

Corbin Building



Technical Assignment 1

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Lighting/ Electrical

AE 481W

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Executive Summary

The spaces studied in the technical assignment 1 are the third floor open, retail space 1, building façade, and the lobby. Each of these spaces had their space properties described which includes the reflectance for all the surfaces in the room. The task and activities were described for each of the spaces. The existing lighting system was analyzed with what type of fixtures and calculated LLF and power density. For the design criteria the quantity and quality of light was described. The last part was a critique of the existing lighting system.

The lighting in the open office uses a two lamp T8 direct/ indirect pendants. The IESNA recommends that the office has an average of 30 fc on the task plane which meets with an average of 30.97 fc. In the model of the circulation space had an average of 19.86 fc and IESNA recommends 20 fc. The power density of 0.84 is lower than ASHRAE 90.1 2010 (0.98 W/ft²) and the 2007 NY State energy conservation code (1.1 W/ft²). The lighting impression created in the office was visual clarity since the task plane has uniform lighting and a brightly light ceiling.

The retail space in the Corbin building does not have any lights since its intended to be designed by the tenant. IESNA recommends to use 20 fc on the general retail space and 7.5 fc in the circulation area. ASHREA lighting power density is 1.0 W/ft² with an additional allowance of 1896 watts. The retail space I am going to create my three lighting designs. I want to incorporate a relaxing impression into the space with guided circulation.

The façade of the Corbin Building is being restored to the original façade of 1910-1917. The south and west sides of the façade are being studied for this report only and consist of three pieces base, shaft, and crown. The façade was not designed to be illuminated at night but is considered to be in zone LZ4. The recommended light levels by IESNA are 40fc for less than .5 reflectance and 20 fc for greater than .5 reflectance for façade details and features. The canopied entries can have a light level of 4 fc. The lighting power density is .2 W/ft² for each illuminated wall, 1.25W/ft² for canopies and 30w/linear foot at the main doors. For my design I want to incorporate a bright lower façade to provide a safe feeling and a bright entrance for wayfinding to the subway.

The Fulton Street Transit Center (FSTC) lobby is an important entrance for the subway system. The light levels in the current light lobby are about 23 fc and IESNA recommends that the light levels should be 10 fc at the day time and 5fc at night. The lighting impression used in the lobby is visual clarity. ASHREA 90.1-2010 code for the lighting power density is 1.3 W/ft² but calculated 1.92 W/ft² which means the lighting in the lobby does not meet code. When redesigning the space I am going to fix the lighting power density to meet code and create some a spaciousness feeling.

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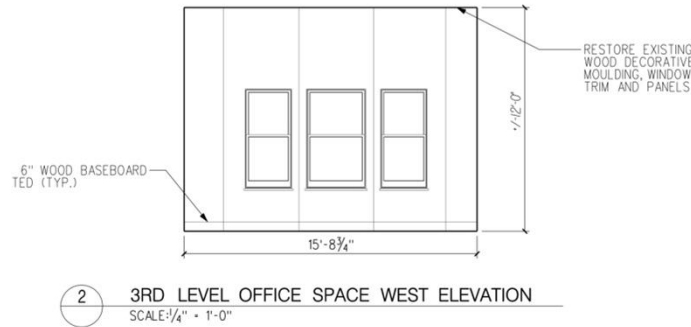


Figure 1.3

South

The south wall is filled with windows providing daylight to enter and will need to watch for direct glare coming through the windows. The window woodwork is also getting restored and assumed reflectance of .2. Inside shades will need to be installed to prevent direct glare on work surfaces. Windows are treated with a low-E-coating. The ceiling on the south side is an arched vault ceiling with a flat Benjamin Moore “China White” plaster assumed reflectance .5.

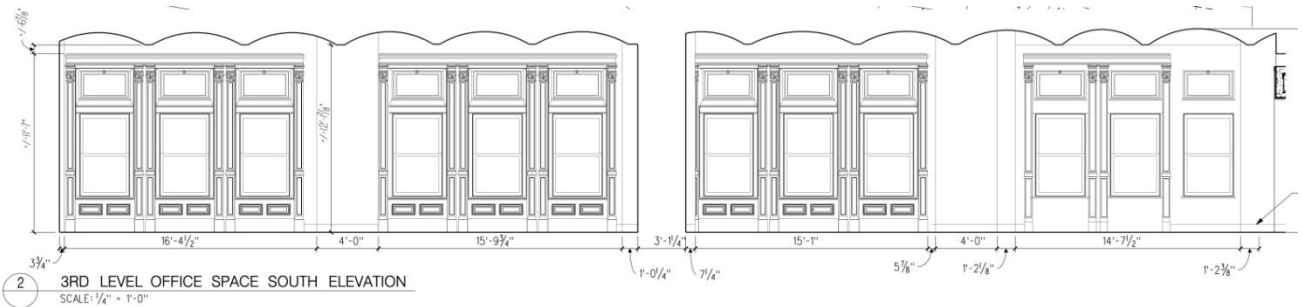


Figure 1.4

The floor in the open office area is concrete with an assumed reflectance of .6.

Material List

Surface	Material	Manufacture	Color	Reflectance
North Wall	Granite	Restored	Dark Green	0.8
North Wall	Stone	Restored	Dark Brown	0.2
North Wall	GWB	Benjamin Moore	China White	0.8
East Wall	GWB	Benjamin Moore	China White	0.8
East Wall	Wood	Restored	Dark Brown	0.2
South Wall	GWB	Benjamin Moore	China White	0.8
South Wall	Wood	Restored	Dark Brown	0.2
Window	Glass		Low -E	$\tau = .7$
Floor	Concrete			0.6
Ceiling	Plaster	Benjamin Moore	China White	0.5



China White Courtesy of Benjamin Moore

Table 1.1

Task/ Activities

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
CF1	0.88	0.92	0.88	0.71
CF3	0.88	0.92	0.88	0.71
48P2	0.88	0.92	0.88	0.71

Table 1.3

Power Density			
Luminaire	Quantity	Watts/ Fixture	Total Power Density
CF1	76	56	6240 Watts/ 5184 sq ft 0.84
CF3	1	56	
48P2	1	56	

Table 1.4



Figure 1.6

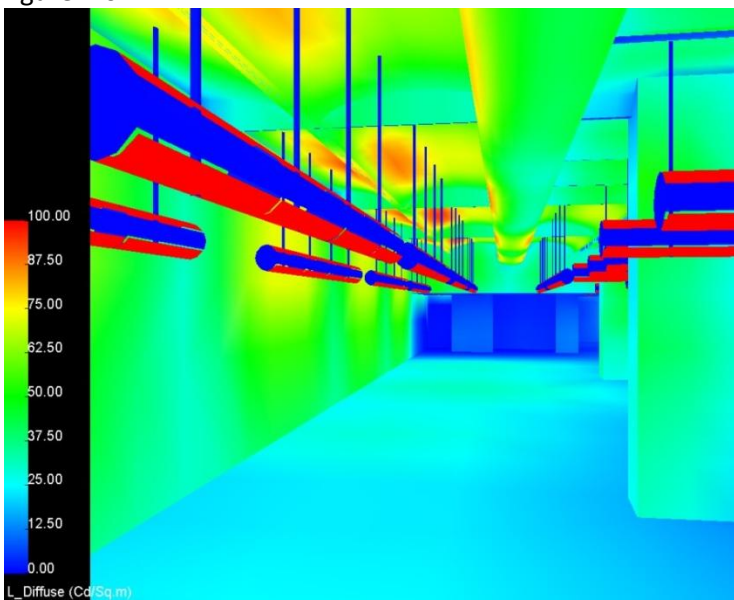


Figure 1.7

The AGI32 model was built according to the drawings and fixtures were laid out according to the lighting rcp.

Open Office Illuminance (Fc)

- Average: 30.97
- Max: 49.5
- Min: 10.7
- Max/Min: 4.63
- Coeff. Variation: 0.26

Circulation Illuminance (Fc)

- Average: 19.86
- Max: 48.7
- Min: 0.5
- Max/Min: 97.4

Design Criteria

Quantity of Light

2010 IESNA handbook:

- Desired illuminance levels office- VDT Screen and Keyboard CSA/ISO Types I and II positive polarity
 - Horizontal-30 fc at 2'-6" AFF
 - Vertical- 15 fc at 3'-6" AFF
- Circulation space
 - Horizontal- 20 Fc at AFF

ASHRAE/IESNA 90.1-2010: Space by Space

- Office- Open Plan LPD 0.98W/ft²

NY State Energy Code 2007

- LPD Office 1.1 W/ft²
- 805.2.2.2 Automatic lighting shutoff. Buildings larger than 5,000 square feet (465 m²) shall be equipped with an automatic control device to shut off lighting in those areas. This automatic control device shall function on either:
 1. A scheduled basis, using time-of-day, with an independent program schedule that controls the interior lighting in areas that do not exceed 25,000 square feet (2323 m²) and are not more than one floor; or
 2. An unscheduled basis by occupant intervention.

Quality of Light

The open office should feel spaciousness since it is a very narrow building and desk might feel like they are top of each other. The south walls already have windows but the north wall which creates a dark wall compared to the south wall. The ceilings are arched and vaulted which is not common in a typical office, so visitors will be looking at the ceiling which means the luminaires choice is very important. By having this decorative

ceiling creating visual clarity for task in the space is easy by creating a brightly light attractive ceiling.

Design Considerations

Very Important

Appearance of Space and Luminaires-

Since the building has such unique arched vaulted ceilings the luminaires need to match the space. The luminaires should be consistent with the architectural forms and use rounded edges and curved surfaces.

Color Appearance-

In an office color rendering is important for both creating a pleasant place to work. An office works with a lot of colors and layouts and needs to ensure their print materials are attractive. Also skin tones need to look presentable for people interactions and meetings. The lamps will have a CRI higher than 80 and a CCT of 4100K.

Flicker/ Strobe-

Flicker and strobe lights can cause headaches and is annoying to occupants. This will cause loss revenues and poor working conditions.

Direct and Reflected Glare-

When a VDT is used in an office it is important to minimize glare so the employees are comfortable and productive, while enhancing contrast for VDT and reading and writing task. Luminaire location is important so it is not in view of the computer monitor.

Light Distribution on Task Plane-

Light distribution on the task plane should be uniform on the workstation at the correct light level recommended by IESNA for task being completed.

Model of Faces and Objects-

Occupant's skin tones should look healthy under electric lighting. Facial recognition is important in face to face meetings and also when interacting with someone in the office.

Important

Daylighting Integration and Control-

Using daylighting as ambient light creates an enjoyable work environment. Daylight needs to be controlled to prevent direct glare. I can use daylight sensors to control lights near the windows.

Luminances on Room Surfaces-

Having light on the wall and ceiling creates a feeling of spaciousness within a very narrow office.

Lighting Critique

The lighting for the office is very typical by using direct/indirect pendants. This allows for a space with the Flynn impression of visual clarity. The IESNA recommends that the office has an average of 30 fc on the task plane which was met with an average of 30.97 fc in the AGI model. One of the design considerations is to have a uniform light distribution on the task plane and the coefficient of variation was 0.26. In the model of the circulation space had an average of 19.86 fc and IESNA recommends 20 fc. The power density of 0.84 is lower than ASHRAE 90.1 2010 (0.98 W/ft²) and the 2007 NY State energy conservation code (1.1 W/ft²).

The design has a few problems with max and min ratios in the circulation space. This space had a min and max ratio of 97.4. This was caused by the circulation space having dark areas by the print room and the entrance to the stairwells since those spaces were not modeled.

The lighting impression created in this office was visual clarity. The luminaires layout created an even light distribution on the task plane. The designers also light the arched vault ceiling brightly. To improve on this design I would add luminaires to the wall on the north side. This would create a feeling of spaciousness and balance out the light from the windows.

Retail Space 1- Special Purpose Space

For my special purpose space I am using retail space 1 and will create three design options. The retail store will be a designer boutique shop. The retail store has entrances on the south and east façade at a prominent corner of Broadway and John street in lower Manhattan. The space has no layout or design and is meant to be fit out by tenant. The retail space is about 32 feet long by 20 feet wide with double height ceilings. The store has about 640 square feet. The retail space has window displays along the south façade.

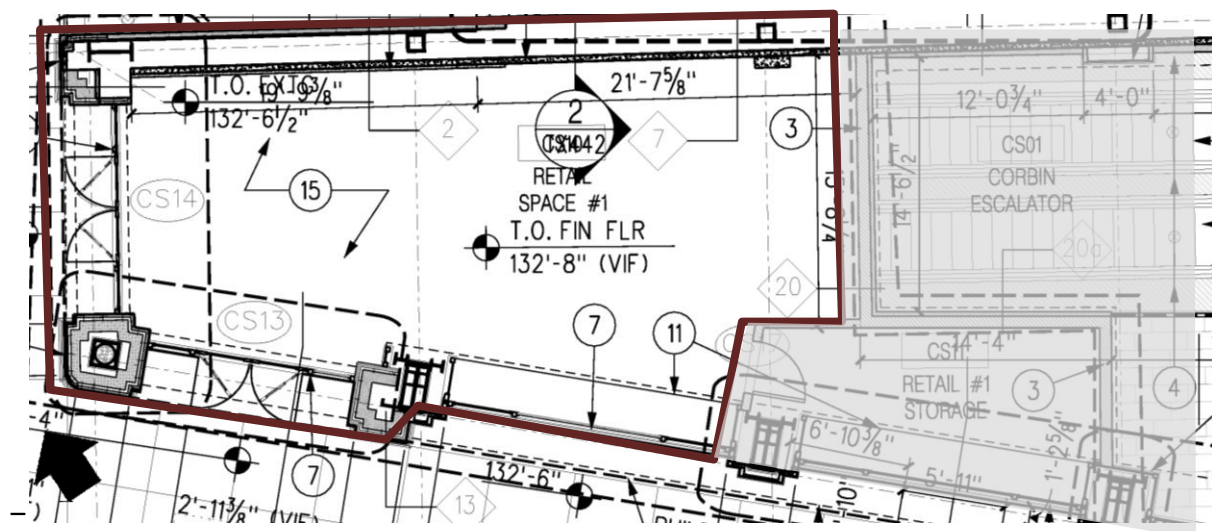


Figure 2.1

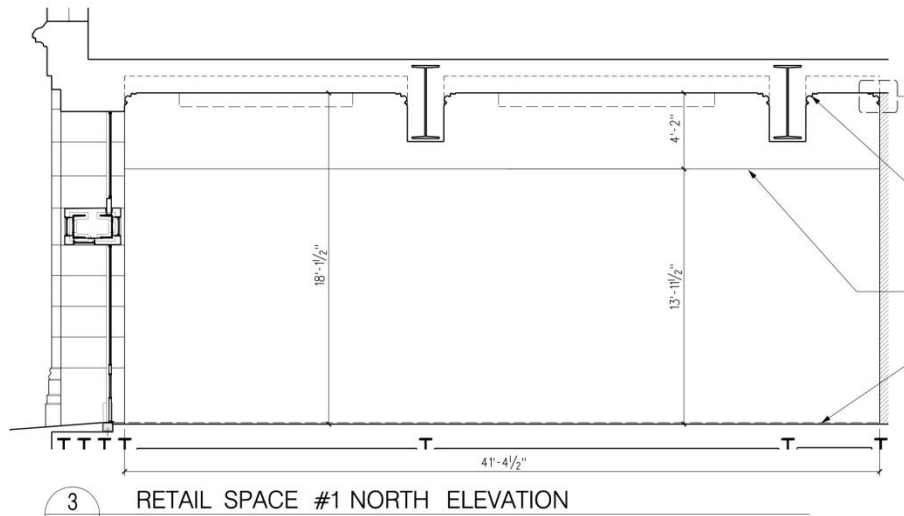


Figure 2.2
Rendering at Intersection of Broadway & John Street (Rendering Courtesy of Arup)

Space Properties

North

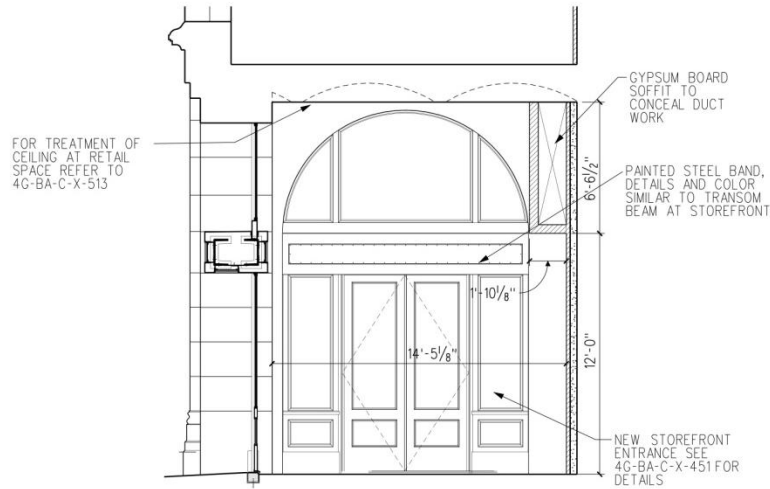
The north wall consists of gypsum wall board paint color picked by tenant will assume .5 for paint reflectance. This will be a good wall to have merchandise on, since it will be easily seen from the south and west entrances.



3 RETAIL SPACE #1 NORTH ELEVATION
Figure 2.3

West

The west wall consists mostly of the west entrance on Broadway. The double door is made out of black steel with laminated safety glass. Will assume the laminated glass has a transmittance of .5.

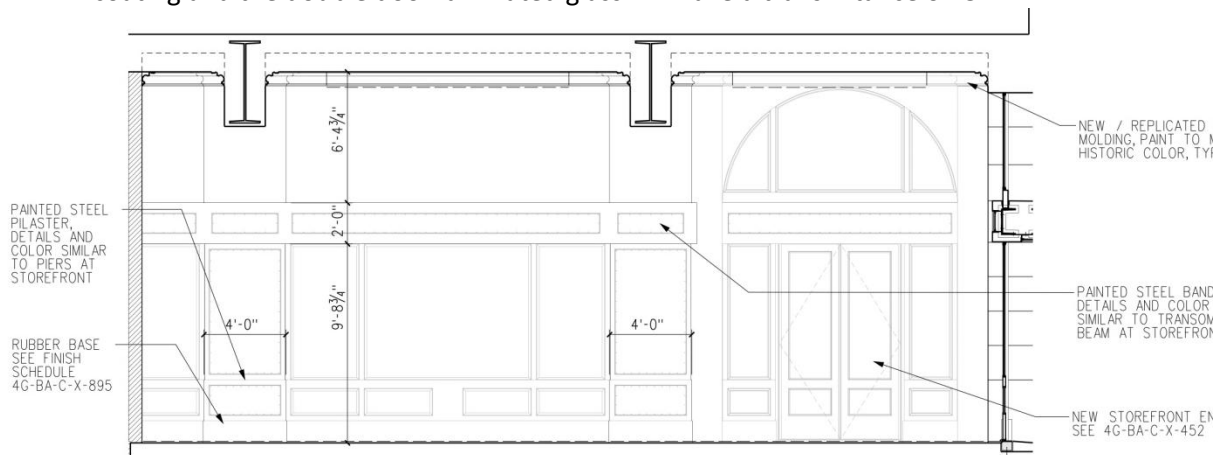


4 RETAIL SPACE #1 WEST ELEVATION
1/4"=1'-0"

Figure 2.4

South

The south wall consist of the entrance from John Street and windows along the south façade. The windows are highlighted with a dark steel band to match the store front with a reflectance of .5. The windows will have a transmittance of .7 with a low e-coating and the double door laminated glass will have a transmittance of .5.



1 RETAIL SPACE #1 SOUTH ELEVATION
1/4"=1'-0"

EX:
TO
AND
TO

Figure 2.5

East

The east wall is two-hour fire-rated gypsum wall board painted by tenant with an assumed reflectance of .5. The west wall will have the register and check out counter since it already has a nook built there. Also there is a door that goes into a storage room.

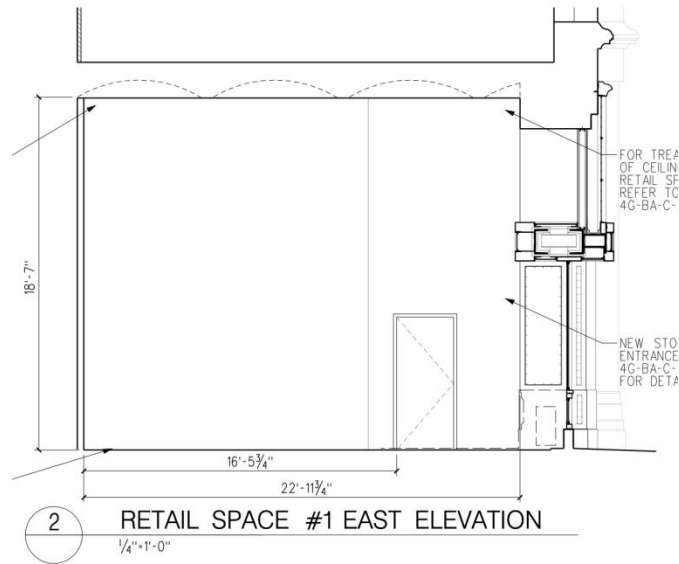


Figure 2.6

Floor/ Ceiling

The floor is a concrete floor with a reflectance of .6. The ceiling is flat with a white plaster and a reflectance of .5. There is also crown molding going around the beams and tops of the walls all around the space. The crown molding is painted to match the historic brown color and has a reflectance of .3.

Material List

Surface	Material	Manufacture	Color	Reflectance
North Wall	GWB	Benjamin Moore	China White	0.8
Door	Glass		Clear	$\tau = .5$
Door	Steel		Black	0.5
Steel	Paint		Black	0.5
East Wall	GWB	Benjamin Moore	China White	0.8
Window	Glass		Low -E	$\tau = .7$
Floor	Concrete		Gray	0.6
Crown Molding	Wood		Brown	0.3
Ceiling	Plaster	Benjamin Moore	China White	0.5

Table 2.1

Task/ Activities

The activities that will go on inside the retail space are circulation for navigating around the store. Also there will be customers looking at merchandise, picking up and looking for their size. Also the workers will be stocking shelves and reorganizing the store. There will be money transaction going on between customer and store clerk.

Existing Lighting System

Since the retail space has no lights and is intended to be designed by tenant, I am going to design the store. The layout out in figure 2.7 is my design for the store layout. The panel is provided in the retail storage room. All the lights are going to be circuited out of this room. I intend to use washing the wall with the wall racks and shelves.

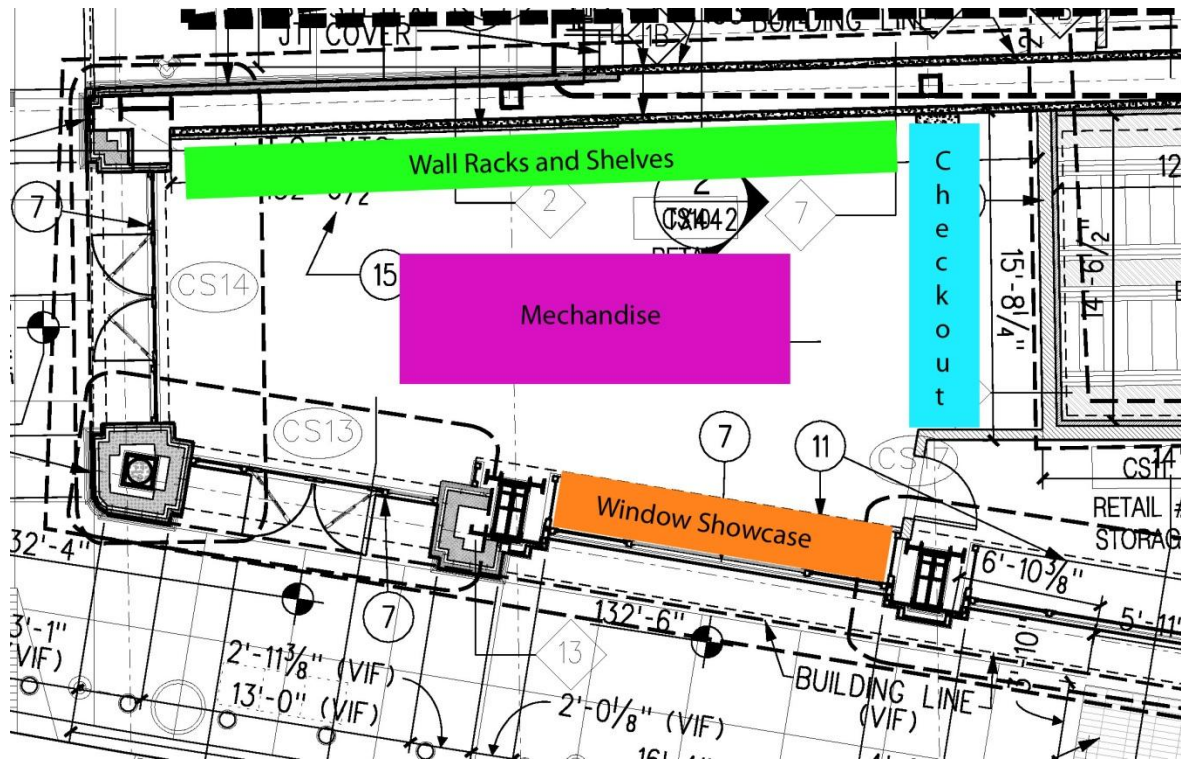


Figure 2.7

Daylighting in this space is going to be tough to achieve with existing tall buildings around the area. Most the daylight coming into the space will be diffused daylight though the door way, on the south side and late in the afternoon on the west side. A daylight study will need to be done to further examine the daylight conditions at different times of the year. Shadows will need to be evaluated to see if the windows are in shaded from the other buildings from the surroundings.

Design Criteria

Quantity of Light

2010 IESNA handbook:

- Desired illuminance levels- designer shop boutique
 - Circulation:
 - Horizontal-7.5 fc at floor
 - Vertical- 2 fc at 5' AFF
 - General Retail:
 - Horizontal-20 fc at 2'-6" AFF
 - Vertical- 7.5 fc at 3'-5" AFF
 - Perimeter

- Vertical- 20fc at 5' AFF
- Feature Displays
 - *Dazzle*
 - 10 times greater than E_h of adjacent retail area
 - *Highlight*
 - 5 times greater than E_h of adjacent retail area

ASHRAE/IESNA 90.1-2010: Space by Space

- Retail LPD 1.0W/ft²
- Additional Interior Lighting Power Allowance = 1000 watts + (Retail Area 3 × 1.4W/ft²)
 - Additional Interior Lighting Power Allowance = 1000 watts + (640 × 1.4W/ft²) = 1896W
- Retail Area 3 = the floor area used for the sale of furniture, clothing, cosmetics, and artwork

Quality of Light

The retail store is going to be a designer boutique store with an upscale atmosphere. It is important that the interior design matches the same quality of the upscale clothes they are selling. The customer is expecting a quality of light in the store. The store needs to have attractive lighting fixtures that have been located and aimed correctly to highlight the merchandise. Accent lighting will be very important to create focal points.

This is the space I am going to create my three design options. Since there will be merchandise all around the store creating a feeling of preference will draw people to specific areas of the store. This can be created by highlighting specific displays and using nonuniform lighting. The customer should feel relaxed in the space so they do not rush out before purchasing. This feeling can be created using the same nonuniform lighting and softly highlighting displays. Also a variation in illuminances will establish a visual hierarchy of merchandise in the store and is central to the design strategy.

Design Considerations

Very Important

Appearance of Space and Luminaires-

Since the store is upscale and selling upscale clothes the luminaires need to blend with the store design and present a uniform look. The luminaires should be consistent with the interior design and be aimed correctly to highlight specific displays.

Color Appearance-

In a retail environment color rendering is important for both creating vibrant colors in the clothing. Also skin tones need to look healthy for interaction between customers and workers. Lamps will be chosen with a CRI greater than 80 and a CCT of 4100K to blend with daylight entering the space.

Flicker/ Strobe-

Flicker and strobe lights can cause headaches and is annoying to occupants. This will cause loss revenues and customers not to return.

Model of Faces and Objects-

It critical that people look good to others, such as when shopping with friends. The intensity and angles of light will determine whether the light is flattering to the merchandise and the people in the store.

Important**Daylighting Integration and Control-**

Using daylighting as ambient light creates an enjoyable shopping environment. Daylight needs to be controlled to prevent direct glare and fading of merchandise. Daylight can also be integrated to highlight a display.

Direct and Reflected Glare-

Direct and reflected glare can cause annoyance and pain. The lights need to be aimed so there is no glare in the customers eyes and also on VDT at the checkout counter. Also the daylight entering on the south side windows might need shades.

Luminances on Room Surfaces-

Having light on the wall and ceiling creates a feeling of spaciousness within a very narrow store.

Light Distribution on Task Plane-

Light distribution on the general merchandise should be uniform on tables at the correct light level recommended by IESNA for task being completed.

Lighting Critique

There is no existing system to critique.

The retail space is going to be the space I use to create three schematic designs. All three designs will implement color appearance and facial recognition. It is important to create a uniform design that is related to the highend atmosphere. The store should have a feeling of relaxation with peripheral emphhasis and nonuniform lighting. The customer should feel relaxed and comfortable to spend time and money in.

One of the designs I want to create is a design to lead people threw the store. This will give the customer a guided path to the merchandise then to the checkout. Another design will incorporate unguided circulation. The last design will focus highlighting the merchandise to draw people into the store. I also want to create a focal point on my window display merchandise so it stands out on a bright city street.

South and West- Building Façade

The façade of the Corbin Building is being restored to the original façade of 1910-1917. Both south and west sides of the façade consist of three pieces base, shaft, and crown. On the street level there is two entrances, one is for the Fulton Street Transit Center Lobby and the other is for the Corbin Building, both which need to light. Also there are two retail stores and window displays. Lighting the

Fulton Street Transit Lobby entrance is very important since it needs to be found easily, so passengers can get to the subway. Also the lower part of the façade is going to be bright since the window displays will be light and entrances to the stores to attract. The façade will be classified in an LZ4 zone with high activity since it's in the middle of lower New York City.



Figure 3.1

Corbin Building 1898 Façade

Picture Source: Avery Architectural and Fine Arts Library, Columbia University

Space Properties

South and West

The south façade of the building runs 162 feet along John Street and about 110 feet tall. The west façade runs twenty feet along Broadway and about 120 feet tall. Both sides of the façade consist of three pieces: base (yellow), shaft (blue), and capital (red) in figure 3.2. The bottom base consists of pasvalco sunset sandstone store windows are laminated glass and steel frame. The shaft is made out of brick with terracotta decoration. The windows are highlighted with cast iron and include scalloped arches around the windows with single plane glass. The crown is made of brick and terracotta details.

The entrances for the retail space are sunk into the thick sandstone walls. The Corbin Building stair entrance is an extruded void into the building. The only entrance that sticks out is the Fulton Street Transit Center lobby. There is also an awning over the door to symbolize the main entrance. This is the most important entrance since it is going to be the most used and needs to be easily found.



Figure 3.2 | South Façade

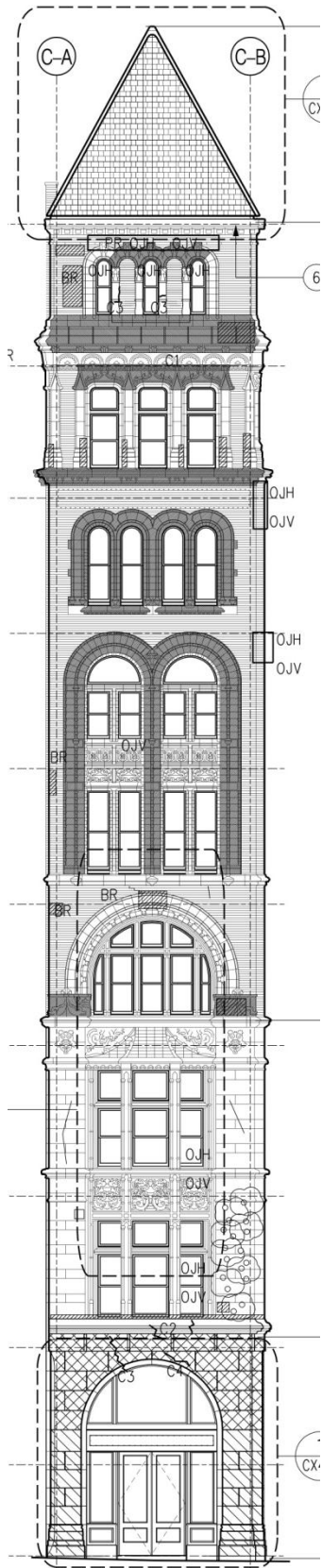


Figure 3.2 | West Façade

Surface	Material	Color	Reflectance
Façade	Sandstone	tawny	0.3
Façade	Brick	Red	0.3
Façade	Terracotta	Red	0.4
Door	Glass	Clear	$\tau = .5$
Door	Steel	Black	0.5
Steel	Paint	Black	0.5
Window	Glass	Low -E	$\tau = .7$
Cast Iron	Iron	Black	0.3

Table 3.1 | Material List



Figure 3.3 Rendering of south-west façade (Courtesy of Arup)

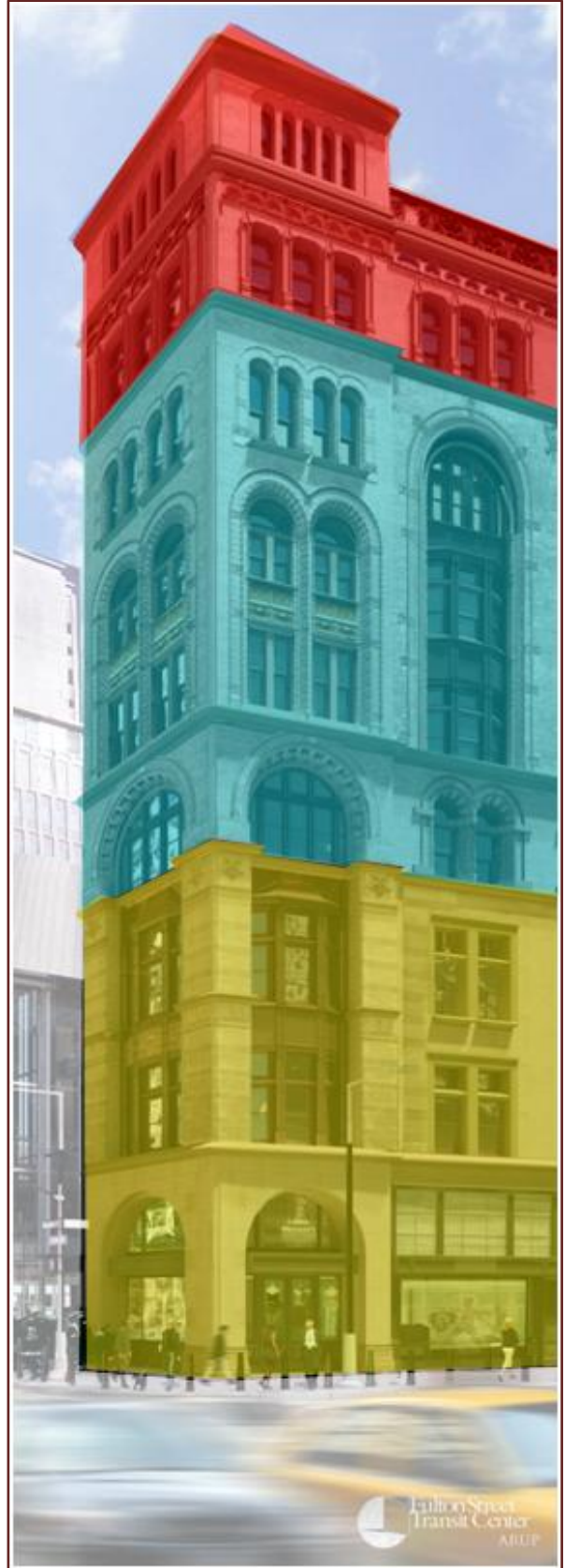


Figure 3.4

Task/ Activites

The façade creates a wayfinding for pedestrians to find the subway. People will be walking down the sidewalk to enter the subway doors at the middle of the building. Also some will be going into the retail stores. The façade lighting needs to create a safe space for pedestrians to walk and feel comfortable. The façade is an extremely detailed building and is a piece of art that provides decoration to the street. The façade is a historical element of the building and is the last thing seen outside before ascending into a modern subway station.



Figure 3.5
 Rendering of south façade (Fulton Street Transit Center entrance) (Rendering Courtesy of Arup)

Existing Lighting System

Currently there is no lighting on the façade or the entrance. I am going to light specific details in the façade. The large amount of terracotta details should be grazed to show all the different curves and create shadows. There is also no lighting at the entrance of the lobby and will use the canopy to hide fixtures.

Design Criteria

Quantity of Light

2010 IESNA handbook:

- Zone: LZ4- High Ambient Lighting
- Façade Details or Features – apply strategically to <25% of the area of the building façade
 - Surface Reflectance <0.5= 40fc
 - Surface Reflectance >0.5= 20fc
- *Canopied Entries- High Activity- LZ4*
 - *Horizontal- 4 fc*
 - *Vertical- 2 fc*

NY State Energy Code 2007

- LPD for façade 1.0W/ft²
- 805.6 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.
- 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.

ASHRAE/IESNA 90.1-2010: Space by Space

Maximum Power Density

- 0.2 W/ft² for each illuminated wall or surface or 5.0 W/ linear foot for each illuminated wall or surface length
- 1.25 W/ft² for Canopies and Overhangs
- 30W/linear ft. of door width for Main entries
- 20W/linear ft. of door width for all other doors
- 1.0 W/ft² for walkways less 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

Quality of Light

The Corbin Building is being saved since it is a historical building and a large amount of money is going into restoring the façade to 1910-1917. The façade should be light at night so pedestrians are able to enjoy this building at all times of the day. Aesthetic issues are very important since the façade is being restored to an age where modern fixtures did not exist.

To create an appealing lighting design on a historical building luminances must be properly balanced, fixtures must be either hidden or architecturally pleasing, and photometry carefully specified to distribute light to the proper places. Shadows, surface details, source/task/eye geometry, face modeling, color, and glare must all be considered to make this happen.

Design Considerations

Very Important

Appearance of Space and Luminaires-

Aesthetic issues are very important since the owner is investing a large amount of money to restore the façade. The fixtures should be hidden if possible or architecturally pleasing to make the least amount of impact on the façade.

Color Appearance-

Color rendering and color temperature have a strong influence on the person sense of visual attraction. To get good color appearance lamps will be chosen with a CRI greater than 80 and a CCT of about 3000K.

Daylighting Integration and Control-

Daylight controls such as photocells need to be integrated into the lighting to be turned on and off dusk and dawn.

Model of Faces and Objects-

Lighting a façade provide pedestrians with a sense of security. Lamps with a CRI of above 80 will help with identifying people and distinguishing colors.

Important

Direct and Reflected Glare-

Direct and reflected glare can cause annoyance and pain. The lights need to be aimed so there is no glare in the pedestrians' eyes that are walking down the street. Also need to be away of glare coming off the glass.

Flicker/ Strobe-

Flicker and strobe lights can cause headaches and is annoying to occupants and cause pedestrians not to look at the façade.

Luminances on Surfaces-

The sidewalk needs to have enough light on it to guide pedestrians into the building safely. Having light on the sidewalks and entrances will need to be coordinated with the security cameras so they are not blinded.

Light Distribution on Task Plane-

Light distribution on the façade should not over power the details and wash them not. Lighting will need to be placed carefully to highlight details.

Lighting Critique

Currently there is no lighting on the façade or the entrance to critique. I am going to light specific details in the façade. The large amount of terrecotta details should be grazed to show all the different curves and create shadows. The west façade is going

Figure 4.1

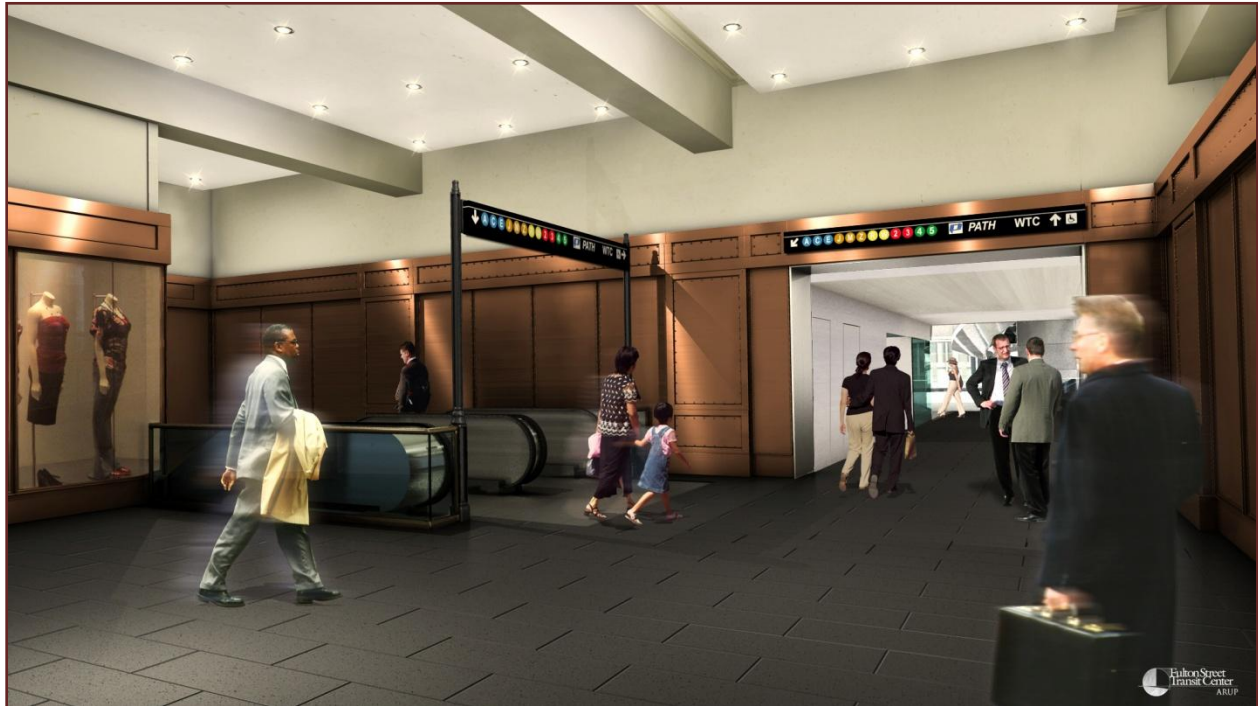


Figure 4.2
Rendering Corbin Building Lobby (FSTC on right entrance)

(Courtesy of Arup)

Space Properties

The lobby materials are consistent throughout the space. The top quarter of the walls are a china white plaster. The bottom three quarters are copper panels to be perforated with terracotta patterns. The steel pilasters are painted to match the storefronts. Also around the bottom of each pillar there is a stone base.

North

On the north section of the lobby there is an entrance to the Fulton Street Transit Center. The door is outlined in a stainless steel. Also there is a sign above the door letting you know what subway lights are straight ahead.

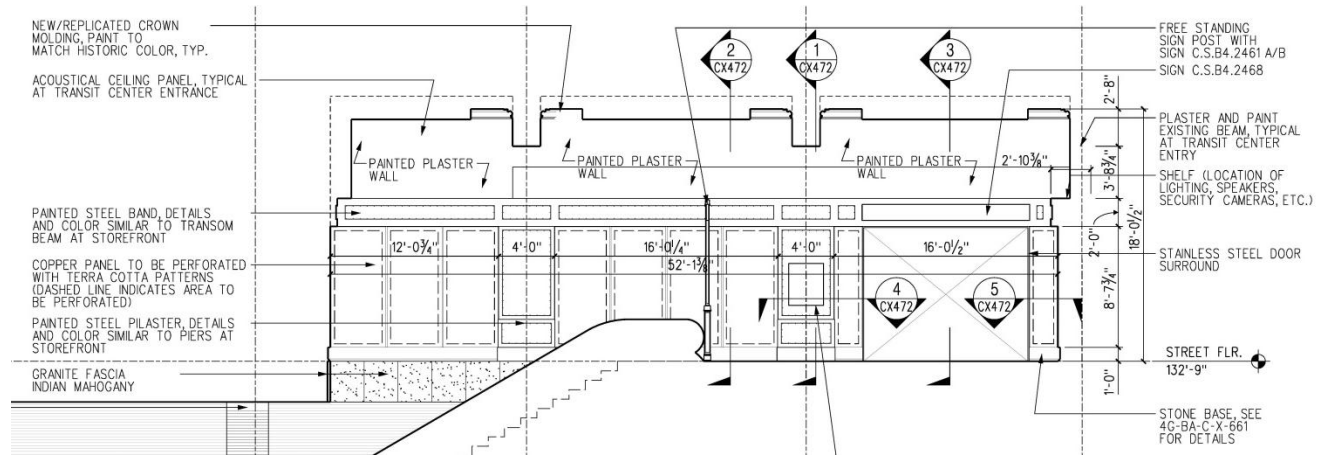


Figure 4.3 North Section

South

The south section of the lobby has the two entrances to the lobby. There are also signs above the door. Above the door there is glass to let daylight into the space.

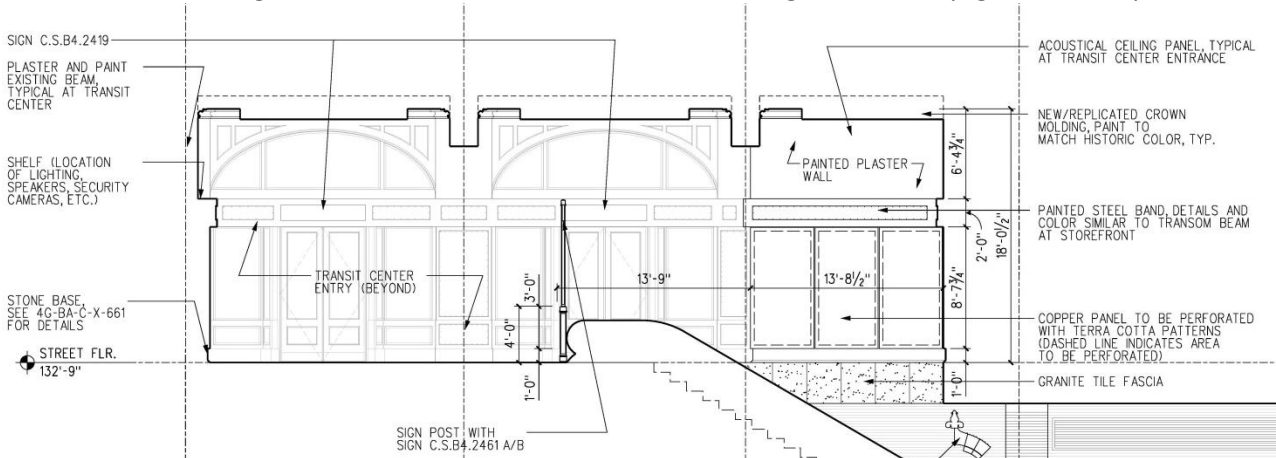


Figure 4.4 South Section

West

The two express escalators are located on the west side of the lobby. People can go up and down these to the platform level of Fulton Street Transit Center. There is also a store front window for the retail space.

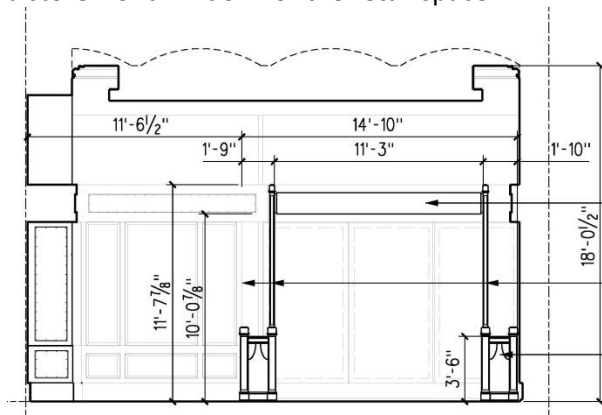


Figure 4.5 West Section

Floor/ Ceiling

The arched vault ceiling is being covered up with plaster and acoustical ceiling tiles. The floor in the lobby is going to be a granite floor.

Material List

Surface	Material	Color	Reflectance
Wall	Plaster	China White	0.8
Wall	Copper	Copper	0.8
Wall	Terracotta	Brown	0.4
Door	Glass	Clear	$\tau = .5$
Door	Steel	Black	0.5
Steel	Paint	Black	0.5
Window	Glass	Low -E	$\tau = .7$
Storefront	Glass	Clear	$\tau = .7$
Ceiling	ACT	White	0.8
Floor	Granite	Gray	0.2

Table 4.1

Existing Lighting System

The lighting for the lobby is an array of open reflector recessed downlights mounted in acoustical ceiling tiles. Each downlight has a horizontal 42W triple tube compact fluorescent. All lighting in the lobby is not switched.

Luminaire Schedule								
Type	Description	Manufacturer	Catalog Number	Lamp			Voltage	Ballast
				No	Watts	Type		
CR1	6 inch recessed downlight with open reflector	Coventry Architectural Series	6HF142T	1	42	PL-T 42W/83 0/4P	120	Electronic

Table 4.2

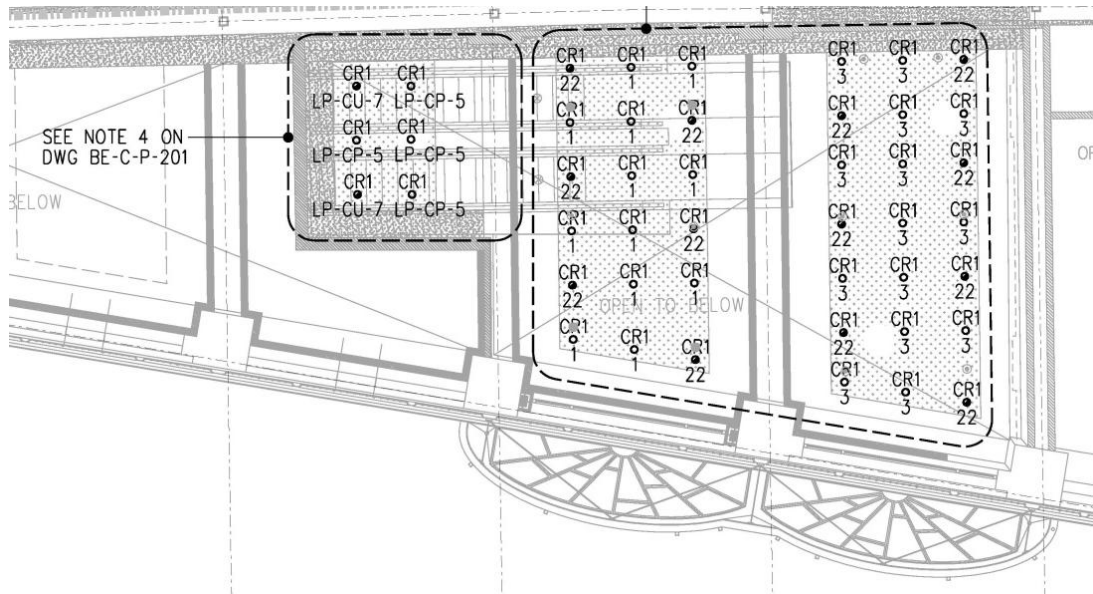


Figure 4.6 | Lobby RCP

The lighting impression being used here is visual clarity. The task plane which is the floor is evenly light by a layout of downlights in a grid. Also the designer specifies thirty-nine forty-two watt lamps to create a bright space.

The following light loss factors were calculated using the 2010 IESNA handbook. The Room Surface Dirt Depreciation (RSDD) was neglected and the Luminaire Dirt Depreciation (LDD) was calculated using the calculation outlined in the book. A lamp maintenance schedule of twelve months was assumed.

Light Loss Factors				
Lamp Type	LLD	LDD	BF	Total
CR1	0.97	0.92	0.85	0.76

Table 4.3

Power Density			
Luminaire	Quantity	Watts/ Fixture	Total Power Density
CR1	45	47	2115 Watts/ 1100 sq ft 1.92

Table 4.4

Design Criteria

Quantity of Light

2010 IESNA handbook:

- Escalators
 - Horizontal- 5 fc at floor
 - Vertical- 3 fc at 5'AFF
- Lobbies at building entries

- Day
 - Horizontal- 10 fc at floor
 - Vertical- 3 fc at 5'AFF
- Night
 - Horizontal- 5 fc at floor
 - Vertical- 2 fc at 5'AFF

NY State Energy Code 2007

- LPD from Table 805.5.2 (Appendix A)
 - Lobby-Other = 1.3W/ft²
- 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 serving 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.
- Exceptions:
- Areas designated as security or emergency areas that must be continuously lighted.
- Lighting in stairways or corridors that are elements of the means of egress.

Design Considerations

Very Important

Color Appearance-

Color rendering and color temperature have a strong influence on the person's sense of clarity. To get good color appearance lamps will be chosen with a CRI greater than 80 and a CCT of about 4100K. This will help the signs and subway maps show the vibrant colors.

Direct and Reflected Glare-

Direct and reflected glare can cause annoyance and pain. The lights need to be aimed so there is no glare in the pedestrians' eyes that are coming up the escalator. Also need to be away of glare coming off the copper walls.

Light Distribution on Task Plane-

Light distribution on the floor is critical since it's the main task of the space people need to see where to walk.

Model of Faces and Objects-

Lighting a façade provide pedestrians with a sense of security within the lobby. Lamps with a CRI of above 80 will help with identifying people and distinguishing colors.

Important

Appearance of Space and Luminaires-

Aesthetic issues are important but since the lobby has been modernized with copper panels and acoustical tiles. The fixtures need to fit the decor of the lobby.

Daylighting Integration and Control-

Daylight controls are not used in this space since the lights are required to be on at all times. Daylight will enter the space through the two main doors during the day.

Flicker/ Strobe-

Flicker and strobe lights can cause headaches and is annoying to occupants and cause pedestrians not to look at the façade.

Luminances on Surfaces-

Since the walls are copper the illuminance on the walls need to be done in a way to prevent glare. Also the light needs to be placed carefully to prevent shines and dark spots in the copper.

Lighting Critique

The lighting in the lobby creates visual clarity since the luminaires layout is in a uniform grid and will create a uniform light level on the task plane which is the floor.

Figure 4.7

The light levels of the current room geometry and using the reflectances in figure 4.7 produce light levels twice as high as IESNA recommends for daytime in a lobby which is 10 fc. ASHRAE 90.1-2010 code for the lighting power density is 1.3 W/ft² but calculated 1.92 W/ft². This means the lighting does not meet code. I will redesign the

space to meet ASHREA by using more efficient lights and lowering the number of fixtures.

I want to incorporate some spaceness into the lobby by lighting the walls. Also I want to use guided light to lead people to the escalator and FSTC doorway. This will help traffic in the lobby move quicker and prevent large backups.

Appendix A

TABLE 805.5.2 INTERIOR LIGHTING POWER

BUILDING OR AREA TYPE	ENTIRE BUILDING (W/ft ²)	TENANT AREA OR PORTION OF BUILDING (W/ft ²)
Auditorium	Not Applicable	1.8
Automotive facility	0.9	Not Applicable
Bank/financial institution ^a	Not Applicable	1.5
Classroom/lecture hall ^b	Not Applicable	1.4
Convention, conference or meeting center ^a	1.2	1.3
Corridor, restroom, support area	Not Applicable	0.9
Courthouse/town hall	1.2	Not Applicable
Dining ^a	Not Applicable	0.9
Dormitory	1.0	NA
Exercise center ^a	1.0	0.9
Exhibition hall	Not Applicable	1.3
Grocery store ^c	1.5	1.6
Gymnasium playing surface	Not Applicable	1.4
Hotel function ^a	1.0	1.3
Industrial work, < 20-foot ceiling height	Not Applicable	1.2
Industrial work, ≥20-foot ceiling height	Not Applicable	1.7
Kitchen	Not Applicable	1.2
Library ^a	1.3	1.7
Lobby—hotel ^a	Not Applicable	1.1
Lobby—other ^a	Not Applicable	1.3
Mall, arcade, or atrium	Not Applicable	0.6
Medical and clinical care ^{b, d}	1.2	1.2
Motel	1.0	Not Applicable
Multifamily	0.7	Not Applicable
Museum ^b	1.1	1.0
Office ^b	1.0	1.1

Parking garage	0.3	Not Applicable
Penitentiary	1.0	Not Applicable
Police/fire station	1.0	Not Applicable
Post office	1.1	Not Applicable
Religious worship ^a	1.3	2.4
Restaurant ^a	1.6	0.9
Retail sales, wholesale showroom ^c	1.5	1.7
School	1.2	Not Applicable
Storage, industrial and commercial	0.8	0.8
Theaters—motion picture	1.2	1.2
Theaters—performance ^a	1.6	2.6
Transportation	1.0	Not Applicable
Other	0.6	1.0