Executive Summary

This spring semester lighting depth submission includes the lighting design from design considerations to final layout and circuiting for the first floor open office and the auditorium in the Geisinger Center for Health Research and Rural Advocacy (CHHRA). The overall lighting design for the space was based on a stream line, linear concept much like the highway to success and medical advancement.

The two spaces included in this report are very different in requirements. The open office is for employees only and is meant to be visually clear and to allow occupants to feel comfortable and productive. The immense amount of daylight in the space requires peripheral lighting in order to balance the streams of sunlight. An integrated lighting system was employed which incorporates automated Lutron window shades with photosensor controlled dimming pendants over the work stations. The rest of the space has on/off lighting which includes compact fluorescent downlights over the corridor, and a Litecontrol wall slot recessed fixture which accents the North wall. A Lutron GP dimming panel was used to control the lighting and the shade system in this space.

The auditorium is a more public space where visitors to the building may attend a lecture or presentation. This space is unique in shape with an ellipsoidal design and is also in need of lighting scene flexibility. Color rendering and facial modeling are crucial in this space where most of the attention of the audience will be towards the speaker. Again, a GP Lutron dimming panel was used to control the space along with the Grafik 4000 system. There is no daylight in the space, so shades were not necessary. I employed a combination of both halogen adjustable recessed lighting over the audience, and fluorescent wall wash in the ellipsoidal cove around the perimeter. Rectangular downlights were used over the stage area and in the back of the auditorium to add additional light. A recessed adjustable halogen downlight is used as a speaker key light at an optimum 45 degree angle so that the speaker's face is clearly lit. All of the lighting components in this space are dimmed and controlled in separate zones to allow for maximum flexibility.

There is still a good amount of improvement that needs to be done on the design for these spaces included fixing some details in the high quality AGI renderings.

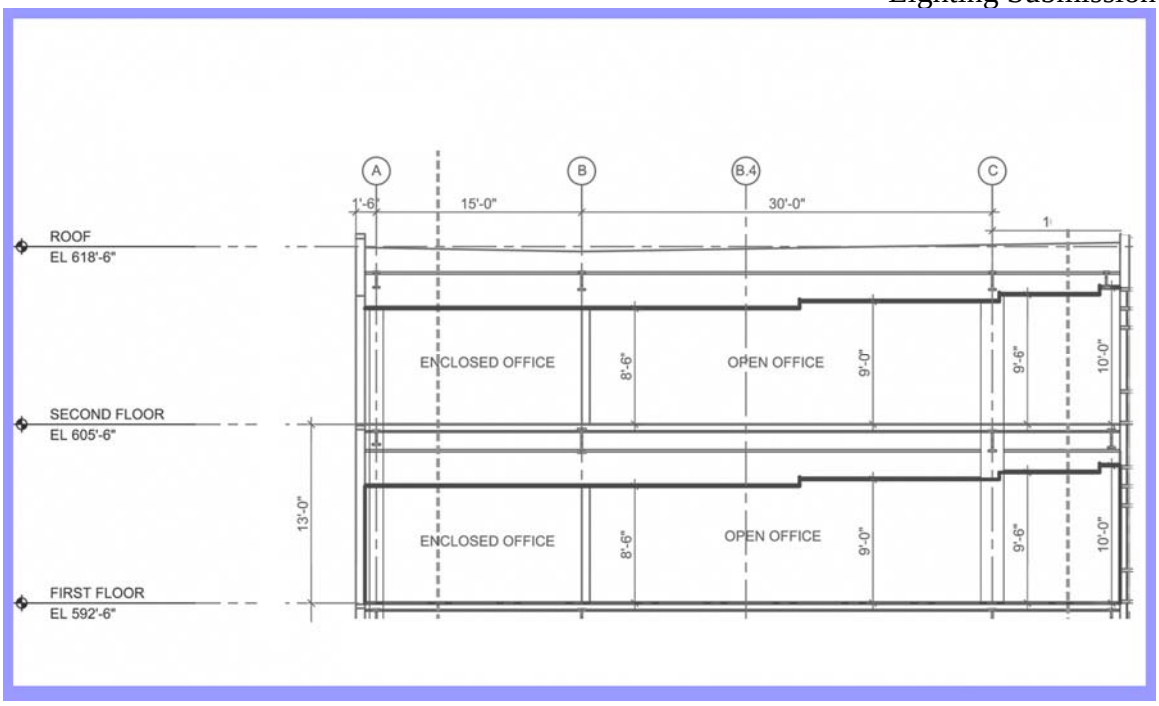
Open Office

Introduction

The open offices are located on the west side of the building one the first and second levels along the south facing glass curtain wall. The office is surrounded by private offices and conferences rooms on the remaining three sides. This space is designed to provide an open and comfortable work environment for thirty Geisinger Health Research employees along with amble room for file storage on each of the two identical floors. As shown in the figure below, the office is laid out with the filing storage areas acting as a buffer between the workstations and the glass façade. The file storage areas are surrounded by partial height drywall partitions which add to the daylight buffer. The row of cubicles farthest from the glass façade has moveable glass wall enclosures along with door, acting like a private office.

Open Office Existing Floor Plan

As seen in the following figure, the south facing elevation shows a glass floor to floor height of ten feet. As you move back through the space, the ceiling steps down in six inch increments from ten feet to eight and a half feet due to plenum height requirements for mechanical equipment.



Open Office North-South Elevation

Architecturally, a cool color palette was used for the interior design of the space. Green carpeting along with green paint and fabric accent wall paper were used along the wall of the private offices. Below are images of the materials and typical reflectance values of the space.

The design intent of this space was to really integrate the natural light and the electric light to create a productive and stimulating working atmosphere. The south facing glass façade not only provides a nice view of the surrounding Danville town, but it also creates an uncomfortable amount of glare and heat gain in the space. My goal for this space was to harness the negative aspects of the daylight and create a more positive integration of the natural light into the space.

Providing adequate light levels on the work plane was one of my main focuses because improper levels can create visual strain. Creating a lighting environment where the electric light alone provides ideal illuminance levels on the horizontal plane was my first goal, and then combining portions of the electric light with the incidental daylight to still create illuminance levels within the acceptable range was my second.

Before any schematic design could begin, the following critical design elements were considered:

Direct Glare:

Glare from the luminaires can be a problem for employees working at their computers. It is important to limit light output at the middle downward angles that can be an issue to employees in a seated position. Using louvers can lower the high contrast between lamp and luminaire that causes direct glare. The south facing façade is a glass curtain; direct sunlight will be entering the space and can cause glare especially in the winter months when there are lower sun angles. The sunlight should be managed with the use of glazing, blinds, or shades to control the direct sunlight.

Part of the reason the glass is such a glare issue is because of its high luminance. The exterior sky, ground, and sun seen through the glass will appear extremely bright compared to the other room surfaces, therefore; it can be a distraction to workers and will slow their productivity. The luminance of the lighting fixtures is also important in an open office space. Having a large luminous area on a darker ceiling will create a high level of contrast (greater than the 3:1 ratio suggested) and will not only be distracting but will also cause reflected glare in the VDT. Having a light colored ceiling can help with the contrast between ceiling and luminaire.

Daylight Integration:

As mentioned briefly above, the integration of daylight into the design of the space is a crucial element to the open office's success. The lighting design will be greatly affected by the luminance of the glass surface, the illuminance levels provided by the daylight through the open office, and the direct sunlight that may reach the cubicles. This open office has a circulation space directly adjacent to the glass which will work as a buffer for much of the direct sunlight. However, this still will not do enough to prevent glare issues.

Reflected Glare:

Reflected glare is a major issue for VDT use in an office. This is a computer intensive space and must be treated as such. The daylight in the space can cause the computer screen to be a complete reflection of the surroundings making the material on the screen invisible. The orientation of cubicles is important to consider. Reflected glare can also occur on the desktop surface. Under cabinet lighting/task lighting can cause reflected glare on glossy desk surfaces, or on reading/writing material.

Shadowing:

Shadowing is an issue in this space because of the large number of cubicles and partitions that are blocking light from reaching the work plane. Placement and distance between luminaires is important to assure an even distribution of lighting on all work plane surfaces. Task lighting can help with this issue and create a more uniform surface which is very important for reading and writing tasks.

Suggested Illuminance/Luminance Values:

The suggested vertical illuminance for the open office space is category B- 5 footcandles. The suggested horizontal illuminance for the open office space (with intensive VDT use) is category D- 30 footcandles. For VDT's, the luminance ratio between screen and paper task should be 3:1. For screen to far background surfaces it should be 10:1. For task lighting the suggested horizontal illuminance is 50fc. This can be achieved using under cabinet lighting.

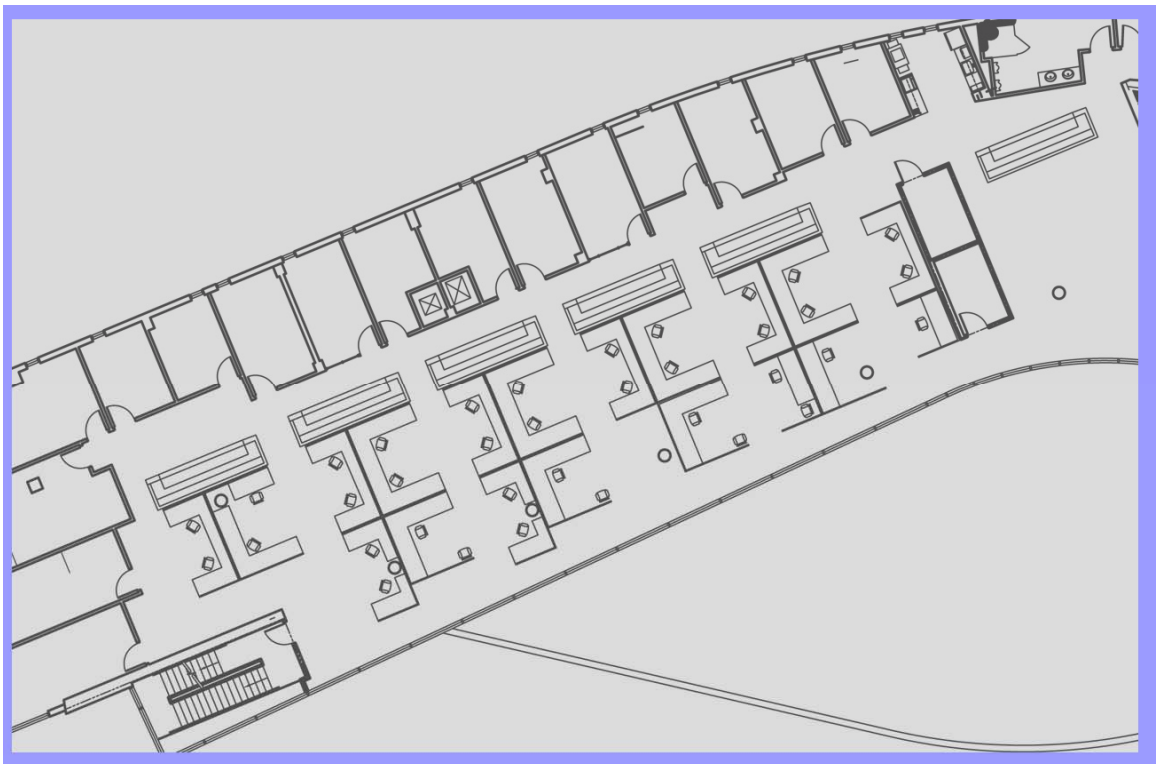
Power Density Allowance:

The power density requirement for an open office space, in accordance with the ASHRAE 90.1 Space-by-Space method, is 1.1 Watts per square foot. An additional 0.35 Watts per square foot is allowed for lighting that is specified to be installed to meet requirements of VDT's as the primary viewing task. An additional 1.0 Watts per square foot is also allowed for accent lighting systems such as the installation of wall sconces or highlighting artwork.

Schematic Design

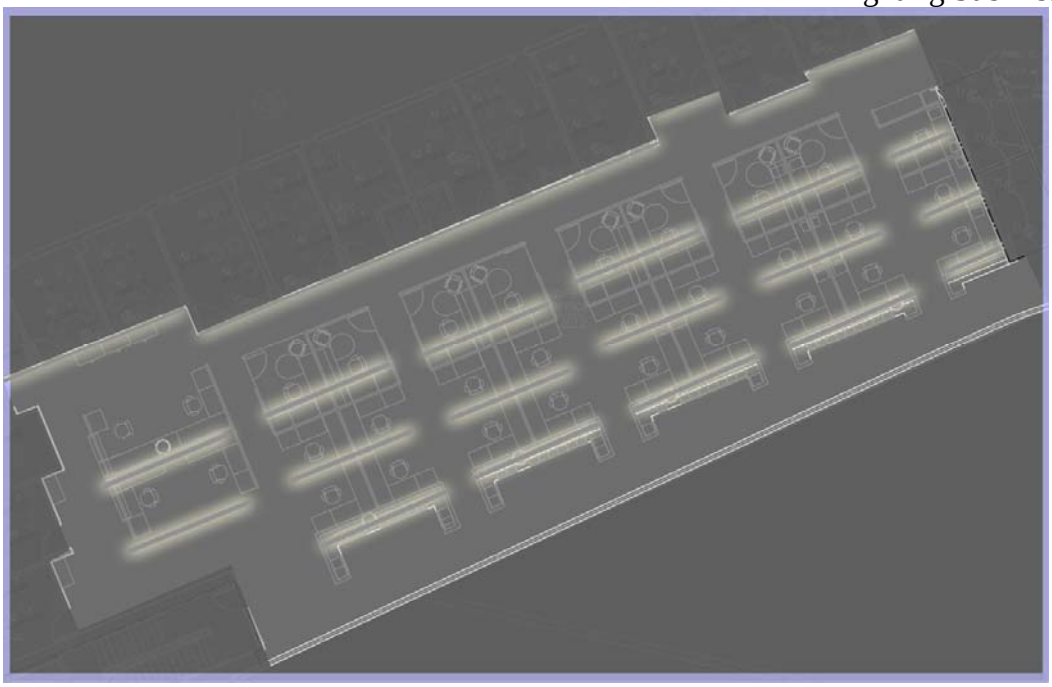
When I first decided on using the open office as one of my lighting redesign spaces, I knew I wanted the space to feel comfortable but at the same time task oriented. This is a work environment, and after all, no one wants employees to feel too relaxed while they are on the job. Cool colors and non-uniform light patterns came to mind when I pictured a work atmosphere that I would like to be in everyday. The south glass façade provides a nice view of the exterior and also allows daylight to enter the space, helping create non-uniform light patterns in the space. I also felt it was important that the lighting match the overall design of not only the building, but also the mission state of the Center for Health Research and Rural Advocacy as a group. Streamline, clean edged design came to mind.

After thinking about possible lighting solutions, I realized that part of really integrating the daylight into the space would be to rearrange the furniture to correspond with the advantages of daylight. Having the filing areas closest to the glass façade took away a large part of the exterior view from the cubicles. The high partitions (six feet) also blocked a great deal of useable daylight from reaching the workplane. In terms of required illuminance levels, reading and distinguishing between files takes much less light than required for extensive reading and writing. By rearranging the office, and placing the file storage farthest away from glass façade, it allowed the cubicles to sit closer to the window and wreak more of the benefits from the natural light.

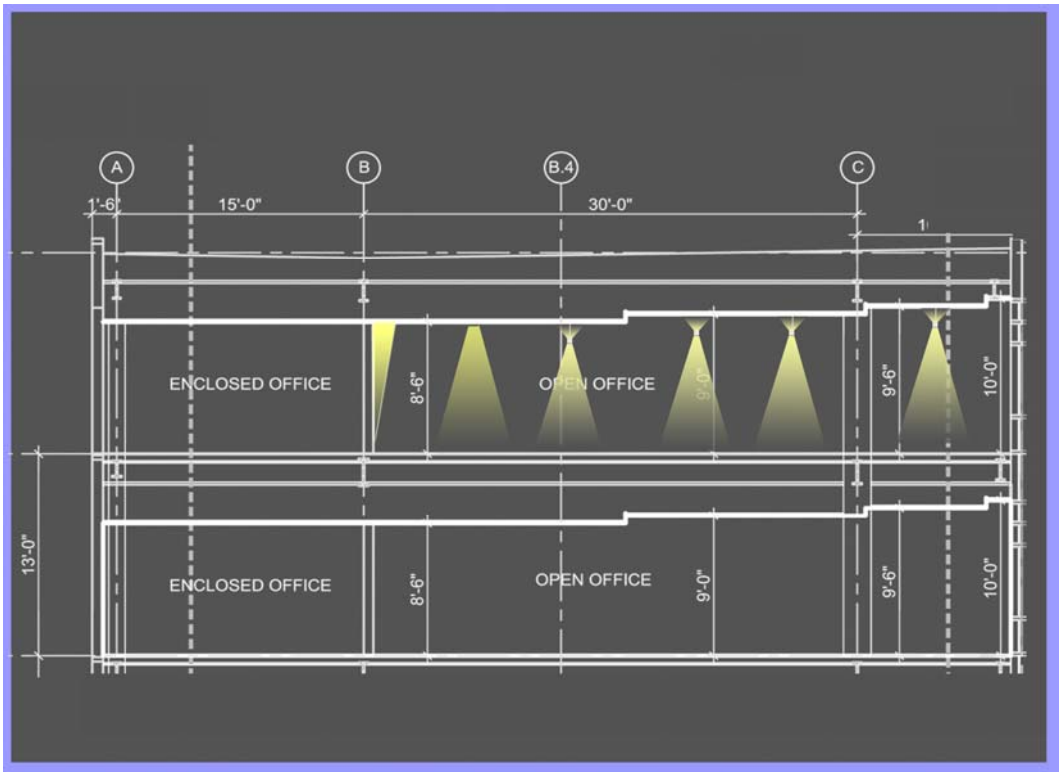


Open Office New Furniture Layout

Below are a few images of my original lighting concept for the space. I wanted to use long groups of linear pendants which would run parallel to the glass façade for optimum daylight integration. I wanted to lightly wash the back wall to create the feel of a brighter space, even though the walls along the private offices are the darkest color and shortest in height of the open office. My goal was to add a wall washing cove along the wall to balance the extreme amount of visual brightness from the glass façade. I also wanted to create a different lighting concept for the filing cabinets.



Open Office Lighting Concept Sketch: Plan View

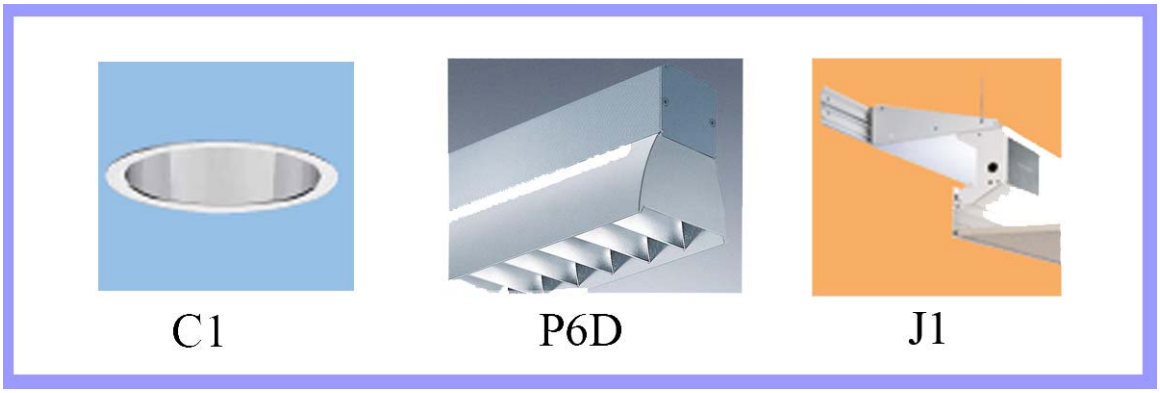


Open Office Lighting Concept Sketch: Elevation View

Lighting Layout

Following figures show plan views and long with information schedules of the luminaires I chose for the space. In order to provide maximum efficiency for the lighting system, T5HO fluorescent lamps were incorporated into the design. Linear pendant mounted fluorescent fixtures were used over the workstation portion of the open office in mainly twelve foot sections. Also, a linear wall slot wall wash was incorporated into the ceiling tile along the private offices' wall. Because of the additional lumen output of the T5HO lamp, I felt the wall slot washed the North wall more effectively with the T8 configuration. The P6D pendant fixture will be dimmable while the C1 downlight and J1 wall slot will be purely on-off.

Open Office: Lighting Plan



Open Office: Luminaire Images

TYPE	DESCRIPTION	MANU	CATALOG NUMBER	LAMP			BALLAST		V	MOUNTING
				NO.	TYPE	WATT	NO	TYPE		
C1	8" DIAMETER APERTURE TWO LAMP COMPACT FLUORESCENT DOWNLIGHT WITH CLEAR ALZAC REFLECTOR, PARABOLIC CROSSBAFFLES AND WHITE PAINTED FLANGE	GOTHAM LIGHTING	AFZ-2/26DTT-84A-277-GEB	2	PL-C 26 4100K 82MIN CRI	26	1	ELECTRONIC	277	RECESSED
J1	LINEAR CONTINUOUS RECESSED PERIMETER SINGLE LAMP FLUORESCENT WALL WASH LUMINAIRE WITH STEEL HOUSING, LOUVER AND INTERNAL ASYMMETRICAL REFLECTOR.	LITE-CONTROL	20-1-*-T8-CWM-ELB-PR 277	1/ SEC	F25T8/F32 T8 4100K 82 MIN CRI	25 32	1	ELECTRONIC	277	RECESSED WALL SLOT
P6D	4" WIDE LINEAR FLUORESCENT DIRECT PENDANT MOUNTED LUMINAIRE WITH MATTE PARABOLIC BAFFLES AND INDIRECT UPLIGHT COMPONENT	ZUMTOBEL	RX5-CI; RX5F-1545-4-DE2-EC2	1/4'	F54T5HO 4100K 82MIN CRI	54	1	ELECTRONIC ECO-10 DIMMING	277	PENDANT (1'-0" FROM CEILING)

Open Office: Luminaire Schedule

Note: Lamp and Ballast catalog numbers and specifications can be found in the appendix

OPEN OFFICE LIGHT LOSS FACTORS						
TYPE	CATEGORY	LLD	BF	RSDD	LDD	**TOTAL**
C1	4	0.86	1.0	0.98	0.89	0.75
J1	3	0.95		0.98	0.87	0.00
P6D	3	0.95	1.0	0.96	0.87	0.79
RCR=1.46						
ASSUME A TWO YEAR CLEANING CYCLE AND A VERY CLEAN ENVIRONMENT						

Open Office: Luminaire Light Loss Factors

Daylight Controls and Shading System

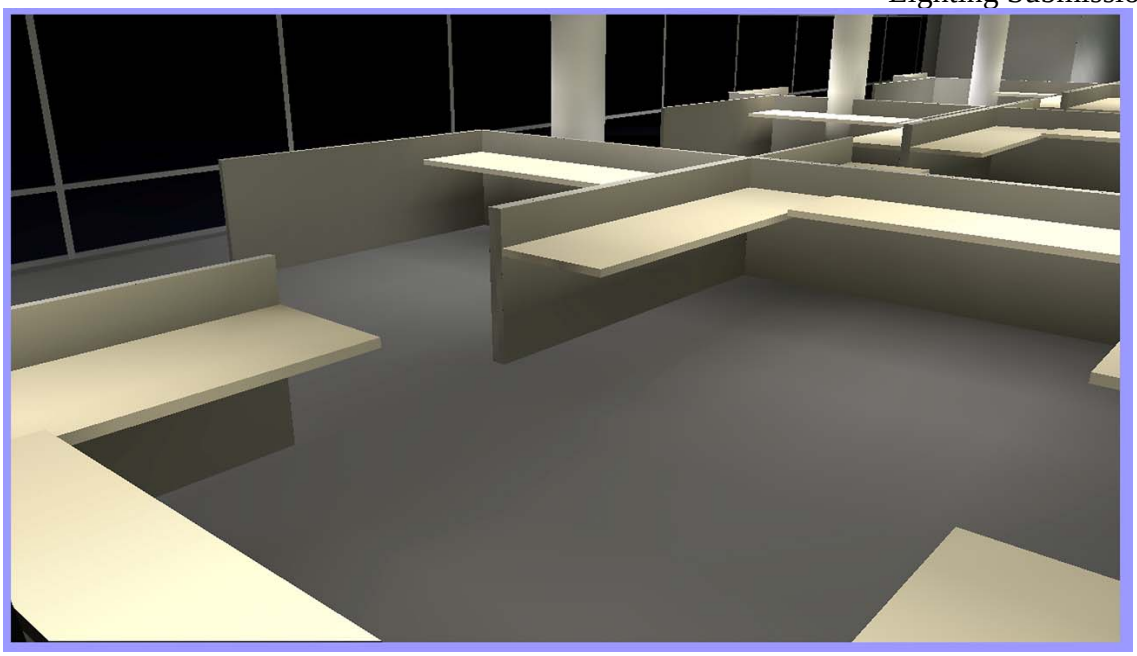
Because of the excessive amount of daylight entering the space, I realized the importance of the incorporation of an automated window shading system. Because of the shorter distance between the cubicles and the glass façade, a perforated shade was added in order to block direct sunlight from reaching the workstations and causing discomfort to the employees. The shades are Lutron Electronics SINOIX QED quiet shades which a new motor technology so the only sound you hear from the moving shades is the unfolding fabric. This new sound technology prevents the shades from becoming an annoyance to anyone working in the vicinity. The shades would move automatically in accordance to the time of day and the position of the sun in the sky due to the time of

year and the building location. I still need to work out more of the details of this integrated system, and I am waiting to hear back from Lutron for some input.

The next step to the total integration of the daylight into the space was to use a photosensor to control the light output of the electric light based on the daylight. The linear luminaires over the workstation are all connected to electronic dimming ballasts. The circuiting of the pendants in the space depends on which luminaires the photosensor will be controlling. A SPOT daylight analysis will be conducted during the semester; however, according to Lutron's published information on the integration of photosensor lighting control and automated window shading system, a proportional control photosensor should be mounted on the ceiling, pointed at the window at a distance equal to the window's height. In this instance, that would be a distance of 10 feet from the window. Until I complete a more detailed daylighting analysis, I placed the photosensor in the middle of two of the work stations as the critical point. Although this will not be the lowest horizontal illuminance in the space, I do not want the photosensor to be over the walkways between work stations because the lighting system was not designed to put out 50 fc here.

AGI Renderings and Pseudo Color Images:

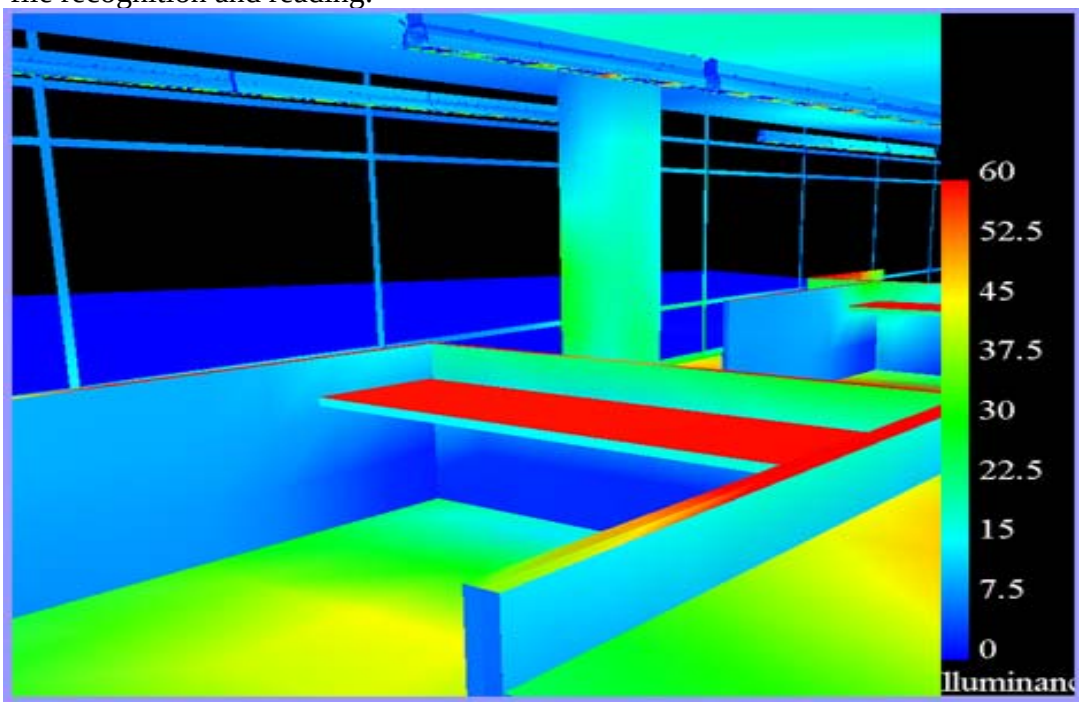
Below are rendered images of the open office space in AGI and also pseudo color images which give a better idea of the illuminance levels both vertically and horizontally in the space. As you can see from the rendered image, the majority of the light output from the pendants is over the desk are of the workplane with the darker areas in between being in the walk spaces between cubicles. The wall slot wall wash on the North private office wall helps to highlight the vertical plane and balance the daylight entering from the South side of the office.



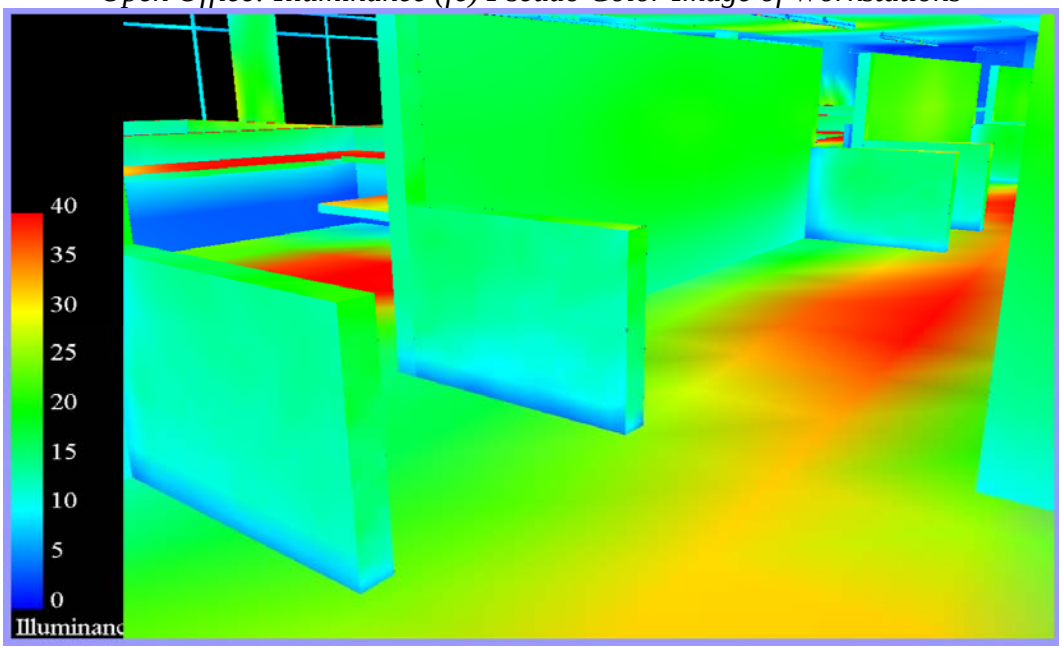
Open Office: Rendering of Work station (No daylight)
(this is NOT a high quality rendering, textures on carpet must be added)*

Open Office: Rendering of Workstations and Corridor
(this is NOT a high quality rendering, textures must be added, mesh levels must be lowered over the doorways, color bleed must be stopped, and lighting fixture objects must be edited).*

The pseudo color images show that there is plenty of light hitting the workplane of the cubicle stations with between 45 and 60 fc hitting all of the desks. The file storage areas have a vertical illuminance of between 20 and 25 fc which is in the optimal range for file recognition and reading.

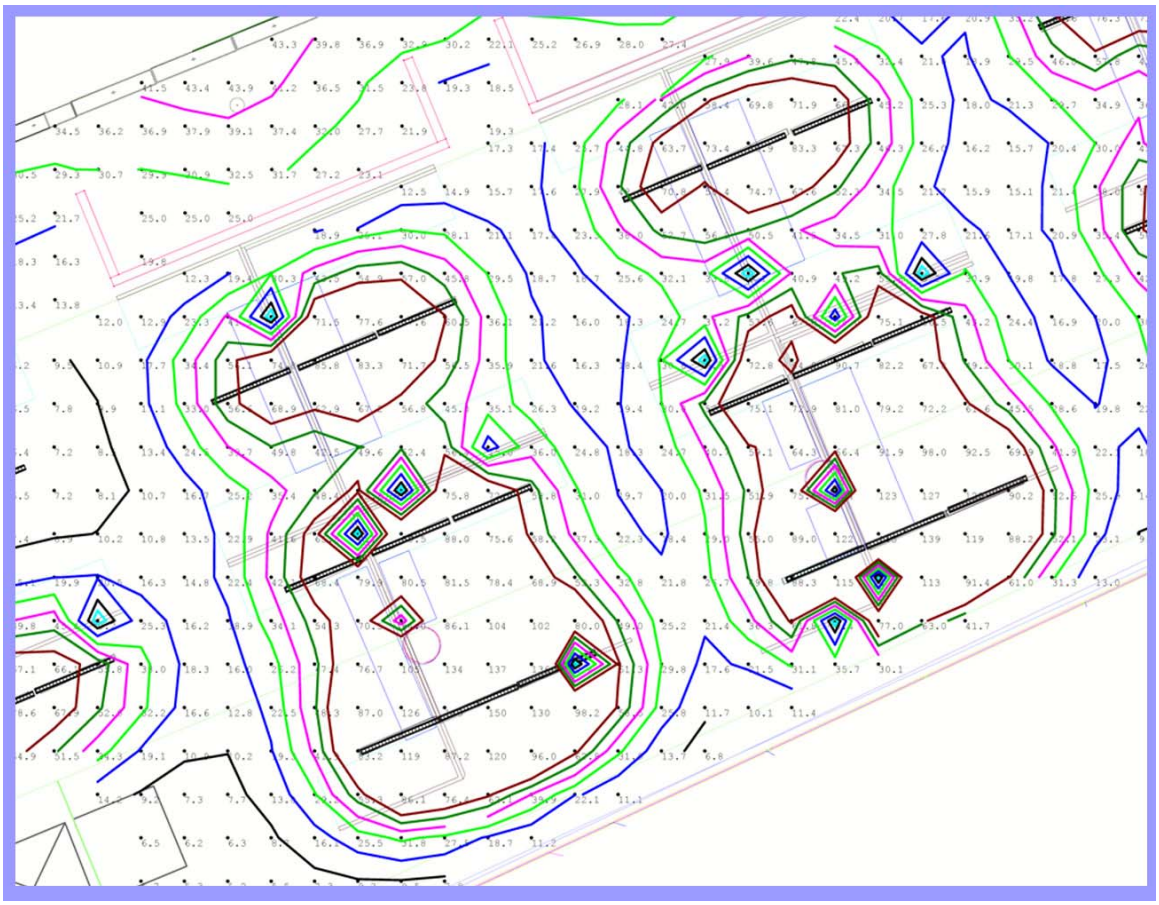


Open Office: Illuminance (fc) Pseudo Color Image of Workstations

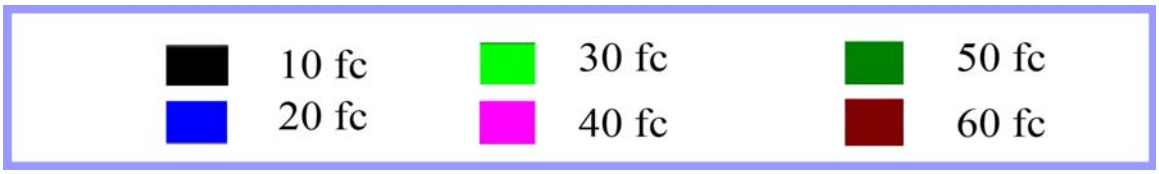


Open Office: Illuminance (fc) Pseudo Color Image of File Storage

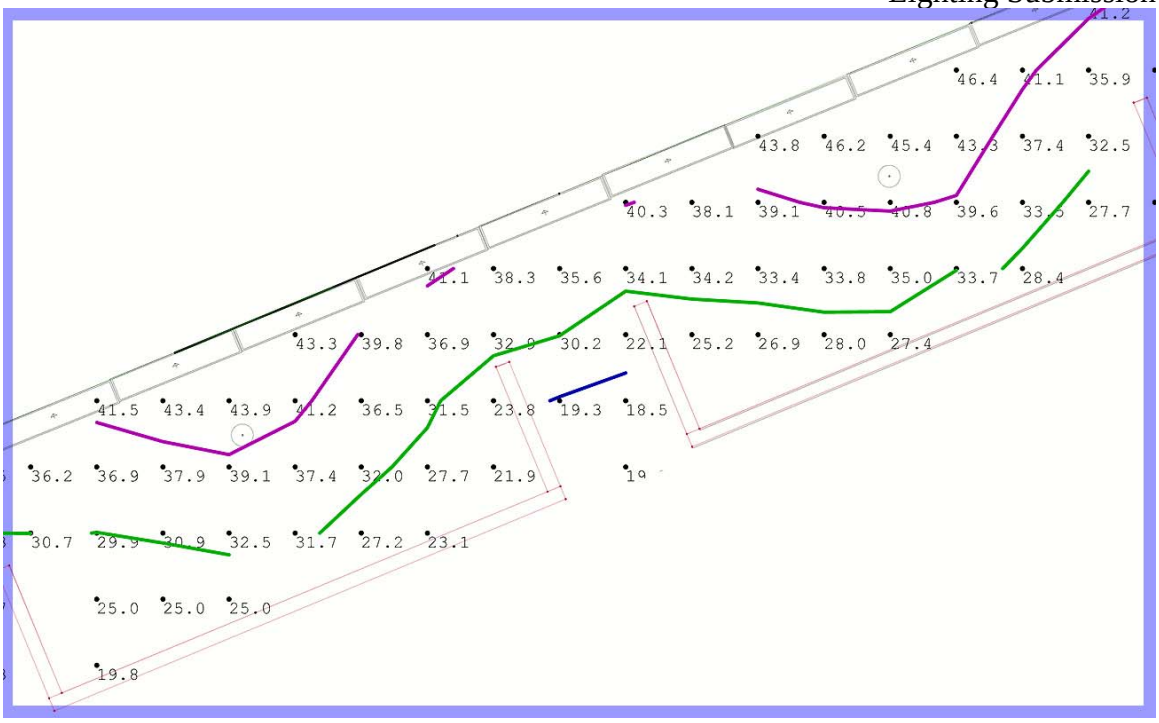
AGI Calculations



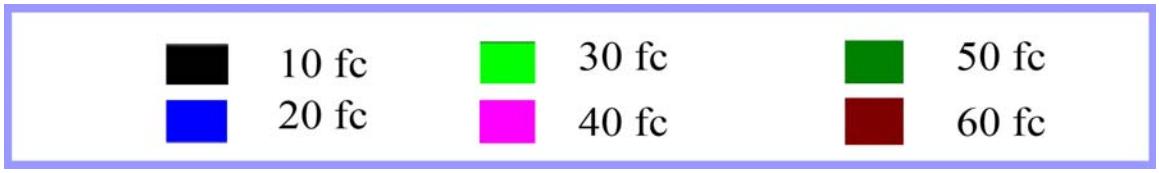
Open Office: Horizontal Illuminance (fc) on the workplane over workstations



Open Office: Illuminance Isoline color legend



Open Office: Horizontal Illuminance (fc) in the corridor and filing storage



Open Office: Illuminance Isoline color legend

Power Density:

As shown in the chart below, the power density for the open office lighting plan is 1.30 watts per square foot. The allowed value in accordance with ASHRAE 90.1 is 1.1 watts per square foot but in this instance I was able to include the additional 1.0 watts per square foot due to the accent wall slot lighting to highlight the artwork on the North wall outside of the private offices. With this added power allowance, the design is within the requirements. Also, the Zumtobel pendant fixture chosen for over the cubicles is a VDT compliant fixture, so the additional 0.35 watts per square foot for VDT fixtures would be applicable.

TYPE	NUMBER	INPUT W	TOTAL W
C1	7	51	357
J1	92	30	2760
P6D	45	65	2925
SQ FT	4633.6	WATTS	6042
POWER DENSITY		**1.30**	

Open Office: Power Density Calculation

Open Office Lighting Circuiting:

Because of the integration between daylight and electric light in the space, the Lutron Grafik Eye 4000 system along with the window shading system will be implemented in this space for controls. Preset wall station switches will be placed in the office for early morning and night time electric light output. The wall station unit will also have an override for the shading system, so that occupants of the space can move the shades up or down if necessary. The shades and the photosensor controlled lighting will run off of the Lutron GP dimming panel DMP-L1 and EDMP-L2 for emergency lighting.

For the shading system, the Lutron SVQ-10-PNL is required because a transformer is needed for the control of each of the EDU shade motors. Future details about this system and the proper equipment integration will be added to the final report when I hear more from Lutron representatives.

In my electrical depth I will be re-circuiting all of the lighting in the building from 120v to 277v; therefore, I will not be resizing the feeders to the panel boards at this time because I do not know all the existing loads yet. This is true for both the auditorium and the open office lighting designs.

Open Office Lighting Design Circuiting Plan

PANEL DMP-L1 : 277V						
DIMMER	ZONE	TYPE	CONTROL	LOAD (kW)	VOLTAGE (V)	LOCATION
1	a	FLUORESCENT	PC-1	2.9	277	OPEN OFFICE PENDANTS
2	b	FLUORESCENT	ON/OFF	2.7	277	OPEN OFFICE WALL SLOT
3	d	SHADES			277	OPEN OFFICE SHADES
4	d	SHADES			277	OPEN OFFICE SHADES
5	d	SHADES			277	OPEN OFFICE SHADES
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
		TOTAL LOAD (kw)		5.6		

Open Office Lutron GP dimming panel DMP-L1

In the dimmer panel schedule above, there is not a load listed for the Lutron shades because I do not have all the information yet as to how they are exactly powered and what the connected load is. There will be more details in my next submission. For all of the dimming panels, a 20A circuit breaker is used with 3#12 & #12G in 3/4"C. These numbers will be checked when final dimmer panel placement is decided upon and voltage drop calculations can be checked. This information is true for both the open office and then auditorium dimming panels.

PANEL EDMP-L1 : 277V						
DIMMER	ZONE	TYPE	CONTROL	LOAD (kW)	VOLTAGE (V)	LOCATION
1	c	COMPACT FL	ON/OFF	0.4	277	OPEN OFFICE DWNLTS
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
		TOTAL LOAD (kw)		0.4		

Open Office Lutron GP dimming panel EDMP-L1

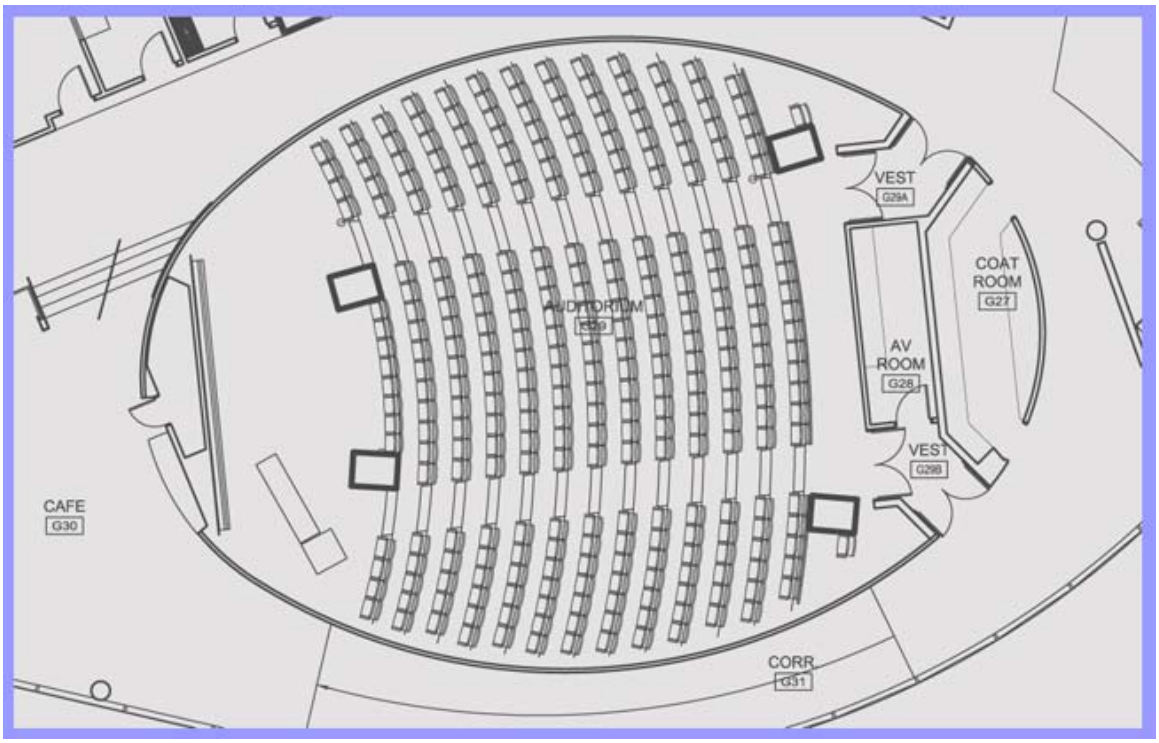
Conclusions:

Although more work is needed in the daylight integration study, I believe the combination of the dimming pendant fixtures and the automated window shades will provide a more comfortable work environment for CHRRA's employees and will also help with energy savings in terms of lighting and heat gain for the mechanical system.

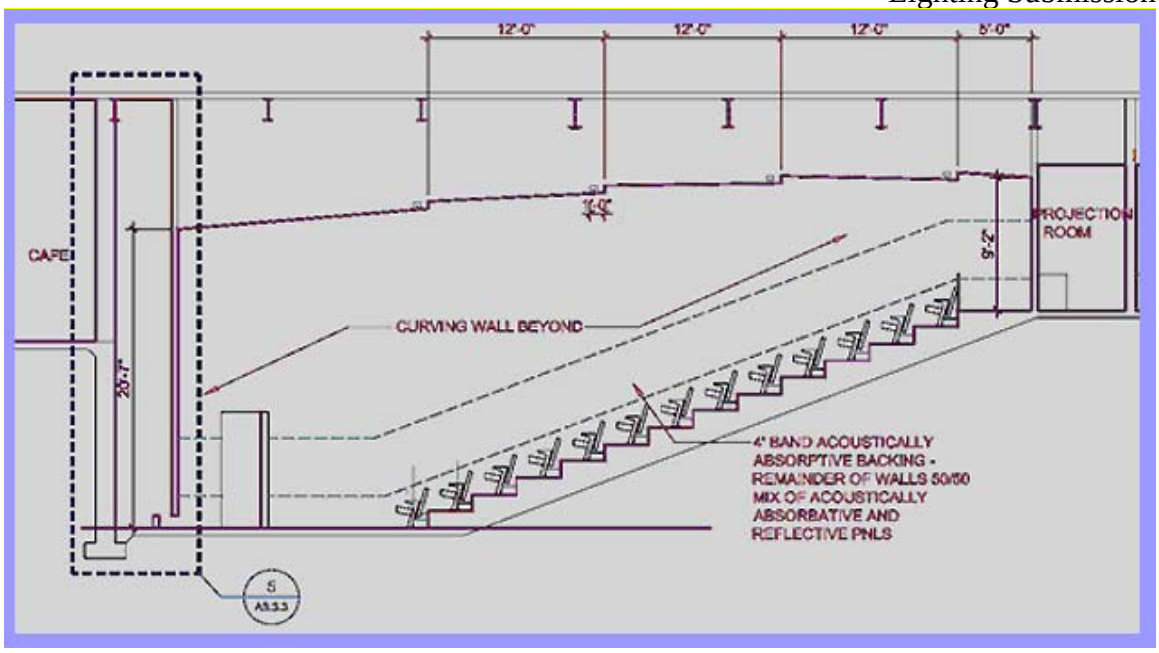
Auditorium

Introduction

The auditorium is located on the ground floor of the Center for Health Research and Rural Advocacy (CHRRA) directly adjacent to the double height lobby; occupants enter at the top of the space and then walk down the stadium seating to the projector screen and speaker area. The space spans vertically between the lower level and the ground floor. As seen in the image below, this unique space is ellipsoidal in plan view with an architectural cove built around the entire perimeter of the space. The space is equipped with over 400 auditorium seats with pull up desks, a front projection system, and a stage area for speakers to stand. There is a control room in the back of the auditorium where the projector hardware is located.



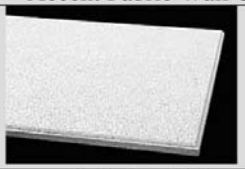
Auditorium Floor Plan



Auditorium Elevation (West-East)

A mixture of creams and greens were used for the interior color palette in this space along with a black curtain projection screen. Three varying fabric acoustical wall coverings were chosen for the curved side walls in this space bring depth and interest. The following chart shows the different materials and reflectances I took into consideration when designing the lighting solution for this space.

Room Surface Materials

 (p=0.08)	 (p=0.03)
Auditorium Commercial Carpeting	Auditorium Rubber Flooring- stairs
 (p=0.46)	(p=0.95)
Accent Fabric Wall Covering	Primary Wall Paint
 (p=0.85)	
Armstrong 2'x4' beveled acoustic tile ceiling	

I thought about the following design considerations for the auditorium before I began my schematic lighting concept for the space. These important issues helped to define the direction I would take in this specific area.

System Control and Flexibility:

System control and flexibility is very important in this space because it will be used for many different types of assemblies. This building houses the heath research department for Geisinger so presentations can range anywhere from completely professional on a scientific level, to educational for children. Different audiences cause a need for different lighting moods in the space. The speaker lighting, audience lighting, and any accent lighting should all be controlled separately and should be dimmable. There should be proper light levels in the audience for reading, and note taking. This room will also hold a front lit projection system for visual demonstration.

Facial Modeling:

Facial modeling and vertical illuminance levels are important for group discussion and presentations. When open discussion takes place, which is possible in this auditorium, both the speaker and the audience should be well lit vertically but also free from direct glare in order to stimulate conversation. It is also important to create a balanced lighting system in the front of the auditorium where both the presenter and the projector screen are located. It is important to front light the speaker but also to avoid lighting the screen to avoid contrast issues, reflected glare, etc. This is why luminaire selection is critical. Lamps must have a tight beam spread in the front of the space to avoid issues with the projector screen.

Fixture Selection and Materials:

Also, it is important to choose fixtures that match with the surrounding architecture and feel appropriate in the space. This is an area where visitors to the campus will come and it is important the auditorium reflect the hospital in a positive manner. The ceiling is also many different levels as it steps back from the stage up to the top of the auditorium. This coupled with the ellipsoidal shape makes it crucial to coordinate the fixture locations with the architects. Lamps should not be visible to avoid any direct glare issues.

Direct Glare:

Glare in the eyes of the speaker is as much a problem as it is for the audience. It is important to front light the speaker, and the optimal angle to do so would be 45 degrees from the normal; however, this would put the speaker in direct view of the lamp and the luminous area of the fixture. It is important for the speaker to appear comfortable and confident to the audience, but this could be somewhat difficult to achieve with an abundance of light in the presenter's face. Choosing luminaires specifically created for this purpose may be necessary.

Veiling Reflections:

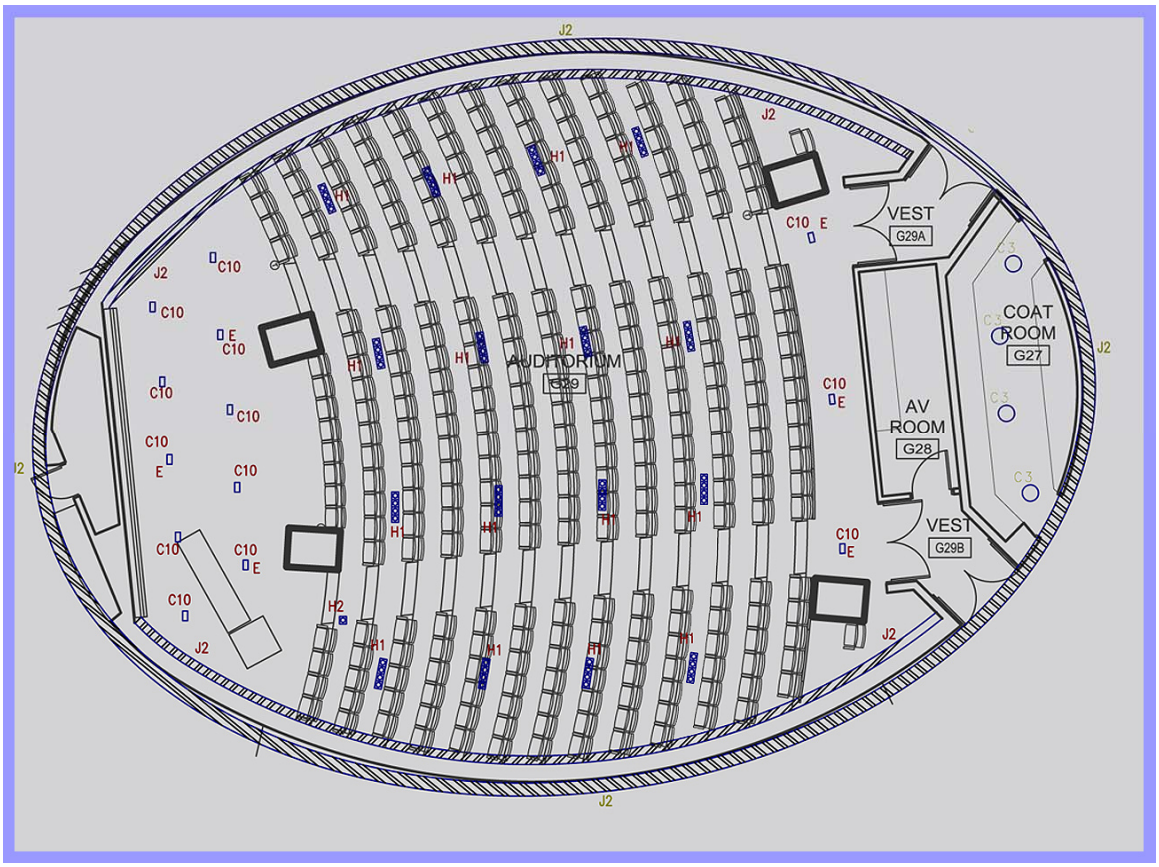
Veiling reflections can be an issue for the audience off of the screen, and off of any highly reflective, specular surfaces. It is important in the auditorium, not only for acoustical reasons but also for lighting design, that the room surfaces are matte and absorptive (fabrics and paneling).

Suggested Illuminance Values:

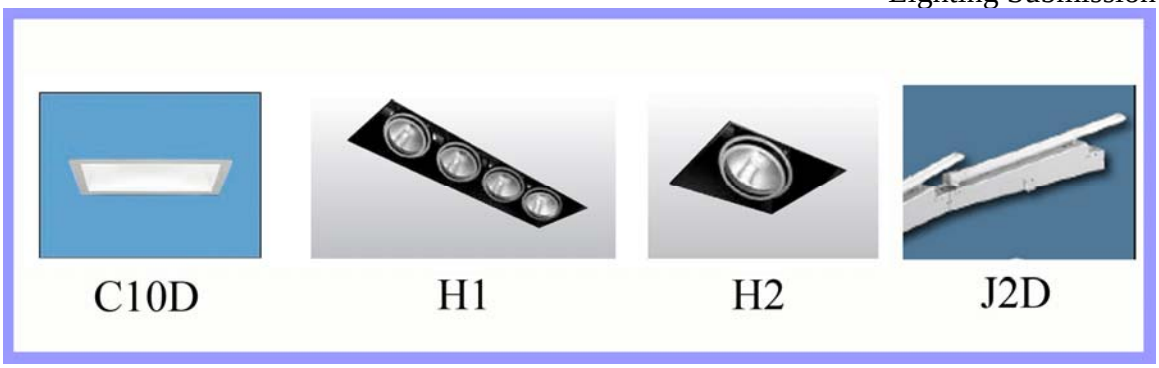
The suggested vertical illuminance on walls for an auditorium is category A- 3 fc. The suggested horizontal illuminance for an auditorium is category B or C- 5 to 10 fc.

Power Density Requirements:

There are no power density requirements for an auditorium space because of the flexibility and multiple lighting system needs for events such as presentations, lectures, discussions, etc. I will aim for the power density listed for a multipurpose room of 1.3 watts per square foot plus the additional 1.0 watts per square foot for accent lighting.



Auditorium Lighting Plan



Auditorium Luminaire Images

TYPE	DESCRIPTION	CATALOG NUMBER	LAMP			BALLAST		V	MOUNTING
			NO.	TYPE	WATT	NO	TYPE		
C10D	RECESSED RECTANGULAR COMPACT FLUORESCENT OPEN DOWNLIGHT FOR SHALLOW PLENUM APPLICATION WITH DUAL REFLECTOR	FRT-04092	1	PL-T 42 4100K 82 MIN CRI	42	1	ELECTRONIC DIMMING	277	RECESSED
H1	RECESSED TRIMLESS PAR COMBO DOWNLIGHT WITH FOUR LAMPS WITH ADJUSTABLE DOUBLE GIMBALS AND WHITE RECTANGULAR HOUSING	CO1800ISTR-WH-DG	4	PAR30 50WFL	50	-	-	120	RECESSED COMBO LIGHT
H2	RECESSED TRIMLESS PAR DOWNLIGHT WITH ADUSTABLE DOUBLE GIMBAL AND WHITE RECTANGULAR HOUSING	CO3810ISTR-WH-DG	1	PAR30 70W SP	70	-	-	120	RECESSED
J2D	ONE LAMP RAMPED FIELD CURVABLE FLUORESCENT STRIP COVE LUMINAIRE WITH DIMMING BALLAST.	2855FX2S392E-*	1/ SEC	BIAX 39 4100K 82 MIN CRI	39	1	ELECTRONIC DIMMING	277	CURVABLE COVE

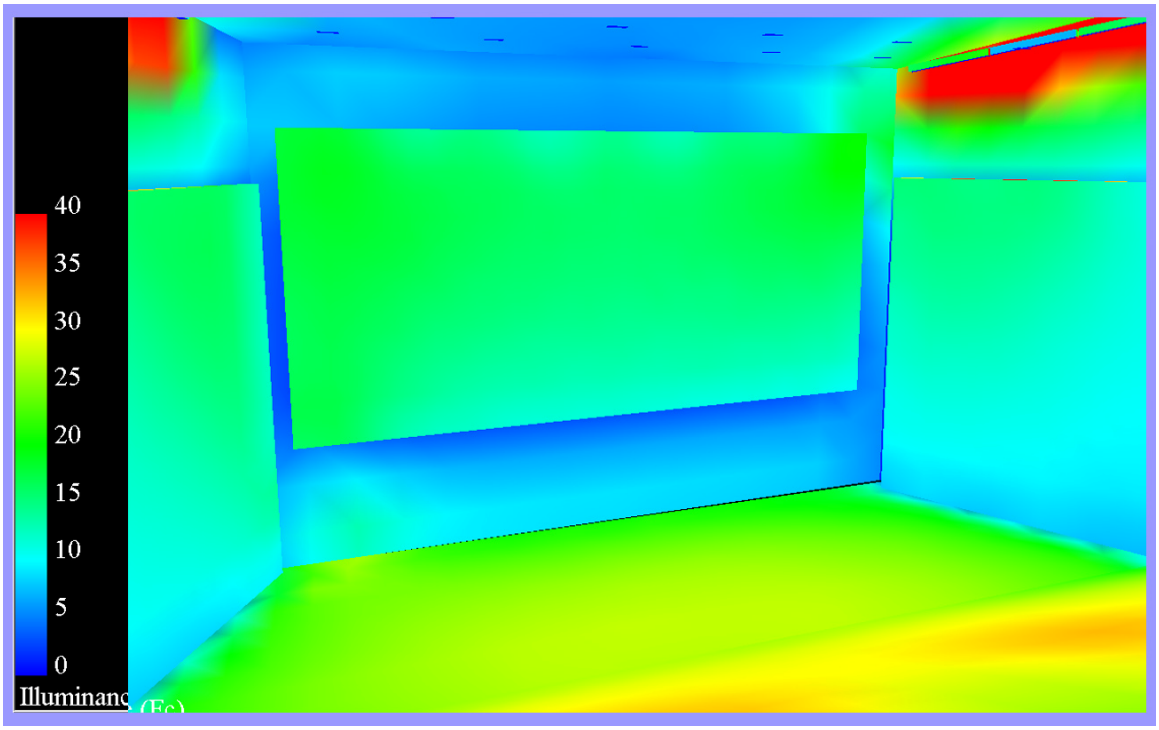
Auditorium Luminaire Schedule

Note: Lamp and Ballast catalog numbers and specifications can be found in the appendix

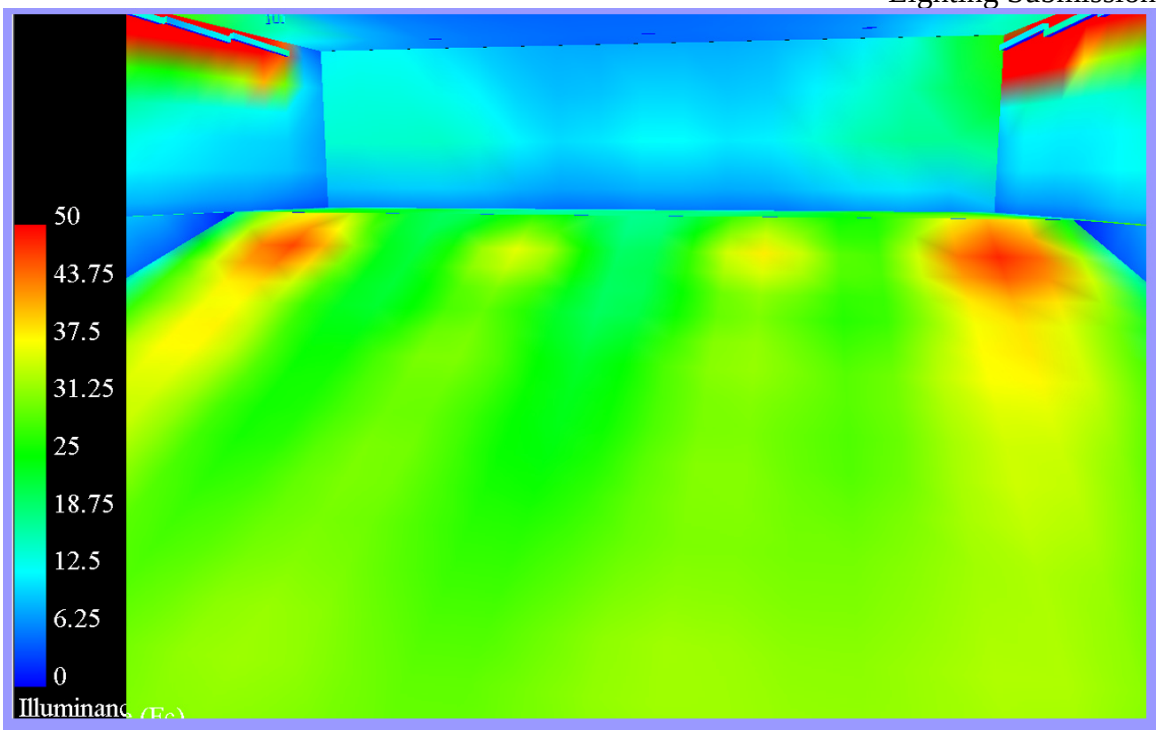
AUDITORIUM LIGHT LOSS FACTORS						
TYPE	CATEGORY	LLD	BF	RSDD	LDD	**TOTAL**
C11D	4	0.85	1	0.98	0.89	0.74
H1	4	0.9	-	0.98	0.89	0.78
H2	4	0.9	-	0.98	0.89	0.78
J2D	1	0.9	0.9	0.98	0.95	0.75
RCR=2.43						
ASSUME A TWO YEAR CLEANING CYCLE AND A VERY CLEAN ENVIRONMENT						

Auditorium Light Loss Factors

AGI Pseudo Color Images:

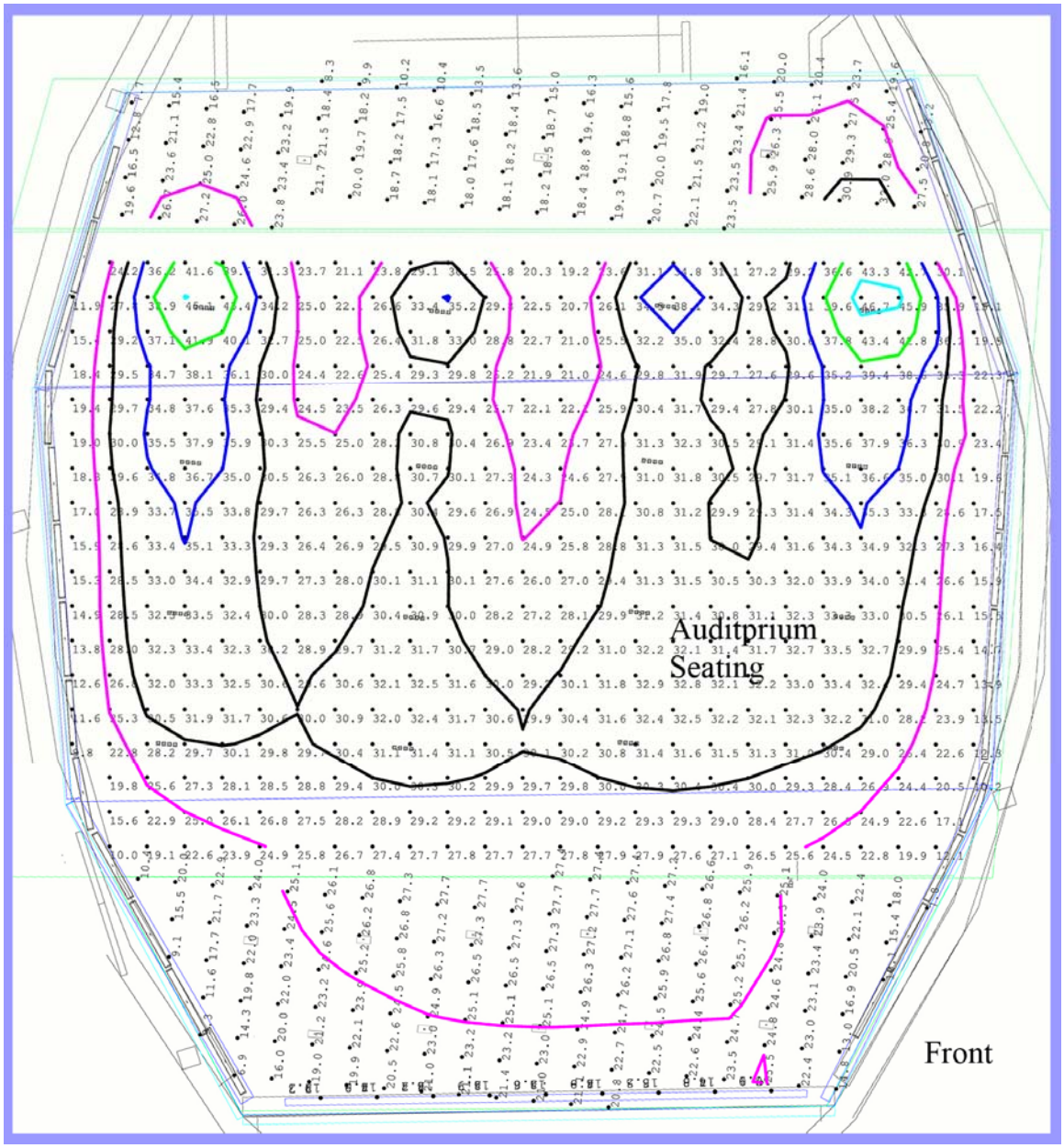


Auditorium Pseudo Color Image

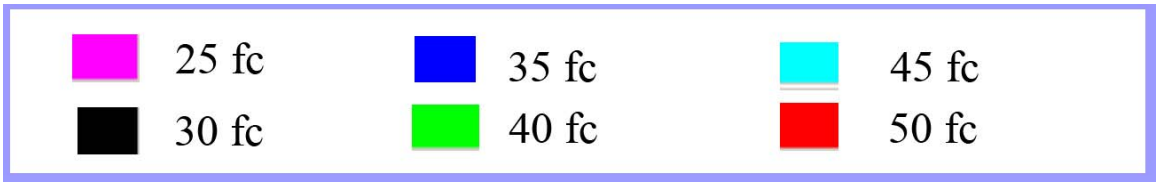


Auditorium Pseudo Color Image

AGI Calculations:



Auditorium Horizontal Illuminance (fc) with Isolines



Auditorium Isoline Color Legend

Power Density Requirements:

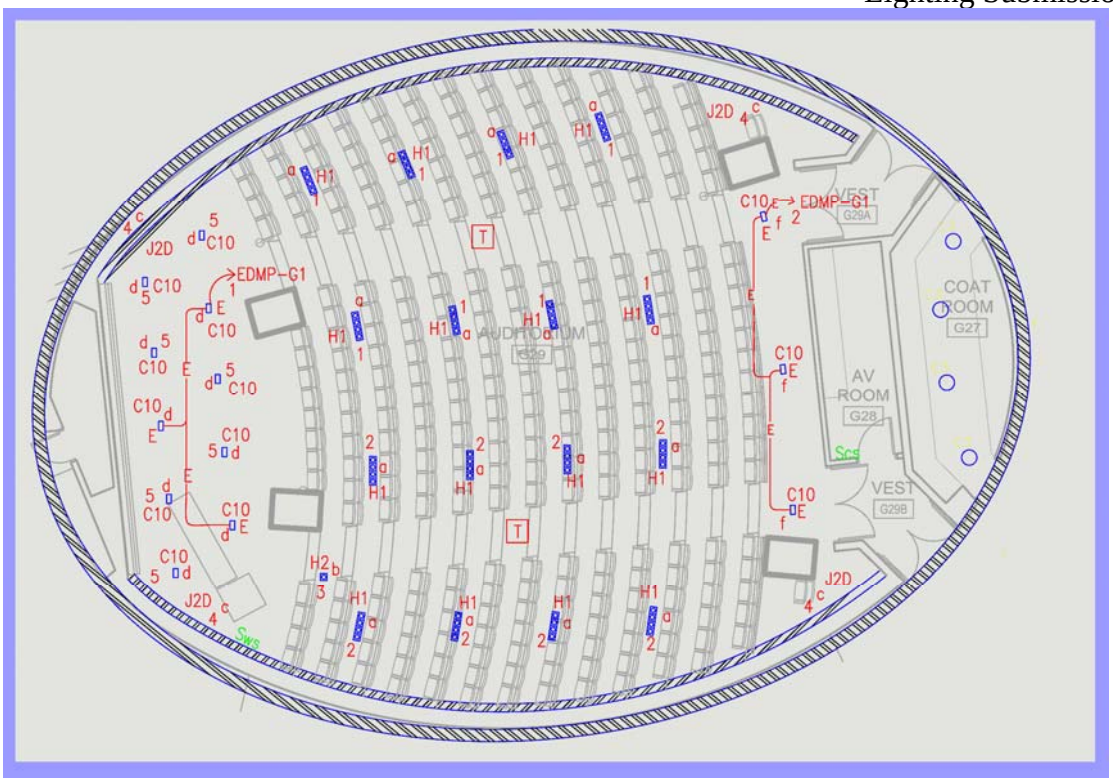
As mentioned earlier in the design goals for the space, there is no required power density for auditorium spaces. Because this is a sustainable building, I wanted to aim for the power density listing of a multipurpose room along with the additional allowed wattage for perimeter lighting. I came close to this value of 2.3 with an actual power density for the new lighting layout of 2.4 watts per square foot.

TYPE	NUMBER	INPUT W	TOTAL W
C11D	13	49	637
H1	16	200	3200
H2	1	70	70
J2D	64	40	2560
SQ FT	2700	WATTS	6467
POWER DENSITY		2.40	

Auditorium Lighting Layout Power Density

Auditorium Lighting Design Circuiting:

Because of the wide variety of activities the auditorium may be used for, I decided to go with a Lutron Grafik 4000 dimming system with uses a wall box control and also a GP dimming panel located in the nearby electrical closet. The master wall station will be in the control room of the auditorium, while a four preset wall state control will be located near the speaker podium. The following plan shows the circuiting to dimming panel DMP-G1 and emergency dimming panel EDMP-G1. In order to operate the halogen combo light fixtures on the 277v dimming panel, I decided to use (2) small transformers to step down the power feed from 277v to 120v.



Auditorium Lighting Circuiting Plan

PANEL DMP-G1 : 277V						
DIMMER	ZONE	TYPE	CONTROL	LOAD (kW)	VOLTAGE (V)	LOCATION
1	a	HALOGEN	DIMM	1.6	277/120	AUDITORIUM SEATING
2	a	HALOGEN	DIMM	1.6	277/120	AUDITORIUM SEATING
3	b	HALOGEN	DIMM	0.2	277/120	AUDITORIUM KEYLIGHT
4	c	FLUORESCENT	DIMM	2.6	277	AUDITORIUM COVE
5	d	COMPACT FL	DIMM	0.4	277	AUDITORIUM STAGE
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
		TOTAL LOAD (kw)		6.4		

Auditorium Lutron GP Dimming Panel DMP-G1

PANEL EDMP-G1 : 277V						
DIMMER	ZONE	TYPE	CONTROL	LOAD (kW)	VOLTAGE (V)	LOCATION
1	d	COMPACT FL	DIMM	0.2	277	AUDITORIUM STAGE
2	f	COMPACT FL	DIMM	0.2	277	AUDITORIUM BACK
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
		TOTAL LOAD (kw)		0.4		

Auditorium Lutron GP Dimming Panel EDMP-G1

Conclusions:

The auditorium lighting design is a flexible one where many different scenes and light outputs will be possible for the different applications. The adjustable fixtures over the audience allow for some flexibility to direct light to different areas where it is felt to be needed after construction. The perimeter cove helps to highlight the walls and give the curved vertical surfaces more depth. More work can be done during the semester to finalize high quality renderings for the space.