

# Cathedral Place

Steven Puchek  
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## Executive Summary

**\*\*NOTE:** This report is submitted in draft form pending the architectural outcome of 3 spaces (and possibly one additional). Revisions to the report and the modeling of spaces shall be completed as soon as possible. See Appendix C for revision comments.

The Lighting Existing Conditions and Design Criteria Report developed here is an in-depth review and summarization of the current lighting designs of spaces in Cathedral Place. The analysis of the following spaces was completed to analyze the proficiencies and deficiencies of the current lighting design for the spaces made available. These spaces include: ground-level office lobby, full building façade, parking level 3, Deloitte & Touche conference room, Deloitte & Touche open office, and Deloitte & Touche reception area. All information made available in the basebuilding plans regarding these spaces regarding luminaires, lamps, and controls, was supplemented with investigative information pertaining to ballasts, light-loss factors, and daylighting elements (especially glass characteristics and specular surfaces).

After the base information had been gleaned from plans or obtained through manufacturer resources, design criteria for the spaces were analyzed, and for the available spaces compared briefly to the installed design's considerations. The criteria were taken directly from the IESNA Handbook Ch. 10 section for particular spaces, and analyzed independently with respect to the actual or perceived spaces for importance level, and particular consideration. In the following report, you will find complete briefs respective to each criterion for each space. The object of this analysis was to identify the lighting considerations that were implemented and ascertain which criteria the redesign should focus upon. Following the existing information and criteria, initial visual and numeric analyses were made of the spaces using drafting and high-end lighting-design software. Personal critiques of the spaces as developed and recommendations for improvement for the individual spaces wrap up each individual analysis. These critiques of the area, the building, and the individual spaces drive the process of redesign.

As a landmark in the immediate community which has seen very little new construction, the aesthetics of the building from the public point-of-view seemed to need further assessment. It was felt that the publicly viewable ground-level spaces and the overall building façade could benefit from a second look and further analysis to better hallmark the building as a prominent downtown structure. In addition to this, altering the interior design issues with regard to control devices, energy management, daylight usage, and innovative luminaire design would lead toward better mechanical, electrical, and daylight integration to reduce building power needs. The building follows very few ASHRAE 90.1 guidelines currently, and does not comply with any particular lighting standard (especially Dark sky). The compliance with these guidelines and the benefits the building would see make up the core of the redesign and analysis seen here.

This report builds a foundation from existing system information from which an aesthetically-improved and power-efficient lighting scheme can be designed and implemented.

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## Ground-floor Office Lobby

### Existing Lighting Overview

The lighting used in the ground-level office lobby is both subtle and prominent. Entering during hours when sunlight penetration is greatest, and the lighting scheme becomes relatively invisible. However, in late afternoons on overcast days, or during nighttime hours the lighting becomes quite apparent. The subtleties such as the pendant strip luminaires, placed adjacent to the drop-ceiling, give the impression that they are recessed. Additionally, uplighting of high wall elements and consequently 20-foot-high ceiling elements are not readily visible upon entrance to the space. Immediately, however, one is drawn to the sculptured luminaire pendants hanging to approximately 12 feet off of the floor. These compact fluorescent lamp luminaires are the creation of Nick Bowers, a local artist, designed specifically for the space. These luminaires follow the path of ingress and lead to the prominent oval area. Bordering the oval and extending west along the north façade, the luminaires continue to follow a typical pedestrian path toward the elevators, which the third row of pendants leads one right to.

Housed in the ceiling are the pendant/recessed linear fluorescent which provide the ambient uniform lighting for the entire space. Nearer the security desk, low voltage MR16 track lighting illuminates architectural elements and metal halide uplighting fixtures provide diffuse illuminance near the entrance/exit of stairwell 1. In the elevator lobby, recessed compact fluorescent downlights illuminate the corridor/lobby, and a neon strip lines the upper ledge of the corridor's south wall. The lobby has a variety of mini-spaces within itself which are well differentiated by the type and arrangement of the luminaires.



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## Control Devices

The lobby section has only one control device and that is the time-clock relay system used throughout the building to shed house-panel fed loads during the times of non-use. There is no occupancy sensor or any daylight sensor in the space and for that reason the illuminance levels vary drastically throughout the day. All of the luminaires in the lobby are controlled via the relay system and none of them have publicly accessible switching.

## Furnishing and Artwork

The lobby space has one piece of furniture, the security desk, and it has been shown in the renderings following. There are no chairs or couches to lounge upon, there are no table to sit at, no benches, or horizontal surfaces of any kind that would allow an individual to sit, lean, or otherwise. This may be due to the fact that the lobby is merely an entrance portal to the spaces in the office tower where individual lobbies allow for such comforts.

Likewise, the lobby has no artwork. The lobby itself is considered the artwork as it has a multitude of various materials, wall heights, edged shapes protruding from walls, and the open oval "atrium" as its centerpiece. The luminaires also serve as the artwork and are luminous, and don't require any additional illumination.

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## Renderings – Luminaire Analysis



Luminaires – Outside from intersection of street



Luminaires – Looking at East Entrance, Parking Elevator Lobby

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Luminaires – View of Oval Atrium from Security Desk



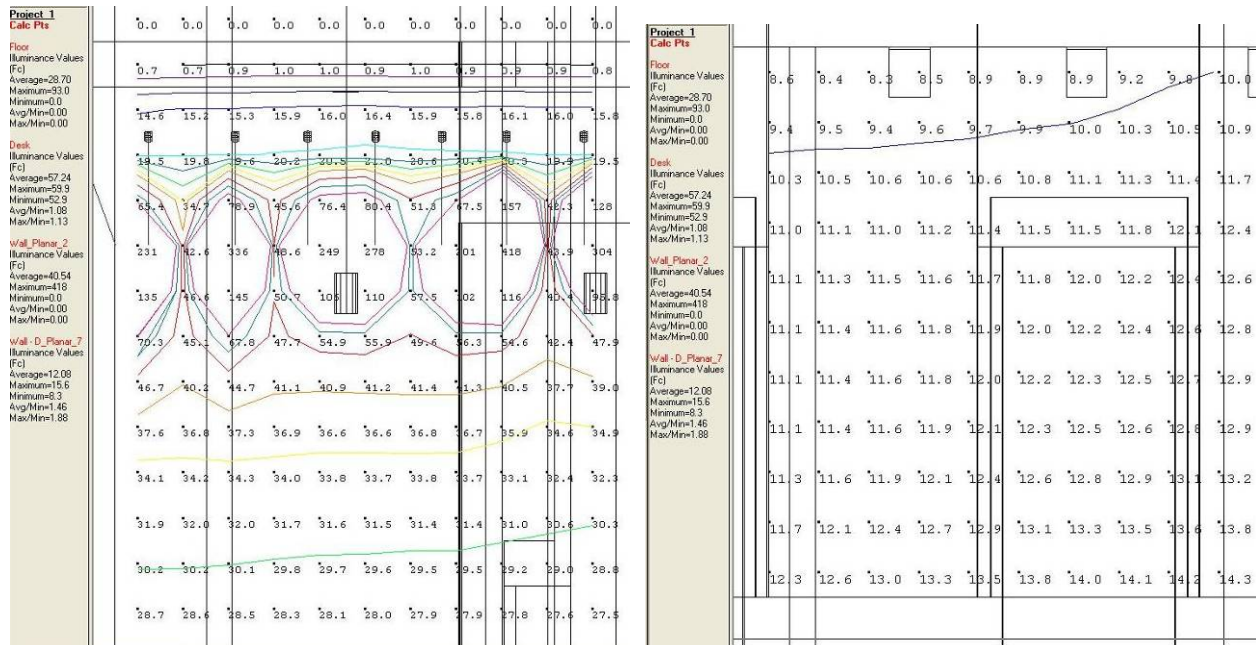
Luminaires – View from Oval toward Security and Elevator Corridor

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Luminaires – View down Elevator Lobby/Corridor



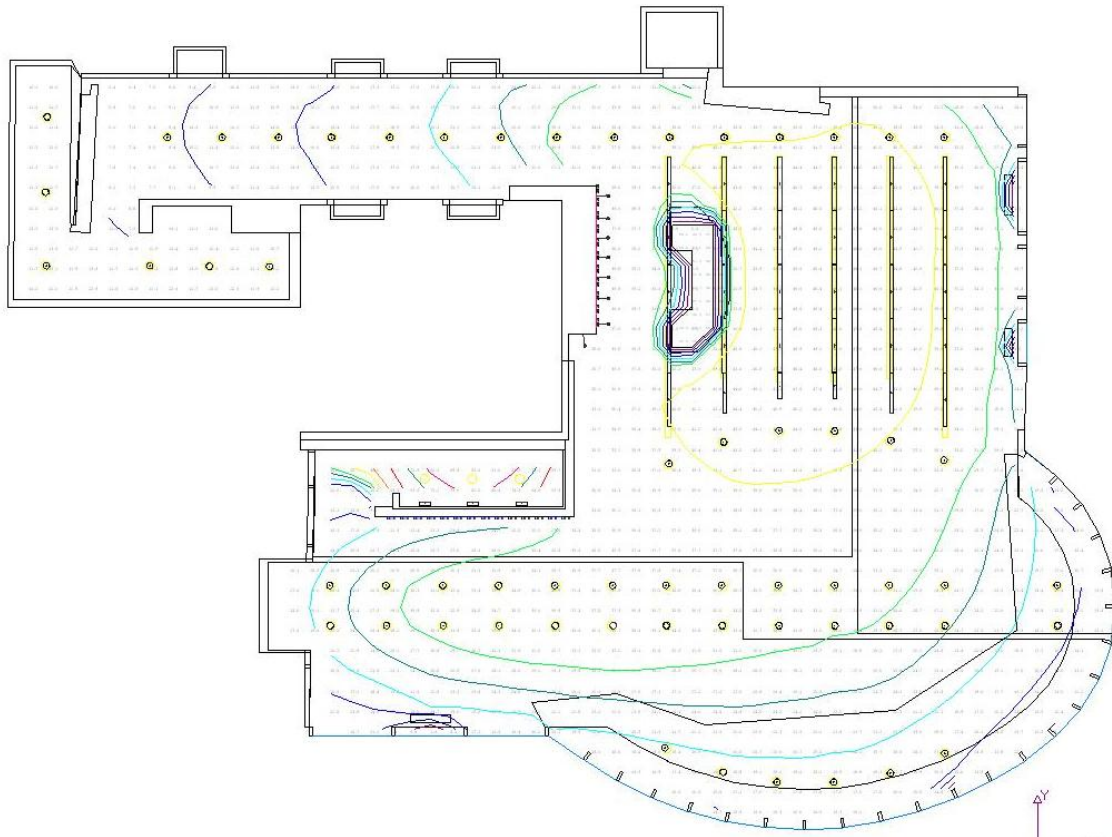
Security Desk Wall Isolines

East Entry Wall Isolines

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<b>Project 1</b>
<b>Calc Pts</b>
<b>Floor</b>
Illuminance Values (Fc)
Average=28.70
Maximum=53.0
Minimum=0.0
Avg/Min=0.00
Max/Min=0.00
<b>Desk</b>
Illuminance Values (Fc)
Average=57.24
Maximum=59.9
Minimum=52.9
Avg/Min=1.08
Max/Min=1.13
<b>Wall_Planar_2</b>
Illuminance Values (Fc)
Average=40.54
Maximum=418
Minimum=0.0
Avg/Min=0.00
Max/Min=0.00
<b>Wall - D_Planar_7</b>
Illuminance Values (Fc)
Average=12.08
Maximum=15.6
Minimum=8.3
Avg/Min=1.46
Max/Min=1.88

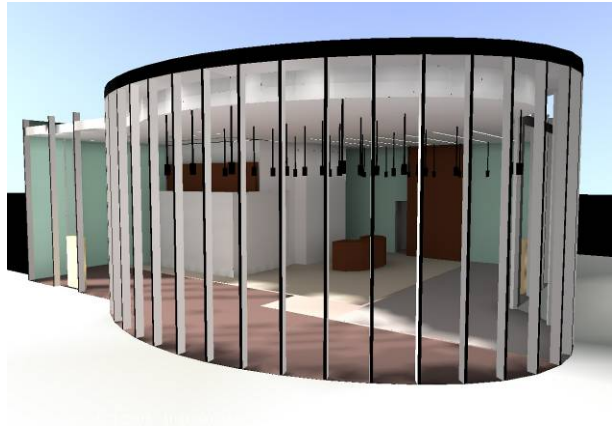


Luminaires – Overall Isoline of Lobby Space



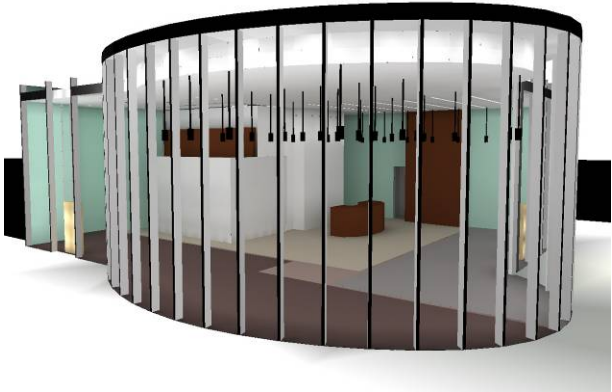
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Renderings – Daylight Analysis



Daylight Studies – March 21, 10:00am

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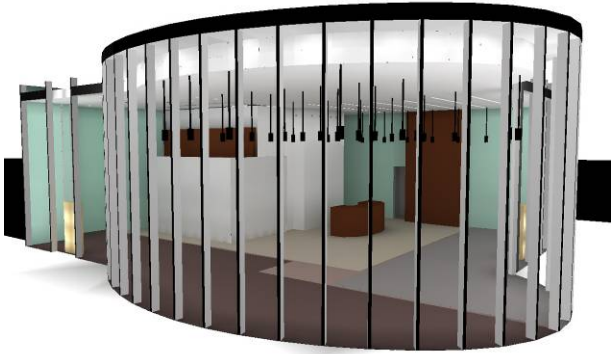
Daylight Studies – March 21, 1:00pm

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Daylight Studies – June 21, 10:00am

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Daylight Studies – June 21, 1:00pm

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Daylight Studies – December 21, 10:00am

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Daylight Studies – December 21, 10:00am



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## Surface Materials and Reflectances

Material and finish schedules could not be obtained in detail from the architects, and thus the reflectances have been determined using a small patch of the material gleaned from photographs and applied as surface materials in AGI which calculates an overall reflectance based on the materials colors and patterns.



The aluminum for the interior spaces has a higher specularity than the aluminum on the façade. The aluminum as is seen on the left side (non-daylight) is grey colored with a high sheen clear glazing giving it the specular look.

Reflectance: 0.7 (based off façade aluminum)



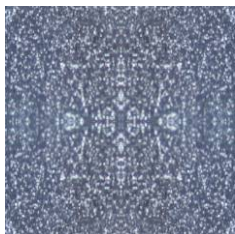
The blue glass interior wall is a deep panel system with the aluminum mullions extruded out 3 inches past the glass. The glass is colored blue to complement the coral green tones seen on other elements and in other glass framing.

Reflectance: 0.27 overall



The ceiling is a whitened grey tone with a high reflectance value. The soft grey was used to complement the other soft colors and not provide a stark bleak background to the otherwise colorful space.

Reflectance: 0.77



The black/blue marble shown here is the pattern seen on half of the floor in the lobby space. It is closest to the eastern façade and accounts for roughly 20% of the floor area.

Reflectance: 0.22

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The white marble is the majority floor covering for the lobby space. The white marble does not sit adjacent to any façade, but is continuous through the main lobby, around the security station and into the main elevator lobby. It is similar to the black/blue marble, but obviously a different shade

Reflectance: 0.69



The red mosaic tile is the only different material used on the floor. Between the black/blue marble and the white marble is a rectangular area (oval atrium) or thin 6” strip of tile extending to each wall. The mosaic pieces are glazed over to match the specularity and smoothness of the marble floor area.

Reflectance: 0.36



The green glass wall complements the blue glass wall, and is of the same construction. While the blue glass wall is on the western side of the room, the green glass wall is on the southern wall leading to the parking elevator lobby.

Reflectance: 0.50



The wood paneling throughout the space has a very light hue with a slightly darker contrast in the “veins”. The wood paneling is located on the western wall as an accent piece to the blue-glass, and at the south end of the elevator lobby. It is also featured behind the east entrance stair-wall.

Reflectance: 0.14



This metal mesh is featured on the desk area and is complimented on the walls in thin strips between light green colored glass paneling (same as the material shown, without the mullions). It is not prominent by surface area, but by location and accentuation.

Reflectance: 0.16



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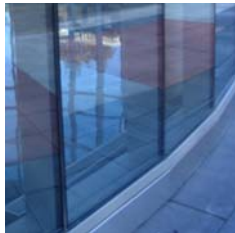
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This wood featured mainly on the security desk as well, is a lighter version of the wood paneling seen on the walls, but complements it very well.

Reflectance: 0.56

## Glazing Specifications – Transmittance and Reflectance



The glass on the exterior, shown to the left, has a slight reflectance and a high transmittance. Because of the viewing angle, a considerable amount of the street can be seen. It is a light hue of blue, but not to the contrast that the picture shows (combination of daylighting and camera quality).

Further information on the glazing is shown below.

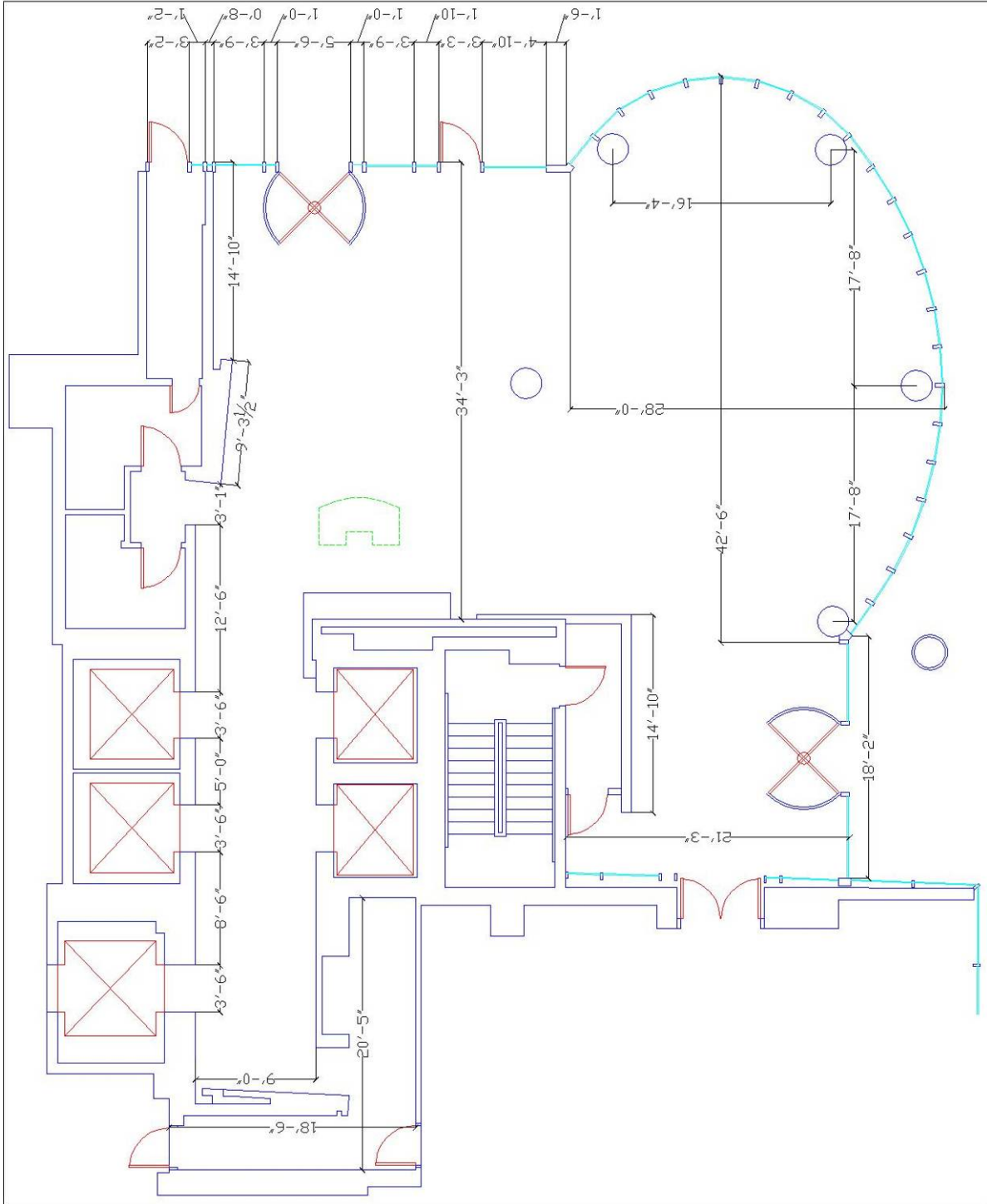
Reflectance:	Forthcoming from Glazing Contractor
Transmittance:	Forthcoming from Glazing Contractor
Solar Heat Gain Coefficient:	Forthcoming from Glazing Contractor
U-Value:	Forthcoming from Glazing Contractor
Thickness and # panes:	Forthcoming from Glazing Contractor

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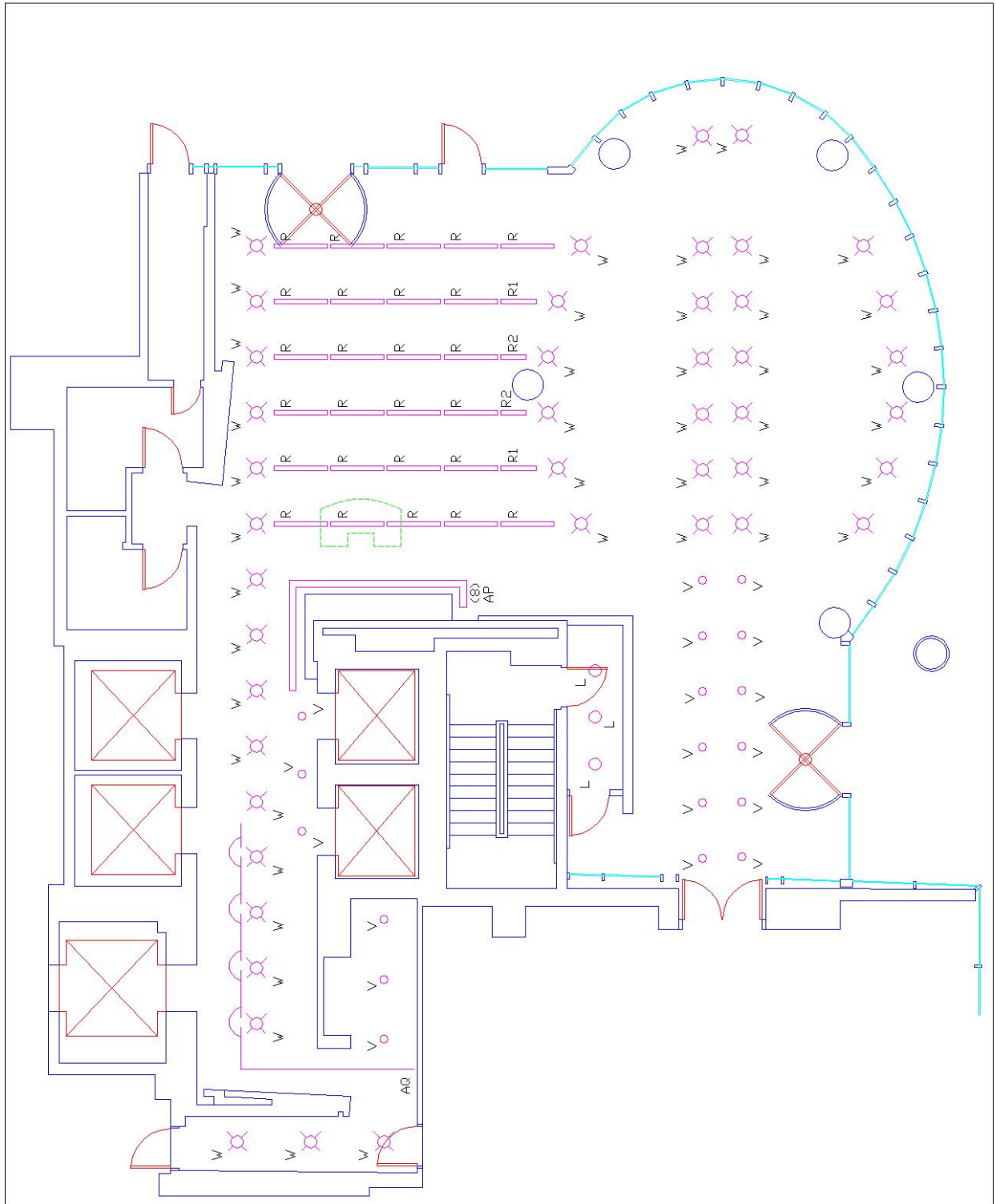
## CAD Drawings, Plans, and Sections

Dimensioned Plan of the Lobby



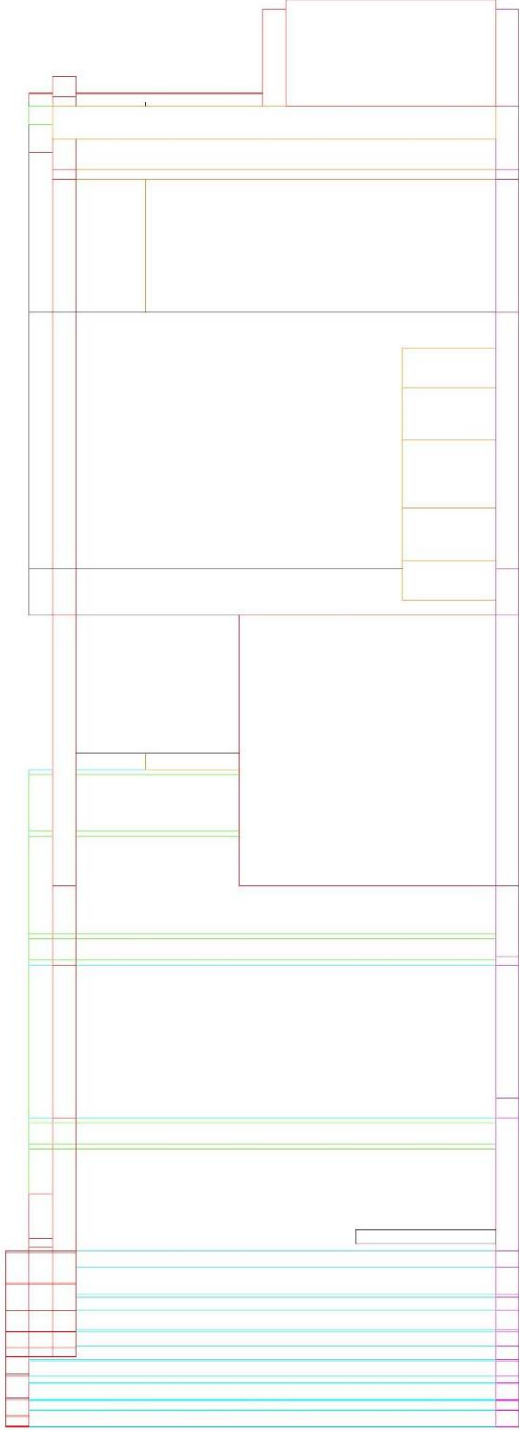
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Luminaire Fixture Plan of the Lobby



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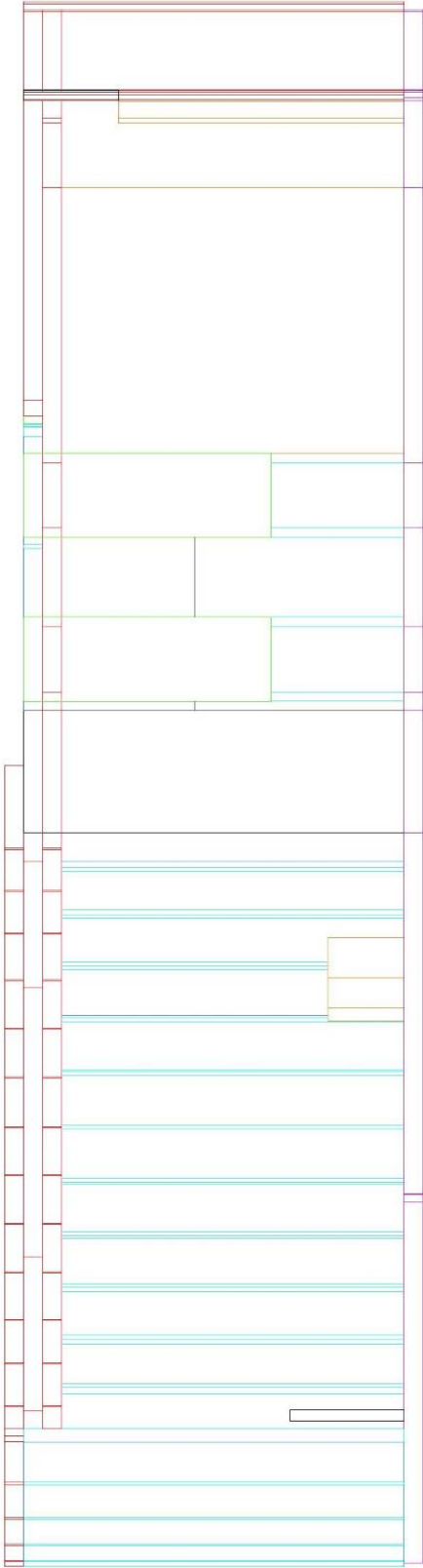
Sections from CAD drawings of the Lobby



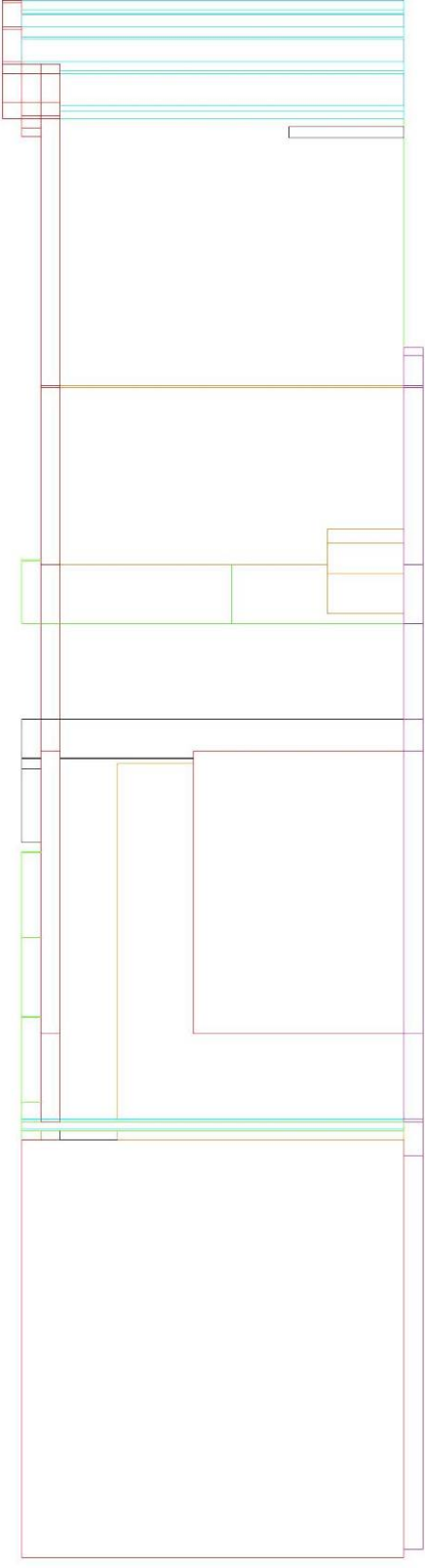
Through Oval looking South at  
Security Desk, Parking Elevator  
Lobby, and Main Elevator Lobby

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Through Main Elevator Lobby looking East  
toward Oval and Security Desk



Through Oval at East Entrance looking West  
toward Security Desk and Stairwell-wall

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 10

The appearance of the main entrance lobby to the office tower is of utmost importance. Business clientele as well as the employees of the offices require a pleasant and calm, yet sophisticated and professional appearance to maintain their reputations and conduct their affairs appropriately. The luminaires should not intrude upon the look of the space, unless they are of particular aesthetic appeal. The space itself should not scream at the occupants what the most unique or particular aspects of its design are, but should calmly present itself and its intricacies only through the occupant's consideration.

Within this lobby, these aspects are fairly well met. All of the luminaires are minimalist, clean-looking, and sharp. The accent pendants, which themselves are artistic pieces, make the bold statement as to the design's unique quality, but present the occupants with something-of-note that any of the businesses would be "proud of." Likewise, the employees and their reputations are only complimented by the use of the sculptured work. The thin pendant linear fluorescents provide appropriate levels of ambient lighting that do not overpower any area of the space, nor the artistic pendants' glows. The variety of architectural materials is well and uniformly lit so as to show their particular characteristics (of note, the metal mesh banding at the south walls).

The quality of the space, its appearance, and the appearance of the well-designed materials must be very high. The appearance of the luminaires and overall aesthetics must conform to the activities to which this lobby will lead, and only enhance the "psychological advantage" of the office tenants.

### Color Appearance and Contrast – Rating: 9

As previously noted, the architectural materials of the space are not to be taken for granted. The translucent glass banding, the fine metal mesh banding, the wood veneers, and aluminum accent pieces all require accurate color rendering for the space to result as the architect had intended. To forego this quality undermines the architect and causes the space to quickly lose appeal. Additionally, the colors of the lobby's terrazzo flooring must also be accented and appropriately viewed. The three differing patterns and color schemes would not seem so brilliant under a poorly color-rendered lighting system. The gentle warm glow of the numerous pendants may have been enough to offset the bluish hue resultant from the linear fluorescents and bring out the colors of the floor.

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## Daylighting Integration and Control – Rating: (current) 2, (needed) 10

Daylighting control within this space is absolutely necessary, but not yet utilized. The daylighting, at times, borders on “severe penetration” due to the extreme specularity of the terrazzo floor, the glare resultant from the floor at early morning hours (times of high use at the start of business day), and the direct glare due to such high ceilings. The entire east and north façades are 20’6” high, 3’ wide glass paneling with diffuse aluminum mullions. During the day on clear days, and especially in the morning hours, daylight penetration is considerable. Control is the greatest aspect required for this space, while integration should further be addressed through energy savings. Currently there is very little control beyond timing-devices and shading is non-existent.

## Direct Glare – Rating: 7

As mentioned in the previous point, direct glare from daylight is terrible. Direct glare from fixtures will be covered here.

As a calm and comfortable atmosphere, direct glare will result in immediate discomfort and reflect poorly on the space, the building, and especially of its occupants. Due to such a vast ceiling height, current direct glare is relatively non-existent. The sculpted luminaires’ lamps cannot be viewed unless the individual is within 10d of nadir. Similarly, the lamps of the recessed downlights and linear fluorescents cannot be seen easily without extending one’s view angle greater than 70d from horizontal.

## Light Distribution on Surfaces – Rating: 7

A differing ratio of distribution can be used as a means of leading an individual from entrance to destination or exit. Contrary, an even distribution can give the occupant a feeling of spaciousness and openness with which they have the freedom to move around. The lack of constraint may prove misleading to points of interest (entrances, exits, elevators, etc.) but would increase the overall immediate comfort level the person has upon entry or while waiting.

The current space has chosen to go with the latter approach. The distribution over the floor (task plane) is relatively uniform and very comfortable, but it leaves no indication of further ingress or ultimate egress. Likewise, it does little to accentuate the security/information desk.

## Luminance of Surfaces – Rating: 8

Complimentary of the appearance and color appearance, the luminance of surfaces will be important in further distribution of diffuse light, and will enhance the depth and relativity aspects of locations in the lobby. Highlighting the dark woods, and decreasing the illumination levels on the aluminums, white surfaces, and translucent glass will even out the depth appearance of some walls but may cause some spatial confusion. Currently, the light level is high enough to limit the affects of these luminances, but areas such as the elevator corridor have poor luminance levels, giving it a dark, cave-like appearance, but also considerable depth.

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## Modeling of Faces and Objects– Rating: 6

Facial modeling is not a distinctly important quality of the lobby. While initial face-to-face contacts may be made, and close personal conversation between individuals is typical, they do not create a great necessity for substantially well modeled faces. Likewise, the space itself has few objects that would cause confusion or be completely neglected due to poor modeling.

## Points of Interest – Rating: 7

Points of interest are quite necessary in differentiating lounge and waiting areas from information and reception areas. In the case of the current design, there is no standard waiting area, and the only reception is centered on the security desk, the only entity within the space. The three remaining points of interest are the entrances and exits, the information panel at the west wall, and the elevator area. Higher illumination in these areas is necessary for differentiation – something that was not well-accomplished in the current scheme.

## Reflected Glare– Rating: 9

Reflected glare, like the direct glare, is important to the comfort and psychology of the office lobby space. Occupants and visitors are unlikely to look up at a 70d angle, but will oftentimes look down at any range of angles (20d being the specular reflectance angle for the same situation, position, and luminaire). Considering the materials used for flooring and walls, reflected glare plays an important role. The terrazzo floor will reflect a great deal of sunlight as well as interior luminaire light during daytime and nighttime hours. The glass facade cannot be neglected either, again especially during the nighttime hours. High reflectances at grazing angles, critical angles, and for high illuminance ratios from interior to exterior will cause considerable discomfort for anyone passing through the lobby throughout the day.

## Source/Task/Eye Geometry – Rating: 3

The majority task of the space is walking to a destination from either within or outside of the building – the destination 99% of the time being the elevators. However, the permanent occupants in the lobby, the security guards, require the use of extremely low-angle VDT for closed circuit security television. At this point, the geometry is important, but not nearly enough to counter any one of the other design criteria's necessities.

## Surface Characteristics – Rating: 7

As has been mentioned, the surfaces used throughout this lobby vary in their reflectances, specularities, colors, and textures. To bring out the greatest aesthetic appeal in the architect's design, these characteristics should be accentuated only when available, or absolutely necessary. At most one wants to make the occupant or visitor aware of the specular, and therefore smooth, slippery nature of the floor as a safety concern. All other accentuation of materials is exorbitantly aesthetic and, for the most part, unnecessary.



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## System Control – Rating: 10

Because of the considerable daylight penetration, the vast spectrum of illuminance levels over the course of the day, and for better energy savings, system control in the lobby should be considerable. It is very important to make the most use of the natural light and to minimize the energy consumption of the lobby, a task the current scheme does not utilize. This is especially true since the lobby operates over the longest time period throughout the day.

## Horizontal Illuminance – Rating: 8

The horizontal illuminance suggested for the lobby space is 100 lux. Since the space has very little activity, no areas for reading or writing, and no distinct tasks are performed within the space, 100 lux is reasonable. However, as the cornerstone of the building, it would be desirable for the space to have a much higher illuminance level to 300 lux and possibly higher dependent on the illuminance levels of the adjacent spaces. The area should be dimmable such that the interior/exterior illuminance ratio does not cause discomfort and strain to any passersby.

Likewise, this increase in illuminance on the horizontal plane is desirable for the work and tasks of the security station. The illuminance should not cause the security monitoring to be compromised, so one would not go as high as 500 lux, but should be increased nonetheless.

## Vertical Illuminance – Rating: 6

The vertical illuminance is not of great concern for two reasons. First, the horizontal illuminance components of the fixtures have a cavity that reaches well above the task plane and heights of the occupying individuals due to such a large ceiling height. Vertical illuminance components of the fixtures are already accounted for through basic distributions and diffuse reflections from the floor and low walls. Second, the daylighting acts as a vertically oriented area source for better vertical illumination. For these reasons, vertical illuminance in the range of 30 to 50 lux, should not have to be distinctly accounted for in the lighting design.

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Office Lobby – Space to Space Method: 1.8 W/sf

ASHRAE Power Density Allowance for Office – Building Area Method: 1.3 W/sf

Lobby square footage: 2900 sf                      ASHRAE allowance StS: 5220 W

ASHRAE allowance BA: 3770 W

Existing Power Density: 1.61 W/sf

Meets ASHRAE 90.1 Space-to-Space  
Does NOT meet ASHRAE 90.1 Building Area

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## Façade

### Existing Lighting Overview

The façade has three main components. The eastern and southern façades are typical of the building. The northern façade accentuates the glass structure and curtain wall at the building's base. The western façade, an alley, is lit more for general use and safety than for aesthetics.

The eastern and southern façade has alternating fixtures of wall mounted custom façade luminaires, and in-ground column-/wall-washing luminaires. The wall-mounted luminaires are tubular and oriented vertically with 3-32w fluorescent lamps contained within. The in-ground column-/wall-washing luminaires have 35w metal halide lamps. Both fixtures put out a generous amount of light and both provide the street level façade with a uniform distribution that is relatively bright. The location of the wall-mount and in-ground are at the retail window spaces and column lines respectively.

The northern façade, which will also include the northern 60 feet of the eastern façade are specific to the tenant building itself. The overhead canopy has integrated 2-foot linear fluorescents for general entrance illumination and the oval corner has the same in-ground accent lighting placed at an offset of 18 inches, but still respective of the column lines.

The western façade has a distinct window section containing two strips of industrial fluorescent luminaires each, for a total of 12 strips. This is the only architectural lighting on that façade. The remainder of the western façade has wall mounted parking fixtures spaced evenly on the center of the precast panels' vertical strips. These offer little more than ambient light for the alley for safety and vehicular ingress and egress from the basement parking garage.



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## Control Devices

The facade has only one control device and that is also the time-clock relay system used throughout the building. There is no occupancy sensor or any daylight sensors on the facade anywhere. Control of the fixtures is relatively unnecessary as the façade is illuminated naturally during the day. All of the luminaires at the facade are controlled via the relay system and none of them have publicly accessible switching.

## Furnishing and Artwork

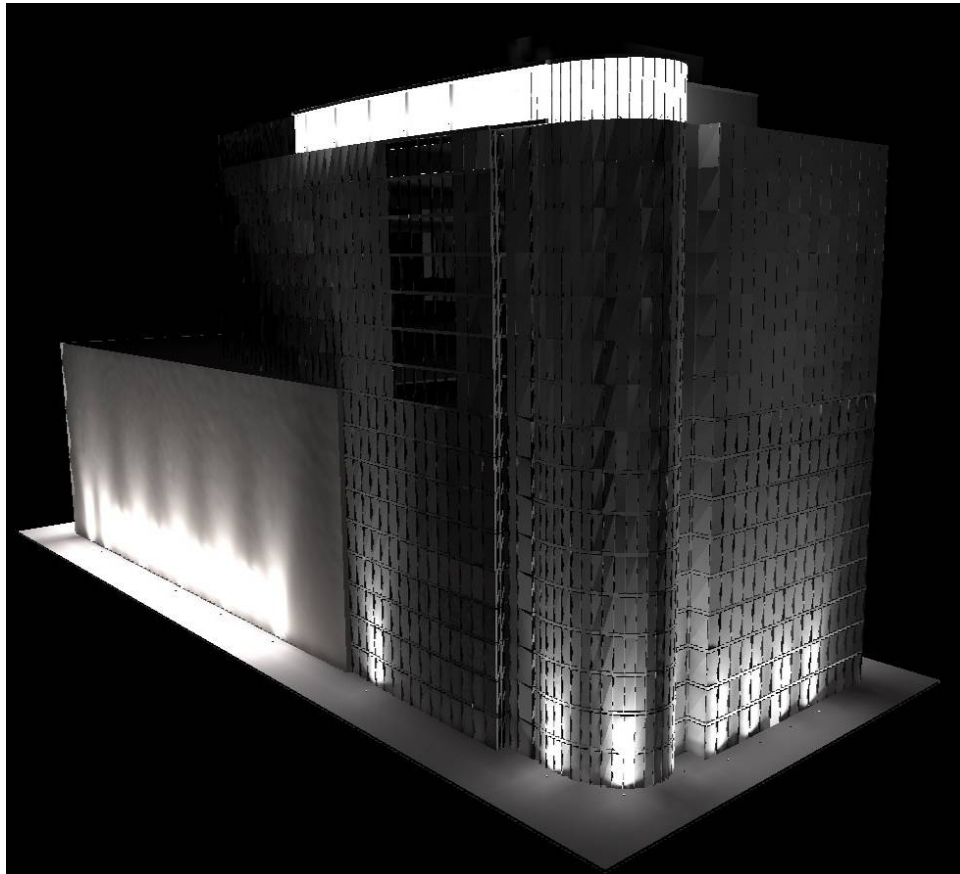
The façade itself is a work of art at the lower levels. There are no furnishings as the building's façade is a vertical surface. In the strictest sense, there are no benches along the sidewalks either due to its narrower width. Artwork is relative to the retail tenants occupying the ground floor spaces. Any artwork illumination is controlled and installed by the tenants. The only pieces of art on the façade, similar to the artwork in the lobby, are the custom-made luminaires used to light the sidewalk and lower façade. These, obviously, do not need to be illuminated again.

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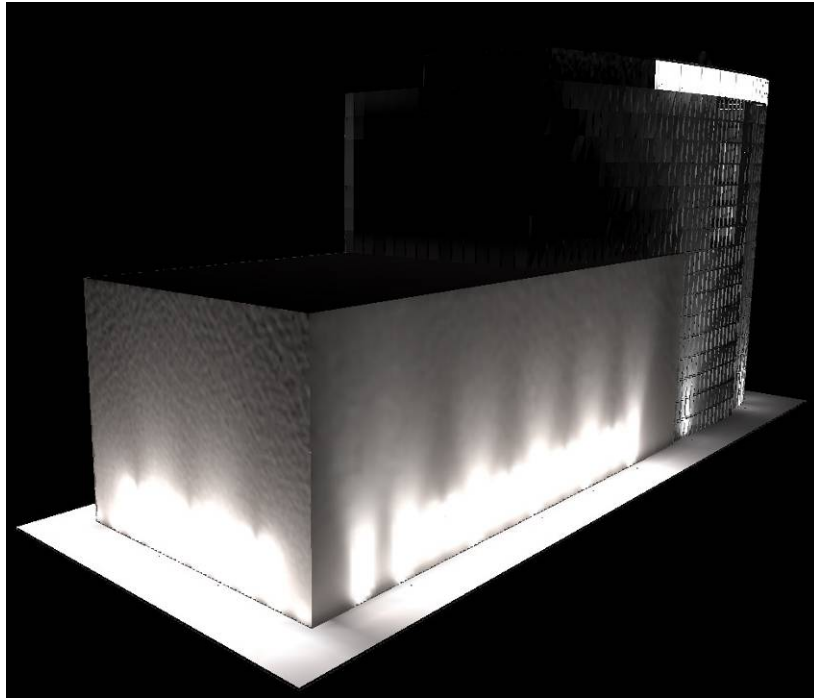
## Renderings– Luminaire Analysis

Please note that to get the impression of the building's existence, the exposure time had to be increased for these renderings and as such does not shown an overly accurate depiction of the light distribution on the sidewalks or at ground level.

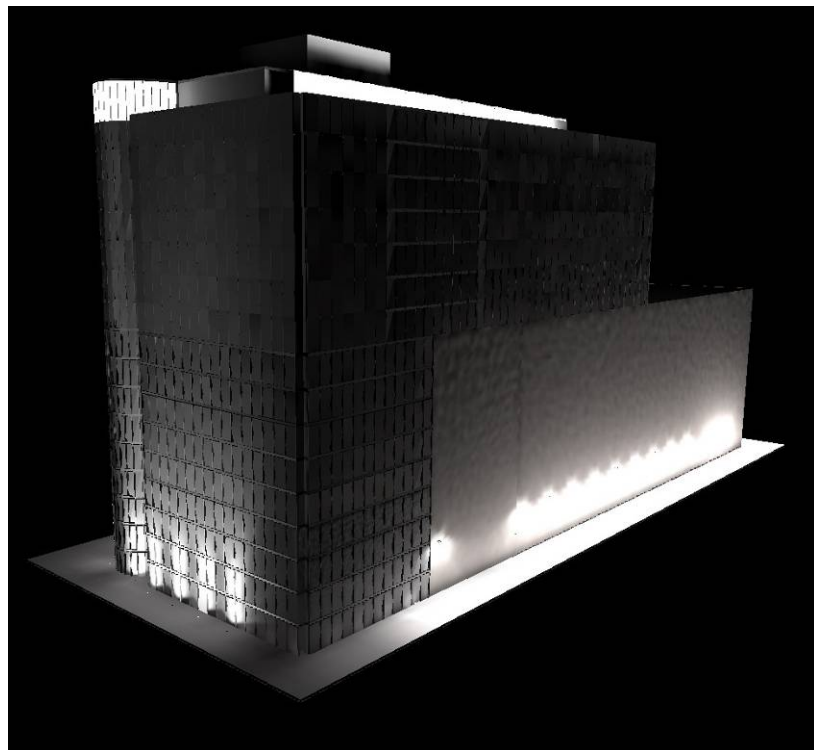


Façade View from the Northeast showing Main Corner of Building

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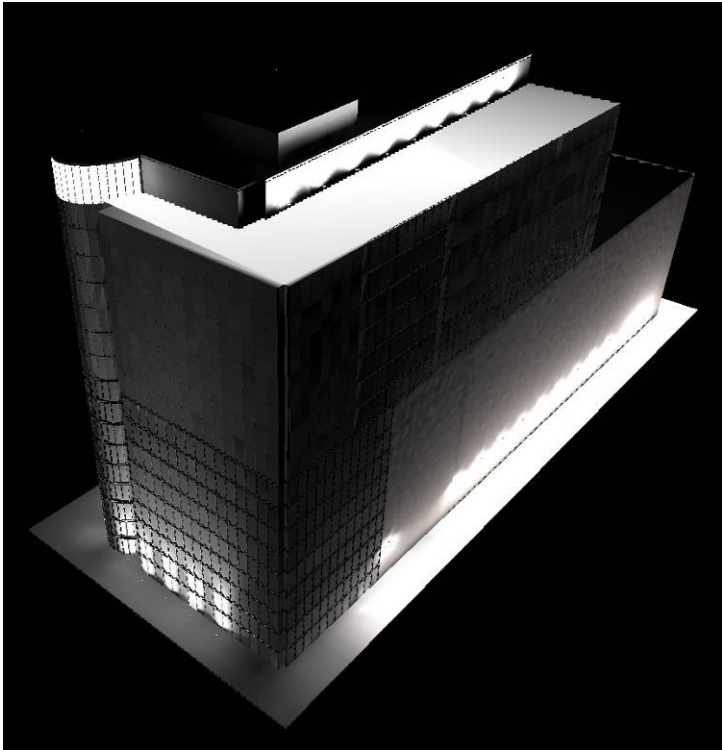


Façade from Southeast showing Retail Spaces and Sidewalks

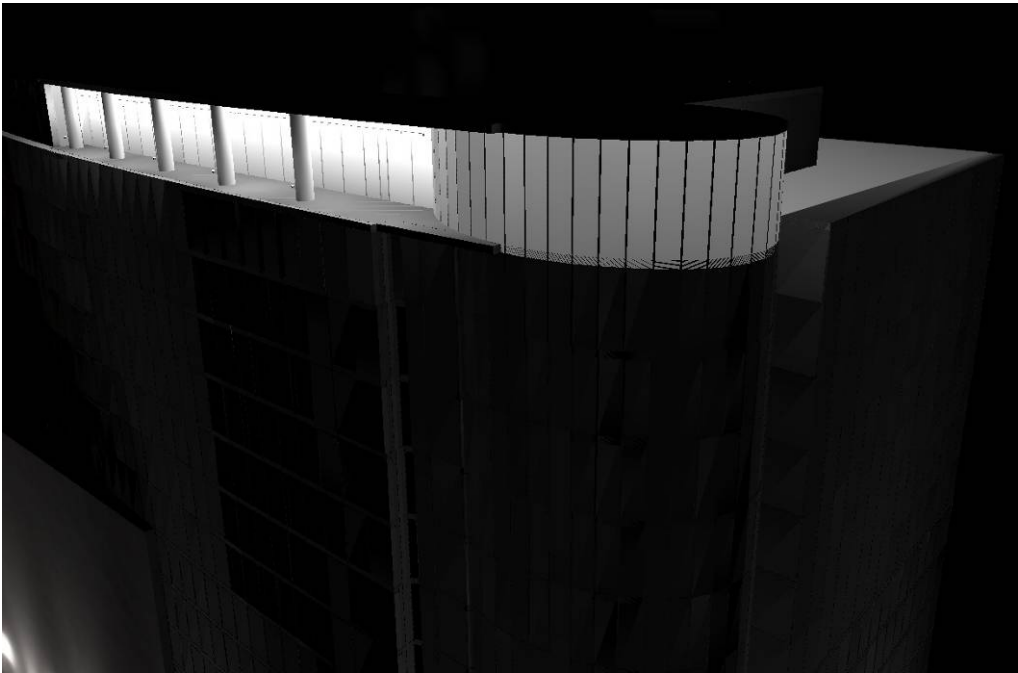


Façade from Northwest showing Alley and North Entrance

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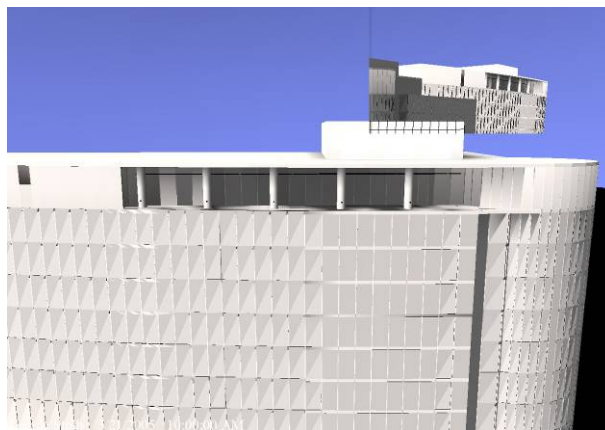
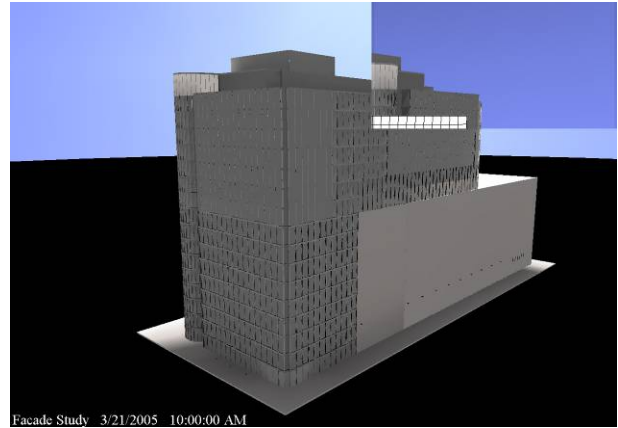
View of Top of Building's Façade Lighting – 17<sup>th</sup> Floor Rear



View of the 17<sup>th</sup> Floor Balcony Lighting

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Renderings–Daylight Analysis

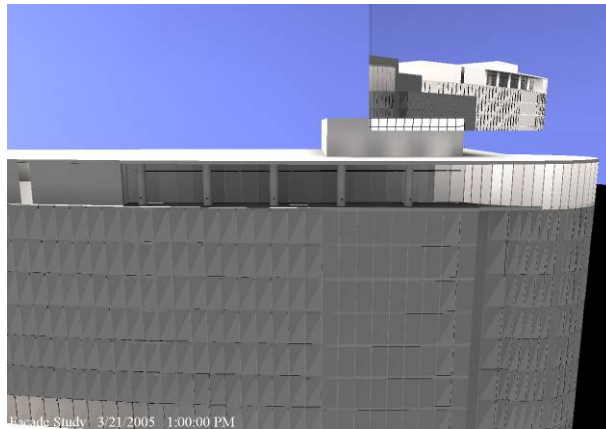
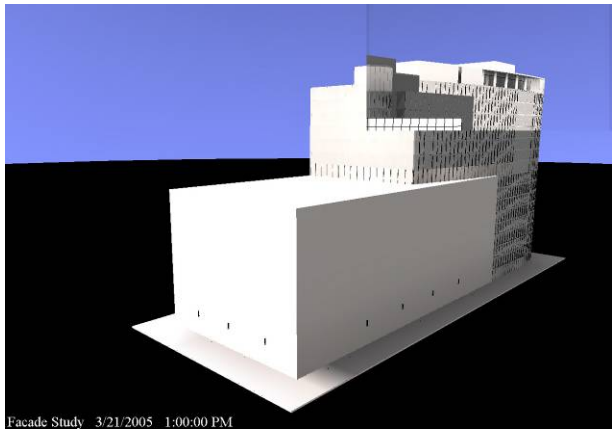


Daylight Studies – March 21, 10:00am

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.



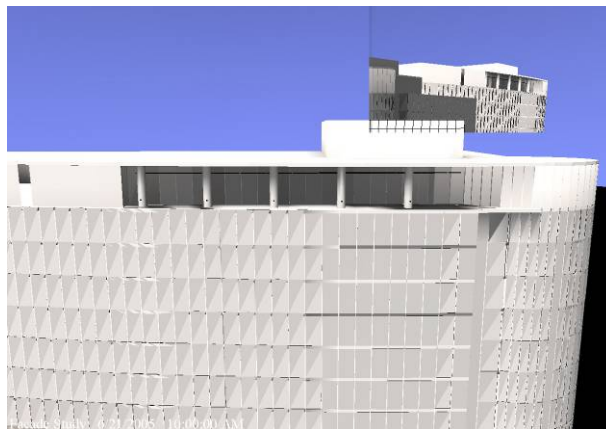
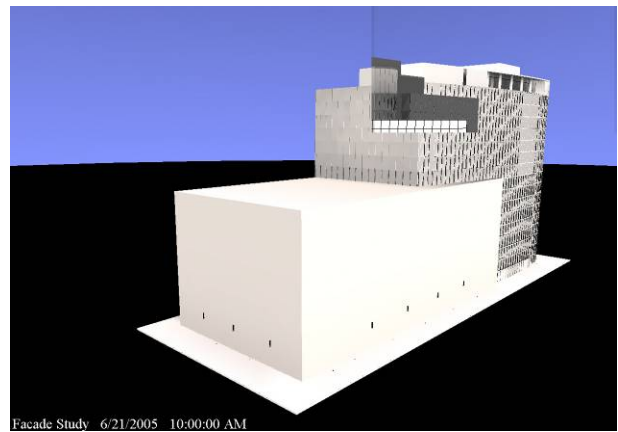
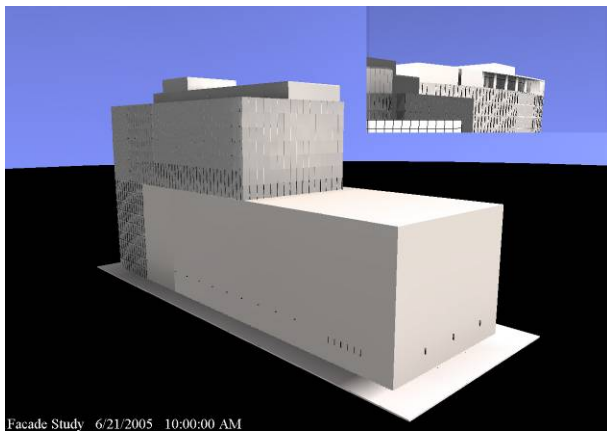
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Daylight Studies – March 21, 1:00pm

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.

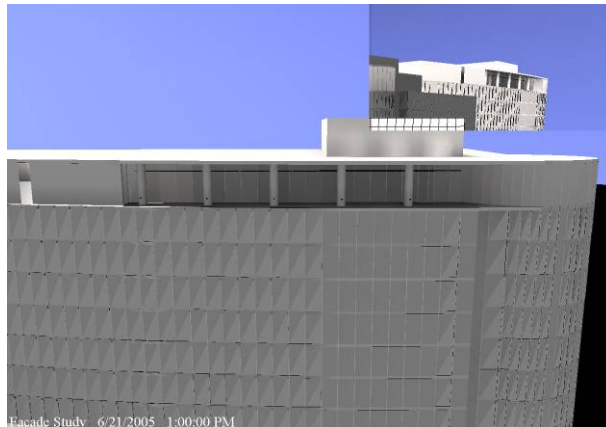
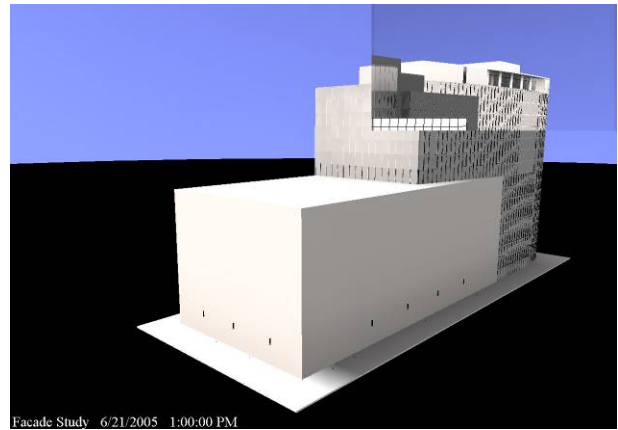
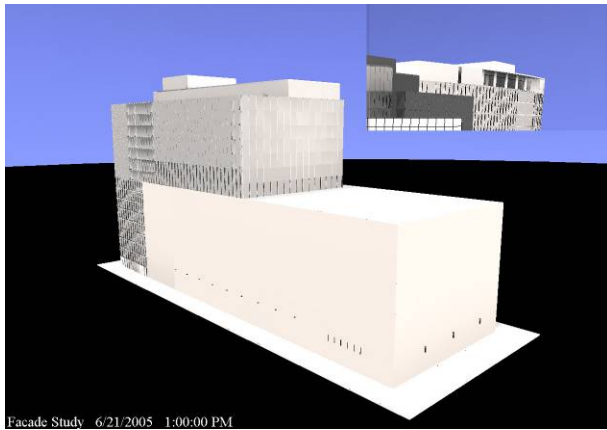
Cathedral Place  
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Daylight Studies – June 21, 10:00am

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.

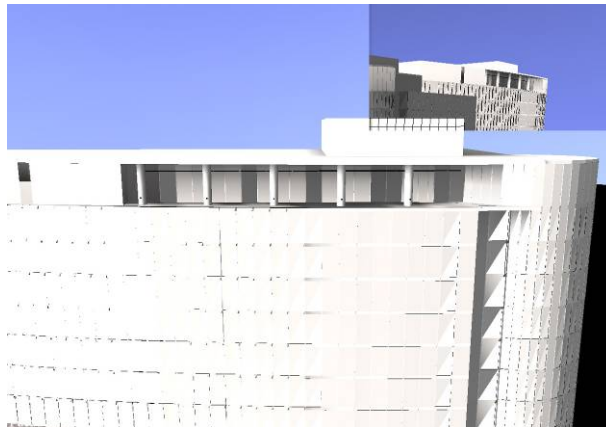
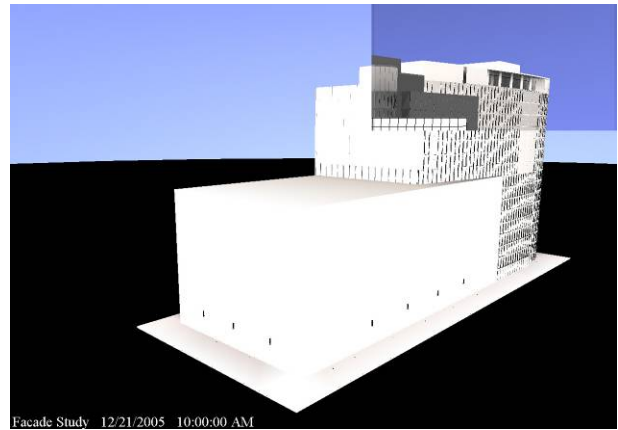
Cathedral Place  
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Daylight Studies – June 21, 1:00pm

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.

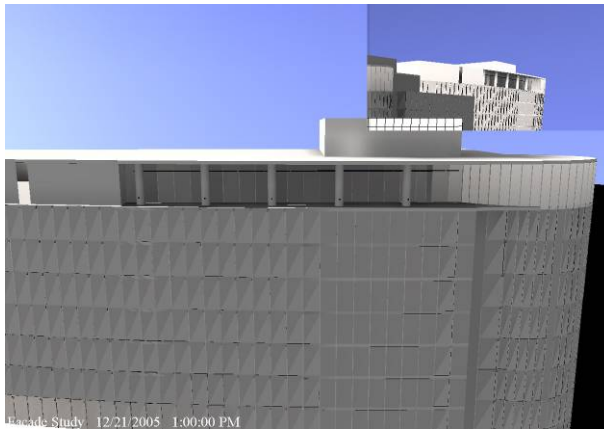
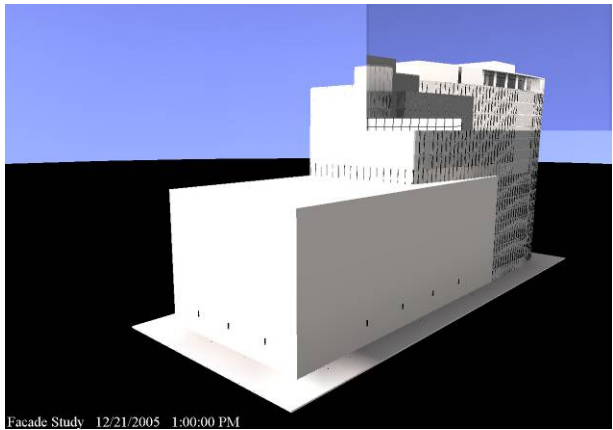
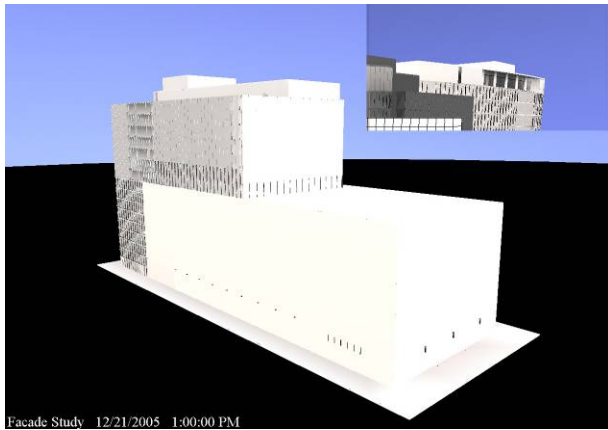
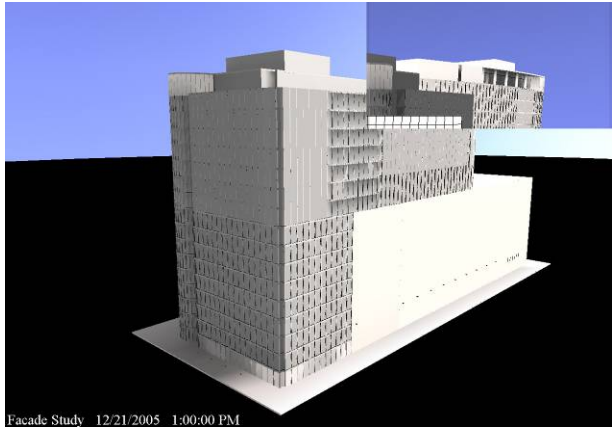
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Daylight Studies – December 21, 10:00am

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.

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Daylight Studies – December 21, 10:00am

\*Please forgive the fragment in the upper-right corner; it is an error in AGI processing.



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## Surface Materials and Reflectances



The roof façade is composed almost entirely of aluminum paneling. The aluminum shown here is from a large section of the roof paneling, but is typical of all of the aluminum used throughout the 17<sup>th</sup> floor and roof façades.

Reflectance: 0.6



The aluminum shown here is typical of the entire façade. It is a little bit lighter than the roof façade but a little duller. There is no specularly associated with this aluminum façade paneling at all which accounts for its slightly increased reflectance compared to the aluminum above.

Reflectance: 0.59



The granite base material shown here is only located at the ground floor, on and around column lines, between retail facades, and no higher than 3 feet off of the ground. The granite is used as an accent piece to the lower façade.

Reflectance: 0.31



The green glass shown here accent outdoor entrances and garage entrances, as well as the accent glass around the retail facades. It is purely opaque, and therefore has no transmittance.

Reflectance: 0.57



The major component to the façade, on the parking structure side, but the majority surface material nonetheless is the concrete precast panels. The precast panels are not just concrete, but have been infused with small specks of black glass to give it a more stone-like or marble look.

Reflectance: 0.68

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The sidewalk pattern shown here is more for informative purposes and is important to the façade lighting. Not a whole lot of downlighting should be used to avoid mixing and bleeding the colors up against the building or against any adjacent building.

Reflectance: 0.42

(for general calculation purposes, less than typical 0.8 for concrete)

## Glazing Specifications – Transmittance and Reflectance



The glass on the exterior, shown to the left, has a slight reflectance and a high transmittance. Because of the viewing angle, a considerable amount of the street can be seen. It is a light hue of blue, but not to the contrast that the picture shows (combination of daylighting and camera quality).

Further information on the glazing is shown below.

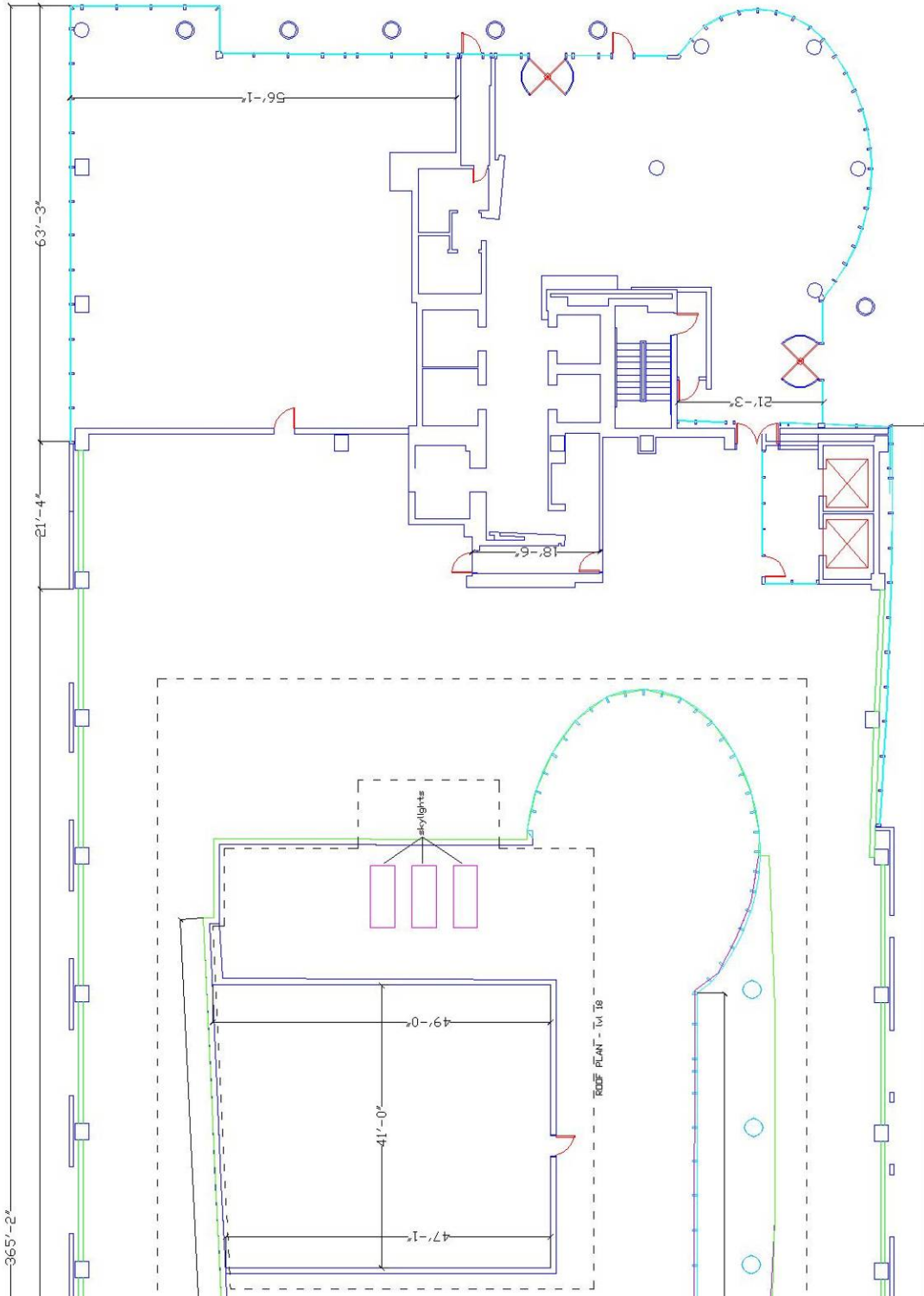
Reflectance:	Forthcoming from Glazing Contractor
Transmittance:	Forthcoming from Glazing Contractor
Solar Heat Gain Coefficient:	Forthcoming from Glazing Contractor
U-Value:	Forthcoming from Glazing Contractor
Thickness and # panes:	Forthcoming from Glazing Contractor

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## CAD Drawings, Plans, and Elevations

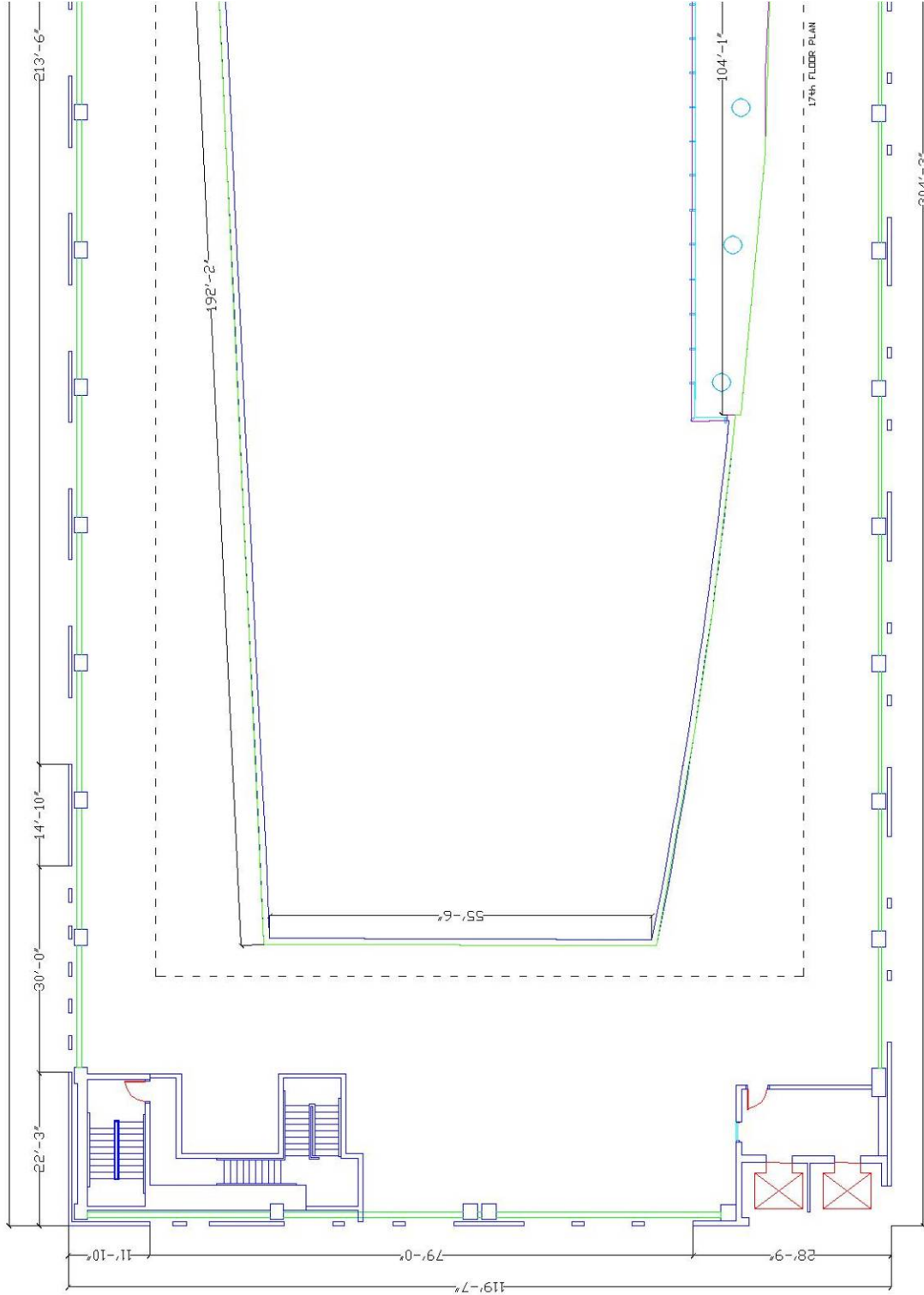
Dimensioned Plan of the Ground, 17<sup>th</sup>, and Roof Facades - North



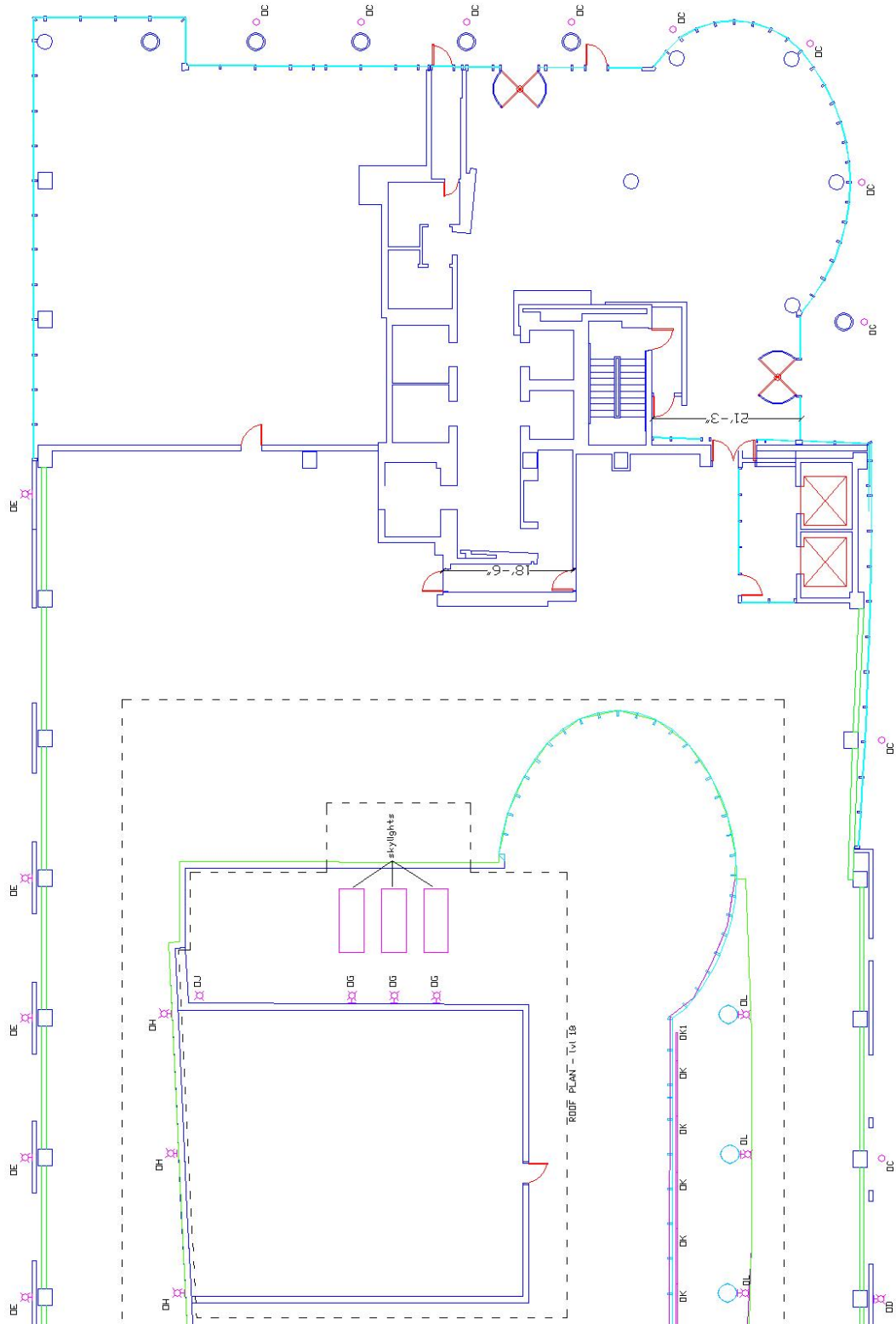


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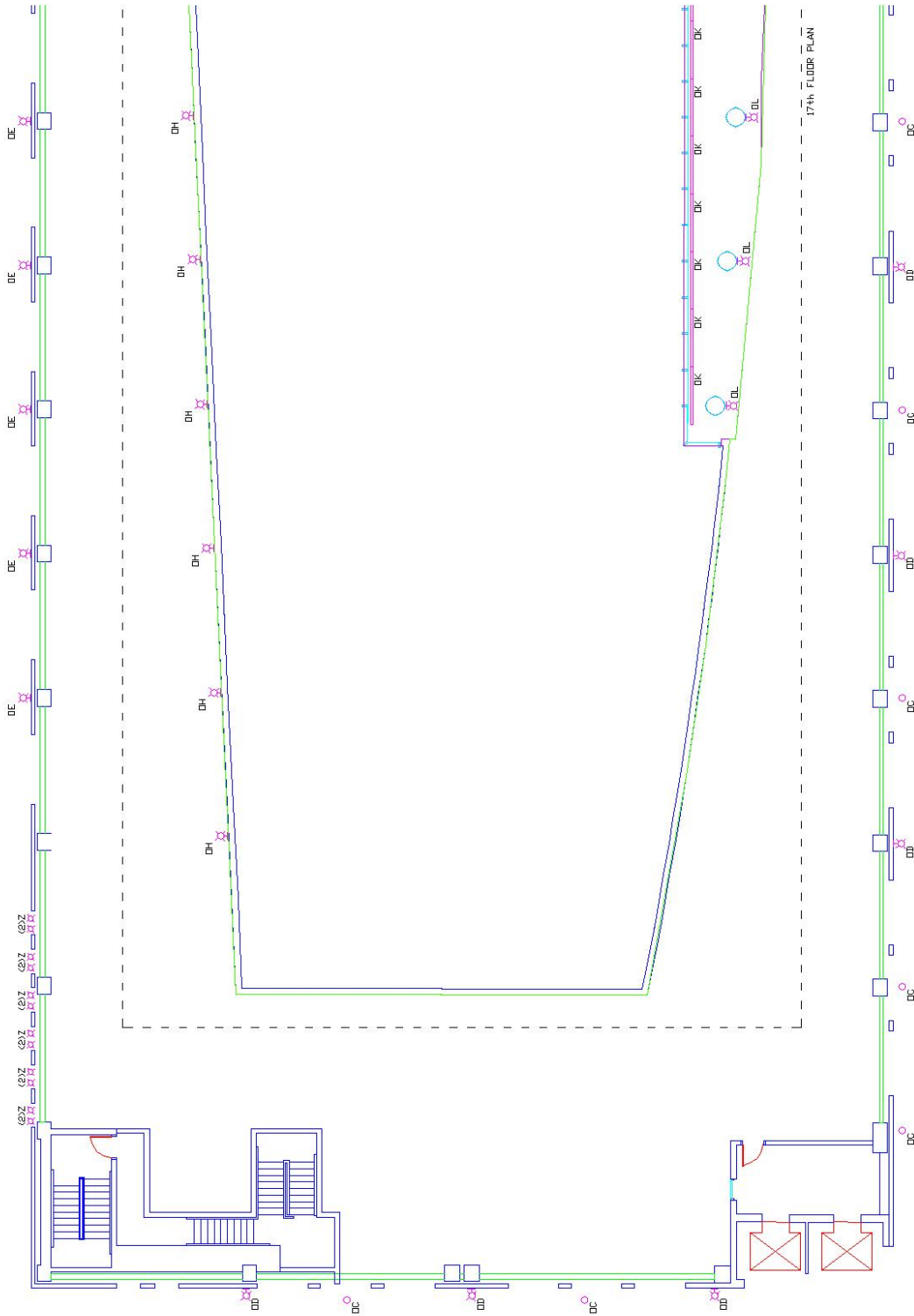
Dimensioned Plan of the Ground, 17<sup>th</sup>, and Roof Facades – South



Luminaire Fixture Plan of the Lobby - North



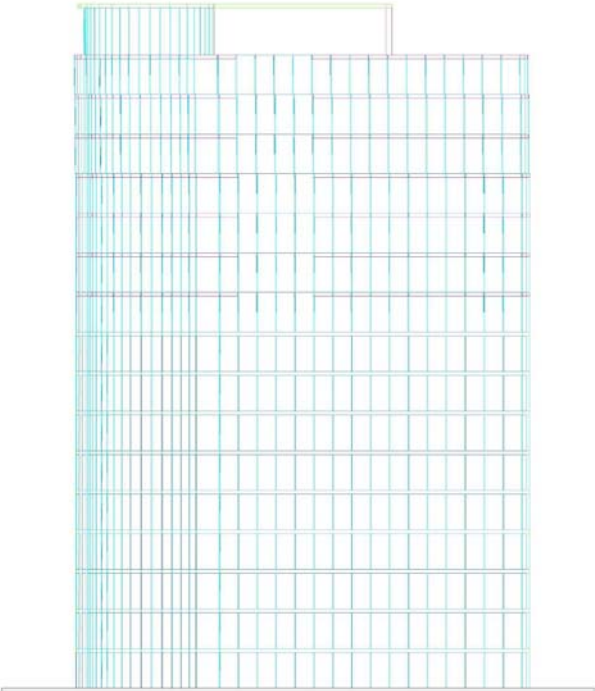
Luminaire Fixture Plan of the Lobby - South



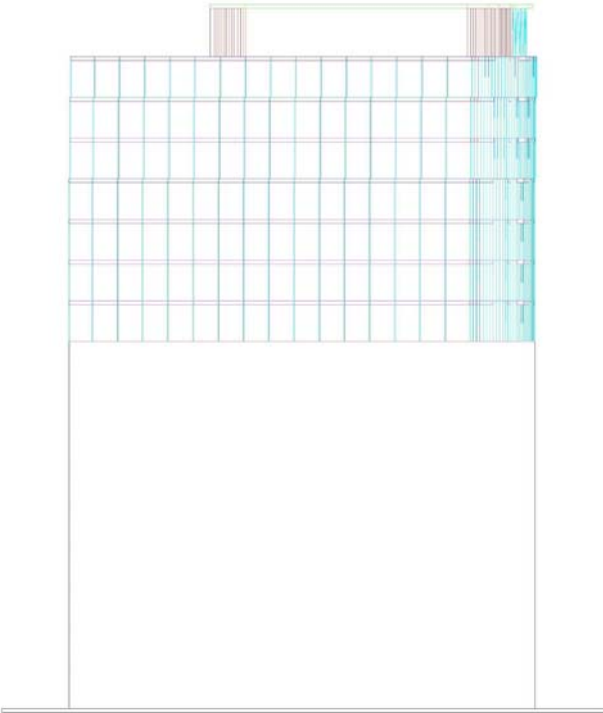
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## Elevations



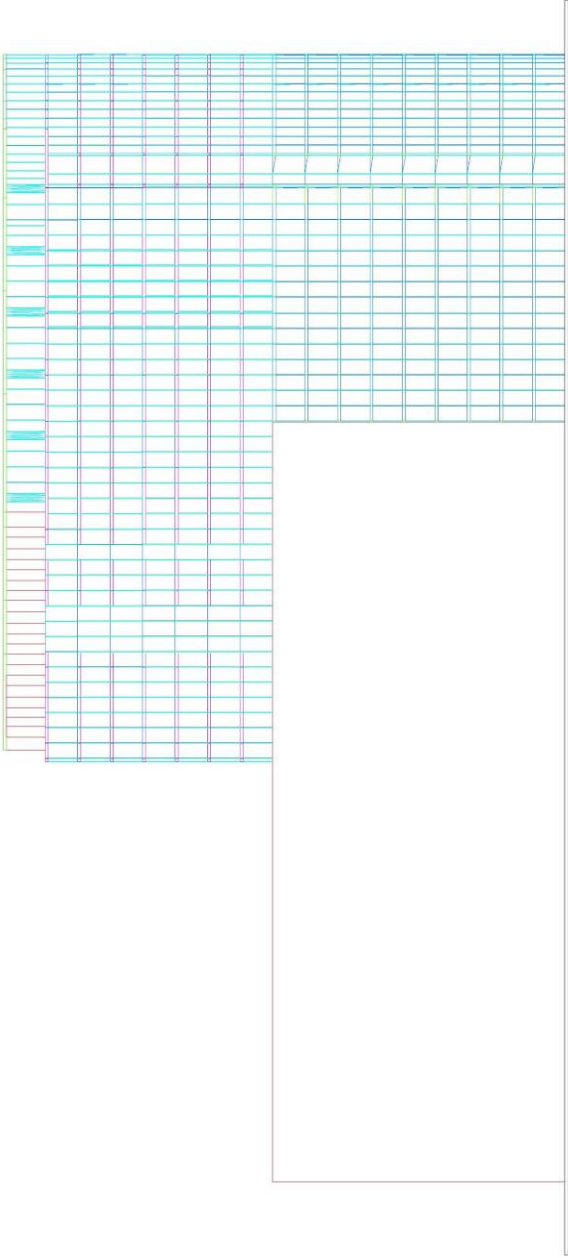
North Elevation



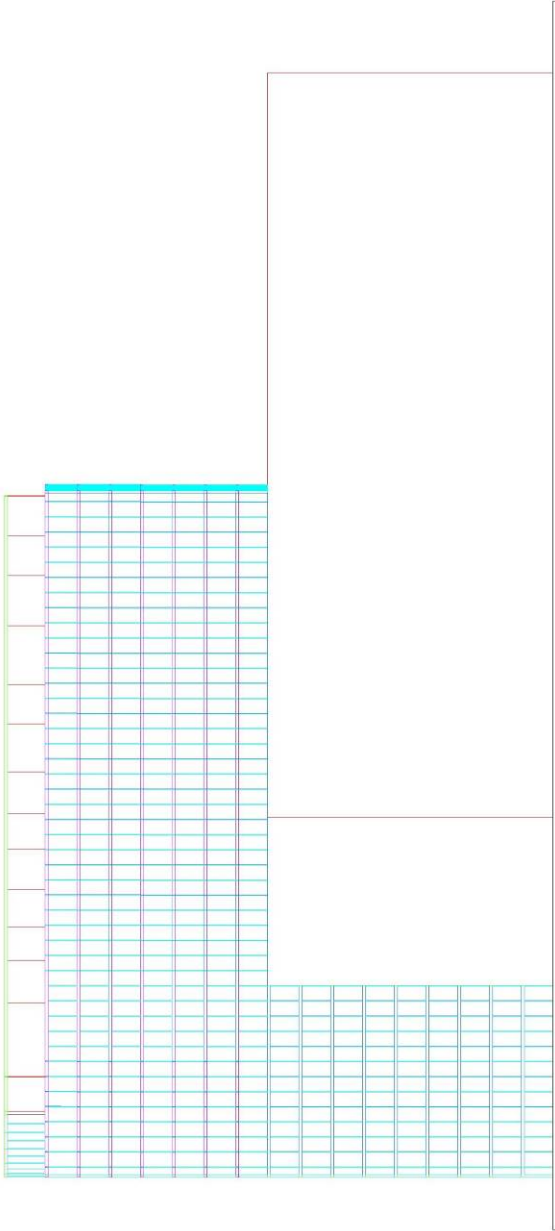
South Elevation

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East Elevation



West Elevation

# Cathedral Place

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 10

The appearance of the façade is of dire importance. Not only does it proclaim the materials used on the building's exterior but it presents the building as a showpiece to the surrounding area and the city given its appropriate size and visibility. The façade in many cases also presents the available public areas to those pedestrians and passers-by that would otherwise not be aware of them. Functionally, lighting the façade also accents the skyline. It gives a form to the building at night and distinguishes its boundaries when the interiors are dark.

The appearance of the façade also acts as a luminous body at night when the building is adjacent to a street, or immediately adjacent to the sidewalk. Cathedral Place does both of these since its proximity to both street and sidewalk is immediate.

At ground level, the façade lighting can also act as a highlight to the retail and restaurant spaces that otherwise have no verticality to their advertising, signage, or landmark accentuation. Façade lighting draws an individual to it both spatially and psychologically, and therefore acts as an advertisement for the building – not only at ground level, but in its entirety. It gives a prominence to the tenant spaces and an affluence that cannot be bought or inferred by the tenant alone.

The appearance of the luminaires is also distinct. The larger ones act as accent pieces and distinguish themselves by adding the unique artistic appeal the building has as a whole. Luminaires are not as prominent have a completely different goal – to be not seen at all. Façade lighting should seem mystifying, if not magical. To view the luminaires that illuminate the façade takes away from the mystery and wonder, and then detracts from the landmark status of the building. Taking away the design uncertainty further opens the door for criticism. Hiding the luminaires is of dire importance when lighting the façade above ground level.

The current design has the former characteristic regarding artistic luminaires, but only provides half of the necessity of hiding architectural accents by placing them in view in the ground and without addressing any of the remaining midsection of the building. It makes a bold statement of boundary however through the illumination of the 17<sup>th</sup> floor east balcony, and the west and north roof lines. The southern office façade lighting is taken to be the soft diffuse ambience caught from the parking deck and splayed across the entire facade.

### Color Appearance and Contrast – Rating: 7

Because the majority of the building is glass, it is hard to illuminate (save from the inside), and the color scheme of the building at night becomes rather plain. Highlighting the aluminum paneling or the precast concrete walls of the parking structure becomes no daunting task as the color variety does not exist as it did on the interior. Nonetheless, for a nighttime scenario, one does not wish to light the building façade with a warm light and impress upon it a reddish tone when the nighttime sky reflects well of black and dark hues of blue.

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## Direct Glare – Rating: 7

The building's in-ground fixtures are a cause for concern for direct glare. Additional façade lighting results in direct glare of particular concern considering vehicular traffic. Direct glare for vehicular traffic could result in catastrophe for a section, area, or major functional component of the building. Given the building's proximity to the street on three of four sides, façade lighting intended for sidewalk illumination and side-building illumination can become major direct glare issues as well. Sharp cut-off angles are required for fixtures installed outside such that they do not distract or, worst-case scenario, blind passing drivers.

## Light Distribution on Surfaces – Rating: 8

Harsh scallops on the façade will alter the linearity of the building (considerable in length at 360') and create an unpleasant wave-effect on the lower portions of the building. Likewise, harsh tight beams of light (if considering narrow spots) will result in a very unpleasant striping pattern on the building façade. Depending on the lighting design intentions, spots should be aimed to accent certain areas, but narrow beams should not be used to reach a large number of floors simultaneously. The current scheme does not attempt to light the midsections of the building in the first place, but does adequately respect the linearity of the building nor eliminate scallops with layered lighting at ground level.

## Luminance of Surfaces – Rating: 6

Surface luminance is not of great concern because of the obvious characteristic of the surfaces. The bright white precast concrete walls will have a great luminance, while the glass panels will have very little. Balancing these light levels or creating an appropriate gradient will be very important to the design scheme. The difference between the light levels is phenomenal, making this criterion important, but easily accounted for.

## Light Pollution and Trespass– Rating: 9

Light pollution from the glass façade may be considerable. Without appropriate lighting (not currently utilized) dark sky recommendations cannot be met. Light trespass to adjacent properties is also of concern due to the variety of zoning in the immediate vicinity. With residential areas to the north and east of Cathedral Place, light trespass will not be tolerated by current residents. Light pollution and trespass should be minimized as an example to future new construction and as a courtesy to those neighboring properties and their current occupants.

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## Modeling of Faces and Objects – Rating: 6

The modeling of faces and objects is important for easy and accurate facial recognition and general safety concerns. Bollards, curbs, wall extensions or protrusions, and spatial awareness are a necessity at ground level when considering façade lighting for the safety of the pedestrian, and passer-by, as well as for vehicular access and awareness.

## Reflected Glare– Rating: --

Reflected glare is only important as far as light pollution and trespass are concerned. For further information please see that section.

## Points of Interest – Rating: 8

Façade lighting, when not independent to the tenant space such as a restaurant or retail shop, is important to identify the entrance(s) and exit(s) to a building. Considering this building's use, the entrances and exits to the parking garages (and the differentiation between them) is extremely important as points of interest. These areas should have a higher illuminance than the adjacent spaces. The point of interest criteria becomes much more interesting when lighting the 17<sup>th</sup> floor balcony. There is no pedestrian ingress or egress, but it serves as a point of interest as an architectural element, and therefore should also have a higher illuminance.

## Shadows – Rating: 8

Shadows at the ground level should be avoided as a general safety concern as well as vehicular-pedestrian safety. A poorly located shadow could make a pedestrian all but invisible to a car entering the parking structure, which would be a great safety concern.

## Surface Characteristics – Rating: 6

As previously noted, the surfaces of the building do not vary considerably, but they do have architectural appeal as many of the intricacies of these elements are lavish in nature and expensive to the building owner. For this reason, it would be in poor design taste to neglect these elements (such as the dark marble at the base of the columns between retail entrances, or the aluminum canopies over each retail and the main entrances). It is also important to note the horizontality of the precast panels and the layered appearance they give.

## Horizontal Illuminance – Rating: 8

The horizontal illuminance on the façade is extremely variable. Horizontal illuminance occurs mainly at ground level, and those values should range from 20 to 50 lux depending on the security condition and the proximity to a major building entrance. Under the canopies, illuminances should attempt to maintain the 50 lux and increase in response to the “point of interest” criteria.



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## Vertical Illuminance – Rating: 6

Vertical illuminances of the façade are extremely variable dependent on the location of measurement. The vertical illuminances at the ground level should be the most uniform with an illuminance similar to that of a parking structure condition – 10 to 30 lux for facial recognition and general safety and spatial awareness concerns. On the building itself, the illuminance will vary highly accounting for hot spots and falloff as the beam reaches further up (or down) the façade.

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Façade – Exterior Lighting: 0.25 W/sf façade lit

Façade square footage: 19200 sf (960' perimeter \* 20' vertical illumination)

ASHRAE allowance : 4800 W

Existing Power Density: 0.28 W/sf

Does NOT meet ASHRAE 90.1 Standard

## Parking Deck Level 3

### Existing Lighting Overview

The parking deck at any typical level is very simple. Ceiling surface mounted metal halide luminaires are staggered in a 4 – 2 pattern for the entire length of the parking structure (approximately 300 feet). The ends of the parking structure, where stairwells and elevator shafts are located, have slightly different lighting schemes. The elevator lobbies have a 12-foot florescent strip (3 4' 32w linear fluorescents) that provides different and additional illumination to those areas. Power is provided in two 277V circuits for the entirety of the parking level.

### Existing Luminaire Schedule

\*For complete schedule and additional lamp or ballast information, see Appendix A

Parking Level														
	Luminaire Type	#	Switching	Lamp	Ballast	Input Power (W)	Total Power (W)	Type	Dirt - Cycle	LLF	RSDD	LLD	BF	LSDD
Typical														
	AA	6		L2	B2	30	1080	II	Clean - 18	0.831	0.97	0.950	0.98	0.92
	PA	46		L18		175	8050	Road	Clean - 36	0.000	0.97	0.684	0.00	0.85
				<b>TOTAL POWER :</b>			<b>9130</b>							

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## Control Devices

The parking deck, like the façade, has only one control device and that is also the time-clock relay system used throughout the building. There is no occupancy sensor or any daylight sensors for the parking structure at all. For the most part, the parking luminaires are either always on, or controlled via the relays. None of the luminaires have publicly accessible switching.

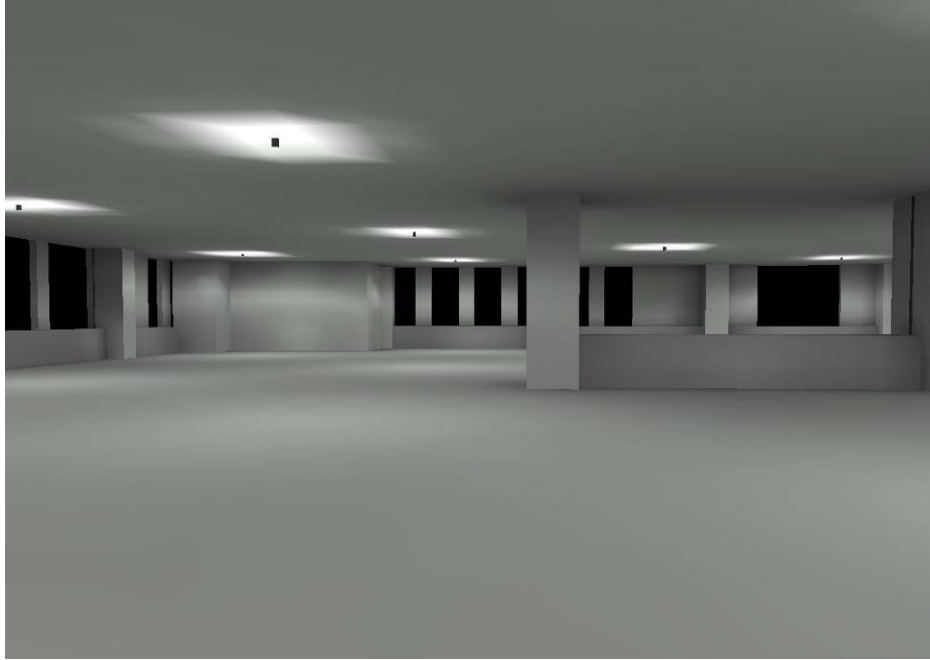
## Furnishing and Artwork

Due to the nature of the space, there is absolutely no furniture or artwork to mention. The parking structure's lobbies are open to the public and as such have no furniture or artwork that would have the slightest possibility of being stolen or vandalized.

# Cathedral Place

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## Renderings– Luminaire Analysis

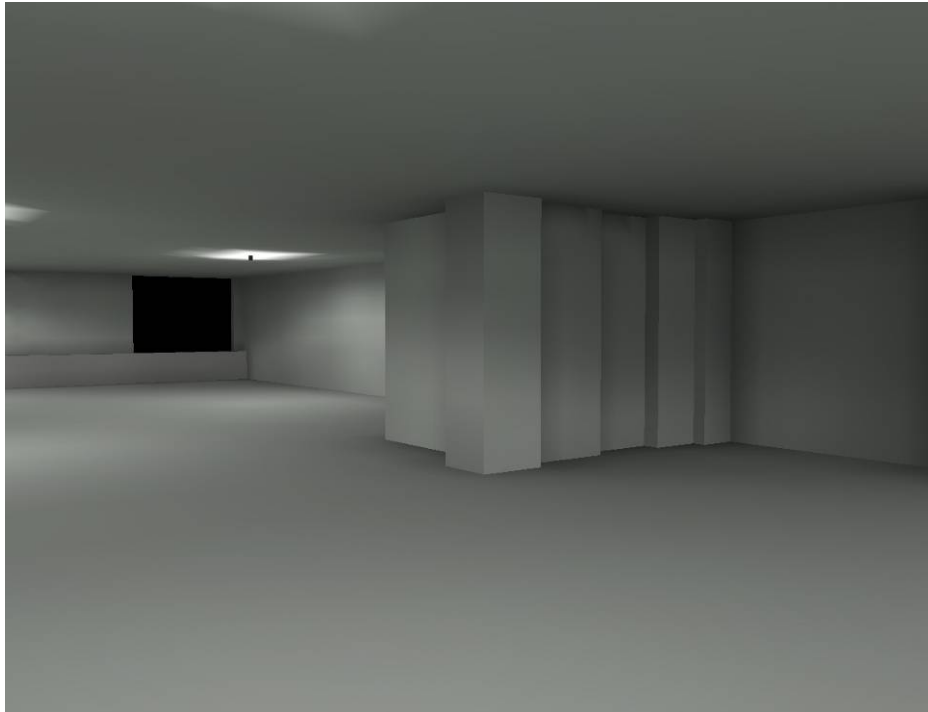


Luminaire – View from the Southeast Lobby Across Structure's Width

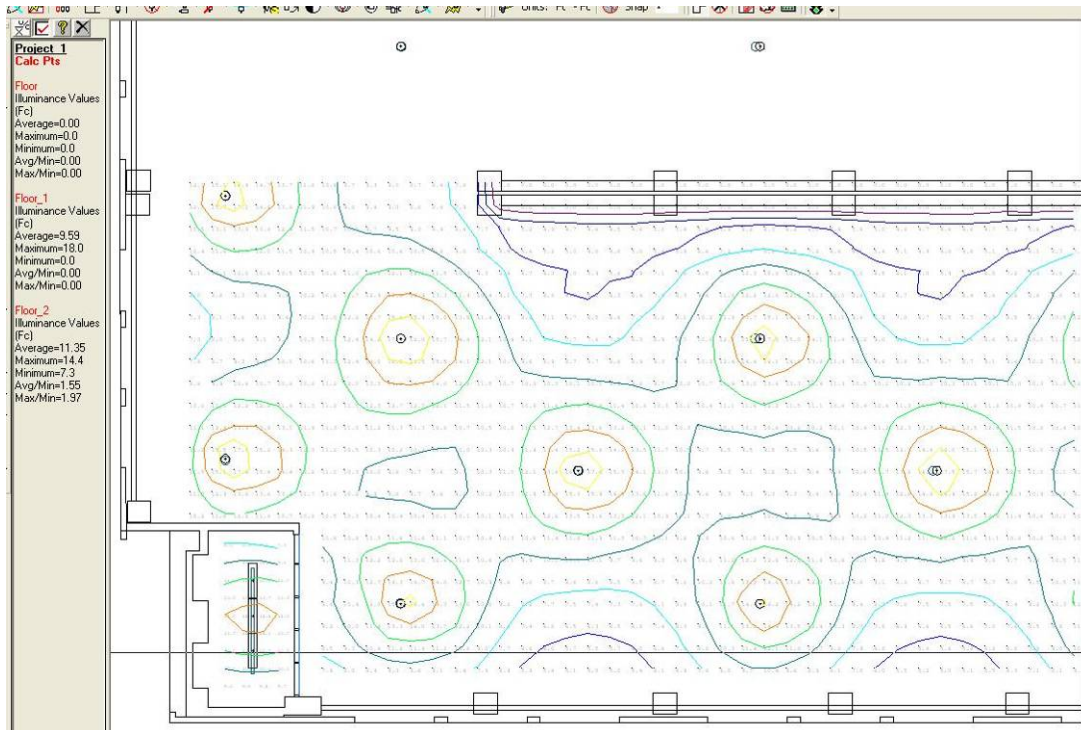


Luminaire – View from the Northeast Lobby Along Structure's Length

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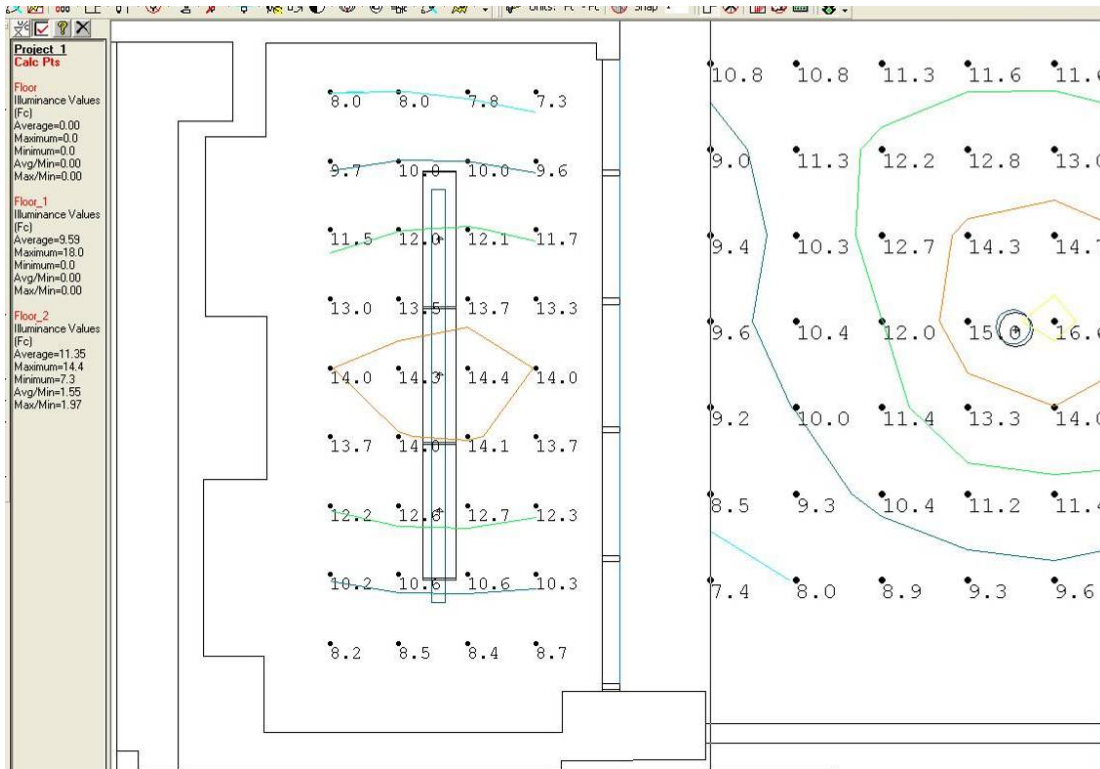
Luminaire – View of the Service Elevator West of NE Lobby



Isoline of Southeast Quadrant around Lobby

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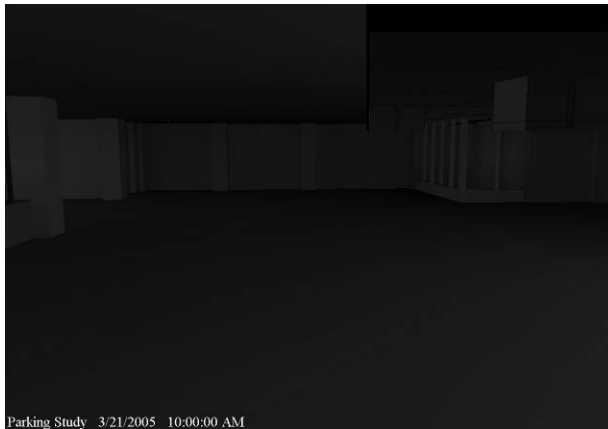


Isoline Close-up of Lobby and Adjacent Parking Area

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## Renderings—Daylight Analysis



NE Lobby



SE Lobby



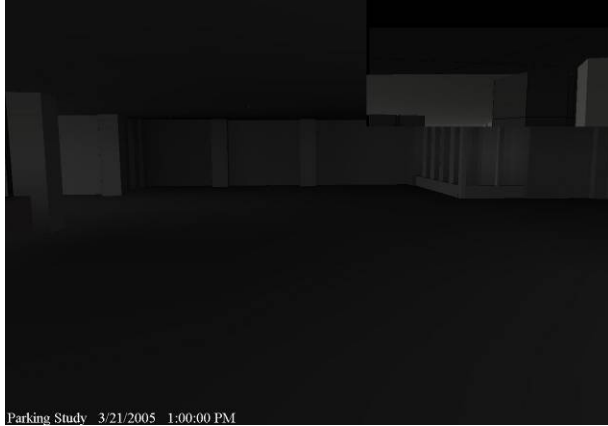
Width



Length

Daylight (no luminaire) – March 21, 10:00am

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NE Lobby



SE Lobby



Width



Length

Daylight (no luminaire) – March 21, 1:00pm



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NE Lobby



SE Lobby



Width



Length

Daylight (no luminaire) – June 21, 10:00am

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NE Lobby



SE Lobby



Width



Length

Daylight (no luminaire) – June 21, 1:00pm

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Parking Study 12/21/2005 10:00:00 AM

NE Lobby



Parking Study 12/21/2005 10:00:00 AM

SE Lobby



Parking Study 12/21/2005 10:00:00 AM

Width



Parking Study 12/21/2005 10:00:00 AM

Length

Daylight (no luminaire) – December 21, 10:00am

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NE Lobby



SE Lobby



Width



Length

Daylight (no luminaire) – December 21, 1:00pm

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## Surface Materials and Reflectances



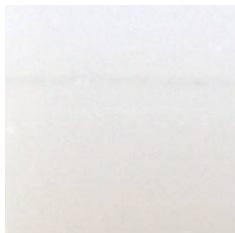
One of the main surface materials is the wall material, which, on interior load-bearing elements are cinderblock masonry walls. These concrete blocks with similar concrete mortar are all of the relatively same color and reflectance. They are a medium grey on average.

Reflectance: 0.41



The floor of the parking structure is uniform except for the elevator lobbies. The surface is a smooth concrete with a similar color and reflectance as the cinderblock walls. It, while dirtier and discolored more often, is an average medium grey.

Reflectance: 0.37



The walls and ceiling of the lobby are a simple white painted drywall. It is highly reflective when compared to the rest of the structure, and as such, stands out as a point of interest.

Reflectance: 0.81



The tile in the lobby on the floor and on the lower few feet of the walls (kickguard tiling) is a deep grey with white grout. This dark surface requires little cleaning, and if so, it is very easy. It also complements the grey color of the structure and doesn't give a "color-bomb" appearance to the lobby.

Reflectance: 0.30

## Glazing Specifications – Transmittance and Reflectance



While there is no technical glazing on the walls, there are any number of open portholes, and as shown to the left, large expansive openings with metal mesh inlays acting as "window screens". This metal mesh surrounded by open air is approximated with diffuse windows and transparent windows respectively.

Transmittance (screen): 0.33

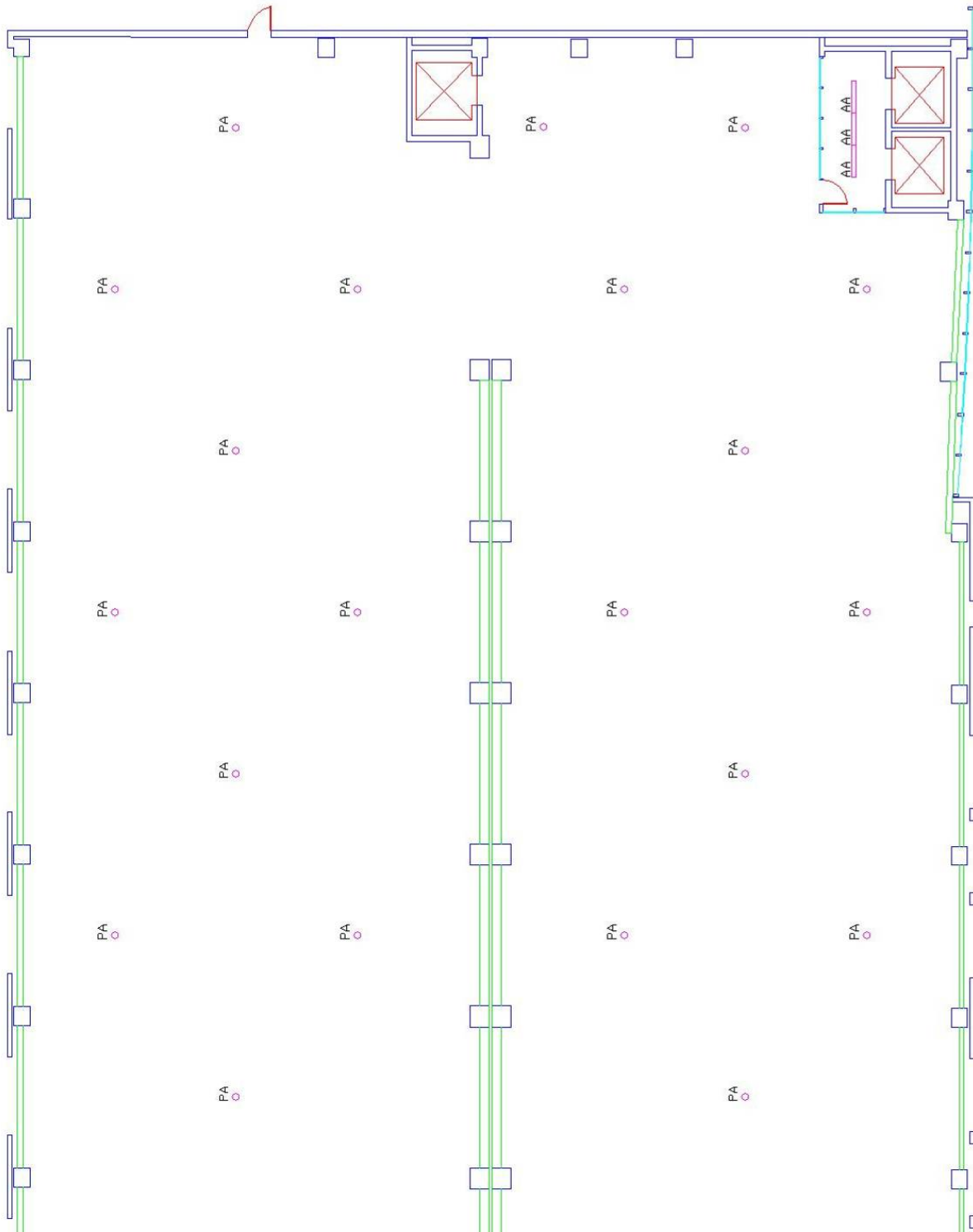
Reflectance (screen): 0.66





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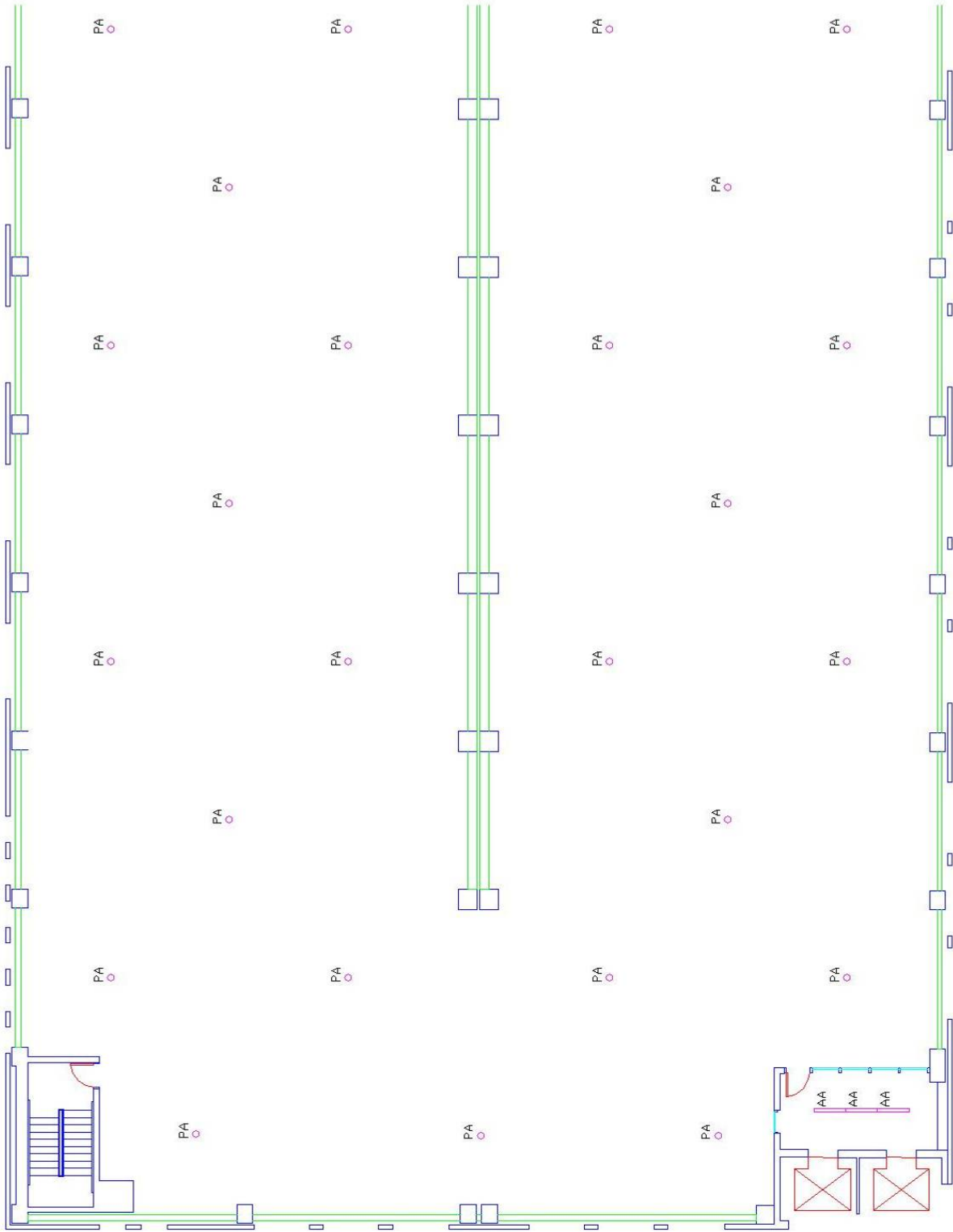
Luminaire Fixture Plan of the Parking Deck – North





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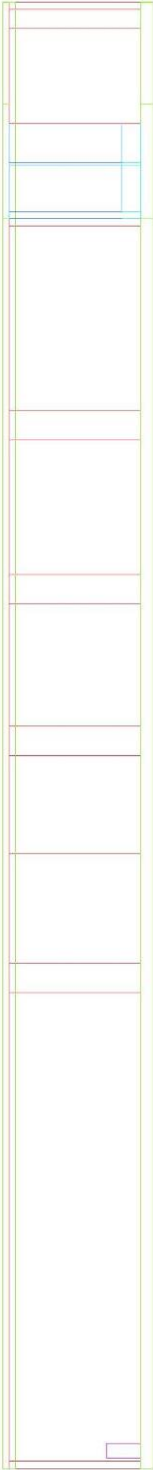
Luminaire Fixture Plan of the Parking Deck – South



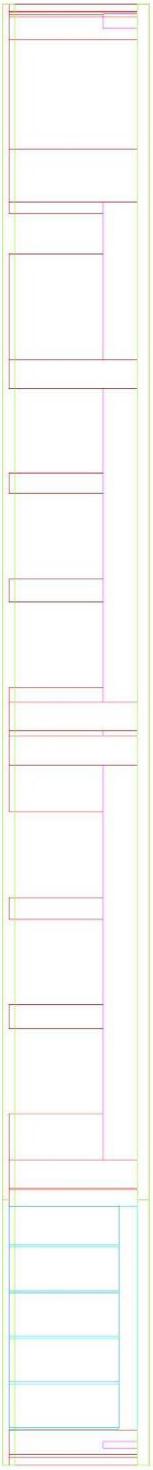
# Cathedral Place

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## Sections



Section Width – Looking North

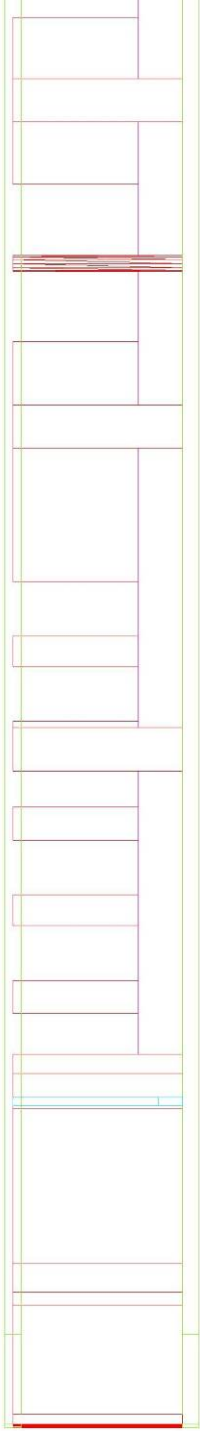


Section Width – Looking South

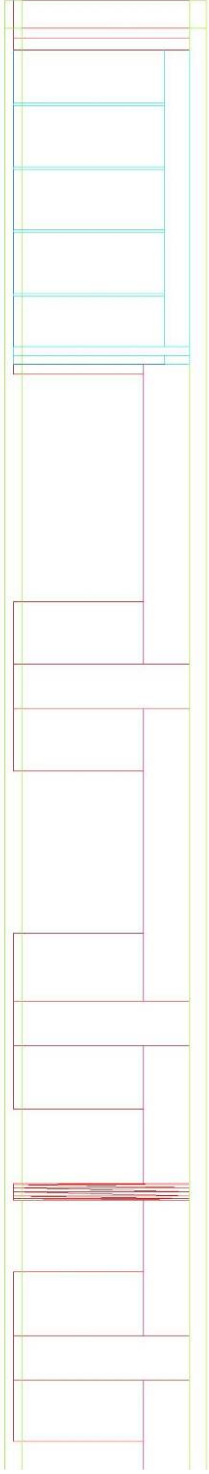
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## Sections



Section Length— Looking East, North Side



Section Length— Looking East, South Side

# Cathedral Place

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 6

The appearance of the parking deck and the luminaires is not of great concern. The parking deck has no architectural aspects that require accenting or special lighting. A general attempt to deviate from the typical parking structure look and feel should be attempted, and a clean, calm environment should be maintained (if not created) with the lighting design. Of note in this design is the integration of the parking structure with the rest of the building. The appearance of the space from the exterior however, is a bit more important. To have a blue/white façade get drowned out by light pollution and trespass from an orange high-pressure sodium glowing box would be hideous. Exterior appearance is very important.

Appearance of the luminaires themselves is not very important either. While an attempt to furnish a more aesthetically pleasing luminaire should be made, the greatest importance lies in the efficiency of the luminaire, not its aesthetic pleasantness.

### Color Appearance and Contrast – Rating: 8

Color appearance and contrast should be regarded as a more important to the design. While the majority of parking structures utilize high pressure sodium lamps for their high efficacies and lower power consumption therewith, the color rendering is horrendous and consequently less safe. The lighting design should attempt to use lamps with high CRIs as well as high efficacies. The lacking appearance of color and accurate rendering should not compromise one's memory or perception for safety issue. Additionally, the color appearance is important to the general façade lighting as mentioned previously. They must be intertwined.

### Direct Glare – Rating: 8

Appropriate fixtures with adequate diffusing lenses should be used to eliminate the direct glare that can accompany low-ceiling parking structure lighting. To overcome direct glare for the safety of the pedestrian and the vehicle, luminaires should be placed off-center with respect to the driving lanes and aisles. This will greatly reduce the direct glare component within the structure.

### Light Distribution on Surfaces – Rating: 5

Distribution of light should be uniform for all surfaces with as slight a gradient as possible. Harsh shadows may impede this uniformity, but driving lanes and pedestrian walkways should maintain a considerable uniformity. Ceiling brightness is not of great concern, and scalloping on walls can be nearly neglected based on the positioning of the luminaires nearest the aisles.

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## Luminance of Surfaces – Rating: 2

Considering the entire structure to be concrete, and unpainted as well, luminance of surfaces only concerns the space itself, and the cars parked within it. The luminance of the walls, floor, and ceiling will be equal in ratios to their illuminances, and concern for spatial depth problems is nullified. Since the specularities of cars cannot be accounted for either, and they vary if type, color, and finish so drastically, it too is neglected.

## Light Pollution and Trespass– Rating: 9

Light pollution would be very important at the top parking deck (half of level 9 mezzanine parking) where the structure has no roof/ceiling. Fixtures at this level should be dark-sky compliant and throw as little light away from the structure as possible. Given the reflectance and diffusivity of the concrete, light pollution will be hard to control.

Light pollution and trespass (one and the same at level 3) should be accounted for as previously noted in the space and color appearance sections. Pollution and trespass through the many openings in the precast concrete walls should be controlled as much as possible through appropriate luminaire placement and selection of appropriate IESNA type fixtures.

## Modeling of Faces and Objects – Rating: 6

Similar to the façade ground-level reasoning for safety concerns and vehicular awareness, face and object modeling is relatively important and a higher light level should be maintained to account for these conditions. Given the exposed internal structure, the bollards around the exposed upper structure, and the precast panel walls, spatial and depth cues should be easily identifiable for all vehicles.

## Points of Interest – Rating: 8

Ingress locations, egress locations, signage, hazard warnings, and the rate schedule should all have higher illuminance than any other part of the structure. This includes the elevator lobbies and pedestrian paths to said lobbies. In the case of the current installation, elevator lobbies not only have high illuminances, but different lamps with differing CCTs as a further point of interest cue. Exit stairs in the case of emergencies should also be highlighted points of interest in the parking structure.

## Shadows – Rating: 7

Shadows, for safety concerns, should be minimized as much as possible and their existence should start at the center of the aisle (none) and become harshest at the head of a parking stall. Shadows created between cars from long throws of light in far fixtures should not be allowed either as it creates a complex layering of shadows that will further degrade the safety factor.

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## Horizontal Illuminance – Rating: 6

The horizontal illuminance varies for points within the parking structure. As noted in chapter 22 of the IESNA Handbook, they should follow this schedule:

	<u>Day</u>	<u>Night</u>
Basic	10 lux	10 lux
Ramps	20 lux	10 lux
Stairs	20 lux	20 lux
Entrance	500 lux (incl daylight)	10 lux

## Vertical Illuminance – Rating: 6

The vertical illuminance varies for points within the parking structure. As noted in chapter 22 of the IESNA Handbook, they should follow this schedule:

	<u>Day</u>	<u>Night</u>
Basic	5 lux	5 lux
Ramps	10 lux	5 lux
Stairs	10 lux	10 lux
Entrance	250 lux (incl daylight)	5 lux

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Parking Active Storage

– Space to Space Method: 1.1 W/sf

ASHRAE Power Density Allowance for Parking Garage

– Building Area Method: 0.3 W/sf

Parking square footage StS: 9000 sf (300' \* 120' \* ¼ storage versus travel lanes)

Parking square footage BA: 36000 sf

ASHRAE allowance StS: 9900 W

ASHRAE allowance BA: 10800 W

Existing Power Density StS: 1.01 W/sf

Existing Power Density BA: 0.255 W/sf

Meets ASHRAE 90.1 Space-to-Space and Building Area

**Cathedral Place**

**Steven Puchek  
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## Conference Room – Deloitte & Touche

### Existing Lighting Overview

Due to the nature of the project, the tenant architect and the security concerns of the tenant, current lighting schemes could not be provided, photographed, or even noted. For this reason, this space is being developed as an independent study to fulfill the Architectural Studies minor. This space is therefore in draft form, as much of the report will be until sufficient design completion has been achieved in the architecture course.

# Cathedral Place

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 10

The appearance of space will be the overriding criteria needing to be met. Likewise, the luminaires will have to be just as aesthetically pleasing for the conference room to appear as intended by the architect. The conference room will be the birthplace of some of Deloitte & Touche's largest single-entity business. It will be the meeting and discussion area for large clients and company financial board members. The appearance of the space will aid in the decision of a client to use Deloitte & Touche's services or not.

The lavish décor and materials throughout the space will proclaim the financial stability and profitability of the company, and sell a previous notion or developing impression of how the company conducts business and how their services can benefit the client. To emphasize the architectural elements, an appropriate lighting design must be achieved and must accent all of these materials and finishes.

The luminaires themselves should be luxurious looking, but maintain a sleek professional profile conducive to a business scene (aka, not a crystal chandelier). Luminaires should visibly provide light if their housings are aesthetically unique or high-class, or should be hidden to give the impression that a great price was paid to so ingeniously illuminate the space.

In addition to the appearance of the luminaires and the artificial light provided, adequate design must also implement the availability of the unobstructed daylight penetrating through the northeastern half of the oval area. Utilizing this light and accenting further will present the space as something of distinction and reflect well upon the company.

### Color Appearance and Contrast – Rating: 9

The conference room should maintain the highest color rendering capabilities. Faces should appear warm and soft, and clothing should appear saturated and bright. The materials of the walls, table, and carpeting should have similar qualities and reflect the calm and comfortable nature of the space. For this reason, lamp selection is crucial and a broad spectrum of wavelengths should be maintained. A CRI above 80 is mandatory and should be the absolute least achieved.

### Daylighting Integration and Control – Rating: 9

Since the conference room has a substantial north-facing glass curtain wall, diffuse daylight penetration into the space is considerable. Daylighting control will be extremely important, especially if the room is used for video-conferencing. In addition to that, early morning sunlight may have the potential to penetrate the eastern-most windows and actually put direct sunlight into the space. This direct component may cause the room to appear dark and uncomfortable given the high illuminance of the strip. Integration should be used as much as possible however to help alleviate the power consumption and account for the vast number of fixtures that will be used to meet other criteria.



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## Direct Glare – Rating: 8

Direct Glare should be almost completely absent from this space. Whether this entails completely indirect lighting or simply a few well positioned spots has yet to be determined. In the case a presentation on white-board or standing easel is given, hot spots and direct glare for the individual presenting should never occur. Likewise, for video-conferencing that might occur, harsh glare will cause the individual to lose focus, squint, become uncomfortable, and cause the client concern. Neither of these situations helps promote the individual or the company's services.

## Light Distribution on Surfaces – Rating: 7

Distribution on the various surfaces should contrast with each other in proportion to their location and use. The conference table should receive the greatest illuminance but should have a nice uniform distribution. The refreshment area ("bar") should have a greater illuminance, but have a steep gradient towards its edges such that it accents the food or sink and falls off quickly before reaching to the adjacent floor. These types of difference should be used for the particular accented areas within the space.

Substantial care has to be taken to ensure that the light distribution from the daylight component does not interfere or override the intentions of the interior light design. Daylight distribution must be accounted for in both the horizontal plane and the vertical plane.

## Luminance of Surfaces – Rating: 8

With the use of video-conferencing and the necessary luminance ratios required between the face and the background, as well as luminance ratios for presentations being given luminance ratios must be strictly controlled. For wood veneer walls, or other low reflectance, low luminance materials, presentations on white paper would force the presentation to stand out. The luminance of the ground and ceiling, dependent on the materials used, will be important for creating comfortable warm atmospheres, and a generally even ratio is necessary to reduce strain on the eyes of the occupants (discomfort to the client means little business will be said client).

## Modeling of Faces and Objects– Rating: 9

Modeling of faces and objects in this conference room is quite important. In the business where personal contact and face-to-face meetings are a necessity, appropriately modeling of faces and expressions can sometimes mean the difference between a good deal, an ok deal, or no deal at all. Likewise, facial modeling for the purpose of video-conferencing becomes the ultimate concern when a face-to-face meeting is digitized. Vertical illuminance on faces, utilizing horizontal illuminance contrasts and key/fill lights will be quite important.

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## Points of Interest – Rating: 7

Points of interest within the conference room will be the architectural details, the support areas of the space (bar, counter, head-of-the-table, etc.), and the people themselves. Considering everything that happens at the conference table to be the focus of interest, the entire conference table should be illuminated to a higher degree than any part of the room.

## Reflected Glare– Rating: 7

Dependent again on the surface chosen, the reflectance and specularly of the table surface will help determine a larger portion of the reflected glare. Assuming the table to be extremely glossy, spot downlighting will only serve to blind a client or employee looking in particular directions. Additionally, reflected glare seen from the full-height windows during nighttime meetings or early morning conferences from otherwise-hidden luminaires may become much more apparent, and poorly-hidden luminaires will be visible at these times.

## Source/Task/Eye Geometry – Rating: 7

Source Task Eye can be considered for the specular table and for any of the video conferencing (where the camera is the eye, and the person is the task). Also, where task is the presenter or a proposal elevated on a vertical plane above the table, spot downlight glare and veiling reflections need to be accounted for. VDT tasks are minimal in this conference room, so the importance is decreased slightly.

## Surface Characteristics – Rating: 7

Grazing angles for some of the wood veneers should be considered to bring out the grain of the more expensive stained woods. All surface characteristics are dependent on the surfaces applied to the conference room (as of yet undersigned).

## System Control – Rating: 10

Considerable control of a variety of atmospheres and light levels should be applied to the room for presentation, video-conferencing, general illumination, nighttime conditions, and various daylighting levels. Dimming ballasts and switches should be used on all luminaires, and programmable scenes and/or a variety of separate controls for small groups of lights.

An occupancy sensor, while necessary to meet ASHRAE 90.1 will be necessary (as opposed to a time clock) such that entrance to the conference room at any time will prompt a specific entry lighting condition.

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## Horizontal Illuminance – Rating: 8

The horizontal illuminance at the maximum light levels (not including daylighting which give the space a distinct imbalance) should reach 500 lux at least. Maximum light levels could broach 750 lux, but that should only occur at full power, for all lighting levels, and/or particularly to narrow beam spotlighting of architectural elements. This light level should be seen at the task plane of the conference table, with a considerable drop-off of no less than 150 lux for general movement in and about the space.

## Vertical Illuminance – Rating: 6

The vertical illuminance should, at the highest light levels, be 300 lux for video-conferencing purposes and can be as little as 50 lux for general meeting purposes. A balanced average of the two will prevent the horizontal illuminance from overpowering the vertical at any given time or for any particular scene developed by the control system.

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Conference Room

– Space to Space Method: 1.5 W/sf

ASHRAE Power Density Allowance for Office

– Building Area Method: 1.3 W/sf

# Cathedral Place

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## Open Office – Deloitte & Touche

### Existing Lighting Overview

Due to the nature of the project, the tenant architect and the security concerns of the tenant, current lighting schemes could not be provided, photographed, or even noted. For this reason, this space is being developed as an independent study to fulfill the Architectural Studies minor. This space is therefore in draft form, as much of the report will be until sufficient design completion has been achieved in the architecture course.

# Cathedral Place

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 9

The appearance of the space from a lighting perspective makes or breaks the design of the space. The lack of individualized luminaires forces the occupant and visitor to look to the ceiling for a large-scale form and function of the space – how far does it reach, how bright are the spaces, and what aesthetic qualities are trying to be presented through the design. The space needs to appear bright and comfortable. It needs to be clean but elegant and flow freely throughout the space. At the same time, the space cannot afford high luminance ratios on the ceiling and walls in a vain attempt to get more light to the task plane without direct illumination. The uniformity on the ceiling distinguishes the design from others in the eyes of both the occupants and the visitors.

The luminaires themselves lend to the space a vast majority of its appearance. The space's appearance must be a result of a stunning luminaire appearance. Straight, fine lines will give linearity to a rectangular room, and nothing better accomplishes this than 4' long 1'-or-less fluorescent fixtures. They can be recessed, surface mounted, or pendants, with the pendants usually leading to the most aesthetically pleasing design. The luminaires' materials will also distinguish them and the overall appearance as a good or exceptional design.

### Color Appearance and Contrast – Rating: 6

In the open office design, color is more of a luxury than other very critical spaces. While color rendering should be maintained at high levels, a small drop in CRI for the lamps is acceptable. If the offset is better power density, or higher output (or both) the CRI can be compromised to about 80. Material colors throughout the space shouldn't be neglected however, and drastic illumination can wash out otherwise bright colors that liven up or warm the space for the occupants. Color appearance, while important, should not give rise to drastic design changes.

### Daylighting Integration and Control – Rating: 4

Daylighting will depend on the location of the open office plan and the location of private office otherwise. Without including the 17<sup>th</sup> floor, which might have skylight penetrations, daylighting integration is very difficult, and control, then, obsolete. If daylight is able to penetrate perimeter spaces (given they are full-height partitions), it will only further benefit the perimeter office who are deficient in horizontal illuminance in the first place. Daylight integration could require drastic reconstruction of a space, but if possible, should only be considered an ancillary benefit.

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## Direct Glare – Rating: 8

The open office design loses appeal with the effect of direct glare. Open office design typically uses baffled or louvered linear luminaires to drastically reduce direct glare. This does not account for those individuals directly underneath the fixtures looking at high horizontal angles. Instead, perforated metal screens on luminaires with considerable uplight components are used to all but eliminate direct glare. Since the space is so large, and the viewing angles of luminaires so low (low partitions and long horizontal distance unobstructed views of luminaires) direct glare should be considered a problem.

## Light Distribution on Surfaces – Rating: 5

With a considerable amount of furniture, cabinets, and low partitions, uniformity on the task plane is hard to attain. Light distribution should remain as uniform as possible over the entirety of the work plane, with increased illuminances on the floor of corridors and walkways. Another heavy consideration should be the light distribution on the ceiling and upper walls for indirect luminaires. As much uniformity as possible should be achieved here as well, albeit a much harder task.

## Luminance of Surfaces – Rating: 8

Luminance of surfaces should be considered for four particular areas: desktops, floor, VDTs and partition walls. While the luminance of the ceiling is high, it will not contrast with anything except the walls, which for architectural purposes might be significant and distinct. The luminance of the partitions and the contrast to the desktops should be closely reviewed. While the illuminance may be the same, a distinct difference in material and texture could result in a very bright surface (high luminance) abutting a very dark surface (low luminance) and that high ratio will strain the eyes. Similarly, an occupant working at a very bright desk and walking down or through a very dark corridor (due to very low reflectance carpeting) will experience visual discomfort.

For VDT usage, the VDT to near surface luminance has to maintain a 3:1 bright to dark ratio. Likewise, the VDT to far surface luminance must maintain a 10:1 bright to dark ratio. In the case that the partitions are dark, this ratio is immediately surpassed, and in the case of dark partitions to bright walls or ceiling, the ratio is again surpassed. Luminance ratios must be maintained to reduce strain on the eyes during working hours.

## Modeling of Faces and Objects– Rating: 5

Facial modeling in the open office is similar to that of the lobby. While it is good, and should be considered because of the face-to-face contact with coworkers and other business people, it is not imperative to read the individual for business gain. Facial modeling, while nice and certainly warranted is not a major design consideration of the open office design.

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## Points of Interest – Rating: 4

Open office has no distinct point of interest unless there is a specific (and relatively hidden) copy machine or coffee maker that everyone should use and cannot readily see. Beyond that, points of interest lie only in the entrance and exit of the open office to adjacent public spaces. Everyone in the open office design is a point of interest, and illuminating them all distinctly is trumped by illuminating the space as a whole

## Reflected Glare– Rating: 9

Save the reflection felt from the ceiling in the case of a luminaire uplight, reflected glare will only occur at the VDT monitor in the case that a CRT monitor is still in use. Reflected glare from a specular ceiling would be the only thing to consider and the architectural design of such a space is an abomination to the open office design (aka, won't happen). Please see the next section for comments on the reflected glare in VDTs.

## Source/Task/Eye Geometry – Rating: 5

Source/Task/Eye geometry is important in the use of CRT monitors. These monitors have glass fronts with high specular reflectance. This reflectance must be analyzed to minimize the effect of viewing the luminaire through the reflection on the working visual surface (monitor screen). With the advent of LCD monitors and real anti-glare coverings, this type of reflection has been eliminated almost entirely. The source task eye geometry now focuses on the ability of the individual to see the task plane while “blocking” direct light onto the task surface. This is easily accounted for in the indirect lighting scheme through diffuse ceiling lighting.

## System Control – Rating: 10

Because of the considerable power consumption of a vast array of luminaires in a large open office and the availability of lights to remain turned on after-hours for individuals, control of the lighting must be flexible, accurate, and adjustable. A distinct control system is necessary for occupancy, and for timing, but able to be overridden and not annoy the occupant with sporadic “blackouts.” System control is very necessary and a combination of the least expensive, but most flexible system should be balanced and chosen.

## Horizontal Illuminance – Rating: 8

In typical open office design, the horizontal illuminance depends on the task being performed. For the Deloitte & Touche space, the tasks are reading fine print, filing, word processing, auditing, and number-crunching. These fine detailed tasks require a horizontal illuminance of 500 lux with any increase benefiting the end user. The corridor illuminance should maintain a 300 lux level, and under cabinet areas should be complimented with individual task lighting systems.

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## Vertical Illuminance – Rating: 6

The vertical illuminance in the open office design should follow that of the conference areas and other general face-to-face conversation spaces. The vertical illuminance should not set below 50 lux and can be as high as 300 lux (although it is not generally suggested to be that high except immediately adjacent to task lighting or while standing under a low ceiling).

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Open Office

	– Space to Space Method:	1.3 W/sf
ASHRAE Power Density Allowance for Office	– Building Area Method:	1.3 W/sf



# Cathedral Place

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## Reception – Deloitte & Touche

### Existing Lighting Overview

Due to the nature of the project, the tenant architect and the security concerns of the tenant, current lighting schemes could not be provided, photographed, or even noted. For this reason, this space is being developed as an independent study to fulfill the Architectural Studies minor. This space is therefore in draft form, as much of the report will be until sufficient design completion has been achieved in the architecture course.

# Cathedral Place

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## Design Criteria and Goals

### Appearance of Space and Luminaires – Rating: 10

Appearance of the reception area is almost as important as the appearance of the conference room of initial client meeting space. The reception area is the first impression a visitor or client gets of the company. For this reason, the lavish materials and furniture, not to mention the company signage, and psychological spatial perceptions need to appear as brilliant and awe-inspiring as possible. The space should exude a sense of prominence, exclusivity, and luxury, but still business-oriented and professional.

Similarly, the luminaires that are visible should also have a class and style that typifies the high-standard architecture of the reception area. Those luminaires that are visible should be minimalist and elegant, and the remaining luminaires should be hidden and simply allow the space to be lit without any indication of the source.

### Color Appearance and Contrast – Rating: 9

Color appearance should be high for this space, and the materials and faces of the occupants be warm, bright, and (for materials) saturated and rich. The lamps in the space should have extremely high CRIs and bring out the best qualities in everything it illuminates. This is not to say it should be as bright as possible, but instead on the curve from saturated that is well before washed-out. The colors should be shown as if the space were a retail display case, since the client is in essence shopping for the business' services.

### Daylighting Integration and Control – Rating: 7

If the reception area is to be on the 17<sup>th</sup> floor, the daylight integration with the northern façade exposure, as well as the skylighting at the north end will have to be utilized as much as possible in the space without overpowering the warm feel the space is given by halogen or incandescent luminaires. Control of shading on the skylights and possible louvers of the northern exposure should ensure that the luminance difference from the lobby to the elevator to the reception area isn't a terribly drastic contrast. Since the northern exposure ensures a diffuse daylighting condition, and the northern longitudinal location ensuring very little direct sunlight penetration, the control should be relatively easy, and integration made relatively simple.

### Direct Glare – Rating: 5

Direct glare should be accounted for with respect to the receptionist. Since the luminaires are being hidden from the client and visitors, the only person who should be able to view the light sources, and also any glaring sources spot-lighting company signage, artwork, or presentation boards, is the receptionist. With few luminaires aimed in opposing directions, direct glare is almost eliminated for anyone except the receptionist.

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## Light Distribution on Surfaces – Rating: 7

Distribution on the reception desk surface should be uniform and overflow onto the floor slightly to give the “holy grail” or “beacon” appearance in an otherwise unfamiliar space (from the visitor’s perspective). Light should not be uniform over the space and not allow the occupants the luxury of accommodation throughout the space. As a reception area, the light distribution should follow a pattern that the occupant/visitor is directed to use as public, and shy away from areas that they have not been specifically invited to. It is not to say the distribution should be harsh, but it should be distinct.

## Luminance of Surfaces – Rating: 8

The entirety of the space should have a nice even luminance, and given the materials of the space, some materials may require higher illuminance to achieve that affect. By the sake token, the luminance of some distinctly adjacent materials (gold company signage on a red wood veneer) should remain directly contrasted to enhance the appearance. Surface luminances in this area should not have drastic ratios as that would cause a very uncomfortable situation for the occupant, and especially given the high luminance of the northern and western exposures. A gentle balance of ratios should be maintained, but a distinct ratio nonetheless.

## Modeling of Faces and Objects– Rating: 9

Facial modeling of the occupant and visitors is necessary, but ultimately more important for the receptionist him/herself. To give a pleasant welcoming experience, the face must be well modeled and not have deep harsh shadows. Likewise, the receptionist does not want the incoming individual to be masked in shadow and begin looking at them with a look of confusion. These two events themselves mark the importance of facial modeling in the space.

## Points of Interest – Rating: 5

The point of interest is the reception desk. The next closest point of interest on an importance scale is the entrance the visitor would take further into the office area. These two prominent points are the only particularly important areas of interest.

## Reflected Glare– Rating: 3

If surfaces were specular in the yet-to-be-determined reception area, reflected glares might be a problem. The only other reflected glare that would need consideration is the glare from a specular company signage resultant of a very narrow beam spotlight.

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## Source/Task/Eye Geometry – Rating: 5

With the use of a VDT by the receptionist, the only Source/Task/Eye geometry that should be accounted for is in reference to the receptionist's task planes at desk level, and at reception level. All other geometries are relative to the height and position of the incoming individual and can be accommodated by slight movements or alterations in the receptionist's position.

## System Control – Rating: 10

System control is very simple for this space. The lighting scheme should be able to adjust to the daylight penetration levels from the windows and skylights. Additionally, the space may want to gently change from a preset single configuration to give the space some variety. Beyond that, when business hours are over, a general lighting level can be reduced significantly and accent lighting turned off to reduce power loads. Further reduction can be achieved by use of an occupancy sensor at the elevator entrance/exit.

## Horizontal Illuminance – Rating: 8

The horizontal illuminance of the reception area is twofold. The horizontal illuminance at the reception desk should parallel that of the open office design and meet the standard for fine print reading, writing, and number crunching. For this reason, and for reasons of accentuation, the illuminance should be around 500 lux. For the general purpose lighting throughout the remainder of the space (not including daylight), the illuminance should exceed 150 lux so as to not create too drastic a contrast.

## Vertical Illuminance – Rating: 6

The vertical illuminance should also be twofold. At the reception area, the vertical illuminance should be between 150 and 300 lux, preferably on the high side. Throughout the remainder of the space, vertical illuminance should exceed 50 lux up to 150 lux for general face-to-face meetings and appropriate facial modeling.

## ASHRAE Power Density Calculation

ASHRAE Power Density Allowance for Reception (Lobby)

– Space to Space Method: 1.8 W/sf

ASHRAE Power Density Allowance for Office

– Building Area Method: 1.3 W/sf

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## Appendix A

This appendix is the complete fixture and lamp/ballast schedule for analyzed spaces.

ID	Lamp #	Lamp Type	Description	Manufacturer	Fixture	Voltage	Mounting	Ceiling Type
A	1	175w MH Coated	Parking Garage Vandal Resistant	McGraw-Edison	PSC-175W-MH-277-CT-V-WH	277	Surface	
AA	6	F32T8 / SPX35	12' direct / indirect fluorescent	Focal Point	FE4-610-B2T8-C30/FG/EC	277	Pendant	Exposed
AP	1	50w MR16 NSP 12d	Track mounted fixture w/ integral xmfr	Eureka	E2056-WH/E2734-E05-WH	120	TRACK	Drywall
AQ	2	15mm Neon	Custom luminous tubing	Terminal Neon		120	COVE	
L	1	150w CMH / T6 / G12	HID wall uplight fixture	Elliptipar	M115-150G-EO2/VO	277	Pendant	Exposed
OA	1	F32T8 / SPX35	4' fluorescent w/ low temp ballast	Metalux	SH-1T8	277	SPCL	
OB	1	35w MR16	4" dia recessed downlight	Eureka	E1058-WH-QA/E1520	277	Recessed	
OC	1	35w MH PAR20	In-ground spot light (7" dia)	BK Lighting	HP-MHTR-O-SAP-CPC/SE	277	GRADE	
OD	3	F32T8 / SPX35	Exterior custom decorative wall sconce	Selux	\$2500 ALLOWANGE	277	Wall	
OE	1	70w MH Coated	Exterior wall mounted fixture	Lumark	MNMON-70-WA1-WA2	277	Wall	
OG	1	70w MH T6	Wall mounted forward throw floodlight	Bega	7475MH-BLK	277	Wall	
OH	1	70w MH T6	Wide beam floodlight (wallwasher)	Bega	6345MH-WHT	277	Wall	
OJ	1	70w MH Coated	Narrow beam floodlight (Roof mtd)	Ruud	LPN-3-40TD/DB-12	277	ROOF	
OK	1/4'	F32T8 / SPX35	8' Pendant mounted exterior indirect	Insight	WF5-03-30"-SAD-8'-TN	277	Pendant	
OK1	1/4'	F32T8 / SPX35	4' Pendant mounted exterior indirect	Insight	WF5-03-30"-SAD-4'-TN	277	Pendant	
OL	1	35w MR16 / NSP 12d	Wall mounted ext accent uplight on column	BK Lighting	EC-O-SAP-9-11-B	120	Wall	
PA	1	175w MH / SPX35	Parking Garage Vandal Resistant	McGraw-Edison	PSC-175W-MH-277-CT-V-WH	277	Surface	
PAM	1	35w MH PAR20	HID track mounted fixture	Staff	902MP035-1-WH	277	TRACK	
PL	1	250w MH Coated	Architectural Area Luminaire - Wall	McGraw-Edison	GRA25124AS GRA25129 MA1029	277	Wall	
PM	4	250w MH Coated	Architectural Area Luminaire - Pole	McGraw-Edison	GRA25124AS GRA25129 MA1028	277	Wall	
PV	1	F32TBX / SPX30	6" dia fluorescent downlight	Portfolio	C6032-6001-LI	277	Recessed	Drywall
R	1	F32T8 / SPX35	4' fluorescent direct pendant	Selux	MIO-IT8-SD-C-004-WH	277	Pendant	
R1	1	F25T8 / SPX35	3' fluorescent direct pendant	Selux	MIO-IT8-SD-C-003-WH	277	Pendant	
R2	1	F17T8 / SPX35	2' fluorescent direct pendant	Selux	MIO-IT8-SD-C-002-WH	277	Pendant	
V	1	F32TBX / SPX30	6" dia fluor. downlight w/ clear reflector	Portfolio	C6032-6001-LI	277	Recessed	Drywall
W	1	F32TBX / SPX30	6" decorative glass pendant	Translite Sonoma	WTI-WH-F32-WC	277	Pendant	
Y	4	F13TBX / SPX30	22" dia surface disc	Scott	S704-C13E-BA	277	Surface	
Z	2	F32T8 / SPX35	4' staggered fluorescent strip	Metalux	SN-132-SR/SYM6	277	COVE	

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ID	Lamp	Watts	Bulb	Initial Lumens	Mean Lumens	CRI	CCT	Life	Length	Socket	Position
	LED										
L1	F32TBX / SPX30	32	T4	2400	2064	82	3000	12000	5.6	gx24q-3	
L2	F32T8 / SPX35	32	T8	3100	2945	85	3500	30000	47.78	Med Bipin	
L3	F26TBX / SPX30	26	T4	1800	1548	82	3000	12000	5	gx24q-3	
L4	F26DBX / SPX35	26	T4	1710	1548	82	3500	12000	6.5	g24q-3	
L5	F25T8 / SPX35	25	T8	2200	2090	85	3500	30000	35.78	Med Bipin	
L6	F17T8 / SPX35	17	T8	1400	1340	85	3500	30000	23.78	Med Bipin	
L7	F13TBX / SPX30	13	T4	900	770	82	3000	12000	4.2	gx24q-1	
L8	F13BX / SPX30	13	T4	900	770	82	3000	12000	5.2	g24q-1	
L9	70w MHT6	70	T6	6700	5360	87	3000	12000	3.94	G12	Universal
L10	70w MH Coated	70	E17	5600	4480	90	3800	12000	5.43	E26 Med	Universal
L11	50w MR16 NSP 12d	50	MR16	10000cp / 800	10000cp / 800	100	3000	4000	1.75	Gu5.3 bipin	
L12	50w MR16	50	MR16	3200cp / 800	3200cp / 800	100	3000	4000	1.75	Gu5.3 bipin	
L13	35w MR16 / NSP 12d	35	MR16	8300cp / 500	8300cp / 500	100	3000	4000	1.75	Gu5.3 bipin	
L14	35w MR16	35	MR16	1650cp / 500	1650cp / 500	100	3000	4000	1.75	Gu5.3 bipin	
L15	35w MH PAR20	35	PAR20	2000	1600	81	3000	9000	3.75	Medium	Universal
L16	250w MH Coated	250	BT28	20500	15500	70	3800	10000	8.31	E39 Mogul	Universal
L17	175w MH Coated	175	BT28	13000	8400	70	3800	8250	8.31	E39 Mogul	Universal
L18	175w MH / SPX35	175	BT28	13600	9300	65	4200	8750	8.31	E39 Mogul	Universal
L19	15mm Neon	5w/ft	15mm	-	-	-	-	65000	-	-	
L20	150w CMH / T6 / G12	150	T6	12700	10160	90	4200	9000	4.125	G12	Universal
L21	150w A19	150	A19	2050	2050	100	2850	2500	4.5	Medium	
L22	100w MH Coated	100	E17	8100	6400	85	3000	12000	5.43	E26 Med	Universal

	Lamp		Ballast	# lamps	Voltage	Input Wattage	BF	pf	THD	Min Temp
B1	F32TBX / SPX30	L1	ICF-2S26-H1-LD@277	1	277	36	0.98	0.98	10%	(-)18C
B2	F32T8 / SPX35	L2	VCN-132-MC	1	277	30	0.98	0.98	10%	(-)18C
B3	F26TBX / SPX30	L3	RCF-2S26-H1-LD-QS	1	120	29	1.1	0.98	10%	(-)18C
B4	F26DBX / SPX35	L4	ICF-2S26-H1-LD@277	1	277	27	1	0.98	10%	(-)18C
B5	F25T8 / SPX35	L5	IOP-2P32-SC@277V	1	277	28	1.05	0.97	10%	(-)29C
B6	F17T8 / SPX35	L6	IOP-1P32-SC@277V	1	277	16	0.9	0.97	10%	(-)29C
B7	F13TBX / SPX30	L7	RCF-2S13-M1-LS-QS	1	120	16	1	0.96	10%	(-)18C
B8	F13BX / SPX30	L8	ICF-2S13-H1-LD@277	1	277	16	1	0.96	10%	(-)18C
B9	70w MH T6	L9	71A5281	1	277	94	0.95	0.9	<30%	(-)30C
B10	70w MH Coated	L10	71A5281	1	277	94	0.95	0.9	<30%	(-)30C
B11	35w MH PAR20	L15	71A5037BP	1	277	48	0.95	0.9	<30%	(-)30C
B12	250w MH Coated	L16	71A5730	1	277	295	0.95	0.9	<30%	(-)30C
B13	175w MH Coated	L17	73B5580	1	277	210	0.95	0.9	<30%	(-)30C
B14	15mm Neon	L19	ANI-7530	33ft	7.5kv	90	1			
B15	150w CMH / T6 / G12	L20	71A5482	1	277	185	0.95	0.9	<30%	(-)30C
B16	100w MH Coated	L22	71A5337BP	1	277	118	0.95	0.9	<30%	(-)30C

**Cathedral Place**  
Steven Puchek  
Milwaukee, WI

## Appendix B

This appendix lists all of the files used to complete the analysis.

DWGs:

A32s:

# Cathedral Place

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Milwaukee, WI

## Appendix C

This appendix lists all of the revisions and comments regarding revision.

10.17.05 – Revision 1, version 1.0 :

- Daylighting situations added
- Surface materials and reflectances added
- Updated Luminaire renderings
- Controls added for Parking
- Drawings and Sections added
- Furnishings and Artwork explicitly stated as nonexistent