



1.0 INTRODUCTION TO LIGHTING DEPTH

Dover Downs is primarily used for entertainment for the wealthy. When people go somewhere to spend money expectations are higher than usual. The lighting design for Dover Downs must work with the existing architecture to provide a warm rich atmosphere. Guests should be overcome with a feeling of opulence and elegance when they first arrive at the front entrance of Dover Downs, when they walk through the main lobby, when they relax at the bar and lounge, and when they enter the performance hall. The lighting should be captivating, comfortable, and intriguing.

1.1 HOTEL TOWER FACAGE AND PORTE COCHERE

The front façade acts as a beacon for Dover Downs to the surrounding city of Dover, DE. On the top of the hotel tower is a roof gazebo. Underneath the front gazebo there is a large sign that exclaims the name of the hotel; Dover Downs. Extending out towards the parking lot is the porte cochere, which covers the valet parking lane and the main entrance into the lobby as well as an entrance into the casino and into the performance hall pre-function area. There are three skylight openings in the roof in front of the lobby vestibule to allow for some daylight. Out front of the porte cochere is a fountain in front of three arches, which together with the decorative stone banister on top of the porte cochere and the dome from the roof of the lobby, mimics the hotel roof gazebos very nicely. Underneath the porte cochere several large columns line the valet parking driveway. Since the hotel tower sits back from the roof line of the front of the building there is plenty of room on the second story roof to provide convenient locations for up-lighting of the hotel tower.

1.1.1 DESIGN CONCEPT

The front façade and the porte cochere of Dover Downs will be responsible for providing the first impression of the hotel and conference center to all of its many guests. During the daylight hours the sun will obviously do its part to illuminate the entire building. However, when night falls, the electric light will take over and aim to provide a look of opulence by accenting the façade with dramatic lighting and an ample amount of light for safety in completion of all necessary tasks.



1.1.2 DESIGN CRITERIA

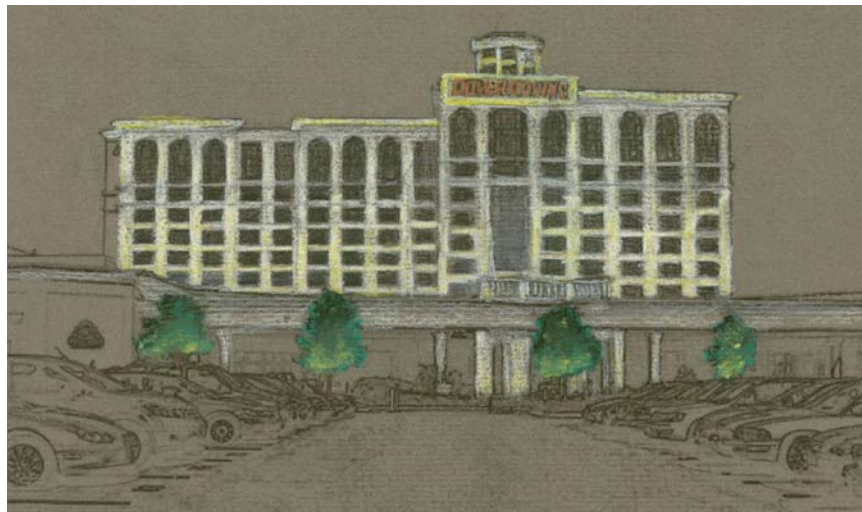
- *Appearance of Space and Luminaires* – The appearance of this exterior space is very important because it gives all patrons their first taste of what is waiting inside. It should draw people towards it and make them want to take their time walking towards the entrance as they admire the beauty before them.
- *Color Appearance* – The lighting used should provide decent color rendering, mainly under the porte cochere, where guests may choose as a meeting spot.
- *Direct and Reflected Glare* – The last thing you want is a customer being blinded by light as they approach the building in which they plan on spending a substantial amount of money. Glare should be avoided as much as possible.
- *Modeling of Faces or Objects* – As for all spaces in the building, the customers should be looking as good as possible.
- *Peripheral Detection* – There should be adequate lighting in all exterior spaces to see in any given direction. There should be no worries or fear on behalf of poor lighting.
- *Points of Interest* – Especially at night, lighting is the key to finding one's way from one place to the next. There are several entrances to Dover Downs along the façade, three of which are under the porte cochere. Every entrance should be well lit, and since most of them lead somewhere specific, the destination should be clearly understandable while approaching the door.
- *Vertical Illuminance* – Should be 3fc or more, depending on the surface in question.
- *Horizontal Illuminance* – This should be 5fc. However, every day and night several senior citizens come and go to and from Dover Downs. Therefore the illuminance should be higher than the prescribed values.



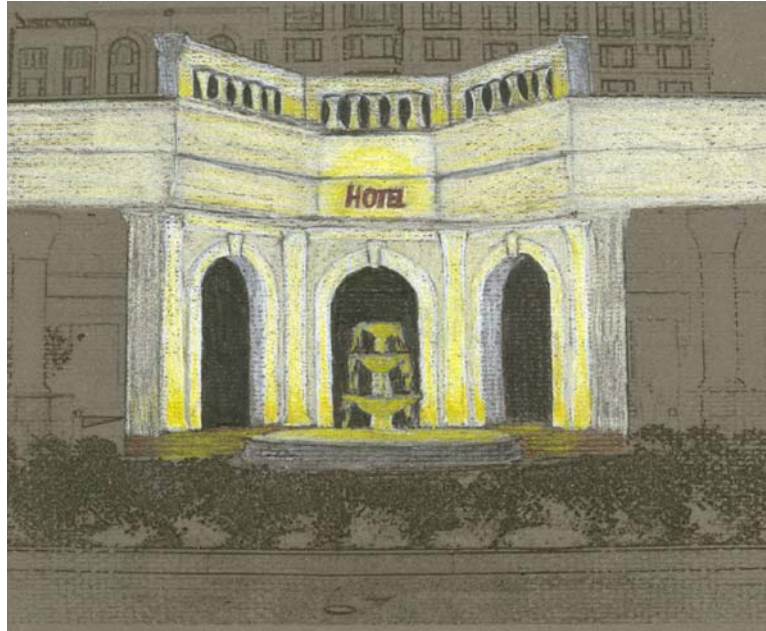
1.1.3 LIGHTING GOALS

- Highlight the main entry and the other entries
- Attract attention and make an excellent first impression
- Reinforce Dover Downs as a beacon to the surrounding area

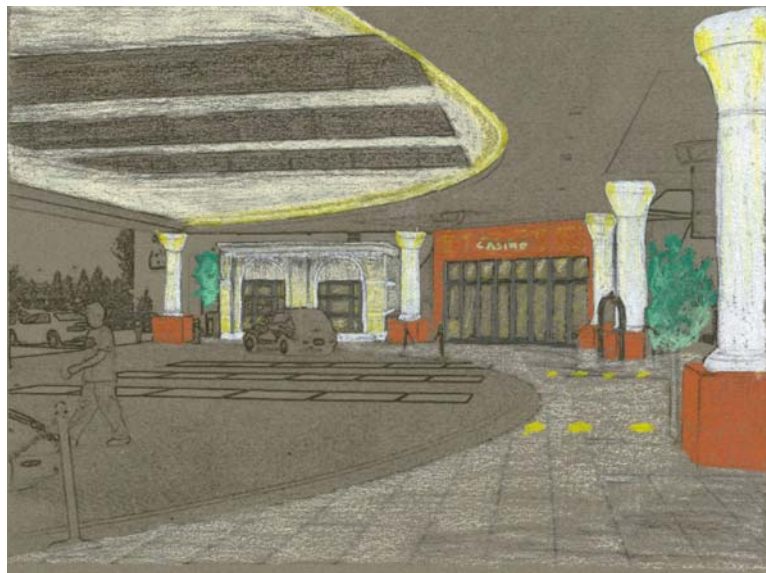
1.1.4 SCHEMATIC DESIGN



- Install lighting in the Dover Downs sign
- Wash hotel tower with floodlights so that the top portion is has a slightly lower illuminance
- Uplight trees in front of the porte cochere



- Recessed fountain lighting to light fountain and to cast a shimmering effect on the arches
- Uplighting on balustrade above fountain



- LED system in cove
- Recessed LED orientation luminaire to highlight main entrance to lobby
- Uplight on valet station



- Increased illuminance from downlights to highlight entries
- Directional downlighting on columns
- Uplighting on bushes

1.1.5 LIGHT LOSS FACTORS (SEE FIG. 1.1.1 FOR SCHEDULE)

Lamp Lumen Depreciation Factor (LLD):

LLD = mean lumens / initial lumens

Luminaire J3, J4: $2600 / 3400 = 0.76$

Luminaire J1, J2, J5: $4100 / 6300 = 0.65$

Luminaire J6: $8100 / 14000 = 0.58$

Luminaire Dirt Depreciation Factor (LDD):

12 month cleaning cycle

Medium Conditions (outside under porte cochere)

Luminaire J1, J2, J3, J4: Maintenance Category IV

LDD = 0.82



Luminaire C: Maintenance Category II

LDD = 0.94

12 month cleaning cycle
Dirty Conditions (no cover)

Luminaire J3, J4: Maintenance Category IV

LDD = 0.74

Luminaire J5, J6: Maintenance Category VI

LDD = 0.74

Ballast Factor (BF):

BF = 1.0

1.1.6 POWER DENSITY

ASHRAE 90.1 standards separate exterior building spaces into several different categories. The scope of this project includes the porte cochere, the hotel tower façade, the Dover Downs sign, and the roof gazebo.

The following categories of the standard will cover all the above mentioned exterior spaces.

1. Building Facades: 0.2W/ft² or 5W/ linear foot of wall
 2. Canopies and Overhangs: 1.25W/ft²
- Signage is exempt.

Porte Cochere (2):

Total S.F. = 14,500 ft²

Downlights:

- 78 @ 77W = 6,006W

Uplights:

- 23 @ 45W = 1,035W

Wall Surface Downlights:

- 12 @ 45W = 540W

LEDs in cove:

- 178 @ 6W = 1,068W

Total Wattage at full power = 8,805W



Power Density of Porte Cochere = $8,805\text{W} / 14,500\text{ ft}^2 = 0.61\text{ W/ ft}^2$
This is well under the ASHRAE 90.1 standard.

Hotel Tower Façade (1):
Total S.F. = 21,840 ft²

Floodlighting:

- 15 @ 160W = 2,400 W
- 27 @ 77W = 2,079W

Total Wattage at full power = 4,479W

Power Density of Façade = $4,479\text{W} / 21,840\text{ ft}^2 = 0.2\text{ W/ ft}^2$
This is exactly what ASHRAE 90.1 has listed as their standard.

1.1.7 PANELBOARD DATA

Panelboards will be slightly rearranged to account for the new lighting system. Below are the corresponding calculations.

Luminaires J1, J2, J5: 120 V, P.F. = 1.0, 77W → 0.642 amps each

Luminaires J3, J4, J7: 120 V, P.F. = 1.0, 45W → 0.375 amps each

Luminaire J6: 120 V, P.F. = 1.0, 160W → 1.33 amps each

Luminaires C: 7 power supplies @ 2.8amps each

<u>Panelboard and circuit number</u>	<u>Load</u>	<u>Voltage</u>
SLP - #1 (porte cochere)	12.742 A	120 V
SLP - #2 (porte cochere)	12.039 A	120 V
SLP - #3 (porte cochere and tree lights)	14.78 A	120 V
SLP - #4 (porte cochere)	11.56 A	120 V
SLP - #5 (porte cochere cove)	11.2 A	120 V



<u>Panelboard and circuit number</u>	<u>Load</u>	<u>Voltage</u>
SLP - #6 (porte cochere)	12.2 A	120 V
SLP - #7 (porte cochere cove)	8.4 A	120 V
SLP - #25 (roof gazebo)	6.0 A	120 V
SLP - #19 (hotel tower façade)	11.56 A	120 V
SLP - #21 (hotel tower façade)	12.43 A	120 V
SLP - #23 (hotel tower façade)	13.3 A	120 V
SLP - #29 (fountain)	4.13 A	120 V
SLP - #31 (ballustrade)	3.38 A	120 V

Wire and Circuit Breaker Type:

- 20 A single pole breaker for each circuit
- #14 THHN, copper conductor rated at 90 degree Celcius

1.1.8 CONTROLS

All exterior luminaries are controlled by a photocell located on the second story roof of Dover Downs, above the main lobby and a timer that is located in the interior valet station that is adjacent to the lobby. The photocell is positioned to see the northern sky. There are two different switching zones. The first zone includes all of the porte cochere lighting, the fountain and balustrade lighting, and the tree lighting in front of the porte cochere. These controls comply with ASHRAE 90.1 which requires automatic shut-off for exterior spaces.



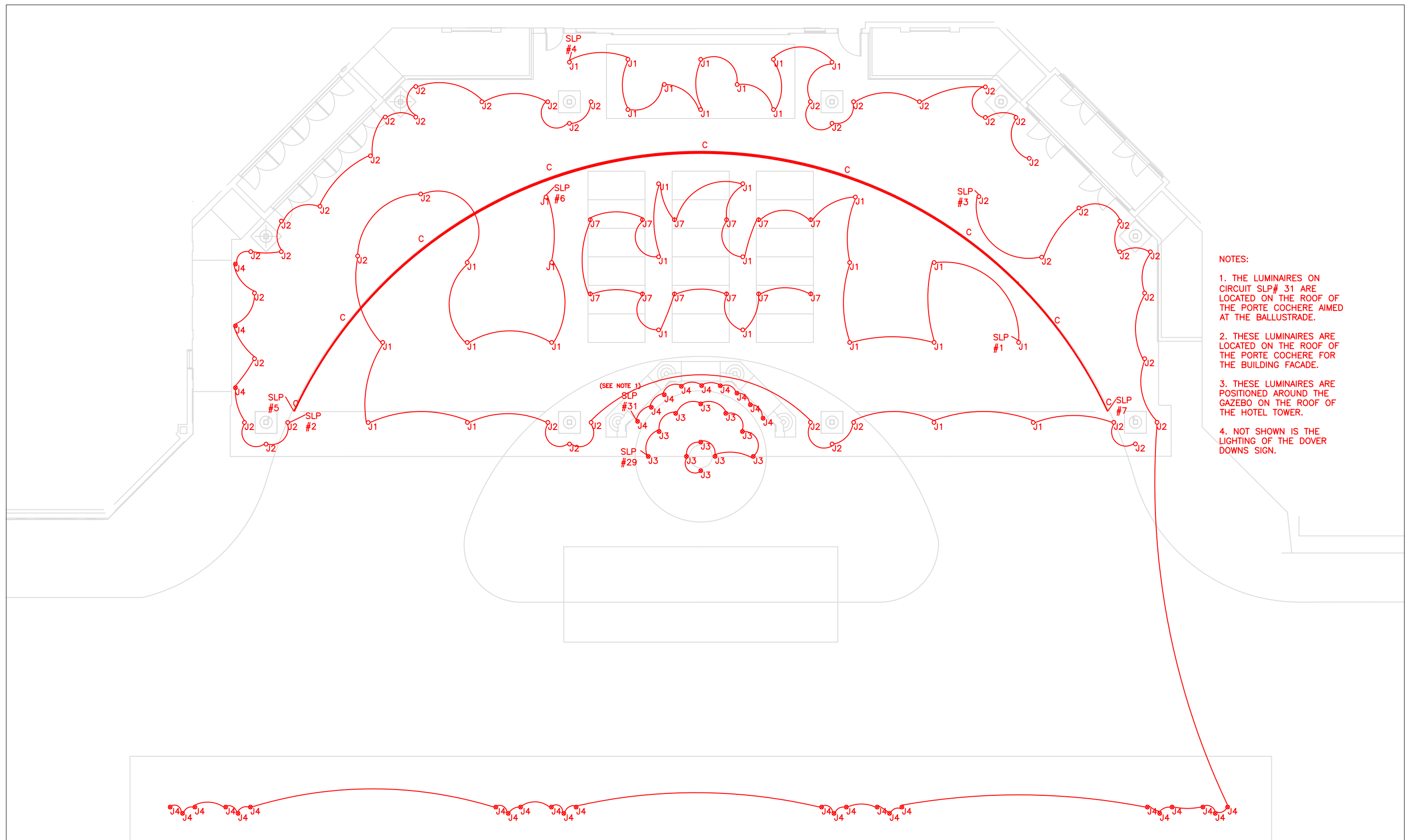
Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manufa - cturer	Initial Lumens	Mean Lumens	CCT (K)	CRI	Symbol
J1	120 V	70W T6 CERAMIC METAL HALIDE	DOWNLIGHT, NOM. 7 15/16" DIA., MAXIMUM 8 11/16" DEEP HOUSING	ELEC - TRONIC	77	ERCO	6300	4100	3000	80	
J2	120 V	70W T6 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 7 15/16" DIA., MAXIMUM 8 11/16" DEEP HOUSING	ELEC - TRONIC	77	ERCO	6300	4100	3000	80	
J3	120 V	39W T4 CERAMIC METAL HALIDE	UPLIGHT, NOM. 9 3/4" DIA., MAXIMUM 14 3/8" DEEP HOUSING, WIDE BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
J4	120 V	39W T4 CERAMIC METAL HALIDE	UPLIGHT, NOM. 9 3/4" DIA., MAXIMUM 14 3/8" DEEP HOUSING, NARROW BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
J5	120 V	70W T6 CERAMIC METAL HALIDE	FLOODLIGHT, 12 5/8" HEIGHT x 8 1/8" BASE x 9 5/8" WIDTH, TILTABLE 0 - 90deg, ROTATEABLE 240deg	ELEC - TRONIC	77	ERCO	6300	4100	3000	80	
J6	120 V	150W T6 CERAMIC METAL HALIDE	FLOODLIGHT, 17 1/4" HEIGHT x 9 1/2" BASE x 9 15/16" WIDTH, TILTABLE 0 - 90deg, ROTATEABLE 240deg	ELEC - TRONIC	160	ERCO	14000	8100	3000	75	

FIGURE 1.1.1 EXTERIOR LUMINAIRE SCHEDULE



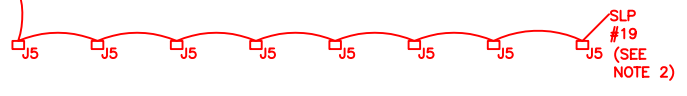
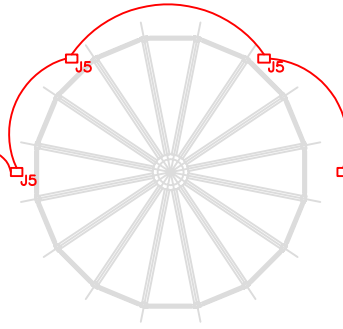
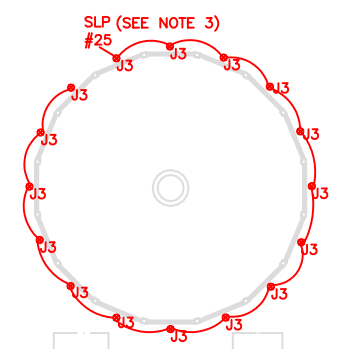
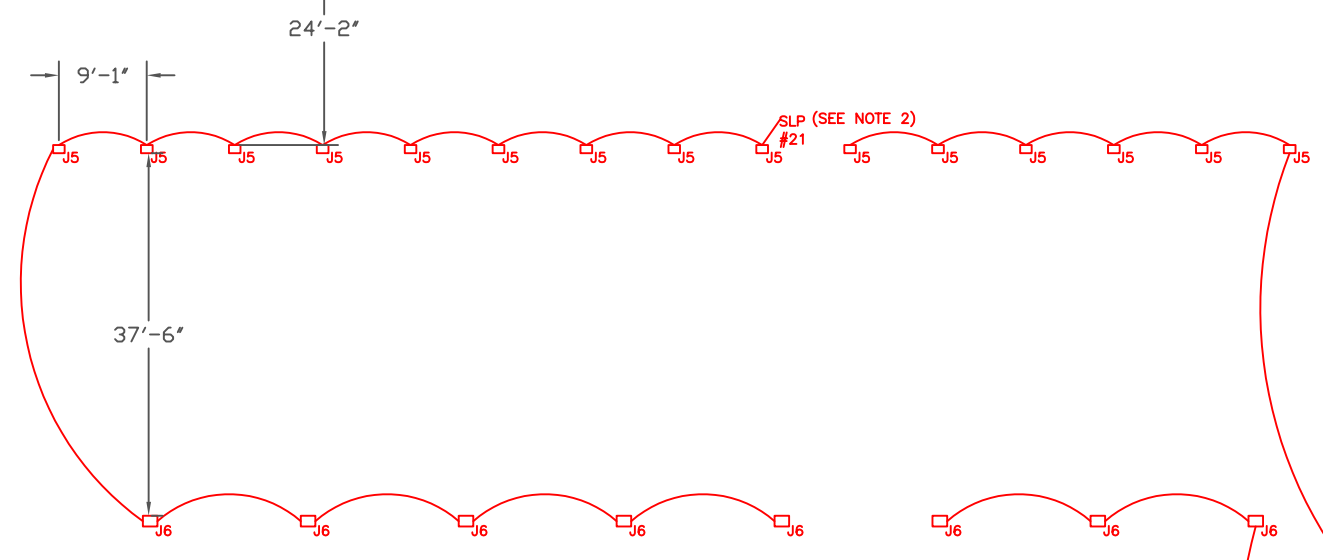
Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manufacturer	Initial Lumens	Mean Lumens	CCT (K)	CRI	Symbol
J7	120 V	39W T6 CERAMIC METAL HALIDE	WALL SURFACE MOUNTED DOWNLIGHT, NOM. 7 1/8" DIA., 11 1/16" DEEP HOUSING	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
C	24 Vdc	LIGHT EMITTING DIODES, 6W MAX	18 HIGH INTENSITY POWER LEDs (6 RED, 6 GREEN, 6 BLUE), 22deg BEAM ANGLE, 150W INTELLIGENT POWER/DATA SUPPLY	NA	6	COLOR KINETICS	NA		1,000 - 10,000	NA	

FIGURE 1.1.1 EXTERIOR LUMINAIRE SCHEDULE (CONTINUED)



- NOTES:
1. THE LUMINAIRES ON CIRCUIT SLP# 31 ARE LOCATED ON THE ROOF OF THE PORTE COCHERE AIMED AT THE BALLUSTRADE.
 2. THESE LUMINAIRES ARE LOCATED ON THE ROOF OF THE PORTE COCHERE FOR THE BUILDING FACADE.
 3. THESE LUMINAIRES ARE POSITIONED AROUND THE GAZEBO ON THE ROOF OF THE HOTEL TOWER.
 4. NOT SHOWN IS THE LIGHTING OF THE DOVER DOWNS SIGN.

DRAWING 1.1.1 PORTE COCHERE LIGHTING PLAN SCALE: $\frac{1}{16}'' = 1'-0''$



**DRAWING 1.1.2
FACADE AND
ROOF GAZEBO
LIGHTING PLAN**

NTS



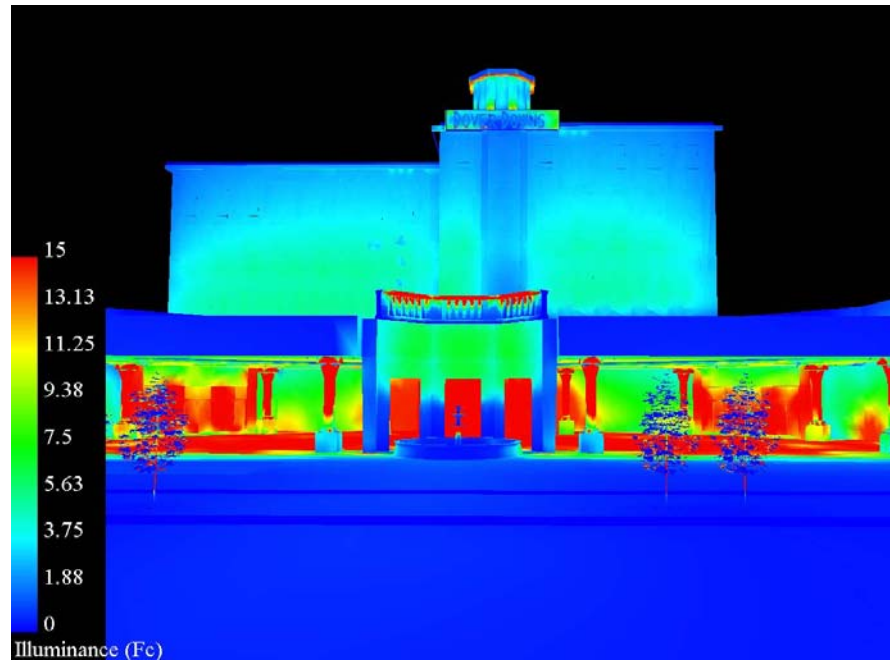
1.1.9 RENDERINGS



RENDERING 1.1.1 AND 1.1.2: DOVER DOWNS AT NIGHT



RENDERING 1.1.2



PSUEDO COLOR 1.1.1

Renderings 1.1.1 and 1.1.2 show the Dover Downs porte cochere and the hotel tower front facade, the full scope of the design. Metal halide floods provide an even distribution of about 5 footcandles (fc) illuminance on the facade. (*See Psuedo Color 1.1.1*) The top of the hotel tower is lit to only $2fc$ to make the Dover Downs sign and the roof gazebo stand out as a beacon to the surrounding area. Light Emitting Diode (LED) luminaires are arranged around the perimeter of the sign to light it at night. Above that the roof gazebo is accented by uplighting mounted on the roof.

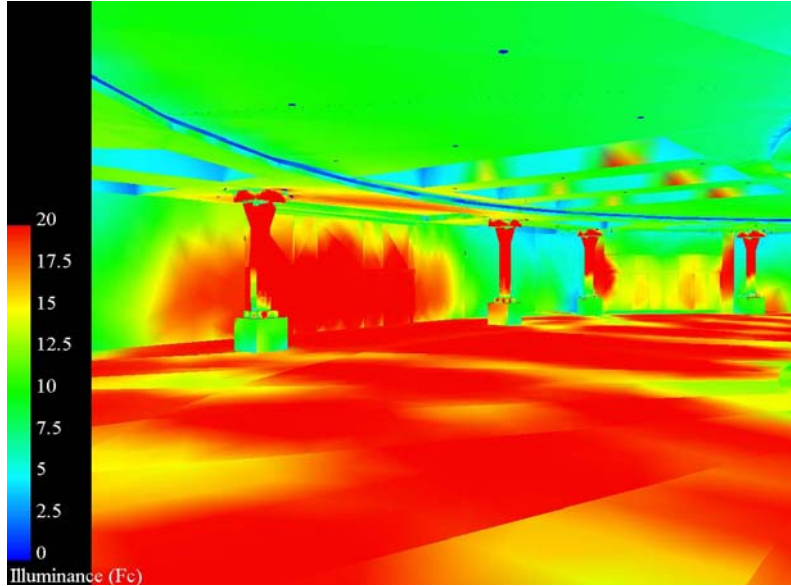
The porte cochere is highlighted by bright columns and a shimmering fountain lit from below the water. In grade uplighting on the roof of the porte cochere accents the balustrade, an architectural feature that mimics the basic form of the roof gazebo. Underneath the porte cochere it is clear from the psuedo color image where the three entrances are. The increased illuminance values indicated to the right and left of the fountain and directly behind the fountain (*Psuedo Color 1.1.1*) indicate the casino entrance, the main lobby entrance, and the entry of the performance hall's pre-function space.



**RENDERING 1.1.3: PORTE COCHERE - VALET STATION, CASINO
ENTRANCE, MAIN ENTRANCE (FROM LEFT TO RIGHT)**



**RENDERING 1.1.4: PORTE COCHERE - PERFORMANCE HALL
PRE-FUNCTION ENTRANCE**



PSUEDO COLOR 1.1.2

Renderings 1.1.3 and 1.1.4 as well as Psuedo Color 1.1.2 show views from underneath the porte cochere. The columns are highlighted with directional downlights. Increased vertical illuminance around the entry way allows easy "way finding." The horizontal illuminance as approximately 15 *fc* at the ground. This relatively high value is necessary because of the large senior citizen population. Not shown in the images is the LED cove system.



RENDERING 1.1.5 FOUNTAIN AND BALUSTRADE



1.1.10 CONCLUSIONS

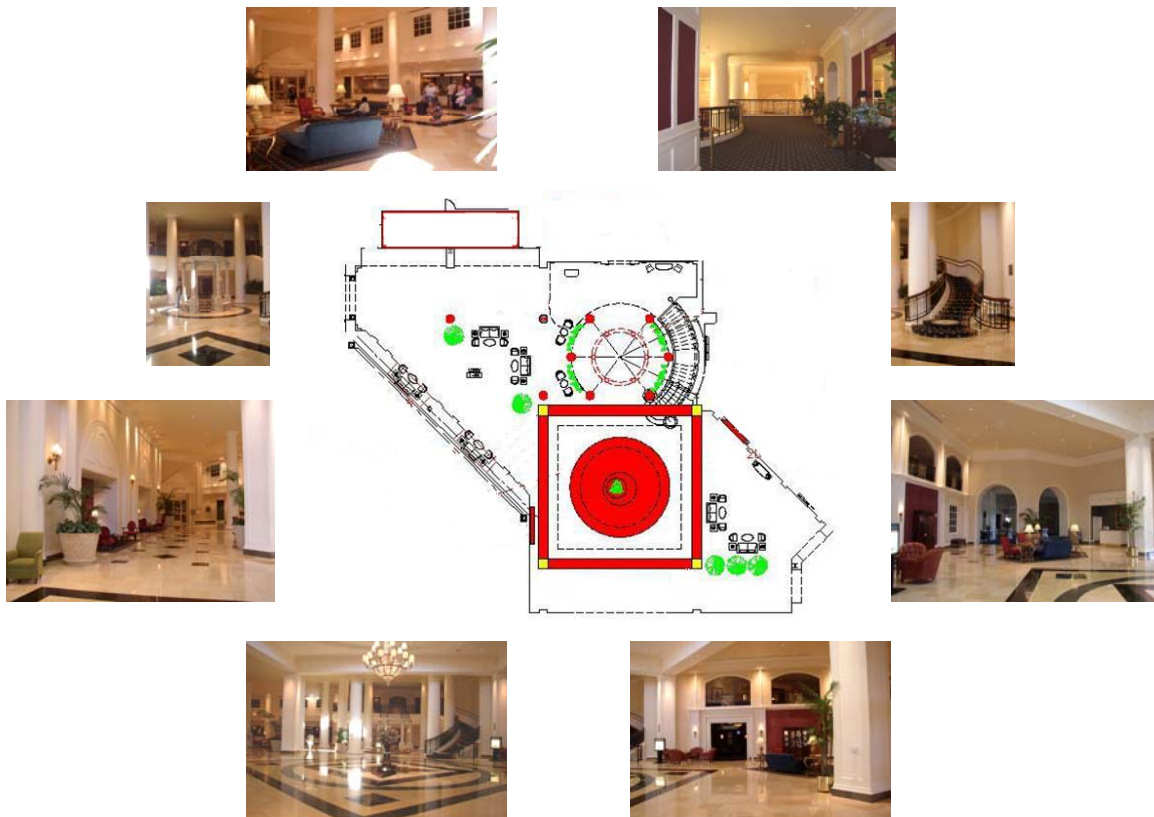
All of the goals of the lighting design have been successfully achieved. Entryways are clearly lit and adequate light levels are provided. *ASHRAE 90.1* standards have been strictly adhered to. The main entry of Dover Downs sparkles from the moment a guest pulls toward the porte cochere. The hotel tower makes a soaring impression only to fade at the top and then burst back at the viewer with the lighting of the Dover Downs sign and roof gazebo. From there the dramatic lighting of the balustrade will indicate the main entry. The fountain in front of the porte cochere is lit to cause a shimmering light on the arches behind making a first impression of elegance. Patrons of Dover Downs know as they approach Dover Downs that their experience will be one of pure class.





1.2 MAIN LOBBY

The lobby serves as the main entrance to the building. It is a two story space with a sweeping staircase leading up to the second floor and a large glass door entrance with a revolving door in the center. The main space in the lobby is under an intricate dome structure with windows surrounding the bottom of the dome. The structural support comes from several columns located toward the back of the lobby space. The lobby is a beautiful, inviting space decorated with a fancy marble floor and a brilliant chandelier hanging from the center of the dome structure. It is mainly a circulation space, serving as a welcoming point for all guests of Dover Downs. In the northeast corner there is the hotel registration desk. Throughout the lobby there are groupings of sofas, chairs, tables and several potted plants. At the foot of the stairs there is an antique decorative gazebo. There are a few large pieces of artwork on the walls. The lobby has access to the casino, the second floor, administrative offices, the elevators, a bar/lounge, the Lobby Shop, and an area used as pre-function for the performance hall



Above is a plan of the main lobby with picture showing the main features.



1.2.1 DESIGN CONCEPT

The lobby will give visitors of Dover Downs their first impression as they enter the building. It is the space that should most reflect the overall lighting design concept explained previously. The decorative features of the architectural elements throughout the space combined with accenting light will create a rich warm atmosphere.

1.2.2 DESIGN CRITERIA

- *Appearance of Space and Luminaires* – The lobby must be visually pleasing. The lobby is perhaps the space that people will remember the most when they leave Dover Downs. It should be well lit and easy to maneuver through no matter which direction you are headed. The luminaires should not look cluttered. Decorative lighting should be plentiful in the space.
- *Color Appearance and Contrast* – The lighting should bring out the true colors of the materials around the lobby. Most of the people walking through the lobby will have just come from outside, so the lobby should offer a smooth transition from sunlight to electric light.
- *Direct and Reflected Glare* – Glare is an issue in the lobby. Sunlight off the marble floor can cause a glare problem as people walk into the lobby. Glare can be distracting and leave patrons of the hotel with a sour feeling as they walk through the lobby.
- *Light Distribution on Surfaces* – Light distribution should be as even as possible, especially on the floor, stairs, and tables that are throughout the space.
- *Light Distribution on Task Plane* – There are several sets of tables and chairs throughout the lobby which may or may not be used for paper tasks and/or reading. Light should be evenly distributed over all these surfaces.
- *Modeling of Faces or Objects* – People are in and out of the lobby all day. Like the performance hall these people should look as good as possible under the light. Also, plants and furniture around the room should be lit so that it appears comfortable.



DESIGN CRITERIA (CONTINUED)

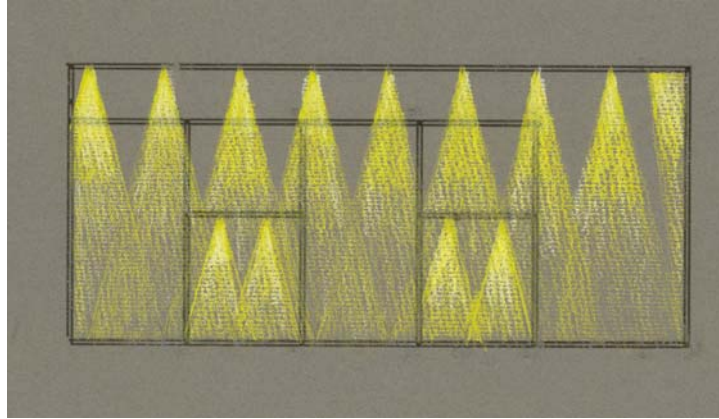
- *Points of Interest* – There are several points of interest in the lobby. There is the main entrance, the staircase, the registration desk, the entrance to the casino, the entrance to the pre-function of the performance hall, and the entrance to the lobby bar and lounge. These spaces should be clearly identifiable with the help of lighting.
- *Sparkle/Desirable Reflected Highlights* - Anything that will make the lobby and therefore all of Dover Downs look better to patrons is important since the prosperity of the hotel depends a lot on happy returning customers.
- *Accent Lighting* – Throughout the lobby there are several large round columns that really give the space a strong, resounding feel. They would look even better and stand out even more if accent lighting was used in some way to highlight this architecture.
- *Horizontal Illuminance* – This should be at least 10fc by regulation, but this design will provide much more light depending on the location. The table tops and the registration desk top should have at least 30fc on their surface.

1.2.3 LIGHTING GOALS

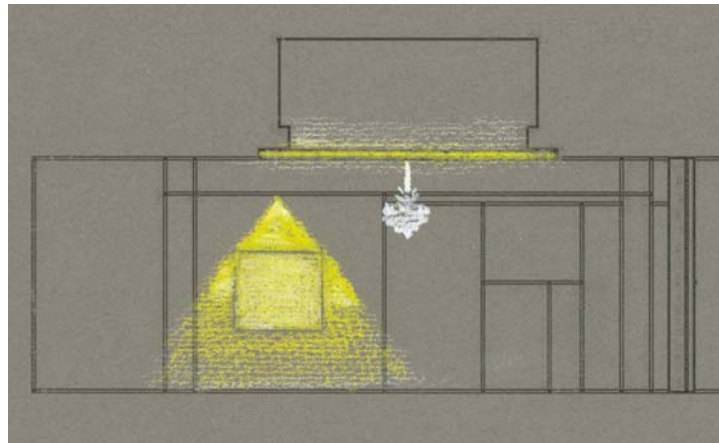
- Provide rich, warm atmosphere full of sparkle
- Create excellent first impression
- Avoid glaring reflections
- Do away with direct glare from daylight through clerestory
- Avoid harsh shadows on faces
- Reduce energy costs



1.2.4 SCHEMATIC DESIGN



- Narrow beam downlights for ambient light



- Cove system to highlight the clearstory
- Install lavish chandelier to help portray opulence
- Spotlight art work on walls



- Make the woodwork above the casino entrance really stand out from the wall behind it by highlighting with narrow beam directional downlights
- Highlight registration area with increased illuminance



- Directional downlights highlight columns
- Uplighting on decorative stone gazebo to provide dramatic accenting
- Spotlights on central table and flower arrangement



1.2.5 LIGHT LOSS FACTORS

Room Surface Dirt Depreciation (RSDD):

The dimensions of the lobby vary in such a way that the RSDD value would vary depending on position. Therefore a value of 0.9 has been assumed for light level calculations.

Lamp Lumen Depreciation Factor (LLD):

LLD = mean lumens / initial lumens

Luminaire E1, E3, E4, E9: $2600 / 3400 = 0.76$

Luminaire E5: $4100 / 6300 = 0.65$

Luminaire E6, E8: $1200 / 1700 = 0.70$

Luminaire E7: **minimal**

Luminaire Dirt Depreciation Factor (LDD):

Same for all non-decorative luminaires

12 month cleaning cycle

Clean conditions

Maintenance Category IV (same for all luminaries)

LDD = 0.88

Ballast Factor (BF):

BF = 1.0



1.2.6 POWER DENSITY

Total S.F. = 9,709 ft² (first floor) + 685 ft² (second floor) = 10,392 ft²

Downlights:

- 147 @ 45W = 6,615 W
- 4 @ 77 W = 308 W
- 39 @ 23 W = 897 W

Uplights

- 6 @ 75 W = 450 W

Cold Cathode Lighting

- 92' @ 15W/ft² = 1,380 W

By ASHRAE 90.1 there are allowances for extra power for decorative lighting. Therefore the wall sconces, chandeliers, and lamps will not be counted in the power density calculation.

Total Wattage at full power = 9,650 W

Power Density = 9,650 W / 10,382 ft² = **0.93 W/ft²**

Using the Space By Space method from ASHRAE 90.1 the allowable lighting power density for a lobby is 1.3 W/ft², which is over the achieved **0.93/ft²**. There is also a special allowance for decorative lighting which the sconces and chandelier fall under.

1.2.6 PANELBOARD DATA

Panelboards will be slightly rearranged to account for the new lighting system. Below are the corresponding calculations.

Downlights:

- 147 @ 45W = 6,615 W
- 4 @ 77 W = 308 W
- 39 @ 23 W = 897 W

Total = 7,820 W

PF = 1.0, 120V power supply = 65.2 amps



Uplights

- 6 @ 75 W = 450 W

PF = 1.0, 120V power supply

= 3.75 amps

Cold Cathode Lighting

- 92' @ 15W/ft = 1,380 W

PF = 1.0, 120V power supply

= 11.5 amps

<u>Panelboard and circuit number</u>	<u>Load</u>	<u>Voltage</u>
ELP - 2 - #13	6.26 A	120 V
ELP - 2 - #14	9.6 A	120 V
RP - 1 - B - #12	4.15 A	120 V
RP - 2 - B - #18	3.00 A	120 V
RP - 2 - B - #20	11.79 A	120 V
RP - 2 - B - #22	11.19 A	120 V
RP - 2 - B - #24	2.25 A	120 V
RP - 2 - B - #26	11.25 A	120 V
RP - 2 - B - #28	11.25 A	120 V
RP - 2 - B - #30	10.83 A	120 V

Wire and Circuit Breaker Type:

- 20 A single pole breaker for each circuit
- #14 THHN, copper conductor rated at 90 degree Celcius.



Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manu - facturer	Initial Lumens	Mean Lumens	CCT (K)	CRI	Symbol
E1	120 V	39W T6 CERAMIC METAL HALIDE	DOWNLIGHT, NOM. 5 1/2" DIA., MAXIMUM 6" DEEP HOUSING, FLOOD BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
E3	120 V	39W T4 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 5 1/2" DIA., MAXIMUM 8" DEEP HOUSING, NARROW SPOT BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
E4	120 V	39W T6 CERAMIC METAL HALIDE	DOWNLIGHT, NOM. 6 3/4" DIA., MAXIMUM 8 1/2" DEEP HOUSING, SPOT BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	
E5	120 V	70W T6 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 8 7/8" DIA., MAXIMUM 10 1/16" DEEP HOUSING, NARROW SPOT BEAM	ELEC - TRONIC	77	ERCO	6300	4100	3000	80	
E6	120 V	20W T4 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 5 1/2" DIA., MAXIMUM 7 1/2" DEEP HOUSING, NARROW SPOT BEAM	ELEC - TRONIC	23	LIGHT - OLIER	1700	1200	3000	81	
E7	12 V	75W PAR 30 HALOGEN	FLOOR RECESSED UPLIGHT, NOM. 8 1/2" DIA., MAXIMUM 8 1/4" DEEP HOUSING, MAGNETIC 120/12 V TRANSFORMER	NA	75	ERCO	940	940	2830	>90	
E8	120 V	20W T4 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 5 1/2" DIA., MAXIMUM 7 1/2" DEEP HOUSING, MED SPOT BEAM	ELEC - TRONIC	23	LIGHT - OLIER	1700	1200	3000	81	
E9	120 V	39W T4 CERAMIC METAL HALIDE	WALLWASHER, NOM. 5 1/2" DIA., MAXIMUM 8 1/2" DEEP HOUSING	ELEC - TRONIC	45	ERCO	3400	2600	3000	82	

FIGURE 1.2.1 MAIN LOBBY LUMINAIRE SCHEDULE





Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manu - factorer	CCT (K)	CRI	Symbol
F	120 V	19 MM 15W PER FOOT	SINGLE ROW OF 25MM COLD CATHODE TUBES MOUNTED IN ARCHITECTURAL COVE. PROVIDE RIGHT ANGLE ELECTRODES FOR CONTINUOUS LINE OF LIGHT.	ELEC - TRONIC	15 W / FT2	ARCHITE CTURAL CATHODE LIGHTING	3000	NA	
G1	120 V	800W INCAN DESCE NT	INCANDESCENT CHANDELIER IN LOBBY. APPROX. WEIGHT 1000LBS. PROVIDED BY OWNER, CONTRACTOR TO ATTACH CRYSTALS AND INSTALL	NA	800	SUPPLIED BY OWNER	NA	NA	
G2	120 V	100W INCAN DESCE NT	INCANDESCENT WALL SCONCE, PROVIDED BY OWNER	NA	100	SUPPLIED BY OWNER	NA	NA	

FIGURE 1.2.1 MAIN LOBBY LUMINAIRE SCHEDULE *CONTINUED*

1.2.8 DAYLIGHT GLARE SOLUTION

Direct sunlight through the windows of the lobby clearstory has the potential to cause a serious glare problem on the columns and walls of the lobby. On a bright day a guest could be blinded by the sun as they walk through the space. The "alternative" solution below does not account for this glare problem with hopes of some daylight being useful in the lobby. There is not enough daylight, and it is not distributed uniformly enough to be useable. The solution proven to be the better of the two accounts for the glare problem by applying a glazing on the windows with a low transmission value.



1.2.9 CALCULATION RESULTS

All calculations were done using AGI32.

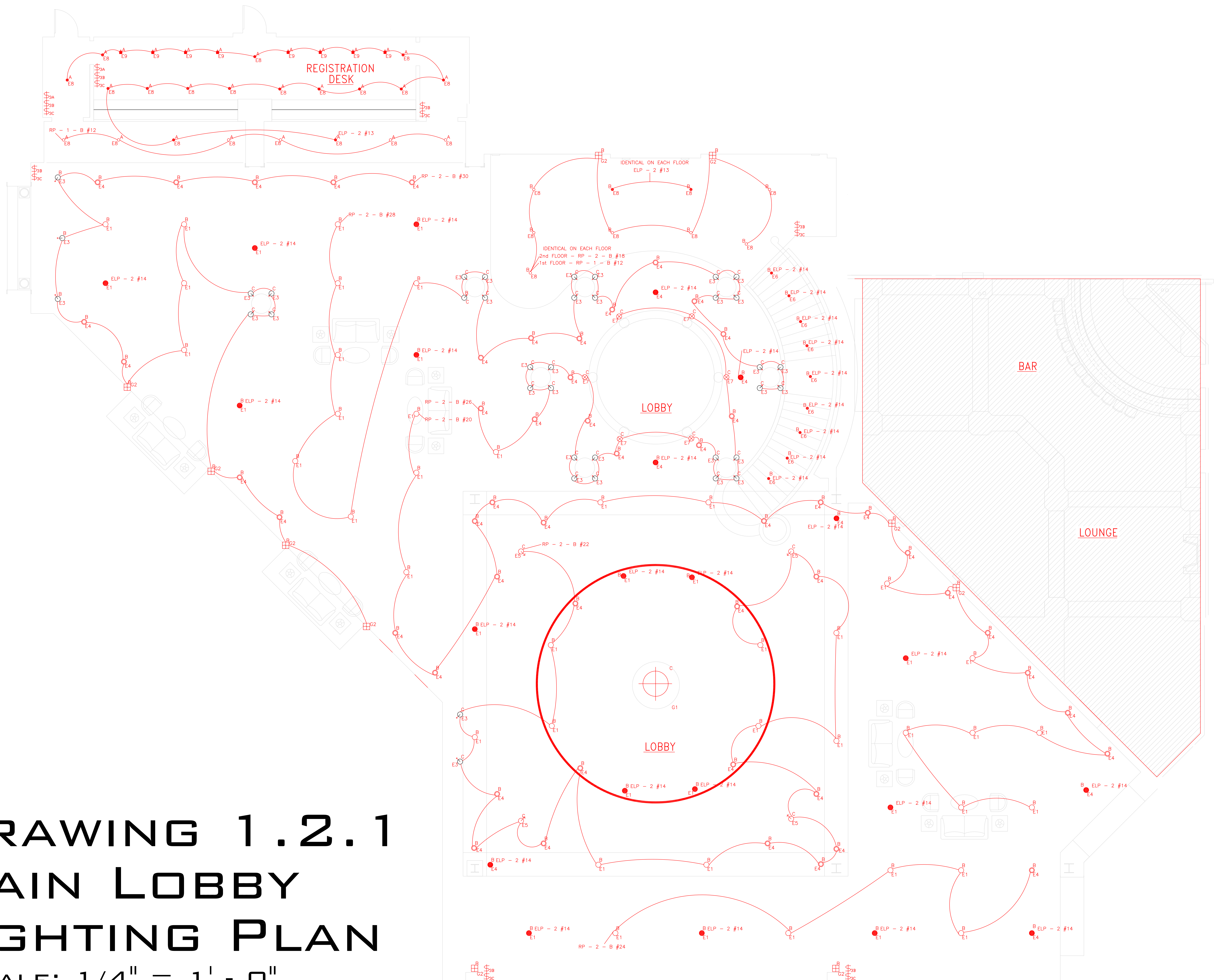
Location	Average Illuminance (fc)	Max	Min
Registration Desk 1	23.7	26	17.2
Registration Desk 2	23.4	25.8	17.8
Casino Entrance Woodwork	34.4	65.2	17.8
Wall Above Casino Entrance	19.7	55.3	9.6
Coffee Table 1	28.3	28.9	27.4
Coffee Table 2	27.9	29.2	26.8
Coffee Table 3	22.6	23	26.8
Coffee Table 4	21.7	21.9	21.6
Registration Area (General Horizontal)	28.5	51.2	15.6
Lobby (General Horizontal) 1	23.7	26.5	20.3
Lobby (General Horizontal) 2	23.5	26.5	20.3
Lobby (General Vertical) 1	9.7	10	9.4
Lobby (General Vertical) 2	14.3	15	13.7
Plant (Vertical) 1	47.2	56.5	37.5
Plant (Vertical) 2	47.2	56.6	41
Plant (Vertical) 3	47.7	59.1	36
Plant (Vertical) 4	46.2	55.3	36.8
Floor Infront of Registration Area	23.3	30.4	16.4
Floor Infront of Coves	26.1	30.7	22.7
Floor Infront of Entry	15.3	21.7	7.4
Floor Under Skylight 1	24.8	65	19
Floor Under Skylight 2	25.1	45.2	18.6

The above values represent the illuminance at key points throughout the lobby. The IES Handbook recommends 10fc for general horizontal lighting in a lobby, but for the circumstances higher values are desirable. This is because of the following reasons:

- Senior citizens frequent the hotel and require higher light levels for adequate vision
- The lobby is adjacent to the exterior of the hotel and therefore it is beneficial to have higher light levels for a smoother transition from electric light to daylight.
- Higher illuminance is desired for the lighting concept proposed.
- The IES Handbook calls for 30fc on reading and working areas in a hotel lobby which the tables and desks fall under

DRAWING 1.2.1 MAIN LOBBY LIGHTING PLAN

SCALE: 1/4" = 1' - 0"



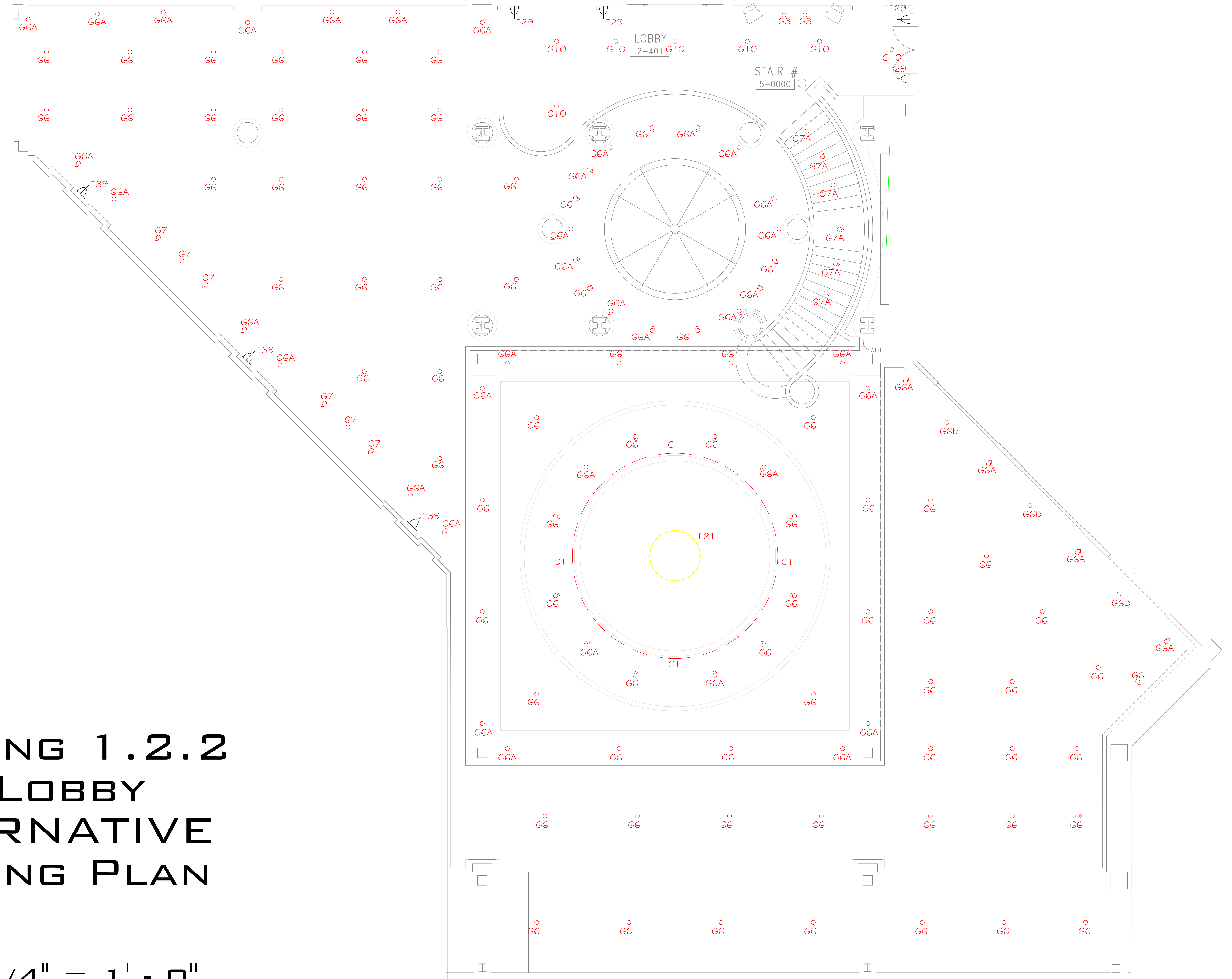


Type	Voltage	Lamp Type	Description	Proposed Manufacturer
C1	120V AC	19MM 15W PER SQUARE FOOT	SINGLE ROW OF 25MM COLD CATHODE TUBES MOUNTED IN ARCHITECTURAL COVE. PROVIDE RIGHT ANGLE ELECTRODES FOR CONTINUOUS LINE OF LIGHT. PROVIDE RECESSED MOUNTED LAMP HOLDER WITH RECESS DEPTH OF 25 INCHES.	ARCHITECTURAL CATHODE LIGHTING
F21	120V AC	INCANDES. 800W	INCANDESCENT CHANDELIER IN LOBBY. APPROX. WEIGHT 1000LBS. PROVIDED BY OWNER, CONTRACTOR TO ATTACH CRYSTALS AND INSTALL.	-
F29	120V AC	INCANDES. 120W	INCANDESCENT WALL SCONCE AT ENTRANCE TO RESTAURANT. PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR.	-
F38	120V AC	INCANDES. 120W	INCANDESCENT WALL SCONCE AT REGISTRATION DESK. PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR	-
F39	120V AC	INCANDES. 120W	INCANDESCENT WALL SCONCE AT ENTRANCE TO RESTAURANT. PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR.	-
G3	120V AC	INCANDES. Q50MR16/NFL 24' (EXZ) 50W	LOW VOLTAGE DOWNLIGHT/ADJUSTABLE ACCENT, NOMINAL 3IN DIA. APERTURE, MAXIMUM 6IN DEEP HOUSING	PRESCOLITE LIGHTOLIER
G6	120V AC	INCANDES. 250PAR38/FL 250W	INCANDESCENT ADJUSTABLE DOWNLIGHT WITH NOMINAL 7 IN DIA. APERTURE, MAXIMUM 12 IN. DEEP HOUSING	EDISON PRICE LIGHTOLIER HALO
G6A	120V AC	INCANDES. 250PAR38/SP 250W	INCANDESCENT ADJUSTABLE DOWNLIGHT WITH NOMINAL 7 IN DIA. APERTURE, MAXIMUM 12 IN. DEEP HOUSING	EDISON PRICE LIGHTOLIER HALO
G7	120V AC	INCANDES. 250PAR38/FL 250W	HALOGEN LENSED WALL WASHER WITH NOM. 6.5 IN. APERTURE, 11.5 IN DEEP BOX	EDISON PRICE LIGHTOLIER HALO
G8	120V AC	INCANDES. 120PAR38/FL 120W	INCANDESCENT ADJUSTABLE DOWNLIGHT WITH NOMINAL 7 IN DIA. APERTURE, MAXIMUM 12 IN. DEEP HOUSING	EDISON PRICE LIGHTOLIER HALO
G10	120V AC	INCANDES. 90A/HL 90W	INCANDESCENT DOWNLIGHT WITH NOMINAL 5 IN. DIAMETER APERTURE, MAXIMUM 8 INCH DEEP HOUSING	EDISON PRICE LIGHTOLIER HALO

**FIGURE 1.2.2 MAIN LOBBY LUMINAIRE SCHEDULE
(ALTERNATIVE DESIGN)**

DRAWING 1.2.2 MAIN LOBBY ALTERNATIVE LIGHTING PLAN

SCALE: 1/4" = 1' - 0"





1.2.10 ALTERNATIVE DESIGN

The alternative lighting design (*Figure 1.2.2 and Drawing 1.2.2*) presents a second solution for lighting the lobby. In this solution PAR 38 incandescent fixtures are used, for the majority of the space, in place of the metal halide fixtures. The luminous output is essentially the same. There are benefits and drawbacks to this incandescent system. *Figure 1.2.3* below shows a comparison of the two systems.

The main difference in the two systems is the power density. Metal halide lamps provide a higher luminous output than do incandescents. Therefore the power density is three times as high in the incandescent system. The one trade off is the problem of color-shifting associated with metal halides. However, for this design, ceramic metal halides have been specified which correct this color-shift. A CRI in the eighties will remain fairly constant throughout the life of the lamps. This CRI is slightly lower than that of the incandescents, but is still adequate for the lobby.

The metal halide design incorporates uplights around the perimeter of the decorative gazebo for accent and also accents the columns and highlights the artwork on the wall to the left upon entry to the lobby from the main entrance. The incandescent design does a poor job of accenting these features and also leaves a number of hot spots on the walls of the lobby. Also, in the incandescent design there is no glazing added to the glass of the lobby clearstory. This leaves a very bright glare that moves with the sun through the space underneath the clearstory. The metal halide system has proven to be the best fit for this space.

Lighting System	Relative Cost	Power Density	Design Criteria Issues and Performance	Relative Life
I - Metal Halide	high	0.99 W/ft ²	lower CRI	high
II - Incandescent	low	3.11 W/ft ²	layout causes hot spots on walls, poor accenting of columns, no accenting of gazebo, no highlighting artwork	low

FIGURE 1.2.3 COMPARISON OF TWO SYSTEMS



1.2.1.1 RENDERINGS

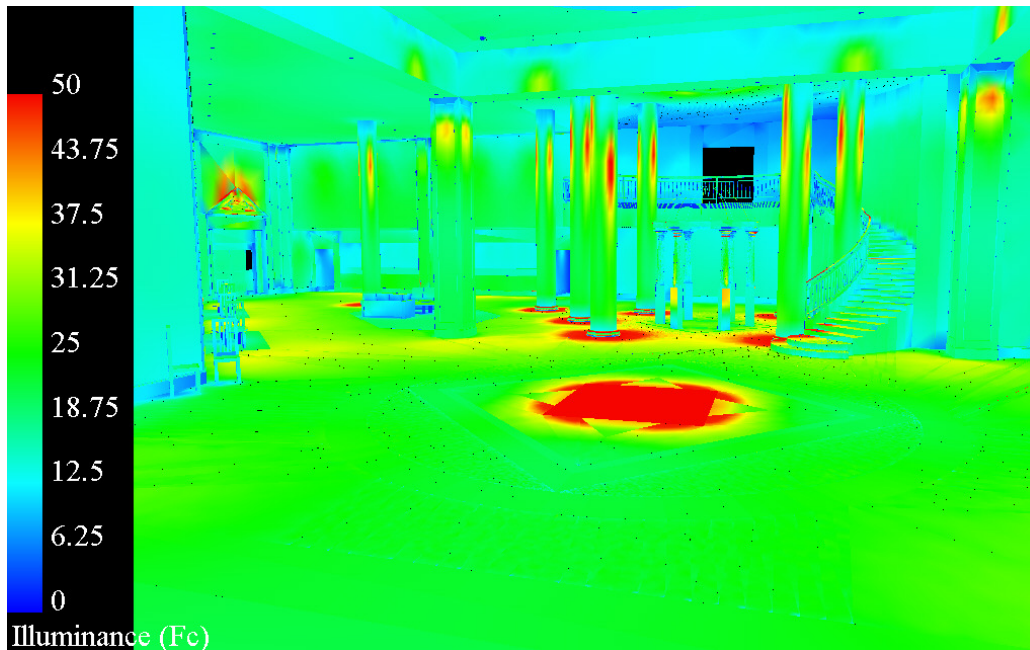


RENDERINGS 1.2.1 AND 1.2.2 VIEWS OF THE LOBBY





Renderings 1.1.1 and 1.1.2 show the lobby lighting design. The highlighted columns stand out throughout the space with a brilliant halo-like glow at the base of each one. The woodwork above the entrance to the casino, as seen in *Rendering 1.1.1* on the left side, has an increased illuminance value compared to the wall above it to really make it stand out, creating an easy way-finding feature. In the center of the black and red tile design, underneath the clearstory, a bright spot can be seen. This is from the spotlights which are meant to shine on the table and flower arrangement that is located there (*not shown in rendering*). These spotlights add punch to the flowers, beautifying the space.



PSUEDO COLOR 1.2.1 MAIN LOBBY



**RENDERINGS 1.2.3 AND 1.2.4
TWO VIEW OF THE MAIN LOBBY**



**RENDERING 1.2.5 (BELOW) SHOWS A VIEW FROM THE
2ND FLOOR FROM ABOVE THE ANTIQUE GAZEBO**





1.2.12 CONCLUSION

The metal halide design for the main lobby of Dover Downs succeeds in meeting all of the goals. Direct glare from sunlight through the clearstory has been eliminated by adding a glazing. The power density is well within the ASHRAE limits. The atmosphere created through the use of accenting and general downlighting will make an excellent first impression as guests enter the space and find the way to their destination.





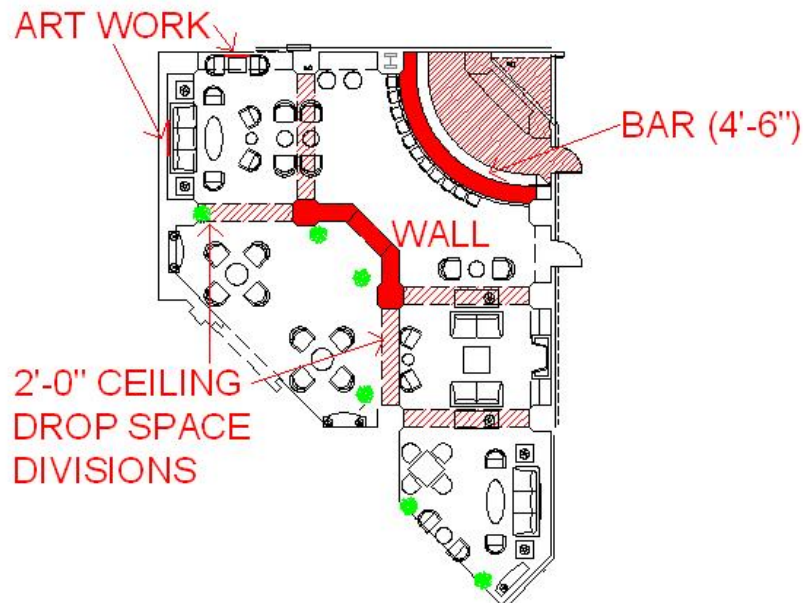
1.3 LOBBY BAR AND LOUNGE

The bar and lounge is directly adjacent to the lobby. This is a space where visitors of Dover Downs can relax and have a few drinks while they chat with friends or watch sports on television. The interior designer of the space intended it to be geared more towards men than women hence it has a sort of cigar parlor appearance to it. The lounge and bar are slightly separated by a small segment of wall. The bar is a quarter circle backed into the southeast corner. There is a fireplace on one wall in the lounge area and several pieces of artwork throughout the space. There are also chairs, tables, couches, and plants throughout the space.

1.3.1 DESIGN CONCEPT

The design concept of the bar and lounge follows the overall concept for all of Dover Downs, attempting to portray a look of opulence and elegance. Since it is a place where people go to unwind and relax the space should have a warm, inviting feel, while at the same time have a creative design that will captivate the patrons and make them excited to spend money there.

FIGURE 1.3.1 BELOW IS A PLAN OF THE BAR AND LOUNGE HIGHLIGHTING SIGNIFICANT FEATURES.





1.3.2 DESIGN CRITERIA

- *System Control and Flexibility* – Depending on the time of day, the activity taking place, and the type of customers this bar needs to be able to achieve a range of different light levels.
- *Color Appearance* – The space should have a very warm feel to it that makes one feel very comfortable and at home. There should also be color highlights, which can be for each individual table, behind the bar, or in the general style of the lighting system.
- *Points of Interest* – The bar itself is obviously a point of interest and should be lit accordingly. Another point of interest may be the fireplace which should be lit with slightly higher light levels than the rest of the space even when there is no fire burning.
- *Modeling of Faces or Objects* – There should be an attempt to make faces look good, even though there are minimal amounts of light. One idea is to light tables from under the table, whether it be through the glass surface of the table or by some other means.
- *Shadows* – Bars are known as being dark places and there are reasons for that. Shadow is a necessary aspect of any bar's lighting. There should be more shadow spots than bright spots and therefore the bright spots will draw even more attention.
- *Vertical Illuminance* – The vertical illuminance can be very low, except on the hanging art where it should be 10fc or more.
- *Horizontal Illuminance* – This should be around 3fc for a bar or table top. More than that is bright for the style of bar. Less than 3fc may be okay.

1.3.3 LIGHTING GOALS

- Make the bar a focal point of the space
- Attract the attention of guests in the lobby with a creative design
- Showcase art on walls
- Provide flexibility with control of the lighting



1.3.4 LIGHT LOSS FACTORS

Room Surface Dirt Depreciation (RSDD):

Room Cavity Ratio (RCR):

$$RCR = 5 \cdot h_c \cdot (l+w) / (l \cdot w)$$

(Length and width have been averaged due to shape of room)

$$RCR = 5 \cdot (7.5') \cdot (35' + 40') / 35' \cdot 40'$$

$$RCR = 2.00$$

Luminaire Distribution Type: Direct

12 month cleaning cycle

Medium conditions (no smoking)

$$RSDD = 0.96$$

Lamp Lumen Depreciation Factor (LLD):

LLD - minimal

Luminaire Dirt Depreciation Factor (LDD):

Downlights and LEDs:

Maintenance Category: IV

12 month cleaning cycle, medium conditions

$$LDD = 0.82$$

1.3.5 POWER DENSITY

Total S.F. = 2000 ft²

Downlights:

- 25 @ 58W = 1450W
- 7 @ 86W = 602W



LEDs:

- 99 @ 6.2W = 613.8W
- 2 @ 25W = 50W

Total Wattage at full power = 2715.8 W

Power Density = $2715.8 / 2000 \text{ ft}^2 = 1.36 \text{ W/ft}^2$

Using the Space By Space method from ASHRAE 90.1 the allowable lighting power density for a bar/lounge is 1.4 W/ft^2 , which is over the achieved 1.36 W/ft^2 . There is also a special allowance for decorative lighting which the in-table LED lighting most likely falls under.

1.3.6 PANELBOARD DATA

Two panelboards will be slightly rearranged to account for the new lighting system. Below are the corresponding calculations.

Downlights

26 @ 58W → 1508W

PF = 1.0, 120V power supply

= 12.57 amps

7 @ 86W → 602W

PF = 1.0, 120V power supply

= 5.02 amps

LEDs

5 power supplies @ 2.8 amps each

= 14 amps

Total amps = 31.59 amps

16 amps per circuit → need 3 circuits to stay under 16

Panel RP - 1 - C

58W Downlights: Circuit #10 12.57 amps

86W downlights: Circuit #12 7.82 amps
and one LED power supply

Circuit 3: LED power supplies Circuit #14 11.2 amps



Symbol	Type	Voltage	Lamp Type	Description	Total Watts	Manu - factorer	Lumens	CCT (K)	CRI
	A	12 V	50W T4	LOW VOLTAGE HALOGEN, NOM. 4" DIA., MAXIMUM 6 1/16" DEEP HOUSING, FROSTED GLASS DIFFUSER AS LAMP COVER, MAGNETIC 120/12 V TRANSFORMER	58	ERCO	950	2750	>90
	B	12 V	75W T4	LOW VOLTAGE HALOGEN, NOM. 5 1/8" DIA., MAXIMUM 7 3/16" DEEP HOUSING, 0-35 DEG TILTABLE x 360 DEG ROTATION, MAGNETIC 120/12 V TRANSFORMER	86	ERCO	1575	3000	>90
	C	24 VDC	LEDs (6.2W)	45 HIGH BRIGHTNESS SURFACE MOUNTED LEDs (15 RED, 15 GREEN, 15 BLUE), 120 DEG x 120 DEG BEAM ANGLE, 150W INTELLIGENT POWER/DATA SUPPLY	6.2	COLOR KINETICS	VARIES	1,000 - 10,000	NA
	D	24 VDC	LEDs (25W MAX)	18 HIGH INTENSITY POWER LEDs (6 RED, 6 GREEN, 6 BLUE), 22 DEG BEAM ANGLE, 150W INTELLIGENT POWER/DATA SUPPLY	25	COLOR KINETICS	VARIES	1,000 - 10,000	

FIGURE 1.3.2 LOBBY BAR AND LOUNGE LUMINAIRE SCHEDULE

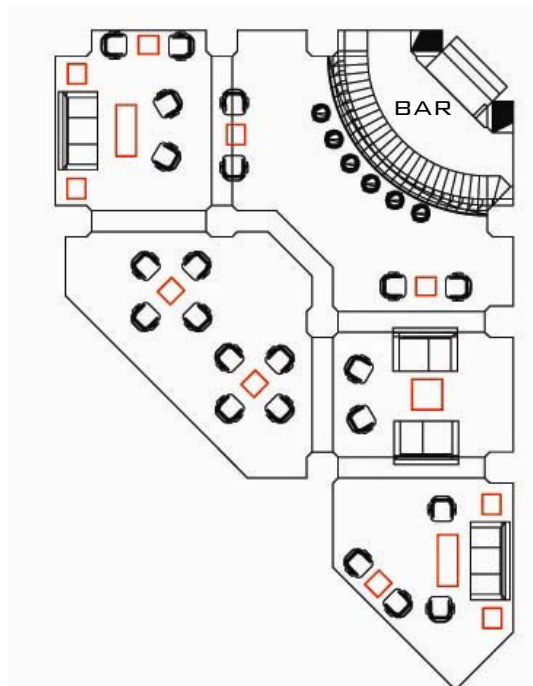
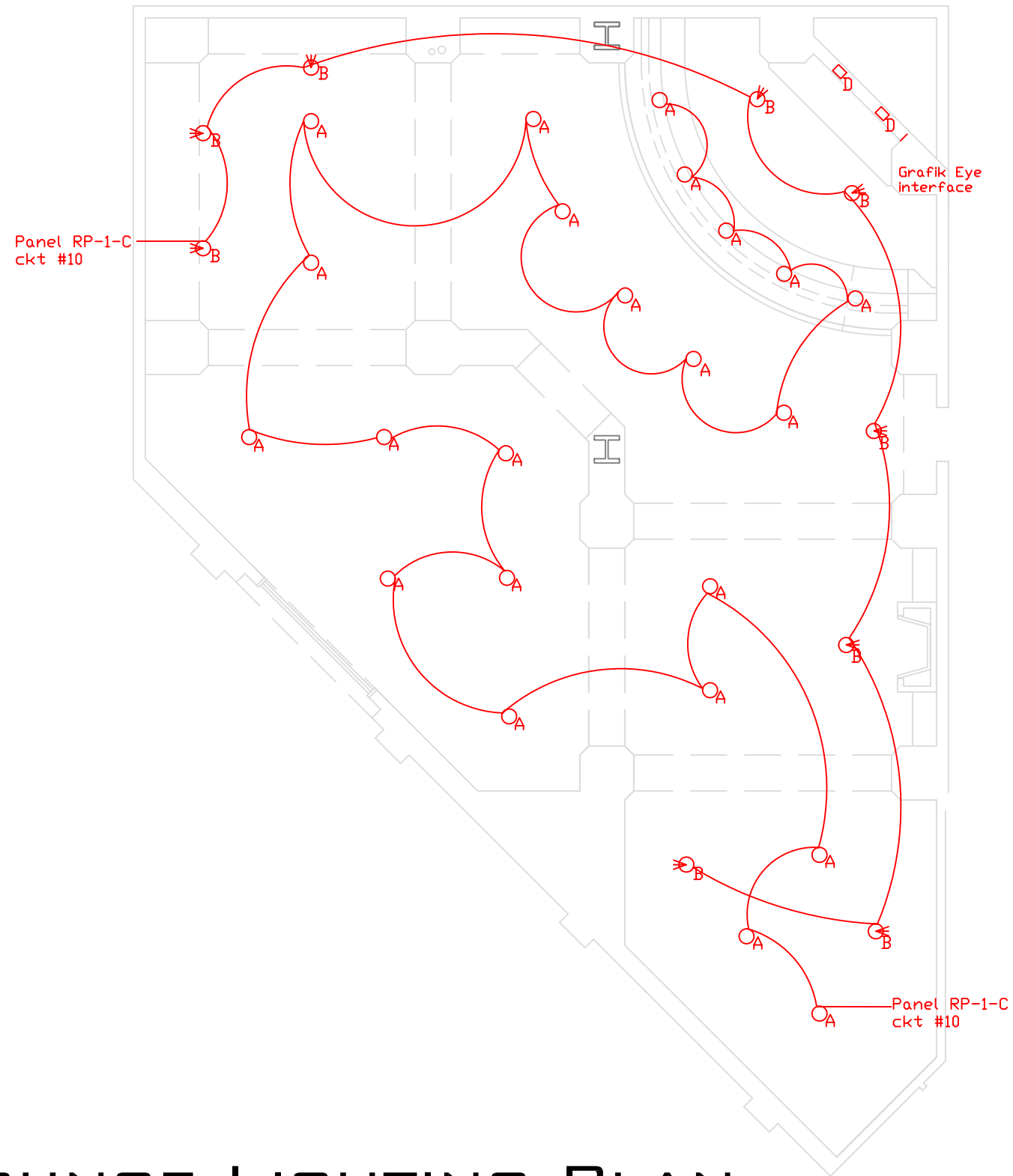
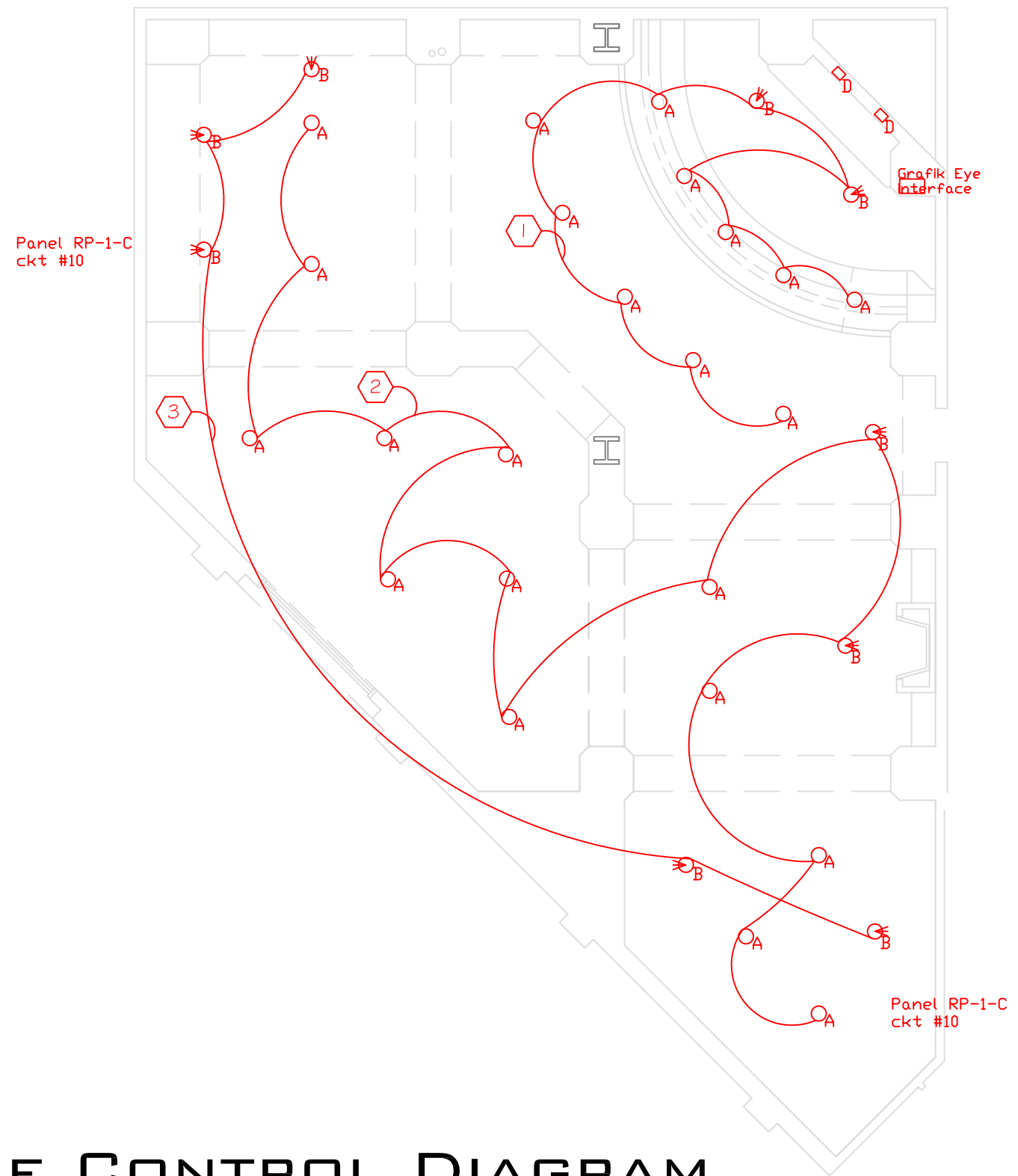


FIGURE 1.3.3 BAR AND LOUNGE FURNITURE PLAN
(CUSTOM LED TABLES OUTLINED IN RED)



**DRAWING 1.3.1
LOBBY BAR AND LOUNGE LIGHTING PLAN**

SCALE: 1/8" = 1' - 0"



**DRAWING 1.3.2
LOBBY BAR AND LOUNGE CONTROL DIAGRAM**

SCALE: 1/8" = 1' - 0"

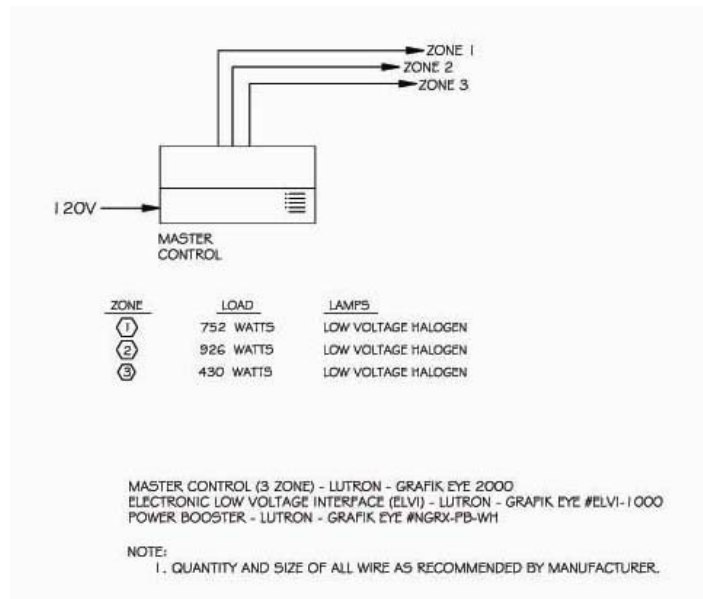
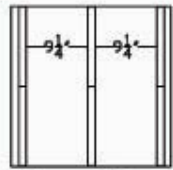


FIGURE 1.3.4 BAR AND LOUNGE CONTROL DIAGRAM

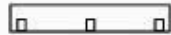
1.3.7 CONTROLS

There are three control zones, which are each controlled by Lutron's Grafik Eye 2000. *Drawing 1.3.2* clearly shows which luminaires are in each zone. To reiterate, *Figure 1.2.4 (above)* also shows the three zones, the load on each, and the luminaires on each. This control setup allows for the light around the bar to be dimmed separately then the remainder of the lounge. Also, the lighting for the artwork can be controlled separately.

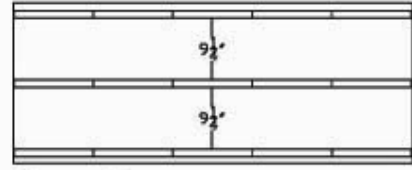
Another issue is the control of the custom LED tables. The tables are not shown on the lighting plan (*Drawing 1.3.1*) or on the controls drawing. However, their location can be seen in *Figure 1.3.3*, the furniture layout. On the following page is a detail of the LED tables (*Figure 1.3.5*). The table LEDs and the LED fixtures that light behind the bar are controlled by Color Kinetics' DMX512 controller. This controller is very user friendly and can be programmed to play light shows or remain any number of single colors.



2' x 2'
typical table
plan



typical table
section



5' x 2'
typical table
plan

FIGURE 1.3.5 CUSTOM LED TABLE DETAILS. NOTE: LED FIXTURE DETAILS ARE AVAILABLE IN THE APPENDIX

1.3.8 CUSTOM LED TABLES

One goal of the lighting design for the bar and lounge was to provide a creative design that would not only look interesting to the patrons of the bar and lounge, but would also attract attention from the adjacent main lobby. These custom LED tables do a great job of this. Each table is simply a standard wooden table with a glass top. Underneath the top is a three inch space where the LED fixtures are located. The glass top is removable for ease of maintenance. The LED fixtures are mounted on the wooden bottom of each table top, as suggested in the specification sheets (*Appendix*) and are aimed to provide as even a facade of light as possible emitting from the glass table top of each table. These "glowing tables" will cast a very subtle colored light on the faces of the guests of the bar and lounge and will make beverage glasses and bottles glow in the dimly lit bar. As mentioned in section 1.3.7, the LEDs can be programmed to run through light shows or to remain any number of colors.



1.3.9 CALCULATION RESULTS

All calculations were done using AGI32.

These numbers are representative of the system at full power. A Lutron Grafik Eye dimming system is included in the design and can achieve a wide range of different light outputs. The bar area has been highlighted with increased illuminance. All artwork in the space is at an increased vertical illuminance and each separate piece has an equal amount of light.

Location	Average Illuminance (fc)
Table tops (average)	7.07
Artwork 1	14.31
Artwork 2	14.43
Artwork 3	14.9
Artwork 4	14.0
Artwork 5	14.18
Bar top	17.21

FIGURE 1.3.6 CALCULATION RESULTS



1.3.10 RENDERINGS



RENDERINGS 1.3.1 BAR AND LOUNGE

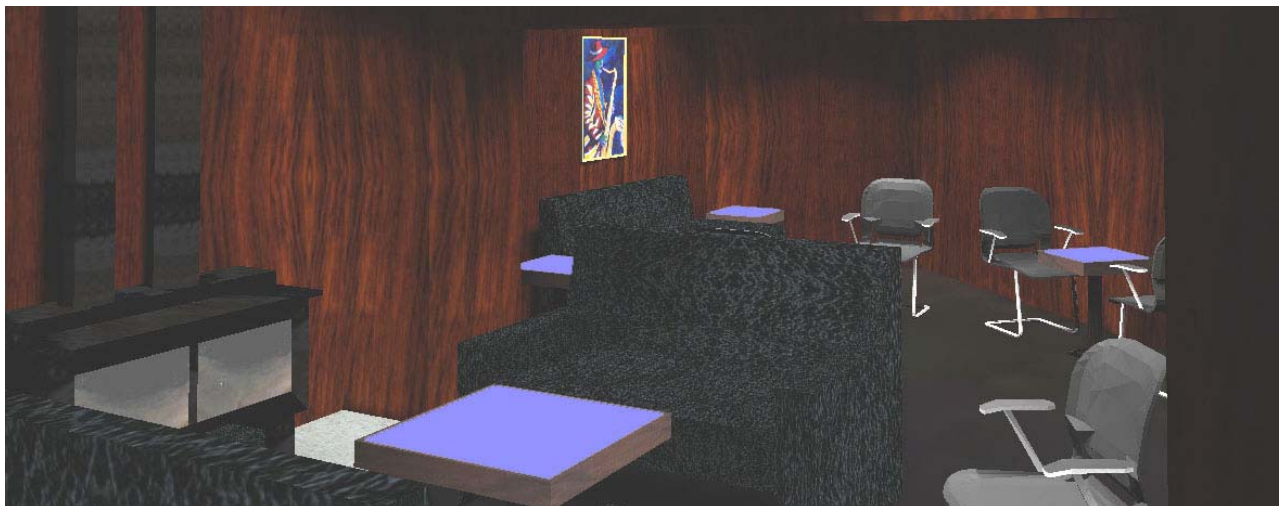
The bar area has increased illuminance, not only on the bar top itself, but also on the walls behind the bar and on the floor in front of the bar. An acrylic panel set up above the bar highlights the centerpiece of the lounge. It is lit by two ColorBlast LED fixtures located behind the lower central shelves. The fixtures are capable of producing any number of static colors or a variety of light shows, which are easily programmable. The same features are available with LED fixtures enclosed under glass in each table.

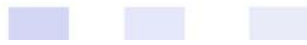




RENDERINGS 1.3.2 LOUNGE AREA

These images show the lounge area where the wood burning stove is. The stove has a directional downlight aimed toward it to highlight the area. The custom tables can be seen throughout the space.





RENDERINGS 1.3.3 ARTWORK IN LOUNGE

1.3.1.1 CONCLUSION

The lighting design of the bar and lounge is creative yet simple. The glowing tables accent the space nicely and attract attention of people in the lobby. Each piece of artwork on the walls is uniformly lit, brighter than the surrounding walls. The space's control system allows great flexibility. The color wall behind the bar ties the space together. The lighting design provides a warm, relaxing atmosphere in which guests can enjoy conversation, libations, and entertainment.





1.4 ROLLINS CENTER PERFORMANCE HALL

The Rollins Center is the name of the multi-purpose performance hall housed inside of Dover Downs. The performance hall is one of the highlights of Dover Downs. It is located close by to the lobby for convenience. The hall is a large open space (18,000ft²) open above to the second floor. The ceiling is very detailed and resembles the lobby ceiling with a large dome in the center and several architectural coves surrounding. The hall can be divided into three sections - 7,200, 4,800 and 6,000 square feet. In the center of the room a boxing ring can be set up, with seating for 2,000 fans around it. Another set up allows tables to be arranged to host up to 1,000 people for dinner, or 1,500 guests for a reception, 100 exhibits for a tradeshow, or 1,500 seats for a concert. Extending from the back wall are 550 retractable arena seats. The whole thing including the chairs folds up compactly into the back wall, but when open, it is carpeted. The hall is a beautiful space that is extremely versatile. Along the side walls there are several large doors leading into pre-function space that can also be used for conferences. There is a permanent stage in the front of the hall with another temporary one below that, which can extend into the room for additional stage space.

1.4.1 DESIGN CONCEPT

The design concept for the lighting of the Rollins Center Performance Hall is very similar to that for all of Dover Downs, especially the lobby. There are a large variety of events that take place in this space and therefore, above all, the lighting should cater to several different appearances suitable to each event. Simultaneously, the lighting should portray a look and feeling of elegance and make a lasting impression on guests of the performance hall.

1.4.2 DESIGN CRITERIA

The performance hall falls under a few different task classes according to the IESNA Lighting Handbook. It can be considered an auditorium, used for assembly and social activity, an exhibition hall, a dance hall or ballroom, and even a boxing ring.



- *System control and flexibility* – This is perhaps the most important of the criteria for the reasons listed above. Also, the space can be divided into three separate spaces and therefore must have the capability to change in at least three separate ways.
- *Appearance of space and luminaires* – Thousands of guests a year will come to the performance hall to have a good time, expecting a high class, architecturally beautiful space. Luminaires should not stand out and the space should have an overall feeling of welcome. The unique ceiling should be highlighted with the lighting.
- *Color Appearance and Contrast* – This goes hand in hand with the appearance of the space. Colors should have a natural warm feeling to allow for the intricate wood work to stand out. The bright red, blue, and tan rug and the textured yellow wallpaper should keep their real colors under the light.
- *Light Distribution of Surfaces* – All surfaces should have a fairly even distribution of light on them. The walls and ceiling should also be even to add to the pleasant appearance of the space.
- *Modeling of Faces or Objects* – This is important because for the most part when people come to the performance hall they will be dressed up and looking good for their night out. Bad lighting can make even the most beautiful people look bad so it is important that the modeling of faces is flattering.
- *Accent Lighting* – There are several column-like structures protruding from the wall in this space that accent lighting could really make stand out and look nice. The appearance of the architectural coves and the dome also benefit from accent lighting.
- *Points of interest* – The lighting could highlight the exits throughout the space, making their location clear to anyone present.
- *Vertical Illuminance* – For all the different setups of the performance hall there should be a vertical illuminance of at least 3fc. There are no real tasks that take place that require high levels of vertical illuminance. However, several of the patrons of Dover Downs are senior citizens and therefore may need higher illuminance levels, both vertical and horizontal.

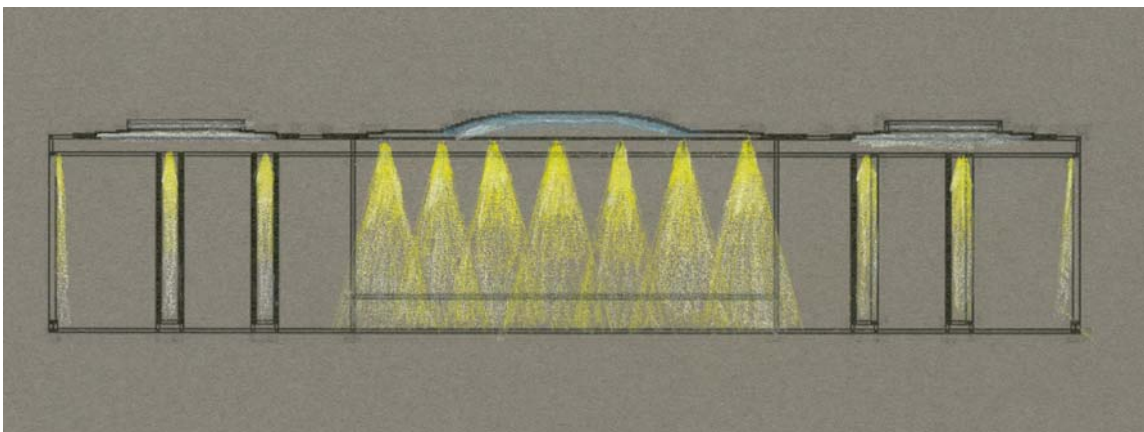


- *Horizontal Illuminance* – The control system in the space should be able to achieve a range of horizontal illuminances. The levels should be able to go as low as 3fc for use when the space is a ballroom or concert hall. If the space is being used as an exhibition hall there should be a horizontal illuminance of at least 10fc. Also, when dinner is being served in the performance hall there must be adequate light on the table for eating and drinking.

1.4.3 LIGHTING GOALS

- Provide flexibility with control of lighting
- Provide rich, warm atmosphere full of sparkle
- Highlight coxes of ceiling and dome
- Avoid glaring reflections
- Avoid harsh shadows on faces
- Low energy costs

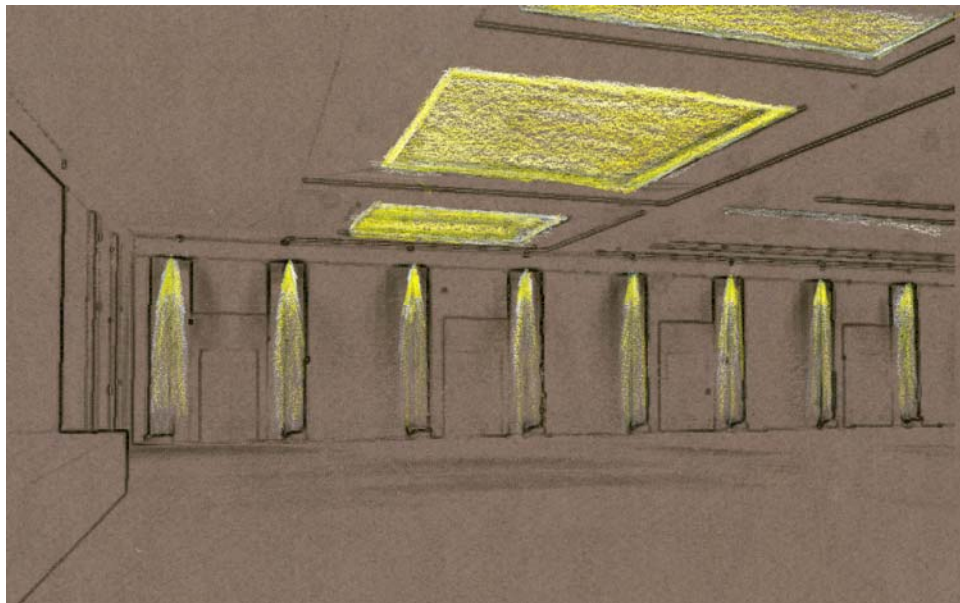
1.4.4 SCHEMATIC DESIGN



- A section view of the key lighting elements



- Highlight ceiling coves with LED system
- LED system in cove around dome to "paint" the dome
- Downlights positioned to avoid hot spots when the partitions are used



- Highlight columns with narrow beam directional downlights



1.4.5 LIGHT LOSS FACTORS

Room Surface Dirt Depreciation (RSDD):

$$\begin{aligned} RCR &= 5 \cdot h_c \cdot (l+w) / (l \cdot w) \\ RCR &= 5 \cdot (20') \cdot (144' + 116') / (144' \cdot 116') \\ RCR &= 1.55 \end{aligned}$$

Luminaire Distribution Type: Direct
12 month cleaning cycle
Clean conditions

$$\mathbf{RSDD = 0.96}$$

Lamp Lumen Depreciation Factor (LLD):

LLD = mean lumens / initial lumens

$$\begin{aligned} \text{Luminaire E1, E10: } &2600 / 3400 = \mathbf{0.76} \\ \text{Luminaire H1, H2, C: } &\text{LLD} = \mathbf{1.0} \end{aligned}$$

Luminaire Dirt Depreciation Factor (LDD):

12 month cleaning cycle
Clean conditions

$$\begin{aligned} \text{Luminaire E1, E10, H1, H2: Maintenance Category IV} \\ \text{LLD} &= \mathbf{0.88} \\ \text{Luminaire C: Maintenance Category II} \\ \text{LDD} &= \mathbf{0.94} \end{aligned}$$

Ballast Factor (BF):

$$\mathbf{BF = 1.0}$$



1.4.6 POWER DENSITY

Total S.F. = 16,796 ft²

Downlights:

- 164 @ 45W = 7,380 W

LEDs:

- 371 @ 6W = 2,226 W

By ASHRAE 90.1 there are allowances for extra power for decorative lighting and for lighting designated for performance. Therefore the chandeliers and spotlights will not be counted in the power density calculation.

Total Wattage at full power = 9, 606W

Power Density = 9,650 W / 16,796ft² = **0.57 W/ft²**

The multi-purpose performance hall falls under several spaces mentioned in the Space by Space method of ASHRAE 90.1. Therefore the lowest power density will be used to determine if this space adheres to the standards. The lowest power density by use is for a convention center. That power density is **0.7 W/ft²**. The performance hall is well under the power density.

1.4.7 PANELBOARD DATA

Panelboards will be slightly rearranged to account for the new lighting system. Below are the corresponding calculations.

Luminaires E1 and E10: 120 V, P.F. = 1.0, 45W → 0.375 amps each

Luminaires H1 and H2: 120 V, P.F. = 1.0, 250W → 2.083 amps each

Luminaires C: 16 power supplies @ 2.8amps each



<u>Panelboard and circuit number</u>	<u>Load</u>	<u>Voltage</u>
ELP - 2 - #30	10.5 A	120 V
ELP - 2 - #32	12.5 A	120 V
PH - 2 - A - #12	10.88 A	120 V
PH - 2 - A - #14	12 A	120 V
PH - 2 - A - #16	12 A	120 V
PH - 2 - A - #18	10.88 A	120 V
PH - 2 - A - #20	4.5 A	120 V
PH - 2 - A - #24	12.5 A	120 V
PH - 2 - A - #26	12.5 A	120 V
PH - 2 - A - #28	1 2.5 A	120 V

Wire and Circuit Breaker Type:

General Lighting

- 20 A single pole breaker for each circuit
- #14 THHN, copper conductor rated at 90 degree Celcius.








Symbol	Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manu - factorer	Initial Lumens	Mean Lumens	CCT (K)	CRI
	E1	120 V	39W T6 CERAMIC METAL HALIDE	DOWNLIGHT, NOM. 5 1/2" DIA., MAXIMUM 6" DEEP HOUSING, FLOOD BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82
	E10	120 V	39W T4 CERAMIC METAL HALIDE	DIRECTIONAL DOWNLIGHT, NOM. 8 7/8" DIA., MAXIMUM 10 1/16" DEEP HOUSING, NARROW SPOT BEAM	ELEC - TRONIC	45	ERCO	3400	2600	3000	82
	H1	120 V	250W PAR38 INCANDES. 30deg	SPOTLIGHT, SUSPENDE FROM 2 CIRCUIT TRACK, TILT THROUGH 90deg, ROTATE THROUGH 360deg, CAST ALUMINUM HOUSING	NA	250	ERCO	AVG LUMENS = 3600		2950	100
	H2	120 V	250W PAR38 INCANDES 10deg	SPOTLIGHT, SUSPENDE FROM 2 CIRCUIT TRACK, TILT THROUGH 90deg, ROTATE THROUGH 360deg, CAST ALUMINUM HOUSING	NA	250	ERCO	AVG LUMENS = 3600		2950	100
	C	24 Vdc	LIGHT EMITTING DIODES, 6W MAX	18 HIGH INTENSITY POWER LEDs (6 RED, 6 GREEN, 6 BLUE), 22deg BEAM ANGLE, 150W INTELLIGENT POWER/DATA SUPPLY	NA	6	COLOR KINETICS	VARIES		1,000 - 10,000	VARIES

FIGURE 1.4.1 PERFORMANCE HALL LUMINAIRE SCHEDULE





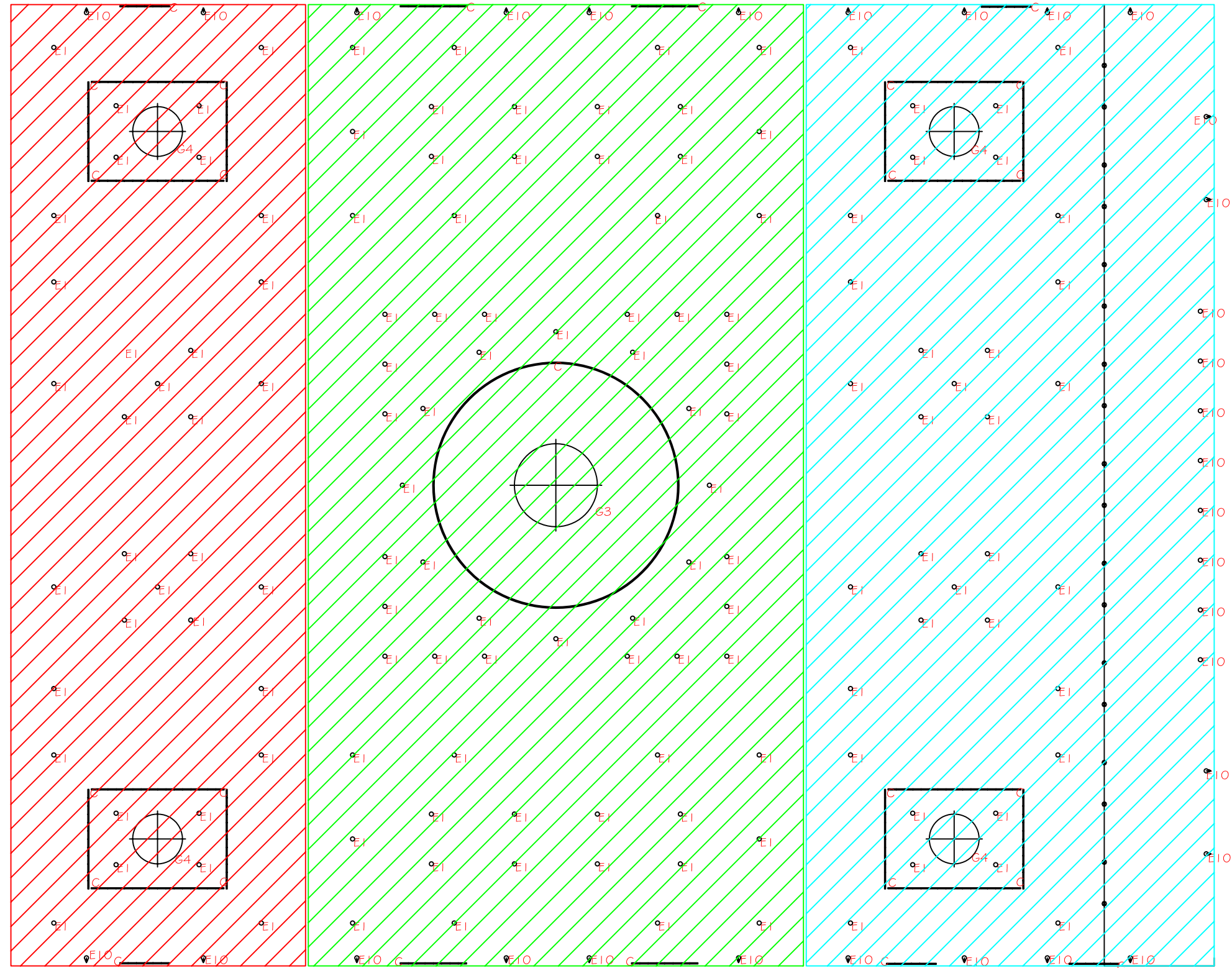
Symbol	Type	Voltage	Lamp Type	Description	Ballast Type	Total Watts	Manu - factorer	Initial Lumens	Mean Lumens	CCT (K)	CRI
	G3	120 V	INCANDES 4800W	INCANDESCENT CRYSTAL CHANDELIER IN CENTER PROVIDED BY OWNER, CONTRACTOR TO ATTACH CRYSTALS INSTALL CHANDELIER, APPROX. WEIGHT 3000 LBS.	NA	4800	SUPPLIED BY OWNER	NA	NA	NA	NA
	G4	120 V	INCANDES. 950W	INCANDESCENT CRYSTAL CHANDELIER IN CORNER BALLROOM PROVIDED BY OWNER, CONTRACTOR TO ATTACH CRYSTALS & INSTALL CHANDELIER, APPROX. WEIGHT 500 LBS.	NA	950	SUPPLIED BY OWNER	NA	NA	NA	NA

FIGURE 1.4.1 LUMINAIRE SCHEDULE (CONTINUED)

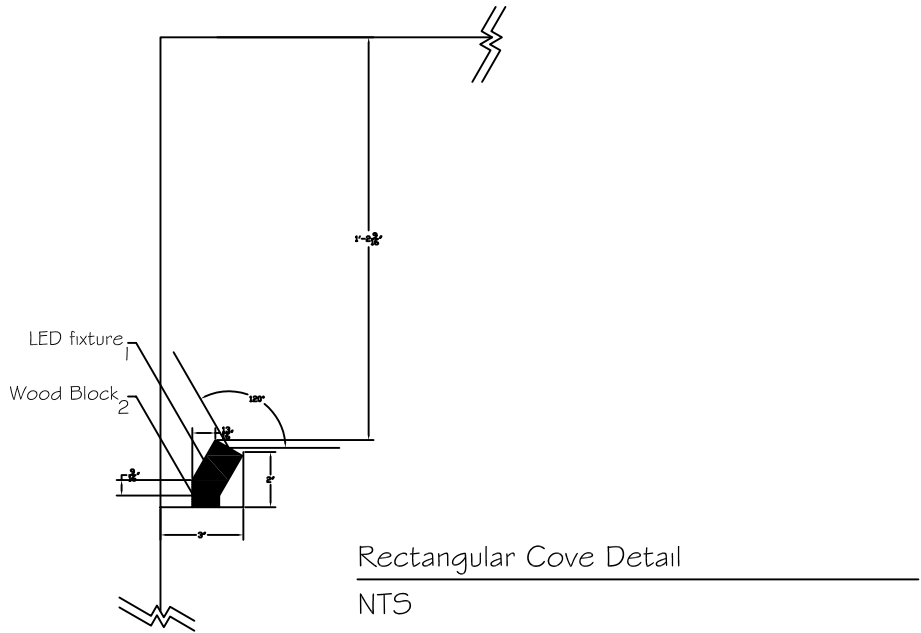
1.4.8 CONTROLS

All the metal halide fixtures in the performance hall will be controlled by WattStopper's DM-100 Bi-level HID Controller. This allows dimming of down to 50% and for each controller to be linked together and controlled from a single location. There are three separate zones as shown on the control zone plan drawing (*Drawing 1.4.1*) The zones can all be dimmed separately or in any combination from two separate controllers. One is mounted in the back of house area, behind the stage. The other is mounted in an audio control room located on the wall opposite the stage.



DRAWING 1.4.1
PERFORMANCE HALL CONTROL ZONES

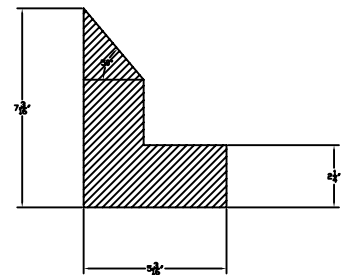
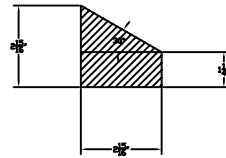
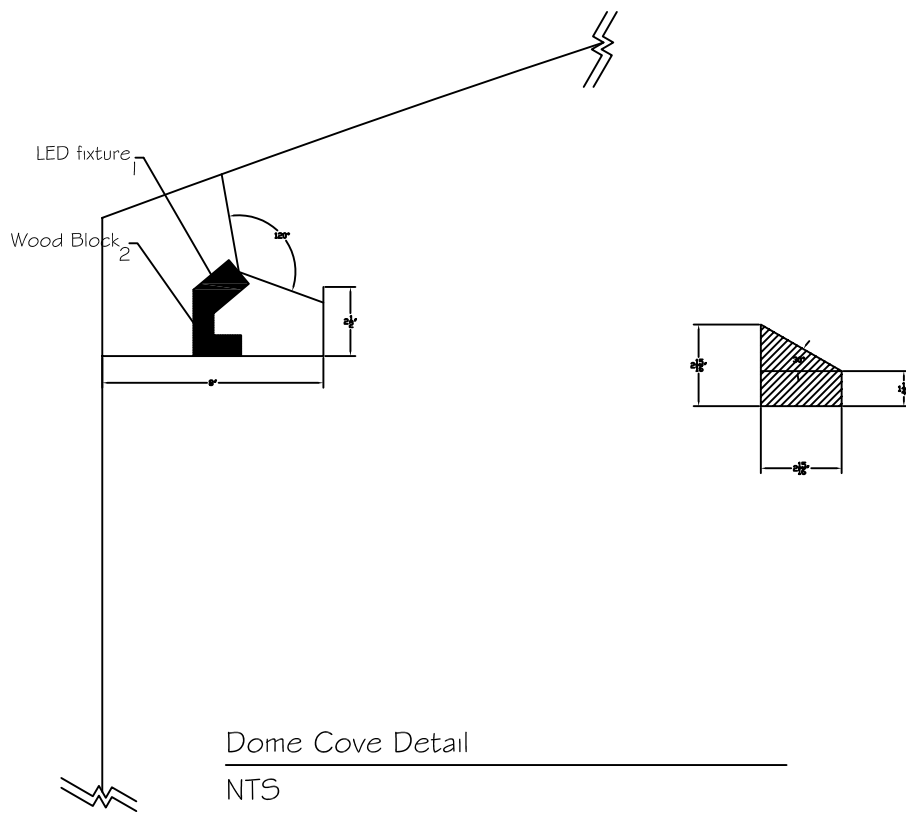
NTS



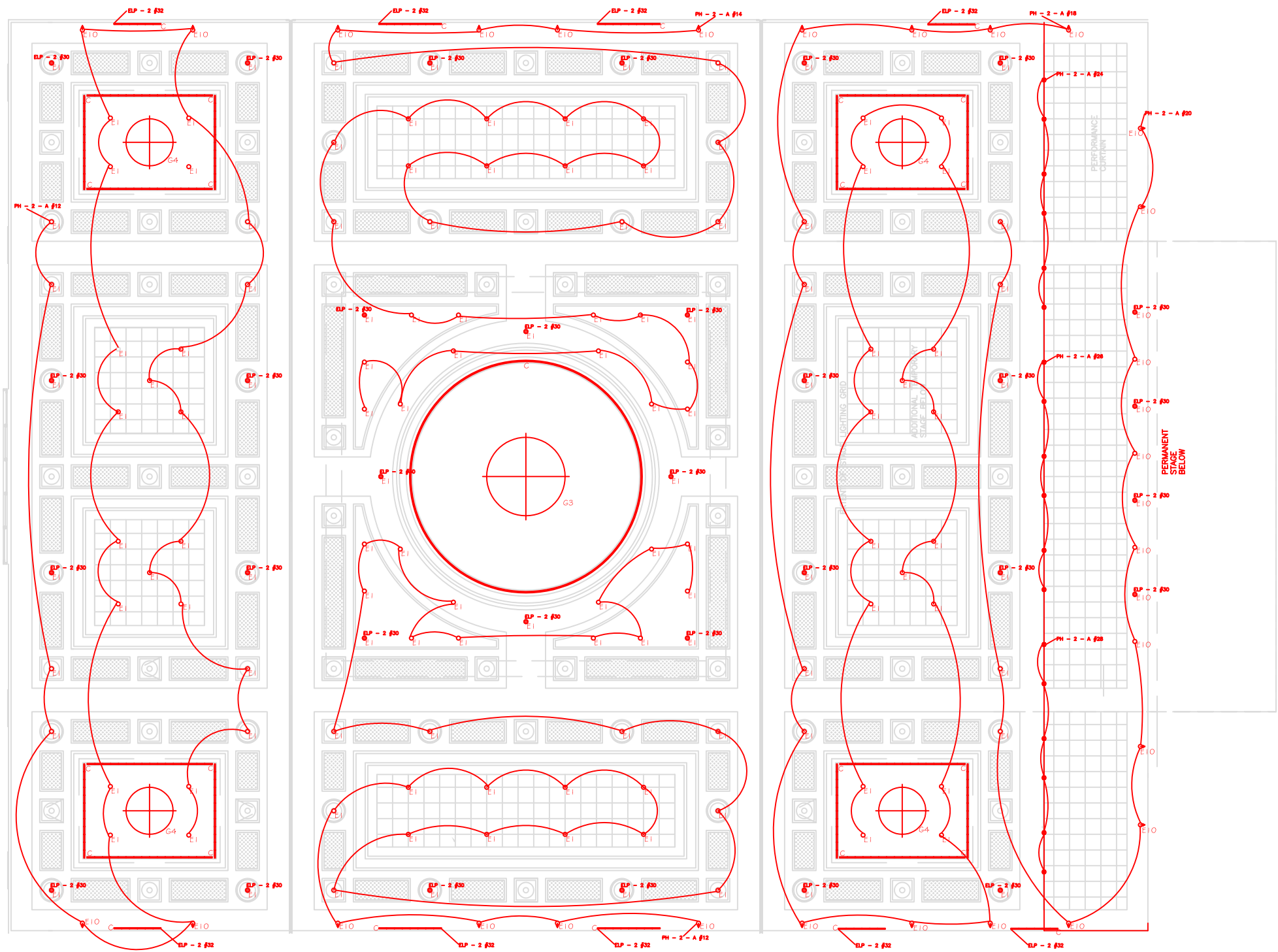
NOTES:

1. LED fixture mounted to wood block with manufacturer's mounting feet and screws. Power supplied from cables behind fixture.

2. Wood block to be installed by contractor; mounted to cove. Details shown below.



DRAWING 1.4.2 LED MOUNTING DETAILS



**DRAWING 1.4.3
PERFORMANCE HALL LIGHTING PLAN**

SCALE: 1/16" = 1' - 0"



1.4.9 RENDERINGS



RENDERING 1.4.1 VIEW OF THE PERFORMANCE HALL FROM STAGE

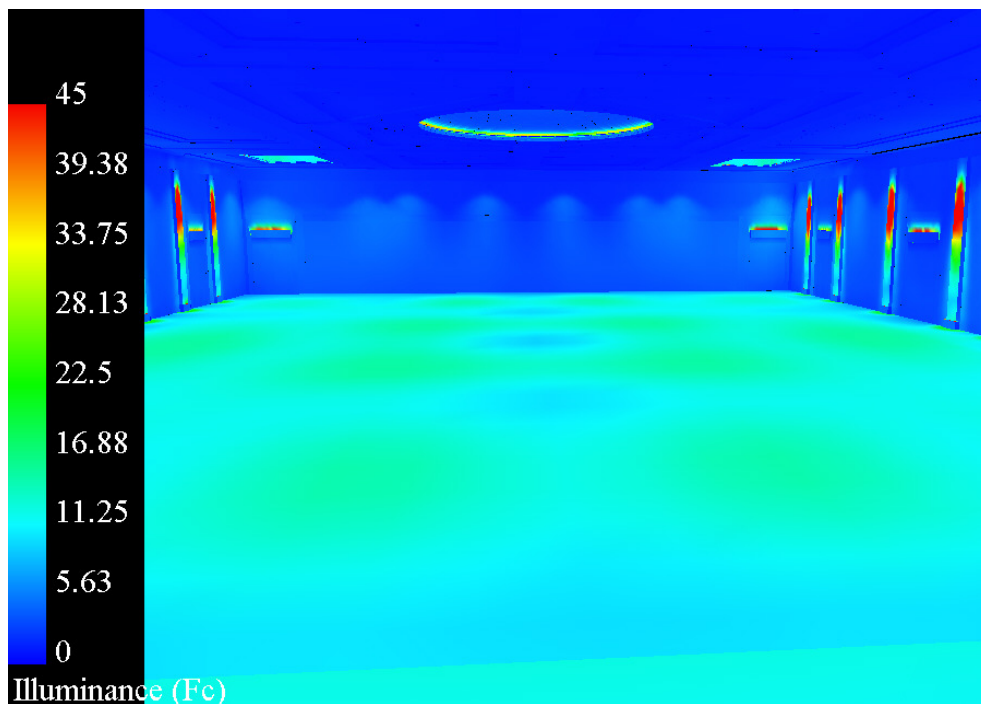
**RENDERING 1.4.2
VIEW OF STAGE FROM OPPOSITE END OF PERFORMNACE HALL**



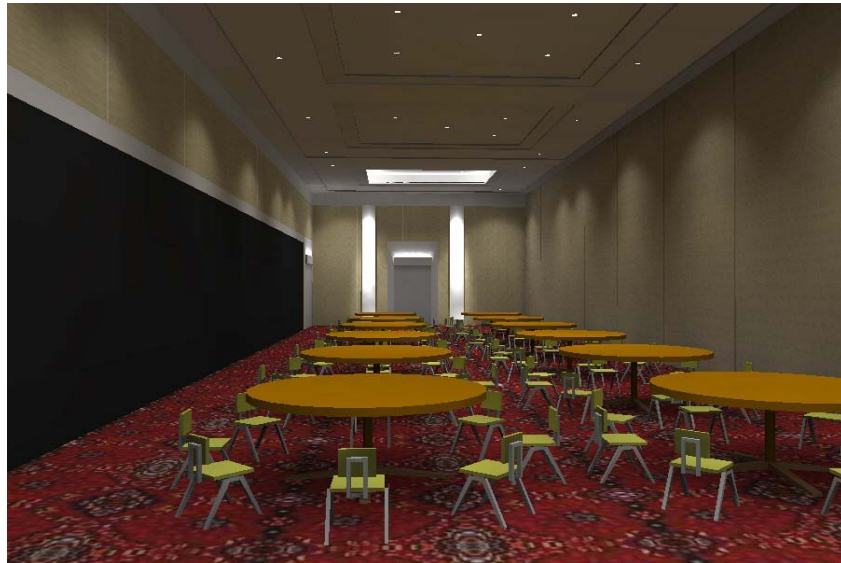


Renderings 1.4.1 and 1.4.2 show the entire performance hall (no space dividers) with no furniture. The columns are highlighted with directional downlights. General light is provided by metal halide downlights. The four ceiling coves in the space and the central dome are each highlighted with continuous rows of LEDs. These LEDs are able to change color but for most uses of the performance hall will remain white light.

The fairly even distribution on the floor of the performance hall can be seen in *Pseudo Color 1.4.1, below*. The illuminance on the floor ranges from approximately 12fc to 16fc, corresponding to the ceiling grid. The ornate ceiling grid limited where downlights could be positioned, but the layout provides decent uniformity.

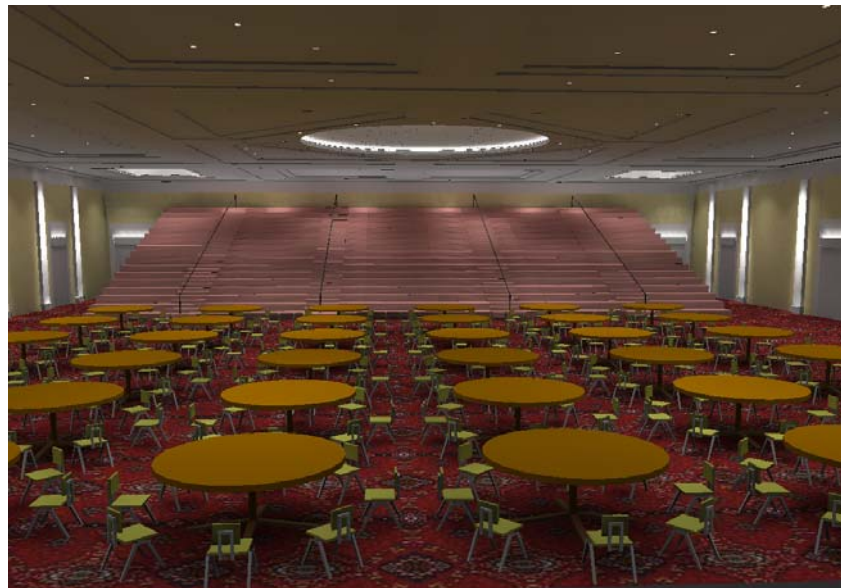


PSUEDO COLOR 1.4.1 PERFORMANCE HALL ILLUMINANCE VALUES

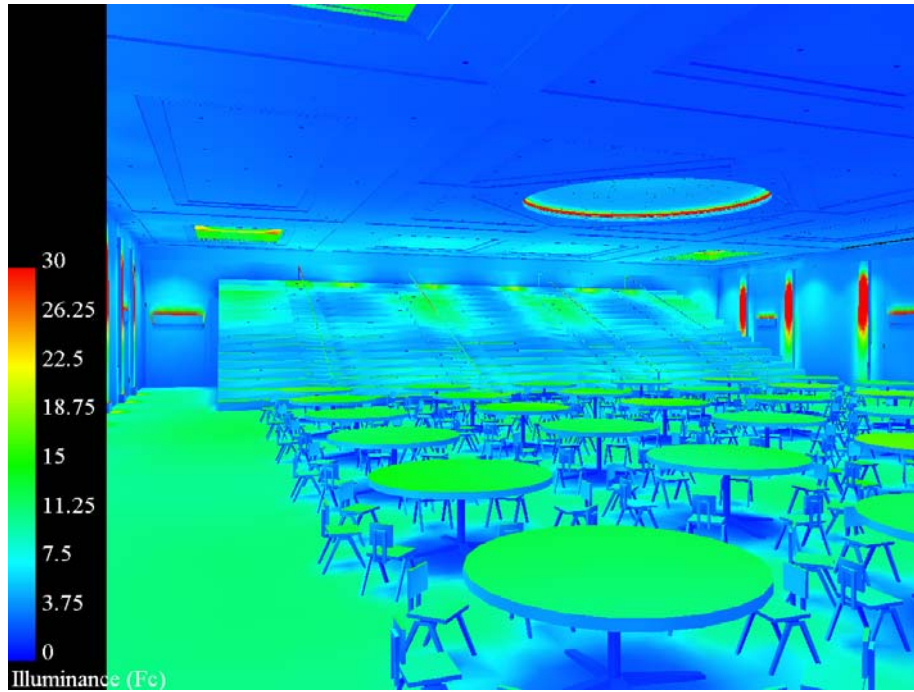


RENDERING 1.4.3

These renderings show two alternate setups of the performance hall. *Rendering 1.4.3* shows the back of the hall with the divider. The location of the dividers was taken into consideration when designing the layout so as to have no hot spots when they were in use. *Rendering 1.4.4* shows the performance hall as it would be for a performance.



RENDERING 1.4.4



PSUEDO COLOR 1.4.2

Psuedo Color 1.4.2 and Rendering 1.4.5 show the even distribution on the tables in the performance hall. It also shows the highlighted columns, coves, the dome, and the space above each door.



RENDERING 1.4.5



1.4.10 CONCLUSION

All goals for the performance hall have been met with this creative lighting design. The design functions well no matter what the set up of the hall. Track spotlighting (*shown in the rendering below*) can be used for events such as boxing matches, comedy acts, and speakers. The architectural elements, including the columns lining the long walls, the rectangular ceiling coves, and the central dome, have been made to stand out as important features of the space. The Rollins Center Performance Hall will make a lasting impression on any guest no matter what brings them to Dover Downs.

