluorescent
- Operating environment: to 140° F; 10 to 95% RH, non-condensing; non-explosive, non-corrosive; stationary applications, NEMA level A
- Dimensions: 4.5" W x 4.5" H x 1.8" D (114.3 mm x 114.3 mm x 46 mm)
- FCC approved for use in commercial and industrial applications
- UL and CUL listed, 916 Energy Management, Class 2
- Five year warranty

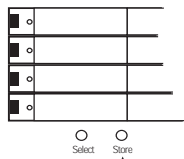
#### Wiring & Installation

#### Group and Scene Controller Wiring

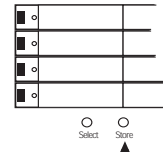


#### Programming the Controller

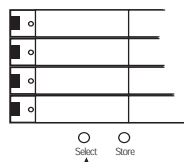
#### Programming Groups & Scenes



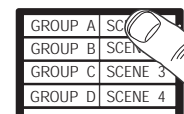
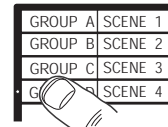
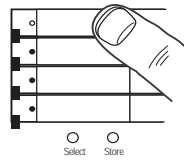
**Step 1. Initialize**  
Press and hold Store button for 5 seconds. Release. LEDs will flash in sequence while ballasts are addressed. Each ballast will turn on as it receives its address.



**Step 3. Store Setting**  
Press Store button to save all groups. All group LEDs will light and all ballasts are on at 100%.



**Step 2. Create Groups**  
Press Select button. First ballast will turn on at maximum level and all others will turn off. Press Group button to add ballast to group. Group button LED will start flashing. Press Select button to select next ballast. Repeat for each ballast.



**Step 4. Create Scenes**  
Adjust lighting levels of each group by pressing and holding Group button to ramp lights up or down. (Releasing stops ramping. Pressing Group button again reverses ramping.) Press and release Group button to turn lights OFF or ON. When desired light level for all groups have been set for a scene, press and hold Scene button until Scene LED lights, indicating that scene is memorized. Repeat for remaining scenes.

#### Ordering Information

Catalog No.	Color	Description	Voltage/ Input Power	Max. Ball.	Max. Groups	Max. Scenes
<input type="checkbox"/> DLCSS4-2	Ivory	ezDALI Group and Scene Controller	16 VDC/40 mA	64	4	4
<input type="checkbox"/> DLCSS4-4	Almond					
<input type="checkbox"/> DLCSS4-7	White					
<input type="checkbox"/> DLCSS4-9	Gray					

Watt Stopper/Legrand®  
Pub. No. 16102

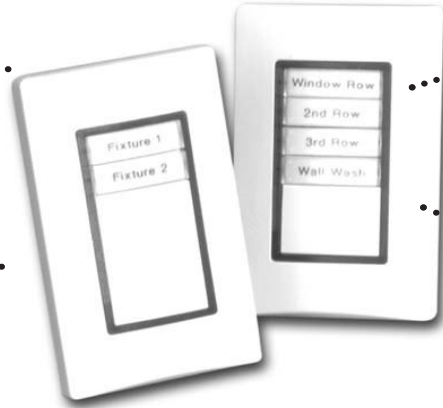


### ezDALI Group Controller

Multi-group dimming controller compatible with DALI dimming ballasts

Modify lighting groups without rewiring or special tools

Integrates with occupancy sensor for automatic shut-off via ezDALI Power Supply



Push-button programming without a computer

Controls up to 64 DALI ballasts individually

Contractor-friendly installation and commissioning

#### Product Overview

#### Description

The ezDALI Group Controller (DLC) is a component in an ezDALI system. It is the source of all commands to the ballasts. In addition, it provides a simple tool for creating ballast groups (a set of ballasts that act in unison, also referred to as a “zone”), and manual dimming of each group to create a preferred “scene” or “preset.” Automatic shut-off, in compliance with energy codes, is achieved by connecting an occupancy sensor via the ezDALI Power Supply.

#### Operation

The ezDALI Group Controller operates with an ezDALI Power Supply and one or more DALI ballasts. Once each ballast has been assigned to a group button on the ezDALI wallbox controller, a user can raise or lower group light levels by pressing and holding the group button. This allows the occupant to set each group to a preferred lighting level. The Master button will toggle between the last setting and off for normal daily operation.

#### Button Options

The ezDALI Group Controller is available in 2- or 4-group models, both of which fit within a standard single-gang wallbox. With the 2-group model, users can create two different lighting groups, while the 4-group model enables control of up to four groups. Both the 2- and 4-group controllers allow the occupant to create a preferred lighting level. Using the Master button provides OFF/Restore capability.

#### Applications

The ezDALI Group Controller is ideal for use in private offices, open offices and hallways. In each of these applications, ezDALI allows the lighting to be tuned to the needs of the occupant while also providing enhanced energy savings. Since it requires no special tools or commissioning software, it can be easily installed by an electrical contractor in any building.

#### Features

- Push-button set-up for easier installation and future changes
- Master OFF/Restore button provides quick access to last lighting scene
- Compatible with standard 24 VDC occupancy sensor (input to Power Supply)
- Designer appearance with screwless wallplate and removable lens caps for labeling
- Impact-resistant Lexan protects against damage
- Locator light bar for finding controller in darkened room
- Max Level Set limits light level for increased energy savings



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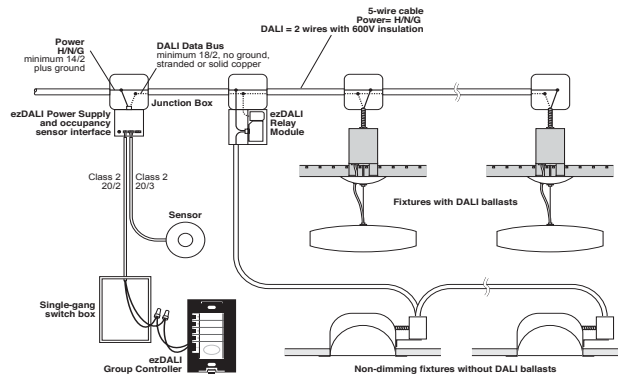
### Group Controller Technical Information

#### Specifications

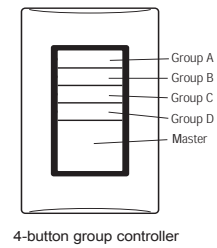
- Input Power: DLC-2 28 mA max @16VDC; DLC-4 40 mA max @16VDC
- ezDALI Class 2, low voltage communications
- 255 dimming steps for each group. 1% dimming for linear fluorescent, 3% for compact fluorescent
- Operating environment: to 140° F; 10 to 95% RH, non-condensing; non-explosive, non-corrosive; stationary applications, NEMA level A
- 2 or 4-button configuration in single gang box
- Dimensions: 2.75" W x 4.5" H x 1.81" D (69.8 mm x 114.3 mm x 46 mm)
- FCC approved for use in commercial and industrial applications
- UL and CUL listed, 916 Energy Management, Class 2
- Five year warranty

#### Wiring & Installation

#### Group Controller Wiring Diagram

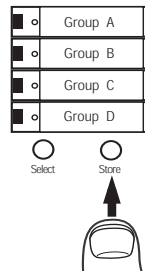


#### Product Controls

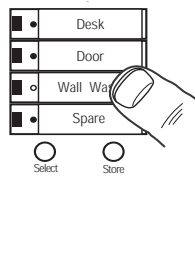


#### Programming the Controller

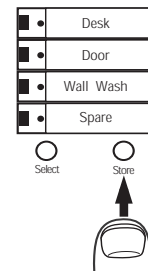
#### Programming Groups



**Step 1. Initialize**  
Press and hold Store button for 5 seconds. Release. LEDs will sequence while ballasts are addressing.



**Step 2. Create Groups**  
Press Select button. First ballast will turn on at maximum level and all others will turn off. Press desired group button (i.e., Group C, wall wash) to add that ballast to desired group. Group LED will begin flashing. Press Select button to select next ballast, which will turn on at maximum level (all others off). Repeat for all ballasts.



**Step 3. Store settings**  
Press and release Store button to save all ballast group assignments. All group LEDs will turn on. Lighting will be at 100%.

#### Ordering Information

Catalog No.	Description	Voltage/Input Power	Max. Ballast	Max. Groups	Max. Scenes
DLC4-x	DALI 4-button Group Controller	16 VDC/40 ma	64	4	0
DLC2-x	DALI 2-button Group Controller	16 VDC/28 ma	64	2	0

"x" indicates color: -2 = ivory, -4 = almond, -7 = white, -9 = gray

The Watt Stopper®, Inc.  
Pub. No. 16001



## ezDALI Relay Module



DALI ON/OFF control for non-dimming loads

Up to 20 amp ballast or incandescent loads

Acceptable for use in plenum spaces

Compatible with DALI ballast commands

Dual 120/277 VAC operation

Contractor-friendly installation and commissioning

PROJECT

LOCATION/TYPE

### Product Overview

#### Description

The ezDALI Relay Module (DRM) is an optional component in an ezDALI system. Mimicking the function of a DALI ballast, the DRM provides ON/OFF control for non-DALI loads such as standard electronic ballasts, incandescent or motor loads.

#### Operation

The ezDALI Relay Module provides isolated high-power (20 amps, 120 or 277 VAC) switching capability for non-dimming ON/OFF loads. The operator addresses and controls the DRM as if it were a DALI ballast. To assign a Relay Module to a group, the operator uses the Select function on an ezDALI controller. When the lighting controlled by the Relay Module turns on, the operator presses the desired group button on the controller to add that lighting to the group. Thereafter, the Relay Module will switch lighting on or off in response to the signal from the ezDALI controller.

#### Control of non-DALI loads

The ezDALI Relay Module coordinates ON/OFF control of non-DALI loads (i.e., incandescent lighting, fans) with the operation of DALI ballasts. When a command issues from a control device, the DRM responds along with other Relay Modules or DALI ballasts in the group or scene. While DALI ballasts may raise or lower light levels, the DRM will switch its load either ON or OFF.

#### Applications

The ezDALI Relay Module can be used for controlling non-dimming loads with ezDALI controls. The DRM can coordinate operation of non-dimming lighting and electrical loads in conference rooms or lecture halls. In small offices, the DRM allows coordinated control of DALI ballasted lighting and non-DALI incandescent lighting.

### Features

- Networked digital control of non-dimming loads
- Addressable and controllable as if a DALI ballast
- Zero crossing protects relay from inrush current and increases relay life
- Compatible with DALI ballast commands
- Can be installed with either Class 1 or Class 2 DALI bus wiring



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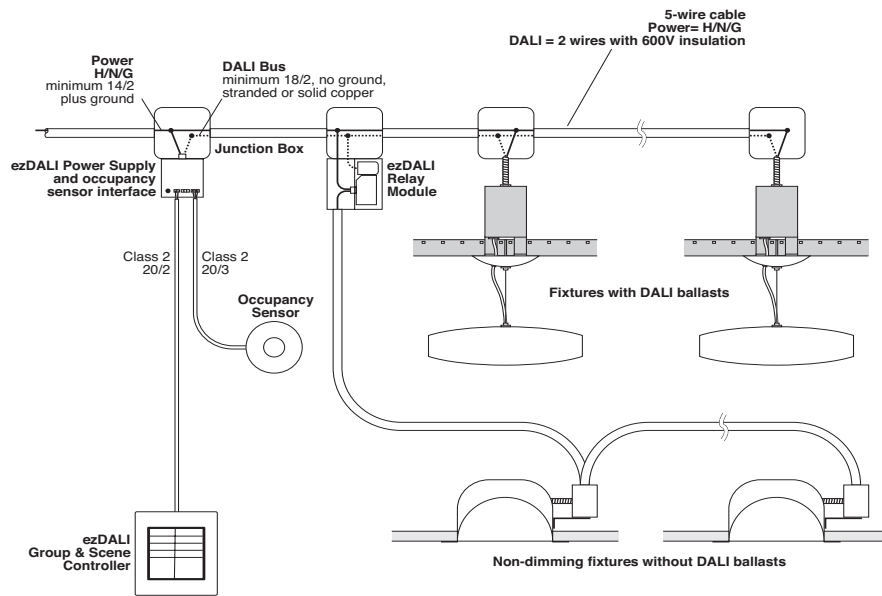
### Relay Module Technical Information

#### Specifications

- Input Power: 120 or 277 VAC, 60 Hz, 0.1 Amps
- Load rating: 20 Amps ballast, 20 Amps incandescent, 1 HP motor @ 120/250 VAC
- DALI bus input power: 16 VDC, 7 mA
- Acceptable for use in plenum spaces
- Dimensions: 4.8" x 4.8" x 2.3" (W x H x D) (122 mm x 122 mm x 58.4 mm)
- FCC approved for use in commercial and industrial applications
- UL & CUL listed, Energy management equipment 86WA
- Five year warranty

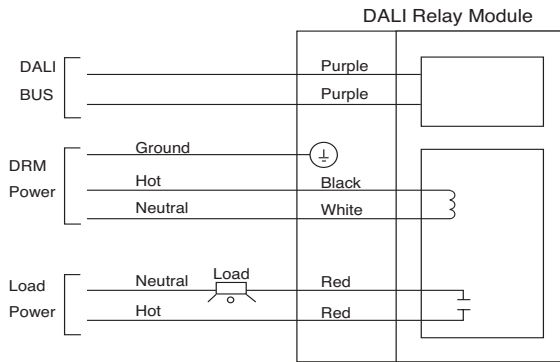
#### ezDALI System Wiring

#### ezDALI System Wiring with Relay Module

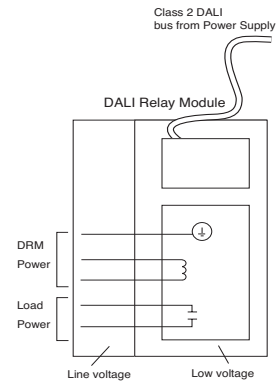


#### Relay Module Wiring

#### Class 1 Relay Module Wiring



#### Class 2 Relay Module Wiring



#### Ordering Information

Catalog No.	Voltage/DALI Power	Max. Current
□ DRM	120/277 VAC/16 VDC/7 mA	20 Amps

Watt Stopper/Legrand®  
Pub. No. 16202

# The Power of Illumination

[www.bplust.com](http://www.bplust.com)

## **DALI Star** Digitally Addressable Low Voltage Isolation Transformer



DALI (Digitally Addressable Lighting Interface) is a protocol dedicated for lighting control use. The DALI protocol transforms a standard lighting system into a dynamic network able to control and manage individual lighting devices, via a common DALI bus. Individual devices can be addressed and programmed in the network as part of groups and scenes. DALI devices can communicate with the controller to provide real time status of the control of devices.

The DALI Star Series electronic transformer is designed specifically to operate 12 Volt halogen lamps in a DALI network with DALI controllers.

The advanced microprocessor-based circuitry of the DS Series transformer is fully compatible with DALI controllers and is digitally addressable to provide precise dimming control and full a range of operation for 12 Volt halogen lamps, as individually addressed devices or part of groups and scenes.

The many features of the DS Series include auto reset short and overload protection, protection against misconnection of line voltage into DALI input, open lamp detection and automatic programmable preset light level on DALI control interrupt.

B+L Technologies' DALI Star transformer offers multiple possibilities to meet digital lighting systems requirements and to please your customers. Contact our customer service representatives to find out more about this and many of our lighting products.

### General Specifications

- ✓ Fully DALI protocol compatible
- ✓ Precise 0 – 100% Dimming Control
- ✓ Open lamp detection
- ✓ Auto reset short circuit protection
- ✓ Auto reset over load protection
- ✓ Protection against line voltage to DALI input
- ✓ Programmable preset light output on DALI line interruption
- ✓ Fully Digitally addressable
- ✓ Programmable multiple groups
- ✓ Programmable 16 scenes, 16 groups
- ✓ Minimum load: 20W
- ✓ Nominal output: 12VAC
- ✓ For 12V halogen lamps
- ✓ Power factor >0.98
- ✓ THD<13%
- ✓ Operating frequency > 20kHz
- ✓ Ambient temperature range: -15 °C to 50 °C
- ✓ Input 120V 60Hz
- ✓ Input current: 0.60 A
- ✓ Input wire gauge: 18 AWG
- ✓ Output wire gauge: 18 AWG
- ✓ DALI line wire gauge: 18 AWG
- ✓ Standby power consumption: 1 W
- ✓ Compact metal casing, available in choice of stud mount or flush mount

**1-800-361-1400**



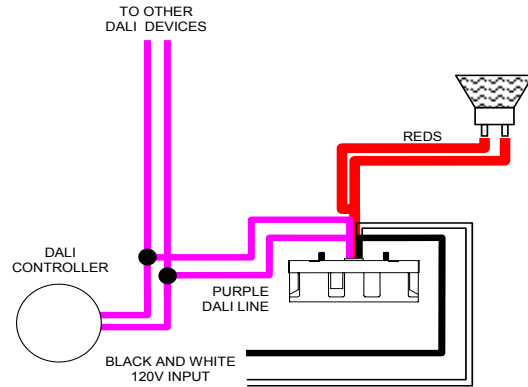


# Appendix A: Lighting Equipment

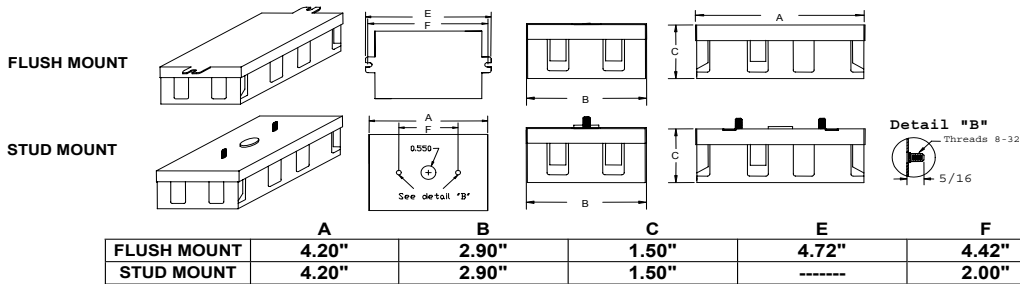
## Ordering Information

MODEL NO.	INPUT VOLTAGE	SHORT CIRCUIT PROTECTION	OVERLOAD PROTECTION	DALI INPUT PROTECTION	MAXIMUM LOAD	OUTPUT TO LAMPS	MOUNTING
DS98100-S	120 VAC	YES	YES	YES	75 W	12 VAC	FLUSH MOUNT
DS98100-C	120 VAC	YES	YES	YES	75 W	12 VAC	STUD MOUNT

## Cabling Diagrams



## Dimensions



## Warranty

3 years from delivery date for:  
**DALI Star 75 Transformer**



1131 Autoroute Laval W.  
Laval (Quebec)  
Canada, H7L 3W3  
Tel.: (450) 663-7884  
1-800-361-1400  
Fax.: (450) 663-7638  
[www.bplust.com](http://www.bplust.com)  
[info@bplust.com](mailto:info@bplust.com)



## LS-301 Dimming Photosensor

Automatic dimming based on ambient light levels

Controls standard 0-10 VDC electronic dimming ballasts

All setup performed remotely with handheld

Optional occupant adjustment via handheld remote

Single zone control

Closed loop daylighting control



PROJECT
LOCATION/TYPE

### Product Overview

#### Description

The LightSaver LS-301 is a ceiling mount, low voltage indoor photosensor that works with standard, 0-10 VDC electronic dimming ballasts to dim lighting as daylight increases.

#### Operation

The LS-301 mounts on a ceiling and utilizes a spectral filtering system to measure daylight and electric light levels. A closed loop daylighting system, the LS-301 measures the total light level from daylight and electric light in the controlled area to adjust electric lighting levels. As the daylight contribution increases, the lights dim down. The photosensor utilizes sliding setpoint control, which responds to the different spatial distribution qualities of electric light and daylight. The LS-301 calculates the required light level for current daylight contribution based on two setpoints. One represents the target level when no daylight is present (night setpoint) and the other when significant daylight is present (day setpoint).

#### Adjustment via Handheld Remote Control

All LS-301 adjustments are made with one of two handheld remotes. The LSR-301-S provides five buttons for initial set-up, which is easily completed by first raising or lowering electric light levels to desired levels, then programming this target level into the photosensor. The LSR-301-P provides three buttons for occupants to adjust light levels. With this optional tool, users can increase target light levels by up to 25% or reduce them to the lamp/ballast minimum level. Pressing the "Auto" button returns the control to programmed levels.

#### Applications

The LS-301 is designed to blend into its surroundings when installed in any environment. It provides one zone of daylighting control in a private office or classroom. In these applications, the LS-301 can be combined with an occupancy sensor. Often, it is possible for the LS-301 to share a single power pack with occupancy sensor(s).

### Features

- Provides precise control of lighting to maintain desired light level
- Extremely linear photocell response with greater than 1% accuracy
- Designed to measure light as the human eye perceives it, eliminating "overreporting" illumination levels provided by daylight
- Separate handheld remote controls for setup and occupant adjustment to prevent tampering
- Boosts energy savings by reducing maximum lamp output, often resulting in a 20% reduction or more compared with lights at full output
- Achieves lumen maintenance by holding target light level as lamp output decreases over time



legrand

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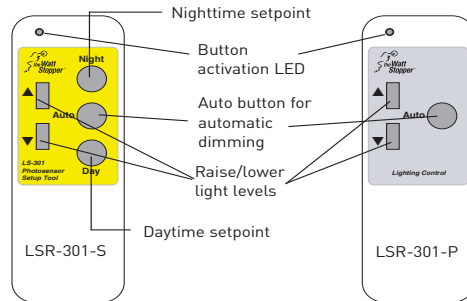
### LS-301 Technical Information

#### Specifications

- Full range dimming: .2 VDC (minimum) to 10 VDC (100% lighting) output voltage
- Current consumption: 30 mA @ 24 VDC
- In typical applications, setpoints are adjustable from 20-60 footcandles (210-640 lux)
- Controls up to 50 standard dimming ballasts in one zone
- Sensor leads: gray and violet to ballast, red and black to 24 VDC
- Dimensions: 2.35" diam. x 0.875" depth (60mm x 22mm), threaded piece extends 1.25" (31.8mm) from back, fits .5" knockout
- 5 year warranty

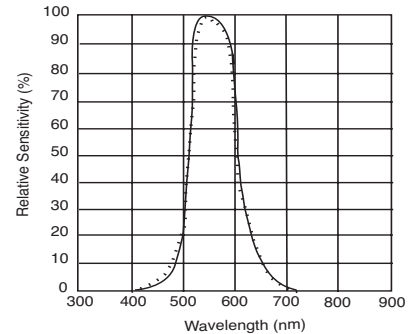
#### Product Controls

#### Remote Controls



Remote handheld (above left) enables easy set-up while optional occupant remote provides adjustability for individual lighting preferences.

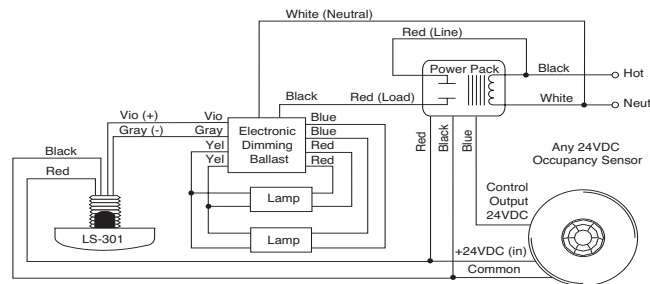
#### Spectral Response Curve



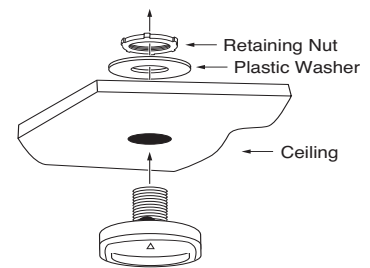
The spectral response of the LS-301 photocell closely matches the sensitivity of the human eye.

#### Wiring & Installation

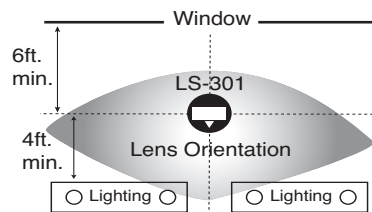
#### Wiring



#### Mounting and Installation



#### Coverage



#### Placement Guidelines

- Mount photocell between 6 and 12 feet (1.8m - 3.7m) from window.
- Do not mount directly above direct/indirect pendant fixtures. Mount at least 4 feet (1.2m) from pendant fixtures.

#### Ordering Information

Catalog No.	Description	Input Voltage
<input type="checkbox"/> LS-301	Dimming Photosensor	24 VDC
<input type="checkbox"/> LSR-301-S	Setup Remote Control (2 AAA batteries included)	
<input type="checkbox"/> LSR-301-P	Occupant Remote Control (2 AAA batteries included)	

LS-301 works with Watt Stopper power packs

Watt Stopper/Legrand®  
Pub. No. 17504



## UT-300 Low Voltage Ultrasonic Occupancy Sensor

Architecturally appealing  
low profile appearance

SmartSet™ automatically  
selects optimal time delay  
and sensitivity

Ultrasonic diffusers give  
more comprehensive  
coverage



Accepts low voltage  
switch input for  
manual-ON operation

Depluggable terminal  
wiring for quick and  
easy installation

Walk-through mode  
increases savings potential

PROJECT
LOCATION/TYPE

### Product Overview

#### Description

Watt Stopper/Legrand's low profile UT-300 ultrasonic occupancy sensor automatically turns lighting on and off based on occupancy. The sensor mounts on the ceiling with a flat, unobtrusive appearance and provides 360° coverage.

#### Operation

The UT-300 operates on 24 VDC, VAC or halfwave rectified. It uses the Doppler Principle and high frequency [40 KHz] ultrasound to sense occupancy and automatically turn lighting on. When no occupancy is detected for the length of the time delay, lighting automatically turns off. For manual-ON operation, the UT works with a low voltage momentary switch.

#### SmartSet

Using SmartSet™ technology, UT sensors require no adjustment at installation. SmartSet continuously monitors the controlled space to identify usage patterns. With this information, it automatically adjusts time delay and sensitivity settings 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

UT sensors offer excellent control of lighting for many spaces including restrooms, large offices, and open office areas. Also, they can control large partitioned office spaces when configured in zone patterns. The UT sensors' performance combined and ease of installation will provide fast paybacks and many years of energy savings.

### Features

- Advanced control logic based on RISC micro-controller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
  - Walk-through mode turns lights off 3 minutes after the area is initially occupied – ideal for brief visits such as mail delivery
- Advanced Signal Processing Circuitry helps to eliminate false ONs
- Patented ultrasonic diffusion technology spreads coverage to a wider area
- LED indicates occupancy detection
- UT-300 works with low voltage momentary switches for manual control
- DIP switch simplifies sensor adjustments
- Clip mounting system makes ceiling tile installation simple
- Uses depluggable terminal wiring system for quick and easy installation
- Available with isolated relay for integration with BAS or HVAC



www.wattstopper.com  
800.879.8585

Project: The Franklin Care Center  
Jennifer Curley  
April 5, 2006

# DALI equipment Occupancy Sensor



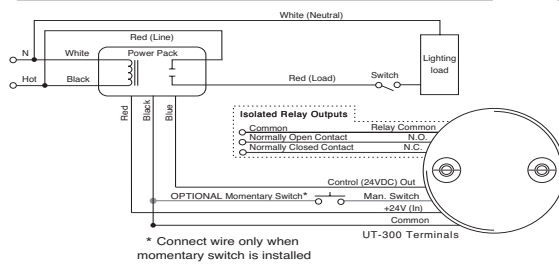
### UT-300 Technical Information

#### Specifications

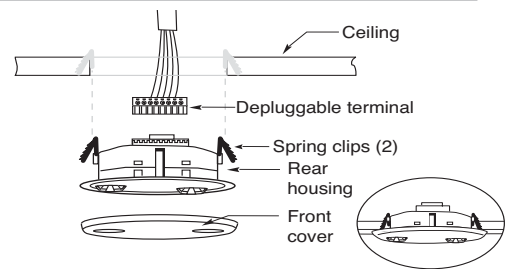
- 24 VDC/VAC
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), walk-through, test-mode
- Ultrasonic frequency of 40 kHz
- UT-300 contains isolated relay with N/O and N/C outputs; rated for 1 Amp at 30 VDC/VAC
- Mounting options: ceiling tile; 4 square junction box with double gang mudring
- Units per power pack: UT-300 up to 2(B), up to 3 (BZ); UT-305 up to 3 (B), up to 4 (BZ)
- Dimensions: 4.5" diameter x 1.02" deep (114.3mm x 25.9mm)
- UL and CUL listed; five year warranty

#### Wiring & Mounting

##### Wiring & Controls

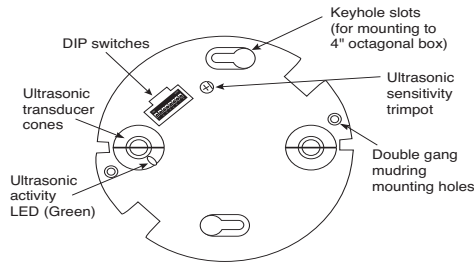


##### Ceiling Mounting



#### Controls & Settings

##### Product Controls



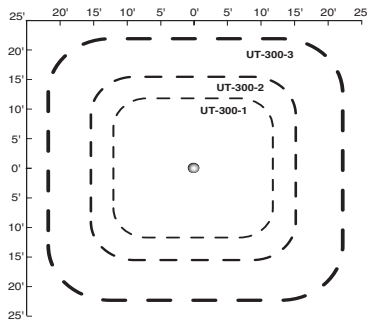
##### DIP Switch Settings

<b>On Mode</b>	1	LED 6
Auto On	-	Disabled -
Manual On	●	Enabled ●
<b>Override</b>	2	
Normal	-	● = ON
Override	●	- = OFF
<b>Time Delay</b>	3 4 5	
5 sec/SmartSet	▲	
5 minutes	-	
10 min.	▲	
10 minutes	-	
15 min.	▲	
15 minutes	-	
20 minutes	-	
30 min.	▲	

▲ = Factory Setting  
▲ = walk-through mode

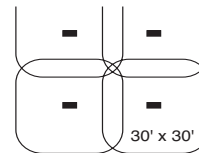
#### Coverage & Placement

##### Coverage



Coverages shown represent half-step walking motion. Actual coverages can vary for each application depending on the shape and use of space and the obstacles present. Coverage may be reduced if product is mounted greater than 12 feet high.

##### Placement



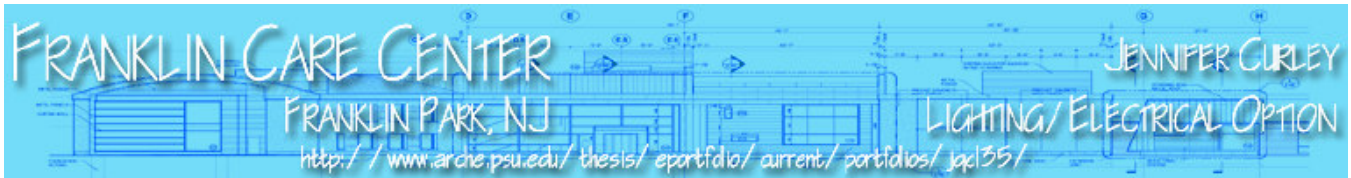
A typical layout for an open office space would be to place UT sensors so they control zones that overlap. For partitioned spaces, a typical zone is about 25' x 25' with an overlap on the coverages that senses motion up to 30' x 30'.

#### Ordering Information

Catalog No.	Voltage	Current	Coverage	Feature
UT-300-1	24 VDC	40 mA	500 ft <sup>2</sup> (46.5 m <sup>2</sup> )	Isolated relay
UT-300-2	24 VDC	40 mA	1000 ft <sup>2</sup> (92.9 m <sup>2</sup> )	Isolated relay
UT-300-3	24 VDC	45 mA	2000 ft <sup>2</sup> (185.8 m <sup>2</sup> )	Isolated relay
UT-305-1	24 VDC	30 mA	500 ft <sup>2</sup> (46.5 m <sup>2</sup> )	
UT-305-2	24 VDC	30 mA	1000 ft <sup>2</sup> (92.9 m <sup>2</sup> )	
UT-305-3	24 VDC	35 mA	2000 ft <sup>2</sup> (185.8 m <sup>2</sup> )	

Watt Stopper/Legrand®  
Pub. No. 16902

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



# Appendix B :

# CM Breadth Cost Analysis

Existing Equipment for DP-RP											
Panelboard	Feeder length per wire in ft	Conductor	Price per wire LF	Total price of wire	Conduit	Price LF	Total conduit price	Circuit breaker	Price each	Transformer	Price each
Kitchen	220	4#2, 1#2 ground	\$198.00	\$2,178.00	1 1/4"	\$5.35	\$1,177.00	100A	\$281.00	n/a	n/a
RP-1A	316	4#2, 1#2 ground	\$198.00	\$3,128.40	1 1/4"	\$5.35	\$1,690.60	100A	\$281.00	n/a	n/a
RP-1B	542	4#2, 1#2 ground	\$198.00	\$5,365.80	1 1/4"	\$5.35	\$2,899.70	100A	\$281.00	n/a	n/a
RP-1C	954	4#2, 1#2 ground	\$198.00	\$9,444.60	1 1/4"	\$5.35	\$5,103.90	100A	\$281.00	n/a	n/a
RP-1D	888	4#2, 1#2 ground	\$198.00	\$8,791.20	1 1/4"	\$5.35	\$4,750.80	100A	\$281.00	n/a	n/a
RP-2A	868	4#2, 1#2 ground	\$198.00	\$8,593.20	1 1/4"	\$5.35	\$4,643.80	100A	\$281.00	n/a	n/a
MDP-1	327	4#3/0, 1#3/0 ground	\$380.00	\$6,213.00	2"	\$7.80	\$2,550.60	200A	\$900.00	n/a	n/a
										300 KVA	\$13,000.00
<b>Subtotals</b>				<b>\$43,714.20</b>	<b>\$22,816.40</b>			<b>\$2,586.00</b>		<b>\$13,000.00</b>	
										<b>Total Price</b>	<b>\$82,116.60</b>

Redesign Equipment for DP-RP											
Panelboard	Feeder length per wire in ft	Conductor	Price per wire LF	Total price of wire	Conduit	Price LF	Total conduit price	Circuit breaker	Price each	Transformer	Price each
Kitchen	220	4#8, 1#8 ground	\$84.00	\$924.00	3/4"	\$2.86	\$629.20	40A	\$181.00	45 KVA	\$3,575.00
RP-1A	316	4#8, 1#8 ground	\$84.00	\$1,327.20	3/4"	\$2.86	\$903.76	40A	\$181.00	45 KVA	\$3,575.00
RP-1B	542	4#8, 1#8 ground	\$84.00	\$2,276.40	3/4"	\$2.86	\$1,550.12	40A	\$181.00	45 KVA	\$3,575.00
RP-1C	954	4#8, 1#8 ground	\$84.00	\$4,006.80	3/4"	\$2.86	\$2,728.44	40A	\$181.00	45 KVA	\$3,575.00
RP-1D	888	4#8, 1#8 ground	\$84.00	\$3,729.60	3/4"	\$2.86	\$2,539.68	40A	\$181.00	45 KVA	\$3,575.00
RP-2A	868	4#8, 1#8 ground	\$84.00	\$3,645.60	3/4"	\$2.86	\$2,482.48	40A	\$181.00	45 KVA	\$3,575.00
MDP-1	327	4#3, 1#3 ground	\$169.00	\$2,763.15	1 1/4"	\$5.35	\$1,749.45	70A	\$225.00	75 KVA	\$4,950.00
<b>Subtotals</b>				<b>\$18,672.75</b>	<b>\$12,583.13</b>			<b>\$1,311.00</b>		<b>\$26,400.00</b>	
										<b>Total Price</b>	<b>\$58,966.88</b>

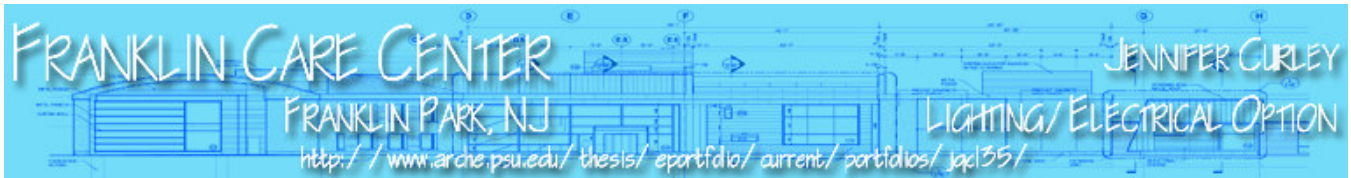
Existing Equipment for DP-EC													
Panelboard	Feeder length per wire in ft	Conductor	Price per wire CLF	Total price of wire	Conduit	Price LF	Total conduit price	Circuit breaker	Price each	Transformer	Price each	Distribution Board	Price
EC-CA	395	4#2, 1#2 ground, 1#2ig	\$198.00	\$4,692.60	1 1/2"	\$6.45	\$2,547.75	100A	\$281.00	n/a	n/a	n/a	n/a
EC-1A	224	4#2, 1#2 ground, 1#2ig	\$198.00	\$2,661.12	1 1/2"	\$6.45	\$1,444.80	100A	\$281.00	n/a	n/a	n/a	n/a
EC-1B	542	4#2, 1#2 ground, 1#2ig	\$198.00	\$6,438.96	1 1/2"	\$6.45	\$3,495.90	100A	\$281.00	n/a	n/a	n/a	n/a
EC-1C	934	4#2, 1#2 ground, 1#2ig	\$198.00	\$11,095.92	1 1/2"	\$6.45	\$6,024.30	100A	\$281.00	n/a	n/a	n/a	n/a
EC-1D	870	4#2, 1#2 ground, 1#2ig	\$198.00	\$10,335.60	1 1/2"	\$6.45	\$5,611.50	100A	\$281.00	n/a	n/a	n/a	n/a
EC-1D1	758	4#6, 1#6 ground, 1#6ig	\$113.00	\$5,139.24	1 1/2"	\$6.45	\$4,889.10	70A	\$225.00	n/a	n/a	n/a	n/a
EC-2A	417	4#2, 1#2 ground, 1#2ig	\$198.00	\$4,953.96	1 1/2"	\$6.45	\$2,689.65	100A	\$281.00	n/a	n/a	n/a	n/a
EC-2B	546	4#2, 1#2 ground, 1#2ig	\$198.00	\$6,486.48	1 1/2"	\$6.45	\$3,521.70	100A	\$281.00	n/a 300 KVA	n/a \$13,000.00	n/a 208/120V 3p, 4w 800A	n/a \$3,225.00
<b>Subtotals</b>				<b>\$51,803.88</b>			<b>\$30,224.70</b>		<b>\$2,192.00</b>		<b>\$13,000.00</b>		<b>\$3,225.00</b>
												<b>Total Price</b>	<b>\$100,445.58</b>

Redesign Equipment for DP-EC													
Panelboard	Feeder length per wire in ft	Conductor	Price per wire LF	Total price of wire	Conduit	Price LF	Total conduit price	Circuit breaker	Price each	Transformer	Price each	Distribution Board	Price
EC-CA	395	4#8, 1#8 ground, 1#8ig	\$84.00	\$1,990.80	1"	\$3.97	\$1,568.15	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-1A	224	4#8, 1#8 ground, 1#8ig	\$84.00	\$1,128.96	1"	\$3.97	\$889.28	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-1B	542	4#8, 1#8 ground, 1#8ig	\$84.00	\$2,731.68	1"	\$3.97	\$2,151.74	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-1C	934	4#8, 1#8 ground, 1#8ig	\$84.00	\$4,707.36	1"	\$3.97	\$3,707.98	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-1D	870	4#8, 1#8 ground, 1#8ig	\$84.00	\$4,384.80	1"	\$3.97	\$3,453.90	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-1D1	758	4#10, 1#10 ground, 1#10ig	\$62.00	\$2,819.76	3/4"	\$2.86	\$2,167.88	30A	\$181.00	30 KVA	\$3,075.00	n/a	n/a
EC-2A	417	4#8, 1#8 ground, 1#8ig	\$84.00	\$2,101.68	1"	\$3.97	\$1,655.49	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
EC-2B	546	4#8, 1#8 ground, 1#8ig	\$84.00	\$2,751.84	1"	\$3.97	\$2,167.62	40A	\$181.00	45 KVA	\$3,575.00	n/a	n/a
<b>Subtotals</b>				<b>\$22,616.88</b>			<b>\$17,762.04</b>		<b>\$1,448.00</b>		<b>\$28,100.00</b>	480/208 3p, 4w, 400A	<b>\$2,475.00</b>
												<b>Total Price</b>	<b>\$72,401.92</b>



**Total Cost of Systems**

	<b>Existing System</b>	<b>Redesign</b>
<b>Conductor</b>	\$95,518.08	\$41,289.63
<b>Conduit</b>	\$53,041.10	\$30,345.17
<b>Circuit breakers</b>	\$4,778.00	\$2,759.00
<b>Transformers</b>	\$26,000.00	\$54,500.00
<b>Resized distribution panel EC</b>	\$3,225.00	\$2,475.00
<b>Total Cost</b>	<b>\$182,562.18</b>	<b>\$131,368.80</b>



# Appendix C :

# Calculations to obtain LEED

# Credits 6.1 and 6.2

## Existing Window Design

Non group perimeter space					
Room Name	Room Number	Greater than 75% perimeter	Sqft that is perimeter space	# of Windows	Type of window
Office	LW050C	Yes	43	0	
Office	LW050B	Yes	100	1	hopper
Social Service	50	No	267	3	fixed frame
Mod. Patient Rm E1-A	NB057	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB059	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB061	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB063	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB065	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB067	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB069	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB071	Yes	212	1	Hopper
Patient Rm-3	NB075	Yes	241	1	Hopper
Patient Rm-3	NB077	Yes	241	1	Hopper
Patient Rm-3	NB079	Yes	241	1	Hopper
Patient Rm-3	NB081	Yes	241	1	Hopper
Patient Rm-3	NB083	Yes	241	1	Hopper
Patient Rm-3	NB085	Yes	241	1	Hopper
Patient Rm-3	NB087	Yes	241	1	Hopper
Patient Rm-3	NB089	Yes	241	1	Hopper
Patient Rm-3	NB091	Yes	241	1	Hopper
Patient Rm-3	NB093	Yes	241	1	Hopper
Medical Prep	NC095d	Yes	140	1	Fixed frame
Nurse Office	NC095b	Yes	169	1	fixed frame
New Patient Rm-5	NB101	Yes	208	1	Hopper
Ex. Patient Rm-E2	NC103	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC105	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC107	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC109	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC113	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC115	Yes	219	1	Hopper

Ex. Patient Rm-E2	NC117	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC131	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC135	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC137	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC139	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC141	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC143	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC145	Yes	219	1	Hopper
Nurse Office	ND121b	Yes	115	1	Fixed frame
Medical Prep Office	ND121d	Yes	173	1	fixed frame
Office	DA161b	Yes	82	0	
Patient Rm-1	NA021	Yes	155	1	Hopper
Patient Rm-1	NA023	Yes	155	1	Hopper
Patient Rm-1	NA025	Yes	155	1	Hopper
Patient Rm-1	NA027	Yes	155	1	Hopper
Patient Rm-1	NA029	Yes	155	1	Hopper
Patient Rm-1	NA031	Yes	155	1	Hopper
Patient Rm-1	NA033	Yes	155	1	Hopper
Patient Rm-1	NA005	Yes	155	1	Hopper
Patient Rm-1	NA007	Yes	155	1	Hopper
Patient Rm-1	NA009	Yes	155	1	Hopper
Patient Rm-1	NA011	Yes	155	1	Hopper
Patient Rm-1	NA013	Yes	155	1	Hopper
Patient Rm-1	NA015	Yes	155	1	Hopper
Patient Rm-1	NA017	Yes	155	1	Hopper
Patient Rm-2	NA020	Yes	261	1	Hopper
Patient Rm-2	NA022	Yes	261	1	Hopper
Patient Rm-2	NA024	Yes	261	1	Hopper
Patient Rm-2	NA026	Yes	261	1	Hopper
Patient Rm-2	NA028	Yes	261	1	Hopper
Patient Rm-2	NA030	Yes	261	1	Hopper
Patient Rm-2	NA032	Yes	261	1	Hopper
Patient Rm-2	NA034	Yes	261	1	Hopper
Patient Rm-2	NA04	Yes	261	1	Hopper
Patient Rm-2	NA06	Yes	261	1	Hopper
Patient Rm-2	NA08	Yes	261	1	Hopper
Patient Rm-2	NA10	Yes	261	1	Hopper

Patient Rm-2	NA12	Yes	261	1	Hopper
Patient Rm-2	NA14	Yes	261	1	Hopper
Patient Rm-2	NA16	Yes	261	1	Hopper
Patient Rm-2	NA18	Yes	261	1	Hopper
Nurse Office	NA019b	Yes	85	1	Fixed frame
New Patient Rm-4	NB056	Yes	220	1	Hopper
Mod Patient Rm-1	NB058	Yes	220	1	Hopper
Mod Patient Rm-E1	NB060	Yes	220	1	Hopper
Patient Rm-3	NB076	Yes	241	1	Hopper
Patient Rm-3	NB078	Yes	241	1	Hopper
Patient Rm-3	NB080	Yes	241	1	Hopper
Patient Rm-3	NB082	Yes	241	1	Hopper
Ex. Patient Rm-E2	NB104	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB106	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB108	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB110	Yes	219	1	Hopper
Office	EA148	Yes	182	1	Fixed frame
Ex. Patient Rm-E2	ND134	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND136	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND138	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND140	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND142	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND144	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND112	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC114	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND116	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND118	Yes	219	1	Hopper
Development Office	EA171	Yes	535	1	Fixed frame
Office	EA168b	Yes	122	1	Fixed frame
Office	EA168d	Yes	122	1	Fixed frame
Office	EA168g	Yes	220	1	Fixed frame
Office	EA161j	Yes	111	1	Fixed frame
Office	EA161m	Yes	120	1	Fixed frame
Office	EA167	Yes	260	1	Fixed frame
Office	EA172	Yes	281	1	Fixed frame
Admin	1689	Yes	230	1	Fixed frame
Office	169a	Yes	220	1	Fixed frame

Office	169c	Yes	220	1	Fixed frame
Office	169f	Yes	220	1	Fixed frame
Office	169h	Yes	200	1	Fixed frame
Office	169k	Yes	200	1	Fixed frame
Patient Rm-1	NA205	Yes	155	1	Hopper
Patient Rm-1	NA207	Yes	155	1	Hopper
Patient Rm-1	NA209	Yes	155	1	Hopper
Patient Rm-1	NA211	Yes	155	1	Hopper
Patient Rm-1	NA213	Yes	155	1	Hopper
Patient Rm-1	NA215	Yes	155	1	Hopper
Patient Rm-1	NA217	Yes	155	1	Hopper
Mod Patient Rm E-1	NB258	Yes	220	1	Hopper
Mod Patient Rm E-1	NB260	Yes	220	1	Hopper
Mod Patient Rm E-1	NB262	Yes	220	1	Hopper
Mod Patient Rm E-1	NB264	Yes	220	1	Hopper
Mod Patient Rm E-1	NB266	Yes	220	1	Hopper
Mod Patient Rm E-1	NB268	Yes	220	1	Hopper
Mod Patient Rm E-1	NB270	Yes	220	1	Hopper
Mod Patient Rm E-1	NB272	Yes	220	1	Hopper
Mod Patient Rm E-1	NB259	Yes	220	1	Hopper
Mod Patient Rm E-1	NB261	Yes	220	1	Hopper
Mod Patient Rm E-1	NB263	Yes	220	1	Hopper
Mod Patient Rm E-1	NB265	Yes	220	1	Hopper
Mod Patient Rm E-1	NB267	Yes	220	1	Hopper
Mod Patient Rm E-1	NB269	Yes	220	1	Hopper
Mod Patient Rm E-1	NB271	Yes	220	1	Hopper
New Patient Rm-4	NB257	Yes	220	1	Hopper
Mod Patient Rm E-1	NB277	Yes	220	1	Hopper
Mod Patient Rm E-1	NB279	Yes	220	1	Hopper
Mod Patient Rm E-1	NB281	Yes	220	1	Hopper
Mod Patient Rm E-1	NB283	Yes	220	1	Hopper
Mod Patient Rm E-1	NB285	Yes	220	1	Hopper
Mod Patient Rm E-1	NB287	Yes	220	1	Hopper
Mod Patient Rm E-1	NB276	Yes	220	1	Hopper
Mod Patient Rm E-1	NB278	Yes	220	1	Hopper
Mod Patient Rm E-1	NB280	Yes	220	1	Hopper
Mod Patient Rm E-1	NB282	Yes	220	1	Hopper

Mod Patient Rm E-1	NB284	Yes	220	1	Hopper
Mod Patient Rm E-1	NB286	Yes	220	1	Hopper
Mod Patient Rm E-1	NB288	Yes	220	1	Hopper
New Patient Rm-4	NB280	Yes	220	1	Hopper
New Patient Rm-4	NB282	Yes	220	1	Hopper
New Patient Rm-4	NB281	Yes	220	1	Hopper
New Patient Rm-4	NB289	Yes	220	1	Hopper
Nurse Office	EA252b	Yes	108	1	Fixed frame
Patient Rm	NA221	Yes	177	1	Hopper
Patient Rm-1	NA223	Yes	155	1	Hopper
Patient Rm-1	NA225	Yes	155	1	Hopper
Patient Rm-1	NA227	Yes	155	1	Hopper
Patient Rm-1	NA229	Yes	155	1	Hopper
Patient Rm-1	NA231	Yes	155	1	Hopper
Patient Rm-1	NA233	Yes	155	1	Hopper
Patient Rm-2	NA220	Yes	261	1	Hopper
Patient Rm-2	NA222	Yes	261	1	Hopper
Patient Rm-2	NA224	Yes	261	1	Hopper
Patient Rm-2	NA226	Yes	261	1	Hopper
Patient Rm-2	NA228	Yes	261	1	Hopper
Patient Rm-2	NA230	Yes	261	1	Hopper
Patient Rm-2	NA232	Yes	261	1	Hopper
Patient Rm-2	NA234	Yes	261	1	Hopper
Nurse Office	NA219b	Yes	85	1	Fixed frame
Patient Rm-2	NA204	Yes	261	1	Hopper

<b>Total Area</b>	<b>34827</b>
<b>Operable windows needed</b>	<b>174</b>
<b>Operable windows in design</b>	<b>139</b>
<b>Operable windows to be added</b>	<b>35</b>

group perimeter space

Room Name	Room Number	Area perimeter	Area Non-perimeter	# Windows	Window Type
Patient Lounge -C	NC097	Yes	1612	1	Fixed Frame
Lounge	111	Yes	175	1	Hopper
Patient Lounge-D	ND125	Yes	1658	1	Fixed Frame
Beauty Shop	LB147	Yes	333	1	Fixed Frame
Lounge	DA161G	Yes	407	1	Fixed Frame
West Lounge A	NA035	Yes	317	4	Casement
East Lounge A	NA001	Yes	317	4	Casement
Visitor's Lounge	DV146	Yes	1100	3	Fixed Frame
West Lounge D	235	Yes	317	4	Casement
East Lounge A	NA201	Yes	317	4	Casement

<b>Total Area</b>	<b>6553</b>
<b>Operable windows needed</b>	<b>33</b>
<b>Operable windows in design</b>	<b>17</b>
<b>Operable windows to be added</b>	<b>16</b>

group non-perimeter space

Room Name	Room Number	Area perimeter	Area Non-perimeter	# Windows	Window Type
Patient Lounge	NB073	1300	1000	2	Fixed Frame
Dining/Meeting	DMB156	615	460	2	Fixed Frame
Adult Daycare	DA161	1014	786	2	Fixed Frame
Conference	170	191	81	1	Fixed Frame
Adult Daycare	DC152	790	815	2	Fixed Frame
Dining Rm	247	1330	2314	8	Fixed Frame
Meeting	NB252a	0	239	0	
Meeting	NA019a	0	164	0	
Conference	DT159q	0	163	0	

<b>Total Perimeter Area</b>	<b>5240</b>
<b>Operable windows needed</b>	<b>27</b>
<b>Operable windows in design</b>	<b>17</b>
<b>Operable windows to be added</b>	<b>10</b>



## New Window Design for LEED credit 6.1

Non group perimeter space					
Room Name	Room Number	Greater than 75% perimeter	Sqft that is perimeter space	# of Windows	Type of window
Office	LW050C	Yes	43	1	Hopper
Office	LW050B	Yes	100	1	hopper
Social Service	50	No	267	3	casement
Mod. Patient Rm E1-A	NB057	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB059	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB061	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB063	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB065	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB067	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB069	Yes	212	1	Hopper
Mod. Patient Rm E1-A	NB071	Yes	212	1	Hopper
Patient Rm-3	NB075	Yes	241	1	Hopper
Patient Rm-3	NB077	Yes	241	1	Hopper
Patient Rm-3	NB079	Yes	241	1	Hopper
Patient Rm-3	NB081	Yes	241	1	Hopper
Patient Rm-3	NB083	Yes	241	1	Hopper
Patient Rm-3	NB085	Yes	241	1	Hopper
Patient Rm-3	NB087	Yes	241	1	Hopper
Patient Rm-3	NB089	Yes	241	1	Hopper
Patient Rm-3	NB091	Yes	241	1	Hopper
Patient Rm-3	NB093	Yes	241	1	Hopper
Medical Prep	NC095d	Yes	140	1	Fixed frame
Nurse Office	NC095b	Yes	169	1	Hopper
New Patient Rm-5	NB101	Yes	208	1	Hopper
Ex. Patient Rm-E2	NC103	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC105	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC107	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC109	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC113	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC115	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC117	Yes	219	1	Hopper

Highlighted windows have been changed in this design

Ex. Patient Rm-E2	NC131	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC135	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC137	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC139	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC141	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC143	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC145	Yes	219	1	Hopper
Nurse Office	ND121b	Yes	115	1	Hopper
Medical Prep Office	ND121d DA161b	Yes Yes	173 82	1 0	fixed frame
Patient Rm-1	NA021	Yes	155	1	Hopper
Patient Rm-1	NA023	Yes	155	1	Hopper
Patient Rm-1	NA025	Yes	155	1	Hopper
Patient Rm-1	NA027	Yes	155	1	Hopper
Patient Rm-1	NA029	Yes	155	1	Hopper
Patient Rm-1	NA031	Yes	155	1	Hopper
Patient Rm-1	NA033	Yes	155	1	Hopper
Patient Rm-1	NA005	Yes	155	1	Hopper
Patient Rm-1	NA007	Yes	155	1	Hopper
Patient Rm-1	NA009	Yes	155	1	Hopper
Patient Rm-1	NA011	Yes	155	1	Hopper
Patient Rm-1	NA013	Yes	155	1	Hopper
Patient Rm-1	NA015	Yes	155	1	Hopper
Patient Rm-1	NA017	Yes	155	1	Hopper
Patient Rm-2	NA020	Yes	261	1	Hopper
Patient Rm-2	NA022	Yes	261	1	Hopper
Patient Rm-2	NA024	Yes	261	1	Hopper
Patient Rm-2	NA026	Yes	261	1	Hopper
Patient Rm-2	NA028	Yes	261	1	Hopper
Patient Rm-2	NA030	Yes	261	1	Hopper
Patient Rm-2	NA032	Yes	261	1	Hopper
Patient Rm-2	NA034	Yes	261	1	Hopper
Patient Rm-2	NA04	Yes	261	1	Hopper
Patient Rm-2	NA06	Yes	261	1	Hopper
Patient Rm-2	NA08	Yes	261	1	Hopper
Patient Rm-2	NA10	Yes	261	1	Hopper
Patient Rm-2	NA12	Yes	261	1	Hopper

Patient Rm-2	NA14	Yes	261	1	Hopper
Patient Rm-2	NA16	Yes	261	1	Hopper
Patient Rm-2	NA18	Yes	261	1	Hopper
Nurse Office	NA019b	Yes	85	1	Hopper
New Patient Rm-4	NB056	Yes	220	1	Hopper
Mod Patient Rm-1	NB058	Yes	220	1	Hopper
Mod Patient Rm-E1	NB060	Yes	220	1	Hopper
Patient Rm-3	NB076	Yes	241	1	Hopper
Patient Rm-3	NB078	Yes	241	1	Hopper
Patient Rm-3	NB080	Yes	241	1	Hopper
Patient Rm-3	NB082	Yes	241	1	Hopper
Ex. Patient Rm-E2	NB104	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB106	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB108	Yes	219	1	Hopper
Ex. Patient Rm-E2	NB110	Yes	219	1	Hopper
Office	EA148	Yes	182	1	Hopper
Ex. Patient Rm-E2	ND134	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND136	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND138	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND140	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND142	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND144	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND112	Yes	219	1	Hopper
Ex. Patient Rm-E2	NC114	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND116	Yes	219	1	Hopper
Ex. Patient Rm-E2	ND118	Yes	219	1	Hopper
Development Office	EA171	Yes	535	6	Hopper
Office	EA168b	Yes	122	1	Hopper
Office	EA168d	Yes	122	1	Hopper
Office	EA168g	Yes	220	1	Hopper
Office	EA161j	Yes	111	1	Hopper
Office	EA161m	Yes	120	1	Hopper
Office	EA167	Yes	260	1	Hopper
Office	EA172	Yes	281	5	Hopper
Admin	1689	Yes	230	1	Hopper
Office	169a	Yes	220	1	Hopper
Office	169c	Yes	220	1	Hopper

Office	169f	Yes	220	1	Hopper
Office	169h	Yes	200	1	Hopper
Office	169k	Yes	200	1	Hopper
Patient Rm-1	NA205	Yes	155	1	Hopper
Patient Rm-1	NA207	Yes	155	1	Hopper
Patient Rm-1	NA209	Yes	155	1	Hopper
Patient Rm-1	NA211	Yes	155	1	Hopper
Patient Rm-1	NA213	Yes	155	1	Hopper
Patient Rm-1	NA215	Yes	155	1	Hopper
Patient Rm-1	NA217	Yes	155	1	Hopper
Mod Patient Rm E-1	NB258	Yes	220	1	Hopper
Mod Patient Rm E-1	NB260	Yes	220	1	Hopper
Mod Patient Rm E-1	NB262	Yes	220	1	Hopper
Mod Patient Rm E-1	NB264	Yes	220	1	Hopper
Mod Patient Rm E-1	NB266	Yes	220	1	Hopper
Mod Patient Rm E-1	NB268	Yes	220	1	Hopper
Mod Patient Rm E-1	NB270	Yes	220	1	Hopper
Mod Patient Rm E-1	NB272	Yes	220	1	Hopper
Mod Patient Rm E-1	NB259	Yes	220	1	Hopper
Mod Patient Rm E-1	NB261	Yes	220	1	Hopper
Mod Patient Rm E-1	NB263	Yes	220	1	Hopper
Mod Patient Rm E-1	NB265	Yes	220	1	Hopper
Mod Patient Rm E-1	NB267	Yes	220	1	Hopper
Mod Patient Rm E-1	NB269	Yes	220	1	Hopper
Mod Patient Rm E-1	NB271	Yes	220	1	Hopper
New Patient Rm-4	NB257	Yes	220	1	Hopper
Mod Patient Rm E-1	NB277	Yes	220	1	Hopper
Mod Patient Rm E-1	NB279	Yes	220	1	Hopper
Mod Patient Rm E-1	NB281	Yes	220	1	Hopper
Mod Patient Rm E-1	NB283	Yes	220	1	Hopper
Mod Patient Rm E-1	NB285	Yes	220	1	Hopper
Mod Patient Rm E-1	NB287	Yes	220	1	Hopper
Mod Patient Rm E-1	NB276	Yes	220	1	Hopper
Mod Patient Rm E-1	NB278	Yes	220	1	Hopper
Mod Patient Rm E-1	NB280	Yes	220	1	Hopper
Mod Patient Rm E-1	NB282	Yes	220	1	Hopper
Mod Patient Rm E-1	NB284	Yes	220	1	Hopper

Mod Patient Rm E-1	NB286	Yes	220	1	Hopper
Mod Patient Rm E-1	NB288	Yes	220	1	Hopper
New Patient Rm-4	NB280	Yes	220	1	Hopper
New Patient Rm-4	NB282	Yes	220	1	Hopper
New Patient Rm-4	NB281	Yes	220	1	Hopper
New Patient Rm-4	NB289	Yes	220	1	Hopper
Nurse Office	EA252b	Yes	108	1	Hopper
Patient Rm	NA221	Yes	177	1	Hopper
Patient Rm-1	NA223	Yes	155	1	Hopper
Patient Rm-1	NA225	Yes	155	1	Hopper
Patient Rm-1	NA227	Yes	155	1	Hopper
Patient Rm-1	NA229	Yes	155	1	Hopper
Patient Rm-1	NA231	Yes	155	1	Hopper
Patient Rm-1	NA233	Yes	155	1	Hopper
Patient Rm-2	NA220	Yes	261	1	Hopper
Patient Rm-2	NA222	Yes	261	1	Hopper
Patient Rm-2	NA224	Yes	261	1	Hopper
Patient Rm-2	NA226	Yes	261	1	Hopper
Patient Rm-2	NA228	Yes	261	1	Hopper
Patient Rm-2	NA230	Yes	261	1	Hopper
Patient Rm-2	NA232	Yes	261	1	Hopper
Patient Rm-2	NA234	Yes	261	1	Hopper
Nurse Office	NA219b	Yes	85	1	Hopper
Patient Rm-2	NA204	Yes	261	1	Hopper

<b>Total Area</b>	<b>34827</b>
<b>Operable windows needed</b>	<b>174</b>
<b>Operable windows in design</b>	<b>174</b>
<b>Operable windows to be added</b>	<b>0</b>

group perimeter space					
Room Name	Room Number	Area perimeter	Area Non-perimeter	# Windows	Window Type
Patient Lounge -C	NC097	Yes	1612	4	Casement
Lounge	111	Yes	175	1	Hopper
Patient Lounge-D	ND125	Yes	1658	4	Casement
Beauty Shop	LB147	Yes	333	1	Fixed Frame
Lounge	DA161G	Yes	407	1	Casement
West Lounge A	NA035	Yes	317	5	Casement
East Lounge A	NA001	Yes	317	5	Casement
Visitor's Lounge	DV146	Yes	1100	3	Casement
West Lounge D	235	Yes	317	5	Casement
East Lounge A	NA201	Yes	317	5	Casement

<b>Total Area</b>	<b>6553</b>
<b>Operable windows needed</b>	<b>33</b>
<b>Operable windows in design</b>	<b>33</b>
<b>Operable windows to be added</b>	<b>0</b>

group non-perimeter space					
Room Name	Room Number	Area perimeter	Area Non-perimeter	# Windows	Window Type
Patient Lounge	NB073	1300	1000	4	Casement
Dining/Meeting	DMB156	615	460	4	Casement and hopper
Adult Daycare	DA161	1014	786	3	Casement
Conference	170	191	81	1	Hopper
Adult Daycare	DC152	790	815	3	Casement
Dining Rm	247	1330	2314	12	Hopper
Meeting	NB252a	0	239	0	
Meeting	NA019a	0	164	0	
Conference	DT159q	0	163	0	

<b>Total Perimeter Area</b>	<b>5240</b>
<b>Operable windows needed</b>	<b>26</b>
<b>Operable windows in design</b>	<b>27</b>
<b>Operable windows to be added</b>	<b>-1</b>

## Lighting Control Calculation for LEED credit 6.1

Non group perimeter space				
Room Name	Room Number	Greater than 75% perimeter	Sqft that is perimeter space	# Ltg. Controls
Office	LW050C	Yes	43	4
Office	LW050B	Yes	100	4
Social Service	50	No	267	4
Mod. Patient Rm E1-A	NB057	Yes	212	2
Mod. Patient Rm E1-A	NB059	Yes	212	2
Mod. Patient Rm E1-A	NB061	Yes	212	2
Mod. Patient Rm E1-A	NB063	Yes	212	2
Mod. Patient Rm E1-A	NB065	Yes	212	2
Mod. Patient Rm E1-A	NB067	Yes	212	2
Mod. Patient Rm E1-A	NB069	Yes	212	2
Mod. Patient Rm E1-A	NB071	Yes	212	2
Patient Rm-3	NB075	Yes	241	2
Patient Rm-3	NB077	Yes	241	2
Patient Rm-3	NB079	Yes	241	2
Patient Rm-3	NB081	Yes	241	2
Patient Rm-3	NB083	Yes	241	2
Patient Rm-3	NB085	Yes	241	2
Patient Rm-3	NB087	Yes	241	2
Patient Rm-3	NB089	Yes	241	2
Patient Rm-3	NB091	Yes	241	2
Patient Rm-3	NB093	Yes	241	2
Medical Prep	NC095d	Yes	140	4
Nurse Office	NC095b	Yes	169	4
New Patient Rm-5	NB101	Yes	208	2
Ex. Patient Rm-E2	NC103	Yes	219	2
Ex. Patient Rm-E2	NC105	Yes	219	2
Ex. Patient Rm-E2	NC107	Yes	219	2
Ex. Patient Rm-E2	NC109	Yes	219	2
Ex. Patient Rm-E2	NC113	Yes	219	2
Ex. Patient Rm-E2	NC115	Yes	219	2
Ex. Patient Rm-E2	NC117	Yes	219	2

Ex. Patient Rm-E2	NC131	Yes	219	2
Ex. Patient Rm-E2	NC135	Yes	219	2
Ex. Patient Rm-E2	NC137	Yes	219	2
Ex. Patient Rm-E2	NC139	Yes	219	2
Ex. Patient Rm-E2	NC141	Yes	219	2
Ex. Patient Rm-E2	NC143	Yes	219	2
Ex. Patient Rm-E2	NC145	Yes	219	2
Nurse Office	ND121b	Yes	115	4
Medical Prep Office	ND121d DA161b	Yes Yes	173 82	4 4
Patient Rm-1	NA021	Yes	155	2
Patient Rm-1	NA023	Yes	155	2
Patient Rm-1	NA025	Yes	155	2
Patient Rm-1	NA027	Yes	155	2
Patient Rm-1	NA029	Yes	155	2
Patient Rm-1	NA031	Yes	155	2
Patient Rm-1	NA033	Yes	155	2
Patient Rm-1	NA005	Yes	155	2
Patient Rm-1	NA007	Yes	155	2
Patient Rm-1	NA009	Yes	155	2
Patient Rm-1	NA011	Yes	155	2
Patient Rm-1	NA013	Yes	155	2
Patient Rm-1	NA015	Yes	155	2
Patient Rm-1	NA017	Yes	155	2
Patient Rm-2	NA020	Yes	261	2
Patient Rm-2	NA022	Yes	261	2
Patient Rm-2	NA024	Yes	261	2
Patient Rm-2	NA026	Yes	261	2
Patient Rm-2	NA028	Yes	261	2
Patient Rm-2	NA030	Yes	261	2
Patient Rm-2	NA032	Yes	261	2
Patient Rm-2	NA034	Yes	261	2
Patient Rm-2	NA04	Yes	261	2
Patient Rm-2	NA06	Yes	261	2
Patient Rm-2	NA08	Yes	261	2
Patient Rm-2	NA10	Yes	261	2
Patient Rm-2	NA12	Yes	261	2



Patient Rm-2	NA14	Yes	261	2
Patient Rm-2	NA16	Yes	261	2
Patient Rm-2	NA18	Yes	261	2
Nurse Office	NA019b	Yes	85	3
New Patient Rm-4	NB056	Yes	220	2
Mod Patient Rm-1	NB058	Yes	220	2
Mod Patient Rm-E1	NB060	Yes	220	2
Patient Rm-3	NB076	Yes	241	2
Patient Rm-3	NB078	Yes	241	2
Patient Rm-3	NB080	Yes	241	2
Patient Rm-3	NB082	Yes	241	2
Ex. Patient Rm-E2	NB104	Yes	219	2
Ex. Patient Rm-E2	NB106	Yes	219	2
Ex. Patient Rm-E2	NB108	Yes	219	2
Ex. Patient Rm-E2	NB110	Yes	219	2
Office	EA148	Yes	182	4
Ex. Patient Rm-E2	ND134	Yes	219	2
Ex. Patient Rm-E2	ND136	Yes	219	2
Ex. Patient Rm-E2	ND138	Yes	219	2
Ex. Patient Rm-E2	ND140	Yes	219	2
Ex. Patient Rm-E2	ND142	Yes	219	2
Ex. Patient Rm-E2	ND144	Yes	219	2
Ex. Patient Rm-E2	ND112	Yes	219	2
Ex. Patient Rm-E2	NC114	Yes	219	2
Ex. Patient Rm-E2	ND116	Yes	219	2
Ex. Patient Rm-E2	ND118	Yes	219	2
Development Office	EA171	Yes	535	4
Office	EA168b	Yes	122	4
Office	EA168d	Yes	122	4
Office	EA168g	Yes	220	4
Office	EA161j	Yes	111	4
Office	EA161m	Yes	120	4
Office	EA167	Yes	260	4
Office	EA172	Yes	281	4
Admin	1689	Yes	230	4
Office	169a	Yes	220	4
Office	169c	Yes	220	4

Office	169f	Yes	220	4
Office	169h	Yes	200	4
Office	169k	Yes	200	4
Patient Rm-1	NA205	Yes	155	2
Patient Rm-1	NA207	Yes	155	2
Patient Rm-1	NA209	Yes	155	2
Patient Rm-1	NA211	Yes	155	2
Patient Rm-1	NA213	Yes	155	2
Patient Rm-1	NA215	Yes	155	2
Patient Rm-1	NA217	Yes	155	2
Mod Patient Rm E-1	NB258	Yes	220	2
Mod Patient Rm E-1	NB260	Yes	220	2
Mod Patient Rm E-1	NB262	Yes	220	2
Mod Patient Rm E-1	NB264	Yes	220	2
Mod Patient Rm E-1	NB266	Yes	220	2
Mod Patient Rm E-1	NB268	Yes	220	2
Mod Patient Rm E-1	NB270	Yes	220	2
Mod Patient Rm E-1	NB272	Yes	220	2
Mod Patient Rm E-1	NB259	Yes	220	2
Mod Patient Rm E-1	NB261	Yes	220	2
Mod Patient Rm E-1	NB263	Yes	220	2
Mod Patient Rm E-1	NB265	Yes	220	2
Mod Patient Rm E-1	NB267	Yes	220	2
Mod Patient Rm E-1	NB269	Yes	220	2
Mod Patient Rm E-1	NB271	Yes	220	2
New Patient Rm-4	NB257	Yes	220	2
Mod Patient Rm E-1	NB277	Yes	220	2
Mod Patient Rm E-1	NB279	Yes	220	2
Mod Patient Rm E-1	NB281	Yes	220	2
Mod Patient Rm E-1	NB283	Yes	220	2
Mod Patient Rm E-1	NB285	Yes	220	2
Mod Patient Rm E-1	NB287	Yes	220	2
Mod Patient Rm E-1	NB276	Yes	220	2
Mod Patient Rm E-1	NB278	Yes	220	2
Mod Patient Rm E-1	NB280	Yes	220	2
Mod Patient Rm E-1	NB282	Yes	220	2
Mod Patient Rm E-1	NB284	Yes	220	2

Mod Patient Rm E-1	NB286	Yes	220	2
Mod Patient Rm E-1	NB288	Yes	220	2
New Patient Rm-4	NB280	Yes	220	2
New Patient Rm-4	NB282	Yes	220	2
New Patient Rm-4	NB281	Yes	220	2
New Patient Rm-4	NB289	Yes	220	2
Nurse Office	EA252b	Yes	108	2
Patient Rm	NA221	Yes	177	2
Patient Rm-1	NA223	Yes	155	2
Patient Rm-1	NA225	Yes	155	2
Patient Rm-1	NA227	Yes	155	2
Patient Rm-1	NA229	Yes	155	2
Patient Rm-1	NA231	Yes	155	2
Patient Rm-1	NA233	Yes	155	2
Patient Rm-2	NA220	Yes	261	2
Patient Rm-2	NA222	Yes	261	2
Patient Rm-2	NA224	Yes	261	2
Patient Rm-2	NA226	Yes	261	2
Patient Rm-2	NA228	Yes	261	2
Patient Rm-2	NA230	Yes	261	2
Patient Rm-2	NA232	Yes	261	2
Patient Rm-2	NA234	Yes	261	2
Nurse Office	NA219b	Yes	85	4
Patient Rm-2	NA204	Yes	261	2

<b>Total Area</b>	<b>34827</b>
<b>Lighting controls required</b>	<b>174</b>
<b>Lighting controls in design</b>	<b>381</b>

Non group non-perimeter space					
Room Name	Room Number	Area sqft	Lighting Control Type	# Occupants	# Controls
Med. Prep	NA019d	131	One DALI group control	1	2
Physical Therapy	DT159a	1500	One DALI group control and 2 photosensors	15	6
Occupational Therapy	DT159b	340	One DALI group control and one occupancy sensor	2	4
Reception	DT159s	100	One DALI group control	3	2
Director	DT159r	100	One DALI group control and one occupancy sensor	1	4
Speech	DT159n	125	One DALI group control and one occupancy sensor	1	4
Phycatrist	DT159k	125	One DALI group control and one occupancy sensor	1	4

<b>Number of Occupants</b>	<b>22</b>
<b>Lighting controls required</b>	<b>11</b>
<b>Lighting controls in design</b>	<b>26</b>

## Group Perimeter Spaces

Room Name	Room Number	Area Sqft	Lighting Control Type	# Controls
Patient Lounge -C	NC097	1612	One DALI group control, one occupancy sensor, one photosensor	6
Lounge	111	175	One DALI group control and one occupancy sensor	4
Patient Lounge-D	ND125	1658	One DALI group control, one occupancy sensor, one photosensor	6
Beauty Shop	LB147	333	One automatic on/off switch and one DALI group controller	4
Lounge	DA161G	407	One DALI group control and one occupancy sensor	4
West Lounge A	NA035	317	One DALI group control, one occupancy sensor, one photosensor	6
East Lounge A	NA001	317	One DALI group control, one occupancy sensor, one photosensor	6
Visitor's Lounge	DV146	1100	One DALI group control and one occupancy sensor	4
West Lounge D	235	317	One DALI group control, one occupancy sensor, one photosensor	6
East Lounge A	NA201	317	One DALI group control, one occupancy sensor, one photosensor	6
			<b>Area sqft</b>	<b>6553</b>
			<b>Lighting controls required</b>	<b>30</b>
			<b>Lighting controls in design</b>	<b>52</b>

Group non-Perimeter Spaces					
Room Name	Room Number	Area perimeter Sqft	Area non perimeter	Lighting Control Type	# Controls
Patient Lounge	NB073	1300	1000	One DALI group control and one occupany sensor	4
Dining/Meeting	DMB156	615	460	One DALI group control and one occupany sensor	4
Adult Daycare	DA161	1014	786	One DALI group control and one automatic on/off switch	4
Conference	170	191	81	One DALI group and scene control and one occupancy sensor	4
Adult Daycare	DC152	790	815	One DALI group control and one automatic on/off switch	4
Dining Rm	247	1330	2314	One DALI group control and one occupany sensor	4
Meeting	NB2529	0	239	One DALI group control and one occupany sensor	4
Meeting	NA019a	0	164	One DALI group control and one occupany sensor	4
Conference	DT159q	0	163	One DALI group control and one occupany sensor	4

Lighting controls required	27
Lighting controls in design	36

## Non-Perimeter Spaces

Room Name	Room Number	Area sqft	Lighting Control Type	# Occupants	Airflow controls	Temperature Controls
Med. Prep	NA019d	131	One DALI group control	1	1	1
Physical Therapy	DT159a	1500	One DALI group control and 2 photosensors	15	4	5
Occupational Therapy	DT159b	340	One DALI group control and one occupancy sensor	2	2	1
Reception	DT159s	100	One DALI group control	3	1	1
Director	DT159r	100	One DALI group control and one occupancy sensor	1	1	1
Speech	DT159n	125	One DALI group control and one occupancy sensor	1	1	1
Phycatrist	DT159k	125	One DALI group control and one occupancy sensor	1	1	1

**Total Controls**

**11**

**11**