

AE 481W: Penn State Architectural Engineering Senior thesis

City of Green Administration Building



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Technical Report 1: Lighting Existing conditions and Design Criteria Report

October 5, 2010

AGI File Locations: P/btk5008/Tech1/Council Chambers.AGI

P/btk5008/Tech1/P_E.AGI



Executive Summary

This report contains a detailed analysis of the existing lighting design and hardware in four primary spaces of the City of Green Administration Building. Each space is described spatially, including plans and sections, followed by the existing lighting design information. Following this, lighting design criteria determined using the IESNA Handbook are explained with regards to specific tasks within that space. At the end of each section there is an evaluation and overall critique of the space. Two of these critiques used AGI lighting analysis software to see if the existing lighting design conformed to the previously mentioned lighting design criteria.

The general lighting design throughout the building is successful at complimenting the architecture and providing functional spaces for everyday use by city employees.



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I. Building Statistics

The City of Green Administration Building houses multiple departments relating to the government and administration of City of Green, Ohio. A large entrance structure and clock tower introduces occupants to the building, followed by an elegantly designed centralized lobby space. Three major wings are accessible from the lobby, which are occupied by various administration departments.

Building Name: City of Green Administration Building

Location and Site: 1755 Town Park Boulevard, City of Green, Ohio 44216

Building Occupant Name: City of Green Administration

Occupancy or Function Type: Class "B," business

Size: 53,671 Gross Square Feet

Stories Above Grade: Two stories above grade and a basement, totaling three levels

Primary Project Team:

Owner: City of Green

Construction Manager: Welty Building Company – Fairlawn, Ohio

Architect: Hasenstab Architects Inc. - Akron, Ohio

Project Architect of Record: Dennis Check

MEP Engineer: Scheeser & Buckley Mayfield, LLC – Uniontown, Ohio

Engineer of Record (HVAC, L/E): Jim Kulick, PE

Civil / Site Planning: Kevin Noble, PE

Civil Engineer (Structural): Floyd Brown Group – Akron, Ohio

Date of Construction: August 2008 – October 2009

Cost: 8.2 million USD

Project Delivery Method: Guaranteed Maximum Price



II. Entrance Structure

A. Spatial Environment

Space Category: Outdoor space

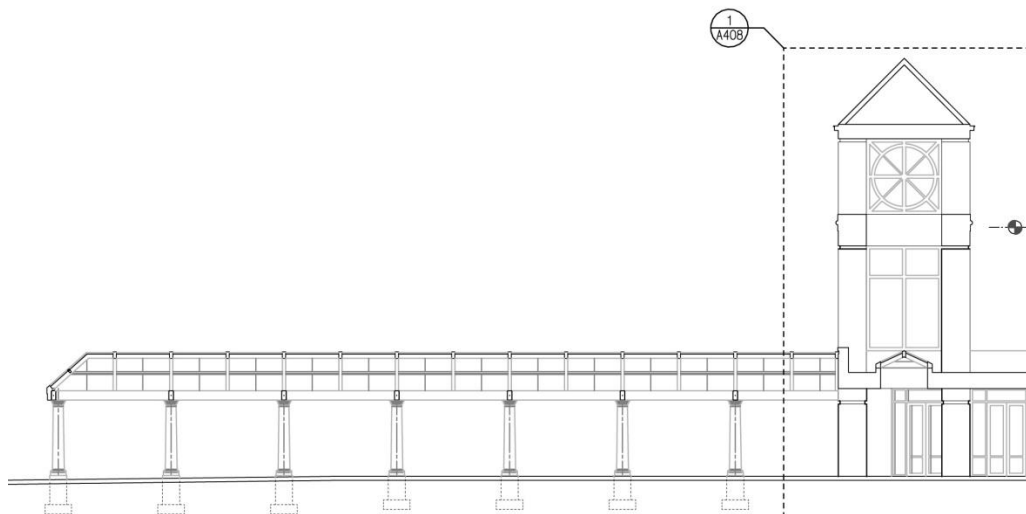
General Description

The Entrance Structure consists of a covered, 10 ft. wide walkway parallel to the West wing façade leading to a clock tower. White fiberglass columns line both sides of the walkway and support the aluminum skylight system which provides shelter to occupants as they enter the vestibule. This skylight system is 13'-2" high, and has an 8"/12" slope on each side of the highest point. The supporting columns are space 12' on center. A monumental clock tower clearly marks the entrance to the building, standing at 43' from ground level.

Surface Materials

Face brick, metal roof on clock tower, aluminum and glazing over walkway, and painted fiberglass columns along walkway. The walkway glazing has a .44 transmittance value.

Plans and Sections: Not to Scale



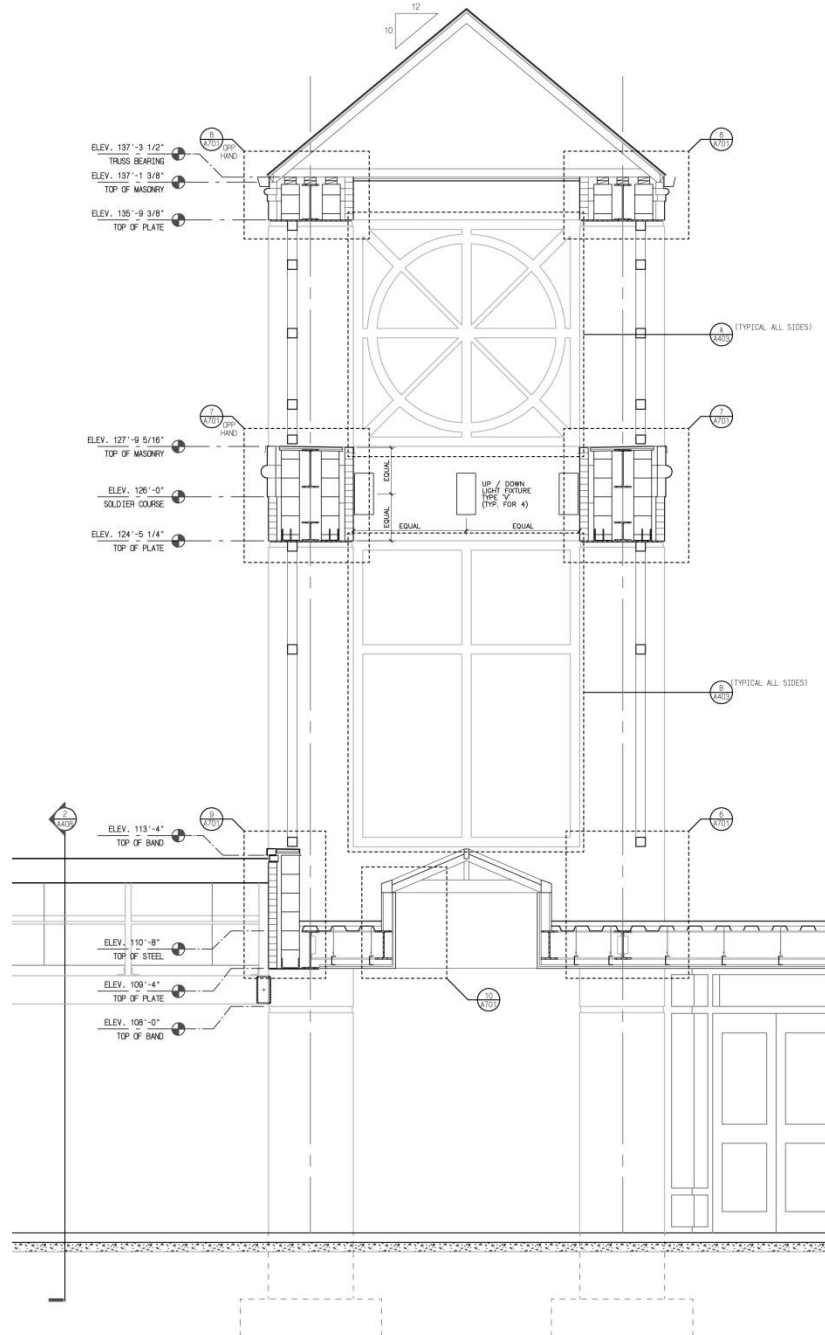
Entrance Structure: Section through Center



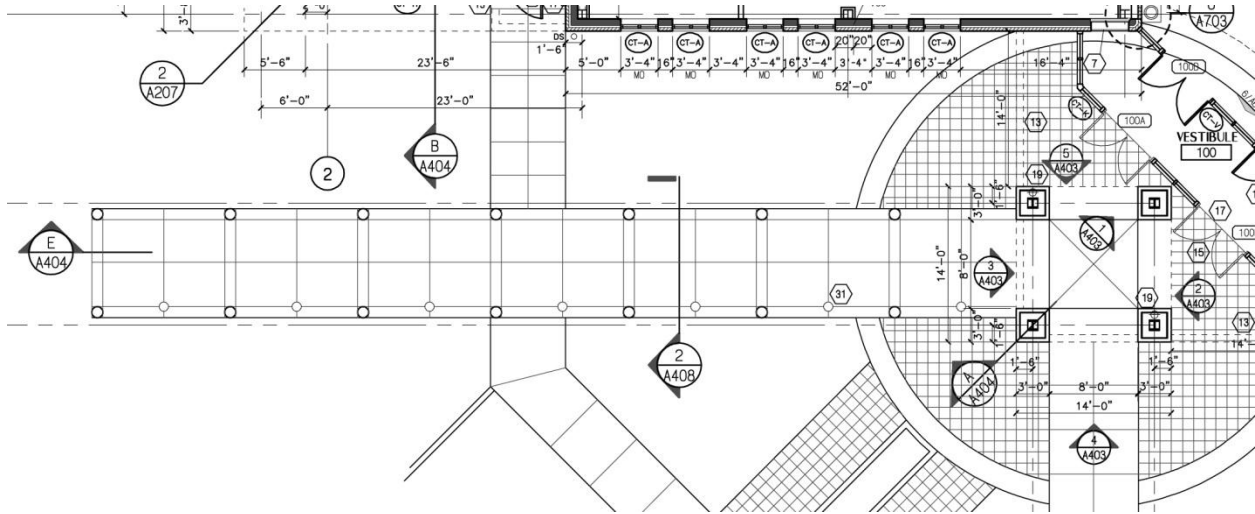
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Entrance Structure: Clock Tower Section



Entrance Structure: Plan View

B. Existing Lighting System Conditions

Description

The Entrance Structure's walkway is primarily illuminated via bollards located in between the columns on one side (Type EE). This is supplemented by column mounted sconce fixtures located on every column (Type DD). In Ground metal halide luminaires wash the side of the building closest to the walkway (Type GG), as well as the adjacent side. Wall mounted up lights located on the second story illuminate the clock tower. Exterior fixtures are controlled automatically by an electronic lighting control system under relay 32 and 24.



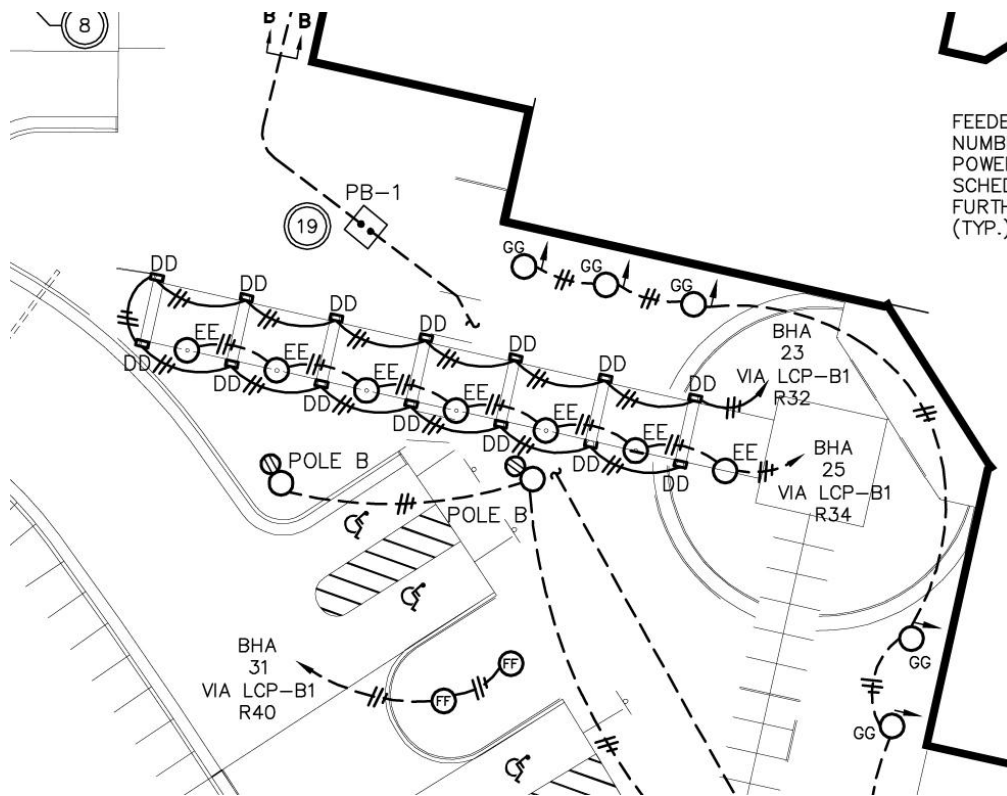
Entrance Structure: Existing Lighting					
Spec. #	Mounting	Locations	Manufacturer Catalog #	Lamp Type	Description
DD	Column Mounted Sconce	One mounted on each column leading to the clock tower	Rebille: CYL-003-7010-142T-FL/UD-XX-277	1-CF42DT/E/IN/835	8"W x 8.5"L x 10.6"D compact fluorescent wall grazer up/down light, embossed specular aluminum high reflectance, clear tempered glass shield, triangular cylinder assembly, one lamp and one 277V electronic ballast. Wet location listed. Flood up/down beam configuration.
EE	Bollard	In-between columns on side farther from building façade	Bega: 8116MH	1-50W MH	5-1/2" diameter x 39 3/8" H bollard, one way light distribution, one piece extruded aluminum housing, one lamp with 277V integral magnetic ballast.
GG	In Ground	Near building façade	Kim Lighting: LTV22-WW-100MH277-TR10	M100/U/MED	12-3/4" diameter x 11-7/8" deep concealed in-grade fixture, LTV720 bronze housing wall wash, composite housing finish, one piece molded silicone gasket, clear tempered borosilicate glass, 5/16" thick flush lens and one 277V electronic ballast.
V	Canopy Up light	2nd floor of clock tower	Rebelle: 7100-150H-AN	1-150W MH	12-5/8"H x 19-1/2"L wall mount fluorescent, one piece die-cast aluminum door with continuous silicone gasket, one piece die-cast aluminum housing, polyester powder coat paint finish, type III optics, quartz restrike, 1-lamp and one 277V electronic ballast with less than 10% THD.



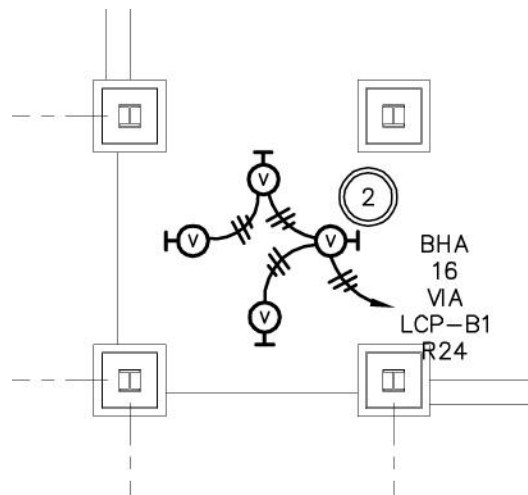
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Entrance Structure: Lighting Plan (Ground Level)



Entrance Structure: Lighting Plan (2nd Level)



C. Lighting System Design Criteria and Consideration

- Reference: IESNA Handbook, Lighting Design Guide
 - Building Exteriors – Inactive (normally locked, infrequent use)
- Deviations from handbook recommendations are explained in individual sections
- I chose to use the “inactive” category of building exterior s because generally, the doors are locked after 5 PM.

Appearance of Space and Luminaires: Somewhat Important

- The City of Green Administration Building represents the surrounding population and area. The appearance of the exterior needs to be clean, functional, and not over the top to convey the professional nature of the building.

Direct Glare: Important

- Because the exterior of the building is being illuminated, direct glare from the wall washers into windows must be avoided.

Reflected Glare: Somewhat Important

- The covered entrance way is made of aluminum and glazing. Luminaires need to have a photometric distribution that does not cause reflected glare off of any of these surfaces.

Surface characteristics: Important

- Characteristics of all surfaces need to be considered to improve the look of the structure. The texture of the brick should be brought to life by the luminaires.
- Secularity of the metal located on various parts of the structure should be considered to avoid unwanted reflections.

Color Appearance and Color Contrast: Important

- The entrance lighting design should attract the public to the building via pleasant aesthetics. Rendering the exterior materials properly is a key component to this goal.



Light Pollution / Trespass: Very Important

- All light directed upwards needs to be carefully considered and aimed as to not allow any light to miss its intended target and contribute to light pollution.

Light Distribution on Surfaces: Somewhat Important

- The distribution on surfaces of the entrance structure and walkway should correspond with the consistent pattern of the columns.
- Overall, the distribution pattern should stay within a 3:1 ratio between brightest and darkest part of the distribution to avoid excessive brightness.

Point(s) of Interest: Important

- The goal of lighting the entrance structure and clock tower is to draw attention to the building by highlighting its unique architectural elements.
- Lighting the inside walls of the clock tower will give the psychological impression of spaciousness while providing luminance contrast to the far away viewer.

Horizontal Illuminance: Important

- Lighting should achieve a horizontal illuminance of **3 fc** for orientation and simple visual tasks.

Vertical Illuminance: Important

- Lighting should achieve a vertical illuminance of **3 fc** for orientation and simple visual tasks.

Power Allowances: ASHRAE Standard 90.1

- Walkways up to 10 ft. wide = 1 W/LF



D. Evaluation and Critique

The City of Green Administration Building utilized many decorative elements in its architecture and lighting. The structure adds interest to the façade, and attracts visitors who notice its monumental clock tower positioned near the entrance. While this structure is a positive aspect of the buildings architecture, it could be illuminated in a more pronounced way. As pictured in the image below, the wall mounted canopy fixtures located on the inside of the second story of the clock tower are hardly noticeable. Most of the focus is being drawn to one side of the walkway columns due to light from pole mounted luminaires in the parking lot. Bringing more attention through higher luminance contrast on the clock tower would benefit the overall composition of the exterior façade. The existing design does attract attention to the decorative columns supporting the walkway; however the clock tower is a far more interesting focal point. If it was illuminated instead of the walkway, the composition of the façade would accompany the buildings architecture in a cleaner way with less visual clutter. It is difficult to tell by the image, but it seems that the design is not allowing much light to escape upwards.





III. Main Lobby

A. Spatial Environment

Space Category: Circulation Space

General Description

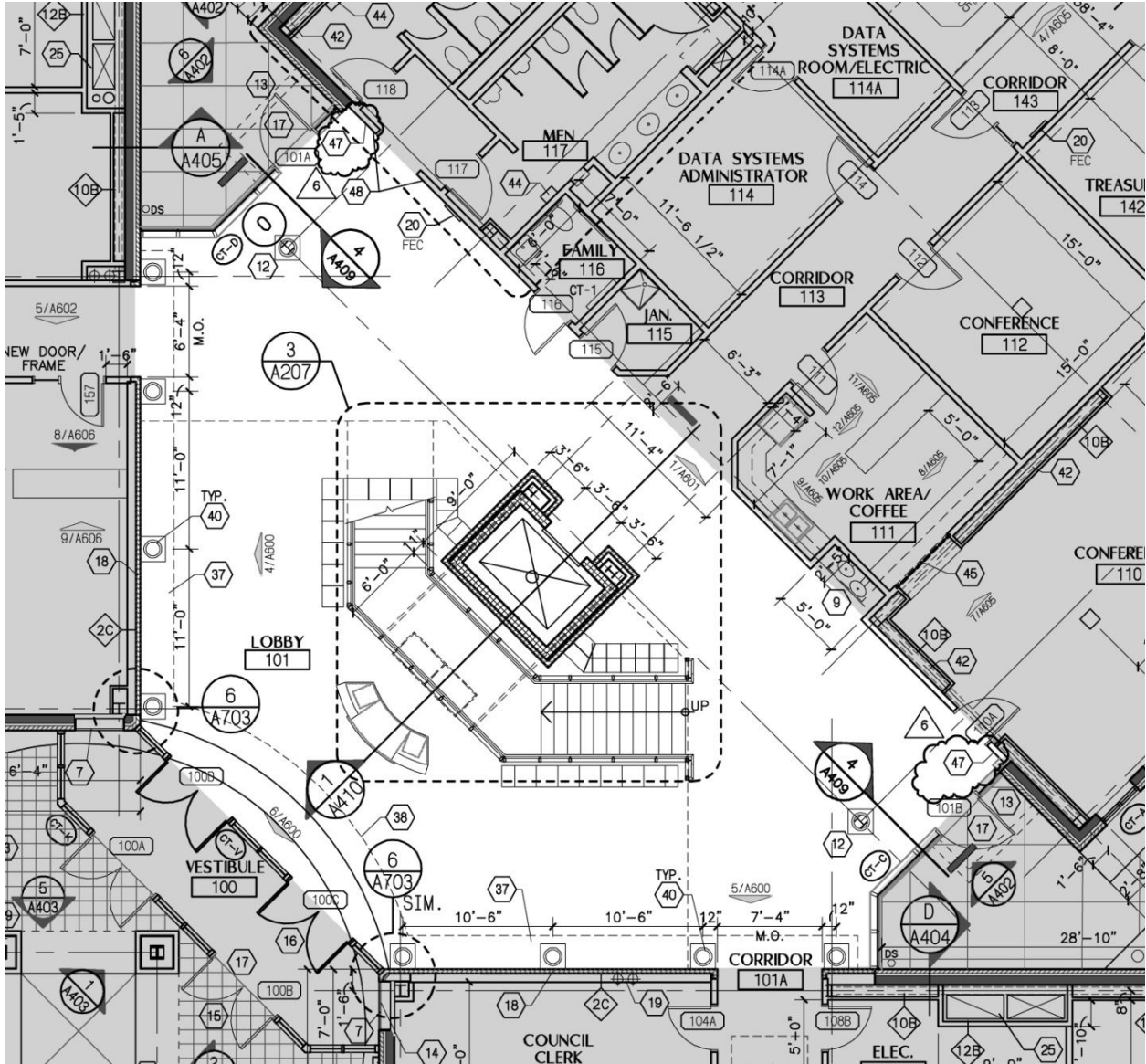
The Main Lobby introduces occupants to the interior space and pulls together the three separate wings of the building. The recessed coves in both the lower ceiling and upper level ceiling allow for decorative luminaires to highlight the architecture and guide people through the space. This architectural feature ties the space heavily with the Council Chambers located directly off the lobby. A staircase spirals around a central elevator with the same geometry as the perimeter of the room. The skylight located at the highest elevation of the lobby further increases its spacious feel while mimicking the entrance structure clock tower's form. Another element of the lobby that compliments the entrance structure is the perimeter columns which match the support columns of the walkway covering. Surface properties of the space are detailed in the following chart.

Surface Materials

Main Lobby: Surface Materials				
Material Type	Manufacturer	Location(s) in Space	Color	Reflectance
Tile	Ergon	Floor	Naturale Rettificato	0.35
Vinyl Wall Covering	Essex	Walls	Trust Fund #SX-AR-13	0.7
Fiberglass painted columns	N/A	Perimeter of Lobby	White	0.8
Nylon Scaper Yarn	Leed	Floor directly inside of entrance doors	Not Mentioned	Not Mentioned
Carpet	Bolyu	Border of 2nd floor lobby	Array	0.25
Carpet	Bolyu	Directly outside elevator on 2nd floor	#DEF27	0.2



Plans and Sections: Not to Scale



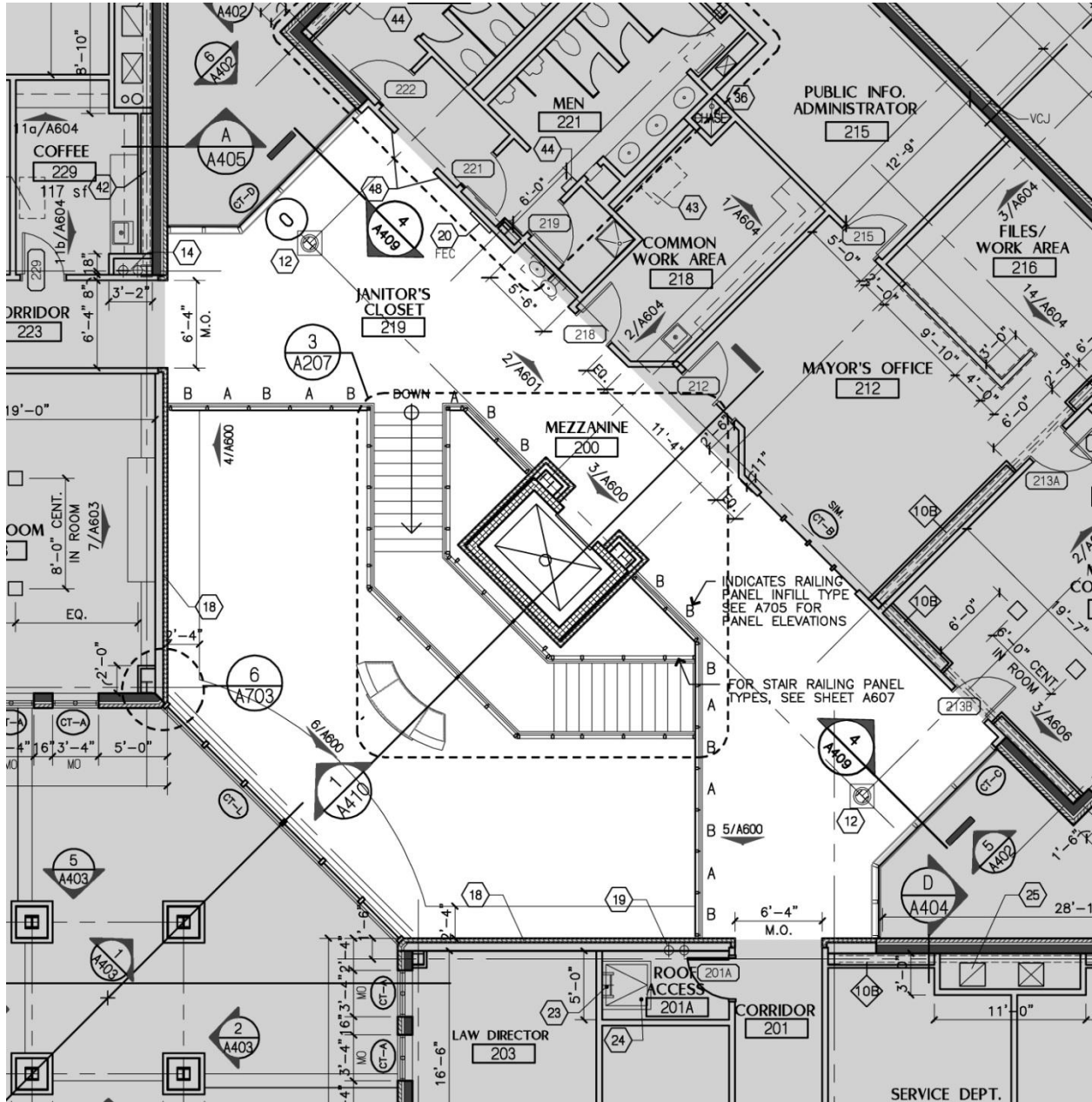
Main Lobby: First Floor Plan



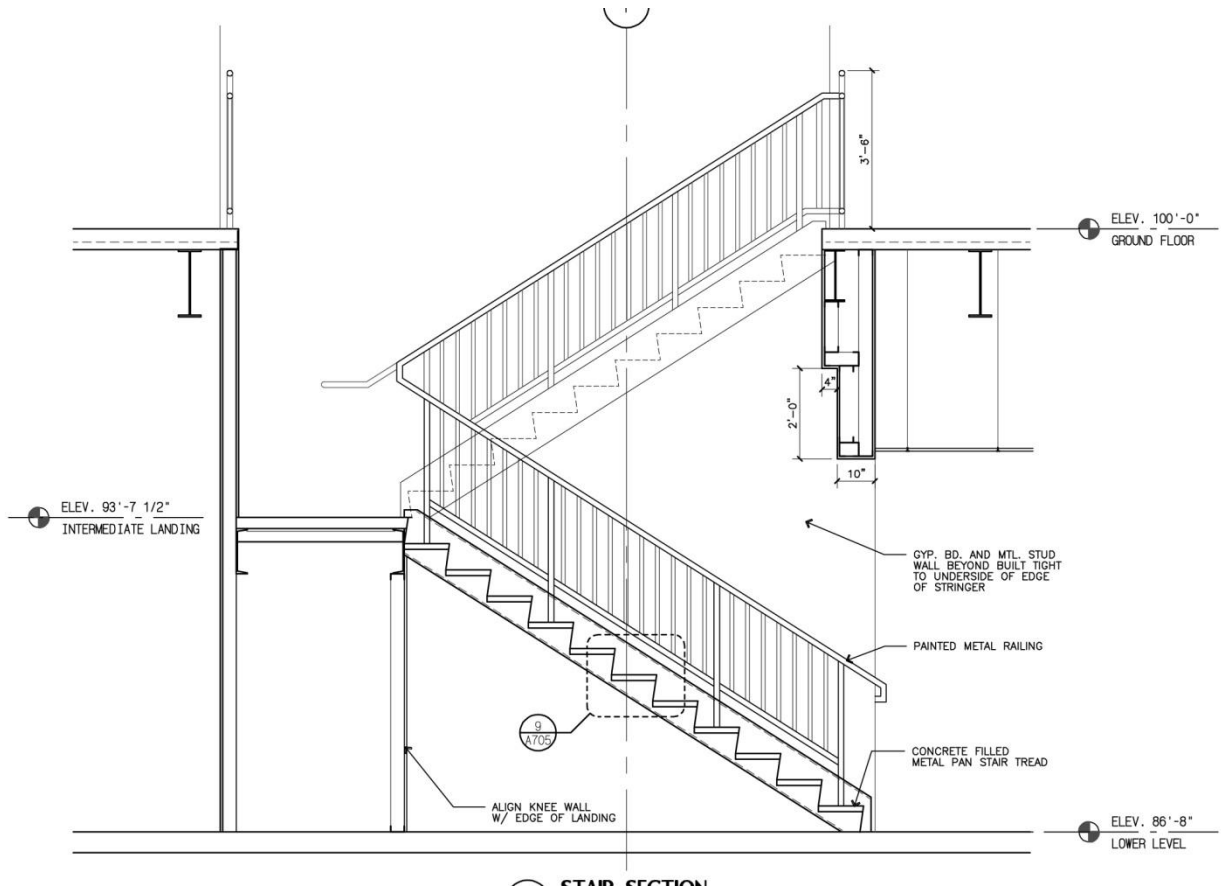
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Main Lobby: Second Floor Plan



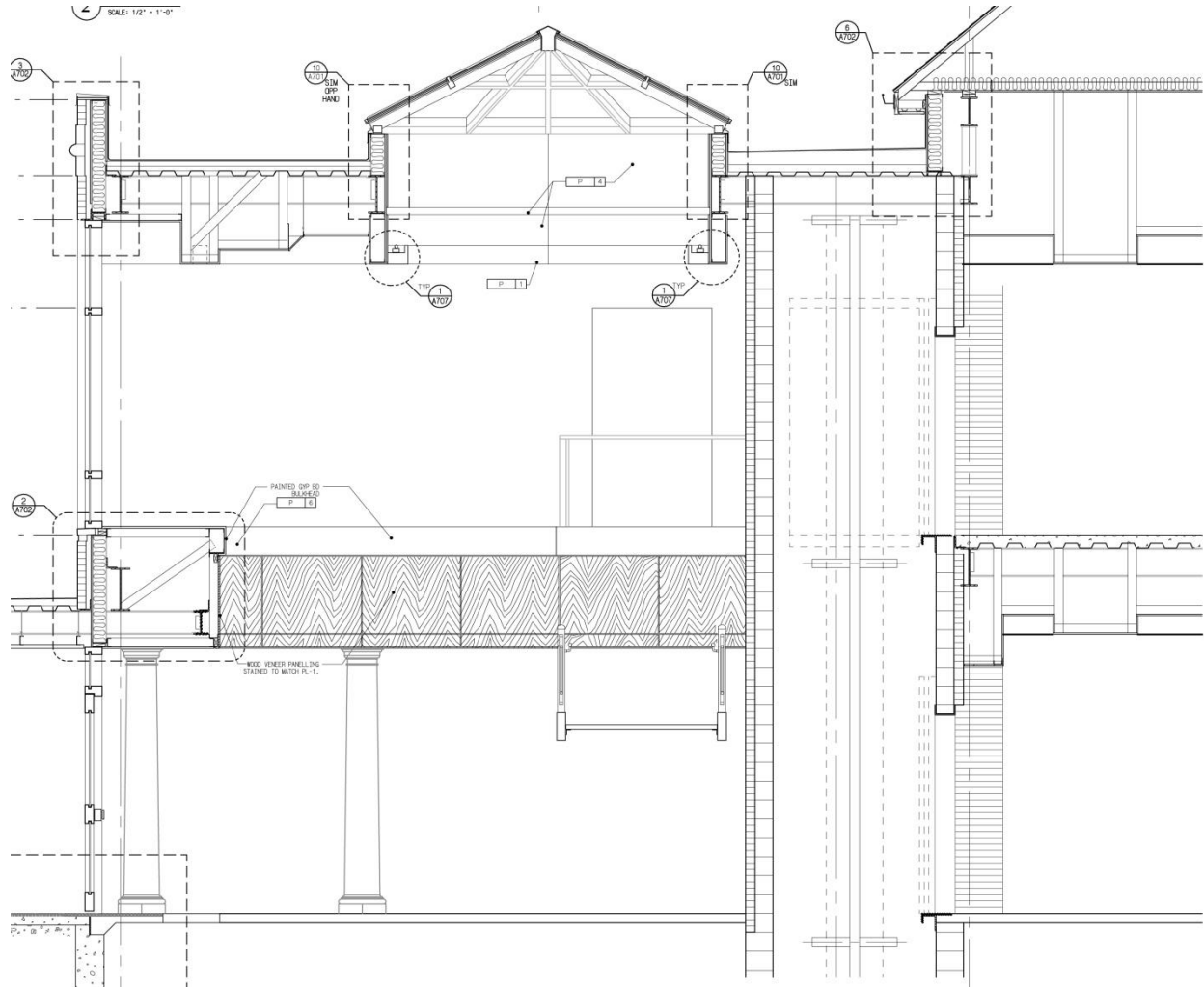
Main Lobby: Stair Section



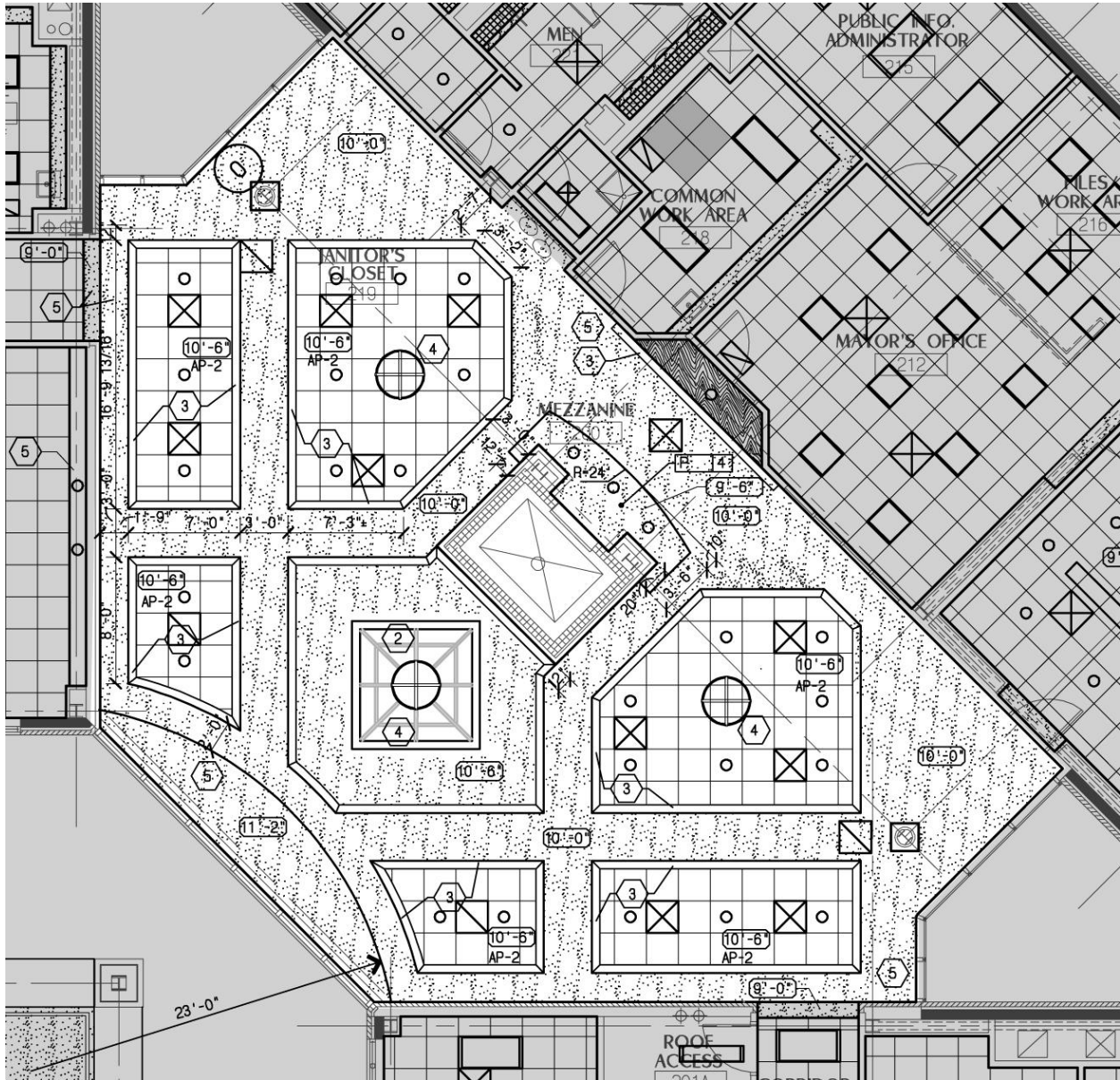
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Main Lobby: Section of First and Second floor



Main Lobby: Second Floor Reflected Ceiling Plan



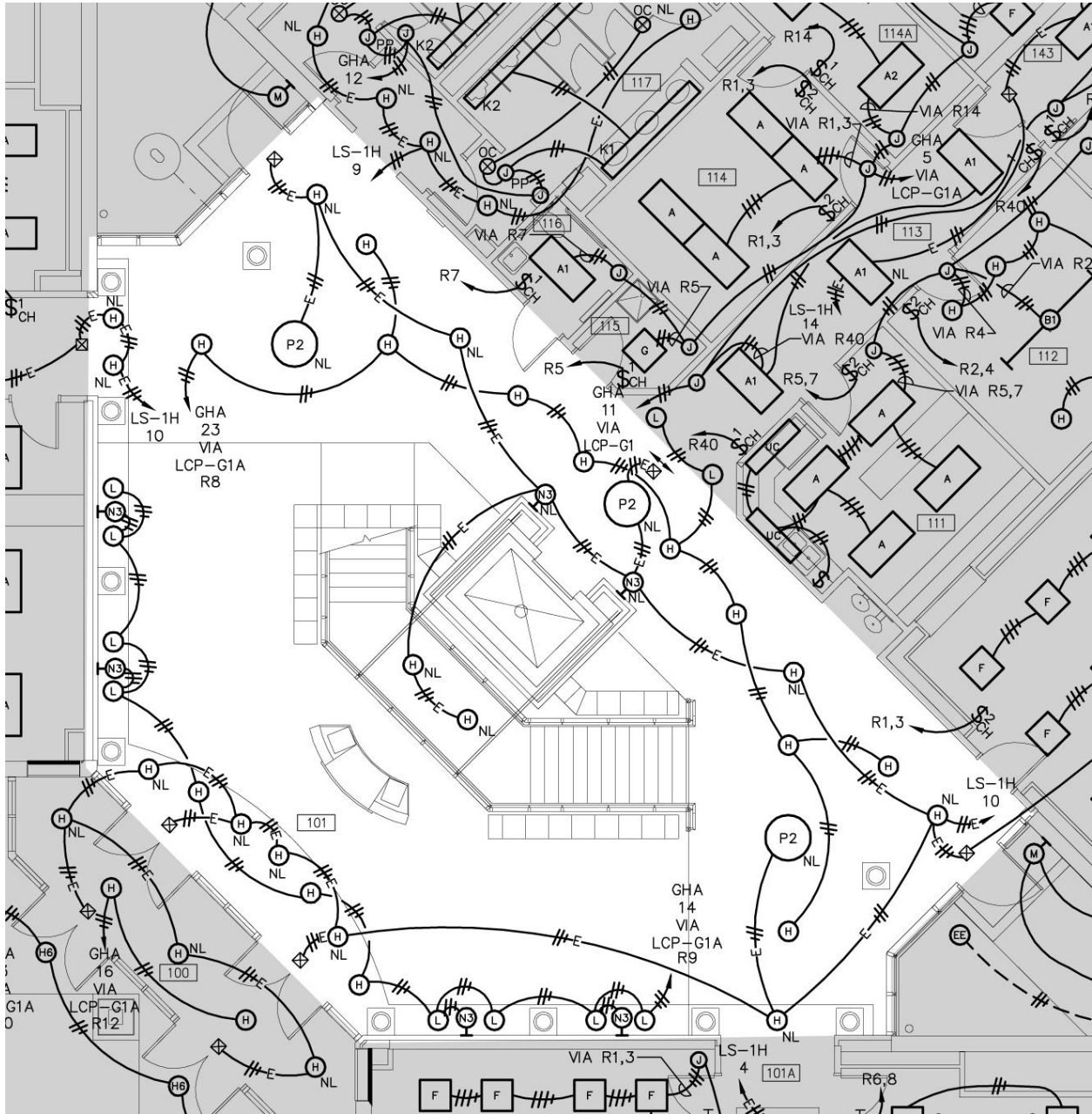
B. Existing Lighting System Conditions

Description

The existing lighting system in the Main Lobby consists of a combination of recessed direct down lights, recessed wall grazers, wall mounted sconces, pendants, and cove lighting on the skylight and large window above the entrance. All luminaires use fluorescent lamps, however are not dimmable in this application. The arrangement of the luminaires increases the feeling of spaciousness in the lobby by lining the elevated sections of the wall with the sconces. Furthermore, the pendants are mounted so they provide up light to the recessed parts of the ceiling. Direct luminaires of different aperture diameters are scattered around the space to provide a general level of illumination. This combined with decorative pendants and sconces produces a visually pleasing space with great circulation. Further details about exact lighting hardware are in the chart below.



Main Lobby: Existing Lighting					
Spec. #	Mounting	Locations	Manufacturer Catalog #	Lamp Type	Description
P2	Pendant	Cove Ceilings	Architectural Lighting: DP-A36-6TF42-OA-BN	6-CF42DT/E/835	36" bowl diameter x 11-1/4" bowl height, opal acrylic diffuser, 6-lamp and one 277V electronic ballast with less than 10% THD.
P3	Pendant	By entrance to council chambers	Architectural Lighting: DP-A30-4TF42-OA-BN	4-CF42DT/E/835	30" bowl diameter x 9-7/8" bowl height, opal acrylic diffuser, 4-lamp and one 277V electronic ballast with less than 10% THD. Brushed nickel finish.
N1	Sconce	diagonal walls at entrance to mayor's office	Shaper: 673-16-CFL/2/27-277-SN-2PVTB	2-F27BX/SPX/RS	16" wall sconce, satin nickel finish, two vertical trim bars and one 277V electronic ballast with less than 10% THD
H4	Ceiling Recessed	Entrance to elevator and mayor's office 2nd floor	Lithonia AF-1/26DTT-6-AR-MVOLT-GEB10IS	1-CF26DT/E/835	7-3/4" Height x 13-5/8" wide with 6" open aperture, specular low iridescent finish, 1-lamp. Provide one MVOLT electronic ballast with less than 10% THD
D	Cove	Wall above vestibule, cove above secretaries desk	Winona: P1-MC-148T5HO-MVOLT-MCVU-RA-X-STD	1-FP54/835/HO	46-5/8"L x 4-3/8"W x 2-1/2"H cove fluorescent, asymmetric distribution, bright anodized specular reflector, 1-T5HO lamp and one MVOLT electronic ballast with less than 10% THD
H	Ceiling Recessed	Ceiling throughout space	Lithonia: AF-2/26DTT-6-AR-MVOLT-GEB10IS	1-CF25DT/E/835	7-3/4" height x 13-5/8" wide with 6" open aperture, specular low iridescent finish, 2-lamp. Provide one MVOLT electronic ballast with less than 10% THD.
L	Ceiling Recessed	1st floor lobby walls	Lithonia: AFW-2/26DTT-6-AR-277-GEB10	2-CF26DT/E/835	7-3/4" height x 13-5/8" wide with 6" open aperture wall wash, specular low iridescent finish, 2-lamp. Provide one 277V electronic ballast with less than 10% THD.
N3	Sconce	1st and 2nd floor lobby walls	Shaper: 673-25-T5/2/14-277-SN-2PEVTB	2-F14T5/835	25" height, 8-2/4" width, wall sconce, satin nickel finish, two vertical trim bars and one 277V electronic ballast with less than 10% THD.



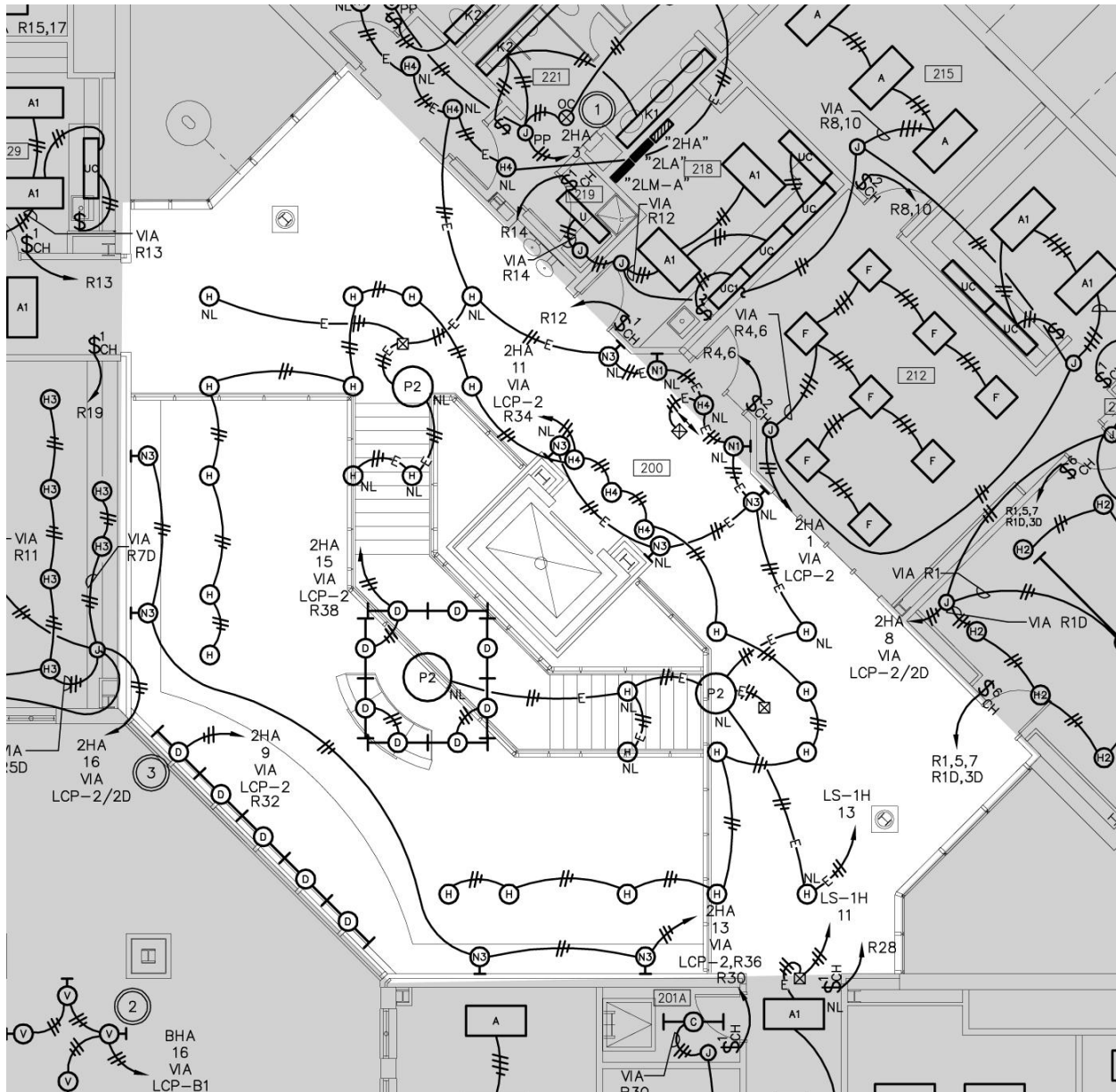
Main Lobby: First Floor Lighting Plan



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Main Lobby: Second Floor Lighting Plan



C. Lighting System Design Criteria and Consideration

- Reference: IESNA Handbook, Lighting Design Guide
 - Offices – Lobbies, lounges, and reception areas
- Deviations from handbook recommendations are explained in individual sections

Appearance of Space and Luminaires: Very Important

- The Main Lobby is the first space new occupants see upon entering the building, so it must be very pleasing and memorable.
- The space has a high ceiling with recessed coves not unlike other spaces in the building.
 - These must be highlighted by decorative luminaires to enhance the architecture.
- Perimeter columns can be highlighted to encourage circulation around the lobby.
- The lighting should also compliment the unique staircase protruding over the secretaries desk

Direct Glare: Important

- Direct glare from the large windows above the entrance doors must be controlled on sunny days.

Indirect Glare: Somewhat Important

- While not a major issue due to the lack of specular surfaces, indirect glare from luminaires causing veiling reflectance's on the secretaries computer screen must be avoided by considering source task eye geometry.

Surface characteristics: Important

- Characteristics of all surfaces need to be considered to improve both aesthetics and functionality of the lobby.
 - Luminance contrast can be used to guide occupants through building.



Modeling of Faces or Objects: Important

- The secretary will be welcoming people to the building. This is a circulation space where a lot of people will be moving through so the lighting should be able to render faces accurately and well.

Day lighting Integration and Control: Important

- The space has one large window which may need daylight control mechanisms to limit the amount of daylight passing into the space.

Light Distribution on Surfaces: Important

- A lobby is there to guide occupants through the building, and light distribution is how this can be done.
- Illuminating the recessed portions of the ceiling located near important spaces such as the council chamber and major wing hallways will attract people to those spaces.

Luminances of Room Surfaces: Important

- The high quality finishes throughout the space must be enriched by the lighting design.

Horizontal Illuminance: Somewhat Important

- Lighting should achieve a horizontal illuminance of **10 fc** for common visual tasks.

Vertical Illuminance: Important

- Lighting should achieve a vertical illuminance of **3 fc** for common visual tasks.
 - This is more important for rendering of faces.

Power Allowances: ASHRAE Standard 90.1

- For a lobby = 1.3 W/ft²

Control Requirements: ASHRAE Standard 90.1

- Automatic lighting shutoff



D. Evaluation and Critique

The Main Lobby must guide people through the space in a way that is not visually distracting. It accomplishes this by using pendant luminaires that have a direct/indirect CIE classification to increase the luminance of the recessed portions of the ceiling on the lower level as well as the mezzanine. This luminance ratio highlights the buildings architecture as well as creating focal points on important paths. Wall grazing fixtures produce a pleasant gradient on the high quality wall materials between the perimeter decorative columns. All of this combines for a successful design that gives the psychological impression of spaciousness and increases spatial circulation. One criticism of the space is the lack of focus on the stairwell behind the secretary. This is the center of the room, as well as a main tool of circulation and should be a main focal point.





IV. Council Chambers

A. Spatial Environment

Space Category

Special Purpose Space

Description

The Council Chambers is where major city officials hold large, often televised meetings. This 2,062 square foot space is directly accessible from the main lobby and occupies the majority of space on the ground floor of the East wing. The almost rectangular floor plan can be divided up into two major areas; audience seating and council members seating. The council member's seating is positioned on a 6 inch raised platform and has two desks facing the audience plus seating for 17 city officials. The space has seating for 109 not including the council.

A drop ceiling forms a grid pattern over the audience. There are three ceiling levels in the space as represented in the following plans. Natural, warm, wood toned materials are used throughout the space. Wood laminate borders the lower section of the perimeter. Above this is a layer of vinyl wall covering followed by painted GWB starting at the lowest ceiling elevation. The ceilings of the four coves formed by the drop ceiling are made of camel colored acoustic ceiling tile. Two large windows are located behind the council, one of which continues up through the second floor.

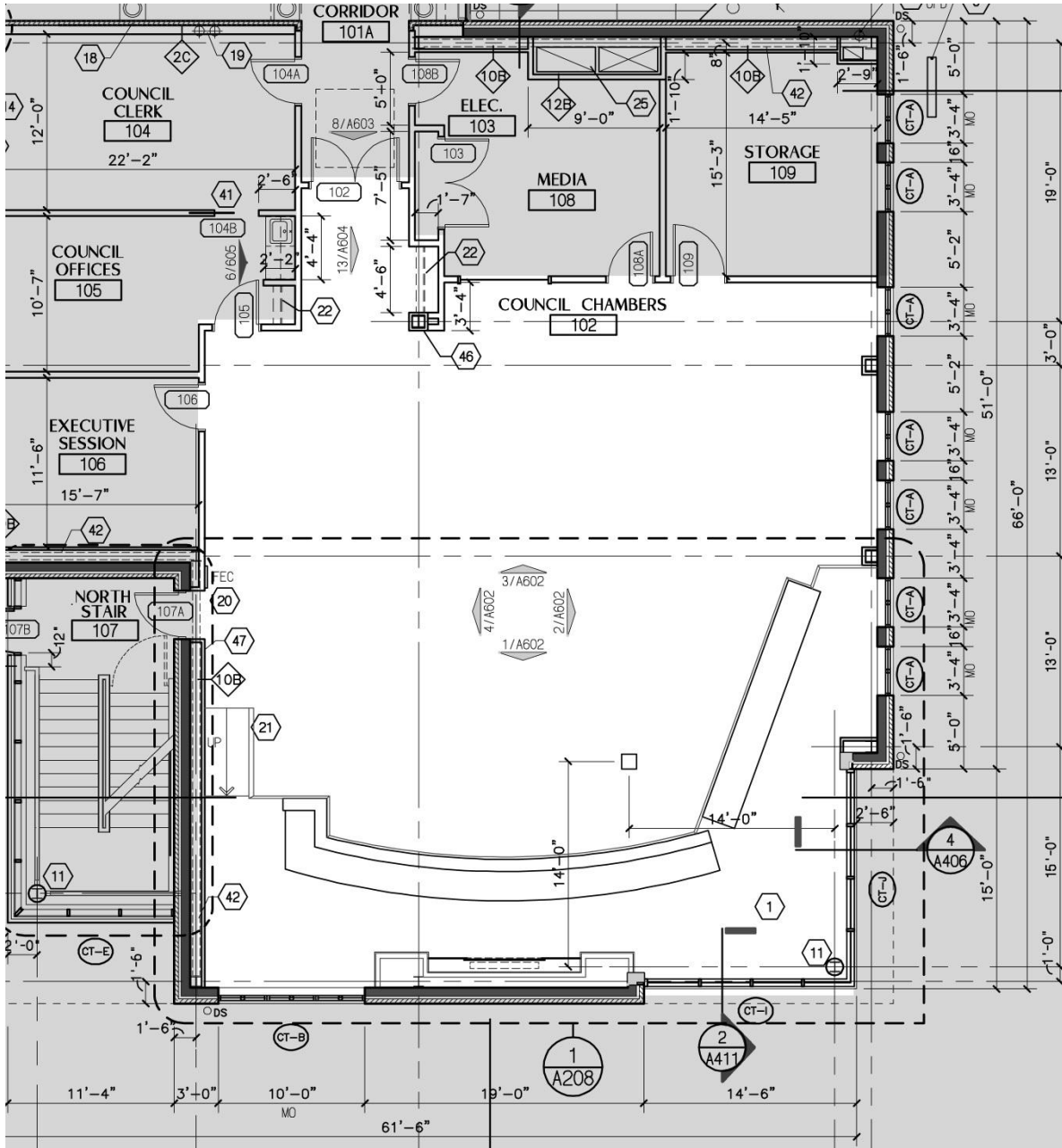


Surface Materials

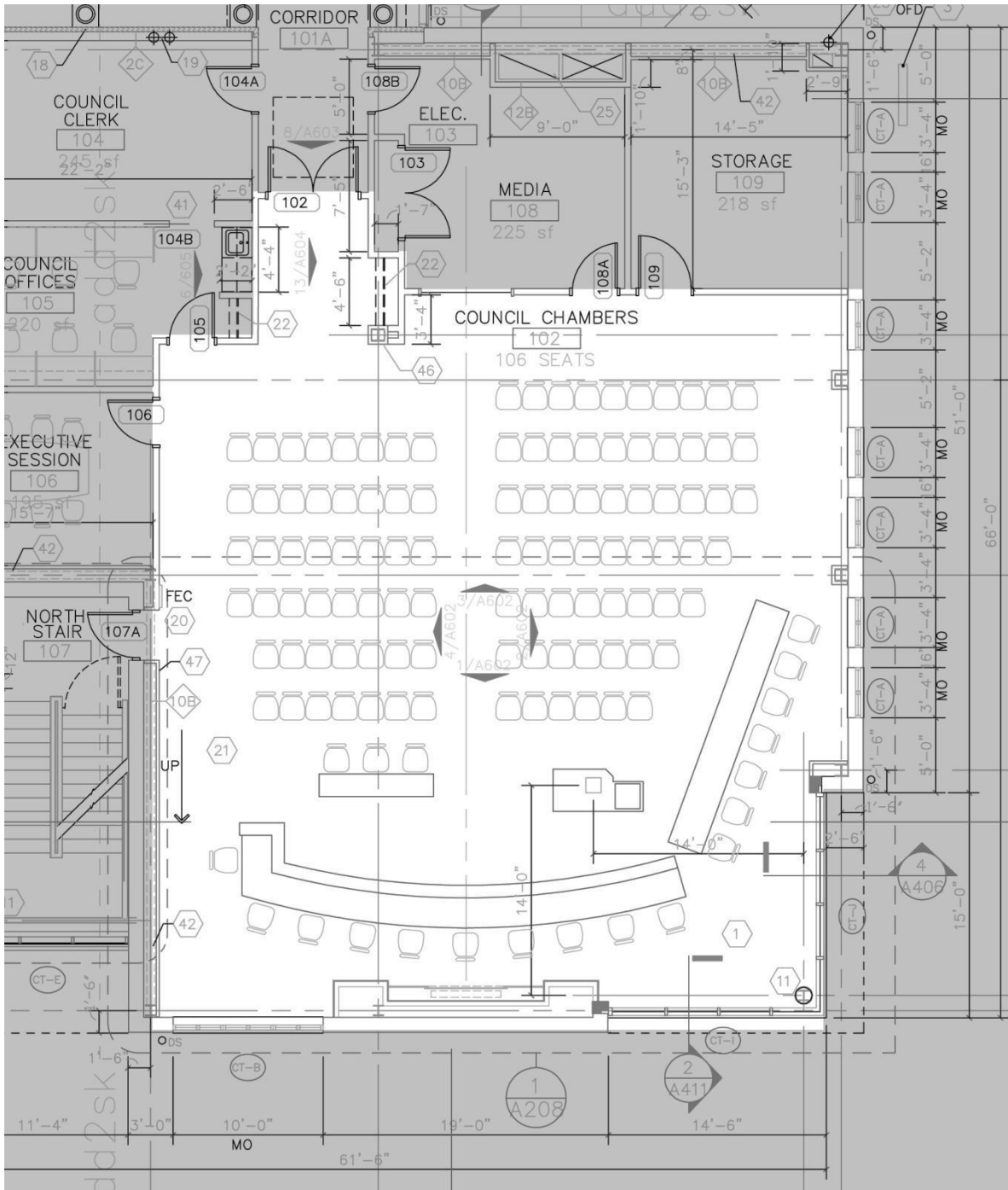
Council Chambers: Surface Materials				
Material Type	Manufacturer	Location(s) in Space	Color	Reflectance
Carpet	Designweave	Floor	Ripple #00578	0.2
Wood Laminate	Wilsonart	Doors (stained to match), Walls between 0' and 2'-9" elevation	Biltmore Cherry #7924-07	0.24
Wood Laminate	Wilsonart	Desks	Huntington Apple #7929-78	0.4
Vinyl Wall Covering	MDC Wallcoverings	Walls between 2'-9" and 8'-10" elevation	Lush Bottoms #BBGO15/4731	0.64
Painted GWB	Benjamin Moore	Walls Above 8'-10" elevation and drop ceiling	White Dove #OC-17	0.93
Acoustic Ceiling Panel	Armstrong: Cirrus Tegular #589	The four coves in drop ceiling grid	Camel	0.86
Glazing	Not Specified	All Glazing in Space	N/A	.44 (Transmittance)



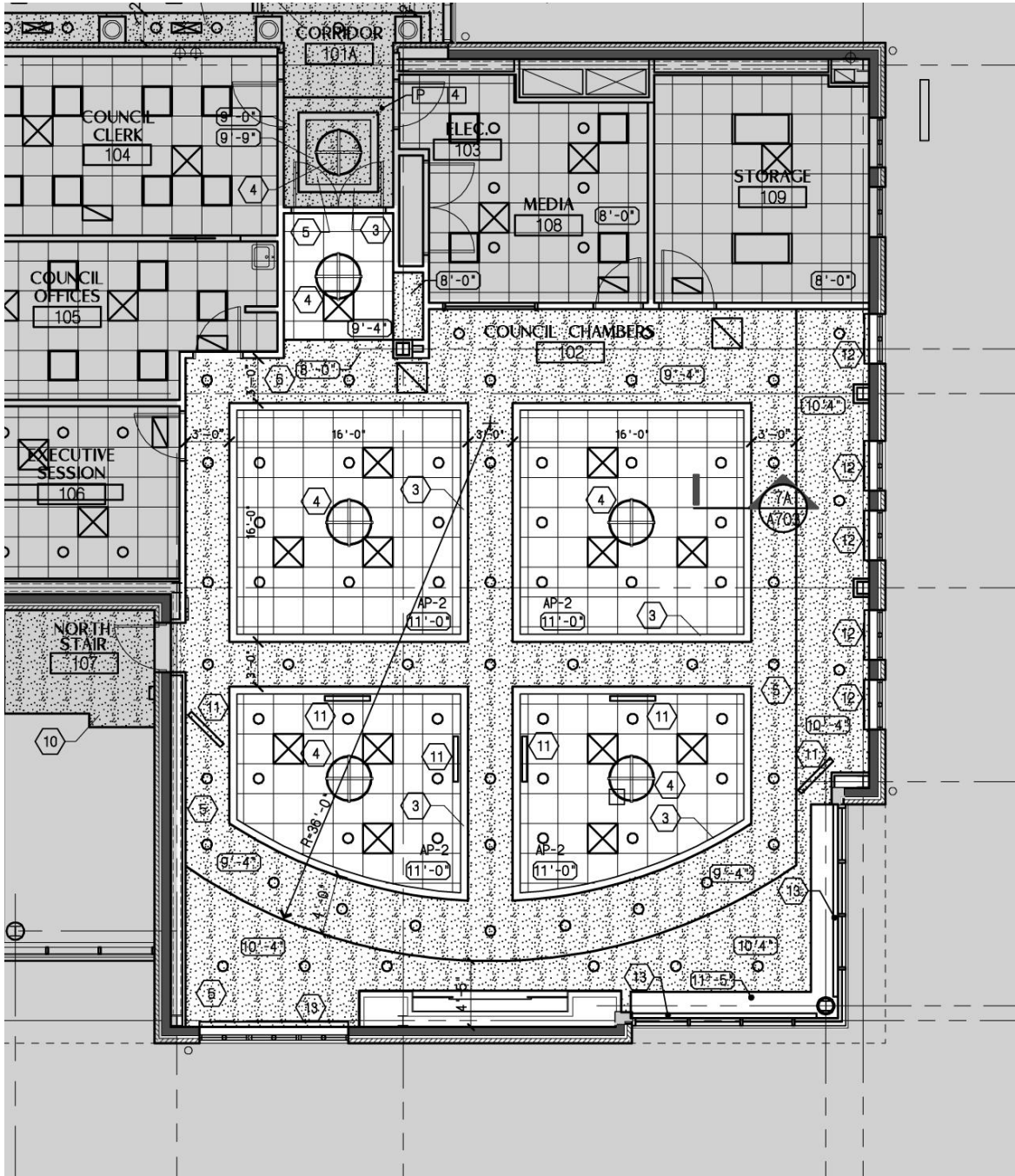
Plans and Sections: Not to Scale



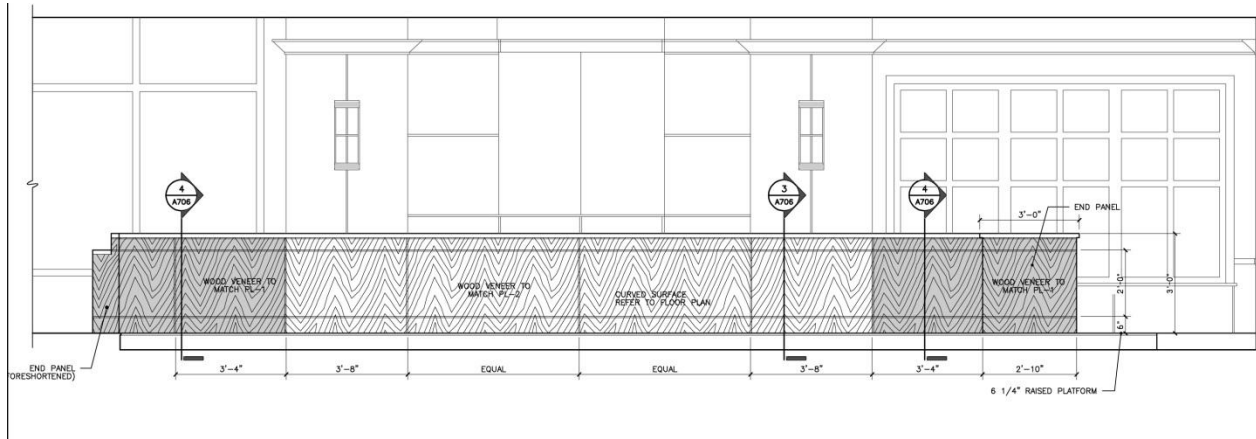
Council Chambers: Floor Plan



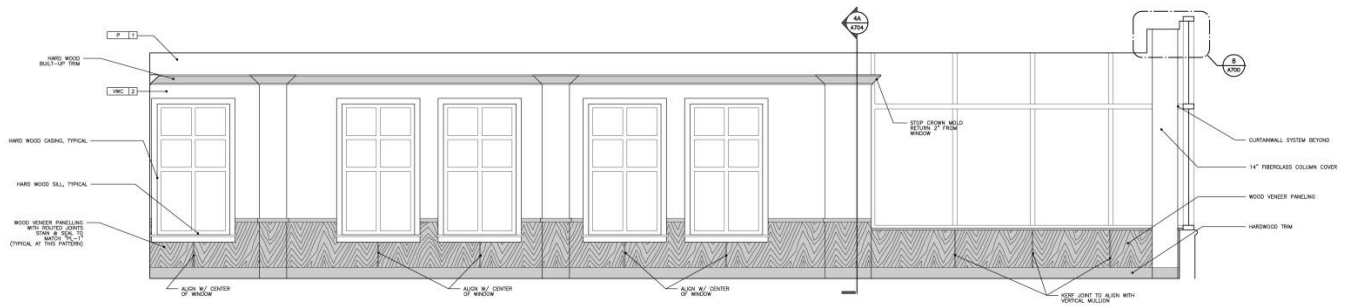
Council Chambers: Furniture Layout



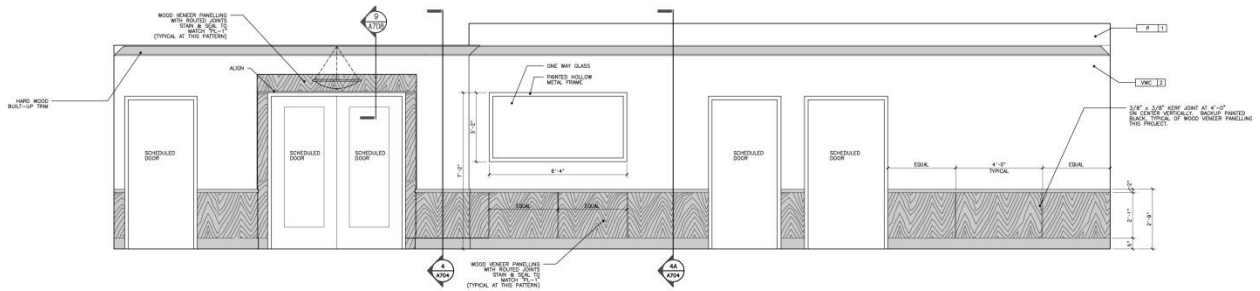
Council Chambers: Reflected Ceiling Plan



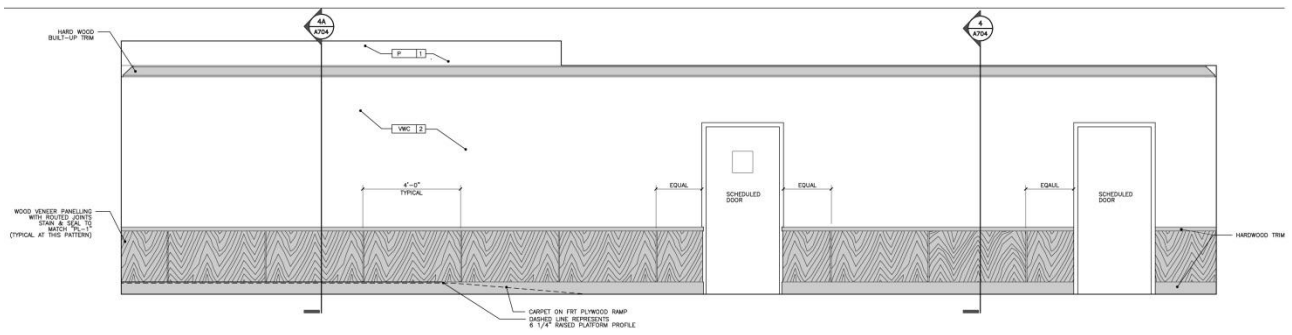
Council Chambers: Section Facing Council Desk



Council Chambers: Section Facing North Wall



Council Chambers: Section Facing Entrance



Council Chambers: Section Facing South Wall



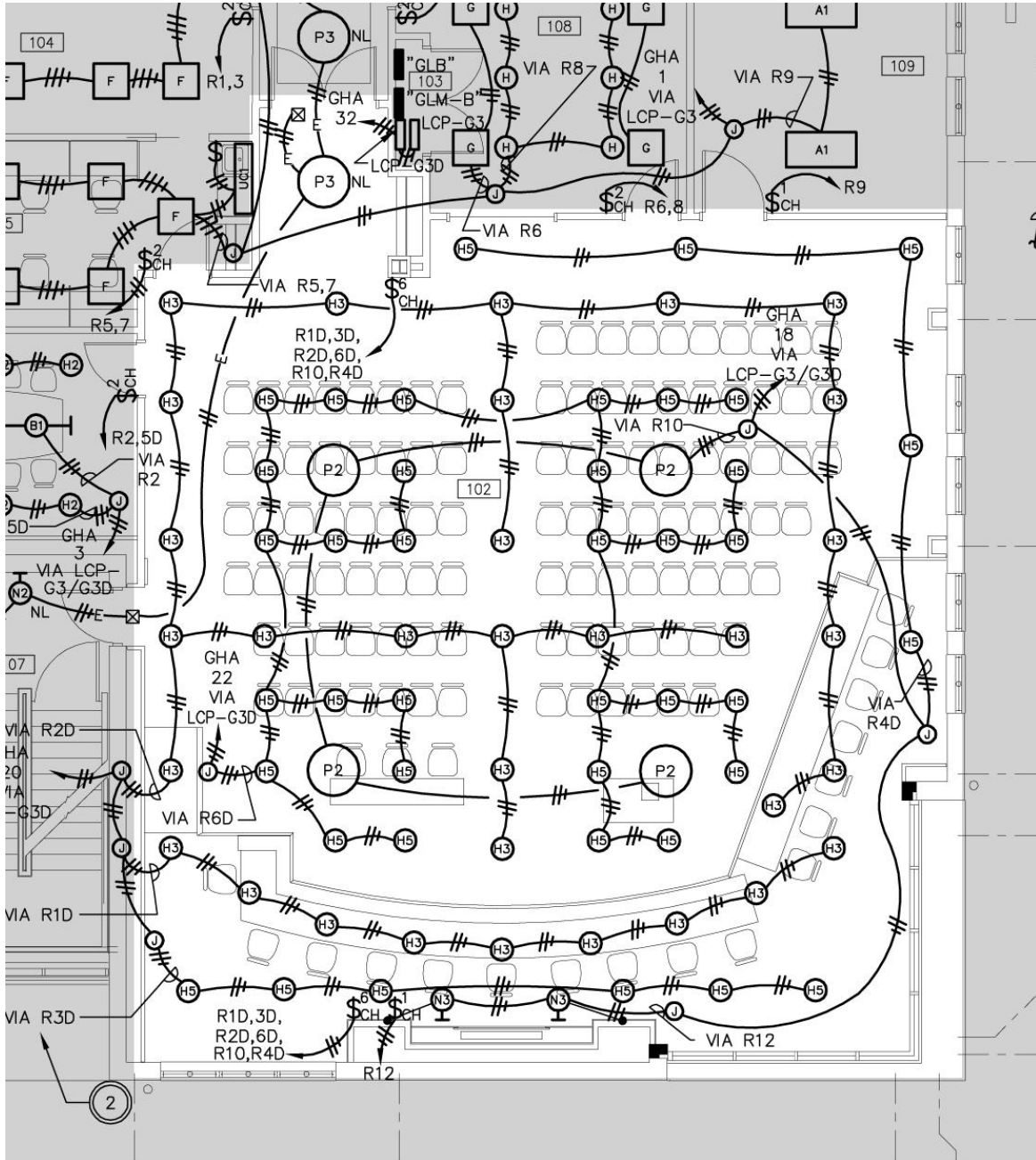
B. Existing Lighting System Conditions

Description

The Council Chamber is a flexibly lit space with many options for dimming in multiple configurations. The building specifications say when one multiple lamp fixture is controlled by two relays on the same switch, one will take the luminaire to full output while the other will dim to 50% light output. The control in the Council Chambers allows for dimming of all perimeters direct and sconce luminaires as well as direct fixtures located on the drop ceiling above the audience. While the photometric distributions and fixture types in this space may not be very diverse, they function exactly as the space requires them to. The same decorative pendant type from the Main Lobby provides some indirect light to the recessed ceiling coves formed by the GWB drop ceiling grid. Detailed lighting hardware information is located below.



Council Chambers: Existing Lighting					
Spec. #	Mounting	Locations	Manufacturer Catalog #	Lamp Type	Description
P2	Pendant	Center of four ceiling covers in drop ceiling grid	Architectural Lighting: DP-A36-6TF42-OA-BN	6-CF42DT/E/835	36" bowl diameter x 11-1/4" bowl height, opal acrylic diffuser, 6-lamp and one 277V electronic ballast with less than 10% THD.
P3	Pendant	Center of entrance ceiling tile grid at elevation = 9'-4"	Architectural Lighting: DP-A30-4TF42-OA-BN	4-CF42DT/E/835	30" bowl diameter x 9-7/8" bowl height, opal acrylic diffuser, 4-lamp and one 277V electronic ballast with less than 10% THD. Brushed nickel finish.
H3	Ceiling Recessed	Drop Ceiling at elevation = 9'-4"	Zumbotobel Staff: CH-7-1H42CFT8B-D1-0D7429-SA-T	1-CF42DT/E/835	7-13/16" height x 7-1/16" wide with 7" open aperture, specular aluminum reflector, die-cast aluminum trim ring, 1-lamp, and one 277V electronic dimming ballast with less than 10% THD.
H5	Ceiling Recessed	ceiling in room next to North and South perimeter wall at elevation = 10'-4"	Zumbotobel Staff: CH-6-1H26CFTH8-D1-0D7429-SA-T	1-CF26DT/E/835	7-13/16" height x 7-1/16" wide with 6" open aperture, specular aluminum reflector, die-cast aluminum trim ring, 1-lamp, and one 277V electronic dimming ballast with less than 10% THD.
N3	Sconce	Behind council desk on South wall, elevation to bottom of fixture is 5'-5"	Shaper: 673-25-T5/2/14-277-SN-2PEVTB	2-F14T5/835	25" height, 8-2/4" width, wall sconce, satin nickel finish, two vertical trim bars and one 277V electronic ballast with less than 10% THD.



Council Chambers: Lighting Plan



C. Lighting System Design Criteria and Consideration

- Reference: IESNA Handbook, Lighting Design Guide: Conference Rooms
- Deviations from handbook recommendations are explained in individual sections
- Lighting criteria was derived from a combination of “meeting” and “video conferencing” sub sections of “conference rooms” due to the nature of the space.

System Control and Flexibility: Very Important

- The Council Chambers lighting system needs to provide flexible control so occupants can easily alter the appearance based on the current application.
- Different lighting requirements will need to be met when the space is unoccupied, while the audience is congregating for a meeting, and during a televised or non-televised event depending on the applicable visual tasks.

Appearance of Space and Luminaires: Very Important

- The Council Chambers is the most publically viewed space in the building because of frequent television exposure.
 - Some decorative fixtures are necessary to improve the look and feel of the space and reinforce architectural elements.
 - These luminaires should be formal in their appearance due to the official nature of activities taking place in the chambers.
 - Their construction should complement the more unique forms and materials of the architecture such as the drop ceiling.
- Functionally well done lighting design is rarely noticed because it does not distract from the visual tasks of the space.
 - General ambient lighting fixtures should go unnoticed yet function well in the various uses of the room.



Direct and Reflected Glare: Very Important

- Direct glare from the luminaires would decrease functionality of the space and cause presentation issues for the council as well as viewing issues for the audience, and must be prevented.
- Consider source/task/eye geometry to reduce reflected glare (veiling reflections) on the ceiling/wall mounted monitors and desk surfaces.

Surface characteristics: Very Important

- Characteristics of all surfaces need to be considered to improve both aesthetics and functionality.
- Specular surfaces must not cause reflected glare.
- Higher quality surfaces should be illuminated more than lower quality and plain surfaces.

Modeling of Faces or Objects: Very Important

- People will be the most viewed object during meetings, which is the primary use of the space, so they must be modeled by the lighting in an aesthetically pleasing way.

Color Appearance and Color Contrast: Important

- The appearance of both the space and council members is important for television
- Lamps should have a high CRI value (>80) for accurate color rendering and a low CCT value to compliment the wood tones through the space.

Day lighting Integration and Control: Important

- The space has two large windows located behind the council's desk as well as five smaller windows on the wall paralleling the audience's line of sight.
 - It should be simple for occupants to block sunlight through these windows with interior shades to reduce direct and reflected glare during conferences.
- Dimmable luminaires are necessary to increase sustainability



Flicker and Strobe: Important

- Flicker and strobe of the lamps would distract the council, so high quality lamps with a long and consistent lamp life should be selected.

Light Distribution on Surfaces: Important

- The vertical surfaces are made up of multiple material types with various textures.
 - Lighting the perimeter walls non-uniformly will bring out the materials aesthetic properties and direct attention to the ceiling, which is the most unique feature of the room.
- Horizontal surfaces above the task plane include an off white grid drop ceiling which forms four recessed areas above the audience.
 - These should be uniformly illuminated via indirect luminaires to compliment the architectural design but not distract from the spaces focal points.
 - Light distribution must also consider reflected glare from ceiling mounted monitors.

Uniformity of Light Distribution on Task Plane: Important

- Light should be uniformly distributed on all task planes to increase ease of visual tasks such as reading and writing.
 - This includes desk tops, as well as the audience.
 - Audience must be able to read hand outs

Luminances of Room Surfaces: Important

- The high quality finishes throughout the space must be enriched by the lighting design.
- Surfaces on the West (rear) side of the room should be at a lower luminance than the front of the room during conferences to guide attention to the council.

Point(s) of Interest: Important

- The city council must be the main focal point while meetings are taking place.



- The general audience still needs to be visible to the council, but should not be noticed by television viewers.
 - Proper luminance ratios must be considered.

Horizontal Illuminance: Important

- Lighting should achieve a horizontal illuminance of **50 fc** for common visual tasks.
 - Horizontal Illuminance may be lower at certain locations depending on the current application and related visual tasks.

Vertical Illuminance: Very Important

- Lighting should achieve a vertical illuminance of **30 fc** for common visual tasks.
 - This vertical illuminance is only needed during televised meetings.
- Lighting should achieve a vertical illuminance of **5 fc** for common visual tasks.
 - Common illuminance value when no meetings are in session.

Power Allowances: ASHRAE Standard 90.1

- For a conference/meeting/multipurpose space = 1.3 W/ft²

Control Requirements: ASHRAE Standard 90.1

- Automatic lighting shutoff
 - Because this is a conference/meeting room with multi-scene control, occupancy sensors are not required.



D. Evaluation and Critique of Existing Conditions

The existing design in the Council Chambers provides the flexibility the space needs. It highlights the distinctive architecture via two different sizes of pendent fixtures, then provides the necessary ambient light with recessed down lights.

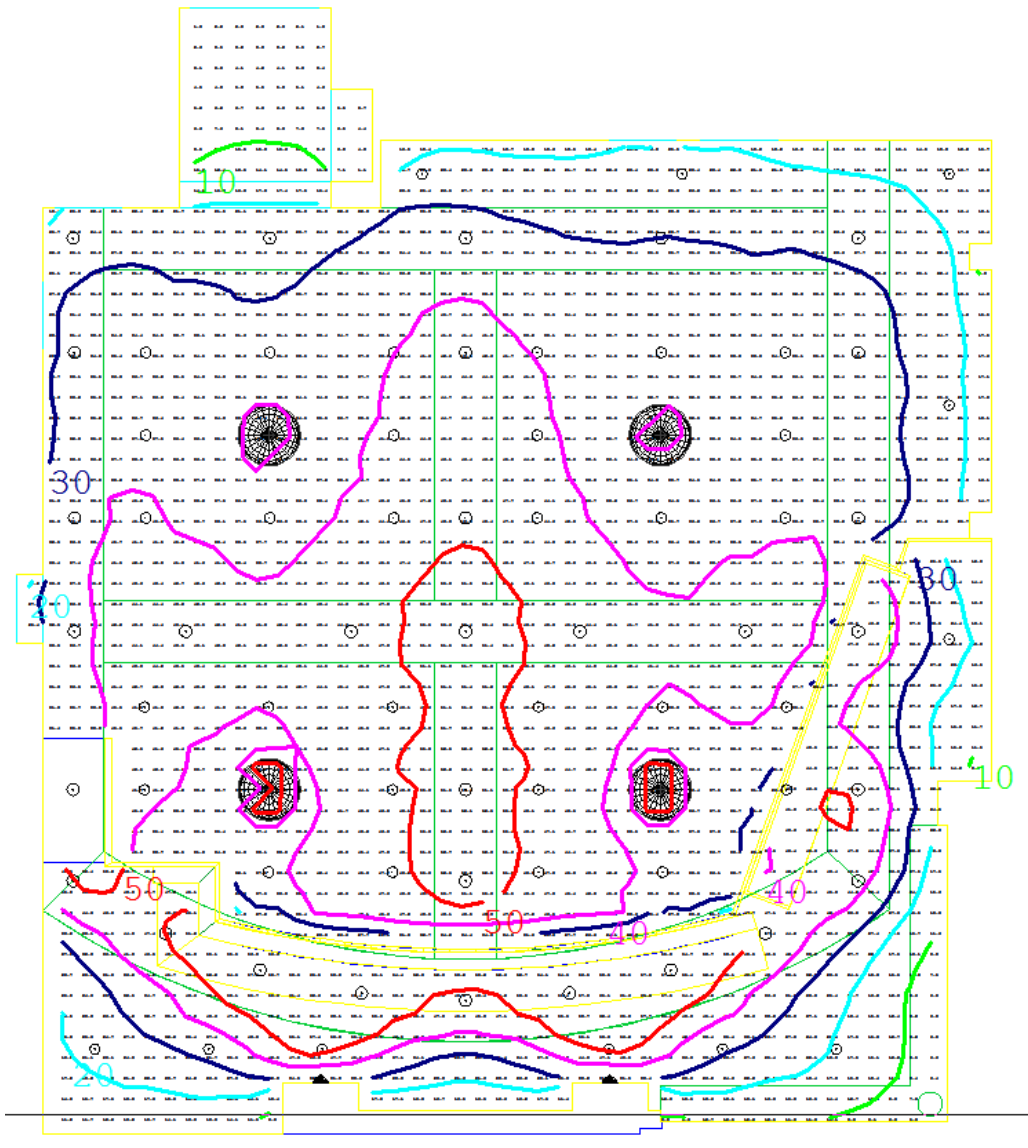
Council Chambers: Light Loss Factor Calculations For Use in AGI32								
Spec. #	Environment	Luminaire	CIE Classification	Cleaning Cycle	LDD	Ballast Factor	LLD	LLF
P2	Clean	Other	Direct / Indirect	12 Months	0.94	0.98	0.841	0.775
P3	Clean	Other	Direct / Indirect	12 Months	0.94	0.98	0.841	0.775
H3	Clean	Open / Unvented	Direct	12 Months	0.94	0.98	0.841	0.775
H5	Clean	Open / Unvented	Direct	12 Months	0.94	1	0.85	0.799
N3	Clean	Other	Direct / Indirect	12 Months	0.94	1.2	0.919	1.037

AGI Renderings:





Task Plane Illuminance:



Average = 35.39 fc

Maximum = 53.4 fc

Minimum = 1.1 fc

Uniformity Gradient = 6.45



V. Planning and Engineering

A. Spatial Environment

Space Category: Large Work Space

Description

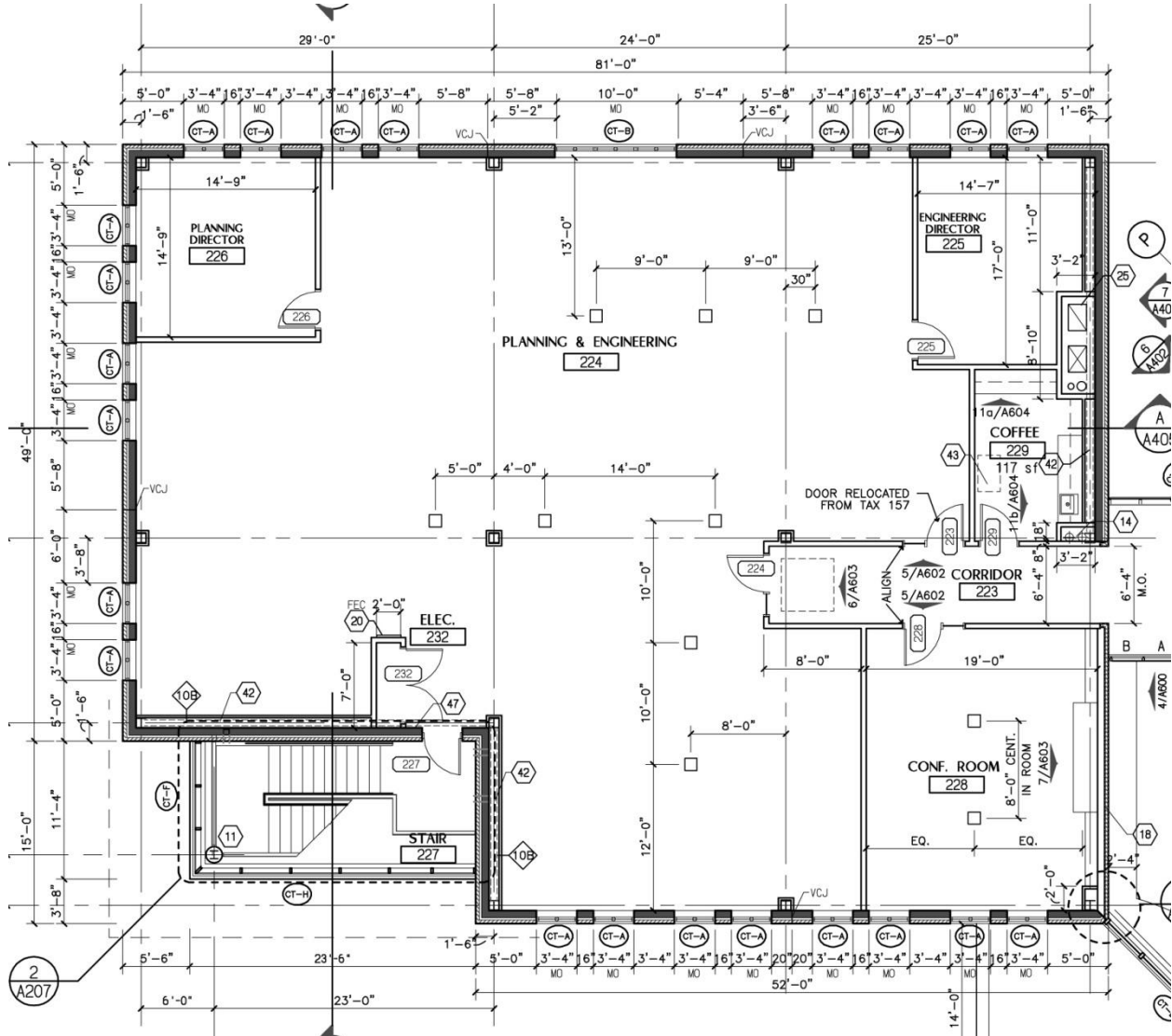
The Planning and Engineering department of the City of Green is a relatively simple space with no distinguishing features. It does have multiple windows around its perimeter so possibilities for the use of day lighting exist. The walls are 8'-4" high, and surfaces do vary; they are detailed in the table below.

Surface Materials

Planning and Engineering: Surface Materials				
Material Type	Manufacturer	Location(s) in Space	Color	Reflectance
Carpet	Bolyu / On the Edge	Floor	On the Edge #OTE24	0.2
Wood	Johnsonite: 4" strait base	Base of Wall	Burnt Umber #63	0.35
Painted GWB	Benjamin Moore	Most Walls: See Below	Waterbury cream #HC-31	0.79
Painted GWB	Benjamin Moore	East and West Wall	Great Barrington Green	0.49
Acoustical Ceiling Tile	Armstrong	Ceiling	Dune Second Look II No. 2722	0.8
Wood	Not Mentioned on Door Schedule	Doors	Wood	0.22
Glazing	Not Specified	All Glazing in Space	N/A	.44 (Transmittance)



Plans and Sections: Not to Scale



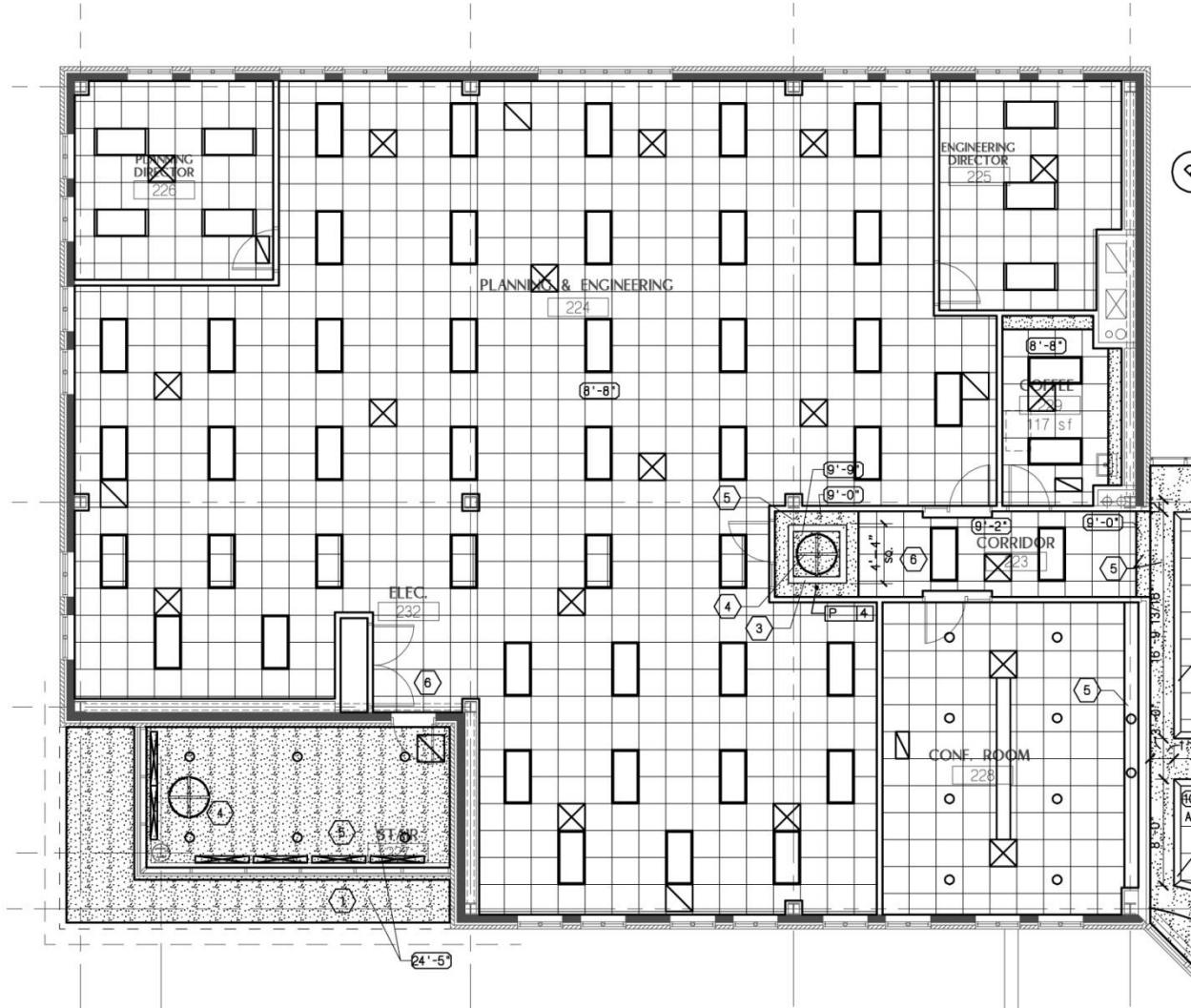
Planning and Engineering: Floor Plan



City of Green Administration Building

1755 Town Park Boulevard
City of Green, Ohio 44215

Brian Koze
Lighting & Electrical
Tech 1
October 05, 2010



Planning and Engineering: Reflected Ceiling Plan



B. Existing Lighting System Conditions

Description

The Planning and Engineering department is an open office that needs to remain configurable for future applications. Because of this, the existing lighting system uses a uniform layout of a single type of 2' by 4' fluorescent luminaire. To further increase the flexibility, the space is divided up into three main areas regarding control. The lower square, left side, and top square of the plans below are all switched separately, and able to be dimmed (stepped) to 50% light output if needed.

Planning and Engineering: Existing Lighting					
Spec. #	Mounting	Locations	Manufacturer Catalog #	Lamp Type	Description
A	Ceiling Recessed	Ceiling throughout space by 2' by 2' ceiling grid	Lithonia: 2RT5-54HO-MVOLT-GEB80S-LPM835P	2-FP54/835/HO	24" X 48" X 3-1/8" Volumetric recessed fluorescent T5HO, two-piece refractive system, linear faceted reflector, impact molded acrylic prismatic refractor with polymer light diffusing film, 2-lamp and one MVOLT electronic stepped dimming ballast.



C. Lighting System Design Criteria and Consideration

- Reference: IESNA Handbook, Lighting Design Guide
 - Offices – Open Plan Office – Intermittent VDT Use
- Deviations from handbook recommendations are explained in individual sections

Luminances of Room Surfaces: Very Important

- IESNA recommends wall luminance values of at least 30 to 100 cd/m² for office work spaces.
- The main goal is to reduce luminance contrast between surfaces, while still maintaining a slightly higher luminance on the work plane or task.
 - The perimeter of the general lighting system must be located close to the perimeter of the room to increase wall luminance.

Direct and Reflected Glare: Very Important

- Direct glare from the luminaires needs to be avoided by choosing proper fixtures for the application.
- An open office needs to be configurable, therefore a uniform series of fixtures is recommended.
- Reflected glare is difficult to predict when designing for a space without a furniture layout.
 - Task lighting must be considered when laying out furniture.

Shadows: Important

- Shadows must be avoided by illuminating the space uniformly, as this open office needs to be reconfigurable.

Appearance of Space and Luminaires: Important

- The overall appearance of the office should reduce visual clutter.
- This space is an office, so uniformity is important as to not distract employees.



- Luminaires should be in line with the space and each other.

Surface characteristics: Important

- The lighting must take into account that all surfaces the space will eventually contain are not known.
- Recessed lighting is recommended because the specified ceiling tile has a high reflectance value, which will reduce luminance contrast between the ceiling and the luminaires.
- Wall surfaces are matte, and colored.
 - These lower reflectance value colors can maintain visual interest.
 - Choose lamps of a high CRI.

Color Appearance and Color Contrast: Important

- The appearance of both the space and employees is important for moral. This space has two different non-white paint colors, and if they are rendered well the atmosphere of the work environment will be more psychologically pleasing.

Day lighting Integration and Control: Important

- I am deviating from the IESNA guide, which lists this as “somewhat important”
- The space contains multiple large windows on three of the four walls.
 - This opportunity for daylight integration needs to be utilized.
 - Photoelectric controls or manual switching and dimming must accompany the daylight integration.

Flicker and Strobe: Important

- Flicker and strobe of the lamps would distract employees, so high quality lamps should be selected.

Light Distribution on Surfaces: Important



- The space is completely planar with no architectural elements, meaning a constant light distribution on these surfaces is important so distracting patterns do not occur.
 - Ceiling and walls should not have more than a 1:3 luminance ratio

Uniformity of Light Distribution on Task Plane: Important

- Distracting patterns must be avoided by selecting and arranging luminaires to provide a uniform general illumination level on the work plane (2'-6").
- Focus on luminaire spacing and photometric distribution.

Horizontal Illuminance: Important

- Lighting should achieve a horizontal illuminance of **50 fc** for common visual tasks.

Vertical Illuminance: Important

- Lighting should achieve a vertical illuminance of **5 fc** for Orientation and simple visual tasks.

Special Considerations: Somewhat Important

- The open nature of the office means that the general lighting needs to accommodate any possible arrangement of furniture.
- Since fluorescent lamps and ballasts will most likely be selected for their efficiency, acoustics must be considered as buzz from the luminaires would distract employees.

Power Allowances: ASHRAE Standard 90.1

- For an office-open plan = 1.1 W/ft²

Control Requirements: ASHRAE Standard 90.1

- Automatic lighting shutoff
 - Interior lighting in buildings larger than 5000 SF shall be controlled with an automatic control device to shut off building lighting in all spaces.
 - Scheduled time of day based device.

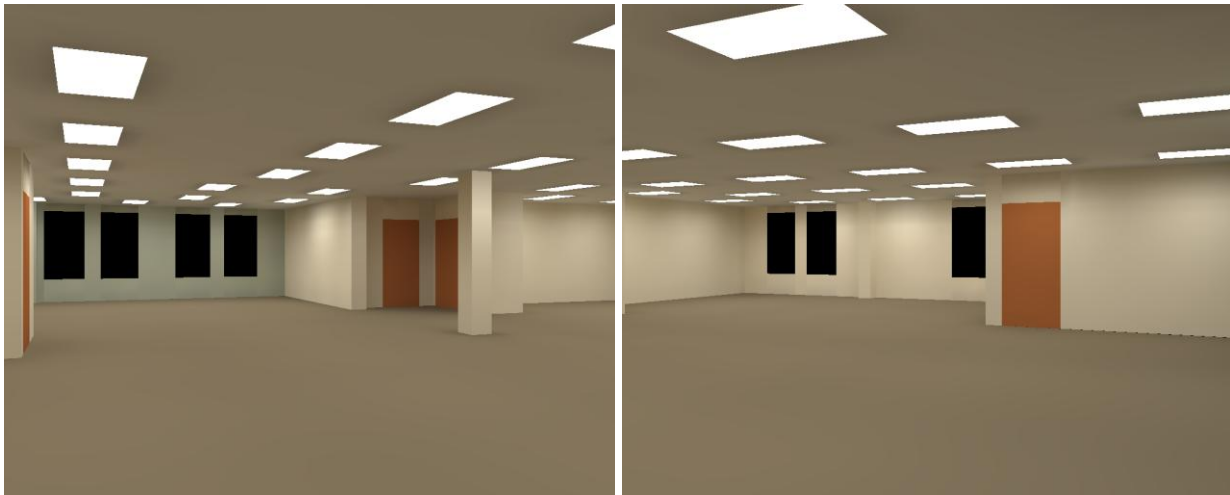


D. Evaluation and Critique

The uniform luminaire layout combined with the option to dim makes this space very flexible. Upon performing AGI32 calculations, it was clear that at 100% light output this luminaire provided too high of an average illuminance. After lowering the light output to 50%, average illuminance values dropped to around 40 fc. The fixtures are also located near the perimeter which increases wall luminance and decreases luminance contrast throughout the space.

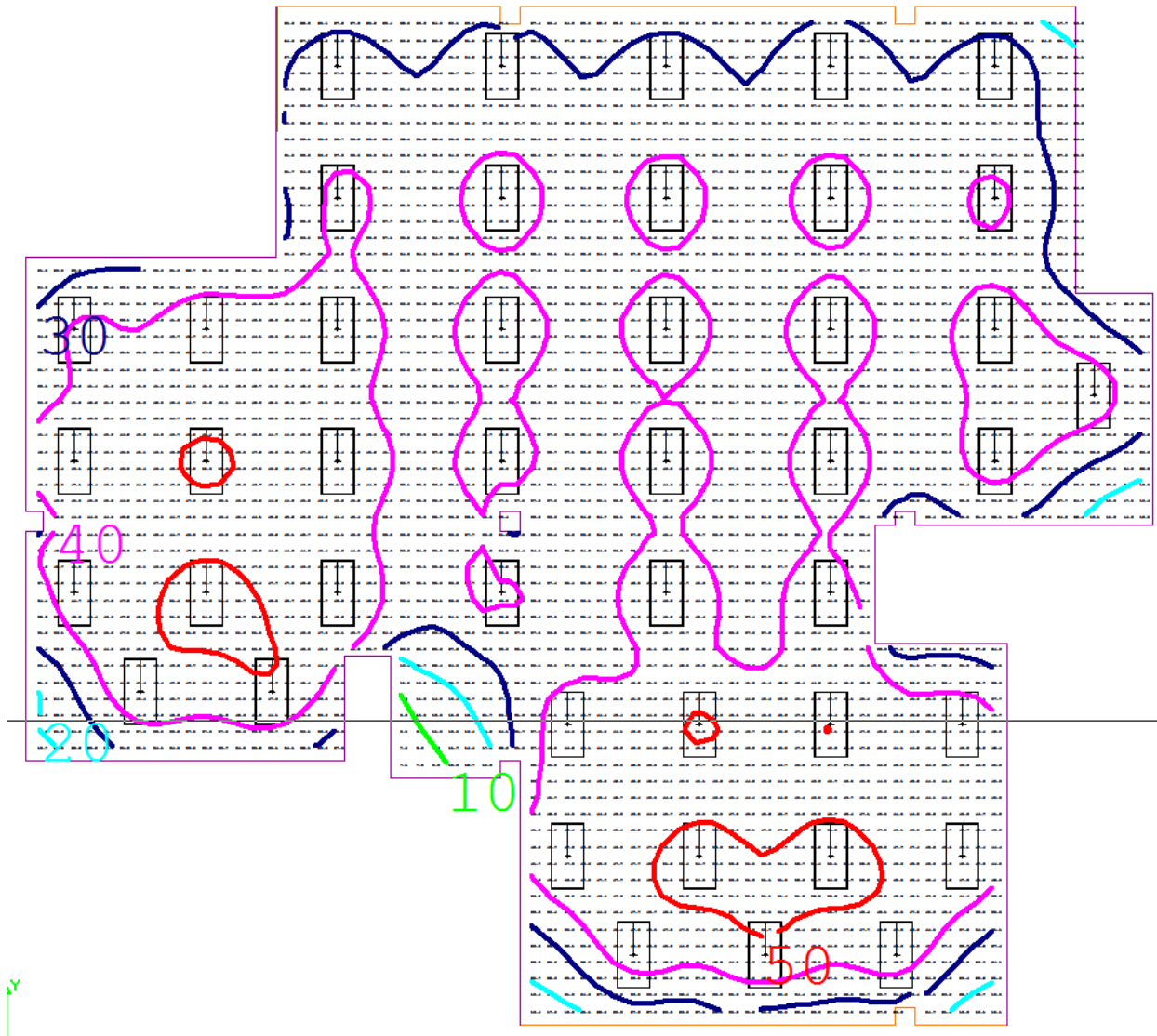
Planning and Engineering: Light Loss Factor Calculations For Use in AGI32								
Spec. #	Environment	Luminaire	CIE Classification	Cleaning Cycle	LDD	Ballast Factor	LLD	LLF
A	Clean	Other	Direct	12 Months	0.94	0.8	0.93	0.699

AGI Renderings





Task Plane Illuminance at 50% light output for all switches:



Average = 38.72 fc

Maximum = 55.1 fc

Minimum = 7.1 fc

Uniformity Gradient = 1.60