Virginia, USA

Hotel and Conference Center

Senior Thesis Final Report

Spring 2011

Haley Darst

Lighting | Electrical

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Hotel and Conference Center

http://www.engr.psu.edu/ae/thesis/portfolios/2011/hld5013

Virginia, USA

Project Information

174,000 sq. ft.
8 stories total
$50 million building cost
constructed fall '08-summer '10

Project Team

Owner: Information withheld
Contractor: Balfour Beatty
Architect: Gensler
Lighting: HLB Lighting Design
MEP: GHT Limited
Structural: Thornton Tomasetti and Abel Consulting Engineers

Architecture

The recently opened Hotel and Conference Center, on the outskirts of one of the country's most respected universities, embodies the notions of comfort and relaxation with professionalism and academic success. Rich colors and woodwork dominate each of the spaces alike, reminding one of the outdoors and the campus setting which provided inspiration to the interior décor. The elegant inn houses 148 guest rooms, a lounge and bar area, a restaurant, a ballroom, 24-hour fitness facility, and various meeting and conference rooms in the convention center.

Lighting | Electrical

Using an array of different luminaires and light sources, the lighting maintains the hotel's elegance and sophistication. Fluorescent, halogen, metal halide, and LED lamps are all utilized. Various decorative pendants, sconces, and chandeliers also help to enhance the overall image and experience of the patrons. Electrically, a high voltage service and pad mounted transformer is provided by the utility, feeding to the 3000A, 480Y/277V, 3 phase, 4 wire main switchboard. A generator producing 150 kW of continuous standby power at 480Y/277V provides emergency power for lighting and life safety.

Mechanical

The mechanical system consists of fourteen roof top units on the conference center roof, ranging from about 1200-5600 CFM. Two outdoor air units, sized at 6500 and 8600 CFM respectively, are located on the roof of the hotel. The roof top units and outdoor air units both provide gas heat. Two make-up air units designated for the kitchen and laundry rooms provide fresh, supply air to these rooms. Nine out of eleven of the water source heat pump units are used. Additionally, a cooling tower found directly outside of the building is sized at 292 tons.

Structural

The structural system in the building is made up of load bearing metal panel walls, ideal for modular or repetitious construction. The hotel portion of the building consists of concrete columns varying in size and the conference center half has steel columns encased in concrete. The floor system is 5" LW concrete with 2" steel deck. Concrete masonry is used in the stairwells for lateral resistance.

Haley Darst lighting | electrical

Executive Summary

The following report includes specific details concerning the work that was completed during the entire spring 2011 semester for the AE Senior Thesis Capstone Project. It contains a brief background and project description of the Hotel and Conference Center, a recently opened hotel on the outskirts of one of Virginia's finest universities.

For the lighting depth, four spaces were redesigned, including an exterior space, a circulation space, a special purpose space, and a large work space. The new lighting design incorporates concepts regarding the architect's vision of bringing the exterior Virginia landscape indoors into every space. Using data and information from the technical reports completed in the fall of 2010, a complete solution was specified for each of the four types of rooms. Design criteria was set out for each space, lighting plans and mounting details were completed, equipment was selected, calculations were done using lighting software, controls were selected, and the overall performance of each system was evaluated.

The existing electrical design was then modified to meet the change in lighting design for each room. Branch circuiting panels, feeders, and voltage drop was resized for each design. The short circuit was also calculated for one electrical path. Two other depth topics were considered here as well, including an analysis of aluminum versus copper feeders and whether or not a photovoltaic array should be implemented for the building.

Two other separate breadths were completed per requirement of the program. As a part of the Ballroom's lighting design concept, daylight was brought into the Ballroom by the use of clerestories. With their placement, two structural columns had to be moved. The column heights and framing was checked after this move, too.

The proposed lighting design changes are not only aesthetically pleasing, but integrate the initial design concepts and goals from start to finish. Energy efficiency, flexibility, and overall pleasing lighting design generally drove the design from start to finish.

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Project Background

Construction on the $50 million dollar Hotel and Conference Center began in the fall of 2008 and finished in the summer of 2010. The building recently opened and is an 8-story, 174,000 square foot facility located on the outskirts of one of the country's most respected universities in Virginia. Although the exterior façade of the building does not boast any discrepancies from the architecture of the university, the handsome interior spaces display the epitome of bringing the campus landscape indoors. Rich colors and woodwork dominate each of the spaces alike, reminding one of the outdoors and the campus setting which provided inspiration to the interior décor. The Hotel and Conference Center provides a luxurious and warm atmosphere to all patrons, whether residing in the hotel or merely attending a business or private event in the conference center. The elegant inn houses 148 guest rooms, a lounge and bar area, a restaurant, ballroom, 24-hour fitness facility, and various meeting rooms in the conference center. Hotel guests not only become immersed in the sophisticated atmosphere, but are reminded of the spirit and vivacity of the university when visiting the facility.

Building Statistics

Building name:	Hotel and Conference Center
Location:	Virginia, USA
Occupancy type:	Mixed use – Hotel (R-1) and Conference (A-3)
Size:	174,000 sq. ft.
Number of stories:	7 stories above grade 1 parking level below grade

Primary project team:

Owner:	Information withheld
Contractor:	Balfour Beatty http://www.balfourbeatty.com/
Architect:	Gensler http://www.gensler.com/
MEP Engineers:	GHT Limited http://www.ghtltd.com/
Interior Designer:	Gensler http://www.gensler.com/
Structural Engineers:	Thornton Tomasetti http://www.thorntontomasetti.com/ Abel Consulting Engineers http://www.acepa.net/
Civil Engineer:	Christopher Consultants http://www.ccl-eng.com/mainpeo.htm
Lighting Designer:	Horton Lees Brogden Lighting Design http://www.hlblighting.com/
Landscape Architect:	ParkerRodriguez http://parkerrodriguez.com/index.cfm
Fire/Life-Safety Consultant:	Schirmer Engineering http://www.aonfpe.com/home.aspx
Vertical Transportation:	Lerch Bates & Associates http://www.lerchbates.com/
AV/Acoustics/IT/Telecom/Security:	Cerami & Associates http://www.ceramiassociates.com/

Dates of construction:	Fall 2008 – Summer 2010
Cost information:	$50 million
Project delivery method:	GMP

Architecture:

Design/functional components:

The recently opened Hotel and Conference Center, on the outskirts of one of the country's most respected universities, embodies the notions of comfort and relaxation with professionalism and academic success. The Hotel and Conference Center provides a luxurious and warm atmosphere to all patrons, whether residing in the hotel or merely attending a business or private event in the conference center. Although the exterior façade of the facility does not boast any discrepancies from the architecture of the university, the handsome interior spaces display the epitome of bringing the campus landscape indoors. Rich colors and woodwork dominate each of the spaces alike, reminding one of the outdoors and the campus setting which provided inspiration to the interior décor. The elegant inn houses 148 guest rooms, a lounge and bar area, a restaurant, ballroom, 24-hour fitness facility, and various meeting rooms in the conference center. Hotel guests not only become immersed in the sophisticated atmosphere, but are reminded of the spirit and vivacity of the university when visiting.

Codes:

2006 | Virginia Uniform Statewide Building Code (VUSBC)
2004 | Commonwealth of Virginia Construction and Professional Services Manual (CPSM)
2005 | National Electrical Code (NFPA 70)

Zoning:

Historical requirements: There are no historical requirements for this area.

Building envelope:

The building façade is constructed of two different types of brick, mainly to differentiate between the public first floor of the hotel and the private hotel room floors of the rest of the building. Glazed aluminum windows and entrance ways line both the convention center and hotel halves of the building. There are also metal canopies over the hotel and conference center entryways.

The roofing consists of multiple-ply built-up roof membrane with thermal insulation.

Construction:

The development team of the Hotel and Conference Center was University Hotel Partners, LLC, a joint venture between Balfour Beatty Construction and Concord Eastridge, Inc. Construction began in the fall of 2008 and was completed in the summer of 2010. The total cost of the building was $50 million, $42 million of that being a part of the construction budget (all hard costs). In order to raise excitement and awareness of the university's new hotel, hard hat tours were frequently coordinated for the university's administrators, donors, and local business leaders.

Electrical:

A pad-mounted transformer owned by the utility company provides power for the Hotel and Conference Center. The main switchboard delivers 3000A at 480Y/277V, 3PH, 4W, which feeds to an 800A panel. This panel steps down the voltage and feeds panels and loads on each of the six floors of the hotel tower. The main switchboard also distributes power to numerous pieces of kitchen, laundry, and lighting equipment. A diesel generator producing 150kW of continuous standby power at 480Y/277V provides back-up power for emergency lighting, the fire alarm system, one of the building elevators at a time, the fire pump, and non-emergency power.

Lighting:

The Hotel and Conference Center in Virginia has a distinct, urbane atmosphere. It is seen through the architecture and the finishes, but more importantly, the lighting. Through the use of coves, branding walls, decorative luminaires, and accent lights, guests feel welcome and relaxed. Halogen lamps are the main lamp-type used, enhancing the rich hues and finishes in the building using warmer tones of light. Dimming systems are implemented into the public facilities of the building. ASHRAE 90.1 lighting power density requirements and IESNA illuminance recommendations were closely examined in each space. With the use of warm colored light on the furniture, innovative ways to highlight signage and accentuate millwork, and decorative fixtures, the Hotel and Conference Center promotes relaxation and elegance through its lighting design.

Mechanical:

The mechanical system consists of fourteen roof top units on the conference center roof, ranging from about 1200-5600 CFM, and two outdoor air units on the roof of the hotel tower, sized at 6500 and 8600 CFM. Both the roof top units and outdoor air units provide gas heat. Two make-up air units are designated for the kitchen and laundry rooms, providing fresh, supply air. There are eleven water source heat pump units but only nine are being used. Additionally, a cooling tower found directly outside of the building is sized at 292 tons.

Structural:

The overall structure of the building is made up of load bearing and non-load bearing metal panel walls, ideal for modular or repetitious construction. Lateral loads are handled utilizing concrete shear walls. The hotel tower consists of concrete columns varying in size, whereas the conference center half of the building has steel columns encased in concrete. The floor system is 5" LW concrete with 2" steel deck.

Fire Protection:

Manual fire alarm stations are located at every entrance of the hotel tower and conference center. There are also two per floor in the hotel tower. Speaker and strobe combination units are common in most rooms of the conference center and first floor of the hotel, and there are typically three per guest floor of the hotel as well. In case of emergencies in the hotel tower on the guest floors, magnetic door hold open devices are installed in every elevator lobby. Fire alarm speakers and system smoke detectors are typical in each guestroom. Photo-electric smoke detectors and heat detectors are placed in the service elevator.

Transportation:

The hotel tower of the Hotel and Conference Center has three elevators and two emergency stairwells. Two of the elevators are for general public use and extend from the lower parking level all the way to the seventh floor. The third elevator is used extensively as a service elevator for employees.

Telecommunications:

A main telecommunications room is located in the conference center portion of the building. There is also one telecommunications room per floor of the hotel tower. Voice and data outlets are located on the walls of rooms, although in the more public areas (meeting rooms, ballrooms, etc), they are mounted into the floor. Wall-mounted television outlets are in the Lounge and in all guest rooms. Wireless internet is available in most rooms in the building, including all of the conference center rooms, the lounge, and all of the guest rooms.

Security:

Security systems are very important in hotels. The Hotel and Conference Center implements both an intercom entry and card reader entry into the lower level parking garage. Card readers are also used for the guest elevators, hallways of the conference center, and guest rooms. Exterior cameras are extensively used around the perimeter of the building, especially around the back-of-house area.

Audiovisual Systems:

The use of audiovisual systems is only on the public first floor of the Hotel and Conference Center. Recessed ceiling speakers are located throughout much of this floor, including the main lobby, the Lounge, restaurant, and ballrooms and meeting rooms in the conference center. Both button based and touch panel based control systems are utilized. The Ballroom uses recessed ceiling projection screens, whereas the other typical meeting rooms generally use flat panel displays or projectors. Microphone usage is also prevalent in the conference center portion of the building.

Lighting Depth

Introduction:

"Our concept is to blur the line between interior and exterior and to pull the outdoors indoors."
-Gensler Architecture Group

The Hotel and Conference Center is located outside of one of Virginia's most prestigious universities. Situated in rural Virginia, the site includes dozens of beautiful cedar trees and landscaping, common to the university as well. Through the use of colors and finishes, the natural landscape has already physically been brought into the building. Deep olive greens, bright oranges and reds, and rich gold hues all evoke the ideas of nature inside the building. Floor finishes and architectural shelving units and millwork made from wood and quarry stone all exhibit the natural wooded landscape. Effective lighting design in each space can help to enhance the unique materials and finishes implemented, and further accentuate the interaction between surfaces and light.

Integrating the idea of nature and the beautiful wooded landscape of the university into the lighting design will complement the interior décor of the facility and tailor to the architect's vision for the building.

Four spaces will be analyzed and redesigned. These four spaces include:

1. Exterior facades of both the hotel and conference center, as well as the central courtyard
2. Main Lobby
3. Lounge
4. Ballroom

New lighting designs in each space will focus on the architect's concept of bringing Virginia's outdoor landscape indoors.

Lighting designs for each space will be designed to establish all important qualitative and quantitative design criteria. IESNA recommendations and power density allowances from ASHRAE Standard 90.1 will be acknowledged and met in each space.

Exterior Space | Façade and Courtyard

Space Description:

As guests arrive at the Hotel and Conference Center, they will drive through an exterior courtyard with a triangular shaped plaza. The façade of the Hotel and Conference Center is made up of two types of brick. The public spaces of the building on the first floor all have a more decorative brick with accent bands, while the rest of the hotel tower is clad in brick without accent bands. Precast cornices break up the tower of the hotel into horizontal lines, accentuating the length of the building. Concrete panels beneath the 6'-0" x 6'-8" windows enhance the height of the hotel tower. Glazed aluminum window walls wrap around the first floor of the Hotel and Conference Center, allowing natural light into the public areas of the building.

Activities | Tasks:

- Hotel and Conference Center entrance and drop-off
- Walking
- Sitting outside

Dimensions:

- Building Height:
  - 71'-7" to roof of Hotel Tower
  - 21'-0" to roof of Conference Center
- Length of Façade:
  - 208'-0" total length of front of Hotel
  - 181'-6" total length of front of Conference Center
- Area = approximately 19,000 sq. ft.
- Perimeter = approximately 970 ft.

Surface Materials:

- Brick
- Precast decorative frames with metal
- Spandrel panels and screen walls
- Glazed aluminum window walls (double pane, clear, Low-E insulating glazing with a transmission value of 0.46)
- Metal entry canopies

Exterior Plans:

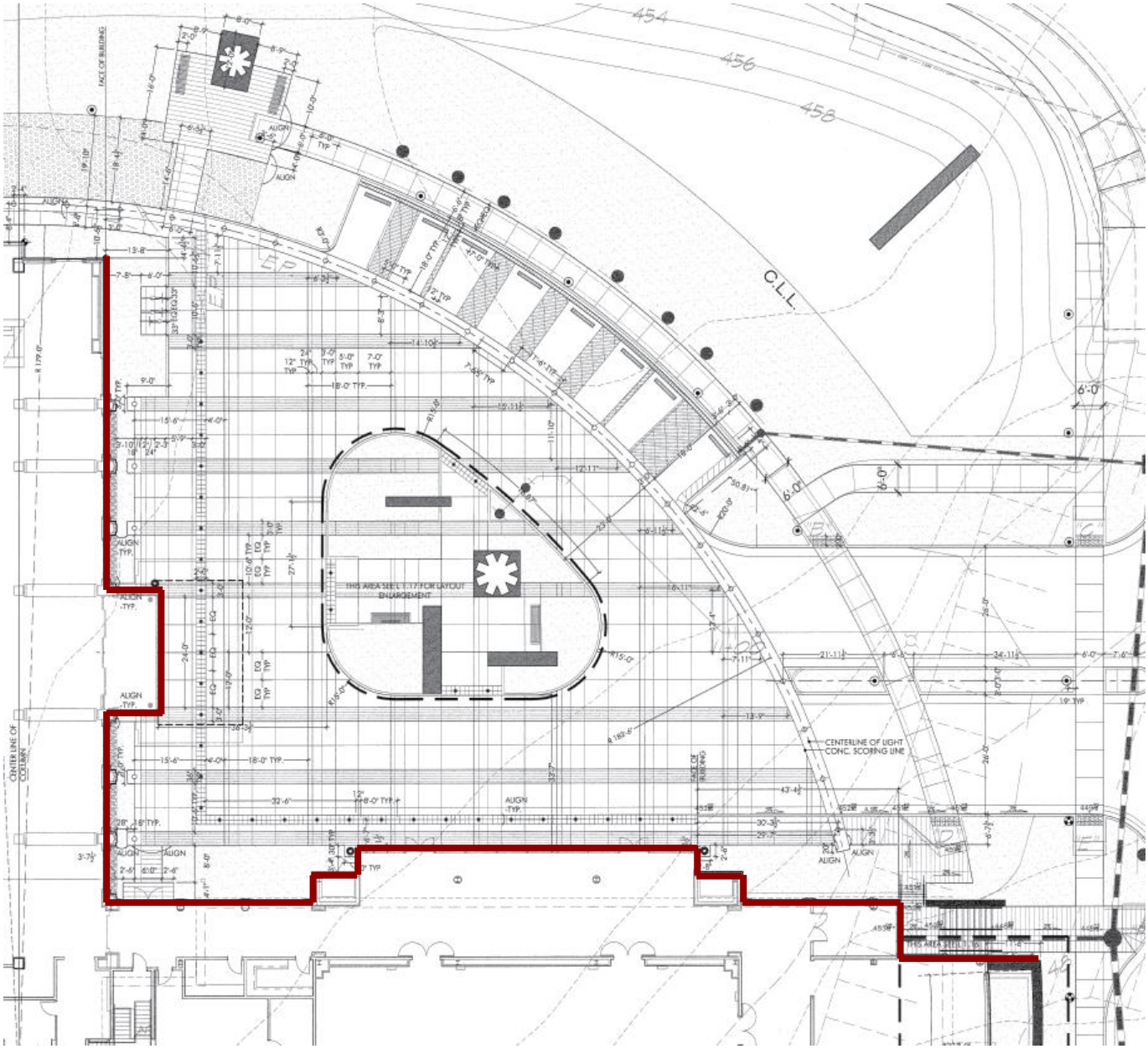


Figure 1: Outline of Building Facade

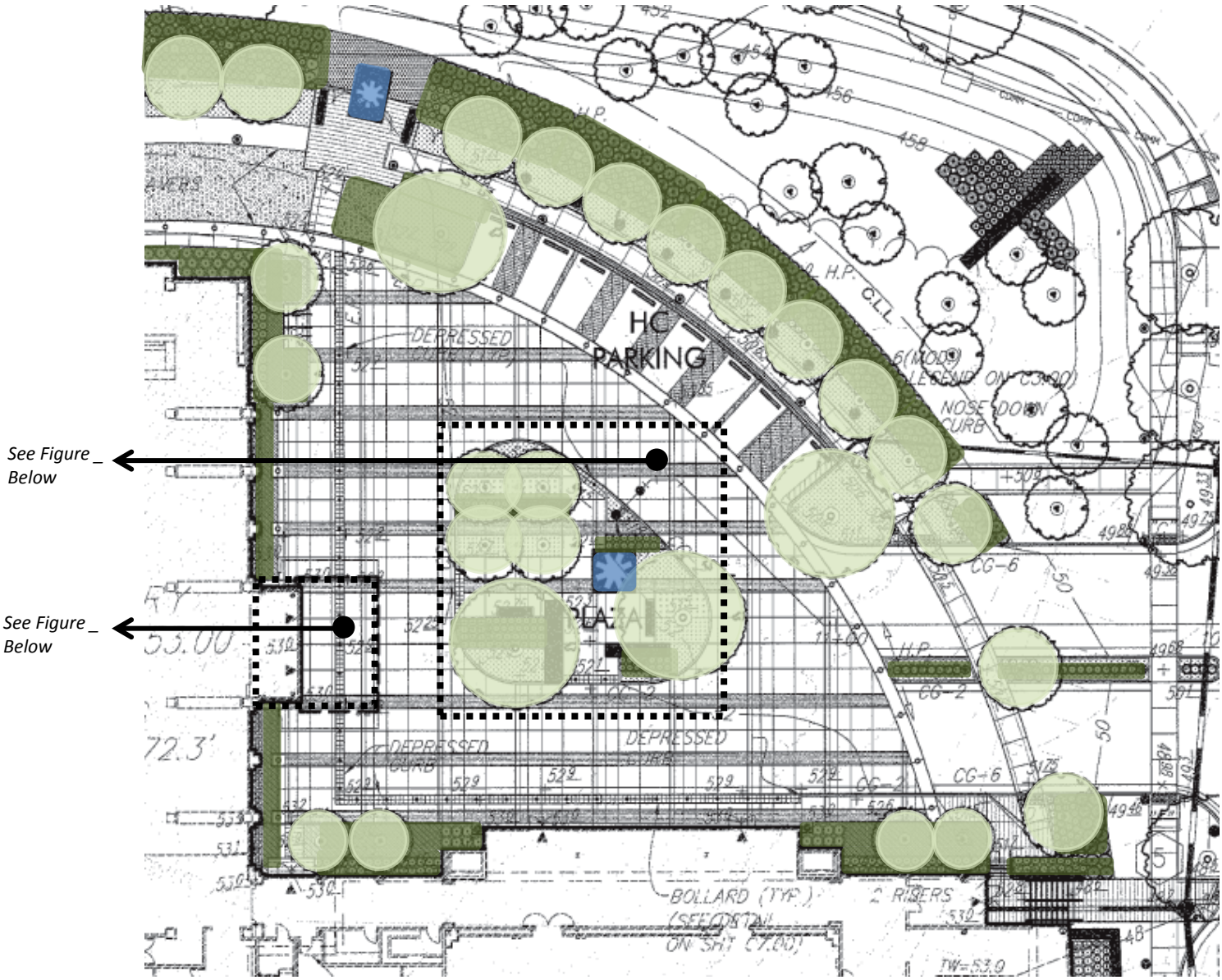


Figure 2: Landscaping Plan in Courtyard | Important landscaping noted, including unknown sculptures

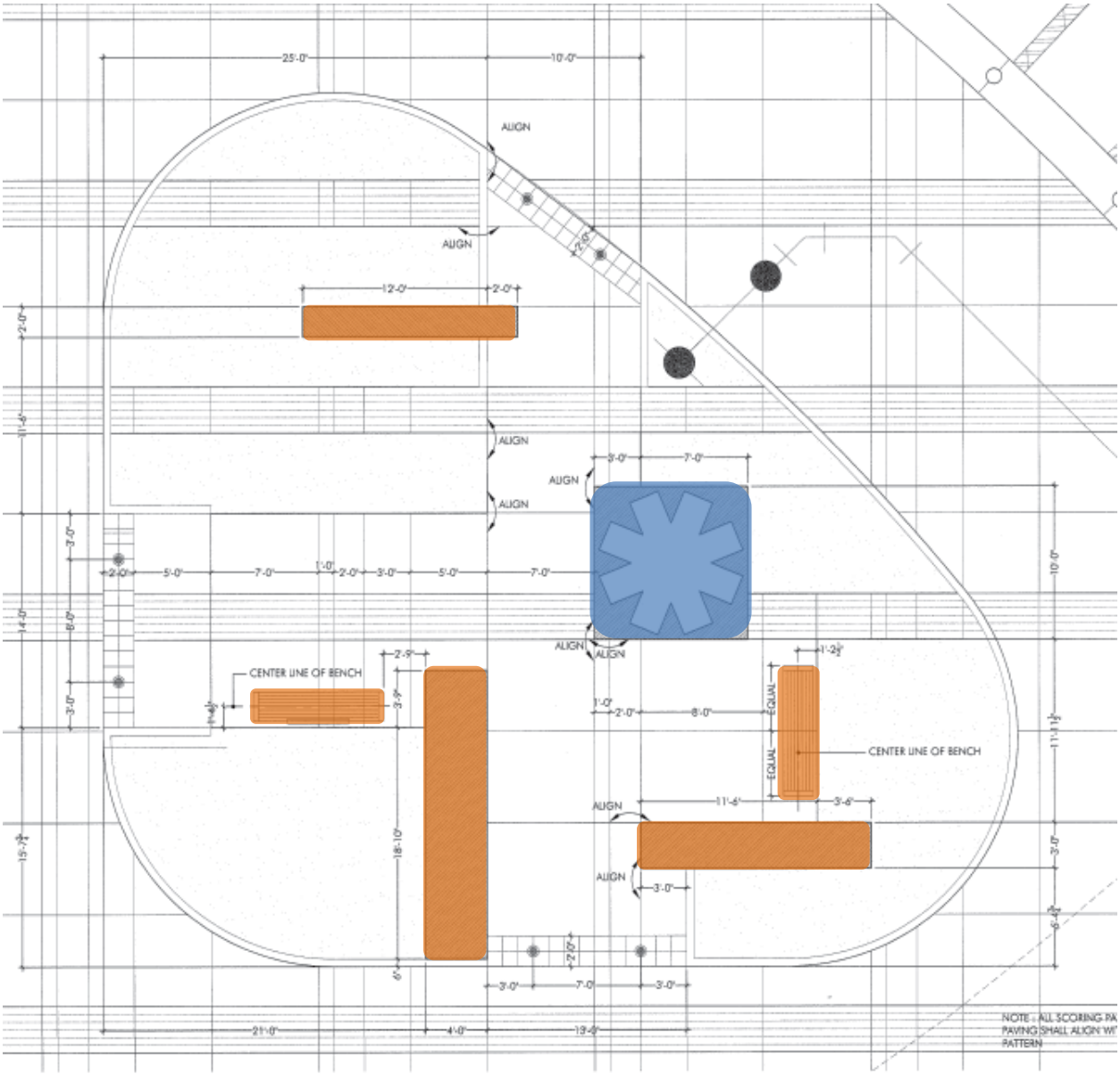


Figure 3: Central Plaza | Benches and unknown sculpture identified

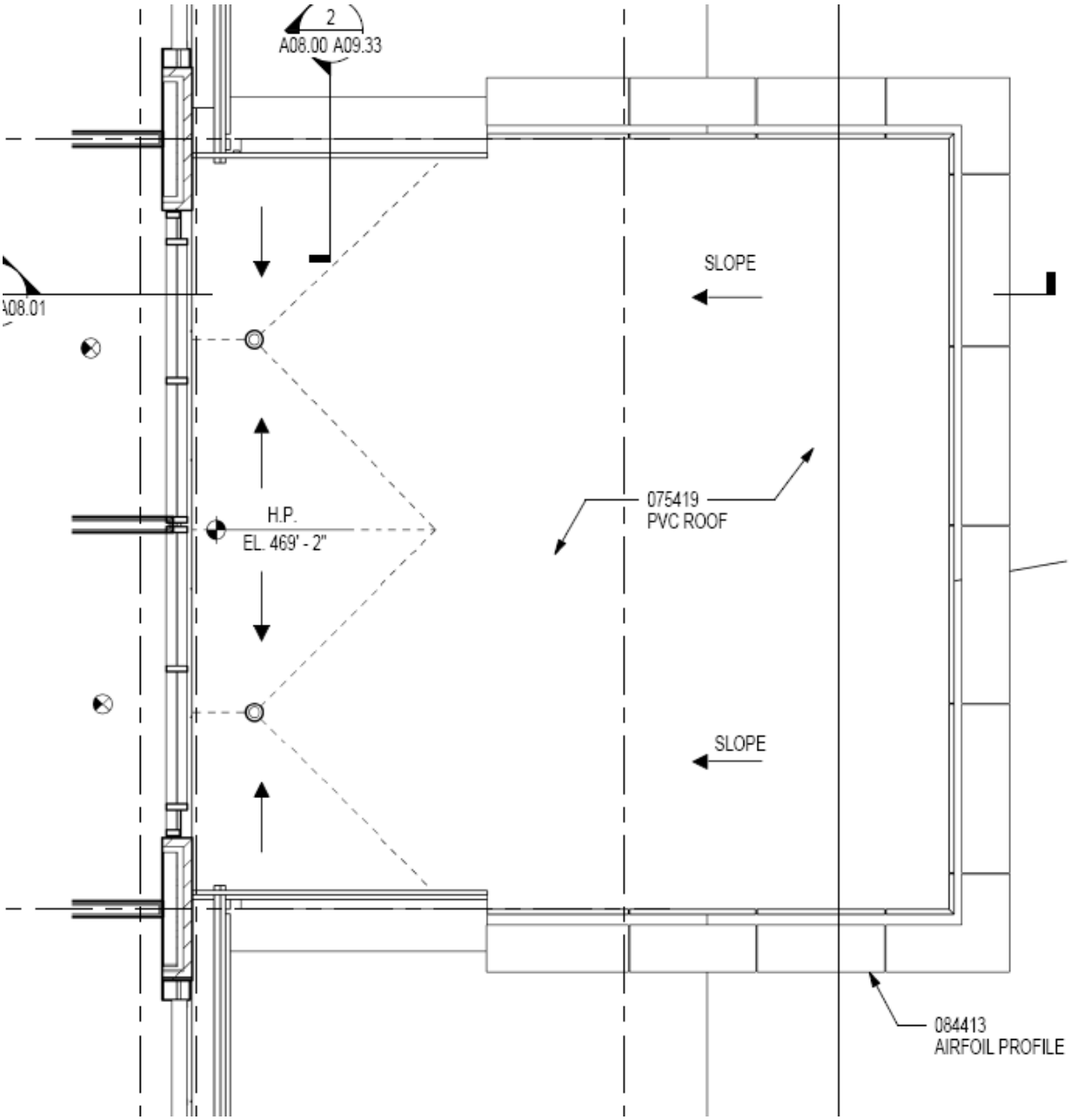


Figure 4: Plan of Hotel Canopy

Exterior Elevations:

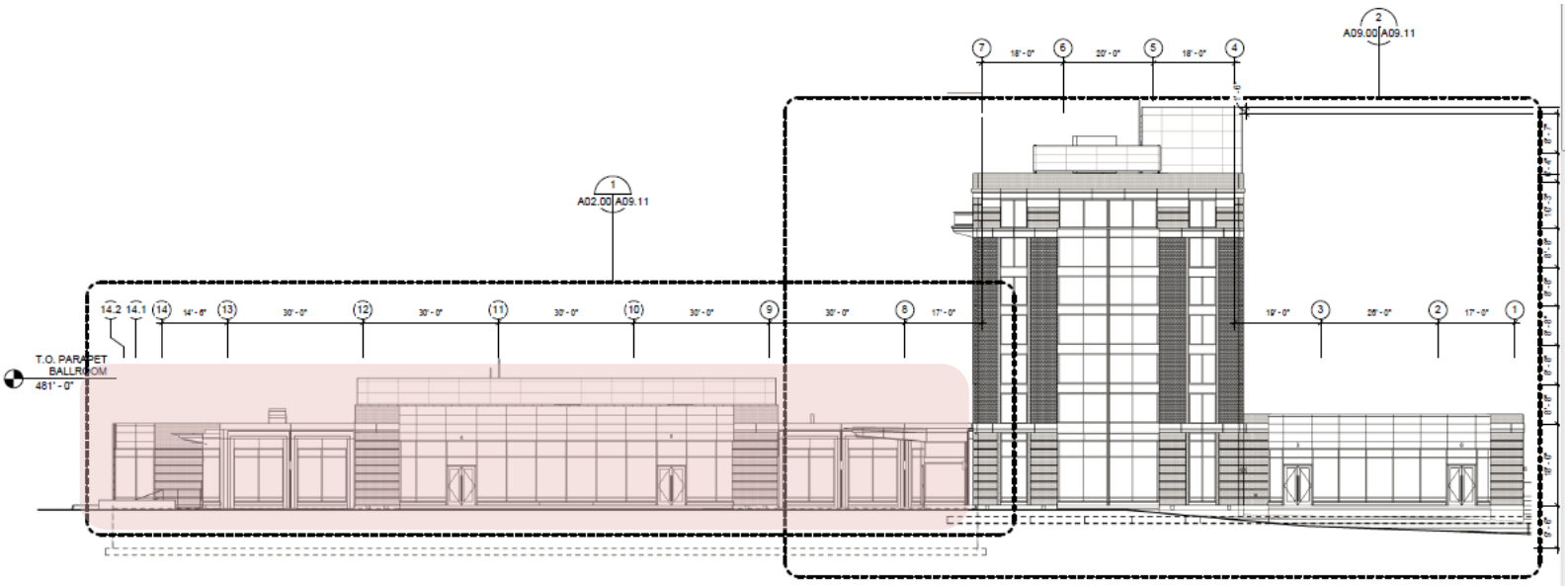


Figure 5: North Elevation | Front Facade of Conference Center

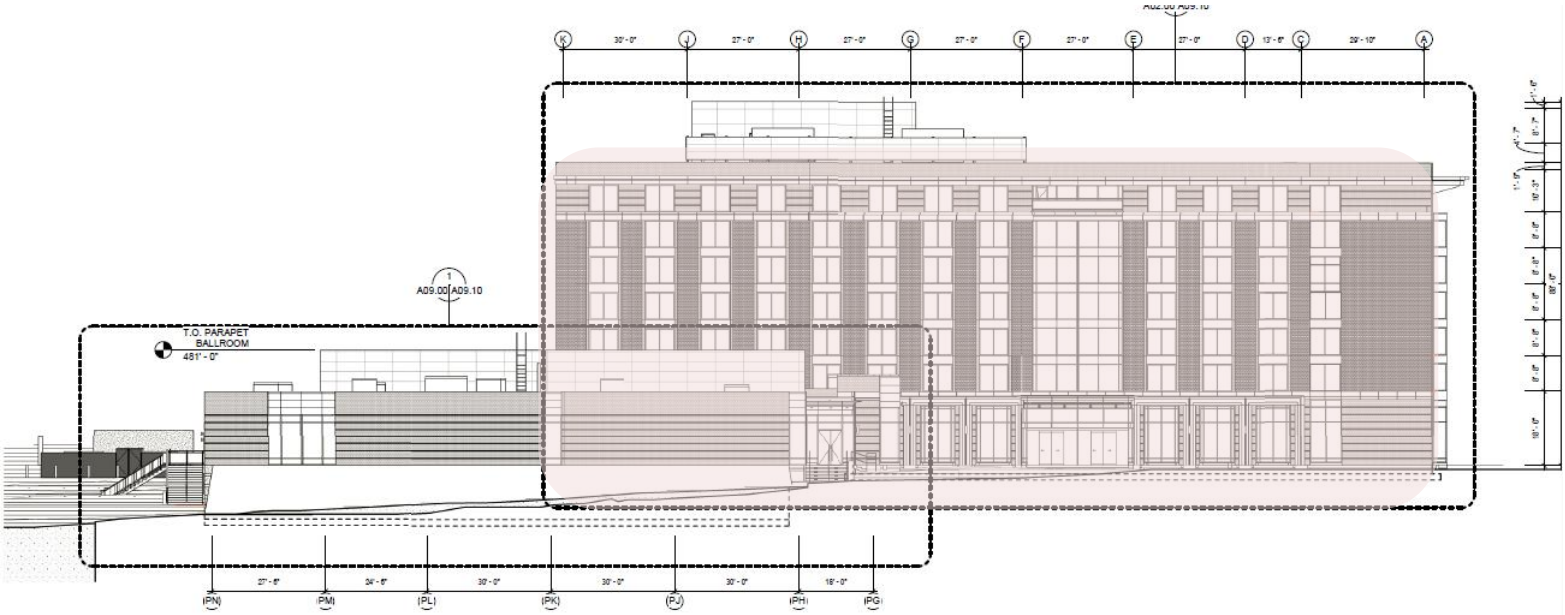


Figure 6: East Elevation | Front Facade of Hotel Tower

Design Criteria and Considerations:

General Lighting Concept:

Nature | Light as a Path

Guests of the Hotel and Conference Hotel arrive at the building and drive around a central courtyard located in front of the facility. The central plaza is made up of planters, benches, and even incorporates walkways to encourage guest interaction with the exterior space. The exterior facades of both buildings include a variety of materials, such as brick, glass, and metal canopies and spandrel panels. Although the architectural design does not differentiate itself much from the rest of the university's buildings, through the use of light, the Hotel and Conference Center can stand alone as an icon reflecting the natural beauty of Virginia.

Figure 7: Inspirational Image

Inspiration of natural light for the exterior façade includes an image of a sunburst, shining through the clouds. This image mirrors the concept of uplight and accentuating forms and textures of the clouds, much like grazing brick on the exterior of the building. However, the proposed lighting design of the exterior façade considers both light trespass and light pollution, as to preserve the natural wooded landscape around the site. Minimal uplight is applied on the middle tier of the hotel tower. Sconces along the first floor levels of the building graze light upwards and downwards while still providing adequate light levels at the pedestrian level and architecturally enhancing the textures of the facades. Most of the light on the exterior is at a pedestrian level, promoting safety and a sense of welcoming onto the site. The metal canopy of the hotel provides higher levels of light for guests to drive up to and gather their bags. Orientation onto the site is also important to help guide guests to the main entrance of the building. Canopy lighting illuminates the entrance area of the building as a focal point and therefore signal to guests the main doors of the building.

Psychological Aspect:
When arriving at the Hotel and Conference Center, guests should feel welcomed as they approach the building. The façade and exterior courtyard should feel inviting and relaxing to guests.

Safety:
Guests need and want to feel safe and secure when staying at a hotel and lighting plays a critical role in this. Having the walkways and parking lots well lit at night will make guests feel safer about walking around outside. Lamps with good CRIs will enable good color appearance and modeling of others.

Connection with Architecture:
The lighting design on the façade should enhance the architecture of the building. The lighting should lead guests up to the front of the building. Having the Hotel and Conference Center glow from within on the first floor also gives the building another dimension as people drive by.

Direct Glare:
Direct glare should be avoided at all costs. As guests approach the building in their vehicles, any glare from luminaires could be dangerous to drivers and pedestrians. Light levels should stay at a relatively uniform illuminance on the site as guests make their way up the driveway, around the central plaza, and to the porte cochere. Direct glare is also relevant in that fixtures should be properly placed so as to not shine any light through the windows.

Horizontal Illuminance:
- Building Exteriors
  -Entrances > Active: 5fc
  -Prominent structures: 5fc

- Gardens
  -General Lighting: 5:1 ratio
  -Paths, Away From Building: 10:1 ratio
  -Trees or Shrubbery, Emphasized: 3fc

Vertical Illuminance:
- Building Exteriors
  -Entrances > Active: 3fc
  -Prominent structures: 3fc

- Gardens
  -General Lighting: 2:1 ratio
  -Paths, Away From Building: 3:1 ratio
  -Trees or Shrubbery, Emphasized: 3fc

Modeling of Faces or Objects:
When guests are outside walking to and from their cars late at night, they should be able to make out other people's facial features and the objects around them. This is so guests feel safe and comfortable while walking outside at night. The use of lamps with high CRIs will help achieve this.

Light Pollution and Light Trespass:
Because the Hotel and Conference Center is located near a major interstate and university, light pollution and light trespass post potential threats. If lighting the actual façade, minimizing the amount of uplight helps with light pollution. Luminaires used should also be direct around the perimeter of the site so as to reduce the effects of light trespass.

Power Density Allowance: ASHRAE 90.1.2007
- Tradable Surfaces > Building Grounds > Plaza Areas = **0.2W/SF**
- Tradable Surfaces > Building Entrances and Exits > Main Entrances = **30W/LF** of door width; Other Entrances = **20W/LF**
- Tradable Surfaces > Walkways = **1.0W/LF**
- Tradable Surfaces > Roadways = **0.15W/LF**
- Tradable Surfaces > Building Entrances > Canopies and Overhangs = **1.25W/SF**
- Nontradable Surfaces > Building Facades > = **0.2W/SF** for each illuminated wall or surface or **5.0W/LF** for each illuminated wall or surface length

Lighting Plan – Refer to Appendix C

Mounting Details – Refer to Appendix C

Luminaire Equipment Schedule:

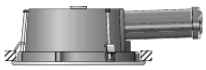
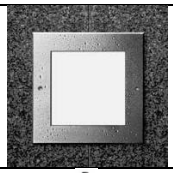
Tag	Luminaire	Description
K1-3		Low voltage Plexineon White 2X Series in 2800°K for warmer light. Lengths vary for use in cove, under the toe kick in bar, and bar shelves. Outside corner pieces also specified.
Q		Recessed wide beam luminaire made of aluminium alloy, aluminium, and stainless steel. Reflector made of anodized pure aluminum. Dust tight and protection against water jets. (1) 42W CFL lamp lamped horizontally.
R		Walk-over and drive-over luminaire recessed in compacted surfaces, paths, and open areas for pressure load up to 5000 kg. Made of aluminium alloy, aluminum, and stainless steel, and contains white safety glass. Dust tight and protection against temporary immersion.
S		Clessidra urban column with 32W in (4) Xicato LEDs. Powder coated polyester and highly resistant to UV and oxidation. Surface mounted and suitable for wet location. Finish color in anthracite gray.
T		Reese exterior sconce from Winona, with (1) F17T8 medium bi-pin lamp. UL listed and CUL approved for wet location. Opal acrylic lens and custom painted finish (gray).
U		Slim profile linear floodlight with a 120° flood distribution for short throw applications, with 6 LEDs per foot and consuming 8W per foot. ½" low profile body sealed for IP68 rating (dry, damp, wet location) and mounted on an 8" cantilever. Extruded and die cast aluminum housing.

Table 1: Condensed Lounge Luminaire Schedule

**The full Lighting Equipment Schedule can be found in Appendix A.*

Light Loss Factors:

Light Loss Factors						
Tag	**Initial Lumens**	**Mean Lumens**	**LLD**	**LDD**	**BF**	**Total**
K1-3	-	-	0.70	0.90	1.0	0.63
Q	3200	2690	0.84	0.74	0.85	0.53
R	265	220	0.83	0.74	0.95	0.58
S	-	-	0.70	0.80	1.0	0.56
T	1325	1260	0.95	0.80	0.95	0.72
U	-	-	0.70	0.74	1.0	0.52

Table 2: Lobby Light Loss Factors

**Use of the new procedure to find LDD was used. As the new handbook does not address RSDD, it was not calculated. According to the new handbook, a LEDs LLD is assumed to be 0.7. A 12 month cleaning interval and "clean" environment was assumed. Any other LLFs not displayed are assumed to be 1.0.*

Controls:

Luminaires located in the exterior plaza and on the façade will be controlled via a time clock within the main Lutron GRAFIK Eye System. The luminaires will be switched off during the day and the time clock will turn them on at night. Please refer to Appendix C for more information.

Control Schedule						
Tag	**Product**	**Manufacturer**	**Product/Catalog No.**	**No. Units**	**Description**	**Location**
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	1	Main wallstation that provides local access to the lighting control system. Operates every scene and zone in the system, as well as the ability to change fade and delay times in any area. Includes a time clock.	AV Closet (Room #1324)

Table 3: Control Schedule | Exterior

Performance Data and Preliminary Renderings:

Note: The calculations were done with all of the lights on and no daylight.

Exterior Entrance | Calculation Summary		
	Ground	**Vertical**
Avg Illuminance	***9.19 fc***	***2.4***
Max Illuminance	13.4 fc	3.73
Min Illuminance	4.5 fc	0.83
Avg/Min	2.04	2.88
Max/Min	2.98	4.48
Criteria	5 fc	3 fc
Compliance?	**Yes**	**Yes**

Table 4: Calculation Summary of Exterior

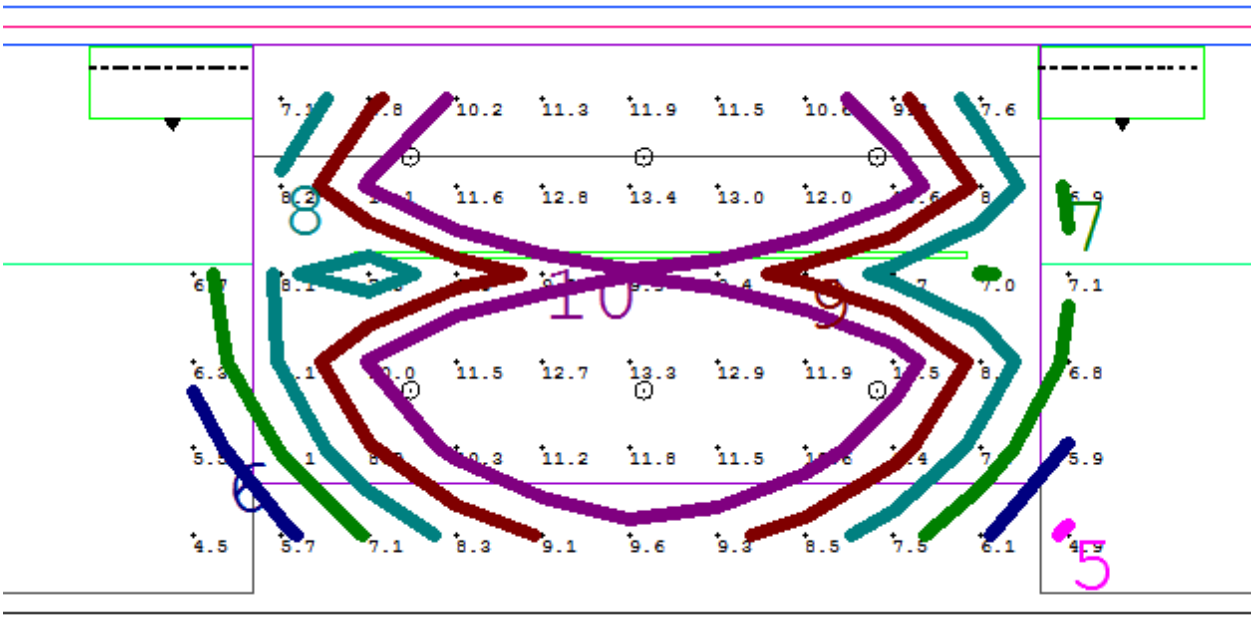


Figure 8: Illuminance Contours | Canopy

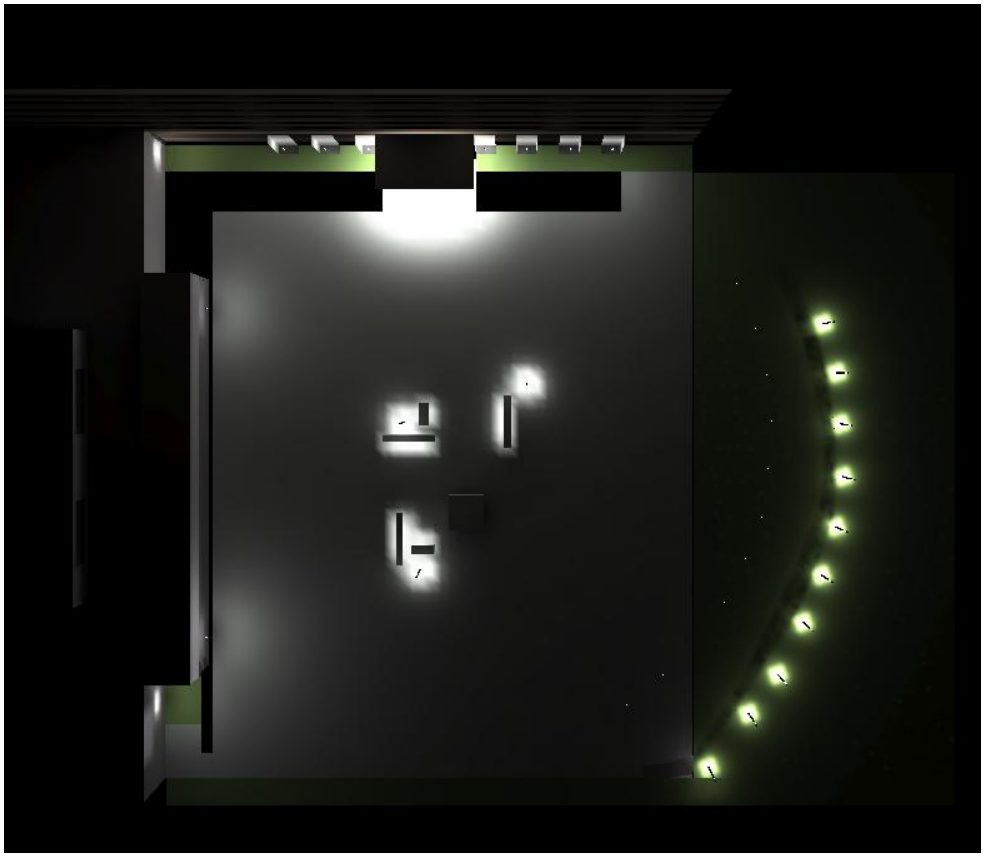


Figure 9: AGI32 Rendering of Exterior Space

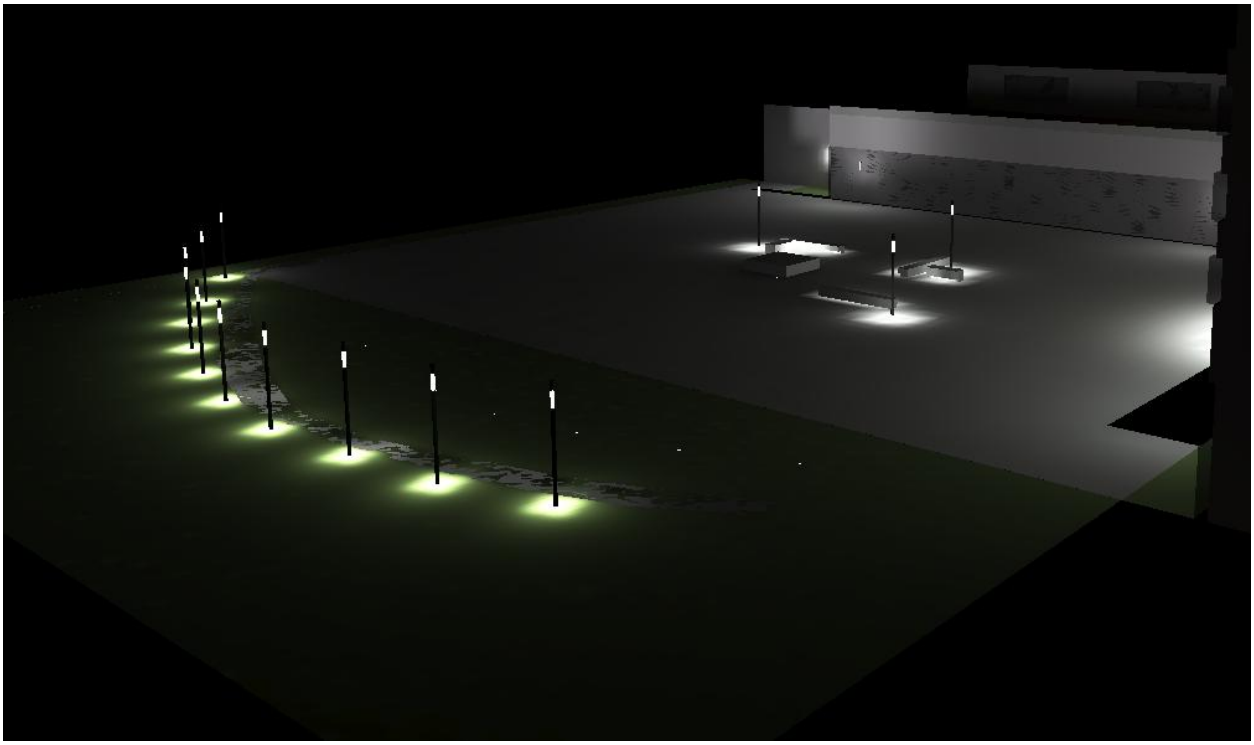


Figure 10: AGI32 Rendering of Exterior

Figure 11: AGI32 Rendering of Exterior

Lighting Power Density:

ASHRAE Standard 90.1 | LPD Summary				
Area	**Size**	**Power Density Allowable**	**Allowable Wattage**	**Designed Wattage**
Façade (nontradable)	15043.83 sf	5.0 W/SF	75219	160
Other entrance (tradable)	6 ft	20 W/LF	120	38
Plaza (tradable)	175.5 ft	0.2 W/LF	35.1	0.15
Canopies and overhangs (tradable)	347.5 sf	1.25 W/SF	434.375	282
Walkways (tradable)	704 ft	1.0 W/LF	704	370
Roadway (tradable)	620 ft	0.15 W/LF	93	0.03
		Total Tradable Watts	**1386.5**	**690.2**

Table 5: LPD Summary Tables | Exterior

Performance Summary:

The lighting design for the Exterior façade and entry courtyard addresses issues that are presented during the nighttime hours. Minimal uplight from LED strips applied along tiers of brick emphasize the verticality of the hotel tower, grazing the texture of the brick. Sconces mounted on linear post elements along the first floor of the hotel glow with light, highlighting the architectural forms and providing additional lighting for the walkways at a more human scale. Recessed compact fluorescent downlights in the entry canopy help make the porte cochere stand out amongst patrons when arriving at the Hotel and Conference Center, bringing attention the hotel's entrance. LED light columns glow around the perimeter of the outer walkway along the exterior portion of the site. Recessed in-ground LED uplights mark parking spaces for patrons and hotel staff. LED strips mounted under the concrete benches in the central courtyard lure patrons to the garden area at nighttime. At night, the Hotel and Conference Center glows with light from within on the first floor, making the building appear more friendly and approachable.

As designed, the lighting design for this space complies with both the IESNA recommendations and ASHRAE Standard 90.1 requirements. It is also successful in creating a nighttime presence and sense of welcoming for the building that is aesthetically pleasing, safe, and effective.

Circulation Space | Main Lobby

Space Description:

Upon arrival at the Hotel and Conference Center, the Main Lobby serves as a particularly important space for guests and staff. Guests enter the main lobby through the vestibule and make their way to the front desk and check-in area. There are also seating areas throughout the main lobby, providing relaxation for guests and serving as waiting areas. These seating nooks are ideal for those waiting to enter either the Restaurant or Lounge. Floor to ceiling windows provide daylight into the space during the day. The lobby is filled with rich colors and finishes, complimenting the relaxing atmosphere.

Activities | Tasks:

- Check in at the front desk
- VDTs at the front desk for employees
- Lounging areas for guests
  - Reading
  - Socializing
  - Waiting for entrance to the Restaurant or Lounge
- Elevator lobby
- Passing through to Conference Center

Dimensions:

Area: 4430 SF

Dimensions: Approximately 121'-6" x 36'-6"

Surface Materials:

Main Surface	Description	Tag	Manufacturer	Color	Reflectance
Ceiling	Overall Ceiling	P-12	Benjamin Moore	Vanilla Ice-Cream	0.87
Floor	Lobby rugs inset into wood flooring	C-3	--	--	0.14
	Porcelain tile with matte finish	PT-1	Daltile	Gold and Almond	0.37
	Solid hardwood				0.56
Walls	Wall covering	WC-1	--	--	0.95
	Medite-FR wood paneling (48"x96") planks, with a membrane film finish	WD-3	Interlam Inc		0.31
Base	Solid hardwood finish with semi-open pore lacquer and 30% sheen finish	WD-4	Danzer Specialty Veneer		0.03
Reception Desk	Solid hardwood finish with semi-open pore lacquer and 30% sheen finish	WD-6	GC to provide		0.03
	Desk top is 12"x12" Interior Stone (Granite) with polished finish, 3/4" thick and 1/16" max grout	ST-2	Daltile	G759-Golden Crystal	0.27
Column Surrounds and Floor Accents	12"x12" Interior Stone (Natural Stone Collection), 1/2" to 1" thick and 1/4" grout	ST-1	Daltile	S783-Golden Sun	0.37
Front entry signage	Plastic laminate	PL-8	Chemetal	Brushed medium bronze aluminum	0.14
Woodwork	Wood veneer, sliced andes cedar with semi-open pore lacquer 30% sheen	WD-1	Danzer Specialty Veneer		0.24
Hostess Stand	Wood veneer, sliced sapele with semi-open pre lacquer 30% sheen	WD-2	Dooge Veneers Inc		0.03

Table 6: Reflectance Values | Lobby

Lobby Plans:

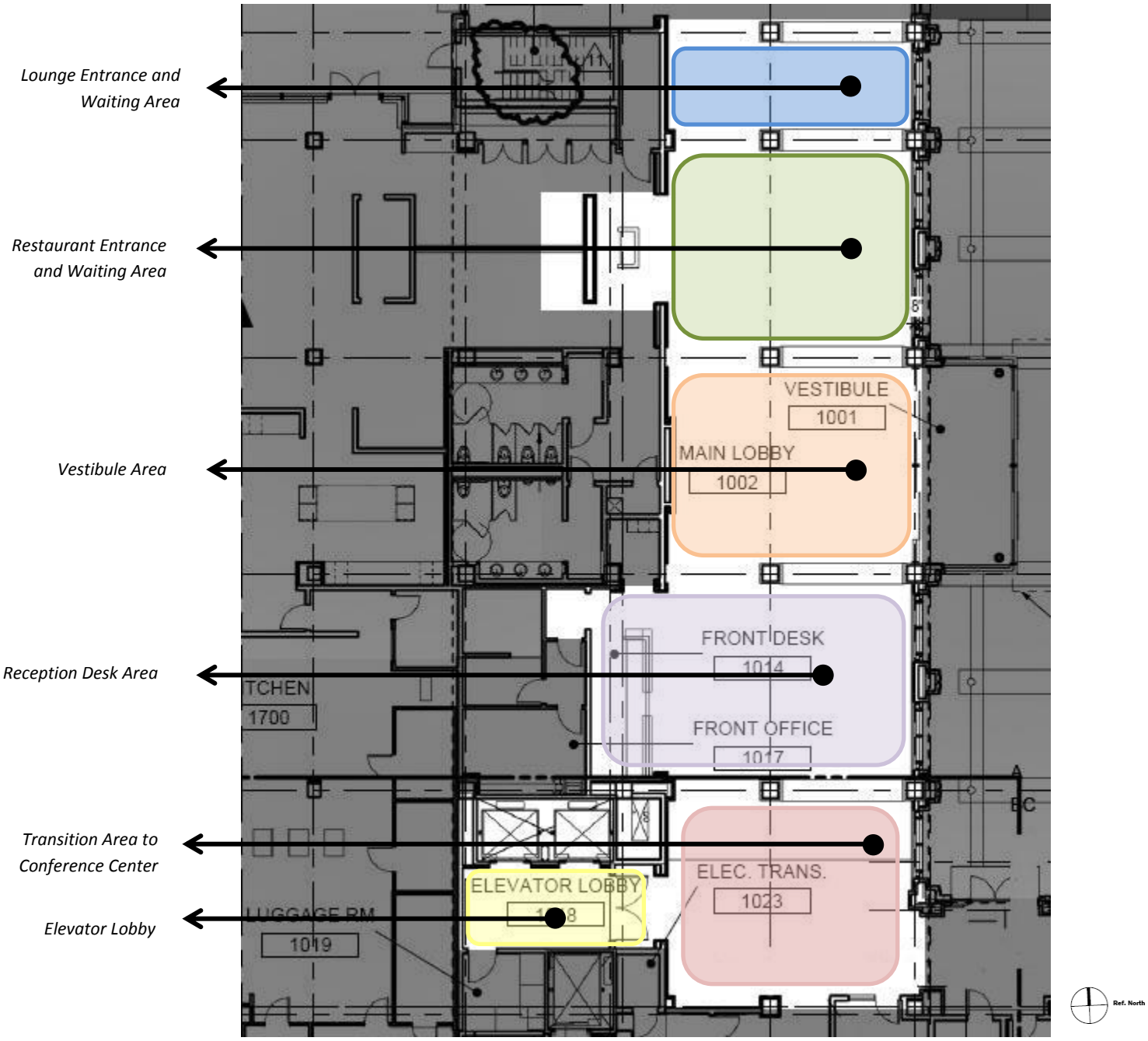


Figure 12: Lobby Plan

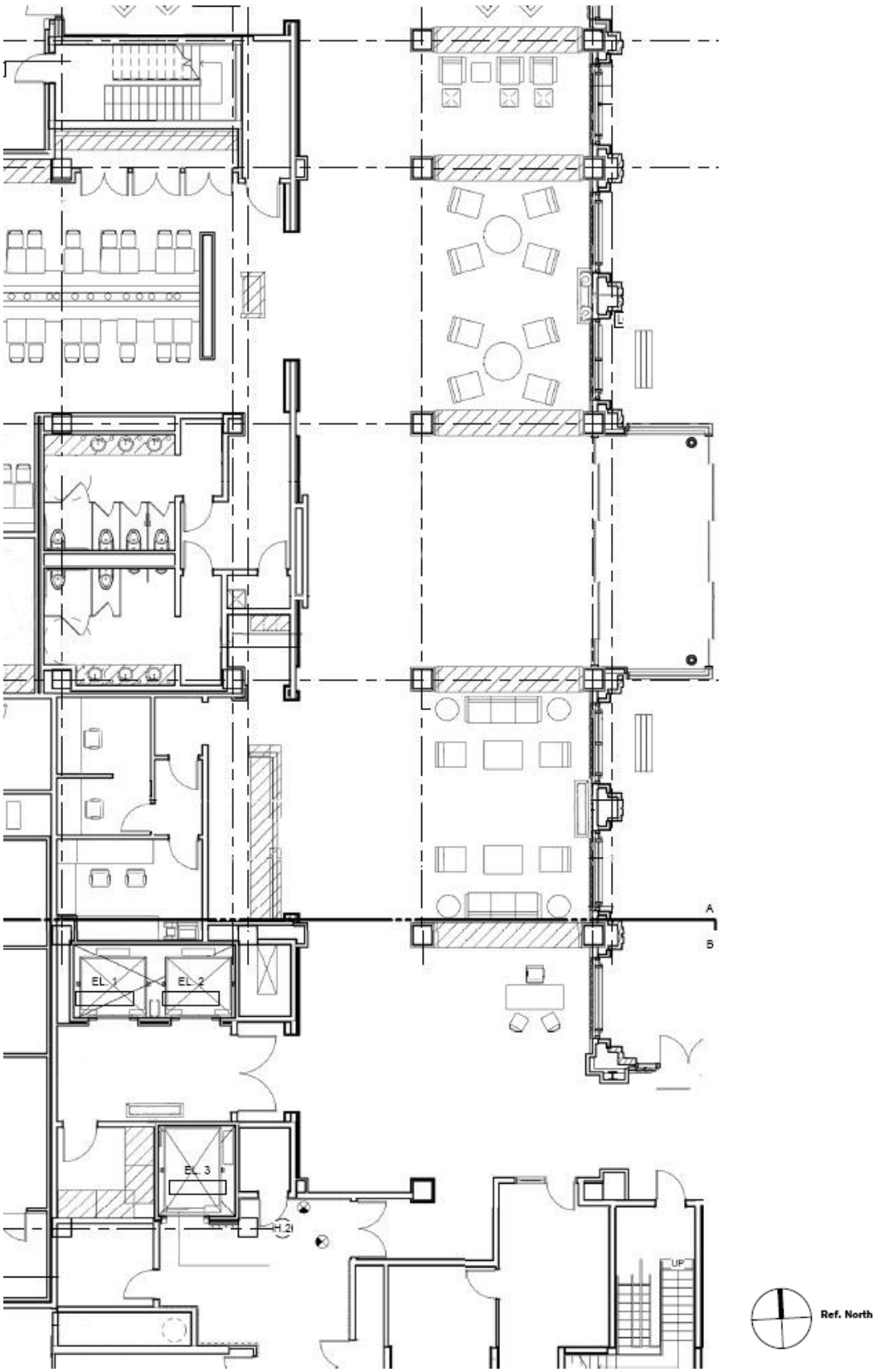


Figure 5: Lobby Furniture Plan

Design Criteria and Considerations:

General Lighting Concept:

Nature | Light as a Pathway

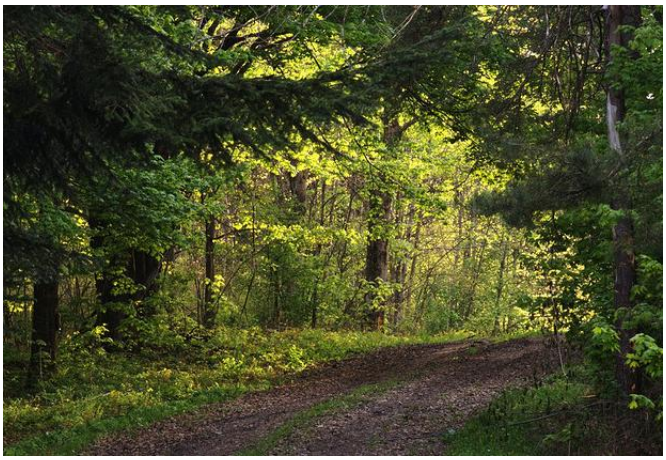


Figure 14: Pathway of Light | Photo from Flicker

The source for inspiration for the Lobby is of a natural wooded landscape, illuminated with light from above. Light cascades onto the pathway of this trail, guiding people as they make their way through the woods. The Lobby of the Hotel and Conference Center should also orient and direct people to particular points and pathways in the building like this pathway does, and lighting can help accomplish this.

Signage displays are seen in the lobby, signaling to guests where different areas of the hotel are located. The main hotel sign and sign behind the reception desk are backlit, while the sign for the restaurant is grazed with light. A cove over each seating area makes the areas more relaxed as light will not directly be on the occupants. Small decorative elements on tables provide task lighting to those wanting to relax and do work in the seating areas. Keeping light on the walls and away from the occupants is generally wanted to create a relaxing and much more intimate atmosphere. Artwork located on walls is accented using fully adjustable track fixtures.

At the front desk, the light levels should be higher than the rest of the lobby. Modeling of faces and objects is important at a front desk, especially when dealing with guests' money. In any way, illuminating people's faces is important and is complete using downlights over the desk, so as not to distract from the backlit sign behind the counter. Light grazes the surface of the desk to enhance the wooden finish. Illuminating the desk with striplights for general task lighting is also utilized for the staff's day-to-day activities.

Psychological Aspect:
The Lobby is the space where guests develop their initial impression of the hotel. Therefore, the lobby should create a warm and welcoming atmosphere. The Lobby should also be relaxing for all of the guests, as they may be waiting to go into the Restaurant or Lounge.

Appearance of Space and Luminaires:
Because the Lobby sets the tone for the rest of the Hotel and Conference Center, an inviting ambiance is wanted. The lighting design should complement the wood millwork and rich finishes and colors in the Lobby. Luminaire selections in the Lobby contribute to maintaining a welcoming and relaxing atmosphere.

Color Appearance and Color Contrast:
The gold, taupe, chocolate brown, and off-white hues in the Lobby should be enhanced by warm light. Lamps with warmer CCTs are specified to stimulate a relaxing atmosphere by keeping light levels low and enhancing the richer colors. Since the Lobby has distinct seating areas for guests, color appearance is important for reading.

Reflected Glare:
Because of the glossy surfaces of the reception desk and some of the table tops in the reading areas, reflected glare could be a potential risk for guests. Transactions between the receptionists and guests at the main desk involve money and paperwork and reflected disability glare would be a distraction. Guests reading in the waiting areas would also experience glare on the tables.

Modeling of Faces or Objects:
At the front desk, visual appearance of the receptionist and guests is imperative for transactions to take place. In general, the light levels at the main desk will be higher than the rest of the Lobby. Lamps with high CRIs (greater than 80) will generate warm skin tones much more naturally and are utilized. Having the receptionist at the front desk appear welcoming and friendly will in turn create happier guests staying at the Hotel and Conference Center.

Daylighting Integration and Control:
Floor to ceiling glazing on the east façade of the Lobby provides the space with plenty of daylight during the day in the summer months. However, in the winter, the sun will not shine directly into the windows and the building may even lose heat during this time. Integrating a dimming system in the Lobby would be ideal as to provide energy savings during daylight hours. Having lower light levels during the evening will help promote the relaxing and comforting atmosphere and mood of the space. When the hotel is open but not as active, a dimming system can be utilized to further decrease the light levels.

Direct Glare:
In a space with a relaxing atmosphere, decorative luminaires should not be the only sources of light as they may appear "glary" to guests reading and relaxing in the seating areas of the Lobby. Direct glare should be avoided at all costs as it will make guests feel tense and will distract them from the rest of the space. Direct glare in the entrance canopy should also be avoided as guests are entering from outside and their eyes need to adjust to the light levels inside.

Light Distribution on Surfaces:
The Lobby can be split up into six distinct zones (see Figure 12) horizontally. Each of these areas has its own purpose, and some overlap. The waiting areas for the Lounge, Restaurant, and Reception Desk all have strong relationships with the furniture present, so light levels can be more or less around furniture surface height. In the Vestibule Area, Elevator Lobby, and Transition Corridor to the Conference Center, getting to and from one spot to another is the most important task. Therefore, the lighting on the floor and walls should help orient guests to their designation. The Reception Desk's main focal point is the actual desk itself and should therefore act as such. In general, the Lobby should have non-uniform lighting vertically as this promotes a more relaxing atmosphere.

Points of Interest:
The branding walls throughout the Lobby not only orient guests, but provide visual interest because they are so large in size and dimension. By implementing back lit glass, cove lighting, and grazing textures, the architectural details stand out to guests and reveal and transform the space. Artwork on some of the walls is also accented. The seating areas are also an important feature, dividing the Lobby into more intimate spaces for conversation and reading.

Luminances of Room Surfaces:
Finishes in the Lobby consist of expensive porcelain tile and custom millwork. Consideration of the luxurious surfaces of the furniture and warm, neutral colors must be included when designing the lighting system.

Horizontal Illuminance:
- General lighting is suggested to be in Category "C", **10fc**. The recommendation seems practical as people will mainly be passing through the lobby and sitting in the waiting areas.
- At the front desk, the IESNA Handbook suggests Category "E" at 50fc. I plan on deviating from this recommendation and producing a solution at **30fc** instead, because I think if the rest of the space is lit at 10fc, the front desk will still remain a focal point at three times the illuminance.

Vertical Illuminance:
(No recommendations noted)

Power Density Allowance: ASHRAE 90.1.2007
- Lobby | For Hotel: 1.1 W/SF
- Additional Interior Lighting Power – In addition to the installation of general lighting, decorative lighting is permitted (chandeliers, sconces, or for highlighting features) as long as it does not exceed 1.0 W/SF.
- Total allowable = **2.1 W/SF**

Lighting Plan – Refer to Appendix C

Mounting Details – Refer to Appendix C

Luminaire Equipment Schedule:

Tag	Luminaire	Description
D		Alfa Gemini fully adjustable, directional track head with G26 bronze, mesh metal shade and vintage bronze hardware. (1) 50W max MR16 halogen utilized per track head.
E		15' MonoTrack starter kit with 300W surface mounted transformer and 5 MonoTrack sections. Includes supports, (6) fixture adapters, and mounting hardware. Hardware finish in vintage bronze.
F		3.5" aperture downlight with Xicato Artsits Series LED module containing 8 LEDs and having an R-9 value of 96. Dark chrome reflector finish and 3000 K color temperature.
G		Covelite with 1-T8 lamp and die-formed 20 gauge cold-rolled steel painted white housing. Highly specular Miro IV aluminum white 20 gauge steel optical system.
H		Perimeter trough recessed 1-light T8 luminaire with die-formed 20 gauge pre-painted steel housing and precision parabolic roll-formed semi-specular aluminum reflector.
I		Staggered strip surface mounted fluorescent lamp with 3" overlap and 1-5/8" deep housing. Made of heavy duty code gauge cold rolled steel and finished with white polyester enamel. Utilizes (1) T8 fluorescent lamp.
K1-3		Low voltage Plexineon White 2X Series in 2800°K for warmer light. Lengths vary for use in cove, under the toe kick in bar, and bar shelves. Outside corner pieces also specified.

Table 7: Condensed Lounge Luminaire Schedule

**The full Lighting Equipment Schedule can be found in Appendix A.*

Light Loss Factors:

Light Loss Factors						
Tag	Initial Lumens	Mean Lumens	LLD	LDD	BF	Total
D	-	470	0.95	0.94	-	0.89
E	-	-	-	-	-	-
F	-	-	0.70	0.94	1.0	0.66
G	2950	2800	0.95	0.90	1.0	0.86
H	2950	2800	0.95	0.94	1.0	0.89
I	2950	2800	0.95	0.90	1.0	0.86
K1-3	-	-	0.70	0.90	1.0	0.63

Table 8: Lobby Light Loss Factors

**Use of the new procedure to find LDD was used. As the new handbook does not address RSDD, it was not calculated. According to the new handbook, a LEDs LLD is assumed to be 0.7. A 12 month cleaning interval and "clean" environment was assumed. Any other LLFs not displayed are assumed to be 1.0.*

Controls:

The Lobby is equipped with a Lutron Grafik Eye System. Hotel personnel in the Lobby will be able to control the lighting scene in the space easily and conveniently by means of a 5-button preset wallstation. A main wallstation controlling the dimming and switching capabilities as well as all scenes and zones of lights is located in the AV Closet (Room #1324) behind the Ballroom.

The Lutron GRAFIK Eye system will provide energy savings during daylight hours, as well as atmosphere and mood during the evening, and lower level lighting during "off" hours when the hotel is still open but less active.

Control Schedule					
Tag	**Product**	**Manufacturer**	**Product/Catalog #**	**Description**	**Location**
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Main wallstation that provides local access to the lighting control system. Operates every scene and zone in the system, as well as the ability to change fade and delay times in any area. Includes a time clock.	AV Closet (Room #1324)
EQ-B	seeTouch Wallstation	Lutron GRAFIK	SO-5WRLN	5-button preset Sivoia QED wallstation with raise/lower capability	Lobby

Table 9: Control Schedule | Lobby

Performance Data and Preliminary Renderings:

Note: The calculations were done with all of the lights on and no daylight.

Lobby - Floor | Calculation Summary	
	Horizontal (2.5')
Avg Illuminance	***12.14 fc***
Max Illuminance	36.9 fc
Min Illuminance	0.5 fc
Avg/Min	24.28
Max/Min	73.80
Criteria	10 fc
Compliance?	**Yes**

Table 10: Calculation Summary of Lobby

The maximum to minimum ratio is obviously really high for the Lobby. This is due to the fact that light spilling from the Lounge was not taken into account in the calculations. Figure x below shows the minimum values which affected the ratio, seen at the Lounge entrance.

Figure 15: Lounge Entrance | Illuminance values highlighted below 2.0 fc

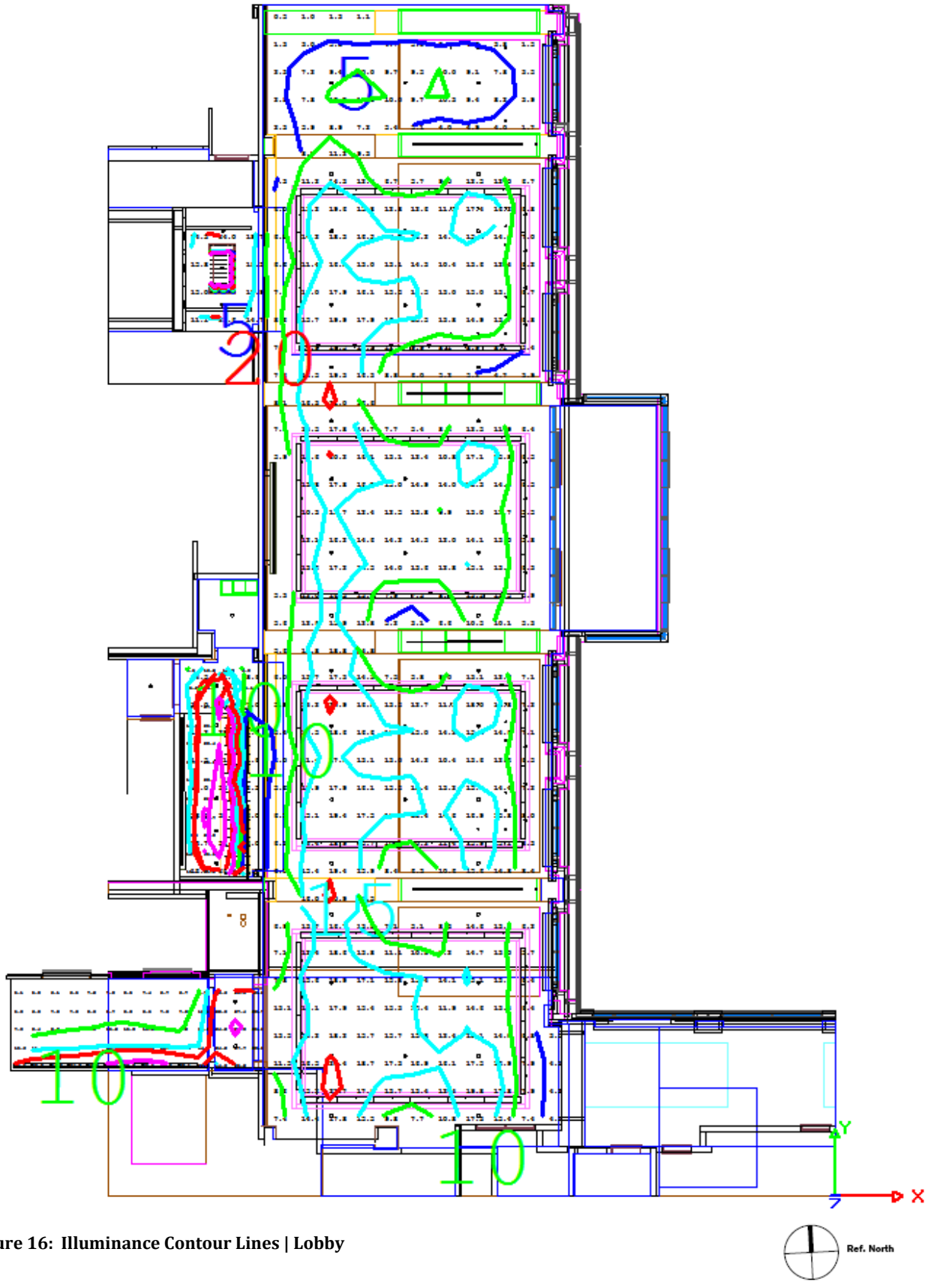


Figure 16: Illuminance Contour Lines | Lobby

Figure 17: Preliminary Rendering | Elevator Lobby Entrance

Figure 18: Preliminary Rendering | Reception Desk

Figure 19: Preliminary Rendering | Restaurant Entrance

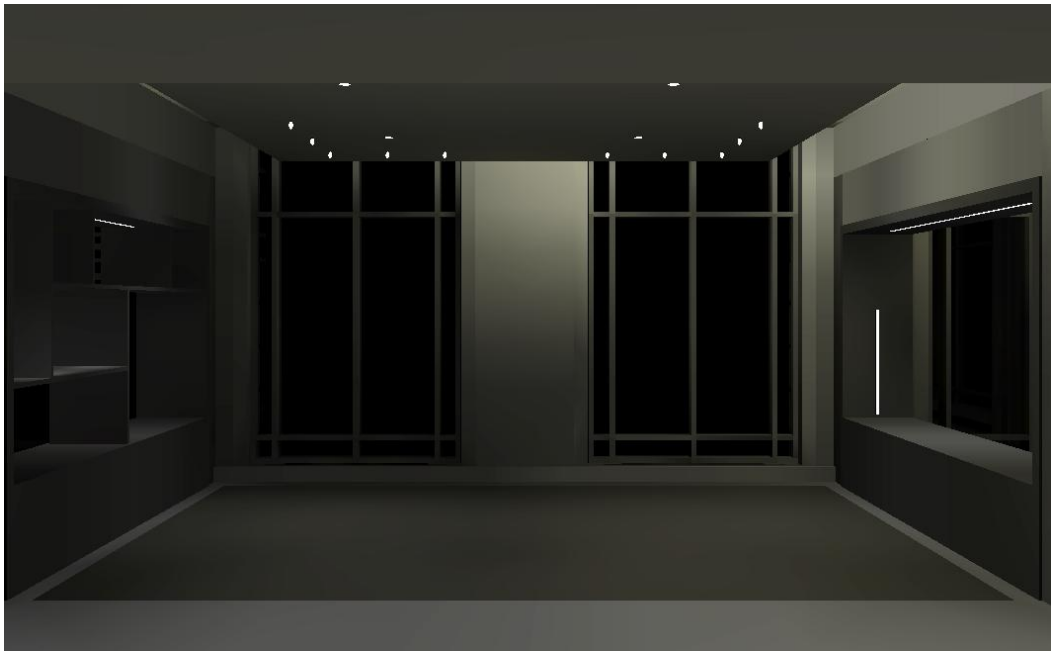


Figure 20: Preliminary Rendering | Looking out to windows from reception desk

Figure 21: Preliminary Rendering | Looking down corridor

Figure 21: Preliminary Rendering | Lines of light in bookshelves

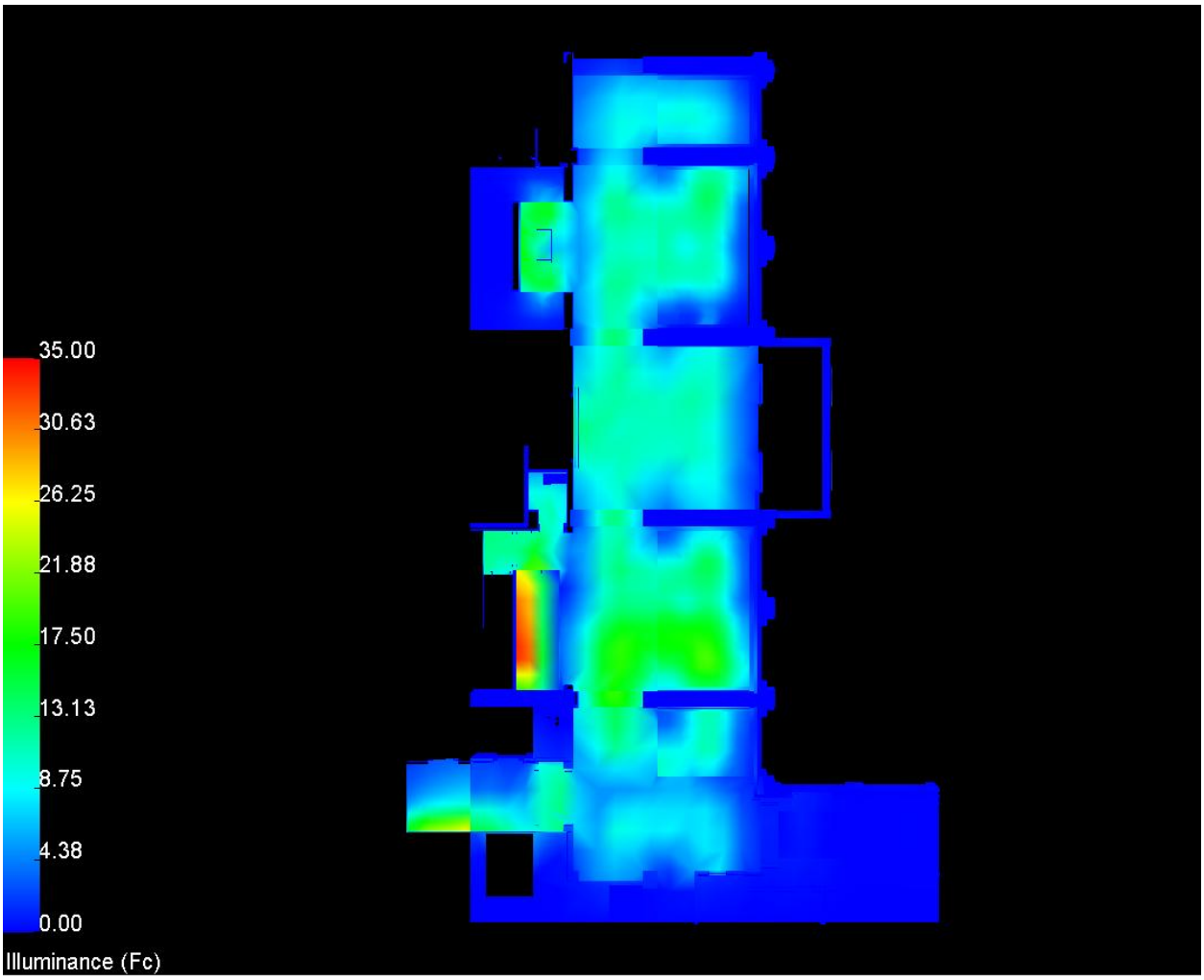


Figure 22: Pseudo color rendering | Lobby

Lighting Power Density:

ASHRAE Standard 90.1 | LPD Summary				
Tag	**Quantity**	**Watts/Luminaire**	**Watts/LF**	**Total Watts**
D[1]	26	50	--	1300
E	5	300	--	1500[2]
F	56	23	--	1288
G	80	35	--	2800
H	5	33		165
I	10	33	--	330
K1-3	106 ft	--	4.32	457.92
			Total Watts	**6540.92**

Table 11: LPD Summary | Lobby

[1]The maximum wattage allowable for the track head is 50W, although the 35W lamp is specified for the project
2The maximum wattage per track is 300W, therefore this value was considered in the LPD calculations because it is greater than the number of track heads specified

ASHRAE Standard 90.1 | LPD Summary						
Room	**Area**	**Power Density Allowable**	**Allowable Wattage**	**Designed Wattage**	**LPD**	**Met?**
Lobby	4430	1.1 W/SF	4873	4400	0.99	Yes
Decorative Allowance	4430	1.0 W/SF	4430	2141	0.48	Yes

Table 12: LPD Summary | Lobby

**Note: The decorative allowance accounted for above includes all of the track fixtures (D/E), the surface mounted fluorescents (I), and 72'-0" of the LED strips (K1-3).*

Performance Summary:

Similarly to the Exterior space, architectural elements, including the rhythmic wood shelving units, are emphasized in the lighting redesign. Fluorescent coves hover overhead with warm light, drawing the eye down the corridor and around each nook of the Lobby. Halogen track lights accent small seating areas and artwork located on the walls, giving the space a more private and relaxing feel. Recessed LED downlights provide enough ambient light on the ground for patrons to be able to get from one place to another, guiding people along a line of light. In the elevator lobby, fluorescent wall washers along the back wall offer an interesting impression to the space, keeping light away from guests and on the walls. While getting from one place to another is extremely important in the lobby of the hotel, the front desk is also important. A backlit glass panel of the Virginia countryside is backlit with fluorescent strips. An LED downlight provides for the majority of the light on the horizontal plane here. LED strip lights mounted underneath the front desk both graze the wood surface and illuminate the desk plane for receptionist usage. The main hotel front desk sign is backlit with fluorescent strips (like the one behind the front desk). At the Restaurant entrance, fluorescent strips graze a textured wall and give the entrance more punch for added attention and interest.

The lighting reinforces the "light as a pathway" notion as the coves simply draw people to open areas when walking along the corridor. Backlit glass signage panels signal to guests important areas of the hotel. The lighting design successfully meets both lighting power density requirements and IESNA recommendations as well.

Special Purpose Space | Lounge

Space Description:

The Lounge in the Hotel and Conference Center is a more private space in the hotel for customers. It is a space separated from the rest of the hotel where guests can enjoy fine food and spirits at the bar during the late afternoon and evening hours. Situated on the northernmost part of the building, floor to ceiling glazing spans almost the entirety of the façade, allowing daylight into the space.

Guests of the Hotel and Conference Center can enter the Lounge through the main lobby and corridor on the first floor. A set of double doors on the western wall provides access to the outdoor terrace.

The ceiling in the Lounge has an overall height of 14'-0", with a 1'-8" cove above the bar. Pine wood flooring with custom area rugs set into the wood flooring give the Lounge a more luxurious feel. The central bar is constructed of walnut, wood veneer and a polished granite bar top, adding to the lavish décor as well. Plush sofas and chairs and leather bar stools encourage conversation and make the space more comfortable.

Activities | Tasks:

- Dining
- Drinking
- Socializing
- Bartenders/Servers
- Guests watching television or reading

Dimensions:

Area: 1730 SF

Dimensions: Approximately 29'-10" x 54'-0"

Surface Materials:

Main Surface	Description	Color	Reflectance
Ceiling	Overall Ceilings	Desolate	0.95
	Dropped Ceiling Canopy	Classic Brown	0.01
Floor	Radiata Pine wood flooring with a clear Finish; planks are 4.25" wide	Cohiban	0.43
	Area rug insert into the wood floor		0.25
	Beige 6"x6" quarry tile with matte finish		0.03
Walls	General wall covering		0.85
Bar	Wood veneer, walnut/semi open Pre-lacquer with 30% sheen paneled barface		0.06
	Polished granite bar top		0.09
	Plastic laminate back bar	Antiqued brushed brass	0.05
Bookcases	High-gloss lacquer	Weather Vane	0.05

Table 13: Reflectance Values | Lounge

Lounge Plans:

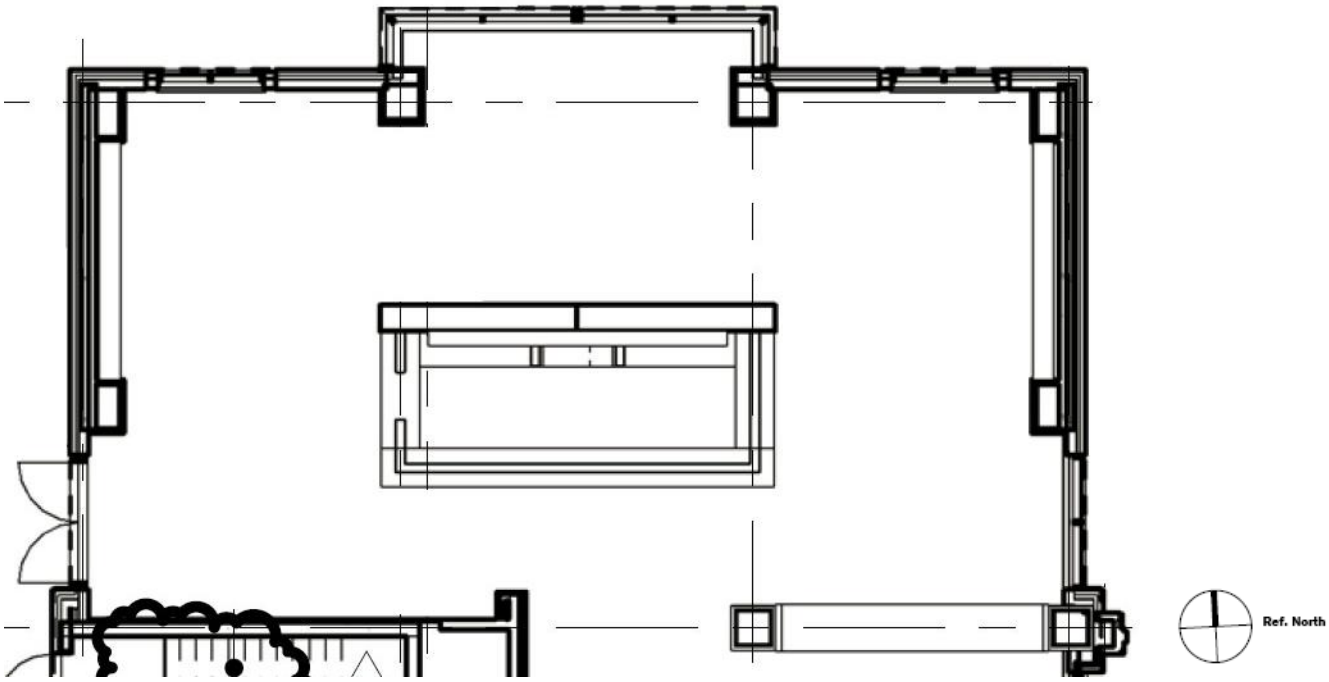


Figure 23: Lounge Plan

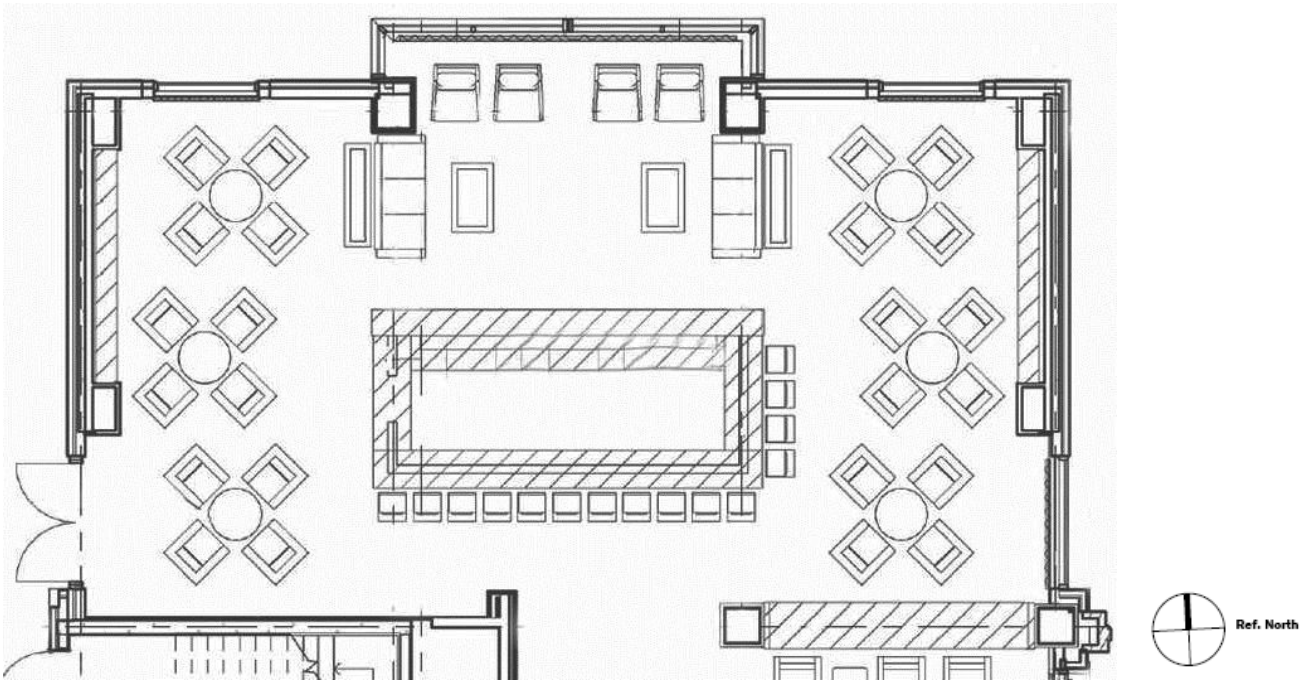


Figure 24: Lounge Furniture Plan

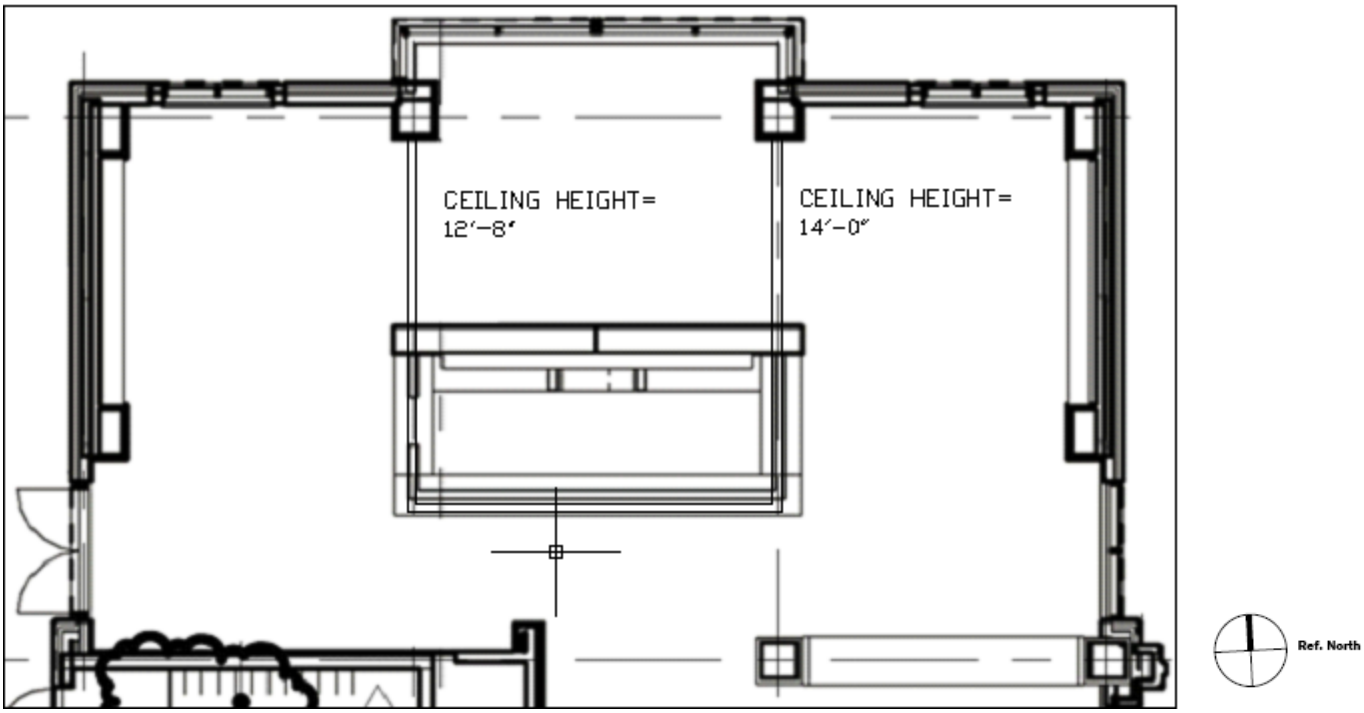


Figure 25: Ceiling Plan

Lounge Elevations:

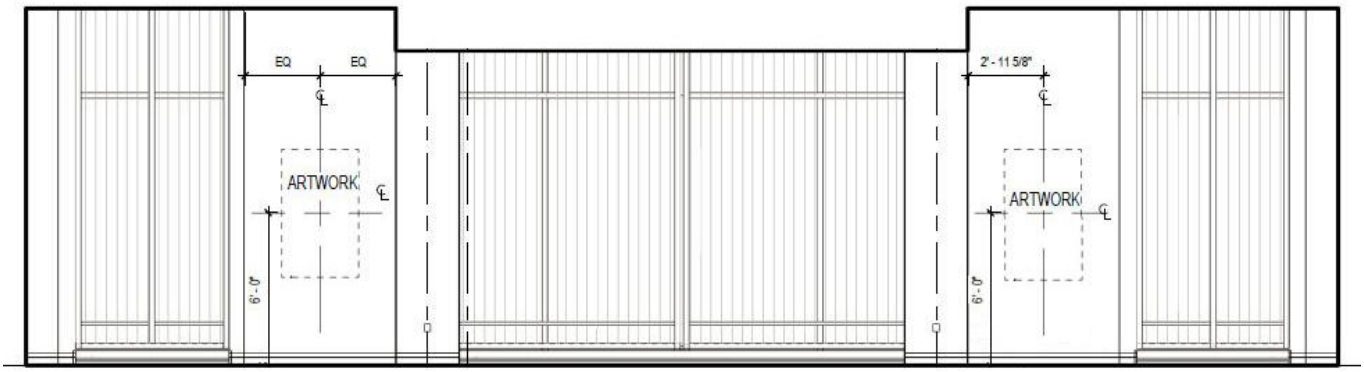


Figure 26: North Elevation

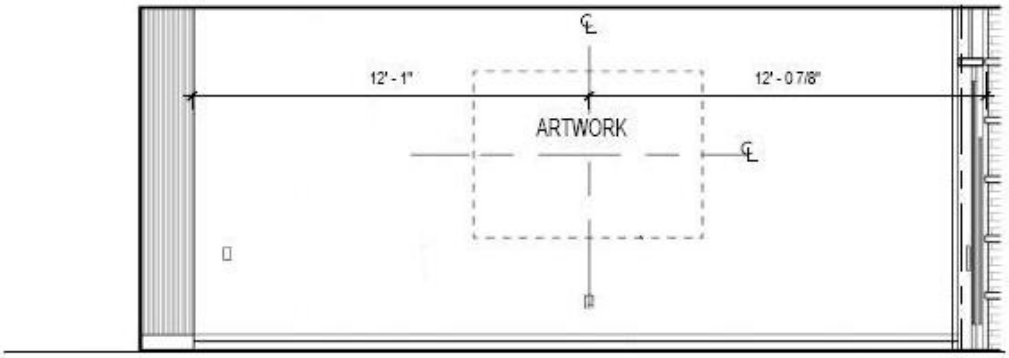


Figure 27: South Elevation

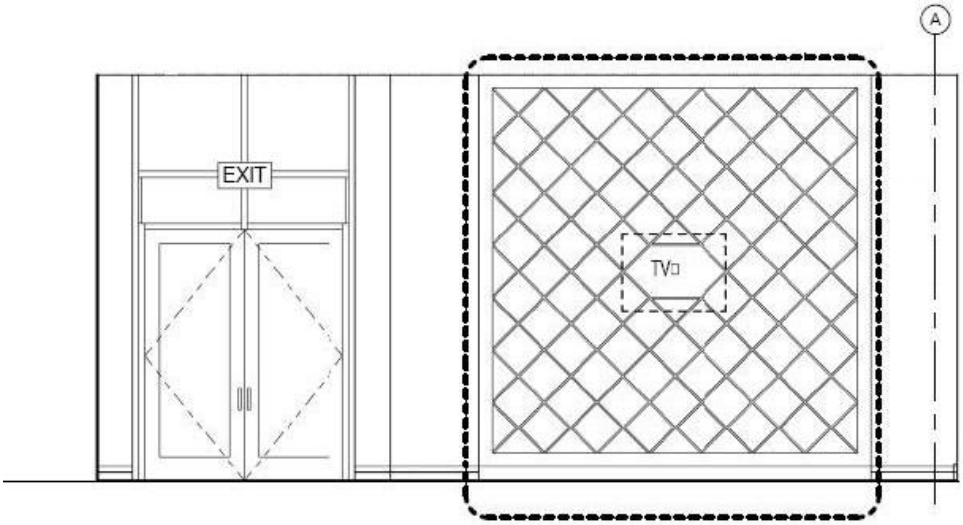


Figure 28: West Elevation

Design Criteria and Considerations:

General Lighting Concept:

Nature | Reflection and Transparency

The sources of inspiration for this space are two images from the original design concepts explored last semester. These two images include the notions of light as a reflection and light as a transparent element. Together, the two concepts combine common techniques of light as seen in nature on a daily basis. They also fully integrate the overall impression of the Lounge as a sophisticated and relaxing space in the Hotel and Conference Center, making great use of light properties and how they interact with the material selections in the room.

Figure 29: Reflection | Photo from Flicker

Reflections are used in the Lounge as a means to emphasize and direct light away from guests. A cove light above the central bar "reflects" or mirrors the glowing element below the bar at the feet of the patrons. Surface properties of both the bar and the tables located throughout the room are specular and reflective to further accentuate this idea of reflection.

Figure 30: Transparency | Photo from Flicker

The impression of transparency is also noted in the Lounge. Instead of having the bar shelving completely hide the seating area directly behind it, integrating a semi-transparent bar engages guests to see what is "on the other side". This also makes the space feel more mysterious at nighttime and gives guests a focal point throughout the day. Small, semi-transparent glass tiles are set in the bar in front of each seat at the bar, glowing from the bottom with a soft light. The light reflects into wine glasses set on top of them and creates an element of sparkle for guests. Decorative candle-light in semi-transparent jars is provided on every table in the direct locale of guests. Recessed square downlights with both reflective and transparent properties tie the lighting concepts together and provide enough light on the workplane for patrons while dining.

Psychological Aspect:
The Lounge is meant for hotel guests to unwind and enjoy good food and wine while relaxing and chatting amongst friends. During the daytime hours, the Lounge is a more public and open atmosphere. Evening and night-time hours will be accompanied with dim, non-uniform light, providing a more intimate and private atmosphere to guests.

Appearance of Space and Luminaires:
The Lounge is an area of the Hotel and Conference Center where guests come to quietly enjoy small specialty platters and organic local and domestic wine. The space is meant for chatting with friends, family, or business partners, or even to perform small tasks in a quiet nook of the hotel. Because of the rich architectural finishes, lavish furniture, fine food and wine being served, and the artwork on

display along the walls, the overall image and experience of the patrons is extremely important. Therefore, having decorative lighting fixtures in the Lounge to compliment the décor is critical to the overall ambience of the room. Although the light utilizes nonconventional applications in the space, it complements the architectural finishes and adds interesting elements and points of interest to guests.

Color Appearance and Color Contrast:
Lighting is not only critical when preparing food, but it is also important when serving food. Color rendering of the food is important because the food served will be fresh. Lamps with high CRIs (above 80) are therefore specified. The CCT of the lamps are also warm in the space, in order to enhance the relaxing, private atmosphere and wood finishes in the room.

Direct and Reflected Glare:
In order to avoid direct glare, general lighting should is utilized with the decorative lighting. Because one of the main design concepts for the Lounge is light and its reflective quality, semi-specular finishes on both the bar and tables were implemented, yet also increase the glare possibility to patrons and/or staff.

Point(s) of Interest:
The main feature in the Lounge is the bar, centrally located in the room. The bar was redesigned as a semi-transparent display case in order to complement the transparency design concept. Shelves containing the bottles and wine are an important feature in the Lounge and highlighting them will not only create visual interest but perhaps even promote more business.

System Control and Flexibility:
Since the Lounge is open during both afternoon and evening hours, utilizing a dimming system provides variation in the quantity and quality of light. Preset scene controls are available for the Lounge (more information given in the Controls section below).

Horizontal Illuminance:
Because simple visual tasks are being performed in the Lounge, **10fc** (Category C) is recommended on the workplane.

Vertical Illuminance:
Vertical illuminance values should be **3fc** (Category A).

Power Density Allowance: ASHRAE 90.1.2007

- Dining Area > Bar Lounge/Leisure Dining: **1.4 W/SF**
- Additional Interior Lighting Power – In addition to the installation of general lighting, decorative lighting is permitted (chandeliers, sconces, or for highlighting features) as long as it does not exceed **1.0 W/SF**.
- Total allowable = **2.4 W/SF**

Lighting Plan – Refer to Appendix C

Mounting Details – Refer to Appendix C

Luminaire Equipment Schedule:

Tag	Luminaire	Description
J		Mira 2 Semi-recessed square downlight with acid-etched, poured Satin White glass diffuser. Utilizes (1) 50W low-voltage, halogen MR-16 lamp.
K1-3		Low voltage Plexineon White 2X Series in 2800°K for warmer light. Lengths vary for use in cove, under the toe kick in bar, and bar shelves. Outside corner pieces also specified.

Table 14: Condensed Lounge Luminaire Schedule

**The full Lighting Equipment Schedule can be found in Appendix A.*

Light Loss Factors:

Light Loss Factors						
Tag	**Initial Lumens**	**Mean Lumens**	**LLD**	**LDD**	**BF**	**Total**
J	-	1000	0.95	0.94	-	0.89
K1-3	-	-	0.70	0.90	1.0	0.63

Table 15: Lounge Light Loss Factors

**Use of the new procedure to find LDD was used. As the new handbook does not address RSDD, it was not calculated. According to the new handbook, a LEDs LLD is assumed to be 0.7. A 12 month cleaning interval and "clean" environment was assumed. Any other LLFs not displayed are assumed to be 1.0.*

Controls:

The Lounge is equipped with a Lutron Grafik Eye System. Bartenders in the Lounge will be able to control the lighting scene specific to the mood and environment in the space easily and conveniently by means of a 5-button preset wallstation. A main wallstation controlling the dimming and switching capabilities as well as all scenes and zones of lights is located in the AV Closet (Room #1324) behind the Ballroom.

Control Schedule					
Tag	**Product**	**Manufacturer**	**Product/Catalog #**	**Description**	**Location**
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Main wallstation that provides local access to the lighting control system. Operates every scene and zone in the system, as well as the ability to change fade and delay times in any area. Includes a time clock.	AV Closet (Room #1324)
EQ-B	seeTouch Wallstation	Lutron GRAFIK	SO-5WRLN	5-button preset Sivoia QED wallstation with raise/lower capability	Lounge

Table 16: Control Schedule | Lounge

Performance Data and Preliminary Renderings:

Note: The calculations were done with all of the lights on and no daylight.

Lounge | Calculation Summary	
	Horizontal (2.5')
Avg Illuminance	***12.03 fc***
Max Illuminance	23.1 fc
Min Illuminance	2.1 fc
Avg/Min	5.73
Max/Min	11.0
Criteria	10 fc
Compliance?	**Yes**

Table 17: Calculation Summary of Lounge

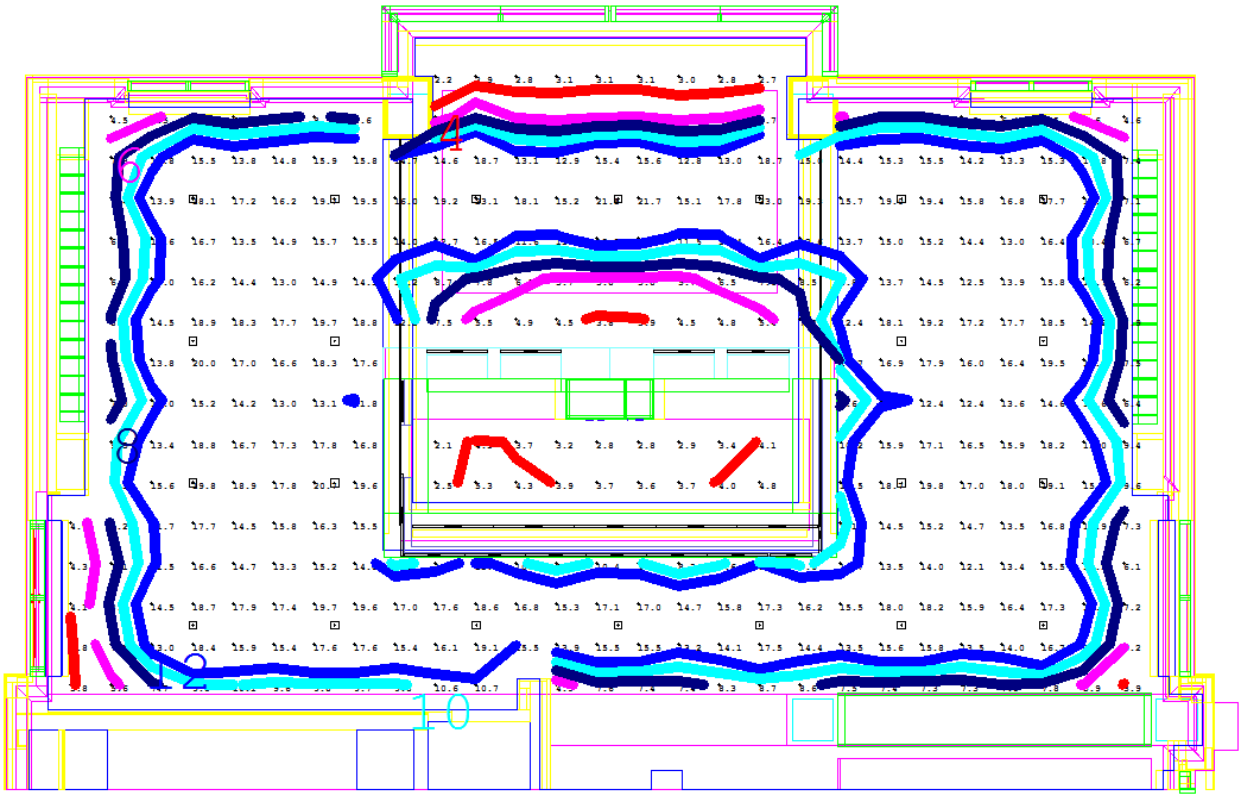


Figure 31: Illuminance Contours of Lounge

Figure 32: Preliminary Draft Rendering | 3D Studio

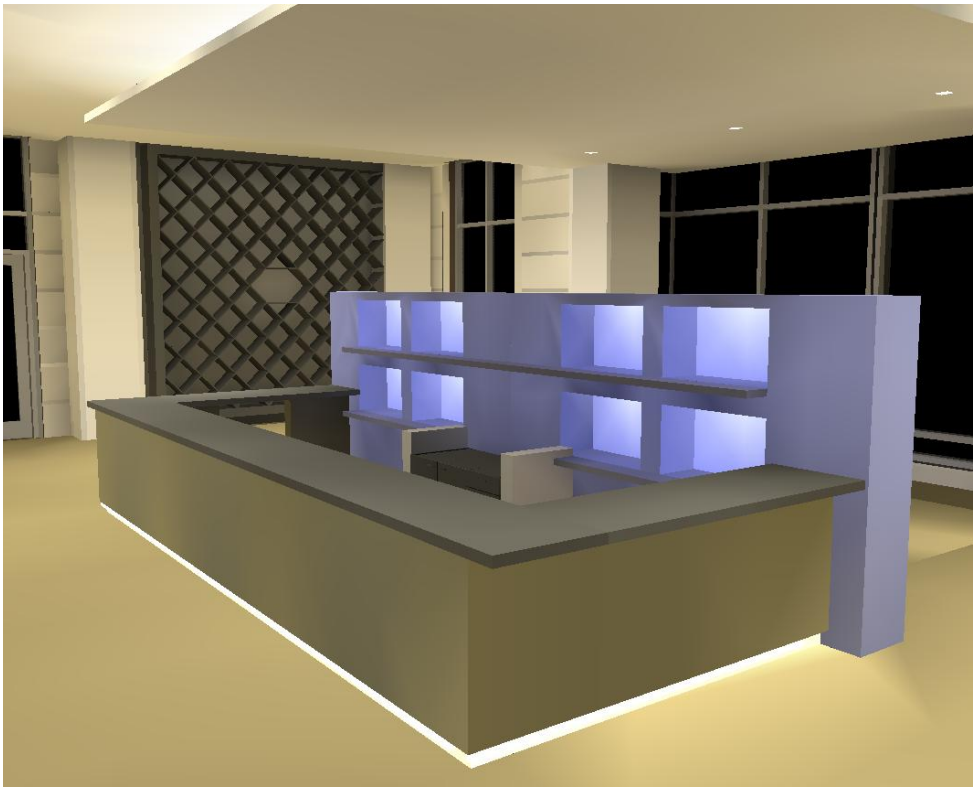


Figure 33: Preliminary Rendering of Lounge | AGI32

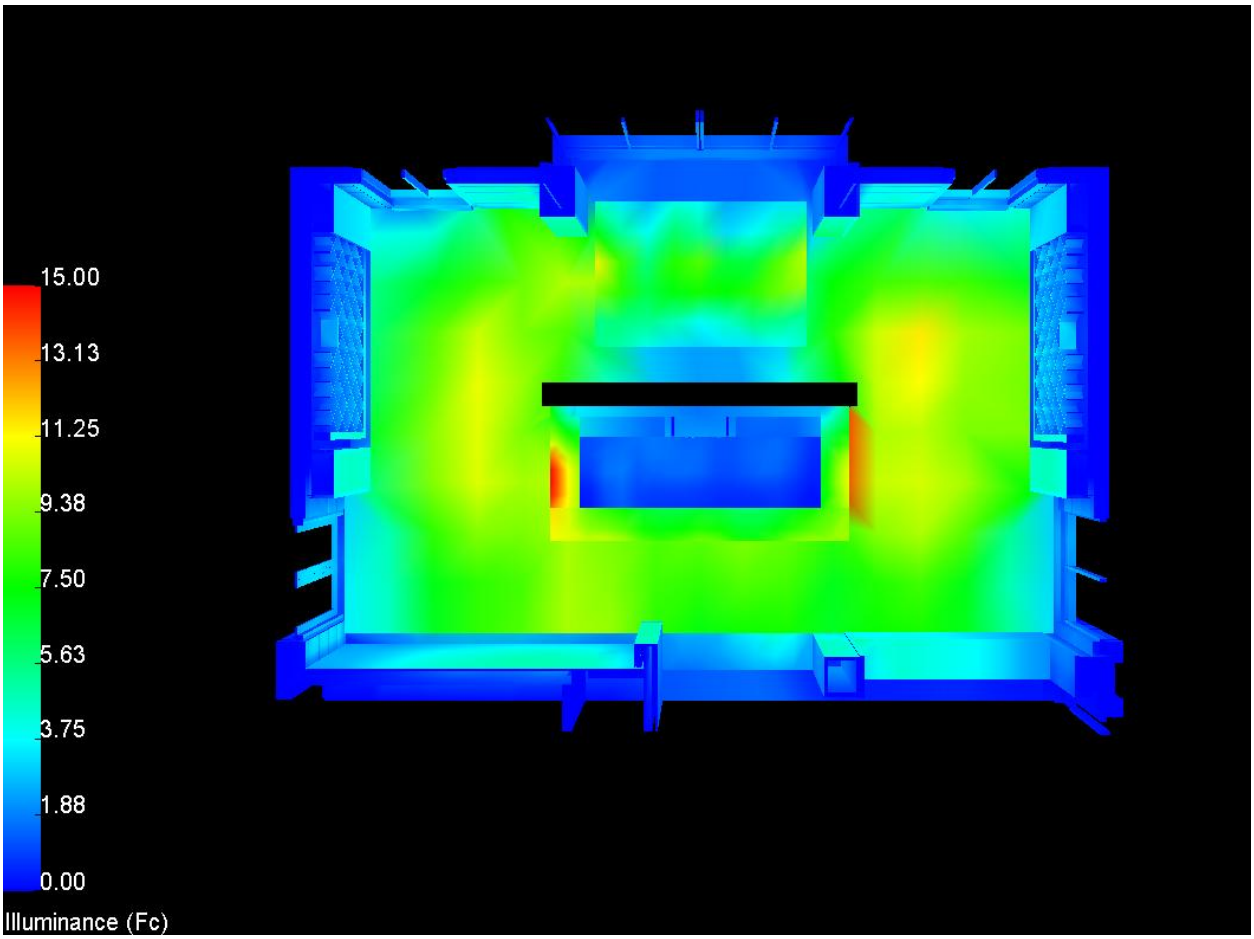


Figure 34: Pseudo Color Rendering of Lounge

Lighting Power Density:

ASHRAE Standard 90.1 | LPD Summary				
Tag	**Quantity**	**Watts/Luminaire**	**Watts/LF**	**Total Watts**
J	22	50	--	1100
K	94 ft	--	4.32	406.08
			Total Watts	**1506.08**

ASHRAE Standard 90.1 | LPD Summary				
Room	**Area**	**Power Density Allowable**	**Allowable Wattage**	**Designed Wattage**
Lounge	1730	1.4 W/SF	2422	1506.08
			W/SF	**0.87**

Table 18: LPD Summary Tables

The Lounge met ASHRAE Standard 90.1 Lighting Power Density requirements without the use of the decorative allowance.

Performance Summary:

Whether during the daytime or at nighttime, the lighting design in the Lounge provides appropriate light for its uses and offers an interesting lighting design concept. During the day, a suitable amount of horizontal footcandles reaches the floor for guests for general illumination. At nighttime, the bar transforms into a bit of a more modern bar, but one that still retains the architectural charm of the space.

The central bar is definitely the focus of the Lounge, so lighting design is crucial here as well. Mirroring the ideas of transparency and reflectance was taken into account on several occasions. First, an LED cove above the bar mirrors a toe-kick light glowing beneath bar, emulating the idea of reflectance. Small, semi-transparent acrylic glass tiles fastened into the bar glow with warm light from below, making wine glasses sparkle. This is not only reflectance but transparency as well, as the glass tiles are semi-transparent. A Leucos square downlight with an acid-etched glass diffuser was specified because of both its transparent and reflective characteristics.

Reflective surfaces in the Lounge were also used for the sole purpose of enhancing the lighting as well. All of the table tops and the bar counter are more reflective in nature than the rest of the space in order to enhance the reflection and transparency that is also found in nature.

Overall, the lighting design exceeded ASHRAE 90.1 for lighting power density requirements. IESNA recommendations and criteria were also met in the space.

Large Workspace | Ballroom

Space Description:

The Hotel and Conference Center highlights various social events in its Ballroom, including themed events, cocktail receptions, company outings, anniversary parties, reunions, and wedding receptions. Capacities may vary in the room, so making use of the two operable partitions is available. These partitions can separate the Ballroom into one, two, or three salons. The Ballroom accommodates up to 579 guests in a reception setting, 611 as a theater, and as many as 456 in a banquet setting.

The ceiling height was increased to include four clerestories (two on both the northern and eastern sides of the space), for a general ceiling height of 22'-0". Four 2'-0" coffers spaced in the center of the room have 2'-0" pop-ups inside of them as well.

Activities | Tasks:

- Dining
- Socializing
- Receptions
- Parties/dancing

Dimensions:

Area: 5400 SF

Dimensions: Approximately 90'-0" x 60'-0"

Surface Materials:

Main Surface	Description	Color	Reflectance
Ceiling	Overall Ceilings	Antique Lace	0.95
	Ceiling popups	Golden Ecru	0.95
Floor	Carpet, ballroom inlays	Multi-colored	0.17
Walls	General wall covering	--	0.94
	Ballroom space inlays wall covering	--	0.98
Woodwork	Wood veneer, sliced andes cedar with semi-open pore lacquer 30% sheen	--	0.24

Table 19: Ballroom Material Schedule

Ballroom Plans:

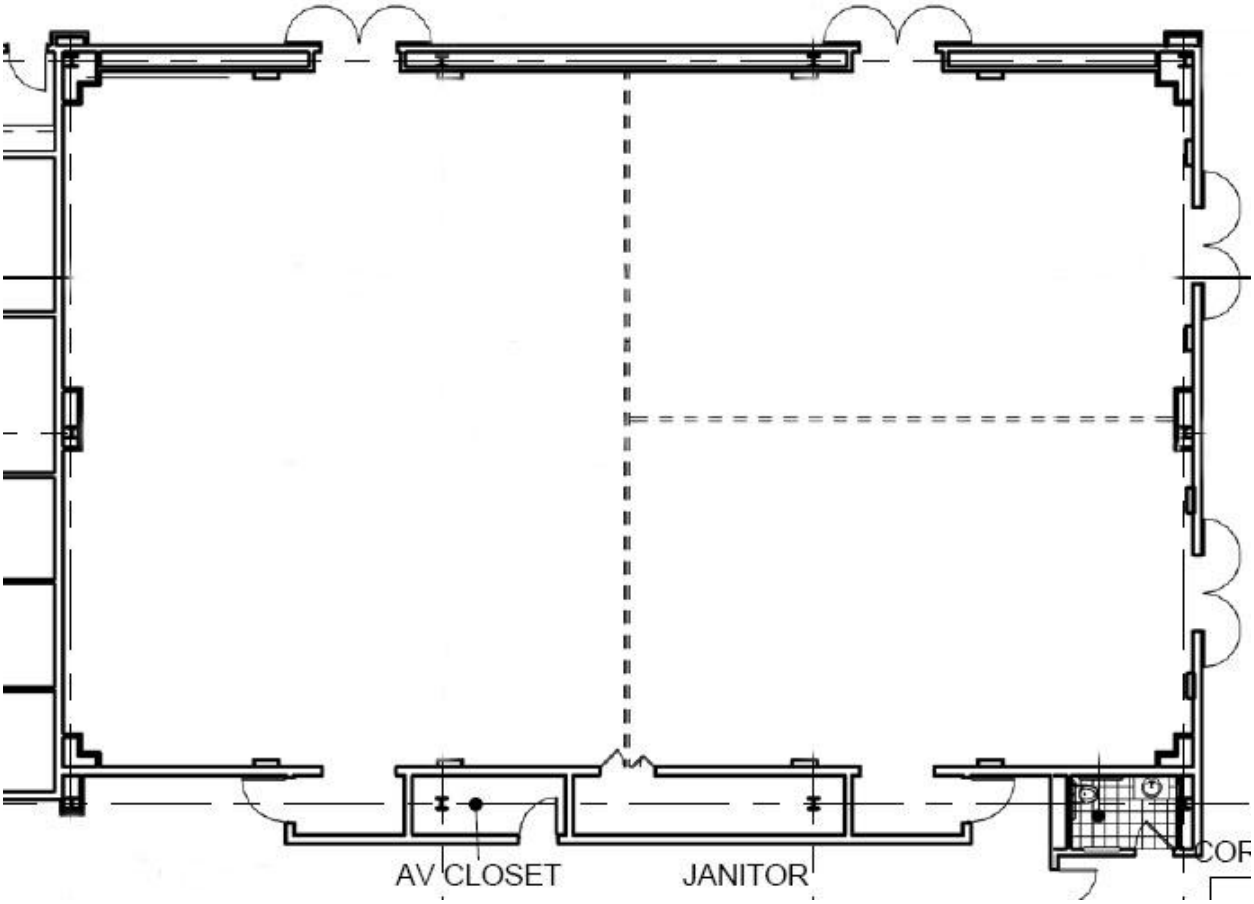


Figure 35: Ballroom Plan with partitions shown (dashed)

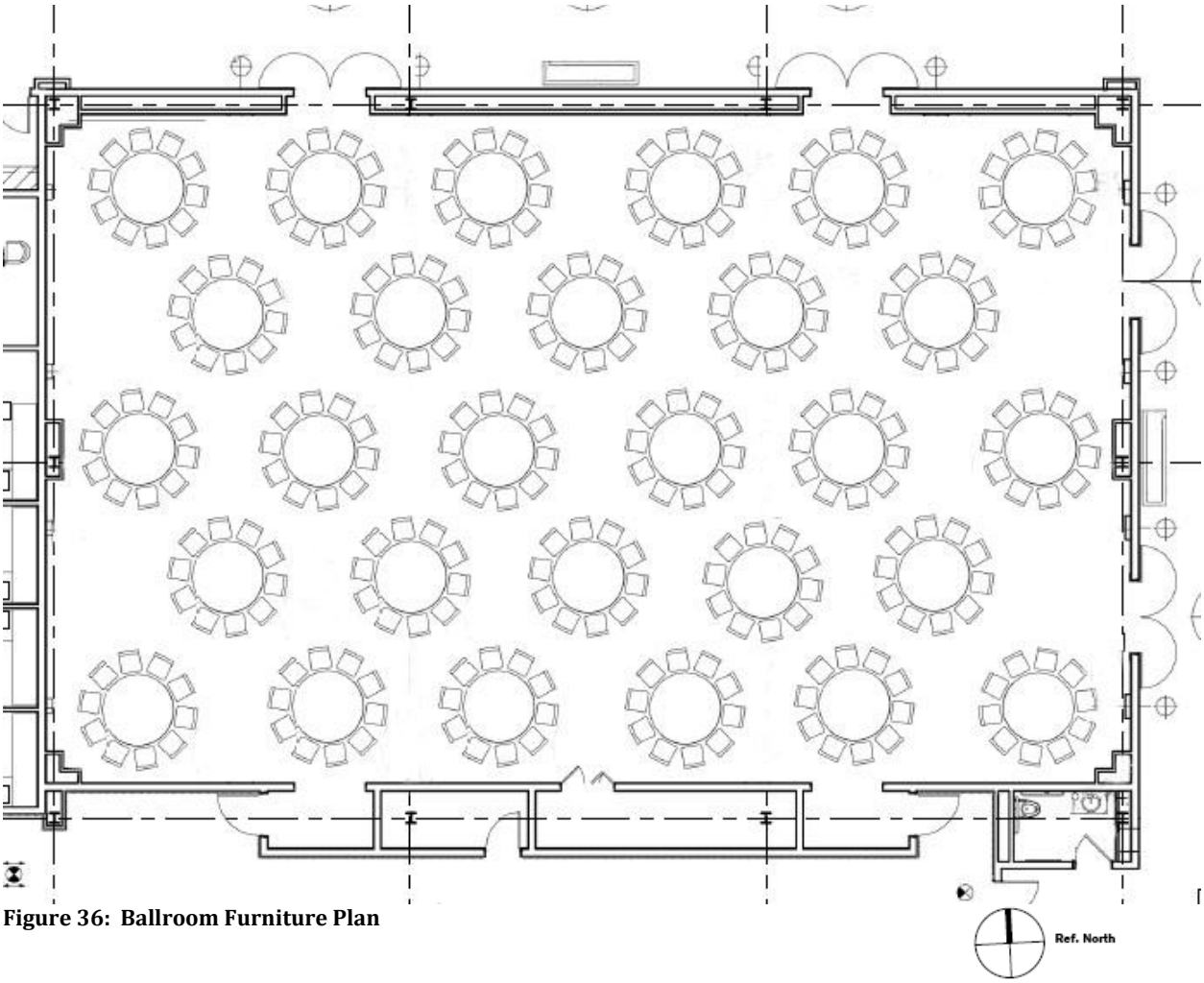


Figure 36: Ballroom Furniture Plan

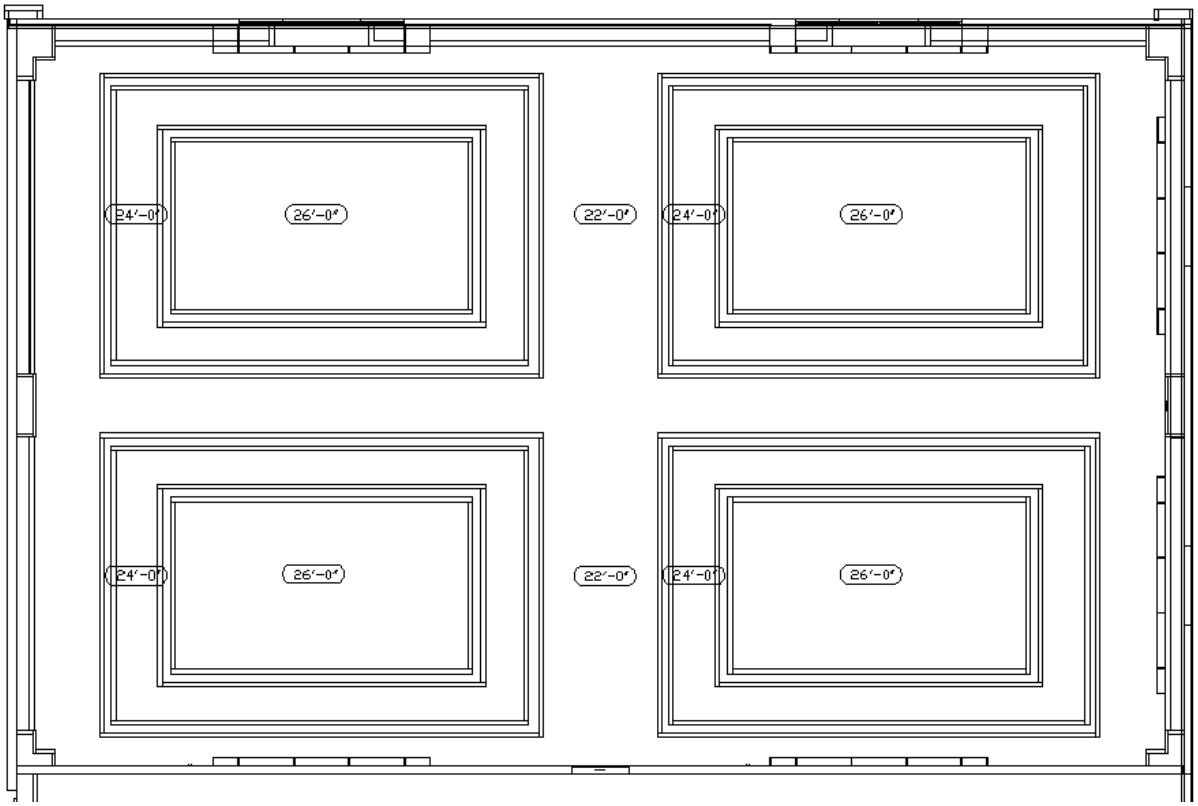


Figure 37: Ballroom Ceiling Plan

Ballroom Elevations:

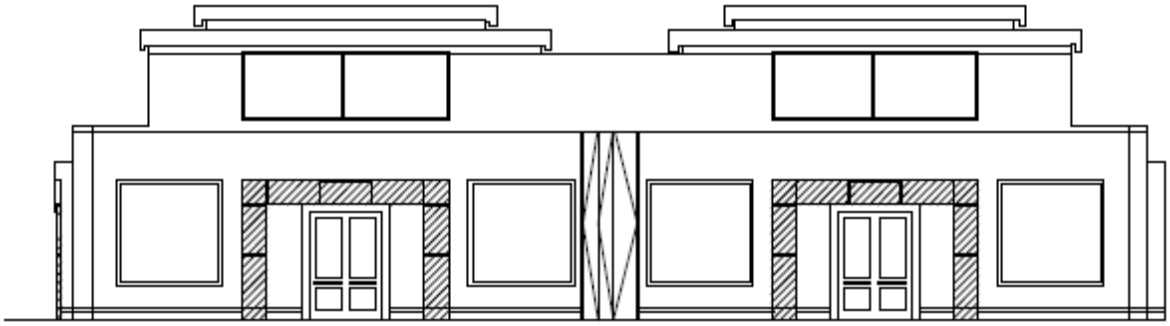


Figure 38: North Elevation

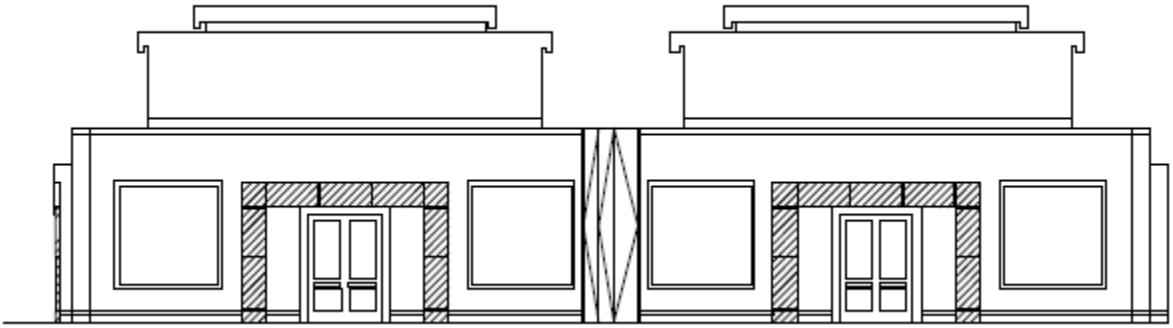


Figure 39: South Elevation

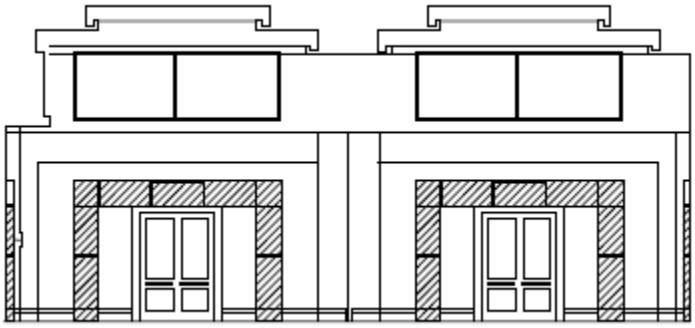


Figure 40: East Elevation

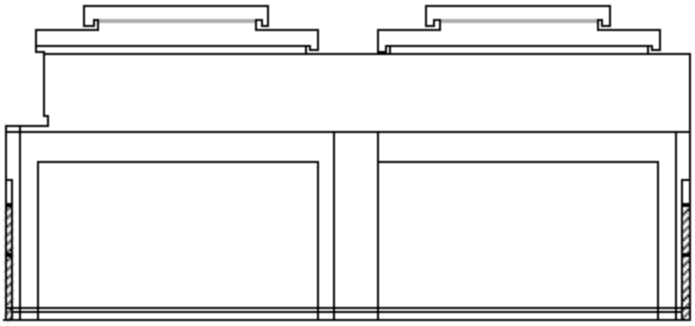


Figure 41: West Elevation

Design Criteria and Considerations:

General Lighting Concept:

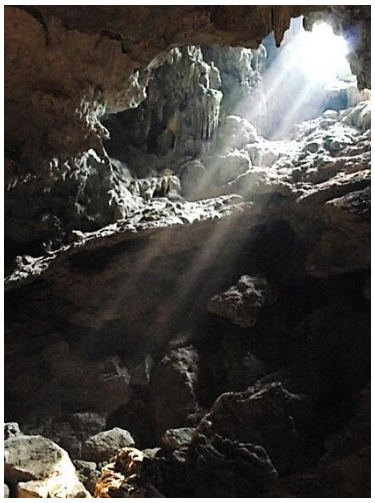


Figure 42: Inspirational Image

Nature | Daylight

The source of inspiration for this space is a dark cave illuminated by a sliver of daylight. Just like a cave in nature, a ballroom in a conference center shuns the daylight. However, adding in daylight into the space really enhances the overall atmosphere during certain types of events, specifically long conferences. With the use of four clerestories, daylight is integrated into the Ballroom. For events not wanting daylight or for those using projection screens, shading devices will be utilized.

Three preset scenes were considered for the lighting design of the Ballroom, as function is a driving factor for the lighting design. Flexibility and controls are of extreme significance for the lighting design solution as well.

First, a more public lighting design was created in the Ballroom. The clerestories are assumed to be open, allowing daylight to come into the room. Uniform perimeter lighting is included to make the space feel more open and spacious during public events or company outings. A double tiered cove lighting system with a uniform glow inside the coves is also included in the design. To add an element of sparkle, decorative chandeliers are added in each of the cove systems.

During a private event, such as a reception or reunion, the lighting design will alter slightly. Shades on the clerestories can be programmed to be down if daylight is not wanted. To make the room more intimate and add visual interest, sconces along the perimeter glow with warm light. Low levels of perimeter lighting and low levels of light from the coved system also add to a more intimate scale during reception events. The decorative chandeliers in the coves remain on to add sparkle and as a focal point to the space.

Themed parties and bar mitzvahs, as well as other very festive and social events, also have the option of utilizing a separate preset scene. Color drives the lighting design in this space--colored light around the perimeter and in the coves not only make the events more memorable, but adds to a more fun and exciting space. Adding sparkle and more intimacy into the room is created with the use of the decorative chandeliers and sconces along the perimeter.

Psychological Aspect:
The Ballroom has the ability to create many different impressions, depending upon the wanted function of the space. For instance, a more public feel with general ambient light would be utilized during a company or university event, such as a conference, meeting, or networking reception. Themed parties, dances, or anniversary parties tend to have a festive atmosphere, and includes the use of color, sparkle, and reflected highlights around the room.

Appearance of Space and Luminaires:
The Ballroom in the Hotel and Conference Center is the largest space available in the building for guests. As such, it is used to showcase the sophistication and uniqueness of the venue. By incorporating chandeliers, wall sconces, and other such decorative luminaires, the space will transform venues and create a chic design. The wood millwork around each of the doorways and crown molding in the coffered ceiling can also be accented, as the details aid in the overall appearance of the Ballroom.

Color Appearance and Color Contrast:
The colors and finishes of the Ballroom match with the rest of the Hotel and Conference Center: warm and relaxing. Lamps with warmer CCTs are specified to uphold the character of the space and enhance the finishes and colors present. Warmer CRIs were also considered because of fresh food being catered or served and the effects of lighting on people's skin.

Luminances of Room Surfaces:
Color and finish selections in the Hotel and Conference Center were thoroughly thought out and executed, as similar ones were selected for the Ballroom. Because of this, the lighting in the Ballroom should enhance the textures and colors.

System Control and Flexibility:
Lighting has a prominent effect and role during large events. Lights dimming or changing color, for example, signal to guests that an important event is starting or happening. The Ballroom should definitely employ a flexible control system for different scene presets. Different presets are used to accommodate for each of the venue options. Control of the shades on the clerestories is also important during events where daylight is not wanted or when the projection screen is in use.

Light Distribution on Surfaces:
Uniform lighting on tables is critical during the more public events, for reading and writing purposes especially. A public atmosphere is achieved with higher levels of illumination and more uniform light distributed on both the horizontal and vertical planes. Having higher luminances on the workplane with peripheral emphasis will make the Ballroom appear more clear and open. Another lighting system is employed during the more private events, with a non-uniform distribution and lower light levels. Emphasis on architectural features will draw guests' eyes towards these surfaces.

Modeling of Faces or Objects:
With the application of lamps with high CRIs, guests' facial features and skin tones will appear much more natural. The Ballroom is a public, social room that is meant for interaction, so vertical illumination is critical.

Sparkle/Desirable Reflected Highlights:
During the more festive activities in the Ballroom, such as themed parties or dances, sparkle is necessary to add to the excitement of the event. Decorative chandeliers and sconces along the wall add sparkle to the space.

Horizontal Illuminance:
A horizontal illuminance is recommended in Category "B", **5fc** for simple visual tasks. It was decided that depending on the type of event occurring in the Ballroom, the following criteria would be met:

- Public (conferences, pre-function type events, etc): **30fc**
- Presentations (screen projector usage): **15fc**
- Private (dinners, receptions, etc): **10fc**
- Festive (wedding receptions, parties, etc): **5fc**

Vertical Illuminance:
A vertical illuminance is recommended in Category "A", **3fc**.

Power Density Allowance: ASHRAE 90.1.2007
- Convention Center > Exhibit Space = **1.3W/SF**
- Additional Interior Lighting Power – In addition to the installation of general lighting, decorative lighting is permitted (chandeliers, sconces, or for highlighting features) as long as it does not exceed **1.0 W/SF**.
- Total allowable = **2.3 W/SF**

Daylighting
As stated in the design concept of the ballroom, daylight integration is wanted within the space. The current design of the ballroom does not include any glazing at all, so glazing had to be added. Because of this addition, an architectural breadth was conducted (refer to the Architectural Breadth study for more information). Four clerestories were added, two on the northern side and two on the eastern side of the ballroom. Each was strategically placed above the four double doors leading out into the prefunction area. Their properties are listed below:

- (4) clerestories; (2) on North façade and (2) on East façade
- 5'-6 1/2" wide x 17'-0" long
- Viracon Low-E (VE) Laminated Glass ½" (VE 1-40)
  - VT = 39%
  - U-value (winter) = 97%
  - U-value (summer) = 88%
  - SHGC = 38%

Shading devices were also specified to have the option of having the shades either open or closed for all of the clerestories. Not all of the functions in the ballroom will want to utilize the clerestories, specifically if the projection screen (on western wall) is being used. Shading devices from Lutron were selected to integrate with the control system.

The shades that are being used in the Ballroom are the Sivoia QED roller20 shades. A pocket lineal (see Figure 43) was selected for having the option of two different shades depending on the event taking place. A sheer, Basketweave NT shade was selected as one of the shades, maintaining the view to the outside while reducing glare, solar heat gain, and ultraviolet penetration. Blackout shade Value Premiere was chosen as the second shade option, so all daylight can be eliminated from the space at any time. These shades have a smooth, quiet operation controlled by an Electronic Drive Unit. The EDU is housed inside of the roller shade assembly and adjusts the shade to the desired preset positions. Because the clerestories are located in all three salons (Ballrooms A, B, and C), two power panels are needed for each room.

Sivoia QED roller20 Shades – Classico Collection								
Shade	**Name**	**Model**	**Color**	**Ts**	**Tv**	**As**	**Rs**	**Openness Factor**
Sheer	*Basketweave NT*	SN-010-10	Sable/Sable	12%	**12%**	52%	36%	10%
Blackout	*Value Premiere*	BP-Q57-0	Wheat	0%	**0%**	36%	64%	0%

Table 20: Shade specifications | Lutron

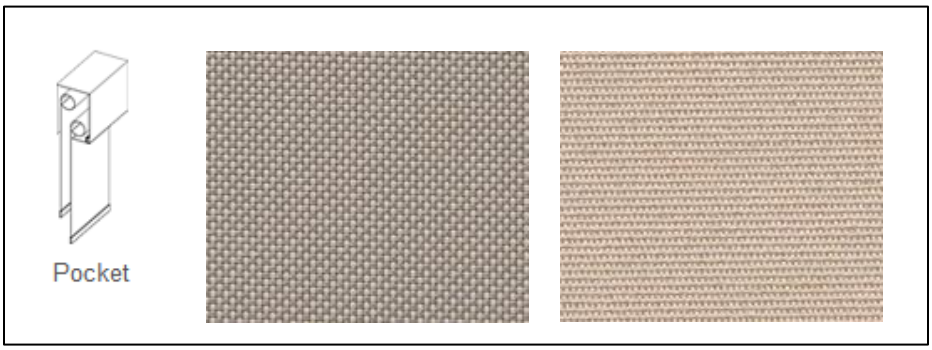


Figure 43: Lineal section, Basketweave NT shade, and Value Premiere shade

Lighting Plan – Refer to Appendix C

Mounting Details – Refer to Appendix C

Luminaire Equipment Schedule:

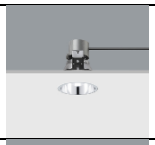
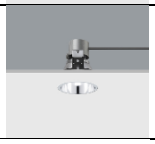
Tag	Luminaire	Description
L		Open recessed 4" aperture downlight with vertical lamp orientation for (1) 100W low voltage halogen lamp. Bright anodized, aluminum darklight reflector with cut-off angle of 30° and a glass, frosted diffuser.
M		Open recessed 4" aperture downlight with vertical lamp orientation for (1) 75W low voltage halogen lamp. Bright anodized, aluminum darklight reflector with cut-off angle of 45° and a glass, frosted diffuser.
N		Colourline. 12" compact linear RGB LED cove light with beam distribution of 120° x 120°. Clear diffuse lens with ratcheting mounting bracket for secure aiming. 20 LEDs per foot. Dimming available.
O		Decorative custom chandelier based on design from Yellow Goat Design with 3 tiers and 21 lamps. Assemblage of clear acrylic swirls and curves to form classic chandelier shape. Crystal accents added for sparkle. Black finish. 48"h x 72"w.
P		Decorative custom sconce with assemblage of clear acrylic swirls and curves. 15.5"h x 9.5"w x 7" projection. Candelabra base. Mounted 7'-0" AFF.

Table 21: Condensed Ballroom Luminaire Schedule

**The full Lighting Equipment Schedule can be found in Appendix A.*

Light Loss Factors:

Light Loss Factors						
Tag	**Initial Lumens**	**Mean Lumens**	**LLD**	**LDD**	**BF**	**Total**
L	-	2350	0.95	0.94	-	0.89
M	-	1600	0.95	0.94	-	0.89
N	--	--	0.70	0.90	1.00	0.63
O	--	60	0.95	0.94	-	0.89
P	--	60	0.95	0.94	-	0.89

Table 22: Ballroom Light Loss Factors

**Use of the new procedure to find LDD was used. As the new handbook does not address RSDD, it was not calculated. According to the new handbook, a LEDs LLD is assumed to be 0.7. A 12 month cleaning interval and "clean" environment was assumed. Any other LLFs not displayed are assumed to be 1.0.*

Controls:

Because the Ballroom is a multi-functional space, specific controls were needed to accommodate the scene changes and different lighting zones assigned in the space. A Viseo Wallstation provides local access to the lighting control system and operates every zone and scene. Shades for the clerestories are controlled with the Sivoia QED Controller interface. The LEDs in the Ballroom are controlled via the DMX512 Control Interface. Because the Ballroom can be divided into three separate, smaller ballrooms (A, B, and C), individual 5-button preset stations are provided in each room, with the main wallstation in the AV Closet directly beside the Ballroom.

Control Schedule						
Tag	**Product**	**Manufacturer**	**Product/Catalog No.**	**No. Units**	**Description**	**Location**
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	1	Main wallstation that provides local access to the lighting control system. Operates every scene and zone in the system, as well as the ability to change fade and delay times in any area. Includes a time clock.	AV Closet (Room #1324)
EQ-B	seeTouch Wallstation	Lutron GRAFIK	SO-5WRLN	3	5-button preset Sivoia QED wallstation with raise/lower capability for Sivoia QED roller20 shades	Ballrooms A, B, and C
EQ-C	DMX512 Control Interface	Lutron GRAFIK	LUT-DMX	1	Allows GRAFIK Eye lighting controls to operate lighting and other equipment including LED-based lamps	Ballroom
EQ-D	roller 20 shades	Lutron | Sivoia QED	Sivoia QED | roller 20	3	Smooth, ultra-quiet operable shades controlled by an Electronic Drive Unit (EDU), housed in the roller shade assembly. The EDU controls the movement positions of the shades	Ballroom

Table 23: Controls Schedule | Ballroom

Performance Data and Preliminary Renderings:

Public Atmosphere—Sconces off, and all other lights on at full output; daylight not considered in calculation

Ballroom | Calculation Summary	
	Horizontal (2.5')
Avg Illuminance	***34.14 fc***
Max Illuminance	50.2 fc
Min Illuminance	13.7 fc
Avg/Min	2.49
Max/Min	3.66
Criteria	30 fc
Compliance?	**Yes**

Table 24: Calculation Summary of Ballroom | Public

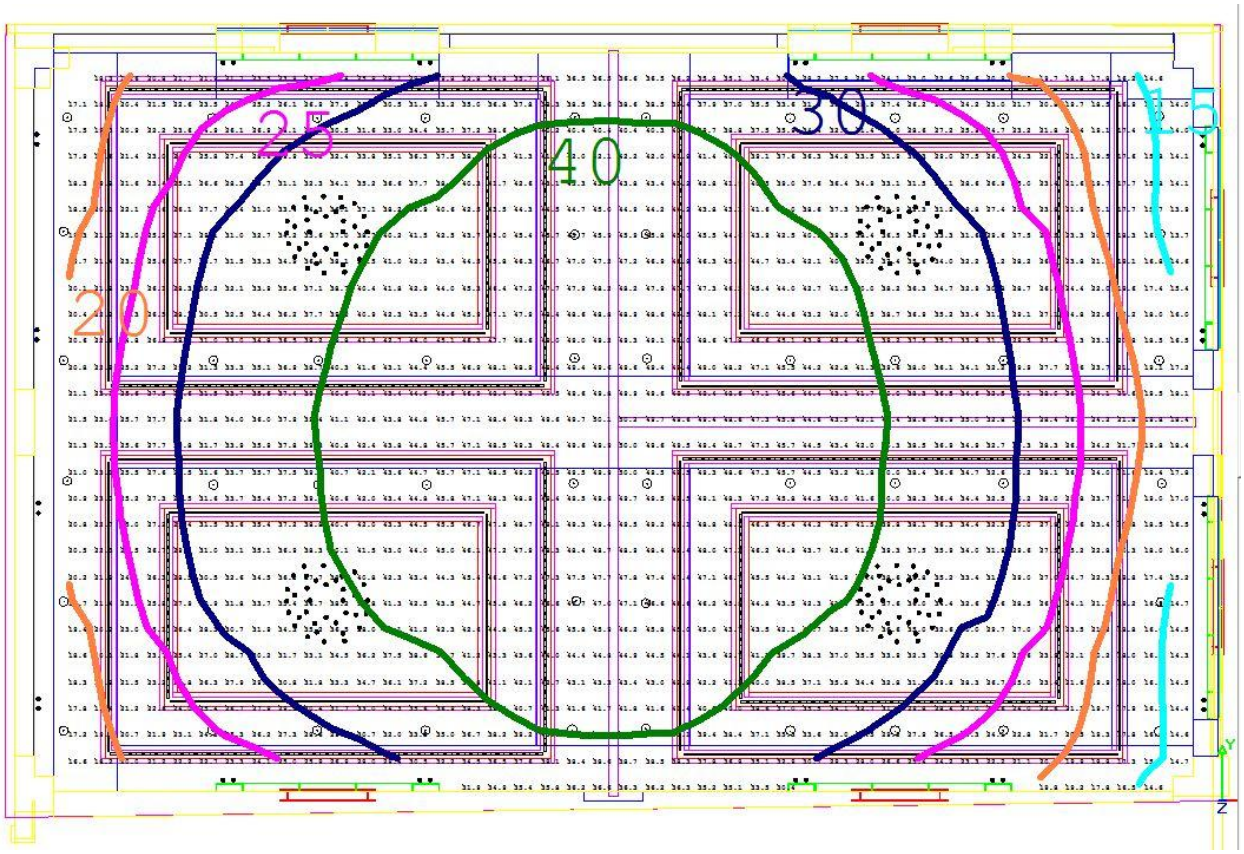


Figure 44: Illuminance Contours of Ballroom | Public

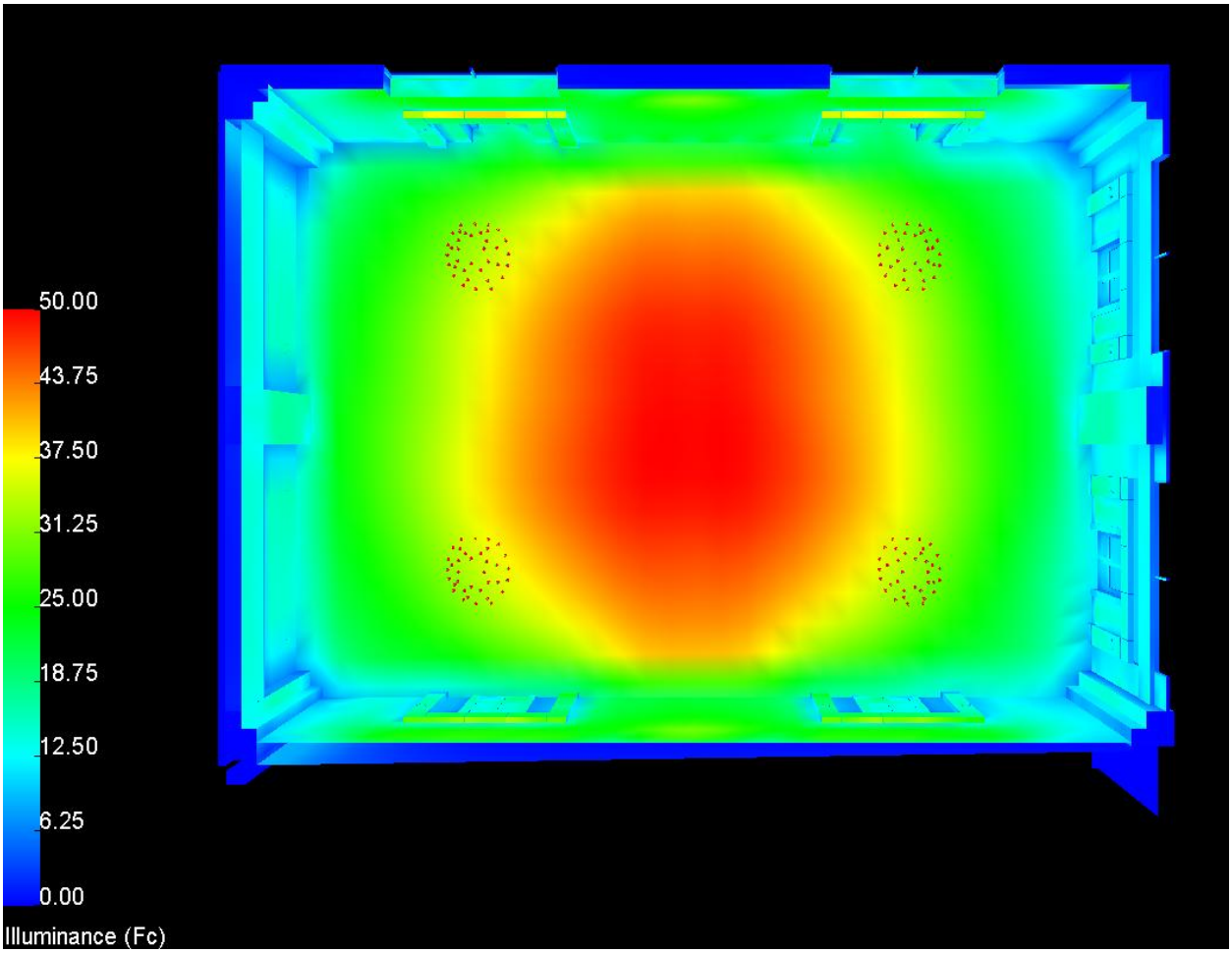


Figure 45: Pseudo Color Rendering of Ballroom | Public

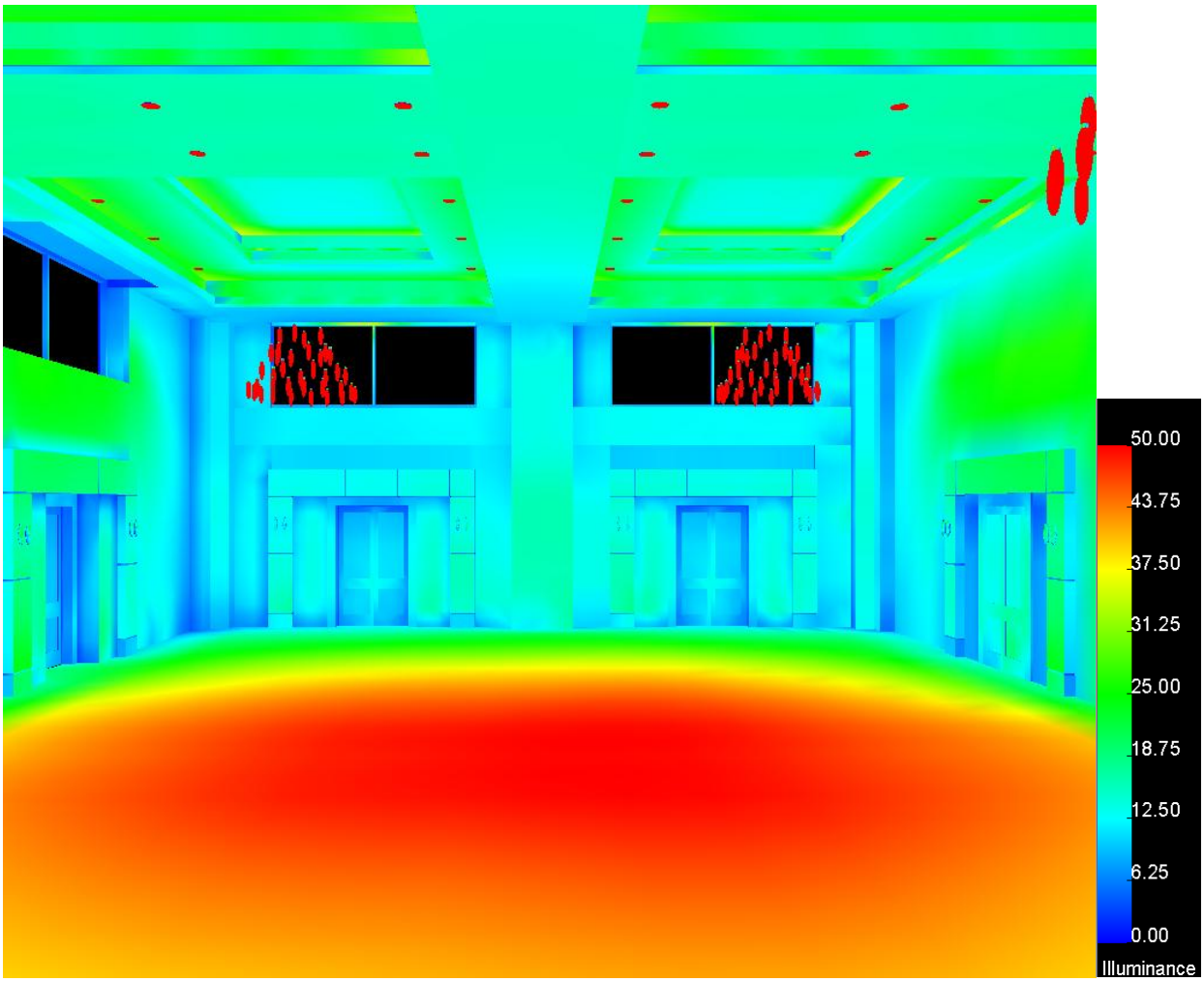


Figure 46: Pseudo Color Rendering of Ballroom | Public

Private Atmosphere—Downlights dimmed to 20%, sconces switched on; no daylight

Ballroom | Calculation Summary	
	Horizontal (2.5')
Avg Illuminance	***10.88 fc***
Max Illuminance	13.9 fc
Min Illuminance	5.2 fc
Avg/Min	2.09
Max/Min	2.67
Criteria Compliance?	10 fc **Yes**

Table 25: Calculation Summary of Ballroom | Private

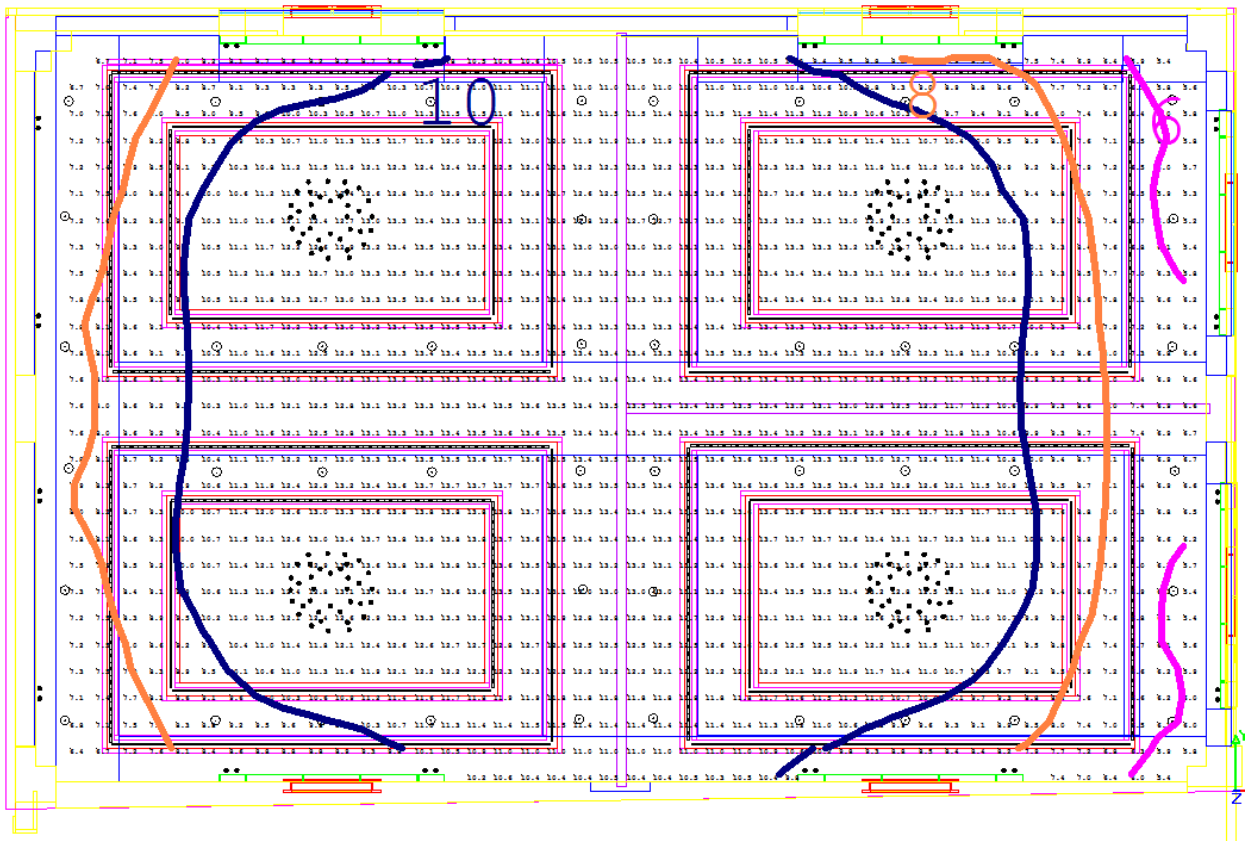


Figure 47: Illuminance Contours of Ballroom | Private

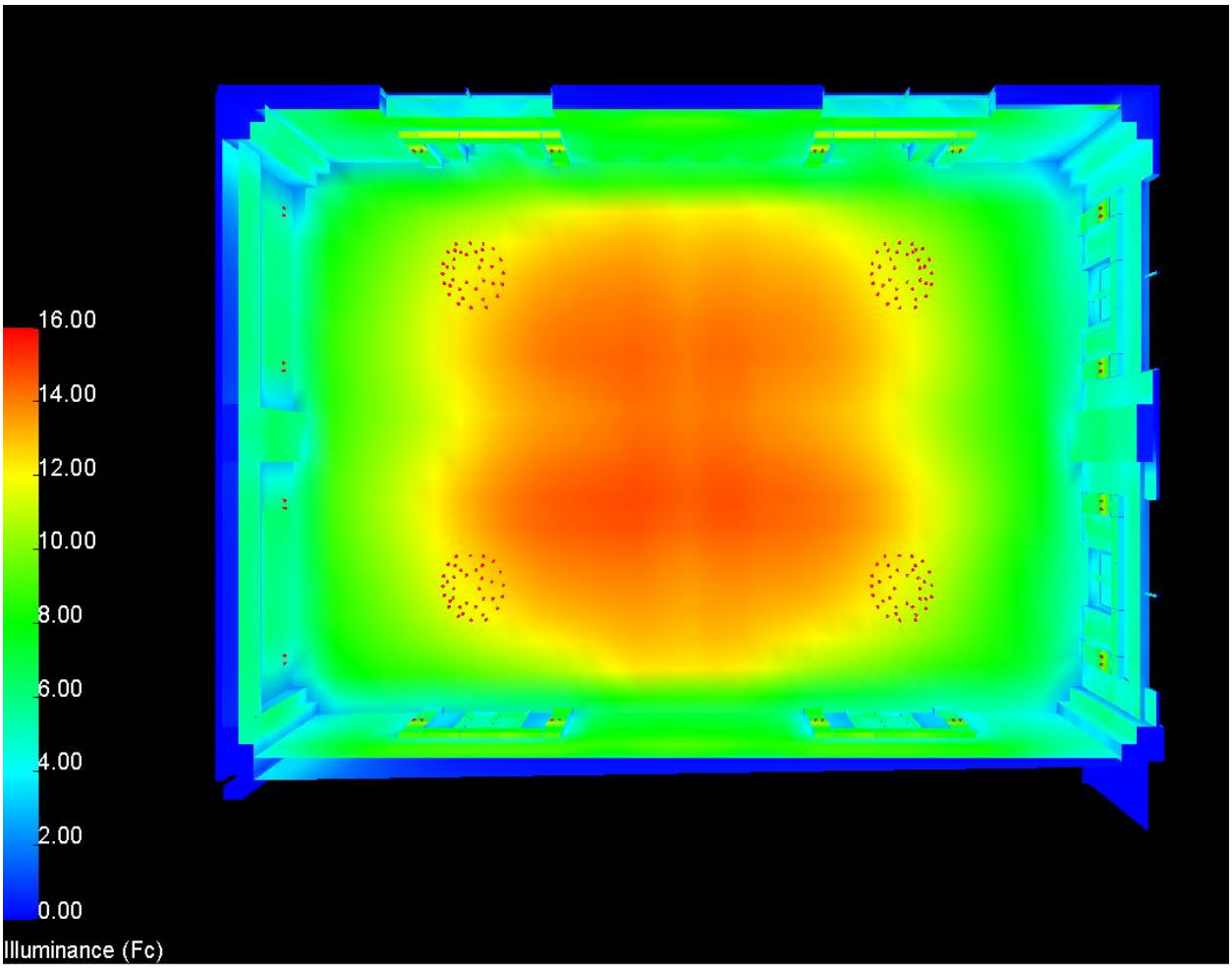


Figure 48: Pseudo Color Rendering of Ballroom | Private

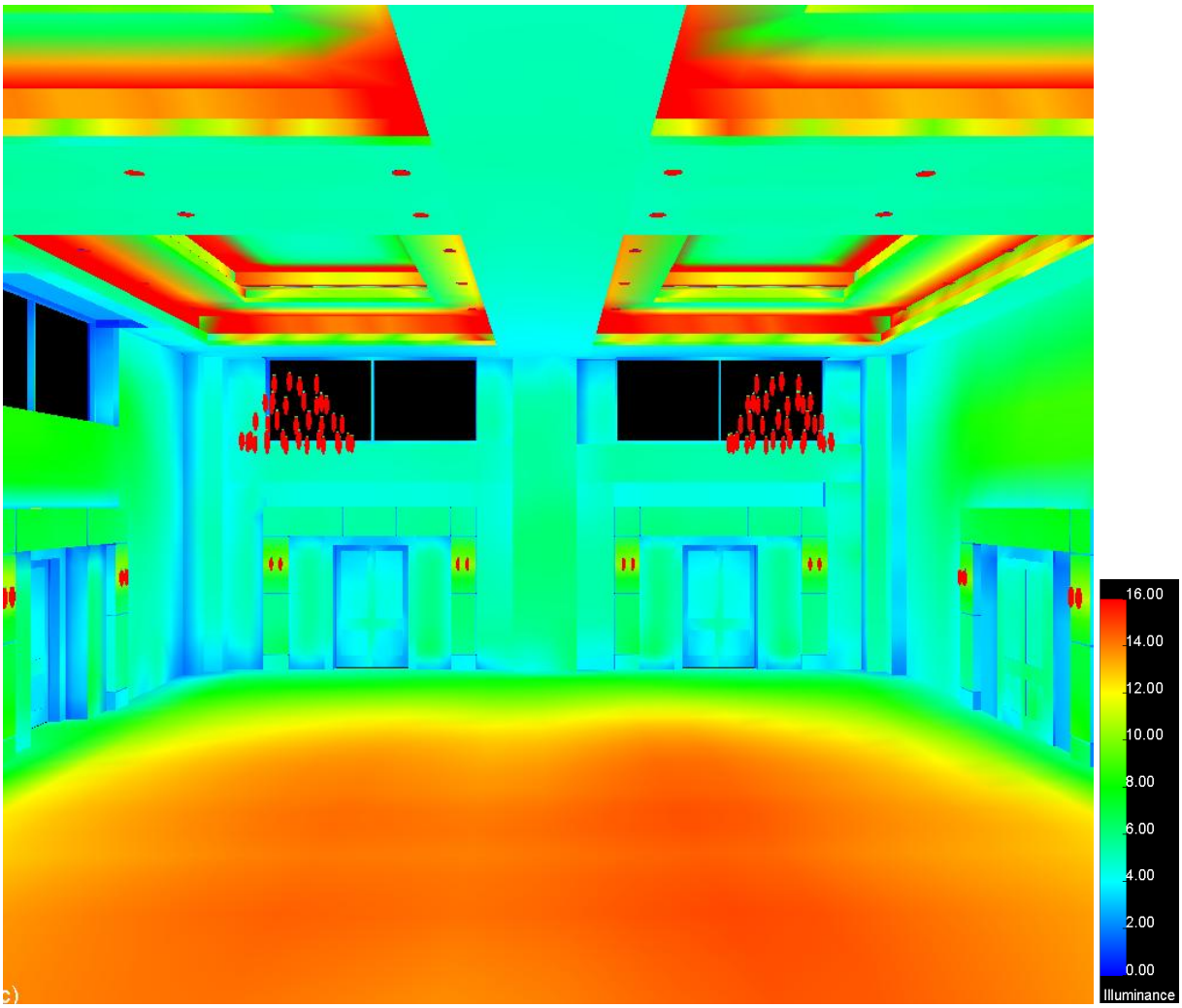


Figure 49: Pseudo Color Rendering of Ballroom | Private

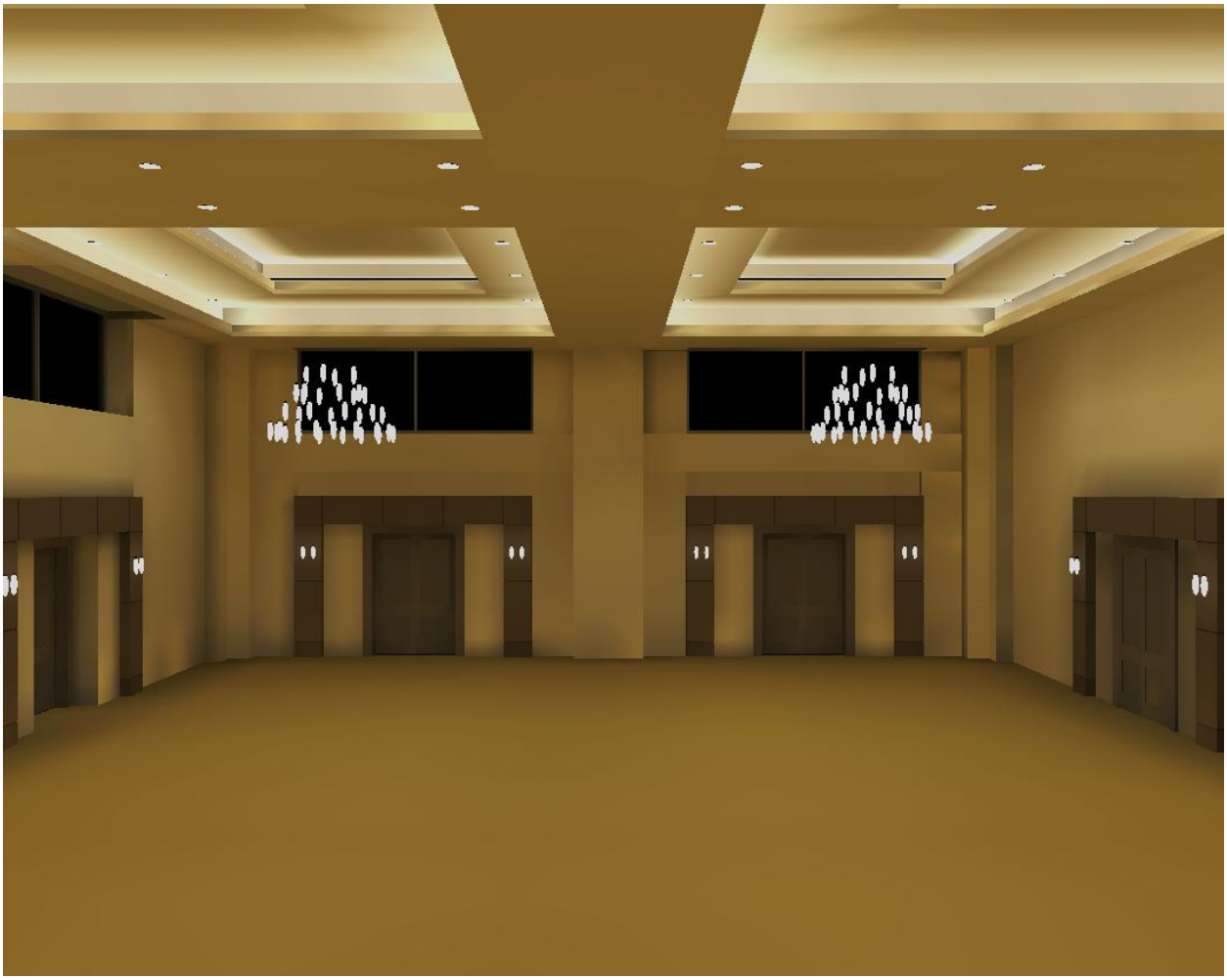


Figure 50: Preliminary Rendering of Ballroom | Private

Presentation Setting—Some downlights on (in cove system only) dimmed to 20%; no daylight

Ballroom | Calculation Summary	
	Horizontal (2.5')
Avg Illuminance	***14.45fc***
Max Illuminance	17.6 fc
Min Illuminance	9.6 fc
Avg/Min	1.51
Max/Min	1.83
Criteria Compliance?	15 fc **Yes**

Table 26: Calculation Summary of Ballroom | Presentation Mode

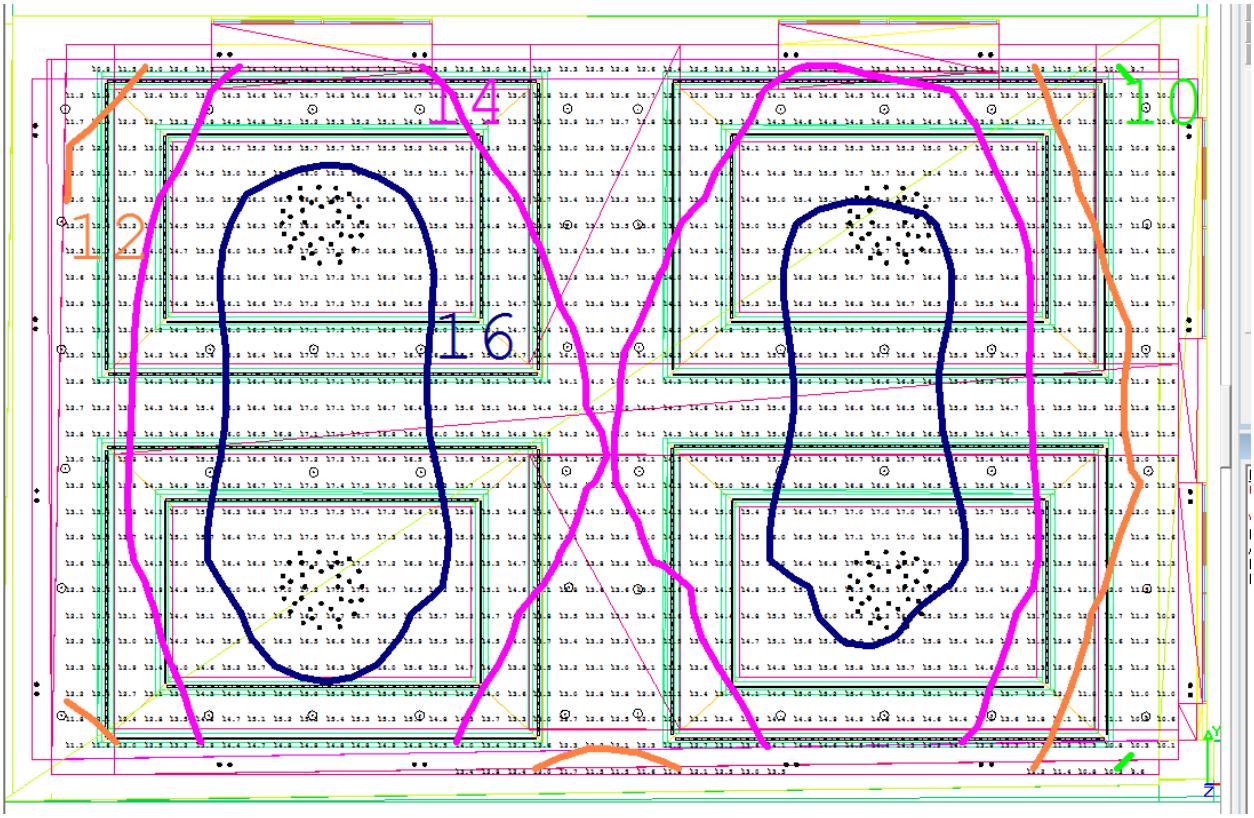


Figure 51: Illuminance Contours | Ballroom - Presentation Mode

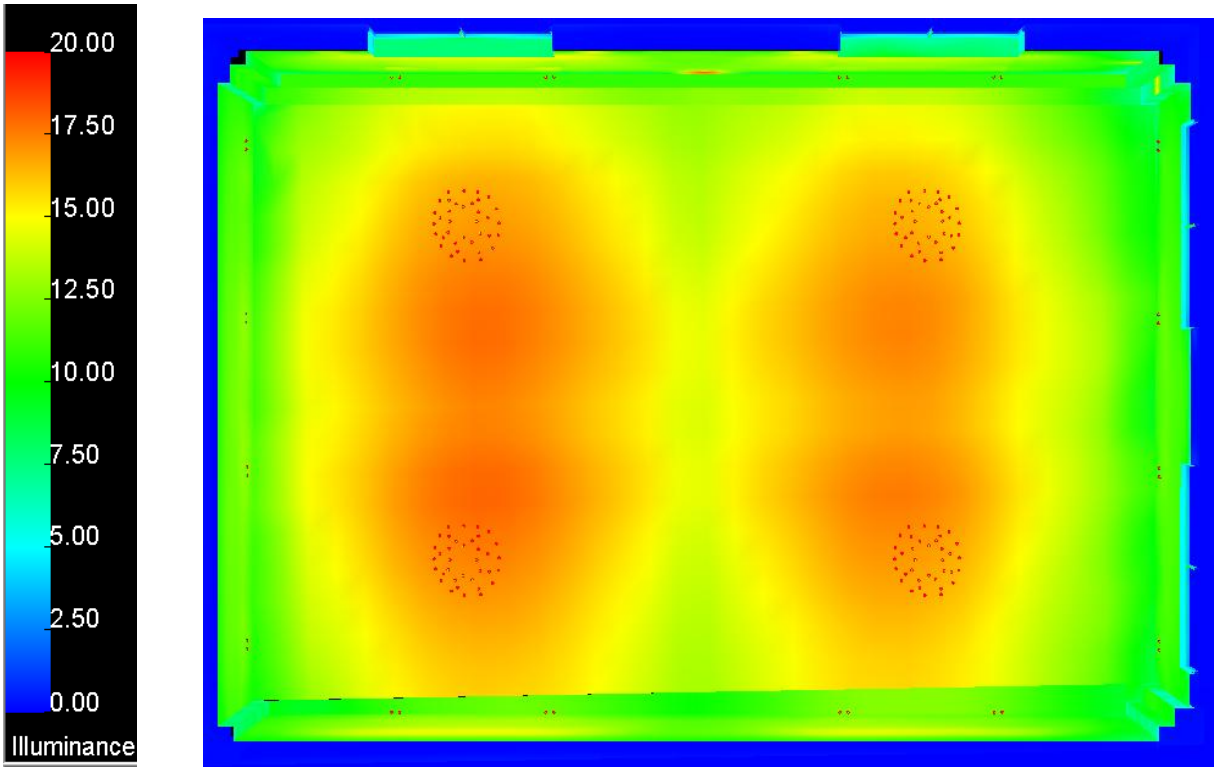


Figure 52: Pseudo color | Presentation Scene

Lighting Power Density:

ASHRAE Standard 90.1 | LPD Summary				
Tag	**Quantity**	**Watts/Luminaire**	**Watts/LF**	**Total Watts**
L	36	100	--	3600
M	12	75	--	900
N	744	3	--	2232
O	4	105	--	420
P	16	10	--	160
			Total Watts	**7312**

ASHRAE Standard 90.1 | LPD Summary						
Room	**Area**	**Power Density Allowable**	**Allowable Wattage**	**Designed Wattage**	**Actual LPD**	**Met?**
Ballroom	5400	1.3 W/SF	7020	6732	1.25	Yes
Decorative Allowance	5400	1.0 W/SF	5400	580	0.11	Yes
			W/SF	**1.24**		

Table 27: LPD Summary Tables

The lighting power density requirements from ASHRAE Standard 90.1 allow only 7020 Watts total in the Ballroom without the decorative allowance. Because there are 7312 Watts total, the decorative allowance was utilized to meet ASHRAE standards. The decorative chandeliers and sconces were accounted for in the decorative allowance.

Performance Summary:

The Ballroom in the Hotel and Conference Center is a very flexible and functional space, able to accommodate all kinds of different events. Therefore, the lighting design should also be flexible and functional. A GRAFIK Eye System controls the scenes and zones of the room in order to change the overall look and feel of the space. Custom decorative chandeliers and sconces sparkle and shine as light reflect off of their surfaces. A double tiered cove system bounces light on the ceiling as well, making the room feel more public and open. The GRAFIK Eye System also controls the shading devices that are to be specified for the clerestories. This is extremely important and useful in knowing, too, specifically because the Ballroom can be split up into three separate "rooms" (with the use of partitions).

With the use of low color temperature halogen lamps and LED luminaires, the lighting design does in fact meet criteria set forth in ASHRAE 90.1 with the use of the decorative allowance. The new lighting design also met design recommendations found in ASHRAE 90.1

Electrical Depth

Redesigned Spaces

Lighting redesign was done for four spaces in the Hotel and Conference Center. These four spaces are the exterior space (façade and courtyard), Main Lobby, Lounge, and Ballroom.

On the exterior of the building, LED and compact fluorescent make up the majority of the new lighting. The original design included a mixture of both LED and compact fluorescent, as well as ceramic metal halide lamps.

The Main Lobby originally had a combination of compact fluorescent, linear fluorescent, LED, and halogen lamps. The projected lighting design actually utilizes the majority of these fixtures as well. For the most part, LED and fluorescent are used in the Lobby, with the exception of halogen accent lights for highlighting artwork around the perimeter of the space.

Originally, the lighting in the Lounge was a mixture of halogen, LED, and fluorescent sources. The modified lighting design incorporates all halogen and LED lamps. During the evening, lower levels of light can be utilized, so dimming presets are optional.

Where the lighting in the Ballroom was a combination of both fluorescent and halogen lamps, the proposed solution employs a mixture of dimmable LED and quartz halogen sources. These sources are also dimmable, allowing for a variety of preset scenes depending on the event taking place.

Branch circuit distribution has been redesigned in response to the new lighting designs. Both the panelboards and feeder sizes changed and their modifications are shown below. Additional lighting controls specified for the rooms are also documented.

The table shown below details the panelboards affected by the lighting modifications:

Panelboards						
Panel Tag	**Voltage**	**System**	**Exterior**	**Main Lobby**	**Lounge**	**Ballroom**
DML	208Y/120V 3ϕ 4W	N				x
DMB	208Y/120V 3ϕ 4W	N		x	x	
HH	480Y/277v 3ϕ 4W	N	x			
EML	208Y/120V 3ϕ 4W	N/E		x		x
EMH	480Y/277v 3ϕ 4W	N/E	x		x	

Table 28: Panelboard Schedule

Exterior (façade and courtyard)

The new lighting design on the exterior portion of the Hotel and Conference Center is made up of LED and compact fluorescent sources. LED light columns and inground compact fluorescent road markers wrap around the walkway along the exterior of the site. The central plaza has a couple more of the light columns, as well as LED strips recessed underneath the concrete seating benches. Compact fluorescent downlights are utilized in the canopy of the hotel entrance and compact fluorescent sconces glow around the perimeter of the building. LED grazers are mounted on the exterior of the façade, accentuating the texture of the brick.

Lighting Plan

The lighting plans with controls and circuiting can be found in Appendix C.

Existing Panelboard Schedule - HH

Circuits that will be modified for the Exterior façade and courtyard on panel HH are highlighted below:

PANELBOARD SCHEDULE — HH

VOLTAGE	PHASE	WIRE	MCB (A)	MLO (A)	AIC	MOUNTING	MANUFAC.	MDL #	DWG REF
277 / 480	3	4	225	–	–	SURFACE	–	–	E6.01

TYPE LEGEND				REMARKS
L	LIGHTING	K	KITCHEN EQ	PROVIDE EQUIPMENT GROUND BUS
R	RECEPTACLES	E	EXISTING	PROVIDE FEED THRU LUGS FOR MULTI-SECTION PANELS
M	MECH EQUIP	O	OTHER	–

CKT. #	ITEM SERVED	TYPE	WIRE	CONDUIT	CKT. BRK TRIP	CKT. BRK P	LOAD (VA)	PHASE	LOAD (VA)	CKT. BRK P	CKT. BRK TRIP	CONDUIT	WIRE	TYPE	ITEM SERVED	CKT. #
1	LTG – LG. MTG. RMS.	L	#12	3/4"	20A	1	2592	A	0	1	20A	–	–	–	SPARE	2
3	LTG – SM. MTG. RMS.	L	#12	3/4"	20A	1	2062	B	200	1	20A	1"	#10	L	SITE LTG	4
5	LTG – BLDG EXT.	L	#12	3/4"	20A	1	1228	C	0	1	20A	1"	#10	L	SITE LTG (SCULPTURE)	6
7	LTG – GUEST FLOORS	L	#12	3/4"	20A	1	768	A	26	1	20A	1"	#10	L	SITE LTG (STEPS)	8
9	SPARE	–	–	–	20A	1	0	B	150	1	20A	1"	#10	L	SITE LTG (BENCHES)	10
11	SPARE	–	–	–	20A	1	0	C	385	1	20A	1"	#10	L	SITE LTG (TERRACE)	12
13	SPARE	–	–	–	20A	1	0	A	0	1	20A	–	–	–	SPARE	14
15	SPARE	–	–	–	20A	1	0	B	0	1	20A	–	–	–	SPARE	16
17	SPARE	–	–	–	20A	1	0	C	0	1	20A	–	–	–	SPARE	18
19	BUSSED SPACE	–	–	–	20A	1	0	A	0	1	20A	–	–	–	BUSSED SPACE	20
21	BUSSED SPACE	–	–	–	20A	1	0	B	0	1	20A	–	–	–	BUSSED SPACE	22
23	BUSSED SPACE	–	–	–	20A	1	0	C	0	1	20A	–	–	–	BUSSED SPACE	24
25	BUSSED SPACE	–	–	–	20A	1	0	A	2176	1	20A	1/2"	#12	L	KIT., LAUN., ETC LTG	26
27	BUSSED SPACE	–	–	–	20A	1	0	B	2500	1	20A	1/2"	#12	L	UTILITY SPACES LTG	28
29	BUSSED SPACE	–	–	–	20A	1	0	C	2500	1	20A	1/2"	#12	L	1ST FLR CORR. LTG	30
31	BUSSED SPACE						0	A	1996	1	20A	1"	#10	L	ADMIN AREA LTG	32
33	BUSSED SPACE						0	B	4400	1	20A	1"	#10	L	EXT. PARK. LTG	34
35	BUSSED SPACE						0	C	341	1	20A	1"	#10	L	SITE LTG	36
37	TRANSFORMER FOR		SEE	SEE	SEE	3	SEE	A	490	1	20A	1"	#10	L	SITE LTG	38
39	PANEL "HL"		RISER	RISER	RISER		SUB	B	490	1	20A	1"	#10	L	SITE LTG	40
41			DIAG.	DIAG.	DIAG.		LOAD	C	97	1	20A	1"	#10	L	SITE LTG	42

	A	B	C	TOTAL
CONNECTED LOAD (VA)	8048	9802	4551	22401

Figure 54: Existing Panelboard Schedule | Exterior

Emergency Panel Affected

PANELBOARD SCHEDULE																EMH	
VOLTAGE		PHASE	WIRE	MCB (A)		MLO (A)		AIC		MOUNTING		MANUFAC.		MDL #		DWG REF	
277 / 480		3	4	250		–		–		SURFACE		–		–		E6.03	
TYPE LEGEND														REMARKS			
L	LIGHTING			K	KITCHEN EQ									PROVIDE EQUIPMENT GROUND BUS			
R	RECEPTACLES			E	EXISTING									PROVIDE FEED THRU LUGS FOR MULTI-SECTION PANELS			
M	MECH EQUIP			O	OTHER									–			

CKT. #	ITEM SERVED	TYPE	WIRE	CONDUIT	CKT. BRK TRIP	CKT. BRK P	LOAD (VA)	PHASE	LOAD (VA)	CKT. BRK P	CKT. BRK TRIP	CONDUIT	WIRE	TYPE	ITEM SERVED	CKT. #
1	PARKING LOT EMERG. LTG	L	#12	3/4"	20A	1	2500	A	180	1	20A	1"	#10	L	COOLING TOWER LTG	2
3	PENTHOUSE EMERG. LTG	L	#10	3/4"	20A	1	350	B	1000	1	20A	3/4"	#10	L	FIRST FLOOR EM. LTG	4
5	LTG-STAIR #1	L	#12	3/4"	20A	1	448	C	0	1	20A	–	–	–	SPARE	6
7	LTG- 1ST FL	L	#10	3/4"	20A	1	2741	A	0	1	20A	–	–	–	SPARE	8
9	LTG- STAIR #2	L	#12	3/4"	20A	1	480	B	0	1	20A	–	–	–	SPARE	10
11	LTG – EXTERIOR	L	#10	3/4"	20A	1	531	C	0	1	20A	–	–	–	SPARE	12
13	LTG – GUEST FLRS	L	#12	3/4"	20A	1	2490	A	0	1	20A	–	–	–	SPARE	14
15	LTG – 1ST FLOOR	L	#12	3/4"	20A	1	615	B	0	1	20A	–	–	–	SPARE	16
17	N.E. EXIT LTG	L	#12	3/4"	20A	1	0	C	0	1	20A	–	–	–	SPARE	18
19	SPARE	–	–	–	20A	1	0	A	0	1	20A	–	–	–	SPARE	20
21	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	22
23	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	24
25	BUSSED SPACE					1	0	A	0	1					BUSSED SPACE	26
27	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	28
29	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	30
31	BUSSED SPACE					1	0	A	0	1					BUSSED SPACE	32
33	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	34
35	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	36
37	PANEL "EML"		SEE	SEE	SEE	3	SEE	A	0	1					BUSSED SPACE	38
39	TRANSFORMER		RISER	RISER	RISER		SUB	B	0	1					BUSSED SPACE	40
41	(SEE RISER FOR MORE INFO)		DIAG.	DIAG.	DIAG.		LOAD	C	0	1					BUSSED SPACE	42

	A	B	C	TOTAL
CONNECTED LOAD (VA)	7911	2445	979	11335

Figure 55: Existing Emergency Panelboard | Exterior

Branch Circuit Calculations

Panelboard HH

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
K1-3	44 lf	4.32/lf	190.08	0.99	480Y/277V	0.23
Q	6	47	282	0.80	480Y/277V	0.42
R	13	11	143	0.82	480Y/277V	0.21
S	13	42	546	0.90	480Y/277V	0.73
T	10	19	190	0.93	480Y/277V	0.21
U	20	50	1000	0.90	480Y/277V	1.34
		Total Watts	**2351**		Total Amps	**3.14**

Table 29: Branch Circuit Calcs | PB HH

The exterior has four different zones of lights: one for the walkway and roadway lights wrapping around the perimeter of the site, one for the plaza, one for the exterior sconces and grazers, and one for the entry canopy downlights. The branch circuit calculations are seen in the tables below:

Panelboard HH

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
4	S	10	42	420	0.90	480Y/277V	0.56
	R	13	11	143	0.82	480Y/277V	0.21
6	K1-3	44 lf	4.32/lf	190.08	0.99	480Y/277V	0.23
	S	3	42	126	0.90	480Y/277V	0.17
8	T	10	19	190	0.93	480Y/277V	0.25
	U	20	50	1000	0.90	480Y/277V	1.34
10	Q	6	47	282	0.80	480Y/277V	0.42
						Total Amps	**3.14**

Table 30: Branch Circuiting Table for Panelboard HH

Panelboard EMH

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
11	R	5	11	55	0.82	480Y/277V	0.08
	S	7	42	294	0.90	480Y/277V	0.39
	T	4	19	76	0.93	480Y/277V	0.10
						Total Amps	**0.57**

Table 31: Branch Circuiting Table for Panelboard HH

Panelboard Sizing

Circuits 4, 6, 8, and 10 were modified in Panel HH for the Exterior façade and courtyard of the Hotel and Conference Center. Emergency Panelboard EMH was modified for the new emergency lighting on the exterior as well. The new panelboards are seen on the next page.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->					HH	Panel Location:			Electrical 1	
Nominal Phase to Neutral Voltage------->					277	Phase:			3	
Nominal Phase to Phase Voltage-------->					480	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Ltg - Lg Mtg Rms	2	Lg Mtg Rm	2592	w	0.95	2592	2728	
2	A	Spare	3	-	0	w	0.99	0	0	
3	B	Ltg - Sm Mtg Rms	2	Sm Mtg Rm	2062	w	0.95	2062	2171	
4	B	Site Ltg	1	Site	563	w	0.86	563	655	
5	C	Ltg - Bldg Ext	1	Site	1228	w	1.00	1228	1228	
6	C	Site ltg (sculpture)	1	Site	316.08	w	0.95	316	334	
7	A	Ltg - guest floors	2	Guest Flrs	768	w	1.00	768	768	
8	A	Site ltg (steps)	1	Site	1190	w	0.92	1190	1301	
9	B	Spare	3	-	0	w	1.00	0	0	
10	B	Site ltg (benches)	1	Site	282	w	0.80	282	353	
11	C	Spare	3	-	0	w	1.00	0	0	
12	C	Site ltg (terrace)	1	Site	385	w	0.80	385	481	
13	A	Spare	3	-	0	w	1.00	0	0	
14	A	Spare	3	-	0	w	1.00	0	0	
15	B	Spare	3	-	0	w	1.00	0	0	
16	B	Spare	3	-	0	w	1.00	0	0	
17	C	Spare	3	-	0	w	1.00	0	0	
18	C	Spare	3	-	0	w	1.00	0	0	
19	A	Bussed Space	4	-	0	w	1.00	0	0	
20	A	Bussed Space	4	-	0	w	1.00	0	0	
21	B	Bussed Space	4	-	0	w	1.00	0	0	
22	B	Bussed Space	4	-	0	w	1.00	0	0	
23	C	Bussed Space	4	-	0	w	1.00	0	0	
24	C	Bussed Space	4	-	0	w	1.00	0	0	
25	A	Bussed Space	4	-	0	w	1.00	0	0	
26	A	Kit Lau 1st Flr Corr	2	1st Flr	2176	w	0.95	2176	2291	
27	B	Bussed Space	4	-	0	w	1.00	0	0	
28	B	Kit Lau 1st Flr Corr	2	1st Flr	2500	w	0.95	2500	2632	
29	C	Bussed Space	4	-	0	w	1.00	0	0	
30	C	Kit Lau 1st Flr Corr	2	1st Flr	2500	w	0.95	2500	2632	
31	A	Bussed Space	4	-	0	w	1.00	0	0	
32	A	Admin Area Ltg	2	1st Flr	1996	w	0.95	1996	2101	
33	B	Bussed Space	4	-	0	w	1.00	0	0	
34	B	Ext Park Ltg	1	Site	4400	w	0.90	4400	4889	
35	C	Bussed Space	4	-	0	w	1.00	0	0	
36	C	Site Ltg	1	Site	341	w	0.90	341	379	
37	A	XFR for HL	5	-	0	w	0.95	0	0	
38	A	Site Ltg	1	Site	490	w	0.90	490	544	
39	B	XFR for HL	5	-	0	w	0.95	0	0	
40	B	Site Ltg	1	Site	490	w	0.90	490	544	
41	C	XFR for HL	5	-	0	w	0.95	0	0	
42	C	Site Ltg	1	Site	97	w	0.90	97	108	
PANEL TOTAL								24.4	26.1	Amps= 94.4

Figure 56: Panelboard Sizing Worksheet | Exterior

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					9.2	9.7	37%	35.1
PHASE TOTAL	B					10.3	11.2	43%	40.6
PHASE TOTAL	C					4.9	5.2	20%	18.6

LOAD CATAGORIES			Connected			Demand				Ver: 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Site Ltg		9.8	10.8		9.8	10.8	0.99		
2	Interior Ltg		14.6	15.3		14.6	15.3	0.95		
3	Spare		0.0	0.0		0.0	0.0			
4	Bussed Space		0.0	0.0		0.0	0.0			
5	Other		0.0	0.0		0.0	0.0			
6			0.0	0.0		0.0	0.0			
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						24.4	26.1			
Spare Capacity			25%			6.1	6.5			
Total Design Loads						30.5	32.7	0.99	Amps=	39.3

Figure 57: Panelboard Sizing Worksheet | Exterior

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W
SIZE/TYPE BUS: 60A
SIZE/TYPE MAIN: 60A/3P MLO

PANEL TAG: HH
PANEL LOCATION: Electrical 1
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Ltg - Lg Mtg Rms	Lg Mtg Rm	2592	20A/1P	1	*			2	20A/1P	0	-	Spare
Ltg - Sm Mtg Rms	Sm Mtg Rm	2062	20A/1P	3		*		4	20A/1P	563	Site	Site Ltg
Ltg - Bldg Ext	Site	1228	20A/1P	5			*	6	20A/1P	316	Site	Site ltg (sculpture)
Ltg - guest floors	Guest Flrs	768	20A/1P	7	*			8	20A/1P	1190	Site	Site ltg (steps)
Spare	-	0	20A/1P	9		*		10	20A/1P	282	Site	Site ltg (benches)
Spare	-	0	20A/1P	11			*	12	20A/1P	385	Site	Site ltg (terrace)
Spare	-	0	20A/1P	13	*			14	20A/1P	0	-	Spare
Spare	-	0	20A/1P	15		*		16	20A/1P	0	-	Spare
Spare	-	0	20A/1P	17			*	18	20A/1P	0	-	Spare
Bussed Space	-	0	20A/1P	19	*			20	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	21		*		22	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	23			*	24	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	25	*			26	20A/1P	2176	1st Flr	Kit Lau 1st Flr Corr
Bussed Space	-	0	20A/1P	27		*		28	20A/1P	2500	1st Flr	Kit Lau 1st Flr Corr
Bussed Space	-	0	20A/1P	29			*	30	20A/1P	2500	1st Flr	Kit Lau 1st Flr Corr
Bussed Space	-	0	20A/1P	31	*			32	20A/1P	1996	1st Flr	Admin Area Ltg
Bussed Space	-	0	20A/1P	33		*		34	20A/1P	4400	Site	Ext Park Ltg
Bussed Space	-	0	20A/1P	35			*	36	20A/1P	341	Site	Site Ltg
XFR for HL	-	0	20A/1P	37	*			38	20A/1P	490	Site	Site Ltg
XFR for HL	-	0	20A/1P	39		*		40	20A/1P	490	Site	Site Ltg
XFR for HL	-	0	20A/1P	41			*	42	20A/1P	97	Site	Site Ltg

CONNECTED LOAD (KW) - A Ph.	9.21	TOTAL DESIGN LOAD (KW)	30.47
CONNECTED LOAD (KW) - B Ph.	10.30	POWER FACTOR	0.99
CONNECTED LOAD (KW) - C Ph.	4.87	TOTAL DESIGN LOAD (AMPS)	39

Figure 58: New Panelboard | Exterior

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					EMH	Panel Location:			Electrical 2	
Nominal Phase to Neutral Voltage------->					277	Phase:			3	
Nominal Phase to Phase Voltage-------->					480	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Pkg Lot EM LTG	2	Pkg Lot	2500	w	0.95	2500	2632	
2	A	Cooling Twr LTG	1	Exterior	180	w	0.95	180	189	
3	B	PentHse EM LTG	2	PentHse	350	w	0.95	350	368	
4	B	1ST FLR EM LTG	2	1ST FLR	300	w	0.95	300	316	
5	C	LTG-Stair #1	1	STAIR 1	448	w	0.95	448	472	
6	C	Spare	3	-	0	w	1.00	0	0	
7	A	LTG-1ST FLR	1	1ST FLR	2741	w	0.95	2741	2885	
8	A	Spare	3	-	0	w	1.00	0	0	
9	B	LTG-Stair #2	1	STAIR 2	480	w	0.95	480	505	
10	B	Spare	3	-	0	w	1.00	0	0	
11	C	LTG-Exterior	1	Exterior	425	w	0.95	425	447	
12	C	Spare	3	-	0	w	1.00	0	0	
13	A	LTG-Guest FLRS	1	Guest Flrs	2490	w	0.95	2490	2621	
14	A	Spare	3	-	0	w	1.00	0	0	
15	B	LTG-1ST FLR	1	1ST FLR	615	w	0.95	615	647	
16	B	Spare	3	-	0	w	1.00	0	0	
17	C	N.E. Exit LTG	1	1ST FLR	0	w	0.95	0	0	
18	C	Spare	3	-	0	w	1.00	0	0	
19	A	Spare	3	-	0	w	1.00	0	0	
20	A	Spare	3	-	0	w	1.00	0	0	
21	B	Bussed Space	4	-	0	w	1.00	0	0	
22	B	Bussed Space	4	-	0	w	1.00	0	0	
23	C	Bussed Space	4	-	0	w	1.00	0	0	
24	C	Bussed Space	4	-	0	w	1.00	0	0	
25	A	Bussed Space	4	-	0	w	1.00	0	0	
26	A	Bussed Space	4	-	0	w	1.00	0	0	
27	B	Bussed Space	4	-	0	w	1.00	0	0	
28	B	Bussed Space	4	-	0	w	1.00	0	0	
29	C	Bussed Space	4	-	0	w	1.00	0	0	
30	C	Bussed Space	4	-	0	w	1.00	0	0	
31	A	Bussed Space	4	-	0	w	1.00	0	0	
32	A	Bussed Space	4	-	0	w	1.00	0	0	
33	B	Bussed Space	4	-	0	w	1.00	0	0	
34	B	Bussed Space	4	-	0	w	1.00	0	0	
35	C	Bussed Space	4	-	0	w	1.00	0	0	
36	C	Bussed Space	4	-	0	w	1.00	0	0	
37	A	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
38	A	Bussed Space	4	-	0	w	1.00	0	0	
39	B	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
40	B	Bussed Space	4	-	0	w	1.00	0	0	
41	C	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
42	C	Bussed Space	4	-	0	w	1.00	0	0	
PANEL TOTAL								10.5	11.1	Amps= 40.0

Figure 59: Emergency Panelboard Sizing Worksheet | Exterior

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					7.9	8.3	75%	30.1
PHASE TOTAL	B					1.7	1.8	17%	6.6
PHASE TOTAL	C					0.9	0.9	8%	3.3

LOAD CATAGORIES			Connected			Demand				Ver: 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Lighting		7.4	7.8		7.4	7.8	0.95		
2	Emergency Lighting		3.2	3.3		3.2	3.3	0.95		
3	Spare		0.0	0.0		0.0	0.0			
4	Bussed Space		0.0	0.0		0.0	0.0			
5	Panel		0.0	0.0		0.0	0.0			
6			0.0	0.0		0.0	0.0			
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						10.5	11.1			
Spare Capacity			25%			2.6	2.8			
Total Design Loads						13.2	13.9	0.95	Amps=	16.7

Figure 60: Emergency Panelboard Sizing Worksheet | Exterior

PANELBOARD SCHEDULE

VOLTAGE: 480Y/277V,3PH,4W
SIZE/TYPE BUS: 60A
SIZE/TYPE MAIN: 60A/3P MLO

PANEL TAG: EMH
PANEL LOCATION: Electrical 2
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Pkg Lot EM LTG	Pkg Lot	2500	20A/1P	1	*			2	20A/1P	180	Exterior	Cooling Twr LTG
PentHse EM LTG	PentHse	350	20A/1P	3		*		4	20A/1P	300	1ST FLR	1ST FLR EM LTG
LTG-Stair #1	STAIR 1	448	20A/1P	5			*	6	20A/1P	0	-	Spare
LTG-1ST FLR	1ST FLR	2741	20A/1P	7	*			8	20A/1P	0	-	Spare
LTG-Stair #2	STAIR 2	488	20A/1P	9		*		10	20A/1P	0	-	Spare
LTG-Exterior	Exterior	425	20A/1P	11			*	12	20A/1P	0	-	Spare
LTG-Guest FLRS	Guest Flrs	2490	20A/1P	13	*			14	20A/1P	0	-	Spare
LTG-1ST FLR	1ST FLR	615	20A/1P	15		*		16	20A/1P	0	-	Spare
N.E. Exit LTG	1ST FLR	0	20A/1P	17			*	18	20A/1P	0	-	Spare
Spare	-	0	20A/1P	19	*			20	20A/1P	0	-	Spare
Bussed Space	-	0	20A/1P	21		*		22	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	23			*	24	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	25	*			26	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	27		*		28	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	29			*	30	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	31	*			32	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	33		*		34	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	35			*	36	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	37	*			38	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	39		*		40	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	41			*	42	20A/1P	0	-	Bussed Space

CONNECTED LOAD (KW) - A Ph.	7.91	TOTAL DESIGN LOAD (KW)	13.16
CONNECTED LOAD (KW) - B Ph.	1.75	POWER FACTOR	0.95
CONNECTED LOAD (KW) - C Ph.	0.87	TOTAL DESIGN LOAD (AMPS)	17

Figure 61: New Emergency Panelboard | Exterior

Feeder Sizing

The data for the table below is a summary of redesigned wires for panelboards DMB and EMH. The 2008 NEC Handbook was referenced for sizes of wires.

Feeder Sizing	
Panelboard Tag	HH
Panelboard Voltage	480Y/277
Calculated Design Load (kW)	30.47
Calculated Power Factor	0.99
Calculated Design Load (A)	39
Calculated Load (A) with spare	48.75
Feeder Protection Size	60A
Sets	1
Wire Size	
Phase	(3) #6 AWG
Neutral	(1) #6 AWG
Ground	(1) #10 AWG
Conduit	1.00" EMT
Power Factor	0.95
Length of Run	48.15 ft
Voltage Drop	2.43
% Drop	0.51

Table 32: Feeder Sizing | PB HH

*Copper wire, 75°C, THWN, EMT conduit

Feeder Sizing	
Panelboard Tag	EMH
Panelboard Voltage	480Y/277
Calculated Design Load (kW)	13.16
Calculated Power Factor	0.95
Calculated Design Load (A)	17
Calculated Load (A) with spare	21.25
Feeder Protection Size	60A
Sets	1
Wire Size	
Phase	(3) #8 AWG
Neutral	(1) #8 AWG
Ground	(1) #10 AWG
Conduit	0.75" EMT
Power Factor	0.95
Length of Run	5.54 ft
Voltage Drop	0.39
% Drop	0.19

Table 33: Feeder Sizing | PB EMH

*Copper wire, 75°C, THWN, EMT conduit

Main Lobby

New lighting design in the Lobby is made up of a mixture of halogen, fluorescent and LED lighting. Halogen track lights accent points of interest in the Lobby such as artwork on the walls. Fluorescent coves separate the Lobby into distinct areas and points of interest for patrons. Surface mounted fluorescent lights graze a textured wall leading into the Restaurant. Fluorescent lamps are also utilized for backlighting display signs in the Lobby and for wallwashing purposes in the Elevator corridor. LED downlights are utilized throughout the Lobby, as well as LED strips for accenting woodwork.

Lighting Plan

The lighting plans with controls and circuiting can be found in Appendix C.

Existing Panelboard Schedule - DMB

Circuits that will be modified for the Main Lobby on panel DMB are highlighted below:

"DMB" GP Dimming Panel Load Schedule

Panel Name: Panel Unit 1
Lutron Model No.: CGP48-1204T8-ML-20-CGP344
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Lobby	6	Z5		A4-5	LED Ceiling Cove	FL - 0-10V	1375	2000	20A-1P	A
Lobby	7	Z5		A4-5	LED Ceiling Cove	FL - 0-10V	1250	2000	20A-1P	B
Restaurant	8	ZR7		A1-7	COVE LED	FL - DSI	1875	2000	20A-1P	C
Lobby	9	Z7		A4-7	LED Shelves	FL - 0-10V	310	2000	20A-1P	A
Lounge	7	ZL5		A3-5	Lobby Ceiling LED Cove	FL - 0-10V	375	2000	20A-1P	B
Restaurant	15	ZR14		A2-6	Private Dining Cove LED	FL - 0-10V	125	2000	20A-1P	C
Lobby	4	Z3		A4-3	LED Entry Wall	FL - 0-10V	125	2000	20A-1P	A
Lounge	10	ZL6-B		A3-8	Bar Counter Edge	FL - 0-10V	125	2000	20A-1P	B
Restaurant	7	ZR6	9	A1-6	AA Table DL	Electronic LV	1087	2000	20A-1P	C
Lobby	5	Z4	10	A4-4	MR16 DL Spline Wall	Electronic LV	684	2000	20A-1P	A
Lobby	17	Z15	11	A5-7	Lobby Curtain Wash	Electronic LV	845	2000	20A-1P	B
Restaurant	10	ZR9	12	A2-1	Buffett WW	Electronic LV	483	2000	20A-1P	C
Lounge	9	ZL7	13	A3-7	Bookshelves WW	Electronic LV	483	2000	20A-1P	A
Lobby	1	Z1	14	A4-1	Entry Foyer MR16 DL	Electronic LV	483	2000	20A-1P	B
Lounge	8	ZL6	15	A3-6	Lounge Bar Niche Shelves	Electronic LV	414	2000	20A-1P	C
Lobby	8	Z6	16	A4-6	MR16 DL Lobby Columns	Electronic LV	403	2000	20A-1P	A
Restaurant	5	ZR4	17	A1-4	Table DL	Electronic LV	322	2000	20A-1P	B
Restaurant	16	ZR15	18	A2-7	Rest. Curtain Wash	Electronic LV	322	2000	20A-1P	C
Restaurant	12	ZR11	19	A2-3	Main Buffett Decorative Pend	Incandescent	300	2000	20A-1P	A
Restaurant	4	ZR3	20	A1-3	WW	Electronic LV	282	2000	20A-1P	B
Lobby	2	Z1	21	A4-1	Entry Foyer MR16 DL	Electronic LV	282	2000	20A-1P	C
Restaurant	6	ZR5	22	A1-5	Small Decorative Pendants	Electronic LV	276	2000	20A-1P	A

Panel Name: Panel Unit 1
Lutron Model No.: CGP48-1204T8-ML-20-CGP344
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Lounge	1	ZL1	23	A3-1	Lounge Pendants	Electronic LV	265	2000	20A-1P	B
Restaurant	3	ZR2	24	A1-2	Wood Wall and RR DL	Electronic LV	242	2000	20A-1P	C
Lobby	18	Z16	25	A5-8	Lobby Sundries Accents	Electronic LV	242	2000	20A-1P	A
Lobby	14	Z12	26	A5-4	Reg. Desk Wall Wash	Electronic LV	242	2000	20A-1P	B
Lobby	20	Z18	27	A6-2	MR16 Firm Group DL	Electronic LV	242	2000	20A-1P	C

Figure 62: Existing Panelboard Schedule | Lobby

Restaurant	9	ZR8	28	A1-8	Wait Station WW	Electronic LV	201	2000	20A-1P	A
Restaurant	2	ZR2	29	A1-2	Wood Wall and RR DL	Electronic LV	201	2000	20A-1P	B
Restaurant	1	ZR1	30	A1-1	Maitre'D WW	Electronic LV	161	2000	20A-1P	C
Lobby	3	Z2	31	A4-2	MR16 Accent Brand Wall	Electronic LV	161	2000	20A-1P	A
Restaurant	11	ZR10	32	A2-2	Main Buffett DL	Electronic LV	161	2000	20A-1P	B
Lobby	12	Z10	33	A5-2	Reg. Desk Pendant	Electronic LV	161	2000	20A-1P	C
Restaurant	14	ZR13	34	A2-5	Private Dining Lg Pendant	Incandescent	150	2000	20A-1P	A
Lobby	13	Z11	35	A5-3	Reg. Desk MR16 DL	Electronic LV	161	2000	20A-1P	B
Lobby	15	Z13	36	A5-5	Elevator Lobby Pendant	FL - Hi-Lume	150	2000	20A-1P	C
Restaurant	13	ZR12	37	A2-4	Private Dining WW	Electronic LV	121	2000	20A-1P	A
Lounge	2	ZL2	38	A3-2	Lounge Curtain WW	Electronic LV	121	2000	20A-1P	B
Lounge	4	ZL2	39	A3-2	Lounge Curtain WW	Electronic LV	121	2000	20A-1P	C
Lounge	6	ZL4	40	A3-4	Bar Wall Accents	Electronic LV	121	2000	20A-1P	A
Lobby	11	z9	41	A5-1	MR16 WW Elevator Foyer	Electronic LV	121	2000	20A-1P	B
Lobby	16	Z14	42	A5-6	Business Center Foyer	Electronic LV	121	2000	20A-1P	C
Lobby	19	Z17	43	A6-1	Lobby Niche AA	Electronic LV	121	2000	20A-1P	A
Restaurant	17	ZR16	44	A2-8	Private Dining Curtain Wash	Electronic LV	81	2000	20A-1P	B
Lounge	3	ZL2	45	A3-2	Lounge Curtain WW	Electronic LV	81	2000	20A-1P	C
Lobby	10	Z8	46	A4-8	MR16 DL Elevator Foyer	Electronic LV	81	2000	20A-1P	A
Lounge	5	ZL3	47	A3-3	Seating DownLights	Electronic LV	81	2000	20A-1P	B
			48		Spare		0	2000	20A-1P	

120/208V, 3Ø-4 Wire Main Lugs GP Dimming Panel containing 1 20A-1Pole branch breaker rated at 10,000AIC for each of the 48 dimming circuits. Panel is subdivided into three sections. Max input feed = 350A
Project Name: GMU Hotel Restaurant, Lounge & Lobby

Feed Type: Normal

Phase A: 5154 W/VA
Phase B: 5116 W/VA
Phase C: 5867 W/VA

Figure 63: Existing Panelboard Schedule | Lobby

Emergency Panel Affected

Circuit 22 on emergency panelboard EML was also modified for new emergency lighting in the Lobby. The existing panelboard schedule is seen below.

PANELBOARD SCHEDULE — **EML**

VOLTAGE	PHASE	WIRE	MCB (A)	MLO (A)	AIC	MOUNTING	MANUFAC.	MDL #	DWG REF
120 / 208	3	4		0	–	SURFACE	–	–	E6.03

TYPE LEGEND				REMARKS
L	LIGHTING	K	KITCHEN EQ	PROVIDE EQUIPMENT GROUND BUS
R	RECEPTACLES	E	EXISTING	PROVIDE FEED THRU LUGS FOR MULTI-SECTION PANELS
M	MECH EQUIP	O	OTHER	

CKT. #	ITEM SERVED	TYPE	WIRE	CONDUIT	CKT. BRK TRIP	CKT. BRK P	LOAD (VA)	PHASE	LOAD (VA)	CKT. BRK P	CKT. BRK TRIP	CONDUIT	WIRE	TYPE	ITEM SERVED	CKT. #
1	DR HOLD OPEN, 1ST FL	O	#10	3/4"	20A	1	200	A	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	2
3	DR HOLD OPEN, 2ND FL	O	#10	3/4"	20A	1	200	B	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	4
5	DR HOLD OPEN, 3RD FL	O	#10	3/4"	20A	1	200	C	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	6
7	DR HOLD OPEN, 4TH FL	O	#10	3/4"	20A	1	200	A	1200	2	20A	1"	#10	O	GENERATOR ENGINE HEATER	8
9	DR HOLD OPEN, 5TH FL	O	#10	3/4"	20A	1	200	B	1200					O		10
11	DR HOLD OPEN, 6TH FL	O	#10	3/4"	20A	1	200	C	1200	3	20A	1"	#10	O	GENERATOR BATTERY CHGR	12
13	DR HOLD OPEN, 7TH FL	O	#10	3/4"	20A	1	200	A	1200					O		14
15	FIRE EXTING. SYSTEM	O	#10	3/4"	25A	1	2400	B	1200					O		16
17	JOCKEY PUMP	–	–	–	20A	1	0	C	720	1	20A	3/4"	#12	R	FIRE PUMP ROOM RECS	18
19	SPARE	–	–	–	20A	1	0	A	612	1	20A	3/4"	#12	R	EMERG. ELEC RM REC & E.FL.	20
21	SPARE	–	–	–	20A	1	0	B	352	1	20A	3/4"	#12	L	LTG- 1ST FL LOBBY	22
23	SPARE	–	–	–	20A	1	0	C	520	1	20A	3/4"	#12	L	LTG- 1ST FL REST	24
25	P-TRAP HEAT TRACE	M	#10	1"	20A	1	624	A	1200	1	20A	3/4"	#12	L	LTG- 1ST FL BALLRM	26
27	CTFS-1 HEATER RECEPT.	R	#10	1"	20A	1	1200	B	720	1	20A	3/4"	#12	L	LTG- 1ST FL BALLRM	28
29	COOLING TOWER YARD REC	R	#10	1"	20A	1	500	C	778	1	20A	3/4"	#12	L	LTG-1ST FL PREFUNC	30
31	CLING TWR HEAT TRACE	M	#10	1"	30A	2	1200	A	0	1		–	–	–	BUSSED SPACE	32
33							1200	B	0	1		–	–	–	BUSSED SPACE	34
35	BUSSED SPACE	–	–	–		1	0	C	0	1		–	–	–	BUSSED SPACE	36
37	BUSSED SPACE	–	–	–		1	0	A	0	1		–	–	–	BUSSED SPACE	38
39	BUSSED SPACE	–	–	–		1	0	B	0	1		–	–	–	BUSSED SPACE	40
41	BUSSED SPACE	–	–	–		1	0	C	0	1		–	–	–	BUSSED SPACE	42

	A	B	C	TOTAL
CONNECTED LOAD (VA)	7136	9172	4618	20926

Figure 64: Existing Emergency Panelboard | Lobby

Branch Circuit Calculations

Panelboard DMB

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
D[1]	26	50	1300	1.00	208Y/120V	3.61
E[2]	5	300	1500	1.00	208Y/120V	4.16
F	56	23	1288	0.90	208Y/120V	3.22
G	80	35	2800	0.99	208Y/120V	7.69
H	5	33	165	0.50	208Y/120V	0.23
I	10	33	330	0.50	208Y/120V	0.46
K1-3	106 lf	4.32W/lf	457.92	0.99	208Y/120V	1.40
		Total Watts	**6540.92**		Total Amps	**17.16**

Table 34: Panelboard DMB

[1]The maximum wattage allowable for the track head is 50W, although the 35W lamp is specified for the project
2The maximum wattage per track is 300W, therefore this value was considered in the LPD calculations because it is greater than the number of track heads specified. It will therefore be considered instead of D.

Panelboard EML

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
F	18	23	414	0.90	208Y/120V	1.28
H	3	33	99	0.50	208Y/120V	0.55
		Total Watts			Total Amps	**1.83**

Table 35: Panelboard EML

The Lobby has seven different zones of lights: one for the decorative track fixtures, one for the LED downlights, one for the fluorescent coves, one for the recessed fluorescent linear fixtures in the elevator lobby corridor, and three different zones for the LED strips. The LED strips are separated into three zones: one for the main reception desk, one for the strips in the book shelves, and one for the fixtures at the hostess stand. Seven circuits were utilized to accommodate the seven zones. The calculations are summarized below for each circuit in the panelboards affected by the modified lighting design:

Panelboard DMB

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
5	E	5	300/track	1500	1.00	208Y/120V	4.17
6	G	80	35	2800	0.99	208Y/120V	7.86
7	H	5	33	165	0.50	208Y/120V	0.92
8	I	10	33	330	0.99	208Y/120V	0.93
9	K1	60 lf	4.32/lf	259.2	0.99	208Y/120V	0.71
10	K2	34 lf	4.32/lf	146.88	0.99	208Y/120V	0.40
11	K3	24 lf	4.32/lf	103.68	0.99	208Y/120V	0.28
						Total Amps	**15.27**

Table 36: Panelboard DMB Circuit Calcs

Panelboard EML

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
22	F	18	23	414	0.90	208Y/120V	1.28
22	H	3	33	99	0.50	208Y/120V	0.55
						Total Amps	**1.83**

Table 36: Panelboard EML Circuit Calcs

Panelboard Sizing

Circuits 5-11 were modified in Panelboard DMB for the Lobby. Only a portion of each of these circuits had luminaires in the Lounge, so in order to modify the circuits, the old loads from only the Lounge were subtracted and the new ones (calculated above) were added. The new panelboard is seen in the figure below.

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					DMB	Panel Location:			Electrical 1	
Nominal Phase to Neutral Voltage------->					120	Phase:			3	
Nominal Phase to Phase Voltage-------->					208	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Lounge/Rest	1	L/R	1744	w	1.00	1744	1744	
2	A	Lounge/Rest	1	L/R	581.2	w	0.99	581	587	
3	B	Lounge/Rest	1	L/R	549.88	w	0.99	550	555	
4	B	Lounge/Rest	1	L/R	510.68	w	0.99	511	516	
5	C	Lobby/Rest	1	L/R	245.17	w	1.00	245	245	
6	C	Lobby/Rest	1	L/R	2955	w	0.99	2955	2985	
7	A	Lobby/Rest	1	L/R	877	w	0.50	877	1754	
8	A	Lobby/Rest	1	L/R	1791	w	0.99	1791	1809	
9	B	Lobby/Rest	1	L/R	460.2	w	0.99	460	465	
10	B	Lobby/Rest	1	L/R	504.88	w	0.99	505	510	
11	C	Lobby/Rest	1	L/R	264.68	w	0.99	265	267	
12	C	Lobby/Rest	1	L/R	461	w	1.00	461	461	
13	A	Lobby/Rest	1	L/R	282	w	1.00	282	282	
14	A	Lobby/Rest	1	L/R	392	w	1.00	392	392	
15	B	Lobby/Rest	1	L/R	275	w	1.00	275	275	
16	B	Lobby/Rest	1	L/R	443	w	1.00	443	443	
17	C	Lobby/Rest	1	L/R	926	w	1.00	926	926	
18	C	Lobby Sundries	1	Lobby	242	w	1.00	242	242	
19	A	Lobby Niche AA	1	Lobby	121	w	1.00	121	121	
20	A	Lobby MR16 DL	1	Lobby	242	w	1.00	242	242	
21	B		2		0	w		0	0	
22	B		2		0	w		0	0	
23	C		2		0	w		0	0	
24	C		2		0	w		0	0	
25	A		2		0	w		0	0	
26	A		2		0	w		0	0	
27	B		2		0	w		0	0	
28	B		2		0	w		0	0	
29	C		2		0	w		0	0	
30	C		2		0	w		0	0	
31	A		2		0	w		0	0	
32	A		2		0	w		0	0	
33	B		2		0	w		0	0	
34	B		2		0	w		0	0	
35	C		2		0	w		0	0	
36	C		2		0	w		0	0	
37	A		2		0	w		0	0	
38	A		2		0	w		0	0	
39	B		2		0	w		0	0	
40	B		2		0	w		0	0	
41	C		2		0	w		0	0	
42	C		2		0	w		0	0	
PANEL TOTAL								13.9	14.8	Amps= 123.5

Figure 65: Panelboard Sizing Worksheet | Lobby

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					6.0	6.9	47%	57.8
PHASE TOTAL	B					2.7	2.8	19%	23.0
PHASE TOTAL	C					5.1	5.1	35%	42.7

LOAD CATAGORIES			Connected			Demand				Ver. 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Lighting		13.9	14.8		13.9	14.8	0.99		
2	Spare		0.0	0.0		0.0	0.0			
3			0.0	0.0		0.0	0.0			
4			0.0	0.0		0.0	0.0			
5			0.0	0.0		0.0	0.0			
6			0.0	0.0		0.0	0.0			
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						13.9	14.8			
Spare Capacity			25%			3.5	3.7			
Total Design Loads						17.3	18.5	0.99	Amps=	51.5

Figure 66: Panelboard Sizing Worksheet | Lobby

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 60A
SIZE/TYPE MAIN: 60A/3P MLO

PANEL TAG: DMB
PANEL LOCATION: Electrical 1
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Lounge/Rest	L/R	1744	20A/1P	1	*			2	20A/1P	581	L/R	Lounge/Rest
Lounge/Rest	L/R	550	20A/1P	3		*		4	20A/1P	511	L/R	Lounge/Rest
Lobby/Rest	L/R	245	20A/1P	5			*	6	20A/1P	2955	L/R	Lobby/Rest
Lobby/Rest	L/R	877	20A/1P	7	*			8	20A/1P	1791	L/R	Lobby/Rest
Lobby/Rest	L/R	460	20A/1P	9		*		10	20A/1P	505	L/R	Lobby/Rest
Lobby/Rest	L/R	265	20A/1P	11			*	12	20A/1P	461	L/R	Lobby/Rest
Lobby/Rest	L/R	282	20A/1P	13	*			14	20A/1P	392	L/R	Lobby/Rest
Lobby/Rest	L/R	275	20A/1P	15		*		16	20A/1P	443	L/R	Lobby/Rest
Lobby/Rest	L/R	926	20A/1P	17			*	18	20A/1P	242	Lobby	Lobby Sundries
Lobby Niche AA	Lobby	121	20A/1P	19	*			20	20A/1P	242	Lobby	Lobby MR16 DL
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	6.03	TOTAL DESIGN LOAD (KW)	17.33
CONNECTED LOAD (KW) - B Ph.	2.74	POWER FACTOR	0.99
CONNECTED LOAD (KW) - C Ph.	5.09	TOTAL DESIGN LOAD (AMPS)	51

Figure 67: New Panelboard Schedule | Lobby

Circuit number 22 on emergency panelboard EML also was modified for the new emergency lighting in the Lobby. The sizing worksheet and the new panelboard schedule are shown below.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->					EML	Panel Location:			Electrical 2	
Nominal Phase to Neutral Voltage------->					120	Phase:			3	
Nominal Phase to Phase Voltage-------->					208	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	DR Hold Open 1F	3	FL 1	200	w	1.00	200	200	
2	A	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
3	B	DR Hold Open 2F	3	FL 2	200	w	1.00	200	200	
4	B	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
5	C	DR Hold Open 3F	3	FL 3	200	w	1.00	200	200	
6	C	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
7	A	DR Hold Open 4F	3	FL 4	200	w	1.00	200	200	
8	A	Gener Engine Htr	3	Exterior	1200	w	1.00	1200	1200	
9	B	DR Hold Open 5F	3	FL 5	200	w	1.00	200	200	
10	B		6		1200	w	1.00	1200	1200	
11	C	DR Hold Open 6F	3	FL 6	200	w	1.00	200	200	
12	C	Gener Battery Chgr	3	Exterior	1200	w	1.00	1200	1200	
13	A	DR Hold Open 7F	3	FL 7	200	w	1.00	200	200	
14	A		6		1200	w	1.00	1200	1200	
15	B	Fire Exiting Sys	3	Fire P Rm	2400	w	1.00	2400	2400	
16	B		6		1200	w	1.00	1200	1200	
17	C	Jockey Pump	3	Fire P Rm	0	w	1.00	0	0	
18	C	Fire Pump Rm Rec	3	Fire P Rm	720	w	1.00	720	720	
19	A	Spare	4		0	w	1.00	0	0	
20	A	EM Elec Rm Rec	3	Em-Elec R	612	w	1.00	612	612	
21	B	Spare	4		0	w	1.00	0	0	
22	B	LTG - 1st FL Lobby	1	Lobby	513	w	0.70	513	733	
23	C	Spare	4		0	w	1.00	0	0	
24	C	LTG - 1st FL Rest	1	Restaurant	520	w	1.00	520	520	
25	A	P-Trap Heat Trace	3		624	w	1.00	624	624	
26	A	LTG - 1st FL BLRM	1	Ballroom	1000	w	1.00	1000	1000	
27	B	CTFS-1 HTR Recs	3		1200	w	1.00	1200	1200	
28	B	LTG - 1st FL BLRM	1	Ballroom	600	w	1.00	600	600	
29	C	Cooling Twr Rec	3	Exterior	500	w	1.00	500	500	
30	C	LTG - 1st FL Prefu	1	Prefunct.	778	w	1.00	778	778	
31	A	Clg Twr Heat Trace	3	Exterior	1200	w	1.00	1200	1200	
32	A	Bussed Space	5		0	w	1.00	0	0	
33	B		6		1200	w	1.00	1200	1200	
34	B	Bussed Space	5		0	w	1.00	0	0	
35	C	Bussed Space	5		0	w	1.00	0	0	
36	C	Bussed Space	5		0	w	1.00	0	0	
37	A	Bussed Space	5		0	w	1.00	0	0	
38	A	Bussed Space	5		0	w	1.00	0	0	
39	B	Bussed Space	5		0	w	1.00	0	0	
40	B	Bussed Space	5		0	w	1.00	0	0	
41	C	Bussed Space	5		0	w	1.00	0	0	
42	C	Bussed Space	5		0	w	1.00	0	0	
PANEL TOTAL								20.8	21.1	Amps= 175.5

Figure 68: Emergency Panelboard Sizing Worksheet | Lobby

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					6.9	7.0	33%	58.0
PHASE TOTAL	B					9.2	9.5	45%	78.8
PHASE TOTAL	C					4.6	4.6	22%	38.7

LOAD CATAGORIES			Connected			Demand				Ver. 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Lighting		3.4	3.6		3.4	3.6	0.94		
2	Lighting and Rec Combo		1.5	1.6		1.5	1.6	0.95		
3	Other		11.1	11.1		11.1	11.1	1.00		
4	Spare		0.0	0.0		0.0	0.0			
5	Bussed Space		0.0	0.0		0.0	0.0			
6	unassigned		4.8	4.8		4.8	4.8	1.00		
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						20.8	21.1			
Spare Capacity			25%			5.2	5.3			
Total Design Loads						26.0	26.3	0.99	Amps=	73.1

Figure 69: Emergency Panelboard Sizing Worksheet | Lobby

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 80A
SIZE/TYPE MAIN: 80A/3P MLO

PANEL TAG: EML
PANEL LOCATION: Electrical 2
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DR Hold Open 1F	FL 1	200	20A/1P	1	*			2	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 2F	FL 2	200	20A/1P	3		*		4	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 3F	FL 3	200	20A/1P	5			*	6	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 4F	FL 4	200	20A/1P	7	*			8	20A/1P	1200	Exterior	Gener Engine Htr
DR Hold Open 5F	FL 5	200	20A/1P	9		*		10	20A/1P	1200	0	0
DR Hold Open 6F	FL 6	200	20A/1P	11			*	12	20A/1P	1200	Exterior	Gener Battery Chgr
DR Hold Open 7F	FL 7	200	20A/1P	13	*			14	20A/1P	1200	0	0
Fire Exiting Sys	Fire P Rm	2400	20A/1P	15		*		16	20A/1P	1200	0	0
Jockey Pump	Fire P Rm	0	20A/1P	17			*	18	20A/1P	720	Fire P Rm	Fire Pump Rm Rec
Spare	0	0	20A/1P	19	*			20	20A/1P	612	Em-Elec R	EM Elec Rm Rec
Spare		0	20A/1P	21		*		22	20A/1P	513	Lobby	LTG - 1st FL Lobby
Spare		0	20A/1P	23			*	24	20A/1P	520	Restaurant	LTG - 1st FL Rest
P-Trap Heat Trace		624	20A/1P	25	*			26	20A/1P	1000	Ballroom	LTG - 1st FL BLRM
CTFS-1 HTR Recs		1200	20A/1P	27		*		28	20A/1P	600	Ballroom	LTG - 1st FL BLRM
Cooling Twr Rec	Exterior	500	20A/1P	29			*	30	20A/1P	778	Prefunct.	LTG - 1st FL Prefu
Clg Twr Heat Trace	Exterior	1200	20A/1P	31	*			32	20A/1P	0		Bussed Space
		1200	20A/1P	33		*		34	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	35			*	36	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	37	*			38	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	39		*		40	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	41			*	42	20A/1P	0		Bussed Space

CONNECTED LOAD (KW) - A Ph.	6.94	TOTAL DESIGN LOAD (KW)	25.96
CONNECTED LOAD (KW) - B Ph.	9.21	POWER FACTOR	0.99
CONNECTED LOAD (KW) - C Ph.	4.62	TOTAL DESIGN LOAD (AMPS)	73

Figure 70: New Panelboard Schedule | Lobby

Feeder Sizing and Voltage Drop

The data for the table below is a summary of redesigned wires for panelboards DMB and EML. Voltage drop calculations for both panels were calculated as well. The 2008 NEC Handbook was referenced for sizes of wires.

Feeder Sizing and Voltage Drop	
Panelboard Tag	DMB
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	17.33
Calculated Power Factor	0.99
Calculated Design Load (A)	17.51
Calculated Load (A) with spare	48.63
Feeder Protection Size	60A
Sets	1
Wire Size	
Phase	(3) #6 AWG
Neutral	(1) #6 AWG
Ground	(1) #8 AWG
Conduit	1.25" EMT
Power Factor	0.95
Length of Run	7.8 ft
Voltage Drop	0.39
% Drop	0.19

Table 37: Feeder Sizing for DMB

*Copper wire, 75°C, THWN, EMT conduit

Feeder Sizing and Voltage Drop	
Panelboard Tag	EML
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	25.96
Calculated Power Factor	0.99
Calculated Design Load (A)	26.22
Calculated Load (A) with spare	72.84
Feeder Protection Size	80A
Sets	1
Wire Size	
Phase	(3) #4 AWG
Neutral	(1) #4 AWG
Ground	(1) #8 AWG
Conduit	1.25" EMT
Power Factor	0.95
Length of Run	8.45 ft
Voltage Drop	0.37
% Drop	0.18

Table 38: Feeder Sizing for EML

*Copper wire, 75°C, THWN, EMT conduit

Lounge

The lighting design in the Lounge is comprised of LED strip lights mounted in a cove, the toe kick of the bar, and the bar shelving, and of square recessed halogen downlights. A dimming panel allows for lower levels of light during the evening. A summary of the electrical changes within the Lounge are documented below.

Lighting Plan

The lighting plans with controls and circuiting can be found in Appendix C.

Existing Panelboard Schedule - DMB

Circuits that were modified for the Lounge on panel DMB are highlighted in purple below:

"DMB" GP Dimming Panel Load Schedule

Panel Name: Panel Unit 1
Lutron Model No.: CGP48-1204T8-ML-20-CGP344
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Lobby	6	Z5		A4-5	LED Ceiling Cove	FL - 0-10V	1375	2000	20A-1P	A
Lobby	7	Z5		A4-5	LED Ceiling Cove	FL - 0-10V	1250	2000	20A-1P	B
Restaurant	8	ZR7		A1-7	COVE LED	FL - DSI	1875	2000	20A-1P	C
Lobby	9	Z7		A4-7	LED Shelves	FL - 0-10V	310	2000	20A-1P	A
Lounge	7	ZL5		A3-5	Lobby Ceiling LED Cove	FL - 0-10V	375	2000	20A-1P	B
Restaurant	15	ZR14		A2-6	Private Dining Cove LED	FL - 0-10V	125	2000	20A-1P	C
Lobby	4	Z3		A4-3	LED Entry Wall	FL - 0-10V	125	2000	20A-1P	A
Lounge	10	ZL6-B		A3-8	Bar Counter Edge	FL - 0-10V	125	2000	20A-1P	B
Restaurant	7	ZR6	9	A1-6	AA Table DL	Electronic LV	1087	2000	20A-1P	C
Lobby	5	Z4	10	A4-4	MR16 DL Spline Wall	Electronic LV	684	2000	20A-1P	A
Lobby	17	Z15	11	A5-7	Lobby Curtain Wash	Electronic LV	845	2000	20A-1P	B
Restaurant	10	ZR9	12	A2-1	Buffett WW	Electronic LV	483	2000	20A-1P	C
Lounge	9	ZL7	13	A3-7	Bookshelves WW	Electronic LV	483	2000	20A-1P	A
Lobby	1	Z1	14	A4-1	Entry Foyer MR16 DL	Electronic LV	483	2000	20A-1P	B
Lounge	8	ZL6	15	A3-6	Lounge Bar Niche Shelves	Electronic LV	414	2000	20A-1P	C
Lobby	8	Z6	16	A4-6	MR16 DL Lobby Columns	Electronic LV	403	2000	20A-1P	A
Restaurant	5	ZR4	17	A1-4	Table DL	Electronic LV	322	2000	20A-1P	B
Restaurant	16	ZR15	18	A2-7	Rest. Curtain Wash	Electronic LV	322	2000	20A-1P	C
Restaurant	12	ZR11	19	A2-3	Main Buffett Decorative Pend	Incandescent	300	2000	20A-1P	A
Restaurant	4	ZR3	20	A1-3	WW	Electronic LV	282	2000	20A-1P	B
Lobby	2	Z1	21	A4-1	Entry Foyer MR16 DL	Electronic LV	282	2000	20A-1P	C
Restaurant	6	ZR5	22	A1-5	Small Decorative Pendants	Electronic LV	276	2000	20A-1P	A

Panel Name: Panel Unit 1
Lutron Model No.: CGP48-1204T8-ML-20-CGP344
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Lounge	1	ZL1	23	A3-1	Lounge Pendants	Electronic LV	265	2000	20A-1P	B
Restaurant	3	ZR2	24	A1-2	Wood Wall and RR DL	Electronic LV	242	2000	20A-1P	C
Lobby	18	Z16	25	A5-8	Lobby Sundries Accents	Electronic LV	242	2000	20A-1P	A
Lobby	14	Z12	26	A5-4	Reg. Desk Wall Wash	Electronic LV	242	2000	20A-1P	B
Lobby	20	Z18	27	A6-2	MR16 Firm Group DL	Electronic LV	242	2000	20A-1P	C

Figure 71: Existing Panelboard DMB

Restaurant	9	ZR8	28	A1-8	Wait Station WW	Electronic LV	201	2000	20A-1P	A
Restaurant	2	ZR2	29	A1-2	Wood Wall and RR DL	Electronic LV	201	2000	20A-1P	B
Restaurant	1	ZR1	30	A1-1	Maitre'D WW	Electronic LV	161	2000	20A-1P	C
Lobby	3	Z2	31	A4-2	MR16 Accent Brand Wall	Electronic LV	161	2000	20A-1P	A
Restaurant	11	ZR10	32	A2-2	Main Buffett DL	Electronic LV	161	2000	20A-1P	B
Lobby	12	Z10	33	A5-2	Reg. Desk Pendant	Electronic LV	161	2000	20A-1P	C
Restaurant	14	ZR13	34	A2-5	Private Dining Lg Pendant	Incandescent	150	2000	20A-1P	A
Lobby	13	Z11	35	A5-3	Reg. Desk MR16 DL	Electronic LV	161	2000	20A-1P	B
Lobby	15	Z13	36	A5-5	Elevator Lobby Pendant	FL - Hi-Lume	150	2000	20A-1P	C
Restaurant	13	ZR12	37	A2-4	Private Dining WW	Electronic LV	121	2000	20A-1P	A
Lounge	2	ZL2	38	A3-2	Lounge Curtain WW	Electronic LV	121	2000	20A-1P	B
Lounge	4	ZL2	39	A3-2	Lounge Curtain WW	Electronic LV	121	2000	20A-1P	C
Lounge	6	ZL4	40	A3-4	Bar Wall Accents	Electronic LV	121	2000	20A-1P	A
Lobby	11	z9	41	A5-1	MR16 WW Elevator Foyer	Electronic LV	121	2000	20A-1P	B
Lobby	16	Z14	42	A5-6	Business Center Foyer	Electronic LV	121	2000	20A-1P	C
Lobby	19	Z17	43	A6-1	Lobby Niche AA	Electronic LV	121	2000	20A-1P	A
Restaurant	17	ZR16	44	A2-8	Private Dining Curtain Wash	Electronic LV	81	2000	20A-1P	B
Lounge	3	ZL2	45	A3-2	Lounge Curtain WW	Electronic LV	81	2000	20A-1P	C
Lobby	10	Z8	46	A4-8	MR16 DL Elevator Foyer	Electronic LV	81	2000	20A-1P	A
Lounge	5	ZL3	47	A3-3	Seating DownLights	Electronic LV	81	2000	20A-1P	B
			48		Spare		0	2000	20A-1P	

120/208V, 3Ø-4 Wire Main Lugs GP Dimming Panel containing 1 20A-1Pole branch breaker rated at 10,000AIC for each of the 48 dimming circuits. Panel is subdivided into three sections. Max input feed = 350A

Project Name: GMU Hotel Restaurant, Lounge & Lobby

Feed Type: Normal

Phase A: 5154 W/VA
Phase B: 5116 W/VA
Phase C: 5867 W/VA

Figure 72: Existing Loads on Panelboard | Lounge

Emergency Panel Affected

Circuit 4 on panelboard EMH was modified in order to accommodate the new emergency lighting in the Lounge.

PANELBOARD SCHEDULE — EMH

VOLTAGE	PHASE	WIRE	MCB (A)	MLO (A)	AIC	MOUNTING	MANUFAC.	MDL #	DWG REF
277 / 480	3	4	250	–	–	SURFACE	–	–	E6.03

TYPE LEGEND				REMARKS
L	LIGHTING	K	KITCHEN EQ	PROVIDE EQUIPMENT GROUND BUS
R	RECEPTACLES	E	EXISTING	PROVIDE FEED THRU LUGS FOR MULTI-SECTION PANELS
M	MECH EQUIP	O	OTHER	–

CKT. #	ITEM SERVED	TYPE	WIRE	CONDUIT	CKT. BRK TRIP	CKT. BRK P	LOAD (VA)	PHASE	LOAD (VA)	CKT. BRK P	CKT. BRK TRIP	CONDUIT	WIRE	TYPE	ITEM SERVED	CKT. #
1	PARKING LOT EMERG. LTG	L	#12	3/4"	20A	1	2500	A	180	1	20A	1"	#10	L	COOLING TOWER LTG	2
3	PENTHOUSE EMERG. LTG	L	#10	3/4"	20A	1	350	B	1000	1	20A	3/4"	#10	L	FIRST FLOOR EM. LTG	4
5	LTG-STAIR #1	L	#12	3/4"	20A	1	448	C	0	1	20A	–	–	–	SPARE	6
7	LTG- 1ST FL	L	#10	3/4"	20A	1	2741	A	0	1	20A	–	–	–	SPARE	8
9	LTG- STAIR #2	L	#12	3/4"	20A	1	480	B	0	1	20A	–	–	–	SPARE	10
11	LTG - EXTERIOR	L	#10	3/4"	20A	1	531	C	0	1	20A	–	–	–	SPARE	12
13	LTG - GUEST FLRS	L	#12	3/4"	20A	1	2490	A	0	1	20A	–	–	–	SPARE	14
15	LTG - 1ST FLOOR	L	#12	3/4"	20A	1	615	B	0	1	20A	–	–	–	SPARE	16
17	N.E. EXIT LTG	L	#12	3/4"	20A	1	0	C	0	1	20A	–	–	–	SPARE	18
19	SPARE	–	–	–	20A	1	0	A	0	1	20A	–	–	–	SPARE	20
21	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	22
23	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	24
25	BUSSED SPACE					1	0	A	0	1					BUSSED SPACE	26
27	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	28
29	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	30
31	BUSSED SPACE					1	0	A	0	1					BUSSED SPACE	32
33	BUSSED SPACE					1	0	B	0	1					BUSSED SPACE	34
35	BUSSED SPACE					1	0	C	0	1					BUSSED SPACE	36
37	PANEL "EML"		SEE	SEE	SEE	3	SEE	A	0	1					BUSSED SPACE	38
39	TRANSFORMER		RISER	RISER	RISER		SUB	B	0	1					BUSSED SPACE	40
41	(SEE RISER FOR MORE INFO)		DIAG.	DIAG.	DIAG.		LOAD	C	0	1					BUSSED SPACE	42

	A	B	C	TOTAL
CONNECTED LOAD (VA)	7911	2445	979	11335

Figure 73: Existing Emergency Panelboard Schedule

Branch Circuit Calculations

Panelboard DMB

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
J	22	50	1100	1.00	208Y/120V	3.05
K1-3	118 lf	4.32/lf	509.76	0.99	208Y/120V	1.40
		Total Watts	**1436.96**		Total Amps	**4.44**

Table 39: Panelboard DMB Branch Circuit Calcs

Panelboard EMH

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
J	6	50	300	1.00	208Y/120V	0.83
		Total Watts	**300**		Total Amps	**0.83**

Table 39: Panelboard DMB Branch Circuit Calcs

The Lounge has four different zones of lights: one for the downlights, one for the LED cove above the central bar, one for the toe-kick below the bar, and one for the LEDs within the bar shelves. Four circuits were utilized to accommodate the four zones. The calculations are summarized below for each circuit in the panelboards affected by the modified lighting design:

Panelboard DMB

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
1	J	22	50	1100	1.00	208Y/120V	3.05
2	K1	60 lf	4.32/lf	259.2	0.99	208Y/120V	0.71
3	K2	34 lf	4.32/lf	146.88	0.99	208Y/120V	0.40
4	K3	24 lf	4.32/lf	103.68	0.99	208Y/120V	0.28
						Total Amps	**4.44**

Table 40: New Panelboard Circuiting

Panelboard EMH

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
4	J	6	50	300	1.00	208Y/120V	0.83
						Total Amps	**0.83**

Table 40: PB EMH | Panelboard Sizing WS

Panelboard Sizing

Circuits 1-4 were modified in Panel DMB for the Lounge. Only a portion of each of these circuits had luminaires in the Lounge, so in order to modify the circuits, the old loads from only the Lounge were subtracted and the new ones (calculated above) were added. The new panelboard is seen on the next page.

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					DMB	Panel Location:			Electrical 1	
Nominal Phase to Neutral Voltage------->					120	Phase:			3	
Nominal Phase to Phase Voltage-------->					208	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Lobby/Lounge/Rest	1	L/L/R	1744	w	1.00	1744	1744	
2	A	Lobby/Lounge/Rest	1	L/L/R	581.2	w	0.99	581	587	
3	B	Lobby/Lounge/Rest	1	L/L/R	549.88	w	0.99	550	555	
4	B	Lobby/Lounge/Rest	1	L/L/R	510.68	w	0.99	511	516	
5	C	Lobby/Lounge/Rest	1	L/L/R	1087	w	1.00	1087	1087	
6	C	Lobby/Lounge/Rest	1	L/L/R	1772	w	1.00	1772	1772	
7	A	Lobby/Lounge/Rest	1	L/L/R	2712	w	1.00	2712	2712	
8	A	Lobby/Lounge/Rest	1	L/L/R	2692	w	1.00	2692	2692	
9	B	Lobby/Lounge/Rest	1	L/L/R	994	w	1.00	994	994	
10	B	Lobby/Lounge/Rest	1	L/L/R	689	w	1.00	689	689	
11	C	Lobby/Rest	1	L/R	282	w	1.00	282	282	
12	C	Lobby/Rest	1	L/R	461	w	1.00	461	461	
13	A	Lobby/Rest	1	L/R	282	w	1.00	282	282	
14	A	Lobby/Rest	1	L/R	392	w	1.00	392	392	
15	B	Lobby/Rest	1	L/R	275	w	1.00	275	275	
16	B	Lobby/Rest	1	L/R	443	w	1.00	443	443	
17	C	Lobby/Rest	1	L/R	926	w	1.00	926	926	
18	C	Lobby Sundries	1	Lobby	242	w	1.00	242	242	
19	A	Lobby Niche AA	1	Lobby	121	w	1.00	121	121	
20	A	Lobby MR16 DL	1	Lobby	242	w	1.00	242	242	
21	B		2		0	w		0	0	
22	B		2		0	w		0	0	
23	C		2		0	w		0	0	
24	C		2		0	w		0	0	
25	A		2		0	w		0	0	
26	A		2		0	w		0	0	
27	B		2		0	w		0	0	
28	B		2		0	w		0	0	
29	C		2		0	w		0	0	
30	C		2		0	w		0	0	
31	A		2		0	w		0	0	
32	A		2		0	w		0	0	
33	B		2		0	w		0	0	
34	B		2		0	w		0	0	
35	C		2		0	w		0	0	
36	C		2		0	w		0	0	
37	A		2		0	w		0	0	
38	A		2		0	w		0	0	
39	B		2		0	w		0	0	
40	B		2		0	w		0	0	
41	C		2		0	w		0	0	
42	C		2		0	w		0	0	
PANEL TOTAL								17.0	17.0	Amps= 141.8

Table 75: PB Sizing Worksheet

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					8.8	8.8	52%	73.1
PHASE TOTAL	B					3.5	3.5	20%	28.9
PHASE TOTAL	C					4.8	4.8	28%	39.8

LOAD CATAGORIES			Connected			Demand				Ver. 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Lighting		17.0	17.0		17.0	17.0	0.99		
2	Spare		0.0	0.0		0.0	0.0			
3			0.0	0.0		0.0	0.0			
4			0.0	0.0		0.0	0.0			
5			0.0	0.0		0.0	0.0			
6			0.0	0.0		0.0	0.0			
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						17.0	17.0			
Spare Capacity			25%			4.2	4.3			
Total Design Loads						21.2	21.3	0.99	Amps=	59.1

Figure 76: Panelboard Sizing Worksheet | Lounge

PANELBOARD SCHEDULE

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

PANEL TAG: DMB
PANEL LOCATION: Electrical 1
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Lobby/Lounge/Rest	L/L/R	1744	20A/1P	1	*			2	20A/1P	581	L/L/R	Lobby/Lounge/Rest
Lobby/Lounge/Rest	L/L/R	550	20A/1P	3		*		4	20A/1P	511	L/L/R	Lobby/Lounge/Rest
Lobby/Lounge/Rest	L/L/R	1087	20A/1P	5			*	6	20A/1P	1772	L/L/R	Lobby/Lounge/Rest
Lobby/Lounge/Rest	L/L/R	2712	20A/1P	7	*			8	20A/1P	2692	L/L/R	Lobby/Lounge/Rest
Lobby/Lounge/Rest	L/L/R	994	20A/1P	9		*		10	20A/1P	689	L/L/R	Lobby/Lounge/Rest
Lobby/Rest	L/R	282	20A/1P	11			*	12	20A/1P	461	L/R	Lobby/Rest
Lobby/Rest	L/R	282	20A/1P	13	*			14	20A/1P	392	L/R	Lobby/Rest
Lobby/Rest	L/R	275	20A/1P	15		*		16	20A/1P	443	L/R	Lobby/Rest
Lobby/Rest	L/R	926	20A/1P	17			*	18	20A/1P	242	Lobby	Lobby Sundries
Lobby Niche AA	Lobby	121	20A/1P	19	*			20	20A/1P	242	Lobby	Lobby MR16 DL
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	8.77	TOTAL DESIGN LOAD (KW)	21.25
CONNECTED LOAD (KW) - B Ph.	3.46	POWER FACTOR	0.99
CONNECTED LOAD (KW) - C Ph.	4.77	TOTAL DESIGN LOAD (AMPS)	59

Figure 77: New Panelboard Schedule | Lounge

Circuit 4 was modified in Panel EMH for the emergency lighting in the Lounge. The new panelboard is seen below.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->					EMH	Panel Location:			Electrical 2	
Nominal Phase to Neutral Voltage------->					277	Phase:			3	
Nominal Phase to Phase Voltage-------->					480	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Pkg Lot EM LTG	2	Pkg Lot	2500	w	0.95	2500	2632	
2	A	Cooling Twr LTG	1	Exterior	180	w	0.95	180	189	
3	B	PentHse EM LTG	2	PentHse	350	w	0.95	350	368	
4	B	1ST FLR EM LTG	2	1ST FLR	300	w	0.95	300	316	
5	C	LTG-Stair #1	1	STAIR 1	448	w	0.95	448	472	
6	C	Spare	3	-	0	w	1.00	0	0	
7	A	LTG-1ST FLR	1	1ST FLR	2741	w	0.95	2741	2885	
8	A	Spare	3	-	0	w	1.00	0	0	
9	B	LTG-Stair #2	1	STAIR 2	480	w	0.95	480	505	
10	B	Spare	3	-	0	w	1.00	0	0	
11	C	LTG-Exterior	1	Exterior	531	w	0.95	531	559	
12	C	Spare	3	-	0	w	1.00	0	0	
13	A	LTG-Guest FLRS	1	Guest Flrs	2490	w	0.95	2490	2621	
14	A	Spare	3	-	0	w	1.00	0	0	
15	B	LTG-1ST FLR	1	1ST FLR	615	w	0.95	615	647	
16	B	Spare	3	-	0	w	1.00	0	0	
17	C	N.E. Exit LTG	1	1ST FLR	0	w	0.95	0	0	
18	C	Spare	3	-	0	w	1.00	0	0	
19	A	Spare	3	-	0	w	1.00	0	0	
20	A	Spare	3	-	0	w	1.00	0	0	
21	B	Bussed Space	4	-	0	w	1.00	0	0	
22	B	Bussed Space	4	-	0	w	1.00	0	0	
23	C	Bussed Space	4	-	0	w	1.00	0	0	
24	C	Bussed Space	4	-	0	w	1.00	0	0	
25	A	Bussed Space	4	-	0	w	1.00	0	0	
26	A	Bussed Space	4	-	0	w	1.00	0	0	
27	B	Bussed Space	4	-	0	w	1.00	0	0	
28	B	Bussed Space	4	-	0	w	1.00	0	0	
29	C	Bussed Space	4	-	0	w	1.00	0	0	
30	C	Bussed Space	4	-	0	w	1.00	0	0	
31	A	Bussed Space	4	-	0	w	1.00	0	0	
32	A	Bussed Space	4	-	0	w	1.00	0	0	
33	B	Bussed Space	4	-	0	w	1.00	0	0	
34	B	Bussed Space	4	-	0	w	1.00	0	0	
35	C	Bussed Space	4	-	0	w	1.00	0	0	
36	C	Bussed Space	4	-	0	w	1.00	0	0	
37	A	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
38	A	Bussed Space	4	-	0	w	1.00	0	0	
39	B	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
40	B	Bussed Space	4	-	0	w	1.00	0	0	
41	C	Panel "EML" XMR	5	Elec Rm 2	0	w	1.00	0	0	
42	C	Bussed Space	4	-	0	w	1.00	0	0	
PANEL TOTAL								10.6	11.2	Amps= 40.4

Figure 78: Emergency Panelboard Sizing Worksheet | Lounge

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					7.9	8.3	74%	30.1
PHASE TOTAL	B					1.7	1.8	16%	6.6
PHASE TOTAL	C					1.0	1.0	9%	3.7

LOAD CATAGORIES		Connected			Demand				Ver. 1.04
		kW	kVA	DF	kW	kVA	PF		
1	Lighting	7.5	7.9		7.5	7.9	0.95		
2	Emergency Lighting	3.2	3.3		3.2	3.3	0.95		
3	Spare	0.0	0.0		0.0	0.0			
4	Bussed Space	0.0	0.0		0.0	0.0			
5	Panel	0.0	0.0		0.0	0.0			
6		0.0	0.0		0.0	0.0			
7		0.0	0.0		0.0	0.0			
8		0.0	0.0		0.0	0.0			
9	unassigned	0.0	0.0		0.0	0.0			
Total Demand Loads					10.6	11.2			
Spare Capacity		25%			2.7	2.8			
Total Design Loads					13.3	14.0	0.95	Amps=	16.8

Figure 79: Emergency Panelboard Sizing Worksheet | Lounge

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 60A
SIZE/TYPE MAIN: 60A/3P MLO

PANEL TAG: EMH
PANEL LOCATION: Electrical 2
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Pkg Lot EM LTG	Pkg Lot	2500	20A/1P	1	*			2	20A/1P	180	Exterior	Cooling Twr LTG
PentHse EM LTG	PentHse	350	20A/1P	3		*		4	20A/1P	300	1ST FLR	1ST FLR EM LTG
LTG-Stair #1	STAIR 1	448	20A/1P	5			*	6	20A/1P	0	-	Spare
LTG-1ST FLR	1ST FLR	2741	20A/1P	7	*			8	20A/1P	0	-	Spare
LTG-Stair #2	STAIR 2	480	20A/1P	9		*		10	20A/1P	0	-	Spare
LTG-Exterior	Exterior	531	20A/1P	11			*	12	20A/1P	0	-	Spare
LTG-Guest FLRS	Guest Flrs	2490	20A/1P	13	*			14	20A/1P	0	-	Spare
LTG-1ST FLR	1ST FLR	615	20A/1P	15		*		16	20A/1P	0	-	Spare
N.E. Exit LTG	1ST FLR	0	20A/1P	17			*	18	20A/1P	0	-	Spare
Spare	-	0	20A/1P	19	*			20	20A/1P	0	-	Spare
Bussed Space	-	0	20A/1P	21		*		22	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	23			*	24	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	25	*			26	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	27		*		28	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	29			*	30	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	31	*			32	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	33		*		34	20A/1P	0	-	Bussed Space
Bussed Space	-	0	20A/1P	35			*	36	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	37	*			38	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	39		*		40	20A/1P	0	-	Bussed Space
Panel "EML" XMR	Elec Rm 2	0	3P	41			*	42	20A/1P	0	-	Bussed Space

CONNECTED LOAD (KW) - A Ph.	7.91	TOTAL DESIGN LOAD (KW)	13.29
CONNECTED LOAD (KW) - B Ph.	1.75	POWER FACTOR	0.95
CONNECTED LOAD (KW) - C Ph.	0.98	TOTAL DESIGN LOAD (AMPS)	17

Figure 80: New Emergency Panelboard Schedule | Lounge

Feeder Sizing and Voltage Drop

The data for the table below is a summary of redesigned wires for panelboards DMB and EMH. Voltage drop calculations for both panels were calculated as well. The 2008 NEC Handbook was referenced for sizes of wires.

Feeder Sizing	
Panelboard Tag	DMB
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	21.25
Calculated Power Factor	0.99
Calculated Design Load (A)	21.46
Calculated Load (A) with spare	59.62
Feeder Protection Size	60A
Sets	1
Wire Size	
Phase	(3) #6 AWG
Neutral	(1) #6 AWG
Ground	(1) #10 AWG
Conduit	1.00" EMT
Power Factor	0.95
Length of Run	7.8 ft
Voltage Drop	0.39
% Drop	0.19

Table 41: Feeder Sizing

*Copper wire, 75°C, THWN, EMT conduit

Feeder Sizing	
Panelboard Tag	EMH
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	13.29
Calculated Power Factor	0.95
Calculated Design Load (A)	13.99
Calculated Load (A) with spare	38.86
Feeder Protection Size	60A
Sets	1
Wire Size	
Phase	(3) #6 AWG
Neutral	(1) #6 AWG
Ground	(1) #10 AWG
Conduit	1.00" EMT
Power Factor	0.95
Length of Run	5.54 ft
Voltage Drop	0.28
% Drop	0.13

Table 42: Feeder Sizing

*Copper wire, 75°C, THWN, EMT conduit

Ballroom

The luminaires in the Ballroom are controlled via a Lutron GRAFIK Eye System. A Viseo Wallstation provides local access to the lighting control system and operates every zone and scene. Shades for the clerestories are controlled by a control interface for the GRAFIK System called the Sivoia QED Controller. LUT-DMX is another control interface specified to control the LED luminaires in the space. Because the Ballroom can be divided into three separate spaces with the use of partitions, each smaller ballroom (A, B, and C) is controlled by its own individual 5-button preset scene wallstation with raise and lower capabilities.

Lighting Plan

The lighting plan with controls and circuiting can be found in Appendix C.

Existing Panelboard Schedule - DML

All of the circuits on panel DML were modified, and the original panel is shown below.

"DML" GP Dimming Panel Load Schedule

Panel Name: Panel Unit 1
Lutron Model No.: GP60-1204ML-20
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Prefunction	12	ZP12	1	A7-4	T8 CEILING COVE	FL - HI-Lume	1792	2000	20A-1P	A
Large Ballroom A	5	ZLB5	2	A3-5	T8 CEILING COVE	FL - HI-Lume	1504	2000	20A-1P	B
Large Ballroom A	5	ZLB5	3	A3-5	T8 CEILING COVE	FL -HI-Lume	1504	2000	20A-1P	C
Prefunction	11	ZP11	4	A7-3	DECORATIVE PENDANT	Incandescent	1120	2000	20A-1P	A
Small Ballroom B	5	ZSB11	5	A2-5	T8 CEILING COVE	FL - HI-Lume	1200	2000	20A-1P	B
Small Ballroom A	5	ZSB5	6	A1-5	T8 CEILING COVE	FL - HI-Lume	1200	2000	20A-1P	C
Large Ballroom A	2	ZLB2	7	A3-2	WALL ACCENT LIGHT	Incandescent	960	2000	20A-1P	A
Prefunction	1	ZP1	8	A6-1	DECORATIVE PENDANT	Incandescent	1000	2000	20A-1P	B
Prefunction	4	ZP4	9	A6-4	T8 CEILING COVE	FL - HI-Lume	1120	2000	20A-1P	C
Prefunction	8	ZP8	10	A6-8	MR16 DOWNLIGHT	Electronic LV	665	2000	20A-1P	A
Prefunction	9	ZP9	11	A7-1	MR16 WALL WASH	Electronic LV	735	2000	20A-1P	B
Large Ballroom A	1	ZLB1	12	A3-1	DECORATIVE SCONCE	Incandescent	800	2000	20A-1P	C
Large Ballroom B	3	ZLB9	13	A4-3	DOWNLIGHTS	Incandescent	720	2000	20A-1P	A
Large Ballroom C	5	ZLB17	14	A5-5	T8 CEILING COVE	FL - HI-Lume	1504	2000	20A-1P	B
Large Ballroom B	5	ZLB11	15	A4-5	T8 CEILING COVE	FL - HI-Lume	1504	2000	20A-1P	C
Prefunction	2	ZP2	16	A6-2	MR16 WALL WASH	Electronic LV	665	2000	20A-1P	A
Prefunction	5	ZP5	17	A6-5	CURTAIN DL	Electronic LV	630	2000	20A-1P	B
Large Ballroom C	3	ZLB15	18	A5-3	DOWNLIGHTS	Incandescent	720	2000	20A-1P	C
Prefunction	6	ZP6	19	A6-6	MR16 DOWNLIGHT	Electronic LV	483	2000	20A-1P	A
Small Ballroom A	2	ZSB2	20	A1-2	WALL ACCENT LIGHT	Incandescent	600	2000	20A-1P	B
Small Ballroom B	2	ZSB8	21	A2-2	WALL ACCENT	Incandescent	600	2000	20A-1P	C
Large Ballroom B	2	ZLB8	22	A4-2	WALL ACCENT	Incandescent	480	2000	20A-1P	A
Small Ballroom A	4	ZSB4	23	A1-4	DOWNLIGHTS	Incandescent	480	2000	20A-1P	B
Small Ballroom B	4	ZSB10	24	A2-4	DOWNLIGHTS	Incandescent	480	2000	20A-1P	C
Large Ballroom A	6	ZLB6	25	A3-6	DECORATIVE PENDANT	Incandescent	960	2000	20A-1P	A
Large Ballroom C	2	ZLB14	26	A5-2	WALL ACCENT LIGHT	Incandescent	480	2000	20A-1P	B

George Mason University GP Dimming Panel Load Schedule

Panel Name: Panel Unit 1
Lutron Model No.: GP60-1204ML-20
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Large Ballroom B	8	ZLB26	27	A5-8	Retractable Ltg Device Ctk 2	Incandescent	575	2000	20A-1P	C
Large Ballroom C	8	ZLB28	28	A6-8	Retractable Ltg	Incandescent	575	2000	20A-1P	A
Small Ballroom A	4	ZSB4	29	A1-4	DOWNLIGHTS	Incandescent	480	2000	20A-1P	B
Prefunction	6	ZP6	30	A7-6	MR16 DOWNLIGHT	Electronic LV	483	2000	20A-1P	C

Figure 80: Existing Panelboard Schedule | Ballroom

Equation 1

Large Ballroom B	2	ZLB8	31	A5-2	WALL ACCENT	Incandescent	480	2000	20A-1P	A
Large Ballroom B	6	ZLB12	32	A5-6	DECORATIVE PENDANT	Incandescent	480	2000	20A-1P	B
Small Ballroom B	4	ZSB10	33	A2-4	DOWNLIGHTS	Incandescent	480	2000	20A-1P	C
Large Ballroom C	6	ZLB18	34	A6-6	DECORATIVE PENDANT	Incandescent	480	2000	20A-1P	A
Prefunction	3	ZP3	35	A7-3	DECORATIVE SCONCE	Incandescent	450	2000	20A-1P	B
Large Ballroom C	2	ZLB14	36	A6-2	WALL ACCENT LIGHT	Incandescent	480	2000	20A-1P	C
Small Ballroom B	6	ZSB12	37	A2-6	DECORATIVE PENDANT	Incandescent	480	2000	20A-1P	A
Small Ballroom A	6	ZSB6	38	A1-6	DECORATIVE PENDANT	Incandescent	280	2000	20A-1P	B
Large Ballroom A	1	ZLB1	39	A3-1	DECORATIVE SCONCE	Incandescent	400	2000	20A-1P	C
Prefunction	10	ZP10	40	A8-2	DECORATIVE SCONCE	FL - Hi-Lume	240	2000	20A-1P	A
Prefunction	13	ZP13	41	A8-5	MR16 WALL WASH	Electronic LV	242	2000	20A-1P	B
Large Ballroom A	2	ZLB2	42	A3-2	WALL ACCENT LIGHT	Incandescent	240	2000	20A-1P	C
Small Ballroom A	1	ZSB1	43	A1-1	DECORATIVE SCONCE	Incandescent	200	2000	20A-1P	A
Large Ballroom A	9	ZLP20	44	A3-8	Wall Accent Light	Incandescent	240	2000	20A-1P	B
Small Ballroom B	1	ZSB7	45	A2-1	DECORATIVE SCONCE	Incandescent	200	2000	20A-1P	C
Prefunction	7	ZP7	46	A7-7	MR16 WALL WASH	Electronic LV	121	2000	20A-1P	A
Small Ballroom A	3	ZSB3	47	A1-3	AA DOWNLIGHTS	Incandescent	120	2000	20A-1P	B
Small Ballroom B	3	ZSB9	48	A2-3	AA DOWNLIGHT	Incandescent	120	2000	20A-1P	C
Large Ballroom A	4	ZLB4	49	A3-4	AA DOWNLIGHT Podium	Incandescent	120	2000	20A-1P	A
Large Ballroom A	8	ZLB19	50	A3-7	AA DOWNLIGHT-PODIUM	Incandescent	120	2000	20A-1P	B
Large Ballroom B	4	ZLB10	51	A5-4	AA DOWNLIGHTS	Incandescent	120	2000	20A-1P	C
Large Ballroom C	4	ZLB16	52	A6-4	AA DOWNLIGHT	Incandescent	120	2000	20A-1P	A

George Mason University GP Dimming Panel Load Schedule

Panel Name: Panel Unit 1
Lutron Model No.: GP60-1204ML-20
Panel Address / Location: 1,2,3 /

Area/Room	Customer Circuit #	Customer Zone	Lutron Circuit #	Lutron Zone	Zone/Circuit Description	Load Type	Actual Load (W/VA)	Max. Load (W/VA)	BRKR Size	Phase
Large Ballroom B	1	ZLB7	53	A5-1	DECORATIVE SCONCE	Incandescent	100	2000	20A-1P	B
Large Ballroom C	1	ZLB13	54	A6-1	DECORATIVE SCONCE	Incandescent	100	2000	20A-1P	C
Large Ballroom A	3	ZLB3	55	A8-6	DOWNLIGHTS	Incandescent	1440	2000	20A-1P	A
			56		Spare		0	2000	20A-1P	
			57		Spare		0	2000	20A-1P	
			58		Spare		0	2000	20A-1P	
			59		Spare		0	2000	20A-1P	
			60		Spare		0	2000	20A-1P	

120/208V, 3Ø-4 Wire Main Lugs GP Dimming Panel containing 1 20A-1Pole branch breaker rated at 10,000AIC for each of the 60 dimming circuits. Panel is subdivided into three sections. Max input feed = 400A

Feed Type: Normal

Phase A: 11088 W/VA
Phase B: 11081 W/VA
Phase C: 11146 W/VA

Figure 81: Existing Panelboard Schedule

Emergency Panel Affected:
The circuiting for emergency panel EML was altered after changing the lighting. The original panelboard schedule is shown with the two circuits modified highlighted below:

PANELBOARD SCHEDULE — EML

VOLTAGE	PHASE	WIRE	MCB (A)	MLO (A)	AIC	MOUNTING	MANUFAC.	MDL #	DWG REF
120 / 208	3	4		0	–	SURFACE	–	–	E6.03

TYPE LEGEND				REMARKS
L	LIGHTING	K	KITCHEN EQ	PROVIDE EQUIPMENT GROUND BUS
R	RECEPTACLES	E	EXISTING	PROVIDE FEED THRU LUGS FOR MULTI-SECTION PANELS
M	MECH EQUIP	O	OTHER	

CKT. #	ITEM SERVED	TYPE	WIRE	CONDUIT	CKT. BRK TRIP	CKT. BRK P	LOAD (VA)	PHASE	LOAD (VA)	CKT. BRK P	CKT. BRK TRIP	CONDUIT	WIRE	TYPE	ITEM SERVED	CKT. #
1	DR HOLD OPEN, 1ST FL	O	#10	3/4"	20A	1	200	A	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	2
3	DR HOLD OPEN, 2ND FL	O	#10	3/4"	20A	1	200	B	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	4
5	DR HOLD OPEN, 3RD FL	O	#10	3/4"	20A	1	200	C	500	1	20A	3/4"	#12	R	ELEVATOR PIT LTG AND REC	6
7	DR HOLD OPEN, 4TH FL	O	#10	3/4"	20A	1	200	A	1200	2	20A	1"	#10	O	GENERATOR ENGINE HEATER	8
9	DR HOLD OPEN, 5TH FL	O	#10	3/4"	20A	1	200	B	1200					O		10
11	DR HOLD OPEN, 6TH FL	O	#10	3/4"	20A	1	200	C	1200	3	20A	1"	#10	O	GENERATOR BATTERY CHGR	12
13	DR HOLD OPEN, 7TH FL	O	#10	3/4"	20A	1	200	A	1200					O		14
15	FIRE EXTING. SYSTEM	O	#10	3/4"	25A	1	2400	B	1200					O		16
17	JOCKEY PUMP	–	–	–	20A	1	0	C	720	1	20A	3/4"	#12	R	FIRE PUMP ROOM RECS	18
19	SPARE	–	–	–	20A	1	0	A	612	1	20A	3/4"	#12	R	EMERG. ELEC RM REC & F-EL-1	20
21	SPARE	–	–	–	20A	1	0	B	352	1	20A	3/4"	#12	L	LTG- 1ST FL LOBBY	22
23	SPARE	–	–	–	20A	1	0	C	520	1	20A	3/4"	#12	L	LTG- 1ST FL REST	24
25	P-TRAP HEAT TRACE	M	#10	1"	20A	1	624	A	1200	1	20A	3/4"	#12	L	LTG- 1ST FL BALLRM	26
27	CTFS-1 HEATER RECEPT.	R	#10	1"	20A	1	1200	B	720	1	20A	3/4"	#12	L	LTG- 1ST FL BALLRM	28
29	COOLING TOWER YARD REC	R	#10	1"	20A	1	500	C	778	1	20A	3/4	#12	L	LTG-1ST FL PREFUNC	30
31	CLING TWR HEAT TRACE	M	#10	1"	30A	2	1200	A	0	1		–	–	–	BUSSED SPACE	32
33							1200	B	0	1		–	–	–	BUSSED SPACE	34
35	BUSSED SPACE	–	–	–		1	0	C	0	1		–	–	–	BUSSED SPACE	36
37	BUSSED SPACE	–	–	–		1	0	A	0	1		–	–	–	BUSSED SPACE	38
39	BUSSED SPACE	–	–	–		1	0	B	0	1		–	–	–	BUSSED SPACE	40
41	BUSSED SPACE	–	–	–		1	0	C	0	1		–	–	–	BUSSED SPACE	42

	A	B	C	TOTAL
CONNECTED LOAD (VA)	7136	9172	4618	20926

Figure 82: Existing Emergency Panelboard | Ballroom

Branch Circuit Calculations

Panelboard DML

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
L	36	100	3600	1.00	208Y/120V	10.00
M	12	75	900	1.00	208Y/120V	2.5
N	744	3	2232	0.99	208Y/120V	6.26
O	4	105	420	1.00	208Y/120V	1.17
P	16	10	160	1.00	208Y/120V	0.44
		Total Watts	**4764**		Total Amps	**20.37**

Table 43: Branch Circuit Calcs | PB DML

Panelboard EML

Luminaire Tag	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
L	10	100	1000	1.00	208Y/120V	2.78
M	8	75	600	1.00	208Y/120V	1.67
		Total Watts	**1356**		Total Amps	**4.45**

Table 44: Branch Circuit Calcs | PB EML

Because the Ballroom has so many different zones of lights and will accommodate four preset scenes, more than one circuit will be used. In fact, because there are 15 zones assigned to the lighting layout, 15 circuits will be used because of dimming purposes in the different scenes. The calculations are summarized below for each circuit:

Panelboard DML

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
1	P	8	10	80	1.00	208Y/120V	0.22
2	M	6	75	450	1.00	208Y/120V	1.25
3	L	18	100	1800	1.00	208Y/120V	5.00
4	N	372	3	1116	0.99	208Y/120V	3.13
5	O	2	105	210	1.00	208Y/120V	0.58
6	P	4	10	40	1.00	208Y/120V	0.11
7	M	3	75	225	1.00	208Y/120V	0.63
8	L	9	100	900	1.00	208Y/120V	2.50
9	N	186	3	558	0.99	208Y/120V	1.57
10	O	1	105	105	1.00	208Y/120V	0.29
11	P	4	10	40	1.00	208Y/120V	0.11
12	M	3	75	225	1.00	208Y/120V	0.63
13	L	9	100	900	1.00	208Y/120V	2.50
14	N	186	3	558	0.99	208Y/120V	1.57
15	O	1	105	105	1.00	208Y/120V	0.29
						Total Amps	**20.38**

Table 45: Branch Circuit Calcs | PB DML

Panelboard EML

Circuit	Luminaires (Tag)	Quantity	Watts/Luminaire	Total Watts	PF	Voltage	Amps
26	L	10	100	1000	1.00	208Y/120V	2.78
28	M	8	75	600	1.00	208Y/120V	1.67
						Total Amps	**4.45**

Table 46: Branch Circuit Calcs | PB EML

Panelboard Sizing

Circuits 1-15 were modified in Panel DML for the Ballroom. Only a portion of each of these circuits had luminaires in the Ballroom, so in order to modify the circuits, the old loads from only the Ballroom were subtracted and the new ones (calculated above) were added. The new panelboard is seen below.

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					DML	Panel Location:			Storage	
Nominal Phase to Neutral Voltage------->					120	Phase:			3	
Nominal Phase to Phase Voltage-------->					208	Wires:			4	
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	Prefunction/Blrms	1	P/B	1480	w	1.00	1480	1480	
2	A	Prefunction/Blrms	1	P/B	1650	w	1.00	1650	1650	
3	B	Prefunction/Blrms	1	P/B	2490	w	1.00	2490	2490	
4	B	Prefunction/Blrms	1	P/B	4156	w	0.99	4156	4198	
5	C	Prefunction/Blrms	1	P/B	3240	w	1.00	3240	3240	
6	C	Prefunction/Blrms	1	P/B	1766	w	1.00	1766	1766	
7	A	Prefunction/Blrms	1	P/B	346	w	1.00	346	346	
8	A	Prefunction/Blrms	1	P/B	1565	w	1.00	1565	1565	
9	B	Prefunction/Blrms	1	P/B	1293	w	0.99	1293	1306	
10	B	Prefunction/Blrms	1	P/B	345	w	1.00	345	345	
11	C	Prefunction/Blrms	1	P/B	1160	w	1.00	1160	1160	
12	C	Prefunction/Blrms	1	P/B	2017	w	1.00	2017	2017	
13	A	Prefunction/Blrms	1	P/B	1142	w	1.00	1142	1142	
14	A	Prefunction/Blrms	1	P/B	558	w	0.99	558	564	
15	B	Prefunction/Blrms	1	P/B	105	w	1.00	105	105	
16	B		2		0	w	1.00	0	0	
17	C		2		0	w	1.00	0	0	
18	C		2		0	w	1.00	0	0	
19	A		2		0	w	1.00	0	0	
20	A		2		0	w	1.00	0	0	
21	B		2		0	w		0	0	
22	B		2		0	w		0	0	
23	C		2		0	w		0	0	
24	C		2		0	w		0	0	
25	A		2		0	w		0	0	
26	A		2		0	w		0	0	
27	B		2		0	w		0	0	
28	B		2		0	w		0	0	
29	C		2		0	w		0	0	
30	C		2		0	w		0	0	
31	A		2		0	w		0	0	
32	A		2		0	w		0	0	
33	B		2		0	w		0	0	
34	B		2		0	w		0	0	
35	C		2		0	w		0	0	
36	C		2		0	w		0	0	
37	A		2		0	w		0	0	
38	A		2		0	w		0	0	
39	B		2		0	w		0	0	
40	B		2		0	w		0	0	
41	C		2		0	w		0	0	
42	C		2		0	w		0	0	
PANEL TOTAL								23.3	23.4	Amps= 194.8

Figure 83: Panelboard Sizing Worksheet | Ballroom

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					6.7	6.7	29%	56.2
PHASE TOTAL	B					8.4	8.4	36%	70.4
PHASE TOTAL	C					8.2	8.2	35%	68.2

LOAD CATAGORIES			Connected			Demand				Ver. 1.04
			kW	kVA	DF	kW	kVA	PF		
1	Lighting		23.3	23.4		23.3	23.4	1.00		
2	Spare		0.0	0.0		0.0	0.0			
3			0.0	0.0		0.0	0.0			
4			0.0	0.0		0.0	0.0			
5			0.0	0.0		0.0	0.0			
6			0.0	0.0		0.0	0.0			
7			0.0	0.0		0.0	0.0			
8			0.0	0.0		0.0	0.0			
9	unassigned		0.0	0.0		0.0	0.0			
Total Demand Loads						23.3	23.4			
Spare Capacity			25%			5.8	5.8			
Total Design Loads						29.1	29.2	1.00	Amps=	81.2

Figure 84: Panelboard Sizing Worksheet | Ballroom

PANELBOARD SCHEDULE

VOLTAGE: 208Y/120V,3PH,4W
SIZE/TYPE BUS: 110A
SIZE/TYPE MAIN: 110A/3P MLO

PANEL TAG: DML
PANEL LOCATION: Storage
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
Prefunction/Blrms	P/B	1480	20A/1P	1	*			2	20A/1P	1650	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	2490	20A/1P	3		*		4	20A/1P	4156	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	3240	20A/1P	5			*	6	20A/1P	1766	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	346	20A/1P	7	*			8	20A/1P	1565	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	1293	20A/1P	9		*		10	20A/1P	345	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	1160	20A/1P	11			*	12	20A/1P	2017	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	1142	20A/1P	13	*			14	20A/1P	558	P/B	Prefunction/Blrms
Prefunction/Blrms	P/B	105	20A/1P	15		*		16	20A/1P	0	0	0
0	0	0	20A/1P	17			*	18	20A/1P	0	0	0
0	0	0	20A/1P	19	*			20	20A/1P	0	0	0
		0	20A/1P	21		*		22	20A/1P	0		
		0	20A/1P	23			*	24	20A/1P	0		
		0	20A/1P	25	*			26	20A/1P	0		
		0	20A/1P	27		*		28	20A/1P	0		
		0	20A/1P	29			*	30	20A/1P	0		
		0	20A/1P	31	*			32	20A/1P	0		
		0	20A/1P	33		*		34	20A/1P	0		
		0	20A/1P	35			*	36	20A/1P	0		
		0	20A/1P	37	*			38	20A/1P	0		
		0	20A/1P	39		*		40	20A/1P	0		
		0	20A/1P	41			*	42	20A/1P	0		

CONNECTED LOAD (KW) - A Ph.	6.74	TOTAL DESIGN LOAD (KW)	29.14
CONNECTED LOAD (KW) - B Ph.	8.39	POWER FACTOR	1.00
CONNECTED LOAD (KW) - C Ph.	8.18	TOTAL DESIGN LOAD (AMPS)	81

Figure 85: New Panelboard Schedule | Ballroom

Circuits 26 and 28 on Panelboard EML were modified for the new emergency lighting in the Ballroom. The new panelboard schedule is shown below.

PANELBOARD SIZING WORKSHEET

Panel Tag---------->				EML	Panel Location:			Electrical 2		
Nominal Phase to Neutral Voltage------->				120	Phase:			3		
Nominal Phase to Phase Voltage-------->				208	Wires:			4		
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Remarks
1	A	DR Hold Open 1F	3	FL 1	200	w	1.00	200	200	
2	A	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
3	B	DR Hold Open 2F	3	FL 2	200	w	1.00	200	200	
4	B	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
5	C	DR Hold Open 3F	3	FL 3	200	w	1.00	200	200	
6	C	Elev Pit Ltg & Rec	2	Elev Pit	500	w	0.95	500	526	
7	A	DR Hold Open 4F	3	FL 4	200	w	1.00	200	200	
8	A	Gener Engine Htr	3	Exterior	1200	w	1.00	1200	1200	
9	B	DR Hold Open 5F	3	FL 5	200	w	1.00	200	200	
10	B		6		1200	w	1.00	1200	1200	
11	C	DR Hold Open 6F	3	FL 6	200	w	1.00	200	200	
12	C	Gener Battery Chgr	3	Exterior	1200	w	1.00	1200	1200	
13	A	DR Hold Open 7F	3	FL 7	200	w	1.00	200	200	
14	A		6		1200	w	1.00	1200	1200	
15	B	Fire Exiting Sys	3	Fire P Rm	2400	w	1.00	2400	2400	
16	B		6		1200	w	1.00	1200	1200	
17	C	Jockey Pump	3	Fire P Rm	0	w	1.00	0	0	
18	C	Fire Pump Rm Rec	3	Fire P Rm	720	w	1.00	720	720	
19	A	Spare	4		0	w	1.00	0	0	
20	A	EM Elec Rm Rec	3	Em-Elec R	612	w	1.00	612	612	
21	B	Spare	4		0	w	1.00	0	0	
22	B	LTG - 1st FL Lobby	1	Lobby	352	w	0.98	352	359	
23	C	Spare	4		0	w	1.00	0	0	
24	C	LTG - 1st FL Rest	1	Restaurant	520	w	1.00	520	520	
25	A	P-Trap Heat Trace	3		624	w	1.00	624	624	
26	A	LTG - 1st FL BLRM	1	Ballroom	1000	w	1.00	1000	1000	
27	B	CTFS-1 HTR Recs	3		1200	w	1.00	1200	1200	
28	B	LTG - 1st FL BLRM	1	Ballroom	600	w	1.00	600	600	
29	C	Cooling Twr Rec	3	Exterior	500	w	1.00	500	500	
30	C	LTG - 1st FL Prefu	1	Prefunct.	778	w	1.00	778	778	
31	A	Clg Twr Heat Trace	3	Exterior	1200	w	1.00	1200	1200	
32	A	Bussed Space	5		0	w	1.00	0	0	
33	B		6		1200	w	1.00	1200	1200	
34	B	Bussed Space	5		0	w	1.00	0	0	
35	C	Bussed Space	5		0	w	1.00	0	0	
36	C	Bussed Space	5		0	w	1.00	0	0	
37	A	Bussed Space	5		0	w	1.00	0	0	
38	A	Bussed Space	5		0	w	1.00	0	0	
39	B	Bussed Space	5		0	w	1.00	0	0	
40	B	Bussed Space	5		0	w	1.00	0	0	
41	C	Bussed Space	5		0	w	1.00	0	0	
42	C	Bussed Space	5		0	w	1.00	0	0	
PANEL TOTAL								20.6	20.7	Amps= 172.4

Figure 86: Emergency Panelboard Sizing Worksheet | Ballroom

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					6.9	7.0	34%	58.0
PHASE TOTAL	B					9.1	9.1	44%	75.7
PHASE TOTAL	C					4.6	4.6	22%	38.7

LOAD CATAGORIES		Connected			Demand				Ver. 1.04
		kW	kVA	DF	kW	kVA	PF		
1	Lighting	3.3	3.3		3.3	3.3	1.00		
2	Lighting and Rec Combo	1.5	1.6		1.5	1.6	0.95		
3	Other	11.1	11.1		11.1	11.1	1.00		
4	Spare	0.0	0.0		0.0	0.0			
5	Bussed Space	0.0	0.0		0.0	0.0			
6	unassigned	4.8	4.8		4.8	4.8	1.00		
7		0.0	0.0		0.0	0.0			
8		0.0	0.0		0.0	0.0			
9	unassigned	0.0	0.0		0.0	0.0			
Total Demand Loads					20.6	20.7			
Spare Capacity		25%			5.2	5.2			
Total Design Loads					25.8	25.9	1.00	Amps=	71.8

Figure 87: Emergency Panelboard Sizing Worksheet | Ballroom

PANELBOARD SCHEDULE

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

PANEL TAG: EML
PANEL LOCATION: Electrical 2
PANEL MOUNTING: SURFACE

MIN. C/B AIC: 10K
OPTIONS: PROVIDE FEED THROUGH LUGS FOR PANELBOARD 1L1B

DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
DR Hold Open 1F	FL 1	200	20A/1P	1	*			2	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 2F	FL 2	200	20A/1P	3		*		4	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 3F	FL 3	200	20A/1P	5			*	6	20A/1P	500	Elev Pit	Elev Pit Ltg & Rec
DR Hold Open 4F	FL 4	200	20A/1P	7	*			8	20A/1P	1200	Exterior	Gener Engine Htr
DR Hold Open 5F	FL 5	200	20A/1P	9		*		10	20A/1P	1200	0	0
DR Hold Open 6F	FL 6	200	20A/1P	11			*	12	20A/1P	1200	Exterior	Gener Battery Chgr
DR Hold Open 7F	FL 7	200	20A/1P	13	*			14	20A/1P	1200	0	0
Fire Exiting Sys	Fire P Rm	2400	20A/1P	15		*		16	20A/1P	1200	0	0
Jockey Pump	Fire P Rm	0	20A/1P	17			*	18	20A/1P	720	Fire P Rm	Fire Pump Rm Rec
Spare	0	0	20A/1P	19	*			20	20A/1P	612	Em-Elec R	EM Elec Rm Rec
Spare		0	20A/1P	21		*		22	20A/1P	352	Lobby	LTG - 1st FL Lobby
Spare		0	20A/1P	23			*	24	20A/1P	520	Restaurant	LTG - 1st FL Rest
P-Trap Heat Trace		624	20A/1P	25	*			26	20A/1P	1000	Ballroom	LTG - 1st FL BLRM
CTFS-1 HTR Recs		1200	20A/1P	27		*		28	20A/1P	600	Ballroom	LTG - 1st FL BLRM
Cooling Twr Rec	Exterior	500	20A/1P	29			*	30	20A/1P	776	Prefunct.	LTG - 1st FL Prefu
Clg Twr Heat Trace	Exterior	1200	20A/1P	31	*			32	20A/1P	0		Bussed Space
		1200	20A/1P	33		*		34	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	35			*	36	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	37	*			38	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	39		*		40	20A/1P	0		Bussed Space
Bussed Space		0	20A/1P	41			*	42	20A/1P	0		Bussed Space

CONNECTED LOAD (KW) - A Ph.	6.94	TOTAL DESIGN LOAD (KW)	25.76
CONNECTED LOAD (KW) - B Ph.	9.05	POWER FACTOR	1.00
CONNECTED LOAD (KW) - C Ph.	4.62	TOTAL DESIGN LOAD (AMPS)	72

Figure 88: New Emergency Panelboard | Ballroom

Feeder Sizing and Voltage Drop

The data for the table below is a summary of redesigned panelboards DML and EML. Voltage drop calculations for both panels were calculated as well. The 2008 NEC Handbook was referenced for sizes of wires.

Feeder Sizing	
Panelboard Tag	DML
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	29.14
Calculated Power Factor	1.00
Calculated Design Load (A)	72
Calculated Load (A) with spare	90
Feeder Protection Size	100A
Sets	1
Wire Size	
Phase	(3) 2/0
Neutral	(1) 2/0
Ground	(1) #8 AWG
Conduit	2.00" EMT
Power Factor	0.95
Length of Run	307.62
Voltage Drop	5.36
% Drop	2.58

Table 47: Feeder Sizing for DML

*Copper wire, 75°C, THWN, EMT conduit

Feeder Sizing	
Panelboard Tag	EML
Panelboard Voltage	208Y/120
Calculated Design Load (kW)	25.76
Calculated Power Factor	1.00
Calculated Design Load (A)	71.56
Calculated Load (A) with spare	89.44
Feeder Protection Size	100A
Sets	1
Wire Size	
Phase	(3) #3 AWG
Neutral	(1) #3 AWG
Ground	(1) #8 AWG
Conduit	1.25" EMT
Power Factor	0.95
Length of Run	8.45
Voltage Drop	0.37
% Drop	0.18

Table 48: Feeder Sizing for EML

*Copper wire, 75°C, THWN, EMT conduit

Dimming Control Diagram

The Ballroom lighting is all on dimming panel DML. Lutron's GRAFIK Eye system controls all of the zones and scenes in the Ballroom. Below is an example of a Lutron GRAFIK Eye Wiring diagram.

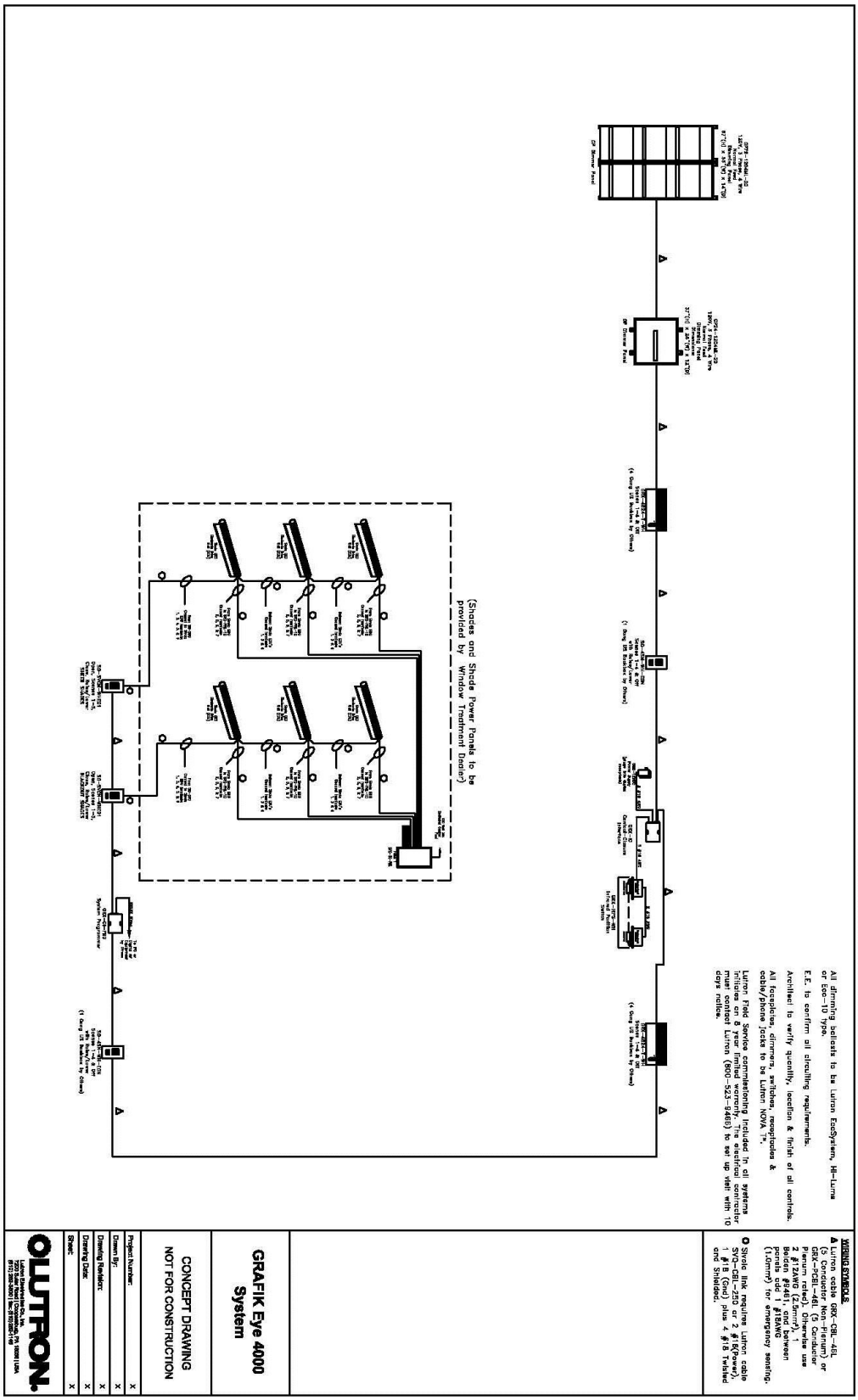


Figure 6: Dimming Control Diagram

Protective Device Coordination Study

A protective device coordination study was conducted addressing a single-path through the distribution system using the Per Unit Short Circuit Method. The path chosen for this study was from the utility transformer to Switchboard C/T to Distribution Panel HM to local panel HM Sec 2. This path is shown below.

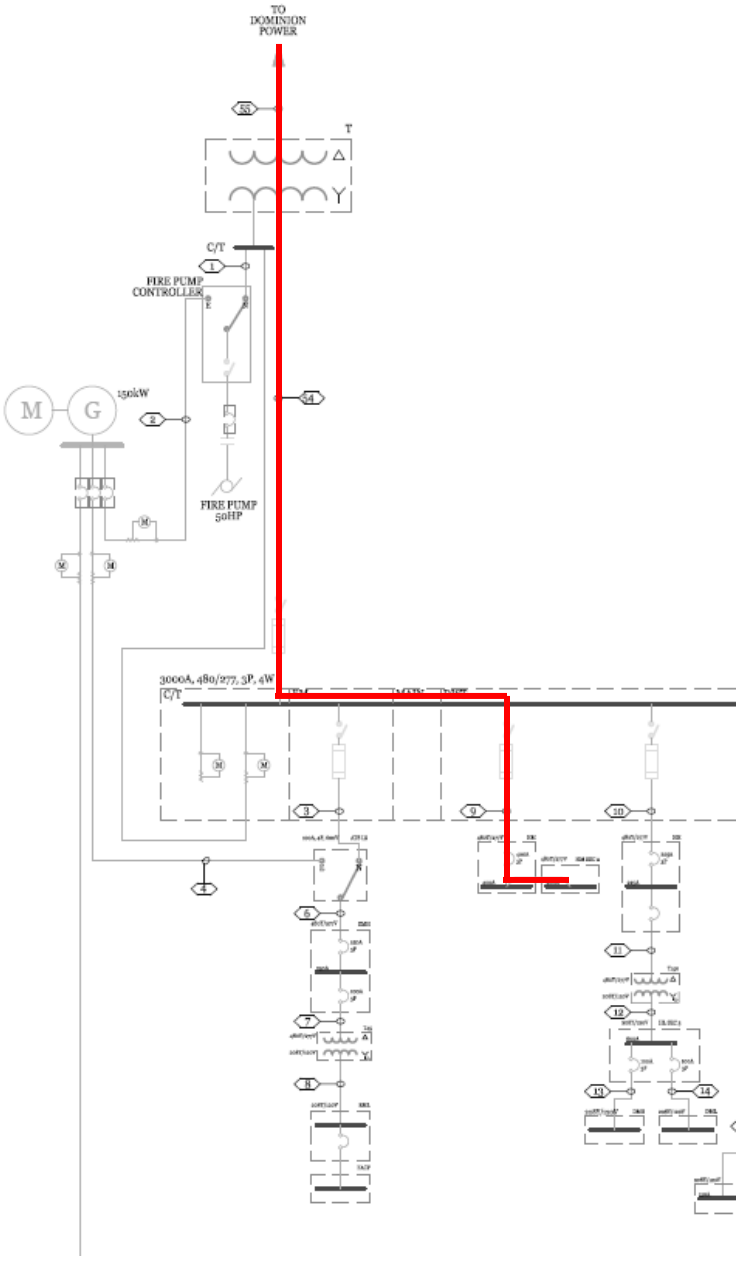


Figure 89: Coordination Study | Path

Fault Current Analysis - Per Unit Method							
	Base kVA	1000	ΣX	ΣR	ΣZ	Isc(A)	
	Available Utility Fault (kVA)	10000					
	System Voltage	0.1					
Utility Transformer Primary							
	X(p.u.) = kVA base / Utility S.C. kVA =	0.0001	0	0	0	**4373**	
	R(p.u.) =	0					
Utility Transformer Secondary							
Avg. %Z =	5.8	X(p.u.) = %X * kVA base / 100 * kVA transformer =	0.0535				
Avg. X/R =	2.38	R(p.u.) = %R * kVA base / 100 * kVA transformer =	0.0225	0.1535	0.0225	0.158	**76109**
%X =	5.35						
%R =	2.25						
kVA =	1000						
Switchboard P							
Wire =	#4	X = (L/1000) * XL * (1/Sets), X(p.u.) =	0.0892				
Length =	32.52	R = (L/1000) * R * (1/Sets), R (p.u.) =	0.4531	0.2427	0.4756	0.6198	**15463**
Sets =	1						
X =	0.0632						
R =	0.321						
Panelboard HM and HM Sec 2							
Wire =	4/0AWG	X = (L/1000) * XL * (1/Sets), X(p.u.) =	0.0476				
Length =	44.11	R = (L/1000) * R * (1/Sets), R (p.u.) =	0.0613	0.3319	0.9287	1.0816	**8153**
Sets =	2						
X =	0.0497						
R =	0.064						

Table 46: Short Circuit Analysis | Results

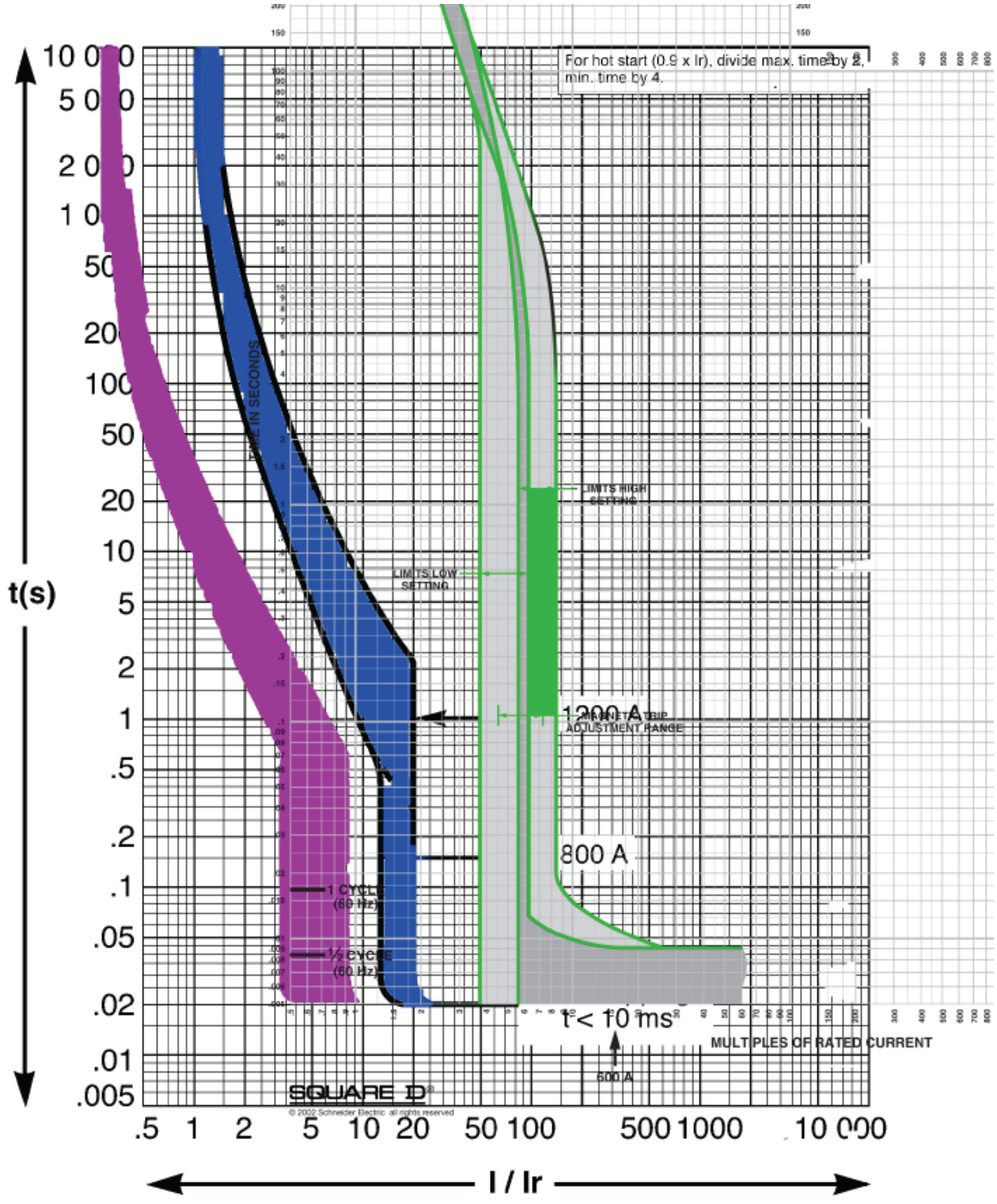
Base kVA	1000														
Utility Contribution (MVA)	10														
Equipment Characteristics											Per-Unit Value Table				
Mark	%X	%R	%Z	kVA	X/1000ft	R/1000ft	Z/1000ft	Length	# sets	3Ph Voltage (V)	Mark	Xu	Ru	Zu	Isc
Utility	0.1			10000						13200	Utility	0.1		0.1	
															4373.866
T-1	5.350	2.250	5.804	1000.000							T-1	0.0535	0.0225	0.058039	
												0.1535	0.0225	0.158039	**76108.73**
FEEDER 1					0.063	0.321	0.327	32.52	1.000	480.000	FEEDER 1	0.089204	0.453078	0.461776	
												0.242704	0.475578	0.619815	**15463.23**
SWBD P											SWBD P				
															15463.23
FEEDER 9					0.050	0.064	0.081	44.11	2.000	480.000	FEEDER 9	0.047575	0.061264	0.077567	
												0.331908	0.928656	1.081591	**8153.362**
HM											HM				
															8153.362

Table 7: Short Circuit Analysis | Calculations

Because information was not found regarding one of the circuit breakers in this run, another run with three circuit breakers was chosen for the protective coordination device study. The three breakers were rated at 60A, 150A, and 600A. The calculations are shown below:

60 x 13 = 780 / 150 = 5.2

60 x 13 = 780 / 600 = 1.3


For hot start (0.9 x Ir), divide max. time by 2, min. time by 4.
TIME IN SECONDS
t(s)
LIMITS HIGH SETTING
LIMITS LOW SETTING
1200 A
ADJUSTMENT RANGE
800 A
1 CYCLE (60 Hz)
½ CYCLE (60 Hz)
t< 10 ms
600 A
MULTIPLES OF RATED CURRENT
SQUARE D
© 2002 Schneider Electric all rights reserved
I / Ir

The 60A breaker is shown in blue, 150A in pink, and 600A in green. The trip curves for the three breakers were placed on the same graph for ease in analyzing the system. According to the study (see figure and calculations above), the circuit breakers were properly sized on the system.

Copper versus Aluminum Feeder Analysis

Introduction:

The purpose of this study is to determine whether a change from copper to aluminum feeders in the distribution system of the Hotel and Conference Center is advantageous or not. There are advantages and disadvantages to both materials that must be considered. Because aluminum is the most abundant metal, it is less expensive than copper, so there is a potential for saving money by changing the feeders. Data from the RS Means Building Construction Cost Data 2011 was referenced for pricing of both aluminum and copper feeders. Spreadsheets comparing the cost data are shown on the next page.

FEEDER SCHEDULE - COPPER

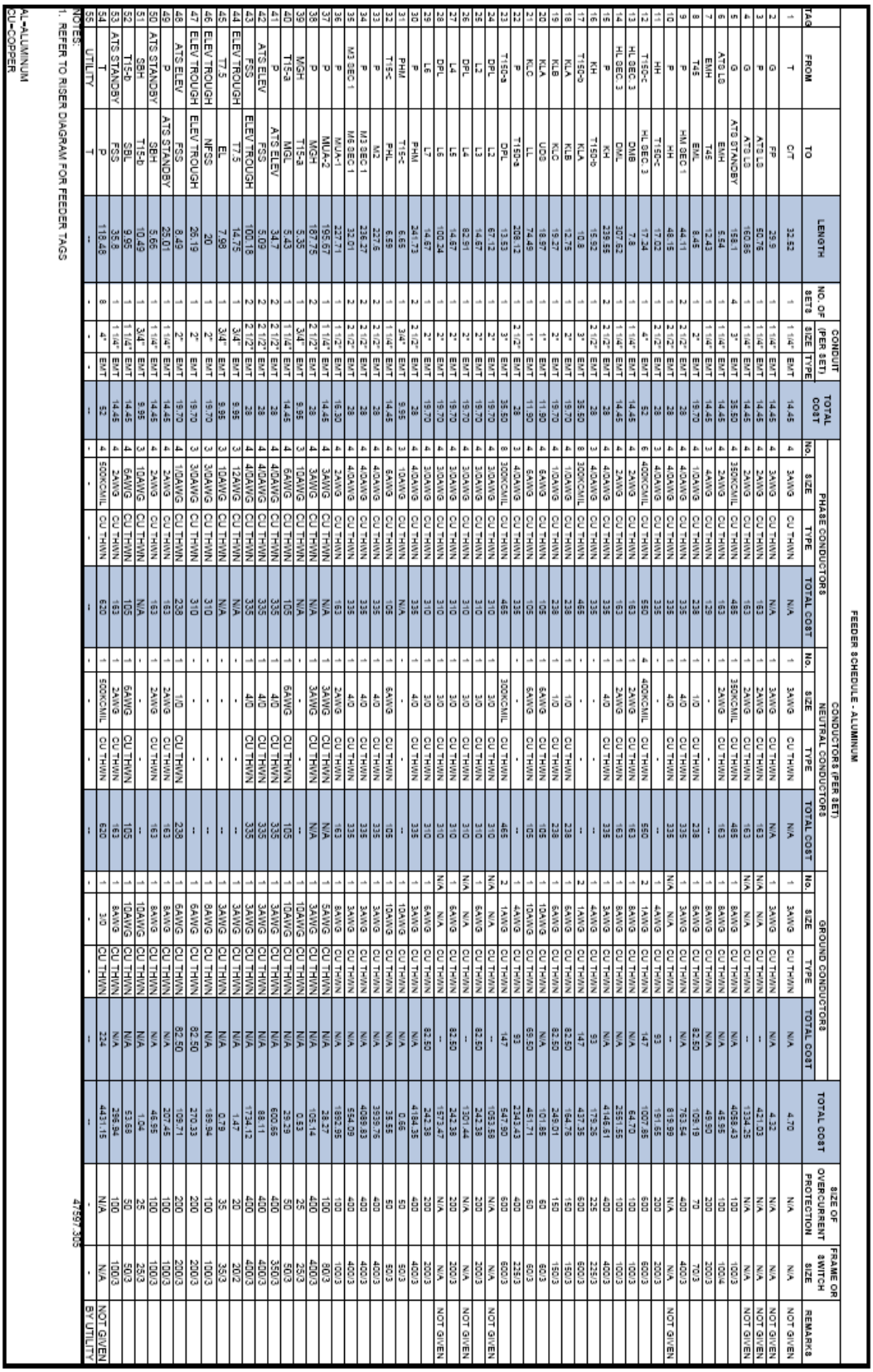
TAG	FROM	TO	LENGTH	CONDUIT (PER SET)			TOTAL COST	CONDUCTORS (PER SET)														SIZE OF		
				NO. OF SETS	SIZE	TYPE		PHASE CONDUCTORS			TOTAL COST	NEUTRAL CONDUCTORS			TOTAL COST	GROUND CONDUCTORS			TOTAL COST	TOTAL COST	OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE	REMARKS
								No.	SIZE	TYPE		No.	SIZE	TYPE		No.	SIZE	TYPE					
1	T	C/T	32.52	1	1 1/4"	EMT	14.45	4	3AWG	CU THWN	239	1	3AWG	CU THWN	239	1	3AWG	CU THWN	N/A	392.31	N/A	N/A	NOT GIVEN
2	G	FP	29.9	1	1 1/4"	EMT	14.45	4	3AWG	CU THWN	239	1	3AWG	CU THWN	239	1	3AWG	CU THWN	N/A	361.63	N/A	N/A	NOT GIVEN
3	P	ATS LB	50.75	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	283	1	N/A	N/A	N/A	723.05	N/A	N/A	NOT GIVEN
4	G	ATS LB	150.95	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	283	1	2AWG	CU THWN	283	1	N/A	N/A	---	2251.37	N/A	N/A	NOT GIVEN
5	G	ATS STANDBY	159.1	4	3"	EMT	38.50	4	350KCMIL	CU THWN	1100	1	2AWG	CU THWN	1100	1	8AWG	CU THWN	85	9065.97	100	100/3	
6	ATS LB	EMH	5.54	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	282	1	8AWG	CU THWN	85	83.68	100	100/4	
7	EMH	T4S	12.43	1	1 1/4"	EMT	14.45	3	4AWG	CU THWN	207	-	-	-	---	1	8AWG	CU THWN	85	188.92	200	200/3	
8	T4S	EML	8.45	1	2"	EMT	19.70	4	1/0AWG	CU THWN	420	1	4/0	CU THWN	420	1	6AWG	CU THWN	116	188.92	70	70/3	
9	P	HM SEC 1	44.11	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	1655.77	400	400/3	NOT GIVEN
10	P	HH	48.15	1	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	N/A	4AWG	CU THWN	---	1795.03	N/A	N/A	NOT GIVEN
11	HH	T15D-C	17.03	1	2 1/2"	EMT	38	3	4/0AWG	CU THWN	740	-	-	-	---	1	4AWG	CU THWN	173	412.05	200	200/3	
12	T15D-C	HL SEC 3	17.34	1	4"	EMT	53	6	400KCMIL	CU THWN	1225	4	400KCMIL	CU THWN	1225	2	1AWG	CU THWN	330	2331.30	600	600/3	
13	HL SEC 3	DMB	78	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	283	1	8AWG	CU THWN	85	1178.82	100	100/3	
14	HL SEC 3	DML	307.83	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	283	1	8AWG	CU THWN	85	4845.85	100	100/3	
15	P	KH	239.55	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	8597.50	400	400/3	
16	KH	T15D-D	15.52	1	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	-	-	-	---	1	4AWG	CU THWN	173	385.42	225	225/3	
17	T15D-D	KLA	10.8	1	3"	EMT	38.50	8	300KCMIL	CU THWN	980	-	-	-	---	2	1AWG	CU THWN	320	919.57	600	600/3	
18	KLA	KLB	12.75	1	2"	EMT	19.70	4	1/0AWG	CU THWN	420	1	1/0	CU THWN	420	1	6AWG	CU THWN	116	285.05	150	150/3	
19	KLB	KLC	19.27	1	2"	EMT	19.70	4	1/0AWG	CU THWN	420	1	1/0	CU THWN	420	1	6AWG	CU THWN	116	430.82	150	150/3	
20	KLA	UDB	18.97	1	1"	EMT	11.90	4	6AWG	CU THWN	152	1	6AWG	CU THWN	152	1	10AWG	CU THWN	69.50	159.61	60	60/3	
21	KLC	LL	74.49	1	1"	EMT	11.90	3	6AWG	CU THWN	740	1	6AWG	CU THWN	152	1	10AWG	CU THWN	69.50	635.75	60	60/3	
22	F	T15D-A	368.12	1	2 1/2"	EMT	38	8	300KCMIL	CU THWN	980	-	-	-	---	2	1AWG	CU THWN	320	5038.89	600	600/3	
23	T15D-A	DPL	67.12	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	N/A	N/A	N/A	---	1152.15	600	600/3	NOT GIVEN
24	DPL	L2	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	N/A	6AWG	CU THWN	---	2077.15	200	200/3	NOT GIVEN
25	L2	L3	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	N/A	6AWG	CU THWN	---	2077.15	200	200/3	NOT GIVEN
26	DPL	L4	82.91	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	1	6AWG	CU THWN	116	2565.52	N/A	N/A	NOT GIVEN
27	L4	L5	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	1	6AWG	CU THWN	116	471.01	200	200/3	
28	DPL	L6	100.34	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	N/A	N/A	CU THWN	---	3102.13	N/A	N/A	NOT GIVEN
29	L6	L7	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	615	1	3/0	CU THWN	615	1	6AWG	CU THWN	116	471.01	200	200/3	
30	P	PHM	241.73	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	9079.38	400	400/3	
31	PHM	T15-C	6.65	1	3/4"	EMT	9.95	4	1/0AWG	CU THWN	152	-	-	-	---	1	10AWG	CU THWN	69.50	21.54	50	50/3	
32	T15-C	PHL	6.59	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	152	1	6AWG	CU THWN	152	1	10AWG	CU THWN	69.50	55.62	50	50/3	
33	F	M2	237.6	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	8548.65	400	400/3	NOT GIVEN
34	F	M3 SEC 1	236.27	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	8874.30	400	400/3	
35	M3 SEC 1	M2	33.01	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	1203.30	400	400/3	
36	P	MUA-1	232.71	2	3 1/2"	EMT	16.30	4	2AWG	CU THWN	283	1	2AWG	CU THWN	283	1	8AWG	CU THWN	85	3443.56	100	100/3	
37	P	MUA-2	195.57	1	1 1/2"	EMT	14.45	4	3AWG	CU THWN	239	1	3AWG	CU THWN	239	1	8AWG	CU THWN	N/A	2366.53	100	100/3	
38	P	MGH	187.75	2	2 1/2"	EMT	38	4	3AWG	CU THWN	239	1	3AWG	CU THWN	239	1	8AWG	CU THWN	N/A	2348.75	400	400/3	
39	MGH	T15-A	5.35	1	3/4"	EMT	9.95	3	1DAWG	CU THWN	61.50	-	-	-	---	1	10AWG	CU THWN	69.50	17.33	25	25/3	
40	T15-A	MGL	5.43	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	152	1	6AWG	CU THWN	152	1	10AWG	CU THWN	69.50	48.83	50	50/3	
41	P	ATS ELEV	34.7	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	1303.33	400	400/3	350/3
42	ATS ELEV	FSS	5.09	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	191.18	400	400/3	400/3
43	FSS	ELEV TROUGH	14.75	2	2 1/2"	EMT	38	4	4/0AWG	CU THWN	740	1	4/0	CU THWN	740	1	3AWG	CU THWN	N/A	3762.75	400	400/3	
44	E.LEV TROUGH	T7.5	100.16	1	3/4"	EMT	9.95	3	12AWG	CU THWN	68	-	-	-	---	1	3AWG	CU THWN	N/A	31.55	20	20/2	
45	T7.5	EL	7.98	1	3/4"	EMT	9.95	3	1DAWG	CU THWN	61.50	-	-	-	---	1	3AWG	CU THWN	N/A	20.31	35	35/3	
46	ELEV TROUGH	NFSS	20	1	2"	EMT	19.70	3	3/0AWG	CU THWN	615	-	-	-	---	1	8AWG	CU THWN	85	392.14	100	100/3	
47	ELEV TROUGH	ELEV TROUGH	26.19	1	2"	EMT	19.70	3	3/0AWG	CU THWN	615	-	-	-	---	1	6AWG	CU THWN	116	518.75	200	200/3	
48	ATS ELEV	FSS	8.49	1	2"	EMT	19.70	4	1/0AWG	CU THWN	420	1	1/0	CU THWN	420	1	6AWG	CU THWN	116	168.81	200	200/3	
49	P	ATS STANDBY	25.01	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	283	1	8AWG	CU THWN	85	377.75	100	100/3	
50	ATS STANDBY	SBH	5.66	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	283	1	8AWG	CU THWN	85	85.49	100	100/3	
51	SBH	T15-B	10.49	1	3/4"	EMT	9.95	3	1DAWG	CU THWN	61.50	-	-	-	---	1	10AWG	CU THWN	69.50	33.98	25	25/3	
52	T15-B	SBL	9.95	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	152	1	6AWG	CU THWN	152	1	10AWG	CU THWN	69.50	83.97	50	50/3	
53	ATS STANDBY	FSS	35.8	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	282	1	2AWG	CU THWN	282	1	8AWG	CU THWN	85	540.74	100	100/3	
54	T	P	118.48	4	4"	EMT	52	4	500KCMIL	CU THWN	1475	1	500KCMIL	CU THWN	1475	1	3/0	CU THWN	530	9888.72	N/A	N/A	NOT GIVEN
55	UTILITY	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	BY UTILITY

NOTES:
1. REFER TO RISER DIAGRAM FOR FEEDER TAGS

AL=ALUMINUM
CU=COPPER

104593.020

Figure 90: Copper Feeder



FEEDER SCHEDULE - ALUMINUM

TAG	FROM	TO	LENGTH	NO. OF SETS	CONDUIT (PER SET) SIZE	CONDUIT (PER SET) TYPE	TOTAL COST	PHASE CONDUCTORS (PER SET) No.	PHASE CONDUCTORS (PER SET) SIZE	PHASE CONDUCTORS (PER SET) TYPE	PHASE CONDUCTORS (PER SET) TOTAL COST	CONDUCTORS (PER SET) NEUTRAL CONDUCTORS No.	CONDUCTORS (PER SET) NEUTRAL CONDUCTORS SIZE	CONDUCTORS (PER SET) NEUTRAL CONDUCTORS TYPE	CONDUCTORS (PER SET) NEUTRAL CONDUCTORS TOTAL COST	GROUND CONDUCTORS No.	GROUND CONDUCTORS SIZE	GROUND CONDUCTORS TYPE	GROUND CONDUCTORS TOTAL COST	TOTAL COST	SIZE OF OVERCURRENT PROTECTION	FRAME OR SWITCH SIZE	REMARKS
1	T	C/T	32.52	1	1 1/4"	EMT	14.45	4	3AWG	CU THWN	N/A	1	3AWG	CU THWN	N/A	1	3AWG	CU THWN	N/A	4.70	N/A	N/A	NOT GIVEN
2	G	FP	29.9	1	1 1/4"	EMT	14.45	4	3AWG	CU THWN	N/A	1	3AWG	CU THWN	N/A	1	6AWG	CU THWN	N/A	4.32	N/A	N/A	NOT GIVEN
3	P	ATS LB	50.76	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	N/A	CU THWN	--	421.03	N/A	N/A	NOT GIVEN
4	G	ATS LB	160.86	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	N/A	CU THWN	--	1334.25	N/A	N/A	NOT GIVEN
5	G	ATS STANDBY	158.1	4	3"	EMT	35.50	4	350KCMIL	CU THWN	485	1	350KCMIL	CU THWN	485	1	8AWG	CU THWN	N/A	4028.43	100	1200/3	NOT GIVEN
6	G	ATS LB	5.54	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	45.95	100	1200/4	
7	P	EMH	12.43	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	49.90	100	2000/3	
8	P	T4S	8.46	1	2"	EMT	19.70	4	1/0AWG	CU THWN	238	1	1/0	CU THWN	238	1	6AWG	CU THWN	N/A	109.19	70	700/3	
9	P	EML	44.11	1	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	763.54	400	4000/3	
10	P	HM SEC 1	48.15	1	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	6AWG	CU THWN	--	819.99	N/A	N/A	NOT GIVEN
11	HH	T15D-c	17.02	1	2 1/2"	EMT	28	3	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	4AWG	CU THWN	93	191.85	200	2000/3	
12	T15D-c	HL SEC 3	17.24	1	4"	EMT	52	6	400KCMIL	CU THWN	550	4	400KCMIL	CU THWN	550	2	1AWG	CU THWN	147	1007.85	600	6000/3	
13	HL SEC 3	DMB	7.8	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	64.70	100	1200/3	
14	HL SEC 3	DML	307.62	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	2551.55	100	1200/3	
15	P	KH	239.55	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	4146.51	400	4000/3	
16	P	T15D-b	15.52	2	2 1/2"	EMT	28	3	4/0AWG	CU THWN	335	-	-	-	-	1	4AWG	CU THWN	93	179.35	225	2250/3	
17	T15D-b	KLA	10.8	1	3"	EMT	35.50	8	300KCMIL	CU THWN	465	-	-	-	-	2	1AWG	CU THWN	147	437.35	600	6000/3	
18	KLA	KLB	12.75	1	2"	EMT	19.70	4	1/0AWG	CU THWN	238	1	1/0	CU THWN	238	1	6AWG	CU THWN	82.50	164.76	150	1500/3	
19	KLB	KLC	19.27	1	2"	EMT	19.70	4	1/0AWG	CU THWN	238	1	1/0	CU THWN	238	1	6AWG	CU THWN	82.50	249.01	150	1500/3	
20	KLA	UDB	18.97	1	1"	EMT	11.90	4	6AWG	CU THWN	105	1	6AWG	CU THWN	105	1	10AWG	CU THWN	N/A	101.86	60	600/3	
21	KLC	LL	74.49	1	1"	EMT	11.90	4	6AWG	CU THWN	105	1	6AWG	CU THWN	105	1	10AWG	CU THWN	69.50	451.71	60	600/3	
22	P	T15D-a	208.12	1	2 1/2"	EMT	28	3	4/0AWG	CU THWN	335	-	-	-	-	1	4AWG	CU THWN	93	2343.43	400	2250/3	
23	T15D-a	DPL	67.12	1	3"	EMT	35.50	8	300KCMIL	CU THWN	465	-	300KCMIL	CU THWN	465	2	1AWG	CU THWN	147	547.90	600	6000/3	
24	DPL	L2	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	310	1	3/0	CU THWN	310	N/A	N/A	CU THWN	--	1053.58	N/A	N/A	NOT GIVEN
25	L2	L3	82.91	1	2"	EMT	19.70	4	3/0AWG	CU THWN	310	1	3/0	CU THWN	310	1	6AWG	CU THWN	82.50	242.38	200	2200/3	
26	DPL	L4	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	310	1	3/0	CU THWN	310	N/A	N/A	CU THWN	--	1351.44	N/A	N/A	NOT GIVEN
27	L4	L5	14.67	1	2"	EMT	19.70	4	3/0AWG	CU THWN	310	1	3/0	CU THWN	310	1	6AWG	CU THWN	82.50	242.38	200	2200/3	
28	DPL	L6	100.24	1	2"	EMT	19.70	4	3/0AWG	CU THWN	310	1	3/0	CU THWN	310	N/A	N/A	CU THWN	--	1573.47	N/A	N/A	NOT GIVEN
29	P	L7	14.67	1	2"	EMT	19.70	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	6AWG	CU THWN	82.50	242.38	200	2200/3	
30	P	PHM	241.73	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	4184.35	400	4000/3	
31	PHM	T15-c	6.65	1	3/4"	EMT	9.95	3	1/0AWG	CU THWN	N/A	-	-	-	-	1	6AWG	CU THWN	N/A	0.66	50	500/3	
32	T15-c	PHL	6.59	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	105	1	6AWG	CU THWN	105	1	10AWG	CU THWN	N/A	35.55	50	500/3	
33	P	M2	227.6	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	3939.76	400	4000/3	
34	P	M3 SEC 1	216.27	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	4099.83	400	4000/3	
35	M3 SEC 1	M2 SEC 1	32.01	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	554.09	400	4000/3	
36	P	MUA-1	227.71	1	1 1/2"	EMT	16.32	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	1582.98	100	1200/3	
37	P	MUA-2	195.57	1	1 1/4"	EMT	14.45	4	3AWG	CU THWN	N/A	1	3AWG	CU THWN	N/A	1	5AWG	CU THWN	N/A	28.27	100	800/3	
38	P	MGH	187.75	2	2 1/2"	EMT	28	4	3AWG	CU THWN	N/A	1	3AWG	CU THWN	N/A	1	10AWG	CU THWN	N/A	105.14	100	1200/3	
39	MGH	T15-a	5.35	1	3/4"	EMT	9.95	3	1/0AWG	CU THWN	N/A	-	-	-	-	1	6AWG	CU THWN	N/A	0.53	25	250/3	
40	T15-a	MGL	5.43	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	105	-	6AWG	CU THWN	-	1	10AWG	CU THWN	N/A	29.29	50	500/3	
41	P	ATS ELEV	34.7	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	600.86	400	4000/3	
42	ATS ELEV	FSS	5.09	2	2 1/2"	EMT	28	4	4/0AWG	CU THWN	335	1	4/0	CU THWN	335	1	3AWG	CU THWN	N/A	88.11	400	4000/3	
43	FSS	ELEV TROUGH	100.18	1	3/4"	EMT	9.95	3	12AWG	CU THWN	N/A	-	-	-	-	1	8AWG	CU THWN	N/A	1734.12	20	20/2	
44	ELEV TROUGH	T7.5	14.75	1	3/4"	EMT	9.95	3	12AWG	CU THWN	N/A	-	-	-	-	1	8AWG	CU THWN	N/A	1.47	20	20/2	
45	T7.5	EL	7.98	1	3/4"	EMT	9.95	3	12AWG	CU THWN	N/A	-	-	-	-	1	8AWG	CU THWN	N/A	0.78	35	35/3	
46	ELEV TROUGH	NFSS	20	1	2"	EMT	19.70	3	3/0AWG	CU THWN	310	-	-	-	-	1	8AWG	CU THWN	N/A	189.94	100	1200/3	
47	ELEV TROUGH	ELEV TROUGH	26.19	1	2"	EMT	19.70	3	3/0AWG	CU THWN	310	-	-	-	-	1	8AWG	CU THWN	82.50	270.33	200	2000/3	
48	ATS ELEV	FSS	8.49	1	2"	EMT	19.70	4	1/0AWG	CU THWN	238	1	1/0	CU THWN	238	1	6AWG	CU THWN	82.50	109.71	200	2200/3	
49	P	ATS STANDBY	25.01	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	N/A	CU THWN	N/A	207.45	100	1200/3	
50	ATS STANDBY	SBH	5.66	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	46.95	100	1200/3	
51	SBH	T15-b	10.49	1	3/4"	EMT	9.95	3	1/0AWG	CU THWN	N/A	-	6AWG	CU THWN	-	1	10AWG	CU THWN	N/A	1.04	25	250/3	
52	T15-b	SBL	9.95	1	1 1/4"	EMT	14.45	4	6AWG	CU THWN	105	1	6AWG	CU THWN	105	1	10AWG	CU THWN	N/A	53.98	50	500/3	
53	ATS STANDBY	FSS	35.8	1	1 1/4"	EMT	14.45	4	2AWG	CU THWN	163	1	2AWG	CU THWN	163	1	8AWG	CU THWN	N/A	296.94	100	1200/3	
54	T	P	118.48	8	4"	EMT	52	4	500KCMIL	CU THWN	620	1	500KCMIL	CU THWN	620	1	3/0	CU THWN	224	4431.15	N/A	NOT GIVEN	NOT GIVEN BY UTILITY
55	UTILITY	T	--	-	-	-	--	-	-	-	--	-	-	-	--	-	-	-	--	--	-	-	

NOTES:
1. REFER TO RISER DIAGRAM FOR FEEDER TAGS

AL=ALUMINUM
CU=COPPER

4/597 308

Figure 91: Aluminum Feeders

Analysis and Conclusions:

After comparing the costs of both aluminum and copper feeders for the distribution system, cost savings were determined. A summary is provided below:

Copper Wire	$104,593.02
Aluminum Wire	$47,597.31
Cost Savings	$56,995.71
Percent Savings	54%

Table 51: Table #51

Part of the reason for such a large difference is due to the fact that some of the cost data for certain feeder sizes were not available in the RS Means Building Construction Cost Data book.

Misconceptions about the inferiority of aluminum conductors are often made throughout the country. The electrical industry has, in fact, utilized aluminum feeders for well over 100 years. Aluminum happens to be a very reliable source for conductors, too, withstanding more surge and overload currents than copper conductors. On a per pound basis, aluminum is over twice as good as conducting electricity than copper. Aluminum conductors also have a longer life than copper. Aluminum conductors do oxidize like copper, however, if surface oxidation occurs again under the right conditions, the exposed surfaces can be protected again; whereas copper completely oxidizes over time.

Copper conductors have a higher tensile strength and conduct electricity better than aluminum. Copper wires also have a less expensive life cycle. Therefore, if space is a critical component of the electrical distribution system in a building, copper tends to be a better option.

If the copper wires were to be replaced with aluminum wires, the wire sizes would have to increase to achieve the same ampacity. This would also increase the conduit size in response. The study does show that there is a huge amount of cost savings by employing aluminum wires. Because the cost benefit is so great in replacing the conductors to aluminum, and because space is not an issue in design, I recommend the aluminum conductors. Additional space to accommodate a greater volume of aluminum enables the alternating current to be greater on its surface than the core. This will mean the conductors will be more efficient, too.

Photovoltaic Array Feasibility Study

Introduction:

Since the Hotel and Conference Center has received a LEED Gold certification by the U.S. Green Building Council, it is evident that sustainability was a driving factor in design. Therefore, an analysis of adding a photovoltaic (PV) array onto the roof was completed in order to evaluate the benefits and feasibility of the system.

Background:

Located in a more rural area, the Hotel and Conference Center will not receive any shadows from buildings as no buildings are located anywhere on its site. However, Virginia is not necessarily the sunniest of locations in the United States and may not be the most ideal location for installing solar panels.

The percentage of sunshine per month in Virginia throughout the year is less than the national average.

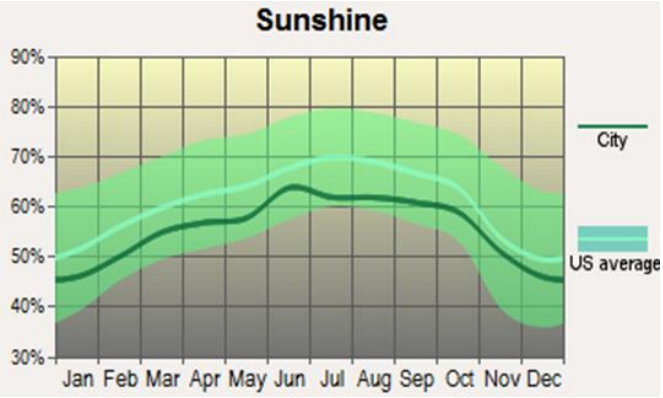


Figure 92: Sunny Days in Unknown City, Virginia

Percentage of cloud cover per month indicates that for the course of an entire year, over 50% of the days will have some sort of cloud coverage.

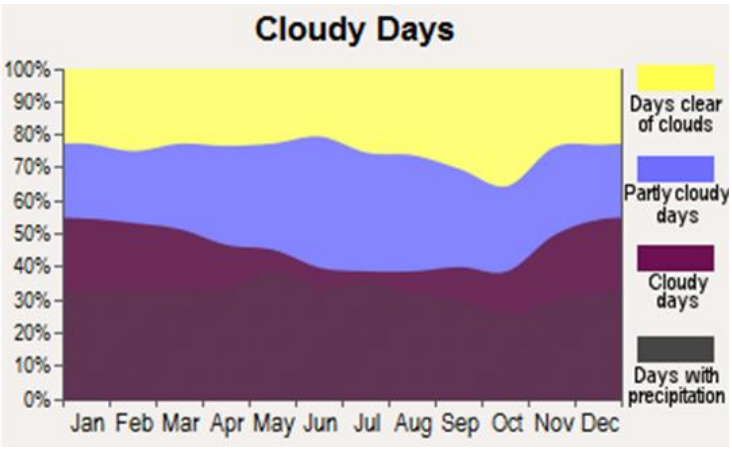


Figure 92: Cloudy Days in Unknown City, Virginia

System:

The proposed photovoltaic array will be mounted on the roof of the hotel tower on the building. Because the roof is flat, the panels will not need to be mounted on racks and angled at all.

The E19/320 Solar Panel from Sunpower is the most efficient photovoltaic panel on the market. It has an efficiency of 19.6%, higher than conventional panels specified.

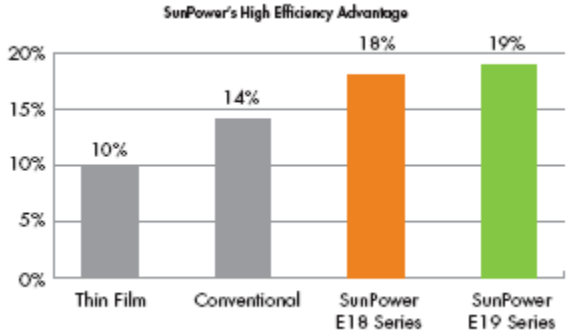


Figure 93: Efficiency Comparison Graph

The proposed photovoltaic system was to try and produce about 500kW (or about 1/3 the power of the main distribution panel) on the hotel tower roof. The square footage of usable roof space is about 10600SF, allowing about (530) 5'-0" x 4'-0" panels at 320kW each. However, the system only receives about half of the power, reaching a maximum of 169.6 kW.

Electrical Data		
Measured at Standard Test Conditions (STC): Irradiance of 1000W/m², AM 1.5, and cell temperature 25° C		
Peak Power (+5/-3%)	P_{max}	320 W
Efficiency	η	19.6 %
Rated Voltage	V_{mpp}	54.7 V
Rated Current	I_{mpp}	5.86 A
Open Circuit Voltage	V_{oc}	64.8 V
Short Circuit Current	I_{sc}	6.24 A
Maximum System Voltage	UL	600 V
Temperature Coefficients	Power (P)	-0.38% / K
	Voltage (V_{oc})	-176.6mV / K
	Current (I_{sc})	3.5mA / K
NOCT		45° C +/-2° C
Series Fuse Rating		15 A

Figure 94: Electrical Data of PV Panel

Calculations:

The maximum voltage of the photovoltaic array occurs at the lowest temperature of the array. Therefore, ASHRAE 90.1-2007 was referenced to find the minimum temperature in Virginia (the exact city cannot be revealed) of 14°F (-10°C). The change in temperature from the Standard Test Condition (STC) and the change in open circuit voltage was accounted for as well.

Noted above, the STD temperature is 25° and the open-circuit voltage changes with a slope of -0.177 V/°C. The open circuit voltage of the PV Array specified is 64.8V. The change in temperature from the STC is then:

-10°C - 25°C = -35°C

The change in open-circuit voltage is:

-0.177 V/°C x -35°C = 6.195V

Therefore, the new open-circuit voltage is 64.8V plus the change of 6.195V, for a total of 70.995V at 10°C.

Next, the maximum voltage of the array was calculated and checked to see how many panels could fit on the inverter specified (Sunny Tower with 6 Sunny Mini with 68.4 kW each).

The maximum DC voltage is 700V. Dividing this total voltage by the voltage of the system allows you to determine how many modules are allowed on the inverter. Therefore, 9 modules are allowed on this system (700V / 70.995V = 9.86 modules = 9). The voltage has to be checked as well (9 * 70.995V = 638.995V) to make sure the system can handle the number of modules. This also means no more than nine panels can be in series with the inverter.

Nine panels at 320W each gives a total of about 2.88kW. The goal of the PV Array study was to determine if the maximum power of the array could indeed be reached (recall maximum of 169.6 kW). This means that 59 rows of panels must be installed in order to reach the maximum (169.6 / 2.88 kW = 59 rows of panels).

Using the dimensions of the roof plan, 54 rows of 9 panels each could be obtained on the roof, or 155.5 kW.

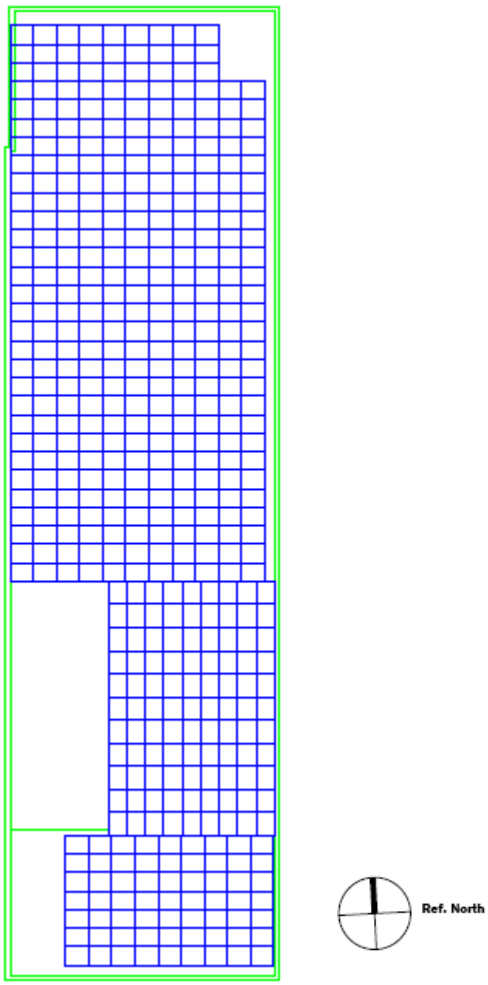


Figure 95: Roof Plan of Hotel Tower | NTS

Analysis and Conclusions

Knowing that the optimal number of panels cannot fit on the roof nor can the targeted amount of kW be generated by the photovoltaic system, it is recommended that the Hotel and Conference do not implement a photovoltaic system.

Architectural Breadth

Introduction:

The Hotel and Conference Center highlights various social events in its Ballroom, including themed events, cocktail receptions, company outings, anniversary parties, reunions, and wedding receptions. Capacities may vary in the room, so making use of the two operable partitions is available. These partitions can separate the Ballroom into one, two, or three salons. The Ballroom accommodates up to 579 guests in a reception setting, 611 as a theater, and as many as 456 in a banquet setting.

The inspirational image for this space is a dark cave illuminated by a sliver of daylight. Just like a cave in nature, a ballroom in a conference center shuns the daylight. However, adding in daylight into the space really enhances the overall atmosphere during certain types of events, specifically long conferences or even early morning breakfasts. With the use of four clerestories, daylight is integrated into the Ballroom. For events not wanting daylight or for those using projection screens, shading devices can be utilized.

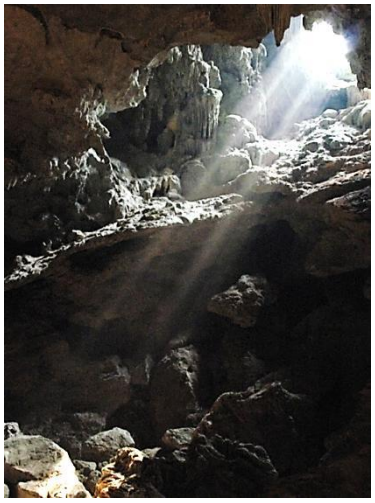


Figure 96: Inspirational Image

The main objectives of the architecture breadth are as follows:

1. Integrate a unique daylighting system within the space to enhance the architect's overall image for the hotel
2. Enhance room aesthetics and architectural integrity

Problem:

Ballrooms typically do not integrate daylight into their design, but with the architect's vision for the building, daylight seemed an integral part that could enhance the aesthetics of the Ballroom.

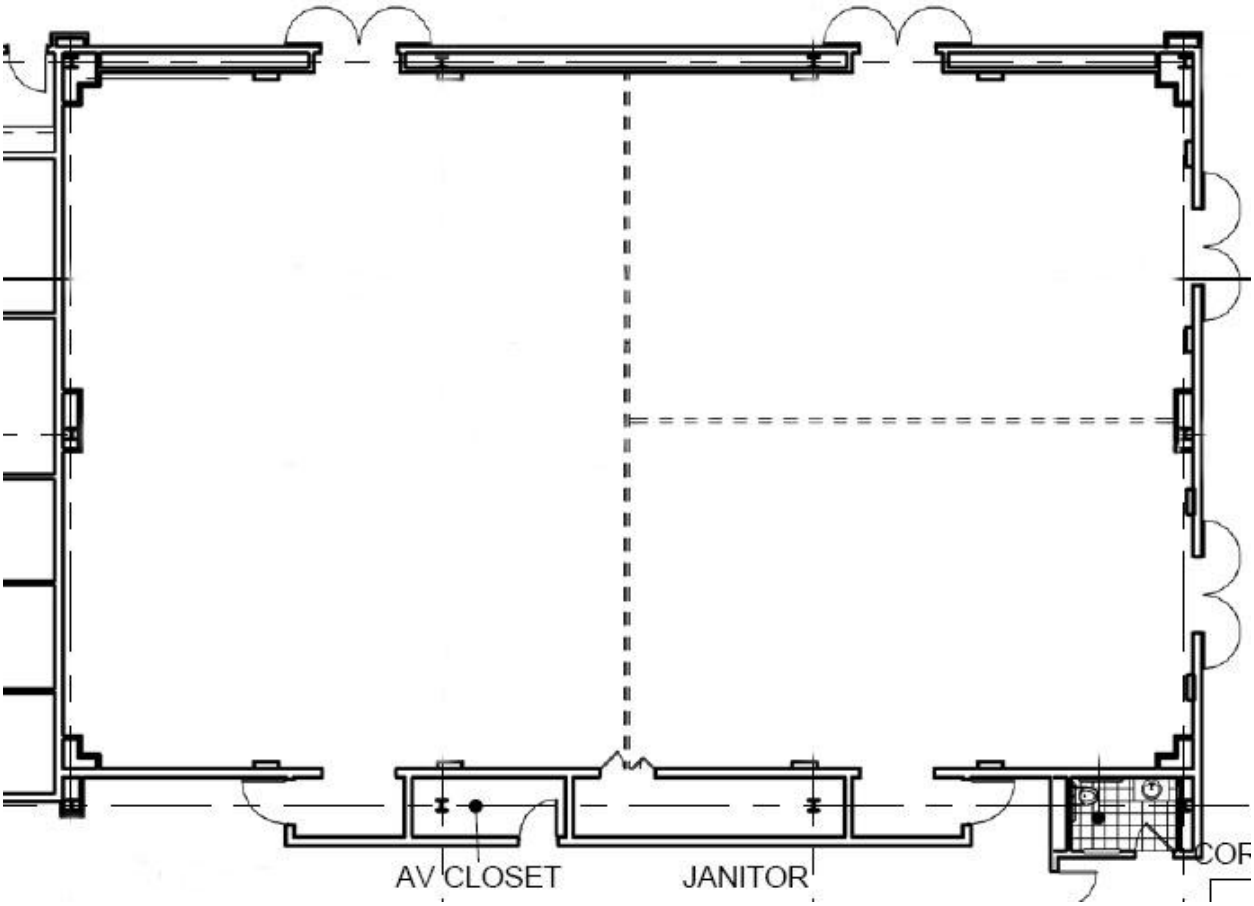


Figure 96: Ballroom Plan | NTS

As seen above, the Ballroom is on the interior of the conference center portion of the building, allowing no natural light into the space. A double tiered cove lighting system actually makes the Ballroom space much taller than the overall height of the rest of the conference center. With another height addition, clerestories could be added that would not distract from the view from the exterior of the building. Clerestories are a simple means of bringing in natural light into a space and can be controlled using appropriate shading devices depending on orientation.

The four clerestories are centered along the entranceways of the Ballroom on the north and east elevations. Even if the Ballroom is split into two or three separate spaces, each room will have some sort of daylight integration with it.

The original elevations of the north and east elevations are shown below.

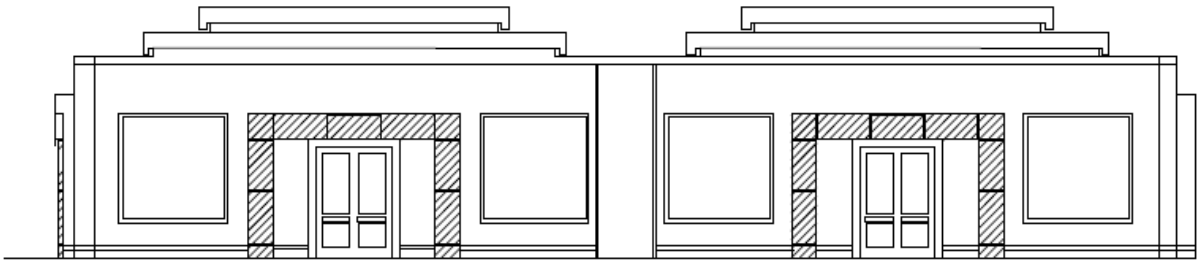


Figure 98: Ballroom North Elevation | Original

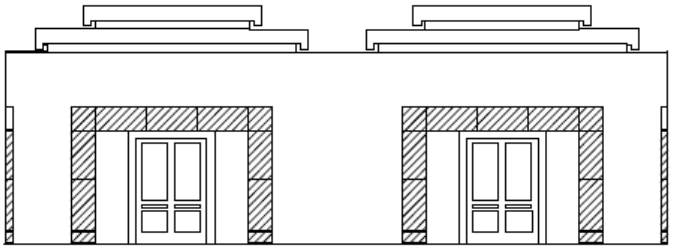


Figure 99: Ballroom East Elevation | Original

Solution:

Adding in daylight into a Ballroom could be troublesome for a variety of reasons. Controls are typically one such reason, and would definitely pose a threat in the Ballroom design as the design implements shades, as well. The proposed Ballroom design includes high-tech dimming, scene, and zone controls via a Lutron Grafik Eye System, which also integrates shading controls. This will allow the users in the space to adjust the shades as necessary.

Originally, the ceiling height of the Ballroom was 16'-0", with a double tiered coffered ceiling extending up to 20'-0" total (each ceiling pop-up was 2'-0" tall). The ceiling height was increased by 6'-0" to include four clerestories (two on both the northern and eastern sides of the space), for a general ceiling height of 22'-0". In order to keep the architectural integrity of the room, the double coffered ceiling was kept and extended as well. This led to an increase in overall height of 26'-0" in the topmost cove.

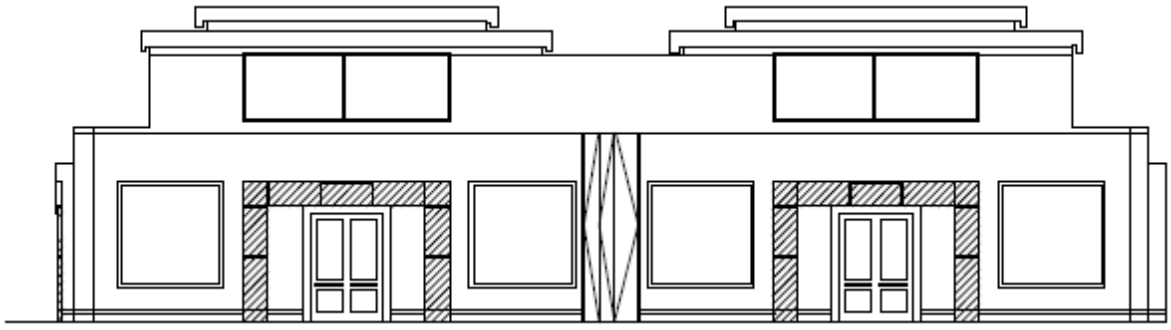


Figure 100: Ballroom North Elevation | New

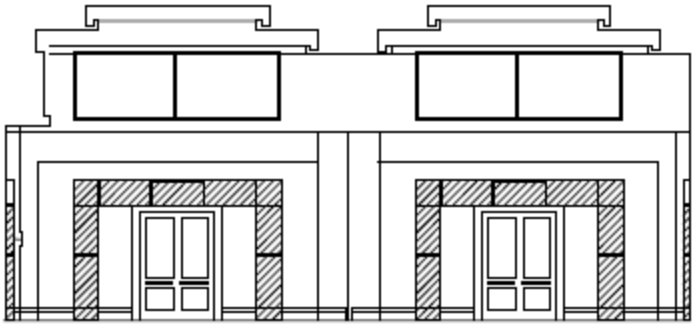


Figure 7: Ballroom East Elevation | New

The clerestories could not be simply added in, however. Two columns on the northern wall of the Ballroom had to be moved in order to accommodate for the size and position of the clerestories (for more information pertaining to this, please refer to the Structural Breadth).

Conclusions:

With the addition of four clerestories in the Ballroom, the Ballroom transforms into an open and airy space, allowing exterior views to the outside. These clerestories bring natural light in, consistent with the architect's vision for bringing the outdoors indoors.

Structural Breadth

Introduction:

As a result of adding clerestories on both the northern and eastern walls of the Ballroom, the structure of the original design had to be analyzed and slightly modified. Adding in the clerestories increased the ceiling height by 6'-0", so checking columns for the height addition was accounted for in the analysis. Redesigning the framing also had to be completed because two of the columns moved as a result of adding the clerestories in their respective places.

The drawing below highlights the columns in the Ballroom that were affected by adding in clerestories. Columns in red indicate that a structural redesign was carried out.

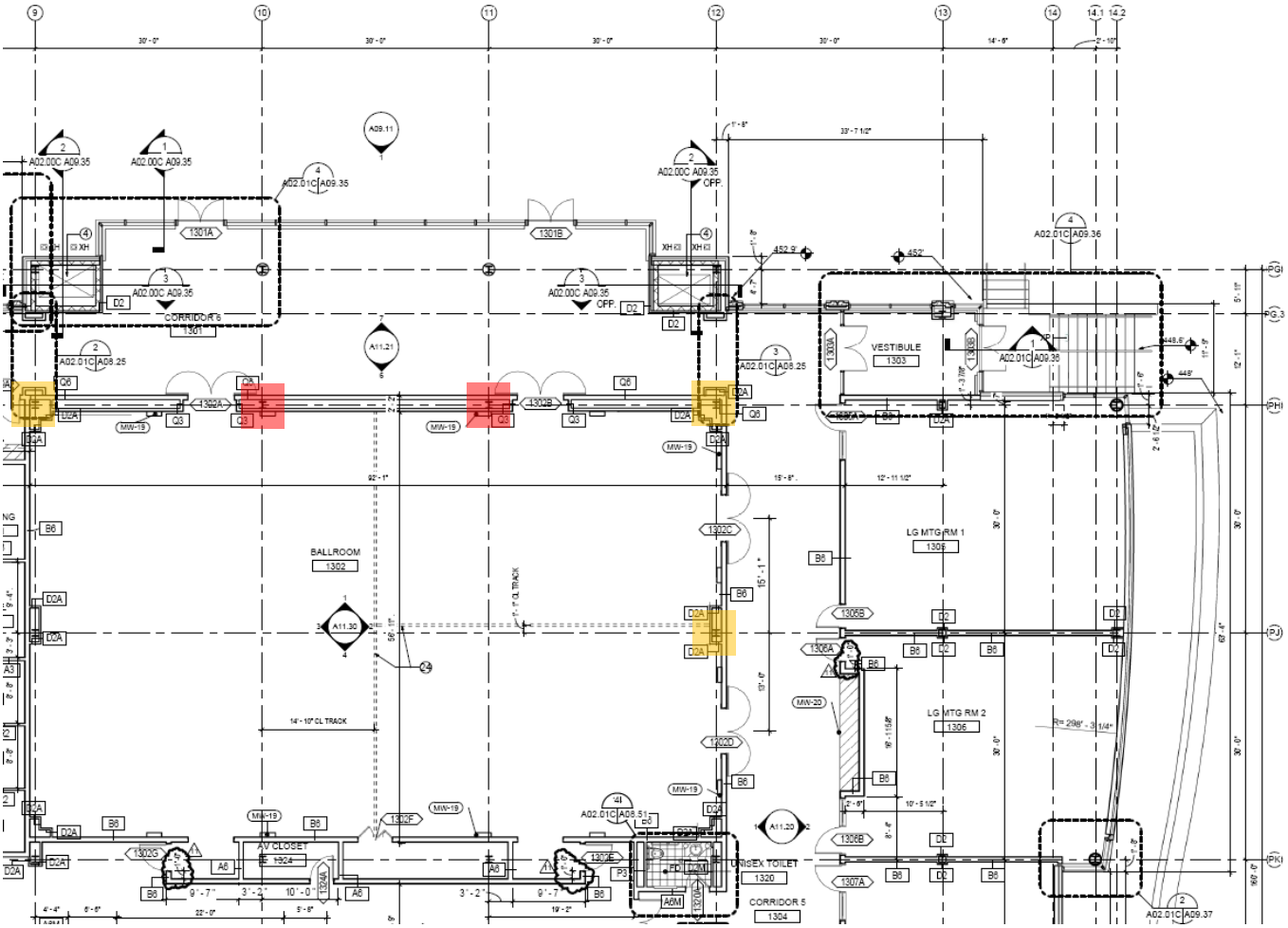


Figure 102: Level 1 Construction Plan

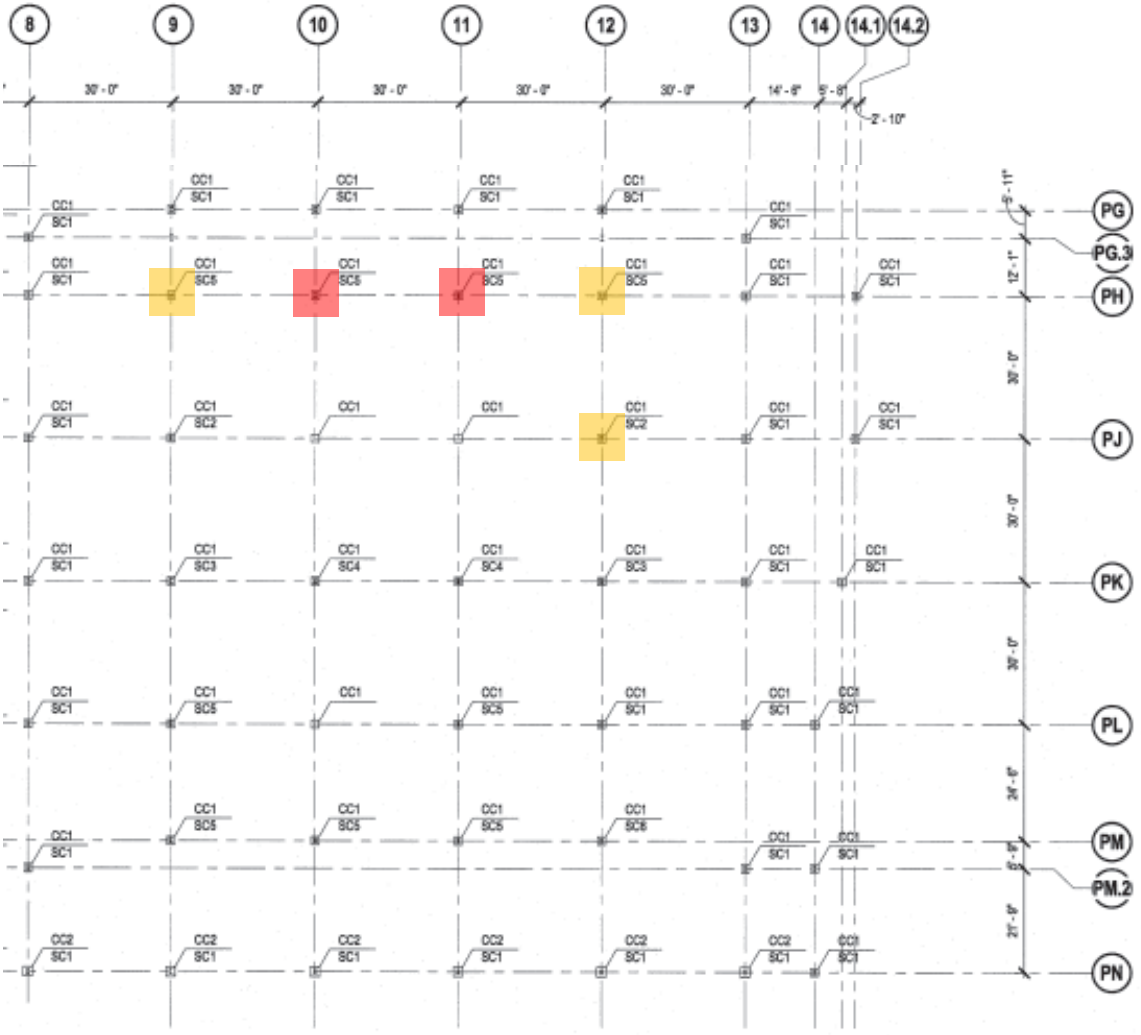


Figure 103: Structural Column Keyplan

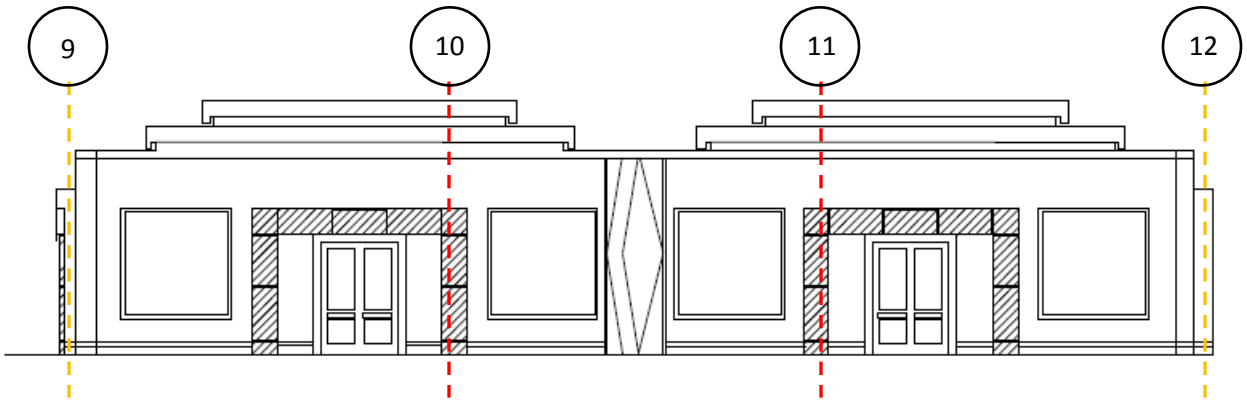


Figure 104: North Elevation of Ballroom | Original

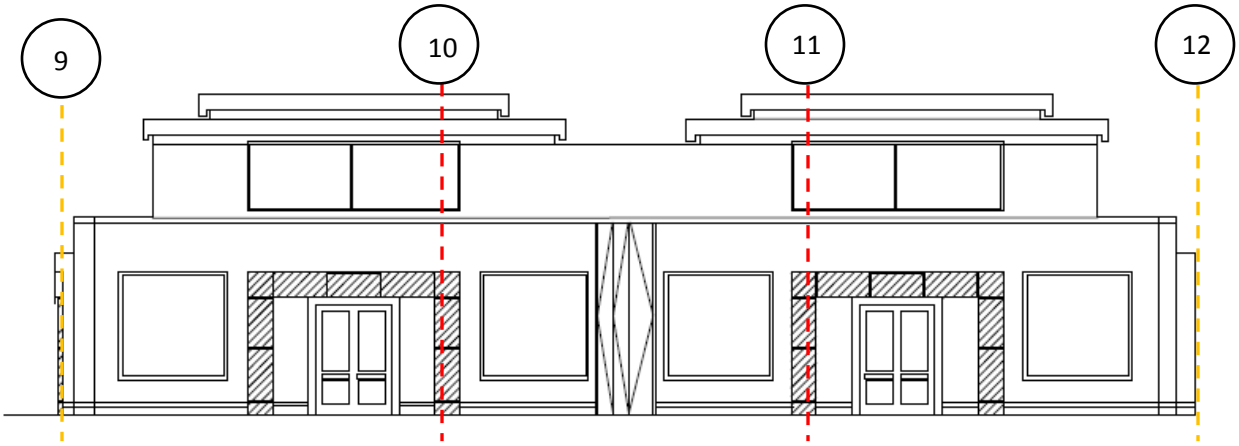


Figure 105: North Elevation of Ballroom | Proposed Location of Clerestories

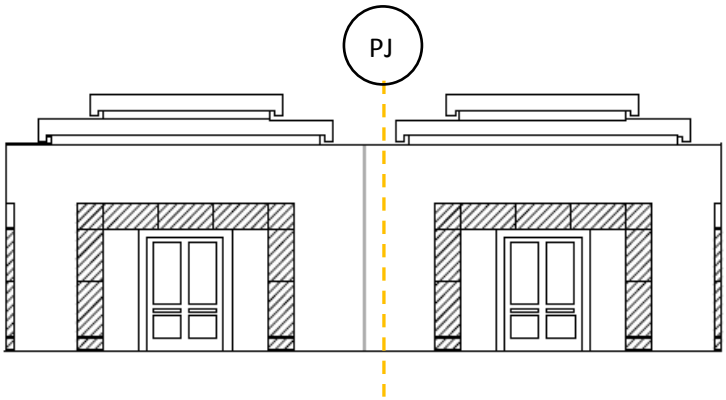


Figure 106: East Elevation of Ballroom | Original

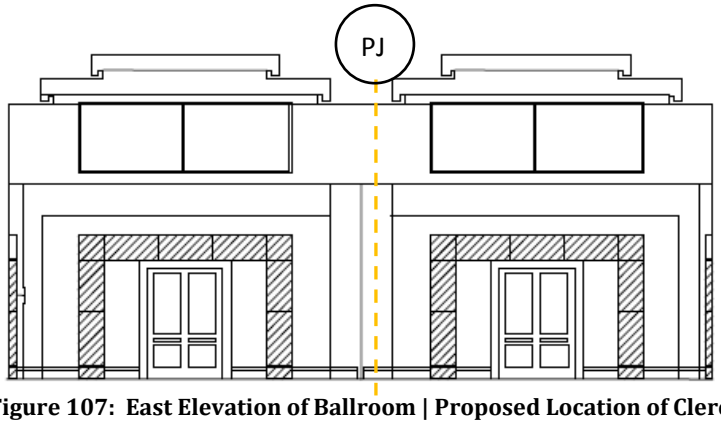


Figure 107: East Elevation of Ballroom | Proposed Location of Clerestories

Beam Calculations:

The columns highlighted in red were each moved in (ie towards each other) by 3'-0" to accommodate for the clerestories on the northern wall of the Ballroom. Because these columns were moved, the framing had to be checked and modified. The braced frames became longer. See the framing plan and braced frame elevations below for more details.

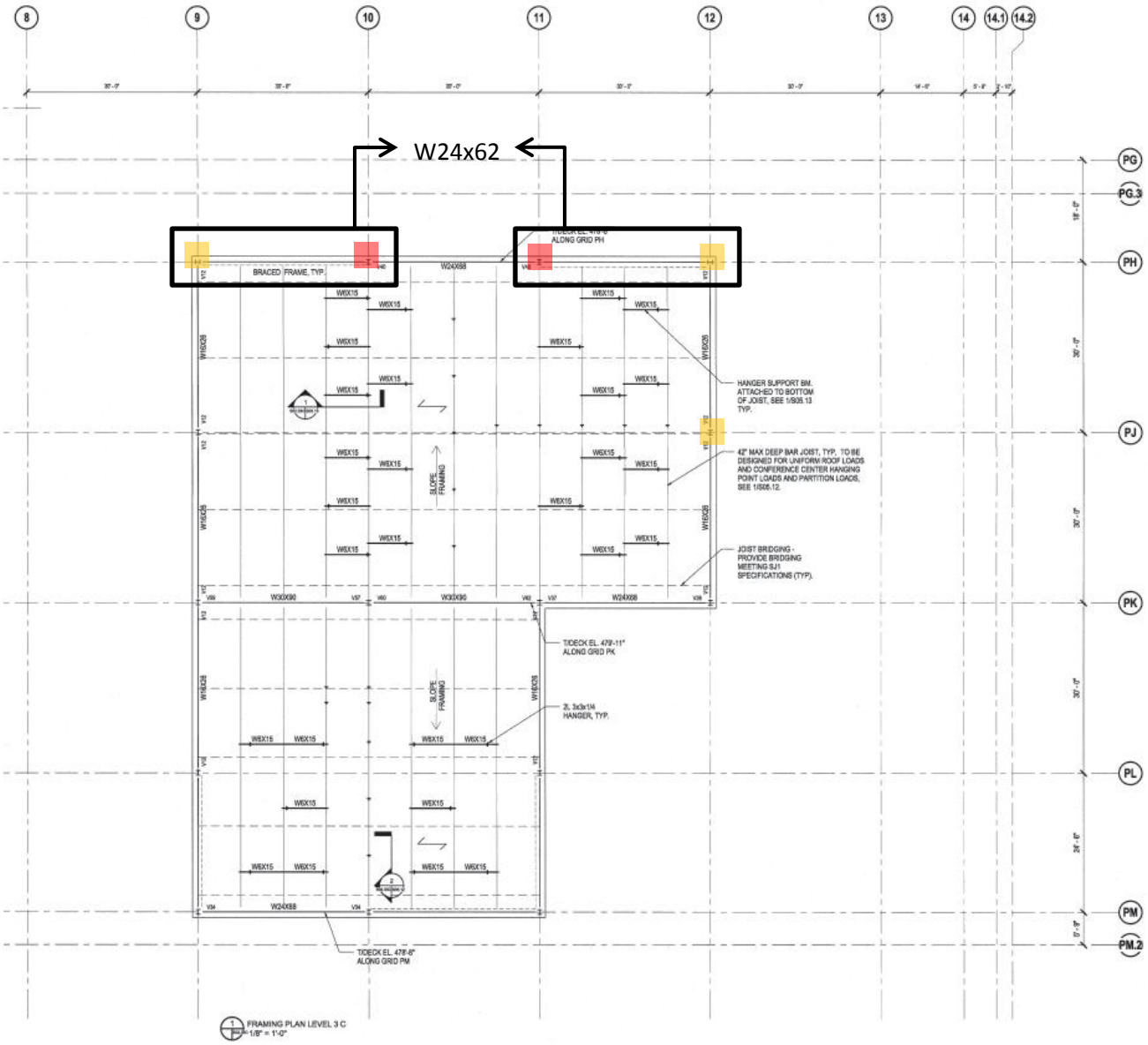


Figure 108: Framing Plan

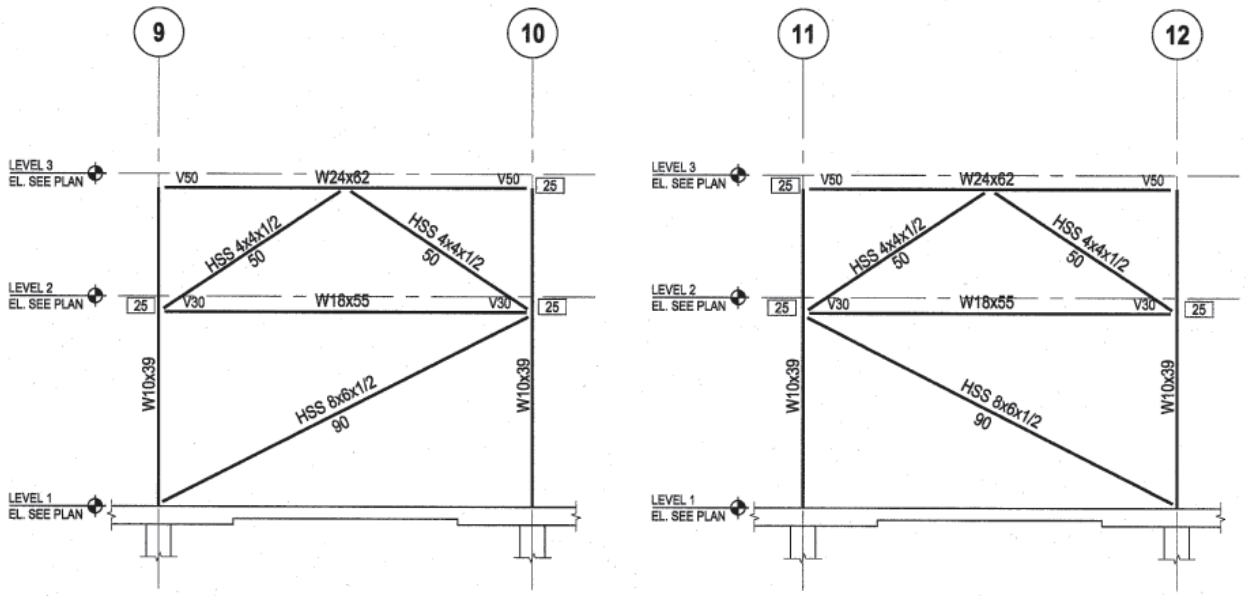


Figure 109: Braced Frame Elevations

Loading from the engineers was then documented and assumed. These values are given below.

Structural Loads	
Snow Load	22 psf
Superimposed Dead Load	10 psf
Roof Load	40 psf
Framing	10 psf

Loading for the beams was calculated to determine resizing would be necessary. The hand calculations for the loads was determined and both these calculations and the sizing checks are provided below.

Tributary area of the joist:
7.5 ft x 30 ft

Dead load:
P_D = (Superimposed Dead Load + Roof Load) x Tributary Area + Joist Load
= (10 psf + 40 psf) x (7.5 ft x 30 ft) + (12 plf x 30 ft)
= 11250 lbs + 360 lbs
= 11610 lbs

Live load:
P_S = Snow Load x Tributary Area
= 22 psf x (7.5 ft x 30 ft)
= 4950 lbs

Total P_U:
P_U = 1.2D + 1.6L = 1.2(11610) + 1.6(4950) = 21.9 kip

The distribution of the 33'-0" W24x62 beam is shown below. The calculations for both the shear and moment follow the diagram.

Sum of the moments at point "A":

$0 = 21.9 \text{ kip } (3 \text{ ft}) + 21.9 \text{ kip } (10.5 \text{ ft}) + 21.9 \text{ kip } (18 \text{ ft}) + 21.9 \text{ kip } (25.5 \text{ ft}) - R_B (33 \text{ ft})$

$R_B = 37.8 \text{ kip}$

Sum of the reactions in the Y direction:

$R_A = 4(21.9 \text{ kip}) - 37.8$

$R_A = 49.8 \text{ kip}$

The maximum shear was determined to be at point "A" and is 49.8 kip. The maximum moment is the point of minimum shear (at 0), and was determined by calculating the area underneath the shear diagram from this point. Therefore, the maximum moment was calculated as 403.65 ft kip.

Using Tables 3-2 (Z tables) and Table 3-10 (Unbraced length table) from the AISC Steel Manual, the following values were recorded for a W24x62 beam.

W24x62 Steel Beam	
φM_P	574 ft kip
φM_R	344 ft kip
φV_N	306 kip
φM_N	510 ft kip

The maximum shear for the W24x62 beam is 306 kip, and the calculated maximum shear is 49.8, therefore, this checks. The maximum moment for the beam is 510 ft kip, which is greater than the 404 ft kip calculated above.

Next, deflection had to be accounted for. Because there are four point loads on the beam, it can be assumed as a distributed load. The maximum deflection calculations are shown below.

Distributed load = $(P_D + P_S)(4) / 33 \text{ ft} = (11610 + 4950)(4) / 33 = 2007 \text{ plf} = 2.01 \text{ klf}$

Using Table 1-1:
$I = 1550 \text{ in}^4$
$E = 29000 \text{ psi}$

$\Delta_{max} = 5wl^4 / 384EI = [(5 \times 2.01 \times 33^4) / (384 \times 29000 \times 1550)] \times 1728^* = 1.193 \text{ in}$
*1728 is the multiplier used to easily convert the units

The check for the deflection is shown below.

$l/240 = (33 \times 12) / 240 = 1.65$ in

$\Delta_{max} < l/240$
1.193 in < 1.65 in, so the member size does not need to be increased for deflection.

Column Calculations:

The ceiling height was increased by 6'-0" with the addition of the clerestories so the column heights therefore also had to increase (the columns were originally 20'-0" and increased to 26'-0"). Steel column length is typically controlled by buckling, so the column strength was calculated below.

As shown in Figure x, columns 10 and 11 are both W10x39.

Details on these columns can be found in the Steel Column Schedule below.

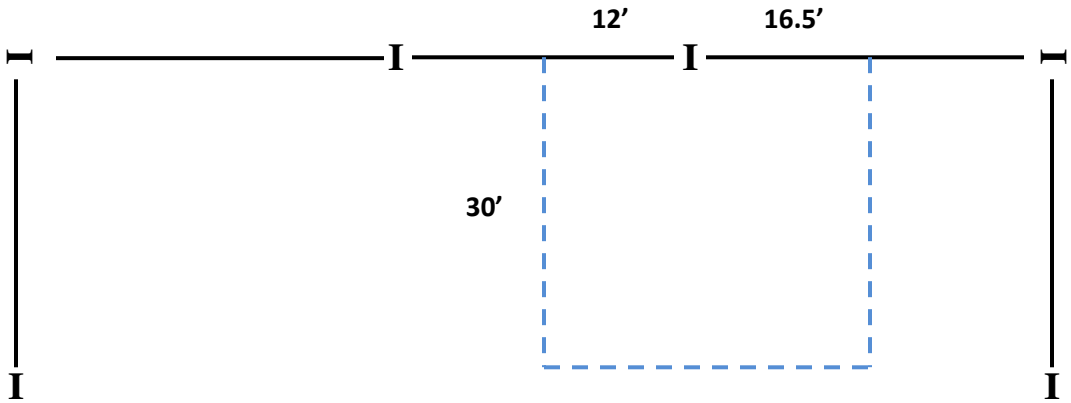
STEEL COLUMN SCHEDULE

FLOOR ELEVATION	COLUMN TYPE						FLOOR ELEVATION
	SC1	SC2	SC3	SC4	SC5*	SC6*	
LEVEL 3							LEVEL 3
EL. SEE PLAN							EL. SEE PLAN
LEVEL 2							LEVEL 2
EL. SEE PLAN	W10x33	W10x39	W10x49	W10x49	W10x39	W10x39	EL. SEE PLAN
LEVEL 1							LEVEL 1
BASE PLATE SIZE "N"x"B"x"T"	12 x 10 x 3/4	12 x 10 x 3/4	12 x 10 x 3/4	12 x 12 x 3/4	20 x 20 x 1-1/2	20 x 20 x 1-1/2	BASE PLATE SIZE "N"x"B"x"T"
REMARKS							REMARKS

NOTES:
1. SEE DETAIL 2/S05.05 FOR TYPICAL GRAVITY BASE PLATE AND COLUMN DETAIL.
2. SEE DETAIL 3/S05.05 FOR TYPICAL LATERAL BASE PLATE AND COLUMN DETAIL.
3. * - DENOTES LATERAL COLUMN.
4. BASE PLATE DIMENSIONS ARE IN INCHES.
5. SEE COLUMN KEYPLAN ON S04.02 FOR COLUMN TYPE ASSIGNMENTS AND COLUMN LOCATIONS.

Figure 110: Steel Column Schedule

The new tributary area for the column is seen below.



The calculation and check of column 11 is seen below.

Table 4-1: φP_N with an effective length of 26'-0" = 104 kip.
*Assume k = 1

Dead Load:
= Superimposed Dead Load + Roof Load + Framing
= 10 psf + 40 psf + 10 psf
= 60 psf

Dead Load x Tributary Area = 60 psf x (30 ft x 28.5 ft) = 51300 = 51.3 kip

Live Load x Tributary Area = 22 psf x (30 ft x 28.5 ft) = 18810 = 18.8 kip

Total P:
$P = 1.2D + 1.6L = 1.2(51.3) + 1.6(18.8) = 91.6$ kip

$P < \varphi P_N$, therefore the column checks.

Conclusions:

With the addition of clerestories, the structural integrity of the Ballroom had to be reevaluated to make sure column heights and framing were in accordance with code. The clerestories added on the north elevation forced two structural columns to be moved, changing the sizing of a couple of beams. In addition, column heights were checked to make sure nothing more needed to be modified.

Summary and Conclusions

In conclusion, great efforts have been made with the architectural and interior design to create a one-of-a-kind experience for guests at the Hotel and Conference Center. Luxurious finishes, wood millwork, and paints and plush furniture fill the rooms and the opportunities for relaxation and enjoyment are abundant.

Lighting design plays an integral right to enhance the architecture of the building and help make the space come to life. The exterior courtyard and façade had two completely different canvases, as one was geared more towards building form and architecture while the other is more about the general idea of light at nighttime and the effects on people.

The central plaza has surface mounted LED strips on the underside of concrete benches. These create linear elements, stressing the horizontal plane on the ground. In-grade fixtures serve as beacons to patrons in vehicles driving through to the porte cochere. Light columns illuminate the walkway found on the exterior of the site. Wall sconces glow on the column accents on the exterior façade while LED wall grazers mounted on a cantilever accentuate the texture of the brick. The exterior lighting guides guests onto the site and serves as the initial impression of the hotel. Once inside, the Main Lobby serves as a welcoming and sets the tone of warm color temperatures and the feeling of relaxation throughout the hotel. The Lounge is a specialty bar with a more modern feel than the rest of the spaces. Various lights in concealed locations illuminate and make the room feel seamless. In the conference center portion of the hotel, the Ballroom brings a multitude of people and events to the Hotel and Conference Center. The lighting design is aesthetically pleasing, with custom decorative chandeliers and sconces for added sparkle, and an intricate double tiered cove system with RGB LED cove lights. Daylight was implemented into the space by raising the ceiling height of the Ballroom. Clerestories were added to further enhance the space in order to have the option of allowing daylight during daylong conferences. Flexible controls were therefore specified in the room, in order to accommodate for over a dozen zones, several different scenes of lights (dependent on function of event), and daylight integration into each separate smaller ballrooms.

The Hotel and Conference Center is all about bringing the outdoors indoors – nature, or the environment, is of utmost importance. Therefore, being energy conscious is also an important concern to the hotel. All four spaces involved in this senior thesis were below lighting power density allowances set forth by ASHRAE 90.1-2007. Utilizing compact fluorescent, fluorescent, and LED sources allowed more energy efficient lamps without the compromise of a cooler temperature, as all warm sources were specified. Illuminance criteria in each of the spaces was met as well.

Electrical design was also considered in the senior thesis. New branch circuit calculations were performed to resize the existing panelboards that were affected by the old lighting designs. A study concerning aluminum versus copper feeders was conducted for the entire building as well, and with the considerable amount of money saved, it is suggested to switch to aluminum feeders. Also, the implementation of a photovoltaic array was, too, considered, but it seems as if the payback would be way too significant for this new design to be used on the building.

Two separate breadth studies were also conducted for the thesis requirements that were outside of the lighting and electrical disciplines. An architecture breadth was chosen as the first one, raising the ceiling height of the Ballroom to implement a daylighting design. With this, a structural analysis had to be completed to make sure the integrity of the structure was still sufficient with the added clerestories.

References

The following software was used for calculations, renderings, and analysis:

Adobe Photoshop CS5
AGI-32
Autodesk AutoCAD 2011
Autodesk 3D Studio Max Design 2011
Autodesk Revit Architecture 2011
RETScreen4

The following references were used in completing the research and design:

AISC-Steel Construction Manual, 13th Edition. American Institute of Steel Construction.

ASHRAE Standard 90.1-2007: Energy Standard for Buildings Except Low-Rise Residential Buildings. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. Atlanta, GA. 2007.

The IESNA Lighting Handbook: Reference & Application, 9th Edition. Illuminating Engineering Society of North America. New York, NY. 2000.

The IESNA Lighting Handbook: Reference & Application, 10th Edition. Illuminating Engineering Society of North America. New York, NY. 2011.

National Electric Code: 2008. National Fire Protection Association. Quincy, MA. 2004.

Acknowledgements

Thank you to the Architectural Engineering Department and Faculty for your guidance and support during my college career, for the wonderful opportunities, and for your continuous dedication to the utmost success of every student in the Architectural Engineering department.

Thank you especially to the following professors, for your generous advice, expertise, and guidance:

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-Dr. Richard Mistrick (Lighting Professor)
-Ted Dannerth (Electrical Consultant)

Thank you to Lee Brandt (HLB Lighting Design) for all of your help in helping me obtain my thesis project last summer, and for all of your advice as I become a lighting designer.

Most importantly,

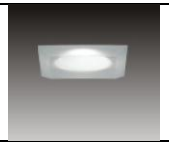
Thank you to all of my fellow AE friends, especially the ***lighting girls*** – I don't know what I would have done without each and every one of you this year as we made it through thesis together!

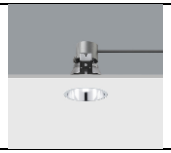
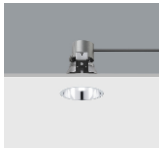
Thank you to my roommate, for putting up with my odd sleeping schedule and for never giving me a hard time when thesis was always my exuse for everything.

Thank you to my family for being so supportive and loving as I pursue my dreams, even when they're hours away from me.

Appendix A

Luminaire Schedule and Cutsheets

Tag	Luminaire	Manufacturer	Description	Catalog No.	Mounting	Lamps		Ballast/ Power Supply	Voltage	Input Watts
						No.	Type			
D		Alfa	Alfa Gemini fully adjustable, directional track head with G26 bronze, mesh metal shade and vintage bronze hardware. (1) 50W max MR16 halogen utilized per track head.	SP3-26-BRZ-BRZ	Track mounted	1	35W MR16 Halogen	None	120	35
E		Alfa	15' MonoTrack starter kit with 300W surface mounted transformer and 5 MonoTrack sections. Includes supports, (6) fixture adapters, and mounting hardware. Hardware finish in vintage bronze.	55004-BRZ	Surface mounted	-	-	-	-	-
F		ACDC	3.5" aperture downlight with Xicato Artsits Series LED module containing 8 LEDs and having an R-9 value of 96. Dark chrome reflector finish and 3000 K color temperature.	ACDC1139/XIC/3000 K/ DRC	Ceiling recessed	-	Xicato LED module (Artists Series) 3000 K 80 min CRI	Electronic driver	120	23
G		Lightolier	Covelite with 1-T8 lamp and die-formed 20 gauge cold-rolled steel painted white housing. Highly specular Miro IV aluminum white 20 gauge steel optical system.	CL08-T01-E-N-04-1-DE-W	Surface mounted in cove	1	Linear fluorescent – F32T8 3000 K 86 min CRI	Electronic Dimming	120	35
H		Lightolier	Perimeter trough recessed 1-light T8 luminaire with die-formed 20 gauge pre-painted steel housing and precision parabolic roll-formed semi-specular aluminum reflector.	PTS5-1-S-O-1-4	Ceiling recessed	1	Linear fluorescent – F32WT8 3000 K 85 min CRI	Electronic	120	33
I		Lightolier	Staggered strip surface mounted fluorescent lamp with 3" overlap and 1-5/8" deep housing. Made of heavy duty code gauge cold rolled steel and finished with white polyester enamel. Utilizes (1) T8 fluorescent lamp.	SS-4-T-1-32-HPF-120-PS	Surface mounted in cove	1	Linear fluorescent - F32WT8 3000 K 86 min CRI	Electronic	120	33
J		Leucos	Mira 2 Semi-recessed square downlight with acid-etched, poured Satin White glass diffuser. Utilizes (1) 50W low-voltage, halogen MR-16 lamp.	Mira 2 Recessed	Ceiling semi-recessed	1	Halogen – 50W MR16 2750 K 82 min CRI	None	120	50

K1-3		iLight Technologies	Low voltage Plexineon White 2X Series in 2800°K for warmer light. Lengths vary for use in cove, under the toe kick in bar, and bar shelves. Outside corner pieces also specified.	T-24X28S__NC-00	Recessed (toe kick, shelves, desk)	-	LED 2800 K	24VDC	120	4.32W/ft
L		ERCO	Open recessed 4" aperture downlight with vertical lamp orientation for (1) 100W low voltage halogen lamp. Bright anodized, aluminum darklight reflector with cut-off angle of 30° and a glass, frosted diffuser.	47012.000	Ceiling recessed	1	(1) 100W T3 bi-pin quartz halogen	Electronic dimming	120	98
M		ERCO	Open recessed 4" aperture downlight with vertical lamp orientation for (1) 75W low voltage halogen lamp. Bright anodized, aluminum darklight reflector with cut-off angle of 45° and a glass, frosted diffuser.	47024.000	Ceiling recessed	1	(1) 75W T4 bi-pin quartz halogen	Electronic dimming	120	47
N		Solid State Luminaires	Colourline. 12" compact linear RGB LED cove light with beam distribution of 120° x 120°. Clear diffuse lens with ratcheting mounting bracket for secure aiming. 20 LEDs per foot. Dimming available.	CL-1-__-WIH	Surface mounted in cove	--	LED – RGB - Dimmable	24VDC from DMX	120	4.5W/ft
O		Custom (based on design from Yellow Goat Design)	Decorative custom chandelier based on design from Yellow Goat Design with 3 tiers and 21 lamps. Assemblage of clear acrylic swirls and curves to form classic chandelier shape. Crystal accents added for sparkle. Black finish. 48"h x 72"w. LED only.	Chaos Theory	Pendant	21	5W single ended halogen T3	--	120	105
P		Custom	Decorative custom sconce with assemblage of clear acrylic swirls and curves. 15.5"h x 9.5"w x 7" projection. Candelabra base. Mounted 7'-0" AFF.	Chaos Theory Sconce	Sconce	2	5W single ended halogen T3	--	120	10
Q		Bega	Recessed wide beam luminaire made of aluminium alloy, aluminium, and stainless steel. Reflector made of anodized pure aluminum. Dust tight and protection against water jets. (1) 42W CFL lamp lamped horizontally.	6807	Canopy recessed	1	42W T4 CFL 3000 K 82 min CRI	Electronic	277	47
R		Bega	Walk-over and drive-over luminaire recessed in compacted surfaces, paths, and open areas for pressure load up to 5000 kg. Made of aluminium alloy, aluminum, and stainless steel, and contains white safety glass. Dust tight and protection against temporary immersion.	8600	Ground recessed	1	5W T4 3000 K 82 min CRI	Electronic	277	11

S		Ghidini	Clessidra urban column with 32W in (4) Xicato LEDs. Powder coated polyester and highly resistant to UV and oxidation. Surface mounted and suitable for wet location. Finish color in anthracite gray.	830.1501	Surface mounted	-	Xicato LED module (Artists Series) 3000 K 80 min CRI	Electronic Driver	277	42
T		Winona	Reese exterior sconce from Winona, with (1) F17T8 medium bi-pin lamp. UL listed and CUL approved for wet location. Opal acrylic lens and custom painted finish (gray).	5254-WL-26-F/T8-277-OA-CPF	Wall mounted	1	F17T8/medium bi-pin 3000 K 78 min CRI	Electronic	277	19
U1-2		Solid State Luminaires	Slim profile linear floodlight with a 120° flood distribution for short throw applications, with 6 LEDs per foot and consuming 8W per foot. ½" low profile body sealed for IP68 rating (dry, damp, wet location) and mounted on an 8" cantilever. Extruded and die cast aluminum housing.	SL-__-3K-CL	Mounted in 8" cantilever	-	6 LEDs per foot 3000 K	Electronic Driver	277	50

P2.24

Alfa

DIRECTIONALS
GEMINI
SP326

Project:

Fixture Type:

Location:

Contact/Phone:

PRODUCT DESCRIPTION

Fully adjustable Quick Jack fixture with G26 Mesh metal shade. 50W max. Lamp: JC, MR8, MR11, or MR16 (not included).

ORDERING INFORMATION

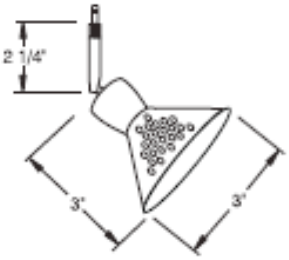
Model	Shade	Hardware Finish	Shade Finish	Example
SP3	26	STN	STN	SP326-STN-STN

Hardware Finish / Shade Finish:
- BLK Black
- BRZ Vintage Bronze / Bronze
- CHR Chrome
- STN Satin Nickel

PRODUCT SPECIFICATIONS

Electrical
Lamp: 50W max. Lamp: JC, MR8, MR11, or MR16 (not included)
Socket: Ceramic Bi-Pin Socket, accepts G4 to GY6.35 Lamps
Agency Approval
Labels: ETL listed to UL 1598 for use in U.S. • ETL listed to CSA C22.2 No. 250 for use in Canada.

DIMENSIONS



9/10

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Systems MonoTrack Kits – Without Fixtures
Low Voltage

Alfa

Starter Kits – Surface Mount Transformers

SS000 9' MonoTrack Starter Kit with 150W Surface Mount Transformer
Contains 3 MonoTrack sections (9'), 150W Surface Mounted Electronic Transformer, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS000	–	STN	SS000-STN

BRZ Vintage Bronze
STN Satin Nickel

SS001 9' MonoTrack Starter Kit with 250W Surface Mount Transformer
Contains 3 MonoTrack sections (9'), 250W Surface Mounted Electronic Transformer, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS001	–	STN	SS001-STN

BRZ Vintage Bronze
STN Satin Nickel

SS002 9' MonoTrack Starter Kit with 300W Surface Mount Transformer
Contains 3 MonoTrack sections (9'), 300W Surface Mounted Magnetic Transformer, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS002	–	STN	SS002-STN

BRZ Vintage Bronze
STN Satin Nickel

SS004 15' MonoTrack Starter Kit with 300W Surface Mount Transformer
Contains 5 MonoTrack sections (15'), 300W Surface Mounted Magnetic Transformer, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS004	–	STN	SS004-STN

BRZ Vintage Bronze
STN Satin Nickel

Starter Kits – Remote Mount Transformers

SS006 21' MonoTrack Starter Kit with 300W Surface Mount Transformer
Contains 7 MonoTrack sections (21'), 300W Surface Mounted Magnetic Transformer, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS006	–	STN	SS006-STN

BRZ Vintage Bronze
STN Satin Nickel

SS012 9' MonoTrack Starter Kit with 300W Remote Transformer
Contains 3 MonoTrack sections (9'), 300W REMOTE Magnetic Transformer, Power feed, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS012	–	STN	SS012-STN

BRZ Vintage Bronze
STN Satin Nickel

SS014 15' MonoTrack Starter Kit with 300W Remote Transformer
Contains 5 MonoTrack sections (15'), 300W REMOTE Magnetic Transformer, Power feed, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS014	–	STN	SS014-STN

BRZ Vintage Bronze
STN Satin Nickel

SS016 21' MonoTrack Starter Kit with 300W Remote Transformer
Contains 7 MonoTrack sections (21'), 300W REMOTE Magnetic Transformer, Power feed, Supports, (2) Figure Adapters, Mounting hardware, instruction sheets included. (Fixtures not included)

Make product selections and build your model number

Model		Hardware Finish	Example
SS016	–	STN	SS016-STN

BRZ Vintage Bronze
STN Satin Nickel

Systems | MonoTrack Kits

Jesco Lighting Group
by Schneider Electric

www.jescolightinggroup.com 969

ACDC LED 10

ARCHITECTURAL DOWNLIGHTS

STORM

Storm Xicato

Storm Devil

Description

Storm is a recent addition to the award-winning range of architectural downlighters from ACDC. Available either with the acclaimed 'Devil' onboard or the Xicato LED module, Storm is a fixed downlighter that features a beautifully designed reflector cup in a number of finishes. The ACDC Devil option offers a slim 100mm profile and choice of four beam angles, whilst the Xicato module features an IP65 rating for use in wet areas.

Finishes

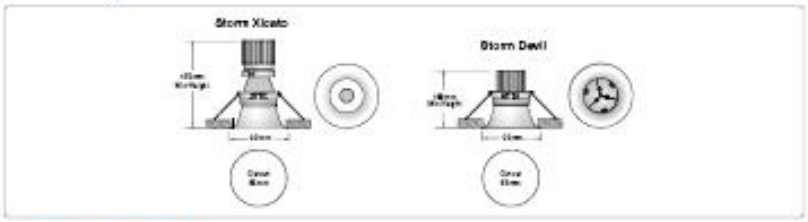
White Matt

Dark Chroma

Silver Anodised

Black Matt

Technical Diagrams



Lighting configurations

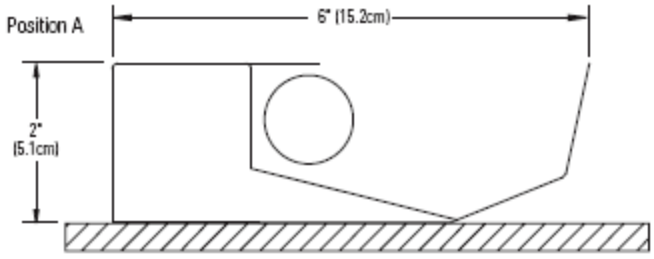
IP Option | Picture / Reading | Wall Wash | Display | Bathroom | Downlight | Colour Change

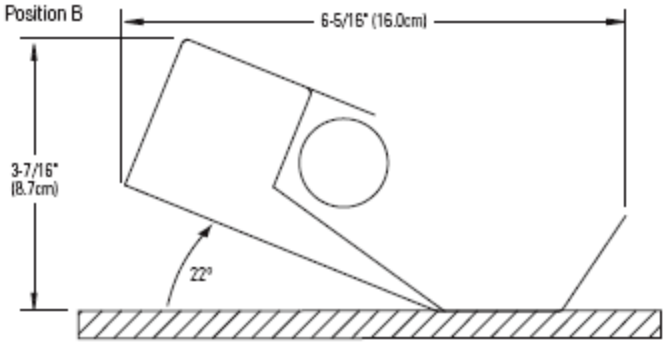
ACDC has a global reputation for outstanding quality and service

Lighting Systems **CL-1**

Page 1 of 2

Covelite 1-Lamp T8





Half Scale

Ordering Information

Style	Lamps	Lower Optics	Upper Optics	Length	Wiring	Voltage	Ballast	Color & Finish
CL08	T01	E	N				E	W
	T01 = 1-Lamp T8	E = Solid Housing	N = None	02 = 2 ft. 03 = 3 ft. 04 = 4 ft. 06 = 6 ft. 08 = 8 ft.	1 = 1 circuit 3 = 1 circuit w/ Emergency circuit 5 = 1 circuit w/ Battery Pack 7 = 1 circuit Dimming	D = Dual 120v/277v 3 = 347v	E = Standard Ballast	W = High Reflective White

Features

Housing: Die-formed 20 gauge cold-rolled steel painted white.

Weight: 3.0 lb/ft.

Optical System: Constructed of highly specular Miro IV ®aluminum and highly reflective white 20 gauge steel to produce an asymmetric distribution.

Lamping: One T8 fluorescent lamp in cross section. 18 watt 2 foot, 32 watt 4 and 8 foot, 25 watt 3 and 6 foot lengths.

Mounting: Fixtures can be screwed down in multiple positions and orientations to enable precise coordination of optical distributions.

Additional Information

Modules Lengths

Module	Nominal Length
2ft	2'0"
3ft	3'0"
4ft	4'0"
6ft	6'0"
8ft	8'0"

Peak Candel Angles

Mounting	Peak
Position A	113°
Position B	91°

Electrical

Factory pre-wired to section ends with quick-wire connectors.
Maximum ballast size is 1.3" (3.3cm) by 1.7" (4.3cm).
Standard dimming ballast is Advance Mark VII.

Labels

Certified to UL & CSA standards.

Job Information **Type:**

Job Name:

Cat. No.:

Lamp(s):

Notes:

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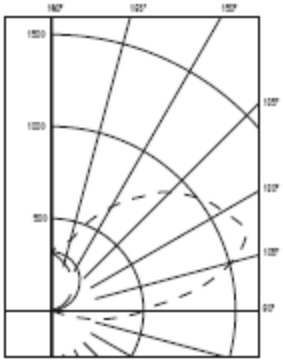
Lighting Systems **CL-1**

Page 2 of 2

Covelite 1-Lamp T8

Performance

Candlepower Curve



Report Number: 990111
Lamp: (1) F32T8
Lumens: 2950
Efficiency: 78.2%
Max. Candela/Angle: 1140/113°

Candela Distribution

	0.0	45.0	90.0	135.0	180.0
0	0	0	0	0	0
5	0	0	0	0	3
15	0	0	0	0	3
25	0	0	0	0	3
35	0	0	0	3	3
45	0	0	0	3	4
55	0	0	0	3	4
65	0	0	0	3	4
75	134	15	0	4	4
85	388	208	0	5	4
90	483	303	7	6	4
95	657	474	22	8	5
105	1012	751	70	28	9
115	1128	771	123	84	66
125	1034	723	172	138	114
135	910	634	216	184	172
145	735	527	256	212	209
155	564	422	286	246	233
165	396	360	307	280	266
175	345	336	317	307	301
180	320	320	320	320	320

Coefficients of Utilization (%)

Ceiling:	80			70			50	
Wall:	50	30	10	70	50	30	50	30	10
0 RCR	75	75	75	65	65	65	46	46	46
1	63	60	57	57	54	51	38	36	34
2	55	50	46	52	47	43	32	30	27
3	48	42	38	47	41	36	28	25	23
4	42	36	31	43	36	31	25	22	19
5	37	31	26	39	32	27	22	19	16
6	33	27	23	36	28	23	20	16	14
7	30	24	19	33	25	20	18	14	12
8	27	21	17	30	23	18	16	13	10
9	24	18	15	28	21	16	14	11	9
10	22	16	13	26	19	14	13	10	8

Based on a floor reflectance of 0.2

Distribution Summary

Zone	Lumens	% Barelamp	% Luminaire
0-90	151	5.1	6.5
90-180	2156	73.1	93.5
0-180	2306	78.2	100.0

Quick Calculators and Ceiling Brightness

Readings are rounded off based on initial footcandles at center of 20-foot run of luminaires. Room reflectance is 80% ceiling, 50% wall and 20% floor.

1Lt, 1 Fixture, 1 Wall, 10" (0.25m) from Ceiling

Distance from wall

Distance From Ceiling	0' / 0	2' / 0.61m	4' / 1.22m	6' / 1.83m	8' / 2.44m	10' / 3.05m	12' / 3.66m	14' / 4.27m
10" (0.25m)		31	11	7	5	4	4	
7'6" (2.29m)		22	20	15	12	9	7	
10'0" (3.05m)								

1Lt, 2 Fixtures, 2 Walls, 10" (0.25m) from Ceiling

Distance from wall

Distance From Ceiling	0' / 0	2' / 0.61m	4' / 1.22m	6' / 1.83m	8' / 2.44m	10' / 3.05m	12' / 3.66m	14' / 4.27m
10" (0.25m)		32	15	11	11	15	32	
7'6" (2.29m)		29	29	27	27	29	29	
10'0" (3.05m)								

1Lt, 1 Fixture, 1 Wall, 14" (0.35m) from Ceiling

Distance from wall

Distance From Ceiling	0' / 0	2' / 0.61m	4' / 1.22m	6' / 1.83m	8' / 2.44m	10' / 3.05m	12' / 3.66m	14' / 4.27m
14" (0.35m)		15	8	5	4	4	4	
7'6" (2.29m)		22	19	15	12	9	7	
10'0" (3.05m)								

1Lt, 2 Fixtures, 2 Walls, 14" (0.35m) from Ceiling

Distance from wall

Distance From Ceiling	0' / 0	2' / 0.61m	4' / 1.22m	6' / 1.83m	8' / 2.44m	10' / 3.05m	12' / 3.66m	14' / 4.27m
14" (0.35m)		49	19	13	13	19	49	
7'6" (2.29m)		28	28	26	26	28	28	
10'0" (3.05m)								

Job Information **Type:**

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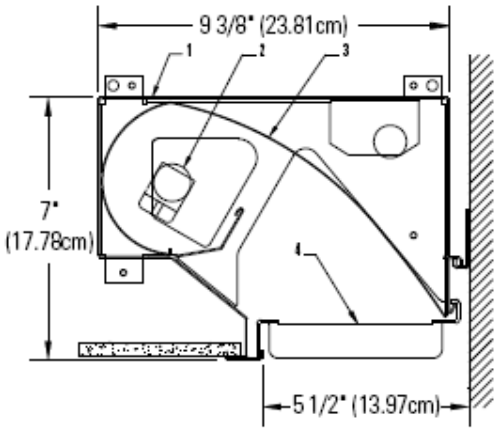
LIGHTOLIER Lighting Systems PTS8-1

Page 1 of 2

Perimeter Trough Recessed 1-Light T8 Per (Nominal) Section



Quarter Scale

Module Ordering Information

Family	Lamps	Shielding	Voltage	Length	Options
PTS8	1				
	1 = 1 Lamp	0 = Open L = Lens S = Straight Blade Louver	1 = 120V 2 = 277V 3 = 347V D1 = 120V Dim. D2 = 277V Dim. E1 = 120V Emerg. E2 = 277V Emerg.	2 = Two-Foot 3 = Three-Foot 4 = Four-Foot 6 = Six-Foot 8 = Eight-Foot	Blank = No Options A = Adjustable* X4 = 4 thru wires X5 = 5 thru wires A4 = Adjustable 4 thru wires* A5 = Adjustable 5 thru wires*

** only available on Two-Foot, Three-Foot and Four-Foot versions. See length variations of adjustable fixtures on page 2.*

Features

1. **Housing:** Die-formed 20 gauge pre-painted steel. Integral heavy gauge bulkheads support housing and trim, permitting modules to be bolted together in continuous runs and facilitate suspension.
2. **Lamping:** Cross-sectional one linear T8 fluorescent lamp. Provided by others.
3. **Reflector:** Precision parabolic roll-formed semi-specular aluminum.
4. **Louver:** Lift and shift straight blade louver constructed from die-formed aluminum and painted to match housing. Louver blades are 1" (2.54cm) high on 1-1/8" (2.86cm) centers. (Optional)

Mounting

"J" Rail is first mounted to the wall and the modules connect to the rail for 1/4" (0.64cm) wall adjustment. Modules are hung from suspension wires attached to the fixture bulkheads and the structure above.

Electrical

Electronic Ballast: Programmed start, 3 conductor, 12 gauge wire. Color-coded quick connectors allow easy connection for modular fixutres. Factory installed ballast disconnect allows the ballast to be disconnected from and reconnected to incoming power under load without turning the entire circuit off.

Dimming: Advance Mark X, use Advance compatible two-wire control (no extra control lead required).

Emergency Battery Pack: 450 Lumens @ 90 minimum.

Ordering Instructions

Individual Fixtures:

1. Order number of MODULES required.
2. Order one END SET per MODULE.

Continuous Rows:

1. Determine run length.
2. Order the appropriate number of MODULES for the complete ROW.
3. Stagger rows must be completed with an adjustable module. (2-light only)
4. Non-stagger rows must be completed with an adjustable module unless row lengths are in precise 1 foot (30.48cm) intervals.
5. Order one END SET per ROW.

Labels

UL, cUL and IBEW

Job Information **Type:**

Job Name:

Cat. No.:

Lamp(s):

Notes:

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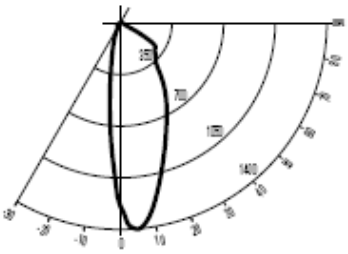
LIGHTOLIER Lighting Systems **PTS8-1**

Page 2 of 2 Perimeter Trough Recessed 1-Light T8 Per (Nominal) Section

Performance & Quick Calculators



Report No: ITL53557
Cat No: PTS81S14
Lamps: 1 F32T8
Lumens: 2900
Efficiency: 39.4%

CANDLEPOWER

ZONE DEG.	0	45	90	135	180
180	0	0	0	0	0
175	0	0	0	0	0
165	0	0	0	0	0
155	0	0	0	0	0
145	0	0	0	0	0
135	0	0	0	0	0
125	0	0	0	0	0
115	0	0	0	0	0
105	0	0	0	0	0
95	0	0	0	0	0
90	12	22	0	0	0
85	16	27	7	9	0
75	21	52	33	33	6
65	43	162	65	59	12
55	297	171	110	85	19
45	340	280	243	86	31
35	509	478	527	89	31
25	742	770	800	159	64
15	1064	1145	1040	346	215
5	1604	1398	1208	927	763
0	1244	1244	1244	1244	1244

COEFFICIENTS OF UTILIZATION

% EFFECTIVE CEILING CAVITY REFLECTANCE

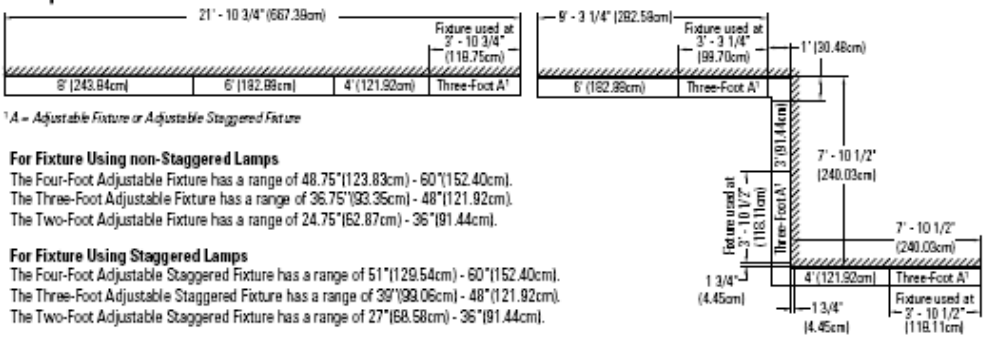
ROOM CAVITY RATIO	80			70			50		
	% WALL REFLECTANCE								
	70	50	30	70	50	30	50	30	10
0	47	47	47	46	46	43	44	44	44
1	44	42	41	43	41	40	40	39	38
2	41	38	36	40	37	35	36	34	33
3	38	34	32	37	34	31	33	31	29
4	35	31	29	35	31	28	30	28	26
5	33	29	26	32	28	26	28	25	23
6	31	27	24	30	26	24	26	23	21
7	29	25	22	29	24	22	24	21	20
8	28	23	20	27	23	20	22	20	18
9	26	22	19	26	21	19	21	19	17
10	25	20	18	24	20	17	20	17	16

Floor cavity reflectance = 20%

ZONAL LUMEN SUMMARY

ZONE	LUMENS	% BARELAMP	% LUMINAIRE
0-90	1162	39.4	100.0
90-180	0	0.0	0.0
0-180	1162	39.4	100.0

Sample Run

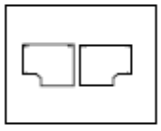


[1]*A = Adjustable Fixture or Adjustable Staggered Fixture*

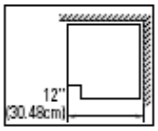
For Fixture Using non-Staggered Lamps
The Four-Foot Adjustable Fixture has a range of 48.75"(123.83cm) - 60"(152.40cm).
The Three-Foot Adjustable Fixture has a range of 36.75"(93.35cm) - 48"(121.92cm).
The Two-Foot Adjustable Fixture has a range of 24.75"(62.87cm) - 36"(91.44cm).

For Fixture Using Staggered Lamps
The Four-Foot Adjustable Staggered Fixture has a range of 51"(129.54cm) - 60"(152.40cm).
The Three-Foot Adjustable Staggered Fixture has a range of 39"(99.06cm) - 48"(121.92cm).
The Two-Foot Adjustable Staggered Fixture has a range of 27"(68.58cm) - 36"(91.44cm).

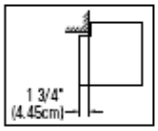
End Plate and Corner Block Accessories



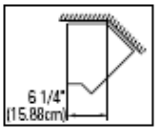
End Cap Set:
PTSEP



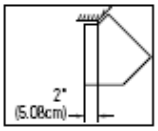
90° Inside Corner:
PTS90INCO - Open
PTS90INCL - Lens
PTS90INCS - Straight Blade Louver



90° Outside Corner:
PTS90OTCO - Open
PTS90OTCL - Lens
PTS90OTCS -Straight Blade Louver



135° Inside Corner:
PTS135INCO - Open
PTS135INCL - Lens
PTS135INCS - Straight Blade Louver



135° Outside Corner:
PTS135OTCO - Open
PTS135OTCL - Lens
PTS135OTCS - Straight Blade Louver

Job Information **Type:**

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PHILIPS

SS Staggered Strip Surface Fluorescent **SS 1 LAMP**

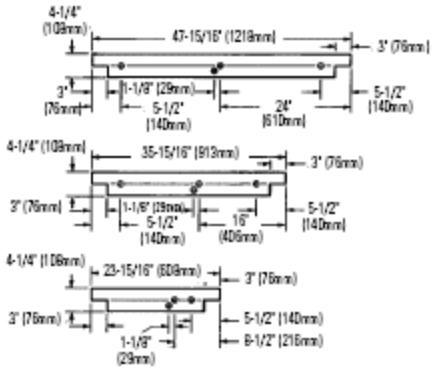
Page 1 of 2

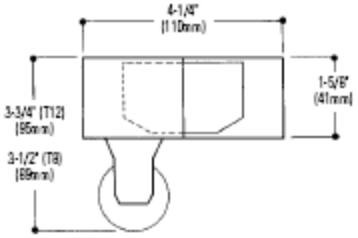
4-1/4" Wide, 1-5/8" Deep, 24", 36", 48", 69", 93" Length, Individual or Tandem, 1 Lamp T8 or T12

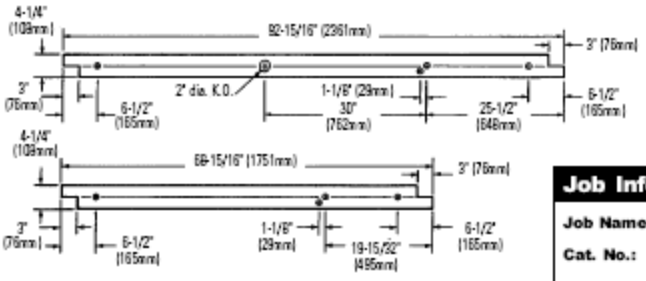
Features

- Full 3" overlap eliminates shadows caused by lampholders or lamp ends.
- Housing is only 1-5/8" deep.
- Safe-handling metal edges.
- Fully enclosed wireway.
- Excellent for perimeter cove lighting or other applications where continuous even illumination is required.

Dimensions







All K.O.s are 7/8" unless otherwise noted.

Job Information	Type:
Job Name:	
Cat. No.:	
Lamp(s):	
Volts/Ballast:	

Lightolier a Genlyte Thomas Company www.lightolier.com
Technical Information: (978) 657-7600 • Fax (978) 658-0595
631 Airport Road, Fall River, MA 02720 • (508) 679-8131 • Fax (508) 674-4710
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Section 3A/Folio H130-11

LIGHTOLIER®

SS Staggered Strip Surface Fluorescent **SS 1 LAMP**

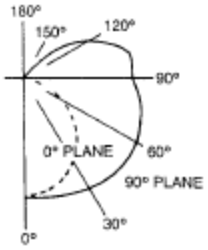
Page 2 of 2

4-1/4" Wide, 1-5/8" Deep, 24", 36", 48", 69", 93" Length, Individual or Tandem, 1 Lamp T8 or T12

Photometry

Model No. SS4S132HPF120SO

REPORT NO: GB9007
CATALOG NO: SS4S132HPF120SO
LAMP TYPE: 1F32 T8
LUMENS PER LAMP: 2950 TOTAL
EFFICIENCY: 99.5%
CIE TYPE: Semi-Direct
SPACING CRITERIA: 1.6
SHIELDING ANGLE: 180



coefficients of utilization — zonal cavity method (effective floor cavity reflectance 0.20)

	RF	20			20			20		
	RC	80			50			30		
	RW	70	50	30	50	30	10	50	30	10
Room cavity ratio	1	89	84	79	71	68	64	64	61	58
	2	80	71	64	68	55	51	54	50	46
	3	72	62	53	52	46	41	47	42	38
	4	65	54	45	46	39	34	41	36	31
	5	59	47	39	40	34	28	36	30	26
	6	54	42	33	36	29	24	32	26	22
	7	50	37	29	32	25	21	29	23	19
	8	46	33	25	29	22	18	26	20	16
	9	43	30	22	26	20	15	23	18	14
	10	40	27	20	24	18	13	21	16	12

Ordering Information

Explanation of Catalog Number. Example: SS4S132HPF120SO6LR†

SS			1		HPF			
Staggered Strip: 4-1/4" wide channel	Fixture Length: 2=24" 3=36" 4=48" 6=69" 8=93"	Lamp Configuration: S=Standard T=3' or 4' Lamps in Tandem (for 6' or 8' Units)	Lamp Quantity	Lamps: (By Others) 17=17 watt (T8) 20=20 watt (T12) (Nominal 24") 25=25 watt (T8) 30=30 watt (T12) (Nominal 36") 32=32 watt (T8) 34=34 watt (T12) (Nominal 48") (One lamp in tandem for 69" and 93" fixtures)	Ballast Type: HPF=High Power Factor	Voltage: 120 or 277	Ballast: 1 or 2 Lamp Mag. T12 Standard Electro-Magnetic (20 or 30 watts only) — LE; 1 or 2 Lamp Elec. (T8) — P; LOL Dimming (T8) — PS; *Instant Start Standard; Other dimming options. Consult factory.	Options: Add appropriate suffix to catalog no., ie: (SLR)

†No Product Change. New Catalog Number Designation.

Options/Accessories

Fusing: Internal fast-blow fusing. Suffix: **GLR**.
Internal slow-blow fusing. Suffix: **GMF**.
Electrical Wiring Options: Consult factory.
Radio Interference Filter: 120 or 277 volt, 50 or 60 Hz. One per fixture. Suffix: **R**. One per ballast. Suffix: **B**.
Stem and Canopy Sets: Suspends fixture 6', 12', 18' or 24' from surface. Catalog Number: **ASC6 CSP** (6"), **ASC12 CSP** (12"), **ASC18 CSP** (18"), **ASC24 CSP** (24").

Specifications

Materials: Chassis parts are die formed heavy duty code gauge cold rolled steel.
Ballast cover–code gauge cold rolled steel, secured by plated quarter-turn latches.
Finish: Chassis exterior–baked white polyester enamel, minimum reflectance 86%.
Electrical: Thermally protected class "P" ballast C.B.M. approved, non PCB. If K.O. is within 3" of ballast, use wire suitable for at least 90°.
Labels: I.B.E.W./UL and ULc Listed.

Job Information **Type:**

Lightolier a Genlyte Thomas Company www.lightolier.com
Technical Information: (978) 657-7600 • Fax (978) 658-0595
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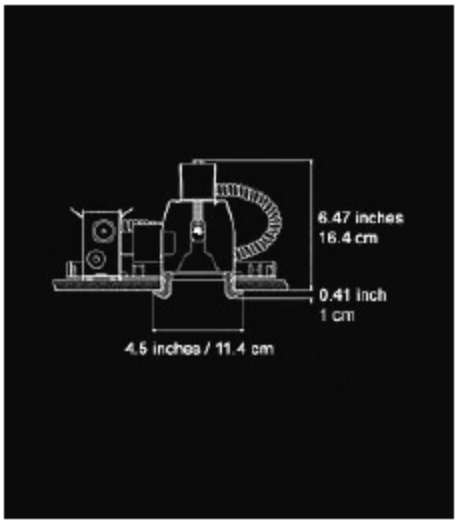
Section3A/Folio H130-11

LIGHTOLIER®

MIRA 2 RECESSED

Roberto Pamio



DIMENSIONS SHOWN FOR NEW CONSTRUCTION

DESCRIPTION

A small-scale, semi-recessed fixture providing downward light through an acid-etched, poured glass diffuser available in a wide range of colors. Provides a narrow to wider beam spread, depending on the lamp, as well as a soft pleasant ceiling glow.

HOUSING & LAMP OPTIONS

Remodel & New Construction:
1x50 watt, low-voltage halogen, MR-16
Insulated Ceiling:
1x35 watt, low-voltage halogen, MR-16
Provided with 120/12V or 277/12V with magnetic transformer.

Housing options :
Remodel Housing, New Construction , Insulated Ceiling, Chicago Plenum, Air Tight, Vapor Tight.

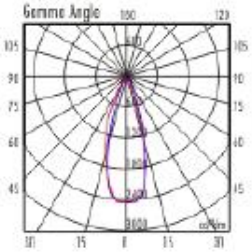
Other lamp options:
Remodel Housing : 13W CFL.
New Construction and Insulated Ceiling : 13W & 18W CFL.
Compatible with quad lamp, 4 Pin, electronic ballast 120/277 Volt only.
Futher options:
1x50 watt, halogen PAR 20 or 1x35 watt, PAR 20 metal halide
Also available with LED, consult factory.

GLASS COLOR

Satin White, Rose, Aquamarine, Pale Blue, Cobalt Blue, Jade Green, Crystal and Mirrored Chrome Glass

NOTE
U.L. listed/CSA approved for damp location. For U.L. compliance, use enclosed MR-16 lamp.

MIRA 2



MIRA 2 - MR16 - 50W 38°

Lux

h	E max	E med
1.00	2262	1318
2.00	565	330
3.00	251	146
4.00	141	82
5.00	90	53

HOUSING & LAMP OPTIONS :

Remodel & New Construction : 1x50 watt, low-voltage halogen, MR-16
Insulated Ceiling : 1x35 watt, low-voltage halogen, MR-16
- Provided with 120/12V or 277/12V with magnetic transformer.

Housing options :
Remodel Housing, New Construction , Insulated Ceiling, Chicago Plenum, Air Tight, Vapor Tight.

Other lamp options :
Remodel Housing : 13W CFL
New Construction and Insulated Ceiling : 13W & 18W CFL.
Compatible with quad lamp, 4 Pin, electronic ballast 120/277 Volt only.
Further options: 1x50 watt, halogen PAR 20
1x35 watt, PAR 20 metal halide
Also available with LED, consult factory.

Opening 3.3/4" - cULus - Damp location

iLIGHT TECHNOLOGIES
www.ilight-tech.com

Plexineon White 2X Series

PRODUCT SUMMARY

PRODUCT FEATURES

- Four Kelvin temperatures
- Energy efficient
- Long lifetime
- Stable and consistent color temperature
- Low voltage
- Easy to install
- Cool to the touch
- For use as exterior or interior accent lighting, direct view or indirect view applications, coves, signage & more

Color Temperatures (+/- 10%)

- 2800°K
- 3500°K
- 4500°K
- 6500°K

Diffuser Color

- Light amber hue (when not illuminated)

Lengths Available

- 2', 4', 6', 8' (610 mm, 1219 mm, 1830 mm, 2438 mm)
- 2' (610mm) field cuttable pieces
- Illuminated outside corner pieces
- Factory custom lengths available to the nearest ½" (13mm)[1] +/-0.25" (6mm)
- Factory convex or concave bends to minimum inside radius of 12" (305mm)[1]
- Factory "easy bends" to ¾" (5mm)[1] radius
- Gentle field bends to a 72" (1830mm) radius[2]

Power Supply

- Class 2 24VDC, 100 Watts - must be supplied by iLight
- Primary voltage: 120 or 120-277 depending on model
- Secondary voltage: 24VDC 4.1 A Max
- Maximum illumination length of a single 100W power supply: 20 feet (6.10m)

Power Supply Tips

- 20% overage for breaker for primary current draw
- Do not plug multiple power supplies into one run of Plexineon
- All iLight power supplies should be on an independent circuit
- Recommend surge protection upstream from power supply
- Verify correct voltage prior to wiring to non-switching power supplies

Low Voltage Cable

Maximum distance of low voltage cable in any given run:

- 14 AWG: 40 feet (12.19m)
- 12 AWG: 60 feet (18.29m)
- 10 AWG: 100 feet (30.48m)

1. Drawing required for production
2. Field bending allowed only on fixtures without C-channel

ORDERING INFORMATION

CLASS	VOLTAGE	COLOR	HOUSING	LENGTH	CHANNEL	VERSION
T	24		S			00
T = Trim	24 = 24V	X28 = White 2X 2800°K X35 = White 2X 3500°K X45 = White 2X 4500°K X65 = White 2X 6500°K	S = Silver	2F = 2 Feet 4F = 4 Feet 6F = 6 Feet 8F = 8 Feet CL = Custom Length TT = 2 Foot Cuttable PC = Outside Corner BE = Bend - Easy BN = Bend - Convex BV = Bend - Concave	SC = Stainless Steel Channel NC = No Channel	00

Specification sheets are subject to change without notice. For the most recent version, please refer to www.ilight-tech.com.

MK-0809

iLight Technologies • 118 South Clinton, Suite 370 • Chicago, IL 60661 • T 312.876.8630 • F 312.876.8631 • www.ilight-tech.com

iLIGHT TECHNOLOGIES
www.ilight-tech.com

Plexineon White 2X Series

TECHNICAL INFORMATION

MECHANICAL

Width & Height Housing
- 0.55"(14mm)w x 1.35"(34mm)h with C-channel
- UV and impact resistant acrylic diffuser
- UV resistant plastic channel
- Stainless steel C-channel for mechanical support

Minimum Piece Spacing
- Linear (end to end) = ⅜" (10mm)
- Parallel (edge to edge) = 1" (25mm)

*The minimum space for ventilation surrounding the Plexineon product is 10". This distance should be maintained on the three sides, left and right of the product as well as in front of product. Other configurations subject to specific application testing.

Mounting
- Stainless steel spring mounted clips
- Clips to be 2" (51mm) in from end of piece and no more than 2' (610mm) maximum between clips

Power Supply Weight
- Electronic (Advance) Power Supply is 2 lbs. (0.9 kg)
- Outdoor Magnetic Hybrid Power Supply is 9 lbs. (4 kg)

Power Supply Dimensions
- Electronic (Advance) = 9.50" x 1.18" x 1.70" (242mm X 30mm X 43mm)
- Outdoor Magnetic Hybrid= 11.25" x 3.25" x 3.36" (286mm x 83mm X 85mm)

ELECTRICAL

Load Voltage
24V DC

Load Current
180 mA/foot at 24VDC (591 mA/meter)
4.32 watts/foot (14.17 watts/meter)

Maximum Run Length
20 feet (6.10m) with an iLight approved power supply

DC Cable
- 14 AWG, PVC/Nylon Type TC 600 Volt power and control cable or equivalent
- FT-4 fire rating
- Class 2 wiring system
- Connectors: Molex Splashproof - JIS D0203 S2

Electrical Tips
- Only use iLight approved power supplies
- Do not cut non-cuttable pieces

ENVIRONMENTAL

Operating Temperature Range
-25°C to 40°C (-13°F to 104°F)

Storage Temperature Range
-25°C to 75°C (-13°F to 167°F)

Certification
- Plexineon is MetLabs listed. MetLabs is a Nationally Recognized Testing Laboratory (NRTL). Complies with UL 1598 and CSA c22.2 No. 250 in Luminaire, Wet location listed.
- Power Supplies are RU listed. RU stands for Recognized Components by Underwriters Laboratory.

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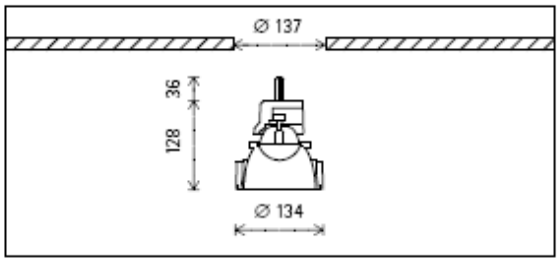
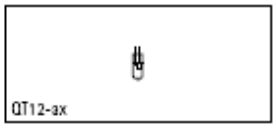
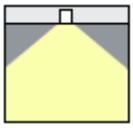
MK-0809

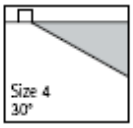
ERCO Quintessence Downlight

for low-voltage halogen lamps



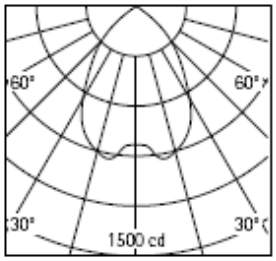






47012.000 Reflector silver
QT12-ax 100W 12V GY6.35 2200lm
Flush mounting detail
Wide diffuser

Product description
Lampholder carrier: cast aluminium, designed as heat sink. Fixing ring: plastic, black.
Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-25mm with covered mounting detail and 12.5-25mm with flush mounting detail.
Cable, L 500mm.
Spherolit technology upper reflector: aluminium, silver, mirror-finish anodised.
Darklight reflector: aluminium, bright anodised. Cut-off angle 30°.
Diffuser: glass, frosted.
Transformer to EN 61558 or EN 61347 to be ordered separately.
Weight 0.45kg



QT12-ax 100W 12V GY6.35 2200lm

LOR	0.58
UGR	21.3
65° <	200 cd/m²

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
Germany
Tel.: +49 2351 551 0
Fax: +49 2351 551 300
info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 25.10.2010
Current version under
www.erco.com/47012.000

ERCO Quintessence Downlight

Planning data

47012.000	QT12-ax 100W 12V GY6.35 2200lm
Connected load without control gear	P: 100 W
Connected load per 100lx	P*: 7.6 W/m²
Number of luminaires per 100lx	n*: 7.6 1/100m²

47012.000	QT12-ax 100W 12V GY6.35 2200lm			
Number of luminaires per 100m² for	100lx	200lx	300lx	500lx
	8	16	23	38

47012.000	QT12-ax 100W 12V GY6.35 2200lm			
Module (m)	1.2x1.8	1.8x1.8	1.8x2.4	2.4x2.4
Illuminance E_n (lx)	611	407	305	229

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	82	63	55	55	51
k	1.0	102	80	72	71	67
k	1.5	117	92	86	83	79
k	2.5	129	100	95	90	87
k	3.0	132	103	99	93	90

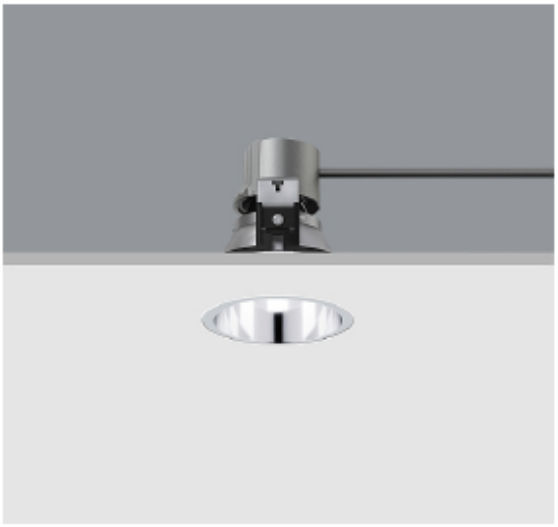
Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

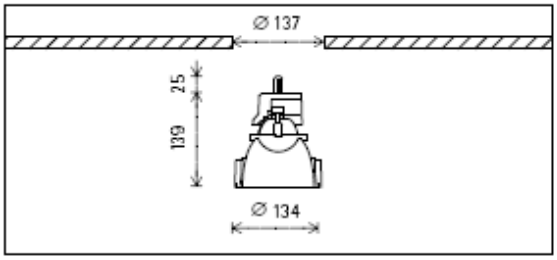
Hours of operation (h)	1000	2000	4000
LLMF	0.99	0.97	0.88
LSF	1	1	1

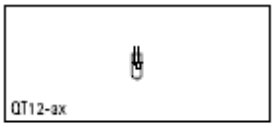
MF	LMFxRSMFxLLMFxLSF
MF	Maintainance Factor
LMF	Lumiaire Maintenance Factor
RSMF	Room Surface Maintenance Factor
LLMF	Lamp Lumens Maintenance Factor
LSF	Lamp Survival Factor
P	Room pure
C	Room clean
N	Room normal
D	Room dirty

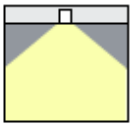
ERCO Quintessence Downlight

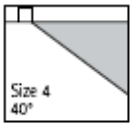
for low-voltage halogen lamps





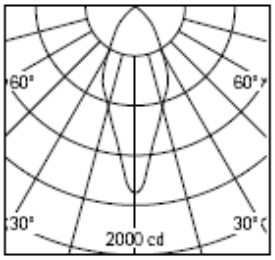






47024.000 Reflector silver
QT12-ax 75W 12V GY6.35 1575lm
Flush mounting detail
Focal diffuser

Product description
Lampholder carrier: cast aluminium, designed as heat sink. Fixing ring: plastic, black.
Mounting ring: plastic, white (RAL9002). Mounting for ceiling thicknesses of 1-25mm with covered mounting detail and 12.5-25mm with flush mounting detail.
Cable, L 500mm.
Spherolit technology upper reflector: aluminium, silver, mirror-finish anodised.
Darklight reflector: aluminium, bright anodised. Cut-off angle 40°.
Diffuser: glass, frosted.
Transformer to EN 61558 or EN 61347 to be ordered separately.
Weight 0.45kg



QT12-ax 75W 12V GY6.35 1575lm

LOR 0.60
UGR 17.8
55° < 1000 cd/m²

ERCO GmbH
Brockhauser Weg 80-82
58507 Lüdenscheid
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Tel.: +49 2351 551 0
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info@erco.com

Technical Region: 230V/50Hz
We reserve the right to make technical and design changes.
Edition: 25.10.2010
Current version under
www.erco.com/47024.000

ERCO Quintessence Downlight

Planning data

47024.000	QT12-ax 75W 12V GY6.35 1575lm
Connected load without control gear	P: 75 W
Connected load per 100lx	P*: 7.6 W/m²
Number of luminaires per 100lx	n*: 10.1 1/100m²

47024.000	QT12-ax 75W 12V GY6.35 1575lm			
Number of luminaires per 100m² for	100lx	200lx	300lx	500lx
	11	21	31	51

47024.000	QT12-ax 75W 12V GY6.35 1575lm			
Module (m)	1.2x1.8	1.8x1.8	1.8x2.4	2.4x2.4
Illuminance E_n (lx)	457	305	229	172

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	88	70	63	63	60
k	1.0	105	83	77	75	72
k	1.5	118	93	88	85	82
k	2.5	128	100	96	91	88
k	3.0	131	102	99	93	90

Cleaning (a)	1				2				3			
Ambient conditions	P	C	N	D	P	C	N	D	P	C	N	D
LMF	0.94	0.88	0.82	0.77	0.91	0.83	0.77	0.71	0.89	0.79	0.73	0.65
RSMF	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81	0.96	0.92	0.87	0.81

Hours of operation (h)	1000	2000	4000
LLMF	0.99	0.97	0.88
LSF	1	1	1

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

solid state luminaires

Type:	Approved:
Fixture:	
Project:	

COLOURLINE

COLOURLINE is an economic indoor color cove and wash light with 120° x 120° wide distributions. COLOURLINE comes in 12" modular length and RGB color. Clear or opal diffuse lens option and ratcheting mounting bracket for secure aiming.

Technical Specifications

Color Temperature		RGB
output	beam spread	120°
	lumens	65
	LEDs per foot	20
	lifetime	> 60,000 hours / L70 or better
electrical	input voltage	20-24VDC
	power consumption	4.5W / ft
physical	dimensions	12" x 1.75" x 1.625"
	weight	0.5 lbs / ft
	housing	plastic PMMA
	mounting	plastic ratcheting bracket
	operating temperature	-20°C to 50°C
	junction temperature	61°C @ TA 25°C
control	interface	0-10VDC, DMX 512, RMD dimming
	remote power	120' (w/ 10 AWG)
certification and safety	certification	ETL / cETL
	standards	UL-Class II, IES LM-79, LM-80
	environment	dry, indoor location, IP20

Due to continuous development and improvements, specifications are subject to change without notice.

Ordering

example: CL-1-DMX-WH

CL			
model	**length**	**options**	**accessories**
CL - COLOURLINE	1 - PC Clear Cover	D - Dimming 0-10V	WH - Wiring Harness
	2 - PO Opal Cover	DMX - DMX 512	
		RMD - RMD Dimming	

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Rev 09/2010

solid state luminaires

COLOURLINE

Photometrics

Illuminance at a Distance

	center beam fc	beam width
1 ft	5 fc	3 ft
2 ft	1 fc	6 ft
3 ft	1 fc	9 ft
4 ft	0 fc	12 ft
5 ft	0 fc	15 ft
6 ft	0 fc	18 ft

112°

Illuminance at a Distance

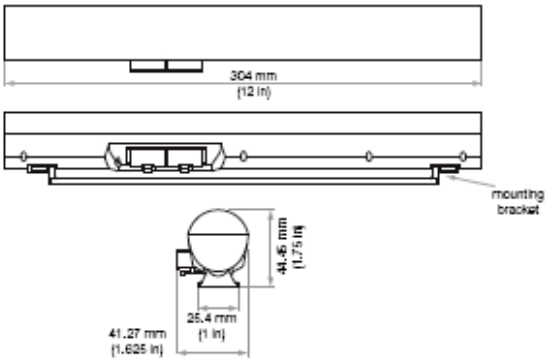
	center beam fc	beam width
1 ft	4 fc	3 ft
2 ft	1 fc	6 ft
3 ft	1 fc	9 ft
4 ft	0 fc	12 ft
5 ft	0 fc	15 ft
6 ft	0 fc	18 ft

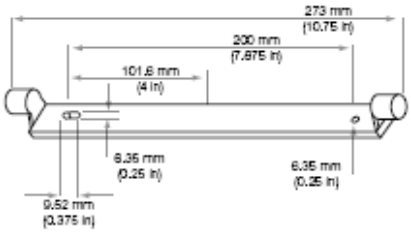
112°

Performance

length	total wattage	RGB lumens
CL-1	4.5	65
CL-2	4.5	51

Physical Dimensions





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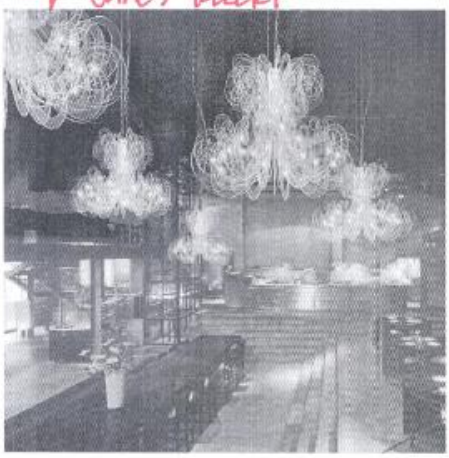
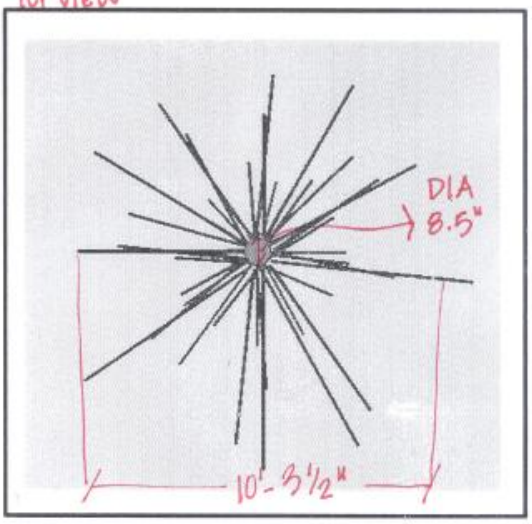
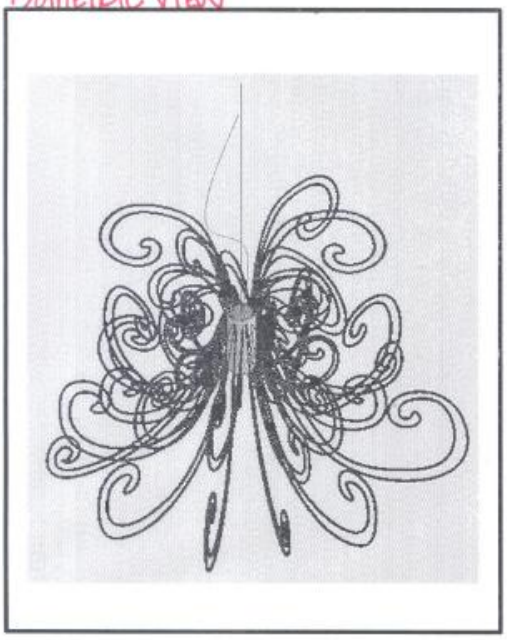
INSPIRATION FROM YELLOW GOAT
→ "CHAOS THEORY"



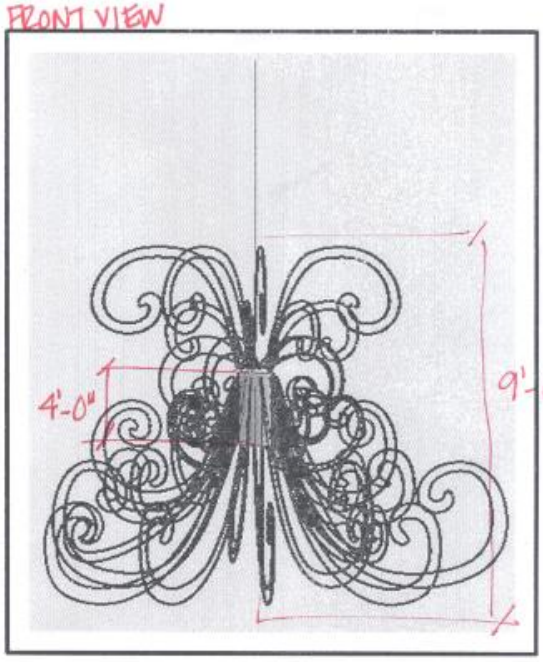
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



→ 3 TIERS

23.11 · Technische Änderungen vorbehalten · Technical amendments reserved · Sous réserve de modifications techniques

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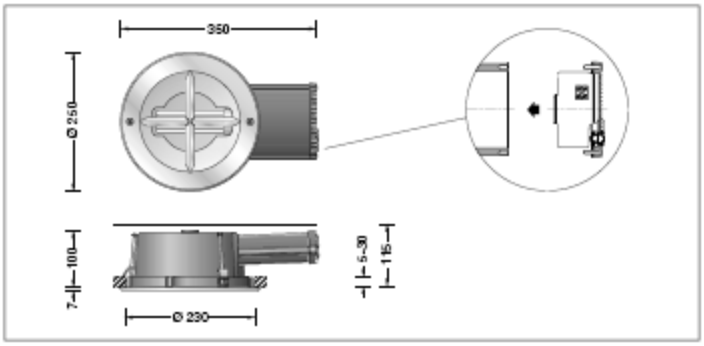
Gebrauchsanweisung Instructions for use Fiche d'utilisation	Deckeneinbauleuchte Recessed ceiling luminaire Plafonnier à encastrer	IP 65	**6807**



Anwendung
Deckeneinbauleuchte mit symmetrisch streuender Lichtstärkeverteilung.
Für den Einbau in Zwischendecken von 5 - 30 mm Stärke.
Erforderliche Einbautiefe 115 mm.
Einbauöffnung ø 230 mm.

Application
Recessed ceiling luminaire symmetrical wide beam light distribution.
For recessing in suspended ceilings from 5 - 30 mm thickness.
Recessed depth required 115 mm.
Ceiling aperture ø 230 mm.

Utilisation
Spot à encastrer à répartition lumineuse symétrique diffuse.
Pour l'installation dans les plafonds suspendus d'épaisseur 5 - 30 mm.
Profondeur d'encastrement nécessaire 115 mm. Découpe de plafond ø 230 mm.

Lampe
Kompakt-Leuchstofflampe
TC-TELI 32 W - GX 24 q-3
TC-TELI 42 W - GX 24 q-4

Osram:	
Dulux T/E 32 W IN PLUS	2400 lm
Dulux T/E 42 W IN PLUS	3200 lm
Philips:	
PL-T TOP 32 W /4p	2400 lm
PL-T TOP 42 W /4p	3200 lm

Bitte beachten Sie die Betriebshinweise der Lampenhersteller.

Lamp
Compact fluorescent lamp
TC-TELI 32 W - GX 24 q-3
TC-TELI 42 W - GX 24 q-4

Osram:	
Dulux T/E 32 W IN PLUS	2400 lm
Dulux T/E 42 W IN PLUS	3200 lm
Philips:	
PL-T TOP 32 W /4p	2400 lm
PL-T TOP 42 W /4p	3200 lm

Please note the lamp manufacturers' operating instructions.

Lampe
Lampe fluorescente compacte
TC-TELI 32 W - GX 24 q-3
TC-TELI 42 W - GX 24 q-4

Osram:	
Dulux T/E 32 W IN PLUS	2400 lm
Dulux T/E 42 W IN PLUS	3200 lm
Philips:	
PL-T TOP 32 W /4p	2400 lm
PL-T TOP 42 W /4p	3200 lm

Veuillez respecter les instructions des fabricants de lampes.

Produktbeschreibung
Leuchte besteht aus Aluminiumguss, Aluminium und Edelstahl
Sicherheitsglas
Silikondichtung
Reflektor aus eloxiertem Reinst-Aluminium
herausziehbare elektrische Einrichtung für eine einfache Montage
Befestigung über drei keilförmig angebrachte, verstellbare Krallen
Europäisches Patent EP 0 686 806
2 Leitungseinführungen zur Durchverdrahtung der Netzanschlussleitung
bis ø 10,5 mm max. 3 x 1,5□
Anschlussklemme 2,5□
Schutzleiteranschluss
Fassung GX 24 q-3/4
Elektronisches Vorschaltgerät
220-240 V ⏦ 0/50-60 Hz
Schutzklasse I
Schutzart IP 65
Staubdicht und Schutz gegen Strahlwasser
▽ Zeichen – Leuchte ist für die Montage auf normal entflammbaren Befestigungsflächen geeignet
CE – Konformitätszeichen
Gewicht: 2,6 kg

Product description
Luminaire made of aluminium alloy, aluminium and stainless steel
Safety glass
Silicone gasket
Reflector made of anodised pure aluminium
extractable electrical unit for an easy installation
Fixing is achieved by using three adjustable wedge-shaped claws
European patent EP 0 686 806
2 cable entries for through-wiring of mains supply cable up to ø 10.5 mm max. 3 x 1.5□
Connecting terminal 2.5□
Earth conductor connection
Lampholder GX 24 q-3/4
Electronic ballast 220-240 V ⏦ 0/50-60 Hz
Safety class I
Protection class IP 65
Dust tight and protection against water jets
▽ Symbol – Luminaire is suitable for mounting on normal inflammable fixing surfaces
CE – Conformity mark
Weight: 2.6 kg

Description du produit
Luminaire fabriqué en fonte d'alu, aluminium et acier inoxydable
Verre de sécurité
Joint silicone
Réflecteur en aluminium pur anodisé
Appareillage électrique amovible pour faciliter l'installation
La fixation s'effectue par trois griffes réglables en forme de clavette
Brevet européen EP 0 686 806
2 entrées de câble pour branchement en dérivation d'un câble de raccordement jusqu'à ø 10,5 mm max. 3 x 1,5□
Bornier 2,5□
Raccordement de mise à la terre
Douille GX 24 q-3/4
Ballast électronique
220-240 V ⏦ 0/50-60 Hz
Classe de protection I
Degré de protection IP 65
Etanche à la poussière et protégé contre les jets d'eau
▽ Sigle – Luminaire approprié à l'installation sur des surfaces de fixation normalement inflammables
CE – Sigle de conformité
Poids: 2,6 kg

Sicherheit

Für die Installation und für den Betrieb dieser Leuchte sind die nationalen Sicherheitsvorschriften zu beachten.
Der Hersteller übernimmt keine Haftung für Schäden, die durch unsachgemäßen Einsatz oder Montage entstehen.
Werden nachträglich Änderungen an der Leuchte vorgenommen, so gilt derjenige als Hersteller, der diese Änderungen vornimmt.

Montage

Leuchtengehäuse darf nicht in wärmedämmende Stoffe eingebaut werden.
Die Einbauöffnung wird durch den Anschlagring des Leuchtengehäuses abgedeckt.
Die Befestigung der Leuchte im Baukörper erfolgt über drei keilförmig angebrachte, verstellbare Krallen.

Einbau in Betondecken:

Hierfür steht das Einbaugehäuse - Ergänzungsteil **777** - zur Verfügung.

Einbau in Zwischendecken:

Es ist eine Einbauöffnung von ø 230 mm mit einer Mindesttiefe von 115 mm erforderlich.
Auf ausreichende Tragfähigkeit der Zwischendecke achten.
Der seitliche Abstand vom Leuchtengehäuse zu Gebäudeteilen muss mindestens 50 mm betragen.
Die Krallen greifen hinter die Deckenverkleidung. Die Mindeststärke der Deckenverkleidung beträgt 5 mm. Bei geringerer Stärke, sowie beim Einbau in Gipskartondecken, muss die Deckenverkleidung rückseitig im Bereich der Krallen verstärkt werden.
Leuchte öffnen:
Schrauben lösen. Abschlussring mit eingeklebtem Sicherheitsglas, Reflektor und Dichtung abnehmen.
Anschlusskasten öffnen:
Schrauben lösen und Deckel mit elektrischer Einrichtung aus dem Anschlusskasten herausziehen.
Netzanschlussleitung durch die Leitungseinführung führen.
Schutzleiterverbindung herstellen und elektrischen Anschluss vornehmen.
Deckel mit elektrischer Einrichtung in Anschlusskasten einschieben.
Schrauben fest anziehen.
Leuchtengehäuse in die Einbauöffnung einsetzen. Schrauben der Krallenbefestigung gleichmäßig anziehen.
Lampen einsetzen.
Auf richtigen Sitz der Dichtung achten.
Abschlussring mit Glas und Dichtung montieren.

Lampenwechsel - Wartung

Anlage spannungsfrei schalten.
Leuchte öffnen und reinigen.
Nur lösungsmittelfreie Reinigungsmittel verwenden. Lampe auswechseln.
Dichtung überprüfen, ggf. ersetzen.
Leuchte schließen.

Ergänzungsteil

Für die Herstellung der Einbauöffnung kann es zweckmäßig sein, Einbaugehäuse aus Aluminium zu verwenden.
777 Einbaugehäuse
Es gibt dazu eine gesonderte Gebrauchsanweisung.

Ersatzteile

Bezeichnung	Bestellnummer
Ersatzglas	140711
EVG	610724
Fassung	630247
Reflektor Abdeckring	760808
Reflektor Gehäuse	760809
Dichtung Gehäuse	830877
Dichtung Abdeckring	830879

Safety indices

The installation and operation of this luminaire are subject to national safety regulations.
The manufacturer is then discharged from liability when damage is caused by improper use or installation.
If any luminaire is subsequently modified, the persons responsible for the modification shall be considered as manufacturer.

Installation

Luminaire housing must not be installed in heat-insulating material.
The recessed opening is covered by the frame of the luminaire housing.
Fixing of the luminaire in the structure is achieved by using three adjustable wedge-shaped claws.

Installation into concrete ceilings:

For this purpose installation housing - accessory **777** - is available.

Installation into inserted ceilings:

A recessed opening of ø 230 mm is necessary to accept the luminaire housing.
Recessed depth min. 115 mm.
Please consider sufficient load capacity of the suspended ceiling.
The lateral distance between recessed luminaire and other building parts must be at least 50 mm.
The claws catch the ceiling facing from the back side. Minimum thickness of the ceiling facing is 5 mm.
If the ceiling facing has a thickness of less than 5 mm or in case of an installation into plasterboard ceilings, the facing thickness in the region of the claws must be increased from the back side.
Open the luminaire:
Undo screw. Remove end ring with glued-in safety glass, reflector and gasket.
Open the connection box:
Undo screws and pull cap with electrical unit out of the connection box.
Lead the mains supply cable through the cable entry.
Make earth conductor connection and electrical connection.
Push cap with electrical unit into the connection box.
Tighten screws.
Insert luminaire housing into the recess opening.
Tighten screws of claw fasteners.
Insert lamps.
Make sure that gasket is positioned correctly.
Assemble end ring with glass and gasket.

Relamping - Maintenance

Disconnect the electrical installation.
Open the luminaire and clean.
Use only solvent-free cleansers.
Change the lamp.
Check the gasket and replace, if necessary.
Close the luminaire.

Accessory

For preparing the recess opening it can be practical to use an installation housing made of aluminium.
777 Installation housing
A separate instructions for use can be provided upon request.

Spares

Description	Part no
Spare glass	140711
Electronic ballast	610724
Lampholder	630247
Reflector for cover ring	760808
Reflector housing	760809
Gasket housing	830877
Gasket for cover ring	830879

Sécurité

Pour l'installation et l'utilisation de ce luminaire, respecter les normes de sécurité nationales.
Le fabricant décline toute responsabilité résultant d'une mise en œuvre ou d'une installation inappropriée du produit.
Toutes les modifications apportées au luminaire se feront sous la responsabilité exclusive de celui qui les effectuera.

Installation

Le boîtier du luminaire ne doit pas être installé dans des matériaux d'isolation.
Les bords de la réservation sont recouverts par l'anneau de butée du boîtier du luminaire.
La fixation du luminaire dans l'ouvrage s'effectue par trois griffes réglables en forme de clavette.

Encastrement dans les murs:

Pour ce type d'installation il existe le boîtier d'encastrement - accessoire **777** -.

Encastrement dans les parois creuses:

Une réservation de ø 230 mm avec une profondeur minimale de 115 mm est nécessaire.
Le plafond suspendu doit être conçu pour supporter le poids du luminaire.
La distance latérale entre le luminaire à encastrer et des parties de bâtiment étant normalement inflammables doit être au minimum 50 mm.
Les griffes se coincent à l'arrière.
L'épaisseur minimale de la paroi doit être 5 mm. Si la paroi est moins épaisse ainsi que pour une installation dans une plafond cloison sèche la paroi doit être renforcée à l'arrière à l'emplacement des griffes.
Ouvrir le luminaire:
Desserrer les vis.
Retirer l'anneau de fermeture avec le verre collé, le réflecteur et le joint.
Ouvrir le boîtier de connexion:
Desserrer les vis et retirer le couvercle avec l'appareillage électrique du boîtier de connexion.
Introduire le câble d'alimentation à travers l'entrée de câble.
Mettre à la terre et procéder au raccordement électrique.
Installer le couvercle avec l'appareillage électrique dans le boîtier de connexion.
Serrer fort les vis.
Installer le boîtier du luminaire dans la réservation. Serrer les vis des griffes.
Installer les lampes.
Veiller au bon emplacement du joint.
Installer l'anneau de fermeture avec le verre et le joint.

Changement de lampe - Maintenance

Travailler hors tension.
Ouvrir le luminaire et nettoyer.
N'utiliser que des produits d'entretien ne contenant pas de solvant. Changer la lampe.
Vérifier et remplacer le joint le cas échéant.
Fermer le luminaire.

Accessoire

Pour la réservation, il peut être pratique d'utiliser des boîtiers d'encastrement en aluminium.
777 Boîtier d'encastrement
Une fiche d'utilisation pour ces boîtiers est disponible.

Pièces de rechange

Désignation	Référence
Verre de rechange	140711
Ballast électronique	610724
Douille	630247
Réflecteur de l'anneau	760808
Réflecteur du boîtier	760809
Joint du boîtier	830877
Joint de l'anneau	830879

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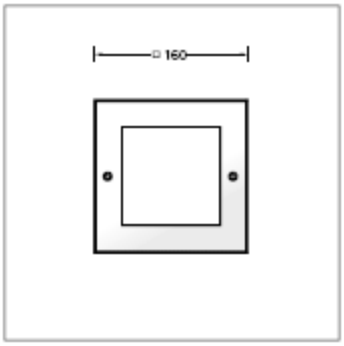
Gebrauchsanweisung Instructions for use Fiche d'utilisation	Bodeneinbauleuchte In-ground luminaire Luminaire à encastrer	IP 67	**8600**



Anwendung
Orientierungsleuchte für den Einbau in befestigte Flächen, Wege und Plätze. Begehbar und überrollbar von Fahrzeugen mit luftgefüllten Reifen.
Für Druckbelastung bis 5000 Kg.
Im Zentrum der Glasoberfläche wird eine Betriebstemperatur von nur 35 °C erreicht (gemessen nach EN 60598 - Umgebungstemperatur ta 15°C).
Bitte beachten Sie: In Fahrspuren, wo die Leuchte horizontalen Kräften durch Bremsen, Beschleunigen und Richtungswechsel ausgesetzt ist, darf die Leuchte nicht eingesetzt werden. Der Abstand zu angestrahlten Gegenständen oberhalb der Lichtaustrittsöffnung muss mindestens ⌀ 0,5 m ▯ betragen. Durch Nässe kann es auf dem Glas der Leuchte zur Rutschgefahr kommen.
Aus Sicherheitsgründen empfehlen wir für begehbare öffentliche Bereiche Leuchten mit rutschhemmendem Glas nach DIN 51130. Diese tragen den Zusatz R hinter der Bestellnummer.

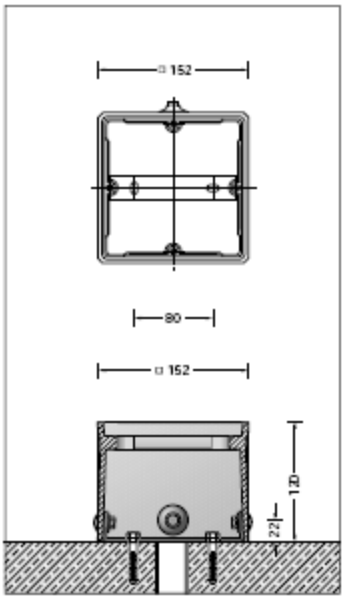
Application
Location luminaire for recessed mounting in compacted surfaces, paths and open areas. Walk-over and drive-over luminaire from vehicles with pneumatic tyres. For pressure load up to 5000 Kg.
In the centre of the glass surface the luminaire attains an operating temperature of only 35 °C (measured according to EN 60598 - ambient temperature of ta 15°C).
Please note: Luminaire must not be used for installations in road lanes, where the fixture is exposed to a horizontal strain due to braking, acceleration and change of direction. The minimum distance to illuminated objects above the light distribution opening must be ⌀ 0.5 m ▯. When the glass of the luminaire is wet, there may be a danger of skidding.
For safety reasons we recommend to use in public areas luminaires equipped with skid-blocking glass according to DIN 51130. These are donated by R after the article number.

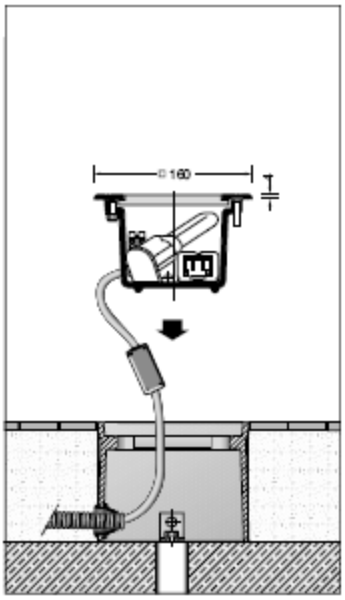
Utilisation
Luminaire d'orientation pour installation dans des surfaces stabilisées, places et chemins. Autorisant la circulation piétonne et le roulement de véhicules équipés de pneumatiques. Pour pression maximale 5000 Kg.
Au centre du verre la température n'atteint que 35 °C (mesurée selon EN 60598 à une température ambiante de ta 15° C).
Attention: Le luminaire ne doit pas être installé dans des voies de circulation où il serait soumis à des sollicitations mécaniques horizontales provoquées par des freinages, des accélérations, des changements de direction. La distance minimale par rapport aux objets éclairés au-dessus du verre doit être ⌀ 0,5 m ▯. En cas d'humidité, le verre de ce luminaire risque d'être glissant. Pour des raisons de sécurité, nous recommandons d'utiliser dans les aires piétonnes publiques ces luminaires équipés de verres antidérapants selon DIN 51130. Pour les commander faire suivre le numéro d'article de la lettre R.

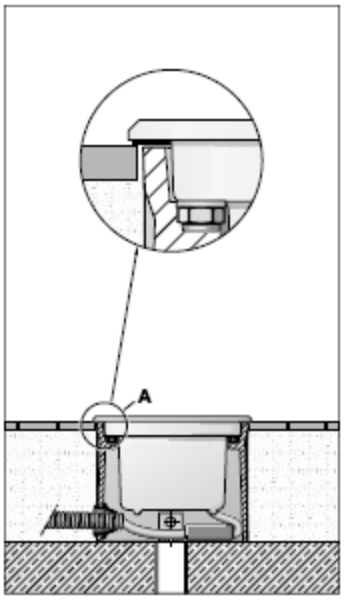
Produktbeschreibung
Leuchte besteht aus Aluminiumguss, Aluminium und Edelstahl
Abdeckrahmen aus Edelstahl
Werkstoff-Nummer 1.4301
Einbaugehäuse mit Leitungseinführung für Installationsrohr max. ø 20 mm
Leuchtengehäuse eloxiert
Sicherheitsglas weiß
1 Leitungsverschraubung
1,8 m wasserbeständige Anschlussleitung H07RN8-F 3G1,5□ mit eingebautem Wasserstopper und 1,2 m PVC Installationsrohr
Fassung G 23
Vorschaltgerät 230 V ∿ 50 Hz
Schutzklasse I
Schutzart IP 67
Staubdicht und Schutz gegen zeitweiliges Untertauchen
▽ Zeichen – Leuchte ist für die Montage auf normal entflammbaren Befestigungsflächen geeignet
CE – Konformitätszeichen
Gewicht: 3,6 kg

Product description
Luminaire made of aluminium alloy, aluminium and stainless steel
Cover frame made of stainless steel
Steel grade number 1.4301
Recess housing with cable entry for cable conduit, max ø 20 mm
Luminaire housing anodised
White safety glass
1 screw cable gland
1.8 m water-resistant connecting cable H07RN8-F 3G1.5□ with implemented water stopper and 1.2 m PVC cable conduit
Lampholder G 23
Ballast 230 V ∿ 50 Hz
Safety class I
Protection class IP 67
Dust tight and protection against temporary immersion
▽ Symbol – Luminaire is suitable for mounting on normal inflammable fixing surfaces
CE – Conformity mark
Weight: 3.6 kg

Description du produit
Luminaire fabriqué en fonte d'alu, aluminium et acier inoxydable
Cadre de finition en acier inoxydable
Matériau No. 1.4301
Châssis de montage avec l'entrée de câble pour gaine de passage de câble max. ø 20 mm
Boîtier-lampe anodisé
Verre de sécurité blanc
1 presse-étoupe
1.8 m de câble de raccordement résistant à l'eau H07RN8-F 3G1,5□ avec stoppe-eau incorporé et 1,2 m de gaine de passage de câble PVC
Douille G 23
Ballast 230 V ∿ 50 Hz
Classe de protection I
Degré de protection IP 67
Etanche à la poussière et protégé contre l'immersion momentanée
▽ Sigle – Luminaire approprié à l'installation sur des surfaces de fixation normalement inflammables
CE – Sigle de conformité
Poids: 3,6 kg







Sicherheit

Für die Installation und für den Betrieb dieser Leuchte sind die nationalen Sicherheitsvorschriften zu beachten.
Wir empfehlen die bauseitige Absicherung über einen Fehlerstrom-Schutzschalter.
Der Hersteller übernimmt keine Haftung für Schäden, die durch unsachgemäßen Einsatz oder Montage entstehen.
Werden nachträglich Änderungen an der Leuchte vorgenommen, so gilt derjenige als Hersteller, der diese Änderungen vornimmt.

Vor der Montage zu beachten:

Um die max. Druckbelastung der Leuchte von 5000 Kg aufnehmen zu können, ist die Errichtung eines Fundamentes erforderlich.
Die Leuchte steht in einem Einbaugehäuse aus hochfestem Aluminiumguss.
Die Druckbelastung wird über dieses Gehäuse auf das bauseits zu erstellende Fundament übertragen. Die Gründung muss auf festem Untergrund erfolgen.
Um eine sichere Standfestigkeit zu erreichen, muss das Einbaugehäuse einbetoniert werden.
Bei der Erstellung des Fundaments ist eine Drainage anzulegen, damit eintretendes Oberflächenwasser aus dem Einbaugehäuse abfließen kann.
Die Lackierung des Einbaugehäuses darf nicht beschädigt werden.
Für die Dichtigkeit der Leuchte ist es wichtig, daß der spätere Bodenbelag auf gleicher Höhe oder unter der Oberkante des Einbaugehäuses liegt. **Abb. A**

Bodenbeschaffenheit:
Die Leuchte darf nicht dauerhaft mit aggressiven Medien in Kontakt kommen.
Aggressive Medien können durch Wasser aus dem Boden gewaschen werden, und das Gehäuse der Leuchte zerstören.
Bei unbekannter Zusammensetzung des Bodens ist daher vor der Montage eine Bodenanalyse vorzunehmen.
Aggressive Medien können auch von der Oberfläche ausgehend auf die Leuchte einwirken, daher ist ein übermäßiger Einsatz von Taumitteln im Umfeld der Leuchte zu vermeiden.
Von außen eintretende Streuströme, die durch die Leuchte in den Boden weiter geleitet werden, verursachen Korrosionsschäden.
Es sind geeignete Gegenmaßnahmen durchzuführen.

Safety indices

The installation and operation of this luminaire are subject to national safety regulations.
We recommend a fuse protection on site by means of a RCCB (residual current circuit breaker).
The manufacturer is then discharged from liability when damage is caused by improper use or installation.
If any luminaire is subsequently modified, the persons responsible for the modification shall be considered as manufacturer.

Notice prior to installation:

To accept the maximum pressure load of 5000 Kg a proper foundation must be provided by the customer.
The luminaire is mounted in a recess housing made of high-strength die cast aluminium.
The pressure load is transferred to the foundation by this housing provided at site. The foundation must be carried out on firm subgrade.
In order to obtain a firm stableness, the recess housing must be firmly concreted in. During preparation of the foundation proper drainage must be provided, so that entering surface water can drain off.
The lacquering of the recess housing must not be damaged.
For the tightness of the luminaire it is important that the ground surface prepared later is either on the same level or slightly below top edge of the recess housing. **Fig. A**

Soil Conditions:
The luminaire must not permanently have contact with aggressive media.
Aggressive media might be washed out of the soil and might corrode the housing of the luminaire.
In case of an unknown composition of the soil a soil analysis should be made before installation.
Aggressive media that is outgoing from the ground surface might also affect the luminaire.
Thus an overuse of de-icing agents in the surroundings should be avoided.
Parasitic current, occuring from the outside, which is conducted by the luminaire into the soil, will cause corrosion damage.
Suitable counter measures must be carried out.

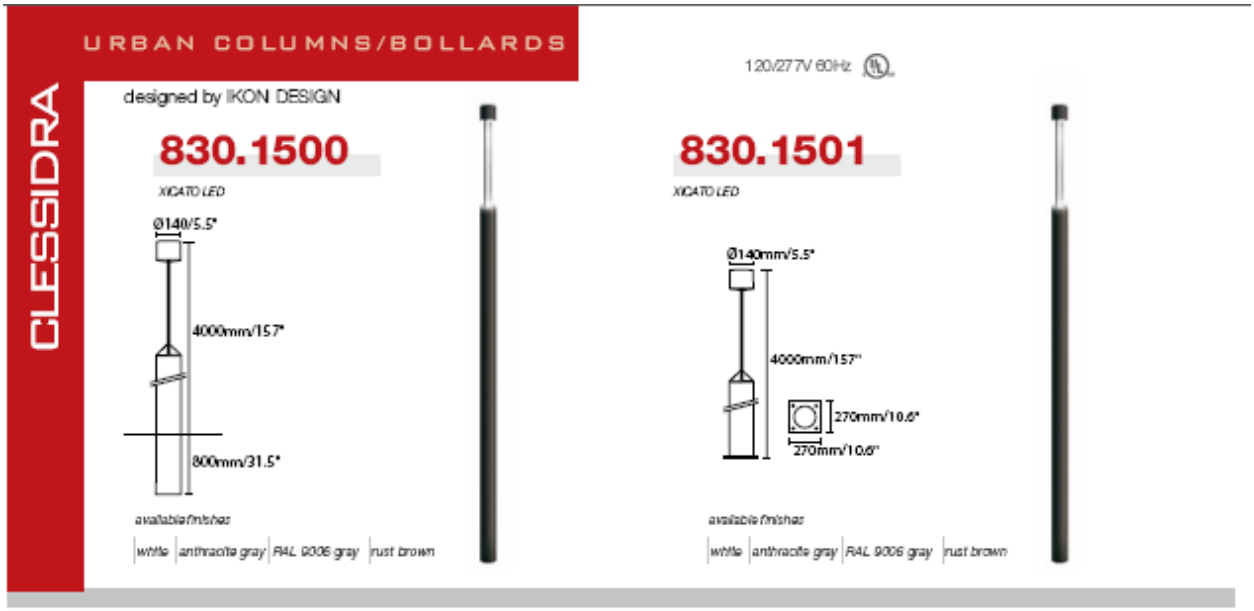
Sécurité

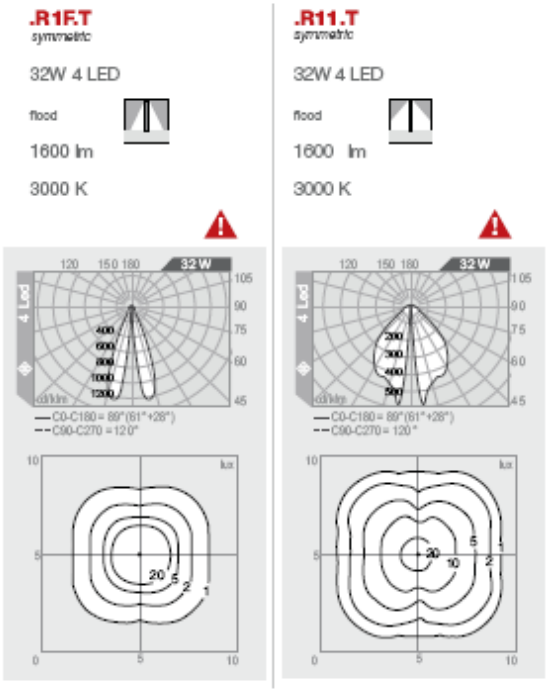
Pour l'installation et l'utilisation de ce luminaire, respecter les normes de sécurité nationales.
Nous recommandons une protection sur le site par un différentiel à installer en amont.
Le fabricant décline toute responsabilité résultant d'une mise en œuvre ou d'une installation inappropriée du produit.
Toutes les modifications apportées au luminaire se feront sous la responsabilité exclusive de celui qui les effectuera.

A respecter avant l'installation:

Pour que le luminaire puisse supporter la pression maximale de 5000 Kg il doit impérativement être fixé sur une fondation stable.
Le luminaire se trouve dans un châssis de montage fabriqué en fonte d'alu très robuste.
La pression est transmise par ce châssis sur une fondation solide qui est à prévoir sur le site.
Le massif de fondation doit être réalisé sur un sol stabilisé.
Afin d'assurer une bonne stabilité, le châssis doit être coulé dans du béton.
Lors de la réalisation de la fondation, un drainage doit être prévu afin que les eaux pénétrant dans le châssis puissent s'en échapper. Le laquage du châssis ne doit pas être endommagé.
Pour la bonne étanchéité du luminaire, il est important que le bord supérieur du châssis de montage ne soit en aucun cas installé plus bas que le bord supérieur de la couche de finition du sol. Celle-ci doit affleurer la sous face de la collerette. **Pos. A**

Nature du sol:
Le luminaire ne doit pas être durablement en contact avec des matériaux corrosifs.
Les matériaux agressifs peuvent provenir de l'eau du sol et altérer le boîtier. Si la qualité du sol n'est pas connue, il faut réaliser une analyse de ses composants avant l'installation du produit.
Certains matériaux agressifs pouvant également attaquer la surface du luminaire, il faut donc limiter l'utilisation de produits de salage des voies publiques aux abords de l'appareil.
Des courants de fuite rentrant par l'extérieur et conduits dans le sol par le luminaire, causent des dommages de corrosion.
Des contre-mesures appropriées doivent être effectuées.





COLOR CODES

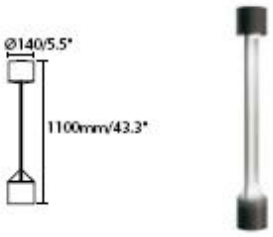
.01 white
.05 anthracite gray
.13 RAL9006 Gray
.45 rust brown

Preliminary photometry

260

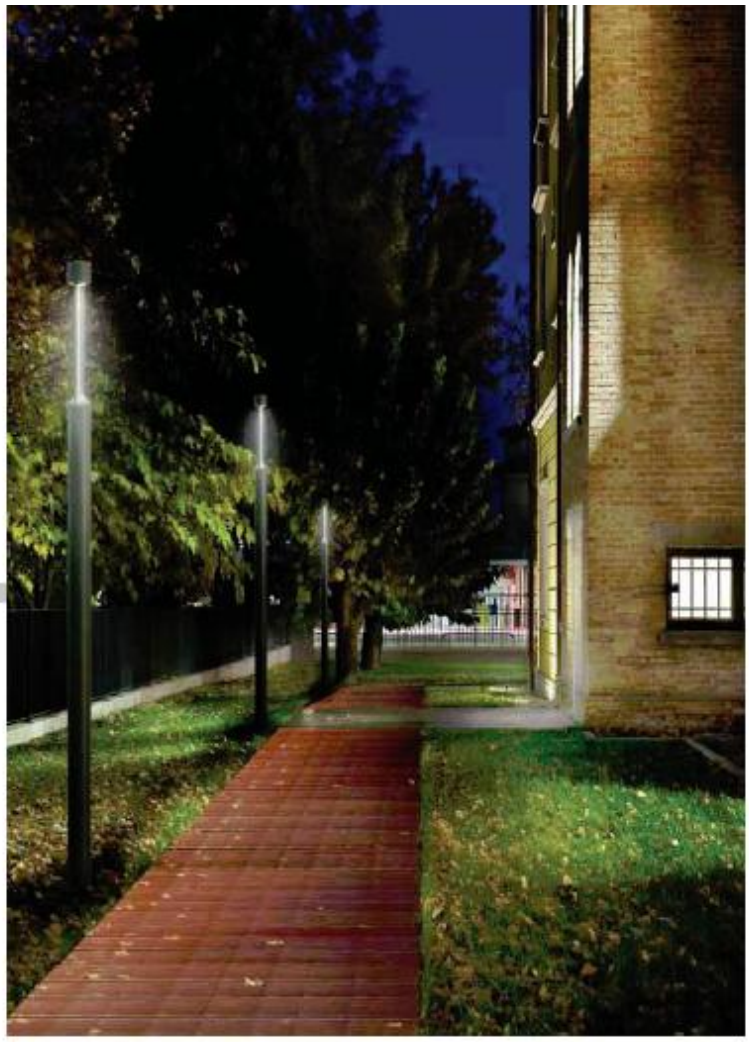
830.1503

XICATO LED



available finishes

| white | antracite gray | RAL 9006 gray | rust brown |



ACCESSORIES

OPTIONAL IN-GROUND PROTECTIVE ACCESSORY IN LOW DENSITY POLYESTER TO PROTECT AGAINST MECHANICAL OR CHEMICAL AGGRESSION

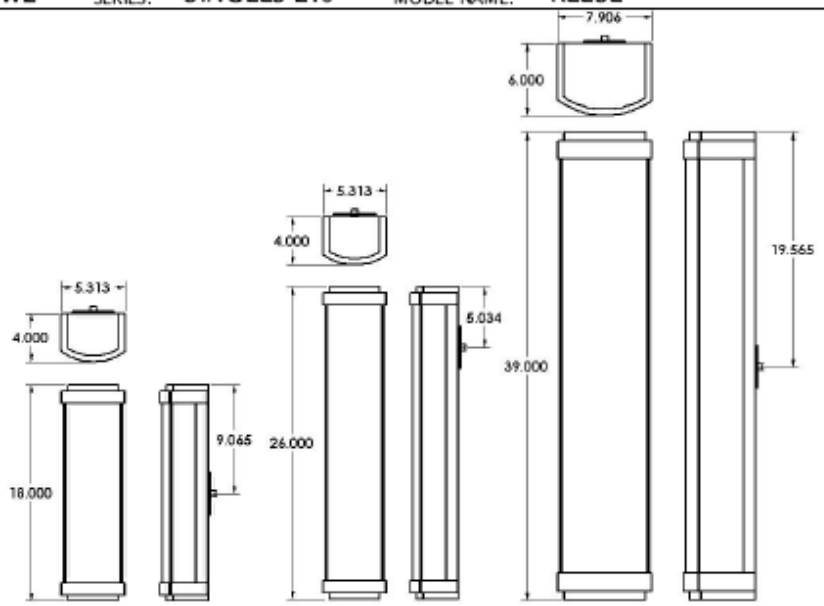
111

261

LUMINAIRE SUBMITTAL SHEET

9/22/2010

MODEL #: 5254-WL SERIES: SINGLES 2.0 MODEL NAME: REESE TYPE:



5254-WL-18 5254-WL-26 5254-WL-39

Your Specification: - - - - -

(Catalog Number) (Lamping) (Voltage) (Lens) (Finish) (Special)

CATALOG NUMBER:
5254-WL-18
5254-WL-26
5254-WL-39

LAMPING:

5254-WL-18
I (2)25W T-10/Med
F (1)FT27W/2G11

5254-WL-26
I (3)25W T-10/Med
F (1)FT40W/2G11
F/T8 (1)F17T8/Med.Bi-Pin

5254-WL-39
I (4)25W T-10/Med
F (2)FT39W/2G11
F/T8 (1)F25T8/Med.Bi-Pin
F/T12 (1)F36T12HO/Recessed D.C

VOLTAGE:
120V 120 Volt
277V 277 Volt
(Incandescent 120V only)

LENS OPTIONS:
OA Opal Acrylic
FAH4 White Vein Hand Painted Faux Alabaster
FAH5 Antique Hand Painted Faux Alabaster (Beige)
FAH6 Gray Vein Hand Painted Faux Alabaster
FAH7 Beige Vein Hand Painted Faux Alabaster

FINISHES:
Standard
LBP Light Bronze Paint with Brushed Texture
LGP Light Gold Iridescent Paint
LSP Light Silver Paint
Custom
CPF Custom Painted Finish (Consult Factory)
CMF Custom Metal Finish (Consult Factory)

SPECIAL:
STD Standard
MOD Modified

WEIGHT (lbs)*: (Hanging)

	5254-WL-18	5254-WL-26
I	10 LBS	15 LBS
F	10 LBS	15 LBS
F/T8		15 LBS

	5254-WL-39
I	20 LBS
F	20 LBS
F/T8	20 LBS
F/T12	29 LBS

*all wall mounts over 25lbs require additional hanging support.

SPECIAL/MODIFICATIONS DESC. (MOD only):

PROJECT: QTY:

NOTES:
- UL LISTED AND CUL APPROVED FOR WET LOCATION.
- WINONA LIGHTING PRODUCTS ARE UNION MADE.
- CUSTOM SIZES AVAILABLE UPON REQUEST. ALL FLUORESCENT AND HID FIXTURES AVAILABLE IN 120 V AND 277 V.
- INCANDESCENT 120 V ONLY.
- WINONA LIGHTING RESERVES THE RIGHT TO MAKE DESIGN CHANGES WITHOUT PRIOR NOTICE.
- LAMPS NOT INCLUDED.
- BALLAST INFORMATION: ELECTRONIC

winona lighting

3760 West Fourth Street - Winona, MN 55987 – 1-800-328-5291 – 507-454-5113 – Fax 507-452-8528 –
www.winonalighting.com

solid state luminaires

Type:	Approved:
Fixture:	
Project:	

SLIMLINE

SLIMLINE is a slim profile linear floodlight with a 120° flood distribution for short throw applications. **SLIMLINE** comes in 13" to 34" lengths and 3000K or 4000K color temperatures. The 1/2" low profile body is sealed for IP68 rating and can be mounted to either the short, 8" cantilever, 36" cable, 18" pendant or surface mount bracket.

Technical Specifications

Color Temperature		3000K	4000K
output	beam spread	120°	
	lumens	357	443
	LEDs per foot	6	
	lifetime	> 60,000 hours / L70 or better	
electrical	input voltage	20-24VDC constant voltage	
	power consumption	8W / ft	
physical	dimensions	A x 1.4" x 0.5"	
	weight	1 lbs / ft	
	housing	extruded and die cast aluminum	
	mounting	short bracket, cantilever 8", cable 36", pendant 18", surface	
	operating temperature	-20°C to 50°C	
	junction temperature	74°C @ TA 25°C	
control	interface	0-10VDC, DMX, RMD dimming	
	remote power	120' (w/ 10 AWG)	
certification and safety	certification	ETL / cETL	
	standards	UL-Class II, IES LM-79, LM-80	
	environment	dry / damp / wet location, IP68	

Due to continuous development and improvements, specifications are subject to change without notice.

Ordering

example: SL-2-3K-DMX-SB

SL					
model	**length**	**color temperature**	**options**	**accessories**	
SL - SLIMLINE	**1** - 305mm (13.2")	**3K** - Warm White	**D** - Dimming 0-10V	**SB** - Short Bracket	**S** - Surface Mount
	2 - 590mm (23.2")	**4K** - Cool White	**DMX** - DMX 512	**CL** - Cantilever 8"	**EMR** - Emergency
	3 - 875mm (34.4")		**RMD** - RMD Dimming	**C** - Cable Line 36"	Backup-Remote (120V)
			LP - Lumen Priority	**P** - Pendant 18"	

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www.solidstateluminaires.com . p 877-SSL-GREEN . f 630-869-8106

Rev 09/2010

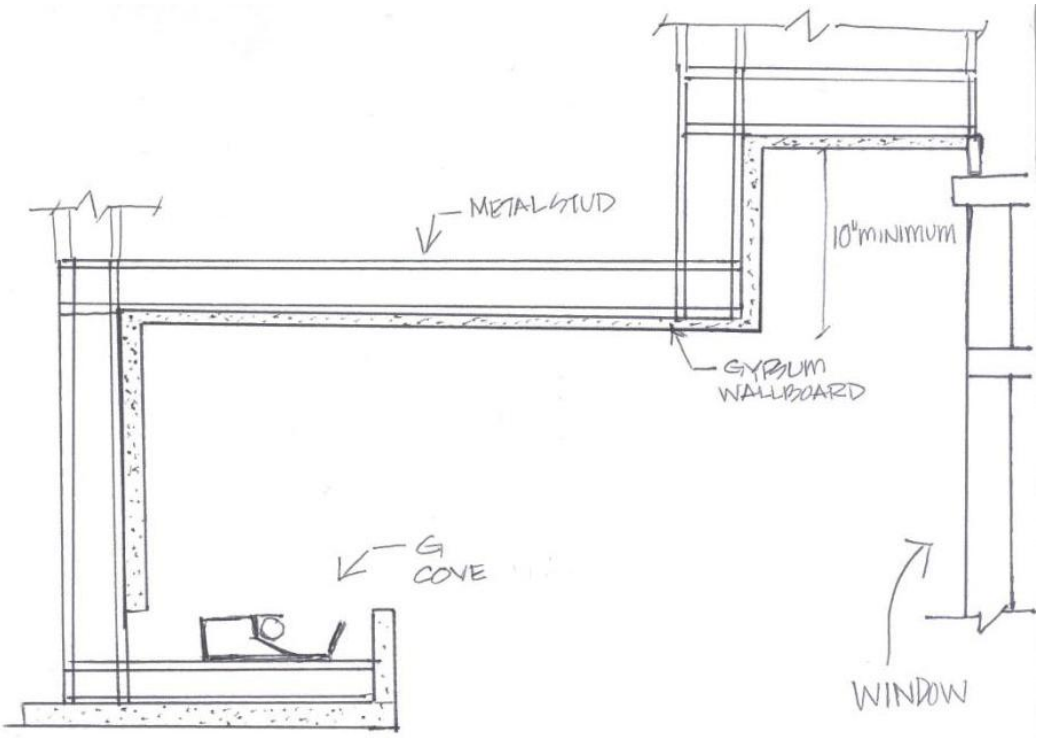


Figure 8: Lobby Cove Detail | NTS

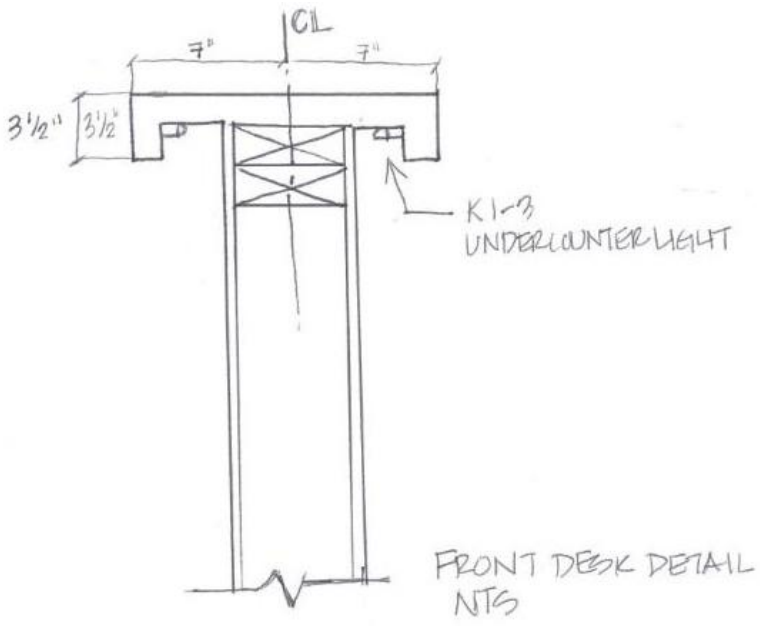


Figure 9: Reception Desk Detail | NTS

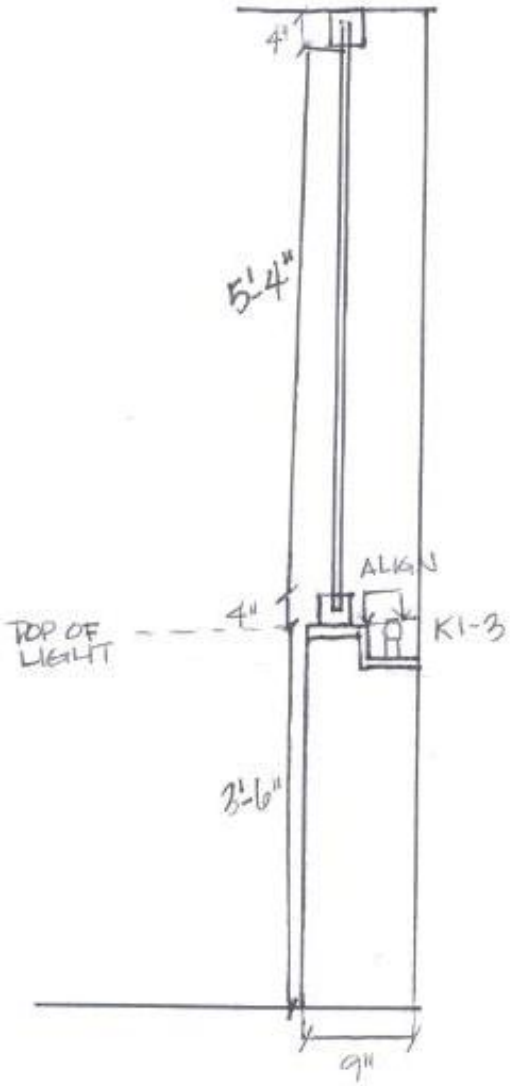


Figure 10: Entry Feature Wall Detail in Lobby | NTS

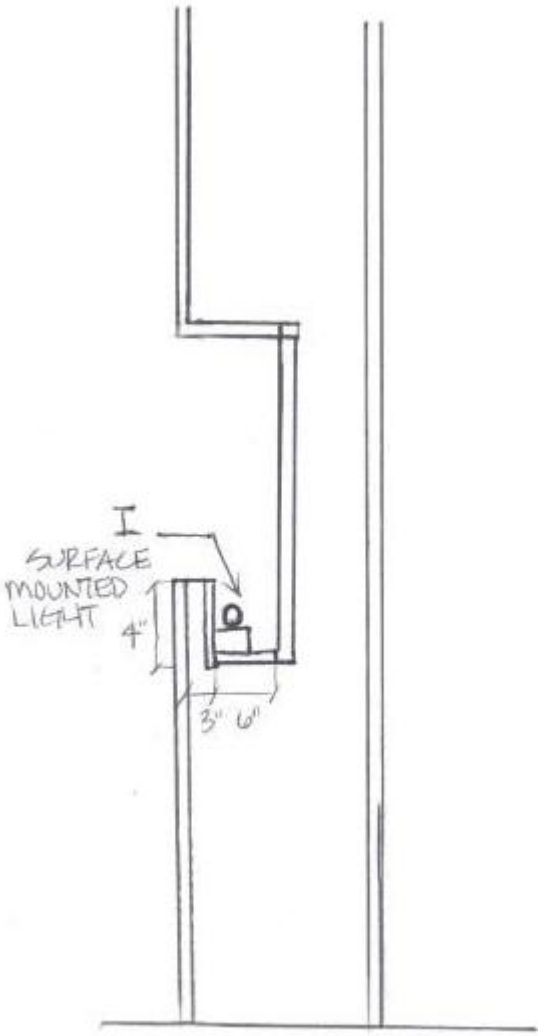


Figure 11: Restaurant Signage Display | NTS

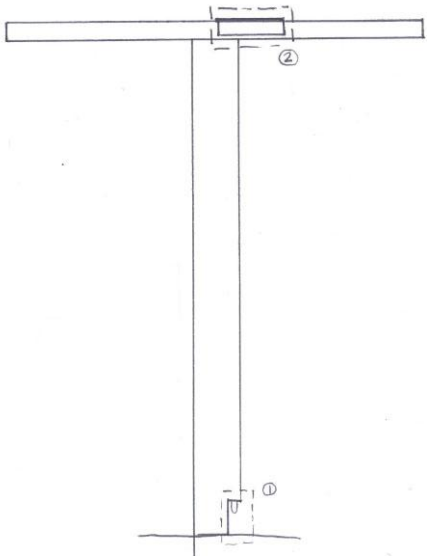


Figure 12: Section of Bar in Lounge | NTS

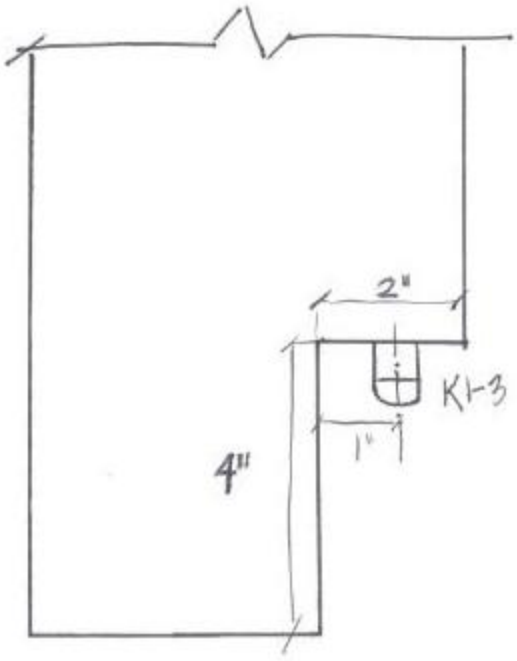


Figure 13: Toe Kick Detail at Bar | NTS

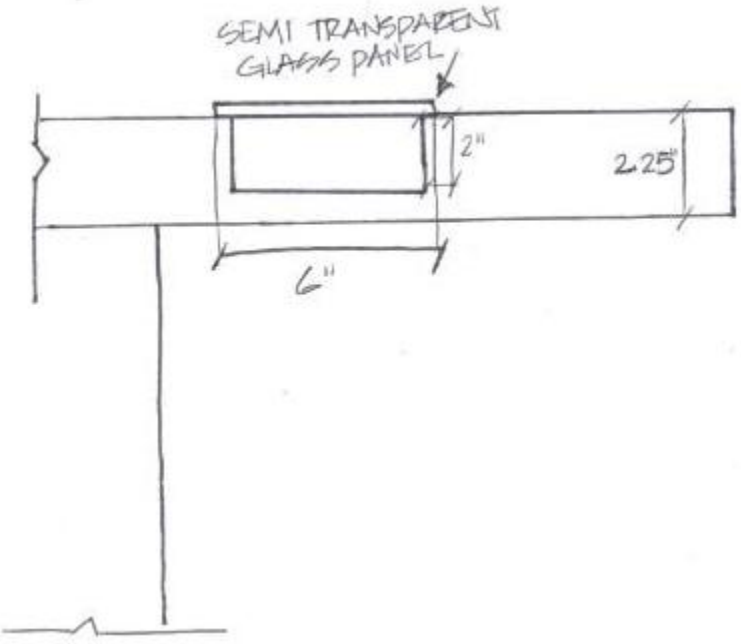


Figure 14: Squares Detail on Bar | NTS

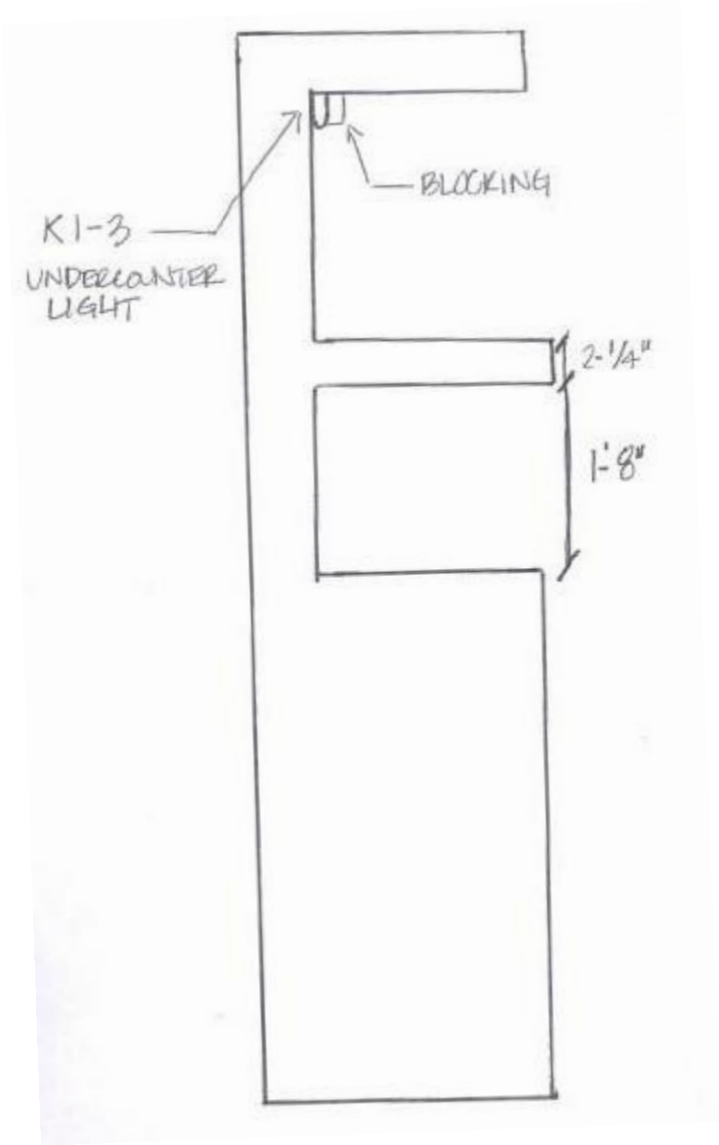


Figure 15: Lounge Back Bar Detail | NTS

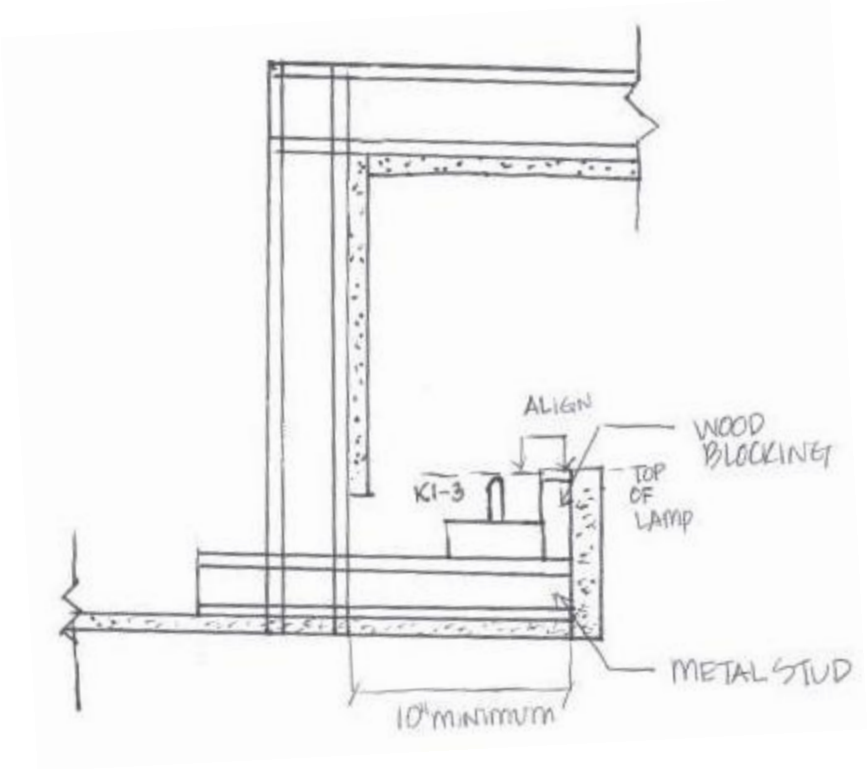
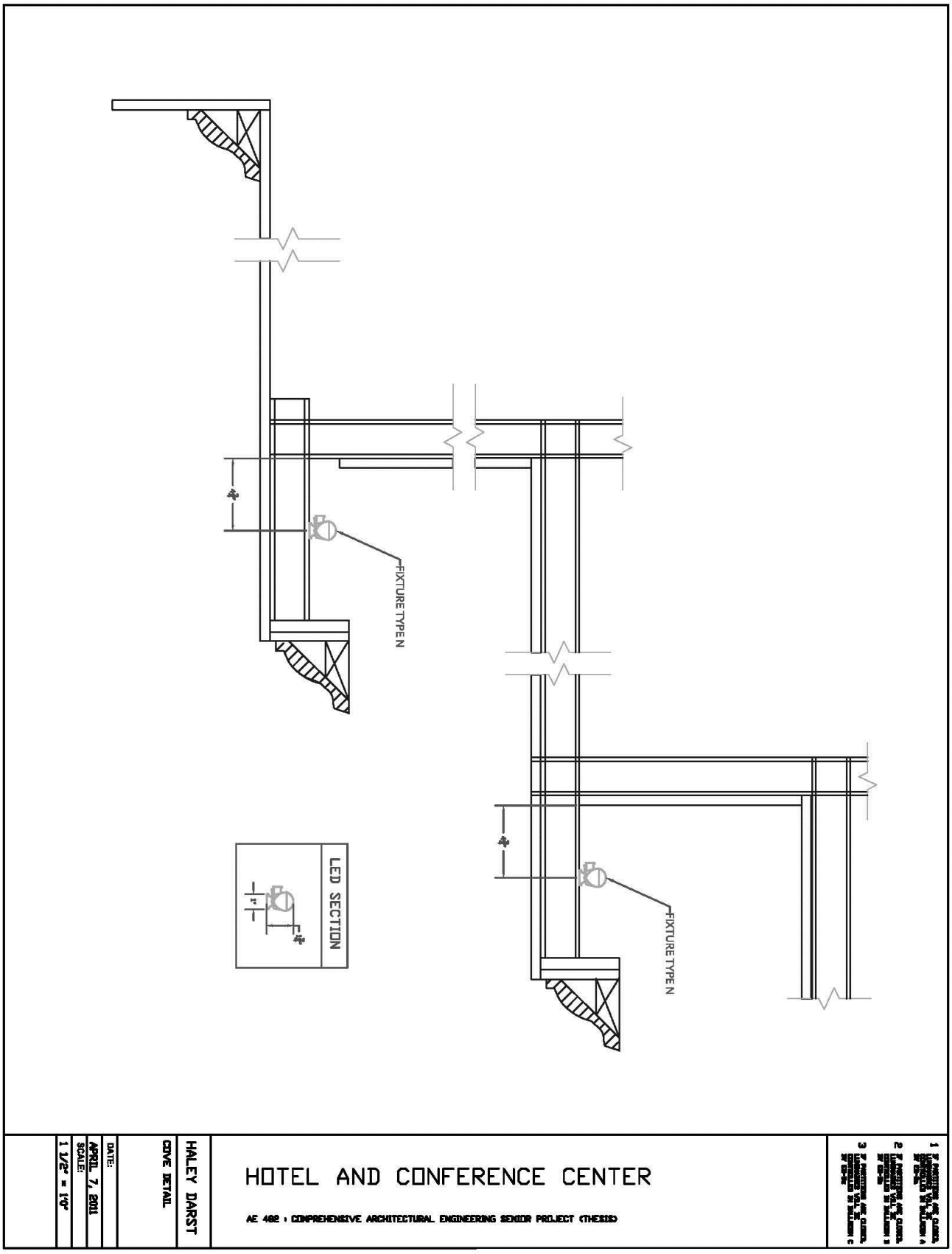


Figure 16: Lounge Cove Detail | NTS


FIXTURE TYPE N
FIXTURE TYPE N
LED SECTION
HOTEL AND CONFERENCE CENTER
AE 402 : COMPREHENSIVE ARCHITECTURAL ENGINEERING SENIOR PROJECT (THESIS)
HALEY DARST
COVE DETAIL
DATE:
APRIL 7, 2001
SCALE:
1 1/2" = 1'-0"

Appendix B

Equipment Cutsheets

(lamps, ballasts, drivers, controls, and other equipment)

WORLDWIDE PARTNER

GE Lighting

Commercial Products & Solutions

SITE SEARCH | HOME | PRODUCTS | EDUCATION / RESOURCES | LIGHTING APPLICATIONS

Where to Buy | FAQs | Contact Us | EliteNet

Products > Compact Fluorescent > 41 - 60 Watts > 97633

97633 – F42TBX/827/A/ECO

GE Ecolux® Biax® T4 - Facilities; Retail Display; Hospitality; Office; Restaurant; Warehouse

Print this Page

Convert to PDF

High Color Rendering
Energy Savings

Bulb

Base

View Larger

GENERAL CHARACTERISTICS

Lamp type	Compact Fluorescent - Plug-In
Bulb	T4
Base	GX24-q4
Wattage	42
Voltage	120/135
Rated Life	17000 hrs
Starting Temperature (MIN)	-18 °C (-0 °F)
Cathode Resistance	2.700 Ohm
LEED-EB MR Credit	66 picograms Hg per mean lumen hour
Rated Life (rapid start) @ Time	17000 h @ 3 h 20000 h @ 12 h
Additional Info	Dimmable with appropriate dimming ballast., End of Life Protection (EOL), TCLP compliant
Primary Application	Facilities; Retail Display; Hospitality; Office; Restaurant; Warehouse

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	3200
Mean Lumens	2690
Nominal Initial Lumens per Watt	76
Color Temperature	2700 K
Color Rendering Index (CRI)	82

ELECTRICAL CHARACTERISTICS

Current (max)	5.2500 A
Open Circuit Voltage (after preheating) (MAX)	265 V
Open Circuit Voltage (MIN)	515 V
Lamp Current	0.320 A
Preheat Voltage (MIN)	4 V

ADDITIONAL RESOURCES

Catalogs
Testimonials
Brochures
Product Brochures
- Ecolux

Sell Sheets
- Fast Warming
- Biax® T/E 42W

Disposal Policies & Recycling Information

Current Crest Factor (MAX)	1.7
Supply Current Frequency	20000 Hz

DIMENSIONS

Maximum Overall Length (MOL)	6.4000 in (162.5 mm)
Nominal Length	6.400 in (162.5 mm)
Base Face to Top of Lamp	5.770 in (146.5 mm)

PRODUCT INFORMATION

Product Code	97633
Description	F42TBX/827/A/ECO
ANSI Code	60901-IEC-7442-2
Standard Package	Case
Standard Package GTIN	10043168976333
Standard Package Quantity	10
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	10
UPC	043168976336

COMPATIBLE GE BALLASTS

Product Code	Description	# of Bulbs	Power Factor	Ballast Factor
47506	C242UNVBES-IP	1	0.93	1.0
71445	GEC226-MVPS-3W	1	0.98	0.98
71443	GEC226-MVPS-BES	1	0.98	0.98
71444	GEC226-MVPS-SE	1	0.98	0.98
71441	GEC242-MVPS-3W	1	0.99	1.0
71439	GEC242-MVPS-BES	1	0.99	1.0
71440	GEC242-MVPS-SE	1	0.99	1.0

⚠ CAUTIONS & WARNINGS

See list of cautions & warnings.

NOTES

- 4-Pin lamp minimum starting temperature is a function of the ballast. Most ballasts are rated with a minimum starting temperature of 50 degrees F (10 C). Ballasts are also available that provide reliable starting to 0 degrees F (-18C) and -20 F (-29C).
- Amalgam product experience stable brightness over a wider temperature range and in various operating positions.
- Based on 60Hz reference circuit.
- Fluorescent lamp lumens decline during life

PHILIPS ADVANCE

REB-2S26-M1-BS-DIM	
Brand Name	AMBISTAR
Ballast Type	Electronic Dimming
Starting Method	Rapid Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
CFQ26W/G24Q	1	26	50/10	0.23	09/27	0.15/0.85	150	0.80	1.7	3.15
CFQ26W/G24Q	2	26	50/10	0.45	17/52	0.15/0.85	150	0.80	1.7	1.63
CFTR26W/GX24Q	1	26	50/10	0.23	09/27	0.15/0.85	150	0.80	1.7	3.15
CFTR26W/GX24Q	2	26	50/10	0.45	17/52	0.15/0.85	150	0.80	1.7	1.63
CFTR32W/GX24Q	1	32	50/10	0.30	10/35	0.15/0.85	150	0.80	1.7	2.43
* CFTR42W/GX24Q	1	42	50/10	0.40	11/47	0.15/0.85	150	0.80	1.7	1.81

Wiring Diagram

Diag. 134

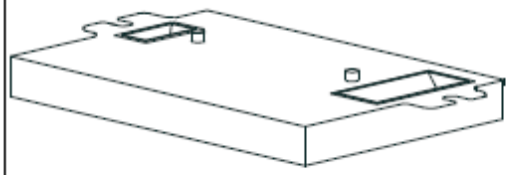
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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

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

Enclosure



Enclosure Dimensions

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

Revised 09/11/2007

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

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

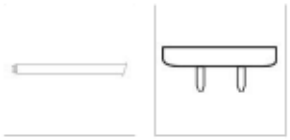
GE Lighting

45741 - F17T8/SP30/ECO

GE Ecolux® Starcoat® T8

• Passes TCLP, which can lower disposal costs.

High Color Rendering



CAUTIONS & WARNINGS

Caution

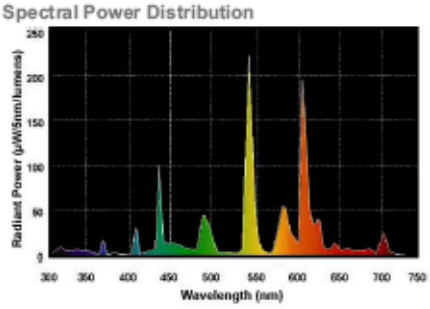
•

Warning

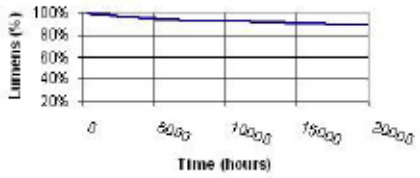
•

GRAPHS & CHARTS

Spectral Power Distribution



Lumen Maintenance



Lamp Mortality

GENERAL CHARACTERISTICS

Lamp Type	Linear Fluorescent - Straight Linear
Bulb	T8
Base	Medium Bi-Pin (G13)
Rated Life	20000 hrs
Rated Life (instant start) @ Time	15000 h @ 3 h
Rated Life (rapid start) @ Time	20000 h @ 12 h 20000.0 @ 3.0/24000.0 @ 12.0 h
Bulb Material	Soda lime
Starting Temperature	10 K (50 °F)
LEED-EB MR Credit	157 picograms Hg per mean lumen hour
Additional Info	TCLP compliant

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	1325
Mean Lumens	1260
Nominal Initial Lumens per Watt	77
Color Temperature	3000 K
Color Rendering Index (CRI)	78
S/P Ratio (Scotopic/Photopic Ratio)	1.3

ELECTRICAL CHARACTERISTICS

Wattage	17
Voltage	70
Open Circuit Voltage (rapid start)	285 V
Open Circuit Voltage (rapid start) Min @ Temperature	210 V @ 10 °C
Cathode Resistance Ratio - Rh/Rc (MIN)	4.25
Cathode Resistance Ratio - Rh/Rc (MAX)	6.5
Current Crest Factor	1.7

DIMENSIONS

Maximum Overall Length (MOL)	23.7800 in(604.0 mm)
Minimum Overall Length	23.67 ft
Nominal Length	24.000 in(609.6 mm)
Bulb Diameter (DIA)	1.000 in(25.4 mm)
Bulb Diameter (DIA) (MIN)	0.940 in(23.9 mm)
Bulb Diameter (DIA) (MAX)	1.100 in(27.9 mm)
Max Base Face to Base Face (A)	23.220 in(589.8 mm)
Face to End of Opposing Pin (B) (MIN)	23.400 in(594.4 mm)
Face to End of Opposing Pin (B) (MAX)	23.500 in(596.9 mm)
End of Base Pin to End of Opposite Pin End (C)	23.670 in(601.2 mm)

PRODUCT INFORMATION

Product Code	45741
Description	F17T8/SP30/ECO
ANSI Code	1001-1
Standard Package	Case
Standard Package GTIN	10043168457412
Standard Package Quantity	24
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	24
UPC	043168457415

For additional information, visit www.gelighting.com

Page 1

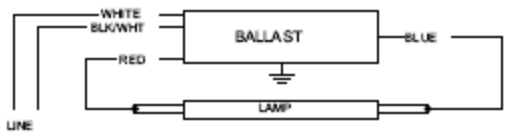
PHILIPS ADVANCE

REL-1P32-SC	
Brand Name	STANDARD ELEC
Ballast Type	Electronic
Starting Method	Instant Start
Lamp Connection	Parallel
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
* F17T8	1	17	0/-18	0.17	19	0.95	30	0.93	1.7	5.00
F25T8	1	25	0/-18	0.21	24	0.92	25	0.96	1.7	3.83
F32T8	1	32	0/-18	0.28	32	0.92	20	0.98	1.5	2.88
F32T8/ES (30W)	1	30	60/16	0.25	29	0.92	20	0.98	1.7	3.17

Wiring Diagram



Diag. 63

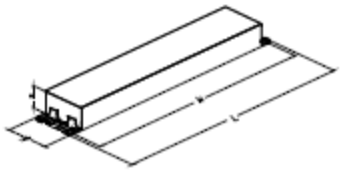
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White	25L	63.5
Red/White		0

Enclosure



Enclosure Dimensions

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

Revised 08/21/2002

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

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GE Lighting

97551 - F5BX/827/ECO

GE Ecolux® Biax® T4 - Facilities; Retail Display; Hospitality; Office; Restaurant; Warehouse

• Passes TCLP, which can lower disposal costs.

High Color Rendering

Photo Not Available

Energy Savings

GENERAL CHARACTERISTICS

Lamp Type	Compact Fluorescent - Plug-In
Bulb	T4
Base	G23
Rated Life	10000 hrs
Starting Temperature	-18 °C (-0 °F)
Cathode Resistance	11.1 Ohm
LEED-EB MR Credit	1818 picograms Hg per mean lumen hour
Additional Info	TCLP compliant
Primary Application	Facilities;Retail Display;Hospitality;Office;Restaurant;'

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	265
Mean Lumens	220
Nominal Initial Lumens per Watt	53
Color Temperature	2700 K
Color Rendering Index (CRI)	82

ELECTRICAL CHARACTERISTICS

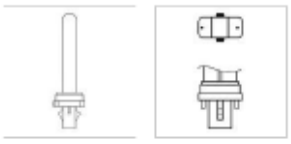
Wattage	5
Voltage	120
Open Circuit Voltage Across Starter	198 V
Lamp Current	0.18 A
Current Crest Factor	1.7
Supply Current Frequency	60 Hz

DIMENSIONS

Maximum Overall Length (MOL)	4.2500 in(107.9 mm)
Nominal Length	4.200 in(106.7 mm)
Bulb Diameter (DIA)	0.500 in(12.7 mm)
Bulb Diameter (DIA) (MAX)	
Base Face to Top of Lamp	3.230 in(82.0 mm)

PRODUCT INFORMATION

Product Code	97551
Description	F5BX/827/ECO
ANSI Code	60901-IEC-0005-1
Standard Package	BUNDLE
Standard Package GTIN	
Standard Package Quantity	100
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	100
UPC	043168975513



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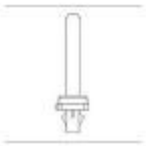

CAUTIONS & WARNINGS

Caution

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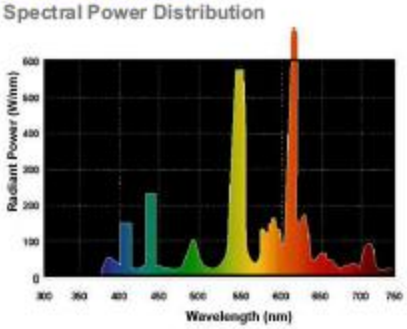
GRAPHS & CHARTS

Spectral Power Distribution



NOTES

- Based on 60Hz reference circuit.
- Fluorescent lamp lumens decline during life

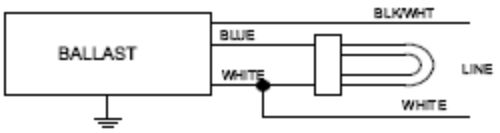
PHILIPS ADVANCE

VH-1B9-TP-BLS	
Brand Name	COMPACT-HPF
Ballast Type	Magnetic
Starting Method	Pre-Heat
Lamp Connection	Series
Input Voltage	277
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Starting Current (Amps)	Open Circuit (Amps)	Input Power (Watts)	Ballast Factor	MAX THD %	Power Factor
CFQ9W/G23	1	9	0/-18	0.05	0.18	0.17	15	0.95	35	0.95
* CFT5W/G23	1	5	0/-18	0.05	0.18	0.17	11	0.95	50	0.82
CFT7W/G23	1	7	0/-18	0.05	0.18	0.17	12	0.93	45	0.84
CFT9W/G23	1	9	0/-18	0.05	0.18	0.17	12	0.94	35	0.89

Wiring Diagram



Diag. 47

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

Standard Lead Length (inches)

	in.	cm.
Black		0
White	7	17.8
Blue	7	17.8
Red		0
Yellow		0
Gray		0
Violet		0

	in.	cm.
Yellow/Blue		0
Blue/White		0
Brown		0
Orange		0
Orange/Black		0
Black/White	7	17.8
Red/White		0

Enclosure

Enclosure Dimensions

OverAll (L)	Width (std)/(TP)	Height (H)	Mounting (M)
4.75 "	2.21875 "/0 "	1.625 "	4.375 "
4 3/4	2 7/32 / 0	1 5/8	4 3/8
12.1 cm	5.6 cm / 0 cm	4.1 cm	11.1 cm

Revised 07/01/1999

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GE Lighting

41487 - Q35MR16/CCG40

GE ConstantColor® Precise™ MR16

-UV protection

CAUTIONS & WARNINGS

Caution

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Warning

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-

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GENERAL CHARACTERISTICS

Lamp Type	Halogen - MR
Bulb	MR16
Base	2-Pin (GU5.3)
Filament	CC-6
Rated Life	4000 hrs
Lamp Enclosure Type (LET)	Covered glass

PHOTOMETRIC CHARACTERISTICS

Center Beam Candlepower (CBCP)	920
Color Temperature	2950 K

ELECTRICAL CHARACTERISTICS

Wattage	35
Voltage	24
Burn Position	Universal burning position

DIMENSIONS

Maximum Overall Length (MOL)	1.875 cm
Bulb Diameter (DIA)	2 cm
Bulb Diameter (DIA) (MAX)	

PRODUCT INFORMATION

Product Code	41487
Description	Q35MR16/CCG40
Standard Package	BUNDLE
Standard Package GTIN	30043168414877
Standard Package Quantity	20
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	20
UPC	043168414876

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For additional information, visit www.gelighting.com

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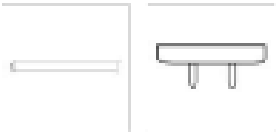
GE Lighting

25611 - F32T8/SPX30/ECO

GE Ecolux® Starcoat® T8

- Contains TCLP, which can have disposal costs.

High Color Rendering



CAUTIONS & WARNINGS

Caution

-

Warning

-

GENERAL CHARACTERISTICS

Lamp Type	Linear Fluorescent - Straight Linear
Bulb	T8
Base	Medium Bi-Pin (G13)
Rated Life	30000 hrs
Rated Life (instant start) @ Time	21000 h @ 3 h
	30000 h @ 12 h
Rated Life (rapid start) @ Time	30000.0 @ 3.0 36000.0 @ 12.0 h
Bulb Material	Soda lime
Starting Temperature	10 K (50 °F)
LEED-EB MR Credit	35 picograms Hg per mean lumen hour
Additional Info	TCLP compliant

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	2950
Mean Lumens	2800
Nominal Initial Lumens per Watt	92
Color Temperature	3000 K
Color Rendering Index (CRI)	85

ELECTRICAL CHARACTERISTICS

Wattage	32
Voltage	137
Open Circuit Voltage (rapid start) Min @ Temperature	315 V @ 10 °C
Cathode Resistance Ratio - Rh/Rc (MIN)	4.25
Cathode Resistance Ratio - Rh/Rc (MAX)	6.5
Current Crest Factor	1.7

DIMENSIONS

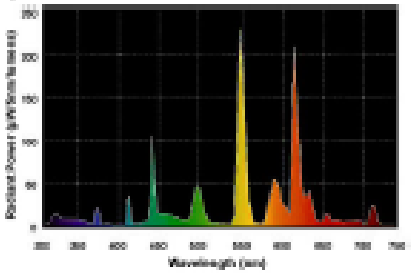
Maximum Overall Length (MOL)	47.78 cm
Minimum Overall Length	47.57 cm
Nominal Length	48.000 in (1219.2 mm)
Bulb Diameter (DIA)	1 cm
Bulb Diameter (DIA) (MIN)	0.94 cm
Bulb Diameter (DIA) (MAX)	1.1 cm
Max Base Face to Base Face (A)	47.22 cm
Face to End of Opposing Pin (B) (MIN)	47.4 cm
Face to End of Opposing Pin (B) (MAX)	47.5 cm
End of Base Pin to End of Opposite Pin End (C)	47.57 cm

PRODUCT INFORMATION

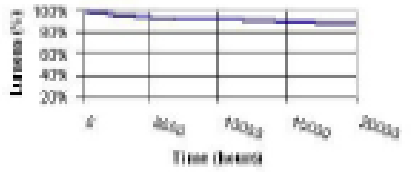
Product Code	25611
Description	F32T8/SPX30/ECO
ANSI Code	1085-2
Standard Package	Case
Standard Package GTIN	10043168256114
Standard Package Quantity	36
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	36
UPC	043168256117

GRAPHS & CHARTS

Spectral Power Distribution



Lumen Maintenance



Lamp Mortality

For additional information, visit www.gelighting.com

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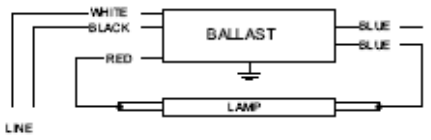
PHILIPS ADVANCE

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

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (ANSI Watts)	Ballast Factor	MAX THD %	Power Factor	MAX Lamp Current Crest Factor	B.E.F.
F17T8	1	17	0/-18	0.30	19	1.02	150	0.50	1.7	5.37
F17T8	2	17	0/-18	0.45	31	0.91	140	0.50	1.7	2.94
F25T8	1	25	0/-18	0.39	26	1.00	150	0.50	1.7	3.85
F25T8	2	25	0/-18	0.61	43	0.89	130	0.50	1.7	2.07
* F32T8	1	32	0/-18	0.48	33	1.00	140	0.50	1.7	3.03
F32T8	2	32	0/-18	0.80	56	0.88	120	0.50	1.7	1.57

Wiring Diagram



Diag. 68

Insulate unused blue lead for 1000V

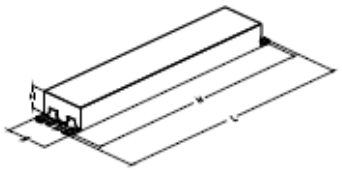
The wiring diagram that appears above is for the lamp type denoted by the asterisk (*)

Standard Lead Length (inches)

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

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

Enclosure



Enclosure Dimensions

OverAll (L)	Width (W)	Height (H)	Mounting (M)
9.50 "	1.7 "	1.18 "	8.90 "
9 1/2	1.7/10	1.9/50	8.9/10
24.1 cm	4.3 cm	3 cm	22.6 cm

Revised 09/11/2007

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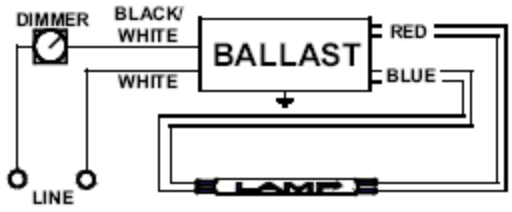
PHILIPS ADVANCE

REZ-132-SC	
Brand Name	MARK 10 POWERLINE
Ballast Type	Electronic Dimming
Starting Method	Programmed Start
Lamp Connection	Series
Input Voltage	120
Input Frequency	60 HZ
Status	Active

Electrical Specifications

Lamp Type	Num. of Lamps	Rated Lamp Watts	Min. Start Temp (°F/C)	Input Current (Amps)	Input Power (Watts) (min/max)	Ballast Factor (min/max)	MAX THD %	Power Factor	Lamp Current Crest Factor	B.E.F.
F17T8	1	17	50/10	0.20	07/24	0.05/1.05	10	0.99	1.6	4.38
F25T8	1	25	50/10	0.26	07/30	0.05/1.05	10	0.99	1.6	3.50
* F32T8	1	32	50/10	0.29	09/35	0.05/1.00	10	0.99	1.6	2.86

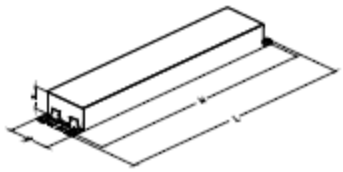
Wiring Diagram



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

Standard Lead Length (inches)

Enclosure



Enclosure Dimensions

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

Revised 08/04/2010

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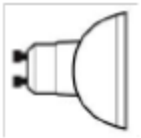
GE Lighting

16751 - Q50GU10/FL/CD

GE Edison™ Quartzline® MR16

- Edison™ halogen bulbs provide a brighter, crisper light that makes your home look its best
- That's why professionals choose Edison for exceptional results and longer bulb life.
- Showcase the beauty of your home with the highest quality of light.



GENERAL CHARACTERISTICS

Lamp Type	Halogen - MR
Bulb	MR16
Base	GU10
Filament	CC-2V
Rated Life	3000 hrs
Primary Application	Indoor Floodlight

PHOTOMETRIC CHARACTERISTICS

Center Beam Candlepower (CBCP)	1000
Color Temperature	2750 K

ELECTRICAL CHARACTERISTICS

Wattage	50
Voltage	120

DIMENSIONS

Maximum Overall Length (MOL)	2.1250 in(54.0 mm)

PRODUCT INFORMATION

Product Code	16751
Description	Q50GU10/FL/CD
Standard Package	Case
Standard Package GTIN	10043168167519
Standard Package Quantity	5
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	5
UPC	043168167512

CAUTIONS & WARNINGS

Caution

- Lamp may shatter and cause injury if broken
  - Dispose of lamp in a closed container.
  - Do not use lamp if outer glass is scratched or broken.

Warning

- Risk of Burn
  - Allow lamp to cool before handling.
- A damaged lamp emits UV radiation which may cause eye/skin injury
  - Turn power off if glass bulb is broken. Remove and dispose of lamp.
- Pressurized lamp--unexpected rupture may cause injury, fire, or property damage
  - Do not exceed rated voltage.
  - Do not use lamp if outer glass is scratched or broken.
- Risk of Fire
  - In table lamp, use only with shade.
  - Keep combustible materials away from lamp.
  - Use in fixture rated for this product.
- Risk of Electric Shock
  - Turn power off before inspection, installation or removal.

*Two year life based on rated life at 4 hours/day.

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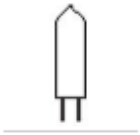
GE Lighting

34676 - Q100T3/12V/CL

GE T3



CAUTIONS & WARNINGS

Caution

-

Warning

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GENERAL CHARACTERISTICS

Lamp Type	Halogen - Single-Ended
Bulb	T3
Base	2-Pin (GY6.35)
Filament	CC-6
Rated Life	2000 hrs

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	2350
Nominal Initial Lumens per Watt	23

ELECTRICAL CHARACTERISTICS

Wattage	100
Voltage	12

DIMENSIONS

Maximum Overall Length (MOL)	1.75 cm
Bulb Diameter (DIA)	0.375 cm
Bulb Diameter (DIA) (MAX)	

PRODUCT INFORMATION

Product Code	34676
Description	Q100T3/12V/CL
Standard Package	BUNDLE
Standard Package GTIN	30043168346765
Standard Package Quantity	100
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	100
UPC	043168346764

Apr 4, 2011 12:39:51 PM
For additional information, visit www.gelighting.com

Page 1

GE Lighting

19377 - Q75T4/CL/CD 5PK

GE Quartz T4 - Display Lights

- GE's specialty bulbs offer innovative solutions for a variety of lighting needs.
- Uses Halogen technology for a brighter, crisper light

GENERAL CHARACTERISTICS

Lamp Type	Halogen - Single-Ended
Bulb	T4
Base	2-Pin (GY6.35)
Filament	C-6
Rated Life	2000 hrs
Primary Application	Display Lights

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	1600
Nominal Initial Lumens per Watt	21

ELECTRICAL CHARACTERISTICS

Wattage	75
Voltage	12

DIMENSIONS

Maximum Overall Length (MOL)	1.75 cm
Bulb Diameter (DIA)	0.5 cm
Bulb Diameter (DIA) (MAX)	
Light Center Length (LCL)	1.125 cm

PRODUCT INFORMATION

Product Code	19377
Description	Q75T4/CL/CD 5PK
Standard Package	Master
Standard Package GTIN	10043168193778
Standard Package Quantity	25
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	25
UPC	043168993777

CAUTIONS & WARNINGS

Caution

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Warning

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For additional information, visit www.gelighting.com

Page 1

GE Lighting

42959 - Q5T3/CL

GE T3

GENERAL CHARACTERISTICS

Lamp Type	Halogen - Single-Ended
Bulb	T3
Base	2-Pin (G4)
Filament	C-6
Rated Life	2000 hrs

PHOTOMETRIC CHARACTERISTICS

Initial Lumens	60
Nominal Initial Lumens per Watt	12

ELECTRICAL CHARACTERISTICS

Wattage	5
Voltage	12

DIMENSIONS

Maximum Overall Length (MOL)	1.25 cm
Bulb Diameter (DIA)	0.375 cm
Bulb Diameter (DIA) (MAX)	
Light Center Length (LCL)	0.75 cm

PRODUCT INFORMATION

Product Code	42959
Description	Q5T3/CL
Standard Package	BUNDLE
Standard Package GTIN	30043168429598
Standard Package Quantity	100
Sales Unit	Unit
No Of Items Per Sales Unit	1
No Of Items Per Standard Package	100
UPC	043168429597

CAUTIONS & WARNINGS

Caution

-

Warning

-
-
-

Apr 4, 2011 2:29:24 PM
For additional information, visit www.gelighting.com

Page 1

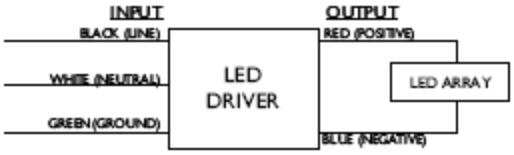
PHILIPS
ADVANCE

LED-120A-0024V-14-F-O	
Brand Name	XITANIUM
Driver Type	Electronic
Input Voltage	120
Input Frequency	50/60Hz
RoHS	Yes
Status	Active

Electrical Specifications

Max. Output Power (W)	Output Voltage (V)	Output Current (A)	Operating Temp. Range (°F/°C)	Input Current at 120V (A)	Max. Input Power (W)	Inrush Current ($A_{pk}/\mu s$)	Max. THD (%)	Min. Power Factor	Surge Protection (KV)	Weight (Lbs)	IP Rating
34	2.8~24.0	1.4	-40°~140°F (-40~60°C)	0.35	42	-	20	0.9	2.0	0.75/340	IP66

Wiring Diagram



Input and Output use lead-wires.
Lead-wires are 18AWG 105C/600V solid copper

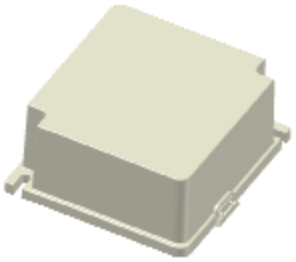
Standard Lead Length

	in.	cm.
Black	6	15
White	6	15
Blue	6	15
Red	6	15
Green	6	15
Violet		

Maximum Wiring Distance (at full load)

Wire Size (AWG)	Distance (feet)
26	4
24	7
22	11
20	17
18	27
16	43
14	69
12	105
10	179

Enclosure



	in. (mm)
Case Length	3.30 (83)
Case Width	3.53 (89)
Case Height	1.50 (38)
Mounting Length	2.78 (70)
Mounting Width	3.02 (76)
Overall Length	3.30 (83)

c UL us — UL Class 2 E220165

c SP us — 7310_S-000 3426-32

Revised 07/15/2009

PHILIPS LIGHTING ELECTRONICS N.A.
10275 WEST HIGGINS ROAD · ROSEMONT, IL 60018
Tel: 800-322-2086 · Fax: 888-423-1882 · www.philips.com/advance
Customer Support/Technical Service: 800-372-3331 · OEM Support: 866-915-5886

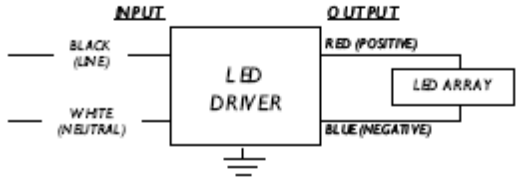
PHILIPS
ADVANCE

LED-120A-0024V-18-F-O	
Brand Name	XITANIUM
Driver Type	Electronic
Input Voltage	120
Input Frequency	50/60Hz
RoHS	Yes
Status	Active

Electrical Specifications

Max. Output Power (W)	Output Voltage (V)	Output Current (A)	Operating Temp. Range (°F/°C)	Input Current at 120V (A)	Max. Input Power (W)	Inrush Current ($A_{pk}/\mu s$)	Max. THD (%)	Min. Power Factor	Surge Protection (KV)	Weight (Lbs)	IP Rating
40	2.8–24.0	1.75	-40°~140°F (-40~60°C)	0.42	50	-	20	0.9	2.0	0.75/340	IP66

Wiring Diagram



Input and Output use lead-wires.
Lead-wires are 18AWG 105C/600V solid copper

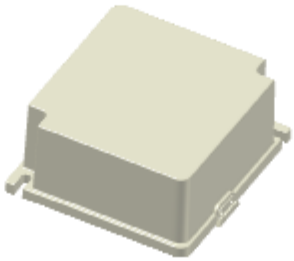
Standard Lead Length

	in.	cm.
Black	6	15
White	6	15
Blue	6	15
Red	6	15
Green		
Violet		

Maximum Wiring Distance (at full load)

Wire Size (AWG)	Distance (feet)
26	3
24	5
22	9
20	14
18	22
16	34
14	55
12	84
10	143

Enclosure



	in. (mm)
Case Length	3.30 (83)
Case Width	3.53 (89)
Case Height	1.50 (38)
Mounting Length	2.78 (70)
Mounting Width	3.02 (76)
Overall Length	3.30 (83)

c UL us — UL Class 2 E220165

c SA us — 7310_S-000 3426-32

Revised 07/15/2009

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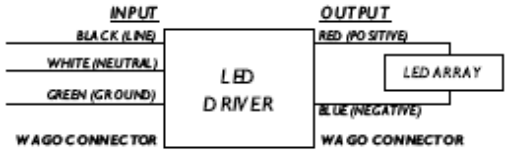
PHILIPS
ADVANCE

Electrical Specifications

LED-120A-0012V-21-F	
Brand Name	XITANIUM
Driver Type	Electronic
Input Voltage	120
Input Frequency	50/60Hz
RoHS	No
Status	Active

Max. Output Power (W)	Output Voltage (V)	Output Current (A)	Operating Temp. Range (°F/°C)	Input Current at 120V (A)	Max. Input Power (W)	Inrush Current ($A_p/\mu s$)	Max. THD (%)	Min. Power Factor	Surge Protection (KV)	Weight (Lbs)	IP Rating
25	2.8~12.0	2.1	-40°~140°F (-40~60°C)	0.25	30.5	-	20	0.9	2.0	0.6/275	IP20

Wiring Diagram



Input is Wago 3-position wire trap connector – use 18AWG solid or tinned stranded.
Output is Wago 4-pin wire trap connector – use 20AWG solid or tinned stranded.

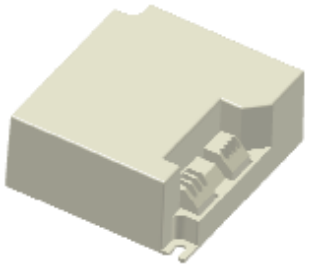
Standard Lead Length

	in.	cm.
Black		
White		
Blue		
Red		
Green		
Violet		

Maximum Wiring Distance (at full load)

Wire Size (AWG)	Distance (feet)
26	3
24	4
22	7
20	11
18	18
16	28
14	46
12	70
10	119

Enclosure



	in. (mm)
Case Length	3.30 (83)
Case Width	3.06 (77)
Case Height	1.34 (33.7)
Mounting Length	2.91 (73.4)
Mounting Width	2.67 (67.4)
Overall Length	3.29 (83)

c UL us — UL Class 2 E220165

C SP US — 7310_S-000 3426-32

Revised 10/19/2009

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PHILIPS
ADVANCE

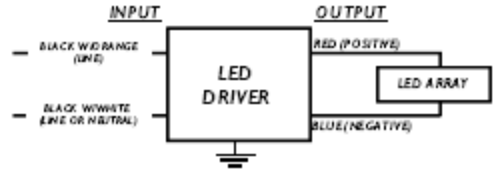
LED-HCNA-0024V-41-F-L-O	
Brand Name	XITANIUM
Description	100W 24V 4.1A
Input Voltage	347~480
Input Frequency	50/60Hz
RoHS	Yes
Status	Active

Electrical Specifications

Output Power (W)	Output Voltage (V)	Output Current (A)	Tcase Max	Input Current (A)	Max. Input Power (W)	Inrush Current ($A_{p-p}/\mu s$)	Max. THD (%)	Min. Power Factor	Surge Protection (KV)	Weight (Lbs)	IP Rating
100	24 cv 3.5~24 cc	0.10~4.16 cv 4.16 cc	85°C	0.32@347V 0.23@480V	117	85/115	20	0.90	3.0	2.84/1270	IP66

cv = constant voltage mode, cc = constant current mode

Wiring Diagram



Input and output use lead-wires.
Lead-wires are 18AWG 105C/600V solid copper

Standard Lead Length

	in.	cm.
Black w/ orange stripe	9	23
Black w/ white stripe	9	23
Blue	9	23
Red	9	23
Gray		
Violet		

Maximum Wiring Distance (at full load)

Wire Size (AWG)	Distance (feet)
26	3
24	4
22	7
20	11
18	18
16	29
14	46
12	71
10	120

Enclosure

	in. (mm)
Case Length	8.34 (211.8)
Case Width	1.76 (42.5)
Case Height	1.1 (27.9)
Mounting Length	8.99 (228.4)
Mounting Width	1.22 (30.9)
Overall Length	9.45 (240)

c UL us
E220165

C SP US

12/21/2010

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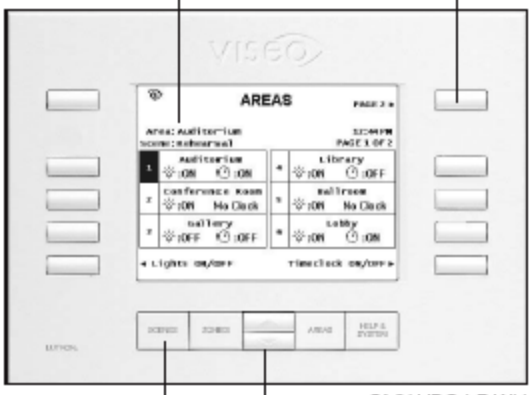
GRAFIK Systems | VISEO | Wallstations

viseo-1 01.10.06

OMX-VDC-LB/OMX-VDC-LF
Viseo® Wallstation



Description

The Viseo Wallstation provides local access to the Lighting Control System.

- Works with GRAFIK 5000™, GRAFIK 6000®, GRAFIK 7000™ Systems.
- Program, monitor, and operate every lighting zone* and scene of a space that is controlled by an individual Processor. For multiple Processor applications, contact Lutron.
- Offers an effective alternative to PC's and other plug-in devices for day-to-day operations.
- Automatically downloads data from your system without reprogramming.
- Modify preset light levels.
- View the lighting status of all the areas in the system.
- View the timeclock status of all the areas in the system
- Take control of any lighting zone* or group of lighting zones* in any area; fine tune in 1% increments with graphic and numeric feedback.
- Program changes to preset light levels, including fade and delay times, in any area.
- Menus and help screens can be displayed in one of 7 languages: English, French, German, Italian, Spanish, Portuguese, or Dutch.

Design Options

Monochrome Color Options:

- High contrast blue/white - OMX-VDC-LB
- Neutral black/white - OMX-VDC-LF

* Does not display Lighting Zone Controller or OMX-3600 zone information.

LUTRON. SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Systems | viseo® | Wallstations

viseo-2 01.10.06

Specifications

Power

Low-voltage Class 2 (PELV)
Operating Voltage: 32 V⎓

Key Design Features

- Liquid Crystal Display (LCD)
  Resolution: 320 x 240 pixels (QVGA)
- Adjustable LCD contrast and backlight brightness.
- Change system time and date.
- Off-line programming allows changes to preset light levels without affecting current lighting scene.
- On-line programming allows for viewing changes to preset light levels as they are being made.
- Central or local options: configure Viseo Wallstation for various control, monitoring and programming options for each individual area of the building.
- Security: set-up and programming configuration options may be restricted via numeric passcode.
- Field upgradeable software: allows future enhancements without hardware changes.
- System information displayed in ASCII 7-bit format (Characters A-Z, a-z, and 0-9) only.
- Menus and help screens can be displayed in one of 7 languages: English, French, German, Italian, Spanish, Portuguese, or Dutch.

System Communications and Capacity

- Low-voltage Class 2 (PELV) wiring connects Wallstations to Processor Panel.
- Up to 32 Wallstations, Control Units, and/or Control Interfaces may be connected per Class 2 (PELV) Control Station Device link. See Low Voltage Wiring page for more details.

Additional Notes

- Hidden spaces will not appear on Viseo stations.
- Viseo does not support hierarchical spaces; they will display all spaces as a single list.

Terminals

Accept up to two #18 AWG (1.0mm²) typical.

Environment

32-104°F (0-40°C). Relative humidity less than 90% non-condensing.

LUTRON. SPECIFICATION SUBMITTAL Page 2

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Systems	LUT-DMX	Control Interfaces

lut-dmx-1 04.30.04

LUT-DMX
DMX512 Control Interface

Description

- Allows GRAFIK Eye lighting controls to operate lighting and other equipment that uses the DMX512 protocol, including:
  - Strobes, fiber optic lighting, and LED-based lamps.
  - Fogger machines.
  - Animated characters and motorized fixtures.
- Converts GRAFIK zone intensities into DMX512 channel settings. Each zone is assigned to a DMX512 channel.
- Works with GRAFIK Eye 3000 and 4000 Series Control Units, as well as GRAFIK 5000/6000/7000 Systems (see DIP switches 1 and 2). Interface does not require an address.

Example of Usage

A DMX512-controlled fiber optic fixture is setup so that:

- Channel 5 controls color channel or dial setting.
- Channel 6 controls shutter open/close.

The Control Unit's scenes are setup so that:

- Zone 5 intensity = desired fiber optic color.
- Zone 6 intensity = desired shutter open/close.

When a scene is selected at the Control Unit:

- DMX512 Interface converts new scene's zone intensities into DMX512 channel settings.
- Fiber optics automatically change color and shutter open/close.

LUTRON. SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

Lutron® | Sivoia QED® roller 20™ shades

Sivoia QED | roller 20

The *Sivoia QED* roller 20 shade utilizes the ultra-quiet, precision controlled Electronic Drive Unit (EDU). The *Sivoia QED* EDU is housed inside the roller shade assembly and controls the movement of the shade, keeps track of the shade's position, and adjusts the shade to the user's desired preset positions.

Sivoia QED roller 20 shade

Features

- Smooth, ultra-quiet operation
- Shades start, move and stop with precision
- Offers programmable stop points. The EDU tracks the position of the shade and is able to adjust it to predetermined locations at the touch of a button
- Provides maximum window coverage with small, symmetrical light gaps, 0.75 in (19 mm) between the shade fabric and the mounting bracket
- Easy-to-read and easy-to-use controls
- Optional infrared (IR) system provides easy, convenient control from anywhere in the room
- Integrates with Lutron lighting control systems and other AV equipment
- Does not require group controllers or relay systems to create shade groups and sub-groups
- The EDU requires only low-voltage wiring
- Power failure memory for the lifetime of the product
- 8 year limited warranty

Specifications

Power

- Requires 24 V⁓, 50 VA
- One transformer is required per EDU
- Power must be provided by a Lutron approved NEC Class 2 power source
- One EDU can power one accessory control (keypads and accessories)

System Capacity

- System allows for a total of 96 devices, including any type of *Sivoia QED* EDU, keypads, Contact Closure Input (CCI) or other interfaces
- If the number of keypads and interfaces in an installation exceeds the number of EDUs, external keypad power supplies are required
- Typical maximum shade size is 20 ft² (1.86 m²)
- Maximum shade size is determined from shade width, fabric type, fabric weight, hembar type etc. (refer to Lutron Shade Configuration Tool (SCT) for your application)

Performance

- Ultra-quiet operation (will not exceed 44dBA measured 3 ft (1 m) from the EDU)
- System allows for symmetrical light gaps as small as 0.75 in (19 mm) on each side
- Each EDU stores programmable presets including open, closed, and any other position
- Presets can be recalled from keypads, CCI's, IR receivers, and other lighting control system interfaces
- Presets can be set with a 5 second button push and hold from the keypads, CCI's, or hand-held remote controls
- Keypad adjustment of presets can be disabled with the "lock out" function on the keypad
- Open and close limits are programmable from the EDU, wall-mounted keypads, and hand-held remote controls
- All system components are Electro Static Discharge (ESD) protected

Grouping

- Keypads and CCIs can control any EDU or group of EDUs without a separate group controller
- System groups and subgroups can be configured at the point of control without rewiring and without access to the EDU
- System may contain multiple EDU types
- Keypads and interfaces within the system are able to operate any group or subgroup of EDUs

Integration

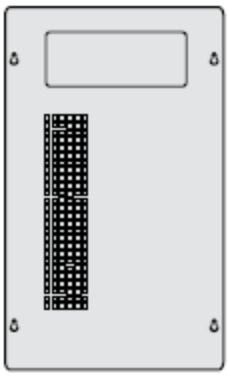
- EDUs seamlessly integrate with Lutron lighting control systems including, GRAFIK Eye®, RadioRA®, HomeWorks®, and RadioTouch®
- Contact closure available to integrate with A/V equipment such as time clocks and security systems.

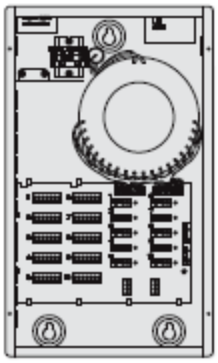
Controls

- Keypads and CCIs are low-voltage and receive their power from the EDUs
- All system devices must be connected through a common communication link
- IR controls available. IR receivers can be wired directly to EDU. There are also *Sivoia QED* keypads and CCIs with built in IR receivers

Sivoia QED | 10 Output Transformer Panel

The Sivoia QED 10 Output Transformer Panel provides low-voltage power for Sivoia QED motorized roller shades, drapery track and/or Roman shades. The panel powers up to 10 Sivoia QED Electronic Drive Units (EDUs). The panel simplifies wiring installations that require multiple transformers.





The panel is hardwired into a standard 120 V~ circuit. The panel contains replacable fuses on the secondary side for miswire protection.

Lutron recommendeds to home run EDUs to the power panel. The panel accomodates home run wiring with individual connectors for up to 10 EDUs (one EDU per output).

Features

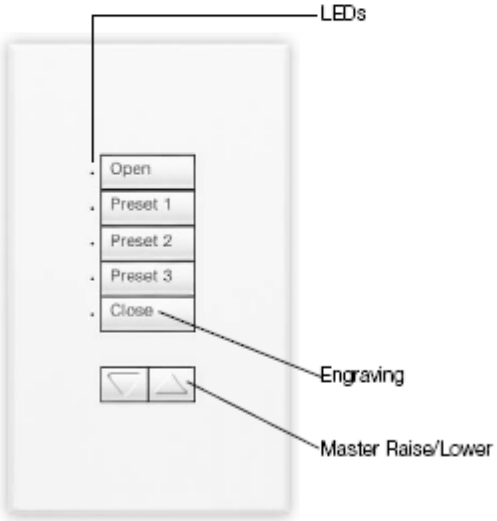
- 24 V~ supply that provides power to EDUs, keypads, and accessories
- Simple wiring scheme uses 7-conductor low voltage link to provide power and communication for both Sivoia QED EDUs and seeTouch keypads
- Flexible wiring topology for easy installation and integration
- 10 output panel provides power for up to 10 EDUs

LUTRON® seeTouch™ Wallstations

so-5wrl 7.18.05

Color and Engraving Codes

SO-5WRLN-___-___
SO-5WRLI-___-___
5-Button Preset Window Treatment Wallstation with Raise/Lower



SO-5WRLN-WH-E01
(Non-insert version)

SO-5WRLI-WH-E01
(Insert version)

Description

- Used to control one or more window treatment zones simultaneously.
- Can control Sivoia QED™ and AC Motorized Window Treatments.
- Receives up to two contact closure inputs via a connector on the back of the Wallstation.
- Large, rounded buttons are easy to use.
- Backlit buttons with on-button engraving make it easy to find and operate the control in low light conditions.
- Optional button engraving is angled up to the eye for easy reading.
- Pressing the Open button once will cause the window treatments to move to their fully open position. If the Open button is pressed again while the window treatments are opening, the movement of the window treatments will stop.
- Pressing the Preset 1, Preset 2, or Preset 3 button once will cause the window treatments to move to the first, second, or third preset position, respectively. If a preset button is pressed while the window treatments are moving to that position, the movement of the window treatments will stop.
- Pressing the Close button once will cause the window treatments to move to their fully closed position. If the Close button is pressed again while the window treatments are closing, the movement of the window treatments will stop.
- Raise/Lower buttons open and close the window treatments for the duration of the button press.
- The LEDs next to each button are used during programming and provide feedback when the buttons are pressed. For *Sivoia QED*, the LEDs provide feedback of the current *Sivoia QED* preset.
- Works with GRAFIK 5000™, GRAFIK 6000®, GRAFIK 7000™ Systems.
- For *Sivoia QED* Motorized Window Treatments, the LEDs provide feedback of the current *Sivoia QED* preset.

Finish and Engraving Options

- Available with button engraving.
- Standard and Non-Standard Text Engraving is available. For more details, please visit the *seeTouch* website at **www.lutron.com/seetouch**.

LUTRON® SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

LUTRON® seeTouch™ Wallstations

sc-p3 7.18.05

How to Build a *seeTouch* Model Number

SO- ____ ____ ____ - ____ - ____

Prefix | Button Configuration | Sensor Option | Insert Style | Color/Finish | Engraving Code

Sensor Option: Omit: CCI; O: Occupant sensor

Insert Style: N: Non-insert; I: Insert

Color/Finish Codes

Matte Finishes

White	WH
Ivory	IV
Beige	BE
Gray	GR
Brown	BR
Black	BL
Taupe	TP

Gloss Finishes

Available with Insert (I) style controls only. Ship with Claro® Wallplates.

White	GWH
Light Almond	GLA

Metal Finishes

With black plastic buttons (standard).

Bright Brass	BB
Bright Chrome	BC
Bright Nickel	BN
Satin Brass	SB
Satin Chrome	SC
Satin Nickel	SN
Antique Brass	QB
Antique Bronze	QZ

Anodized Aluminum Finishes

With black plastic buttons (standard).

Clear	CLA
Black	BLA
Brass	BRA

Satin Colors™

Available with Insert (I) style controls only.

Snow	SW
Biscuit	BI
Eggshell	ES
Midnight	MN
Blue Mist	BT*
Limestone	LS*
Stone	ST*
Desert Stone	DS*
Terracotta	TC*
Ochre	OC*
Hot	HT*

*Note: Some *Satin Colors* units ship with different color buttons. For more information, please visit the *seeTouch* website at www.lutron.com/seetouch.

Engraving Codes

Unengraved	E00

General/Standard Engraving

Arabic	A*xx*
Portug. (Latin)	B*xx*
Chinese	C*xx*
Danish	D*xx*
English	E*xx*
French	F*xx*
German	G*xx*
Italian	I*xx*
Japanese	J*xx*
Spanish (Latin)	L*xx*
Dutch	N*xx*
Portug. (Euro)	P*xx*
Spanish (Euro)	S*xx*

Note: Replace the *xx* with either GN (general engraving) or a two-digit number (01-99; standard engraving. Please visit the *seeTouch* website at www.lutron.com/seetouch for a listing of the standard engraving choices.

Non-Standard Text Engraving

Customized button engraving for particular needs. Use with Faceplate Replacement Kits only (model number begins with SR). Use an engraving code of NST. To order, contact Lutron customer service. Please visit the *seeTouch* website at www.lutron.com/seetouch for custom engraving sheets.

LUTRON® SPECIFICATION SUBMITTAL Page 3

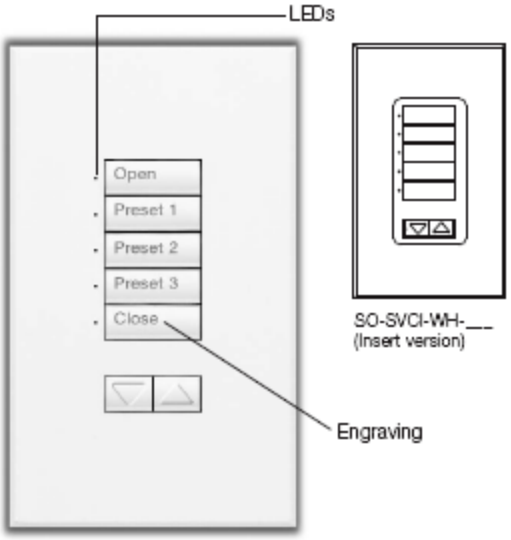
Job Name:	Model Numbers:	
Job Number:		

GRAFIK Systems	SO-SVC	Control Interfaces

sc-svc-1 10.20.07

Color and Finish Codes

SO-SVCN-___-___
GRAFIK Systems
Sivoia QED™ Controller



SO-SVCN-WH-E01

Description

- Provides programming and control of one group of Sivoia QED™ Window Treatments.
- Allows selection of preset window treatment levels from GRAFIK Systems.
- Connects to both the GRAFIK™ Systems link and the Sivoia QED Electronic Drive Unit (EDU) link.
- One SO-SVC needed per group of Sivoia QED Window Treatments (up to 96 devices).
- Maximum of 32 GRAFIK Systems Sivoia QED Controllers per wallstation link.
- Large, rounded buttons are easy to use.
- Backlit buttons with optional engraving make it easy to find and operate the control in low light conditions.
- Optional button engraving is angled up to the eye for easy reading.
- Pressing the Open button once will cause the window treatments move to their fully open position. If the Open button is pressed again while the window treatments are opening, the movement of the window treatments will stop.
- Pressing the Preset 1, Preset 2, or Preset 3 button once will cause the window treatments to move to the first, second, and third preset level, respectively. If the Preset 1, Preset 2, or Preset 3 button is pressed while the window treatments are moving to that position, the window treatments will stop.
- Pressing the Close button once will cause the window treatments move to their fully closed position. If the Close button is pressed again while the window treatments are closing, the movement of the window treatments will stop.
- Pressing the Raise/Lower buttons will cause the window treatments to open/close while the button is pressed.
- The LEDs next to each button are used during programming and provide feedback of the current Sivoia QED preset.
- Works with GRAFIK 5000™, 6000®, and 7000® Systems.

Finish and Engraving Options

- Available with button engraving.
- Standard and Non-Standard text engraving available. For more details, visit the website at **www.lutron.com/seetouch**.

LUTRON. SPECIFICATION SUBMITTAL Page 1

Job Name:	Model Numbers:	
Job Number:		

GRAFIK Systems	SO-SVC	Control Interfaces

so-svc-2 10.20.07

Specifications

Power

Low-voltage type PELV (Class 2: USA). Operating voltage: 24 V⁓, supplied by Sivoia QED System.

Key Design Features

- Field-changeable button and faceplate assemblies allow easy customization.
- Front accessible DIP switches allow change of function without removing the unit from the wall.
- Meets IEC 801-2. Tested to withstand 15 kV electro-static discharge without damage or memory loss.
- Faceplate snaps on with no visible means of attachment.
- Available as an "insert" style control for multi-ganging.
- Can be ganged to share a common faceplate with NovaT*® and Vareo® Dimmers. To order new Wallplates for multi-ganging, specify "R3" openings in a Lutron NovaT* multi-gang FB (fins broken) Series model number.
- Use Button Replacement Kits to change color, button configuration, or engraving.
- Button Replacement Kits may also be used to convert between non-insert and insert configurations.

System Communications and Capacity

- Low-voltage type PELV (Class 2: USA) wiring connects Wallstations and Sivoia QED Controllers to GRAFIK Systems components.
- The Sivoia QED Controller is wired on the GRAFIK 5000™, 6000®, or 7000® wallstation/CSD link.
- Up to 32 GRAFIK Systems Sivoia QED Controllers may be connected per wallstation/CSD link.
- Each GRAFIK Systems Sivoia QED Controller is capable of controlling up to 96 Electronic Drive Units as a group.
- Each Sivoia QED Electronic Drive Unit requires its own 24 V⁓ transformer.

Terminals

Communications to GRAFIK Systems Central Processor: One 4-pin removable terminal block. Each pin will accept one wire up to #18 AWG. (1.0 mm²).
Communications to Sivoia QED EDU: One 5-pin removable terminal block. Each pin will accept one wire up to #18 AWG (1.0 mm²).

Environment

32 - 104 °F (0 - 40 °C). Relative humidity less than 90% non-condensing.

Mounting

Typical backbox dimensions: 95 mm (3.74 in.) high, 55 mm (2.17 in.) wide, 70 mm (2.75 in.) deep.

LUTRON. SPECIFICATION SUBMITTAL Page 2

Job Name:	Model Numbers:	
Job Number:		

SUNPOWER

E19 / 320 SOLAR PANEL

MAXIMUM EFFICIENCY AND PERFORMANCE

BENEFITS

Highest Efficiency
SunPower™ Solar Panels are the most efficient photovoltaic panels on the market today.

More Power
Our panels produce more power in the same amount of space—up to 50% more than conventional designs and 100% more than thin film solar panels.

Reduced Installation Cost
More power per panel means fewer panels per install. This saves both time and money.

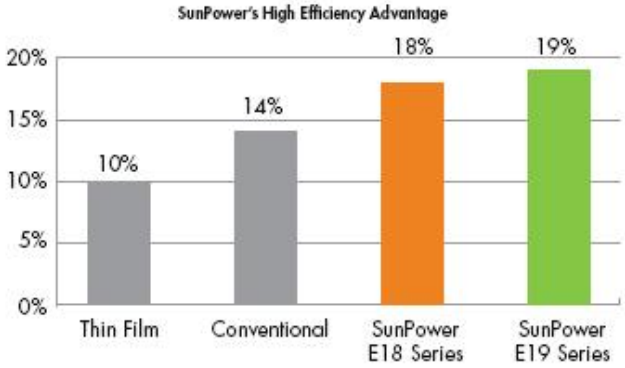
Reliable and Robust Design
Proven materials, tempered front glass, and a sturdy anodized frame allow panel to operate reliably in multiple mounting configurations.

E19 SERIES

The planet's most powerful solar panel.

The SunPower™ 320 Solar Panel provides today's highest efficiency and performance. Utilizing 96 back-contact solar cells, the SunPower 320 delivers a total panel conversion efficiency of 19.6%. The 320 panel's reduced voltage-temperature coefficient, anti-reflective glass and exceptional low-light performance attributes provide outstanding energy delivery per peak power watt.

SPR-320E-WHT-D



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SUNPOWER

E19 / 320 SOLAR PANEL

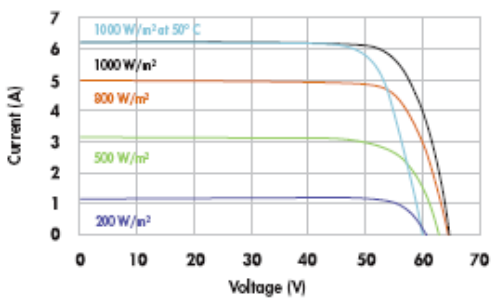
MAXIMUM EFFICIENCY AND PERFORMANCE

Electrical Data

Measured at Standard Test Conditions (STC): Irradiance of 1000W/m², AM 1.5, and cell temperature 25° C

Peak Power (+5/-3%)	P_{max}	320 W
Efficiency	η	19.6 %
Rated Voltage	V_{mpp}	54.7 V
Rated Current	I_{mpp}	5.86 A
Open Circuit Voltage	V_{oc}	64.8 V
Short Circuit Current	I_{sc}	6.24 A
Maximum System Voltage	UL	600 V
Temperature Coefficients	Power (P)	-0.38% / K
	Voltage (V_{oc})	-176.6mV / K
	Current (I_{sc})	3.5mA / K
NOCT		45° C +/-2° C
Series Fuse Rating		15 A

I-V Curve



Current/voltage characteristics with dependance on irradiance and module temperature.

Tested Operating Conditions

Temperature	-40° F to +185° F (-40° C to + 85° C)
Max load	113psf 550 kg/m² (5400 Pa), front (e.g. snow) w / specified mounting configurations 50 psf 245 kg/m² (2400 Pa) front and back – e.g. wind
Impact Resistance	Hail 1 in (25 mm) at 51mph (23 m/s)

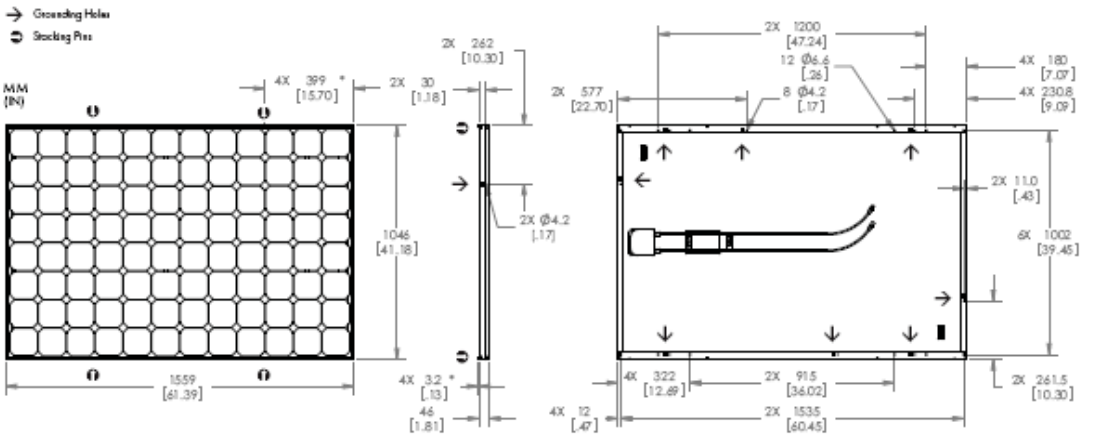
Mechanical Data

Solar Cells	96 SunPower all-back contact monocrystalline
Front Glass	High transmission tempered glass with anti-reflective (AR) coating
Junction Box	IP-65 rated with 3 bypass diodes Dimensions: 32 x 155 x 128 (mm)
Output Cables	1000mm length cables / MultiContact (MC4) connectors
Frame	Anodized aluminum alloy type 6063 (silver); stacking pins
Weight	41.0 lbs (18.6 kg)

Warranties and Certifications

Warranties	25 year limited power warranty
	10 year limited product warranty
Certifications	Tested to UL 1703. Class C Fire Rating

Dimensions



CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
Visit sunpowercorp.com for details

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sunpowercorp.com
Document #001-64281 Rev** / DTR_EN

Efficient
- Efficiency of up to 98%
- Low specific price
- Greater yield with multiple MPP trackers

Safe
- Integrated ESS DC load disconnection switch

Flexible
- Modular design
- Sunny Mini Central and Sunny Boy inverters can be combined
- Suitable for outdoors

Convenient
- Delivered as a turnkey solution
- Easy installation
- Integrated data acquisition with optional Sunny WebBox

SUNNY TOWER

Easy installation and maximum yield

The Sunny Tower is easy to install and profitable. Its exceptional efficiency of up to 98 percent and easy installation ensure maximum power yield. The intelligent OptiCool™ temperature management system makes the Sunny Tower suitable for use at high ambient temperatures. In addition, the modular structure allows for combining Sunny Mini Central and Sunny Boy inverters, ensuring maximum flexibility in system design and expansion.

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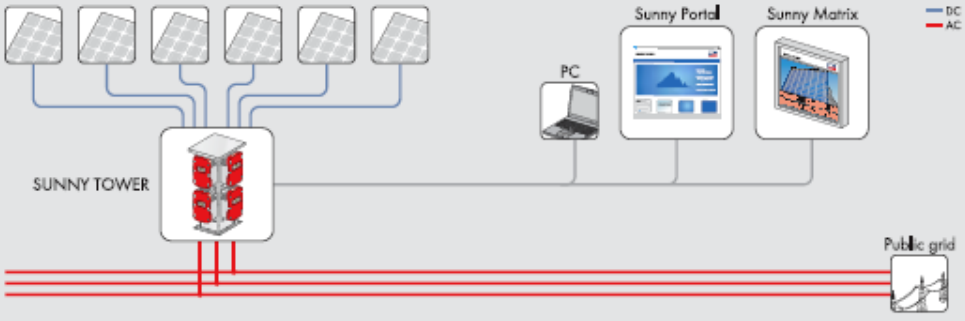
Sunny Tower

Technical data	Sunny Tower with 6 Sunny Mini Central 8000TL	Sunny Tower with 6 Sunny Mini Central 11000TL
Input (DC)		
Max. DC power	49.6 kW	68.4 kW
PV voltage range	333 V – 500 V	333 V – 500 V
Max. DC voltage	700 V	700 V
Max. input current	6 x 25 A	6 x 34 A
DC voltage ripple	< 10%	< 10%
Max. number of strings (parallel)	6 x 4	6 x 5
Reverse polarity protection	short-circuit diode	short-circuit diode
Output (AC)		
Continuous AC power	48 kW at 40 °C (104 °F)	66 kW at 40 °C (104 °F)
Nominal AC power	48 kW	66 kW
Max. output current	3 x 70 A	3 x 96 A
THD of grid current	< 4%	< 4%
Nominal AC voltage	220 V – 240 V	220 V – 240 V
Nominal AC frequency	50 Hz / 60 Hz	50 Hz / 60 Hz
Power factor (cos φ)	1	1
Grid connection	bolt clamp, max. 5 x 95 mm²	bolt clamp, max. 5 x 95 mm²
Efficiency		
Max. efficiency / Euro-Eta	98.0% / 97.7%	98.0% / 97.5%
Protection devices		
Thermally monitored varistors	●	●
Ground fault monitoring	●	●
ESS DC load disconnection switch	●	●
Grid monitoring (SMA Grid Guard)	●	●
Short-circuit tolerance (current control)	●	●
Line circuit breaker	6 x B50	6 x B63
General data		
Inverter/Sunny Tower protection rating (acc. to IEC 60529)	IP65 / IP44	IP65 / IP44
Cooling concept	OptiCool	OptiCool
Operating temperature range	-25 °C ... +60 °C (-13 °F ... +140 °F)	-25 °C ... +60 °C (-13 °F ... +140 °F)
Topology	transformerless	transformerless
Number phase conductors	3	3
Weight	320 kg (705 lb)	320 kg (705 lb)
Dimensions (W / H / D) in mm (in)	1100 / 1810 / 990 (43 / 71 / 39)	1100 / 1810 / 990 (43 / 71 / 39)
Features		
Warranty: 5 / 10 years	●/○	●/○
Plant monitoring (pre-wired): RS485 / Sunny WebBox / SMA Power Balancer	○/○/○	○/○/○
Data at nominal conditions		
● Standard features ○ Optional features		
Type designation	ST6	ST6



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Appendix C
Lighting Plans and Details

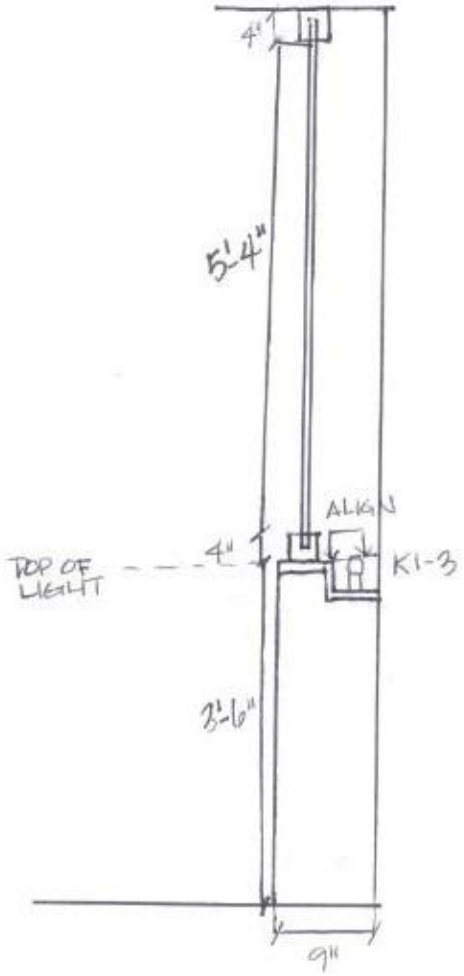

Figure 17: Entry Signage/ Receptionist Back Wall Detail in Lobby | NTS

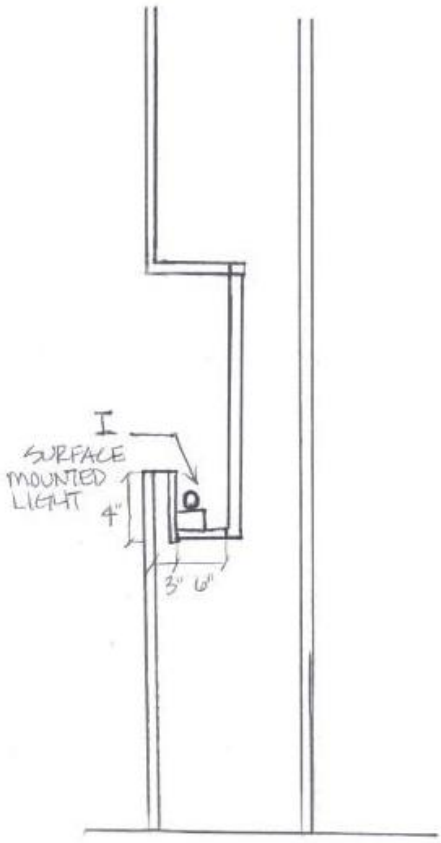

Figure 18: Restaurant Signage Detail in Lobby | NTS

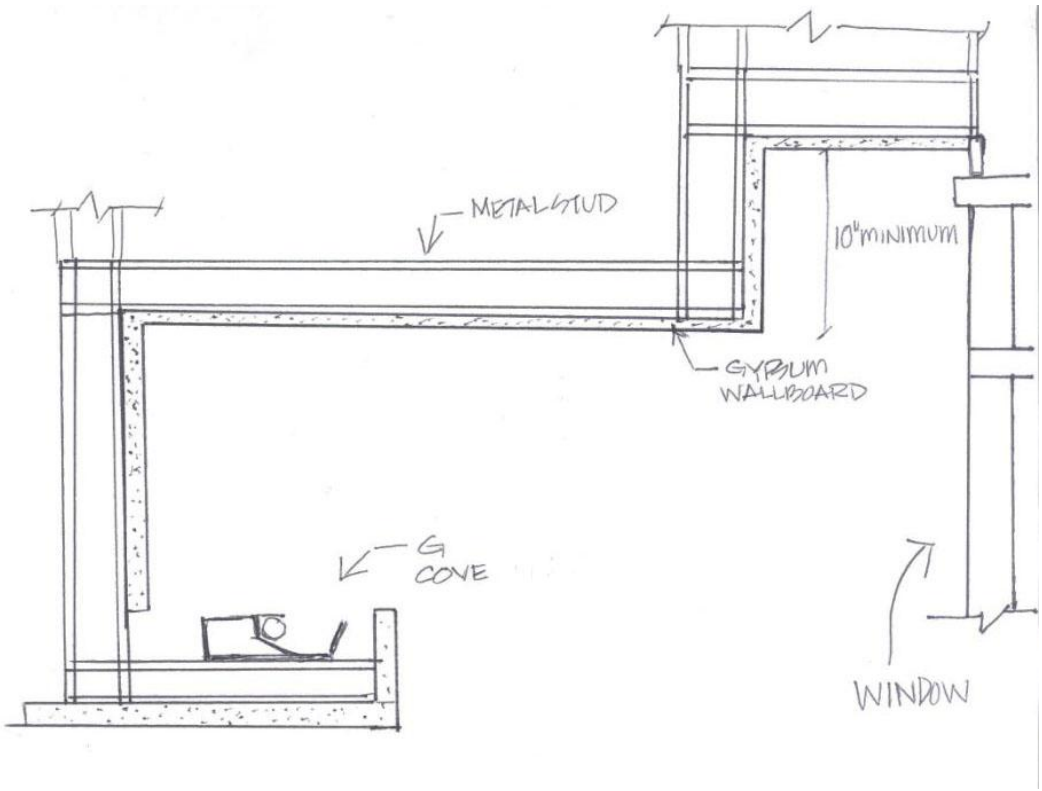

Figure 19: Lobby Cove Detail | NTS

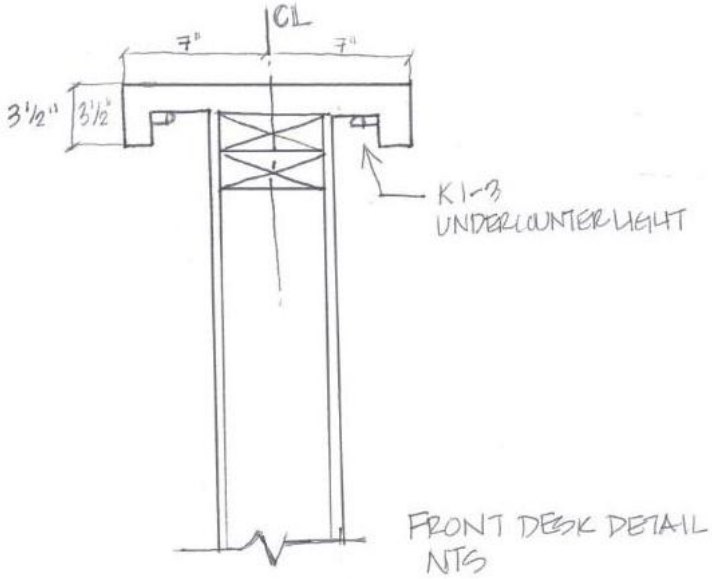

Figure 20: Front Desk Detail in Lobby | NTS

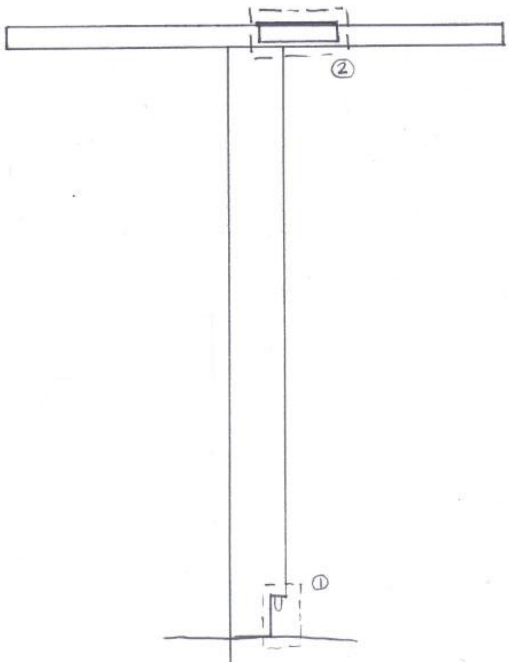

Figure 21: Bar Detail in Lounge | NTS

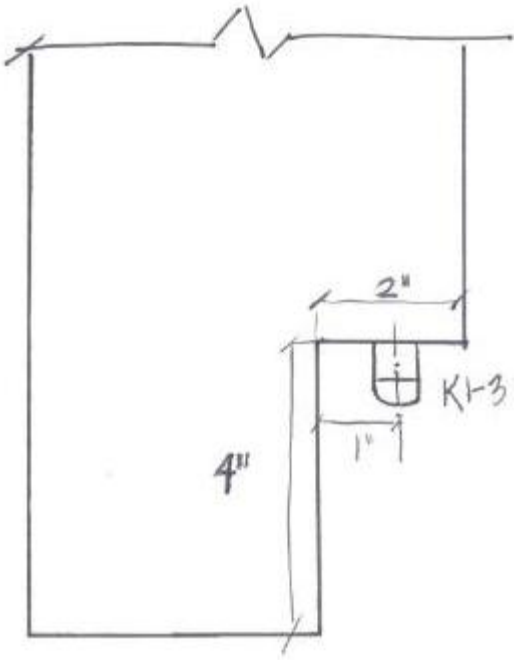

Figure 22: Toe Kick Detail in Lounge | NTS

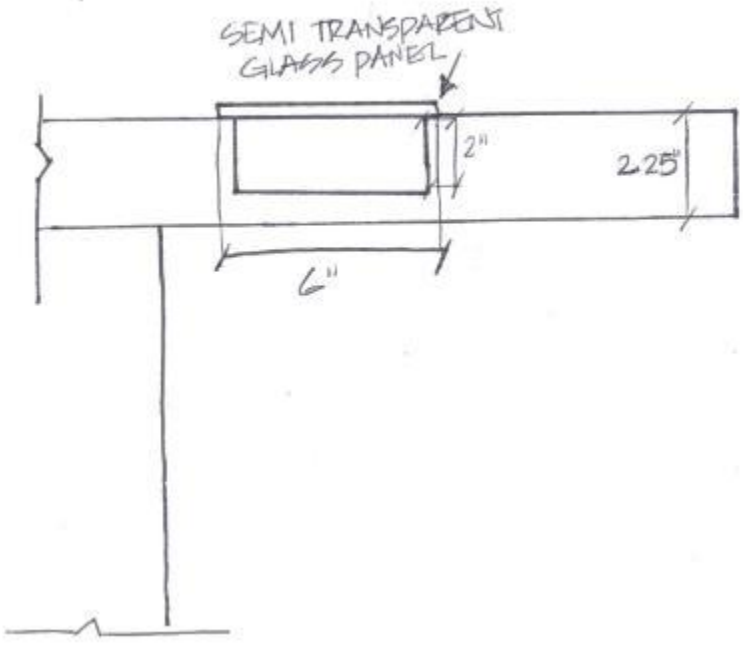

Figure 23: Square Glass Panel Detail in Lounge | NTS

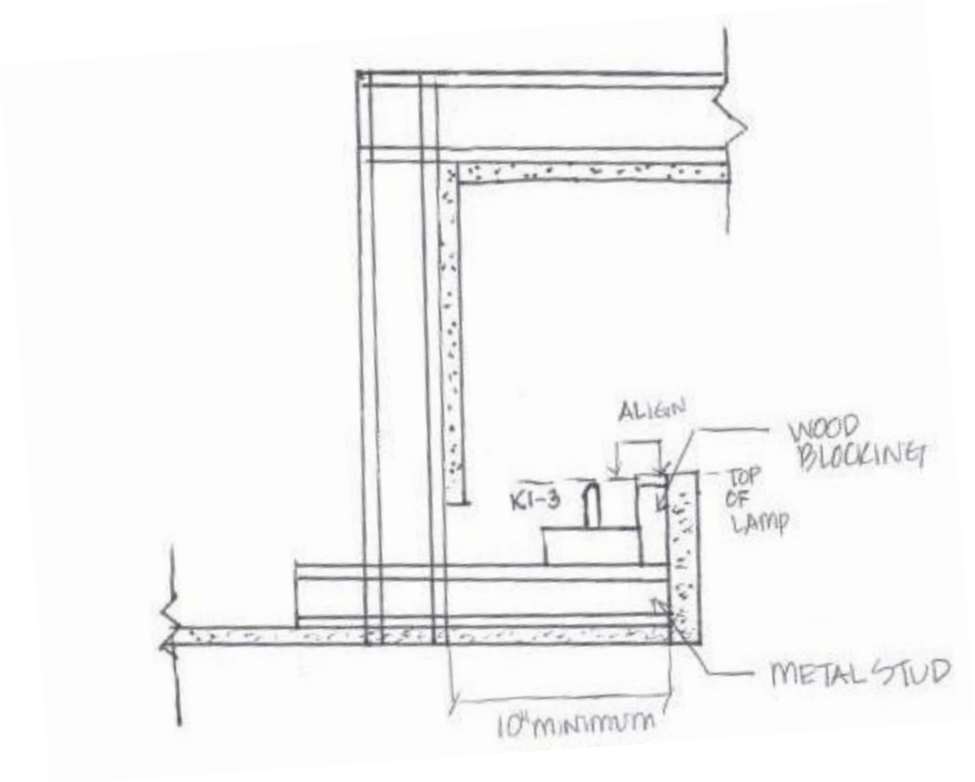

Figure 24: Cove Detail in Lounge | NTS

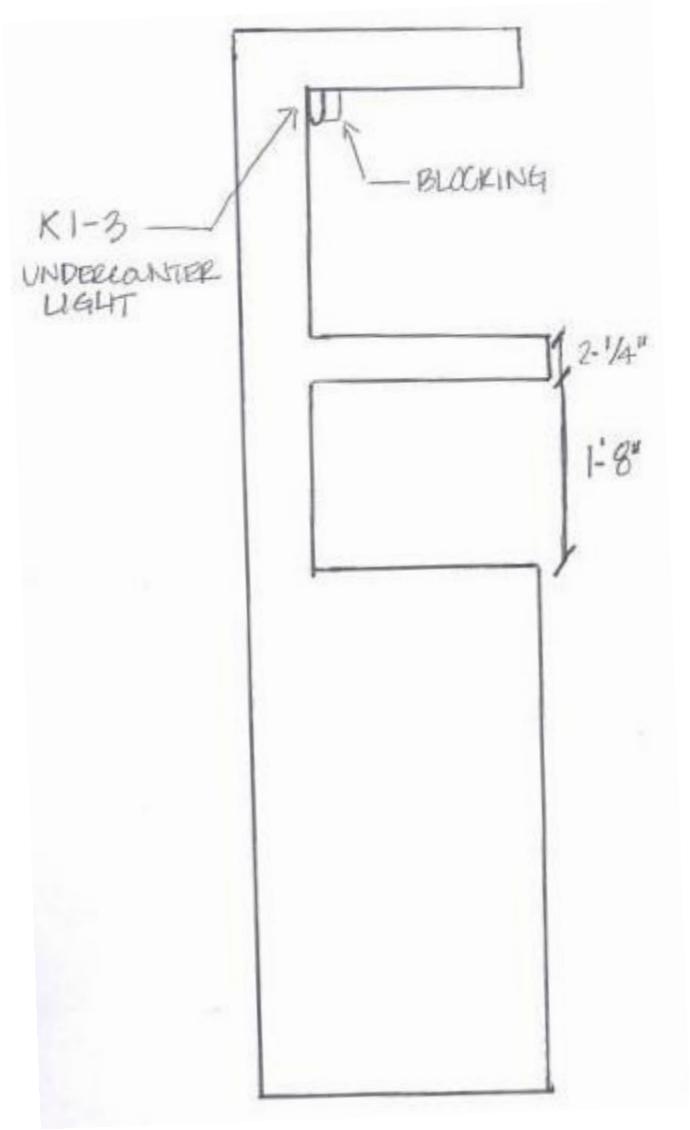

Figure 25: Bar Detail (typ in all shelves) | NTS