



Half Moone

*Cruise and Celebration Center
Norfolk, Virginia*

Technical Assignment 1

9/29/08

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Lighting/Electrical Option

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<http://www.engr.psu.edu/ae/thesis/portfolios/2009/jcw5009/computerfiles1.html>



Executive Summary

Half Moone Cruise and Celebration Center is designed to enhance the cruise passenger experience and create a large multipurpose space in downtown Norfolk. The lighting design is critical for a successful experience because it must accommodate the various tasks in the building and enhance the architectural form.

Each of the four main spaces I analyzed requires unique design criteria. The Lobby large is a transition space where daylight penetration is acceptable. The Ticket Queuing and Waiting Lounge/Meeting Rooms area must be flexible to accommodate both a terminal setting and a social gathering hall. The Conference Room requires specific controls so that video presentations are clear. Outside the building, the façade should be illuminated in a way that impresses viewers. This façade lighting is especially important because the building is visible from a heavily-used public park and from across a large river.

The existing lighting design meets some of the design criteria, but in general does not meet ASHRAE 90.1 for the allowable power density. Overall, the building's lighting design seems to focus on achieving illuminance values rather than create certain impressions. The exceptions to this generalization are the custom pendant luminaire in the Lobby, various cove lighting systems, and the colored LEDs accenting the supertrusses.



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Lobby




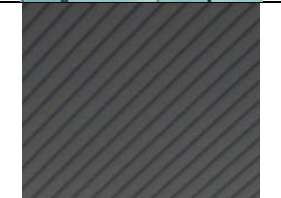

Spatial Overview

The Lobby is the first major room that passengers enter from the Entry Pavilion Bridge. It is approximately 37'-6" high and includes a 54'-2" embedded mermaid image on the terrazzo-finished floor (Figure 1). There are several tiers of finished ceiling stepping up to the highest ceiling point (Figure 3). The windows on the western wall are full-height. Stemming from the Lobby are two Conference Rooms, two exits to an outdoor terrace, and four X-ray stations which lead to the Passageway.

Finishes

Materials in the Lobby contain cool, low saturated colors. The floor is semi-specular, but the other surfaces are mostly diffuse. The lower tier of ceiling has a warm wood finish.

Materials

Floor: Terrazzo Tile – Reflectance 50% (Assumed)			
Walls: Skimcoat plaster over Gypsum Wall Board. Reflectance 70% (Assumed)			
Glass: Transmittance 20% (Assumed)			
Ceiling: Metal finish. Reflectance 10% (Assumed)			
Ceiling Wood: Reflectance 15% (Assumed)			



Plan and Section Drawings

Figure 1 – Lobby Plan

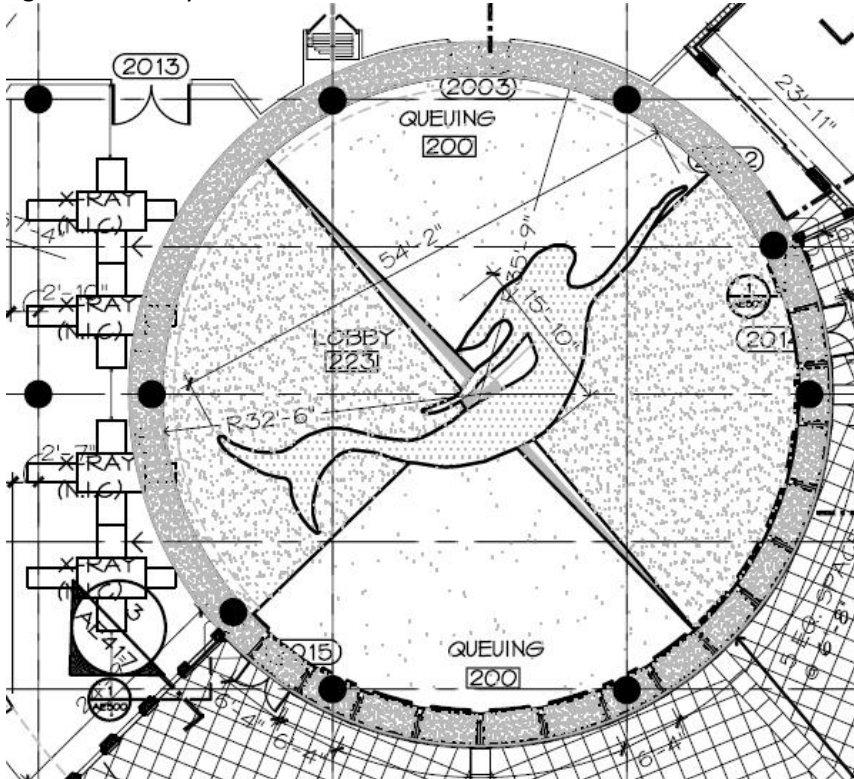




Figure 2 – Lobby Lighting Plan

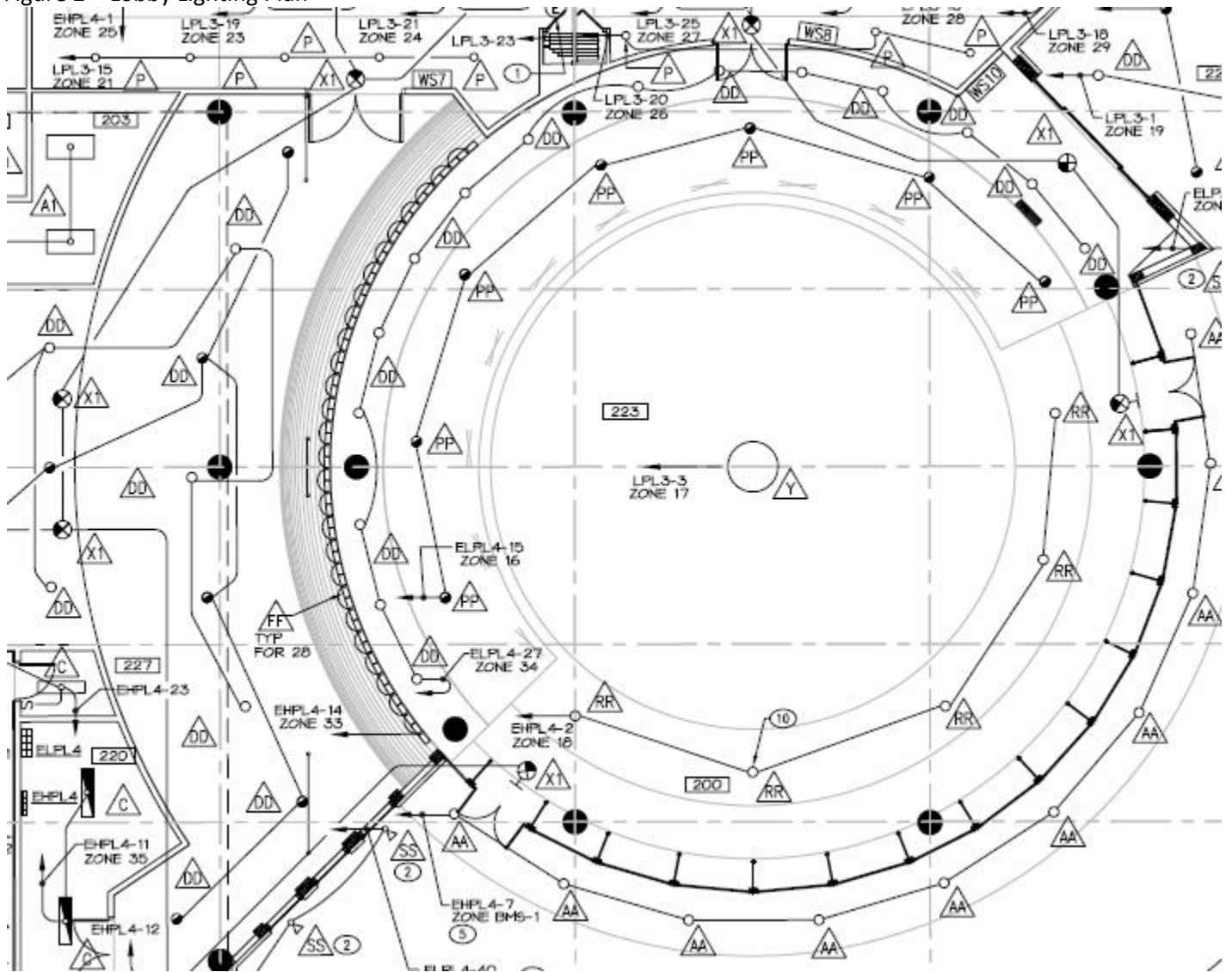
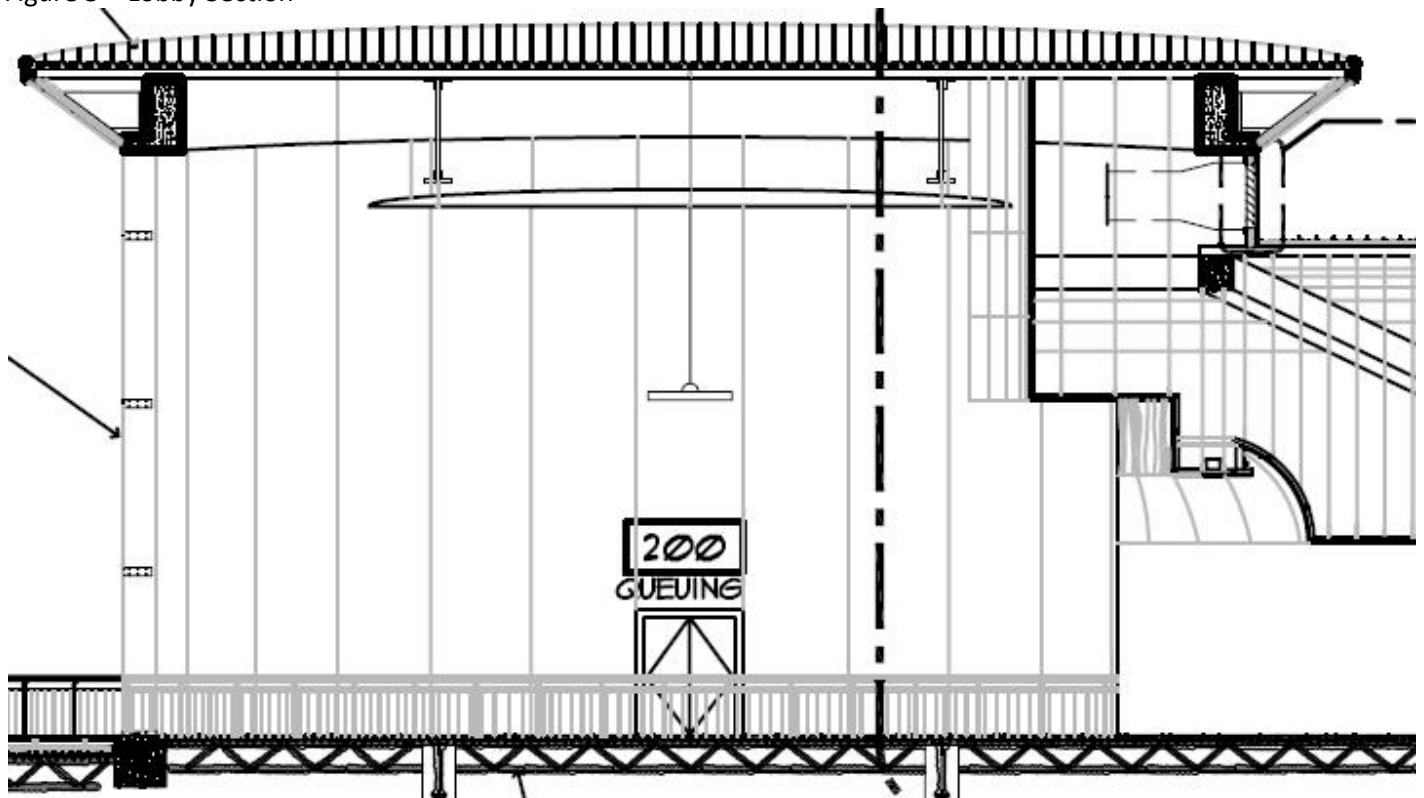




Figure 3 – Lobby Section



Luminaire Schedule

Type	Description	Lamping	Volts	Quantity	Watts*
RR	Pendant Downlight	250W Metal Halide	277	5	295
X1	Edge-lit LED exit	LED	277	4	2
PP	9" Open Downlight	(2) 70W DBL. Quad Compact Fluorescent	120	7	156
DD	9" Open Downlight	(2) 57W DBL. Quad Compact Fluorescent	120	32	128
FF	2' Field-Curvable Seamless Cove Lighting	(1)50W Biax Compact Fluorescent	277	28	54
Y	Custom Glass Pendant	(10)G9 Halogen 40W	120	1	640**

Note: Full Luminaire Schedule attached at the end of the report.

*Watts determined using ballast information from Advance.

**The Custom Glass Pendant has approximately 16 lamps (Assumption).



Light Loss Factors (LLF)

Type	BF	Cleaning	Maintenance	LLD	LDD*	RSDD	LLF
RR	1.0	12 month	IV	0.8	0.89	0.94	0.67
X1	N/A	12 month	N/A	N/A	N/A	N/A	N/A
PP	1.0	12 month	IV	0.9	0.89	0.94	0.75
DD	1.0	12 month	IV	0.92	0.89	0.94	0.77
FF	0.98	12 month	VI	0.9	0.86	0.89	0.68
Y	N/A	12 month	II	1	0.94	0.89	0.83

*Assumes Clean Dirt Condition

Power Density and Illuminance Levels

Total Watts = 8823 W
 Total Square Feet = 6655 SF
 Power Density = 1.33 W/SF

Using the Space-By-Space Method from ASHRAE 90.1
 Lobby: 1.3 W/SF allowable

The existing lighting design does not meet the power density requirements in ASHRAE 90.1. The power was calculated by assuming ballast input watts. Since the calculated value is very close to the allowed, it is possible that the power density is acceptable due to an inaccuracy in calculating square feet or input watts.

Illuminance Levels:

According to the IESNA Handbook Lighting Design Guide:
 Transportation Terminal Waiting Room and Lounge:
 Horizontal: 5fc on work plane
 Vertical: 3fc

Controls

The loads for the lighting in the Lobby are distributed between three Lighting Control Panels. Two are dimming panels and one is a switching panel. All loads have 20A breakers in the panels. There are five circuits and five zones, but each circuit is not its own zone necessarily. Type RR, PP, and DD along the curved ceiling each are on its own circuit. Type FF (cove) is on the same circuit as some DD luminaires above the X-ray machines. All Type DD luminaires above the X-ray machines are all in the same zone. There is one Programmable Wallstation and one Large Button Wallstation which controls 7 zones in this space (Figure 2). Both include a lockable cover.

Performance Considerations and Design Criteria

Illuminance: The Lobby is unique in the building because there is a significant amount of glass. Combined with lightly colored materials, there is potential for high Illuminance values on the workplane. Even though the IES does not recommend high levels of Illuminance, highly reflective materials along with large amounts of southern-facing glass mean that there will be far more Illuminance than required. Since the Lobby is the first space that people enter, it needs to be a transition space in the sense that the light levels need to help the eyes adjust to the interior environment of other spaces in the building. The light levels should be lower than the daylight on the outside. 5 fc on the work plane is recommended.



Luminance: The luminance ratios from the Lobby to the Passageway should be low, even though the Passageway should be appear less bright.

Glare: This means that the Glare should be considered because of the potential for direct sunlight. At night, glare from electrical lights should be minimized.

VDT: There are two flat panel LCD video monitors mounted from the lower wooden ceiling at approximately 10 feet above the floor. It is important to consider Illuminance values on the screen so that the images are clearly visible.

Accent Lighting: There is little need for accenting displays, except perhaps on the northwest wall.

Color Appearance: Color rendering is important.

Psychological Aspects: The space should feel spacious and welcoming. Wall emphasis could be used to make the space feel more spacious, but only at night since the contribution of daylight would render additional electric light practically useless.

Appearance of Space and Luminaires: Sparkle could be used to enhance the feeling of the space. According to the IESNA Handbook, the appearance of the space and luminaires is very important. Since it is a large gathering space where occupants will not spend extended amounts of time reading, direct sunlight penetration is not bad. In fact, it could enhance the space and make it feel large and welcoming. If there were a blind system (which there is not), it could be distracting from how the space should feel. The glass wall provides some shielding simply by its transmittance value. This makes the sky, clouds and water seem darker and bluer.

Controls: It is important for the space to have controlled zones because not all electric lights need to be on all the time. There must be at least two control devices in this space since it is less than 10,000 SF (ASHRAE 90.1).

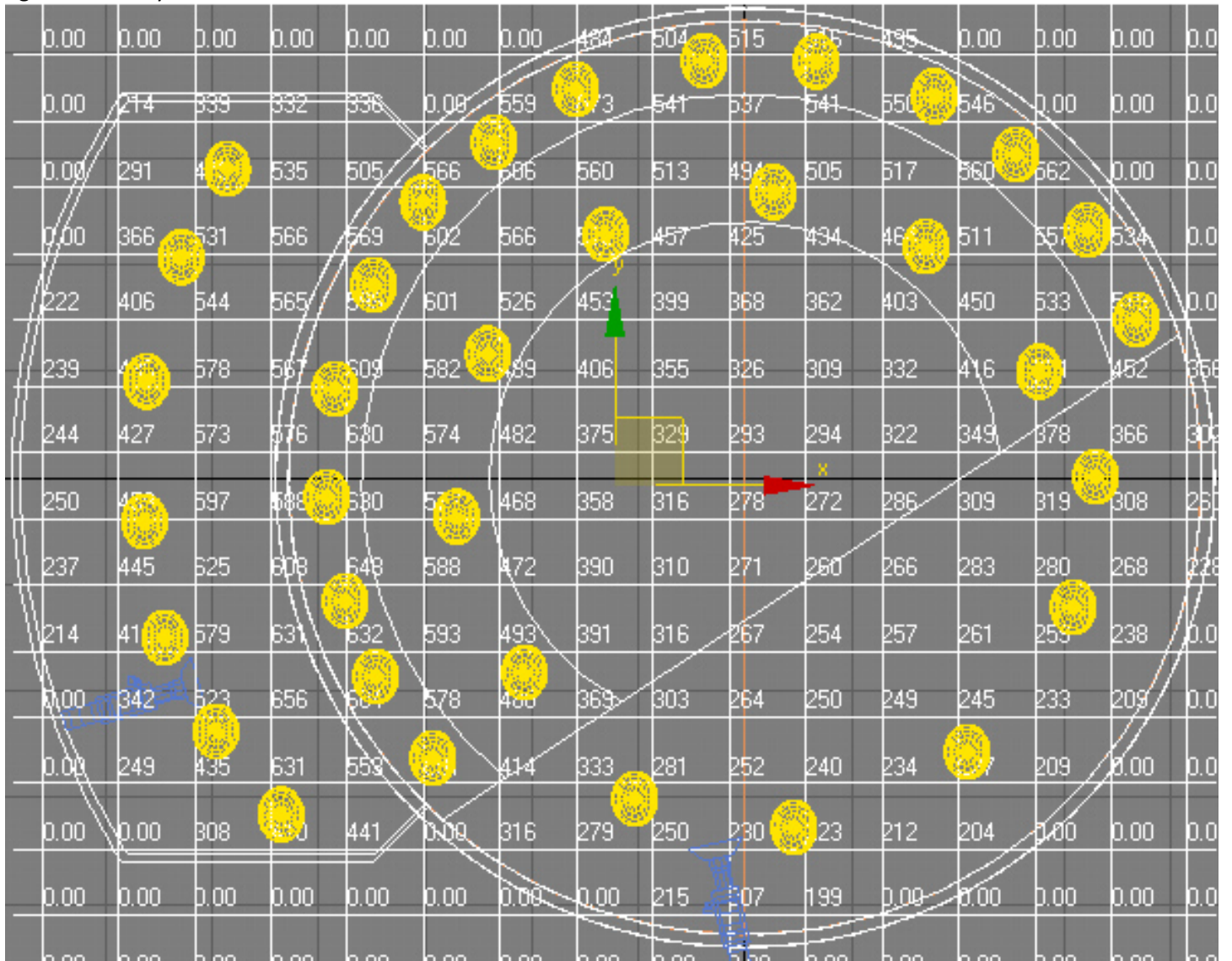
Power Allowance: According to ASHRAE 90.1, 1.3 W/SF is the maximum allowable.

Evaluation of Existing Lighting System:

The Lobby has far more footcandles than necessary, but because it is a large gathering and transition space, the Illuminance levels are acceptable (Figure 4). The large custom luminaire avoids too much glare because of its mounting height and size. Instead, this luminaire adds to the overall feel of the space with its sparkle. While there is no electric accent lighting, the sun illuminates the space unevenly. This is acceptable because people will not spend much time in this space during the day, and it is unlikely that any discomfort will occur while reading since it is a circulation and gathering space. Figures 5,6 and 7 show renderings of the space.



Figure 4 – Lobby Illuminance



Illuminance values are indicated in lux.



Figure 5 – Lobby Rendering

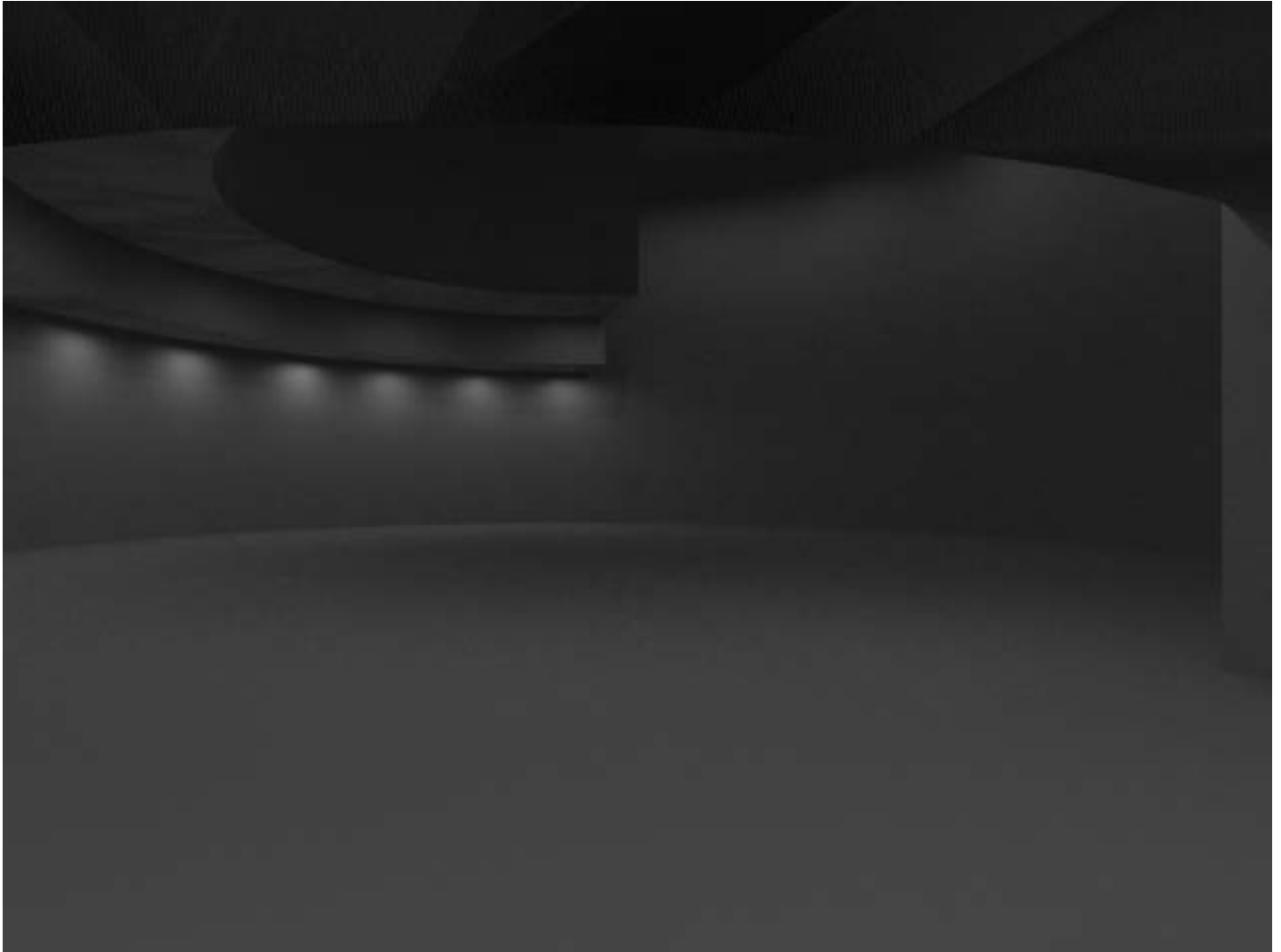


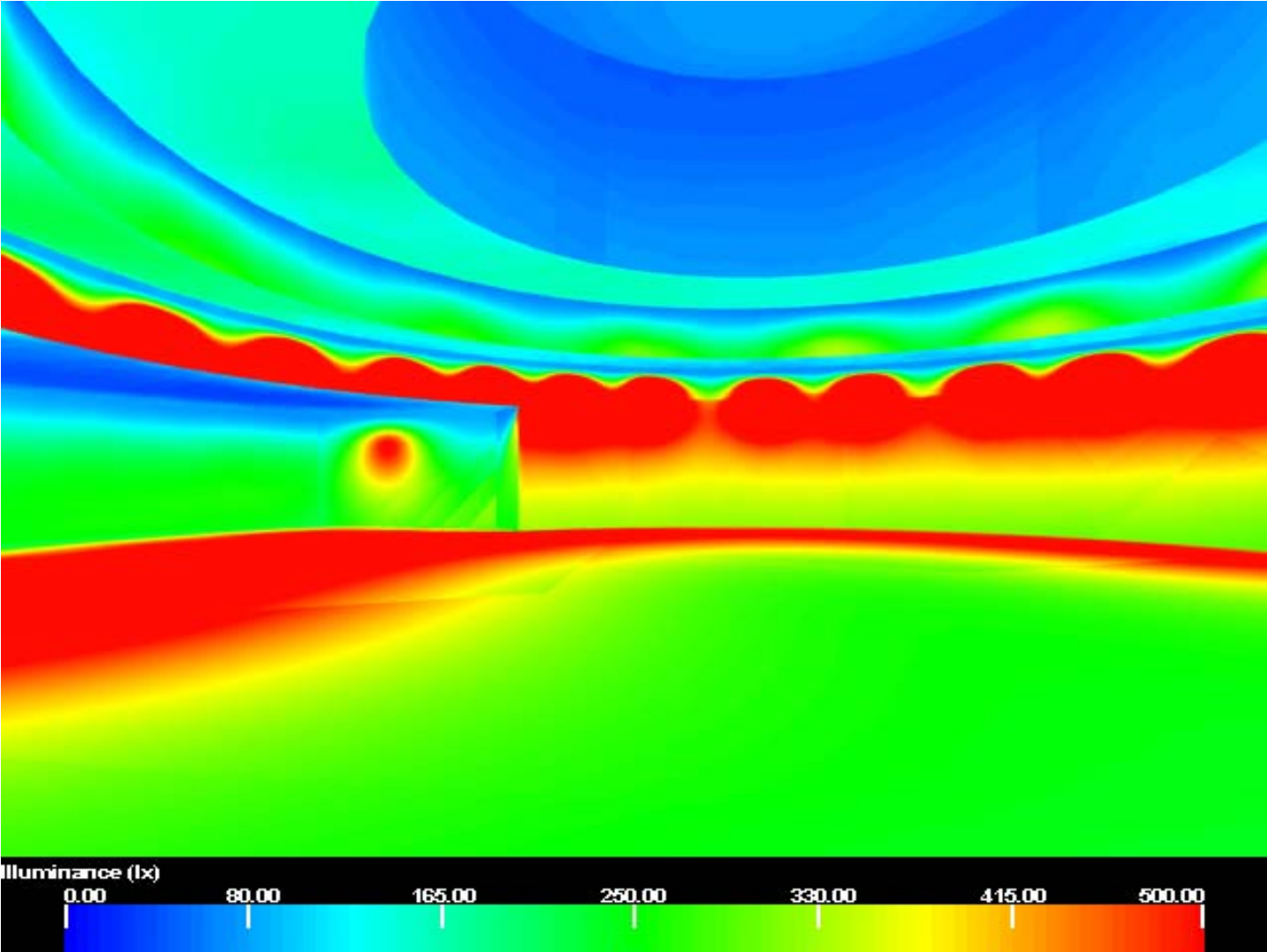


Figure 6 – Lobby Rendering





Figure 7 – Lobby Pseudo Color Rendering





Ticket Queuing and Waiting Lounge/Meeting Rooms


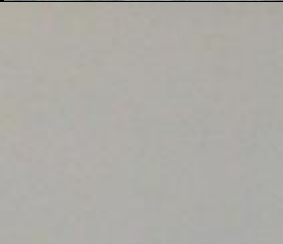


Spatial Overview

This space is one architectural space, despite two separate room numbers. It is 11,563 square feet and is approximately 23'-4" high, though the exposed steel trusses are curved, increasing the height in the spaces center (Figure 8, 11, 12). The northern curtain wall of windows is approximately 16'3" high. During a cruise event, the main purpose of this space is to form queues to the Mobile Ticket Counters and provide a waiting lounge area. During non-cruise special events, the space is used as a ballroom and social gathering area.

Finishes

The materials in the Ticket Queuing and Waiting Lounge/Meeting Rooms space are relatively light colored, including the floor. The wood panel system on the wall which leads to the Passageway is the darkest main material in the space. The ceiling is light-painted, ribbed metal.

Materials

<p>Floor: 2' carpet tiles and is a light blue-gray color. Reflectance: 45% (Assumed)</p>			
<p>Walls: Light tan color. Reflectance: 65% (Assumed)</p>			
<p>Wood Wall: Reflectance: 15% (Assumed)</p>			
<p>Ceiling: Reflectance: 80% (Assumed)</p>			



Plan and Section Drawings

Figure 8 – Ticket Queuing and Waiting Lounge/Meeting Rooms Plan

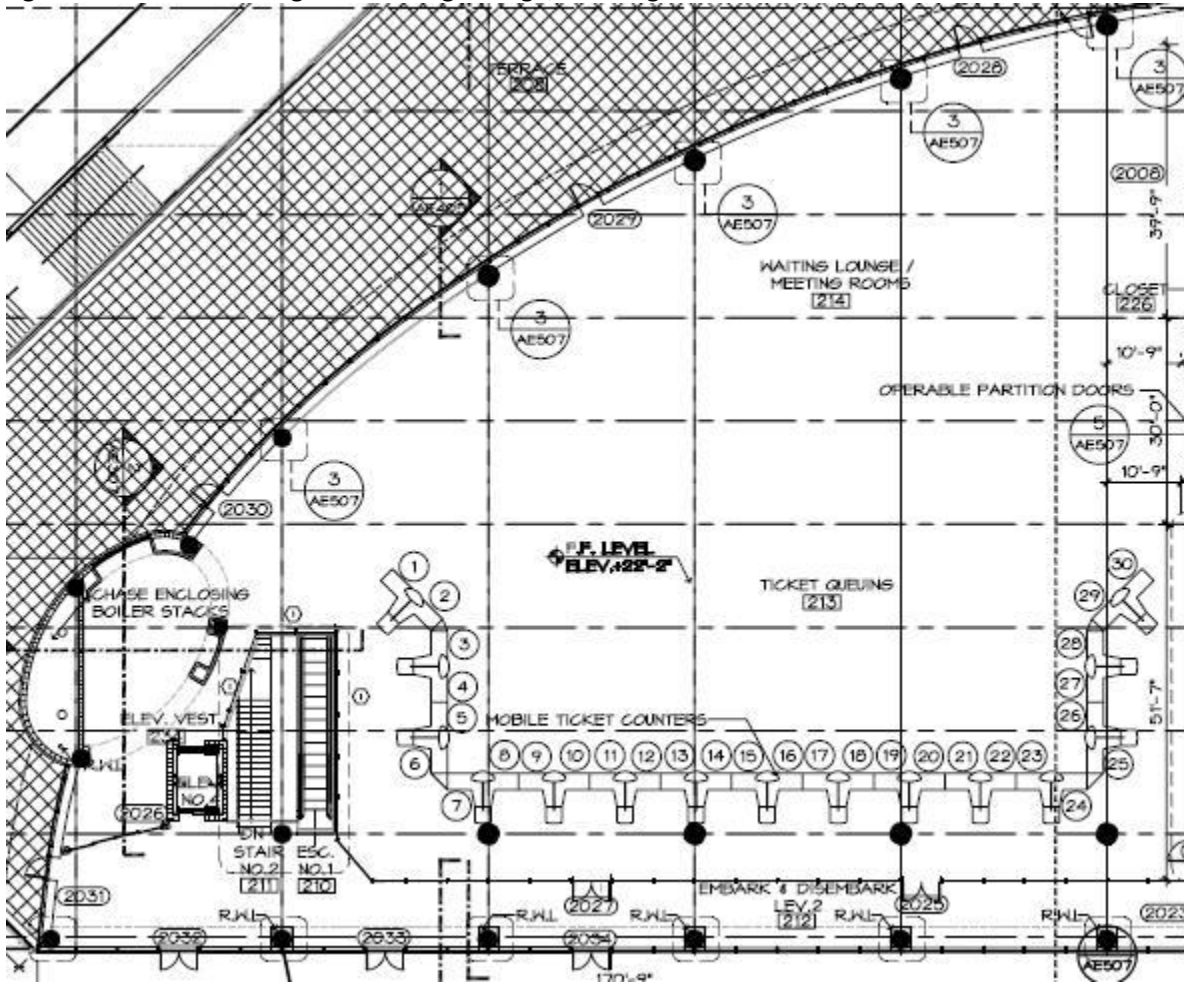




Figure 9 - Ticket Queuing and Waiting Lounge/Meeting Rooms Lighting Plan

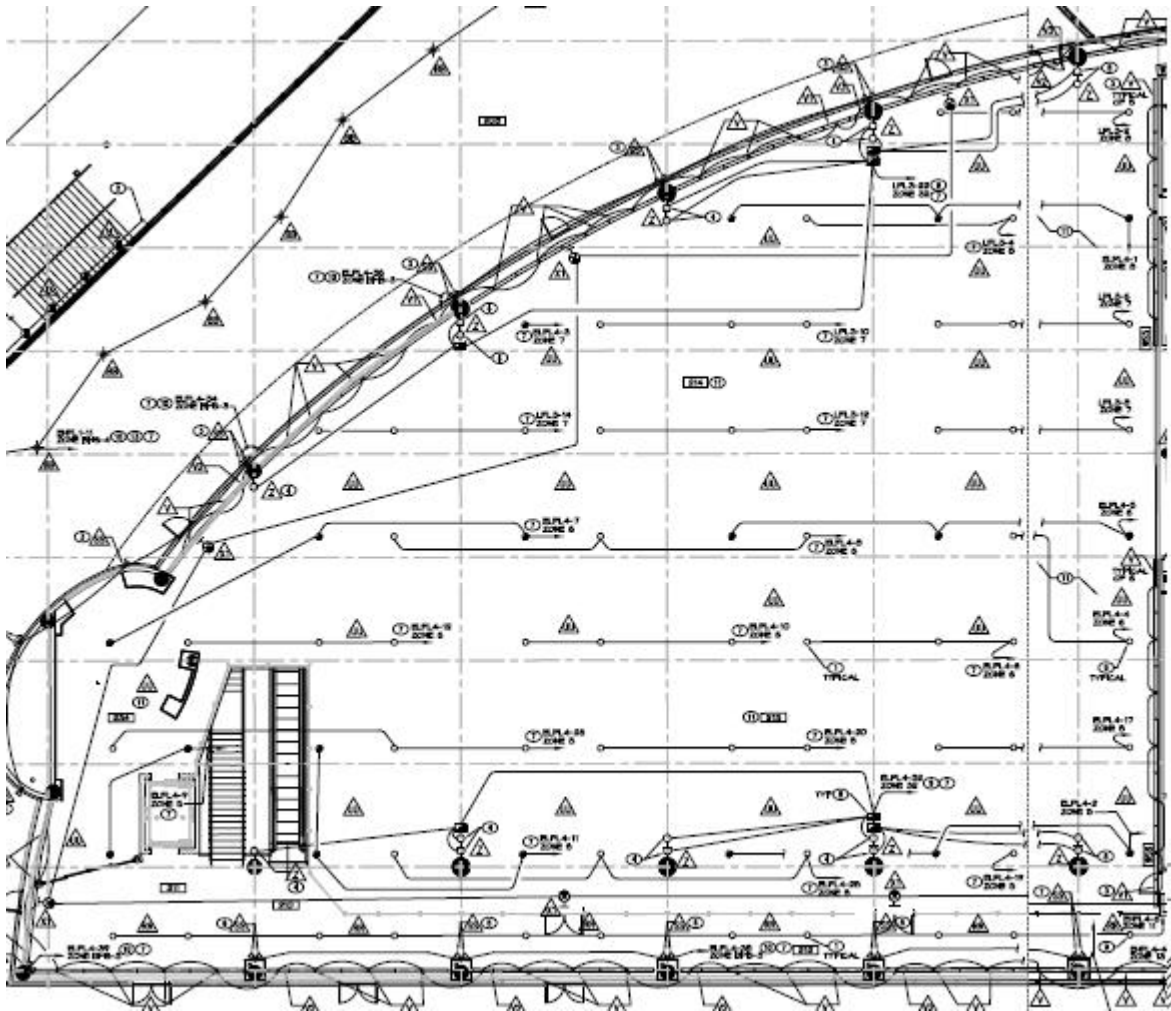




Figure 10 - Ticket Queuing and Waiting Lounge/Meeting Rooms Lighting Plan

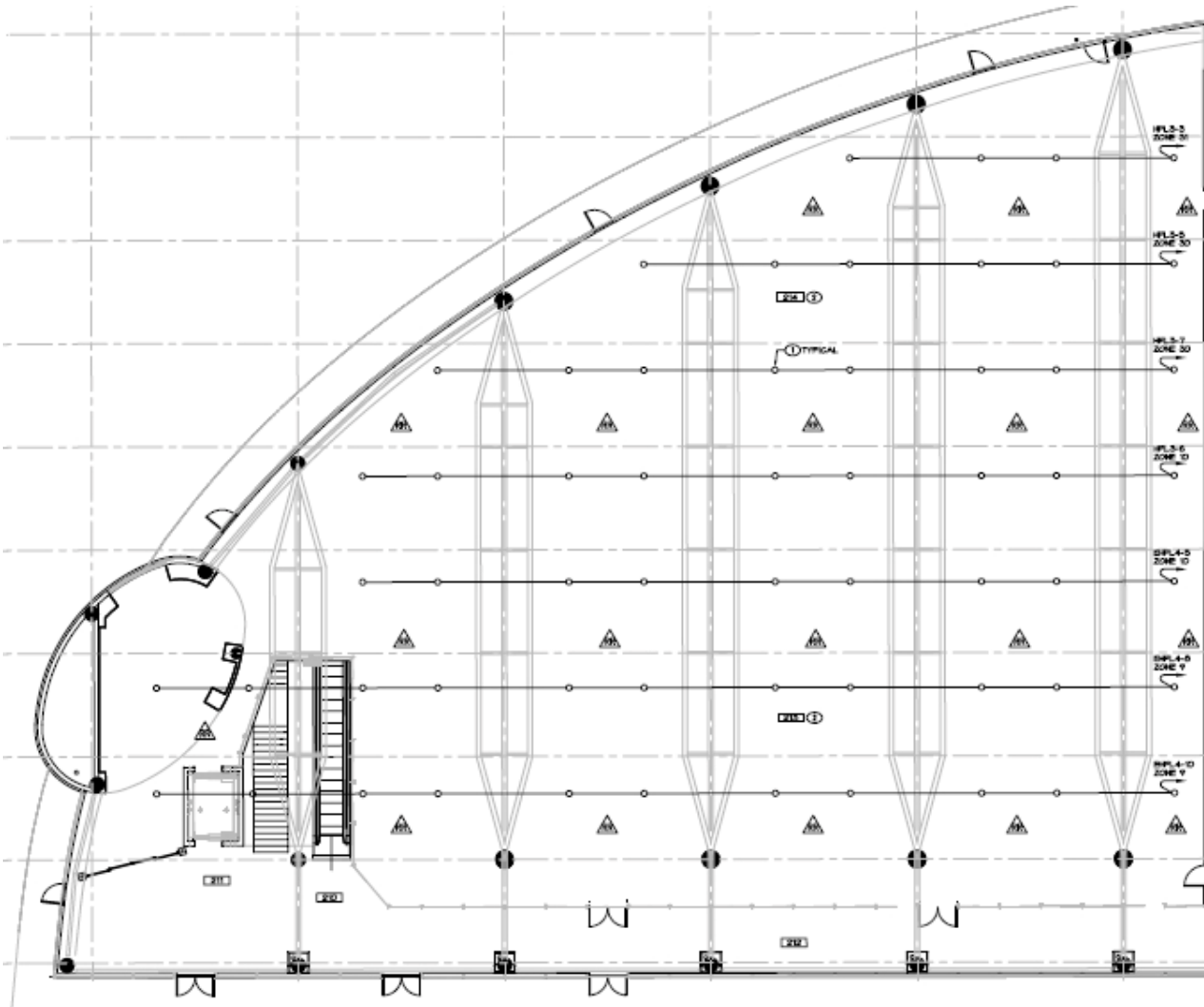


Figure 11 - Ticket Queuing and Waiting Lounge/Meeting Rooms Section

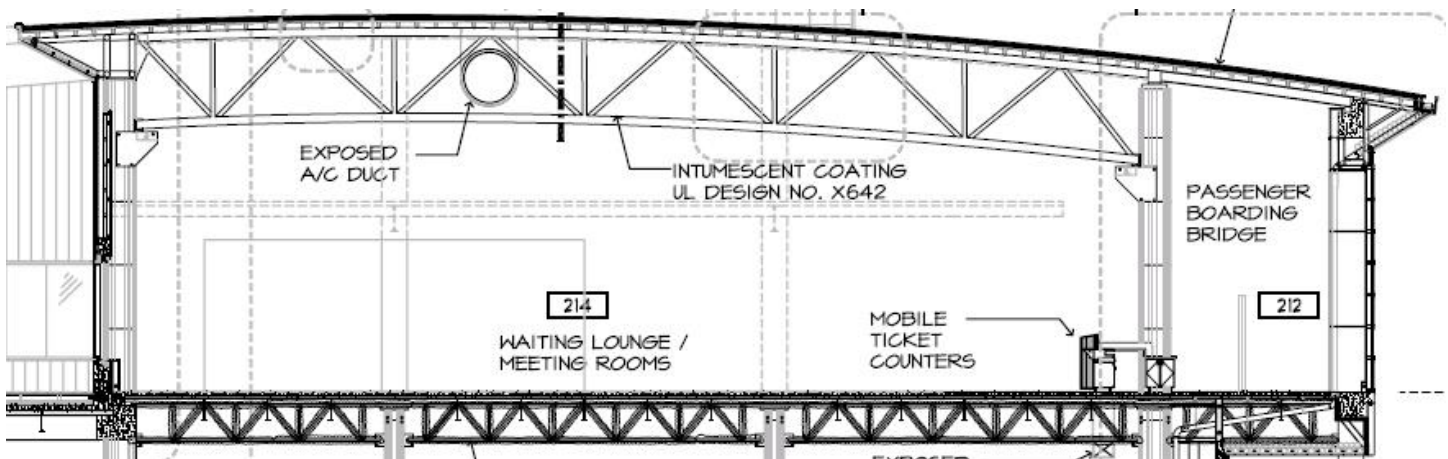
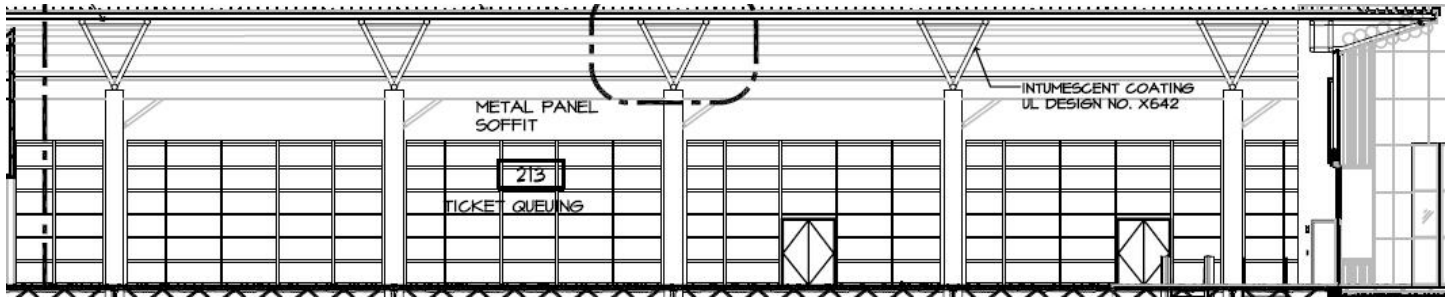




Figure 12 - Ticket Queuing and Waiting Lounge/Meeting Rooms Section



Luminaire Schedule

Type	Description	Lamping	Volts	Quantity	Watts*
V	8' Staggered Single Lamp Strip	(2)32W T8	277	49	61
V1	4' Staggered Single Lamp Strip	(1)32W T8	277	3	36
V2	3' Staggered Single Lamp Strip	(1)25W T8	277	6	27
V3	2' Staggered Single Lamp Strip	(1)17W T8	277	2	16
RR	Pendant Downlight	250W Metal Halide	277	69	295
SS	1 Lamp Par Wide Floodlight	(1)300W Par-56	120	12	300
UU	Pendant Downlight	(1)500W T-4 Quartz	120	64	500
Z	Multi-Color Wallwasher	LED	120	18	97
X1	Edge-lit LED exit	LED	277	7	2

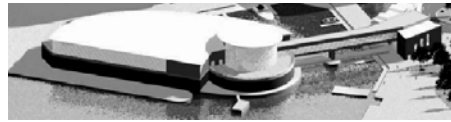
Note: Full Luminaire Schedule attached at the end of the report.

*Watts determined using ballast information from Advance.

Light Loss Factors (LLF)

Type	BF	Cleaning	Maintenance	LLD	LDD*	RSDD	LLF
V	1.01	12 month	VI	0.95	0.86	0.89	0.73
V1	1.03	12 month	VI	0.95	0.86	0.89	0.75
V2	1.05	12 month	VI	0.92	0.86	0.89	0.74
V3	0.97	12 month	VI	0.93	0.86	0.89	0.69
RR	1.0	12 month	IV	0.8	0.89	0.94	0.67
SS	N/A	12 month	IV	1	0.89	0.97	0.86
UU	N/A	12 month	IV	1	0.89	0.97	0.86
Z	N/A	12 month	VI	1	0.86	0.89	0.77
X1	N/A	12 month	N/A	N/A	N/A	N/A	N/A

*Assumes Clean Dirt Condition



Power Density and Illuminance Levels

Total Watts = 61,006 W
Total Square Feet = 15,572 SF
Power Density = 3.92 W/SF

Using the Space-By-Space Method from ASHRAE 90.1
Conference/Meeting/Multipurpose Room: 1.3 W/SF allowable

The existing lighting design does not meet the power density requirements in ASHRAE 90.1. The existing design exceeds the allowed power density by a factor of 3.

Illuminance Levels:

According to the IESNA Handbook Lighting Design Guide:

Transportation Terminal Waiting Room and Lounge:

Horizontal: 5fc on work plane

Vertical: 3fc

Transportation Terminal Ticket Counters:

Horizontal: 50 fc on work plane

Vertical: 30 fc

Controls

The luminaires in this space are powered by four Lighting Control Panels and are on a total of 37 circuits. Two of the four panels are designated emergency panels. Two are High Power (480Y/277V) and two are Low Power (208Y/277V). All of the Lighting Control Panels tie into the Lighting Control Processor Panel in Room 136. The Color Kinetics LED luminaires are powered and controlled by various Power/Data supply boxes mounted where the truss and column meet. One of the building's several Programmable Wallstations is located in this space and controls 13 zones including the LEDs which are all on one zone. In addition, this space includes two Large Button Wallstations. All Wallstations in this space have a lockable cover (Figure 9, 10).

Performance Considerations and Design Criteria

Illuminance: Because this space is a multipurpose area, the potential Illuminance needs to be higher than a typical Terminal Waiting Room. It could be used more as a Meeting Conference Room, in which case the Horizontal Illuminance criterion is 30 fc. While used for a Terminal Waiting Room, the Horizontal Illuminance should be 5 fc.

Luminance: It is important that there are no accidental light scallops on the walls because this variation of luminances is distracting.

Glare: Because of the building orientation, dimensions of the space and window height, glare consideration due to the sun are not critical. From electric light, it is more critical that there is minimal glare near the Ticket Counter area.

VDT: VDT criteria should be considered for the mounting of flat panel LCD video displays on columns. It is important that the VDTs have a diffuse screen.



Accent Lighting: Wall emphasis can enhance the space.

Color Appearance: The wooden wall will look the best under warm CCT. High CRI is important because there will be lots of face-to-face communication.

Psychological Aspects: The space should feel spacious since many people will occupy the area at once. To create a pleasant environment, non-uniform lighting and wall emphasis should be used.

Appearance of Space and Luminaires: The space should be able to accommodate the look and feel of a dance hall at one event and a Transportation Terminal Waiting Room during the next building use.

Controls: It is important for the space to have controlled zones because not all electric lights need to be on all the time. There must be at least one control device in this space since it is greater than 10,000 SF (ASHRAE 90.1).

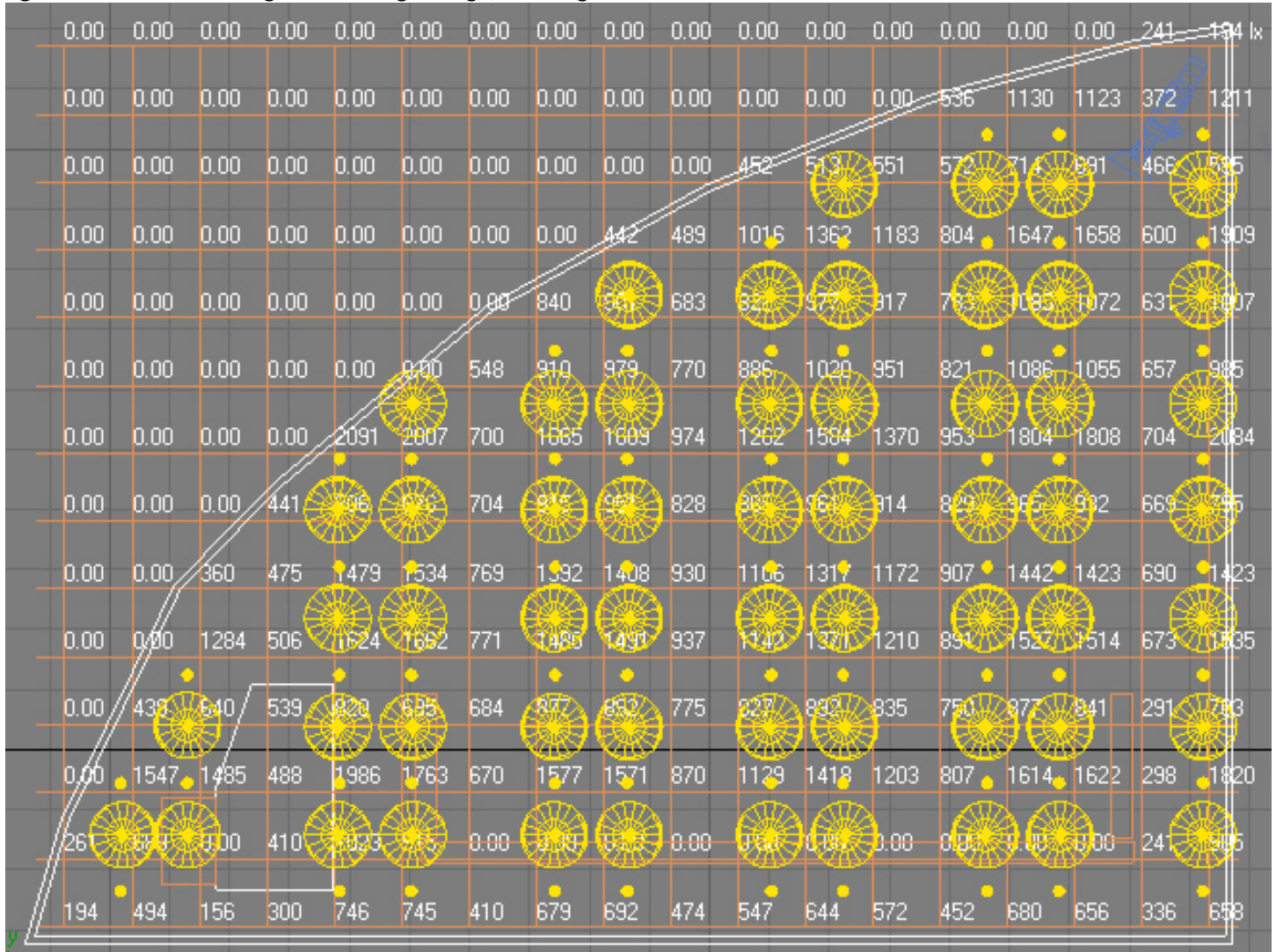
Power Allowance: According to ASHRAE 90.1, 1.3 W/SF is the maximum allowable.

Evaluation of Existing Lighting System:

According to the computer models, this space receives more than 75fc when all the lights are on (Figure 13 and 14). This is more light than is necessary since the recommended Illuminance is 30fc. At 50fc, the Illuminance level is sufficient on the Ticket Counter work plane. There are some distracting light scallops on the walls, which detract from the overall appearance of the space (Figure 15 and 16). The existing lighting illuminates the walls sufficiently, and the colored LEDs enhance the space, especially during social events. The LEDs, however, could be improved because there is glare potential from the existing design. The downside is that the power density is much higher than allowed by ASHRAE 90.1. Even if there were only Luminaire Type UU's in the space, the power density would still exceed that allowed by ASHRAE 90.1.



Figure 13 - Ticket Queuing and Waiting Lounge/Meeting Rooms Illuminance



Illuminance values are indicated in lux.



Figure 14 - Ticket Queuing and Waiting Lounge/Meeting Rooms Rendering

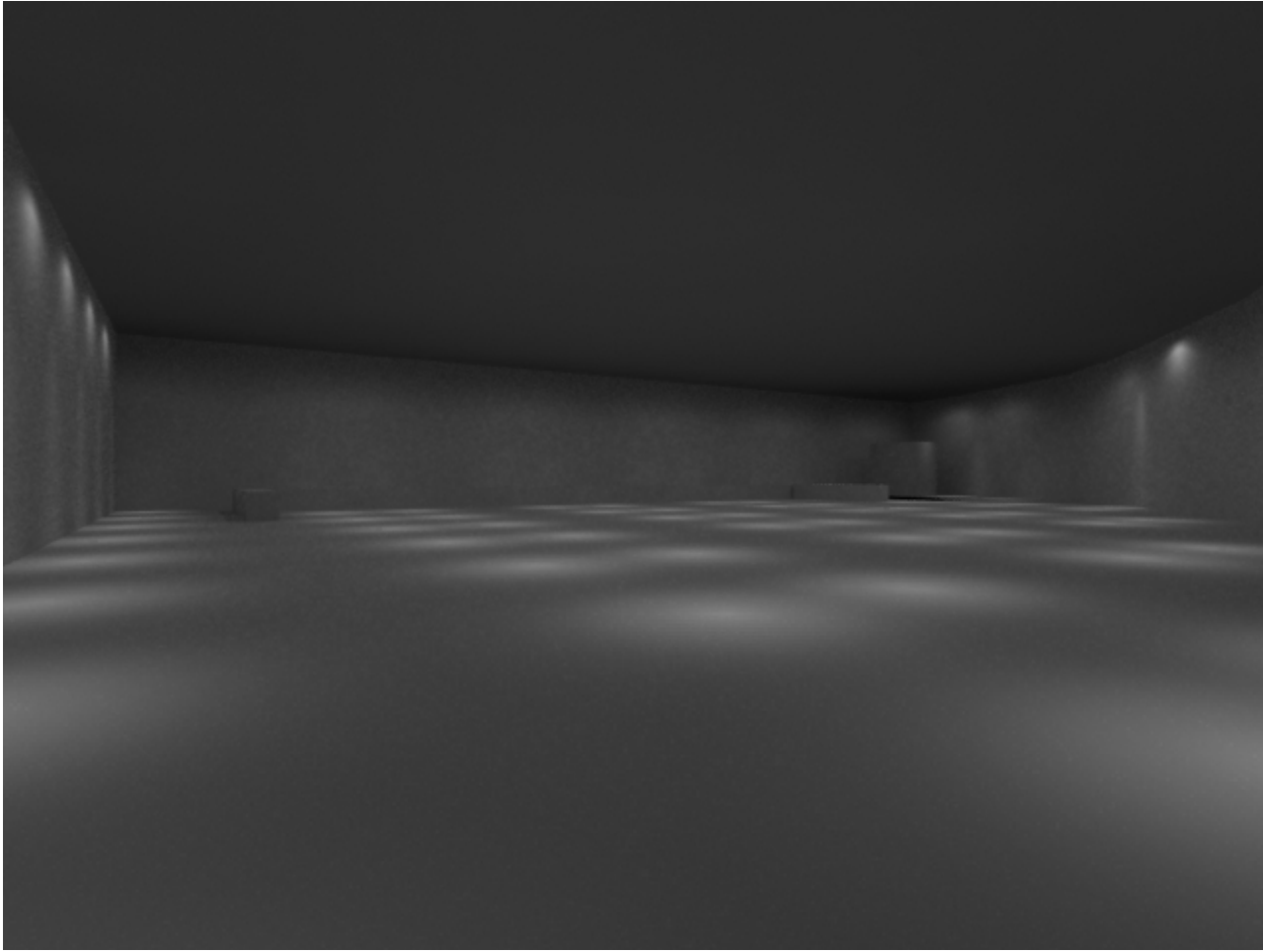




Figure 15 - Ticket Queuing and Waiting Lounge/Meeting Rooms Pseudo Color Rendering

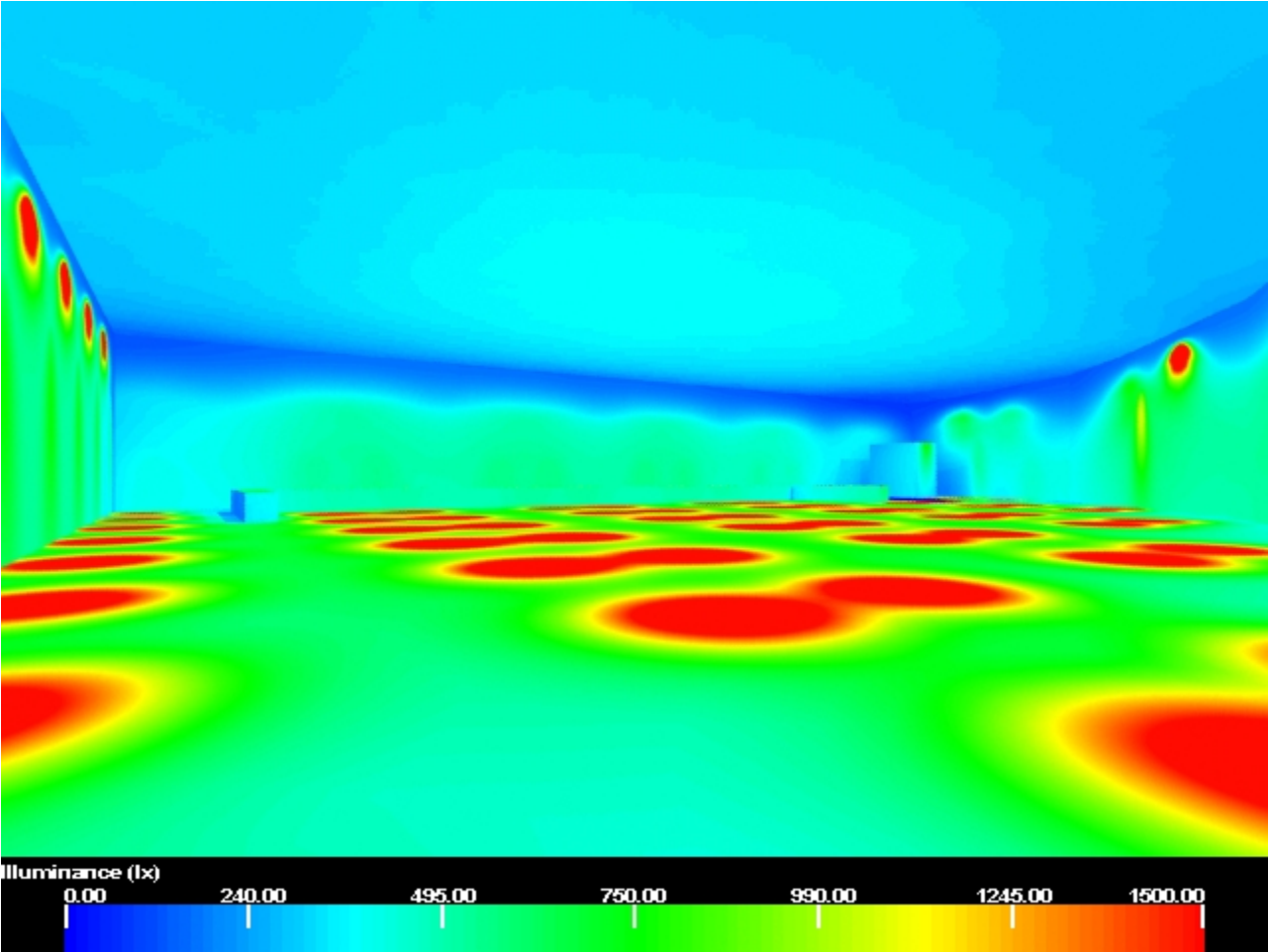
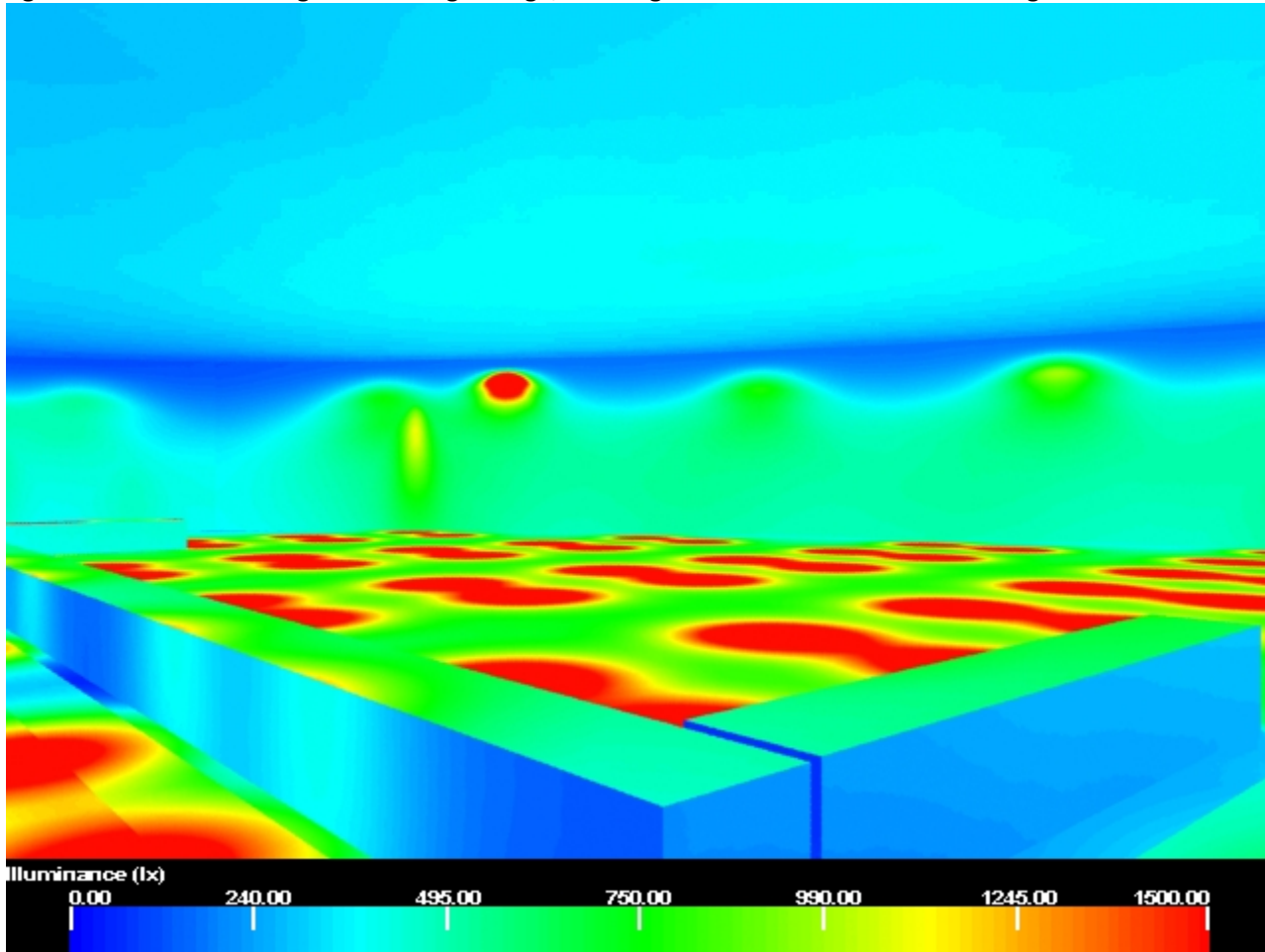




Figure 16 - Ticket Queuing and Waiting Lounge/Meeting Rooms Pseudo Color Rendering





Conference Room #2

Spatial Overview

This space is connected to Conference Room No. 1 (Room 201) when the folding partition is retracted. There is a continuous row of windows lining the curved exterior wall, and the ceiling height is 15'-3". There is a ceiling-mounted projector aimed to the ceiling-mounted retractable screen on the north wall (Figure 17).

Finishes

The materials in Conference Room #2 are low saturated and neutral colors. Dark, moveable wooden tables, desks and chairs are present throughout the space. The carpet is the same as in the Ticket Queuing and Waiting Lounge/Meeting Rooms.

Materials

<p>Floor: 2' carpet tiles and is a light blue-gray color. Reflectance: 45% (Assumed)</p>			
<p>Walls: Light tan color. Reflectance: 47% (Assumed)</p>			
<p>Wood Tables: Reflectance: 15% (Assumed)</p>			
<p>Ceiling: Reflectance: 80% (Assumed)</p>			



Plan and Section Drawings

Figure 17 – Conference Room Plan

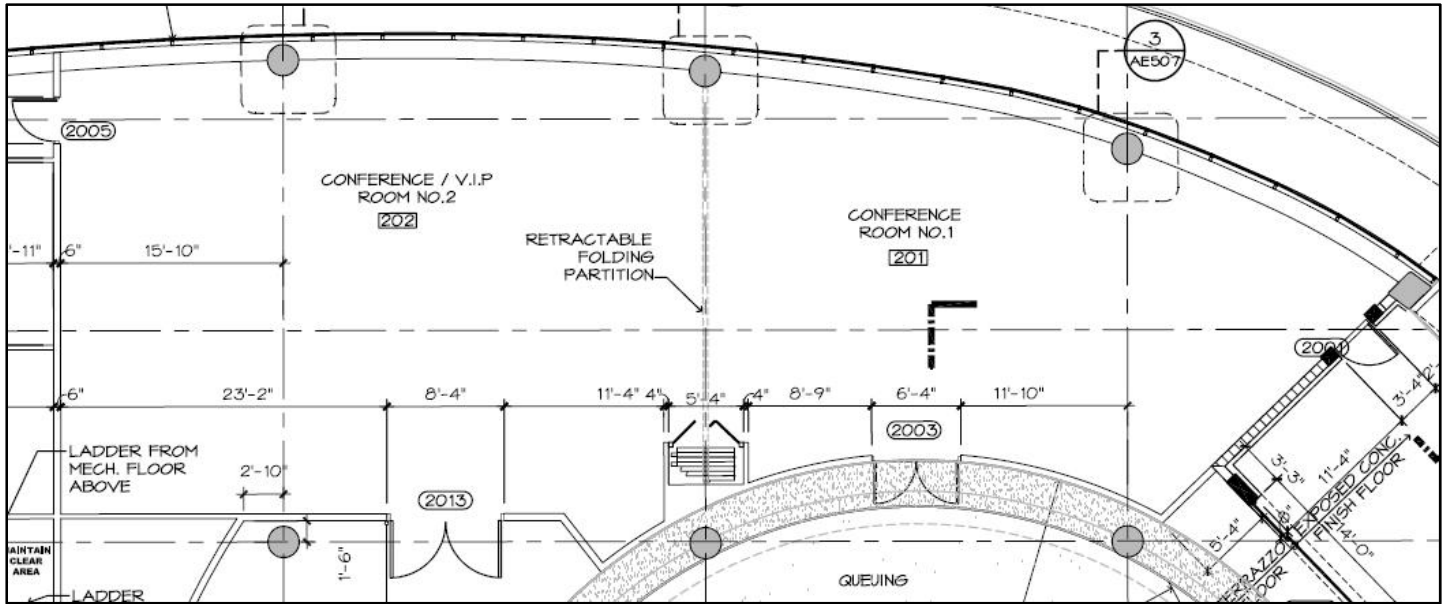
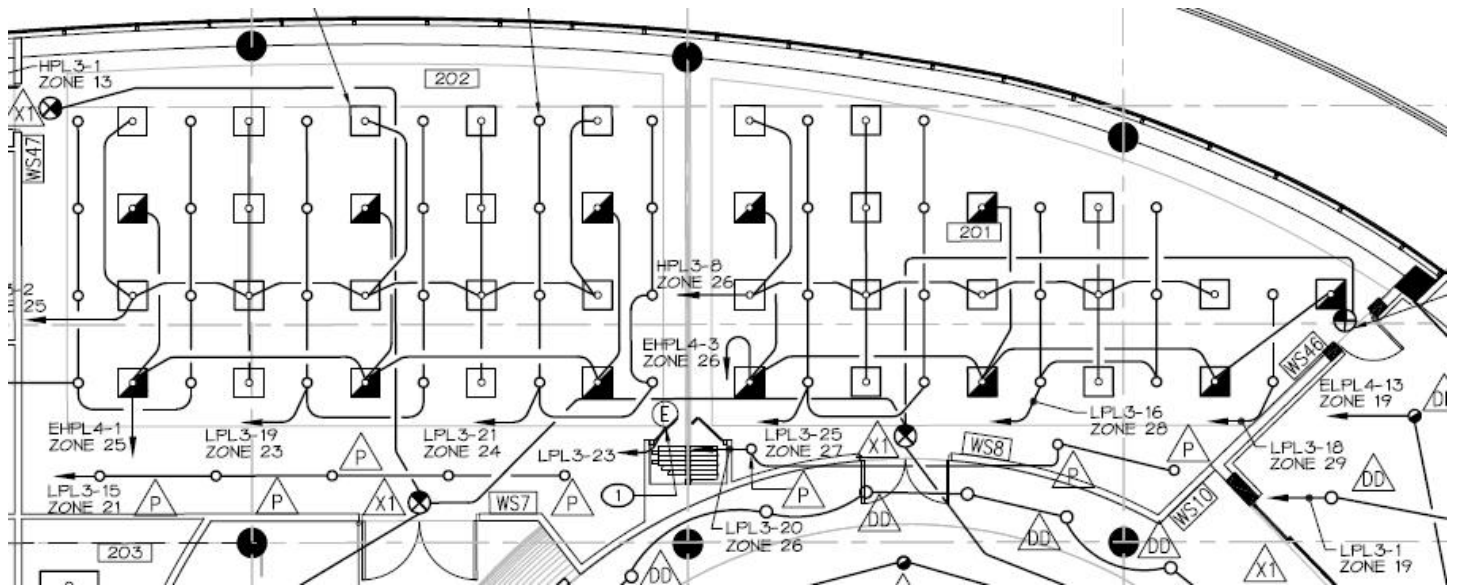


Figure 18 – Conference Room Lighting Plan





Luminaire Schedule

Type	Description	Lamping	Volts	Quantity	Watts*
P	8" Diameter – 1 Lamp Incandescent Downlight with Black Baffle	(1)200W Incandescent	120	48	200
EE	2'x2' 2 Lamp Direct/Indirect Troffer	(2)50W Biax Compact Fluorescent	277	37	106
X1	Edge-lit LED exit	LED	277	7	2

Light Loss Factors (LLF)

Type	BF	Cleaning	Maintenance	LLD	LDD*	RSDD	LLF
P	N/A	12 month	IV	1	0.89	0.97	0.86
EE	0.98	12 month	II	0.9	0.94	0.93	0.77
X1	N/A	12 month	N/A	N/A	N/A	N/A	N/A

*Assumes Clean Dirt Condition

Power Density and Illuminance Levels

Total Watts = 13,522 W
 Total Square Feet = 2,542 SF
 Power Density = 5.32 W/SF

Using the Space-By-Space Method from ASHRAE 90.1
 Conference/Meeting/Multipurpose Room: 1.3 W/SF allowable

The existing lighting design does not meet the power density requirements in ASHRAE 90.1. The existing power density is four times higher than allowed.

Illuminance Levels:
 According to the IESNA Handbook Lighting Design Guide:
 Meeting Conference Room:
 Horizontal: 30 fc on work plane
 Vertical: 5 fc

Controls

The luminaires in this space are powered by three Lighting Control Panels and are on a total of 13 circuits. One of the panels is designated an emergency panel. One is High Power (480Y/277V) and one is Low Power (208Y/277V). All of the Lighting Control Panels tie into the Lighting Control Processor Panel in Room 136. Five of the nine zones are controlled by a Programmable Wallstation and a Large Button Wallstation in the Conference Room #2 in Room 202. The other four zones have the same controls and are in Conference Room #1 in Room 201 (Figure 18).

In addition, there is a Contact Closure Interface to control Audio/Video Equipment in Room 202. There is also a Partition Sensor Blackbox in each room.



Performance Considerations and Design Criteria

Illuminance: The lighting system must accommodate various tasks that take place in a conference room. The IES Handbook recommends 30 fc on the workplane and 5 fc for vertical illuminance.

Luminance: There should be a blinds system which reduces luminance ratios from the outside objects compared to inside surfaces.

Glare: It is important that there is minimal glare from daylight and luminaires.

VDT: It is recommended that there be no more than 5 fc of vertical illuminance on the Overhead Screen. The conference is not equipped for video conferencing. Veiling reflections of highly luminous objects are problematic for laptop screens and should be avoided.

Accent Lighting: Accent lighting should be used to highlight various displays on the walls.

Color Appearance: The space should have a high CRI. The dark wood furniture will look best under a warm CCT.

Psychological Aspects: Peripheral lighting emphasis is needed to help create an impression of pleasantness and assist with visual clarity.

Appearance of Space and Luminaires: Conference Room #1 and #2 need to function coherently both alone and together. This applies for controls, lighting aesthetics and performance.

Controls: To allow for several scenes, the luminaires must be dimmable and tied into a control system capable of programmable dimming. There must be at least two control devices in this space since it is less than 10,000 SF (ASHRAE 90.1).

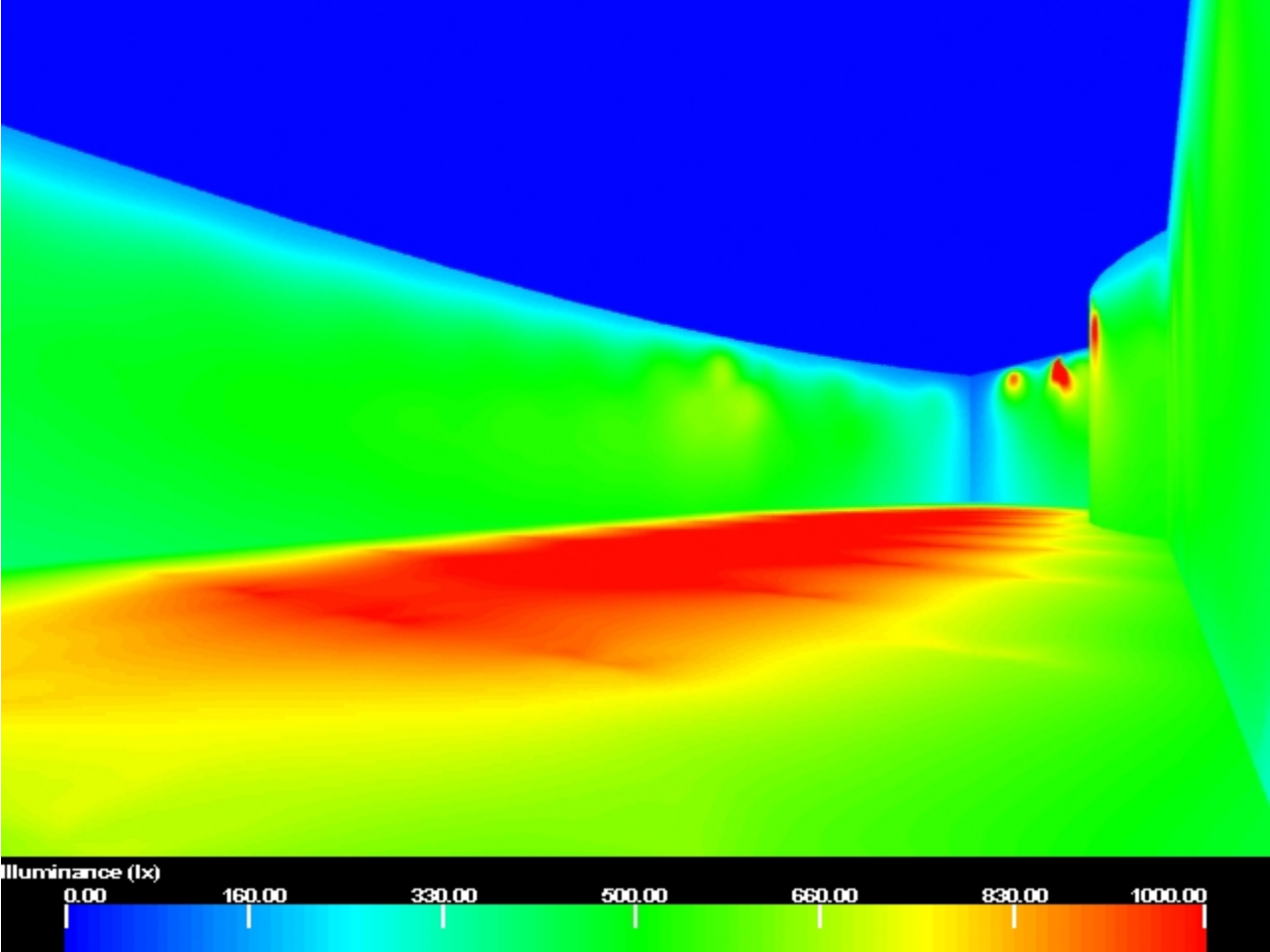
Power Allowance: According to ASHRAE 90.1, 1.3 W/SF is the maximum allowable.

Evaluation of Existing Lighting System:

According to the computer models, this space receives more than 80fc over most of the work plane area (Figure 19). This is far more than the design criterion of 30fc. Despite the lighting controls, this overdesign means there are more luminaires than necessary, more potential used watts than necessary, and more ceiling clutter than necessary. ASHRAE 90.1 is not met in this space. The space should have very good color rendering because of the 48 incandescent lamps, but the drawbacks are energy efficiency and lamp life. Also, there is no accent lighting on the wall displays (Figure 20). There are two lighting systems (Luminaire Type EE and P, respectively). Each system independently exceeds the design criterion of 30fc. (Figure 21, 22 and 23).



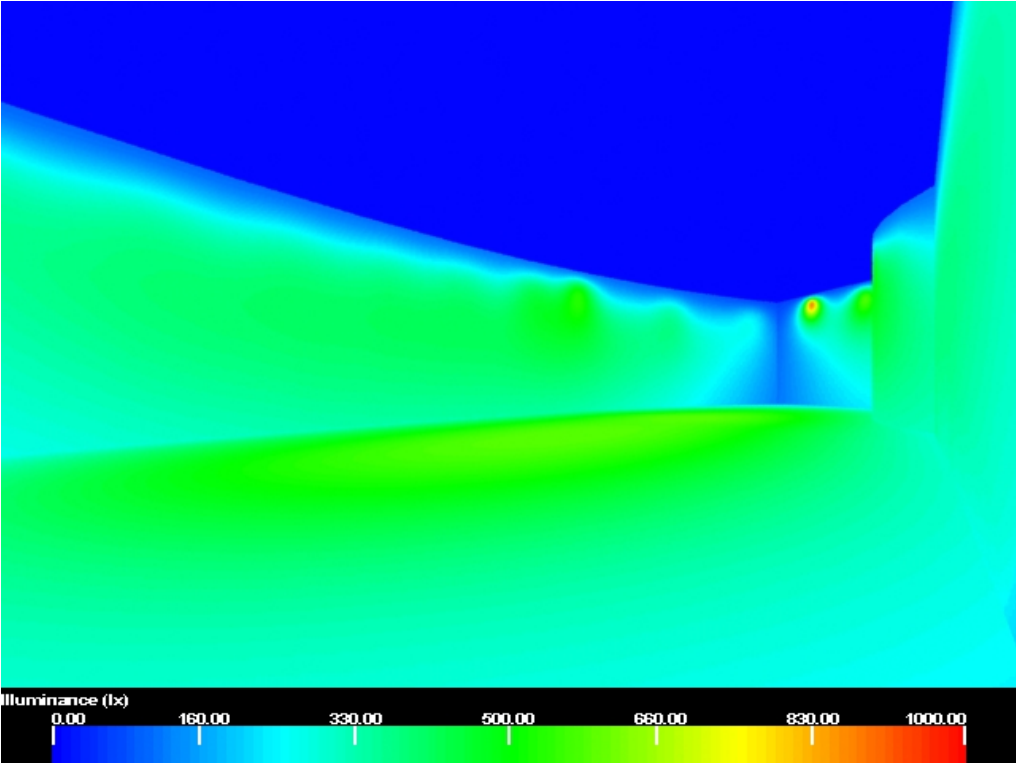
Figure 21 – Conference Room Pseudo Color Rendering



Both Luminaire Type EE and Type P are on.

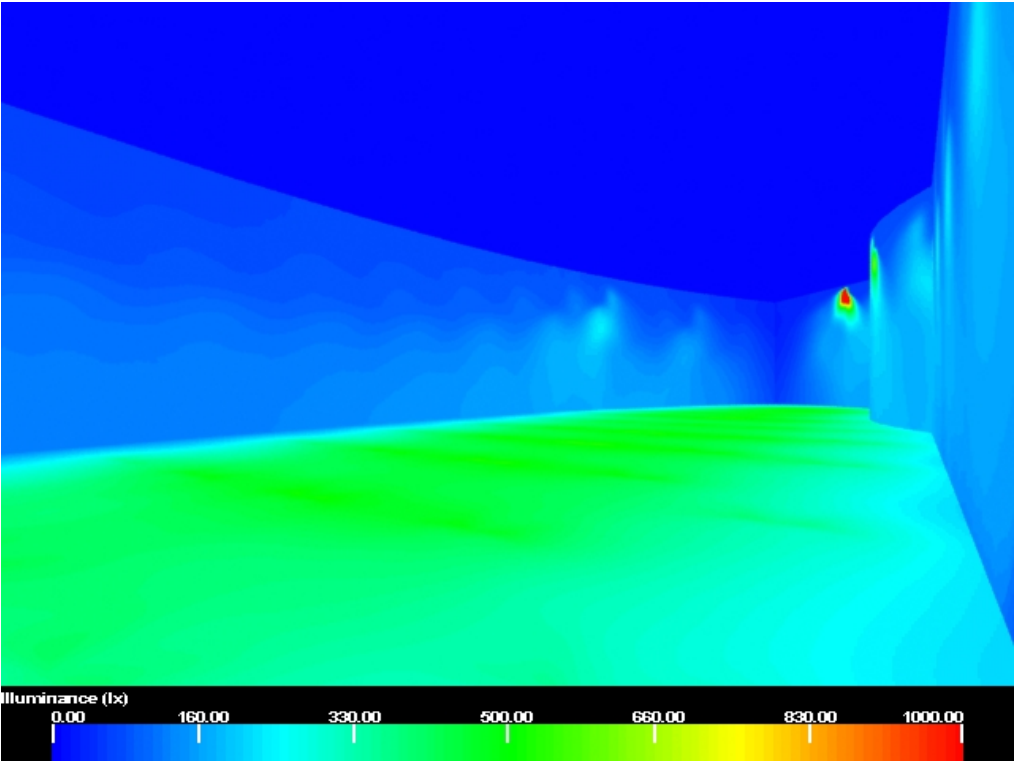


Figure 22 - Conference Room Pseudo Color Rendering



Only Luminaire Type EE is on.

Figure 23 - Conference Room Pseudo Color Rendering



Only Luminaire Type P is on.



Entry Pavilion Façade

Spatial Overview

The Entry Pavilion is the main entrance and exit point for most building users (Figure 24 and 28). During cruise ship boarding, people climb the stairs or take one of three elevators to the second floor and cross the bridge to the Lobby (Figure 25 and 26). People leaving a cruise exit the lower retractable bridge, which leads to the first floor of this 2-floor Entry Pavilion (Figure 27).

The Entry Pavilion itself is a large, 2-floor outdoor space with a bridge. It is completely open to the outdoor environment. Extended lighting analysis will be focused on how the façade appears. The scope of analysis will not include the tasks of people using the Entry Pavilion because the scope of this analysis is the façade.

Finishes

The first floor façade is rugged concrete, which blends into the concrete pier. The second floor features a blue vertical-ribbed metal wall system. The Pedestrian Bridge is constructed with steel trusses and rests on concrete columns. The roof of the Pedestrian Bridge is ribbed metal and rests on steel columns. The overall feel is exposed structure and ruggedness, except for the finished brick floor near the elevators.

Materials



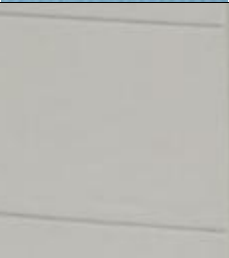

Floor: Red Brick – Reflectance: 37% (Assumed)			
Façade: Blue, vertical-ribbed metal – Reflectance 25% (Assumed)			
Façade: Concrete – Reflectance 38% (Assumed)			
Truss: Painted Aluminum – Reflectance 48% (Assumed)			



Figure 24 – Exterior Plan of Project Scope

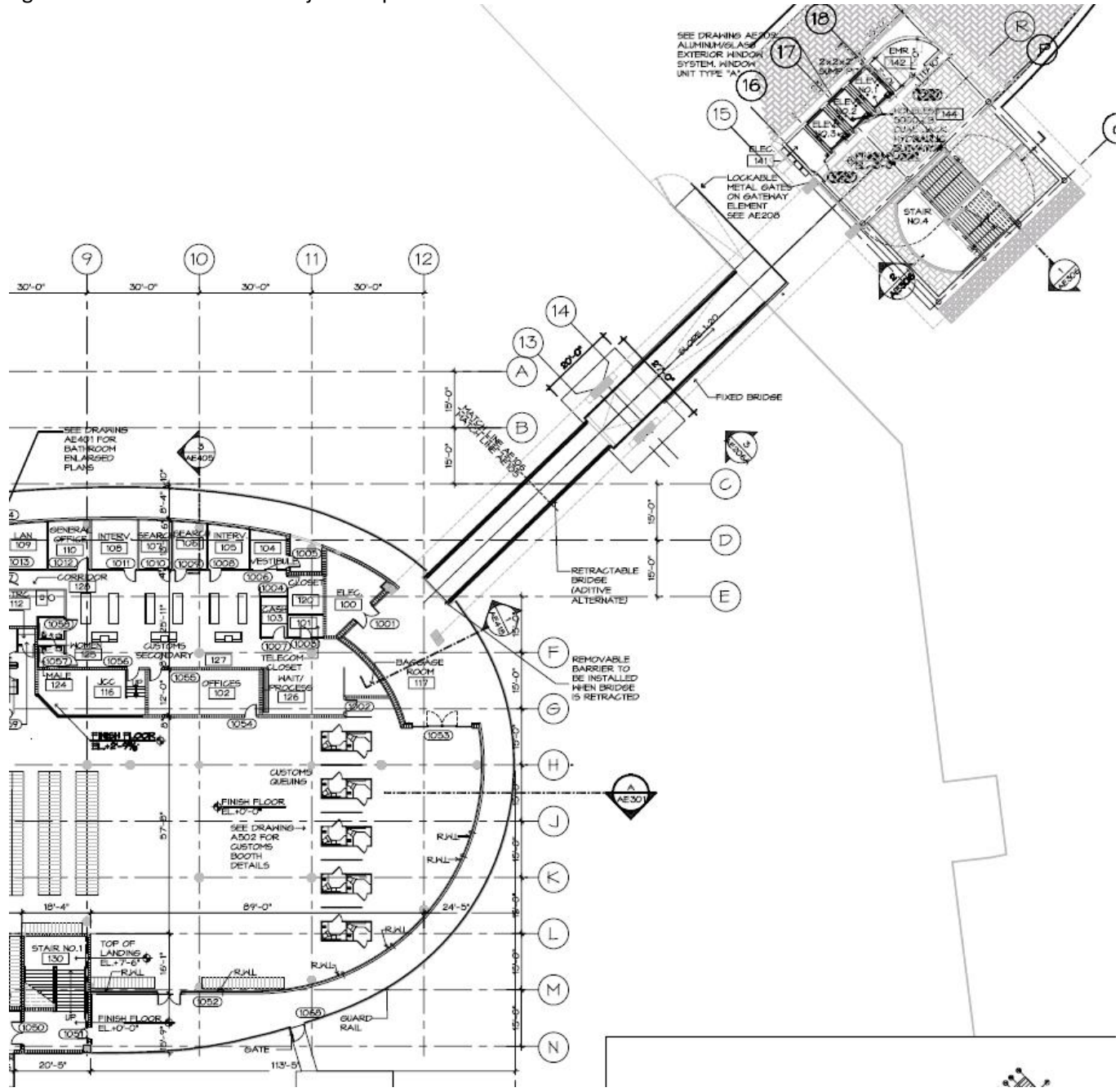




Figure 25 – Exterior Elevation of Entry Pavilion

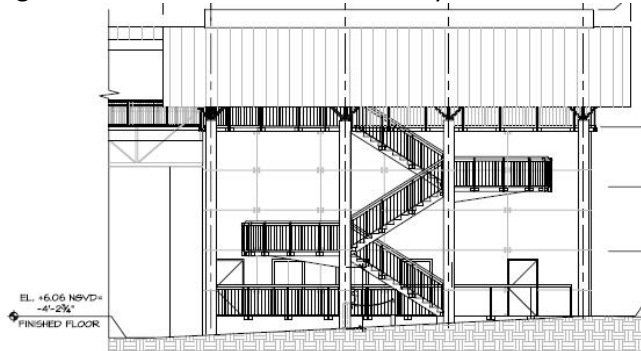


Figure 26 – Exterior Elevation of Entry Pavilion

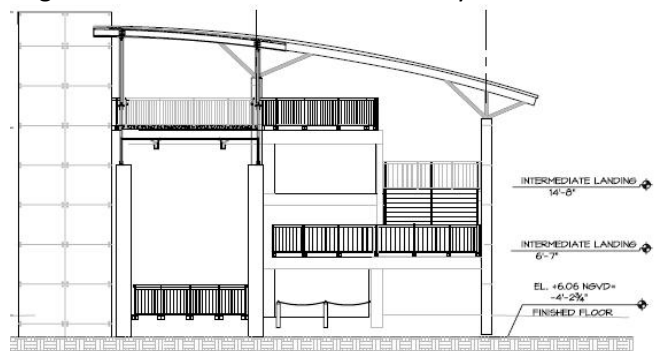
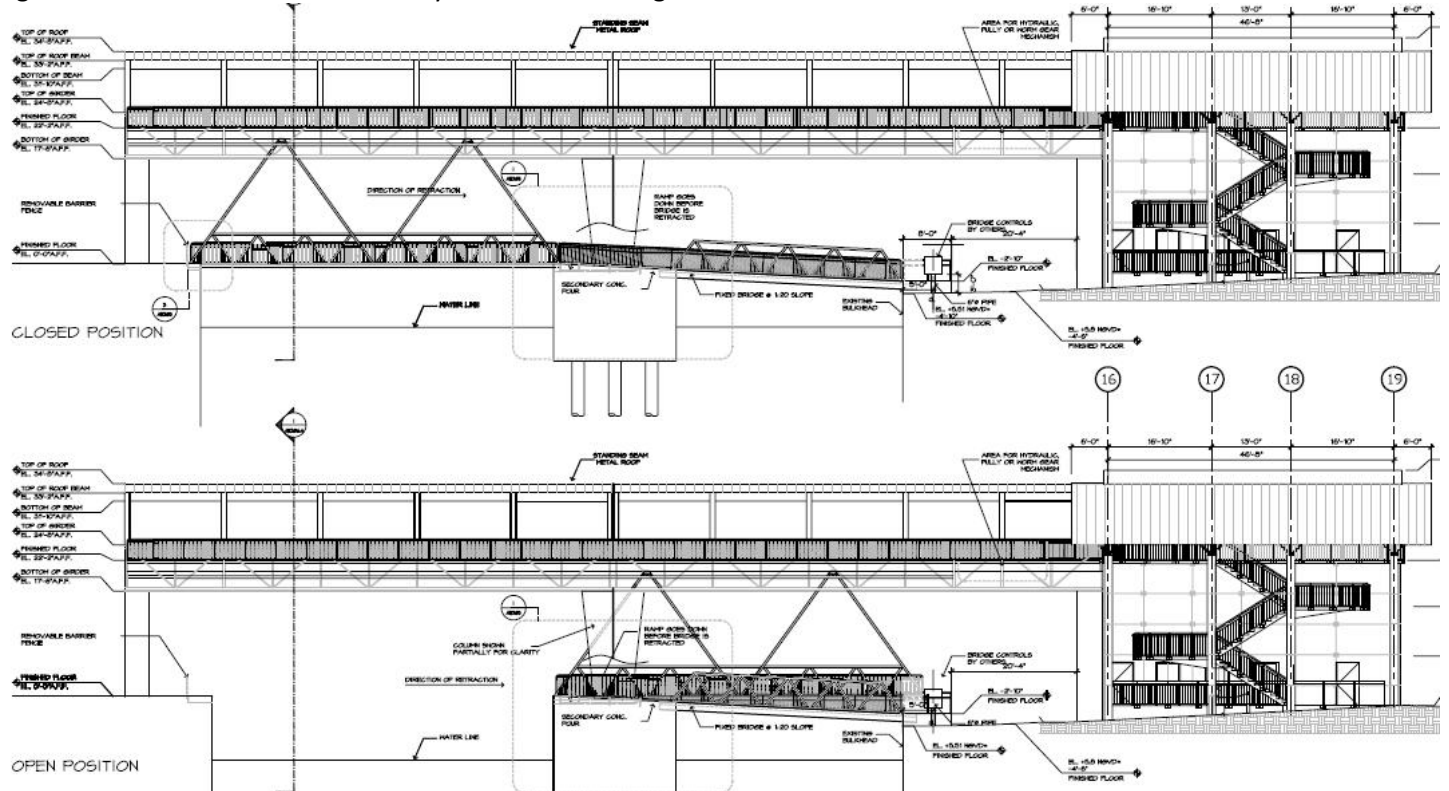


Figure 27 – Exterior Elevation of Entry Pavilion and Bridges



The Lower Bridge is retractable. Both positions are shown.

Figure 28 – Exterior South Elevation of Building

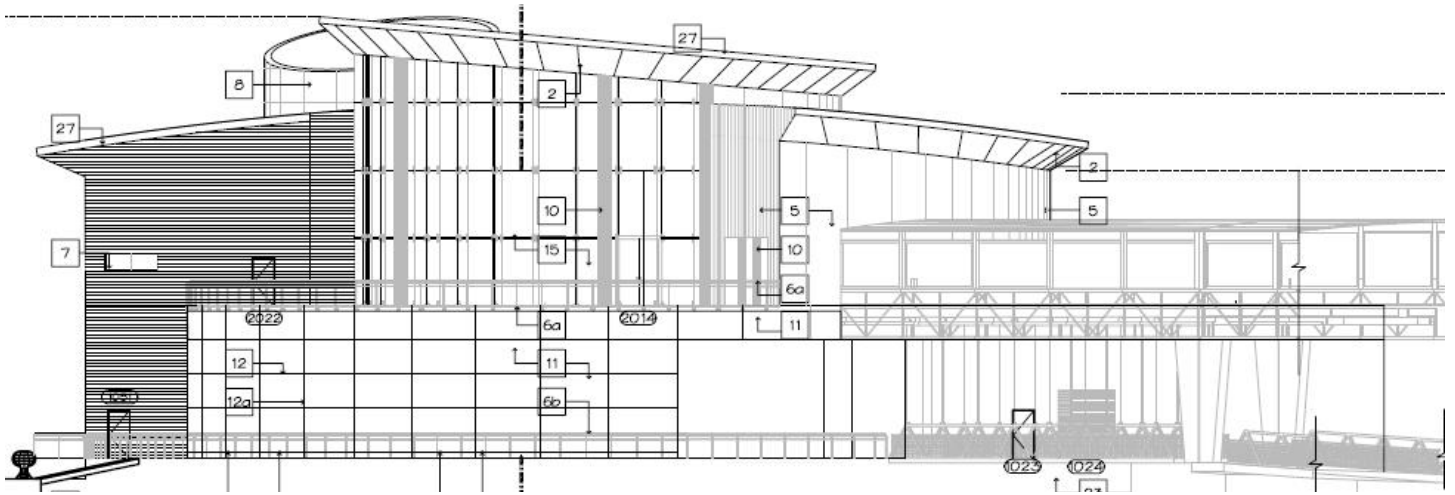


Figure 29 – Exterior Lighting Plan (First Floor)

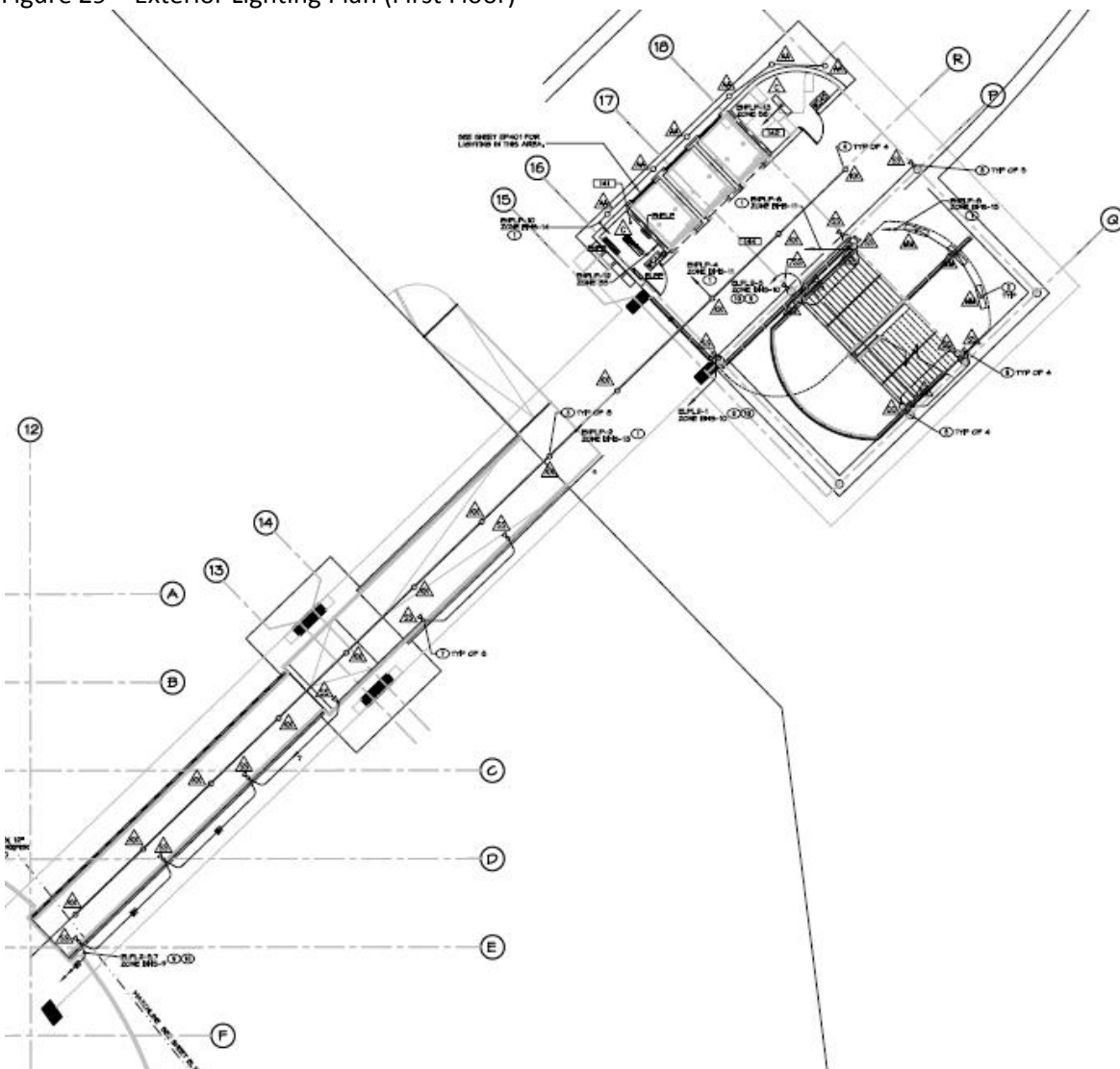


Figure 30 – Exterior Lighting Plan (Second Floor)

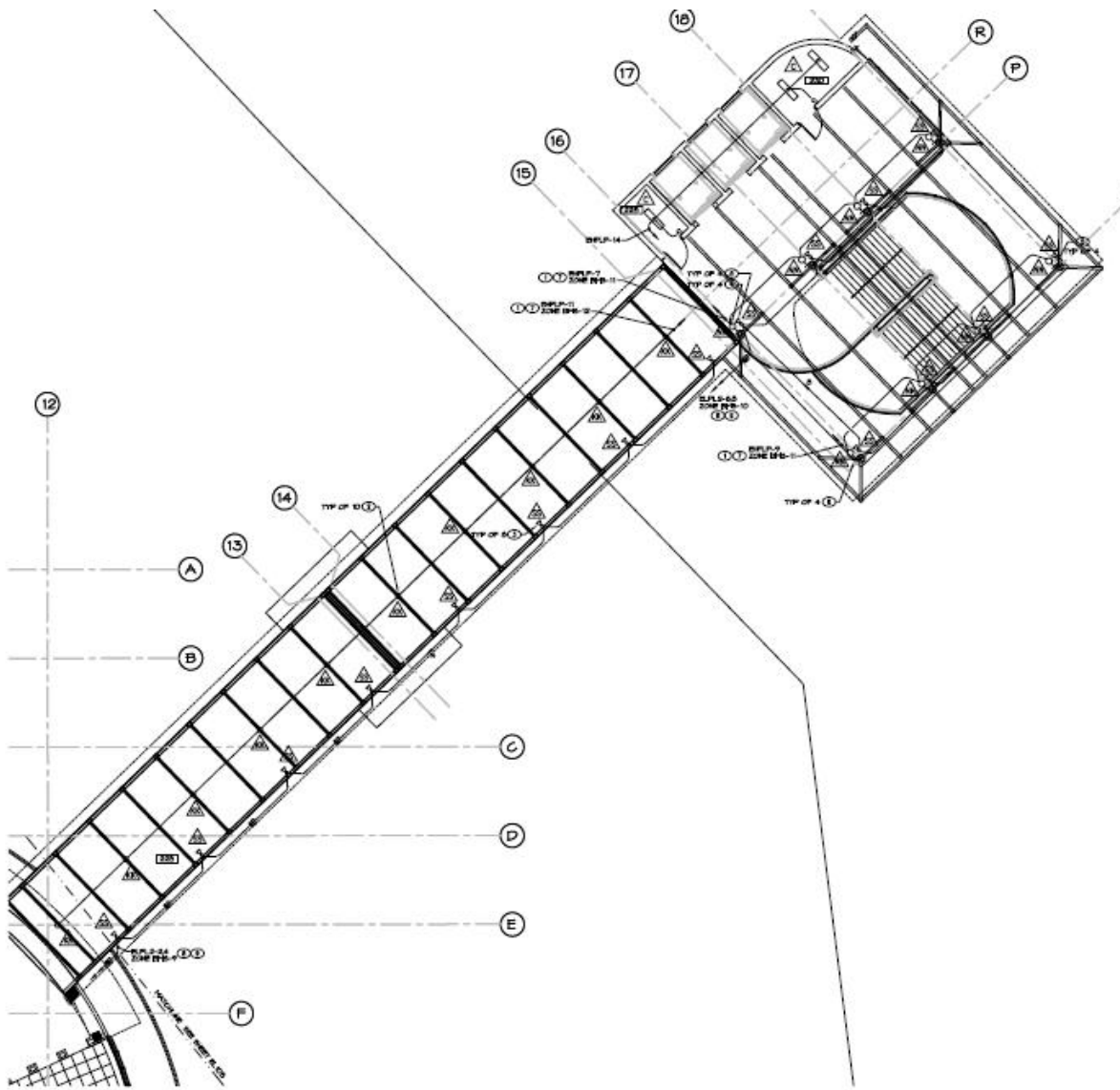




Figure 31 – Exterior Lighting Plan (First Floor)

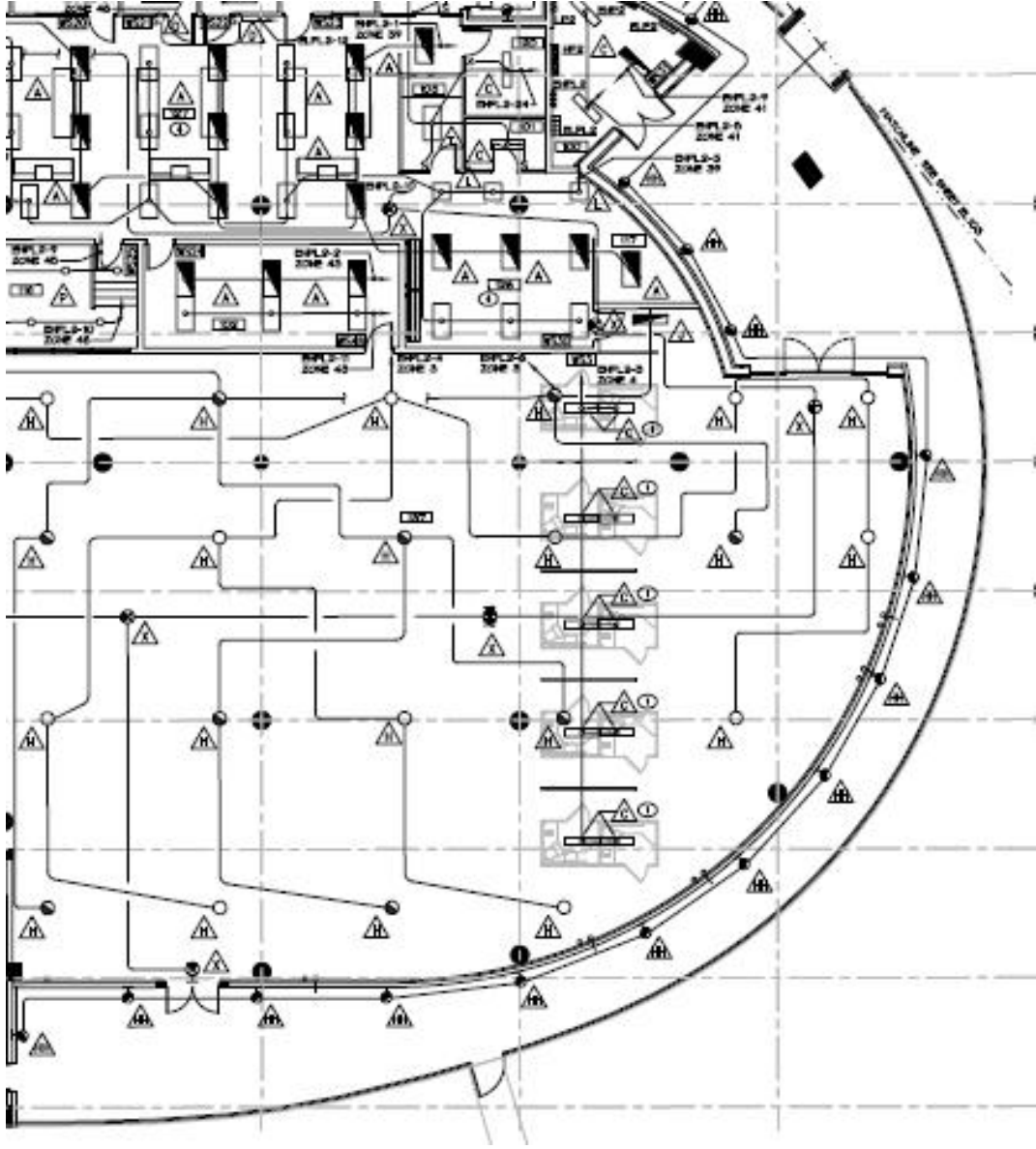
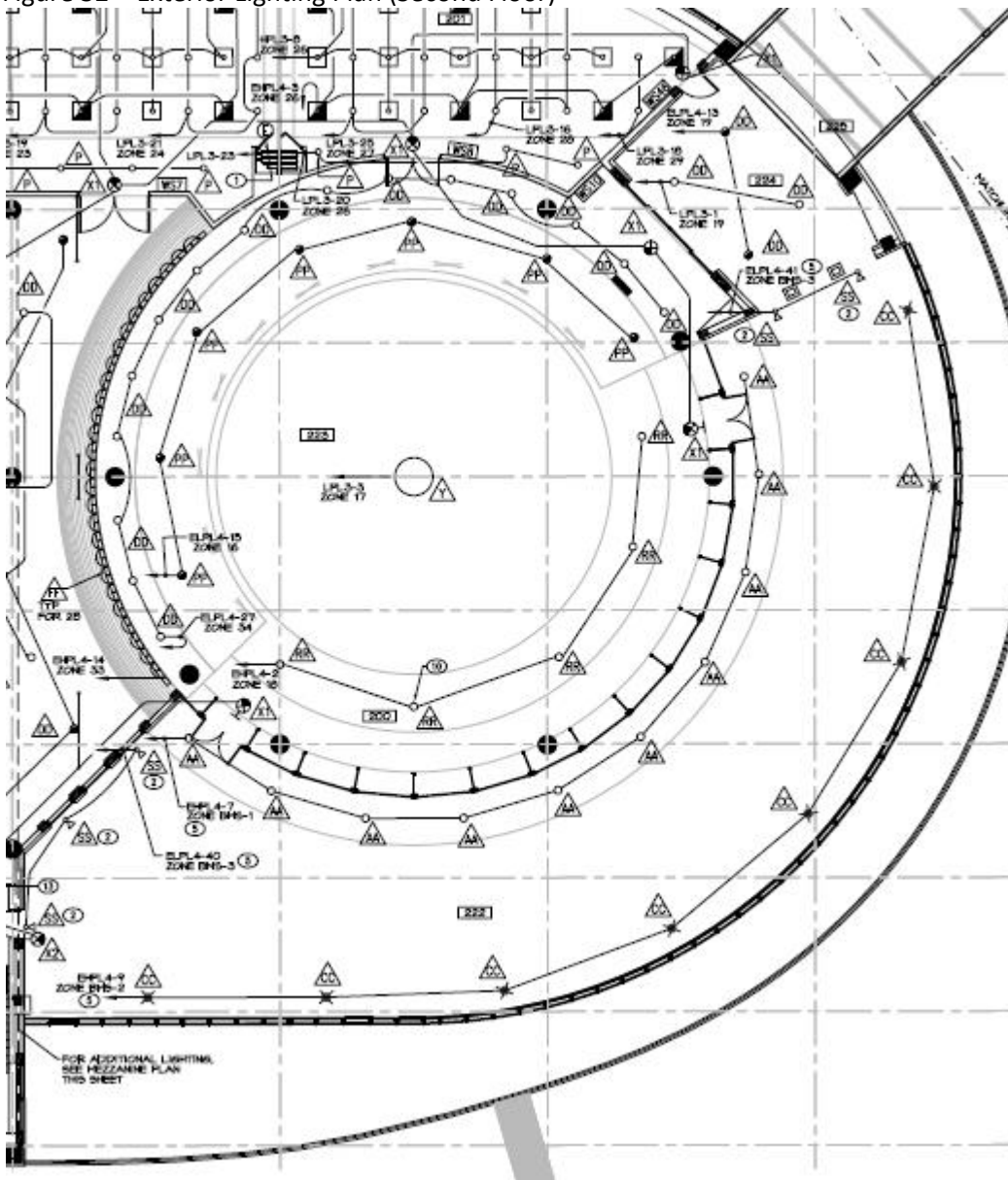




Figure 32 – Exterior Lighting Plan (Second Floor)





Luminaire Schedule (Entry Pavilion, First Floor):

Type	Description	Lamping	Volts	Quantity	Watts*
QQ	1 Lamp Surface Mounted Round Light	(1)50W Metal Halide	277	4	500
SS	1 Lamp Par Wide Floodlight	(1)300W Par-56	120	15	300
MM	1'x4' – 1 Lamp Damp Location Strip	(1)32W T8 Fluorescent	277	3	36
KK	1 Lamp Pendant Mounted Round Light	(1)100W Metal Halide	277	12	118
AA	Cool Lens Well Light	(1)175W ED17 Metal Halide	277	6	210
C	1'x4' – 2 Lamp Pendant Mounted Industrial Strip	(2)32W T8 Fluorescent	120/277	2	63

Luminaire Schedule (Entry Pavilion, Second Floor):

Type	Description	Lamping	Volts	Quantity	Watts*
SS	1 Lamp Par Wide Floodlight	(1)300W Par-56	120	16	300
NN	Exterior Uplight	(1)400W ET18 Metal Halide	277	8	452
C	1'x4' – 2 Lamp Pendant Mounted Industrial Strip	(2)32W T8 Fluorescent	120/277	3	63
KK	1 Lamp Pendant Mounted Round Light	(1)100W Metal Halide	277	10	118

Luminaire Schedule (Main Building Exterior, Southwest Side, First Floor):

Type	Description	Lamping	Volts	Quantity	Watts*
HH	Exterior Wall	(1)32W Compact Fluorescent	277	14	36



Luminaire Schedule (Main Building Exterior, Southwest Side, First Floor):

Type	Description	Lamping	Volts	Quantity	Watts*
DD	9" Open Downlight	(2) 57W DBL. Quad Compact Fluorescent	120	4	128
CC	Exterior Bollard	(1)70W Metal Halide	277	8	90
AA	Cool Lens Well Light	(1)175W ED17 Metal Halide	277	10	210
SS	1 Lamp Par Wide Floodlight	(1)300W Par-56	120	5	300

Light Loss Factors (LLF)

Type	BF	Cleaning	Maintenance	LLD	LDD*	RSDD	LLF
QQ	1.0	12 month	IV	0.68	0.80	N/A	0.54
SS	N/A	12 month	IV	1.0	0.80	N/A	0.80
MM	1.03	12 month	IV	0.95	0.80	N/A	0.78
KK	1.0	12 month	IV	0.75	0.80	N/A	0.60
AA	1.0	12 month	IV	0.80	0.80	N/A	0.64
C	1.0	12 month	IV	0.95	0.80	N/A	0.76
NN	1.0	12 month	IV	0.80	0.80	N/A	0.64
HH	0.98	12 month	IV	0.85	0.80	N/A	0.67
DD	1.0	12 month	IV	0.92	0.80	N/A	0.74
CC	1.0	12 month	VI	0.74	0.81	N/A	0.60

*Assumes Medium Dirt Condition

Power Density and Illuminance Levels

Façade Watts (Type AA)= 2,100W
 Façade Total Square Feet = 112ft length x 37ft high = 4,144 SF
 Power Density = 0.51 W/SF of façade.

Using Table 9.4.5 from ASHRAE 90.1
 Building Façade: 0.2 W/SF allowable (Option #1) or:
 Building Façade: 5 W/linear foot (Option #2)

The existing façade lighting design does not meet the power density requirements in ASHRAE 90.1.

Second Level Bridge (Type KK and Type SS)= 3,580W
 Bridge Total Square Feet = 2,030 SF
 Power Density = 1.76 W/SF

Using Table 9.4.5 from ASHRAE 90.1
 Building Grounds (Walkways 10 feet wide or greater, and Special Feature Areas): 0.2 W/SF

The existing Second Level Bridge does not meet the power density requirements in ASHRAE 90.1.

Note: These are two examples of Power Density Calculations. The scope of the exterior analysis focuses on the façade.



Performance Considerations and Design Criteria

Illuminance: Illuminance levels are not critical for this façade lighting. There are Illuminance recommendations for the Bridge and Stairs, but this is not in the scope of the exterior analysis. The existing lighting plans are shown in Figures 29, 30, 31 and 32.

Luminance and Accent Lighting: Visual clutter should be avoided. Only key architectural features should be illuminated.

Glare: Direct Glare should be minimized because the large luminance ratios could be discomforting.

VDT: There is no need to design for VDT use.

Color Appearance: The CCT of exterior lamps should be the same in each space or zone. For example, different CCTs should not be used to wash the same wall.

Psychological Aspects: The Cruise Terminal is located very near a major public park in Norfolk. There are many festivals and special events in this park each year. It is to the City's advantage to make this area spectacular. The building should be illuminated in a way that emphasizes the architectural and structural elements.

Appearance of Luminaires: The luminaires should appear industrial and durable. Large luminaires are acceptable because of the large building and ship scale.

Controls: The lighting should have controls so that the Owner can turn the accent lighting only when desired. The safety lighting needs to be on according to code, and this light also allows security cameras to work properly.

Evaluation of Existing Lighting System:

Judging from the night photograph (Figure 33), the existing lighting design seems to illuminate many of the building's main features. Each luminaire appears to be intended to provide footcandles on a work plane (Figure 34). This means that there might have been minimal considerations for how the space should look and feel. The exception to this observation is Luminaire Type AA, which sends light to the top roof soffit around the Lobby. These luminaires sufficiently light up the intended surface and enhance this architectural element. In contrast, the wall sconce luminaires mounted on First Floor façade seem to take away from the architectural form, but most certainly provide the recommended Illuminance values.

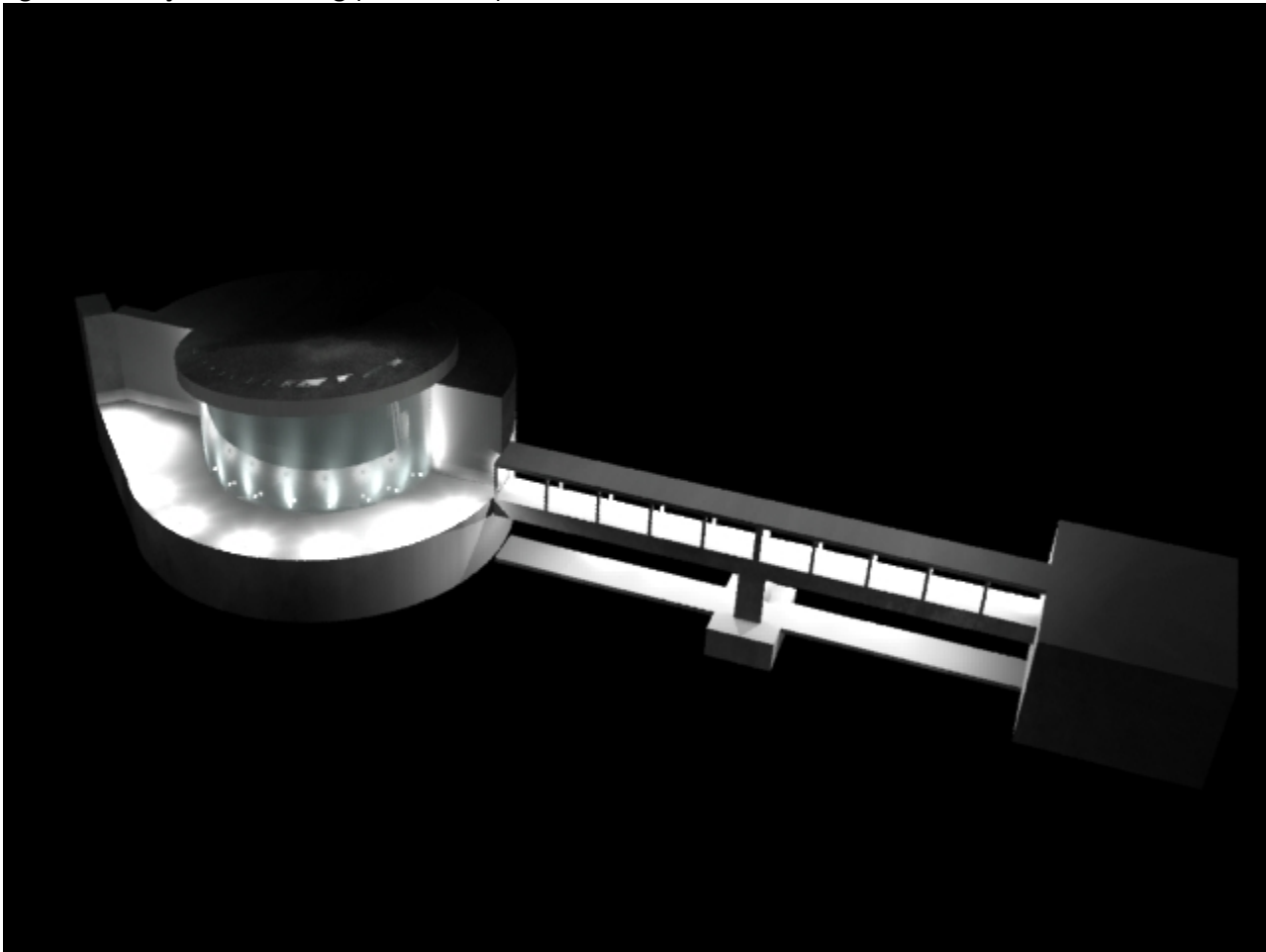


Figure 33 – Exterior Façade Photograph





Figure 34 – Façade Rendering (Aerial View)





Evaluation of Existing Lighting System (Entire Building):

The building's lighting system is controlled by the Lighting Control Processor Panel in Room 136. The User Interface is a Desktop Computer in the same room. Another User Interface link provides access to the system through a Building Management System. The Lighting Control Processor Panel feeds all the dimming and switching panels, emergency lighting, and all wallstation links.

Throughout the building, there are many fluorescent, halogen and metal halide lamps. The luminaires are large in several spaces including the Luggage Room and the Ticket Queuing and Waiting Lounge/Meeting Rooms. The scale of these luminaires fits well with the space scale. In some spaces, such as the Conference Rooms and Ticket Queuing and Waiting Lounge/Meeting Rooms, there are two lighting systems. This, however, poses problems for complying with ASHRAE 90.1 for power density, and creates additional challenges such as aesthetics. Overall, the Illuminance levels generally exceed the recommended footcandle values from IESNA.

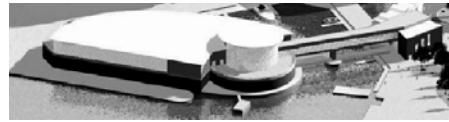
The exterior fixtures are weatherproof and provide light to the building's terraces, walkways and two bridges and façade.

Several important spaces such as the Lobby, Ticket Queuing and Waiting Lounge/Meeting Rooms, and Conference Rooms receive some Illuminance from daylight. In some cases, no electric light is needed to provide a safe, aesthetically pleasing environment. Some additional Illuminance from electric lights may be needed to carry out specific tasks.



Luminaire Schedule (Entire Building):

TYPE	DESCRIPTION	MANUFACTURER AND CATALOG NUMBER	LAMP	VOLTS	MOUNTING
A	2'X4' - 3 LAMP PLASTIC CUBE LOUVER TROFFER	COLUMBIA #ST824-3326-FAPC4-EB8LH277	(3) 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
B	10'X4' - 2 LAMP SURFACE MOUNT WRAPAROUND	COLUMBIA #WC4-232-EB8LH277	(2) 32WATT T8 FLUORESCENT	277	CEILING/SURFACE
C	1'X4' - 2 LAMP PENDANT MOUNTED INDUSTRIAL STRIP	COLUMBIA #KL4-232-EB8LH277	(2) 32 WATT T8 FLUORESCENT	120/277	NOTES 1 AND 2
D	5" DIA. - LED GLASS CYLINDER	TERON # WEDGE-POLY	LED.	120	CEILING/SURFACE
E	1'X4' - 2 LAMP LENSED SECURITY TYPE TROFFER	KENALL # RGA 2 3/3 2 32 PB 1 277 0/6 1	(2) 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
F	8" DIA. - 1 LAMP INCANDESCENT DOWNLIGHT WITH BLACK BAFFLE	FRESCOLITE # INC800/INT1805	(1) 150 WATT INCANDESCENT	120	CEILING/RECESSED
H	18" DIA. - 1 LAMP LOW BAY	HUBBELL # SW-D-250-H-B-A-P-WH	(1) 250 WATT METAL HALIDE	277	PENDANT/18'-0" AFF
J	1'X4' - 2 LAMP ROUGH SERVICE STRIP	COLUMBIA # WAL4-2JD-32-EB8LH277	(2) 32 WATT T8 FLUORESCENT	277	HALL/ 8'-0" AFF
K	ROUGH SERVICE COMPACT FLUORESCENT	TERON # PAVIN CF - PN126GE	(1) 26 WATT COMPACT FLUORESCENT	120	+48" ABOVE ELEVATOR PIT FLOOR
L	2'X2' - 2 LAMP PLASTIC CUBE LOUVER TROFFER	COLUMBIA #ST822-231U16-FAPC4-EB8LH277	(2) U-31 WATT T8 FLUORESCENT	277	CEILING/RECESSED
M	2'X4' - 4 LAMP LENSED SECURITY TYPE TROFFER	KENALL # RCD 4 0/0 4 32 PB 1 277 8/8 1	(4) 32WATT T8 FLUORESCENT	277	CEILING/RECESSED
N	3' - 2 LAMP WALL MOUNTED SURFACE COMMERCIAL	COLUMBIA # WAL3-225-EB8LH277	(2) 25 WATT T8 FLUORESCENT	277	HALL/CENTERED ABOVE VANITY MIRROR
P	8" DIA. - 1 LAMP INCANDESCENT DOWNLIGHT WITH BLACK BAFFLE	FRESCOLITE # INC800/INT1805	(1) 200 WATT INCANDESCENT	120	CEILING/RECESSED
Q	1 LAMP PENDANT MOUNTED ROUND LIGHT	LUMINIS # SR3405 M175	(1) 175 WATT METAL HALIDE	277	PENDANT/NOTE 4
S	2 LAMP LENSED SECURITY FIXTURE	KENALL RQPB-1WA-213-EB10THD-1-277-4/7-1	(2) 13 WATT COMPACT FLUORESCENT	277	CEILING/RECESSED
T	2'X4' - 4 LAMP PLASTIC CUBE LOUVER TROFFER	COLUMBIA # ST824-4326-FAPC4-EB8LH277	(4) 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
U	10" DIA. - 1 LAMP STEP LIGHT	ARCHITECTURAL AREA LIGHTING # ASL10-RD-CROSS-L5-MAL-CF26	(1) 26 WATT COMPACT FLUORESCENT	277	3'-0" ABOVE STEP TREAD
V	8' STAGGERED SINGLE LAMP STRIP	COLUMBIA # 55B-132ASYM-EB8LH277-55RA	(2) 32 WATT T8 FLUORESCENT	277	COVE/SURFACE
V1	4' STAGGERED SINGLE LAMP STRIP	COLUMBIA # 554-132ASYM-EB8LH277-55RA	(1) 32 WATT T8 FLUORESCENT	277	COVE/SURFACE
V2	3' STAGGERED SINGLE LAMP STRIP	COLUMBIA # 553-125ASYM-EB8LH277-55RA	(1) 25 WATT T8 FLUORESCENT	277	COVE/SURFACE
V3	2' STAGGERED SINGLE LAMP STRIP	COLUMBIA # 552-117ASYM-EB8LH277-55RA	(1) 17 WATT T8 FLUORESCENT	277	COVE/SURFACE



	DIE-CAST ALUMINUM LED EXIT	EXITRONIX # 400U/LB/BA	LED.	277	CEILING/WALL
	EDGE-LIT LED EXIT	EXITRONIX # 902U/LB/RC/XX/BA	LED.	277	CEILING/WALL
	WET LOCATION/NEMA RATED LED EXIT SIGN	EXITRONIX # VRC/U/R/LB	LED.	277	SURFACE
	CUSTOM GLASS PENDANT	ANDROMEDA NASTRO "MILL" SERIES- CUSTOM	69 HALOGEN	120	PENDANT
	MULTI-COLOR WALLWASHER	COLOR KINETICS # COLOR BLAST 12	LED.	120	SURFACE/COLUMN
	COOL LENS WELL LIGHT	KIM LIGHTING # 6360-NF-175MH277-SL10	(1) 175 WATT ED17 METAL HALIDE	277	RECESSED/IN-GROUND
	EXTERIOR PEDESTRIAN AREA LIGHT	KIM LIGHTING # FM-BNSI-H3-100MH277-XX-XX-SF	(1) 100 WATT METAL HALIDE	277	POLE
	EXTERIOR BOLLARD	KIM LIGHTING # BNB-70PMH277-XX-X	(1) 70 WATT METAL HALIDE	277	BOLLARD
	9" OPEN DOWNLIGHT	FRESCOLITE # CFTD957HEB-DM-STFD957/70HMFC-LH-WT	(2) 57WATT DBL. QUAD COMPACT FLUORESCENT	120	RECESSED/CEILING
	2'X2' 2 LAMP DIRECT/INDIRECT TROFFER	COLUMBIA # STR22-250TT6-MPO-EBT277	(2) 50WATT BIAx COMPACT FLUORESCENT	277	CEILING/RECESSED
	2' FIELD-CURVABLE SEAMLESS COVE LIGHTING	BELFER # 2855-FX25-50-2-E-20	(1) 50WATT BIAx COMPACT FLUORESCENT	277	COVE/CONTINUOUS ROW
	EXTERIOR WALL	KIM # WF21P-32CFL277-WH-P-SF	(1) 32 WATT COMPACT FLUORESCENT	277	WALL/+9'-0" ABOVE FINISHED CONCRETE
	1 LAMP PENDANT MOUNTED ROUND LIGHT	LUMINIS # SR3405 M100	(1) 100 WATT METAL HALIDE	277	PENDANT/8'-0" AFF
	9" OPEN DOWNLIGHT	FRESCOLITE # CFTD957HEB-DM-STFD957/70HMFC-LH-WT	(2) 57WATT DBL. QUAD COMPACT FLUORESCENT	277	RECESSED/CEILING
	1'X4' - 1 LAMP DAMP LOCATION STRIP	COLUMBIA # LUN4-132-EB8LH277-S6L	(1) 32 WATT T8 FLUORESCENT	277	SURFACE/ UNDERSIDE OF LANDING
	EXTERIOR UPLIGHT	SPI #EXI-2603-277-XXX-WL-CS	(1) 400 WATT ET18 METAL HALIDE	277	SURFACE/ COLUMN
	9" OPEN DOWNLIGHT	FRESCOLITE # CFTD970HEB-DM-STFD957/70HMFC-LH-WT	(2) 70 WATT DBL. QUAD COMPACT FLUORESCENT	120	RECESSED/CEILING
	1 LAMP SURFACE MOUNTED ROUND LIGHT	LUMINIS # SR340T M50	(1) 50 WATT METAL HALIDE	277	SURFACE/COLUMN
	PENDANT DOWNLIGHT	GUTH # ELA-E2-22-25CM-2-WCA	(1) 250 WATT METAL HALIDE	277	PENDANT/NOTE 15
	1 LAMP PAR HIDE FLOODLIGHT	HUBBELL #309ML	(1) 300 WATT PAR-56	120	SURFACE/SEE PLAN NOTES
	PENDANT DOWNLIGHT	FRESCOLITE #1138-992-120V	(1) 500 WATT T-4 QUARTZ	120	PENDANT/NOTE 17
	2'X4' - 3 LAMP PLASTIC CUBE LOUVER TROFFER	COLUMBIA # ST824-332F-FAPC4-EB8LH277	(3) 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	2'X2' - 2 LAMP PLASTIC CUBE LOUVER TROFFER	COLUMBIA # ST822-231UF-FAPC4-EB8LH277	(2) U-31 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	RECESSED PERIMETER	PRUDENTIAL # P-80-2T8-R25'-9"-SPL-5C-277-XX-10THD	4'- 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	8" OPEN DOWNLIGHT	FRESCOLITE # TBX-T0955	(1) 26 WATT TRIPLE TUBE COMPACT FLUORESCENT	277	CEILING/RECESSED
	RECESSED PERIMETER	PRUDENTIAL # P-80-2T8-R15'-6"-SPL-5C-277-XX-10THD	4'- 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	RECESSED PERIMETER	PRUDENTIAL # P-80-2T8-R24'-7"-SPL-5C-277-XX-10THD	4'- 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	RECESSED PERIMETER	PRUDENTIAL # P-80-2T8-R10'-5"-SPL-5C-277-XX-10THD	4'- 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED
	RECESSED PERIMETER	PRUDENTIAL # P-80-2T8-R31'-11"-SPL-5C-277-XX-10THD	4'- 32 WATT T8 FLUORESCENT	277	CEILING/RECESSED