

Woolly Mammoth Theatre Washington DC



Kate Feato
February 16th Lighting Electrical Submission
Lighting Advisor: Dr. Mistrick
Electrical Advisor: Professor Dannerth

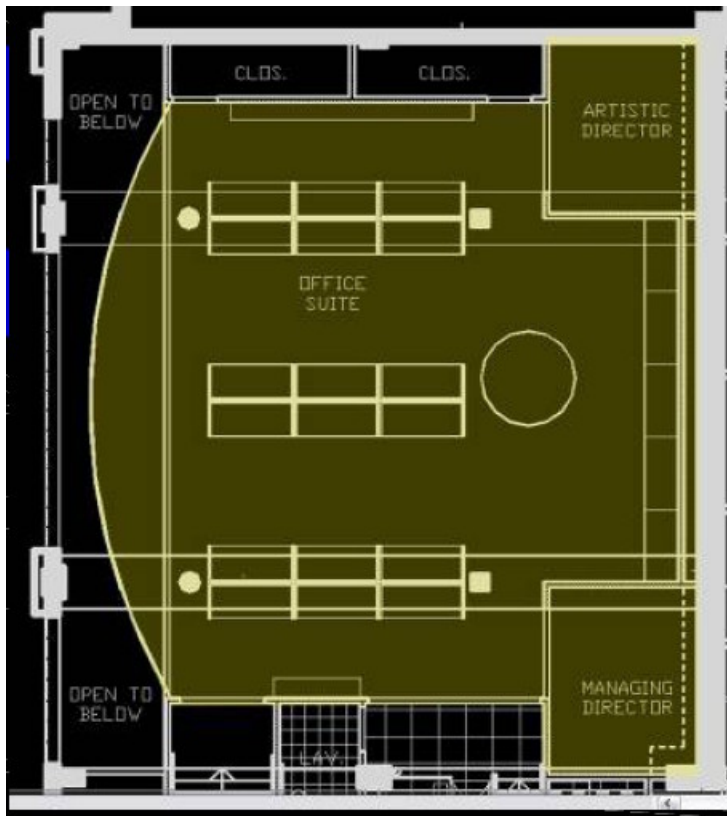
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LIGHTING/ELECTRICAL OPTION
WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Office

Space Overview

The office has an open plan with two private offices for the artistic director and the managing director. There are movable cubicles set up in three sections. It is a comfortable environment for the key personnel of the theatre to do work. The space is rather small but has a spacious feel. This was achieved by using glass for the surrounding interior walls connecting the office to the vestibule, hub area and exterior.



The surface materials in the space:

- concrete slab ceiling- clear finish
- orange painted gypsum walls
- carpet- medium gray
- cubicle partitions- light

reflectance = 20%
reflectance = 55%
reflectance = 25%
reflectance = 60%

Glazing:

- ½" tempered glass and channel wall

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Design Criteria

General

The lighting in the office should be very comfortable. The work plane should be uniformly lit. In the office there is intermittent use of VDTs. Direct and reflected glare should be avoided completely. It is important to not have direct sunlight hitting the work plane creating glare. Also the luminances of surfaces and contrast must be carefully analyzed. The open plan office has moveable cubicles, and therefore the lighting should be flexible.

Illuminance and Luminance

According to the IESNA Lighting Handbook the illuminance on the work plane for an open office with intense VDT work should be 30 footcandles. The vertical illuminance should be 5 footcandles. When using VDTs, the luminance ratio of screen to paper task should be 3:1. For screen to far background the luminance ratio should be 10:1.

Power Density

According to Ashrea 90.1, the Space- By- Space Method, the power density allowed in an open plan office is 1.1 W/SF.

Schematic Design/ Design Intent

Design Goals

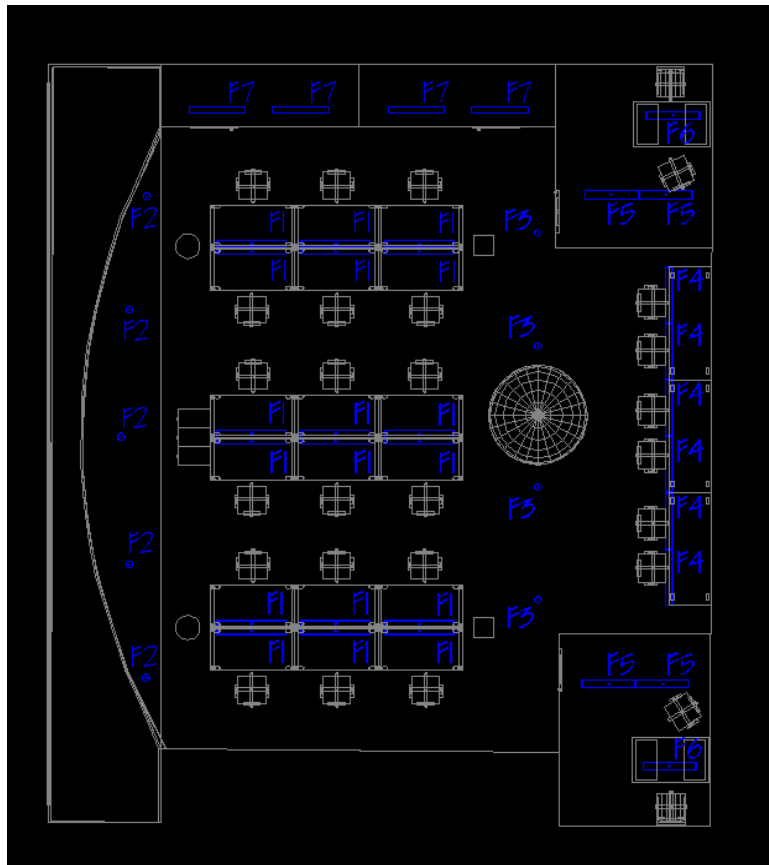
- Spacious
- Comfortable
- Energetic

These goals were achieved in the office space by using many techniques. The office is small in square footage, and rather cramped with cubicles throughout it. Two of the four walls are made of glass, which helps to expand the feeling of the space. In the lighting of the space, the orange accent wall is washed with light. This will keep the space feeling spacious. To keep the office comfortable for the employees, direct and reflected glare must be avoided completely. This was accomplished by using a desk mounted fixture with direct and indirect light. The energetic feeling was achieved by using indirect light to stop the “cave” effect. Also there are differing light levels away from task areas to give depth.

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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Final Design
Luminaire Plan



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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Luminaire Schedule

FIXTURE TYPE	DESCRIPTION	LAMP	MANUFACTURER	CATALOG NUMBER	MOUNTING		NOTES
					SURFACE	RECESS	
F1	DESK MOUNTED TASK AMBIENT FLUORESCENT	SYLVANIA FP35/835/ECO	TAMBIENT	STYLE L201	X		LOCATION: OFFICE
F2	RECESSED DOWNLIGHT	SYLVANIA CF26DT/E/IN/835/ECO	LIGHTOLIER	8021-CCLP		X	LOCATION: OFFICE
F3	SURFACE MOUNTED COMPACT FLUORESCENT CYLINDER	SYLVANIA CF26DT/E/IN/835/ECO	LIGHTOLIER	CS6132	X		LOCATION: OFFICE
F4	SURFACE MOUNTED FLUORESCENT WALL WASH	SYLVANIA FP28/835/ECO	ELLIPTIPAR	F144-T128-S-22-T	X		LOCATION: OFFICE
F5	SURFACE MOUNTED FLUORESCENT DIRECT PENDANT	SYLVANIA (1) FP54/835/HO/ECO	METALUMEN	C6B4NXUK	X		LOCATION: OFFICE
F6	SURFACE MOUNTED FLUORESCENT DIRECT PENDANT	SYLVANIA (2) FP54/835/HO/ECO	METALUMEN	C6A4NXUK	X		LOCATION: OFFICE
F7	CLOSET FLUORESCENT STRIP	SYLVANIA FO32/835/ECO	LIGHTOLIER	JS4C132	X		LOCATION: OFFICE

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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Light Loss Factors							
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF
F1	12 months (clean)	II	1.01	0.93	0.94	0.89	0.79
F2	12 months (clean)	IV	1.10	0.86	0.88	0.96	0.80
F3	12 months (clean)	IV	1.10	0.86	0.88	0.96	0.80
F4	12 months (clean)	IV	1.04	0.93	0.88	0.96	0.82
F5	12 months (clean)	IV	0.99	0.93	0.88	0.96	0.78
F6	12 months (clean)	IV	0.99	0.93	0.88	0.96	0.78
F7	12 months (clean)	IV	0.92	0.92	0.88	0.96	0.71
RCR Calculated to be 2.2							

Power Density					
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF
F1	18	41	738		
F2	5	29	145		
F3	4	29	116		
F4	6	33	198		
F5	4	62	248		
F6	2	118	236		
F7	4	32	128		
			1809	2145	0.84

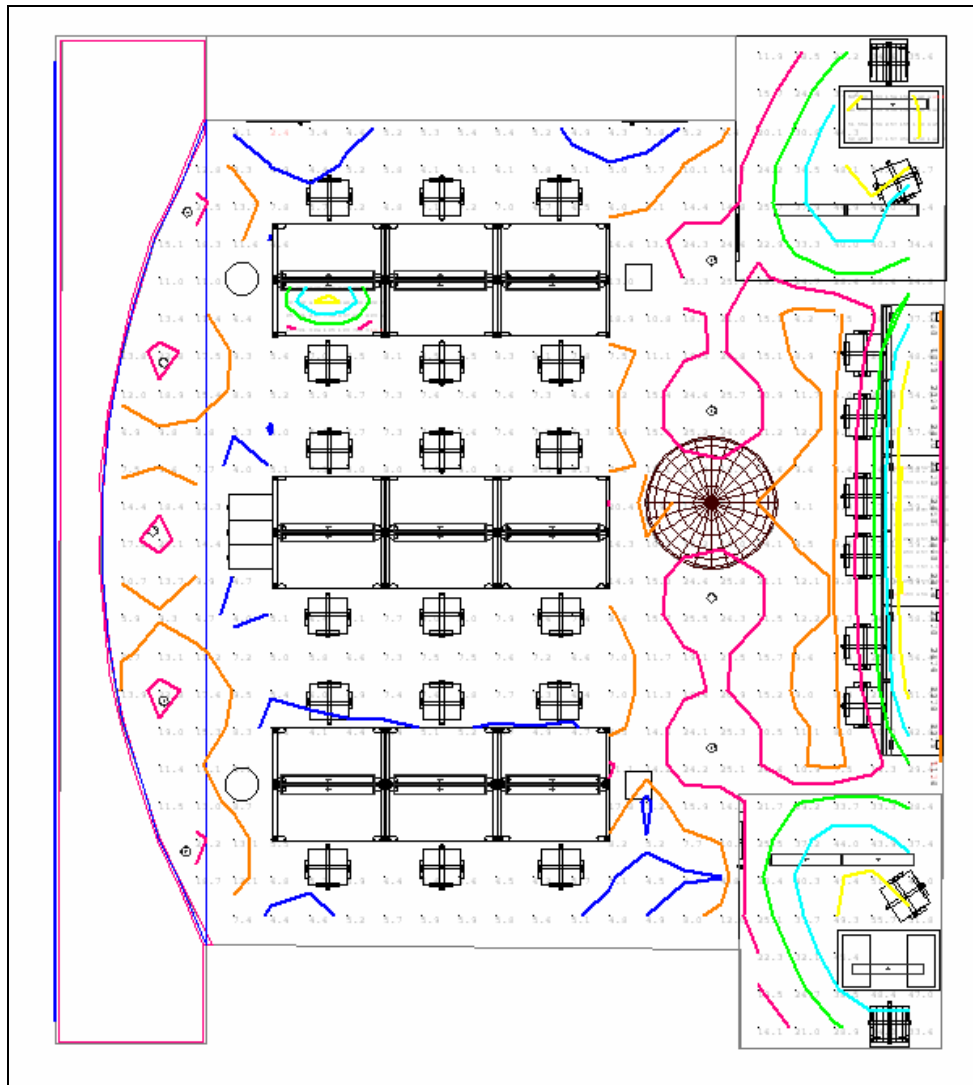
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WASHINGTON, DC



Calculation Grids

Numeric Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Orange Wall	Illuminance	Fc	17.86	24.6	5.3	3.37
Office Desk	Illuminance	Fc	52.89	57.4	45.4	1.16
Office Cubicle	Illuminance	Fc	33.08	52.5	14.4	2.30
Private Office Desk	Illuminance	Fc	51.87	57.1	43.1	1.20
Workplane	Illuminance	Fc	16.07	59.2	2.4	6.70







Value (Fc)	Color	Value (Fc)	Color
5	Blue	30	Green
10	Orange	40	Cyan
20	Magenta	50	Yellow

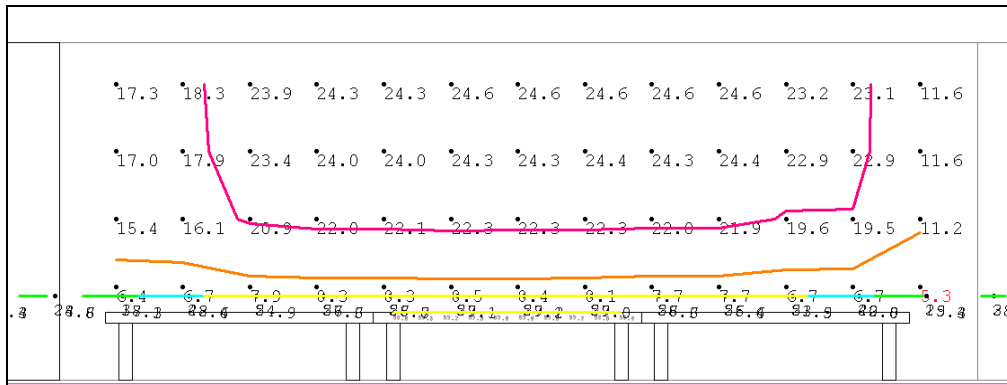


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Orange Accent Wall

Value (Fc)	Color	Value (Fc)	Color
5		30	
10		40	
20		50	



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Renderings



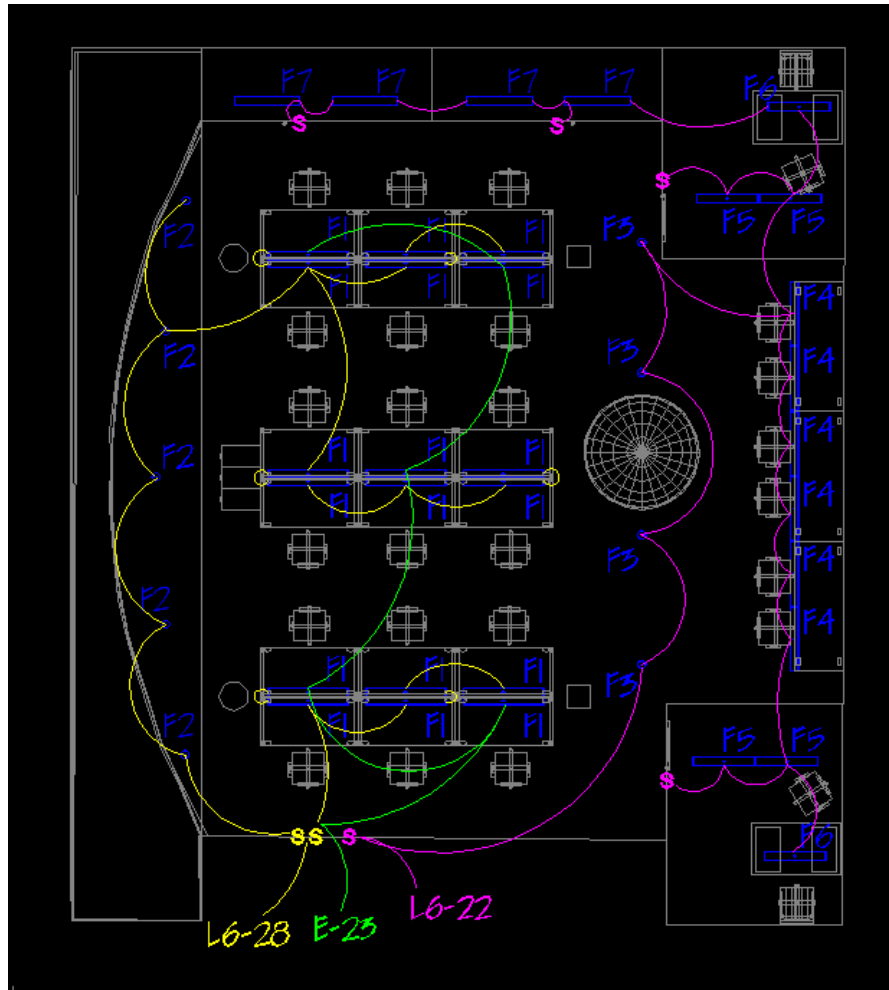
These renderings are missing details in the exposed ceiling (ductwork, pipes etc). Also in the final renderings all of the glass throughout the space will be more reflective. Now it looks as if there isn't the curved glass wall, but that will be perfected at a later time.

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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Control

The open office will be switched dimming. All cubicles will be dimmed together. The downlights adjacent to the glass wall will be dimmed on one zone. Lastly the cylinders near the skylight will be dimmed together. The rest of the office will not be dimmed.



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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Existing Panel L6

PANELBOARD SCHEDULE													
VOLTAGE: 208 SIZE/TYPE BUS: SIZE/TYPE MAIN: 225 A MAIN LUGS			PANEL TAG: L6 PANEL LOCATION: Second Level PANEL MOUNTING: SURFACE						MIN. C/B AIC: 85K OPTIONS: PROVIDE SUB FEED LUGS				
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION	
SYSTEMS FURN	0	800	20A/1P	1	*			2	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	3		*		4	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	5			*	6	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	7	*			8	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	9		*		10	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	11			*	12	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	13	*			14	20A/1P	0		SPARE	
SYSTEMS FURN		800	20A/1P	15		*		16	20A/1P	0		SPARE	
SYSTEMS FURN		800	20A/1P	17			*	18	20A/1P	0		SPARE	
RECEPTACLE		200	20A/1P	19	*			20	20A/1P	400		DISPOSABLE	
RECEPTACLE		200	20A/1P	21		*		22	20A/1P	1600		LIGHTS	
RECEPTACLE		200	20A/1P	23			*	24	20A/1P	1600		LIGHTS	
RECEPTACLE		200	20A/1P	25	*			26	20A/1P	800		LIGHTS	
RECEPTACLE		200	20A/1P	27		*		28	20A/1P	0		SPARE	
RECEPTACLE		1200	20A/1P	29			*	30	20A/1P	1100		TRACK LIGHTS	
RECEPTACLE		1000	20A/1P	31	*			32	20A/1P	400		RECEPTACLE	
RECEPTACLE		400	20A/1P	33		*		34	20A/1P	400		RECEPTACLE	
RECEPTACLE		1000	20A/1P	35			*	36	20A/1P	100		CHAIR LIFT	
RECEPTACLE		1200	20A/1P	37	*			38	20A/1P	100		CARD READER	
RECEPTACLE		1000	20A/1P	39		*		40	20A/1P	400		F-5	
RECEPTACLE		400	20A/1P	41			*	42	20A/1P	0		SPARE	
CONNECTED LOAD (KW) - A		7.50							TOTAL DESIGN LOAD (KW)				14.06
CONNECTED LOAD (KW) - B		7.40							POWER FACTOR				0.97
CONNECTED LOAD (KW) - C		8.40							TOTAL DESIGN LOAD (AMPS)				40

New Panel L6

PANELBOARD SCHEDULE													
VOLTAGE: 208 SIZE/TYPE BUS: SIZE/TYPE MAIN: 225A MAIN LUGS			PANEL TAG: L6 PANEL LOCATION: 0 PANEL MOUNTING: SURFACE						MIN. C/B AIC: 85K OPTIONS: PROVIDE SUB FEED LUGS				
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION	
SYSTEMS FURN	0	800	20A/1P	1	*			2	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	3		*		4	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	5			*	6	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	7	*			8	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	9		*		10	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	11			*	12	20A/1P	400		RECEPTACLE	
SYSTEMS FURN		800	20A/1P	13	*			14	20A/1P	0		SPARE	
SYSTEMS FURN		800	20A/1P	15		*		16	20A/1P	0		SPARE	
SYSTEMS FURN		800	20A/1P	17			*	18	20A/1P	0		SPARE	
RECEPTACLE		200	20A/1P	19	*			20	20A/1P	400		DISPOSABLE	
RECEPTACLE		200	20A/1P	21		*		22	20A/1P	903		LIGHTS	
RECEPTACLE		200	20A/1P	23			*	24	20A/1P	1600		LIGHTS	
RECEPTACLE		200	20A/1P	25	*			26	20A/1P	800		LIGHTS	
RECEPTACLE		200	20A/1P	27		*		28	20A/1P	699		LIGHTS	
RECEPTACLE		1200	20A/1P	29			*	30	20A/1P	1100		TRACK LIGHTS	
RECEPTACLE		1000	20A/1P	31	*			32	20A/1P	400		RECEPTACLE	
RECEPTACLE		400	20A/1P	33		*		34	20A/1P	400		RECEPTACLE	
RECEPTACLE		1000	20A/1P	35			*	36	20A/1P	100		CHAIR LIFT	
RECEPTACLE		1200	20A/1P	37	*			38	20A/1P	100		CARD READER	
RECEPTACLE		1000	20A/1P	39		*		40	20A/1P	400		F-5	
RECEPTACLE		400	20A/1P	41			*	42	20A/1P	0		SPARE	
CONNECTED LOAD (KW) - A		7.50							TOTAL DESIGN LOAD (KW)				14.06
CONNECTED LOAD (KW) - B		7.40							POWER FACTOR				0.97
CONNECTED LOAD (KW) - C		8.40							TOTAL DESIGN LOAD (AMPS)				40

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LIGHTING/ELECTRICAL OPTION
WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Existing Panel E

PANELBOARD SCHEDULE												
VOLTAGE: 208 SIZE/TYPE BUS: SIZE/TYPE MAIN: 100A MAIN LUGS			PANEL TAG: E PANEL LOCATION: Room Name PANEL MOUNTING: SURFACE						MIN. C/B AIC: MATCH EXISTING ATS OPTIONS:			
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
FACP	0	200	20A/1P	1	*			2	20A/1P	200		ELEV TROUGH
THEATER LIGHTS		300	20A/1P	3		*		4	20A/1P	1000		ELEV PIT
THEATER LIGHTS		1900	20A/1P	5			*	6	20A/1P	200		EXIT SIGNS
THEATER LIGHTS		1900	20A/1P	7	*			8	20A/1P	100		LIGHT
SPARE		0	20A/1P	9		*		10	20A/1P	200		EXIST SIGNS
CONTROL RM LIGHT		500	20A/1P	11			*	12	20A/1P	200		EXIT SIGNS
LIGHTS		300	20A/1P	13	*			14	20A/1P	200		REIGHT ELEV TROUGH
LIGHTS		900	20A/1P	15		*		16	20A/1P	100		FREIGHT ELEV LIGHT
LIGHTS-1ST FL		600	20A/1P	17			*	18	20A/1P	1000		FREIGHT ELEV PIT
THEATER LIGHTS		300	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
THEATER LIGHTS		200	20A/1P	21		*		22	20A/1P	1000		TRACK LIGHTS
LIGHTS OFFICE		500	20A/1P	23			*	24	20A/1P	0		STEP LIGHTS
LIGHTS OFFICE		300	20A/1P	25	*			26	20A/1P	0		SPARE
LIGHTS SLL		300	20A/1P	27		*		28	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	29			*	30	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	31	*			32	20A/1P	0		SPARE
LIGHTS-1ST FL		1500	20A/1P	33		*		34	20A/1P	0		SPARE
LIGHTS CORR		300	20A/1P	35			*	36	20A/1P	0		SPARE
LIGHTS-1ST FL		1300	20A/1P	37	*			38	20A/1P	4000		SPACE
LIGHTS-2ND FL		500	20A/1P	39		*		40	20A/1P	4000		SPACE
LIGHTS TRACK		700	20A/1P	41			*	42	20A/1P	4000		SPACE
CONNECTED LOAD (KW) - A		10.40								TOTAL DESIGN LOAD (KW)		18.74
CONNECTED LOAD (KW) - B		10.00								POWER FACTOR		1.00
CONNECTED LOAD (KW) - C		6.40								TOTAL DESIGN LOAD (AMPS)		52

New Panel E

PANELBOARD SCHEDULE												
VOLTAGE: 208 SIZE/TYPE BUS: SIZE/TYPE MAIN: 100A MAIN LUGS			PANEL TAG: E PANEL LOCATION: Room Name PANEL MOUNTING: SURFACE						MIN. C/B AIC: MATCH EXISTING ATS OPTIONS:			
DESCRIPTION	LOCATION	LOAD (WATTS)	C/B SIZE	POS. NO.	A	B	C	POS. NO.	C/B SIZE	LOAD (WATTS)	LOCATION	DESCRIPTION
FACP	0	200	20A/1P	1	*			2	20A/1P	200		ELEV TROUGH
THEATER LIGHTS		300	20A/1P	3		*		4	20A/1P	1000		ELEV PIT
THEATER LIGHTS		1900	20A/1P	5			*	6	20A/1P	200		EXIT SIGNS
THEATER LIGHTS		1900	20A/1P	7	*			8	20A/1P	100		LIGHT
SPARE		0	20A/1P	9		*		10	20A/1P	200		EXIST SIGNS
CONTROL RM LIGHT		500	20A/1P	11			*	12	20A/1P	200		EXIT SIGNS
LIGHTS		300	20A/1P	13	*			14	20A/1P	200		REIGHT ELEV TROUGH
LIGHTS		900	20A/1P	15		*		16	20A/1P	100		FREIGHT ELEV LIGHT
LIGHTS-1ST FL		600	20A/1P	17			*	18	20A/1P	1000		FREIGHT ELEV PIT
THEATER LIGHTS		300	20A/1P	19	*			20	20A/1P	400		TRACK LIGHTS
THEATER LIGHTS		200	20A/1P	21		*		22	20A/1P	1000		TRACK LIGHTS
LIGHTS OFFICE		205	20A/1P	23			*	24	20A/1P	0		STEP LIGHTS
LIGHTS OFFICE		300	20A/1P	25	*			26	20A/1P	0		SPARE
LIGHTS SLL		300	20A/1P	27		*		28	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	29			*	30	20A/1P	0		SPARE
LIGHTS CORR		1200	20A/1P	31	*			32	20A/1P	0		SPARE
LIGHTS-1ST FL		1500	20A/1P	33		*		34	20A/1P	0		SPARE
LIGHTS CORR		300	20A/1P	35			*	36	20A/1P	0		SPARE
LIGHTS-1ST FL		1300	20A/1P	37	*			38	20A/1P	4000		SPACE
LIGHTS-2ND FL		500	20A/1P	39		*		40	20A/1P	4000		SPACE
LIGHTS TRACK		700	20A/1P	41			*	42	20A/1P	4000		SPACE
CONNECTED LOAD (KW) - A		10.40								TOTAL DESIGN LOAD (KW)		18.42
CONNECTED LOAD (KW) - B		10.00								POWER FACTOR		1.00
CONNECTED LOAD (KW) - C		6.11								TOTAL DESIGN LOAD (AMPS)		51

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Panel L6

Design Load: 40 Amps

Circuit Breaker Size: 40 Amps

Feeder Size: #8 - 75 degree lugs THW

Conduit Size: 1 inch

Panel E

Design Load: 51 Amps

Circuit Breaker Size: 60 Amps

Feeder Size: #6 - 75 degree lugs THW

Conduit Size: 1 inch

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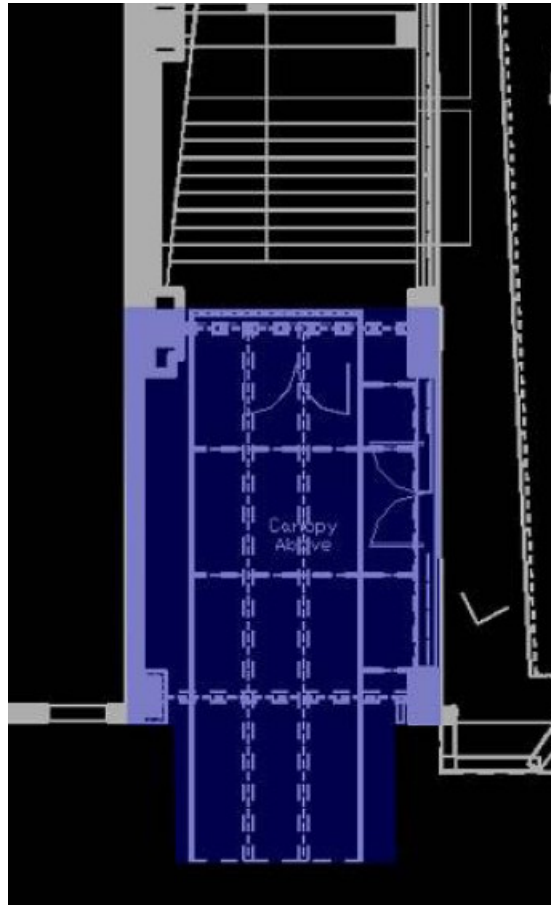
Canopy

Space Overview

The Woolly Mammoth Theatre sits on a busy street in downtown DC. It has a historic brick façade facing this street and remains very low-key. The doors to this storefront remain closed. To enter the theatre, patrons must go around the corner.

The alley does have a canopy to make it more apparent. The canopy is made of black steel columns/beams and a plastic glazing panel. There is also an area to hang advertisements for upcoming shows. Yet this canopy is not glitzy or glamorous. It has an industrial feel, which will prevail throughout the space.

The canopy will direct patrons to the entrance of the theatre. The appearance of the luminaires will foreshadow what will be seen throughout the building. There should be accent lighting on the wall of the adjacent building where posters are being displayed. This area should have sparkle and be eye-catching. The steel and glass surfaces should appear to be beautiful.



The surface materials in the space:

- black steel structure
- brick walkway
- semi-translucent polycarbonate panel

reflectance = 20%

reflectance = 35%

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WASHINGTON, DC



Also in the space:

- brick and glass façade of theatre on one side
- concrete block building on other side

Glazing:

- Polygal- translucent extruded polycarbonate sheet with internal ribbing and smooth flat exterior surface

Horizontal Illuminance

According to IESNA Handbook there should be 5 footcandles of horizontal illuminance on the ground. There should also be at least 3 footcandles of vertical illuminance.

Power Density

According to the ASHREA 90.1, using the Space- By- Space method, the power density allowed for an entrance canopy is 1.25 W/SF.

Schematic Design/Design Intent

Design Goals

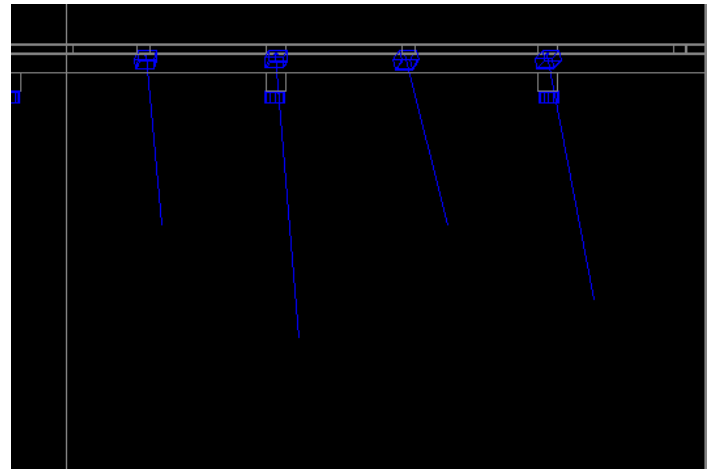
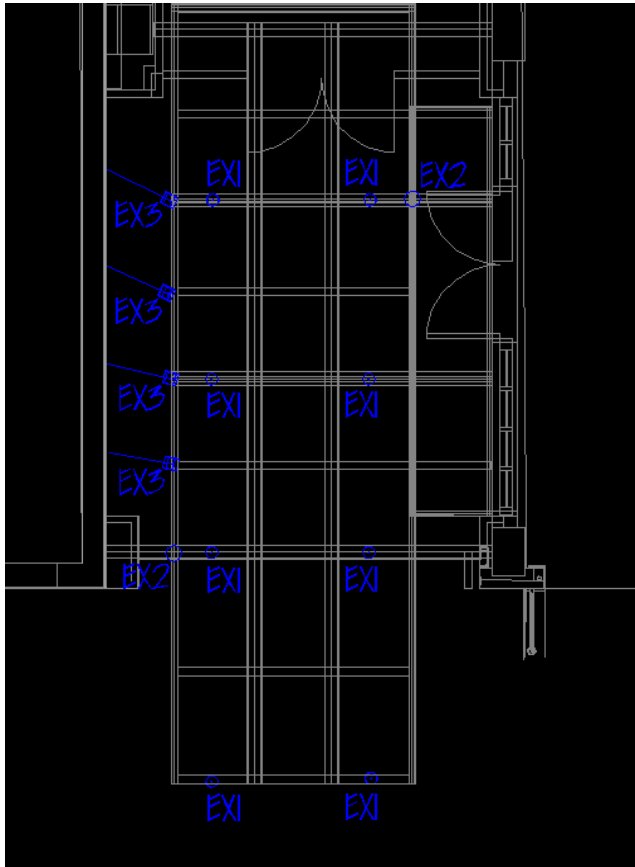
- Eye-catching
- Peeks Interest
- Dynamic
- Foreshadow What Is Inside

The entrance to the Woolly Mammoth Theatre is located in an alleyway. To make the canopy eye-catching, color and texture were used. The RGB LED downlights will be able to be a variety of colors. This will peek the interest of on-lookers. They will want to know what is inside the building. The two automated moving heads will be colored close to white. They will have gobos to add texture and move through the canopy area. This will make the space dynamic. All of these features will foreshadow the color and texture to be seen once entering the building.

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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Final Design
Luminaire Plan And Wall Aiming Plan



CANOPY LUMINAIRE SCHEDULE							
FIXTURE TYPE	DESCRIPTION	LAMP	MANUFACTURER	CATALOG NUMBER	MOUNTING		NOTES
					SURFACE	RECESS	
EX1	RGB LED SPOTLIGHT	31 LUXEON HIGH LUX LEDS	TIR	DES-30-RGB-BLK-DMK	X		LOCATION: CANOPY
EX2	AUTOMATED MOVING HEAD SPOTLIGHT	MARTIN METAL HALIDE 150 W DISCHARGE INCLUDED	MARTIN ARCHITECTURAL	MINIMAC PROFILE	X		LOCATION: CANOPY
EX3	YOKE MOUNTED HALOGEN CYLINDER	SYLVANIA 50PAR30CAPIRNFL25	LSI	FB-30-B	X		LOCATION: CANOPY

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WOOLLY MAMMOTH THEATRE
WASHINGTON, DC



Power Density					
Fixture	Quantity	Wattage	Total Wattage	SF	W/SF
EX1	8	35	280		
EX2	2	150	300		
EX3	4	50	200		
			780	500	1.56

Light Loss Factors							
Fixture	Cleaning Interval	Category	BF	LLD	LDD	RSDD	LLF
EX1	12 months (medium)	IV	1.00	1.00	0.81	0.94	0.76
EX2	12 months (medium)	IV	0.95	1.00	0.81	0.94	0.72
EX3	12 months (medium)	IV	1.00	1.00	0.81	0.94	0.76
RCR Calculated to be 5.6							

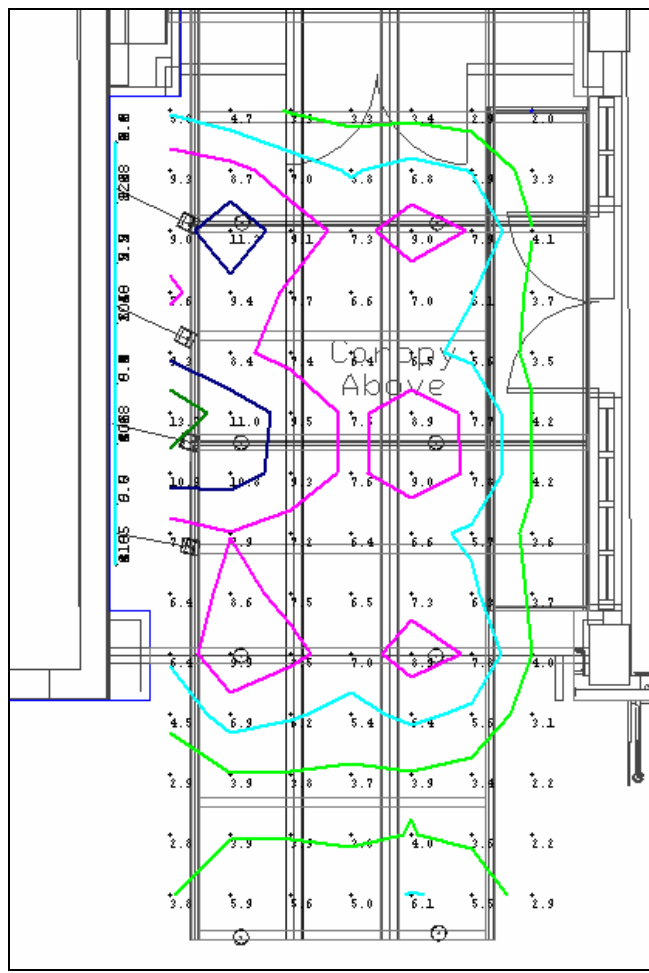
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Calculation Grids

Numeric Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
Wall	Illuminance	Fc	6.19	20.8	1.8	3.44
Ground	Illuminance	Fc	6.24	13.7	2.0	3.12

Value (Fc)	Color	Value (Fc)	Color
2	Blue	8	Magenta
4	Green	10	Dark Blue
6	Cyan	12	Dark Green

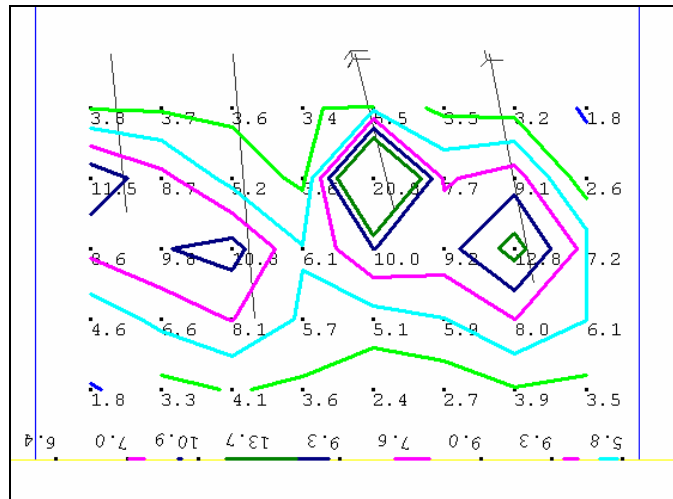


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Brick Façade with Art

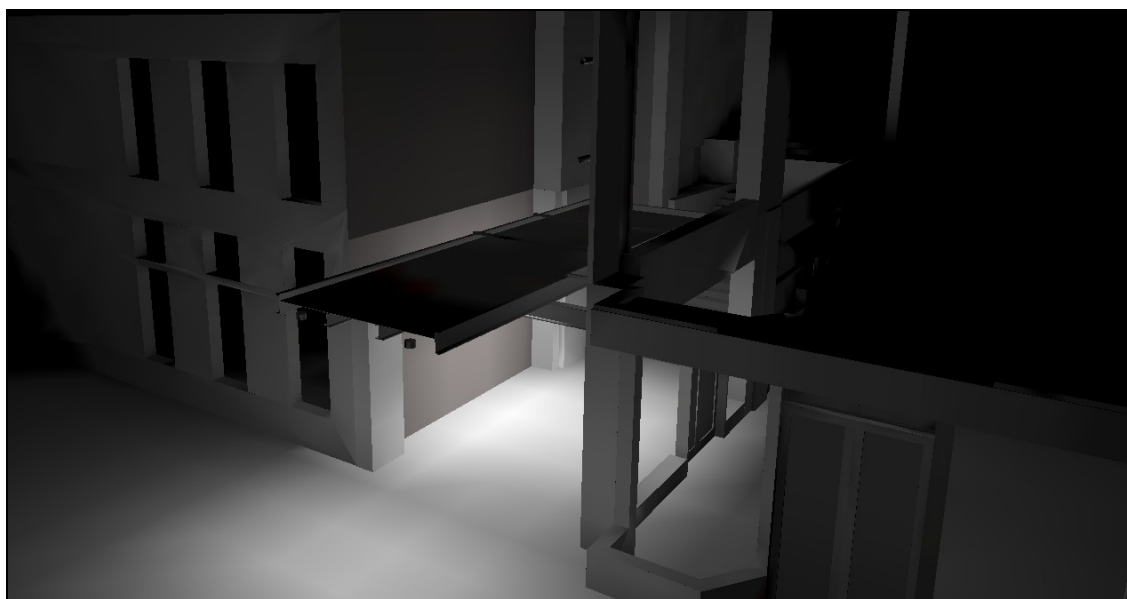
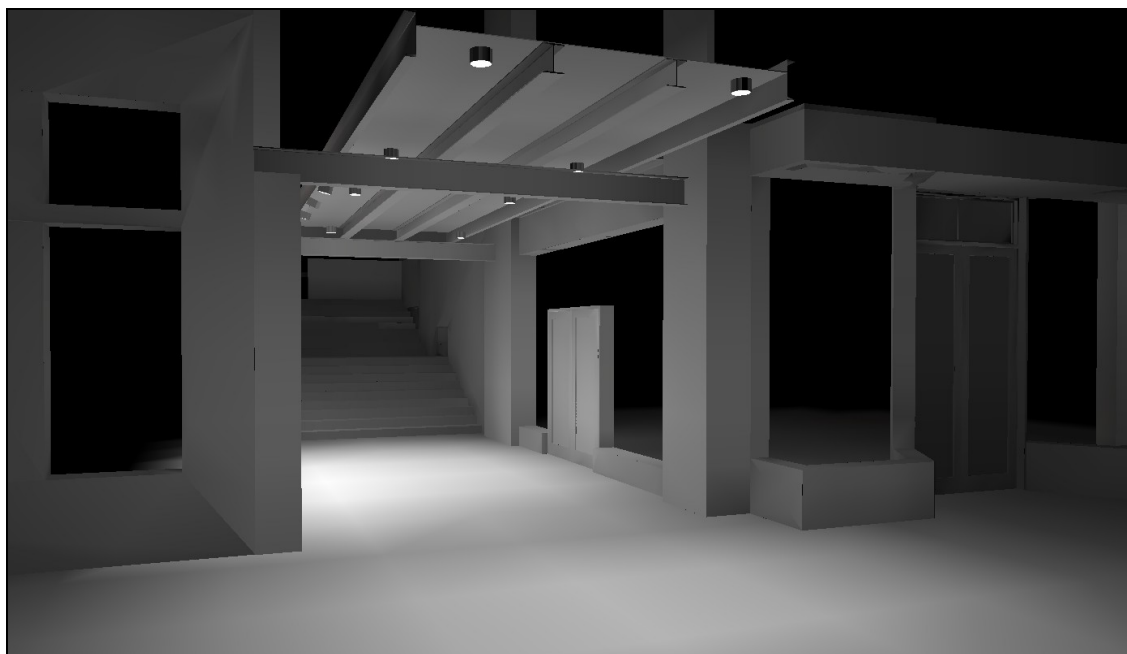
Value (Fc)	Color	Value (Fc)	Color
2	Blue	8	Magenta
4	Green	10	Dark Blue
6	Cyan	12	Dark Green



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Renderings



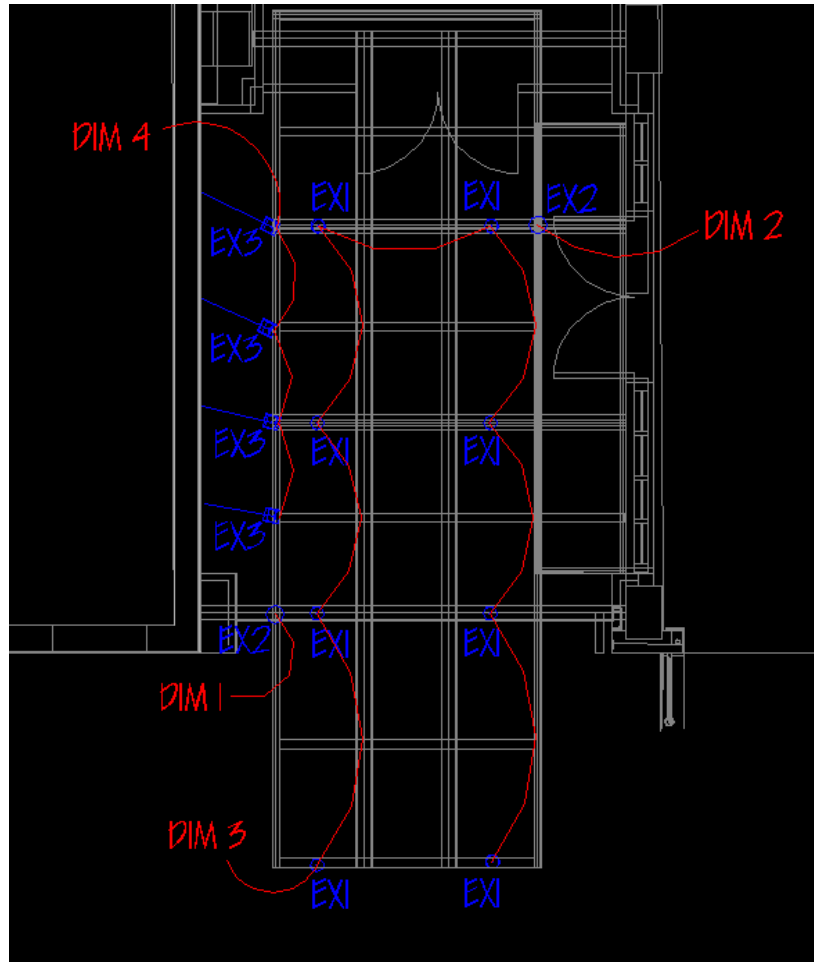
In the final renderings, the materials will have color and textures. Also in this model there are a few surfaces still missing. The glass will be much more reflective in the final rendering.

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Control

The canopy lighting will be controlled by the ETC Pharos control system. The system has two complementary parts: a Light Playback Controller and the Designer software, which is run on any personal computer and is only required when creating/modifying the lighting. The LPC 1 is designed for smaller systems and includes one DMX512 output (up to 512 dimmers or 170 RGB colour-mixing units).



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New Panel X

DIMMER SCHEDULE						
ZONE. NO	CKT NO.	FIXTURE TYPE		WATTS/ FIXTURE	QTY.	TOTAL LOAD (W)
1	1	EX2	AUTOMATED LED SPOT	150	1	150
2	2	EX2	AUTOMATED LED SPOT	150	1	150
3	3	EX1	LED DOWNLIGHT	8	35	280
4	4	EX3	CYLINDER ACCENT	4	50	200
5						
6						
7						
8						
9						
10						
11						
				TOTAL LOAD (W)		780