Technical Report 1

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report describes the existing architecture and lighting systems of the Hotel Felix's Exterior Façade, Entrance Lobby, Bar, Conference Room and Spa. A list of lighting design criteria is determined for each space following an in-depth analysis of the architecture and function of each space. The existing lighting systems are scrutinized against these criteria and potential improvements are suggested.

The Hotel Felix is an LEED Silver certified boutique hotel that strives to be elegant, comfortable and sustainable. It's most noticeable spaces, such as the façade, lobby and bar, are very well designed and include many interesting architectural elements that accept light well. The existing lighting system uses horribly inefficient Halogen MR16 downlights and accent lights to provide general illumination in the lobby, bar, conference room, spa and guestrooms while only using more sustainable sources for back of the house general illumination and decorative lighting. Although the lighting design in the five spaces studied is flawless in its functionality, the proper emotional impressions are either undeveloped or nonexistent.

The interesting architecture and imperfect lighting systems of the Hotel Felix allow for many potential improvements. High-efficacy sources should be employed in all spaces to reduce energy consumption and promote a truly sustainable establishment. The new design needs to pay greater attention to the quality of light and the emotional impressions that are created. This, more than anything else, will improve the lighting of the Hotel Felix.

BUILDING OVERVIEW

Building Name: Hotel Felix

Location and Site: 111 West Huron St. Chicago IL, 60654

Building Occupant Name: DACCORD Group

Occupancy or function types: Single Room Occupancy Hotel

Size: 85,700 ft^2

Number of Stories Above Grade: 12

Primary Project Team:

Owner:	Daccord Group	http://www.daccordgroup.com/
Architect:	Cubellis	– no longer operational
General Contractor:	Pepper Construction	http://www.pepperconstruction.com/
Lighting Design	Schuler Shook	http://www.schulershook.com/
MEP	WMA	http://www.wmace.com/
Structural Engineers	TGRWA	http://www.tgrwa.com/profile/index.html
Interiors	Gettys	http://www.gettys.com/

Dates of Construction: 9/28/07 – March 09

Actual Cost: $28 Million – overall project cost

Project Delivery Method: Design-Bid-Build

Overview of Existing Lighting:

In general, halogen fixtures are used in the front of house areas while fluorescent fixtures are used in hallways, bathrooms and back of house areas. Metal halide and LED sources are used to decoratively light the façade. LED coves surround the lobby and bar areas. Almost all general illumination fixtures are recessed cylindrical downlights. All fixtures have low profiles or are hidden entirely. The existing design is clean, directional and inefficient.

EXTERIOR FACADE

Figure 1.1: North and East Exterior Façades. (Image Courtesy Schuler Shook)

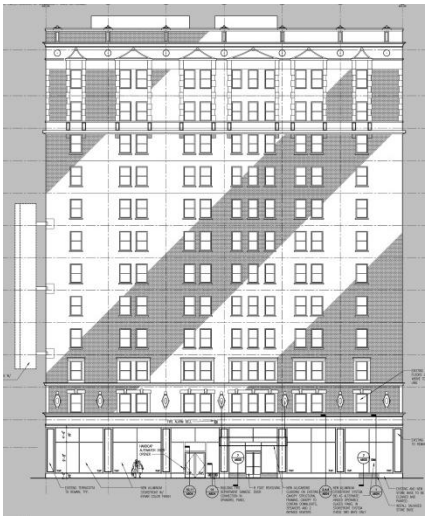


Figure 1.2: North Façade Elevation (NTS)

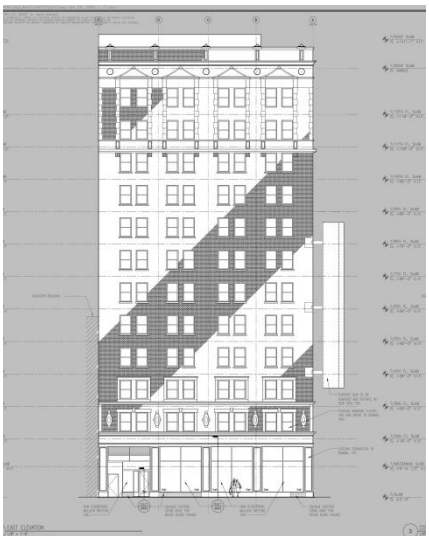


Figure 1.3: East Façade Elevation (NTS)

ARCHITECTURAL DESCRIPTION

Material definitions and properties are available in Appendix B on page 54

GENERAL LAYOUT AND FUNCTION:

Designed in 1926 by the Chicago architectural firm Levy and Klein, the North and East exterior façades of the Hotel Felix closely follow the teachings of the Chicago School of Architecture. Brick, terracotta and large areas of glass combine to delineate this 141' tall skyscraper into the three elements of the classical column: the base, shaft and crown (*See Figure 1.4)*.

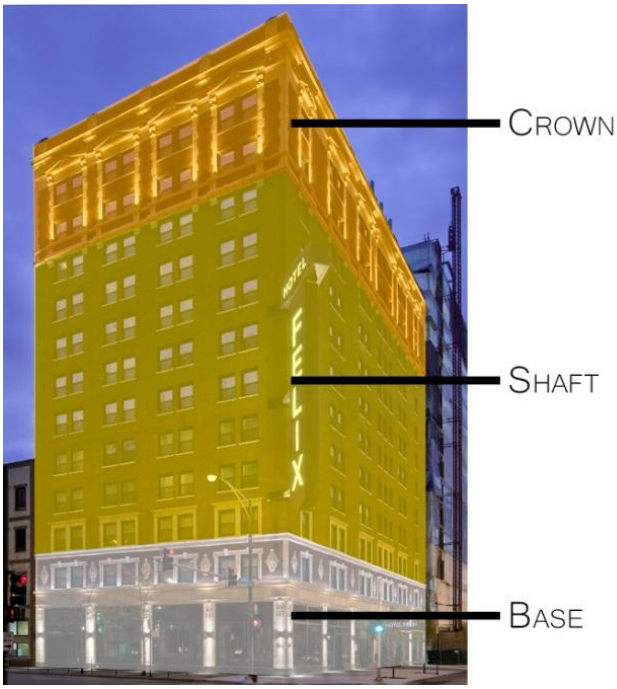


Figure 1.4: Base, Shaft and Crown Elements

Figure 1.5: Entrance Canopy and Terracotta details

The base is the foundation of the composition. It raises the heavy brick façade though the use of 14'5" tall storefront windows separated by terracotta-clad columns. This large expanse of transparent glass looks relatively weightless in comparison to the darker, brick-laden upper stories, which lends a certain floating quality to the building. The glass also accentuates the verticality of the columns. Jutting out of the North Facade is a modern steel entrance canopy that was not part of Levy and Klein's original design. It accentuates the entrance and welcomes visitors inside. As shown in Figure 1.5, the entire length of the 2nd floor is adorned with terracotta ornamentation that makes the entire story look like some kind of abstracted entablature resting atop the terracotta-clad columns. These elements combine to form a cohesive platform from which the shaft of the façade rises.

The shaft is the body of the composition but it is not the focus. Rather, it acts as a connection between the more interesting base and crown. The simple nature of this element allows for an easily-repeatable pattern that lends itself well to skyscraper design. The façade can be any number of stories and the shaft design would not need to change. In this case, its lack of ornament allows it to serve as a non-competing backdrop for the 5-story tall sign that is hung

between the third and ninth floors. This sign is illuminated from within and becomes a very important element at night. Overall, the shaft has a vertical attitude, which is expressed by the blank expanses of brick that span along the column lines.

The crown is the most detailed portion of the façade and acts as the finale of the composition. Ornate terracotta arches and a beautiful cornice surround the windows of the 11th and 12th floors, effectively capping the vertical motion expressed in the shaft. As is clearly evident in Figure 1.1, the white terracotta makes the crown naturally brighter and more visible than the bricked shaft, even when both materials are similarly lit.

Materials and Construction:

The North and East facades are constructed of nonbearing, A-2 Classification masonry walls. Two wythes of red and black common-bond face brick (*Material 1.1*) are accented by terracotta ornamentation (*Material 1.2*). The first floor has 14'5" x 15'1" inoperable storefront windows made with 69% transmissive double-pane Low E glass *(Material 4.2)*. The windows on all other floors are 3'8" x 6'0" (rough opening) double-hung windows that use 79% transmissive dual-pane glass (*Material 4.1)*. Other specific material descriptions and properties can be found in Appendix B, p53.

Daylight Elements:

Small guest rooms claim almost every one of the windows in the Hotel Felix's facade and have the potential to use daylight effectively. As described above, the first floor has 14'5" tall storefront windows that allow generous amounts of daylight to enter the lobby and restaurant. Fortunately, the lobby is one of the few large spaces in the hotel that could benefit from an airy, daylit feel. It conveniently has the largest windows that will be almost continuously shaded from direct sun, meaning there is the potential to gather large quantities of moderately bright diffuse skylight. Most interior rooms are less well-off and have neither views nor daylighting potential. As shown in Figure 1.4, the Hotel Felix is located with a large parking lot adjacent to its north facade and a tall skyscraper adjacent to its east facade. These conditions limit unwanted, low-angle morning sun penetration while maximizing pleasant skylight penetration. All other windows open into small rooms that do not require large amounts of light or deep throws. Small windows are perfectly adequate for these conditions. Overall, the façade offers the potential for daylighting.

Figure 1.6: Surrounding Conditions

EXISTING LIGHTING EQUIPMENT

Lighting and Electrical Elevations are available in Appendix A.1 on page 49

Luminaire schedule and descriptions are available in Appendix C.1 on page 55

FIXTURES AND LAMPS:

There are two types of ceramic metal halide exterior fixtures and two types of linear LED fixtures on the façade. As shown in appendices A.1 and C.1, Type S1 CMH fixtures are used to accent the 1st floor columns and provide a sense of scale. They have both uplight and downlight components that serve purely decorative purposes. A spread lens accessory smooths their distributions. Type S3 CMH fixtures are the same basic fixture as Type S1, but they are single-ended and use 20W lamps instead of 39W lamps. They are surface mounted on a ledge at the 11th floor. These cylindrical spotlights accent the terracotta arches and bring out the detail of the cornice. They are also mounted at several locations inside the entrance canopy for general illumination. Type S2 warm white LED strip fixtures are surface mounted on the 2nd floor ledge and illuminate the ornamentation of the entablature element. They are standard output (213 lm/ft.) fixtures with 5° grazing optics. They effectively separate the base element from the shaft element and create a gradient of light on the façade. Type SAC Color-changing LED fixtures are cleverly incorporated into inverted channels that mimic the structure of the canopy (see figure 1.5 below).

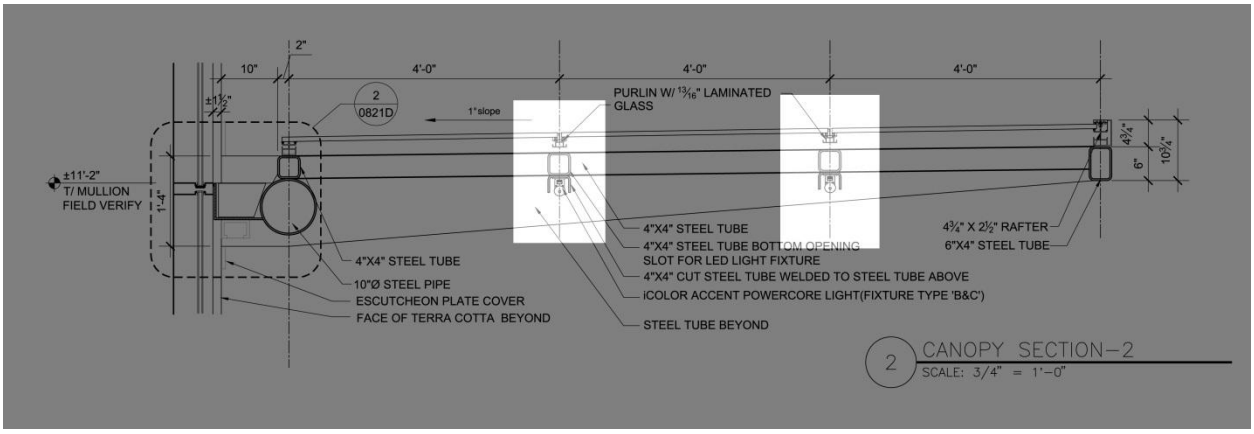


Figure 1.5: Fixture Type SAC mounted in canopy (NTS)

Overall, the exterior lighting is simple, elegant, and energy efficient. The hardware used is reliable and proven. The metal halide lamps and Type S2 LEDs are 3000K, which gives a nice warm light that renders the red brick well. The color changing Type SAC fixtures add visual interest and intrigue to the entrance of the hotel.

BALLASTS:

The Type S1 CMH fixtures have remote electronic ballasts provided by the luminaire manufacturer that gives them a cleaner look. Type S3 CMH fixtures have integral ballasts. Type S2 fixtures are powered by remote 24V 100W drivers by Advance. Type SAC fixtures have a proprietary integral driver technology that allows them to be run off line voltage.

CONTROLS:

The data enablers, RGB controls, keypad and cables needed to control the Type SAC iCOLOR fixtures are located in the same channel as the fixtures themselves. They cycle through a series of dynamic presets that are programmed in by the user. All exterior lights are run continuously through the night and are controlled by a time clock.

EMERGENCY LIGHTING:

There is no emergency lighting required on the exterior façade.

Lighting Design Criteria

IESNA Lighting Design Guide Recommended Criteria: Reference Chapter 21

Very Important

- Appearance of Space and Luminaires
- Light Distribution on Surfaces
- Light Pollution / Trespass
- Lighting must not interfere with visibility for pedestrians, motorists, or boaters.

Important

- Color Appearance and Color Contrast
- Direct Glare
- Modeling of Faces or Objects
- Points of Interest
- Shadows
- Source/Task/Eye Geometry
- Surface Characteristics
- Vertical Illuminance

Recommended Illuminances

- **Light Surfaces |** 3 fc
- **Medium Light Surfaces |** 5 fc
- **Medium Dark Surfaces |** 5 fc
- **Dark Surfaces |** 10 fc

LEED-NC Version 2.2 Criteria

- **SSc8: Light Pollution Reduction**
  - Exterior lighting power densities can't exceed ASHRAE 90.1-2004 requirements for the project zone per IESNA RP-33
  - Meet light trespass limits at site boundary for the project zone
  - Conduct light trespass analysis for all site lighting
  - Design lighting so that angle of maximum candela from each luminaire intersects opaque surfaces and does not exit out through the windows or automatically control all non-emergency interior lighting to turn off during non-business hours

- **EA Prereq 1: Minimum Energy Performance**
  - Comply with ASHRAE 90.1-2004
- **EAc1: Optimize Energy Performance**
  - Reduce entire building power consumption by 10-42% for 1-10 points
- **MRc4: Recycled Content: Mercury Content Reduction**
  - 90% of mercury containing lamps in project must contain less than 90 picograms of Hg per lumen-hr

ASHRAE 90.1 2004

- **Maximum Power Density**
  - 0.2 W/ft^2 for each illuminated wall or surface or 5.0 W/ linear foot for each illuminated wall or surface length
  - 1.25 W/ft^2 for Canopies and Overhangs
  - 30W/linear ft. of door width for Main entries
  - 20W/linear ft. of door width for all other doors
  - 0.2 W/ft^2 for walkways greater than 10 ft. wide
- **Additional Allowance |** Total allowance is the sum of the individual power densities plus an unrestricted 5% of that sum
- **Tradable Allowance |** All power densities listed above are tradable except for the façade
- **Exemptions |** Advertising signage lighting

Chicago Energy Code Requirements

- **Refer to 18-23-805.5 Exterior Lighting |** When the power for exterior lighting is supplied through the energy service to the building, all exterior lighting, other than low-voltage landscape lighting, shall have a source efficacy of at least 45 lumens per watt.

  Exception: Where approved because of historical, safety, signage, or emergency considerations.

- **Refer to 18-13-805.2.3 Exterior Lighting Controls |** Automatic switching or photocell controls shall be provided for all exterior lighting not intended for 24-hour operation. Automatic time switches shall have a combination seven-day and seasonal daylight program schedule adjustment, and a minimum 4-hour power backup.

Quantitative Design Criteria Discussion:

The City of Chicago Energy Conservation Code Exterior does not require any minimum or maximum Illuminance requirements but it does demand minimum fixture efficacy requirements. The existing design received silver rating from LEED NC v2.2. It is assumed that ASHRAE 90.1-2004 was followed as well because the lighting system must meet or exceed those requirements in order to meet several important LEED credits.

The IESNA handbook listed several recommended Illuminance levels for surfaces in bright environments. These values, listed above, should act as guidelines but not be used prescriptively. It is more important to balance the luminances of the various elements than to achieve a specific Illuminance level.

In order to meet SSc8 and follow IESNA recommendations on light trespass, great attention must be paid to the placement of fixtures and the quantity of spill light. Overall luminances should be kept as low as possible to limit light pollution. Glare that interferes with pedestrians and motorists must be avoided. MRc4 requires 90% of mercury-laden lamps on the project to have less than 90 picograms of mercury per lumen-hour. This may be hard to achieve with the CMH sources that are typically used in exterior façade applications. LEDs could be a viable alternative.

Qualitative Design Criteria Discussion:

The Hotel Felix's website advertises itself as "an upscale and intimate boutique hotel that blends comfortable elegance with inspiring natural elements." This should be what the façade conveys. As the first and last thing a patron sees upon visiting the Hotel, the facade must act as the spokesman for the entire establishment and make a good impression. For these reason the aesthetic considerations are the most important criteria for the exterior facades, second only to those code requirements specified by law.

In order to create the most appealing lighting design possible, luminances must be properly balanced, fixtures must be either hidden or architecturally pleasing, and photometry must be carefully specified to distribute light to the proper places. Shadows, surfaces characteristics, source/task/eye geometry, object modeling, color characteristics, glare and points of interest must all be considered to make this happen.

Prioritized List of Design Criteria:

1. Meet Energy Code Requirements
2. Advertise an upscale, elegant, intimate boutique hotel
3. Create the most appealing and balanced lighting design possible
4. Meet all LEED credit requirements
5. Avoid technical errors, including exposed fixtures, glare, and inappropriate light trespass

Analysis of Existing Lighting System

Impression created by Existing Lighting System:

At night the Hotel Felix shines on the corner of Huron and Clark St. The façade has strong contrast, great detail, and a wonderful composition of elements. It makes the Hotel Felix seem elegant and important without being overpowering and flashy.

Performance Analysis:

According to the criteria listed above, the current design is very successful. The wonderful impression is created with only 4100 installed watts of light, which is less than ¾ of the 5650 watts allowed by ASHRAE 90.1-2004. All fixtures meet the efficacy requirements and none are visible or poorly chosen. It successfully meets code, creates a positive impression of the Hotel and avoids technical errors. The single major flaw in the entire system lies in the fact that the CMH fixtures do not meet the mercury content requirement needed to receive LEED MRc4.

Areas that Need Improvement:

Although the CMH lamps used in the facade could be a part of the 10% buffer allowed in the MRc4 credit, a perfect design that truly follows the principles of sustainability would avoid all mercury-laden lamps where possible. The system is energy efficient but as is the case with many older lighting designs, there may be room for improvement. A perfect replacement of the current façade lighting system would have reduced mercury content and use less energy. LEDs fixtures may achieve these goals.

ENTRANCE LOBBY

Figure 2.1: Entrance Lobby. Courtesy Schuler Shook

ARCHITECTURAL DESCRIPTION

Material definitions and properties are available in Appendix B on page 54

GENERAL LAYOUT AND FUNCTION:

The entrance lobby of the Hotel Felix is by far the most luxurious room in the entire hotel and with maximum dimensions of 73’ x 39’ and a height of 16’ 10”’, it is also the most spacious. Cubellis and their interior architects, Getty, put a lot of effort into this space because it functions not only as the reception area, lobby and lounge, but also as an introduction to the entire establishment. As seen in Figure 2.1 above, most of the lobby is two stories tall but along the southern wall there are two single-story areas that hold the reception desk, elevators, and bar area. A staircase in the center of the lobby leads to the mezzanine level lounge that overlooks the lobby. There is a fireplace along the western wall and a floating glass orb sculpture hanging from the ceiling. There is a separate vestibule area separated by a glass wall that serves as the main entrance to the first floor restaurant. The Hotels main entrance is a rotating door that exits under the canopy.

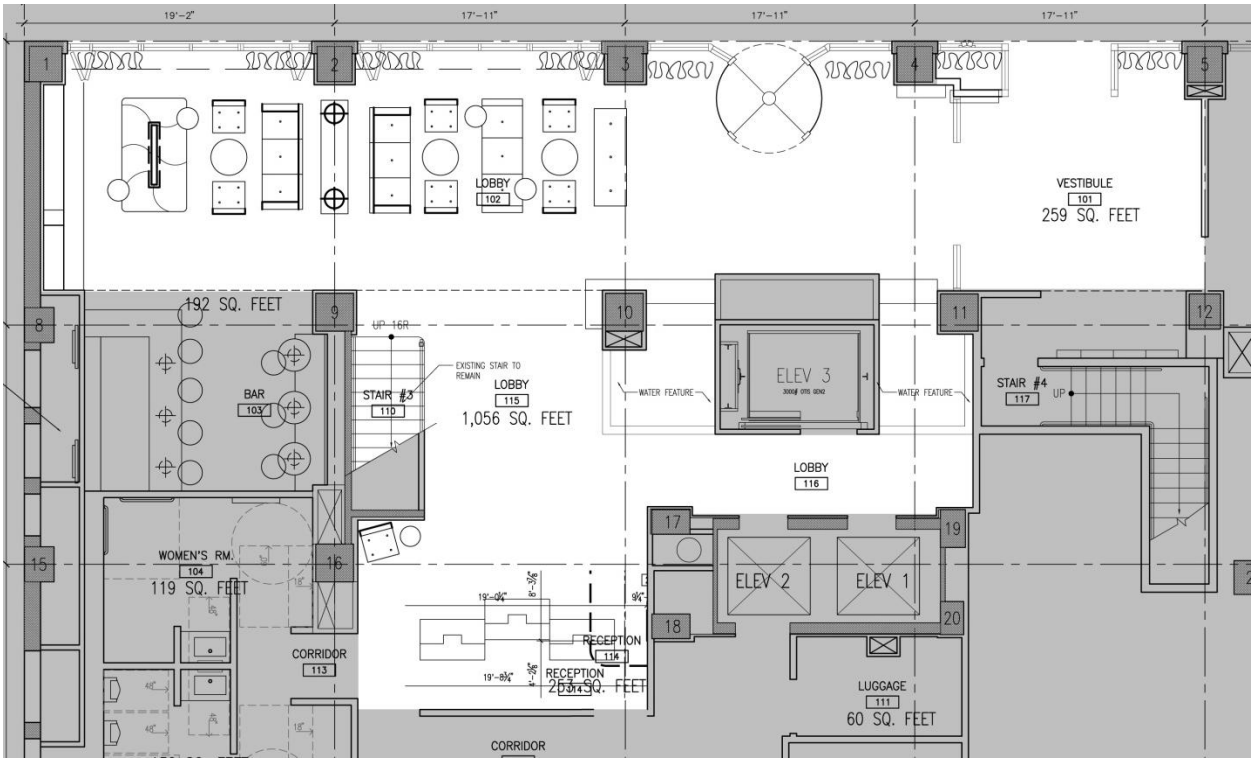


Figure 2.2: Entrance Lobby Ground Floor Plan (NTS)

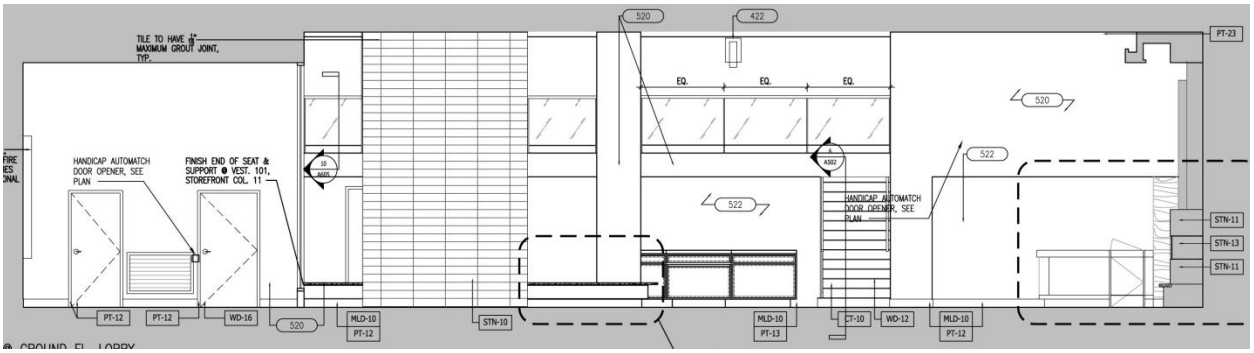


Figure 2.3: Lobby South Elevation (NTS)

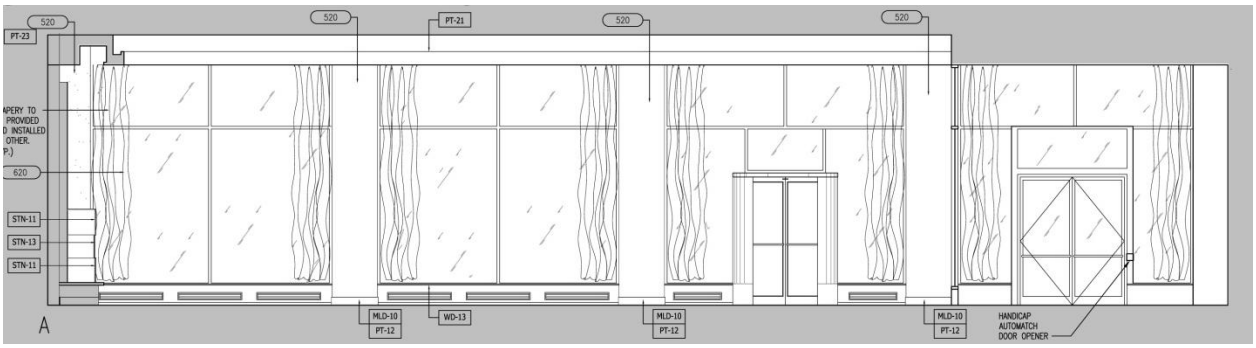


Figure 2.4: Lobby North Elevation (NTS)

AESTHETICS AND DECORATION:

The aesthetics can be easily summed up in two words: Contemporary and Comfortable. The amber-colored glass orbs that float above the length of the lobby draws patrons from the entrance vestibule towards the far end of the lobby, where a 10' tall woodpile sculpture and a sleek natural-gas burning fireplace anchor the architectural composition. Decorations include a metallic sculpture by the entrance, two paintings next to the reception desk, the glass orb installation and the woodpile sculpture. Figures 2.5, 2.6, 2.7 and 2.8 show these features in detail.

Figure 2.5: Entrance Sculpture

Figure 2.6: Reception Desk Painting

Figure 2.7: Woodpile Sculpture

Figure 2.8: Glass Orbs

MATERIALS:

The furnishings incorporate materials with high levels of recycled content while still maintaining a refined and elegant look. The color scheme includes many olive-green, grey and brown hues that match well with the natural green of the many potted plants spread throughout the area. The furniture in Figures 2.10 and 2.12 follow this theme. Other notable features include a curved ceiling cove (*Figure 2.8*), a small reflecting pool (*Figure 2.9*), a textured white stone wall (*Figure 2.11, Material 1.5*) and a two-story tall glass façade along the entire north wall (*Figures 2.4 and 2.12, Material 4.2*). The floor is a 2' x2' tan terrazzo tile (*Material 3.1)* and the ceiling is white painted gypsum board (*Material 2.1)*. The elevator lobby walls have dark-grey wallpaper (*Material 1.4)* and all other walls are gypsum board painted white (*Material 1.3)*.

Figure 2.9: Reflecting Pool

Figure 2.10: Lounge Furniture

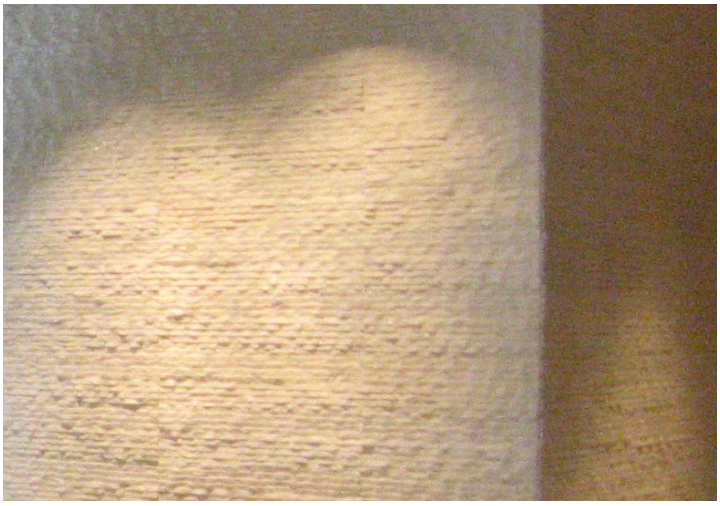


Figure 2.11: Textured White Stone Wall

Figure 2.12: Glass Facade

Daylight Elements:

The north wall of the lobby has 14’5” x 15’1” windows made with 65% transmissive double-pane clear glazing. These windows have the capability of being shaded by a 20% transmissive screen and an opaque fabric shade. Although functional in theory, these shades are always kept open for aesthetic purposes. The large parking lot across the street allows considerably more skylight into the space than would be expected at similar downtown locations. There are no other windows. Figure 2.13 shows an example of the daylight penetration on a summer afternoon with clear skies.

Figure 2.13: Daylight Penetration

EXISTING LIGHTING EQUIPMENT

Lighting RCPs and Electrical Plans are available in Appendix A.2 on page 50

Luminaire schedule and descriptions are available in Appendix C.2 on page 56

FIXTURES AND LAMPS:

The existing lighting system in the lobby uses entirely halogen MR16 fixtures with the exception of the coves, which use LED strips, and the two exterior ceramic metal halide downlights in the vestibule. The halogen MR16 lamps range from 35W to 71W and use NSP10, NSP10, SP20 NFL25, and FL40 distributions. The LEDs are 3000K warm white high output LED cove fixtures with integral drivers. The CMH lamps are 3000K 39W PAR20 lamps with a SP10 distribution.

BALLASTS:

Every halogen fixture except for Type SG has an integral magnetic core and coil transformer. The LED strips have integral drivers. They are not programmable so data enablers are not required. The CMH fixtures have integral electronic ballasts.

CONTROLS:

Every fixture in the lobby is dimmable. Due to the integral transformers mentioned above, each Halogen fixture is MLV, except for Type SG, which is listed as INC. The LEDs are of course LED loads. There are 12 control zones in the lobby as shown in figure 2.14.

DIMMING PANEL SCHEDULE

Control Channel #	Dimming/ Switching Panel	Circuit / Dimmer #	Description	Fixt. Type	Approx. # Fixt.	Watts / Fixture	Approx. Total Connected Load (Watts)	Load Type
LOBBY								
	DP-1	D1	Halogen bordestrip	SG	11	50	550	INC
	DP-1	D2	Halogen downlight	SK2	8	50	500	MLV
	DP-1	D3	Halogen accent	SJ, SJ1	10	71	888	MLV
	DP-1	D4	Linear LED - toekick	ST	54	6	324	LED
	DP-1	D5	Halogen Wallwashers	SL	12	50	750	MLV
	DP-1	D6	Halogen accent	SF, SL	8	50	500	MLV
	DP-1	D7	Halogen downlight	SQ, SL	5	50	313	MLV
	DP-1	D8	Halogen accent	SQ1	4	50	250	MLV
	DP-1	D9	Linear LED - cove	ST	30	6	180	LED
	DP-1	D10	Halogen downlight	SQ1	3	50	188	MLV
	DP-1	D11	Halogen downlight	SQ2	2	35	88	MLV
	DP-1	D12	Halogen accent	SL	6	50	375	MLV

Figure 2.14: Dimming Panel Schedule

EMERGENCY LIGHTING:

3 SQ fixtures in the elevator lobby, one SL wallwasher behind the reception desk, both S4 and SQ2 vestibule downlights, and four SQ2 lobby downlights are on an emergency circuit. Refer to appendix A.2 for Electrical plans.

Lighting Design Criteria

IESNA Lighting Design Guide Recommended Criteria for Hotel Lobbies

Very Important

- Modeling of Faces and Objects at Front Desk
- Reflected Glare at Front Desk

Important

- Appearance of Space and Luminaires
- Color Appearance and Color Contrast
- Daylighting Integration and Control
- Direct Glare
- Light Distribution on Surfaces
- Luminances of Room Surfaces
- Modeling of Faces or Objects
- Points of Interest
- Reflected Glare

Recommended Illuminances

- **General Lighting |** 10 fc
- **Reading and Work Area |** 30 fc
- **Entrance Canopy |** 3 fc

LEED-NC Version 2.2 Criteria

- **SSc8: Light Pollution Reduction**
  - Exterior lighting power densities can't exceed ASHRAE 90.1-2004 requirements for the project zone per IESNA RP-33
  - Meet light trespass limits at site boundary for the project zone
  - Conduct light trespass analysis for all site lighting
  - Design lighting so that angle of maximum candela from each luminaire intersects opaque surfaces and does not exit out through the windows or automatically control all non-emergency interior lighting to turn off during non-business hours
- **EA Prereq 1: Minimum Energy Performance**

  - Comply with ASHRAE 90.1-2004
- **EAc1: Optimize Energy Performance**
  - Reduce entire building power consumption by 10-42% for 1-10 points
- **IEQc8.1: Daylight &Views, Daylight 75% of Spaces**
  - 75% of all regularly occupied spaces must have a minimum of 25 fc on the equinox at 9:00AM and 3:00 PM = 1 point, 90% = 2 points
- **IEQc8.2: Daylight &Views, Views to the Outside**
  - 90% of all occupants achieve a direct line of sight to the outdoor environment through vision glazing between 2'6" from the floor but less than 7'6"
- **MRc4: Recycled Content: Mercury Content Reduction**
  - 90% of mercury containing lamps in project must contain less than 90 picograms of Hg per lumen-hr

ASHRAE 90.1 Requirements

- **Maximum Power Density: Hotel Lobby** | 1.1 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with ASHRAE 90.1-2004 9.6.3

Chicago Energy Code Requirements

- **Maximum Power Density: Hotel Lobby |** 1.9 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with Table 18-23-805.4.2
- **Refer to 18-13-805.2.1: Interior Lighting Controls |** Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting servicing that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.

Desired Flynn Impressions (Reference ALD by Gary Steffy)

Spaciousness

- More uniform
- Peripheral
- Higher luminances

Relaxation

- More nonuniform
- peripheral
- lower luminances

Quantitative Design Criteria Discussion:

The lobby must adhere to the relatively lenient sections of the Chicago Energy Code listed above but if it wants to receive certain LEED credits for lighting, it must follow the stricter ASHRAE 90.1-2004. The CEC allows 1.9 W/ft^2 for a hotel lobby with the potential for up to 1 W/ft^2 in decorative allowance. ASHRAE 90.1-2004, on the other hand, only allows 1.1 W/ft^2 with an additional 1 W/ft^2 decorative allowance. This means that pursuing LEED NC v2.2 will force the designer to use a fraction of a shrunken power allowance. Following ASHRAE will make energy consumption a much more important design criteria than it would be if the CEC was the dominant code.

The other LEED credits place limitations on the design as well. In order to get SSc8 all fixtures must be placed so that they cannot be seen along a direct line of sight from the outside. MRc4 requires lamp mercury content to be minimized. Daylighting credits IEQc8.1 and IEQc8.2 affect the size and quality of the glazing, which in turns affects the relative appearance of lamp color and Illuminance levels. If glazing is changed to meet these credits the color of the lamps and the Illuminance levels will need to be examined.

Due to the fact that there is little penetration into the interior of the building, it is assumed that IEQc8.1 and IEQc8.2 are not being pursued. However, there will still be a lot of daylight penetration, credit or no credit, so these factors should be considered very important.

Whatever the code, the IESNA recommends 10 fc for general lighting, 30 fc for reading areas, and 3 fc for entrance canopies. Although these values are not required by law they should be closely followed because the quantity of light affects the quality of the tasks being performed in the space.

Qualitative Design Criteria Discussion:

The lobby is the most complex and decorated space in the entire building. The architects and interior designers clearly spent a lot of time on this space, so the lighting should be very high quality. Quality, as it relates to this lobby, means several things. It involves good facial modeling of the receptionist, proper placement of light to create the appropriate Flynn impressions, a clear hierarchy of light that leads patrons to the correct location and a harmonious overall composition that reflects the character of the Hotel Felix. Creating all of these things involves paying careful attention to the placement, intensity and color of the light being used.

Spaciousness and Relaxation are opposing Flynn Impressions. The first requires uniform, high luminances while the other requires non-uniform, low luminances. Both agree on the need for light around the periphery. The spaciousness feeling is desirable because it makes the lobby look larger, and thus more elegant and impressive. The relaxation feeling is important because the Hotel Felix prides itself on giving patrons a relaxing environment. The best way to combine these two feelings without losing both is to have non-uniform, low level light in the lounge area where people are sitting and relaxing but to also light certain architectural elements with high-luminance uniform light that “raises” the ceiling. In short, the Relaxation Flynn impression will be main impression but several variations of the Spaciousness impression will be incorporated to make the space seem larger.

Prioritized List of Design Criteria:

1. Meet Energy Code Requirements
2. Create an elegant and intimate hotel environment by controlling the color, intensity and luminance within a clear hierarchy of light.
3. Follow the modified relaxation Flynn impression
4. Model receptionist's face and provide adequate task lighting
5. Meet all LEED requirements, with the exception of the daylighting credits.

Analysis of Existing Lighting System

Impression created by Existing Lighting System:

Upon arriving at the Hotel Felix one is welcomed by a large, brightly lit space. The various spaces that branch off the lobby combine with the diverse assortment of furnishings and decorations to create a busy, almost cluttered space. Fortunately, this feeling is not overwhelming because the decorations are all very beautiful. The lighting design does not draw the various elements together. During a bright day the warm light of the cove looks terrible against the bright blue daylight.

Performance Analysis:

For a hotel that prides itself on being Green and sustainable, using 3.2 W/ft^2 in the lobby is an embarrassment. The Halogen lighting that dominates the space is inefficient and improper for a modern building. One has to assume that the design team valued the color rendering, dimmability and color temperature of halogen but with the advancement of LEDs in the past several years these qualities are now available in a much more energy efficient source. Energy considerations aside, lighting only meets a few of the prioritized criteria. The coves are uniform and contrasting, the workspaces are properly illuminated and the front desk allows proper facial modeling but there is no impression of relaxation and the LEED energy credits are not met. As mentioned before the space feels a little disjointed and busy, but that may have more to do with the interior design than the lighting.

Areas that Need Improvement:

Switching away from halogen lighting is the easiest way to reduce the energy consumption of the space. Modern Xicato LED fixtures now provide the color-rendering and dimming performance needed to replace the existing halogen fixtures without sacrificing too much quality. Once more appropriate fixtures are selected a redesign is needed to create a more balanced composition between the various elements. Attention should be paid to circulation and hierarchy of brightness. The overall space should feel more relaxing and calm than it currently does. Color changing LEDs may allow the cove to fluctuate between cool-white and warm-white as the levels of daylight change.

BAR

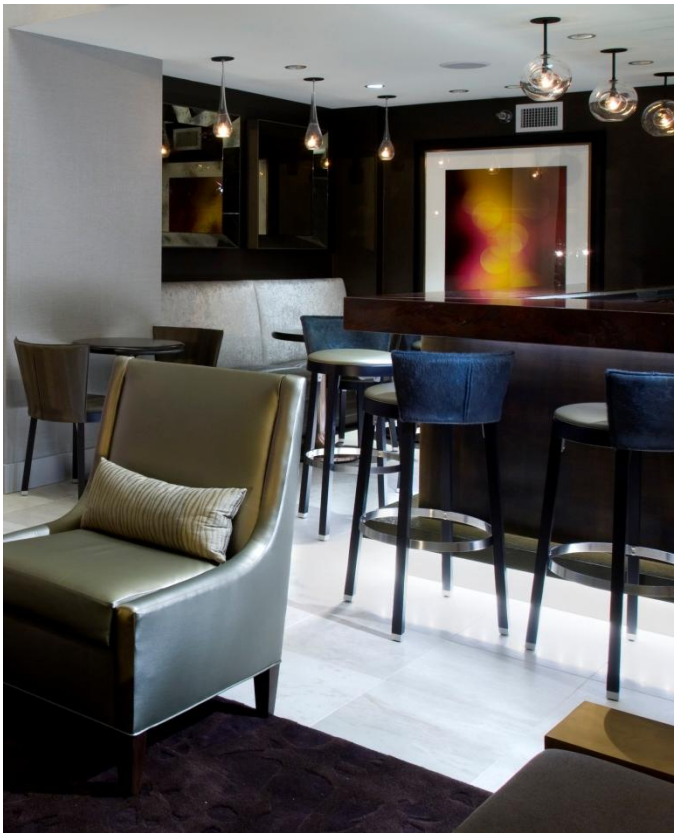


Figure 3.1: Bar. Courtesy Schuler Shook

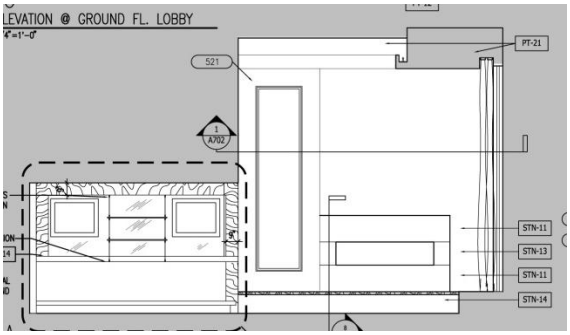


Figure 3.2: Bar and Lobby Fireplace Section

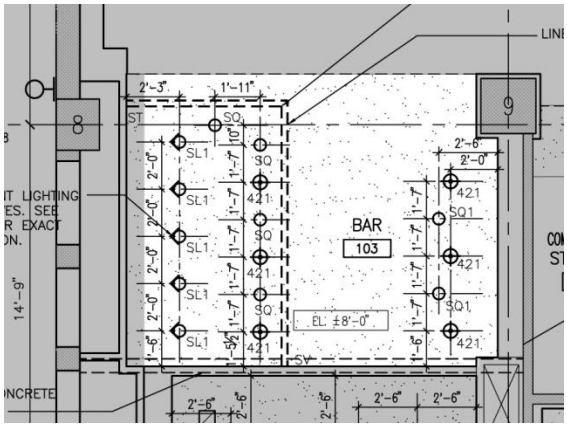


Figure 3.3: Bar RCP

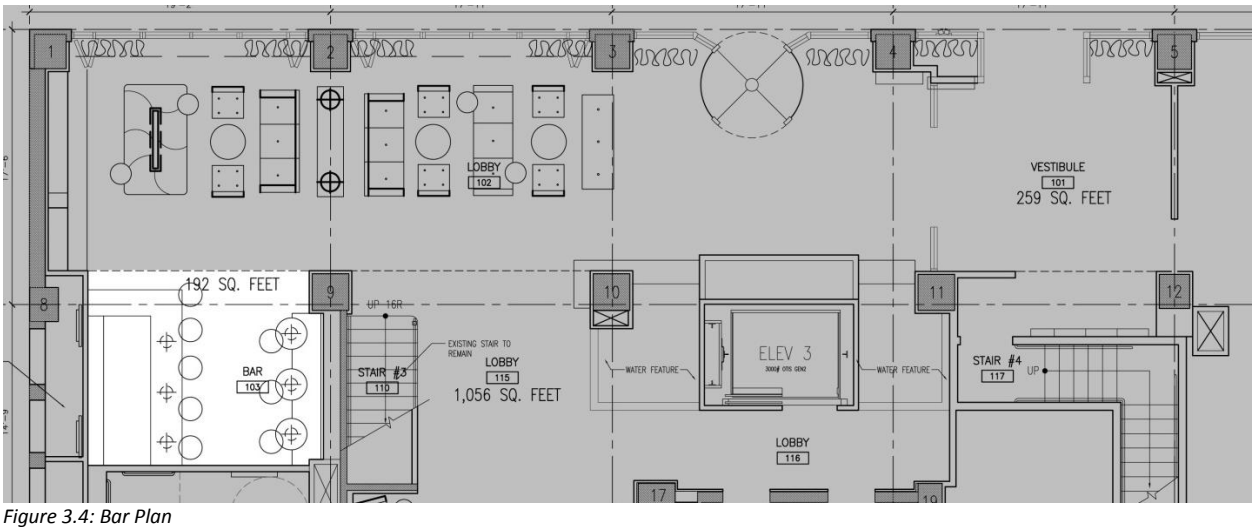


Figure 3.4: Bar Plan

ARCHITECTURAL DESCRIPTION

Material definitions and properties are available in Appendix B on page 54

Figure 3.5: Reflective Finish

GENERAL LAYOUT AND FUNCTION:

The bar is a one-story tall 19' x 12' extension of the lobby located adjacent to the fireplace. It consists of three small tables, a couch and a five-chair, L-shaped bar. There is enough space for two bar tenders to sit behind the bar, but only one is usually needed. The lighting of the bar should consider the lobby because the two spaces are not separated by any walls.

AESTHETICS AND DECORATION:

Like the lobby, the bar area is contemporary, sustainable and comfortable. It mixes the soft feel of brushed metal finishes and amorphous glass luminaires with the racy elegance of mirrored metal and highly polished wood veneers. This contrast adds a little more edge than is seen in the lobby and makes the entire space feel more fun. A large painting on the south wall dominates the corner and brings a fiery red and yellow tone to the space (*figure 3.6*). There are two large square mirrors on the eat wall that are framed with a reflective metal. These make the small space feel a little larger.

Figure 3.6: Painting

MATERIALS:

Figure 3.1 shows how the current lighting system brings out the character of the different materials. The tiled floor (*Material 3.1*), white-painted gypsum wall (*Material 1.3*), wallpaper accent wall (*Material 1.4*), and white-painted gypsum ceiling (*Material 2.1*) are all the same materials as seen in the lobby. A close up of the reddish-purple stained oak bar is shown in Figure 3.7 (*Material 5.1)*. Notice how the texture of the brushed-bronze bar (*Material 5.2*) contrasts with the mirrored brass tables (*Material 5.3*) in Figure 3.5.

Figure 3.7: Brushed Finish and marbled bar material

DAYLIGHT ELEMENTS:

The daylight that enters this space comes from the large windows in the lobby. It should be assumed that this space will often see a lot of daylight but any shading will occur in the lobby, not the bar.

EXISTING LIGHTING EQUIPMENT

Electrical Plan is available in Appendix A.3 on page 52

Luminaire schedule and descriptions are available in Appendix C.3 on page 57

FIXTURES AND LAMPS:

The lighting in the space is entirely halogen with two decorative LED coves. Lensed 50W halogen downlights provide general illumination while 100W decorative halogen pendants add character and visual interest. A close up of these fixtures can be seen in Figure 3.8. There are also two runs of standard output, warm white LED strip fixtures concealed in the bar. The first is below the bat-top and the second is recessed under the toe kick.

Figure 3.8: Decorative fixture type 421

BALLASTS:

All halogen fixtures have integral low voltage magnetic transformers. The LED strips have integral drivers.

CONTROLS:

All bar fixtures are controlled by a dimmer located next to the reception desk as shown in Figure 3.9 below.

BAR/LOUNGE								
	DP-1	D13	Linear LED – toekick	ST	18	6	108	LED
	DP-1	D14	NOT USED					
	DP-1	D15	Linear LED	SV	18	7.6	137	LED
	DP-1	D16	Halogen accent	SL1	5	50	313	MLV
	DP-1	D17	Decorative pendant	421	6	100	600	INC
	DP-1	D18	Halogen accent	SQ1,SQ2	4	50	250	MLV

Figure 3.9: Dimming Panel Schedule for Bar fixtures

EMERGENCY LIGHTING:

One SQ downlight and one SQ1 downlight are on an emergency circuit.

Lighting Design Criteria

IESNA Lighting Design Guide Recommended Criteria for Ballrooms/Social Events

Very Important

- Appearance of Space and Luminaires
- Color Appearance and Color Contrast
- Sparkle/ Desirable Reflected Highlights
- System Control and Flexibility

Important

- Light Distribution on Surfaces
- Luminances of Room Surfaces
- Modeling of Faces or Objects
- Points of Interest

Recommended Illuminances

- **Horizontal Illuminance |** 5 fc
- **Vertical Illuminance |** 3 fc

LEED-NC Version 2.2 Criteria

- **SSc8: Light Pollution Reduction**
  - Exterior lighting power densities can't exceed ASHRAE 90.1-2004 requirements for the project zone per IESNA RP-33
  - Meet light trespass limits at site boundary for the project zone
  - Conduct light trespass analysis for all site lighting
  - Design lighting so that angle of maximum candela from each luminaire intersects opaque surfaces and does not exit out through the windows or automatically control all non-emergency interior lighting to turn off during non-business hours
- **EA Prereq 1: Minimum Energy Performance**
  - Comply with ASHRAE 90.1-2004
- **EAc1: Optimize Energy Performance**
  - Reduce entire building power consumption by 10-42% for 1-10 points
- **IEQc8.1: Daylight &Views, Daylight 75% of Spaces**

  - 75% of all regularly occupied spaces must have a minimum of 25 fc on the equinox at 9:00AM and 3:00 PM = 1 point, 90% = 2 points
- **IEQc8.2: Daylight &Views, Views to the Outside**
  - 90% of all occupants achieve a direct line of sight to the outdoor environment through vision glazing between 2'6" from the floor but less than 7'6"
- **MRc4: Recycled Content: Mercury Content Reduction**
  - 90% of mercury containing lamps in project must contain less than 90 picograms of Hg per lumen-hr

ASHRAE 90.1 Requirements

- **Maximum Power Density: Bar Lounge/Leisure Dining** | 1.4 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with ASHRAE 90.1-2004 9.6.3

Chicago Energy Code Requirements

- **Maximum Power Density: Hotel Function |** 2.4 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with Table 18-23-805.4.2
- **Refer to 18-13-805.2.1: Interior Lighting Controls |** Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting servicing that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.
- **Refer to 18-13-805.2.2.1 Bilevel Switching |** Each Area less than 250 ft^2 that is required to have a manual control shall also allow the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by at least 50%.

Desired Flynn Impression (Reference ALD by Gary Steffy)

Relaxation

- More nonuniform
- peripheral
- lower luminances

Quantitative Design Criteria Discussion:

According to IESNA, bar environments only need and average of 5 horizontal fc, and 3 vertical fc. These low light levels make it relatively easy to meet the 1.4 W/ft^2 maximum power density required by ASHRAE 90.1-2004 and even easier to meet the 2.4 W/ft^2 required by the CEC. The CEC also requires that spaces under 250 ft^2 be controlled by a bilevel switch, or some other controlling method that allows the maximum output to be reduced by 50%.

Meeting LEED EA prereq 1 and EAc1 means that power densities must fall at least 10% below the ASHRE code on average throughout the building. As discussed in the lobby criteria, IEQc8.1 and IEQc8.2 will not be pursued. Mercury content must fall below 90 picograms per lumen-hr for 90% of all mercury-laden lamps in order to get MRc4. The light pollution reduction required by SSc8 will be very easy to meet because the only windows viewable from the bar are across the lobby. So long as the maximum candlepower of the fixtures do not face those windows the credit will be met.

Qualitative Design Criteria Discussion:

Bar environments offer the opportunity for very creative lighting designs because the mood created by the lighting is critical to creating a successful space. That is why the most important design criteria, according to IESNA, is the appearance of the space, the color, the controllability and the sparkle/ desired reflected highlights. These all have profound effects on the mood. I would personally include the rendering of faces into this most important category because one of the main reasons for going to a hotel bar is to meet other patrons. Lighting should always be designed for people first, especially in a setting that focuses so intensely on human interaction. The distribution of light, luminances, and points of interest are all important criteria, but they are more the means by which we fulfill the most important criteria previously discussed.

According to Flynn, relaxing spaces need nonuniform, low luminance peripheral lighting. This advice should be closely followed. Creating the proper mood in the space is the highest priority of all. The intention of this space should be to create a relaxing mood that encourages and enhances patron interaction. It should be more intimate than the lobby.

The bar currently sits in the far corner of the lobby and is overpowered by the cool looking fireplace lounge. There is an opportunity for the lighting design to connect these two spaces in a way that makes the bar look more inviting.

Prioritized List of Design Criteria:

1. Meet Energy Code Requirements
2. Create a relaxing Flynn impression that encourages and enhances patron interaction
3. Allow good facial modeling
4. Achieve appropriate light levels according to IESNA recommendations
5. Connect the bar to the fireplace lounge
6. Meet all LEED requirements, with the exception of the daylighting credits.

Analysis of Existing Lighting System

Impression created by Existing Lighting System:

The current lighting system has some very cool looking decorative pendants that give the bar a fun, laid-back feel. They are very successful. Unfortunately, the large amount of daylight entering during the day makes the space far too bright to be intimate or relaxing. At night the bar feels much more comfortable, but the 5 downlights combined with the 6 decorative pendants provide far too much light. They need to be dimmed more than they are currently.

Performance Analysis:

Like the lobby, the bar uses halogen for general illumination. This results in an absurdly high power density of 5.9 W/ft^2. Needless to say, this amount does not meet code on its own so they must be trading power allowance from other space to pay for this one. Although this is legal, it does not follow any sustainable principles. Having downlights and decorative pendants is redundant, as the pendants should be able to provide task lighting and create the appropriate ambiance if selected properly. Currently the north wall is lit by 5 halogen wallwashers set back 2'3" from the wall with 2' spacings. There may be a fixture that can provide an even wash with fewer fixtures. The led strip fixtures do a wonderful job adding visual interest near the toe kick but they do not light the bronze bar material very well.

Areas that Need Improvement:

This space needs a complete renovation from an energy consumption point of view. Fewer fixtures that incorporate high-efficacy sources would greatly reduce the connected load. However, energy is not the most important criteria in this space. The mood and patron interaction is essential to a successful design. Halogen may very well be the best source to support good color rendering and facial modeling. It also tends to look best in decorative fixtures while LEDs, the most efficacious alternative, may not even be available in many of the most applicable decorative fixtures. For these reasons halogen should not be ruled out completely.

Nevertheless, fixtures need to be chosen that enhance the mood while using less energy. Extraneous fixtures, such as the halogen downlights and unsuccessful cove lights can be removed. The wallwashers can be replaced with fewer fixtures that have better distributions. This space has the potential to support various creative designs. Time should be spent exploring interesting outside-the-box solutions that achieve the design criteria in a more successful and sustainable way than the current design.

CONFERENCE ROOM

Figure 4.1: Conference Room Model

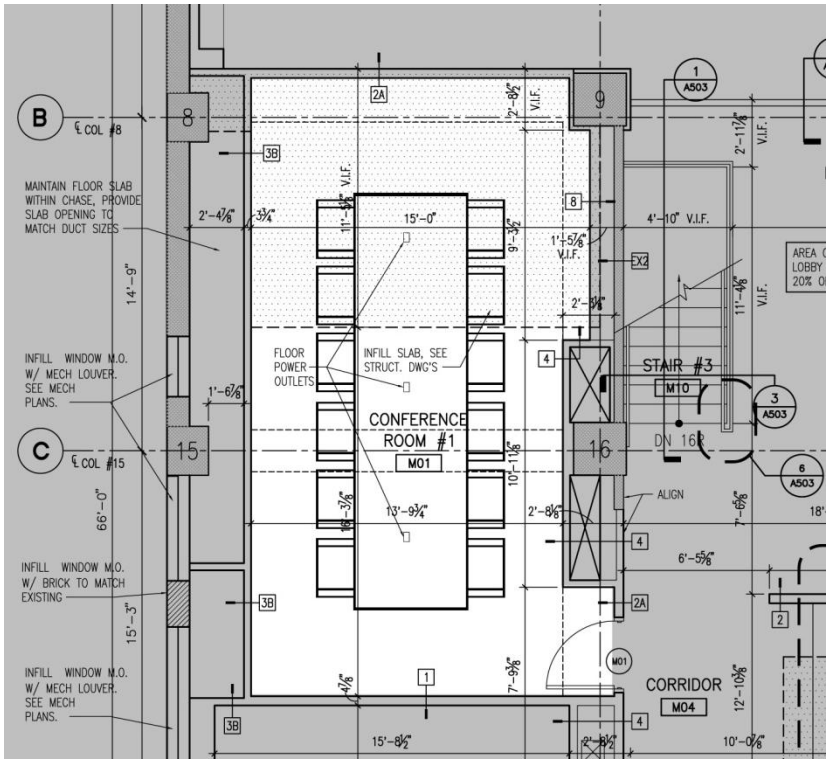


Figure 4.2: Conference Room Plan (NTS)

Architectural Description

Material definitions and properties are available in Appendix B4 on page 54

General Layout and Function:

The conference room is a relatively unimpressive 30' x 20' room with an 8' tall ceiling. Its total floor area is 385 ft^2.The structural beam that spans across the center of the room reduces the already low ceiling height to 7'5", making the space feel tight and uncomfortable. There are no windows and only one door. There is a single table running the length of the room and a projector screen on the north wall. Two small setbacks in the East wall disrupts the otherwise perfectly rectangular space.

Aesthetics and Materials:

The conference room is plain. The walls and the ceiling are both painted white gypsum board (*Materials 1.3 and 2.1 respectfully)* and the floor is a blue-grey carpet (*Material 3.2)*. There are several framed paintings on the wall that look very similar to Ansel Adams. The door is a light brown wood (*Material 1.6).*

Daylight Elements:

There are no daylight elements in this space. It is windowless.

Existing Lighting Equipment

Lighting RCPs and Electrical Plans are available in Appendix A.4 on page 53

Luminaire schedule and descriptions are available in Appendix C.4 on page 57

Fixtures and Lamps:

There are two fixture types in this space. Type SK is a lensed halogen 50W MR16 downlight that is recessed into the ceiling and arranged in a 3'6" x 4' grid. It provides general illumination. The second fixture is a Type SC linear fluorescent asymmetric wallwasher that is used to light the north wall of the conference room. It uses 28WT5 lamps with a 3000K color temperature. It is assumed that these will light presentations if need be. They are semi-recessed into the ceiling and have white trim.

Ballasts:

The fluorescent wallwashers have integral 100% - 10% electronic dimming ballasts. The halogen downlights have integral magnetic transformers.

Controls:

Both fixture types are dimmable and controlled by a 4-preset dimming panel.

Emergency Lighting:

The SK downlight closest to the door is on an emergency circuit.

LIGHTING DESIGN CRITERIA

IESNA LIGHTING DESIGN GUIDE RECOMMENDED CRITERIA:

Very Important

- Appearance of Space and Luminaires
- Direct Glare
- Modeling of Faces or Objects

Important

- Color Appearance and Color Contrast
- Light Distribution on Surfaces
- Light Distribution on Task Plane (Uniformity)
- Luminances of Room Surfaces
- Reflected Glare
- Surface Characteristics

Recommended Illuminances

- **Horizontal Illuminance |** 30 fc
- **Vertical Illuminance |** 5 fc

LEED-NC VERSION 2.2 CRITERIA

- **SSc8: Light Pollution Reduction**
  - Exterior lighting power densities can't exceed ASHRAE 90.1-2004 requirements for the project zone per IESNA RP-33
  - Meet light trespass limits at site boundary for the project zone
  - Conduct light trespass analysis for all site lighting
  - Design lighting so that angle of maximum candela from each luminaire intersects opaque surfaces and does not exit out through the windows or automatically control all non-emergency interior lighting to turn off during non-business hours
- **EA Prereq 1: Minimum Energy Performance**
  - Comply with ASHRAE 90.1-2004
- **EAc1: Optimize Energy Performance**

  - Reduce entire building power consumption by 10-42% for 1-10 points
- **IEQc8.1: Daylight &Views, Daylight 75% of Spaces**
  - 75% of all regularly occupied spaces must have a minimum of 25 fc on the equinox at 9:00AM and 3:00 PM = 1 point, 90% = 2 points
- **IEQc8.2: Daylight &Views, Views to the Outside**
  - 90% of all occupants achieve a direct line of sight to the outdoor environment through vision glazing between 2'6" from the floor but less than 7'6"
- **MRc4: Recycled Content: Mercury Content Reduction**
  - 90% of mercury containing lamps in project must contain less than 90 picograms of Hg per lumen-hr

ASHRAE 90.1 Requirements

- **Maximum Power Density: Conference/Meeting/Multipurpose** | 1.3 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with ASHRAE 90.1-2004 9.6.3

Chicago Energy Code Requirements

- Maximum Power Density: Convention, conference or meeting center | 1.5 W/ft^2
- Decorative Allowance | 1 W/ft^2 in accordance with Table 18-23-805.4.2
- **Refer to 18-13-805.2.1: Interior Lighting Controls |** Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting servicing that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.

Desired Flynn Impression (Reference ALD by Gary Steffy)

Spaciousness

- More uniform
- Peripheral
- Higher luminances

Visual Clarity

- More central, higher work surface and overhead illuminances
- Some peripheral

Quantitative Design Criteria Discussion:

The conference room is a functional space and needs to have a lighting system that supports reading, writing and viewing presentations. The system must be controllable to allow for many different types of activities to take place.

IESNA recommends an average of 30fc on the horizontal workplane and an average of 5 fc in the vertical. The horizontal level is critical to specific tasks such as reading but the 5 fc is a more subjective recommendation related to viewing faces. The horizontal value should be closely followed but the vertical Illuminance should be determined by the arrangement of seating and the task at hand. For example, vertical Illuminance is much more critical at seat locations and presentation areas than at an unused section of the wall. The relative brightness's of the different elements should be determined by the desired Flynn impressions, but they must provide the minimum illuminances required by the task. If levels must be changed to create the Flynn impression higher illuminances are better than lower illuminances because they still support the task.

There are no windows in the conference room, so LEED credits SSc8, IEQc8.1 and IEQc8.2 do not apply. Mercury content and energy consumption must be reduced to get MRc4, EA prereq 1 and EAc1. The space should adhere to ASHRAE 90.1-2004 and the CEC controlling requirements. It is also important to choose fixtures that have shallow housings. There is not much space in the ceiling and it is already incredibly low for the size of the room.

Qualitative Design Criteria Discussion:

The quality of the light in this space must support the task. Good facial modeling, uniform distribution on the task plane and no prohibitive glare is essential. Although IESNA claims that the appearance of the space and luminaires is very important for conference rooms, it is only moderately important here. Unlike most fancy conference rooms, this one lacks any architectural design that may be ruined by unappealing fixtures. That being said, a pleasing space is desirable because it supports the legitimacy of any important work being discussed. The new lighting system should try to improve the aesthetics of this space, even though it may be difficult. The appearance of the luminaires is important but it should not trump the functionality of the system.

Conference rooms should provide a feeling of clarity and spaciousness because it encourages productivity and attentiveness. According to Flynn, these feelings are created using higher Illuminances from a central overhead location and by uniformly lighting the periphery and workplane.

Prioritized List of Design Criteria:

1. Meet all energy code requirements
2. Specify fixtures with shallow housings
3. Create a dimmable system capable of adequately lighting the various tasks expected
4. Avoid glare and veiling reflections
5. Provide good facial modeling
6. Create the appropriate Flynn impression
7. Meet all LEED credits and follow sustainable principles
8. Improve the aesthetics of the space

Analysis of Existing Lighting System

Lighting RCPs and Architectural elevations are available in Appendix A.4 on page 54

Luminaire schedule and descriptions are available in Appendix C.4 on page 57

Impression created by Existing Lighting System:

The current system is uses an array of 21 halogen downlights to provide general illumination and has three recessed linear fluorescent fixtures washing the north wall. Having almost all of the light come from downlights mounted in an 8' ceiling makes the space feel incredibly small and tight. The quality of light on the faces of occupants is terrible because the ratio of direct light to indirect light is very high. It has a strange cave-like quality that is both unsettling and depressing. It is surprising that a Hotel with such an exciting lobby could have such an uninviting conference room.

Performance Analysis:

Assuming very clean environment, a 6 month cleaning schedule for all luminaires, and immediate replacement of all burned out lamps, the total light loss factors for the luminaires are as shown in figure 4.2

Light Loss Factors						
Fixture Type	LLD	LDD	BF	RSDD	LBF	Total
SC	0.93	0.95	1	0.95	1	0.839325
SK	0.93	0.95	1	0.95	1	0.839325

Figure 4.2: Light Loss Factors

Workplane Illuminance						
Average (fc)	Max (fc)	Min (fc)	Max/Min	Avg/Min	Max/Avg	Uniformity Gradiant
48.03	59.00	27.30	2.16	1.76	1.23	1.91

Figure 4.3: Workplane Illuminance Summary

Figure 4.3 summarizes the lighting on the workplane. Figures 4.4 and 4.5 show the illuminances on all surfaces. The numbers represent illuminance values calculated 2.5' above the floor.

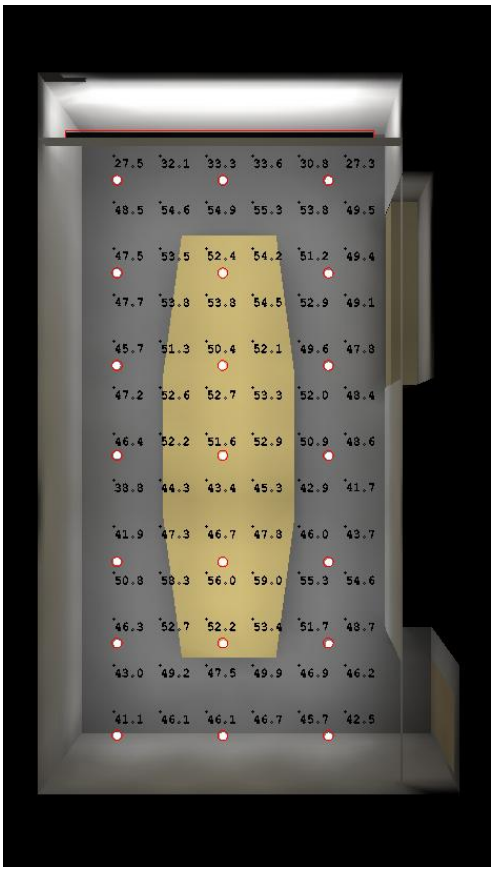


Figure 4.4: Horizontal Illuminance Levels

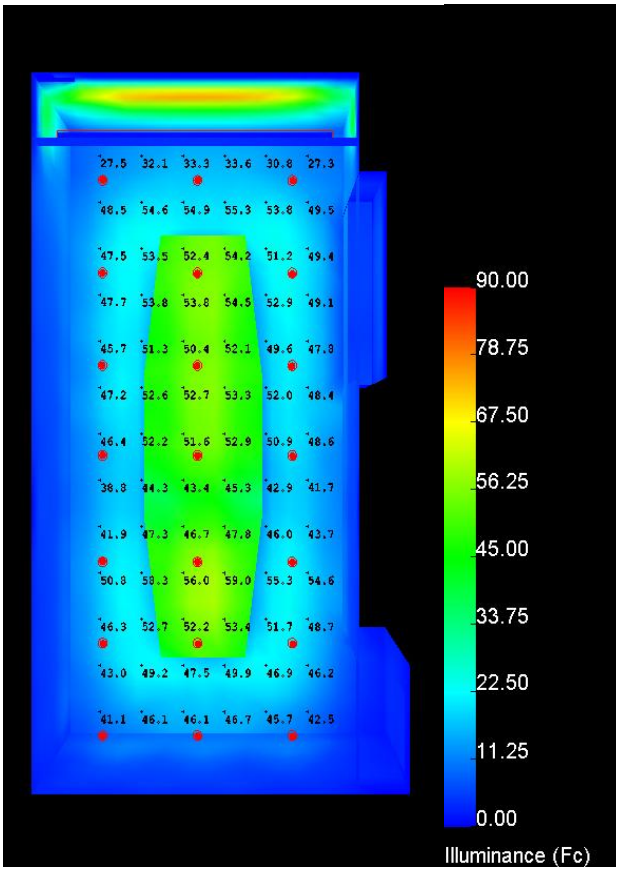


Figure 4.5: Horizontal Illuminance Levels_Pseudo-color

As shown in figures 4.4 and 4.5, the lighting is brighter in the center of the room and gradually dies off towards the edges. Its 48fc average is incredibly close to its 59 fc maximum, which supports the feeling of uniformity in the space. 48 fc is also almost twice the IESNA recommended illuminance levels. There is very little contrast of visually intriguing elements. The lighting system lights everything from above and only puts light where the task requires it. There is a slight dip in Illuminance levels near where the beam crosses the room. This is due to the fact that the downlights had to be spaced slightly farther apart to avoid the beam. Figure 4.1 proves that this difference in workplane Illuminance is very noticeable.

As shown in Figure 4.6, the minimum vertical Illuminance at face level is right above 5fc, the IESNA recommended value for vertical illuminance. It has a very low coefficient of variation, meaning that all faces will look similarly bright. Although these levels are spot on, it should be noted that there are rows of lights almost directly above every seat location. Although these will combine with the center row to produce proper calculated values, it will render faces poorly by creating strange shadows across the face. It would be better to light the people like sculptures, with key light from a side angle to define features, soft ambient fill light to reduce shadow contrast, and background light to define the edge of the face. This will model faces more appropriately than the current system, which essentially illuminates the faces from directly above.

Vertical Illuminance at Face Height						
Average (fc)	Max (fc)	Min (fc)	Max/Min	Avg/Min	Max/Avg	Coefficient of Variation
7.21	9.00	5.40	1.67	1.34	1.25	0.13

Figure 4.6: Vertical Illuminance Levels Summary

The current design does not meet many of the prioritized design criteria. At 3 W/ft^2, its power density is 2.3 times the ASHRAE standard 1.3 W/ft^2. Considering that there are no decorative lights in the space that might have received a decorative allowance, this space does not meet code on its own. It must be using traded Watts from other areas of the building.

The SK downlights have shallow housings that fit in the low ceiling, and the dimmability of both the downlights and the linear fluorescent fixtures allow the system to accommodate several different activities. The downlights have soft lenses that reduce glare and veiling reflections. As mentioned before, the current system does a very poor job rendering faces. Fortunately, the high-illuminance central/overhead lighting creates an environment of visual clarity, which is the desired Flynn impression. The systems absolute disregard for energy usage does not allow it to meet any applicable LEED credit except for MRc4, which it accidentally meets due to the fortunate fact that halogen lamps contain no mercury.

Overall the existing lighting system is an energy hog that functionally delivers the recommended Illuminance without considering the quality or the aesthetics of the space. It is unsustainable and unflattering.

Areas that Need Improvement:

This space would benefit greatly from a source of light that come from somewhere other than directly above. Uniformly washing one of the peripheral walls would help make the room feel more spacious while also providing a diffuse source of fill light for facial modeling. This would add some visual interest and help dispel the harshness of the downlights.

One of the major flaws of the conference room is the cave-like feeling that is caused by the poor architectural design. A covelight where the wall meets the ceiling might visually lift the ceiling and allude to a larger space above.

The energy issue must be dealt with in order to meet code and secure LEED credits. Halogen works very well in conference rooms due to its wonderful color rendering and dimmability but it should not be the only source used for general illumination. Halogen can be kept as key light on faces, but high CRI fluorescent or some other highly-efficacious source should be used for general fill light and taskplane illumination. The overall light levels can be reduced to around 30 fc on the horizontal.

SPA

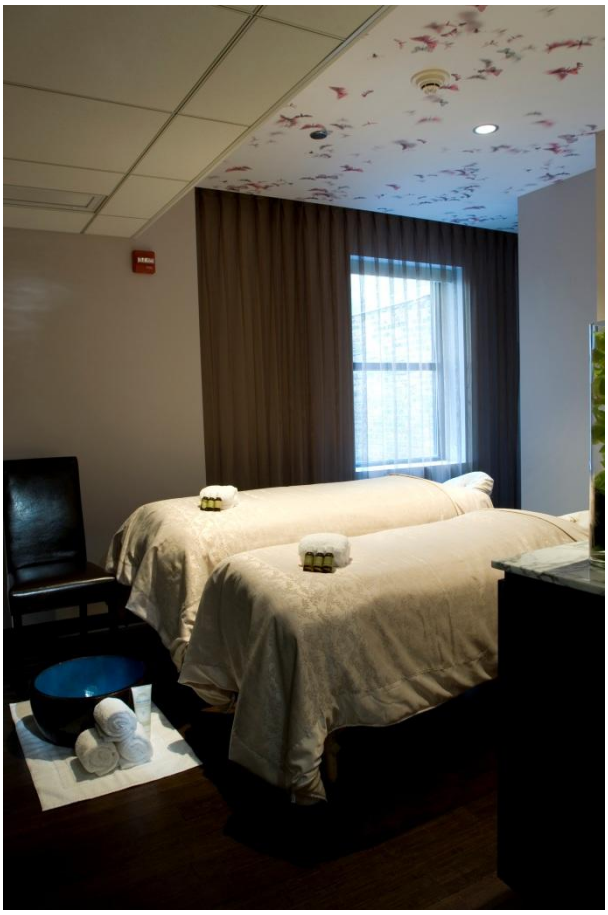


Figure 5.1: Spa. (Photo Courtesy Schuler Shook)

ARCHITECTURAL DESCRIPTION

Material definitions and properties are available in Appendix B on page 54

GENERAL LAYOUT AND FUNCTION:

The spa consists of an entrance hallway, a reception area and three treatment rooms. This project will focus on the reception area, one treatment room and one bathroom, as shown in figure 5.3. Each treatment room is roughly 12’ x 10’ with 8’4” ceilings. Above the entrance to each room the acoustic ceiling tiles drop down to 7’2” to make space for ventilation ducts. The entrance hallway has an abstract tree motif imprinted into the smooth plastic wall as shown in Figure 5.5. Although the rest of the hotel it lit fairly brightly, the reception area only has a few lights and feels very dark. It is hard to see the face of the receptionist when one first enters. There are refreshments and soft chairs in the 8’ x 20’reception area. Each treatment room has a window, one or two spa beds, several cabinets, and a full bathroom. Each bathroom has a toilet, sink, standing shower and mirror.

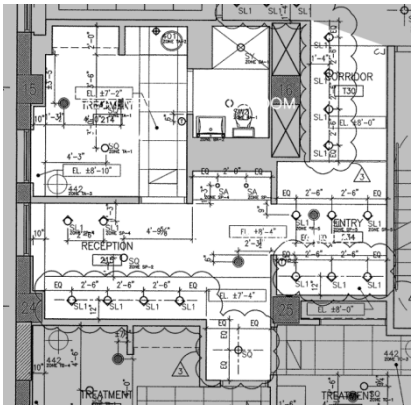


Figure 5.2: Spa RCP (NTS)

Figure 5.3: Spa Rooms

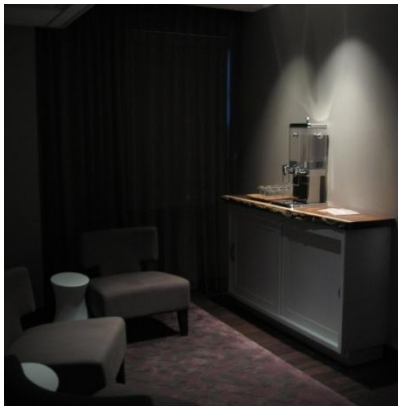


Figure 5.4: Reception Area

Aesthetics and Decoration:

Overall, this space has a lot of contrast. There are very dark areas and very bright spaces, but very little in between. Cushioned chairs, dark wood and butterfly-inspired carpets and wallpaper emit an unaggressive attitude. There are several framed butterfly paintings on the walls.

Materials:

A dark wood floor *(Material 3.3)* and a pink and green butterfly carpet *(Material 3.4)* cover the reception area (*figure 5.4)*. The treatment rooms have the same dark wood floor. The bathrooms have the same terrazzo tile as the lobby *(Material 3.1).* The ceilings are mostly white painted gypsum board *(Material 2.1)* but there are several areas where acoustical tiles *(Material 2.2)* drop down. The ceilings above the spa beds are covered with butterfly wallpaper *(Material 2.3)*. The windowed walls of the treatment rooms are covered in dark brown drapes *(Material 1.7)* that hang like the curtains of a theater (*Figure 5.1*)

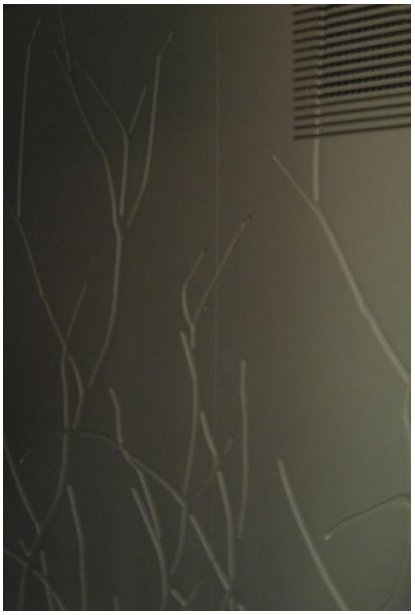


Figure 5.5: Tree motif in entrance hallway

Daylight Elements:

Every treatment room has a single double-hung window with 79% transmissive glazing (*Material 4.1)*. There are opaque shades that can be drawn closed to block the daylight during certain treatments. The reception area also has a similar window.

EXISTING LIGHTING EQUIPMENT

Luminaire schedule and descriptions are available in Appendix C5 on page 58

FIXTURES AND LAMPS:

Similar to most of the other spaces in the Hotel Felix, the Spa uses dimmable 50W halogen MR16 downlights and wallwashers for general illumination. The bathrooms each have a single 26W CFL downlight in the center and a wet-location-rated 26W CFL downlight in the shower. All CFL lamps are 3000K with a CRI in the 80s. There are several adjustable 50W MR16 fixtures in the reception area that light the coffee stand, reception desk and display case. Many lighting fixtures were value-engineered out of this space at the last minute, including a wall slot fixture that was intended to illuminate the south wall of the reception area.

BALLASTS:

Every halogen fixture is dimmable and contains an integral magnetic transformer. The CFL fixtures contain integral electronic ballasts with a 1.0 ballast factor.

CONTROLS:

A single dimming panel located at the reception desk controls all halogen fixtures. The CFL fixtures are switched.

EMERGENCY LIGHTING:

The only emergency lighting near the spa is in the corridors.

Lighting Design Criteria

IESNA Lighting Design Guide Recommended Criteria: Reference Hospital Recovery Rooms

Very Important

- Color Appearance and Color Contrast
- Direct Glare
- Flicker and Strobe

Important

- Light Distribution on Surfaces
- Light Distribution on Task Plane (Uniformity)
- Luminances of Room Surfaces
- Modeling of Faces or Objects
- Reflected Glare

Recommended Illuminances

- **Horizontal Illuminance |** 10 fc
- **Vertical Illuminance |** 3 fc

LEED-NC Version 2.2 Criteria

- **SSc8: Light Pollution Reduction**
  - Exterior lighting power densities can't exceed ASHRAE 90.1-2004 requirements for the project zone per IESNA RP-33
  - Meet light trespass limits at site boundary for the project zone
  - Conduct light trespass analysis for all site lighting
  - Design lighting so that angle of maximum candela from each luminaire intersects opaque surfaces and does not exit out through the windows or automatically control all non-emergency interior lighting to turn off during non-business hours
- **EA Prereq 1: Minimum Energy Performance**
  - Comply with ASHRAE 90.1-2004
- **EAc1: Optimize Energy Performance**
  - Reduce entire building power consumption by 10-42% for 1-10 points

- **IEQc8.1: Daylight &Views, Daylight 75% of Spaces**
  - 75% of all regularly occupied spaces must have a minimum of 25 fc on the equinox at 9:00AM and 3:00 PM = 1 point, 90% = 2 points
- **IEQc8.2: Daylight &Views, Views to the Outside**
  - 90% of all occupants achieve a direct line of sight to the outdoor environment through vision glazing between 2'6" from the floor but less than 7'6"
- **MRc4: Recycled Content: Mercury Content Reduction**
  - 90% of mercury containing lamps in project must contain less than 90 picograms of Hg per lumen-hr

ASHRAE 90.1 Requirements

- **Maximum Power Density: Lounge/Recreation** | 1.2 W/ft^2
- **Decorative Allowance |** 1 W/ft^2 in accordance with ASHRAE 90.1-2004 9.6.3

Chicago Energy Code Requirements

- **Maximum Power Density: Hotel Function** | 2.4 W/ft^2
- **Decorative Allowance** | 1 W/ft^2 in accordance with Table 18-23-805.4.2
- **Refer to 18-13-805.2.1: Interior Lighting Controls |** Each area enclosed by walls or floor-to-ceiling partitions shall have at least one manual control for the lighting servicing that area. The required controls shall be located within the area served by the controls or be a remote switch that identifies the lights served and indicates their status.
- **Refer to 18-13-805.2.2.1 Bilevel Switching |** Each Area less than 250 ft^2 that is required to have a manual control shall also allow the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by at least 50%.

Desired Flynn Impression (Reference ALD by Gary Steffy)

Relaxation

- More nonuniform
- peripheral
- lower luminances

Quantitative Design Criteria Discussion:

The power density for this space must be below 1.2 W/ft^2 to meet ASHRAE 90.1-2004 or below 2.4 W/ft^2 to meet the CEC. Both codes allow a decorative allowance of 1 W/ft^2. LEED EAc1 requires a power density of at least 10% less than ASHRAE 90.1-2004. Due to the fact that all the rooms are less than 250 ft^2, there must be a control that allows occupants to reduce light levels by 50%.

IESNA recommends that light levels be around 10 fc in the horizontal and 3 fc in the vertical for hospital recovery rooms, which are similar to the spa. By using lighting design criteria meant for recovery rooms, the spa will have an environment that promotes health, wellbeing and recovery.

All mercury-laden lamps need to contain less than 90 picograms of mercury per lumen-hour to help comply with MRc4. Although every room in the spa has access to daylight, the LEED credits are not being pursued and their specific requirements will not be followed. The spirit of these credits should be addressed however, so daylight and direct views outside should be maximized if it proves beneficial to the occupants. Unfortunately, daylight tends to be a very bright source that might ruin any feeling of relaxation, so operable shades should be employed to allow daylight in when needed, but also keep it out when it degrades the quality of the space. In order to meet SSc8 light trespass out of the windows should be eliminated or reduced wherever possible.

Qualitative Design Criteria Discussion:

The patron is the most important element in the spa and the lighting must enhance his or her experience. The quality of light must be strictly controlled in order to create the proper emotional environment and as such it is essential to avoid direct glare, flicker, strobe, and other distracting lighting qualities. Color rendering and source CCT are very important because poor color rendering can make a space feel flat and can render skin tones in an unpleasant way. Warm CCTs promote feelings of relaxation and should be used throughout the space.

The placement, relative intensity, and character of the lighting needs to be carefully considered in order to create the relaxation impression described by Flynn. There should be low level, nonuniform, peripheral light that gives soft shadows and good facial modeling. It should be noted that the spa does not need uniform lighting on the task plane, as recommended by IESNA. This criterion is meant for hospital recovery rooms and not for spas.

Prioritized List of Design Criteria:

1. Meet code requirements
2. Avoid all glare, strobing, flicker and other annoying lighting qualities
3. Create the Flynn impression of Relaxation
4. Properly control daylight penetration
5. Provide adequate light levels as advised by IESNA
6. Use high CRI and warm CCT sources that present the patron in a flattering way
7. Meet all LEED requirements, with the exception of the daylighting credits.

Analysis of Existing Lighting System

Impression created by Existing Lighting System:

The spa is very, very dark. Upon entering one has a difficult time seeing the receptionists face if she is not standing directly in the accent lights that are aimed at her desk. After walking past the bright accent lights at the receptionist's desk the severely lower light levels of the reception area look almost black. Decorations cannot be easily seen because two very bright accent lights ensure that your eyes cannot adjust to the low levels. The lights are aimed at a random table as if it some kind of sculpture. It dominates the brightness hierarchy (see figure 5.4). Despite the poor facial modeling and the strangeness of the highlighted table, the contrast between light and dark is quite appealing. It makes the space feel very different from the rest of the hotel, which is perfect for a spa but the contrast between the brightest place and the darkest places makes the room feel tense, not relaxing. The windows are heavily shaded by drapes, so there is no connection to the outside. Stepping into the treatment rooms is a bit of a letdown because the space is poorly decorated compared to the reception area. It would look a lot better if the drop-down acoustic ceiling tiles were less visible. Unfortunately, this unattractive feature is very noticeable and makes the entire space look like an office with a bed in it. Whatever mystery and intrigue that was created by the reception area is weakened by the treatment room and then totally destroyed upon entering the bathroom. The bathroom feels bright, uniform, and incredibly boring. It feels like it was designed without any consideration of the spaces it supports.

Performance Analysis:

Assuming that the spa is a clean environment, has a six month luminaire cleaning cycle and has all lamps immediately replaced upon burnout, then the light loss factors for each fixture are as shown in Figure 5.6. All calculations assume 80/50/20 ceiling/wall/floor reflectances. As illustrated in figures 5.8 through 5.10, the spa area has very bright spaces and very dark spaces mixed together. Note that the area lit by the accent lights in the reception area is almost 500 times brighter than the hallway. Although the average Illuminance of the reception area and treatment room are right around the recommended 10 fc, the nonuniformity of the spaces ensures that the light levels are rarely ever 10 fc. It is either much brighter or much darker.

Light Loss Factors						
Fixture Type	LLD	LDD	BF	RSDD	LBF	Total
SA	0.93	0.95	1	0.95	1	0.84
SL1	0.93	0.95	1	0.95	1	0.84
SQ	0.93	0.95	1	0.95	1	0.84
SW3	0.84	0.95	1	0.95	1	0.76
SY	0.84	0.95	1	0.95	1	0.76

Figure 5.6: Spa Light Loss Factors

Workplane Illuminance							
Area	Average (fc)	Max (fc)	Min (fc)	Max/Min	Avg/Min	Max/Avg	Uniformity Gradiant
Reception Area	11.01	99.30	0.20	496.50	55.05	9.02	23.93
Treatment Room	14.02	64.00	0.30	213.33	46.73	4.56	5.50
Bathroom	12.40	15.80	7.90	2.00	1.57	1.27	1.31

Figure 5.7: Spa Workplane Illuminances

In general the reception area and treatment rooms are characterized by very bright focal points surrounded by a very dark periphery. This kind of high illuminance with no peripheral lighting creates a tense and uncomfortable atmosphere. In fact, this lighting design does the exact opposite of what Flynn recommends for creating the impression of relaxation.

The bathroom is lit much more uniformly than the treatment room or reception area, as shown by the difference in uniformity gradients in Figure 5.5. It is the only one of the three spaces that has a small max/min value. Figures 5.6- 5.8 show how different this space looks from the other two.

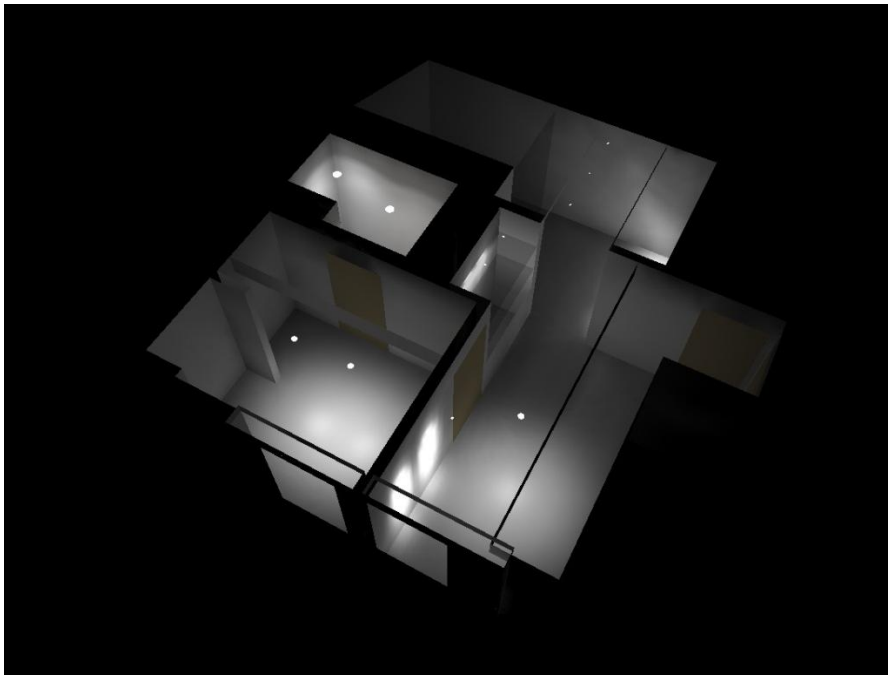


Figure 5.8: Spa Birds-eye View Render

Figure 5.9: Spa Illuminance Plan

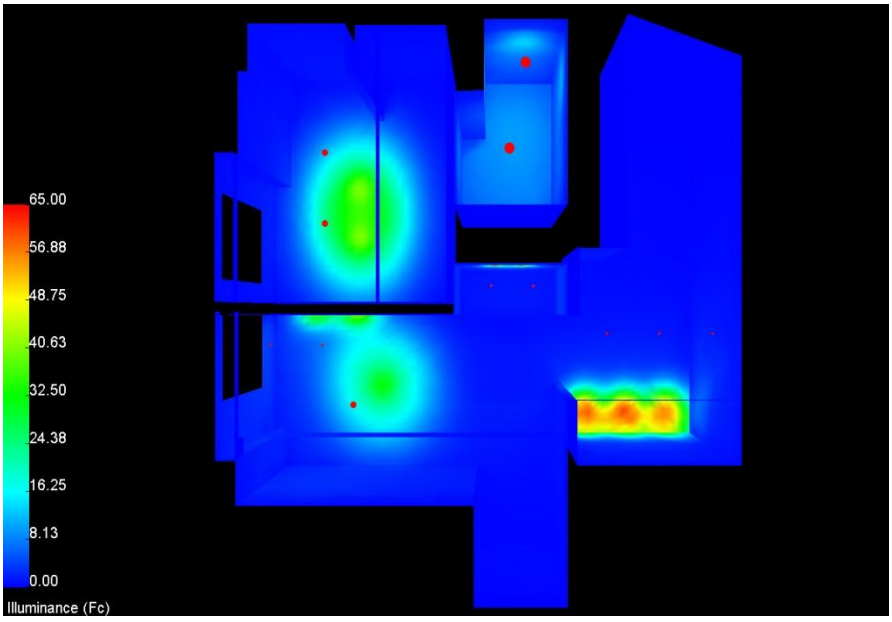


Figure 5.10: Spa Illuminance Plan Pseudo-color

Although my personal experience of walking through this space makes want to call it unsuccessful, it achieves many of the prioritized criteria listed above. It has a power density of .99 W/ft^2, which is less than the 1.2 W/ft^2 required by ASHRAE 90.1-2004, it avoids glare and strobing by using halogen sources placed at high angles, daylight is controlled with heavy curtains and it incorporates warm sources with high CRI. Missing from this list of achieved criteria is the very important Flynn

impression of relaxation. Although technically sound, the existing design does not create the atmosphere that it should. Failing to satisfy this single criterion makes the entire design a failure.

Areas that Need Improvement:

The lighting design needs to create the Flynn impression of relaxation. Changing the location of the lights in the treatment rooms from directly above the beds to a location off to the side would make the patron feel less "in the hot seat" and more comfortable. Even though the current system has comfortably dark spaces, the brightest areas are so overpowering those dark spaces cannot impart any sense of relaxation. Reducing the magnitude of the brightest luminances will make the entire space much more comfortable. Another solution could involve switching the accent lights from a narrow spot distribution MR16 to a flood distribution MR16. This will reduce the CBCP and create more ambient light.

Attention needs to be paid to the journey from entrance to treatment room. The odd adaptation issues described above should be resolved and the entire path should feel harmonious. Lowering max luminances will help with this as well. Increasing the minimum Illuminance from less than .5 fc to 3 fc will help balance the contrast ratios.

The bathroom needs to be completely relit so that it is treated in the same way as the rest of the spa. It currently feels disconnected from the rest of the space. A high-contrast wall sconce or mirror light may be able to provide enough Illuminance on the task plane while lighting the space less uniformly.

Conclusion:

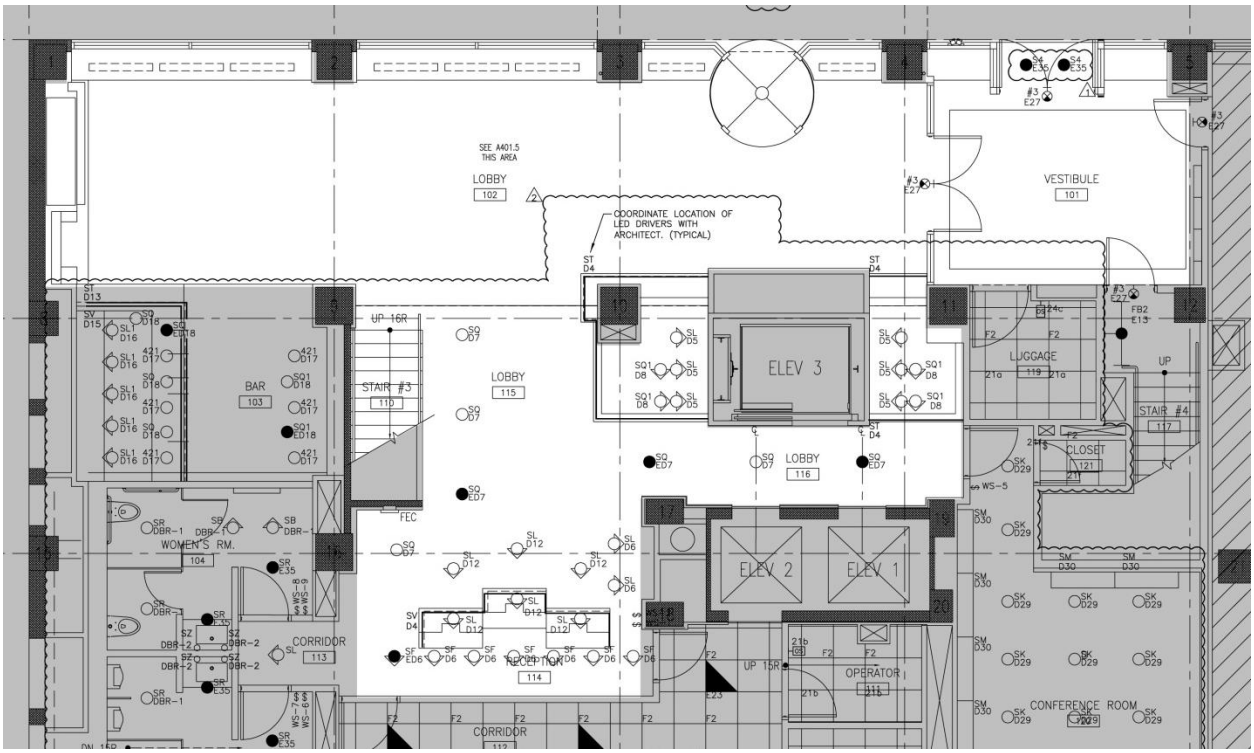
The existing lighting system in the Hotel Felix achieves most of the functional criteria and does not contain any technical errors, but it does not create the emotional atmosphere that the architecture needs. A new system that uses less downlight and higher-efficacy sources may be able to create a more sustainable and emotionally pleasing hotel. More attention should be paid to the quality of light and the impression that it creates.

APPENDIX A

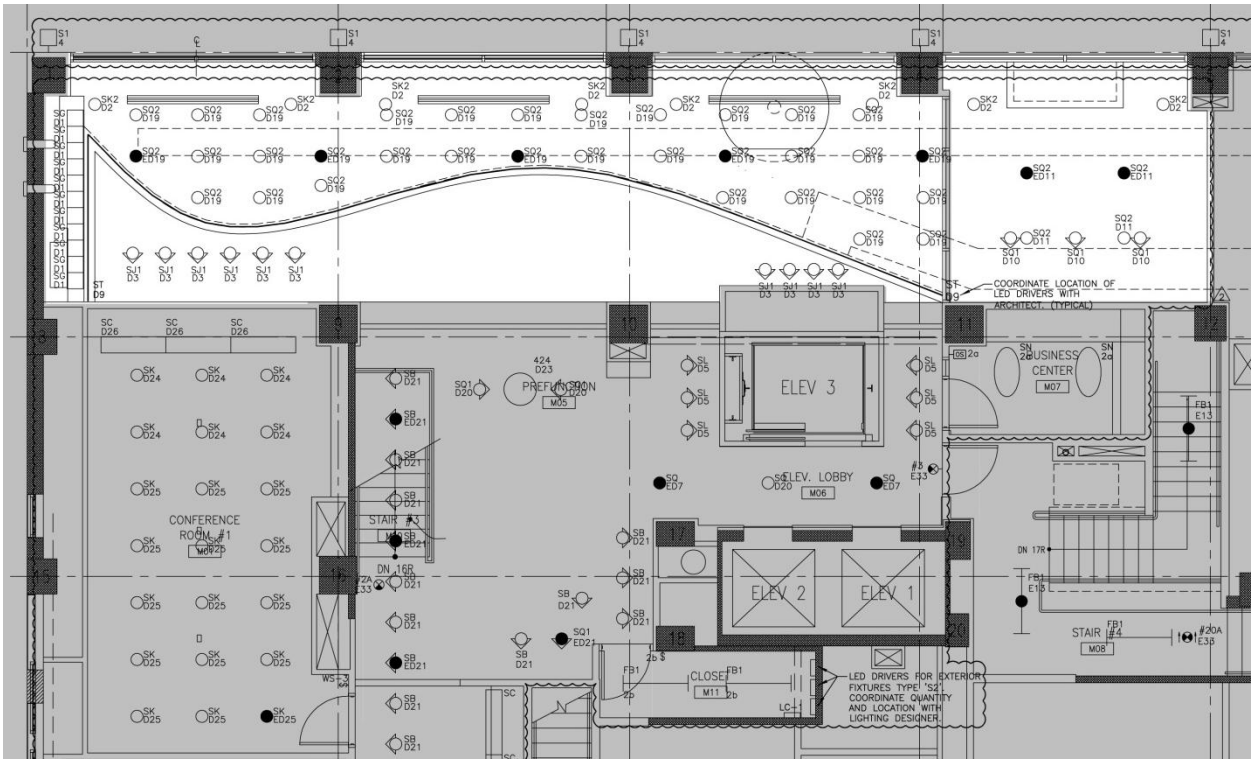
A.1

A.1.1: Façade Lighting Elevations. (NTS)

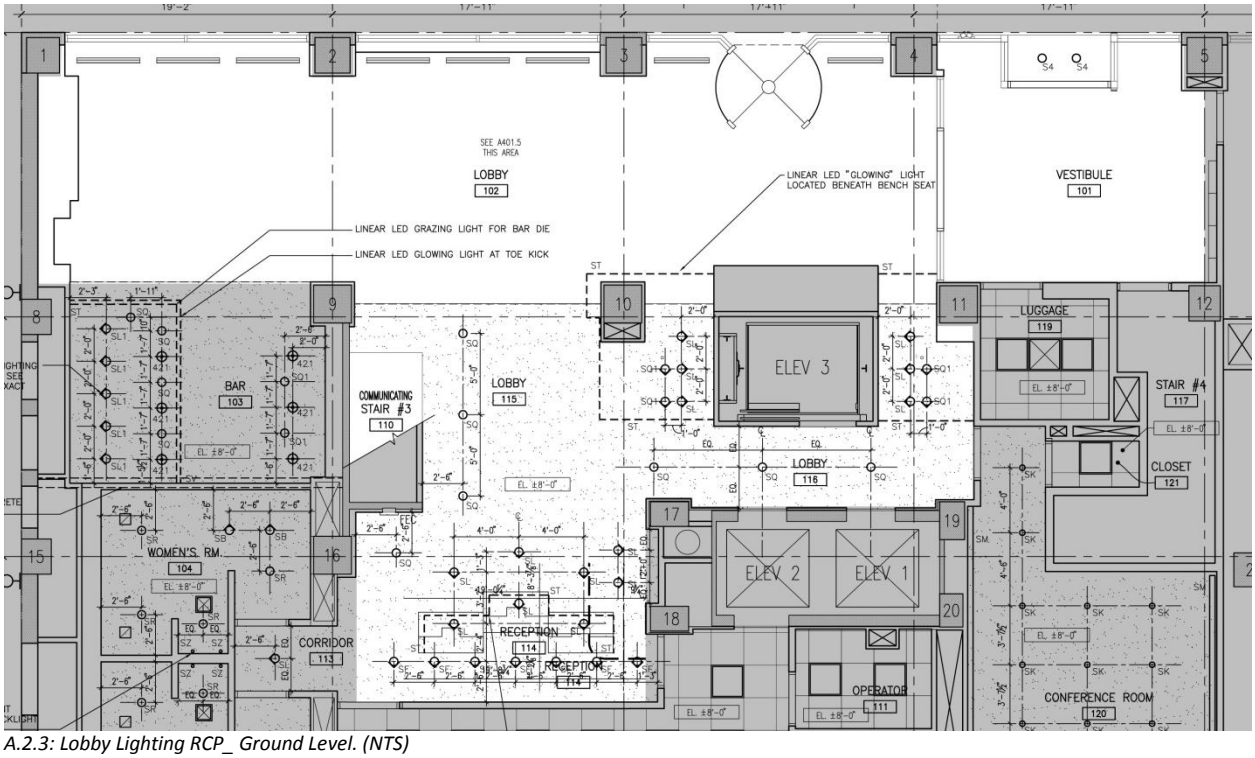
A.2



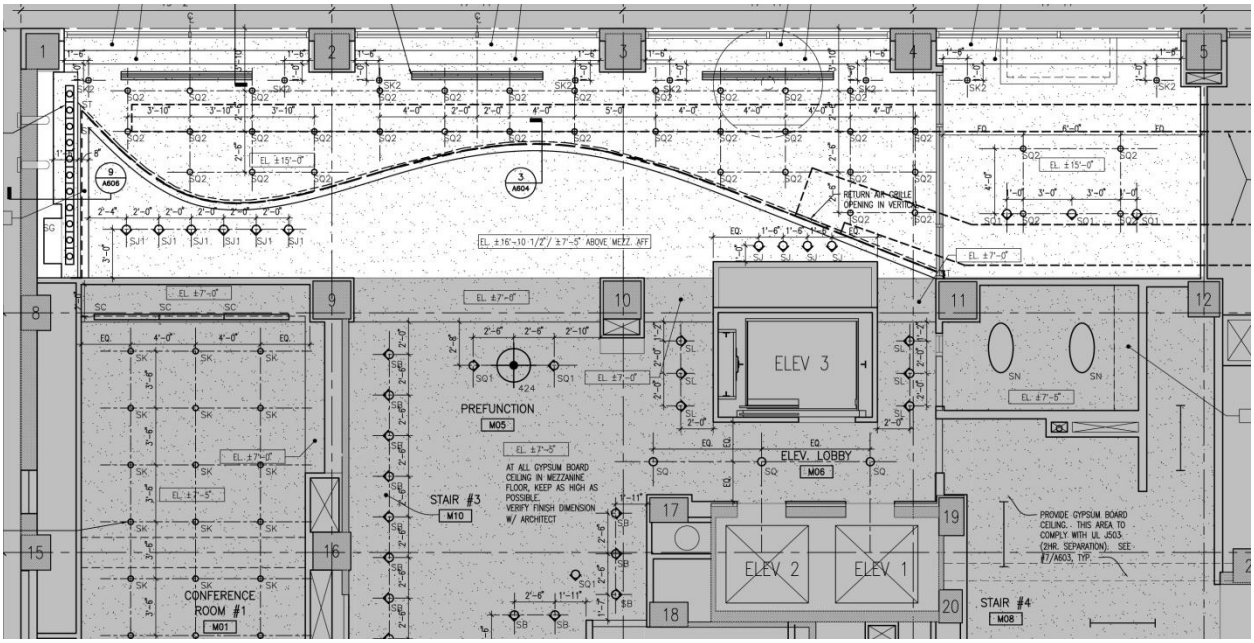
A.2.1: Lobby Electrical Plan_ Ground Level. (NTS)



A.2.2: Lobby Electrical Plan_ Mezzanine Level. (NTS)

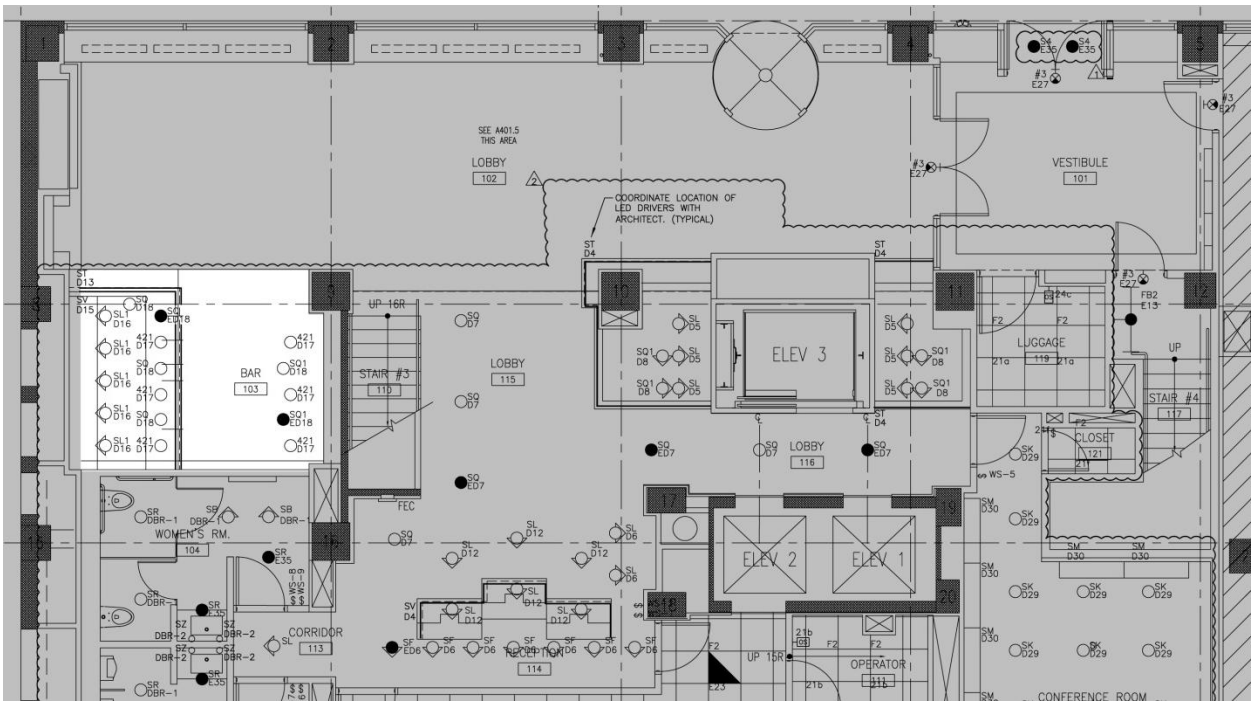


A.2.3: Lobby Lighting RCP_ Ground Level. (NTS)



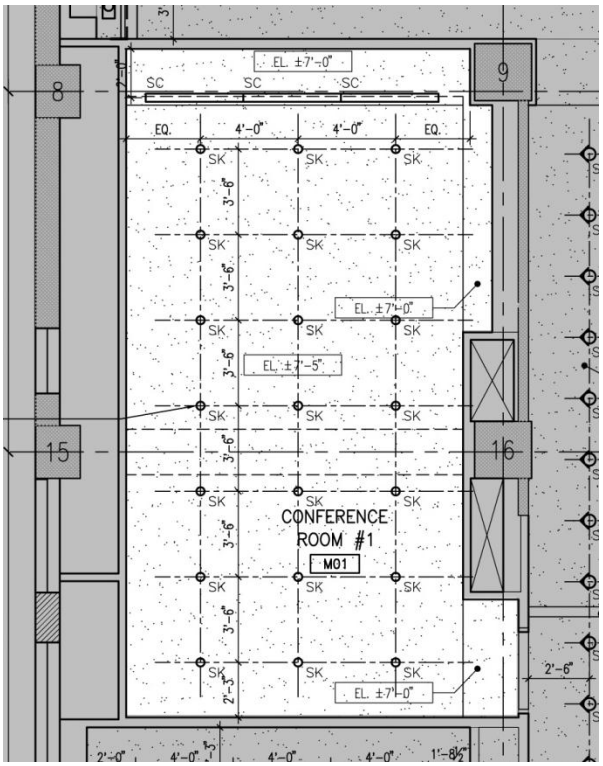
A.2.4: Lobby Lighting RCP_ Mezzanine Level. (NTS)

A.3

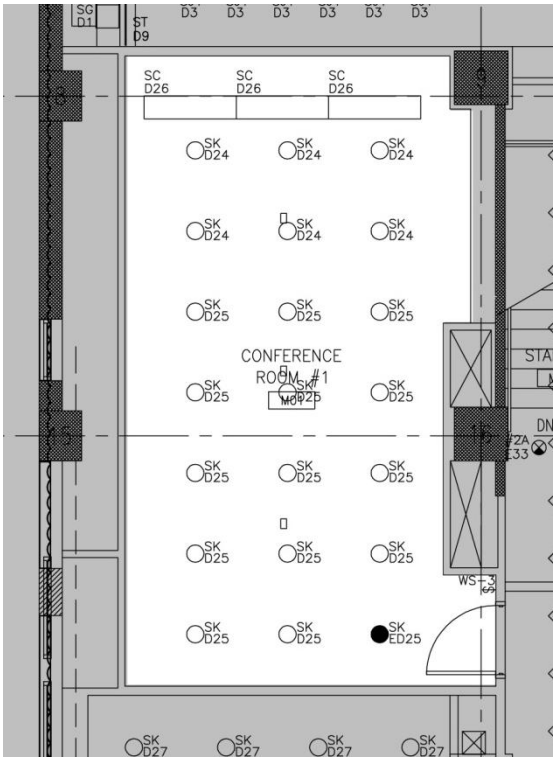


A.3.1: Bar Electrical Plan. (NTS)

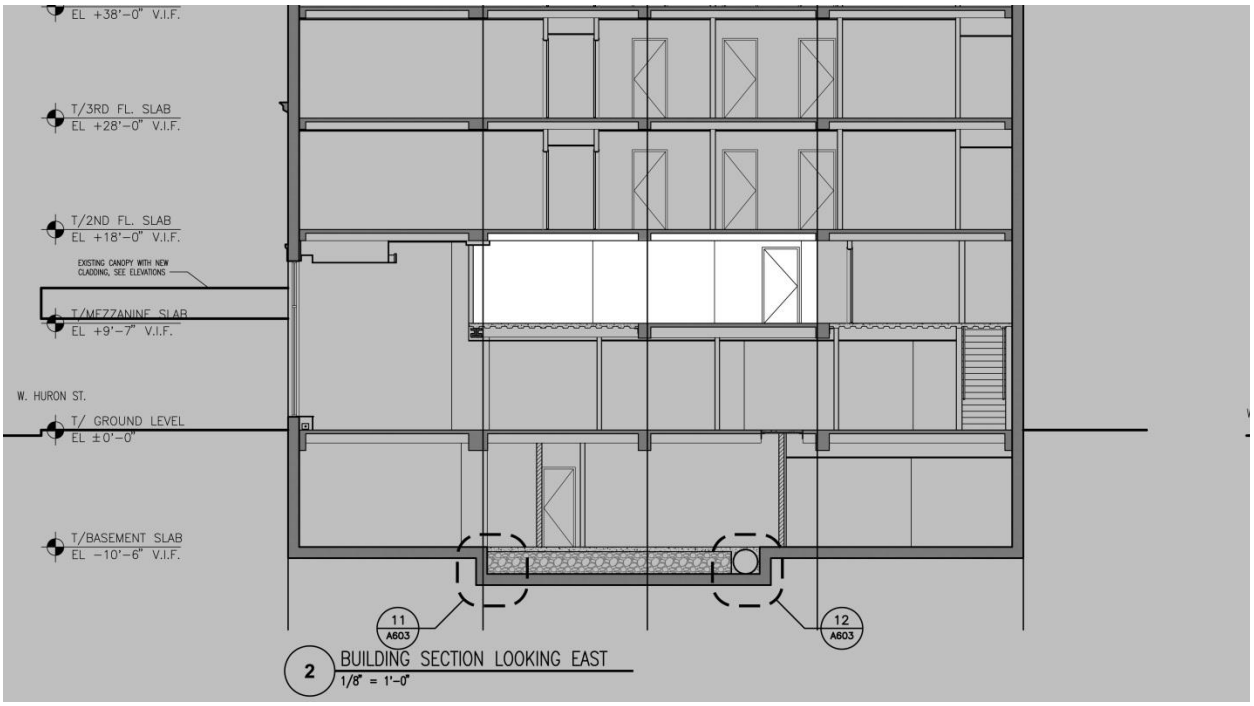
A.4



A.4.1:Conference Room Lighting RCP. (NTS)



A.4.2:Conference Room Electrical Plan. (NTS)



A.4.3:Conference Room Section. (NTS)

APPENDIX B

Material List

	Type	Location	Material	Color	Finish	Assumed Reflectance	Description
Wall	1.1	Façade	Face Brick	Red and Black	N/A	0.15	Common-bond, 8"x2.25" brick with 1/4" mortar.
	1.2	Façade	Terracotta	Ivory White	N/A	0.5	Decorative, unglazed ceramic tile.
	1.3	Public	Painted Gyp	White	Eggshell	0.5	Must not exceed low voc limits. Class 1, Flame spread 0-25
	1.4	Public	Wallpaper	Grey	Matte	0.35	Xorel pattern, paper backed, SCS certified
	1.5	Public	Decorative Stone	Crystal White	Chiseled	0.7	6" by 24" slabs, chiseled
	1.6	Conference	Wood	Light Pine	Semi-glass	0.3	Wood laminated solid core door.
	1.7	Spa	Drapes	Dark Brown	N/A	0.09	100% solution dyed cotton. Pleated and hung from a brass hanging rod
Ceiling	2.1	Public	Painted Gyp	Vanilla Ice Cream	Flat	0.85	Must not exceed low voc limits. Class 1, Flame spread 0-25
	2.2	Spa	Acoustical Tiles	Vanilla Ice Cream	Flat	0.89	Must not exceed low voc limits. Class 1, Flame spread 0-25
	2.3	Spa	Butterfly Wallpaper	White and purple	Matte	0.75	Butterfly pattern, paper backed, SCS certified
Floor	3.1	Lobby	Terrazzo Tile	Tan	Semi-gloss	0.35	2' x 2' tile. IMOLA TIME 60DV. Grout: CBP New Taupe #185, sanded
	3.2	Conference	Carpet	Blue-grey	N/A	0.2	100% solution dyed nylon. Green label plus certified. All adhesives to be low VOC per LEED standards
	3.3	Spa	Wood Floor	Dark brown	Matte	0.09	Solid 1/4" thick wood panels, sealed with low VOC polyurethane finish. Sanded.
	3.4	Spa	Butterfly Carpet	Purple-Green	N/A	0.15	100% solution dyed nylon. Green label plus certified. All adhesives to be low VOC per LEED standards
Glazing	4.1	Façade	Window Glazing	clear	N/A	0.15	Clear dual-pane | VLT % = .79, SHGC = .71, U-factor = .82
	4.2	Façade	Storefront Glazing	slight gray tint	N/A	0.29	PPG Solarban 60 Low E | VLT% = .69, SHGC = .37, U-factor = .77
Furniture	5.1	Bar	Stained Oak	Reddish-purple	Gloss	0.25	Rift cut oak, stained
	5.2	Bar	Metal Bar	Bronze	Brushed	0.2	Bronze anodized aluminum sheeting
	5.3	Bar	Brass Tables	Brass	Polished	0.4	Brass anodized aluminum

APPENDIX C

C.1

Exterior Façade Fixture Schedule							
Type	**Fixture Description**	**Mounting**	**Manufacturer**	**Catalog number**	**Lamps**	**Watts/ Lamp**	**Quantity**
S1	Ceramic metal halide PAR20 cylinder uplight and downlight with nominal 3 in. diameter, maximum overall height of 13 in., clear, tempered, borosilicate glass lenses, stainless steel hardware and UL listing for wet location	Surface Column	Lumiere	714-2-MH39PAR20	(2) CMH39/PAR20/SP10 Lamp by GE	39	12
	A: Remote electronic ballast		Lumiere	ELWR			
	B: Spread lens		Lumiere	LVR-20			
S2	LED uplight lightbar with 2x2 in. profile, symmetric distribution, continuous lengths, clear acrylic lens, UL listed for wet location.	Surface Bracket	IO	04-E-3K-5G-100-1-zz-1	3000K warm white LEDs integral	12 watts/ linear foot	
	A: Bracket		IO	LA-BK-SURFT			
	B: Power Supply		Advance	LEDINTA0024V41FO			
S3	Halogen low voltage lensed wallwasher with nominal 4-1/2 in. aperture, self-flanged haze reflector, linear spread lens, and integral magnetic core and coil dual tap transformer	Recessed Ceiling	Portfolio	714-1-MH20PAR20	CMH20/PAR20/SP10 Lamp by GE	50	22
SAC	LED linear light with programmable color changing capability, nominal 4 ft. and 2 ft. lengths, diffuse lens, extruded aluminum housing 250° beam spread, minimum of 180° rotation, positive locking for rotation and UL listing for wet location	Surface in Cove	Color Kinetics	iCOLOR Accent Powercore	Red, Green, and Blue LED's Lamps integral to fixture	10 watts/ linear foot	8 - 4ft 2 - 2ft

C.2

Lobby Fixture Schedule							
Type	**Fixture Description**	**Mounting**	**Manufacturer**	**Catalog number**	**Lamps**	**Watts/ Lamp**	**Quantity**
S4	CMH Par20 Downlight with nominal 6 in. aperture, brushed stainless steel faceplate, clear tempered glass lens, perforated stainless steel baffle, integral electronic blast and UL listed for wet locations	Recessed Ceiling	BEGA	6940MH/562MH	CMH39/PAR20/SP10 Lamp by GE	39	2
SB	CFL lensed wallwasher with 6" aperture, self-flanged haze reflector and integral electronic ballast	Recessed Ceiling	Portfolio	CLW6-1-26-1D26-CP-6491-H	F26TBX/830/A/ECO Lamp by GE	26	
	A: 100%-5% dimming ballast		Lutron	FDB-T426-xxx-1			
SF	Halogen low voltage lensed wallwasher with nominal 4-1/2 in. aperture, self-flanged haze reflector, linear spread lens, and integral magnetic core and coil dual tap transformer	Recessed Ceiling	Portfolio	HA3MR-CP-DR50-3841-H-xx	Q50MR16/C/FL40 Lamp by GE	50	7
SG	Halogen PAR20 borderstrip with lamp sockets 12 in. on center, linear spread lens, positive locking for tilt.	Recessed Ceiling	Times Square	701-xx-MOD-xx-SBB-GF26-600 **MOD**= provide lamps on 12 in. centers	50PAR20/H/NSP10 Lamp by GE	50	11
SJ	Halogen MR16 low voltage adjustable accent light with nominal 3-1/2 in. aperture, self-flanged haze reflector,0° to 45° tilt, 360° rotation, positive locking in both tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-CP-3451	Q71MR16/C/NFL2S Lamp by GE	71	4
SJ1	Same as SJ except for accessories	Recessed Ceiling	Portfolio	HA3MR-CP-3451	Q71MR16/C/NFL25 Lamp by GE	71	6
	A: Prismatic Spread Lens		Portfolio	L113			
SK2	Halogen low voltage MR16 downlight with nominal 3 in. aperture, self-flanged haze reflector, and integral magnetic core and coil dual tap transformer	Recessed Ceiling	Portfolio	HD3MR-DR50-CP-3401-H	Q50MR16/C/NSP15 Lamp by GE	50	8
	A: Linear Spread Lens		Portfolio	L115			
SL	Halogen MR16 low voltage adjustable accent light with nominal 3-1/2 in. aperture, self-flanged haze reflector,0° to 45° tilt, 360° rotation, positive locking in both tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q71MR16/C/NSP15 Lamp by GE	50	14
	A: Prismatic Spread Lens		Portfolio	L113			
SQ	Halogen MR16 low voltage adjustable accent light with nominal 3-1/2 in. aperture, self-flanged haze reflector,0° to 45° tilt, 360° rotation, positive locking in both tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NFL25 Lamp by GE	50	7
	A: Prismatic Spread Lens		Portfolio	L113			
SQ1	Same as SQ except accessories	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NFL25 Lamp by GE	50	7
	A: Soft Focus Lens		Portfolio	L111			
SQ2	Same as SQ except pinspot, trim, lamp and accessories	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q35MR16/C/SP20 Lamp by GE	35	34
ST	LED linear warm white cove light with nominal 1.5-in. x 1.5-in. profile, nominal 12-in. length, 110◦ beam distribution, and rated for line voltage power	Surface Cove	Color Kinetics	523-000004-00	High Output 3000K warm white LEDs. Lamps integral.	6	108 Feet

C.3

Bar Fixture Schedule

Type	Fixture Description	Mounting	Manufacturer	Catalog number	Lamps	Watts/ Lamp	Quantity
SL1	Halogen MR16 low voltage downlight with nominal 3 in. aperture, self-flanged haze reflector, 0° to 45° tilt, 360° rotation, positive locking for tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NSP15 Lamp by GE	50	5
	A: linear spread lens		Portfolio	L115			
SQ	Halogen MR16 low voltage adjustable downlight with nominal 3 ½ in. aperture, self-flanged haze reflector, 0° to 45° tilt, 360° rotation, positive locking for tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NFL25 Lamp by GE	50	3
	A: Prismatic spread lens		Portfolio	L113			
SQ1	Halogen low voltage lensed wallwasher with nominal 4-1/2 in. aperture, self-flanged haze reflector, linear spread lens, and integral magnetic core and coil dual tap transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NFL25 Lamp by GE	50	2
	A: Soft focus lens		Portfolio	L111			
ST	LED linear warm white cove light with nominal 1.5-in. x 1.5-in. profile, nominal 12-in. length, 110◦ beam distribution, and rated for line voltage power	Surface Cove	Color Kinetics	523-000004-00	High Output 3000K warm white LEDs. Lamps integral.	6	18ft
SV	LED light bar with .75 x .75 in. profile, symmetric distribution, nominal 4 ft. length, clear acrylic lens, integral driver	Surface Bracket	IO	03-I-3KHO-10-100-1-xx-x-3	3000K warm white LEDs integral	7.6 W/ft.	18 ft.
	A: Bracket		IO	LA-BK-SURFT			
	B: Power Supply		Advance	LEDINTA0024V41FO			
421	Incandescent decorative pendant	Pendant	Owner supplied		100W Incandescent	100	6

C.4

Conference Room Fixture Schedule

Type	Fixture Description	Mounting	Manufacturer	Catalog number	Lamps	Watts/ Lamp	Quantity
SC	Linear fluorescent semi-recessed asymmetric wallwash with 4 ft. length, 3 in. wide aperture, white trim finish and integral electronic dimming ballast	Recessed Ceiling	Focalpoint	FAVA-NS1T5-1C-xxx-D-F-XX-WH-4	F28T5/830 Lamp by GE	28	3
SK	Halogen low voltage MR16 downlight with nominal 3 in. aperture, self-flanged haze reflector, and integral magnetic core and coil dual tap transformer	Recessed Ceiling	Portfolio	HD3MR-DR50-CP-3401-H	Q50MR16/C/FL40 Lamp by GE	50	21
	A: Frosted Lens		Portfolio	L110			

C.5

Spa Fixture Schedule							
Type	**Fixture Description**	**Mounting**	**Manufacturer**	**Catalog number**	**Lamps**	**Watts/ Lamp**	**Quantity**
SA	Halogen MR16 low voltage remodeler downlight with nominal 1-1/2 in. aperture, black semi specular Alzak reflector with white flange, integral magnetic transformer	Recessed Ceiling	Lightolier	2000LVR-2011	Q50MR16/C/NSP15	50	2
SL1	Halogen MR16 low voltage downlight with nominal 3 in. aperture, self-flanged haze reflector, 0° to 45° tilt, 360° rotation, positive locking for tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NSP15 Lamp by GE	50	7
	A: linear spread lens		Portfolio	L115			
SQ	Halogen MR16 low voltage adjustable downlight with nominal 3 ½ in. aperture, self-flanged haze reflector, 0° to 45° tilt, 360° rotation, positive locking for tilt and rotation, integral magnetic core and coil transformer	Recessed Ceiling	Portfolio	HA3MR-DR50-CP-3451-H	Q50MR16/C/NFL25 Lamp by GE	50	8
	A: Prismatic spread lens		Portfolio	L113			
SW3	Compact Fluorescent one (1) lamp downlight with horizontal lamp position, nominal 6 in. aperture, shallow housing, haze, self-flanged reflector, integral electronic ballast and Chicago plenum rated	Recessed Ceiling	Portfolio	C6-1-26-E-CP-6151-H	F26TBX/830/A/ECO Lamp by GE	26	3
SY	Compact Fluorescent one (1) lamp lensed downlight with horizontal lamp position, nominal 6 in. aperture, shallow housing, haze, self-flanged reflector, integral electronic ballast and rated for wet location	Recessed Ceiling	Portfolio	C6-1-26-E-CP-6281-H-2G	F26TBX/830/A/ECO Lamp by GE	26	3