Penn State Architectural Engineering Senior Thesis

Salamander Hospitality Resort and Spa

Luke Renwick – Lighting/Electrical Option

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Salamander Hospitality Resort and Spa

Building Statistics:

Location: Middleburg, VA
Size: 230,000 sq. ft. (2-4 stories)
Cost: $93 million

Owner: Salamander Hospitality
Architect: Architecture Inc. / WATG
MEP: RG Vanderweil Engineers
Structural: Rathgerber/Gross Assoc.
General Contractor: Turner Construction
Landscape Architect: Oculus

Architecture

- 340 acre site in Virginia horse/wine country
- 5 star, 5 diamond resort and spa
- exterior walls: stucco and ruble stone veneer
- roofing material: composite slate shingles made of recycled tires and plastic
- flat roofing is epdm single ply roofing membrane (tpo)

Interior

- 30,000 sq. ft. spa wing
- equestrian-themed restaurant
- grand ballroom
- wine bar
- cooking studio
- 168 luxury guest rooms

Mechanical

- primary vav air system with constant volume for kitchen exhaust
- fan coil units provide heating and cooling to lodging wing.
- dehumidification for spa/pool areas
- heat recovery from spa, laundry, and lodge areas

Structural

- concrete column footers topped with 5" slab on grade
- composite decking over steel framing
- two-way concrete slab on concrete columns with post tensioning

Electrical

- high voltage service and pad mounted transformer provided by utility - stepped down to 480Y/277V
- 650 kw emergency diesel generator: 480Y/277V, 3 ph, 4w.
- 80 kva npower ups: 480-208Y/120V

Lighting

- vast variety of luminaires and light sources including fluorescent, incandescent, halogen, and hid lamps
- numerous custom decorative wall sconces and pendant chandeliers
- programmable dimming





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Executive Summary

The Salamander Resort and Spa is a Five Star/Five Diamond resort under construction in Middleburg, VA. When completed, this resort and spa will be the signature building for Salamander Hospitality. The building boasts luxurious interiors, spas, indoor pools, outdoor pool and terraces, a restaurant, wine bar, ballroom, and 168 guest rooms. Salamander Hospitality has requested that this building be LEED certified in environmental and energy efficient design, making it one of the only LEED certified buildings of its kind. Therefore, an interesting mixture of luxury, energy efficiency, and environmental responsibility make up the design strategies for the building.

The following report covers several topics regarding aesthetics, energy efficiency, cost analysis, and functionality. The main focus is to provide complete lighting design for four spaces throughout the resort and spa. Lighting design criteria, documentation, equipment, graphics, and performance data are provided for the following spaces: the Entry Courtyard, Living Room, Wine Bar, and Grand Ballroom. The lighting designs for all spaces enhance the architecture and interior design while expressing general themes of relaxation and Virginia horse and wine country, which Middleburg is known for. Beyond the aesthics of the lighting redesign, a daylight harvesting study and photosensor control integration analysis was completed in the Living Room and energy savings were maximized.

Existing electrical design was modified to meet the change in lighting design. Branch circuiting panels, feeders, and voltage drop were resized for each space. Also, electrical depth topics are included as additional studies on equipment efficiency, cost, and functionality.

As part of the general goal to enhance the interior spaces and complete interdisciplinary studies in the design industry, an architectural breadth study is included in the form of a fireplace and Wine Bar room layout redesign. In addition, a mechanical breadth redesign and heat recover analysis is also provided.

The lighting design solutions proved to be aesthetically pleasing, decorative, functional, flexible, technical, and energy efficient. With such a design, the Salamander Resort will one day provide an relaxing and enjoyable experience to their guests.

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Building Information and Statistics

Located on a 340-acre site in the heart of Virginia horse and wine country, the five star, five diamond Salamander Hospitality Resort and Spa will be a luxurious and relaxing retreat for all visitors, especially those in the Washington, DC region. The exterior of the resort resembles historical Virginian horse country architecture, with a mixture of stucco and ruble stone veneer and is surrounded by rural landscaping. The interior of the resort is full of elegant spaces, such as the 30,000 square foot spa area, equestrian-themed restaurant, ballroom, wine bar, cooking studio, indoor pools, and 168 luxury guest rooms, including a 2,000 square foot Presidential Suite. All interior spaces are provided with great views out to the countryside and access to outdoor function spaces including the Stallion Barn, Pavilion at the Pond, Grand Lawn, poolside settings, and Herb Garden. Salamander Hospitality owner Sheila Johnson has been dedicated to make the Salamander Resort and Spa the pinnacle of her luxury resort and hotel enterprise.

Building Name: Salamander Hospitality Resort and Spa

Location and Site: Middleburg, VA

Building Occupant: Salamander Hospitality and resort guests

Occupancy Type: Mixed Use – Hospitality: Resort, Spa, Restaurant

Size: 230,000 sq. ft.

Stories Above Grade:

Main Lobby, Spa Wing, Ballroom Wing – 1
Guest Room Wing – 4 + Mechanical Equipment Penthouse

Primary Project Team:

Owner: Salamander Hospitality – Middleburg, VA
General Contractor: Turner Construction – New York, NY
Architect: Architecture Inc. – Reston, VA
Design Architect: Wimberly Allison Tong and Goo – Irvine, CA
MEP Engineer: Vanderweil Engineers, Inc. – Alexandria, VA
Interior Designer: Forrest Perkins – Washington, DC
Structural Engineer: Rathgeber/Goss Associates – Rockville, MD
Landscape Architect: Oculus – Washington, DC

Dates of Construction:

Spring 2004 – 2007 (Davis Construction)
October 2007 – Spring 2011 (Turner Construction)

Cost: Total building cost ≈$93,000,000

Project Delivery Method: Guaranteed Maximum Price

Main Courtyard Entrance

Description:
Guests of the Salamander Resort and Spa will enter the building through this main courtyard, which is bordered by the spa wing and ballroom/restaurant wing. The entrance façade is a mixture of stucco and rubble stone veneer. The stone is a mosaic pattern building stone ranging from 6 x 6 inches to 18 x 18 inches and an average thickness of 4 to 6 inches. The spa, ballroom/restaurant, and tenant room wings of the building have an exterior façade of stucco. Chimneys and dormers project out of the sloped, composite slate roof. Aluminum clad windows of double pane, clear, Low-E insulating glazing (3/4" thick) line the exterior. A main feature to this entrance is the porte cochere where guests will meet a valet to park their vehicles. The landscaping is made up of a central courtyard with bordering planter beds, benches, and three fountain features.

Space Category:
An outdoor space/building façade

Materials:
Stone veneer; Synthetic slate shingles; Painted HDP Column Moldings; Smooth stucco

Dimensions:
Main north façade: 116' x 45'; East/West façade: approx. 120' x 35' each
Area = approximately 14,000 sq.ft.
Perimeter – aprrox. 470 ft.

Figure 1: North Exterior Elevation (NTS)

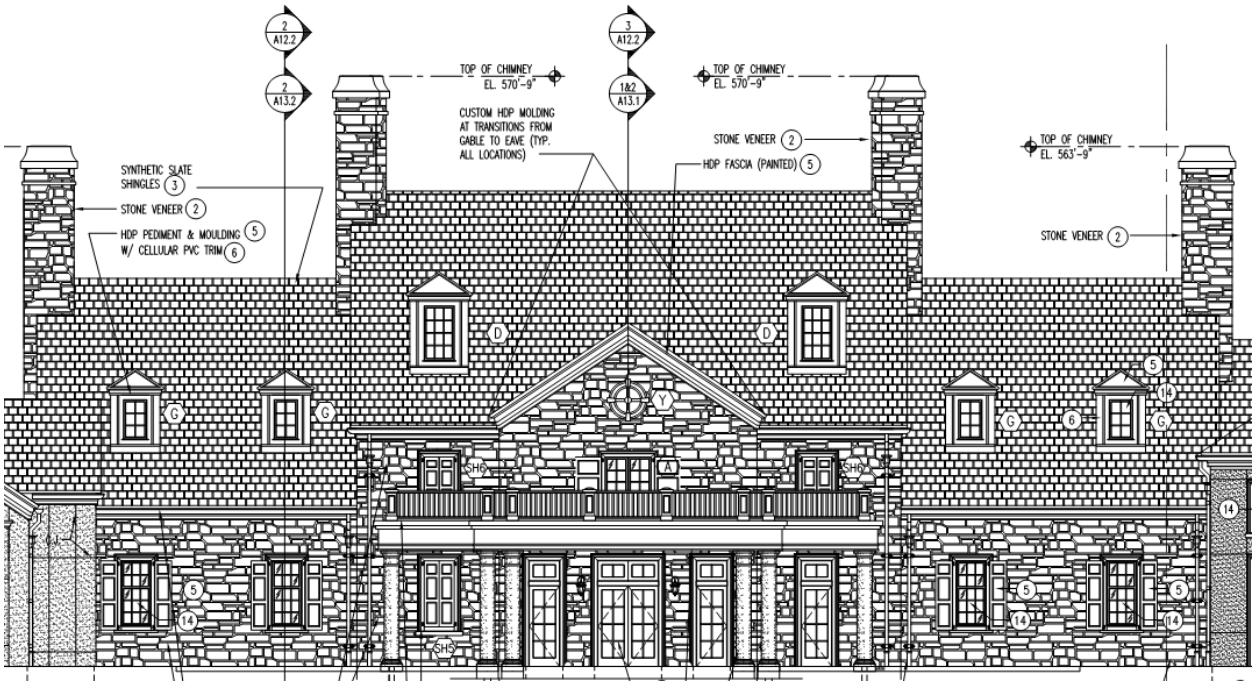


Figure 2: Porte Cochere Elevation (NTS)

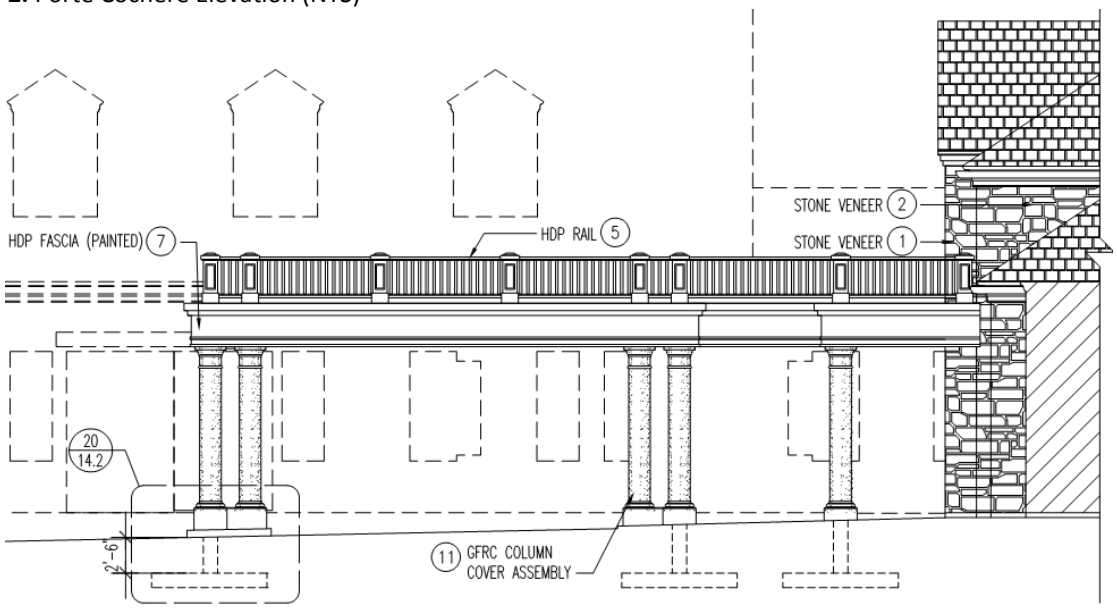


Figure 3: Courtyard Plan (NTS)

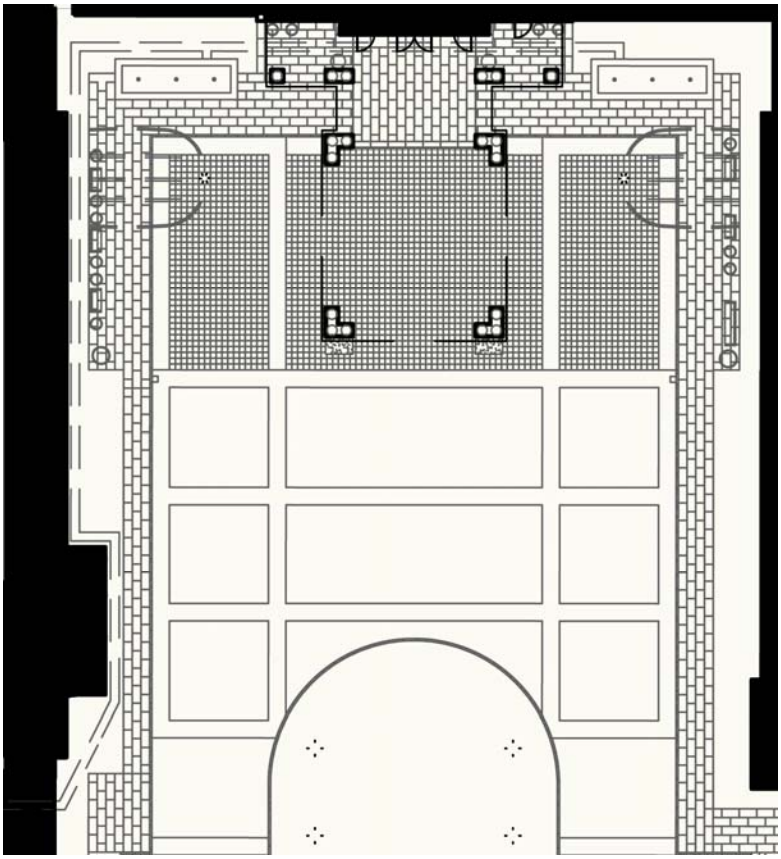


Figure 4: Architectural sketch rendering.

Lighting Design Criteria and Consideration:

- **Psychological Impression**
  - The lighting design for the exterior of the building should be welcoming. It should make those entering the resort feel welcome and comforted to enter the building and begin their stay.

- **Reinforce Architecture, Landscape, and Materials**
  - Lighting should enhance the texture of the stone veneer façade
  - The materials of Virginia horse and wine country architecture should be enhanced, even at night
  - Landscaping should be emphasized in the courtyard space

- **Visual Environment**
  - Attract guests to the main entrance of the building
  - Lead travel from roadside lighting to courtyard landscaping and to the porte cochere entrance
  - Mask the elegance of interiors to landscape and fountain features outside the building

- **Quantitative Visual Performance** (IESNA Lighting Design Guide)
  - Building Exteriors
    - Entrances – Active – Horizontal: **5 fc** on the ground; Vertical: **3 fc** on vertical surfaces
    - Prominent Structures –Horizontal: **5 fc** on the ground; Vertical: **3 fc** on vertical surfaces
  - Gardens
    - General lighting – Horizontal: 5:1 ratio; Vertical: 2:1 ratio
    - Paths– Horizontal: 10:1 ratio; Vertical: 3:1 ratio
    - Trees or Shrubbery Emphasized - Horizontal: 3 **fc** ; Vertical: **3 fc**
    - Decorative structures – Horizontal: **5 fc** ; Vertical: **3 fc**

- **Glare Issues**
  - Pedestrian walkways and seating are throughout the courtyard. The lighting must be oriented as to reduce glare for those in the courtyard – for comfort and for safety with vehicular traffic.
  - Guests driving to the porte cochere must not experience glare to ensure safety of drivers and pedestrians.
  - Windows into the entry, retail area, and adjacent wings of the building must not see direct light.

- **Controls**
  - Exterior lighting must be on a programmable timer switch or daylight sensor.

- **Power Density Allowance**
  - Energy Code Requirements - ASHRAE 90.1-2007
    - Tradable Surfaces-Building entrances and exits-Main entries: **30W/linear ft.** of door width.
    - Tradable Surfaces-Canopies and Overhangs: **1.25W/sq ft.** for attached canopies and overhangs
    - Tradable Surfaces-Walkways:**1.0W/lin. ft.**
    - Tradable Surfaces-Roadways: **0.5W/lin. ft.**
    - Nontradable Surfaces-Building facades: **0.2 W/sq. ft.** for each illuminated wall or surface OR **5 W/linear ft.** for each illuminated wall or surface length.

  - Exterior Building Grounds Lighting -
    All exterior building grounds luminaires that operate at greater than 100watts shall contain lamp s having minimum efficacy of 60 lm/w unless the luminaire is controlled by a motion sensor.

- **Security**
  - Provide adequate lighting for visual surveillance at front entrance.

- **Light Pollution/Sky Glow**
  - Resort is alone on a 340 acre site. Light pollution could affect those sleeping in the lodging wing.
  - Minimize non-target illumination, limit flux above horizontal.

Lighting Plans – See Appendix A

Mounting Details – See Appendix B

Luminaires

Figure5: Luminaire Schedule. Luminaires, lamps, and ballast specifications can be found in Appendix C.

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
A		Troy Lighting	CCD8990OR	Exterior ceiling surface mounted decorative downlight. 14"W x 9"H. Clear seeded glassware. Hand-worked wrought iron metalwork. English bronze finish.	Surface-mounted	Self-ballasted	120	(2) DULUX EL Self-ballasted "Flame" CFL. Candelabra base. CF9EL/B14/C/830/ADP/BL2	18 W
A1		Troy Lighting	CCD8990OR	Exterior ceiling surface mounted decorative downlight. 24"W x 12"H. Clear seeded glassware. Hand-worked wrought iron metalwork. English bronze finish.	Surface-mounted	Self-ballasted	120	(3) DULUX EL Self-ballasted "Flame" CFL. Candelabra base. CF9EL/B14/C/830/ADP/BL2	27 W
B		Troy Lighting	B9491EB	Exterior surface mounted decorative wall sconce. 14"W x 37" H x 14.5"P; 25.75" TCD; solid brass; English Bronze finish; clear glass.	Wall-mounted	Self-ballasted	120	(4) DULUX EL Self-ballasted "Flame" CFL. Candelabra base. CF9EL/B14/C/830/ADP/BL2	36 W
C		BK Lighting	RM-MR-2-BLP-10	Ring Mount Delta Star ™ tree-mounted downlight for moon lighting effect. Solid aluminum body with enclosed, water-proof wireway and heat sink. 1" diameter brass mounting ring for cable or hook mounting. Water-tight seal. Tempered, clear glass lens; hermetically sealed optical compartment. Tamper-resistant, stainless steel harware. Polyester powder coating on aluminum. 40 degree flood distribution.	Tree-mounted: hanging	Remote Transformer	12 VAC	(1) 20W MR-16. 20MR16/FL36-BAB	20 W
D		BK Lighting	HP2 - T635-SP-RD-81-BZP-GS-RM-H35E-120	Ground-recessed spot accent light. Flush with ground: 7" diameter. Sheet molded polyester compound housing. G12 bi-pin base. IP-68 rated vacuum sealed enclosure. Anti-condensation valve. High heat, shock resistant, tempered 1/4" borosilicate flat glass lens. Suitable for walk-over and drive-over applications. Glare shield for pedestrians. Polyester powder coating over aluminum.	Ground recessed	Electronic (remote)	120	(1) 35T6/MH/830	41 W
E		Philips Color Kinetics	523-000030-02	Stone façade eW ® Graze Powercore LED wall grazer. 2.1" x 2.7" x 48". 10 degree beam angle. Low profile extruded anodized aluminum housing. Clear polycarbonate lens. Multi-positional, constant torque locking hinge mounting. IP 66 - Wet environment rated. Dimming capability. 2700K	Surface-mounted under roof overhang.	(Line Voltage)	120	LED Class 2 product	60 W/4 ft.

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
E2		Prudential Lighting	PSM-101 1T8 04' BWE 120 DM	Linear fluorescent strip fixture for dormer interiors. Aluminum body. 4' - 0" die-formed steel housing. White enamel finish.	Surface	Electric dimming	120	Philips Extra long life, extra low mercury: F32T8 TL830 XLL ALTO	35 W
F		Erco	34068.023	Corrosion-resistant cast aluminum housing. Double powder-coated. Hinge with internal wiring - 130 degree tilt. Mounting plate rotatable through 240 degrees. Reflector: aluminum, silver, mirror-finish anodised. IP65.	Cantilever arm - Product # 3450.023 (See Appendix B for mounting detail)	Electronic	120	70W HIT-CE Metal Halide. MC70T6/U/G12/930PB	45 W
G		Erco	33764.023	LED Orientation luminaire. Housing with gasket: stainless steel. Clear prismatic diffuser with circular light aperture. Cover ring: corrosion resistant stainless steel with 1/4" safety glass. IP68.	Ground recessed	33858.023 Control gear.	30 VDC	LED 0.9W 30V DC	0.9 W
H		Philips Color Kinetics	116-000024-01	Ultra-thin, submersible fountain fixture. RGB LED color changing capability. Cast brass housing. 10 degree beam angle. Frosted tempered glass lens.	Fountain wall recessed	PDS-60	24 VDC	Class 2 LEDs	25 W
I		BK Lighting	DS-MR-2-BLP-9-A-360L	Delta Star landscaping flood light. Solid aluminum housing. Full 180 degree vertical adjustment. High temperature silicone O-Ring prividesw water-tight seal. Shock resistant, tempered clear glass lens. Polyester powder coat finish, black color. 45 degree cutoff.	Ground surface	12 VAC remote transformer	12 VAC	(1) 20W MR-16. 20MR16/FL36-BAB	20 W
I2		BK Lighting	S-NS-LED-e22-WFL-BLP-12-360SL	Nite Star (SSL) landscape light. Wide flood, 3000K light with flush mounted lens. Tamper resistand, stainless steel hardware. Aim-and-Lock feature. Black polyester powder coat finish. Integral heat sink. Outdoor/wet-rated.	Ground Surface	Remote Transformer	12 VAC	8W, 12V B-K Solid-State Lighting LED	8 W

Light Loss Factors

Light Loss Factors				
Type	LLD	LDD	BF	LLF Total
A	0.9	0.82	1	0.738
B	0.9	0.82	1	0.738
C	0.9	0.82	1	0.738
D	0.9	0.82	1	0.738
E	0.95	0.85	1	0.8075
F	0.9	0.82	1	0.738
G	0.95	0.85	1	0.8075
I	0.9	0.82	1	0.738

Controls

The exterior courtyard luminaires will be controlled by a time clock within the main Lutron GRAFIK Eye System. This time clock will turn the luminaires on at night and switch them off during the day. See Appendix C for specifications and cut sheets.

Table 1: Control Schedule.

Equipment Schedule					
Type	Product Name	Manufacturer	Product/Catalog Number	Description	Location
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Lutron GRAFIK 7000 System master control. Wallstation with LCD screen. Every lighting zone and scene programmable. Timeclock included.	"Storage 1117"

Lighting Design –

Design Concept

The architecture of the main entrance façade is very traditional and symmetric in style; therefore, the lighting design concept is to mask that symmetry. Non-uniform lighting throughout the landscape and on the surrounding buildings' facades is used to create interest within the "space."

Desired Space Perceptions

The space should be welcoming. The use of light to accent the landscape and architecture should not only indicate that this area is the entrance to the building, but it should actually catch people's attention and draw them in.

Accent/Texture Issues
The primary architectural elements of the main entrance façade are the porte cochere, the dormers, and the stone veneer façade. It was very important to accent all three of these elements. The great texture of the stone veneer will pop from the wall-grazing luminaires mounted above, under the roof overhang. The porte cochere is accentuated by in-grade recessed luminaires that light the columns. The dormers are accented by flood lights mounted on the roof of the two surrounding buildings (see mounting detail). Also, the interior of each dormer, which is not occupied space, will provide a glow to the outside. Finally, the trees within the central courtyard are accented from below, while the trees adjacent to the porte cochere will give a moonlighting effect to the sidewalk below by the tree-mounted lumianaires above.

Lighting Design Renderings

Figure6: Exterior Rendering

Figure 7: Exterior Rendering

Figure 8: Exterior Rendering

Figure 9: Exterior Rendering

Figure 10: Exterior Illuminance Pseudo Color Rendering (lux)

Performance Graphics

Figure 11: Porte cochere illuminance contours (footcandles).

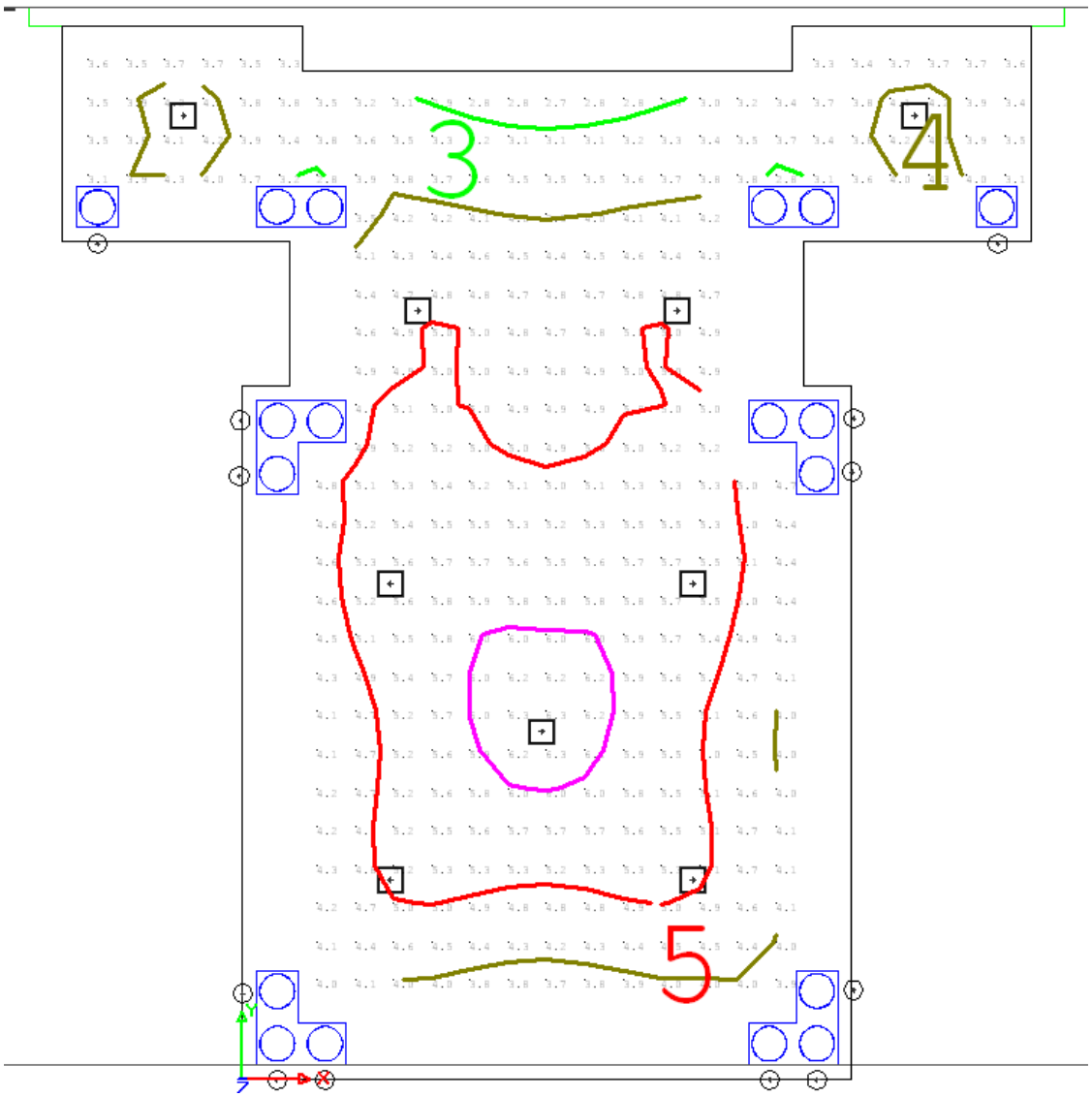


Figure 12: Porte cochere Illuminance Pseudo Color

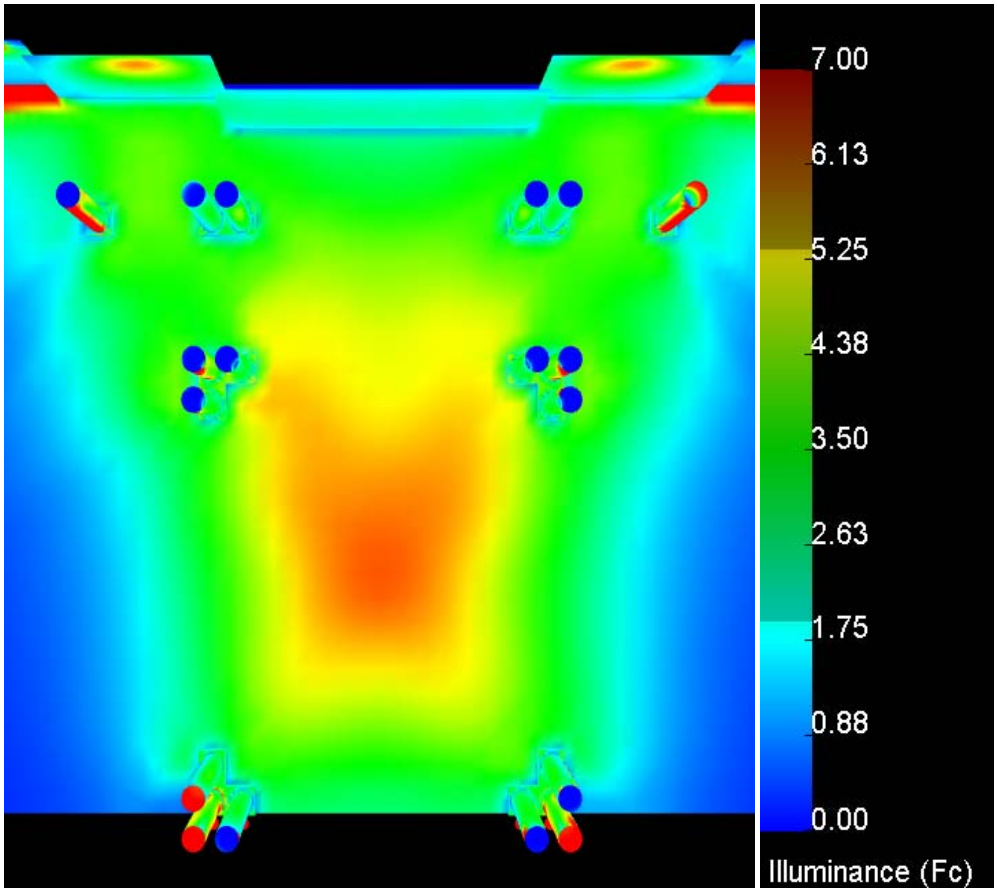


Figure 13: Exterior Illuminance Pseudo Color Rendering (fc)

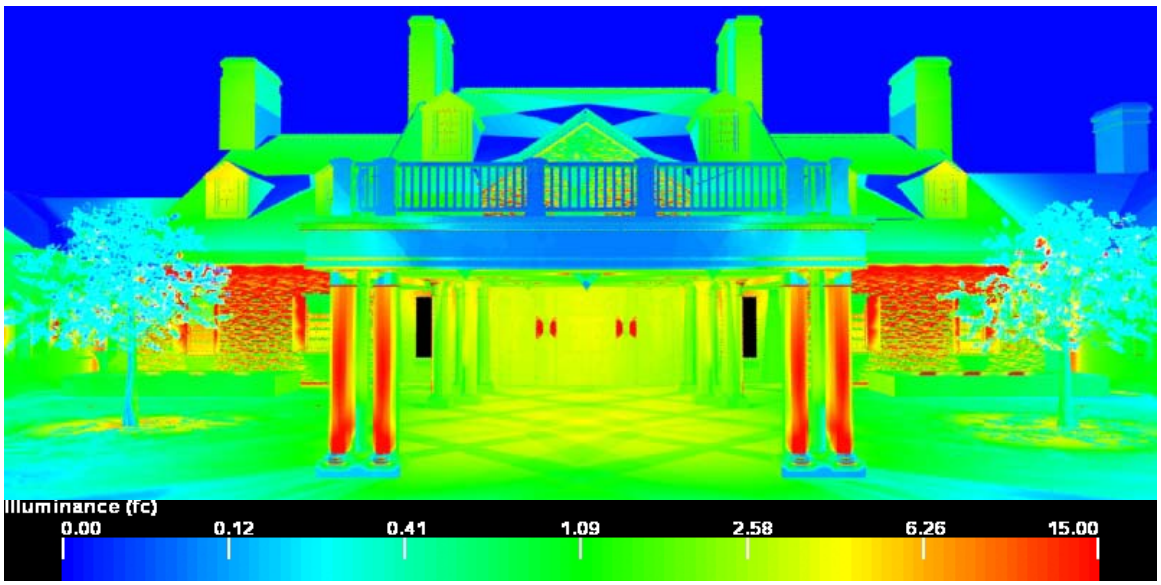
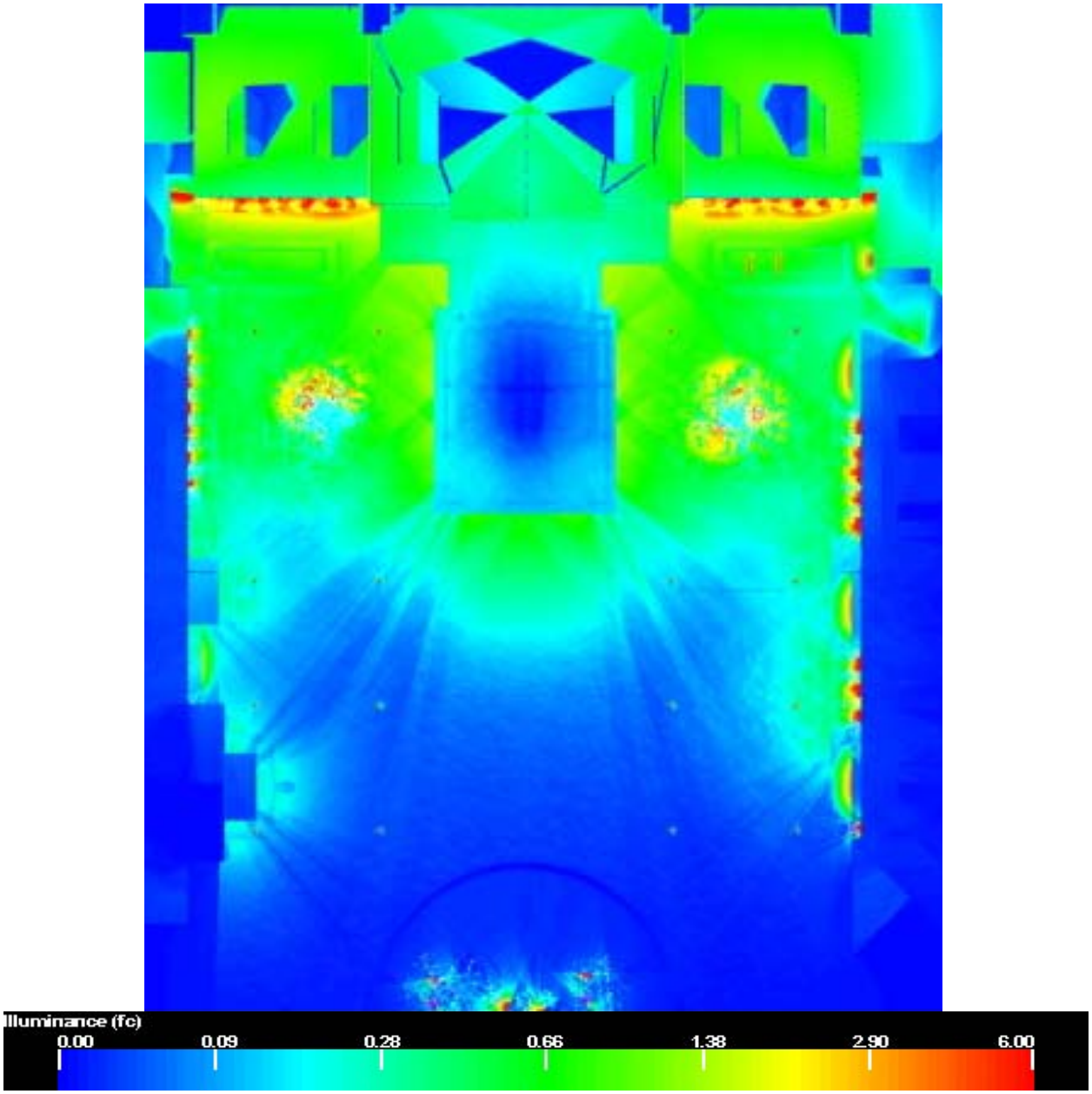


Figure 14: Exterior Illuminance Pseudo Color Rendering (fc)



Energy Code Compliance

Table 2: Energy Calculations – ASHRAE Standard 90.1

ASHRAE Standard 90.1 - Lighting Power Density				
Area	Size	Power Density Allowable	Allowable Wattage	Designed Wattage
Façade (Nontradable)	332.9 ft.	5 W/ft	1665.00	1400
Building Entrance (Tradable)	8 ft.	30 W/lin. Ft.	240	90
Canopies and Overhangs - Porte Cochere (Tradable)	1356 sq. ft.	1.25 W/sq. ft.	1695	924
Walkways (Tradable)	366 ft.	1 W/lin. Ft.	366	501.6
Roadway (Tradable)	284 ft.	0.15 W/lin. Ft.	42.6	12.6
		Total Tradable	**2343.6**	**1528.2**

Performance Summary

The lighting design for the entry courtyard of the Salamander Resort and Spa sets the tone for the luxury brand of the resort itself. With a mixture of architectural emphasis, decorative lantern luminaires, and landscape lighting, the courtyard is brought to life at night. It not only enhances the aesthetics of the courtyard, but the light is functional in bringing guests into the main entry of the building. A definite increasing hierarchy of light levels causes one to walk toward the main entry. There is adequate light for pedestrians along the perimeter paths and orientation luminaires signifying the driveway for vehicular traffic.

Interesting features for the courtyard experience are moonlighting effects from luminaires mounted within trees, fountain lighting that is capable of color-changing for special occasions, and the emphasized texture of the stone veneer by use of the wall-grazing luminaires. While the roof itself is subtly flood-lighted, the warm glow from within dormer windows signifies to guests what experience awaits them.

The lighting design is not only qualitatively functional, but meets illuminance and lighting power density criteria. All surrounding walkways receive at least 1.0 footcandle of light, and the porte cochere canopy receives the 5 footcandles that are recommended for unloading luggage at night. The lighting power density for "tradable" spaces set by ASHRAE 90.1 is 70% of the allowable wattage, meaning that this design is energy efficient.

Electrical Redesign

Specialty lighting within the Salamander Resort and Spa is circuited to and powered by Lutron GP Dimming Panels, which have the ability to power dimmed or non-dimmed circuits to luminaires. All dimming panels used in the electrical engineering design of the resort are 120/208V, 3 phase, 4 wire with main circuit breakers as overcurrent protection.

All panels affected by lighting redesign are shown in Table 2 below, with the panels containing courtyard circuits highlighted in yellow.

Table 3: Dimming panels affected by lighting redesign.

Panels Affected by Lighting Redesign							
Panel Tag	Voltage	N, N/E, E?	Dimming Panel?	Courtyard	Living Room	Wine Bar	Ballroom
DIM213	120/208 3PH, 4W	N	Yes	X			
EDIM211	120/208 3PH, 4W	E	Yes	X	X	X	
DIM211A	120/208 3PH, 4W	N	Yes	X			
DIM211B	120/208 3PH, 4W	N	Yes	X	X	X	
EDIM212	120/208 3PH, 4W	E	Yes				X
DIM212B	120/208 3PH, 4W	N	Yes				X

Lighting Plan

The Entry Courtyard lighting plan with controls and circuiting can be found in Appendix A, drawings E1.1 and E1.2.

Existing Panelboards Affected

Circuits modified by lighting redesign are highlighted in yellow.

DIMMING PANEL "DIM213" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER — LUTRON MOD#: GP60-120-4-M100-20

CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CONCIERGE	01co	AF	INC	DIM	37	7	259
2	CONCIERGE	02co	RCPT– TABLE/FLOOR LAMP	INC	DIM			500
3	CONCIERGE							
4	CONCIERGE	03co	AA	LV	DIM	37	10	370
5	SPARE							
6	SPARE							
7	SPARE							
8	SPARE							
9	SALON	13ps	AA	INC	DIM	37	3	111
10	SALON	14c	SB			20	72	1440
11	SPA	02p	AH–2	LV	DIM	37	6	222
12	SPA	03p	DP–27	INC	DIM	500	1	500
13	SPA	05p	AA; AH–2	LV	DIM	37	5;1	222
14	SPA	06p	AA	LV	DIM	37	2	74
15	SPA	07p	SA	CC	DIM	14W/LFT	15 FT	210

DIMMING PANEL "DIM213" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD#: GP60-120-4-M100-20		
16	SPA	08p	AA	LED	DIM	37	8	296
17	SPA RETAIL	09p	TA/TRACK	LV	DIM	37	20	740
18	SPA RETAIL	09p	TA/TRACK	LV	DIM	150W/2LFT	16 FT	1200
19	SPA RETAIL	10p	SB-1,SD	LV	DIM	5W/3" O.C/9	33 FT/1	669
20	SPA	11p	AH-2	LV	DIM	37	6	222
21	SPA	13p	SD	LV	DIM	0.9W/1.2" O.C.	68 FT	612
22	SPA	14p	DP-21	INC	DIM	600	1	600
23	SPA	16p	SB	LV	DIM	5W/3" O.C.	71 FT	1420
24	SPA	18p	UA	LV	DIM	37	4	148
25	SPA	20p	AJ	LV	DIM	37	10	370
26	SPA	22p	DP-29	INC	DIM	200	1	200
27	SPA	23p	RCPT- TABLE/FLOOR LAMP	INC	DIM			500
28	SPA RETAIL	27p	DS-17				2	150
29	SPA	25p	RCPT- TABLE/FLOOR LAMP	INC	DIM			500
30	COURTYARD	29c						
31	COURTYARD	30c	WB	INC	DIM	180	1	180
32	NORTH CORRIDOR MAITRE'D	31c	AA	LV	DIM	37	4	148
33	SPA	30p	WB	INC	DIM	60	4	148
34	EXTERIOR	44p	EA	LV	DIM	50	4	200
35	EXTERIOR	43p	WE	LV	DIM	60	13	780
36	SPA LOCKER ROOMS	02pr	AC; AC-1	LV	DIM	37	12	444
37	SPA LOCKER ROOMS	03pr	DS-15, DS-17	INC	DIM	75	15	1125
38	SPA LOCKER ROOMS	05pr	AC-1	LV	DIM	37	5	185
39	SPA LOCKER ROOMS	06pr	AC-1	LV	DIM	37	11	407
40	SPA LOCKER ROOMS	07pr	DP-25	INC	DIM	250	2	500
41	SPA LOCKER ROOM	09pr	XH			150	4	600
42	SPA LOCKER ROOMS	08pr	AG	LV	DIM	37	6	222
43	SPA LOCKER ROOMS	10pr	SC	NEON	DIM	6.5W/LFT	45 FT	293
44	SPA LOCKER ROOMS	11pr	AH-2	LV	DIM	37	6	222
45	SPA LOCKER ROOMS	12pr	DP-3	INC	DIM	250	1	250
46	SPA LOCKER ROOMS	13pr	SB-2	LV	DIM	5W/3" O.C.	8	160
47	SPA LOCKER ROOMS	21pr	AA	LV	DIM	37	7	259
48	SPARE							
49	SPA LOCKER ROOMS	31pr	AA	LV	DIM	37	2	74
50	SPA LOCKER ROOMS	32pr	AA	LV	DIM	37	9	333
51	SPA LOCKER ROOMS	33pr	RCPT- TABLE/FLOOR LAMP	INC	DIM			500
52	SPARE							
53	SPA SALON	01ps	DP-33	INC	DIM	150	3	450
54	SPA SALON	03ps	RCPT- TABLE/FLOOR LAMP	INC	DIM			500
55	SPA LOCK	14pr	AC-1			37	5	185
56	SPARE							
57	SPARE							
58	SPARE							
59	SPARE							
60	SPARE							

TOTAL KVA:
TOTAL AMP:
52.4"W x 87H x 14.15"D

DIMMING PANEL "EDIM211" 120/208, 3ø, 4W, 100A MCB – EMERGENCY POWER						LUTRON MOD#: GP36–120–4–M60–20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	03c	AA	LV	DIM	39	37	1443
2	CORRIDOR FIRST FLOOR	06c	AI	LV	DIM	37	4	148
3	CORRIDOR FIRST FLOOR	15c	DP	LV	DIM	200	1	200
4	CORRIDOR FIRST FLOOR	22c	DS–4	INC	DIM	60	4	240
5	CORRIDOR FIRST FLOOR	25c	AA	LV	DIM	37	7	256
6	CORRIDOR FIRST FLOOR	26c	AA/AC–1	LV	DIM	37	7	256
7	CORRIDOR FIRST FLOOR	01c	DP	INC	DIM	200	1	200
8	BILLIARD FIRST FLOOR	01cb	AA	LV	DIM	37	10	370
9	BILLIARD FIRST FLOOR	07cb	AA	LV	DIM	37	2	74
10	PUBLIC RESTROOM FIRST FLOOR	01r	AC–1/AA	LV	DIM	37	12	444
11	COOKING STUDIO FIRST FLOOR	01d	AC–1	TBD	DIM	37	15	555
12	HOTEL SPA CHECK–IN	13c	SC	CC	DIM	5.5 W/LFT	58	319
13	RESTAURANT FIRST FLOOR	05s	DS/DS–1	INC	DIM	75	8	600
14	RESTAURANT FIRST FLOOR	08s	AA–1/AA	LV	DIM	37	10	370
15	RESTAURANT & VEST. FIRST FLOOR	12s	AA	LV	DIM	37	3	111
16	RESTAURANT FIRST FLOOR	14s	AA	LV	DIM	37	4	148
17	RESTAURANT FIRST FLOOR	16s	WB	INC	DIM	60	13	780
18	SPARE							
19	BOARD ROOM FIRST FLOOR	02fra	AE	INC	DIM	150	6	900
20	BOARD ROOM FIRST FLOOR	02frb	AE	INC	DIM	150	6	900
21	CHECK–IN FIRST FLOOR	03ci	AA	LV	DIM	37	12	444
22	LIBRARY FIRST FLOOR	02cr	AA	LV	DIM	37	18	666
23	LIVING ROOM FIRST FLOOR	03cg	AA	LV	DIM	37	4	148
24	LIVING ROOM FIRST FLOOR	07cg	AH–2	LV	DIM	37	6	222
25	LIVING ROOM FIRST FLOOR	11cg	AA	LV	DIM	37	3	111
26	PORTE–CACHERE FIRST FLOOR	02cv	AA	LV	DIM	37	2	74
27*	PORTE–COCHERE FIRST FLOOR	10cv	B	CFL		27	2	54
28	WINE BAR FIRST FLOOR	02cw	AA	LV	DIM	37	18	666
29	RETAIL FIRST FLOOR	02t	AA	LV	DIM	37	9	333
30	PRIVATE DINING FIRST FLOOR	03sp	AA	LV	DIM	37	16	592
31	SPARE							
32	SPARE							
33	SPARE							
34	SPARE							
35	SPARE							
36	SPARE							

TOTAL KVA: 11.69
TOTAL AMP: 32.39
20.2"W x 14.15"D x 67.00"H

DIMMING PANEL "DIM211A" 120/208, 3ø, 4W, 150A MCB – NORMAL POWER						LUTRON MOD#: GP60–120–4–M150–20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	01c	DP	INC	DIM	400	2	800
2	CORRIDOR FIRST FLOOR	02c	AA	LV	DIM	37	6	222
3	CORRIDOR FIRST FLOOR	04c	AA	LV	DIM	37	4	148
4	CORRIDOR FIRST FLOOR	05c	DS–10	INC	DIM	40	4	160
5	CORRIDOR FIRST FLOOR	10c	AF	LV	DIM	37	12	444
6	SPARE							
7	CORRIDOR FIRST FLOOR	21c	DP–6	INC	DIM	160	3	420
8	CORRIDOR FIRST FLOOR	23c	AA	LV	DIM	37	2	74
9	CORRIDOR FIRST FLOOR	24c	DS–6	INC	DIM	75	4	300
10	CORRIDOR FIRST FLOOR	27c	AA	LV	DIM	37	8	296
11*	EXTERIOR COURT YARD FIRST FLOOR	28c	WB	CFL		45	4	180
12	CORRIDOR FIRST FLOOR	32c	SD	LV	DIM	10W/LFT	8' 0"	72
13*	EXTERIOR COURTYARD		G	LED		0.947	18	17.1

DIMMING PANEL "DIM211A" 120/208, 3ø, 4W, 150A MCB – NORMAL POWER						LUTRON MOD#: GP60–120–4–M150–20		
14	BILLIARDS FIRST FLOOR	02cb	DS–5	INC	DIM	120	8	960
15	BILLIARDS FIRST FLOOR	03cb	RCPT – FLOOR/TABLE LAMPS	INC	DIM			500
16*	EXTERIOR FACADE		E	LED	DIM	60.6	16	1091
17	BILLIARDS FIRST FLOOR	04cb	DP–9	INC	DIM	600	3	1800
18	BILLIARDS FIRST FLOOR	05cb	AA	LV	DIM	37	3	111
19	BILLIARDS FIRST FLOOR	06cb	AA	LV	DIM	37	3	111
20	PRIVITE DINING FIRST FLOOR	07sp	AA	LV	DIM	37	4	148
21	PUBLIC RESTROOMS FIRST FLOOR	02r	AC	LV	DIM	37	10	370
22	PUBLIC RESTROOMS FIRST FLOOR	03r	DS–8	INC	DIM	75	13	975
23	PUBLIC RESTROOMS FIRST FLOOR	04r	AC–1	LV	DIM	37	7	259
24	PUBLIC RESTROOMS FIRST FLOOR	05r	AC–1	LV	DIM	37	3	111
25	PRIVITE DINING FIRST FLOOR	06sp	KA			100	4	400
26	COOKING STUDIO FIRST FLOOR	02d	PV	LV	DIM	37	22	814
27	COOKING STUDIO & KIT. FIRST FLOOR	03d	CABINET LTG		DIM			1600
28	COOKING STUDIO FIRST FLOOR	04d	UNDERCABINET LTG		DIM			100
29	RESTAURANT VEST. FIRST FLOOR	12s	AA	LV	DIM	37	2	74
30	RESTAURANT FIRST FLOOR	01s	DP–2	INC	DIM	400	1	400
31	RESTAURANT FIRST FLOOR	02s	DP–2	INC	DIM	400	1	400
32	RESTAURANT FIRST FLOOR	03s	DP–2	INC	DIM	400	1	400
33	RESTAURANT FIRST FLOOR	04s	SC	NEON	DIM	6.5W/LFT	72 FT	468
34	RESTAURANT FIRST FLOOR	07s	AA–1	LV	DIM	37	7	259
35	RESTAURANT FIRST FLOOR	09s	DS–9	INC	DIM	75	8	600
36	RESTAURANT FIRST FLOOR	10s	DP–16	INC	DIM	200	8	1600
37	RESTAURANT FIRST FLOOR	11s	AA	LV	DIM	37	7	250
38	RESTAURANT FIRST FLOOR	13s	AI	LV	DIM	37	2	74
39	RESTAURANT EXTERIOR	15s	JA	LV	DIM	37	23	851
40	RESTAURANT FIRST FLOOR	06s	AA	LV	DIM	37	4	148
41	PRIVATE DINING FIRST FLOOR	01sp	DP–15	INC	DIM	200	2	400
42	PRIVATE DINING FIRST FLOOR	02sp	AA	LV	DIM	37	8	296
43	PRIVATE DINING FIRST FLOOR	04sp	AI	LV	DIM	37	2	74
44	PRIVATE DINING FIRST FLOOR	05sp	DS–	INC	DIM	100	6	600
45	MAITRE D' FIRST FLOOR	31c	AA	LV	DIM	37	4	148
46	BOARD ROOM FIRST FLOOR	01fra	DP–11	INC	DIM	60 x 2	2	240
47	BOARD ROOM FIRST FLOOR	03fra	SA	CC	DIM	14W/LFT	80 FT	1120
48	BOARD ROOM FIRST FLOOR	04fra	AF	LV	DIM	37	22	814
49	BOARD ROOM FIRST FLOOR	05fra	AF–1, AA	LV	DIM	37	2/1	111
50	BOARD ROOM FIRST FLOOR	01frb	DP–11	INC	DIM	60 x 2	2	240
51	BOARD ROOM FIRST FLOOR	03frb	SA	CC	DIM	14W/LFT	80 FT	1120
52	BOARD ROOM FIRST FLOOR	04frb	AF	LV	DIM	37	26	962
53	RETAIL FIRST FLOOR	01t	TC, TRACK	LV	DIM	37	16	592
54	RETAIL FIRST FLOOR	01t	TC, TRACK	LV	DIM	37	16	592
55	RETAIL FIRST FLOOR	01t	TC, TRACK	LV	DIM	37	15	555
56	RETAIL FIRST FLOOR	01t	TC, TRACK	LV	DIM	37	15	555
57	SPARE							
58	RETAIL FIRST FLOOR	03t	DP – (TBD)	INC	DIM	TBD	1	500
59	RETAIL FIRST FLOOR	04t	SB–3	LV	DIM	5W@3" O.C.	46 FT	920
60	RETAIL FIRST FLOOR	05t	KA	LV	DIM		8	216

CIRCUIT #13 – DORMER LIGHTING FIXTURES. CONTROL SHALL BE ON/OFF ON SUNSET/OFF SUNRISE. PHOTOCELL CONTROL.

TOTAL KVA: 28.058
TOTAL AMP: 77.94
52.4"W x 87H x 14.15"D

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD#: GP60–120–4–M100–20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
2	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
3	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
4	CORRIDOR FIRST FLOOR	02c	AA	LV	DIM	37	16	666
5	CORRIDOR FIRST FLOOR	05c	DS–1	INC	DIM	100	12	1200
6	CHECK–IN FIRST FLOOR	01ci	DP–4	INC	DIM	200	2	400
7	CHECK–IN FIRST FLOOR	02ci	RCPT – TABLE/FLOOR LAMPS	INC	DIM		4	500
8	SPARE							
9	SPARE							
10	SPARE							
11	LIBRARY FIRST FLOOR	01cr	DP–6	INC	DIM	320	1	320
12	LIBRARY FIRST FLOOR	03cr	DS–2	INC	DIM	75	12	900
13	LIBRARY FIRST FLOOR	04cr	AA	LV	DIM	37	4	185
14	LIBRARY FIRST FLOOR	05cr	AH	LV	DIM	37	4	148
15	LIBRARY FIRST FLOOR	06cr	RCPT – TABLE/FLOOR LAMPS					500
16	SPARE							
17	LIBRARY FIRST FLOOR	07cr	AA	LV	DIM	37	4	148
18	SPARE							
19	SPARE							
20	LIVING ROOM FIRST FLOOR	01cg	DP–7	INC	DIM	520	2	1040
21	LIVING ROOM FIRST FLOOR	02cg	AA	LV	DIM	37	4	148
22	LIVING ROOM FIRST FLOOR	04cg	DS–3	INC	DIM	75	12	900
23	LIVING ROOM FIRST FLOOR	05cg	SC	CC	DIM	6.5W/LFT	176 FT	1140
24	LIVING ROOM FIRST FLOOR	06cg	AA	LV	DIM	37	10	370
25	LIVING ROOM FIRST FLOOR	08cg	LR	LV	DIM	37	4	148
26	LIVING ROOM FIRST FLOOR	09cg	RCPT – TABLE/FLOOR LAMPS					500
27	SPARE							
28	EXTERIOR FIRST FLOOR	10cg	WC	INC	DIM	60	4	240
29	EXTERIOR FIRST FLOOR	12cg	WB	INC	DIM	60	2	120
30	EXTERIOR FIRST FLOOR	13cg	EB	LV	DIM	20	11	220
31	EXTERIOR FIRST FLOOR	14cg	EA	LV	DIM	50	14	700
32	SPARE							
33	ENTRY FIRST FLOOR	01cv	DP–2	INC	DIM	400	1	400
34	ENTRY FIRST FLOOR	03cv	SE	LV	DIM	37 2/3 LFT	54 FT	666
35	ENTRY FIRST FLOOR	04cv	SB	LV	DIM	15W@3" O.C.	8 FT	160
36	ENTRY FIRST FLOOR	05cv	AA	LV	DIM	37	2	74
37	ENTRY FIRST FLOOR	06cv	AC–1	LV	DIM	37	2	74
38	ENTRY FIRST FLOOR	07cv	AA	INC	DIM	37	3	111
39*	EXTERIOR FIRST FLOOR	08cv	A, A1	CFL	DIM	30, 45	6, 1	225
40*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8
41	VALET FIRST FLOOR	09cv	AF	LV	DIM	37	3	111
42*	EXTERIOR FIRST FLOOR		C	LV	DIM	22.2	6	133.3
43	ENTRY FIRST FLOOR	12cv	AA	LV	DIM	37	2	74
44*	EXTERIOR FIRST FLOOR	13cv	D	LV	DIM	45.6	12	546.7
45*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER							LUTRON MOD#: GP60–120–4–M100–20	
46	WINE BAR FIRST FLOOR	01cw	DP–8	INC	DIM	4 x 40	3	480
47	WINE BAR FIRST FLOOR	03cw	AA	LV	DIM	37	12	444
48	WINE BAR FIRST FLOOR	04cw	DS–4	INC	DIM	TBD	8	840
49	WINE BAR FIRST FLOOR	05cw	AH	LV	DIM	37	8	296
50	WINE BAR FIRST FLOOR	06cw	DP–18	INC	DIM	TBD	4	400
51	WINE BAR FIRST FLOOR	07cw	AA	LV	DIM	37	5	185
52	WINE BAR FIRST FLOOR	08cw	SB	LV	DIM	14W/LFT	20 FT	560
53	WINE BAR FIRST FLOOR	09cw	SD	LV	DIM	0.9W@1.2" O.C.	24 FT	171
54	WINE BAR FIRST FLOOR	10cw	SB–1	LV	DIM	05W@3" O.C.	20 FT	460
55	WINE BAR FIRST FLOOR	11cw	AI	LV	DIM	37	5	185
56	WINE BAR FIRST FLOOR	12cw	SB–1	LV	DIM	5W@3" O.C.	16	160
57	SPARE							
58	SPARE							
59	SPARE							
60	SPARE							

TOTAL KVA: 21.29
TOTAL AMP: 59.14
52.4"W x 87H x 14.15"D

Panelboard Sizing Worksheets/New Panels

The following tables are the modified dimming panelboards with new loads according to lighting redesign. Feeders were resized based on NEC table 310.16. Conduit was sized with the Conduit Sizing Worksheet provided in class.

DIM213

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					DIM213	Panel Location:			Elec. Rm. 3158	
Nominal Phase to Neutral Voltage------->					120	Phase:			3	
Nominal Phase to Phase Voltage-------->					208	Wires:			4	
DIMMING PANEL "DIM 213" 120/208V, 3Ph., 4W. 90A MCB - Normal Power										
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	5	CONCIERGE	259	w	1.00	259	259	DIM
2	A	LIGHTING	5	CONCIERGE	500	w	1.00	500	500	DIM
3	B	LIGHTING	5	CONCIERGE	0	w	1.00	0	0	
4	B	LIGHTING	5	CONCIERGE	370	w	1.00	370	370	DIM
5	C	SPARE			0	w		0	0	
6	C	SPARE			0	w		0	0	
7	A	SPARE			0	w		0	0	
8	A	SPARE			0	w		0	0	
9	B	LIGHTING	5	SALON	111	w	1.00	111	111	DIM
10	B	LIGHTING	5	SALON	1440	w	1.00	1440	1440	NON DIM
11	C	LIGHTING	5	SPA	222	w	1.00	222	222	DIM
12	C	LIGHTING	5	SPA	500	w	1.00	500	500	DIM
13	A	LIGHTING	5	SPA	222	w	1.00	222	222	DIM
14	A	LIGHTING	5	SPA	74	w	1.00	74	74	DIM
15	B	LIGHTING	3	SPA	210	w	0.90	210	233	DIM
16	B	LIGHTING		SPA	296	w	0.90	296	329	DIM
17	C	LIGHTING	5	SPA	740	w	1.00	740	740	DIM
18	C	LIGHTING	5	SPA	1200	w	1.00	1200	1200	DIM
19	A	LIGHTING	5	SPA	669	w	1.00	669	669	DIM
20	A	LIGHTING	5	SPA	222	w	1.00	222	222	DIM
21	B	LIGHTING	5	SPA	612	w	1.00	612	612	DIM
22	B	LIGHTING	5	SPA	600	w	1.00	600	600	DIM

23	C	LIGHTING	5	SPA	1420	w	1.00	1420	1420	DIM
24	C	LIGHTING	5	SPA	148	w	1.00	148	148	DIM
25	A	LIGHTING	5	SPA	370	w	1.00	370	370	DIM
26	A	LIGHTING	5	SPA	200	w	1.00	200	200	DIM
27	B	LIGHTING	5	SPA	500	w	1.00	500	500	DIM
28	B	LIGHTING	5	SPA RETAIL	150	w	1.00	150	150	NON DIM
29	C	LIGHTING	5	SPA	500	w	1.00	500	500	DIM
30	C	LIGHTING	3	COURTYARD	180	w	0.90	180	200	NON DIM
31	A	LIGHTING	5	COURTYARD	180	w	1.00	180	180	DIM
32	A	LIGHTING	5	NORTH CORRIDOR	148	w	1.00	148	148	DIM
33	B	LIGHTING	5	SPA	148	w	1.00	148	148	DIM
34	B	LIGHTING	5	EXTERIOR	200	w	1.00	200	200	DIM
35	C	LIGHTING	5	EXTERIOR	780	w	1.00	780	780	DIM
36	C	LIGHTING	5	SPA LOCKER RM.	444	w	1.00	444	444	DIM
37	A	LIGHTING	5	SPA LOCKER RM.	1125	w	1.00	1125	1125	DIM
38	A	LIGHTING	5	SPA LOCKER RM.	185	w	1.00	185	185	DIM
39	B	LIGHTING	5	SPA LOCKER RM.	407	w	1.00	407	407	DIM
40	B	LIGHTING	5	SPA LOCKER RM.	500	w	1.00	500	500	DIM
41	C	LIGHTING	5	SPA LOCKER RM.	600	w	1.00	600	600	NON DIM
42	C	LIGHTING	5	SPA LOCKER RM.	222	w	1.00	222	222	DIM
43	A	LIGHTING	3	SPA LOCKER RM.	293	w	0.90	293	326	DIM
44	A	LIGHTING	5	SPA LOCKER RM.	222	w	1.00	222	222	DIM
45	B	LIGHTING	5	SPA LOCKER RM.	250	w	1.00	250	250	DIM
46	B	LIGHTING	5	SPA LOCKER RM.	160	w	1.00	160	160	DIM
47	C	LIGHTING	5	SPA LOCKER RM.	259	w	1.00	259	259	DIM
48	C	SPARE			0	w		0	0	NON DIM
49	A	LIGHTING	5	SPA LOCKER RM.	74	w	1.00	74	74	DIM
50	A	LIGHTING	5	SPA LOCKER RM.	333	w	1.00	333	333	DIM
51	B	LIGHTING	5	SPA LOCKER RM.	500	w	1.00	500	500	DIM
52	B	SPARE			0	w		0	0	NON DIM
53	C	LIGHTING	5	SALON	450	w	1.00	450	450	DIM
54	C	LIGHTING	5	SALON	500	w	1.00	500	500	DIM
55	A	LIGHTING	5	SPA LOCKER RM.	185	w	1.00	185	185	NON DIM
56	A	SPARE			0	w		0	0	
57	B	SPARE			0	w		0	0	
58	B	SPARE			0	w		0	0	
59	C	SPARE			0	w		0	0	
60	C	SPARE			0	w		0	0	
PANEL TOTAL								19.9	20.0	Amps= 55.5

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					5.26	5.29	26%	44.1
PHASE TOTAL	B					6.45	6.51	33%	54.3
PHASE TOTAL	C					8.17	8.19	41%	68.2

LOAD CATAGORIES		Connected			Demand				Ver. 104
		kW	kVA	DF	kW	kVA	PF		
1	receptacles	0.0	0.0	0.70	0.0	0.0			
2	computers	0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting	0.7	0.8	1.00	0.7	0.8	0.90		
4	HID lighting	0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting	18.9	18.9	1.00	18.9	18.9	1.00		
6	HVAC fans	0.0	0.0	0.80	0.0	0.0			
7	heating	0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment	0.0	0.0	0.80	0.0	0.0			
9	unassigned	0.0	0.0	1.00	0.0	0.0			
Total Demand Loads					19.6	19.7			
Spare Capacity		20%			3.9	3.9			
Total Design Loads					23.5	23.6	1.00	Amps=	65.5

65.5A * 1.25 = 81.92A → 90A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #4 AWG + #8 AWG Ground
(Feeder worksheet shown below in Table 4)

DIM213	Conduit Sizing Worksheet	
Total Cross Sectional of Wire Area	0.3662	sq. inches
Calculated EMT Conduit Size (minimum size is 3/4")	1.25 "	EMT
Calculated IMC Conduit Size (minimum size is 3/4")	1.00 "	IMC
Calculated RMC Conduit Size (minimum size is 3/4")	1.25 "	RMC
Calculated RNC Conduit Size (minimum size is 3/4")	1.25 "	RNC
Ref: 2005 NEC, Tables 4, 5 and 8		

									Totals	
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area
	No.	Area	No.	Area	No.	Area	No.	Area		
14		0.0139		0.0097		0.0139		0.004	0	0
12		0.0181		0.0133		0.0181		0.006	0	0
10		0.0243		0.0211		0.0243		0.011	0	0
8		0.0437	1	0.0366		0.0437		0.017	1	0.0366
6		0.0726		0.0507		0.0590		0.027	0	0
4		0.0973	4	0.0824		0.0814		0.042	4	0.3296

DIM211A

PANELBOARD SIZING WORKSHEET

Panel Tag---------->	DIM211A	Panel Location:	Corridor 2100	
Nominal Phase to Neutral Voltage------->	120	Phase:	3	
Nominal Phase to Phase Voltage-------->	208	Wires:	4	

DIMMING PANEL "DIM211A" 120/208V, 3Ph., 4W. 125A MCB - Normal Power

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	5	CORRIDOR 1ST FL.	800	w	1.00	800	800	DIM
2	A	LIGHTING	5	CORRIDOR 1ST FL.	222	w	1.00	222	222	DIM
3	B	LIGHTING	5	CORRIDOR 1ST FL.	148	w	1.00	148	148	DIM
4	B	LIGHTING	5	CORRIDOR 1ST FL.	160	w	1.00	160	160	DIM
5	C	LIGHTING	5	CORRIDOR 1ST FL.	444	w	1.00	444	444	DIM
6	C	SPARE			0	w		0	0	
7	A	LIGHTING	5	CORRIDOR 1ST FL.	420	w	1.00	420	420	DIM
8	A	LIGHTING	5	CORRIDOR 1ST FL.	74	w	1.00	74	74	DIM
9	B	LIGHTING	5	CORRIDOR 1ST FL.	300	w	1.00	300	300	DIM
10	B	LIGHTING	5	CORRIDOR 1ST FL.	296	w	1.00	296	296	DIM
11	C	LIGHTING	3	COURTYARD	476	w	0.60	476	793	NON DIM
12	C	LIGHTING	5	CORRIDOR 1ST FL.	72	w	1.00	72	72	DIM
13	A	LIGHTING	9	COURTYARD	96.2	w	0.95	96	101	NON DIM
14	A	LIGHTING	5	BILLIARDS	960	w	1.00	960	960	DIM
15	B	LIGHTING	5	BILLIARDS	500	w	1.00	500	500	DIM
16	B	LIGHTING	9	EXTERIOR	660	w	0.99	660	667	NON DIM
17	C	LIGHTING	5	BILLIARDS	1800	w	1.00	1800	1800	DIM
18	C	LIGHTING	5	BILLIARDS	111	w	1.00	111	111	DIM
19	A	LIGHTING	5	BILLIARDS	111	w	1.00	111	111	DIM
20	A	LIGHTING	5	PRIVATE DINING	148	w	1.00	148	148	DIM
21	B	LIGHTING	5	PUBLIC RESTROOMS	370	w	1.00	370	370	DIM
22	B	LIGHTING	5	PUBLIC RESTROOMS	975	w	1.00	975	975	DIM
23	C	LIGHTING	5	PUBLIC RESTROOMS	259	w	1.00	259	259	DIM
24	C	LIGHTING	5	PUBLIC RESTROOMS	111	w	1.00	111	111	DIM
25	A	LIGHTING	5	PRIVATE DINING	400	w	1.00	400	400	NON DIM
26	A	LIGHTING	5	COOKING STUDIO	814	w	1.00	814	814	DIM
27	B	LIGHTING	5	COOKING STUDIO	1600	w	1.00	1600	1600	DIM
28	B	LIGHTING	5	COOKING STUDIO	100	w	1.00	100	100	DIM
29	C	LIGHTING	5	RESTAURANT VEST.	74	w	1.00	74	74	DIM
30	C	LIGHTING	5	RESTAURANT	400	w	1.00	400	400	DIM

31	A	LIGHTING	5	RESTAURANT	400	w	1.00	400	400	DIM
32	A	LIGHTING	5	RESTAURANT	400	w	1.00	400	400	DIM
33	B	LIGHTING	5	RESTAURANT	468	w	1.00	468	468	DIM
34	B	LIGHTING	5	RESTAURANT	259	w	1.00	259	259	DIM
35	C	LIGHTING	5	RESTAURANT	600	w	1.00	600	600	DIM
36	C	LIGHTING	5	RESTAURANT	1600	w	1.00	1600	1600	DIM
37	A	LIGHTING	5	RESTAURANT	250	w	1.00	250	250	DIM
38	A	LIGHTING	5	RESTAURANT	74	w	1.00	74	74	DIM
39	B	LIGHTING	5	RESTAURANT EXT.	851	w	1.00	851	851	DIM
40	B	LIGHTING	5	RESTAURANT	148	w	1.00	148	148	DIM
41	C	LIGHTING	5	PRIVATE DINING	400	w	1.00	400	400	DIM
42	C	LIGHTING	5	PRIVATE DINING	296	w	1.00	296	296	DIM
43	A	LIGHTING	5	PRIVATE DINING	74	w	1.00	74	74	DIM
44	A	LIGHTING	5	PRIVATE DINING	600	w	1.00	600	600	DIM
45	B	LIGHTING	5	MAITRE D'	148	w	1.00	148	148	DIM
46	B	LIGHTING	5	BOARD RM.	240	w	1.00	240	240	DIM
47	C	LIGHTING	3	BOARD RM.	1120	w	0.90	1120	1244	DIM
48	C	LIGHTING	5	BOARD RM.	814	w	1.00	814	814	DIM
49	A	LIGHTING	5	BOARD RM.	111	w	1.00	111	111	DIM
50	A	LIGHTING	5	BOARD RM.	240	w	1.00	240	240	DIM
51	B	LIGHTING	5	BOARD RM.	1120	w	1.00	1120	1120	DIM
52	B	LIGHTING	5	BOARD RM.	962	w	1.00	962	962	DIM
53	C	LIGHTING	5	RETAIL	592	w	1.00	592	592	DIM
54	C	LIGHTING	5	RETAIL	592	w	1.00	592	592	DIM
55	A	LIGHTING	5	RETAIL	555	w	1.00	555	555	DIM
56	A	LIGHTING	5	RETAIL	555	w	1.00	555	555	DIM
57	B	SPARE		SPARE	0	w		0	0	
58	B	LIGHTING	5	RETAIL	500	w	1.00	500	500	DIM
59	C	LIGHTING	5	RETAIL	920	w	1.00	920	920	DIM
60	C	LIGHTING	5	RETAIL	216	w	1.00	216	216	DIM
PANEL TOTAL								28.0	28.5	Amps= 79.1

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					7.30	7.31	26%	60.9
PHASE TOTAL	B					9.81	9.81	34%	81.8
PHASE TOTAL	C					10.90	11.34	40%	94.5

LOAD CATAGORIES			Connected			Demand				Ver. 104
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0	0.70	0.0	0.0			
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		1.6	2.0	1.00	1.6	2.0	0.78		
4	HID lighting		0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting		25.7	25.7	1.00	25.7	25.7	1.00		
6	HVAC fans		0.0	0.0	0.80	0.0	0.0			
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		0.8	0.8	1.00	0.8	0.8	0.98		
Total Demand Loads						28.0	28.5			
Spare Capacity			20%			5.6	5.7			
Total Design Loads						33.6	34.2	0.98	Amps=	94.9

94.9 A * 1.25 = 118.6A ➔ 125A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #1 AWG + #6 AWG Ground
(Feeder worksheet shown below in Table 4)

DIM211A	**Conduit Sizing Worksheet**	
Total Cross Sectional of Wire Area	0.6755	sq. inches
Calculated EMT Conduit Size (minimum size is 3/4")	1.50 "	EMT
Calculated IMC Conduit Size (minimum size is 3/4")	1.50 "	IMC
Calculated RMC Conduit Size (minimum size is 3/4")	1.50 "	RMC
Calculated RNC Conduit Size (minimum size is 3/4")	1.50 "	RNC
Ref: 2005 NEC, Tables 4, 5 and 8		

									Totals	
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area
	No.	Area	No.	Area	No.	Area	No.	Area		
14		0.0139		0.0097		0.0139		0.004	0	0
12		0.0181		0.0133		0.0181		0.006	0	0
10		0.0243		0.0211		0.0243		0.011	0	0
8		0.0437		0.0366		0.0437		0.017	0	0
6		0.0726	1	0.0507		0.0590		0.027	1	0.0507
4		0.0973		0.0824		0.0814		0.042	0	0
3		0.1134		0.0973		0.0962		0.053	0	0
2		0.1333		0.1158		0.1146		0.067	0	0
1		0.1901	4	0.1562		0.1534		0.087	4	0.6248

EDIM211

PANELBOARD SIZING WORKSHEET

Panel Tag---------->	EDIM211	Panel Location:	Corridor 2100
Nominal Phase to Neutral Voltage------->	120	Phase:	3
Nominal Phase to Phase Voltage-------->	208	Wires:	4

DIMMING PANEL "EDIM211" 120/208V, 3Ph., 4W. 35A MCB - Emergency Power

Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	5	CORRIDOR FIRST FL.	1443	w	1.00	1443	1443	DIM
2	A	LIGHTING	5	CORRIDOR FIRST FL.	148	w	1.00	148	148	DIM
3	B	LIGHTING	5	CORRIDOR FIRST FL.	200	w	1.00	200	200	DIM
4	B	LIGHTING	5	CORRIDOR FIRST FL.	240	w	1.00	240	240	DIM
5	C	LIGHTING	5	CORRIDOR FIRST FL.	256	w	1.00	256	256	DIM
6	C	LIGHTING	5	CORRIDOR FIRST FL.	256	w	1.00	256	256	DIM
7	A	LIGHTING	5	CORRIDOR FIRST FL.	200	w	1.00	200	200	DIM
8	A	LIGHTING	5	BILLIARD FIRST FL.	370	w	1.00	370	370	DIM
9	B	LIGHTING	5	BILLIARD FIRST FL.	74	w	1.00	74	74	DIM
10	B	LIGHTING	5	PUBLIC RESTROOMS	444	w	1.00	444	444	DIM
11	C	LIGHTING	5	COOKING STUDIO	555	w	0.60	555	925	DIM
12	C	LIGHTING	5	HOTEL SPA CHECK-IN	319	w	1.00	319	319	DIM
13	A	LIGHTING	5	RESTAURANT	600	w	0.95	600	632	DIM
14	A	LIGHTING	5	RESTAURANT	370	w	1.00	370	370	DIM
15	B	LIGHTING	5	RESTAURANT	111	w	1.00	111	111	DIM
16	B	LIGHTING	5	RESTAURANT	148	w	0.99	148	149	DIM
17	C	LIGHTING	5	RESTAURANT	780	w	1.00	780	780	DIM
18	C	SPARE				w		0	0	
19	A	LIGHTING		BOARD ROOM	900	w	0.90	900	1000	DIM
20	A	LIGHTING		BOARD ROOM	900	w	0.90	900	1000	DIM
21	B	LIGHTING		CHECK-IN	444	w	0.90	444	493	DIM
22	B	LIGHTING		LIBRARY	666	w	0.90	666	740	DIM
23	C	LIGHTING	9	LIVING ROOM	86	w	0.90	86	96	DIM

24	C	SPARE				w		0	0	DIM	
25	A	SPARE				w		0	0		
26	A	SPARE				w		0	0		
27	B	LIGHTING	3	PORTE-COCHERE	54	w	0.60	54	90	NON-DIM	
28	B	LIGHTING	3	WINE BAR	114	w	0.90	114	127	DIM	
29	C	LIGHTING	5	RETAIL	333	w	1.00	333	333	DIM	
30	C	LIGHTING	5	PRIVATE DINING	592	w	1.00	592	592	DIM	
31	A	SPARE				w		0	0		
32	A	SPARE				w		0	0		
33	B	SPARE				w		0	0		
34	B	SPARE				w		0	0		
35	C	SPARE				w		0	0		
36	C	SPARE				w		0	0		
PANEL TOTAL								10.6	11.4	Amps=	31.6

PHASE LOADING									
PHASE TOTAL	A					4.93	5.16	45%	43.0
PHASE TOTAL	B					2.50	2.67	23%	22.2
PHASE TOTAL	C					3.18	3.56	31%	29.6

LOAD CATAGORIES			Connected			Demand				Ver. 104
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0	0.70	0.0	0.0			
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		0.2	0.2	1.00	0.2	0.2	0.78		
4	HID lighting		0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting		7.4	7.8	1.00	7.4	7.8	0.95		
6	HVAC fans		0.0	0.0	0.80	0.0	0.0			
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		0.1	0.1	1.00	0.1	0.1	0.90		
Total Demand Loads						7.7	8.2			
Spare Capacity			20%			1.5	1.6			
Total Design Loads						9.2	9.8	0.94	Amps=	27.2

27.2 A * 1.25 = 34A ➔ 35A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #8 AWG + #10 AWG Ground
(Feeder worksheet shown below in Table 4)

EDIM211

Conduit Sizing Worksheet

Total Cross Sectional of Wire Area	0.1675	sq. inches
Calculated EMT Conduit Size (minimum size is 3/4")	0.75 "	EMT
Calculated IMC Conduit Size (minimum size is 3/4")	0.75 "	IMC
Calculated RMC Conduit Size (minimum size is 3/4")	0.75 "	RMC
Calculated RNC Conduit Size (minimum size is 3/4")	0.75 "	RNC
Ref: 2005 NEC, Tables 4, 5 and 8		

									Totals	
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area
	No.	Area	No.	Area	No.	Area	No.	Area		
14		0.0139		0.0097		0.0139		0.004	0	0
12		0.0181		0.0133		0.0181		0.006	0	0
10		0.0243	1	0.0211		0.0243		0.011	1	0.0211
8		0.0437	4	0.0366		0.0437		0.017	4	0.1464

DIM211B

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					DIM211B	Panel Location:		Corridor 2100		
Nominal Phase to Neutral Voltage------->					120	Phase:		3		
Nominal Phase to Phase Voltage-------->					208	Wires:		4		
DIMMING PANEL "DIM211B" 120/208V, 3Ph., 4W. 70A MCB - Normal Power										
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	5	CORRIDOR	1200	w	1.00	1200	1200	DIM
2	A	LIGHTING	5	CORRIDOR	1200	w	1.00	1200	1200	DIM
3	B	LIGHTING	5	CORRIDOR	1200	w	1.00	1200	1200	DIM
4	B	LIGHTING	5	CORRIDOR	666	w	1.00	666	666	DIM
5	C	LIGHTING	5	CORRIDOR	1200	w	1.00	1200	1200	DIM
6	C	LIGHTING	5	CHECK-IN	400	w	1.00	400	400	DIM
7	A	LIGHTING	5	CHECK-IN	500	w	1.00	500	500	DIM
8	A	SPARE				w		0	0	
9	B	SPARE				w		0	0	
10	B	SPARE				w		0	0	
11	C	LIGHTING	5	LIBRARY	320	w	0.60	320	533	DIM
12	C	LIGHTING	5	LIBRARY	900	w	1.00	900	900	DIM
13	A	LIGHTING	5	LIBRARY	185	w	0.95	185	195	DIM
14	A	LIGHTING	5	LIBRARY	148	w	1.00	148	148	DIM
15	B	LIGHTING	5	LIBRARY	500	w	1.00	500	500	DIM
16	B	SPARE				w	0.99	0	0	
17	C	LIGHTING	5	LIBRARY	148	w	1.00	148	148	DIM
18	C	LIGHTING	3	LIVING ROOM	654	w	0.90	654	727	DIM
19	A	LIGHTING	3	LIVING ROOM	608	w	0.90	608	676	DIM
20	A	LIGHTING	9	LIVING ROOM		w	0.90	0	0	DIM
21	B	LIGHTING	9	LIVING ROOM		w	0.90	0	0	DIM
22	B	LIGHTING	9	LIVING ROOM		w	0.90	0	0	DIM
23	C	LIGHTING	9	LIVING ROOM		w	0.90	0	0	DIM
24	C	LIGHTING	3	LIVING ROOM		w	0.90	0	0	DIM
25	A	LIGHTING	9	LIVING ROOM		w	0.90	0	0	DIM
26	A	LIGHTING		LIVING ROOM		w	0.90	0	0	DIM
27	B	SPARE				w		0	0	
28	B	LIGHTING	5	EXTERIOR	240	w	1.00	240	240	DIM
29	C	LIGHTING	5	EXTERIOR	120	w	1.00	120	120	DIM
30	C	LIGHTING	5	EXTERIOR	220	w	1.00	220	220	DIM
31	A	LIGHTING	5	EXTERIOR	700	w	1.00	700	700	DIM
32	A	SPARE				w		0	0	
33	B	LIGHTING	5	ENTRY	400	w	1.00	400	400	DIM
34	B	LIGHTING	5	ENTRY	666	w	1.00	666	666	DIM
35	C	LIGHTING	5	ENTRY	160	w	1.00	160	160	DIM
36	C	LIGHTING	5	ENTRY	74	w	1.00	74	74	DIM
37	A	LIGHTING	5	ENTRY	74	w	1.00	74	74	DIM
38	A	LIGHTING	5	ENTRY	111	w	1.00	111	111	DIM
39	B	LIGHTING	3	EXTERIOR	709	w	0.90	709	788	NON-DIM
40	B	SPARE				w		0	0	
41	C	LIGHTING	5	VALET	111	w	1.00	111	111	DIM
42	C	SPARE				w		0	0	
43	A	LIGHTING	5	ENTRY	74	w	1.00	74	74	DIM
44	A	SPARE				w		0	0	
45	B	SPARE				w		0	0	
46	B	LIGHTING	9	WINE BAR	353	w	0.90	353	392	DIM
47	C	LIGHTING	3	WINE BAR	345	w	0.90	345	383	DIM

48	C	LIGHTING	3	WINE BAR	145	w	0.90	145	161	DIM	
49	A	LIGHTING	9	WINE BAR	278.5	w	0.90	279	309	DIM	
50	A	SPARE	9			w		0	0		
51	B	SPARE				w		0	0		
52	B	SPARE				w		0	0		
53	C	SPARE				w		0	0		
54	C	SPARE				w		0	0		
55	A	SPARE				w		0	0		
56	A	SPARE				w		0	0		
57	B	SPARE				w		0	0		
58	B	SPARE				w		0	0		
59	C	SPARE				w		0	0		
60	C	SPARE				w		0	0		
PANEL TOTAL								14.6	15.2	Amps=	42.2

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL		A				5.08	5.19	34%	43.2
PHASE TOTAL		B				4.73	4.85	32%	40.4
PHASE TOTAL		C				4.80	5.14	34%	42.8

LOAD CATAGORIES			Connected			Demand				Ver. 104
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0	0.70	0.0	0.0			
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		2.5	2.7	1.00	2.5	2.7	0.90		
4	HID lighting		0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting		11.5	11.7	1.00	11.5	11.7	0.98		
6	HVAC fans		0.0	0.0	0.80	0.0	0.0			
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		0.6	0.7	1.00	0.6	0.7	0.90		
Total Demand Loads						14.6	15.2			
Spare Capacity			20%			2.9	3.0			
Total Design Loads						17.5	18.2	0.96	Amps=	50.6

50.6 A * 1.25 = 63.23A ➔ 70A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #6 AWG + #8 AWG Ground
(Feeder worksheet shown below in Table 4)

DIM211B

Conduit Sizing Worksheet

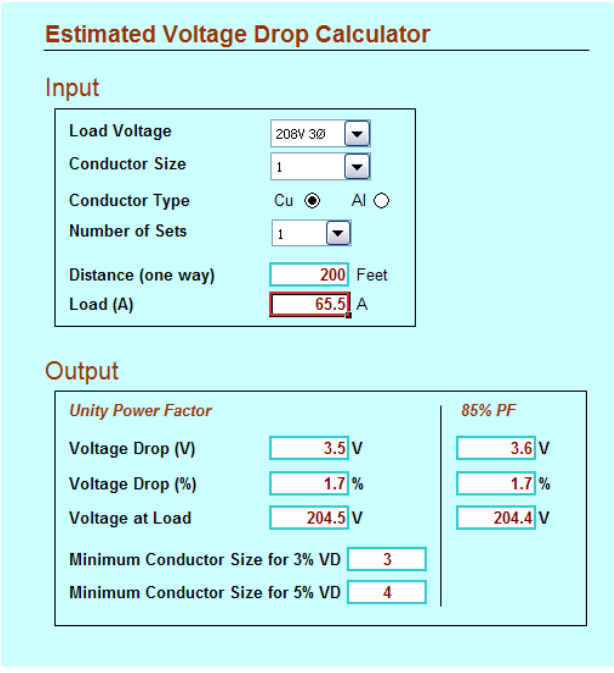
Total Cross Sectional of Wire Area	0.2394	sq. inches
Calculated EMT Conduit Size (minimum size is 3/4")	1.00 "	EMT
Calculated IMC Conduit Size (minimum size is 3/4")	1.00 "	IMC
Calculated RMC Conduit Size (minimum size is 3/4")	1.00 "	RMC
Calculated RNC Conduit Size (minimum size is 3/4")	1.00 "	RNC
Ref: 2005 NEC, Tables 4, 5 and 8		

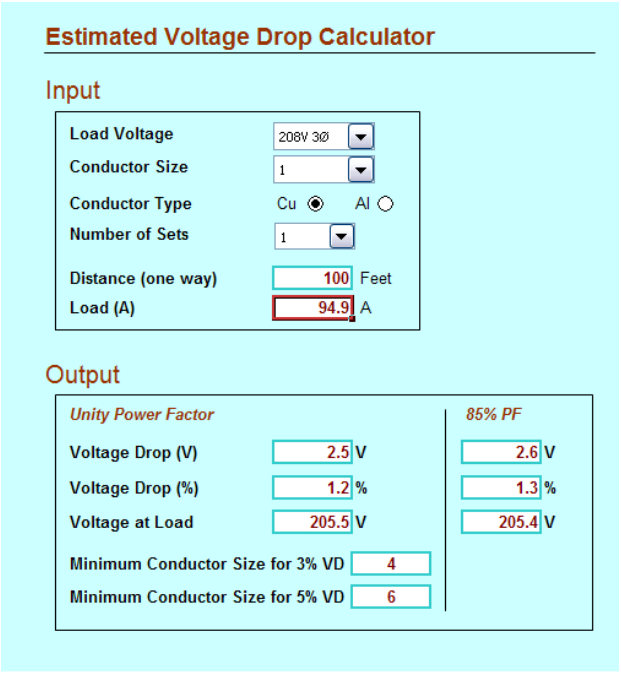
									Totals	
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area
	No.	Area	No.	Area	No.	Area	No.	Area		
14		0.0139		0.0097		0.0139		0.004	0	0
12		0.0181		0.0133		0.0181		0.006	0	0
10		0.0243		0.0211		0.0243		0.011	0	0
8		0.0437	1	0.0366		0.0437		0.017	1	0.0366
6		0.0726	4	0.0507		0.0590		0.027	4	0.2028

Table 4: Feeder Sizing Worksheet for the Entry Courtyard lighting branch circuit redesign.

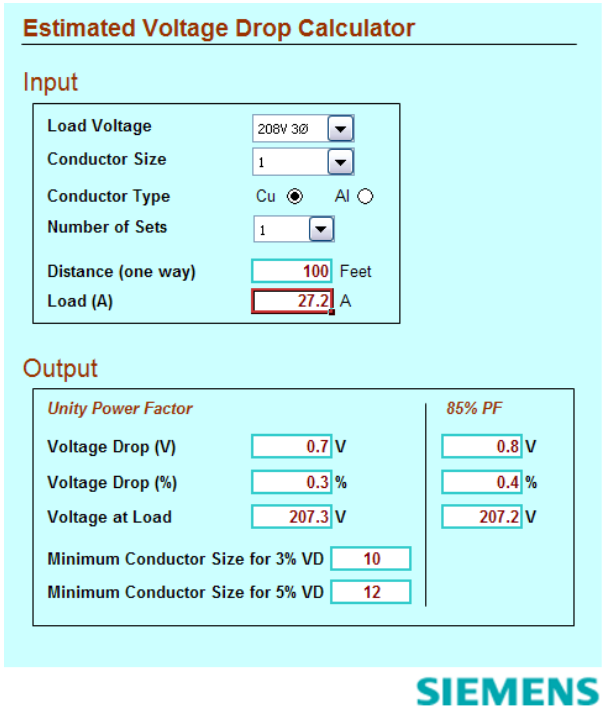
FEEDER SIZING WORKSHEET				
Panelboard Tag	DIM213	DIM211A	EDIM211	DIM211B
Panelboard Voltage	120/208	120/208	120/208	120/208
Calculated Design Load (kW)	23.5	33.6	9.2	17.5
Calculated Design Load (kVA)	23.6	34.2	9.8	18.2
Calculated Design Load (amps)	65.5	94.9	27.2	50.6
Feeder Sizing				
Sets	1	1	1	1
Wire Size				
Phase	#4 AWG	#1 AWG	#8 AWG	#6 AWG
Neutral	#4 AWG	#1 AWG	#8 AWG	#6 AWG
Ground	#8 AWG	#6 AWG	#10 AWG	#8 AWG
Wire Area				
Each Phase	0.0824	0.1562	0.0366	0.0507
Total - Phase Conductors	0.2472	0.4686	0.1098	0.1521
Neutral	0.0824	0.1562	0.0366	0.0507
Ground	0.0366	0.0507	0.0211	0.0366
Total Area	0.3662	0.6755	0.1675	0.2394
Conduit Size	1.25" EMT	1.5" EMT	0.75" EMT	1.0" EMT

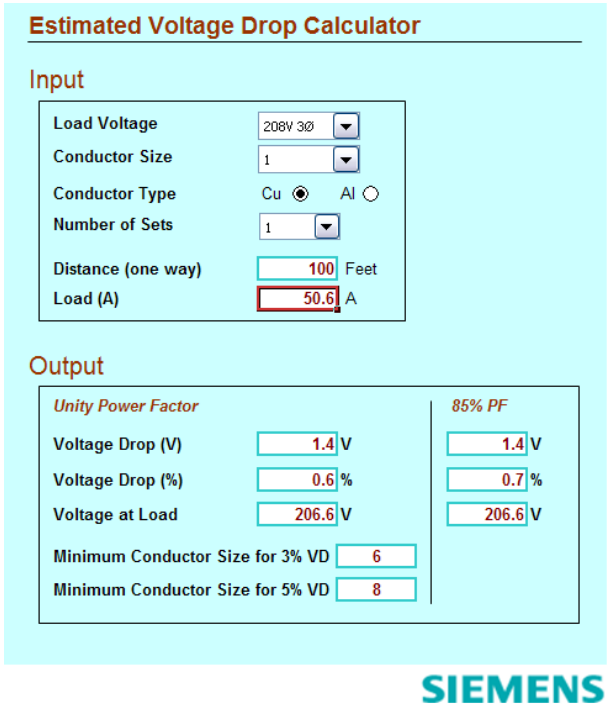
Voltage Drop for DIM213, DIM211A





Voltage Drop for EDIM211, DIM211B





Lutron Dimming Panel Specification Cutsheets:
See Appendix C

The Living Room

Description:
Guests enter the Salamander Resort and Spa through the main entry courtyard, pass through the entry foyer, and are welcomed into the resort by a lobby-like space, called the Living Room. The Living Room is equipped for relaxation. With fine furniture, two fireplaces, and access out to an outdoor terrace, this space sets the tone for the entire resort experience. The hardwood floor is made of stained French oak, which is contrasted in its dark color to the painted "Palace White" and "Putnam Ivory" trim work as well as the white travertine stone of the two fireplaces in the room. Different pieces of furniture sit on two patterned rugs that cover about half of the floor space. The ceiling is painted Putnam ivory on the lower, curved and vaulted ceiling, while the upper rectangular ceiling is a semi-gloss latex Palace white. The walls are painted with a pale blue-green "Rhine River" color. While no specific task is completed here, this space must be pleasant in nature for guests to pass through or relax in while they check in.

Area: 1938 Sq. ft.

Dimension: Approximately 51'-0" x 38'-0" x 22'-0"

Space Category:
A circulation space (lobby)

Materials:

MATERIAL/FINISH	LOCATION	OBJECT	COLOR	REFLECTANCE
French oak	Living Room	Wood floor	Bordeaux	0.3
Semi-gloss Latex Paint	Living Room	Baseboards, Door Casings, Crown Molding	Palace White	0.86
Flat Latex Paint	Living Room	Lower ceiling	Putnam Ivory	0.7
Semi-gloss Latex Paint	Living Room	Cove molding	Palace White	0.86
Eggshell Latex Paint	Living Room	Walls	Rhine River	0.7
White oak	Living Room	Doors		0.5
Flat Latex Paint	Living Room	Ceiling Coffer	Palace White	0.86

Living Room Plans –

Figure15: Living Room Furnishing Plan.

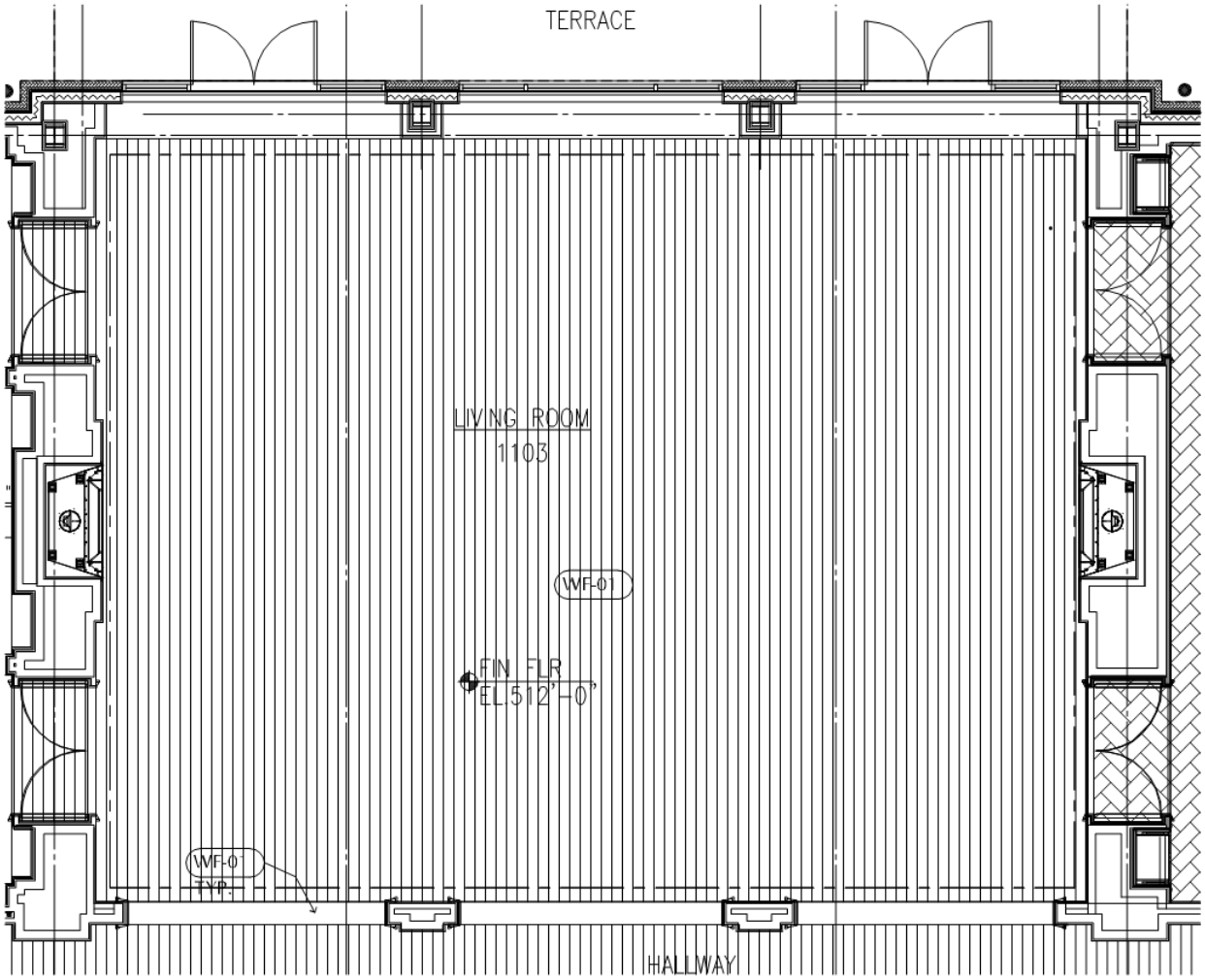


Figure 16: Living Room Furnishing Plan.

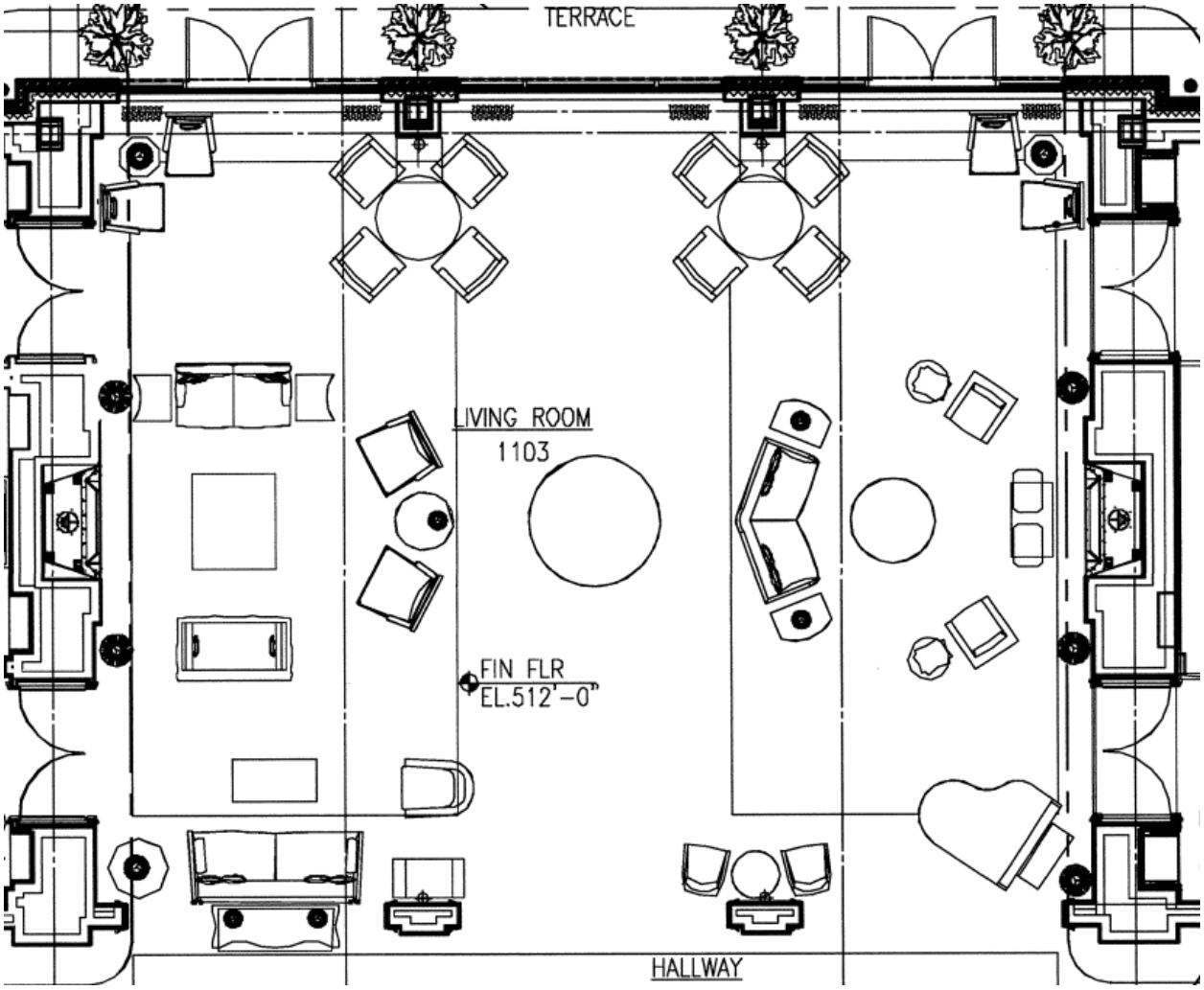


Figure 17: Living Room ceiling plan

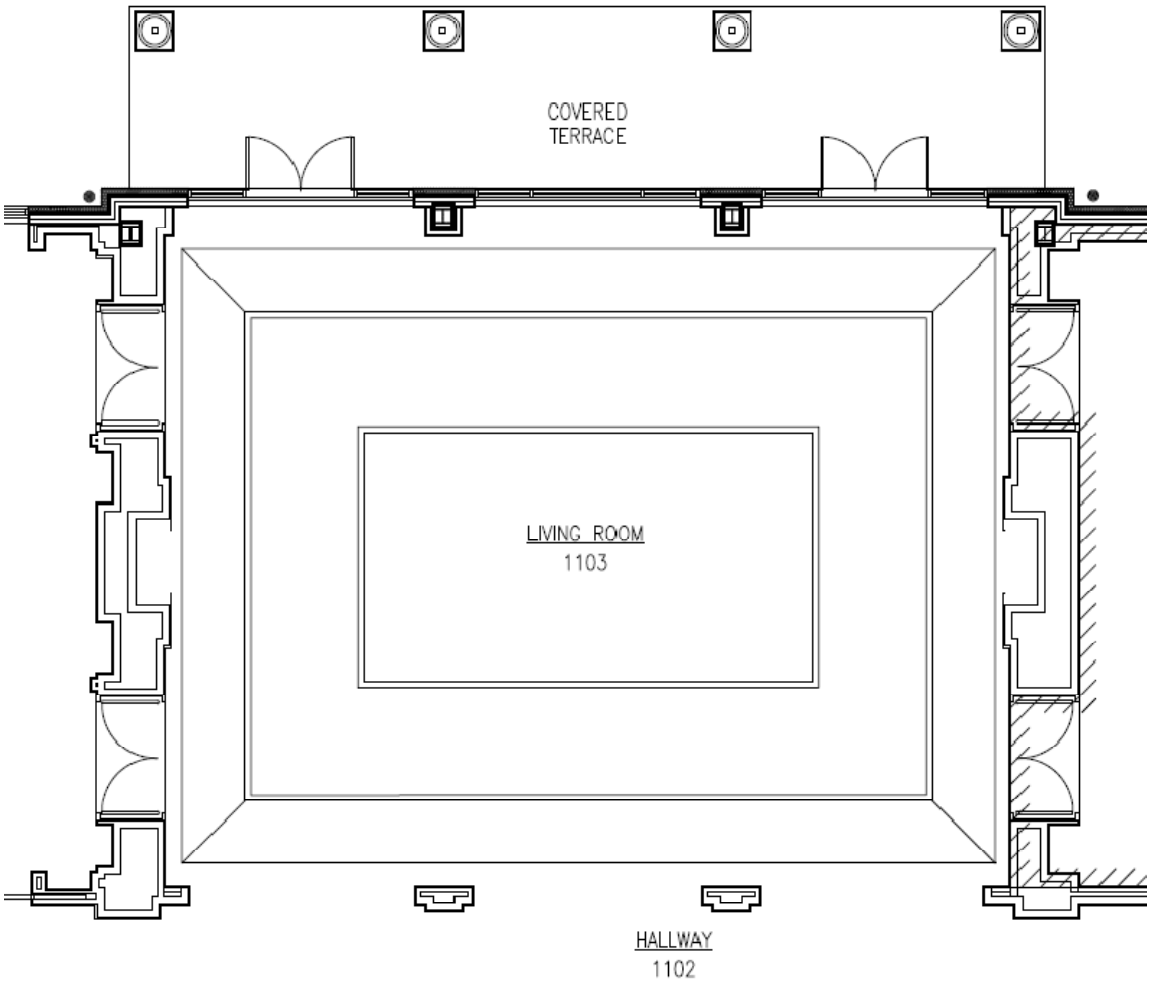
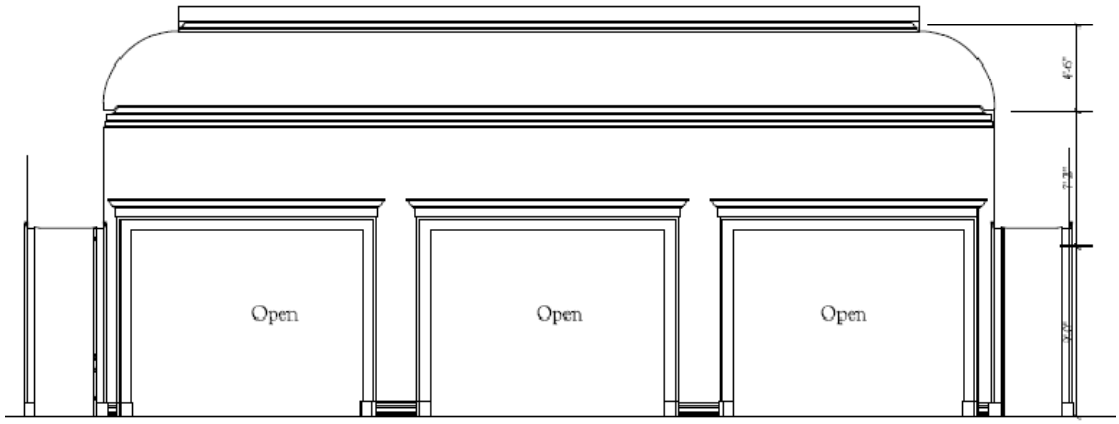


Figure 18: Living Room east elevation.

Figure 19: Living Room north elevation.

Figure 20: Living Room south elevation.



Lighting Design Criteria and Consideration

(*IESNA Handbook*: Interior-Hotels-Lobby-General Lighting)

- **Psychological Impressions**
  - There is no specific task for the Living Room other than a space to sit down and relax. Therefore, the impression the lighting design should strive for is relaxation.

- **Appearance of Space and Luminaires** (Important)
  - Once guests enter the resort, they pass through the entrance foyer and see the Living Room open before them. This is the first complete space they will see. The fine finishes and materials should be masked by the luminaires and enhanced by their lighting. This room sets the tone for the entire resort and spa.

- **Color Appearance (and Color Contrast)** (Important)
  - The light sources in this space should be warmer in CCT to promote relaxation. Also, the "white" painted finishes of the trim-work and ceiling are an ivory and cream-like color. The warmer color of light would complement these finishes well.
  - A use of lighting with high CRI would do justice to the high-end finishes and colors. There are dark browns in this space from the wood floor, a pale blue-green on the walls, and ivory/off-white trimming and surfaces which need to be appropriately conveyed to guests.

- **Daylighting Integration and Control** (Important)
  - Access to the outdoor terrace is made through the glass doors in the Living Room. The two doors and the equally large window between the doors will enable daylight to enter the space. The electric lighting must flexible to accommodate for this. Dimmable luminaires will be necessary.

- **Direct & Reflected Glare** (Important)
  - In order to maintain relaxation in the Living Room space, direct glare from light sources and luminaires must be prevented. Any reading that may take place in this space will require that reflected disability glare is also prevented.

- **Light Distribution on Surfaces** (Important)
  - Vertically, the lighting should be non-uniform to showcase some of the finishes and crown molding. The lower ceiling, which is curved and vaulted up and into the center of the room, could be lighted with a gradient from the cove. Horizontally, the room is divided into two halves of seating areas. The two areas may be uniformly lighted at the furniture surface level.

- **Luminances of Room Surfaces** (Important)
  - The interior design of the Living Room boasts high-end finishes that must be enhanced by lighting. The texture of the decorative trim-work and colors of the ceiling and walls must be visible to those visiting or staying at the Salamander Resort and Spa. The lighting must facilitate visual pleasure to those in the Living Room.

- **Points of Interest** (Important)
  - The seated areas on either side of the room are the main points of interest within the space and must have adequate lighting. However, this furniture is movable. General lighting across the space will suit any furniture layout. Architecturally, the lower ceiling and cove will need to be lighted and act as a point of interest.

- **Horizontal Illuminance** (Important)
  - General lighting within the Living Room requires **10 fc** for simple visual tasks.

- **Vertical Illuminance** (Not applicable)

- **Power Density Allowance:** ASHRAE 90.1 2007
  - For a Lobby in a Hotel: 1.1 W/sq. ft.
  - For a Lounge/Recreational space: 1.2 W/ft.
  - Additional interior lighting power density allowance for spaces in which lighting is specified to be installed in addition to the general lighting of the purpose of decorative appearance (chandeliers and sconces):
    - Additional lighting power shall not exceed 1.0 W/sq.ft.

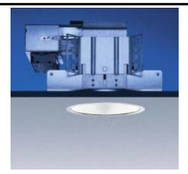
Lighting Plans – See Appendix A

Mounting Details – See Appendix B

Luminaires

Figure 21: Luminaire Schedule. Luminaires, lamps, and ballast specifications can be found in Appendix C.

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
J		Zumtobel	S5D4312 D1 4311R MC	Open recessed downlight. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Spun aluminum reflector with white matte finish.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
J1		Zumtobel	S5D4312 D1 4311W MC	Open recessed downlight/wallwash. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Wallwasher reflector - hydroformed aluminum kicker plate is mounted to the main reflector for wall illumination. Reflector is fully rotatable from below.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
K		Erco	88147.023	Adjustable recessed narrow spot light. 6" aperture. 0-40 degree tilt, 360 degree rotation. Lockable angles. Reflector: aluminum, anodised, mirror-finish. Safety glass. White powder-coated external ring. Flush mounted.	Ceiling Recessed	Electronic	120	20W HIT-TC-CE Metal Halide. MC20TC/U/G6.5/830PB	24 W
K1		Erco	88148.023	Adjustable recessed spot light. 6" aperture. 0-40 degree tilt, 360 degree rotation. Lockable angles. Reflector: aluminum, anodised, mirror-finish. Safety glass. White powder-coated external ring. Flush mounted.	Ceiling Recessed	Electronic	120	20W HIT-TC-CE Metal Halide. MC20TC/U/G6.5/830PB	24 W

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
L		DDP	Cwi-24-60-27K	LED CoveWash luminaire. Low-profile linear fixture with linear parabolic reflector and thin film diffusers. 1.0" deameter clear extruded acrylic housing (UV resistant). Diffuse end caps to prevent shadows. 2' - 0" length	Cove surface mounted	24VDC Class 2	24 VDC	LED	4W/ft
L1		DDP	Cwi-12-60-27K	LED CoveWash luminaire. Low-profile linear fixture with linear parabolic reflector and thin film diffusers. 1.0" deameter clear extruded acrylic housing (UV resistant). Diffuse end caps to prevent shadows. 1' - 0" length	Cove surface mounted	24VDC Class 2	24 VDC	LED	4W/ft
M		2nd Ave.	75606.2.X	"Esther" decorative wall sconce. 13" x 14" x 8". Iron metalwork with bronze finish. Fabric shade, decorative crystal, fiber drip candle covers. Handcrafted. Candelabra base.	Wall surface		120	(2) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	5 W

Light Loss Factors

Light Loss Factors					
Type	LLD	LDD	RSDD	BF	LLF Total
J	0.932	0.9	0.97	1	0.81
J1	0.932	0.9	0.97	1	0.81
K	0.932	0.9	0.97	1	0.81
K1	0.932	0.9	0.97	1	0.81
L	0.93	0.89	0.9	1	0.74
M	0.96	0.94	0.9	1	0.81
N	0.96	0.94	0.9	1	0.81

Assumptions: Very Clean ; 12 month cleaning period.

Controls

The luminaires in the Living Room are all controlled by a Lutron Grafik Eye system (master control EQ-A). Per ASHRAE90.1, luminaires in the Living Room have automatic shutoff control by Wattstopper occupancy sensors. Passive Infrared sensors are oriented into the room on the south wall to prevent view into the corridor, which could incorrectly turn on luminaires when guests pass by.

While the Grafik Eye wall box can dim all luminaires, automatic dimming control is done using daylight sensor "EQ-D". More information on daylighting control is given in the Daylight Analysis section of this report.

Table 5: Control equipment. Product specifications can be found in Appendix C.

Equipment Schedule					
Type	Product Name	Manufacturer	Product/Catalog Number	Description	Location
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Lutron GRAFIK 7000 System master control. Wallstation with LCD screen. Every lighting zone and scene programmable. Timeclock included.	"Storage 1117"
EQ-B	Wall-Mounted PIR Occupancy Sensor	Watt Stopper	CX-100	Wall-mounted passive infrared occupancy sensor. 24 VDC. For large areas, can cover up to 2000 sq. ft. Digital time delay adjustable from 15 seconds to 30 minutes.	Living Room/Ballroom "A" & "C"
EQ-D	LightSaver Dimming Photosensor	Watt Stopper	LS-301	Closed loop, ceiling-mounted, low voltage indoor photosensor. 0-10VDC electronic dimming. Controls up to 50 dimming ballasts per zone.	Living Room

Lighting Design

Design Concept

The design concept was to provide a mixture of the following:

- Ambient light to the seating areas – no specific task is being done and furniture layouts are subject to change
- Accent the interior design elements:
  - Accent the curved vault to the ceiling from within the cove below
  - Spot-light the artwork located above the fireplaces as well as the horse statue in the center of the room
  - Provide decorative elements to mask the decorative context of the interior design
  - Wall sconces provide perimeter light
  - Chandeliers provide some indirect light on the 22'-0" high ceiling.

Theme/metaphor

The lighting should convey class in the style of Virginia horse and wine country that is the trademark of Middleburg. Conservative, old-fashioned decoration is prevalent through the Salamander Resort and Spa and the decorative luminaires as well as the lighting itself blend.

Desired space perceptions

The perception of the space is relaxation. This room sets the tone for the entire resort as guests enter the building through the main courtyard.

Accent issues

The ERCO Gimbal (Type K,K1) recessed adjustable spotlight was specified for performance and aesthetic reasons. Accent lighting was desirable above the fireplace; however, a narrow spot was needed to prevent light leakage onto the curved and vaulted portion of the ceiling as well as not to interfere with the cove lighting. This luminaire is recessed cleanly into the flat portion of the ceiling, taking emphasis away from its housing as if it is not there at all.

The curved, vaulted portion of the ceiling was intentionally left at a glow within the cove to accentuate its curvature. Washing the entire curve evenly would flatten it out.

Lighting Design Renderings

Figure 22: Living Room Rendering

Figure 23: Living Room Daylight Rendering – June 21st 6:00 PM.

Figure 24: Living Room Rendering from outdoor terrace looking in.

Performance Graphics

Figure 25: Living Room contours (footcandles).

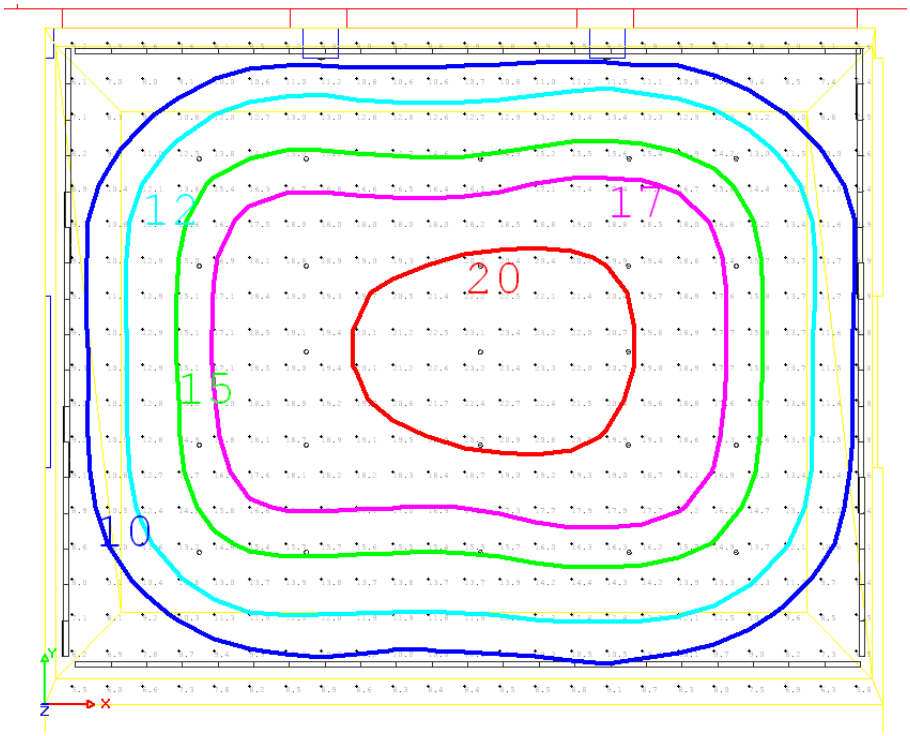


Figure 26: Living Room Pseudo Color Rendering.

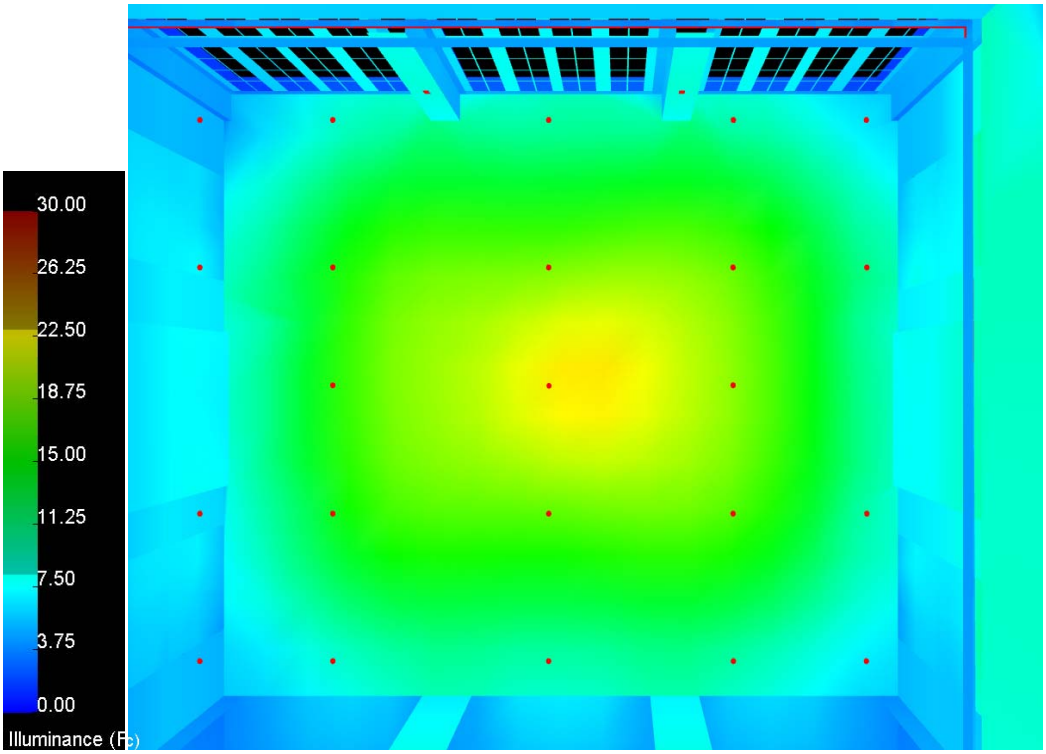


Figure 27: Living Room Pseudo Color Rendering.

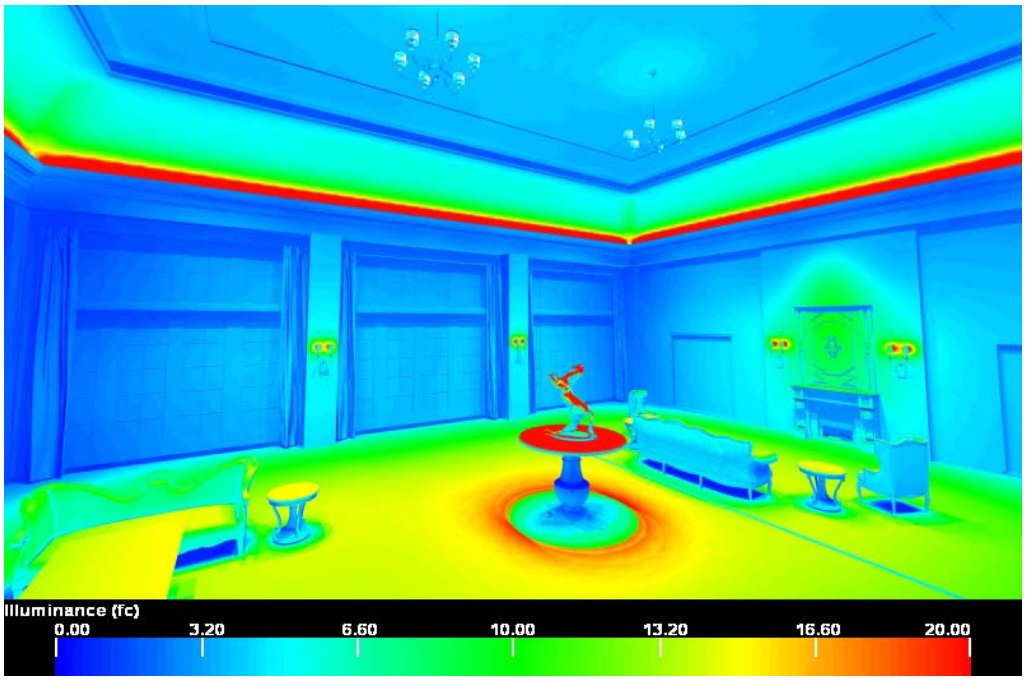
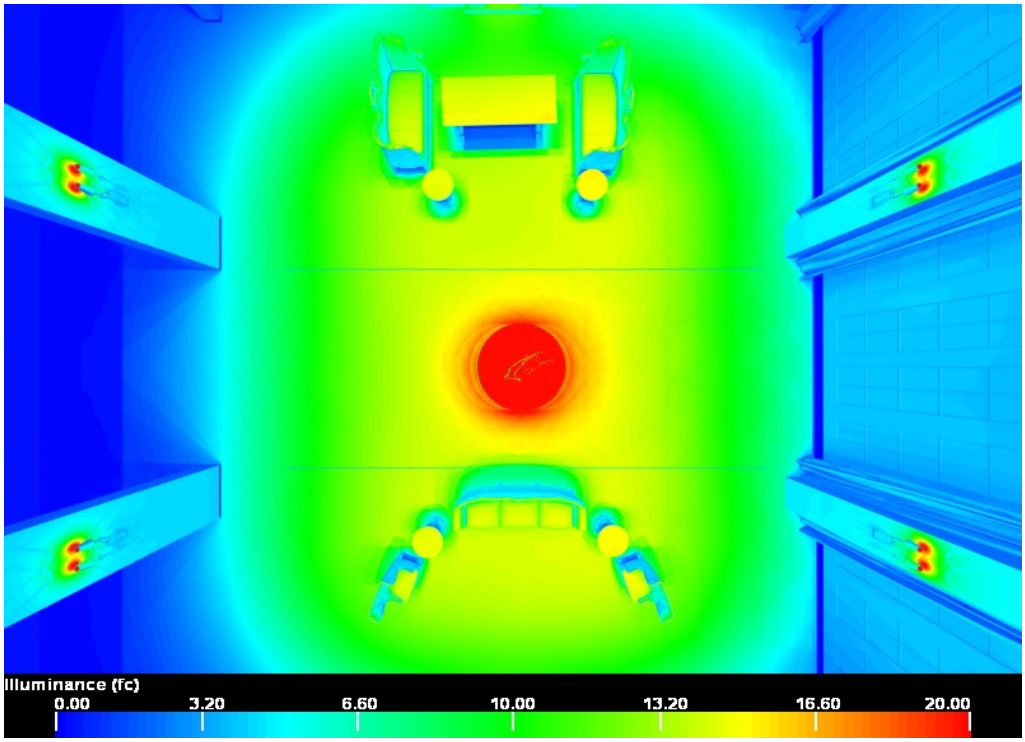


Figure 28: Living Room Pseudo Color Rendering.



Energy Code Compliance

Table 6: Energy Calculations – ASHRAE Standard 90.1

ASHRAE Standard 90.1 - Lighting Power Density			
LUMINAIRE	# OF LUMINAIRES	WATTAGE	TOTAL WATTS
J	27	24	648
K	1	24	24
K1	2	24	48
M	8	5	40
N	2	15	30

LUMINAIRE	LINEAR FEET	W/LF.	TOTAL WATTS
L	172	5	1060

TOTAL WATTS	1850

ASHRAE Standard 90.1 - Lighting Power Density				
Area	Size (sq. ft.)	Power Density Allowable	Allowable Wattage	Designed Wattage
Living Room	1938	1.2 W/sq. ft.	2325.60	1850

W/SQ. FT	0.95

Performance Summary

The lighting design for the Living Room of the Salamander Resort and Spa fulfills its purpose: to provide general lighting to the space as well as accentuate high-end finishes. By putting the interior design on display for guests, this room sets the tone for the entire resort. The curved ceiling structure will be accented by cove lighting and the chandeliers, though decorative, will provide some indirect light on the 22'-0" high flat portion of the ceiling. Decorative sconces will give some non-uniform lighting to the space, and all warm color temperature lamps will give a feeling of relaxation.

In terms of functionality, the downlighting provides general ambient light for any configuration of furniture. Accent lighting is given to artwork above the fireplaces as well as the central horse statue, which establishes the equestrian theme throughout the building. This space has the ability to change throughout the day with daylighting without the problem of direct glare, and the daylighting control system will adjust to that change and save some energy in the process.Quantitatively, the lighting power density is under the 1.2 W/sq.ft. limit given by ASHRAE 90.1 and the average illuminance at 13.8 fc meets the IESNA recommendation of 10 fc.

Electrical Redesign

All panels affected by lighting redesign in the Living Room are shown in Table __ below, highlighted in yellow.

Table 7: Dimming panels affected by lighting redesign.

Panels Affected by Lighting Redesign							
Panel Tag	Voltage	N, N/E, E?	Dimming Panel?	Courtyard	Living Room	Wine Bar	Ballroom
DIM213	120/208 3PH, 4W	N	Yes	X			
EDIM211	120/208 3PH, 4W	E	Yes	X	X	X	
DIM211A	120/208 3PH, 4W	N	Yes	X			
DIM211B	120/208 3PH, 4W	N	Yes	X	X	X	
EDIM212	120/208 3PH, 4W	E	Yes				X
DIM212B	120/208 3PH, 4W	N	Yes				X

Lighting Plan

The Living Room lighting plan with controls and circuiting can be found in Appendix A, drawing E2.1.

Existing Panelboards Affected

Circuits modified by lighting redesign are highlighted in yellow.

DIMMING PANEL "EDIM211" 120/208, 3ø, 4W, 100A MCB – EMERGENCY POWER								LUTRON MOD# GP36–120–4–M60–20
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	03c	AA	LV	DIM	39	37	1443
2	CORRIDOR FIRST FLOOR	06c	AI	LV	DIM	37	4	148
3	CORRIDOR FIRST FLOOR	15c	DP	LV	DIM	200	1	200
4	CORRIDOR FIRST FLOOR	22c	DS–4	INC	DIM	60	4	240
5	CORRIDOR FIRST FLOOR	25c	AA	LV	DIM	37	7	259
6	CORRIDOR FIRST FLOOR	26c	AA/AC–1	LV	DIM	37	7	259
7	CORRIDOR FIRST FLOOR	01c	DP	INC	DIM	200	1	200
8	BILLIARD FIRST FLOOR	01cb	AA	LV	DIM	37	10	370
9	BILLIARD FIRST FLOOR	07cb	AA	LV	DIM	37	2	74
10	PUBLIC RESTROOM FIRST FLOOR	01r	AC–1/AA	LV	DIM	37	12	444
11	COOKING STUDIO FIRST FLOOR	01d	AC–1	TBD	DIM	37	15	555
12	HOTEL SPA CHECK–IN	13c	SC	CC	DIM	5.5 W/LFT	58	319
13	RESTAURANT FIRST FLOOR	05s	DS/DS–1	INC	DIM	75	8	600
14	RESTAURANT FIRST FLOOR	08s	AA–1/AA	LV	DIM	37	10	370
15	RESTAURANT & VEST. FIRST FLOOR	12s	AA	LV	DIM	37	3	111
16	RESTAURANT FIRST FLOOR	14s	AA	LV	DIM	37	4	148
17	RESTAURANT FIRST FLOOR	16s	WB	INC	DIM	60	13	780
18	SPARE							
19	BOARD ROOM FIRST FLOOR	02fra	AE	INC	DIM	150	6	900
20	BOARD ROOM FIRST FLOOR	02frb	AE	INC	DIM	150	6	900

DIMMING PANEL "EDIM211" 120/208, 3ø, 4W, 100A MCB – EMERGENCY POWER								LUTRON MOD# GP36–120–4–M60–20
21	CHECK–IN FIRST FLOOR	03ci	AA	LV	DIM	37	12	444
22	LIBRARY FIRST FLOOR	02cr	AA	LV	DIM	37	18	666
23	LIVING ROOM FIRST FLOOR	03cg	AA	LV	DIM	37	4	148
24	LIVING ROOM FIRST FLOOR	07cg	AH–2	LV	DIM	37	6	222
25	LIVING ROOM FIRST FLOOR	11cg	AA	LV	DIM	37	3	111
26	PORTE–CACHERE FIRST FLOOR	02cv	AA	LV	DIM	37	2	74
27*	PORTE–COCHERE FIRST FLOOR	10cv	B	CFL		27	2	54
28	WINE BAR FIRST FLOOR	02cw	AA	LV	DIM	37	18	666
29	RETAIL FIRST FLOOR	02t	AA	LV	DIM	37	9	333
30	PRIVATE DINING FIRST FLOOR	03ap	AA	LV	DIM	37	16	592
31	SPARE							
32	SPARE							
33	SPARE							
34	SPARE							
35	SPARE							
36	SPARE							

TOTAL KVA: 11.59
TOTAL AMP: 32.39
26.2"W x 14.15"D x 87.00"H

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD#: GP60–120–4–M100–20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
2	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
3	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
4	CORRIDOR FIRST FLOOR	02c	AA	LV	DIM	37	16	666
5	CORRIDOR FIRST FLOOR	05c	DS–1	INC	DIM	100	12	1200
6	CHECK–IN FIRST FLOOR	01ci	DP–4	INC	DIM	200	2	400
7	CHECK–IN FIRST FLOOR	02ci	RCPT – TABLE/FLOOR LAMPS	INC	DIM		4	500
8	SPARE							
9	SPARE							
10	SPARE							
11	LIBRARY FIRST FLOOR	01cr	DP–6	INC	DIM	320	1	320
12	LIBRARY FIRST FLOOR	03cr	DS–2	INC	DIM	75	12	900
13	LIBRARY FIRST FLOOR	04cr	AA	LV	DIM	37	4	185
14	LIBRARY FIRST FLOOR	05cr	AH	LV	DIM	37	4	148
15	LIBRARY FIRST FLOOR	06cr	RCPT – TABLE/FLOOR LAMPS					500
16	SPARE							
17	LIBRARY FIRST FLOOR	07cr	AA	LV	DIM	37	4	148
18	SPARE							
19	SPARE							
20	LIVING ROOM FIRST FLOOR	01cg	DP–7	INC	DIM	520	2	1040
21	LIVING ROOM FIRST FLOOR	02cg	AA	LV	DIM	37	4	148
22	LIVING ROOM FIRST FLOOR	04cg	DS–3	INC	DIM	75	12	900
23	LIVING ROOM FIRST FLOOR	05cg	SC	CC	DIM	6.5W/LFT	176 FT	1140
24	LIVING ROOM FIRST FLOOR	06cg	AA	LV	DIM	37	10	370
25	LIVING ROOM FIRST FLOOR	08cg	LR	LV	DIM	37	4	148
26	LIVING ROOM FIRST FLOOR	09cg	RCPT – TABLE/FLOOR LAMPS					500
27	SPARE							
28	EXTERIOR FIRST FLOOR	10cg	WC	INC	DIM	60	4	240
29	EXTERIOR FIRST FLOOR	12cg	WB	INC	DIM	60	2	120
30	EXTERIOR FIRST FLOOR	13cg	EB	LV	DIM	20	11	220

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD# GP60–120–4–M100–20		
31	EXTERIOR FIRST FLOOR	14cg	EA	LV	DIM	50	14	700
32	SPARE							
33	ENTRY FIRST FLOOR	01cv	DP–2	INC	DIM	400	1	400
34	ENTRY FIRST FLOOR	03cv	SE	LV	DIM	37 2/3 LFT	54 FT	666
35	ENTRY FIRST FLOOR	04cv	SB	LV	DIM	15W@3" O.C.	8 FT	160
36	ENTRY FIRST FLOOR	05cv	AA	LV	DIM	37	2	74
37	ENTRY FIRST FLOOR	06cv	AC–1	LV	DIM	37	2	74
38	ENTRY FIRST FLOOR	07cv	AA	INC	DIM	37	3	111
39*	EXTERIOR FIRST FLOOR	08cv	A, A1	CFL	DIM	30, 45	6, 1	225
40*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8
41	VALET FIRST FLOOR	09cv	AF	LV	DIM	37	3	111
42*	EXTERIOR FIRST FLOOR		C	LV	DIM	22.2	6	133.3
43	ENTRY FIRST FLOOR	12cv	AA	LV	DIM	37	2	74
44*	EXTERIOR FIRST FLOOR	13cv	D	LV	DIM	45.6	12	546.7
45*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8
46	WINE BAR FIRST FLOOR	01cw	DP–8	INC	DIM	4 x 40	3	480
47	WINE BAR FIRST FLOOR	03cw	AA	LV	DIM	37	12	444
48	WINE BAR FIRST FLOOR	04cw	DS–4	INC	DIM	TBD	8	840
49	WINE BAR FIRST FLOOR	05cw	AH	LV	DIM	37	8	296
50	WINE BAR FIRST FLOOR	06cw	DP–18	INC	DIM	TBD	4	400
51	WINE BAR FIRST FLOOR	07cw	AA	LV	DIM	37	5	185
52	WINE BAR FIRST FLOOR	08cw	SB	LV	DIM	14W/LFT	20 FT	560
53	WINE BAR FIRST FLOOR	09cw	SD	LV	DIM	0.9W@1.2" O.C.	24 FT	171
54	WINE BAR FIRST FLOOR	10cw	SB–1	LV	DIM	05W@3" O.C.	20 FT	460
55	WINE BAR FIRST FLOOR	11cw	AI	LV	DIM	37	5	185
56	WINE BAR FIRST FLOOR	12cw	SB–1	LV	DIM	5W@3" O.C.	16	160
57	SPARE							
58	SPARE							
59	SPARE							
60	SPARE							

TOTAL KVA: 21.29
TOTAL AMP: 59.14
52.4"W x 87H x 14.15"D

Panelboard Sizing Worksheets/New Panels

Panels EDIM211 and DIM211B can be found in the Entry Courtyard electrical redesign section.

Voltage Drop for EDIM211

Estimated Voltage Drop Calculator

Input

Load Voltage	208V 3Ø	
Conductor Size	1	
Conductor Type	Cu ◉	Al ○
Number of Sets	1	
Distance (one way)	180	Feet
Load (A)	27.2	A

Output

	Unity Power Factor		85% PF	
Voltage Drop (V)	1.3	V	1.4	V
Voltage Drop (%)	0.6	%	0.7	%
Voltage at Load	206.7	V	206.6	V
Minimum Conductor Size for 3% VD	6			
Minimum Conductor Size for 5% VD	8			

SIEMENS

Voltage Drop for DIM211B

Estimated Voltage Drop Calculator

Input

Load Voltage	208V 3Ø	
Conductor Size	1	
Conductor Type	Cu ◉	Al ○
Number of Sets	1	
Distance (one way)	180	Feet
Load (A)	50.6	A

Output

	Unity Power Factor		85% PF	
Voltage Drop (V)	2.4	V	2.5	V
Voltage Drop (%)	1.2	%	1.2	%
Voltage at Load	205.6	V	205.5	V
Minimum Conductor Size for 3% VD	4			
Minimum Conductor Size for 5% VD	6			

SIEMENS

Living Room Daylighting Analysis – Honors Additional Study

The majority of the north wall of the Living Room is glazing, with two glass doors leading out to a covered terrace. The daylighting influence within this space is worth analyzing, as the change in light throughout the day and year will have a dynamic impact on the overall impression of the room itself. The Salamander Resort and Spa has gone to great efforts to provide interiors that promote enjoyment and relaxation for their guests. The design team has also put effort in making this resort one of the first LEED certified buildings of its type. Therefore, daylight harvesting, glare prevention, and control integration with electric lighting systems is needed in the Living Room.

The following is an analysis of the daylighting environment and its effects on the space itself, data on how often appropriate light levels are reached from daylight only, photosensor integrating and cost savings using switching and dimming systems, and data on the optimal scenario for daylight integration with the electric lighting system.

Environment Data
Middleburg, VA: 33°N latitude, -77° longitude
Polar North correction: rotate building 9° east (See Figure 30)

Figure 29: Polar North Correction for United States.

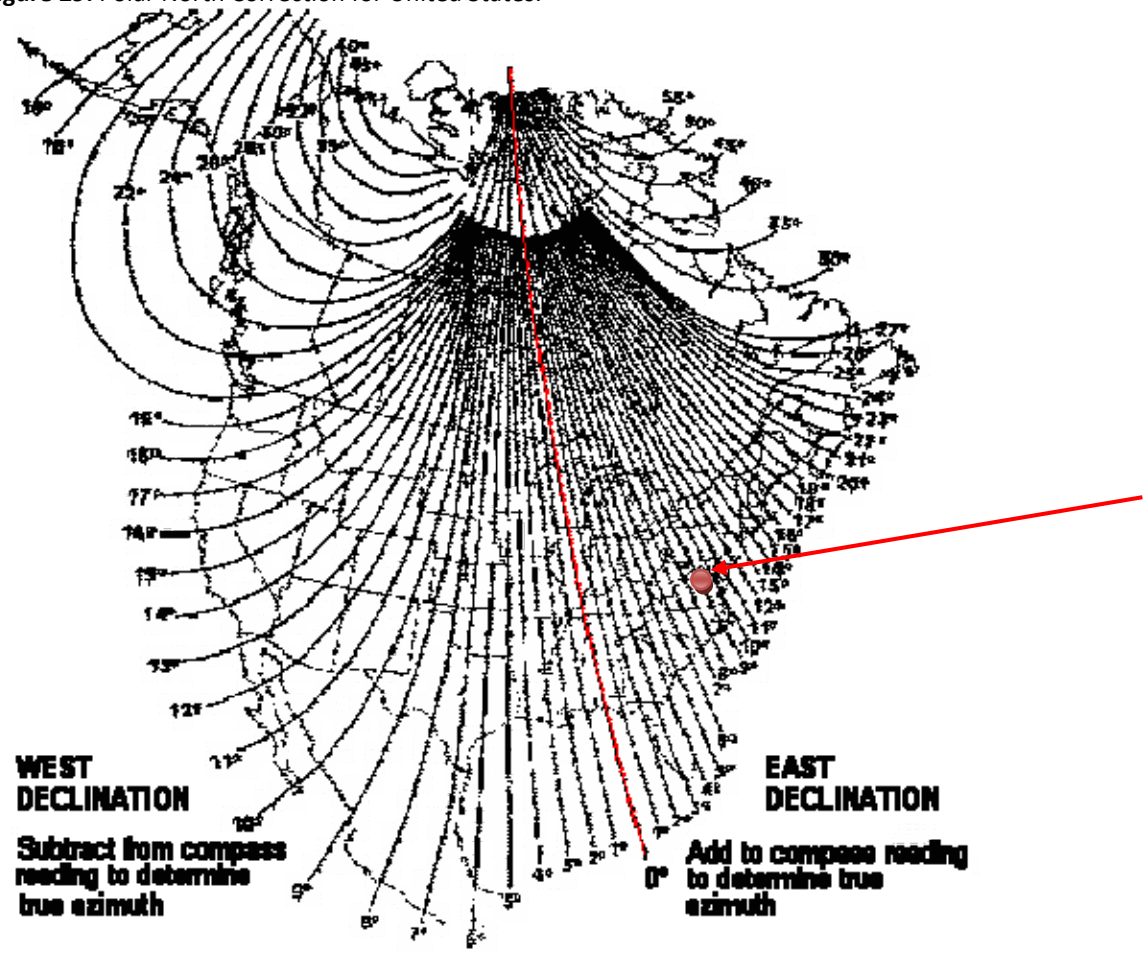


Figure 30: Overall building outline. The Living Room north wall is about 9 degrees west of magnetic north.

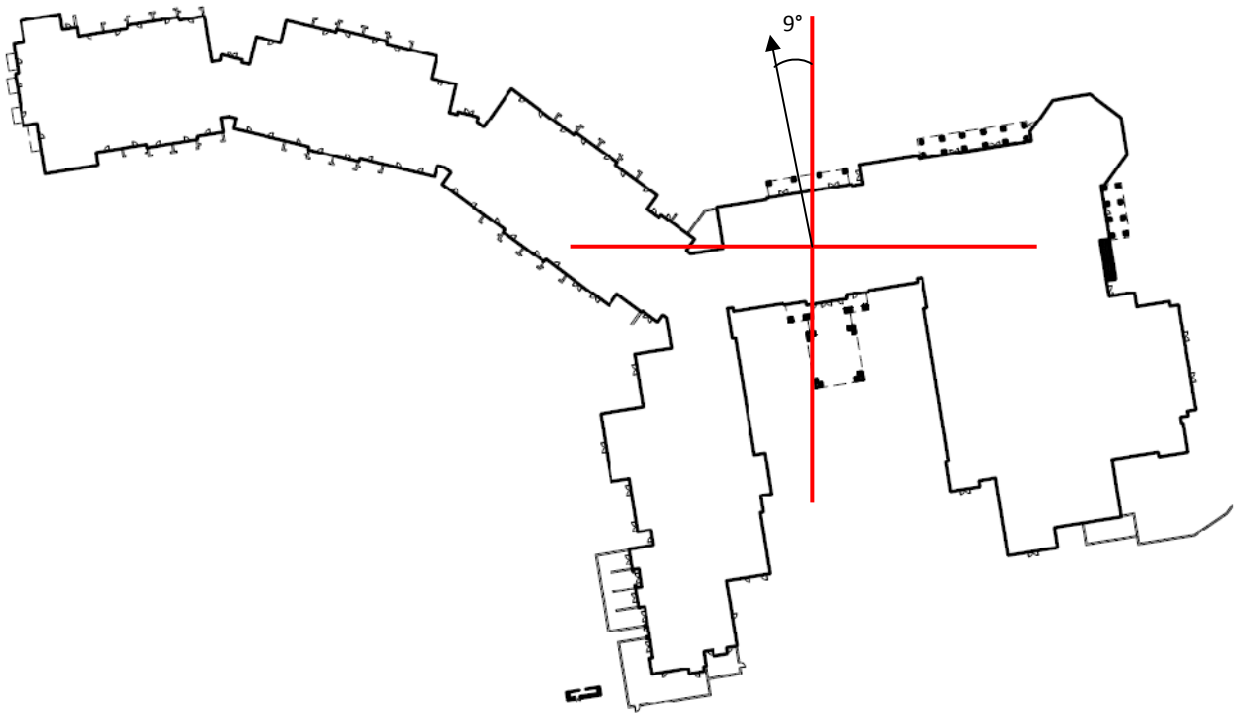


Figure 30 above shows that the building is oriented slightly west of north, with the Living Room north wall facing about 9 degrees west of north. With the polar north correction of 9 degrees, the glazing is facing approximately true polar north (9°NW magnetic north + 9°NE correction to polar north = 0° N).

Using the solar analysis tools in Autodesk Ecotect, the annual sun path and shadowing from building geometry was determined. Figures 31 to 33 show such graphics. Due to the building's orientation to true north and the outdoor terrace overhang, there are only a few hours of the year in which the Living Room will receive direct sunlight. Figure ___ shows the shadow sweep across the building throughout the day for the equinox and solstice conditions. Solar penetration is shown in Figures ___ to ___, where penetration is minimal and only takes place for a few hours of the entire year. Therefore, no change is recommended to the overhang outside although slightly extending the structure in all directions would most likely block sunlight penetration at all times of the year.

Figure 31: Annual sun path diagram for Middleburg, VA in plan view of Salamander Resort and Spa.

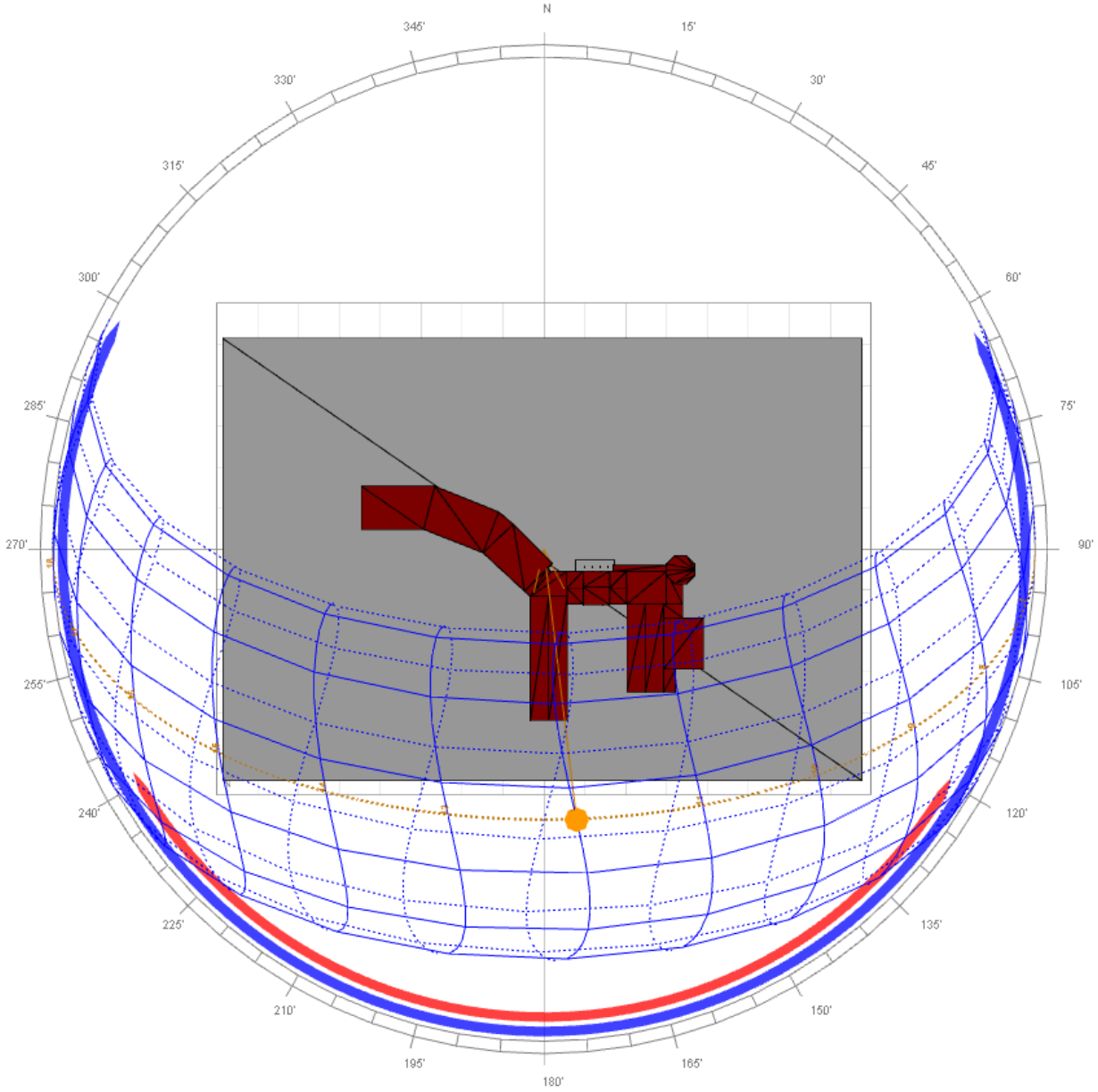


Figure 32: Annual sun path diagram for Middleburg, VA in east view of Salamander Resort and Spa.

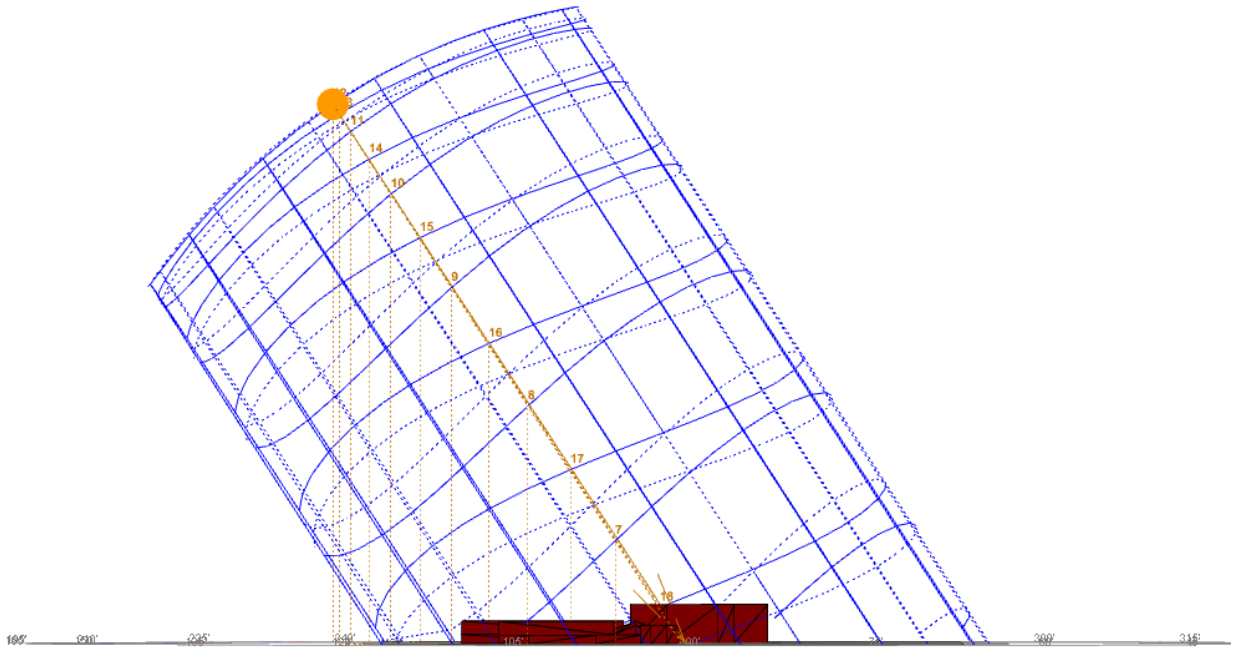


Figure 33: Annual sun path diagram for Middleburg, VA in east view of Salamander Resort and Spa.

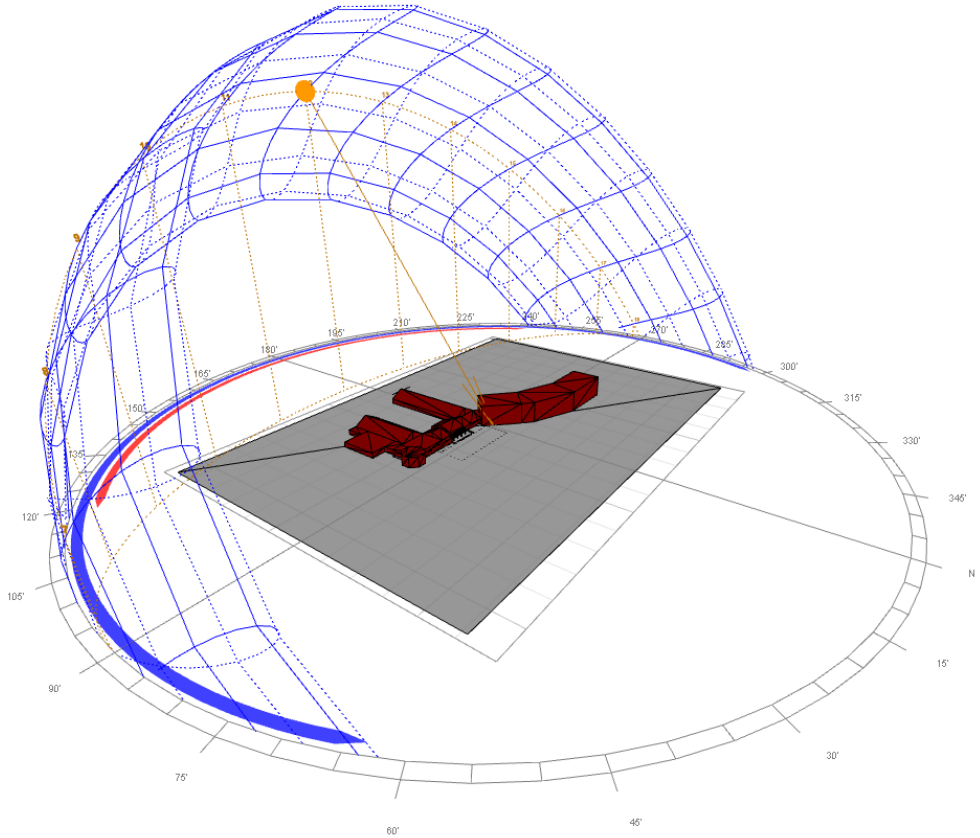
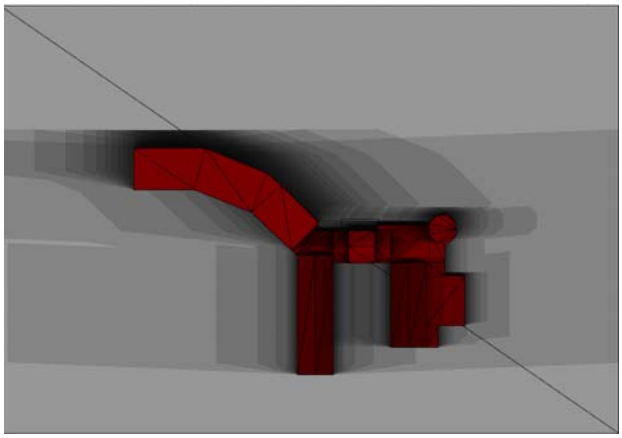
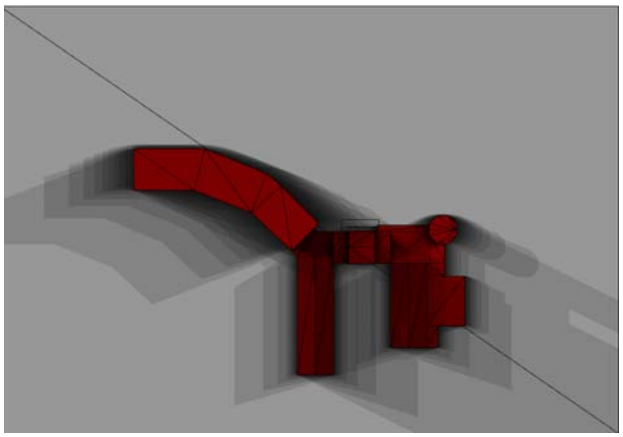


Figure 34: Daily shadow projections for equinox and solstice conditions.

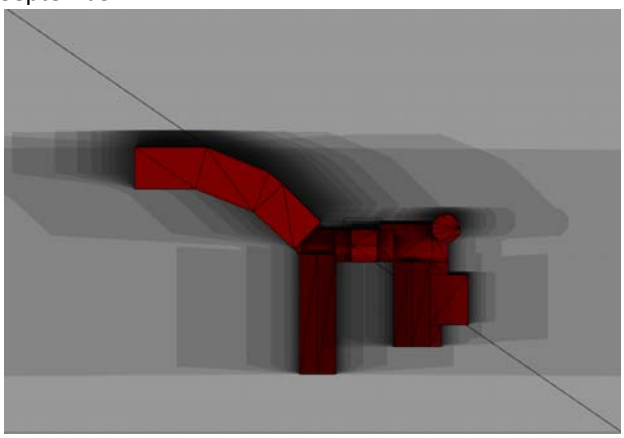
March 21



June 21



September 21



December 21

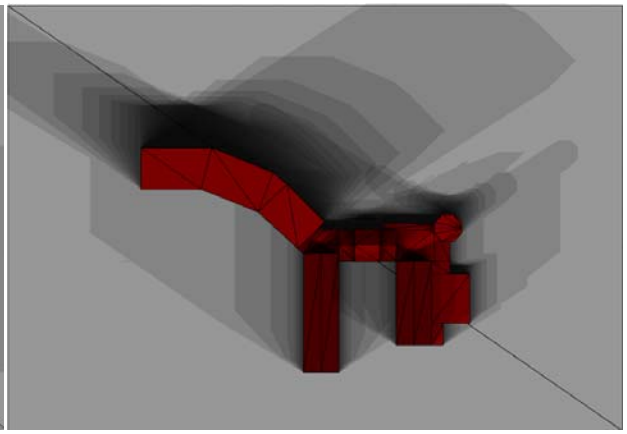


Figure 35: Sunlight penetration conditions for June 21st – 6:00 AM; 7:00 AM; 6:00 PM.

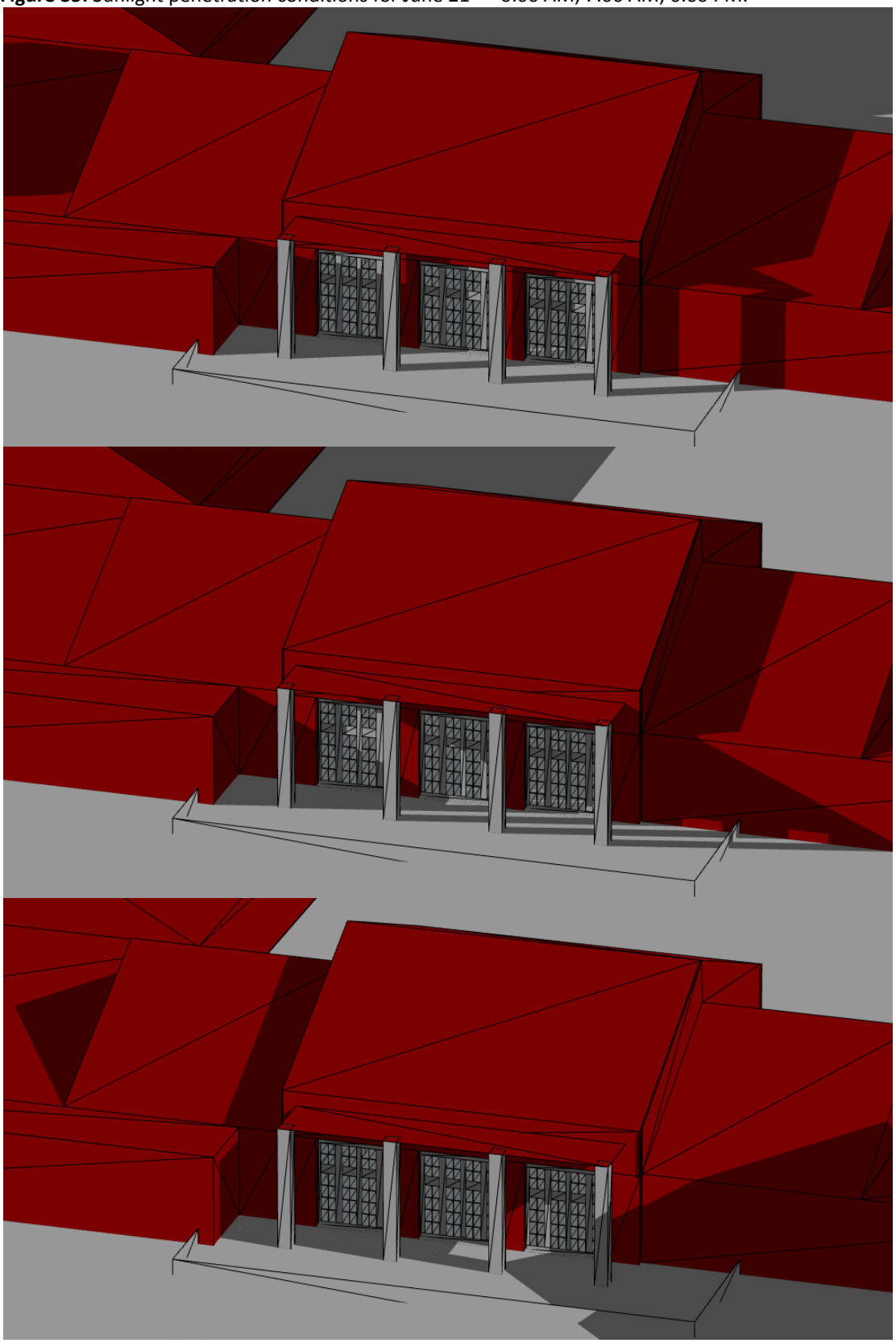


Figure 36: Daylight penetration at 6:00 PM on June 21st (clear sky condition).

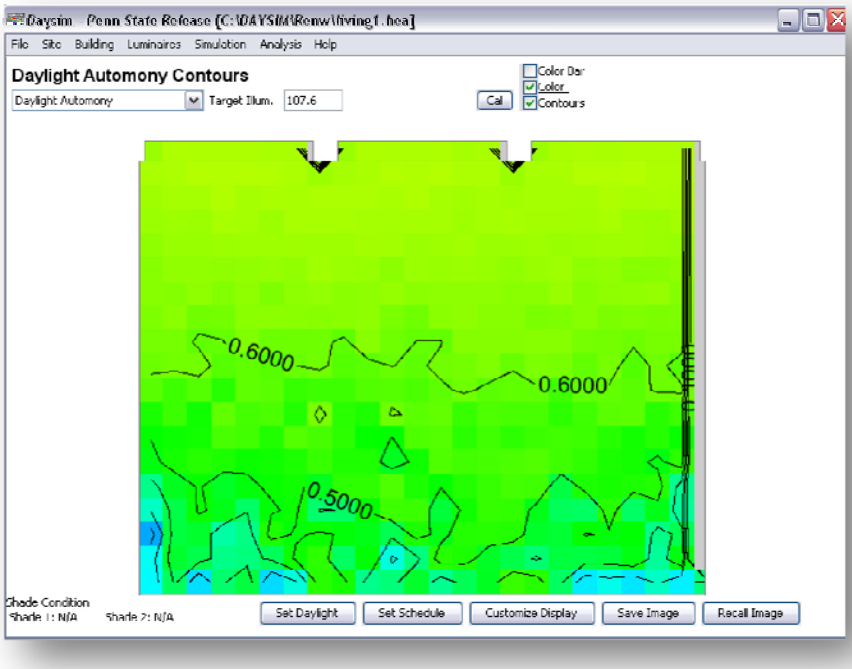
Daylight Autonomy and Continuous Daylight Autonomy

To justify whether daylighting control integration is a valid solution to this room, metrics like Daylight Autonomy (DA) and Continuous Daylight Autonomy (DAcon) had to be determined. The IESNA Lighting Handbook recommends 10 fc. of horizontal illuminance for simple visual tasks in the Living Room; therefore, the number of operable hours over the entire year in which daylight alone can reach this target illuminance is useful information. DA and DAcon for the Living room were calculated using the Penn State version of Daysim.

Figure 37 shows that at a target level of 10 fc., the majority of the room receives this amount of daylight for 50-60% of all the operable hours. Since the Salamander Resort and Spa is open 24 hours, these numbers would be higher if the occupancy schedule was set to daylight hours. However, to calculate energy savings, the 24 hour occupancy schedule is realistic.

Figure 38 shows the DA and DAcon for a practical daytime occupancy schedule of 8:00 AM to 5:00 PM. Pure daylight can provide enough illuminance in the room for the majority of the days over the year. It is now very clear that daylight has an important role in the in environment of the Living room, and in a pleasant, diffuse way. Daylight can reach recommended illuminance levels for most days; therefore, a daylighting control strategy should be designed to save energy on electric lighting. The next step of this analysis was to determine which daylight control strategy would save the most energy.

Figure 37: DA and DAcon for the Living Room – Target level of 10 fc (24 hour occupancy schedule).



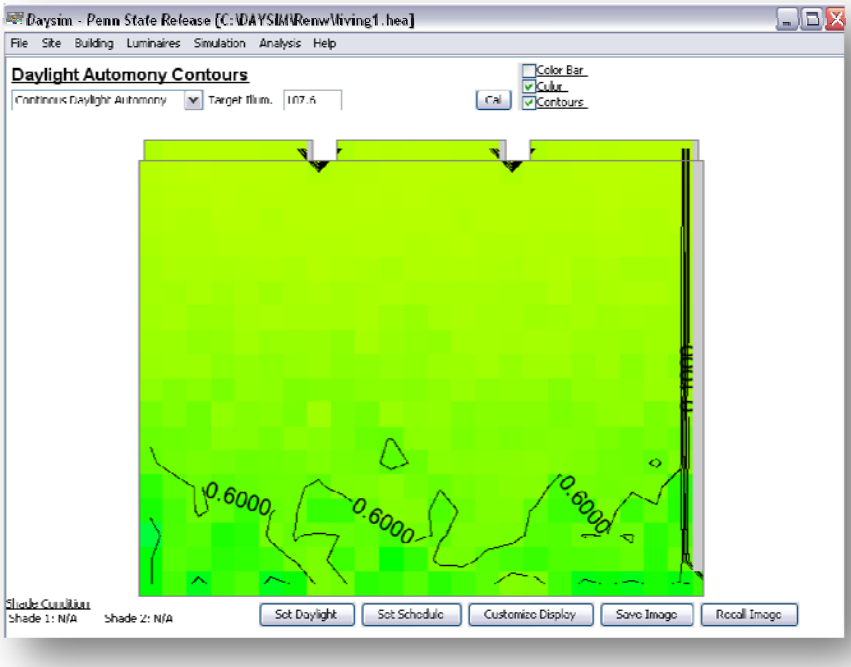
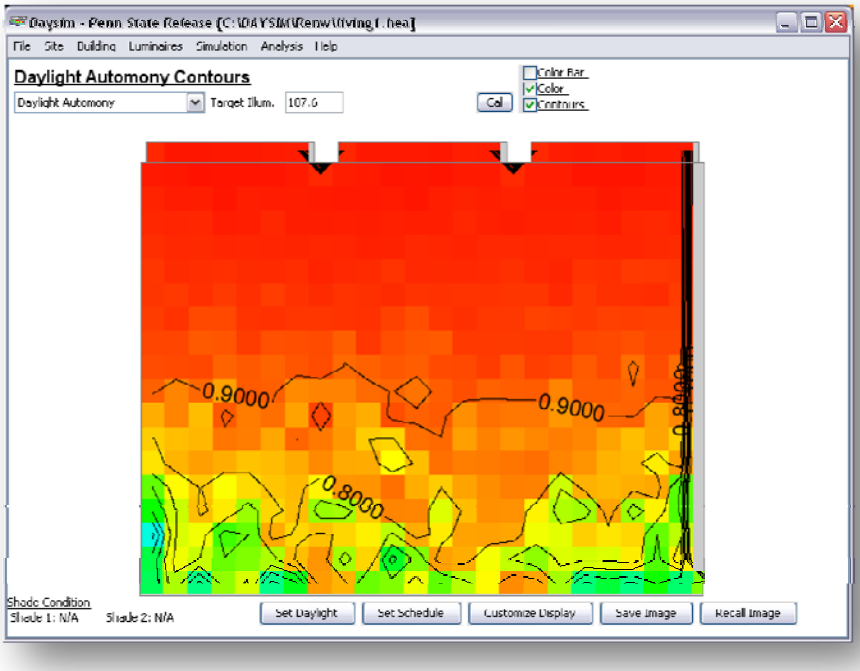
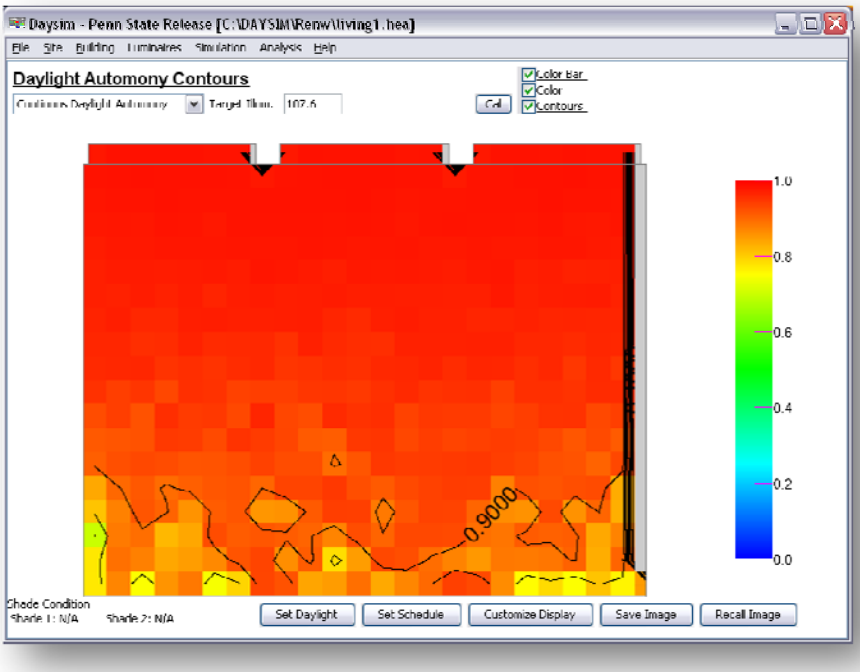


Figure 38: DA and DAcon for the Living Room – Target level of 10 fc (daytime occupancy schedule).

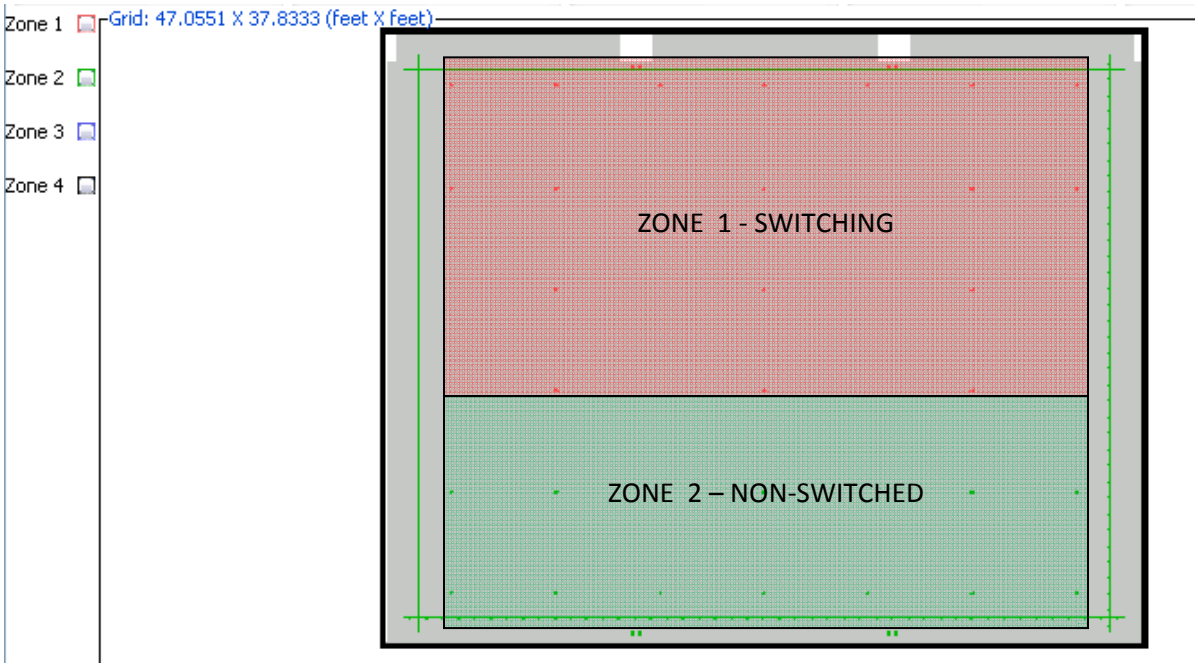




Daylighting Control Strategies

Using a closed loop constant setpoint photosensor located at the center of the room, switching strategies were studied in the Living Room. Figure 39 shows that the sconces and downlights in the northern portion of the room are switched off when the photosensor reads a specific signal/illuminance. The back two rows of downlights as well as the cove lighting are not switched by the photosensor.

Figure 39: Daysim lighting layout and control zones.



The following scenarios (1 – 3) involve switching configurations in which the photosensor is calibrated to switch Zone 1 off and back on at different illuminance levels due to daylight. Although the photosensor is located in the center of the ceiling, it is calibrated from the critical point. This point, shown in Figure 40 is selected based on the area in the room where daylight contribution and non-switched electric light contribution are at a minimum. The objective of this study was to determine which of these switching scenarios resulted in the most energy saved. Figures 41 to 43 detail the OFF/ON settings of the photosensor; the target illuminance of the daylight and electric light combination; the illuminance and signal data for the critical point; the total energy savings for the control zone and total lighting system; and finally a breakdown of how many hours Zone 1 would be switched per year, month, and day.

Scenario #3 results in the most savings because it switches the luminaires off at a lower illuminance level than Scenario #1 and turns the luminaires back on at 25 fc. compared to the 30 fc. target of Scenarios 1 and 2. Therefore, the deadband is longer, resulting in more hours switched off, and ultimately more savings.

Scenarios #4 and #5 shown in Figures 44 and 45 involve dimming with the use of a closed loop proportional photosensor. All luminaires within the Living Room are already capable of dimming by use of Lutron dimming panels and GRAFIK Eye master control, so extra cost due to a dimming control strategy is not an issue. The Zone configuration in Figure 39 was kept constant other than Zone 1 being changed to a dimmed zone instead switched. Due to the amount of daylight exposure to the room and the electric light contribution of the non-dimmed row, the target illuminance was increased to 40 fc. for Scenario #4 and 30fc for Scenario #5.

Figure 40: Critical point selection. Target illuminance = 30 fc.

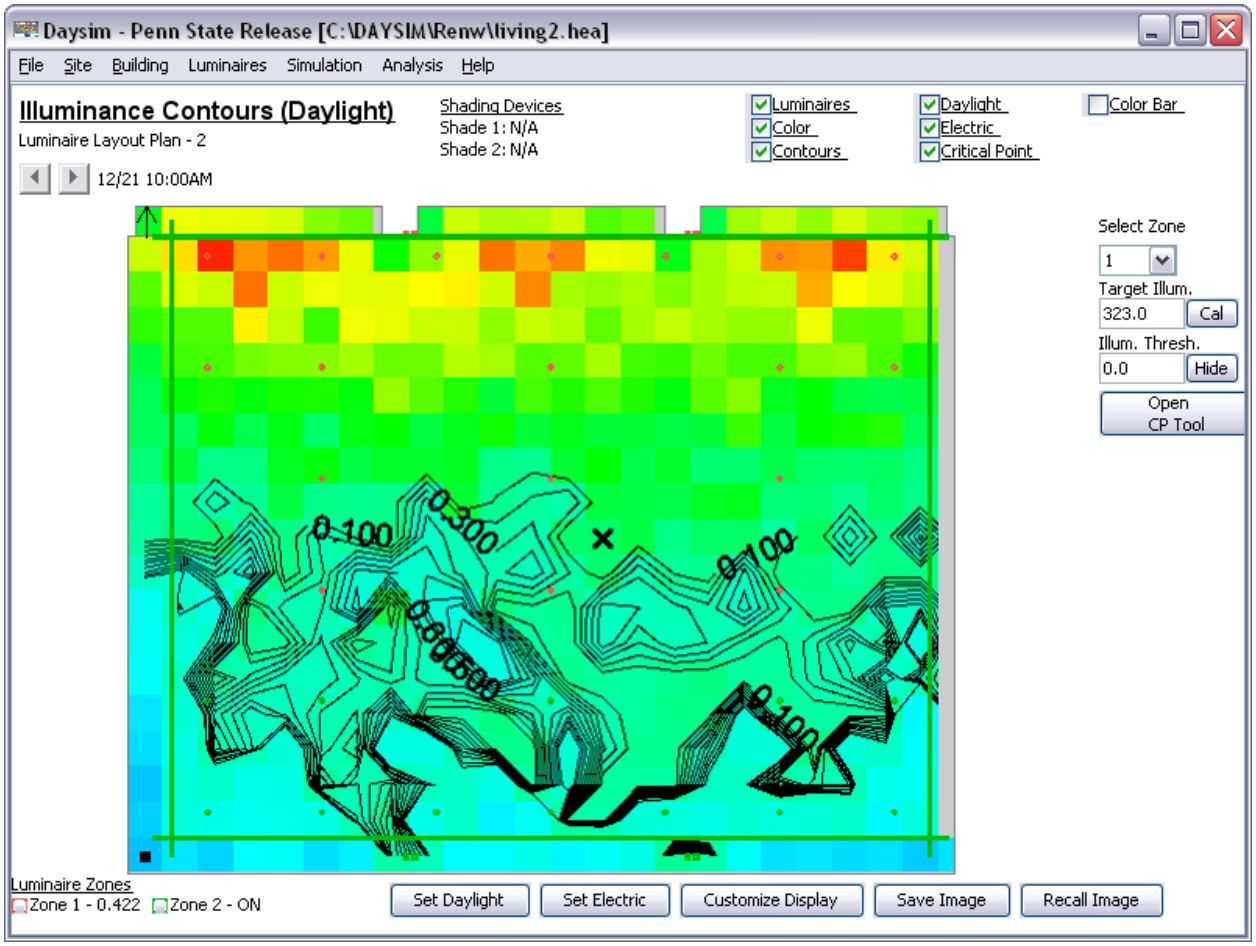


Figure 41: Switching scenario #1.

Switching Scenario #1: 219.67 kWh saved

CRITICAL POINT				
E_{DAYLT}	S_{DAYLT}	$S_{D+NONSW}$	S_{D+ELEC}	S_{D+SW}
210	187	219	241.1	22.1

INPUT
OUTPUT

OFF SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
645.6	574.9

ON SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
376.6	335.4

TARGET ILLUMINANCE
E_{TARGET} (LUX)
323

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	274.04	247.52	274.04	265.2	274.04	265.2	274.04	274.04	265.2	274.04	265.2	274.04	3226.6
Optimal	233.37	206.85	190.5	150.72	149.83	125.96	124.2	144.97	174.14	190.06	235.58	243.1	2169.33
Algorithm	274.04	247.52	274.04	238.68	247.07	205.97	204.64	238.23	263.43	274.04	265.2	274.04	3006.92
Savings	0.0	0.0	0.0	26.52	26.96	59.22	69.39	35.8	1.76	0.0	0.0	0.0	219.67

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	870.6	786.35	870.6	842.52	870.6	842.52	870.6	870.6	842.52	870.6	842.52	870.6	10250.66
Optimal	829.94	745.68	787.06	728.04	746.4	703.29	720.76	741.54	751.46	786.62	812.9	839.66	9193.39
Algorithm	870.6	786.35	870.6	816.0	843.64	783.29	801.21	834.8	840.75	870.6	842.52	870.6	10030.98
Savings	0.0	0.0	0.0	26.52	26.96	59.22	69.39	35.8	1.76	0.0	0.0	0.0	219.67

Statistics

24 HRS/DAY
8760 HRS/YR
3226.6 KWH OF CONTROLLED ZONE
0.368333 KW IN CONTROLLED ZONE
219.67 KWH SAVED
596.3891 HRS SWITCHED OFF/YR

	HOURS SWITCHED											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
kWh SAVE	0	0	0	26.5	27.0	59.2	69.4	35.8	1.8	0	0	0
HRS OFF	0	0	0	72.0	73.2	160.8	188.4	97.2	4.8	0	0	0
PER DAY	0	0	0	2.4	2.4	5.4	6.1	3.1	0.2	0	0	0

Figure 42: Switching scenario #2.

Switching Scenario #2: 388.07 kWh saved

CRITICAL POINT				
E_{DAYLT}	S_{DAYLT}	$S_{D+NONSW}$	S_{D+ELEC}	S_{D+SW}
210	187	219	241.1	22.1

INPUT
OUTPUT

OFF SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
538	479.1

ON SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
376.6	335.4

TARGET ILLUMINANCE
EDAYLT (LUX)
323

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	274.04	247.52	274.04	265.2	274.04	265.2	274.04	274.04	265.2	274.04	265.2	274.04	3226.6
Optimal	233.37	206.85	190.5	150.72	149.83	125.96	124.2	144.97	174.14	190.06	235.58	243.1	2169.33
Algorithm	274.04	247.52	264.75	206.41	225.42	193.15	177.68	201.55	234.7	274.04	265.2	274.04	2838.52
Savings	0.0	0.0	9.28	58.78	48.62	72.04	96.35	72.48	30.49	0.0	0.0	0.0	388.07

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	870.6	786.35	870.6	842.52	870.6	842.52	870.6	870.6	842.52	870.6	842.52	870.6	10250.66
Optimal	829.94	745.68	787.06	728.04	746.4	703.29	720.76	741.54	751.46	786.62	812.9	839.66	9193.39
Algorithm	870.6	786.35	861.32	783.73	821.98	770.47	774.24	798.11	812.02	870.6	842.52	870.6	9862.58
Savings	0.0	0.0	9.28	58.78	48.62	72.04	96.35	72.48	30.49	0.0	0.0	0.0	388.07

Statistics

24 HRS/DAY
8760 HRS/YR
3226.6 KWH OF CONTROLLED ZONE
0.3683333 KW IN CONTROLLED ZONE
388.07 KWH SAVED
1053.5837 HRS SWITCHED OFF/YR

	HOURS SWITCHED											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
SAVED	0	0	9.3	58.8	48.6	72.0	96.4	72.5	30.5	0	0	0
HRS OFF	0	0	25.2	159.6	132.0	195.6	261.6	196.8	82.8	0	0	0
PER DAY	0	0	0.8	5.3	4.3	6.5	8.4	6.3	2.8	0	0	0

Figure 43: Switching scenario #3.

Switching Scenario #3: 465.86 kWh saved

CRITICAL POINT				
E_{DAYLT}	S_{DAYLT}	$S_{D+NONSW}$	S_{D+ELEC}	S_{D+SW}
210	187	219	241.1	22.1

INPUT
OUTPUT

CONTROL SETTING 5

OFF SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
538	479.1

ON SETTING	
E_{DAYLT} (LUX)	S_{DAYLT}
269	239.5

TARGET ILLUMINANCE
EDAYLT (LUX)
269

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	274.04	247.52	274.04	265.2	274.04	265.2	274.04	274.04	265.2	274.04	265.2	274.04	3226.6
Optimal	209.95	173.7	162.65	131.71	128.17	110.49	106.52	129.5	150.27	167.07	197.57	211.71	1879.38
Algorithm	274.04	247.52	261.22	195.36	212.16	180.77	163.54	182.54	230.28	274.04	265.2	274.04	2760.73
Savings	0.0	0.0	12.81	69.83	61.88	84.42	110.5	91.49	34.91	0.0	0.0	0.0	465.86

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	870.6	786.35	870.6	842.52	870.6	842.52	870.6	870.6	842.52	870.6	842.52	870.6	10250.66
Optimal	806.51	712.53	759.22	709.03	724.74	687.82	703.08	726.07	727.6	763.64	774.89	808.28	8903.44
Algorithm	870.6	786.35	857.78	772.68	808.72	758.09	760.1	779.11	807.6	870.6	842.52	870.6	9784.79
Savings	0.0	0.0	12.81	69.83	61.88	84.42	110.5	91.49	34.91	0.0	0.0	0.0	465.86

Statistics

24 HRS/DAY
8760 HRS/YR
3226.6 KWH OF CONTROLLED ZONE
0.3683333 KW IN CONTROLLED ZONE
465.86 KWH SAVED
1264.8 HRS SWITCHED OFF/YR

	HOURS SWITCHED											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
SAVED	0	0	12.8	69.8	61.9	84.4	110.5	91.5	34.9	0	0	0
HRS OFF	0	0	34.8	189.6	168.0	229.2	300.0	248.4	94.8	0	0	0
PER DAY	0	0	1.1	6.3	5.4	7.6	9.7	8.0	3.2	0	0	0

Figure 44: Dimming scenario #1 (Scenario #4).

Dimming Scenario #1: 839.25 kWh saved

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	274.04	247.52	274.04	265.2	274.04	265.2	274.04	274.04	265.2	274.04	265.2	274.04	3226.6
Optimal	264.21	229.78	230.66	178.34	177.68	146.69	140.78	166.16	200.64	221.09	257.72	269.48	2483.28
Algorithm	245.86	220.9	221.99	166.49	180.33	151.63	141.58	164.04	190.87	202.28	240.77	260.52	2387.34
Savings	28.17	26.61	52.04	98.7	93.7	113.56	132.45	109.99	74.32	71.75	24.42	13.51	839.25

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	870.6	786.35	870.6	842.52	870.6	842.52	870.6	870.6	842.52	870.6	842.52	870.6	10250.66
Optimal	860.77	768.62	827.22	755.66	774.24	724.01	737.35	762.72	777.96	817.65	835.04	866.04	9507.34
Algorithm	842.42	759.73	818.56	743.81	776.89	728.95	738.14	760.61	768.19	798.85	818.09	857.09	9411.4
Savings	28.17	26.61	52.04	98.7	93.7	113.56	132.45	109.99	74.32	71.75	24.42	13.51	839.25

Statistics

24	HRS/DAY
8760	HRS/YR
3226.6	KWH OF CONTROLLED ZONE
0.368333	KW IN CONTROLLED ZONE
839.25	KWH SAVED
2278.507	HRS DIMMED OFF/YR

	HOURS DIMMED											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
SAVED	28.2	26.6	52.0	98.7	93.7	113.6	132.5	110.0	74.3	71.8	24.4	13.5
HRS OFF	76.5	72.2	141.3	268.0	254.4	308.3	359.6	298.6	201.8	194.8	66.3	36.7
PER DAY	2.5	2.6	4.6	8.9	8.2	10.3	11.6	9.6	6.7	6.3	2.2	1.2

Figure 45: Dimming scenario #2 (Scenario #5).

Dimming Scenario #2: 1174.82 kWh saved

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	274.04	247.52	274.04	265.2	274.04	265.2	274.04	274.04	265.2	274.04	265.2	274.04	3226.6
Optimal	220.2	188.8	175.58	141.02	139.53	118.91	114.9	136.51	160.5	174.79	212.37	221.35	2004.52
Algorithm	221.23	193.16	181.5	138.66	147.66	125.99	121.89	141.72	165.03	178.16	213.11	223.61	2051.77
Savings	52.8	54.35	92.53	126.53	126.37	139.2	152.14	132.31	100.16	95.87	52.08	50.42	1174.82

Energy Tables (KWh)

Controlled Zone | Grand Total

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Base	870.6	786.35	870.6	842.52	870.6	842.52	870.6	870.6	842.52	870.6	842.52	870.6	10250.66
Optimal	816.76	727.63	772.14	718.34	736.09	696.23	711.46	733.07	737.82	771.36	789.69	817.92	9028.58
Algorithm	817.79	731.99	778.06	715.98	744.22	703.31	718.45	738.29	742.35	774.73	790.43	820.18	9075.83
Savings	52.8	54.35	92.53	126.53	126.37	139.2	152.14	132.31	100.16	95.87	52.08	50.42	1174.82

Statistics

		HOURS DIMMED											
		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
24 HRS/DAY	SAVED KWH	52.8	54.4	92.5	126.5	126.4	139.2	152.1	132.3	100.2	95.9	52.1	50.4
8760 HRS/YR	HRS DIM	143.3	147.6	251.2	343.5	343.1	377.9	413.0	359.2	271.9	260.3	141.4	136.9
3226.6 KWH OF CONTROLLED ZONE	PER DAY	4.6	5.3	8.1	11.5	11.1	12.6	13.3	11.6	9.1	8.4	4.7	4.4
0.368333 KW IN CONTROLLED ZONE													
1174.82 KWH SAVED													
3189.557 HRS DIMMED /YR													

Conclusions

The following conclusions can be made regarding daylighting in the Living Room and photosensor control integration with the electric lighting system:

- Daylight penetration is almost non-existant except for a few hours in June, with two of those hours being early in the morning before most guests will be occupying the space. Therefore, there is no need for automatic shading devices or modifications to the terrace overhang.
- Although glare is not a problem in this space, daylight will have a major role in the appearance of the room throughout the day. For the daytime hours of the day throughout the year, the Living Room receives 10 fc. or more over 80% of the time. A electric lighting control strategy is desirable to save energy by switching or dimming luminaires when their light is not needed.
- Out of several switching configurations studied, the scenarios that saved the most energy had an OFF setting of around 50-60 footcandles and an ON setting of 20-30 footcandles. The dimming configurations saved slightly more energy. Judging by the daylight autonomy figures, the luminaires are likely dimmed to minimum output for most of the day, which may lead to the decision to save money on equipment and switch luminaires. However, the Salamander Resort and Spa already has Lutron dimming panels powering/controlling all specialty lighting. Therefore, the existing dimming system combined with photosensor dimming control of the Living Room will save about 1200 kWh per year.

The Wine Bar

Description:
The wine bar serves an extensive menu of small plates throughout the day and features a list of world-class wines, with an emphasis on those from Virginia's local wineries. This special space features a mixture of fine finishes, reclaimed materials, a painted mural, and an overall relaxing experience. The floor is made of reclaimed bricks while the bar surface is reclaimed wood from a barn with imbedded artifacts. The ceiling consists of stained white oak millwork running in both directions and painted coffers (about 13'x13'). The room has a feel to it of luxury and relaxation mixed with an old-time wine cellar.

Area: 940 Sq. ft.

Dimension: 27'-0" x 36'-0" x 12'-0"

Space Category:
Special Purpose Space

Materials:

MATERIAL/FINISH	OBJECT	COLOR	REFLECTANCE
Quarry Tile	Back bar floor	Golden Flash	0.4
Reclaimed Brick Flooring	Floor	Brick Red	0.1
Flat Latex Paint	Ceiling	Papaya	0.8
Clear Tempered Glass	Cabinet glass	(Clear)	0.86
Eggshell Latex Paint	Walls	NA (Custom Mural by Artist)	0.7
White oak	Doors, baseboards, door trim, cabinets		0.35
Reclaimed barn wood	Bar	NA	0.35

Wine Bar Plans

Figure 46: Wine Bar finish plan

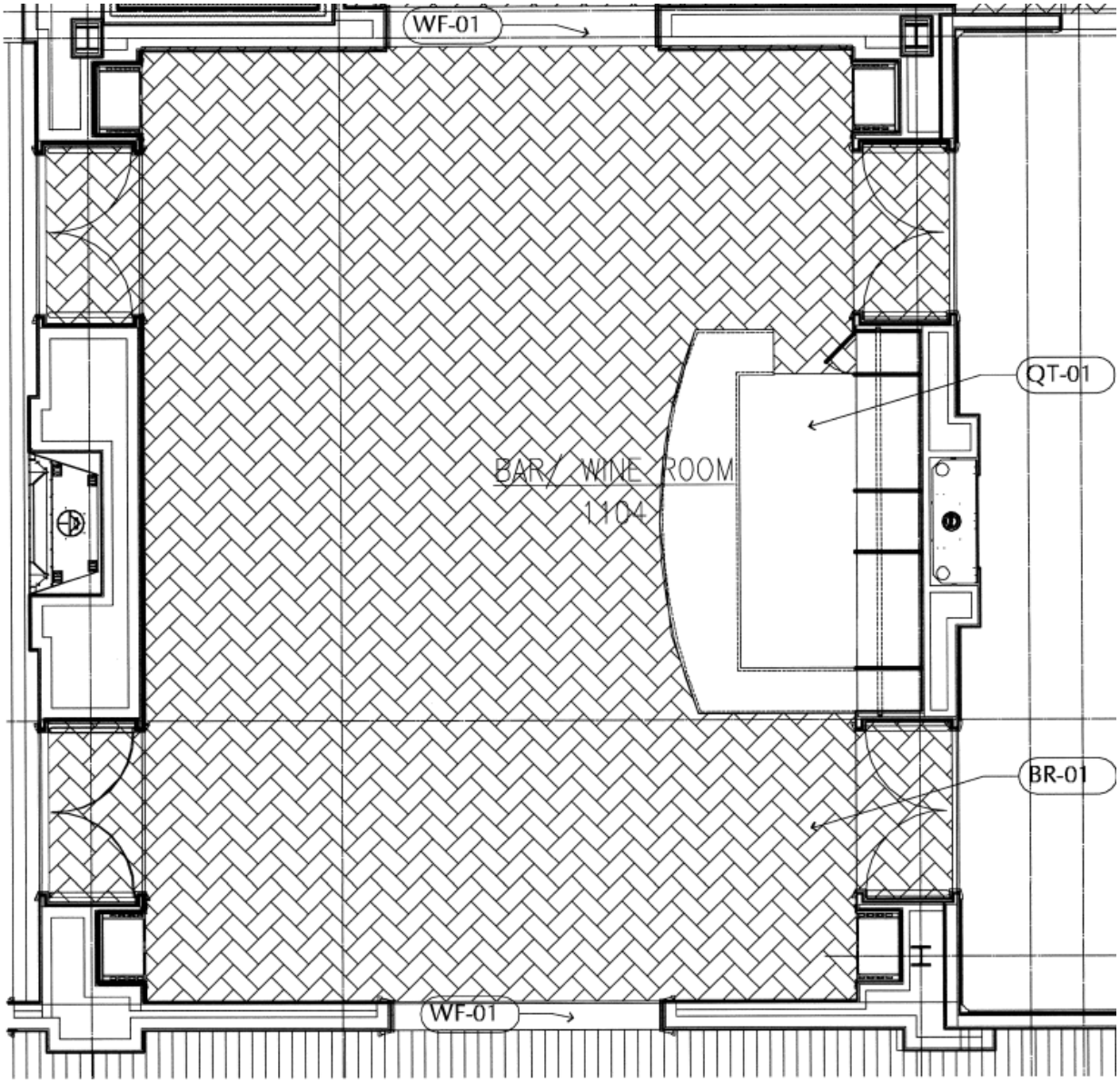


Figure 47: Wine Bar furnishing Plan

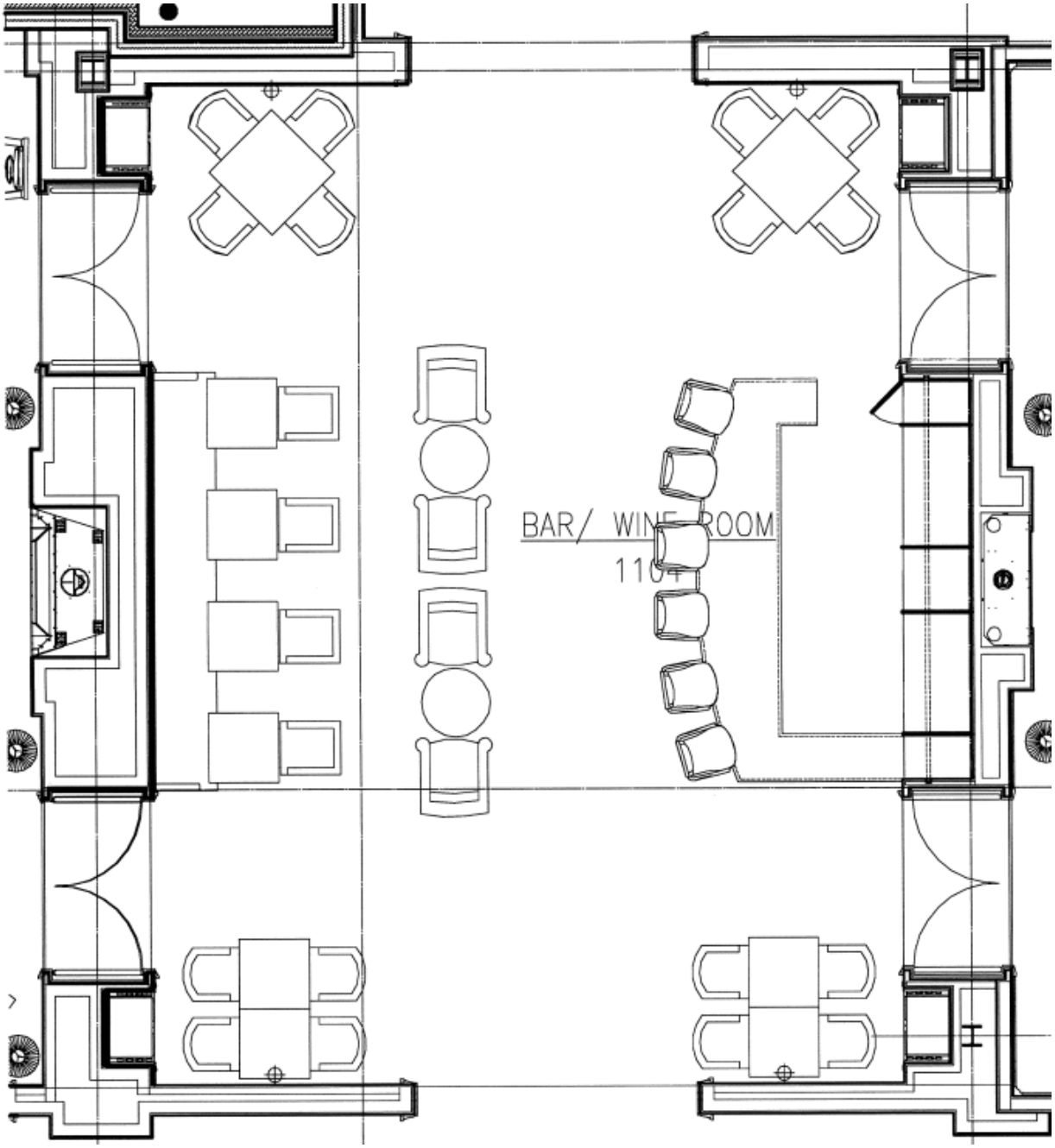
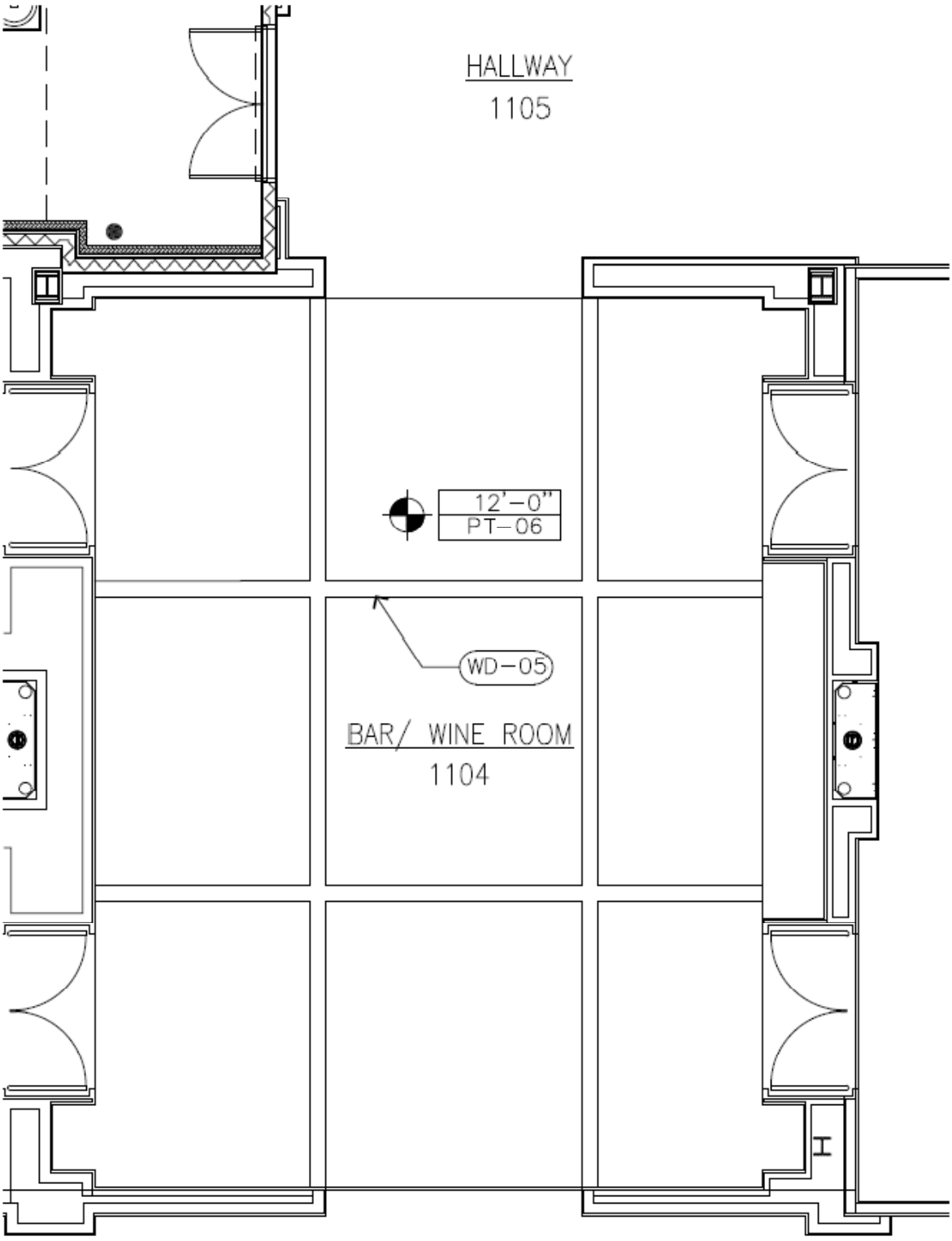


Figure 48: Wine Bar ceiling plan



Wine Bar Elevations –

Figure 49: Wine Bar west elevation.

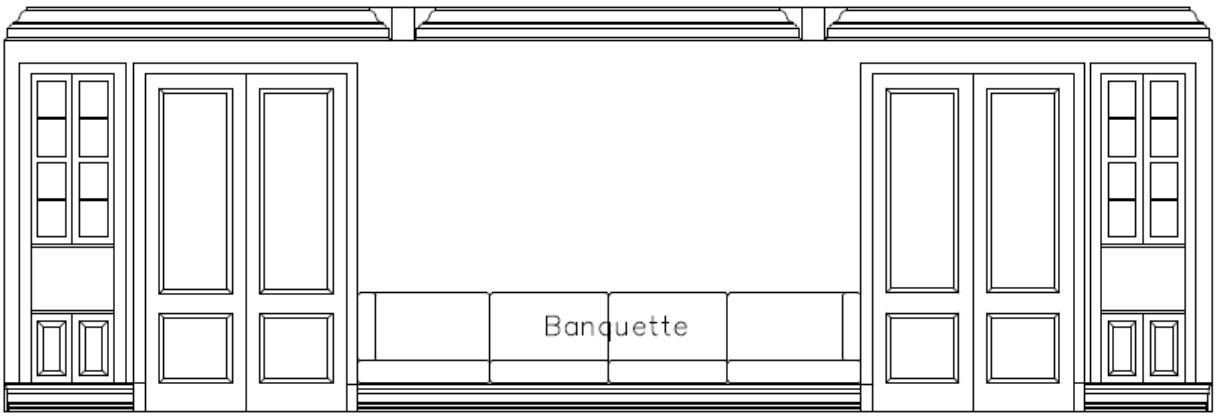


Figure 50: Wine Bar north/south elevation.

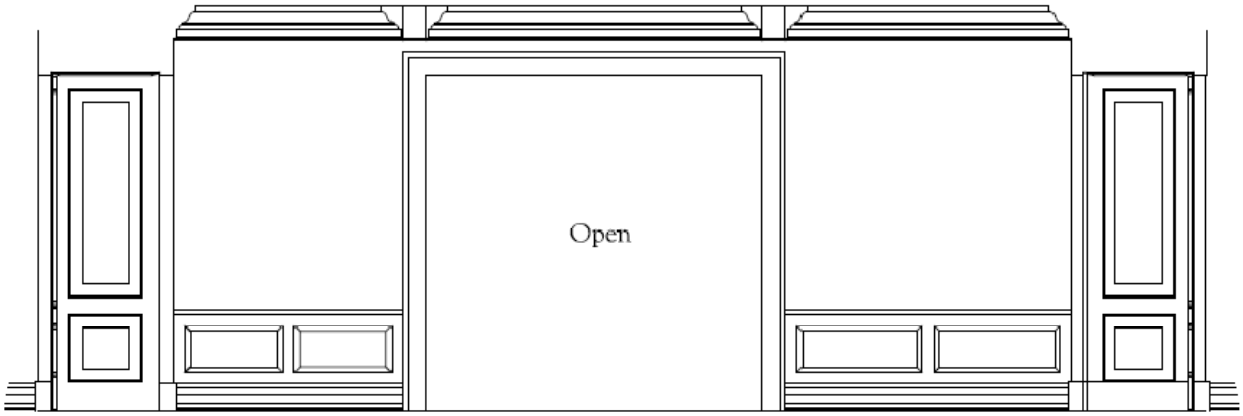


Figure 51: Wine Bar east elevation – wood paneling down.

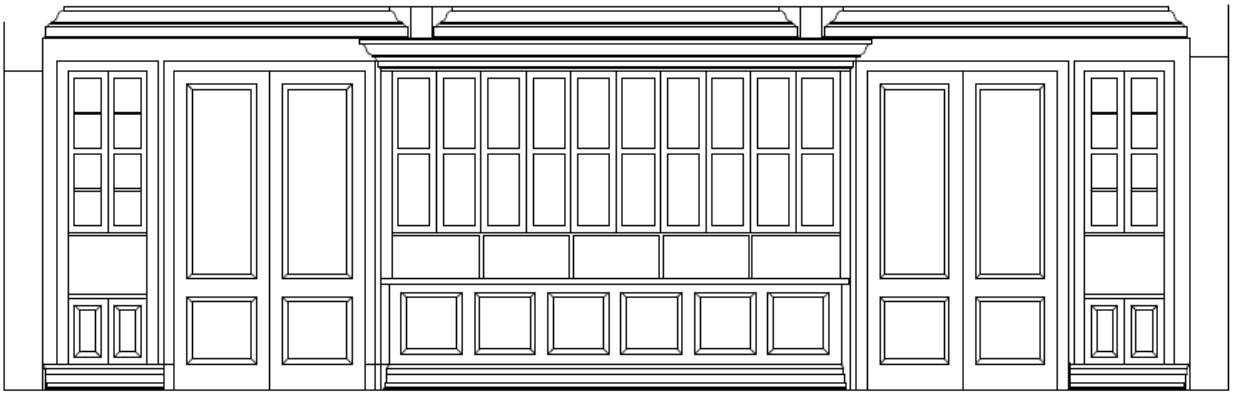
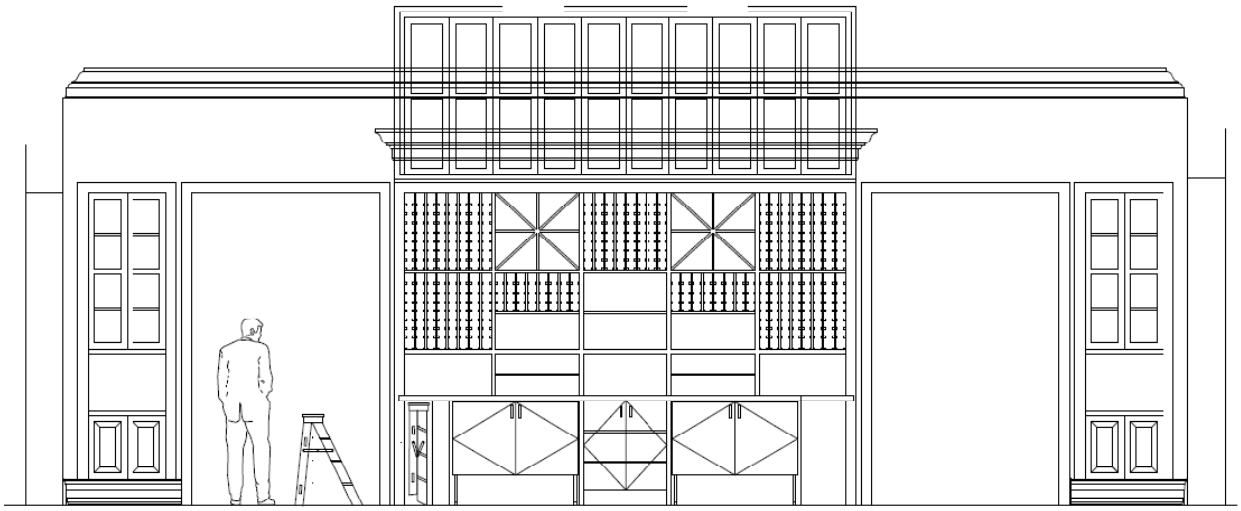


Figure 52: Wine Bar east elevation – wood paneling recessed in ceiling.



Lighting Design Criteria and Consideration

(*IESNA Handbook*: Interior-Food Service Facilities-Dining)

- **Psychological Impressions**
  - The purpose of the Wine Bar is a special space for guest to come eat great snack food, have some world-class wine and relax. Therefore, the impression the lighting design should strive for is relaxation.

- **Appearance of Space and Luminaires** (Important)
  - This room is a special feature within the resort. Guests will expect the lighting to reflect the high-class food and wine being served within the space. With fine wood finishes and furniture, a painted mural, bottles of wine on display, and the bar feature with reclaimed barn wood and artifacts, the appearance of Wine Bar is very important in this case. The luminaires must be decorative in nature with an old-country/wine cellar look to fit within the interior design.

- **Color Appearance (and Color Contrast)** (Very Important)
  - The light sources in this space should be warmer in CCT to promote relaxation. The warmer light also fits better with the wood finishes and red brick flooring.
  - A use of lighting with high CRI is key to the task of eating food. Guests will want their food to look the way the chef meant it to look.

- **Direct & Reflected Glare** (Important)
  - In order to maintain relaxation in the Living Room space, direct glare from light sources and luminaires must be prevented. Menus listing appetizers and wine choices will require that reflected disability glare is also prevented.

- **Points of Interest** (Important)
  - There are several points of interest in the Wine Bar space. Lighting must accent the mural painted on the walls as well as the bar itself. The bar has been detailed with elegant wood trim work, and the casework holding the wine combines this high-end wood finish with clear tempered glass. Lighting will guide guests' vision to these points of interest.

- **Horizontal Illuminance** (Somewhat Important)
  - General lighting within the Wine Bar requires **10 fc** for simple visual tasks.

- **Vertical Illuminance** (Somewhat Important)
  - Vertical surfaces require **3 fc.**

- **Power Density Allowance:** ASHRAE 90.1 2007
  - Dining area-Bar Lounge/Leisure Dining: 1.4 W/sq. ft.
  - Additional interior lighting power density allowance for spaces in which lighting is specified to be installed in addition to the general lighting of the purpose of decorative appearance:
    - Additional lighting power shall not exceed 1.0 W/sq.ft.
  - Total allowable = **2.4 W/SQ. FT.**

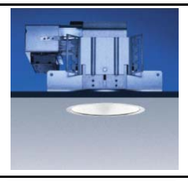
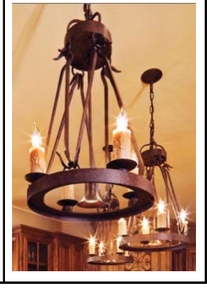
Lighting Plans – See Appendix A

Mounting Details – See Appendix B

Luminaires

Figure 53: Luminaire Schedule. Luminaires, lamps, and ballast specifications can be found in Appendix C.

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
J		Zumtobel	S5D4312 D1 4311R MC	Open recessed downlight. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Spun aluminum reflector with white matte finish.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
J1		Zumtobel	S5D4312 D1 4311W MC	Open recessed downlight/wallwash. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Wallwasher reflector - hydroformed aluminum kicker plate is mounted to the main reflector for wall illumination. Reflector is fully rotatable from below.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
L		DDP	Cwi-24-60-27K	LED CoveWash luminaire. Low-profile linear fixture with linear parabolic reflector and thin film diffusers. 1.0" deameter clear extruded acrylic housing (UV resistant). Diffuse end caps to prevent shadows. 2' - 0" length	Cove surface mounted	24VDC Class 2	24 VDC	LED	4W/ft
M2		2nd Ave.	751118.1	"Renzo" wall sconce. 6.5" x 15" x 9". Antique iron gate finish. Handcrafted. Candelabra base.	Wall surface		120	Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	2.5 W
N3		2nd Ave.	01.0750.18.DL	Lakeshore Chandelier with downlight. 18" x 30". "Cajun Spice finish" 3 ft. chain, handcrafted, C2 Canopy.	Pendant mounted		120	(5) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	12.5 W

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
N4		Steven Handelman Studios	CH46.12	"Sirracco" Pendant. Iron. Burnished gold finish (Tier 3). Hammered glass (Tier 1). 12" x 19"	Pendant mounted			(2) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	5 W
P		Osram Sylvania	BLP/BL04/W3F-865	BACKlight 2G Protect BL04 Chain LED module for signage. 11.8 ft., 120 LEDs per module.	Mounted to wine bar casement	OPTOTRONIC power suply - OT50	10.5 VDC	Osram Sylvania LED - White 6500K	23 W
P1		Osram Sylvania	HF2Narrow Stick 830H	HF2Narrow Stick Compact High Intensity LED Module for edge lighting. 5/8" wide. 10" segments can be connected end-to-end.	Mounted to wine bar casement	OPTOTRONIC power suply - OT96D	24 VDC	Osram Sylvania LED - White 3000K	4.2 W
Q		Philips Color Kinetics	523-000028-18	eW Profile Powercore 2700K. Ultra-low profile, white light LED under cabinet fixture. Direct line voltage. 11" length with end-to-end connections. Clear polycarbonate lens, Extruded aluminum, polycarbonate white powder-coated finish. 0.88" height x 1.7" width.	Under cabinet		120	2700K Class 1M LED	5.5 W

Light Loss Factors

Light Loss Factors					
Type	LLD	LDD	RSDD	BF	LLF Total
J	0.932	0.9	0.97	1	0.813636
J1	0.932	0.9	0.97	1	0.813636
L	0.93	0.89	0.9	1	0.74493
M2	0.96	0.94	0.9	1	0.81216
N3	0.96	0.94	0.9	1	0.81216
N4	0.96	0.94	0.9	1	0.81216
P	0.93	0.89	0.9	1	0.74493
P1	0.93	0.89	0.9	1	0.74493
Q	0.93	0.89	0.9	1	0.74493

Assumptions: Very Clean ; 12 month cleaning period.

Controls

The luminaires in the Wine Bar are all controlled by a Lutron Grafik Eye system. The bartender will have a 5-button preset scene control GRAFIK Wallstation, in which he or she can easily change the lighting scene to suit the time or environment. All dimming and switching capability can be programmed from the main Viseo Wallstation, EQ-A, where specific scenes can be changed at specific times every day. Also in accordance with ASHRAE 90.1 automatic shutoff requirements, a dual technology occupancy sensor is mounted into the ceiling.

Table 8: Control Schedule

Equipment Schedule					
Type	Product Name	Manufacturer	Product/Catalog Number	Description	Location
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Lutron GRAFIK 7000 System master control. Wallstation with LCD screen. Every lighting zone and scene programmable. Timeclock included.	"Storage 1117"
EQ-E	Dual Technology Ceiling Occupancy Sensor	Watt Stopper	DT-300	Ceiling-mounted dual technology occupancy sensor. Combined benefit of PIR and ultrasonic techonologies. 360 degrees of coverage. 24 VDC/VAC. Light level sensor: 10 to 300 footcandles. 4.5" diameter x 1.02" deep. 40' x 40' coverage.	Wine Bar
EQ-F	GRAFIK Wallstation	Lutron	NTOMX-4S-NRL	5 button preset scene control. 4 scene control plus OFF-button.	Wine Bar/Ballroom

Lighting Design

Design Concept

The design concept was to provide general lighting for daytime activities which distributes an even amount of light to the seating areas and highlights the custom wall mural. During the late afternoon and evening, the Wine Bar will become more active with dining and sampling of fine wines for the local wineries. This scene will be dim, with non-uniform lighting of warm color temperatures mixed throughout the room (suspended glow, wall sconces, cabinet glow, candle light at the tables). The main emphasis, though, is the bar itself. With a mixture of backlighting to make bottles glow, grazing for texture of wine racks/bottles, and under cabinet lighting for glasses and bottles, the bar is the featured element. When the wood panels are lowered to cover the wine racks, cove lighting above the bar continues to establish the bar's upper placement in the hierarchy of interest within the space.

Theme/metaphor

The lighting design coupled with the selection of decorative luminaires has an old-country wine cellar theme. The chandeliers are minimalistic in nature with rustic bronze finishes and ironwork that gives this feel to the space. The lantern-like pendants above the bar as well as the sconces fit in the same style.

Desired space perceptions

The perceptions of the space change throughout the day. During the day, the Wine Bar has a more open feel with a uniform spread of light, with emphasis on the custom painted walls and the bar itself. The dim, non-uniform warm glow of the night lighting scene has a private, more intimate feel for guests to dine with their spouses or families.

Accent issues

Using the wall wash component of Zumtobel downlight/wall wash luminaires (Type J1), light is accenting the interior design of the custom painted mural that covers the walls. Throughout the space, wine bottles are on display in racks and cabinets. These bottles are accented with under cabinet luminaires and backlit within wine racks. The emphasis of the space is clearly wine, so the bottles should be accentuated with light.

Texture emphasis

Within the back bar itself, the vertical wine racks coupled with the shape of the bottles being held provides an interesting element to graze and show texture. By using ultra-thin strips of LED's mounted within the wood casement (See Appendix B), the light grazes up or down the surface of the vertical racks and brings out the bottle/rack geometries.

Lighting Design Renderings

Figure 54: Wine bar rendering - daytime scene.

Figure 55: Wine bar rendering - night dining scene.

Figure 56: Wine bar rendering – night scene.

Figure 57: Wine bar rendering – night scene.

Performance Graphics

Figure 58: Wine bar illuminance contours (footcandles).

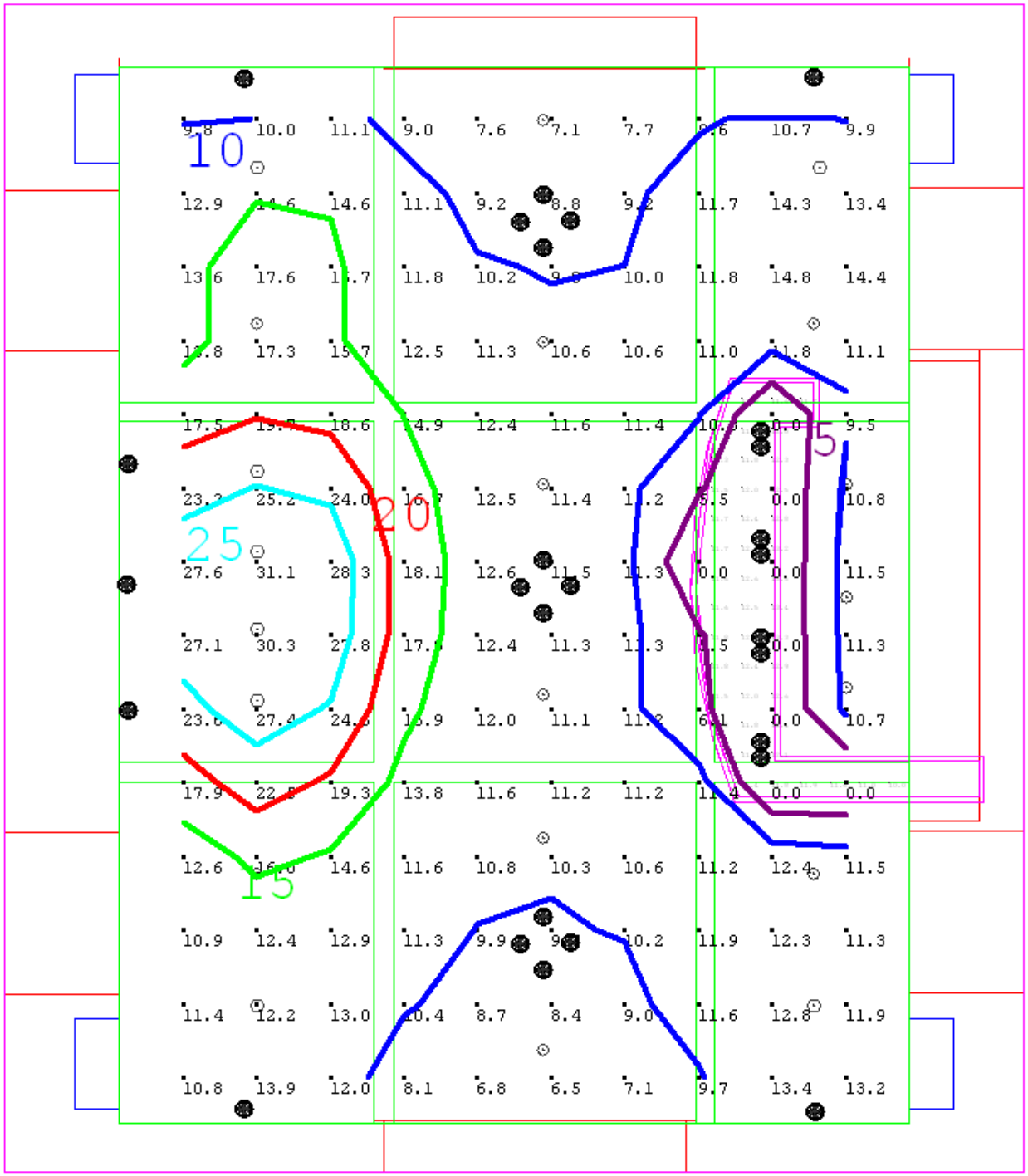
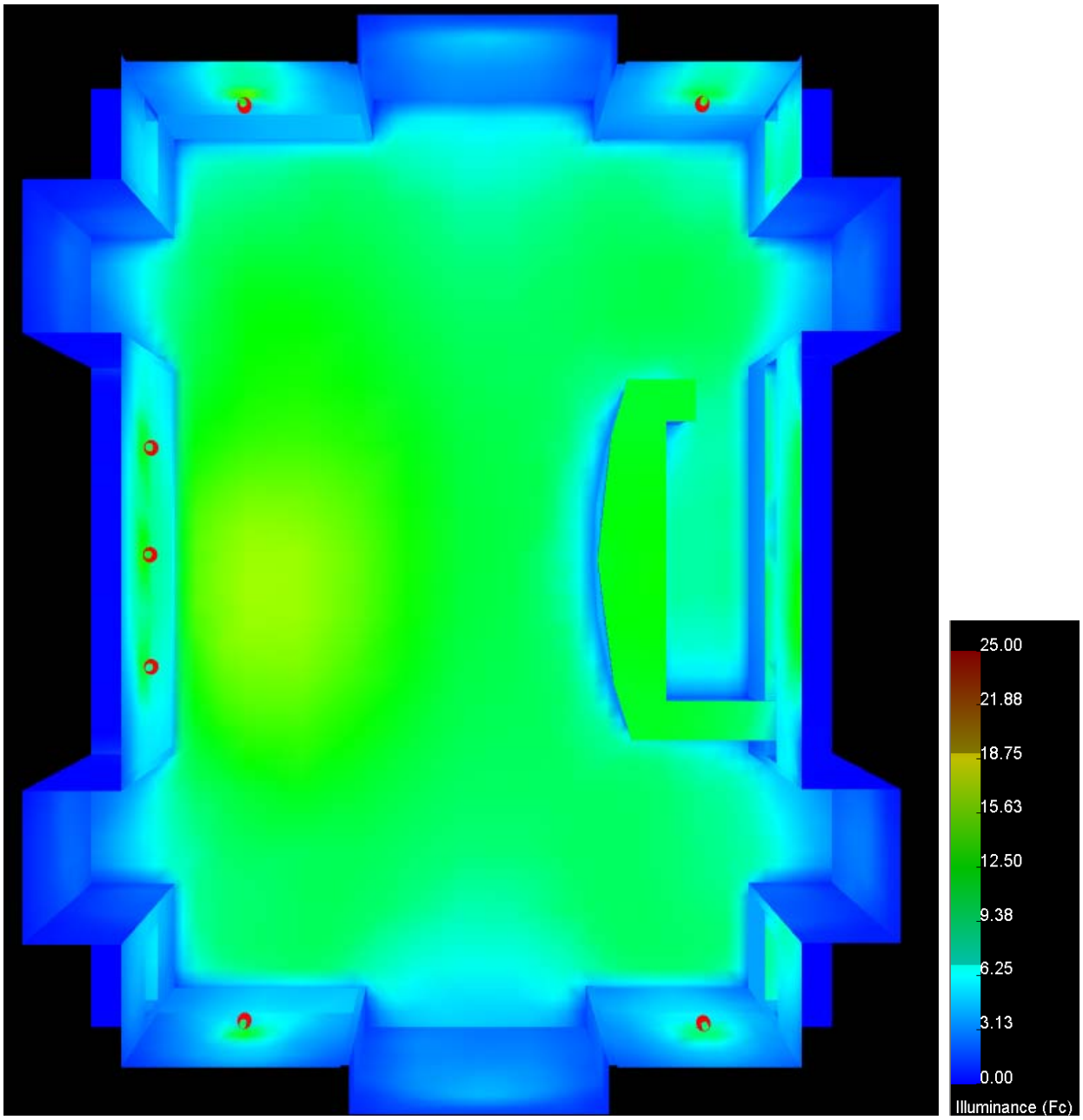


Figure 59: Wine bar illuminance pseudo color (footcandles).



Energy Code Compliance

Table 9: Energy Calculations – ASHRAE Standard 90.1

ASHRAE Standard 90.1 - Lighting Power Density			
LUMINAIRE	# OF LUMINAIRES	WATTAGE	TOTAL WATTS
J	13	23	299
J1	7	23	161
M2	7	2.5	17.5
N3	3	12.5	37.5
N4	4	5	20
P	2	23	46
P1	28	4.2	216
Q	14	5.5	77

LUMINAIRE	LINEAR FEET	W/LF.	TOTAL WATTS
L	15	4	156

TOTAL WATTS	691

ASHRAE Standard 90.1 - Lighting Power Density				
Area	Size (sq. ft.)	Power Density Allowable	Allowable Wattage	Designed Wattage
Living Room	938	2.4 W/sq. ft.	2251.20	691

W/SQ. FT	0.74

Performance Summary

Overall, whether during the day or night, the lighting design within the Wine Bar room provides appropriate light for its use and gives guests a special experience during their time in the space. During the day, an appropriate amount of general horizontal illuminance is provided for simple visual tasks. IESNA recommends 10 fc. for such activities – this design at full output gives an average of about 13 fc. Qualitatively during the day, there is emphasis put on the custom painted wall mural by use of wall washing luminaires.

At night, an intimate, relaxing feel is created through non-uniform lighting, warm glow from cabinets, sconces, and chandeliers. Candle light at the tables and the dim illumination from overhead will be enough for guests to order food and wine. The main emphasis of the space is the bar itself, and the lighting design lets guests know this by use of a mixture of lighting strategies. Accent on wine bottles through under cabinet lighting and backlighting mixed with grazing of wine racks and bottles to provide texture will definitely put focus on the bar and away from the dim glow of the tables. This strategy is successful in giving the feeling of privacy.

Attention has been made to make sure that sources lighting the back bar bottles and racks will not be seen from guests sitting at the bar. Also, the use of extremely low profile luminaires to light the back bar elements will prevent major modifications to the architecture for installation (See Appendix B).

While the theme of the space is that of old-country style mixed with a wine cellar feel, decorative allowances provide the space with a high-end lighting power density limit of 2.4 W/sq. ft. However, the use of LED products and compact fluorescent luminaires has resulted in a low energy solution of under 0.8 W/sq.ft.

Electrical Redesign

All panels affected by lighting redesign in the Wine Bar are shown in Table 10 below, highlighted in yellow.

Table 10: Dimming panels affected by lighting redesign.

Panels Affected by Lighting Redesign							
Panel Tag	Voltage	N, N/E, E?	Dimming Panel?	Courtyard	Living Room	Wine Bar	Ballroom
DIM213	120/208 3PH, 4W	N	Yes	X			
EDIM211	120/208 3PH, 4W	E	Yes	X	X	X	
DIM211A	120/208 3PH, 4W	N	Yes	X			
DIM211B	120/208 3PH, 4W	N	Yes	X	X	X	
EDIM212	120/208 3PH, 4W	E	Yes				X
DIM212B	120/208 3PH, 4W	N	Yes				X

Lighting Plan

The Wine Bar lighting plan with controls and circuiting can be found in Appendix A, drawing E3.1.

Existing Panelboards Affected

Circuits modified by lighting redesign are highlighted in yellow.

DIMMING PANEL "EDIM211" 120/208, 3ø, 4W, 100A MCB – EMERGENCY POWER						LUTRON MOD# GP36-120-4-M60-20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	03c	AA	LV	DIM	39	37	1443
2	CORRIDOR FIRST FLOOR	06c	AI	LV	DIM	37	4	148
3	CORRIDOR FIRST FLOOR	15c	DP	LV	DIM	200	1	200
4	CORRIDOR FIRST FLOOR	22c	DS-4	INC	DIM	60	4	240
5	CORRIDOR FIRST FLOOR	25c	AA	LV	DIM	37	7	259
6	CORRIDOR FIRST FLOOR	26c	AA/AC-1	LV	DIM	37	7	259
7	CORRIDOR FIRST FLOOR	01c	DP	INC	DIM	200	1	200
8	BILLIARD FIRST FLOOR	01cb	AA	LV	DIM	37	10	370
9	BILLIARD FIRST FLOOR	07cb	AA	LV	DIM	37	2	74
10	PUBLIC RESTROOM FIRST FLOOR	01r	AC-1/AA	LV	DIM	37	12	444
11	COOKING STUDIO FIRST FLOOR	01d	AC-1	TBD	DIM	37	15	555
12	HOTEL SPA CHECK-IN	13c	SC	CC	DIM	5.5 W/LFT	58	319
13	RESTAURANT FIRST FLOOR	05s	DS/DS-1	INC	DIM	75	8	600
14	RESTAURANT FIRST FLOOR	08s	AA-1/AA	LV	DIM	37	10	370
15	RESTAURANT & VEST. FIRST FLOOR	12s	AA	LV	DIM	37	3	111
16	RESTAURANT FIRST FLOOR	14s	AA	LV	DIM	37	4	148
17	RESTAURANT FIRST FLOOR	16s	WB	INC	DIM	60	13	780
18	SPARE							
19	BOARD ROOM FIRST FLOOR	02fra	AE	INC	DIM	150	6	900
20	BOARD ROOM FIRST FLOOR	02frb	AF	INC	DIM	150	6	900

DIMMING PANEL "EDIM211" 120/208, 3ø, 4W, 100A MCB – EMERGENCY POWER						LUTRON MOD# GP36-120-4-M60-20		
21	CHECK-IN FIRST FLOOR	03ci	AA	LV	DIM	37	12	444
22	LIBRARY FIRST FLOOR	02cr	AA	LV	DIM	37	18	666
23	LIVING ROOM FIRST FLOOR	03cg	AA	LV	DIM	37	4	148
24	LIVING ROOM FIRST FLOOR	07cg	AH-2	LV	DIM	37	6	222
25	LIVING ROOM FIRST FLOOR	11cg	AA	LV	DIM	37	3	111
26	PORTE-COCHERE FIRST FLOOR	02cv	AA	LV	DIM	37	2	74
27*	PORTE-COCHERE FIRST FLOOR	10cv	B	CFL		27	2	54
28	WINE BAR FIRST FLOOR	02cw	AA	LV	DIM	37	18	666
29	RETAIL FIRST FLOOR	02t	AA	LV	DIM	37	9	333
30	PRIVATE DINING FIRST FLOOR	03sp	AA	LV	DIM	37	16	592
31	SPARE							
32	SPARE							
33	SPARE							
34	SPARE							
35	SPARE							
36	SPARE							

TOTAL KVA: 11.89
TOTAL AMP: 32.39
26.2"W x 14.15"D x 87.00"H

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER								LUTRON MOD#: GP60–120–4–M100–20
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
2	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
3	CORRIDOR FIRST FLOOR	01c	DP–5	INC	DIM	400	3	1200
4	CORRIDOR FIRST FLOOR	02c	AA	LV	DIM	37	16	666
5	CORRIDOR FIRST FLOOR	05c	DS–1	INC	DIM	100	12	1200
6	CHECK–IN FIRST FLOOR	01ci	DP–4	INC	DIM	200	2	400
7	CHECK–IN FIRST FLOOR	02ci	RCPT – TABLE/FLOOR LAMPS	INC	DIM		4	500
8	SPARE							
9	SPARE							
10	SPARE							
11	LIBRARY FIRST FLOOR	01cr	DP–6	INC	DIM	320	1	320
12	LIBRARY FIRST FLOOR	03cr	DS–2	INC	DIM	75	12	900
13	LIBRARY FIRST FLOOR	04cr	AA	LV	DIM	37	4	185
14	LIBRARY FIRST FLOOR	05cr	AH	LV	DIM	37	4	148
15	LIBRARY FIRST FLOOR	06cr	RCPT – TABLE/FLOOR LAMPS					500
16	SPARE							
17	LIBRARY FIRST FLOOR	07cr	AA	LV	DIM	37	4	148
18	SPARE							
19	SPARE							
20	LIVING ROOM FIRST FLOOR	01cg	DP–7	INC	DIM	520	2	1040
21	LIVING ROOM FIRST FLOOR	02cg	AA	LV	DIM	37	4	148
22	LIVING ROOM FIRST FLOOR	04cg	DS–3	INC	DIM	75	12	900
23	LIVING ROOM FIRST FLOOR	05cg	SC	CC	DIM	6.5W/LFT	176 FT	1140
24	LIVING ROOM FIRST FLOOR	06cg	AA	LV	DIM	37	10	370
25	LIVING ROOM FIRST FLOOR	08cg	LR	LV	DIM	37	4	148
26	LIVING ROOM FIRST FLOOR	09cg	RCPT – TABLE/FLOOR LAMPS					500
27	SPARE							
28	EXTERIOR FIRST FLOOR	10cg	WC	INC	DIM	60	4	240
29	EXTERIOR FIRST FLOOR	12cg	WB	INC	DIM	60	2	120
30	EXTERIOR FIRST FLOOR	13cg	EB	LV	DIM	20	11	220

DIMMING PANEL "DIM211B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD# GP60–120–4–M100–20		
31	EXTERIOR FIRST FLOOR	14cg	EA	LV	DIM	50	14	700
32	SPARE							
33	ENTRY FIRST FLOOR	01cv	DP–2	INC	DIM	400	1	400
34	ENTRY FIRST FLOOR	03cv	SE	LV	DIM	37 2/3 LFT	54 FT	666
35	ENTRY FIRST FLOOR	04cv	SB	LV	DIM	15W@3" O.C.	8 FT	160
36	ENTRY FIRST FLOOR	05cv	AA	LV	DIM	37	2	74
37	ENTRY FIRST FLOOR	06cv	AC–1	LV	DIM	37	2	74
38	ENTRY FIRST FLOOR	07cv	AA	INC	DIM	37	3	111
39*	EXTERIOR FIRST FLOOR	08cv	A, A1	CFL	DIM	30, 45	6, 1	225
40*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8
41	VALET FIRST FLOOR	09cv	AF	LV	DIM	37	3	111
42*	EXTERIOR FIRST FLOOR		C	LV	DIM	22.2	6	133.3
43	ENTRY FIRST FLOOR	12cv	AA	LV	DIM	37	2	74
44*	EXTERIOR FIRST FLOOR	13cv	D	LV	DIM	45.6	12	546.7
45*	EXTERIOR FLOOD LIGHTS		F	MH		88.9	2	177.8
46	WINE BAR FIRST FLOOR	01cw	DP–8	INC	DIM	4 x 40	3	480
47	WINE BAR FIRST FLOOR	03cw	AA	LV	DIM	37	12	444
48	WINE BAR FIRST FLOOR	04cw	DS–4	INC	DIM	TBD	8	840
49	WINE BAR FIRST FLOOR	05cw	AH	LV	DIM	37	8	296
50	WINE BAR FIRST FLOOR	06cw	DP–16	INC	DIM	TBD	4	400
51	WINE BAR FIRST FLOOR	07cw	AA	LV	DIM	37	5	185
52	WINE BAR FIRST FLOOR	08cw	SB	LV	DIM	14W/LFT	20 FT	560
53	WINE BAR FIRST FLOOR	09cw	SD	LV	DIM	0.9W@1.2" O.C.	24 FT	171
54	WINE BAR FIRST FLOOR	10cw	SB–1	LV	DIM	05W@3" O.C.	20 FT	460
55	WINE BAR FIRST FLOOR	11cw	AI	LV	DIM	37	5	185
56	WINE BAR FIRST FLOOR	12cw	SB–1	LV	DIM	5W@3" O.C.	16	160
57	SPARE							
58	SPARE							
59	SPARE							
60	SPARE							

TOTAL KVA: 21.29
TOTAL AMP: 59.14
52.4"W x 87H x 14.15"D

Panelboard Sizing Worksheets/New Panels

Panels EDIM211 and DIM211B can be found in the Entry Courtyard electrical redesign section.

Voltage Drop for EDIM211

Estimated Voltage Drop Calculator

Input

Load Voltage	208V 3Ø	
Conductor Size	1	
Conductor Type	Cu ◉	Al ○
Number of Sets	1	
Distance (one way)	140	Feet
Load (A)	27.2	A

Output

	Unity Power Factor		85% PF	
Voltage Drop (V)	1.0	V	1.1	V
Voltage Drop (%)	0.5	%	0.5	%
Voltage at Load	207.0	V	206.9	V
Minimum Conductor Size for 3% VD	8			
Minimum Conductor Size for 5% VD	10			

SIEMENS

Voltage Drop for DIM211B

Estimated Voltage Drop Calculator

Input

Load Voltage	208V 3Ø	
Conductor Size	1	
Conductor Type	Cu ◉	Al ○
Number of Sets	1	
Distance (one way)	140	Feet
Load (A)	50.6	A

Output

	Unity Power Factor		85% PF	
Voltage Drop (V)	1.9	V	2.0	V
Voltage Drop (%)	0.9	%	0.9	%
Voltage at Load	206.1	V	206.0	V
Minimum Conductor Size for 3% VD	6			
Minimum Conductor Size for 5% VD	8			

SIEMENS

The Grand Ballroom

Description:
The grand ballroom is a multifunctional space that can satisfy social gatherings, meetings, wedding receptions, etc. Comfortable accommodating up to 340 guests, the ballroom has features of five large decorative custom chandeliers, custom wall sconces, elegant finishes and materials, and access to an outdoor terrace. The space is designed to accommodate dances with retractable theater lighting equipment installed. The floor is covered with custom designed carpeting, while the walls are covered with fabric upholstery. The ceiling is constructed as two levels – a painted white lower ceiling and a yellow "Pittsfield Buff" colored upper coffered ceiling.

Area: 5,000 Sq. ft.

Dimension: 91'-0" x 55'-0"

Space Category: Large Work Space

Materials:

MATERIAL/FINISH	OBJECT	COLOR	REFLECTANCE
Axminster Carpet	Ballroom floor	Custom	0.3
Flat Latex Paint	Lower Ceiling	Timid White	0.9
Flat Latex Paint	Ceiling Coffer	Pittsfield Buff	0.81
Semi-gloss Latex Paint	Baseboards, door trim, crown molding, cove molding	Parchment	0.86
White oak	Doors		0.86
Wall Upholdstery	Walls	NA	0.5

Grand Ballroom plans and elevations –

Figure60: Ballroom ceiling plan.

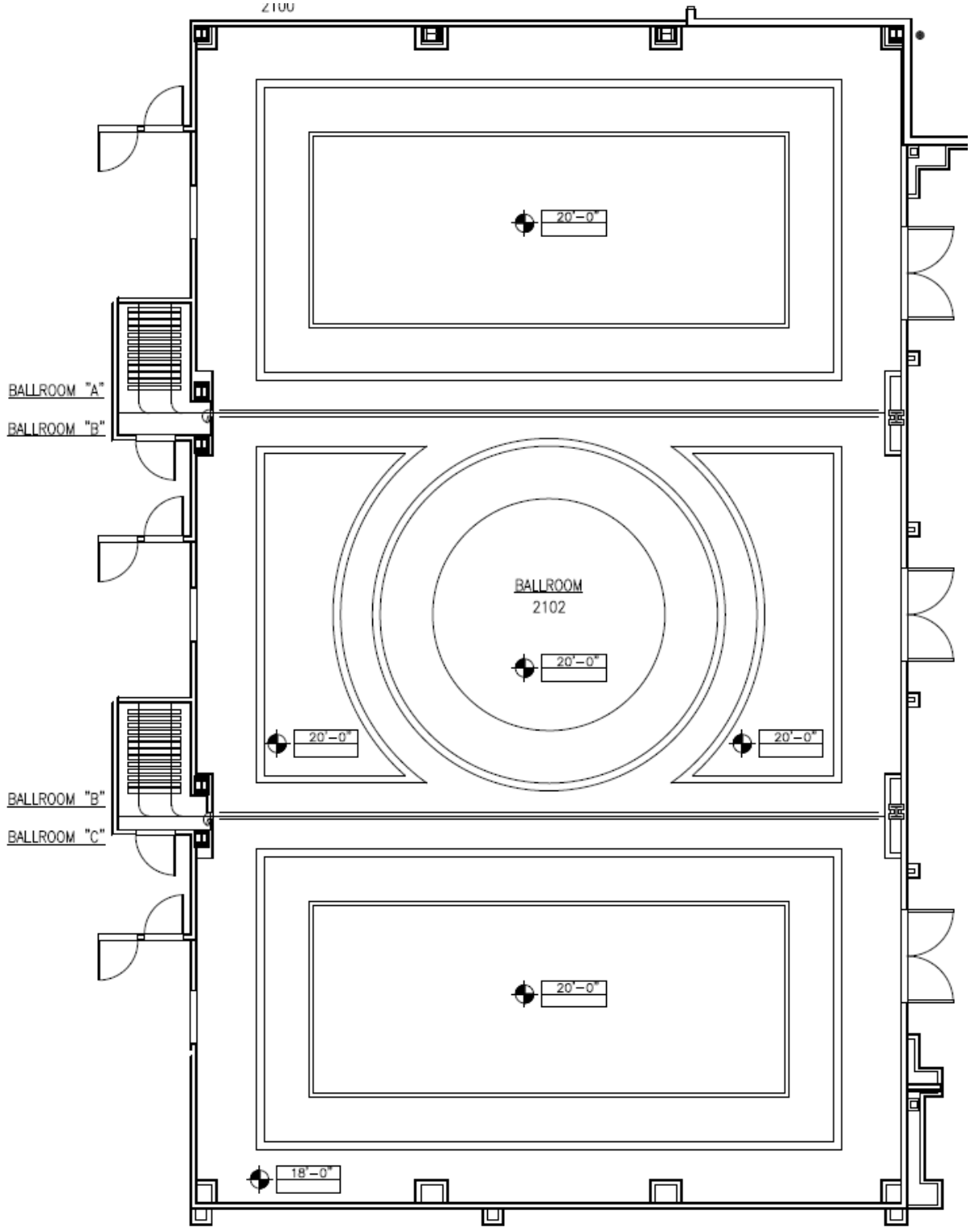


Figure 61: Ballroom east elevation.

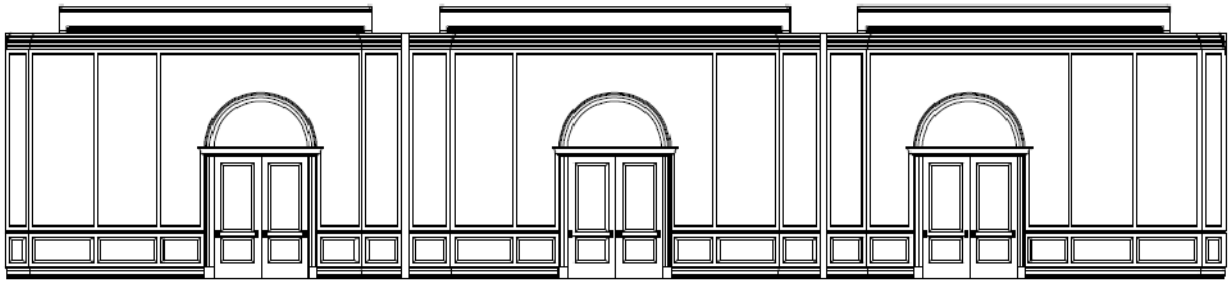


Figure 62: Ballroom north/south elevation.

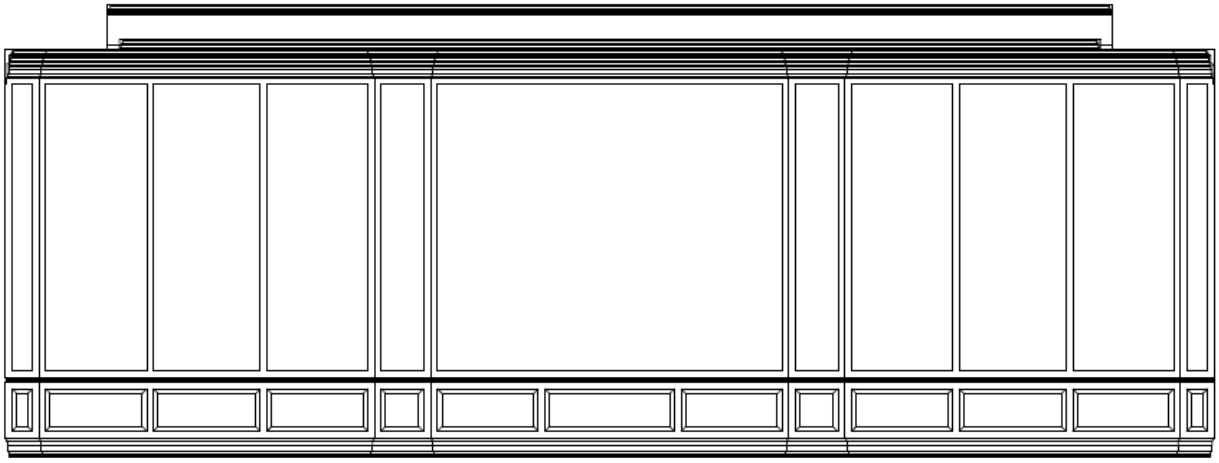
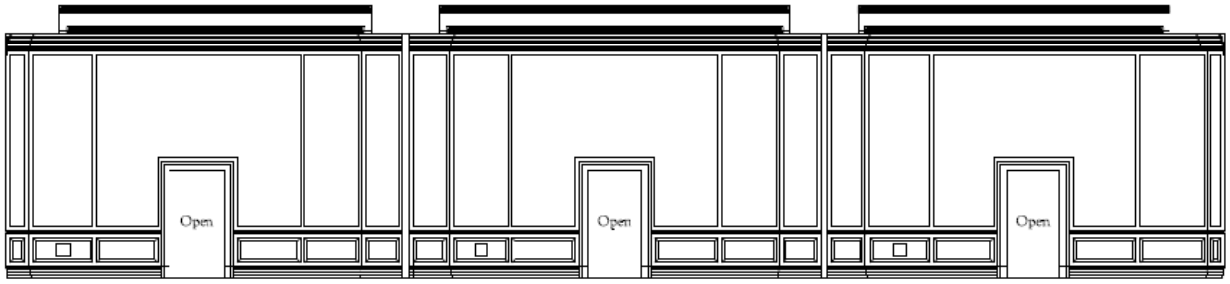


Figure 63: Ballroom west elevation.



Lighting Design Criteria and Consideration

(*IESNA Handbook*: Interior-Dance Halls/Discotheques-Ballrooms/social events)

- **Psychological Impressions**
  - Depending on the function taking place in the ballroom, the lighting design in this space can promote more than one psychological impression. During conferences with multiple activities happening at once, the lighting can create a public feeling with the use of uniform ambient light.
  - During a wedding reception where dancing and celebration would take place, a festive lighting atmosphere must be created with lower ambient light and sparkle and possible color-changing capabilities.

- **Appearance of Space and Luminaires** (Very Important)
  - The ballroom is a highly decorative space. The upholstery-covered walls, painted walls, custom-designed carpeting, and detailed millwork and crown molding must all be on display. The lighting equipment must accomplish this and also enhance the appearance. It is very important that the interior design of the space be on display and do justice to the elegance that Salamander Hospitality has gone through so much effort to promote. Lighting along the perimeter to highlight the walls and crown molding is desirable. Luminaires within the ceiling area must highlight the furniture in the room.

- **Color Appearance (and Color Contrast)** (Very Important)
  - This exciting space is equipped with colorful paints and wood finishes that must be rendered correctly to promote high aesthetics. Also, the clothing that guests wear into the ballroom will require appropriate color rendering. Therefore, light sources with high Color Rendering Index will be required.

- **Light Distribution on Surfaces** (Important)
  - During functions that are public in nature, the ballroom will require an even distribution of light on the horizontal and vertical surfaces, promoting public and spacious feelings. For more intimate activities, the lighting will need to change accordingly. See "Points of Interest."

- **Luminances of Room Surfaces** (Important)
  - As discussed above, the color appearance of the paints, fabrics, and wood finishes in the space are very important. Luminances of these surfaces must be high enough to recognize their unique and beautiful qualities. For public, open activities, vertical room surfaces must have higher luminances.

- **Modeling of Faces or Objects** (Important)
  - Activities in the ballroom are all very social. It is important that vertical illumination allow facial recognition between those in the space. Avoiding harsh facial shadows is also desirable.

- **Points of Interest** (Important)
  - The points of interest in this space are not specified due to the flexibility of activities that can be held in the ballroom. Therefore, the lighting design must also be flexible to accent points of interest no matter where the important objects may be.

- The interior design in the ballroom has created a few points of interest itself. The decorative chandeliers must receive light from the ceiling cavity to appropriately appear to those in the room. Also, custom wood-carved horses in the wooden arch-work above the doors in the ballroom will create a point of interest. Grazing these wood carvings will aid in the artistry.

- **Sparkle/Desirable Reflected Highlights** (Very Important)
  - It is very important that the lighting design has the ability to create sparkle for festive events like wedding receptions. The deliberate use of sparkle will add to the excitement of the space. This must come directly from the luminiares due to the beige-colored wall upholstery, which will not reflect a considerable amount of light.

- **System Control and Flexibility** (Very Important)
  - As stated before, it is imperative that the lighting system have control and flexibility to accommodate the flexibility of tasks that will take place in the ballroom. Conferences, wedding receptions, dances, meetings, etc. all require different preset light settings.

- **Horizontal Illuminance** (Somewhat Important)
  - General lighting within the Grand Ballroom requires **5 fc** for simple visual tasks.

- **Vertical Illuminance** (Somewhat Important)
  - Vertical surfaces require **3 fc.**

- **Power Density Allowance:** ASHRAE 90.1 2007
  - Conference/Meeting/Multipurpose space: 1.3 W/sq. ft.
  - Additional interior lighting power density allowance for spaces in which lighting is specified to be installed in addition to the general lighting of the purpose of decorative appearance (chandeliers and sconces):
    - Additional lighting power shall not exceed 1.0 W/sq.ft.
  - Total allowable = **2.3 W/SQ. FT.**

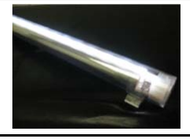
Lighting Plans – See Appendix A

Mounting Details – See Appendix B

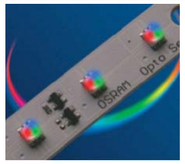
Luminaires

Figure 64: Luminaire Schedule. Luminaires, lamps, and ballast specifications can be found in Appendix C.

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
J		Zumtobel	S5D4312 D1 4311R MC	Open recessed downlight. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Spun aluminum reflector with white matte finish.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
J1		Zumtobel	S5D4312 D1 4311W MC	Open recessed downlight/wallwash. 4" aperture. Vertical CFL lamp orientation. 20 gauge galvanized, die-formed plaster frame. Adjustable butterfly mounting brackets. Wallwasher reflector - hydroformed aluminum kicker plate is mounted to the main reflector for wall illumination. Reflector is fully rotatable from below.	Ceiling Recessed	Electric dimming	120	Sylvania Dulux Ecologic: CFT18DT/E/IN/827/ECO	23 W
L		DDP	Cwi-24-60-27K	LED CoveWash luminaire. Low-profile linear fixture with linear parabolic reflector and thin film diffusers. 1.0" deameter clear extruded acrylic housing (UV resistant). Diffuse end caps to prevent shadows. 2' - 0" length	Cove surface mounted	24VDC Class 2	24 VDC	LED	4W/ft
M1		2nd Ave.	75835.2.X	"Josephine" decorative wall sconce. 18" x 21" x 9". Iron metalwork with Autumn Leaf finish. Decorative crystal, fiber drip candle covers. Handcrafted. Candelabra base.	Wall surface		120	(2) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	5 W

Luminaire Schedule

Type		Manufacturer	Catalog Number	Description	Mounting	Ballast/ Power Supply	Voltage	Lamp	Wattage
N1		2nd Ave.	87809.30.X	"Annabella" decorative chandelier. 30" Diameter x 45" height. Candelabra base, corinth finish. 3 ft. chain. Crystal decoration, fiber drip candle covers, handcrafted.	Pendant mounted		120	(8) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	20 W
N2		2nd Ave.	87618.42.X	"Minuet" decorative chandelier. 42" Diameter x 60" height. Candelabra base, pompei gold finish. 160 lbs. Fiber drip candle covers. Gold dipped crystal decoration.	Pendant mounted		120	(16) Philips EnduraLED Candle LED lamps. 3BA END/CL WW 120V 8/I	40 W
O		Osram Sylvania	LNRCLRMX/LM01M/RGB	LINEARlight Colormix Rigid Colormixing LED Module. 0.45" wide x 0.14" deep x 18" long. Each LED contains individually powered red, green, and blue chip. RGB dimmable by pulse width modulation. Ideal for areas with space limitations.	See Appendix B	OPTOTRONIC	24 VDC	Osram Sylvania RGB LEDs	8 W

Light Loss Factors

Light Loss Factors					
Type	LLD	LDD	RSDD	BF	LLF Total
E	0.93	0.89	0.9	1	0.74493
J	0.932	0.9	0.97	1	0.813636
J1	0.932	0.9	0.97	1	0.813636
L	0.93	0.89	0.9	1	0.74493
M1	0.96	0.94	0.9	1	0.81216
N1	0.96	0.94	0.9	1	0.81216
N2	0.96	0.94	0.9	1	0.81216
O	0.93	0.89	0.9	1	0.74493

Controls

The luminaires in the Ballroom are all controlled by a Lutron Grafik Eye system, with the ability to create dynamic color changing effects with a Lutron DMX512 Interface. Since the ballroom is divisible by three, each section (A,B, C) is controlled separately if needed by individual 5-button preset scene control. When the whole ballroom is used, the room will be controlled by one GRAFIK wallstation. Automatic shutoff is enabled by use of passive infrared occupancy sensors.

Table 11: Control Schedule

Equipment Schedule					
Type	Product Name	Manufacturer	Product/Catalog Number	Description	Location
EQ-A	Viseo Wallstation	Lutron GRAFIK	OMX-VDC-LF	Lutron GRAFIK 7000 System master control. Wallstation with LCD screen. Every lighting zone and scene programmable. Timeclock included.	"Storage 1117"
EQ-B	Wall-Mounted PIR Occupancy Sensor	Watt Stopper	CX-100	Wall-mounted passive infrared occupancy sensor. 24 VDC. For large areas, can cover up to 2000 sq. ft. Digital time delay adjustable from 15 seconds to 30 minutes.	Living Room/Ballroom "A" & "C"
EQ-C	Ceiling mounted PIR Occupancy Sensor	Watt Stopper	CI-300	Ceiling-mounted passive infrared occupancy sensor. 24 VDC. 360 degrees of coverage. 4.5" x 1.02". Coverage of 44' x 44'	Ballroom "B"
EQ-F	GRAFIK Wallstation	Lutron	NTOMX-4S-NRL	5 button preset scene control. 4 scene control plus OFF-button.	Wine Bar/Ballroom
EQ-G	DMX512 Control Interface	Lutron	LUT-DMX	DMX512 Control Interface. Allows GRAFIK Eye lighting controls to operate lighting and other equipment that uses the DMX512 protocol, including LED-based systems.	Ballroom

Lighting Design

Design Concept

The design concept is different for each scene. The general ambient lighting scene concept involves uniform ambient light. A uniform wash on the vertical walls and across the horizontal floor is necessary for general use in the space. The dining setting concept is of a dim glow. A combination of switched off and dimmed luminaires combine with decorative wall sconces, chandeliers, cove lighting, and perimeter non-uniform lighting to deliver a subtle glow to the users in the room. When weddings, dances, or special functions add decorations and fabrics to the walls, the low-profile color-changing LED luminaires recessed in the perimeter molding will give a dynamic effect to the space .

Theme/metaphor

The theme is of class and elegance.

Desired space perceptions

The first scene shown below is a general ambient lighting scene that would give a *public* perception. A general distribution of light across the horizontal and vertical surfaces gives this feel. The second scene ,the "dining scene," is a *private* space perception. This scene dims downlights and adds glow to the walls in a much more non-uniform way.

Accent issues

The Zumtobel combined downlight/washlight luminaires recessed in the lower portion of the ceiling had to be pushed toward the center of the room in order to provide a uniform wash on the walls. It is important for the public high ambient light scene to give a uniform distribution of light onto all surfaces. The cove elements and light accent the subtractive and multidimensional nature of the ceiling. Fabrics and linens that will be draped over the walls for special events will be accented with white light from the perimeter slot luminaires (Type O) and will pop with color during dances or exciting theatrical events.

Texture Issues

The custom carved horse heads above each of the doors on the east wall provide an interesting texture and creative interior element to the space. Shown in Appendix C, a linear grazing luminaire is hidden in the cove-like crown molding above each door.

Lighting Design Renderings

Figure 64: Ballroom general ambient setting (Public)

Figure 65: Ballroom dining setting – downlights dimmed to 10%, sconces switched on, perimeter glow switched on.

Figure 66: Ballroom dark projection screen setting – downlights switched off.

Performance Graphics

Figure 67: Ballroom illuminance contours (footcandles).

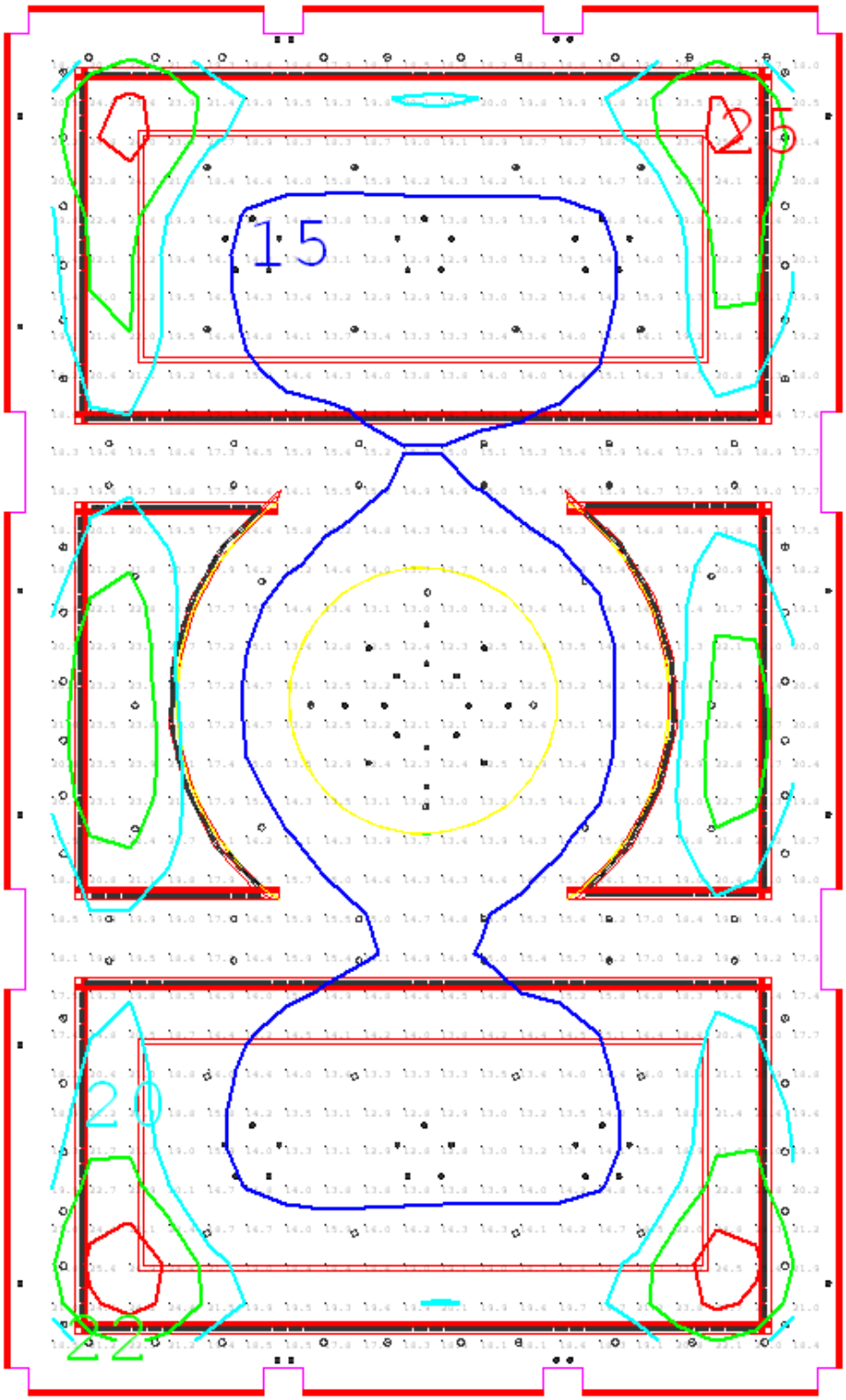
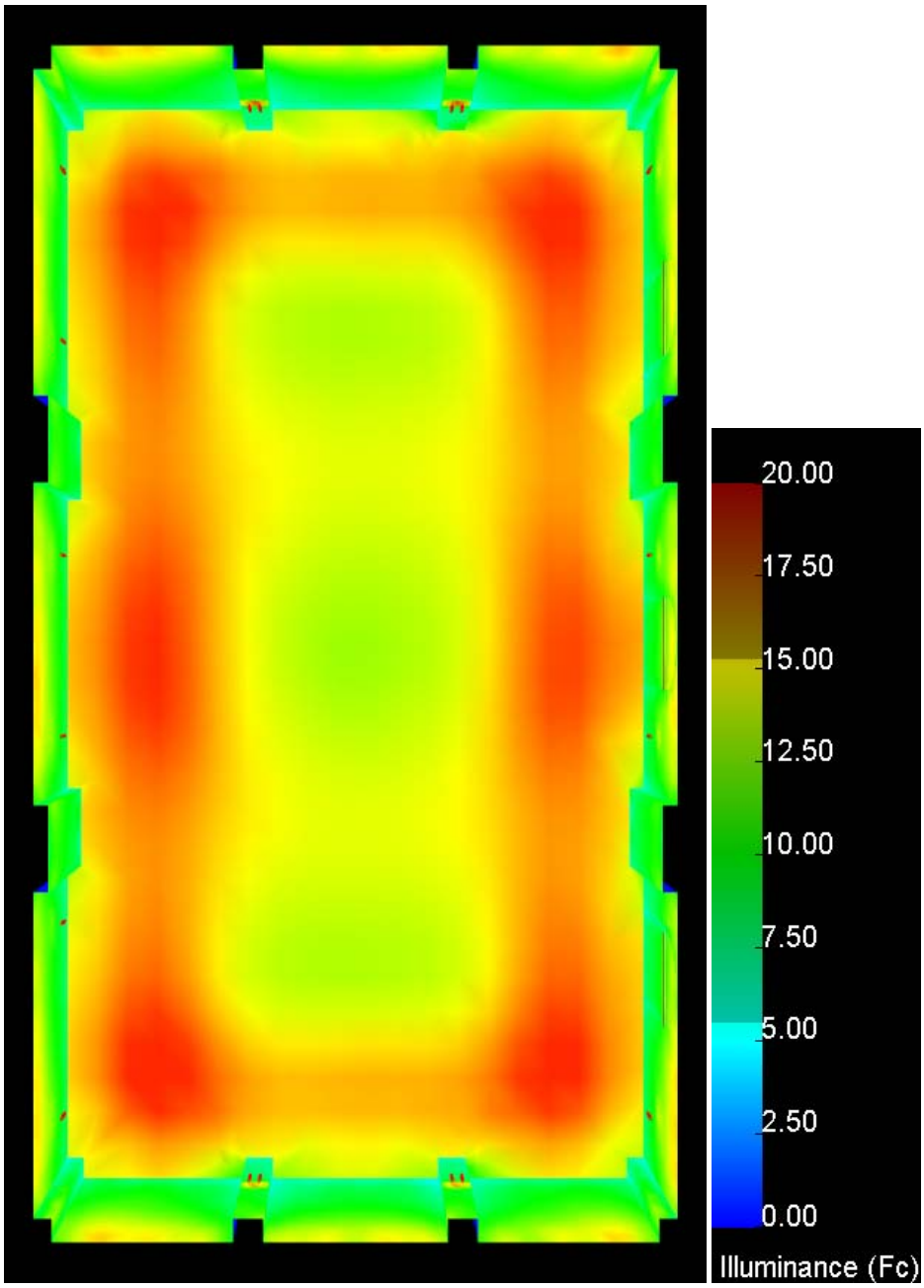


Figure 68: Ballroom illuminance pseudocolor.



Energy Code Compliance

Table 12: Energy Calculations – ASHRAE Standard 90.1

ASHRAE Standard 90.1 - Lighting Power Density			
LUMINAIRE	# OF LUMINAIRES	WATTAGE	TOTAL WATTS
J	54	24	1296
J1	52	24	1248
M1	14	5	70
N1	1	48	48
N2	6	25	150
O	40	12	480

LUMINAIRE	LINEAR FEET	W/LF.	TOTAL WATTS
L	500	4	2600

TOTAL WATTS	5412

ASHRAE Standard 90.1 - Lighting Power Density				
Area	Size (sq. ft.)	Power Density Allowable	Allowable Wattage	Designed Wattage
Living Room	5000	2.3 W/sq. ft.	11500.00	5412

W/SQ. FT	1.08

Performance Summary

The Grand Ballroom is a multifunctional, flexible space. Therefore, the lighting design in the ballroom is also flexible in nature. With GRAFIK Eye controls and color-changing ability, this space can be transformed into a convention with high ambient uniform lighting to a wedding reception with dining and dance lighting capability. The lighting also highlights the decorative architectural and interior design elements. Cove lighting and decorative chandeliers provide decoration, sparkle and glow overhead. Decorative sconces give appropriate glow and non-uniformity for dining scene settings.

Quantitatively, with use of low color temperature compact fluorescent lamps and LED luminaires, the lighting design is only slightly above 1.0 W/sq.ft., which is far lower than the 2.3 W/sq.ft. allowed. An average of 22 fc. across the horizontal plane is enough light for visual tasks completed in this space. The lighting design is functional, aesthetically pleasing, and energy efficient.

Electrical Redesign

All panels affected by lighting redesign in the Ballroom are shown in Table __ below, highlighted in yellow.

Table 13: Dimming panels affected by lighting redesign.

Panels Affected by Lighting Redesign							
Panel Tag	Voltage	N, N/E, E?	Dimming Panel?	Courtyard	Living Room	Wine Bar	Ballroom
DIM213	120/208 3PH, 4W	N	Yes	X			
EDIM211	120/208 3PH, 4W	E	Yes	X	X	X	
DIM211A	120/208 3PH, 4W	N	Yes	X			
DIM211B	120/208 3PH, 4W	N	Yes	X	X	X	
EDIM212	120/208 3PH, 4W	E	Yes				X
DIM212B	120/208 3PH, 4W	N	Yes				X

Lighting Plan

The Ballroom lighting plan with controls and circuiting can be found in Appendix A, drawing E4.1.

Existing Panelboards Affected

Circuits modified by lighting redesign are highlighted in yellow.

DIMMING PANEL "EDIM212" 120/208, 3ø, 4W, 70A MCB – EMERGENCY POWER — LUTRON MOD#: GP36-120-4-M70-20

CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	CORRIDOR	03c	AA	LV	DIM	37	53	1961
2		03c						
3		06c	AI	LV	DIM	37	4	148
4		10c	WD	INC	DIM	60	4	240
5	SPARE			LV	DIM	37	7	256
6	MEETING ROOM 2112	04fma	AE	INC	DIM	150	8	1200
7	MEETING ROOM 2111	04fmb	AE	INC	DIM	150	8	1200
8	MEETING ROOM 2115	04fmc	AE	INC	DIM	150	8	1200
9		08fmc	AA	LV	DIM	37	4	148
10	PUBLIC RESTROOM	01r	AC-1	LV	DIM	37	15	555
11	PUBLIC RESTROOM	07r	AF	LV	DIM	37	8	296
12	SPARE							
13	BALLROOM A	02fba	AB	INC	DIM	250	8	2000
14		02fba						
15		08fba	AA	LV	DIM	37	1	37
16	BALLROOM B	02fbq	AB	INC	DIM	250	8	2000
17		02fba						
18		08fba	AA	LV	DIM	37	1	37
19	BALLROOM A	02fbb	AB	INC	DIM	250	8	2000
20		02fbb						
21		08fbb	AA	LV	DIM	37	2	74
22	BALLROOM C	02fbc	AB	INC	DIM	250	8	2000
23		02fbc						
24		08fbc	AA	LV	DIM	37	2	74
25	SPARE							
26	PRE-FUNCTION	02fp	AA	LV	DIM	37	10	370
27		04fp	AA	LV	DIM	37	5	185
28		06fp	AA-2	LV	DIM	37	6	222
29		08fp	AA	LV	DIM	37	9	333
30		09fp	WD	INC	DIM	60	6	360
31		12fp	AA	LV	DIM	37	6	222
32	SPARE							
33	SPARE							
34	SPARE							
35	SPARE							
36	SPARE							

TOTAL KVA: 16.98
TOTAL AMP: 47.2
26.2"W x 14.15"D x 87.00"H

DIMMING PANEL "DIM212B" 120/208, 3ø, 4W, 100A MCB – NORMAL POWER						LUTRON MOD#: GP48-120-4-M100-20		
CIRCUIT NUMBER	AREA/ROOM	CUSTOMER ZONE	FIXTURE TYPE	LOAD TYPE	CONTROL TYPE	LOAD PER FIXTURE (W/VA)	No. OF FIXTURES	TOTAL LOAD (W/VA)
1	BALLROOM "A"	01fba	DP-13	INC	DIM	600	2	1200
2		03fba	DS – (TBD)	INC	DIM		2	200
3		04fba	SA	CC	DIM	6.5W/LFT	100FT	650
4		05fba	AH	LV	DIM	37	12	444
5		06fba	AD	INC	DIM	100	20	2000
6		06fba						
7		07fba	SB-2	LV	DIM	5W@3" O.C.	7 FT	140
8		09fba	ZZ JP	INC	DIM	575	1	575
9		10fba	JP	INC	DIM	575	1	575
10		11fba	JP	INC	DIM	575	1	575
11		12fba	ZZ JP	INC	DIM	575	1	575
12		13fba	JP	INC	DIM	575	1	575
13		14fba	JP	INC	DIM	575	1	575
14	BALLROOM "B"	01fbb	DP-22	INC	DIM	1200	1	1200
15		03fbb	DS – (TBD)	INC	DIM		2	200
16		04fbb	SA	CC	DIM	6.5W/LFT	237FT	1540
17								
18		05fbb	AH	LV	DIM	37	12	444
19		06fbb	AD	INC	DIM	100	11	1100
20		07fbb	SB-2	LV	DIM	5W@3" O.C.	7 FT	140
21		15fbb	ZZ JP	INC	DIM	575	1	575
22		16fbb	JP	INC	DIM	575	1	575
23		17fbb	JP	INC	DIM	575	1	575
24		18fbb	ZZ JP	INC	DIM	575	1	575
25		19fbb	JP	INC	DIM	575	1	575
26		20fbb	JP	INC	DIM	575	1	575
27		27fbb	AH	LV	DIM	37	12	444
28	BALLROOM "A"	01fbc	DP-13	INC	DIM	600	2	1200
29		03fbc	DS – (TBD)	INC	DIM		2	200
30		04fbc	SA	CC	DIM	6.5W/LFT	100FT	650
31		05fbc	AH	LV	DIM	37	12	444
32		06fbc	AD	INC	DIM	100	20	2000
33		06fbc						
34		07fbc	SB-2	LV	DIM	5W@3" O.C.	7 FT	140
35		21fbc	ZZ JP	INC	DIM	575	1	575
36		22fbc	JP	INC	DIM	575	1	575
37		23fbc	JP	INC	DIM	575	1	575
38		24fbc	ZZ JP	INC	DIM	575	1	575
39		25fbc	JP	INC	DIM	575	1	575
40		126bc	JP	INC	DIM	575	1	575
41	SPARE							
42	SPARE							
43	SPARE							
44	SPARE							
45	SPARE							
46	SPARE							
47	SPARE							
48	SPARE							

TOTAL KVA: 24.6
TOTAL AMP: 68.3
52.4"W x 87H x 14.15"D

Panelboard Sizing Worksheets/New Panels

The following tables are the modified dimming panelboards with new loads according to lighting redesign. Feeders were resized based on NEC table 310.16. Conduit was sized with the Conduit Sizing Worksheet provided in class.

EDIM212

PANELBOARD SIZING WORKSHEET										
Panel Tag---------->					EDIM212	Panel Location:		Storage 2108		
Nominal Phase to Neutral Voltage------->					120	Phase:		3		
Nominal Phase to Phase Voltage-------->					208	Wires:		4		
DIMMING PANEL "EDIM212" 120/208V, 3Ph., 4W. 40A MCB - Emergency Power										
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	5	CORRIDOR	962	w	1.00	962	962	DIM
2	A	LIGHTING	5	CORRIDOR	1036	w	1.00	1036	1036	DIM
3	B	LIGHTING	5	CORRIDOR	222	w	1.00	222	222	DIM
4	B	LIGHTING	5	CORRIDOR	420	w	1.00	420	420	DIM
5	C	SPARE				w		0	0	
6	C	LIGHTING	5	MEETING ROOM 2112	1200	w	1.00	1200	1200	DIM
7	A	LIGHTING	5	MEETING ROOM 2111	1200	w	1.00	1200	1200	DIM
8	A	LIGHTING	5	MEETING ROOM 2115	1500	w	1.00	1500	1500	DIM
9	B	LIGHTING	5	MEETING ROOM 2115	148	w	1.00	148	148	DIM
10	B	LIGHTING	5	PUBLIC RESTROOMS	555	w	1.00	555	555	DIM
11	C	LIGHTING	5	PUBLIC RESTROOMS	259	w	0.60	259	432	DIM
12	C	SPARE				w		0	0	
13	A	LIGHTING	3	BALLROOM	96	w	0.95	96	101	DIM
14	A	SPARE				w		0	0	
15	B	LIGHTING	5	PRE-FUNCTION	370	w	1.00	370	370	DIM
16	B	LIGHTING	5	PRE-FUNCTION	222	w	1.00	222	222	DIM
17	C	LIGHTING	5	PRE-FUNCTION	222	w	1.00	222	222	DIM
18	C	LIGHTING	5	PRE-FUNCTION	360	w	1.00	360	360	DIM
19	A	SPARE				w		0	0	
20	A	SPARE				w		0	0	
21	B	LIGHTING	5	PRE-FUNCTION	222	w	1.00	222	222	DIM
22	B	SPARE				w		0	0	
23	C	SPARE				w		0	0	
24	C	SPARE				w		0	0	
25	A	SPARE				w		0	0	
26	A	SPARE				w		0	0	
27	B	SPARE				w		0	0	
28	B	SPARE				w		0	0	
29	C	SPARE				w		0	0	
30	C	SPARE				w		0	0	
31	A	SPARE				w		0	0	
32	A	SPARE				w		0	0	
33	B	SPARE				w		0	0	
34	B	SPARE				w		0	0	
35	C	SPARE				w		0	0	
36	C	SPARE				w		0	0	
PANEL TOTAL								9.0	9.2	Amps= 25.5

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					4.79	4.80	52%	40.0
PHASE TOTAL	B					2.16	2.16	24%	18.0
PHASE TOTAL	C					2.04	2.21	24%	18.4

LOAD CATAGORIES			Connected			Demand				Ver. 104
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0	0.70	0.0	0.0			
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		0.1	0.1	1.00	0.1	0.1	0.95		
4	HID lighting		0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting		8.9	9.1	1.00	8.9	9.1	0.98		
6	HVAC fans		0.0	0.0	0.80	0.0	0.0			
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		0.0	0.0	1.00	0.0	0.0			
Total Demand Loads						9.0	9.2			
Spare Capacity			20%			1.8	1.8			
Total Design Loads						10.8	11.0	0.98	Amps=	30.6

30.6 * 1.25 = 38.22 A ➔ 40A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #8 AWG + #10 AWG Ground
(Feeder worksheet shown below in Table 14)

EDIM212 **Conduit Sizing Worksheet**

Total Cross Sectional of Wire Area	0.1675	sq. inches
Calculated EMT Conduit Size (minimum size is 3/4")	0.75 "	EMT
Calculated IMC Conduit Size (minimum size is 3/4")	0.75 "	IMC
Calculated RMC Conduit Size (minimum size is 3/4")	0.75 "	RMC
Calculated RNC Conduit Size (minimum size is 3/4")	0.75 "	RNC
Ref: 2005 NEC, Tables 4, 5 and 8		

									Totals	
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area
	No.	Area	No.	Area	No.	Area	No.	Area		
14		0.0139		0.0097		0.0139		0.004	0	0
12		0.0181		0.0133		0.0181		0.006	0	0
10		0.0243	1	0.0211		0.0243		0.011	1	0.0211
8		0.0437	4	0.0366		0.0437		0.017	4	0.1464

DIM212B

PANELBOARD SIZING WORKSHEET

Panel Tag---------->				DIM212B	Panel Location:			Storage 2108		
Nominal Phase to Neutral Voltage------->				120	Phase:			3		
Nominal Phase to Phase Voltage-------->				208	Wires:			4		
DIMMING PANEL "DIM212B" 120/208V, 3Ph., 4W. __A MCB - Emergency Power										
Pos	Ph.	Load Type	Cat.	Location	Load	Units	I. PF	Watts	VA	Control Type
1	A	LIGHTING	9	BALLROOM-A	680	w	0.95	680	716	DIM
2	A	LIGHTING	9	BALLROOM-A	531	w	0.95	531	559	DIM
3	B	LIGHTING	3	BALLROOM-A	270	w	0.90	270	300	DIM
4	B	LIGHTING	3	BALLROOM-A	520	w	0.90	520	578	DIM
5	C	LIGHTING	3	BALLROOM-B	592	w	0.90	592	658	DIM
6	C	LIGHTING	9	BALLROOM-B	738	w	0.95	738	777	DIM
7	A	LIGHTING	9	BALLROOM-B	350	w	0.95	350	368	DIM
8	A	LIGHTING	3	BALLROOM-C	680	w	0.90	680	756	DIM
9	B	LIGHTING	9	BALLROOM-C	531	w	0.95	531	559	DIM
10	B	LIGHTING	9	BALLROOM-C	270	w	0.95	270	284	DIM
11	C	LIGHTING	3	BALLROOM-C	520	w	0.90	520	578	DIM
12	C	SPARE				w		0	0	
13	A	SPARE				w		0	0	
14	A	SPARE				w		0	0	
15	B	SPARE				w		0	0	
16	B	SPARE				w		0	0	
17	C	SPARE				w		0	0	
18	C	SPARE				w		0	0	
19	A	SPARE				w		0	0	
20	A	SPARE				w		0	0	
21	B	SPARE				w		0	0	
22	B	SPARE				w		0	0	
23	C	SPARE				w		0	0	
24	C	SPARE				w		0	0	
25	A	SPARE				w		0	0	
26	A	SPARE				w		0	0	
27	B	SPARE				w		0	0	
28	B	SPARE				w		0	0	
29	C	SPARE				w		0	0	
30	C	SPARE				w		0	0	
31	A	SPARE				w		0	0	
32	A	SPARE				w		0	0	
33	B	SPARE				w		0	0	
34	B	SPARE				w		0	0	
35	C	SPARE				w		0	0	
36	C	SPARE				w		0	0	
PANEL TOTAL								5.7	6.1	Amps= 17.0

PHASE LOADING						kW	kVA	%	Amps
PHASE TOTAL	A					2.24	2.40	39%	20.0
PHASE TOTAL	B					1.59	1.72	28%	14.3
PHASE TOTAL	C					1.85	2.01	33%	16.8

LOAD CATAGORIES			Connected			Demand				Ver. 104
			kW	kVA	DF	kW	kVA	PF		
1	receptacles		0.0	0.0	0.70	0.0	0.0			
2	computers		0.0	0.0	0.90	0.0	0.0			
3	fluorescent lighting		2.6	2.9	1.00	2.6	2.9	0.90		
4	HID lighting		0.0	0.0	1.00	0.0	0.0			
5	incandescent lighting		0.0	0.0	1.00	0.0	0.0			
6	HVAC fans		0.0	0.0	0.80	0.0	0.0			
7	heating		0.0	0.0	1.25	0.0	0.0			
8	kitchen equipment		0.0	0.0	0.80	0.0	0.0			
9	unassigned		3.1	3.3	1.00	3.1	3.3	0.95		
Total Demand Loads						5.7	6.1			
Spare Capacity			20%			1.1	1.2			
Total Design Loads						6.8	7.4	0.93	Amps=	20.4

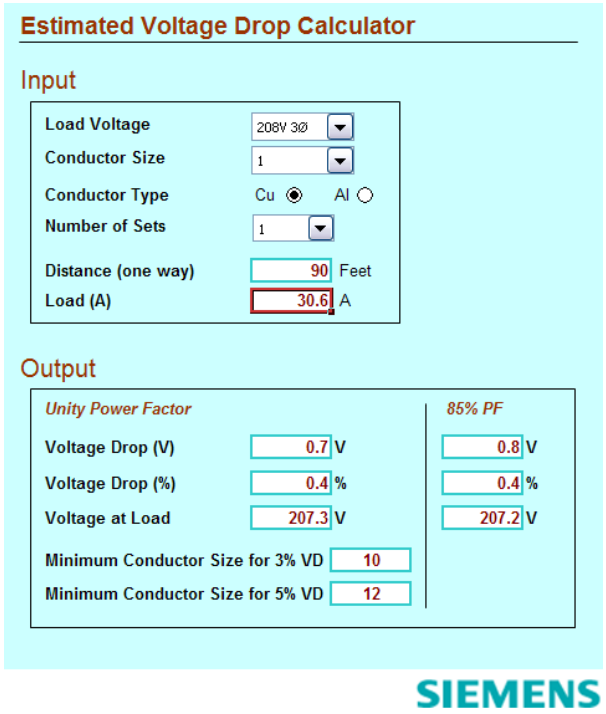
20.4 * 1.25 = 25.55 A ➔ 35A CIRCUIT BREAKER; 100A BUS BARS
Feeder: (4) #8 AWG + #10 AWG Ground
(Feeder worksheet shown below in Table 14)

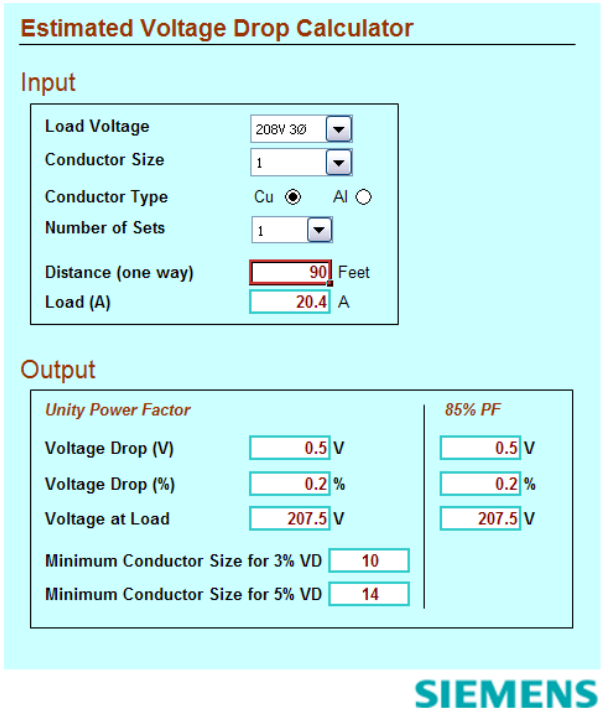
DIM212B	Conduit Sizing Worksheet										
Total Cross Sectional of Wire Area									0.1675	sq. inches	
Calculated EMT Conduit Size (minimum size is 3/4")									0.75 "	EMT	
Calculated IMC Conduit Size (minimum size is 3/4")									0.75 "	IMC	
Calculated RMC Conduit Size (minimum size is 3/4")									0.75 "	RMC	
Calculated RNC Conduit Size (minimum size is 3/4")									0.75 "	RNC	
Ref: 2005 NEC, Tables 4, 5 and 8											
									Totals		
Wize Size	TW, THW		THWN, THHN		XHHW		Bare Wire		No.	Area	
	No.	Area	No.	Area	No.	Area	No.	Area			
14		0.0139		0.0097		0.0139		0.004	0	0	
12		0.0181		0.0133		0.0181		0.006	0	0	
10		0.0243	1	0.0211		0.0243		0.011	1	0.0211	
8		0.0437	4	0.0366		0.0437		0.017	4	0.1464	

Table 14: Feeder Sizing Worksheet for the Entry Courtyard lighting branch circuit redesign.

FEEDER SIZING WORKSHEET		
Panelboard Tag	EDIM212	DIM212B
Panelboard Voltage	120/208	120/208
Calculated Design Load (kW)	10.8	6.8
Calculated Design Load (kVA)	11.9	7.4
Calculated Design Load (amps)	30.6	20.4
Feeder Sizing		
Sets	1	1
Wire Size		
Phase	#8 AWG	#8 AWG
Neutral	#8 AWG	#8 AWG
Ground	#10 AWG	#10 AWG
Wire Area		
Each Phase	0.0366	0.0366
Total - Phase Conductors	0.1098	0.1098
Neutral	0.0366	0.0366
Ground	0.0211	0.0211
Total Area	0.1675	0.1675
Conduit Size	0.75" EMT	0.75" EMT

Voltage Drop for EDIM212, DIM212B

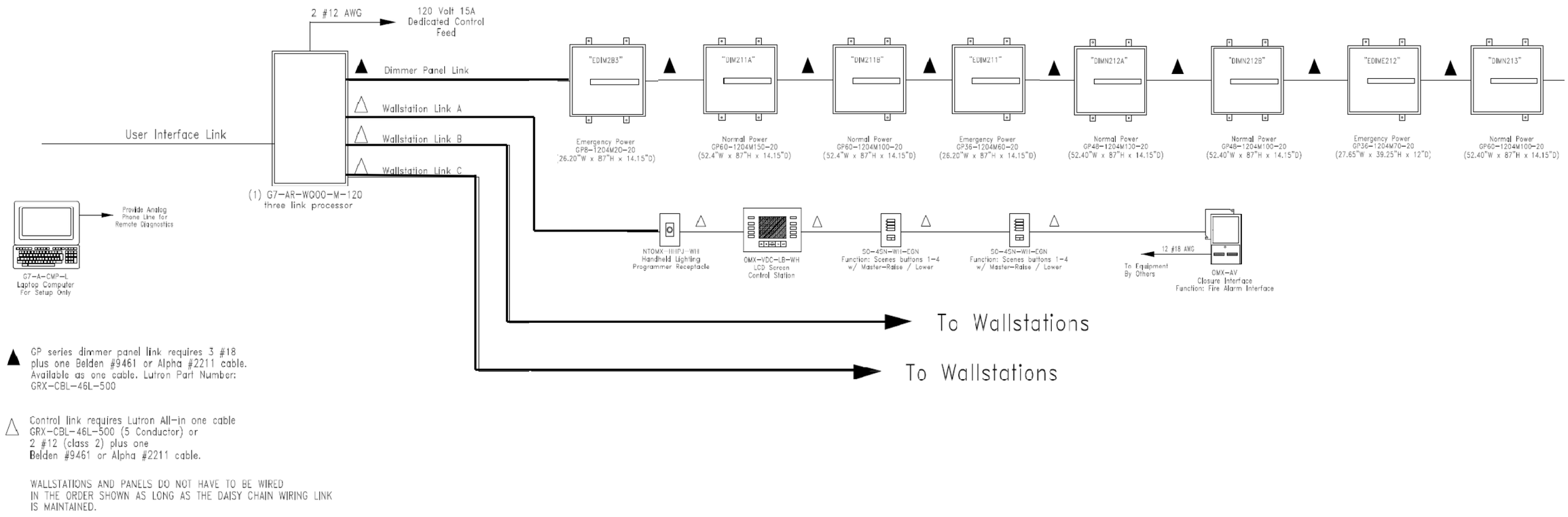




Dimming Control Diagram

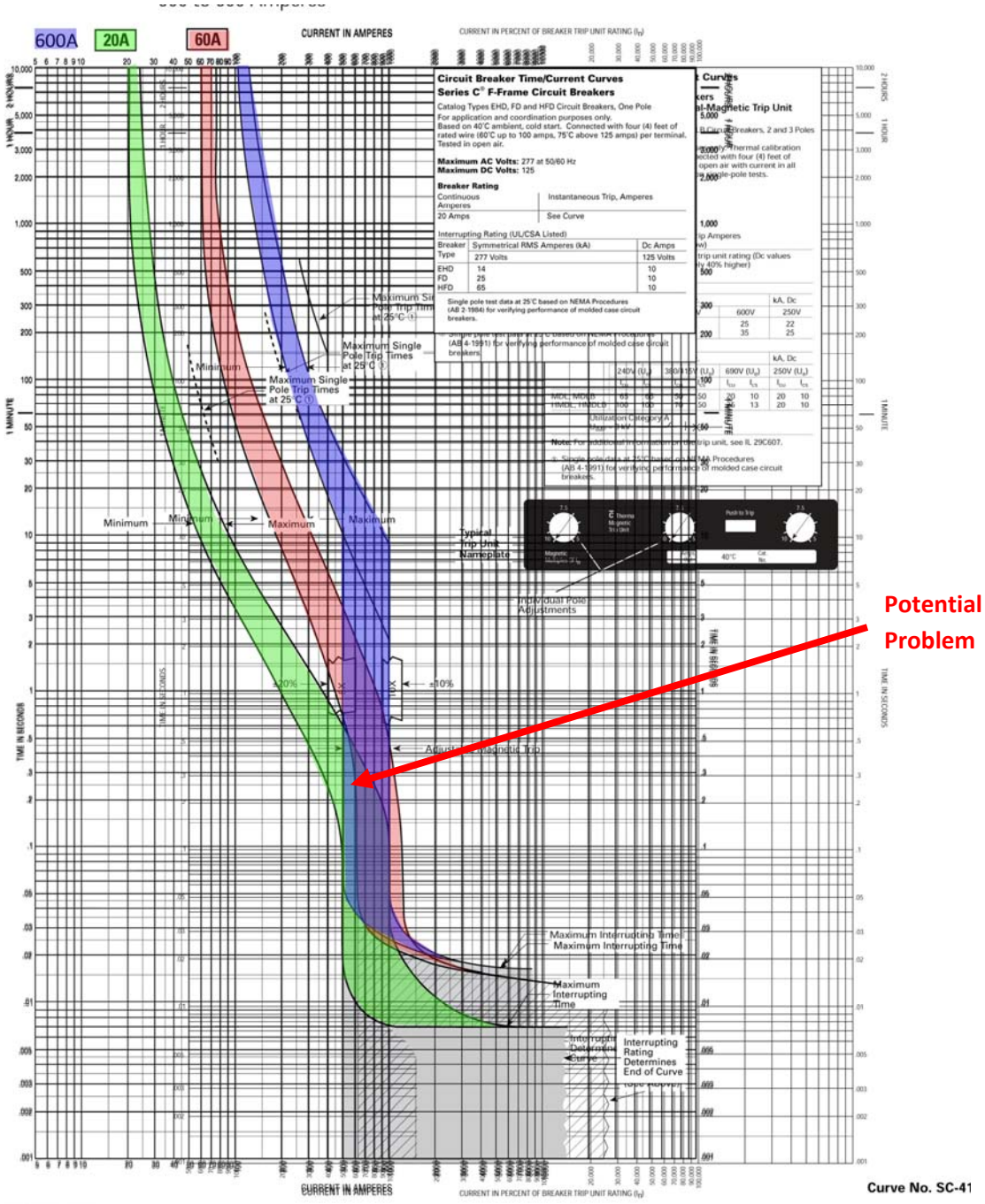
The Salamander Resort and Spa specialty lighting is completely powered by Lutron GP Dimming Panels (See Appendix C for specifications). The control portion of the lighting is done by a GRAFIK Eye system. The general dimming control diagram is shown in Figure 69 below.

Figure 69: GRAFIK Eye 7000 Dimming Control Diagram.



Overcurrent Device Coordination Study

- Main Switchboard – MSB
  - 3200AT
- Distribution Panel – DN4G4A
  - 600A MLO
- Branch Circuit Panel – N414A
  - 60A MLO



There is a potential problem between the minimum trip rating of the 600A breaker and the 60A breaker, where the minimum trip rating falls slightly below the minimum trip rating of the 60A breaker.

Short Circuit Calculation

SHORT CIRCUIT ANALYSIS - PER UNIT METHOD							
		SYSTEM VOLTAGE		480			
		BASE kVA		2500			
		AVAILABLE FAULT (kVA) - UTILITY COMPANY (ASSUMED)		100000	∑ X	∑ R	∑ Z	I_{SC} (A)
UTILITY PRIMARY								
		$X(p.u.) = (KVA_{base})/(UTILITY\ S.C.\ KVA)$	=	0.025	0.025	0	0.025	120281.3
TRANSFORMER SECONDARY								
%Z=	5.5	$X_{(p.u.)} = (\%X*KVA_{base})/(100*KVA_{xfmr})$	=	0.0548	0.0798	0.0046	0.0799	37615.83
X/R=	12	$R_{(p.u.)} = (\%R*KVA_{base})/(100*KVA_{xfmr})$	=	0.0046				
%X=	5.481							
%R=	0.457							
Kva=	2500							
SWITCHBOARD MSB								
WIRE=	600	$X_{(p.u.)} = (L*X_L*KVA_{base})/(1000^2*\#\ of\ Sets*kV^2)$	=	0.005024	0.0848	0.0074	0.0852	35313.61
LENGTH=	80	$R(p.u.) = (L*R*KVA_{base})/(1000^2*\#\ of\ Sets*kV^2)$	=	0.002789				
SETS=	8							
X=	0.00046							
R=	0.00026							
DISTRIBUTION PANEL DN4G4A								
WIRE=	600	$X_{(p.u.)} = (L*X_L*KVA_{base})/(1000^2*\#\ of\ Sets*kV^2)$	=	0.150716	0.2356	0.0910	0.2525	11907.99
LENGTH=	600	$R_{(p.u.)} = (L*R*KVA_{base})/(1000^2*\#\ of\ Sets*kV^2)$	=	0.083659				
SETS=	2							
X=	0.01389							
R=	0.00771							

Electrical Depth Topic: Static vs. Rotary Uninterruptable Power Supply (UPS)

The following analysis compares advantages and disadvantages of static and rotary uninterruptible power sources. The electrical engineering design of the Salamander Resort and Spa currently specifies a Liebert N-Power-80 Double Conversion Static UPS of 80 kVA. The purpose of this comparative analysis is to determine whether a static or rotary UPS should be specified in the context of this building. Multiple electrical design sources state that at 80kVA, the vast majority of UPS systems specified are static. This study will analyze whether the latest technology in "battery free" flywheel UPS's are worth substituting the existing static device. The defining factors for making a conclusion are the following: efficiency, cost, maintenance, and environmental impact.

Being that different UPS systems are optimized by different building sizes and applications, it is important in this study to understand the context and specific application of the UPS in the Salamander Resort and Spa. While the resort is large (230,000 sq.ft.), it does not contain typical critical equipment found in hospitals or data centers, where UPS systems are needed to maintain clean power flow between power failures and emergency generator start-up. However, security is an important issue for this luxury resort. Therefore, the UPS specified for the Salamander Resort and Spa contains two panels that provide circuits of uninterruptible power to security racks, cabinets, receptacles and plug strips that are critical to the safety of the resort. Salamander Hospitality is clearly concerned with security; therefore, the most reliable UPS system at the lowest cost is desirable. This analysis will determine whether that UPS system is a static or rotary structure.

The main difference between static and rotary UPS systems is the way the critical power is generated and supplied to critical loads. Piller Power Systems even markets a "Hybrid Rotary" UPS, which combines batteries and a flywheel. The question remains, "which system is the best?" In an Eaton white paper titled, "Emerging UPS Standby Power Sources," the following conclusions are made:

A. Static UPS- Lead Acid Batteries
   - Advantages
     - Suitable for long idle time and sudden, rapid use at high current
     - Lead acid ideal for high amounts of current on short notice
     - High amount of backup time (5-15 minutes) at low price
     - Most cost effective standby power storage solution currently available
   - Disadvantages
     - Large in size and extremely heavy: medium sized UPS systems can weigh 5-8 tons.
     - High Maintenance costs: marketed as "maintenance free"; however, need to be inspected at least twice a year by specialists at about $1,000+ per year.
     - High replacement costs: 4-5 year service life. Must budget to replace batteries 2-3 times over the lifespan of the UPS.
     - High disposal costs: contain highly toxic sulfuric acid. Disposal is tightly regulated and very expensive.

- Battery reliability must be tested, which permanently reduces capacity and operating life each time.

B. Flywheels – under normal operation, power spins a large disk. The disk continues to spin under a power outage, generating DC power during generator start-up until the disk finally stops spinning.
   - Advantages
     - Compact size: significantly smaller and lighter than batteries
     - Environmental impact: do not contain ecologically-harmful chemicals
     - Long lifespan: Ten-year service life. Can be used hundreds or thousands of times without affecting performance or service life.
     - Lower maintenance overhead: simple mechanism requiring less maintenance and at a lower cost of service.
   - Disadvantages
     - Lower backup time: typically can maintain standby energy for only 30 seconds, compared to 15 minutes from batteries. Multiple flywheels add time but also cost.
     - Higher cost: purchase price of the average flywheel UPS system is about double the initial cost of the average lead acid battery-based system.

Presently, static systems are primarily used based on the disparity between backup times. The fifteen minutes that batteries can provide compared to 30 seconds with a flywheel seems to be quite a deciding factor. However, under specification section 16231 – Packaged Engine Generator, section 2.2D8: the start time is required to comply with NFPA 110, Type 10 system requirements. Under NFPA 110, Type 10, the maximum time between a utility outage and the standby generator supplies power is 10 seconds or less. This begs the question of why batteries of 15-minute capacity are even necessary? The 30 seconds provided by a flywheel rotary system would cover the gap between outage and emergency power. The issue of initial cost is still in favor static systems, with rotary flywheel UPS's costing as much as double up front.

In a study complete by Dr. Ian F. Bitterlin from Prism Power in Watford, UK, a group of flywheel energy storage UPS products were compared against battery energy storage UPS products for relative reliability in terms of Mean Time Between Failures (MTBF) and total cost of ownership. Figure 1 below shows the results of MTBF over service life between a flywheel and battery. A 10-year battery is proven to decrease by half MTBF at 8 years. It is then replaced and full MTBF is restored, creating the "saw-tooth" graph in Figure 70. Dr. Bitterlin's research data of Relative Reliability in MTBF between flywheel and batter products is shown in Figure 71. The two rows highlighted in blue are battery UPS products.

Figure 70: Mean Time Between Failure vs. Service life for flywheels and batteries in terms of energy storage/backup for UPS systems.

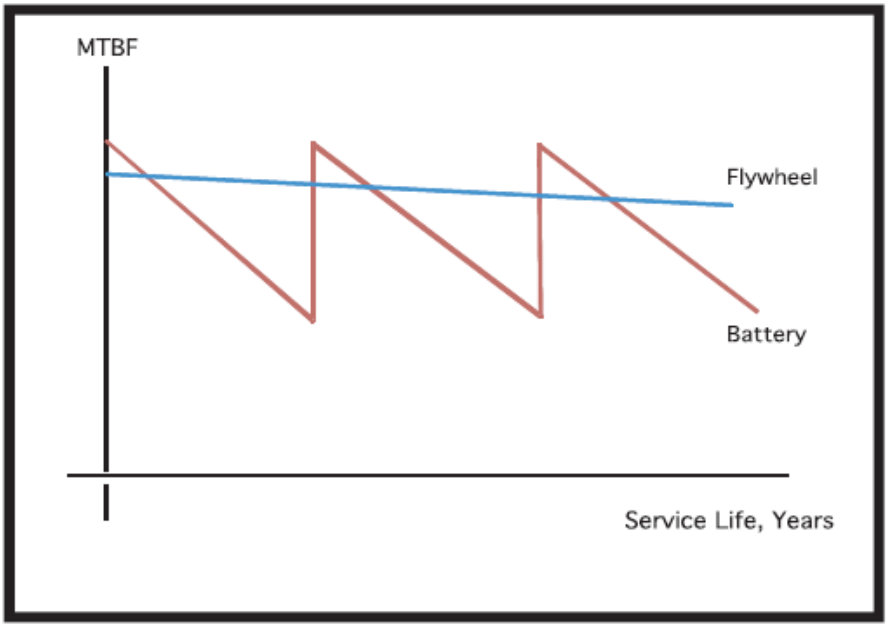


Figure 71: Mean Time Between Failure vs. Service life for flywheels and batteries in terms of energy storage/backup for UPS systems.

Energy Storage	Relative Reliability	Availability
KST-Rotabloc	100.0%	99.9968%
Active Power CSDC	41.7%	99.9953%
Piller Powerbridge	41.1%	99.9953%
10-Year VRLA Multi-String	40.7%	99.9829%
Vycon VDC	26.8%	99.9892%
Pentadyne	25.5%	99.9775%
5-Year VRLA Single-String	4.1%	99.8289%

At first glance, this data shows a competitive edge for flywheel systems. Unfortunately, all the flywheel products listed in Figure 2 are for applications that require more power than the Salamander Resort and Spa. As the sizes of rotary UPS products decrease, so do the efficiencies of those products. The KST-Rotabloc shown in Figure 2 drops from 96.2% efficiency at 1500 kVA to 92.5% efficiency at 200kVA (www.keitec.com). The Liebert 80kVA NPower static UPS specified in the Salamander Resort and Spa lists an efficiency of 92-93.5%.

This analysis also led to a discovery that all commercially available flywheel products are for slightly larger applications than the Salamander Resort and Spa. Therefore, availability is a real problem for finding a viable rotary replacement for the static UPS specified in this building.

Conclusions

Table 1 shows the conclusions made from research between static UPS systems and "battery free" flywheel UPS systems. While maintenance costs are cheaper for flywheels and batteries have much higher associated costs, the first costs can be double the price of a static system. (American Power Conversion Symmetra PX 80kW Scalable to 80kW N+1 with Premium XR Battery is listed at $71,100.00) Rotary UPS efficiencies are listed as higher than static; however, at 80kVA those efficiencies drop lower than the NPower static UPS. Backup time is the largest disparity between the two technologies. Batteries can provide 15 minutes of backup time, while the best flywheels can only provide 30 seconds. However, it was discovered that 30 seconds would actually cover the 10 seconds that the generator needs to start up.

While flywheel technologies may have a promising future, currently due to cost, efficiency, and no commercial true rotary products available the size of 80kVA, the Salamander Resort and Spa is recommended to use a static UPS.

	Static	Rotary
Efficiency	X	
Cost	X	
Maintenance		X
Backup Time	X	
Environmental Impact		X
Availability	X	

Sources:

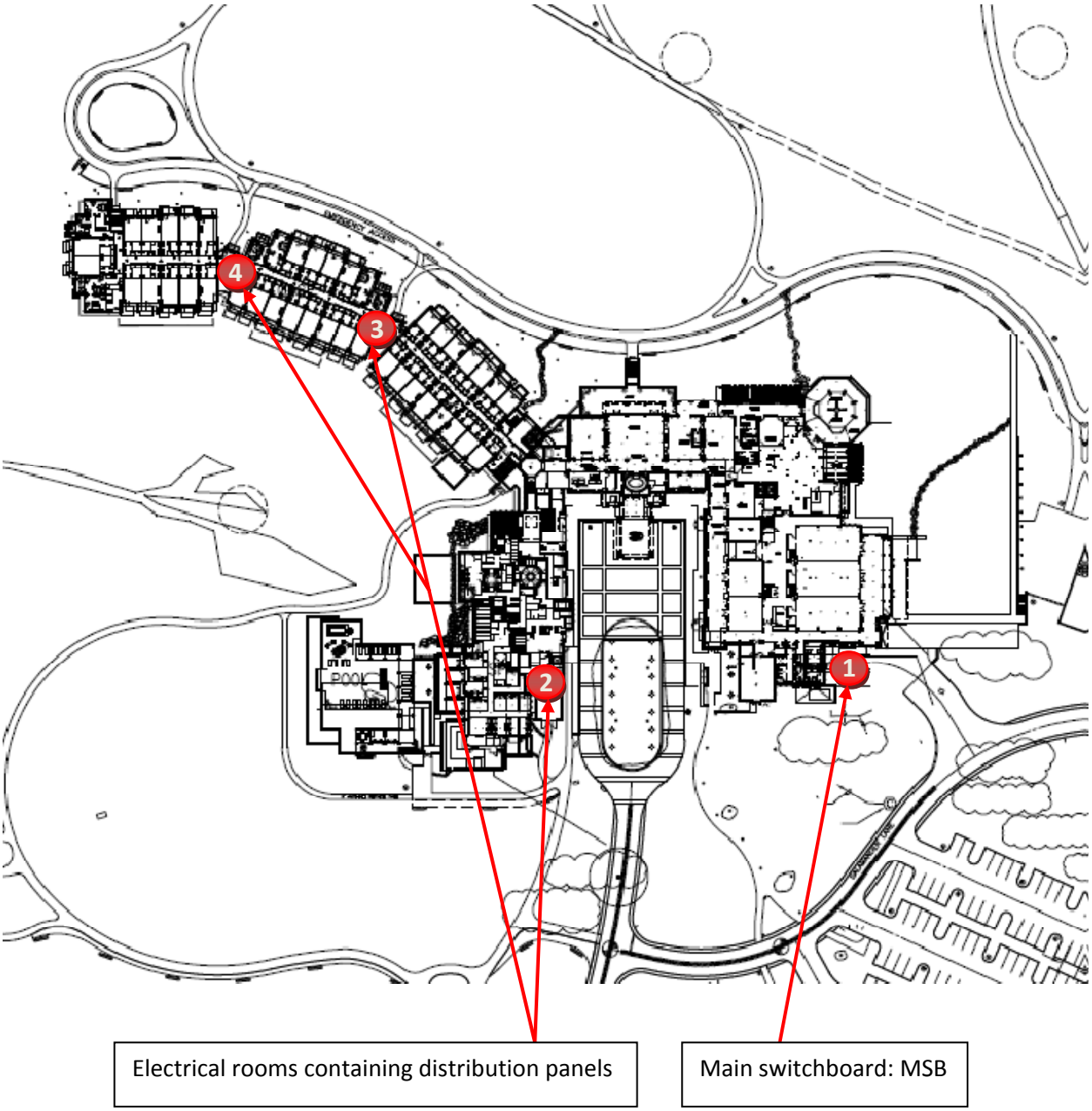
1. "Emerging UPS Standby Power Sources," by Ed Spears – Eaton Corporation: White Paper 10, December 2009.
2. "Flywheel Energy Storage: an alternative to batteries in UPS Systems," by Dr. Ian F. Bitterlin – Prism Power.
3. KPS Rotary UPS brochure. http://www.keyitec.com.
4. www.liebert.com

Electrical Depth Topic #2: Long Run Copper Feeders vs. Electrical Bus Duct

The goal of this analysis was to complete a study that would provide data for an economical engineering decision. Specifically, the Salamander Resort and Spa distributes power from the main electrical room, "Main Distribution Frame," by use of feeders only. While feeders are cost effective for short runs between electrical equipment, the hypothesis is that a lower cost solution may be available for long distances between equipment. This analysis provides cost comparisons between the use of long-run feeders and busduct from the main switch board to distribution panels.

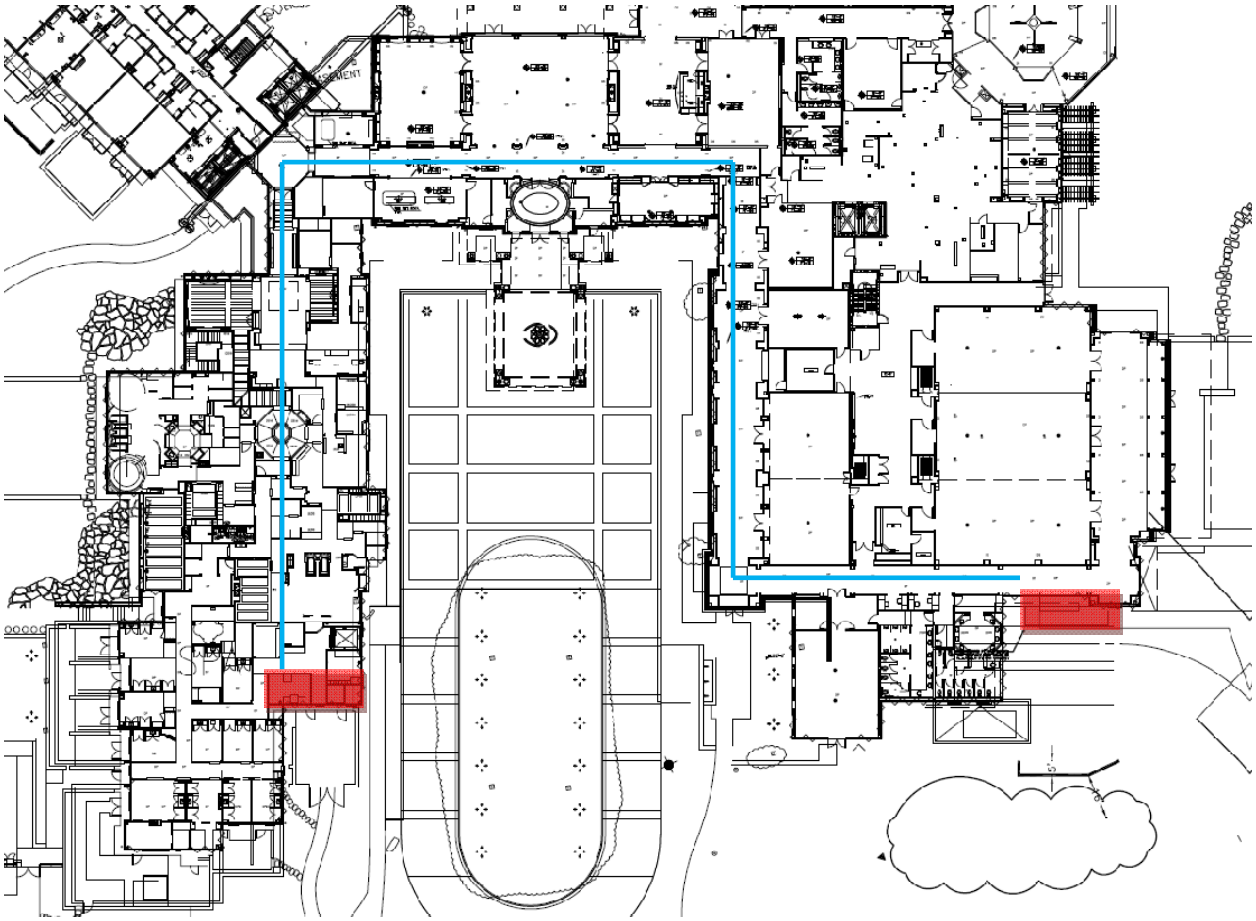
There are four main electrical rooms in the Salamander Resort and Spa: the Main Distribution Frame room, which contains the main switchboard, "MSB" ; Mechanical Room 3B20, containing distribution panels "DN4B3" and "DN4B3A" ; Electrical/Telecommunications Room 4G53, containing distribution panel "DN4G4A" ; and Electrical/Telecommunications Room 4G56, containing distribution panel "DN4G4B." Figure 72 shows the location of these rooms. Using the existing feeder design plus four other busduct designs, the five scenarios and their respective costs were compared to find the most economical solution. The five scenarios are described in detail below.

Figure 72: Locations of main electrical equipment.



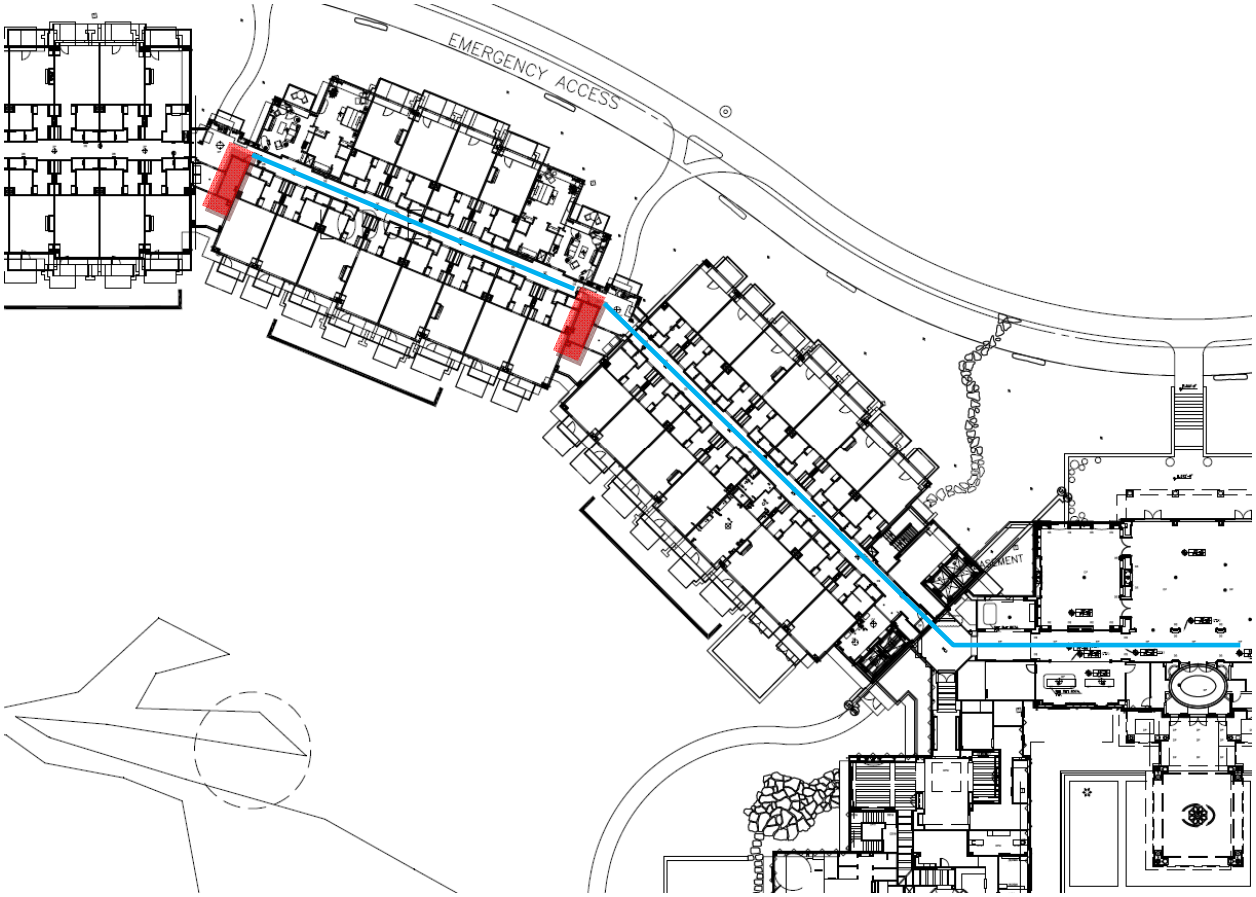
1. Main Distribution Frame Room 2B03 – Main Switchboard “MSB”
2. Mechanical Room 3B20 – Distribution Panels “DN4B3” and “DN4B3A”
3. Electrical/Telecommunications Room 4G53 – Distribution Panel “DN4G4A”
4. Electrical/Telecommunications Room 4G56– Distribution Panel “DN4G4B”

Figure 73: Distance from MSB to DN4B3/DN4B3A = 610 ft.



An appropriate path was determined for the runs of busduct. Distances, as well as the number of turns for elbow fittings, are cost-determining factors. From MSB to DN4B3 and DN4B3A, there is a distance of 610 feet with three elbow fittings and a end box to tap off and distribute power from the busduct down to the panels.

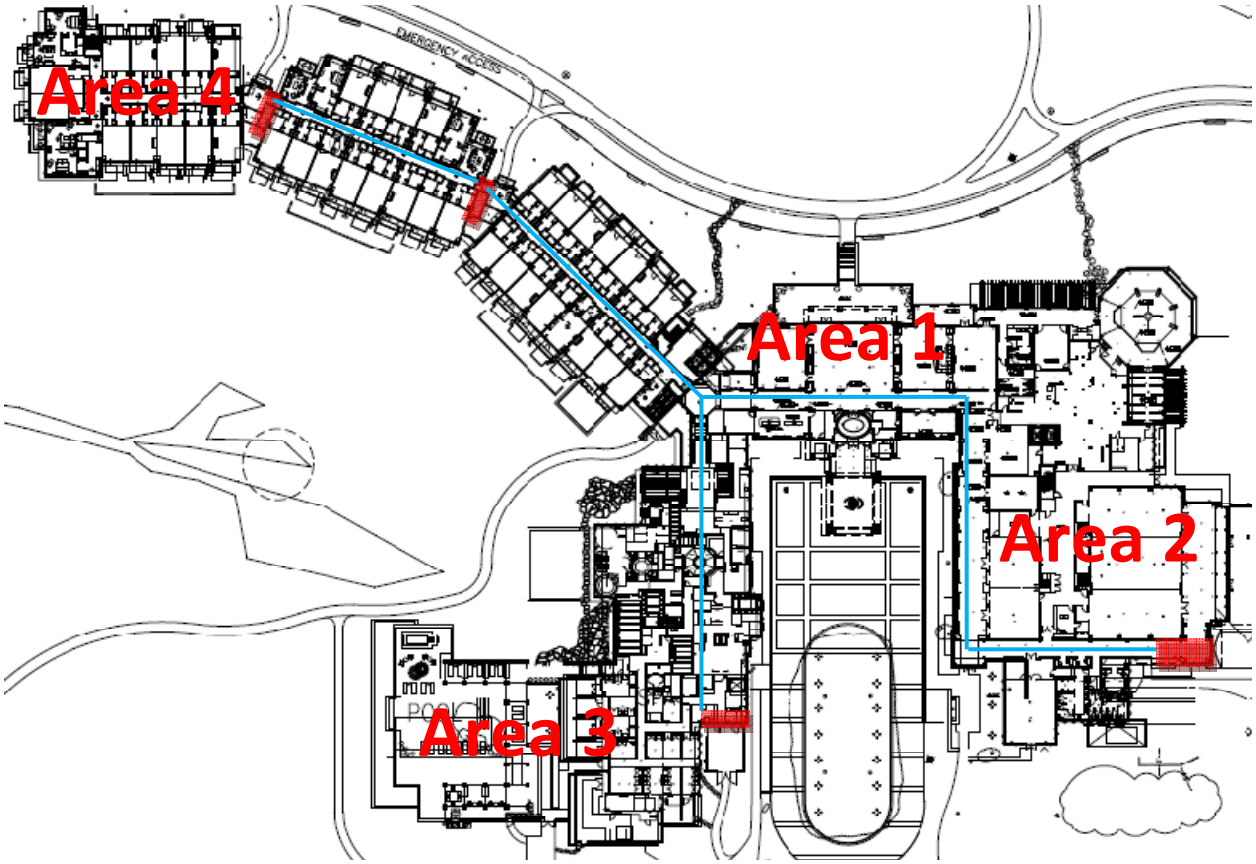
Figure 74: Distance from MSB to DN4G4A = 600 ft.; Distance from MSB to DN4G4B = 741 ft. ; Distance from DN4G4A to DN4G4A = 141 ft.



Power is distributed to these electrical rooms in Area 4 of the building, which is the Lodge wing of the building. The ground level electrical rooms contain the distribution panels, which then distribute power vertically to branch circuit panels in floors 1-4.

Analysis Scenarios

- **Scenario #1:** Existing scenario – Feeders from MSB to DN4B3/DN4B3A/DN4G4A/DN4G4B
- **Scenario #2:** Separate bus duct – (1) Busduct from Main Distribution Frame to Mech. Rm. 3B20; (1) Busduct from Main Dist. Frame to 4G53; (1) Busduct from ELEC/TELE Rm. 4G53 to ELEC/TELE Rm.4G56
- **Scenario #3:** (1) Large busduct + tap-offs to panels – (1) Busduct from Main Dist. Frame to corridor between Area 3 and Area 4; Tap-off to DN4B3/DN4B3A; Tap-off to DN4G4A/DN4G4B
- **Scenario #4:** Scenario #2 with Aluminum Busduct
- **Scenario #5:** Scenario #3 with Aluminum Busduct



Results

Scenario # 1: Feeders to Distribution Panels

- [Cost of Phase wires + cost of neutral wires + cost of ground wires] * [total distance/100] + [Cost of conduit * distance]

FEEDER COST DATA													
FEEDER NUMBER	FROM	TO	# OF SETS	WIRE SIZE - PHASE	WIRE SIZE - NEUTRAL	WIRE SIZE - GROUND	CONDUIT SIZE	DISTANCE (ft.)	PHASE COST/100FT	NEUTRAL COST/100FT	GROUND COST/100FT	CONDUIT COST/LF.	TOTAL COST
12	MSB	DN4B3	1	(3) 600KCMIL	(1) 600 KCMIL	(1) 3AWG	4"	670	5550	1850	260	34.5	$74,437.00
22	MSB	DN4B3A	1	(3) 600KCMIL	(1) 600 KCMIL	(1) 3AWG	4"	670	5550	1850	260	34.5	$74,437.00
14	MSB	DN4G4B	3	(3) 500KCMIL	(1) 500 KCMIL	(1) 2/0AWG	3-1/2"	741	4950	1650	555	31.5	$229,080.15
15	MSB	DN4G4A	2	(3) 600KCMIL	(1) 600 KCMIL	(1) 1/0AWG	4"	600	5550	1850	455	34.5	$135,660.00

TOTAL** $513,614.15

Scenario # 2: Individual Busduct to Distribution Panels

- [Cost of transition elbows/tees/etc. + Cost of End Box/Cable Tap Box] + [Cost of Feeder within busduct/ft. * Distance]

BUS DUCT COST DATA - Scenario 2							
FROM	TO	SIZE	DISTANCE	TRANSITION COST	END BOX/CABLE TAP BOX	FEEDER Cost/LF.	TOTAL COST
MSB	DN4G4A	1200A	600	6225	2450	380	$236,675.00
DN4G4A	DN4G4B	600A	141	0	1725	219	$32,604.00
MSB	DN4B3/DN4B3A	800A	610	5100	1931	268	$170,511.00

TOTAL** $439,790.00

Scenario # 3: Large Busduct Tapping-Off to Distribution Panels

- [Cost of transition elbows/tees/etc. + Cost of End Box/Cable Tap Box] + [Cost of Feeder within busduct/ft. * Distance]

BUS DUCT COST DATA - Scenario 3							
FROM	TO	SIZE	DISTANCE	TRANSITION COST	END BOX/CABLE TAP BOX	FEEDER Cost/LF.	TOTAL COST
MSB	CORRIDOR BETWEEN AREA 3 & 4	2000A	426	5850	3425	620	$273,395.00
TAP OFF TO	DN4G4A	1200A	175	0	2450	380	$68,950.00
DN4G4A	DN4G4B	600A	141	0	1725	219	$32,604.00
TAP OFF TO	DN4B3/DN4B3A	800A	182	0	1925	219	$41,783.00

TOTAL** $416,732.00

Scenario # 4: Scenario #2 with Aluminum Busduct

BUS DUCT COST DATA - Scenario 2 (Aluminum)							
FROM	TO	SIZE	DISTANCE	TRANSITION COST	END BOX/CABLE TAP BOX	FEEDER Cost/LF.	TOTAL COST
MSB	DN4G4A	1200A	600	6225	2525	270	$170,750.00
DN4G4A	DN4G4B	600A	141	0	1825	201	$30,166.00
MSB	DN4B3/DN4B3A	800A	610	4200	2025	237	$150,795.00

TOTAL** $351,711.00

Scenario # 5: Scenario #3 with Aluminum Busduct

BUS DUCT COST DATA - Scenario 3 (Aluminum)							
FROM	TO	SIZE	DISTANCE	TRANSITION COST	END BOX/CABLE TAP BOX	FEEDER Cost/LF.	TOTAL COST
MSB	CORRIDOR BETWEEN AREA 3 & 4	2000A	426	5750	3700	535	$237,360.00
TAP OFF TO	DN4G4A	1200A	175	0	2525	270	$49,775.00
DN4G4A	DN4G4B	600A	141	0	1825	201	$30,166.00
TAP OFF TO	DN4B3/DN4B3A	800A	182	0	2025	237	$45,159.00
TOTAL**	$362,460.00						

**NOTE: Cost figures taken from RS Means Electrical Cost Data (2009)

Comparison:

Scenario	Total Cost
#1: MSB to Distribution Panels via Feeders	**$513, 614.15**
#2: Individual Busduct to Distribution Panels	**$439.790.00**
#3: Large Busduct with Tap-offs to Panels	**$416,732.00**
#4: Scenario #2 with Aluminum Busduct	**$351,711.00**
#5: Scenario #3 with Aluminum Busduct	**$362,460.00**

Conclusion:

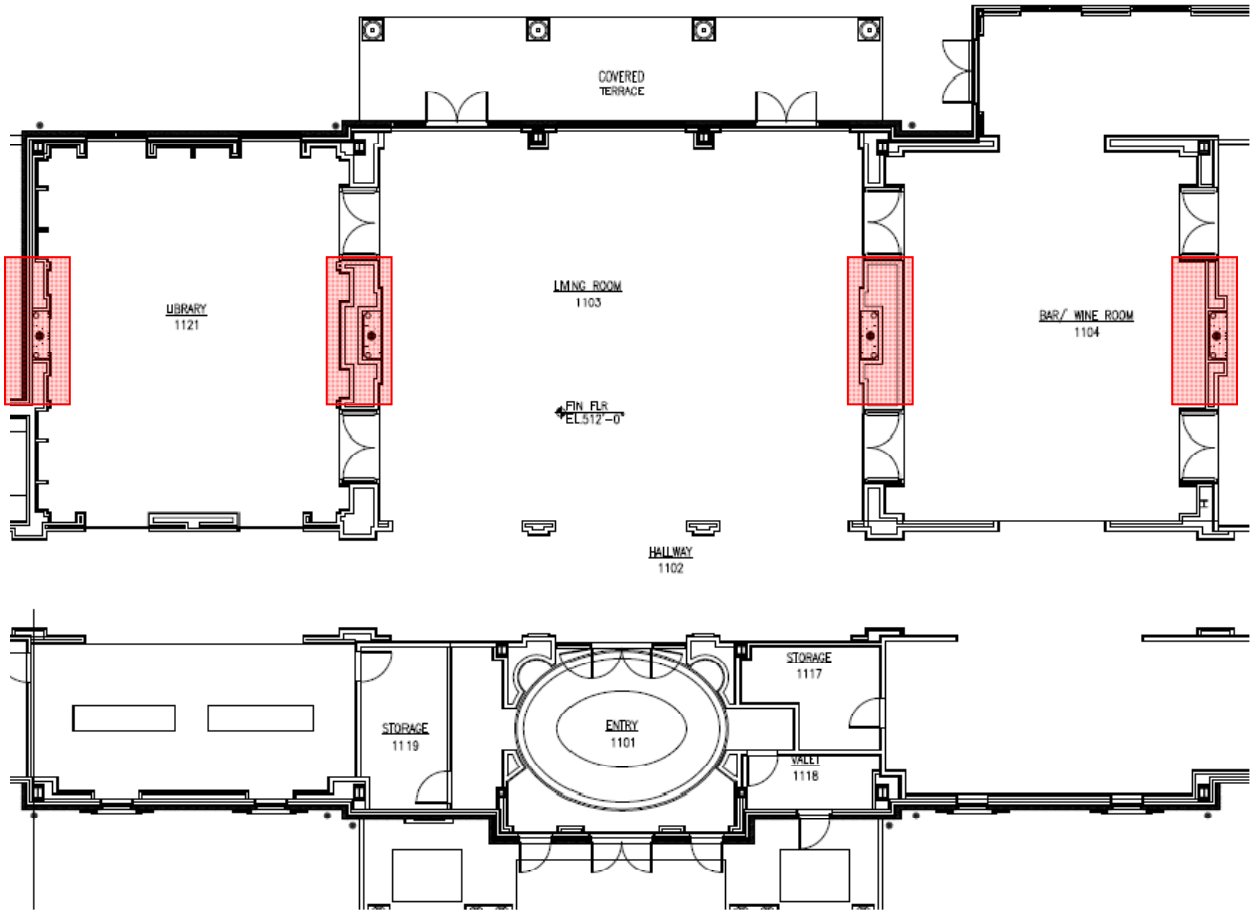
From the results of this analysis, the recommended scenario would be to distribute power from the main electrical room to distribution panels using smaller individual runs of aluminum busduct. This design would save **$161,903.15**.

Architectural Breadth Topic: Fireplace Design

During a personal tour of the construction site of the Salamander Resort and Spa in August 2009, the mechanical contractor spoke of problems with the constructability of the fireplaces. Mechanical engineers designed exhaust ductwork to fit within the fireplace chimneys; however, this space was tight to begin with, causing problems early on in construction. A considerable amount of money went into change orders to prefabricate the fireplace ductwork systems before installation.

As an architectural breadth topic, the design goal will be to increase the shaft size within the fireplace and chimney to make mechanical ductwork construction feasible. Also, aesthetics and sustainable design will play a part in this change. Being that the fireplace on the eastern wall of the Living Room shares a wall with the Wine Bar, opening the fireplace to both rooms could create two completely different and unique features for guests. The Living Room fireplace design will be ornate and clean in appearance, while the Wine Bar side of the fireplace will have a rougher look with reclaimed stone and ruble from a local stone manufacturer attached as a veneer. The Wine Bar has rustic features like a reclaimed wood barn door as the bar surface; therefore, this aesthetic will mold in the room nicely and add a feature to the interior environment.

Figure 74a: Locations of fireplaces highlighted in red.



In Figure 74b, the plan view of the fireplace redesign is shown. By opening up the fireplace on the Wine Bar side, the chimney shaft area was nearly doubled, which will clearly improve constructability and prevent costly change orders for prefabrication. Figures 74c and 74d show the elevation view of the Wine Bar-side fireplace design.

Figure 74b: Fireplace redesign plan.

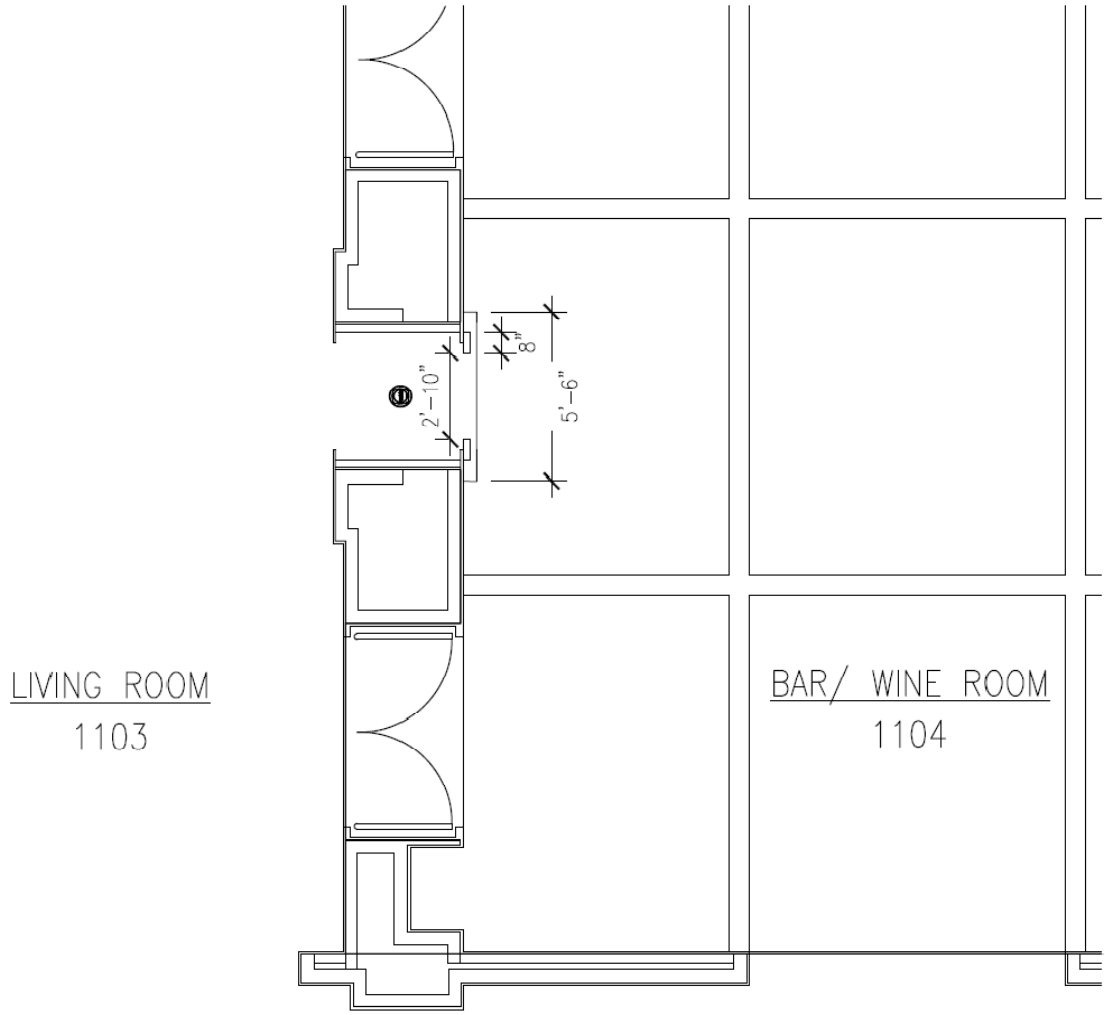


Figure 74c: Fireplace redesign elevation.

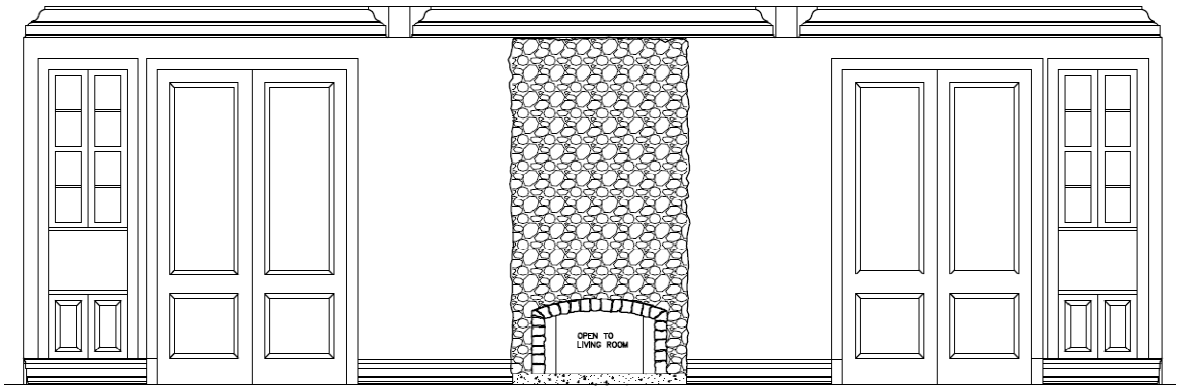
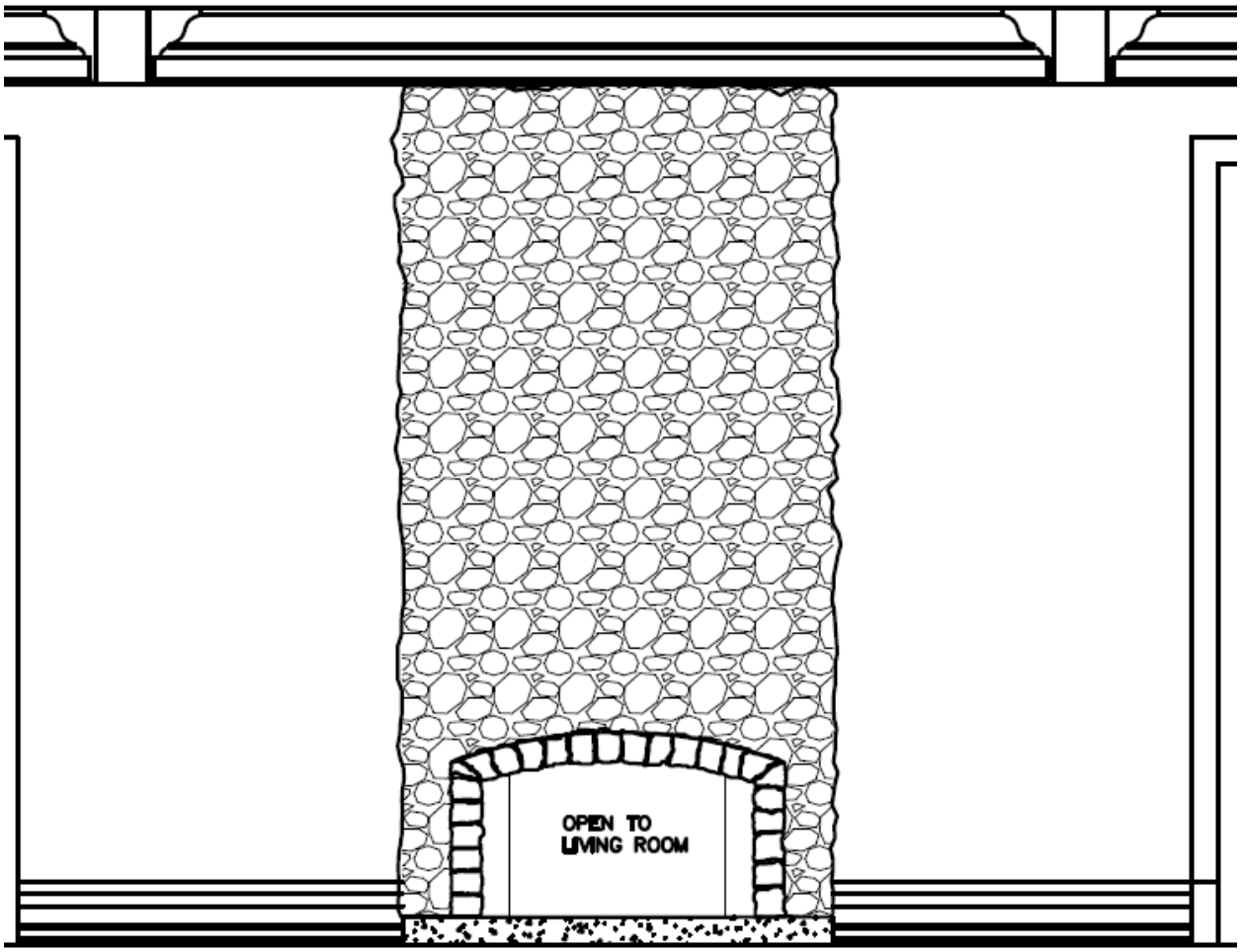


Figure 74d: Fireplace redesign elevation.



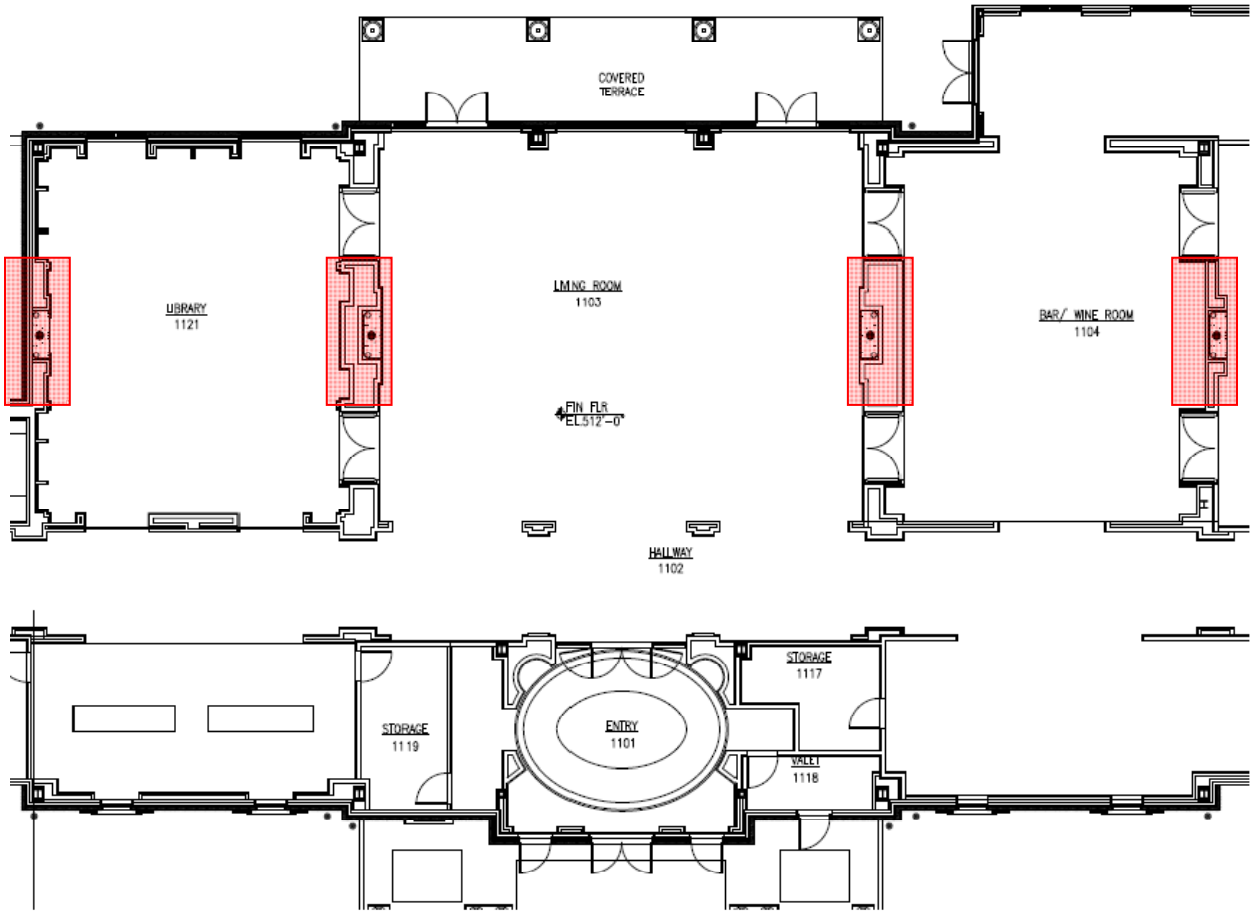
Adding to the sustainability goal of the Salamander Resort and Spa design team, this fireplace and rock wall feature will be a mixture of reclaimed stone and brick. Materials will be from local Virginia fireplace manufacturer Fireplace Solutions and are shown below in Figure 74e.

Figure 74e: Fireplace Solutions - materials.

Mechanical Breadth Topic: Fireplace Exhaust Heat Recovery

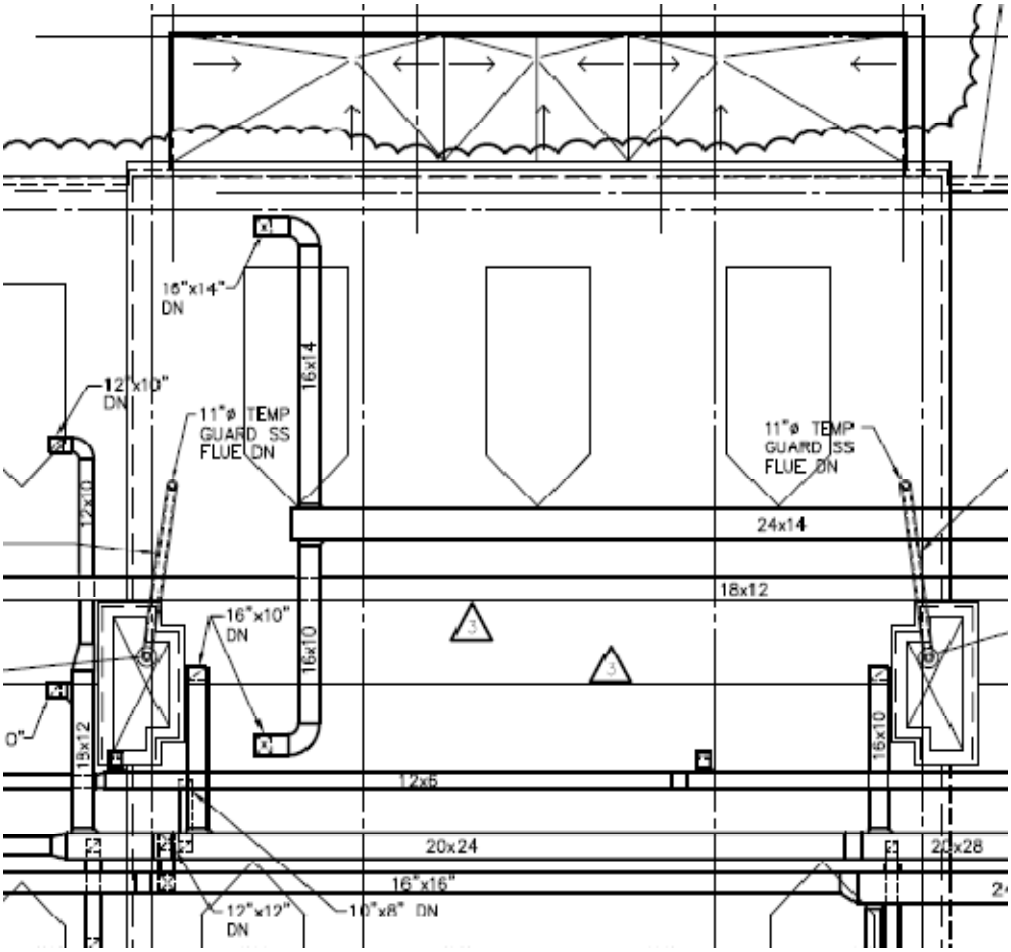
In the "Front of House" space of the Salamander Resort and Spa, which includes the Living Room, Wine Bar, Library, and Billiards rooms, fireplaces are an architectural feature of the interior design. Shown in Figure 75, the areas highlighted by red represent those fireplaces. This breadth study contains the mechanical engineering strategies to develop a heat recovery system that would provide full demand load temperature difference to the preheat coil in air handling unit AHU-2. Using AHU-2 demand data within the mechanical equipment schedules, the heat recovery loop was sized to meet MBH demand when all fireplaces are running. This will offset heat needed from the boiler and therefore save energy and cost in the long-run.

Figure 75: Locations of fireplaces highlighted in red.



The existing mechanical engineering design with the fireplaces (Figure 76) is to exhaust the fireplaces horizontally to the back façade of the building using an 11” flue. The heat recovery will consist of a loop that harnesses fireplace exhaust heat and directs that higher temperature to the preheat coil of AHU-2. The method of this design consisted of determining target demand in MBH, calculating pressure drop for the loop; determining the appropriate flow rate in gallons per minute, sizing the recirculation pump for the loop, and calculating energy/cost savings based on an assumed usage schedule. The heat recovery schematic is shown in Figure ___.

Figure 76: Existing mechanical design. 11” diameter flue to outside.



Assumptions:

- Air handling unit Entering Water Temperature (EWT): 140 °F
- Air handling unit Leaving Water Temperature (LWT): 180 °F
- Total MBH demand to recover = 480 MBH
- 70% efficient heat recovery

Pressure Drop Calculation:

Pipe Length
270 ft. * 4ft./100ft. = **10.8 ft.**

Fittings - "Equivalent Length" Method (Figure 10-22a-b, Table 10-2, *Advanced HVAC)*
(4) 90° elbows: K = 30ft; friction factor = 0.018
30*0.018 = 0.54 ft. ➔ Equivalent length = 8ft. * 4 fittings = **32ft.**

Coils
(5) * 5psi * 1/0.443 = **11.5 ft.**

Total Head = 54.3 ft.

Determining GPM to achieve 480 MBH of recovery

	Fireplace Coil Heat Recovery			
	GPM	EWT °F	LWT °F	MBH Recovered
FPC-1	6	140	180	120
FPC-2	6	140	180	120
FPC-3	6	140	180	120
FPC-4	6	140	180	120
	24			**480**

Equations Used

MBH= 500 x GPM x ΔT

Sizing Recirculation Pump

Figure 77: Pump Sizing graph.

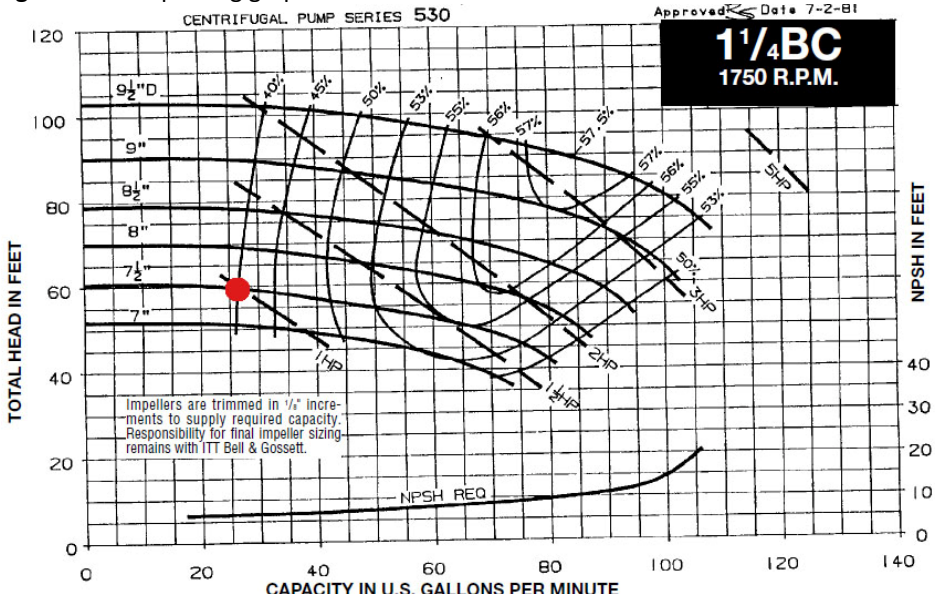
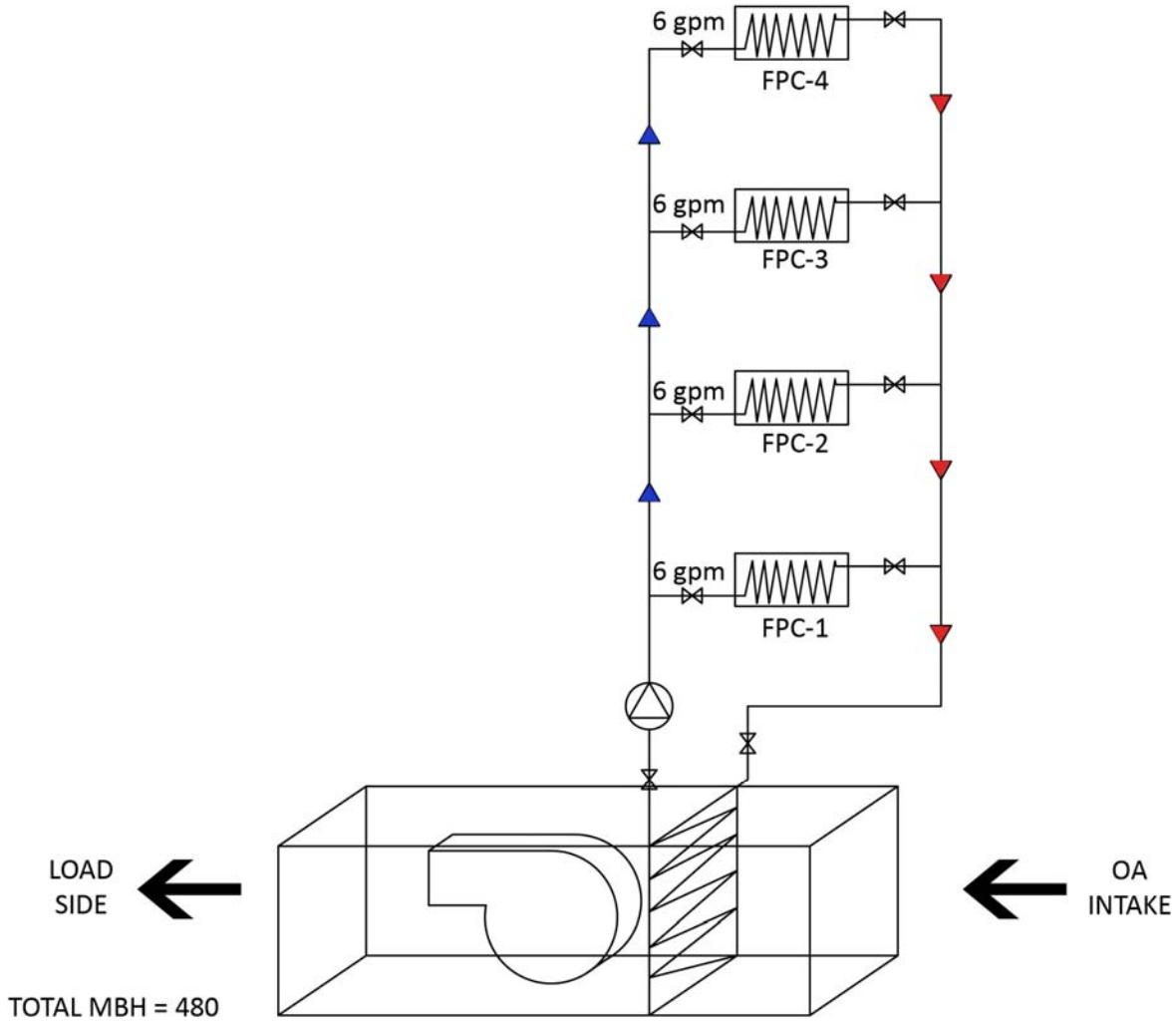


Table 14: Heat recovery pump schedule.

Heat Recovery Pumps													
Unit	Manufact.	Frame Size	Service	Type	GPM	Total Head (f.t. H_20)	VFD	Emer. Power	Min Casing Size Disc x Inlet x Impel.	Motor Data at 60 Hz			
										HP	RPM	Volts	Phase
HRP-1	Bell & Goss.	143T	AHU-2	End Suction	25	55	Y	Y	1.5"x2"x7.5"	3	1750	480	3

Figure 78: Fireplace heat recovery loop schematic. **FPC =** Fireplace Coil



Concluding Remarks

In conclusion, great efforts have been made with architectural and interior design to create a luxurious experience for guests at the Salamander Resort and Spa that also conveys the Middleburg, old-country equestrian/wine country feel. Luxurious finishes, millwork, paints and furniture fill the rooms and the opportunities for relaxation and enjoyment are abundant. It goes without saying that the lighting design is absolutely necessary to enhance this architecture and make spaces come to life at night. The Entry Courtyard lighting design is multi-dimensional with landscape lighting, wall grazing, glow from within the building, and perimeter decorative lanterns. Together this outdoor entry area turns into a space to both enjoy and facilitate entry to the building. The Living Room design is welcoming and sets the tone of warm color temperatures and the feeling of relaxation throughout the resort. The Wine Bar is a special room with its own identity. It has a wine cellar feel with wood finishes, exposed brick flooring, and a reclaimed barn door as the bar surface itself. The decorative luminaires have a unique, rustic and antique look that add to the interior design while providing sparkle and dim light. The unique back bar wine racks are made a focal point to the room, with a mixture of grazing, accenting, and backlighting techniques to emphasize the wine. Finally, the Grand Ballroom will bring a multitude of people and events to the Salamander Resort and Spa. The lighting design is aesthetically pleasing with decorative chandeliers and wall sconces, cove lighting of the 20'-0" high ceiling and a specialty low-profile perimeter slot light feature recessed in the millwork for events allowing dynamic and color-changing lighting. The flexibility of lighting within the ballroom will allow for large open conventions, dances, wedding receptions, dinners, film-watching, etc.

The Salamander Resort and Spa design team is striving to make this resort one of the only LEED certified buildings of its kind. Therefore, energy-efficient design is necessary. All four spaces involved in this body of work were below or considerably below lighting power density allowances set forth by ASHRAE 90.1. By using compact fluorescent lamps and LED lamps/luminaires, the wattage demand was decreased while holding warm color temperature and dimming capabilities constant. Illuminance criteria were also satisfied for all spaces, allowing tasks like reading a menu while sitting at the wine bar. Using daylight and solar study software, it was determined that the Living Room receives enough diffuse daylight throughout the year to light the space on its own. Based on occupancy schedules and the electric lighting system, a photosensor dimming control system was calibrated to save about 1200 kWh per year in this room.

Electrical design was also improved in this work. Branch circuit lighting loads fed by Lutron GP dimming panels were consolidated to reduce panel sizes and the number of branch circuits required. Also, a cost comparative analysis of long-run feeders and electrical bus duct revealed that use of bus duct for long runs from the main switchboard to distribution panels can save up to $160,000.

Finally, breadth studies were completed to analyze alternate design techniques to disciplines in the construction industry outside of lighting and electrical design. An architectural breadth was completed, showing the effects of opening the back side of the Living Room fireplace and making a feature within the Wine Bar, and a heat recovery loop and pump system was sized to recover fireplace exhaust heat for air handler preheating in the winter.

References

Software Tools:

AGI32
Autodesk 3D Studio Max 2010
AutoCAD 2010
Autodesk Ecotect
Penn State Daysim version 2_22
Adobe Photoshop
Siemens Electrical Design Tools

Handbooks/Text:

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

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