

# SUPPORTING DOCUMENTS

## APPENDIX A: REFERENCES

“2013 California Building Code.” *International Code Council*. California Building Standards

Commission, n.d. Web. Fall 2013.

"Building Energy Efficiency Program." - *California Energy Commission*. N.p., n.d. Web.

Leadership in Energy and Environmental Design (2008). LEED 2009 For Schools New Construction and Major Renovations. Fall 2013. Web.<<http://www.usgbc.org/ShowFile.aspx?DocumentID=5547>>.

National Electric Code: 2011. Quincy, MA: *National Fire Protection Association*, 2010.Nfpa72

DiLaura, David L., Kevin W. Houser, Richard G. Mistrick, and Gary R. Steffy. *The Lighting Handbook*. 10th ed. N.p.: *IES*, 2011.










“Maximize energy savings between on and off” WattStopper (2011) Web










<<http://www.wattstopper.com/~media/WattStopper/Documents/PDF/Wallbox-Product-Brochure.ashx>>

## APPENDIX B: LEED PLATINUM SUMMARY

LEED 2009 for New Construction and Major Renovations			Project Checklist		Project Name				
					Date				
<b>21</b>	<b>Sustainable Sites</b>	<b>Possible Points: 26</b>	<b>Materials and Resources, -Continued</b>						
Y	Prereq 1	Construction Activity Pollution Prevention	2	C	Credit 4	Recycled Content	1 to 2		
1	C	Credit 1	2	C	Credit 5	Regional Materials	1 to 2		
5	C	Credit 2			Credit 6	Rapidly Renewable Materials	1		
		Credit 3			Credit 7	Certified Wood	1		
		Credit 4							
6	C	Credit 4.1	<b>12</b>	<b>Indoor Environmental Quality</b>	<b>Possible Points: 15</b>				
1	C	Credit 4.2	Y	Prereq 1	Minimum Indoor Air Quality Performance				
3	C	Credit 4.3	1	M	Prereq 2	Environmental Tobacco Smoke (ETS) Control			
2	C	Credit 4.4	1	C	Credit 1	Outdoor Air Delivery Monitoring	1		
		Credit 5.1			Credit 2	Increased Ventilation	1		
		Credit 5.2			Credit 3.1	Construction IAQ Management Plan—During Construction	1		
		Credit 6.1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1		
		Credit 6.2			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1		
1	C	Credit 7.1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1		
1	L	Credit 7.2			Credit 4.3	Low-Emitting Materials—Flooring Systems	1		
1	L	Credit 8			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1		
					Credit 5	Indoor Chemical and Pollutant Source Control	1		
<b>8</b>	<b>Water Efficiency</b>	<b>Possible Points: 10</b>			Credit 6.1	Controllability of Systems—Lighting	1		
Y	Prereq 1	Water Use Reduction—20% Reduction			Credit 6.2	Controllability of Systems—Thermal Comfort	1		
2	C	Credit 1			Credit 7.1	Thermal Comfort—Design	1		
2	M	Credit 2			Credit 7.2	Thermal Comfort—Verification	1		
4	M	Credit 3			Credit 8.1	Daylight and Views—Daylight	1		
					Credit 8.2	Daylight and Views—Views	1		
<b>30</b>	<b>Energy and Atmosphere</b>	<b>Possible Points: 35</b>	<b>3</b>	<b>Innovation and Design Process</b>	<b>Possible Points: 6</b>				
Y	Prereq 1	Fundamental Commissioning of Building Energy Systems	1	M	Credit 1.1	Innovation in Design: Specific Title	1		
Y	Prereq 2	Minimum Energy Performance			Credit 1.2	Innovation in Design: Specific Title	1		
Y	Prereq 3	Fundamental Refrigerant Management			Credit 1.3	Innovation in Design: Specific Title	1		
19	M	Credit 1			Credit 1.4	Innovation in Design: Specific Title	1		
2	L	Credit 2			Credit 1.5	Innovation in Design: Specific Title	1		
2	C	Credit 3			Credit 2	LEED Accredited Professional	1		
2	M	Credit 4							
3	M	Credit 5			<b>4</b>	<b>Regional Priority Credits</b>	<b>Possible Points: 4</b>		
2	M	Credit 6			1	C	Credit 1.1	Regional Priority: Specific Credit	1
					1	C	Credit 1.2	Regional Priority: Specific Credit	1
<b>8</b>	<b>Materials and Resources</b>	<b>Possible Points: 14</b>			1	C	Credit 1.3	Regional Priority: Specific Credit	1
Y	Prereq 1	Storage and Collection of Recyclables			1	C	Credit 1.4	Regional Priority: Specific Credit	1
		Credit 1.1							
		Credit 1.2							
2	C	Credit 2							
2	C	Credit 3							
<b>86</b>	<b>Total</b>	<b>Possible Points: 110</b>	Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110						

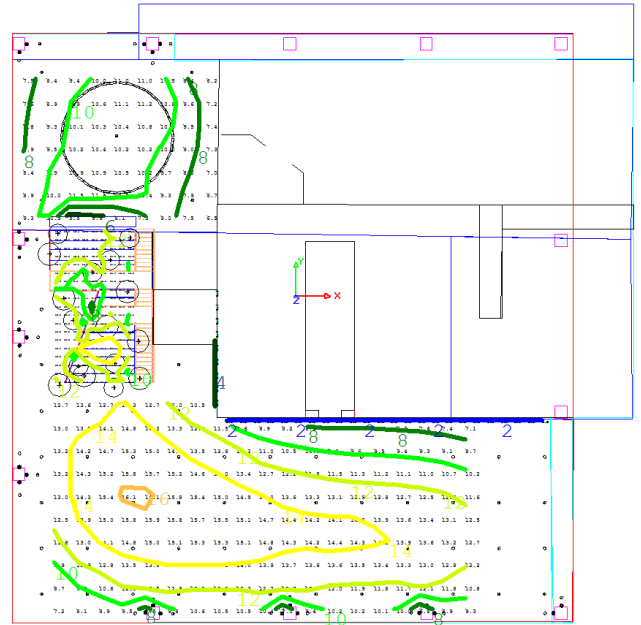
## APPENDIX C: FIXTURE SCHEDULE

	Description	Location	Manufacturer	Watts	Lamping	Catalog No.	Images
A	4' nominal length, 4" x 5" profile LED up/down pendant with standard diffuse acrylic panels, 0-10V dimming Driver, earthquake compliant mounting options, Part of the G-Beam series, stainless steel connections	Open Offices	Gammalux	66.7W	3500K LED	GB45B-1/ISOLED35-120V-DIM-4'-SEQ12"-APL/ASL-WSG	
B	4.5" x 4.5" square recessed LED downlight with dimming capabilities, to be installed in gypsum board ceiling finishes	Print Stations, Elevator Lobbies	Lightolier	8.7W	3500K LED	C4X4L05-DL-35K-CL-W	
C	4.5" Diameter round recessed LED downlight with dimming capabilities and a flangeless mounting option to be installed in gypsum board ceiling finishes	Offices, Executive Offices, Conference Rooms	Lightolier	8.7W	3500K LED	C4L05-DL-35K-CL-FT	
D	4' Radius recessed linear T5 fluorescent fixture with dimming ballast and mounting option to be installed in acoustic ceiling tiles	Break Room	Winona	21W	(1) 36" F21 T5 Mini Bi-Pin Fluorescent	6200-RS-LC-4R-120V-OAF-SGW-DIM	
D-1	4' Radius recessed linear T5 fluorescent fixture with dimming ballast and mounting option to be installed (mud-in) in gypsum board ceiling finishes	Offices, Executive Offices, Reception, Conference Rooms	Winona	21W	(1) 36" F21 T5 Mini Bi-Pin Fluorescent	6200-RS-HCMD-4R-120V-OAF-SGW-DIM	
D-2	6' Radius recessed linear T5 fluorescent fixture with dimming ballast and mounting option to be installed (mud-in) in gypsum board ceiling finishes	Reception	Winona	48W	(2) 24" F24 T5HO Mini Bi-Pin Fluorescent	6200-RS-HCMD-6R-120V-OAF-SGW-DIM	
D-3	3' Long recessed linear T5 fluorescent fixture with dimmin ballast and mounting option to be installed (mud-in) in gypsum board ceiling finishes	Reception, Conference Rooms	Winona	21W	(1) 36" F21 T5 Mini Bi-Pin Fluorescent	6200-ST-HCMD-3L-120V-OAF-SGW-DIM	
E	5' Diameter circular luminous pendant with remote driver located in accessible location	Meeting Room	Delray	219W	3500K LED	6725-S-w35-1-BDIM-W	
F	8' Pendant mounted linear T5HO fixture with radiused parabolic semi-specular baffle and integrated occupancy sensor	Library	Litecontrol	48W	(2) 48" F24 T5HO Mini Bi-Pin Fluorescent	P-ID-59M28T5HO-PBSS-TCMW-DIM	

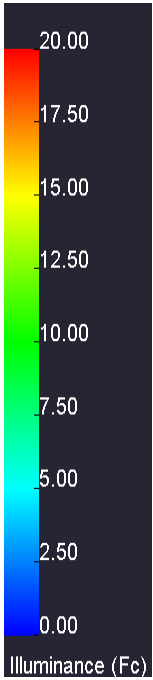
G	Surface mounted LED strip light with mountin track and remote driver located in accessible location	Elevator Lobby	LEDLinear	3W/ft	3700K LED	VarioLED-Flex-VENUS-W37/[length] TV IP68	
H	2' Nominal length, Asymetric,semi-recessed linear LED wall washer with mounting option to be installed in gypsum board ceiling finishes	Reception	Elliptipar	16W	4000K LED	S215-J214-T-02-1T-00-0-40-L3	
I	Not used						
J	Modular, linear LED fixture to be mounted in cove, with Mounting channel and remote dimming driver located in nearby accessible location	Conference Rooms	Tokistar	2.16W/ft	3000K LED	AV-2.4-LIW-MC	
K	Column mounted, RGB color changing uplights with dimming capabilities, DMX controls, and visor accessory to reduce glare	Lower/Upper Lobby	Lumenpulse	14W	RGB LED	LBS-120-RGB-VN-BK-SK	
L	7" Diameter round recessed LED downlight with dimming capabilities and a flangeless mounting option to be installed in gypsum board ceiling finishes	Lower/Upper Lobby	Lightolier	27W	3000K LED	C7L1520DL-30K-M-CCL-FT	
L-1	7" Diameter round recessed LED wall washer with dimming capabilities and a flangeless mounting option to be installed in gypsum board ceiling finishes	Lower/Upper Lobby	Lightolier	27W	3000K LED	C7L1520LW-30K-CCL-FT	
M-1	5' Diameter circular luminous-ring pendant with remote driver	Lobby Staircase	Delray Lighting	72W	RGB LED	6705-S-SQ-1-BDIM-RGB	
M-2	5' Diameter circular luminous-ring pendant with remote driver	Lobby Staircase	Delray Lighting	72W	RGB LED	6805-S-SQ-1-BDIM-RGB	
N	12' Radius recessed linear T5 fluorescent fixture with dimming ballast and mounting option to be installed (mud-in) in gypsum board ceiling finishes	Upper Lobby	Winona	42w	(2) 36" F21 T5 Mini Bi-Pin Fluorescent	6200-FC-HCMD-24D-OAF-SGW-DIM	

## APPENDIX D: LOBBY LIGHT LEVELS

This page contains graphics from AGI, the calculation software we used to determine how well our lighting system performed. To the right is a plan view of the lower lobby, staircase and upper lobby, with colored lines to illustrate the amount of light in each area. Below are two pseudo-color renderings, with representative gradient to illustrate the light levels on each surface.

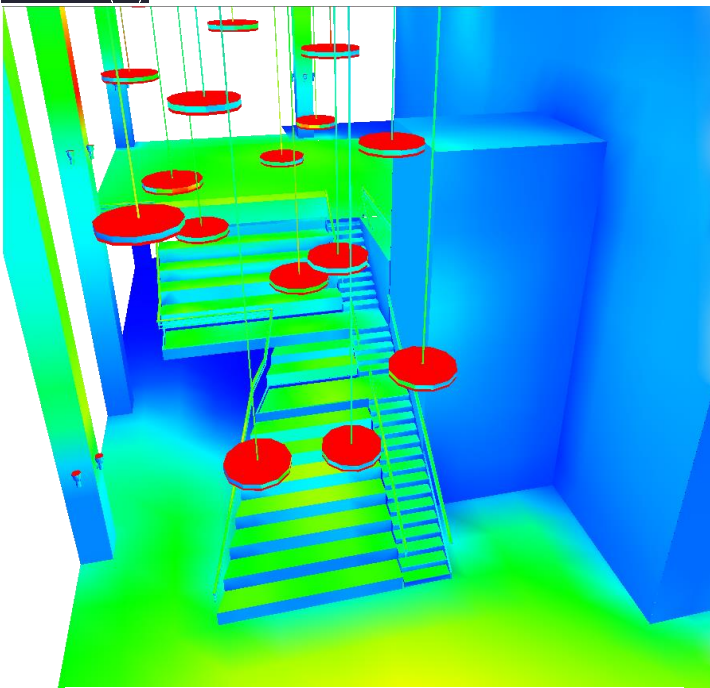


Lower Lobby, Staircase and Upper lobby

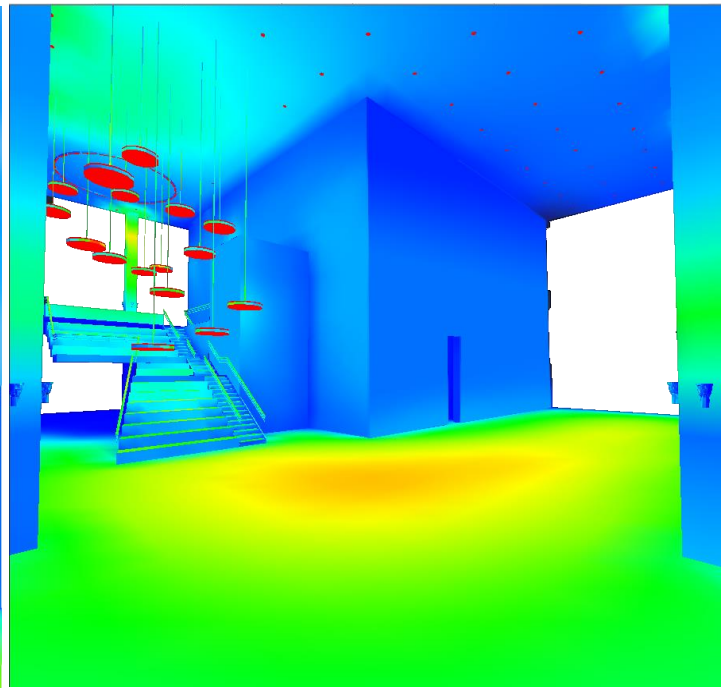


One concern with lighting the lobby was how the lighting design interacts with the LED display. As seen in the renderings below, and the results found in the table, we managed to keep the spill light on the screen to a minimum, thus maximizing it's effect. This was accomplished by utilizing medium degree recessed LED downlights, which were able to throw light onto the floor where it was needed, but whose distribution was tight enough that it did not spill onto the vertical core walls.

		Floor Illuminance (Footcandles)	Vertical Illuminance on LED screen (Footcandles)	Avg:Min	LPD W/ft <sup>2</sup>
Lower Lobby	Target	10	>5	1.5	0.9
	Designed	12.4	3.37	1.8	0.48
Staircase	Target	10	-	1.5	-
	Designed	11.8	-	1.6	-
Upper Lobby	Target	10	-	1.5	0.9
	Designed	9.22	-	1.68	0.51

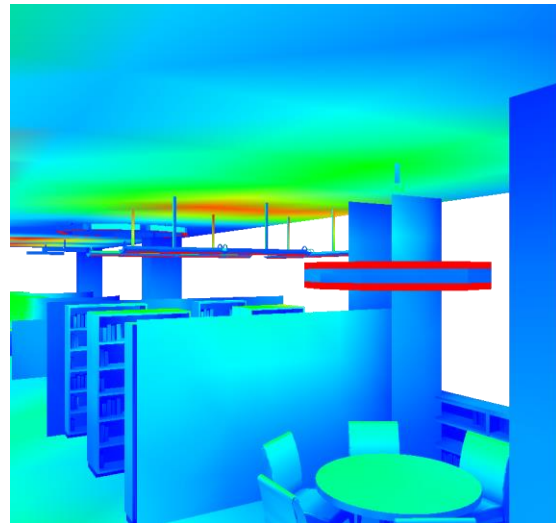


Lobby Staircase

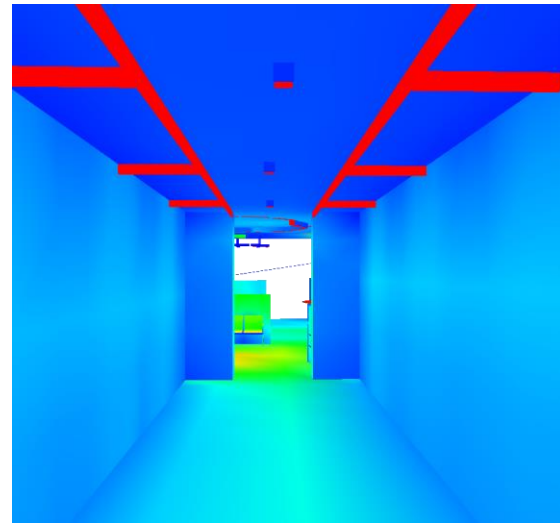


Lower Lobby and core walls

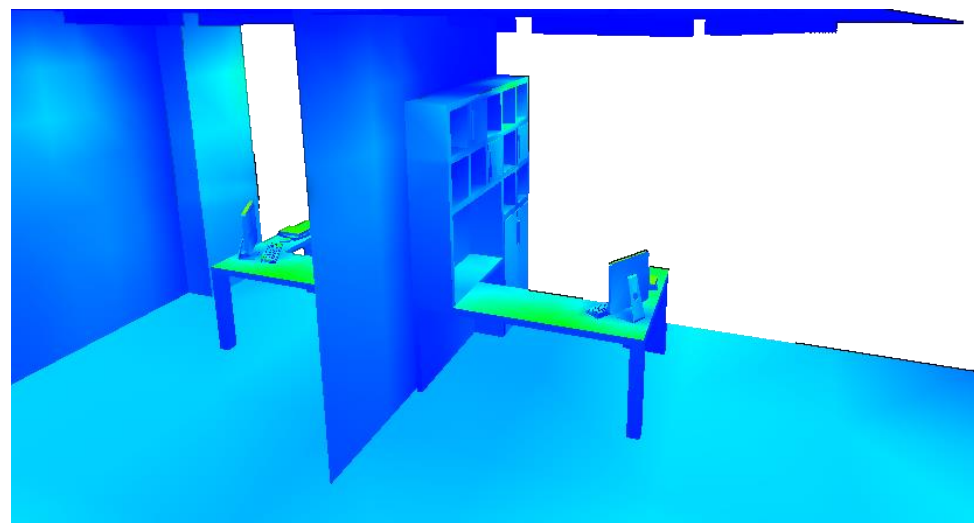
APPENDIX E: OFFICE LIGHT LEVELS



Meeting Room and Library



Elevator Lobby



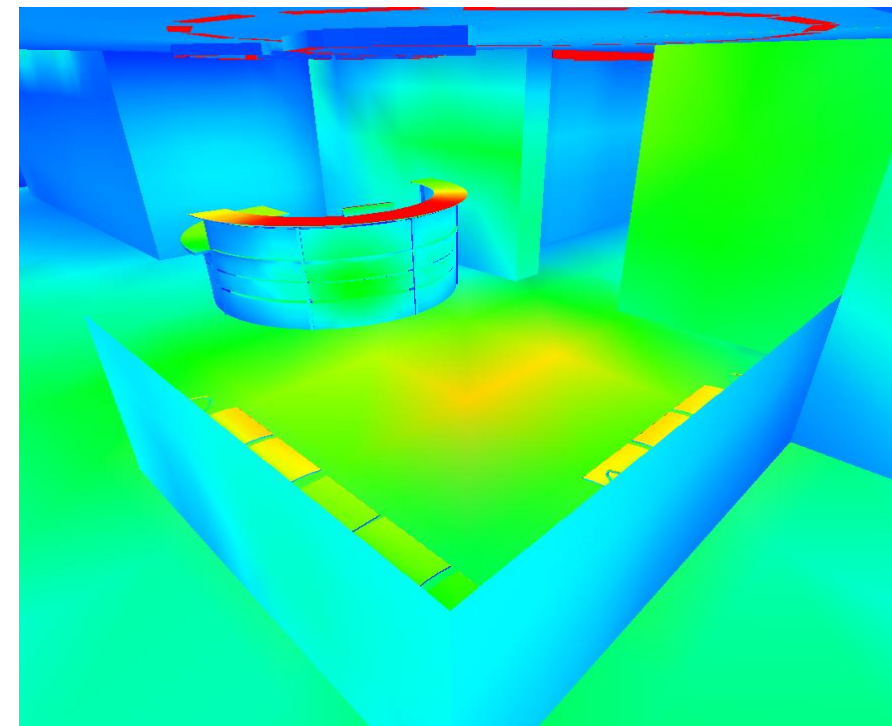
Perimeter Offices

		Avg. Floor Illuminance (Footcandles)	Avg. Desk Illuminance (Footcandles)	Avg:Min	LPD W/ft <sup>2</sup>
Perimeter Offices	Target	10	30	1.5	1.1
	Designed	10.6	29.3	1.6	0.88

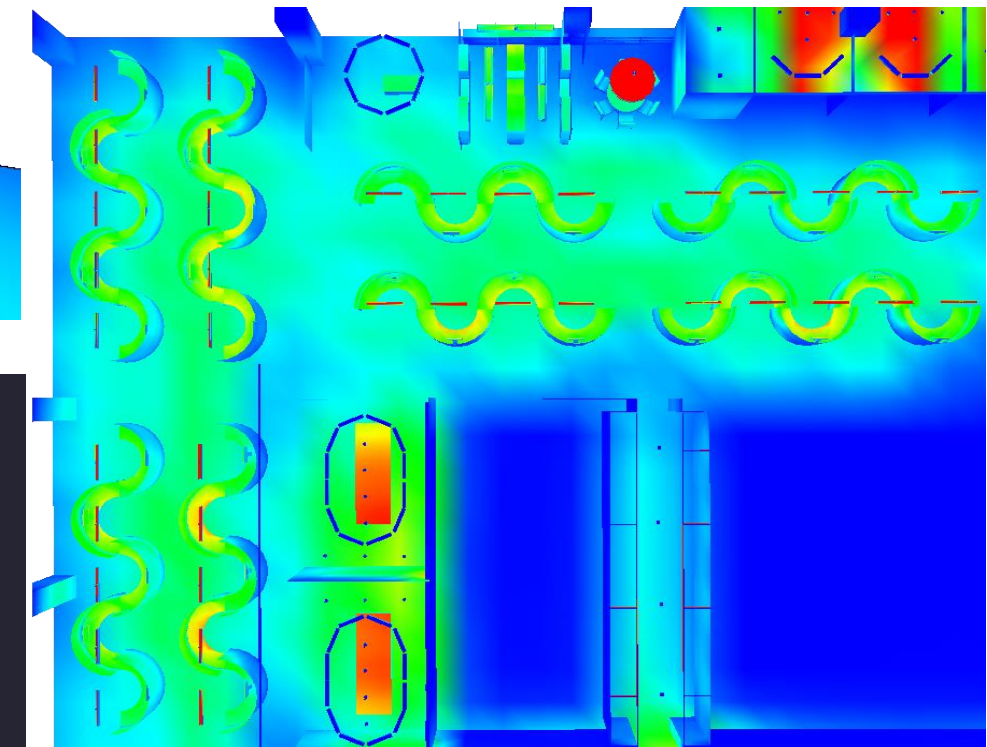
		Avg. Floor Illuminance (Footcandles)	Avg. Desk Illuminance (Footcandles)	Avg:Min	LPD W/ft <sup>2</sup>
Open Office	Target	10	30	2	0.92
	Designed	15.3	29.2	2.9	0.51

		Avg. Floor Illuminance (Footcandles)	Avg. Desk Illuminance (Footcandles)	Avg:Min	LPD W/ft <sup>2</sup>
Elevator Lobby	Target	5	-	1.5	0.64
	Designed	3.47	-	1.08	0.44
Reception	Target	10	50	2	0.9
	Designed	7.8	48.5	2.68	1.17

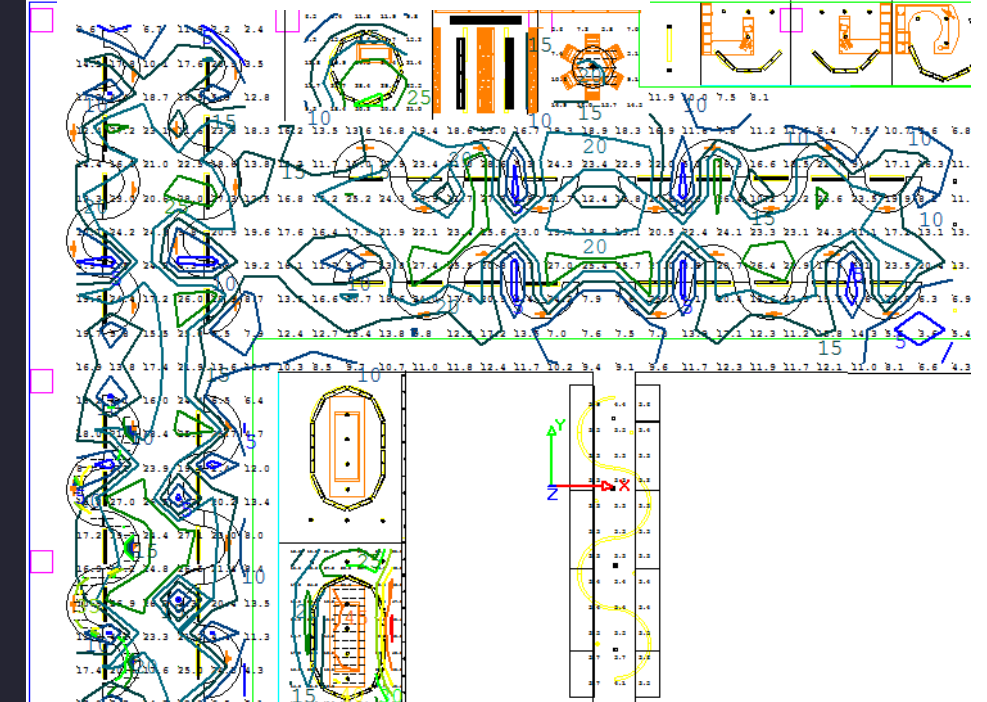
Anxillary Spaces		Floor Illuminance (Footcandles)	Desk Illuminance (Footcandles)	Vertical Illuminance on Bookshelves (Footcandles)	Avg:Min	LPD W/ft <sup>2</sup>
Break Room	Target	10	-	-	2	1.23
	Designed	18.3	-	-	2.82	0.67
Library	Target	-	-	15	-	1.71
	Designed	-	-	11.6	-	0.87
Meeting Room	Target	10	30	-	1.5	1.23
	Designed	9.74	19.66	-	1.16	0.85



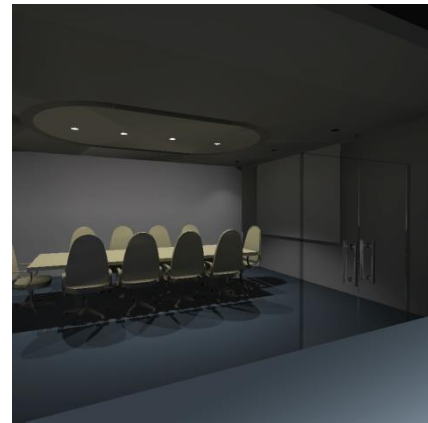
Reception Area



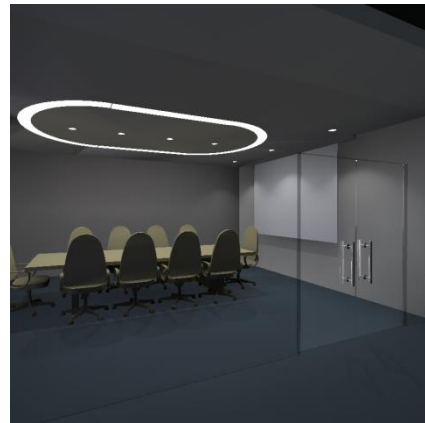
Open Offices, Perimeter Offices, and Ancillary Spaces



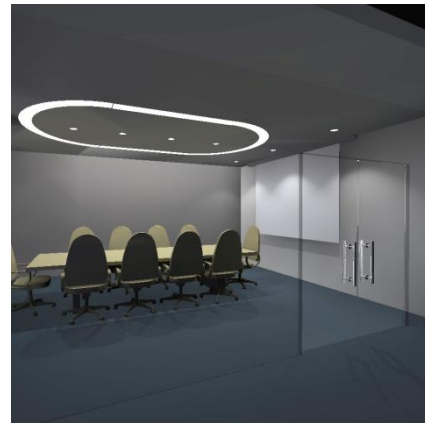
Open Offices, Perimeter Offices, and Ancillary Spaces



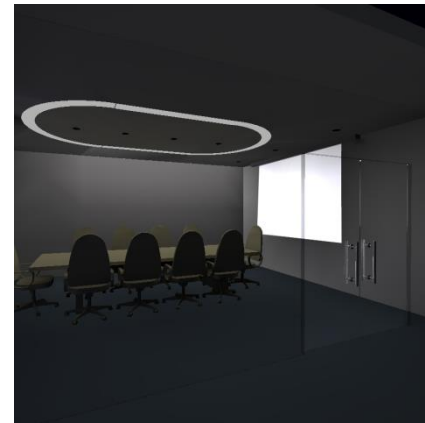
Low Setting Rendering



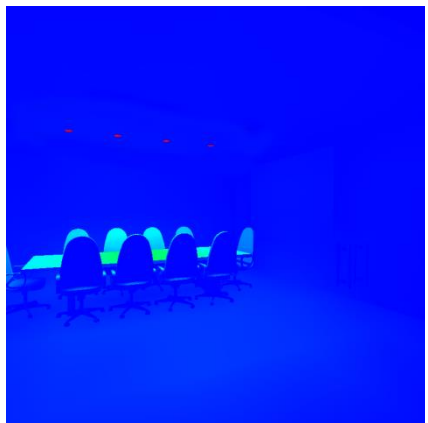
Medium Setting Rendering



High Setting Rendering



Audio/Visual Setting Rendering



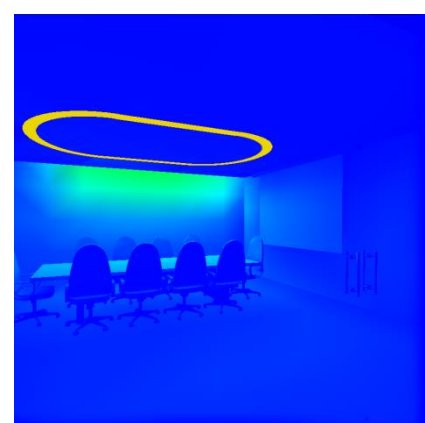
Low Setting Pseudo Color



Medium Setting Pseudo Color



High Setting Pseudo Color



Audio/Visual Setting Pseudo

## APPENDIX F: CONFERENCE ROOM LIGHT LEVELS AND CONTROL

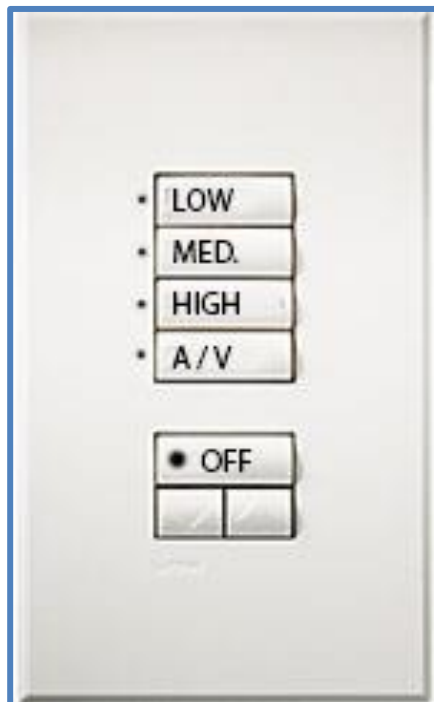
The variable conference room lighting will have the ability to retain 4 preset controls as well as on/off switching and general dimming. We recommend the following presets, based on projected room usage and necessary light levels pertaining to those uses.

The first and second pre-set scenes are for everyday use, and are meant to reduce unneeded power consumption. By reducing the number of fixtures on in scene 1, and reducing the power of selected fixtures in scene 2, the power used to accomplish low and medium level tasks is significantly reduced.

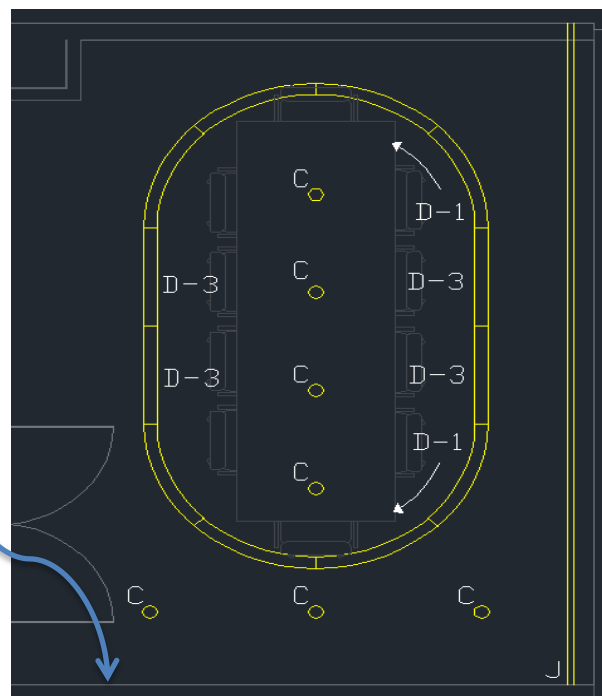
The third scene, 'High,' is meant to be used for high level tasks, such as reading/writing fine print or viewing very detailed and miniscule drawings. This setting may also be used for groups of people over the age of 65, who may require more illumination to perform visual tasks.

The final scene is for audio/visual presentations. These projection screen presentations, which often occur in office conference rooms such as these, rely on very little light hitting the projection screen to be seen clearly. There is still illumination on the table to allow for taking notes or glancing at documents, but the primary focus is on the presentation screen.

Each of these scenes can be dimmed up or down depending on the user's need by using the touchpad on the wall. The control scheme includes vacancy sensors (as required by California's Title 24). They will turn off the lights when they sense no movement after a certain amount of time.



Wall-mounted dimming and preset scene control



	Name	Purpose	Luminaires	Power
1	LOW	Everyday use, meetings	C Fixtures at Table	100%
2	MED.	Low level reading/writing, conferences	D-1, D-3 Fixtures	100%
			All C Fixtures	50%
3	HIGH	High level reading/writing that require task illumination for fine detail	All C, D-1, D-3, J Fixtures	100%
4	A/V	Audio Visual presentations	D-1, D-3 Fixtures	25%
			All J Fixtures	50%

Conference Rooms		Floor Illuminance (Footcandles)				Table Illuminance (Footcandles)				Avg:Min				Vertical Illuminance (Footcandles)		LPD W/ft <sup>2</sup>
		1	2	3	4	1	2	3	4	1	2	3	4	1,2,3	4	
		Target	5	10	15	3	15	30	40	5	1.5	1.5	1.5	2	-	
Designed		7	11	22	7	18	24	37	6	1.3	1.2	1.3	1.3	-	3	1.57

Location	Square Footage	Luminaire	Number	Wattage	LPD	Target*	% Below Target	
Open Office	9000	A	64	66.7	0.47	0.51	0.98	48%
		H	18	16	0.03			
Print Stations	210	B	8	8.7	0.33	0.33	0.98	66%
514 Server Room	105	B	2	8.7	0.17	0.17	0.95	83%
Library	165	A	3	48	0.87	0.87	1.71	49%
Break Room	250	D	8	21	0.67	0.67	1.23	45%
Meeting Room	150	E	1	128	0.85	0.85	1.23	31%
509 Office	100	C	4	8.7	0.35	0.98	1.11	12%
		D-1	3	21	0.63			
510 Office	120	C	4	8.7	0.29	0.82	1.11	27%
		D-1	3	21	0.53			
511 Executive Office	200	C	7	8.7	0.30	0.83	1.11	25%
		D-1	5	21	0.53			
512 Office	85	C	3	8.7	0.31	0.80	1.11	28%
		D-1	2	21	0.49			
516 Office	100	C	4	8.7	0.35	0.98	1.11	12%
		D-1	3	21	0.63			
517 Office	100	C	4	8.7	0.35	0.98	1.11	12%
		D-1	3	21	0.63			
518 Executive Office	200	C	7	8.7	0.30	0.83	1.11	25%
		D-1	5	21	0.53			
519 Office	120	C	4	8.7	0.29	0.82	1.11	27%
		D-1	3	21	0.53			
520 Office	110	C	4	8.7	0.32	0.89	1.11	20%
		D-1	3	21	0.57			
521 Office	110	C	4	8.7	0.32	0.89	1.11	20%
		D-1	3	21	0.57			
Reception	625	D-1	11	21	0.37	1.17	0.9	-30%
		D-2	7	48	0.54			
		D-3	1	21	0.03			
		H	9	16	0.23			
Elevator Lobby	410	G	48	3	0.35	0.44	0.64	32%
		C	4	8.7	0.08			
522 Conference Room	290	C	7	8.7	0.21	1.57	1.23	-28%
		D-1	8	21	0.58			
		D-3	4	48	0.66			
522 Conference Room	290	J	16	2.16	0.12	1.57	1.23	-28%
		C	7	8.7	0.21			
		D-1	8	21	0.58			
522 Conference Room	290	D-3	4	48	0.66	1.57	1.23	-28%
		J	16	2.16	0.12			

### APPENDIX G: LPD CALCULATION

The tables found on this page demonstrate a lighting power density calculation for the typical office floor and the lobby. Each luminaire and its wattage contribute to the calculation of the LPD of each space, measuring how many watts are being used per square foot of space.

The red color denotes the areas where our designed LPD exceeds our target. The remaining spaces are designed to less than what code allows. Because we are using the 'tradable watts' from these other areas and the space by space method these designs are acceptable.

The LPD's in the rest of the building are 12-66% better than what is allowed by code, which reduces the energy this building uses, contributing to our successful near net-zero design.

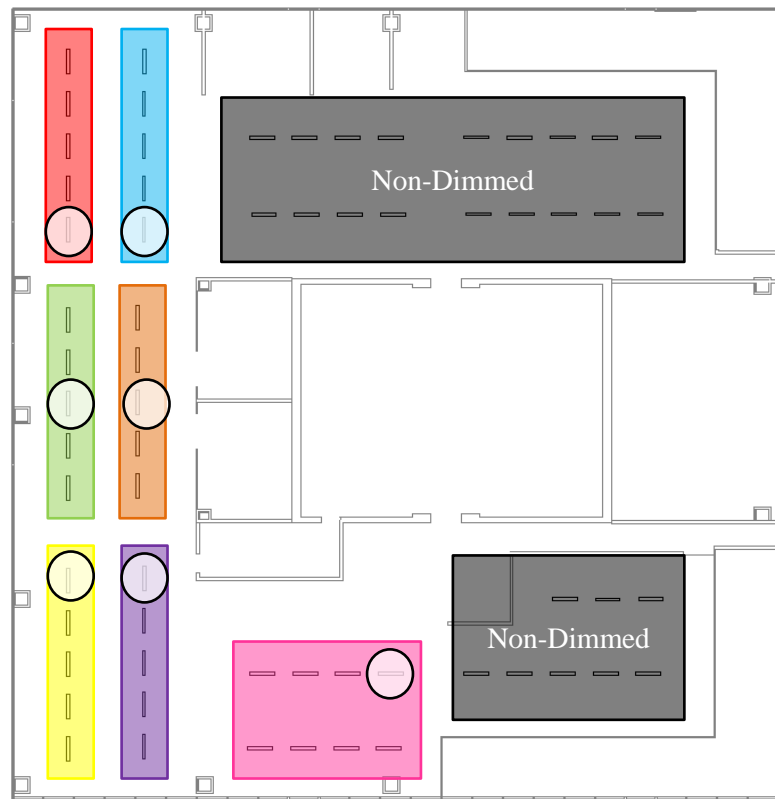


Location	Square Footage	Luminaire	Number	Wattage	LPD	Target*	% Below Target	
Lower Lobby	6917	K	17	14	0.03	0.48	0.9	46%
		L-1	17	27	0.07			
		L	55	27	0.21			
		M-1	8	72	0.08			
		M-2	8	72	0.08			
Upper Lobby	1900	K	8	14	0.06	0.51	0.9	43%
		L	5	27	0.07			
		L-1	8	27	0.11			
		N	24	21	0.27			
Elevator Lobby	410	G	48	3	0.35	0.44	0.64	32%
		C	4	8.7	0.08			

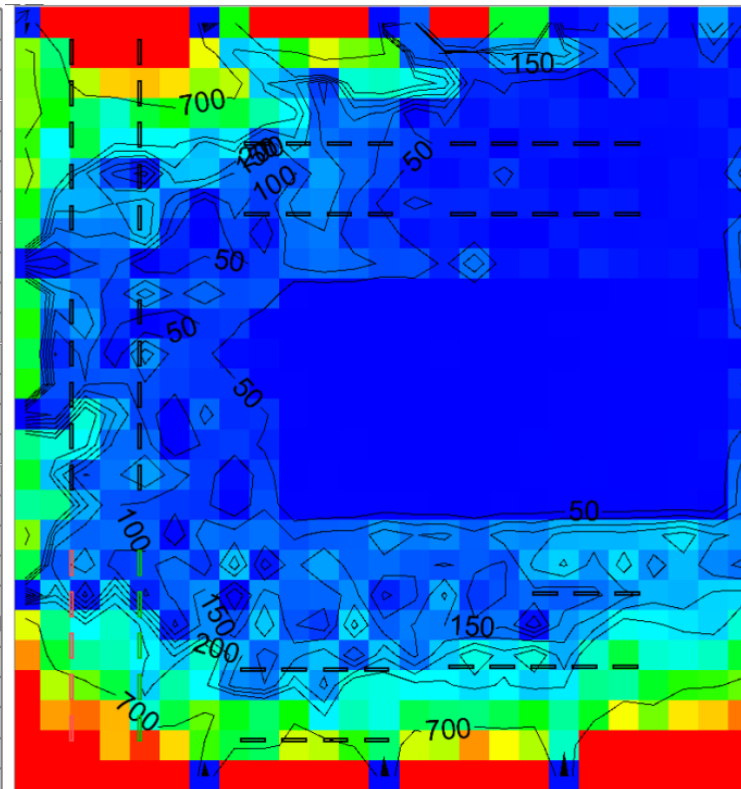
\*All target values based on allowances by ASHRAE 90.1 2010



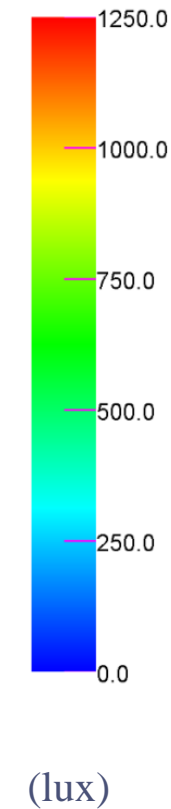
APPENDIX H:  
DAYLIGHTING CALCULATION



Daylighting Zone Diagram  
[critical point denoted with circle]



Example Daylight Illuminance Contour



Zone 1				
Illuminance				
	Dec	March	June	Sept
9:00 AM	350	600	300	150
12:00 PM	500	700	700	700
3:00 PM	50	150	700	150
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.00	0.00	0.00	0.50
12:00 PM	0.00	0.00	0.00	0.00
3:00 PM	0.83	0.50	0.00	0.50
Average Dimming Level = 0.19				

Zone 2				
Illuminance				
	Dec	March	June	Sept
9:00 AM	350	200	250	200
12:00 PM	450	600	250	350
3:00 PM	100	200	350	200
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.00	0.33	0.17	0.33
12:00 PM	0.00	0.00	0.17	0.00
3:00 PM	0.67	0.33	0.00	0.33
Average Dimming Level = 0.19				

Zone 3				
Illuminance				
	Dec	March	June	Sept
9:00 AM	350	600	450	100
12:00 PM	500	700	700	700
3:00 PM	50	150	250	100
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.00	0.00	0.00	0.00
12:00 PM	0.00	0.00	0.00	0.00
3:00 PM	0.83	0.50	0.17	0.67
Average Dimming Level = 0.18				

Zone 4				
Illuminance				
	Dec	March	June	Sept
9:00 AM	225	200	350	50
12:00 PM	750	700	300	700
3:00 PM	100	150	200	75
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.25	0.33	0.00	0.83
12:00 PM	0.00	0.00	0.00	0.00
3:00 PM	0.67	0.50	0.33	0.75
Average Dimming Level = 0.31				

Zone 5				
Illuminance				
	Dec	March	June	Sept
9:00 AM	350	500	300	200
12:00 PM	750	700	700	700
3:00 PM	200	250	300	150
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.00	0.00	0.00	0.33
12:00 PM	0.00	0.00	0.00	0.00
3:00 PM	0.33	0.17	0.00	0.50
Average Dimming Level = 0.11				

Zone 6				
Illuminance				
	Dec	March	June	Sept
9:00 AM	300	300	300	200
12:00 PM	800	700	700	700
3:00 PM	100	150	275	150
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.00	0.00	0.00	0.33
12:00 PM	0.00	0.00	0.00	0.00
3:00 PM	0.67	0.50	0.08	0.50
Average Dimming Level = 0.17				

Zone 7				
Illuminance				
	Dec	March	June	Sept
9:00 AM	100	300	700	150
12:00 PM	200	500	300	350
3:00 PM	50	400	200	200
Dimming Level				
	Dec	March	June	Sept
9:00 AM	0.67	0.00	0.00	0.50
12:00 PM	0.33	0.00	0.00	0.00
3:00 PM	0.83	0.00	0.33	0.33
Average Dimming Level = 0.25				

Our daylight harvesting system utilizes seven dimmed zones, shown above. In order to estimate the amount of energy our daylight harvesting system would save, we analyzed illuminance data from 84 different hours in the year, and averaged the dimming level required for each zone. Ultimately, we found that the average dimming level across all fixtures, and all operating hours throughout the year was 24%. This level of dimming will reduce the electrical load of the fixtures by 60% or 383,000 kWhr/year.

Our daylighting model includes roller shades placed inside the double façade, also controlled by a photosensor. The shades have three settings: open, half-closed, and closed. The shades are Insolroll's Oasis 2700 Exterior Sun Shades. Importantly, the shades are waterproof, and will not deteriorate in the sometimes humid conditions inside the double-façade. Further, they have a 10% openness factor, allowing in a good deal of daylight even when they are in the closed position blocking direct glare from the sun.



Oasis 2700 Exterior Sun Shade



Sahara Fabric  
7% openness factor

APPENDIX I: ELECTRICAL  
EQUIPMENT SCHEDULE

TYPE	TAG	LOCATION		AREA SERVED	ELECTRICAL DATA			BASIS OF DESIGN	
		Level	Room		PHASE	WIRES	SIZE	MANUF.	MODEL
Main Switchgear	SWGR-1	B1	B118B	Building	3	4	4000 A	GE	AKD-20
Generator	GEN	B1	B118B	Building	3	4	350 kVA	Cummins	TP-C350-T1-60
Automatic Transfer Switch	ATS-1	B1	B118B	Building	3	4	500 A	GE	ZT3ST
Distribution Panel	DE-1	B1	B118B	Floors: 5-12	3	4	250 A	Eaton	PRL4D - BX3673
Distribution Panel	DE-2	B1	B118B	Floors: 14-21	3	4	250 A	Eaton	PRL4D - BX3673
Distribution Panel	DE-3	B1	B118B	Floors 22-30	3	4	250 A	Eaton	PRL4D - BX3673
Distribution Panel	RDP-1,5,6	1	101B	Floors: 1,5,6	3	4	600 A	Eaton	PRL4D - BX3673
Distribution Panel	LDP-1	1	101B	Floors: 1,5,6,7,8	3	4	250 A	Eaton	PRL4D - BX3673
Transformer	TF-1	1	101B	Floors 1,5,6	3	4	225 kVA	Eaton	V48M28B22EE
Panelboard	LP-1	1	101B	Floor 1	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	RP-1A	1	101B	Floor 1	3	4	225 A	Eaton	PRL2a - YS2048
Panelboard	RP-1B	1	101B	Floor 1	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	LP-5,6	5	501B	Floors: 5,6	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	RP-5A	5	501B	Floor 5	3	4	225 A	Eaton	PRL2a - YS2048
Panelboard	RP-5B	5	501B	Floor 5	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	EQ-5,6	6	601B	Floors: 5,6	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	RP-6A	6	601B	Floor 6	3	4	225 A	Eaton	PRL2a - YS2048
Panelboard	RP-6B	6	601B	Floor 6	3	4	100 A	Eaton	PRL2a - YS2060
Distribution Panel	RDP-7,8	7	701B	Floors: 7,8	3	4	600 A	Eaton	PRL4D - BX3673
Transformer	TF-7	7	701B	Floors: 7,8	3	4	225 kVA	Eaton	V48M28B22EE
Panelboard	LP-7,8	7	701B	Floors: 7,8	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	EQ-7,8	7	701B	Floors: 7,8	3	4	225 A	Eaton	PRL2a - YS2048
Panelboard	RP-7A	8	801B	Floor 7	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	RP-7B	8	801B	Floor 7	3	4	225 A	Eaton	PRL2a - YS2048
Panelboard	RP-8A	8	801B	Floor 8	3	4	100 A	Eaton	PRL2a - YS2060
Panelboard	RP-8B	8	801B	Floor 8	3	4	100 A	Eaton	PRL2a - YS2060
Distribution Panel	DP-PV	Roof		Upper Floors	3	4	225 A	Eaton	PRL2a - YS2048
Distribution Panel	DP-CHP1	Roof		Upper Floors	3	4	600 A	Eaton	PRL4D - BX3673
Distribution Panel	DP-CHP2	Roof		Upper Floors	3	4	600 A	Eaton	PRL4D - BX3673
Distribution Panel	DP-CHP3	Roof		Upper Floors	3	4	600 A	Eaton	PRL4D - BX3673
<b>NOTES:</b>	<b>Floors 7 and 8 represent typical office floor equipment up to floor 30.</b>								
	<b>Life safety equipment denoted with yellow</b>								

APPENDIX J:  
TYPICAL PANEL LAYOUTS

LOCATION: WEST ELECTRIC CLOSET					REMARKS:			DISTRIBUTION PANEL DESIGNATION <b>RDP-1,5,6</b>		
SERVICE: 208/120 VOLTS 3 PHASE										
MAINS: 600 AMPS 4 WIRE										
MOUNTING: SURFACE					GROUNDING:					
NEUTRAL: YES/NO					GROUND BUS: YES/NO					
					ISOLATED GROUND BUS: YES/NO					
Circuit Number	PROTECTIVE DEVICE				FEEDER	SERVICE	REMARKS	LOAD		
	TYPE	SWITCH / FRAME (AMP)	POLES	FUSE/TRIP (AMP)				CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
1	FUSW	225	3	225	-	RP-1A	-	1.0	80%	10.0
2	FUSW	225	3	225	-	RP-5A	-	1.0	80%	50.4
3	FUSW	100	3	100	-	RP-5B	-	1.0	80%	25.0
4	FUSW	225	3	225	-	RP-6A	-	1.0	80%	50.4
5	FUSW	100	3	100	-	RP-6B	-	1.0	80%	25.0
								DEMAND LOAD(KVA):		160.9
								DEMAND FACTOR:		1.0
								TOTAL DEMAND LOAD(KVA):		160.9
								TOTAL DEMAND LOAD x		1.25 SPARE 201.1
								AMPERE (at		208.0 V) 558.9

LOCATION: B118B					REMARKS:			DISTRIBUTION PANEL DESIGNATION <b>DE-1</b>		
SERVICE: 480/277 VOLTS 3 PHASE										
MAINS: 1000 AMPS 4 WIRE										
MOUNTING: SURFACE					GROUNDING:					
NEUTRAL: YES/NO					GROUND BUS: YES/NO					
					ISOLATED GROUND BUS: YES/NO					
Circuit Number	PROTECTIVE DEVICE				FEEDER	SERVICE	REMARKS	LOAD		
	TYPE	SWITCH / FRAME (AMP)	POLES	FUSE/TRIP (AMP)				CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
1	FUSW	100	3	100	-	EQ-5,6	-	1.0	100%	23.5
2	FUSW	100	3	100	-	EQ-7,8	-	1.0	100%	23.5
3	FUSW	100	3	100	-	EQ-9,10	-	1.0	100%	23.5
4	FUSW	100	3	100	-	EQ-11,12	-	1.0	100%	23.5
								TOTAL CONNECTED LOAD(KVA):		4.0
								DEMAND LOAD(KVA):		93.9
								DEMAND FACTOR:		1.0
								TOTAL DEMAND LOAD(KVA):		93.9
								TOTAL DEMAND LOAD x		1.25 SPARE 117.4
								AMPERE (at		480.0 V) 141.3

LOCATION: 501B					REMARKS:			PANEL DESIGNATION: <b>RP-5A</b>				
SERVICE: 208/120 VOLTS, 3 PHASE, 4 WIRE												
MAINS: 125 AMPS					MAIN OVERCURRENT PROTECTION:							
MOUNTING TYPE: SURFACE					M.C.B.: 225 AMP							
GROUNDING:					M.L.O.: YES/NO							
					ISOLATED GRD. BUS: YES/NO							
					POLES: 42							
SERVICE TO:					A	B	C	SIZE	NO.	SERVICE TO:		
PLUGMOLD RECEPTACLES					1.4			20	1	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.4		20	3	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES							1.4	20	5	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES					1.4			20	7	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.4		20	9	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES							1.4	20	11	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES					1.4			20	13	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.4		20	15	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES							1.4	20	17	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES					1.4			20	19	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.4		20	21	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES							1.4	20	23	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES					1.4			20	25	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.4		20	27	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES							1.4	20	29	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES					1.4			20	31	PLUGMOLD RECEPTACLES		
PLUGMOLD RECEPTACLES						1.1		20	33	CLEANING RECEPTACLES		
PLUGMOLD RECEPTACLES							1.1	20	35	CLEANING RECEPTACLES		
SPARE								20	37	SPARE		
SPARE								20	39	SPARE		
SPARE								20	41	SPARE		
SUBTOTALS					8.64	8.28	8.28			8.64	8.28	8.28
TOTAL LOADS:					17.28	KVA PHASE A	144	A PHASE A	CONNECTED LOAD (PWR):	50.40	KVA	
					16.56	KVA PHASE B	138	A PHASE B	DEMAND FACTOR (PWR):	60%		
					16.56	KVA PHASE C	138	A PHASE C	DEMAND LOAD:	30.24	KVA	
TOTAL CONNECTED LOAD:					50.40	KVA			DEM. LOAD x 1.25 SPARE:	37.80	KVA	
									AMP: (at	208 V)	105 A	

LOCATION: 501B					REMARKS:			PANEL DESIGNATION: <b>RP-5B</b>				
SERVICE: 208/120 VOLTS, 3 PHASE, 4 WIRE												
MAINS: 70 AMPS					MAIN OVERCURRENT PROTECTION:							
MOUNTING TYPE: SURFACE					M.C.B.: 100 AMP							
GROUNDING:					M.L.O.: YES/NO							
					ISOLATED GRD. BUS: YES/NO							
					POLES: 42							
SERVICE TO:					A	B	C	SIZE	NO.	SERVICE TO:		
COMPUTER LAB					0.7			20	1	PRINTERS		
COMPUTER LAB						0.7		20	3	PRINTERS		
COMPUTER LAB							0.7	20	5	COMPUTERS		
COMPUTER LAB					0.7			20	7	PLOTTER		
OFFICE						0.9		20	9	PRINTERS		
OFFICE							0.9	20	11	PRINTERS		
OFFICE					0.9			20	13	COMPUTERS		
OFFICE						0.9		20	15	PLOTTER		
OFFICE							0.9	20	17	CONVENIENCE RECEPTACLES		
OFFICE					0.9			20	19			
OFFICE						0.9		20	21			
OFFICE							0.9	20	23			
EXECUTIVE OFFICE					1.1			20	25			
EXECUTIVE OFFICE						1.1		20	27			
COFFEE MAKER							1.5	20	29			
MICROWAVE					1.0			20	31			
REFRIDGERATOR						0.5		20	33			
TOASTER							1.0	20	35			
SPARE								20	37	SPARE		
SPARE								20	39	SPARE		
SPARE								20	41	SPARE		
SUBTOTALS					5.32	5.00	5.92			3.22	3.50	2.08
TOTAL LOADS:					8.54	KVA PHASE A	71.2	A PHASE A	CONNECTED LOAD (PWR):	25.04	KVA	
					8.50	KVA PHASE B	70.8	A PHASE B	DEMAND FACTOR (PWR):	70%		
					8.00	KVA PHASE C	66.7	A PHASE C	DEMAND LOAD:	17.53	KVA	
TOTAL CONNECTED LOAD:					25.04	KVA			DEM. LOAD x 1.25 SPARE:	21.91	KVA	
									AMP: (at	208 V)	61 A	

APPENDIX J (CONTINUED):  
TYPICAL PANEL LAYOUTS

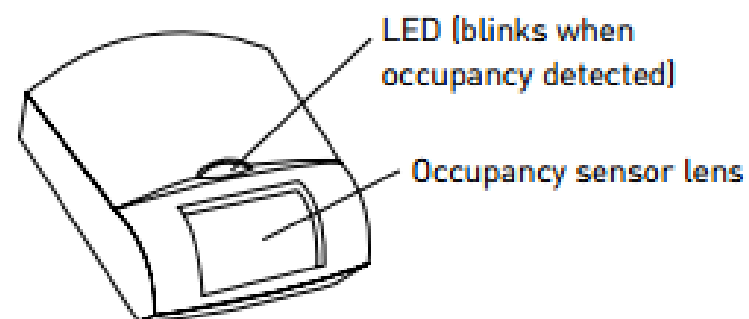
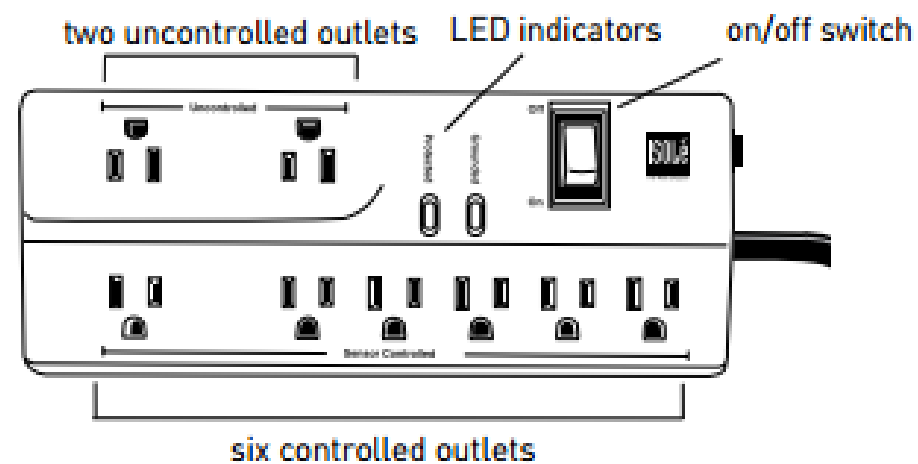
<b>LOCATION:</b> 101B					<b>REMARKS:</b>					<b>DISTRIBUTION PANEL DESIGNATION LDP-1</b>		
<b>SERVICE:</b> 480/277					<b>3 PHASE</b>							
<b>MAINS:</b> 250 AMPS					<b>4 WIRE</b>							
<b>MOUNTING TYPE:</b> SURFACE					<b>GROUNDING:</b>							
<b>NEUTRAL:</b> YES					GROUND BUS: YES ISOLATED GROUND BUS: YES							
Circuit Number	PROTECTIVE DEVICE				FEEDER	SERVICE	REMARKS	LOAD				
	TYPE	SWITCH #FRAME (AMP)	POLES	FUSE/TRIP (AMP)				CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)		
1	FUSW	100	3	100	-	LP-1	-	1.0	100%	10.0		
2	FUSW	100	3	100	-	LP-5,6	-	1.0	100%	18.8		
3	FUSW	100	3	100	-	EQ-5,6	-	1.0	100%	23.5		
4	FUSW	100	3	100	-	LP-7,8	-	1.0	100%	18.8		
5	FUSW	100	3	100	-	EQ-7,8	-	1.0	100%	23.5		
								<b>DEMAND LOAD(KVA):</b>			71.0	
								<b>DEMAND FACTOR:</b>			1.0	
								<b>TOTAL DEMAND LOAD(KVA):</b>			71.0	
								<b>TOTAL DEMAND LOAD x</b>		1.25	<b>SPARE</b>	88.7
								<b>AMPERE (at</b>		208.0	<b>V)</b>	246.5

<b>LOCATION:</b> ELECTRIC CLOSET										<b>REMARKS:</b>										<b>PANEL DESIGNATION: LP-5,6</b>				
<b>SERVICE:</b> 480/277 VOLTS, 3 PHASE, 4 WIRE										<b>MAIN OVERCURRENT PROTECTION:</b>														
<b>MAINS:</b> 100 AMPS										<b>M.C.B.: 100 AMP</b>														
<b>MOUNTING TYPE:</b> SURFACE										<b>M.L.O.: YES/NO</b>														
<b>GROUNDING:</b>										<b>POLES: 42</b>														
<b>ISOLATED GRD. BUS: YES/NO</b>																								
SERVICE TO:		A	B	C	SIZE	NO.		NO.	SIZE	A	B	C	SERVICE TO:											
OPEN AREA LIGHTING		0.8			20	1	-	2	20	0.8			OPEN AREA LIGHTING											
OPEN AREA LIGHTING			0.8		20	3		4	20		0.8		OPEN AREA LIGHTING											
OPEN AREA LIGHTING				0.8	20	5		6	20			0.8	OPEN AREA LIGHTING											
OPEN AREA LIGHTING		0.8			20	7	-	8	20	0.8			OPEN AREA LIGHTING											
OPEN AREA LIGHTING			0.8		20	9		10	20		0.8		OPEN AREA LIGHTING											
OPEN AREA LIGHTING				0.8	20	11		12	20			0.8	OPEN AREA LIGHTING											
OPEN AREA LIGHTING		0.8			20	13	-	14	20	0.8			OPEN AREA LIGHTING											
OFFICE LIGHTING			0.1		20	15		16	20		0.1		OFFICE LIGHTING											
OFFICE LIGHTING				0.1	20	17		18	20			0.1	OFFICE LIGHTING											
OFFICE LIGHTING		0.1			20	19	-	20	20	0.1			OFFICE LIGHTING											
OFFICE LIGHTING			0.1		20	21		22	20		0.1		OFFICE LIGHTING											
CONFERENCE LIGHTING				1.1	20	23		24	20			0.3	CONFERENCE LIGHTING											
EXECUTIVE OFFICE LIGHTING		0.1			20	25	-	26	20	0.1			EXECUTIVE OFFICE LIGHTING											
EXECUTIVE OFFICE LIGHTING			0.1		20	27		28	20		0.1		EXECUTIVE OFFICE LIGHTING											
PRINTING ROOM				0.1	20	29		30	20			0.1	PRINTING ROOM											
COMPUTER LAB		0.1			20	31	-	32	20	0.1			COMPUTER LAB											
KITCHENETTE			0.1		20	33		34	20		0.1		KITCHENETTE											
BATHROOMS				0.1	20	35		36	20			0.1	BATHROOMS											
SPARE					20	37	-	38	20				SPARE											
SPARE					20	39		40	20				SPARE											
SPARE					20	41		42	20				SPARE											
<b>SUBTOTALS</b>		<b>2.75</b>	<b>2.10</b>	<b>3.05</b>							<b>2.75</b>	<b>2.10</b>	<b>2.24</b>											
<b>TOTAL LOADS:</b>		<b>5.50</b>	<b>KVA PHASE A</b>	<b>45.8</b>	<b>A PHASE A</b>	<b>CONNECTED LOAD (PWR):</b>				<b>15.00</b>	<b>KVA</b>													
		<b>4.21</b>	<b>KVA PHASE B</b>	<b>35.1</b>	<b>A PHASE B</b>	<b>DEMAND FACTOR (PWR):</b>				<b>100%</b>														
		<b>5.30</b>	<b>KVA PHASE C</b>	<b>44.1</b>	<b>A PHASE C</b>	<b>DEMAND LOAD:</b>				<b>15.00</b>	<b>KVA</b>													
<b>TOTAL CONNECTED LOAD:</b>		<b>15.00</b>	<b>KVA</b>					<b>DEM. LOAD x 1.25 SPARE:</b>				<b>18.75</b>	<b>KVA</b>											
						<b>AMP: (at 208 V)</b>				<b>52</b>	<b>A</b>													

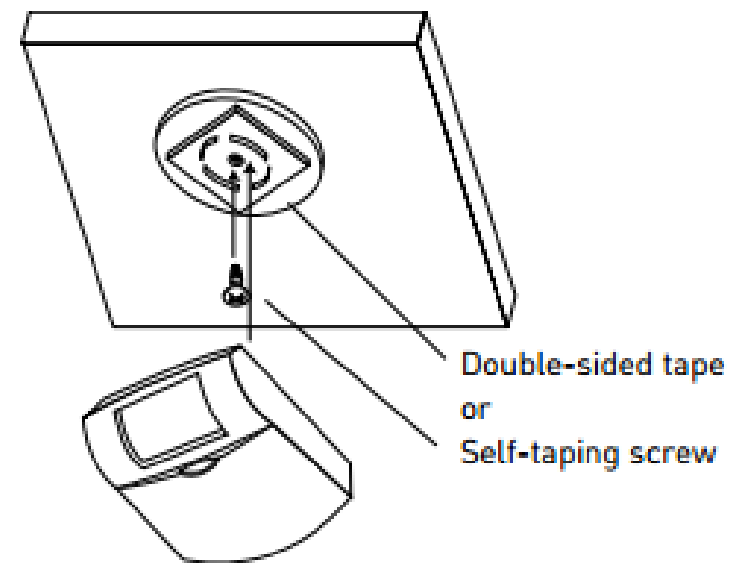
<b>LOCATION:</b> ELECTRIC CLOSET										<b>REMARKS:</b>										<b>PANEL DESIGNATION: EQ-5,6</b>				
<b>SERVICE:</b> 480/277 VOLTS, 3 PHASE, 4 WIRE										<b>MAIN OVERCURRENT PROTECTION:</b>														
<b>MAINS:</b> 100 AMPS										<b>M.C.B.: 100 AMP</b>														
<b>MOUNTING TYPE:</b> SURFACE										<b>M.L.O.: YES/NO</b>														
<b>GROUNDING:</b>										<b>POLES: 42</b>														
<b>ISOLATED GRD. BUS: YES/NO</b>																								
SERVICE TO:		A	B	C	SIZE	NO.		NO.	SIZE	A	B	C	SERVICE TO:											
FAN ROOM AHU		1.9			20	1	-	2	20	1.9			FAN ROOM AHU											
			1.9		20	3		4	20		1.9		FAN ROOM AHU											
				1.9	20	5		6	20			1.9	FAN ROOM AHU											
FAN ROOM AHU		1.9			20	7	-	8	20	1.9			FAN ROOM AHU											
			1.9		20	9		10	20		1.9		FAN ROOM AHU											
				1.9	20	11		12	20			1.9	FAN ROOM AHU											
EMERGENCY LIGHTING		0.3			20	13	-	14	20	0.3			EMERGENCY LIGHTING											
EMERGENCY LIGHTING			0.3		20	15		16	20		0.3		EMERGENCY LIGHTING											
					20	17		18	20															
					20	19	-	20	20															
					20	21		22	20															
					20	23		24	20															
					20	25	-	26	20															
					20	27		28	20															
					20	29		30	20															
					20	31	-	32	20															
					20	33		34	20															
					20	35		36	20															
SPARE					20	37	-	38	20				SPARE											
SPARE					20	39		40	20				SPARE											
SPARE					20	41		42	20				SPARE											
<b>SUBTOTALS</b>		<b>4.02</b>	<b>4.02</b>	<b>3.70</b>							<b>4.02</b>	<b>4.02</b>	<b>3.70</b>											
<b>TOTAL LOADS:</b>		<b>8.04</b>	<b>KVA PHASE A</b>	<b>67</b>	<b>A PHASE A</b>	<b>CONNECTED LOAD (PWR):</b>				<b>23.47</b>	<b>KVA</b>													
		<b>8.04</b>	<b>KVA PHASE B</b>	<b>67</b>	<b>A PHASE B</b>	<b>DEMAND FACTOR (PWR):</b>				<b>100%</b>														
		<b>7.40</b>	<b>KVA PHASE C</b>	<b>61.7</b>	<b>A PHASE C</b>	<b>DEMAND LOAD:</b>				<b>23.47</b>	<b>KVA</b>													
<b>TOTAL CONNECTED LOAD:</b>		<b>23.47</b>	<b>KVA</b>					<b>DEM. LOAD x 1.25 SPARE:</b>				<b>29.34</b>	<b>KVA</b>											
						<b>AMP: (at 208 V)</b>				<b>82</b>	<b>A</b>													

## Controls & Mounting

### Product Controls



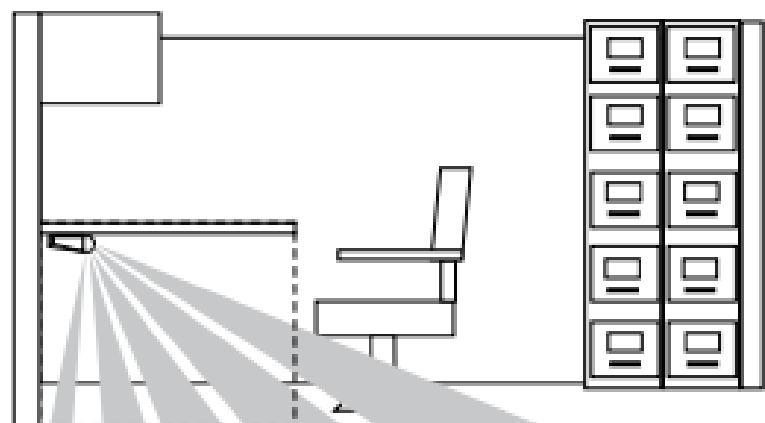
### Personal Sensor Mounting



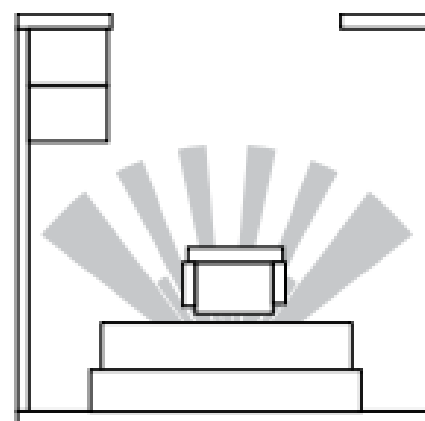
Sensor mounts under desk or binder bin with double-sided tape or self-taping screw

## Coverage

### Side Coverage Pattern



### Overhead Coverage Pattern



### PV OUTPUT CALCULATION

241	panels
2.44	m <sup>2</sup> /panel
3,544.43	Whr/(m <sup>2</sup> -day)

multiply the above to get:

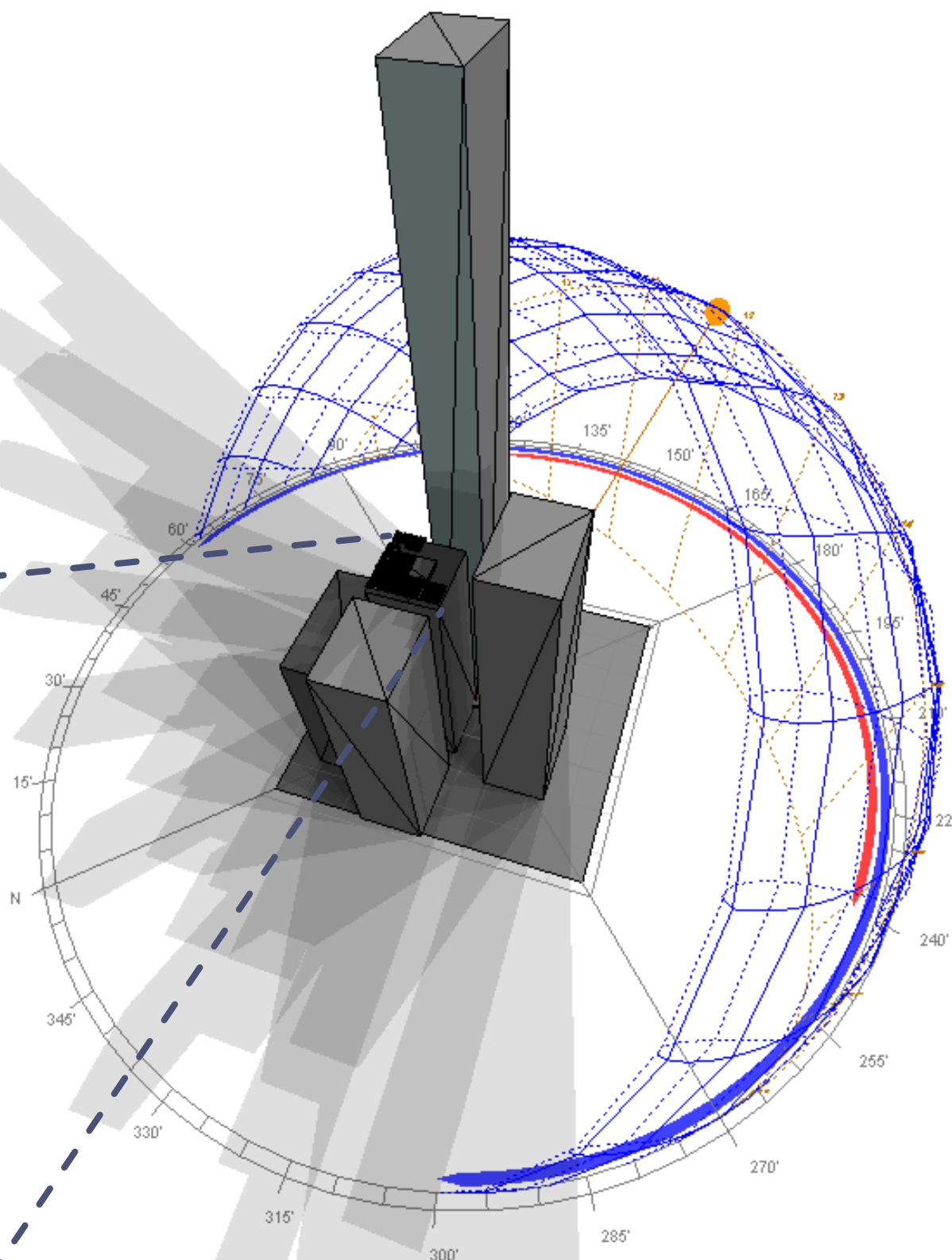
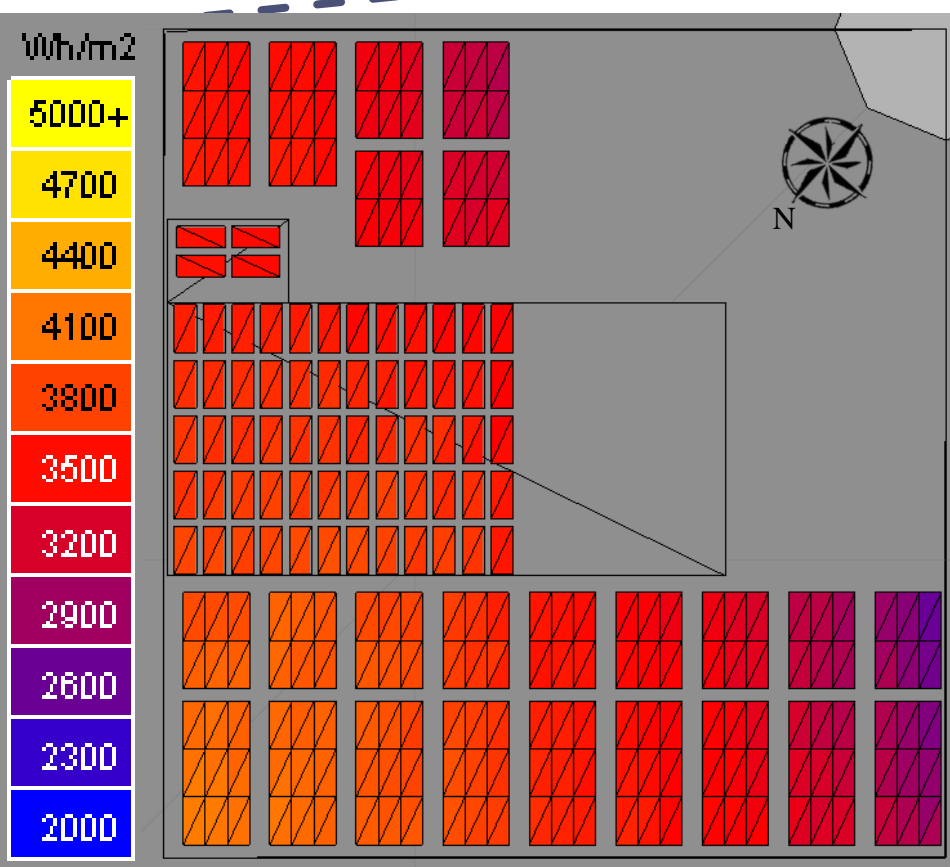
2,083.41	kWhr/day
760,445.53	kWhr/year
19.7%	system efficiency

$760,445.53 * 19.7\% =$

**149,808 kWhr/year produced**

### APPENDIX L: PHOTOVOLTAIC SYSTEM ANALYSIS

Our team utilized Autodesk's Ecotect Analysis software to analyze our photovoltaic array. By modeling the site and surrounding buildings, we were able to calculate the average daily incident solar radiation on each of the panels, displayed below. Using this information, as well as the efficiency of our specified photovoltaic cells, we were able to calculate the annual energy output of our photovoltaic system, which is 149,808 kWhr.



Ecotect model of 350 Mission site

Panel #	Incident Solar Radiation (Wh/m <sup>2</sup> )
1	3477.16
2	3477.13
3	2964.73
4	2903.82
5	2784.32
6	2777.82
7	2647.24
8	2660.31
9	2841.54
10	2873.9
11	2759.91
12	2771.18
13	2594.23
14	2584.13
15	3087.66
16	3109.75
237	3557.84
239	3616.27
240	3594.24
241	3591.11
<b>Average:</b>	<b>3544.43</b>

APPENDIX M: PHOTOVOLTAIC SYSTEM

## SUNPOWER

## E19 / 425 SOLAR PANEL

MAXIMUM EFFICIENCY AND PERFORMANCE


**BENEFITS**

**Highest Efficiency**  
SunPower™ Solar Panels are the most efficient photovoltaic panels on the market today.

**More Power**  
Our panels produce more power in the same amount of space—up to 50% more than conventional designs and 100% more than thin film solar panels.

**Reduced Installation Cost**  
More power per panel means fewer panels per install. This saves both time and money.

**Reliable and Robust Design**  
Proven materials, tempered front glass, and a sturdy anodized frame allow panel to operate reliably in multiple mounting configurations.



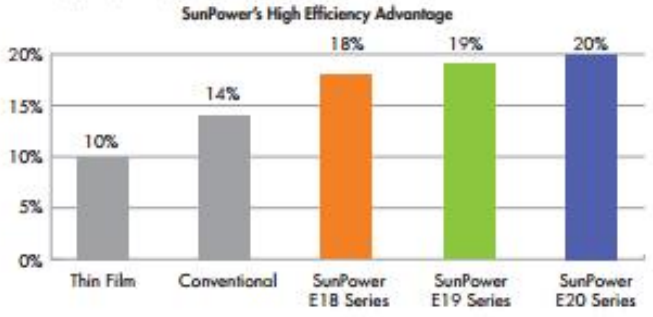
E19

SERIES


**A new standard for power plants.**

The SunPower® 425 Solar Panel provides today's highest efficiency and performance. Utilizing 128 back-contact solar cells, the SunPower 425 delivers a total panel conversion efficiency of 19.7%. The panel's reduced voltage-temperature coefficient, anti-reflective glass and exceptional low-light performance attributes provide outstanding energy delivery per peak power watt.


**SunPower's High Efficiency Advantage**



Technology	Efficiency (%)
Thin Film	10%
Conventional	14%
SunPower E18 Series	18%
SunPower E19 Series	19%
SunPower E20 Series	20%



SPR-425E-WHT-D



## SUNPOWER

## E19 / 425 SOLAR PANEL

MAXIMUM EFFICIENCY AND PERFORMANCE

Electrical Data		
Measured at Standard Test Conditions (STC) (irradiance of 1000W/m <sup>2</sup> , AM 1.5, and cell temperature 25° C)		
Peak Power (+/-5%)	P <sub>max</sub>	425 W
Efficiency	η	19.7 %
Rated Voltage	V <sub>mpp</sub>	72.9 V
Rated Current	I <sub>mpp</sub>	5.83 A
Open Circuit Voltage	V <sub>oc</sub>	85.6 V
Short Circuit Current	I <sub>sc</sub>	6.21 A
Maximum System Voltage	UL	600 V
Temperature Coefficients	Power (P)	-0.38% / K
	Voltage (V <sub>oc</sub> )	-235.5mV / K
	Current (I <sub>sc</sub> )	3.5mA / K
NOCT		45° C +/-2° C
Series Fuse Rating		20 A

Mechanical Data	
Solar Cells	128 SunPower all-back contact monocrystalline
Front Glass	High transmission tempered glass with anti-reflective (AR) coating
Junction Box	IP-65 rated with 3 bypass diodes Dimensions: 32 x 155 x 128 (mm)
Output Cables	700 mm cables/ Multi-Contact (MC4) compatible connectors
Frame	Anodized aluminum alloy type 6063 (silver); stacking pins
Weight	56.0 lbs. (25.4 kg)

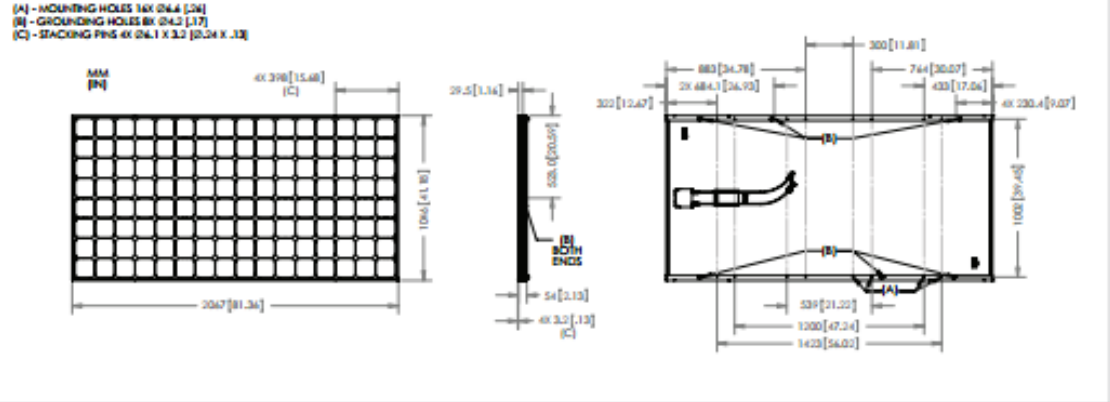
Tested Operating Conditions	
Temperature	-40° F to +185° F (-40° C to + 85° C)
Max load	50 psf (245 kg/m <sup>2</sup> ) (2400 Pa) front and back – e.g. wind
Impact Resistance	Hail 1 in (25 mm) at 52mph (23 m/s)

Warranties and Certifications	
Warranties	25 year limited power warranty 10 year limited product warranty
Certifications	Tested to UL 1703, Class C Fire Rating

**Dimensions**



(A) - MOUNTING HOLES 1/4" DIA. (3/4")  
(B) - GROUNDING HOLES 3/16" DIA. (1.7)  
(C) - STACKING PINS 4X 1/8" X 3/32" (3.18 X .32)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Visit [sunpowercorp.com](http://sunpowercorp.com) for details

SUNPOWER and the SUNPOWER logo are trademarks or registered trademarks of SunPower Corporation.  
© 2011 November SunPower Corporation. All rights reserved. Specifications included in this document are subject to change without notice.

sunpowercorp.com  
Document #001-47015 Rev. A / 07\_10

AEI Team No. 05-2014

E-14

## APPENDIX N: COMBINED HEAT AND-POWER




---

**65 kW Capstone Microturbines**


---

Electrical Efficiency	29%
Generation Capacity	627 kW
Quantity	10
Actual Capacity	650 kW

---

**Energy Production**

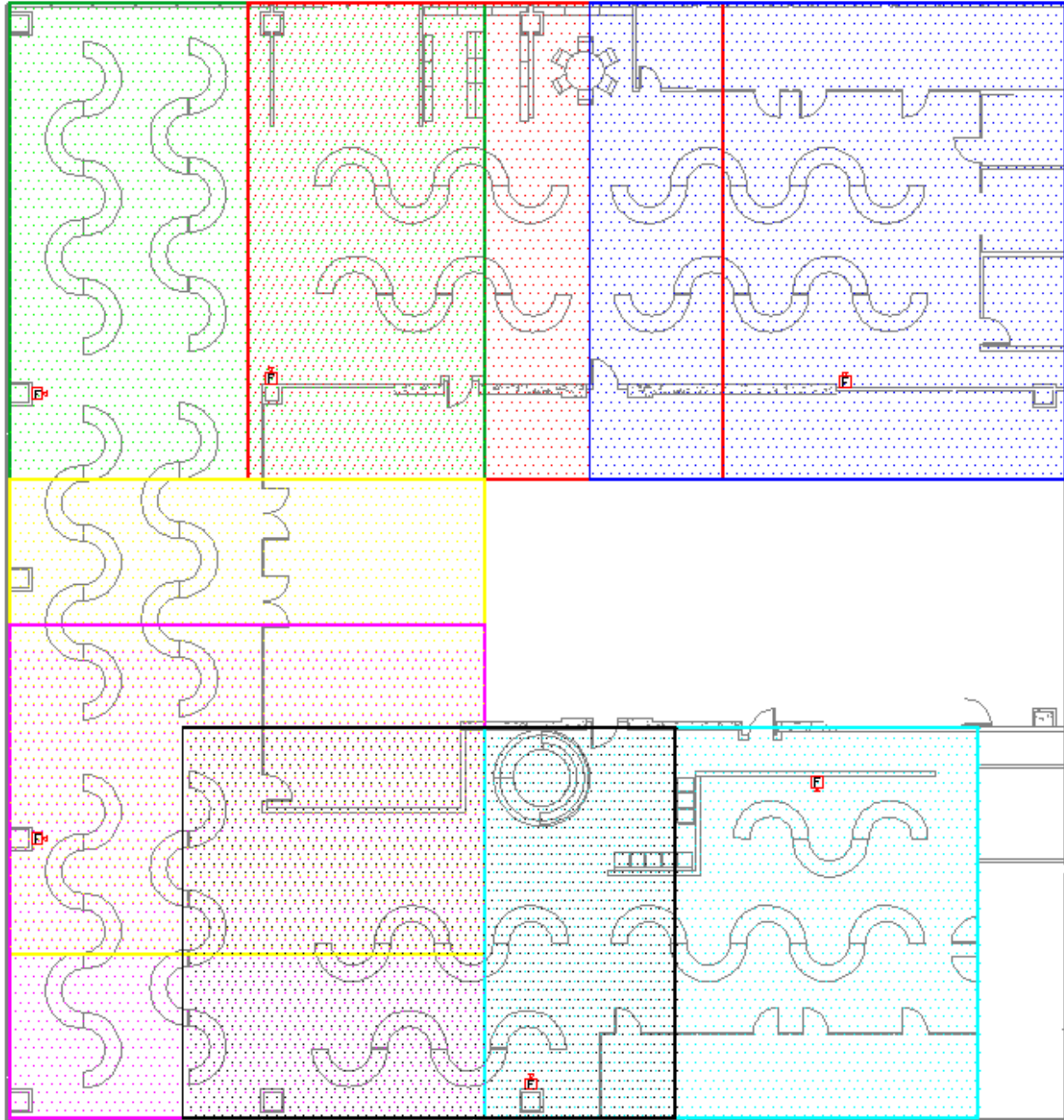

---

Generation Capacity	650 kW
Operating Hours	1,560 hrs/yr
Generated Power	1,014,000 kWh/yr
Building Power Consumption	3,815,944 kWh/yr
Electrical Capacity Met	27%

Our combined heat-and-power system utilizes ten 65kW Capstone Microturbines, located in a mechanical room on the roof of the building. In order to reduce transmission losses, the CHP system directly feeds the office loads on the top fifteen floors of 350 Mission (see E-106 Riser Diagram for details).

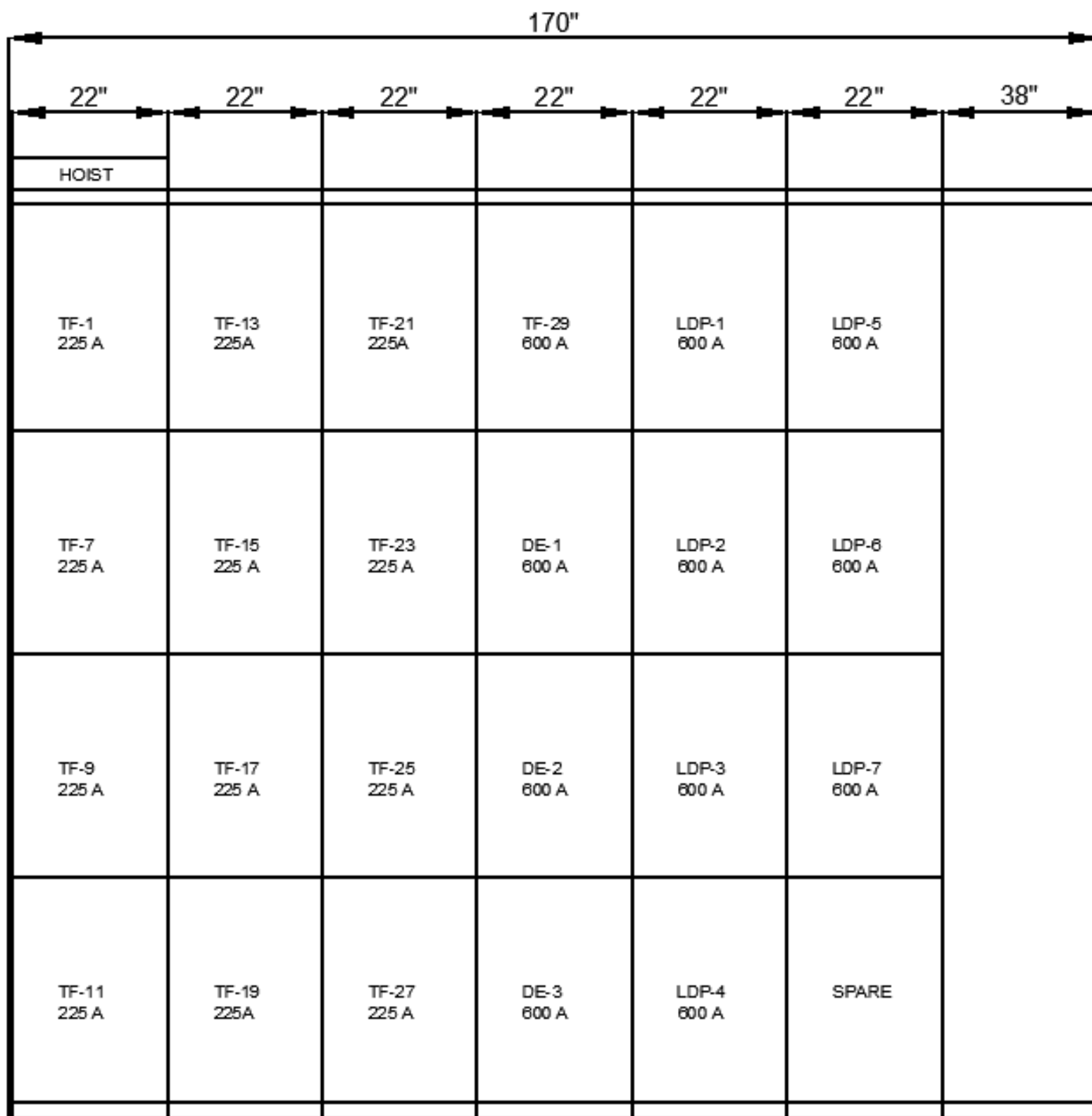


## APPENDIX O: FIRE ALARM SYSTEM



As per NFPA 72, our open office plan has been broken up into seven smaller 55' x 55' (or smaller) areas shown above. The design is such that each area contains at least one initiating device. According to NFPA 72, this design requires the strobe devices to emit at least 150 cd of light.

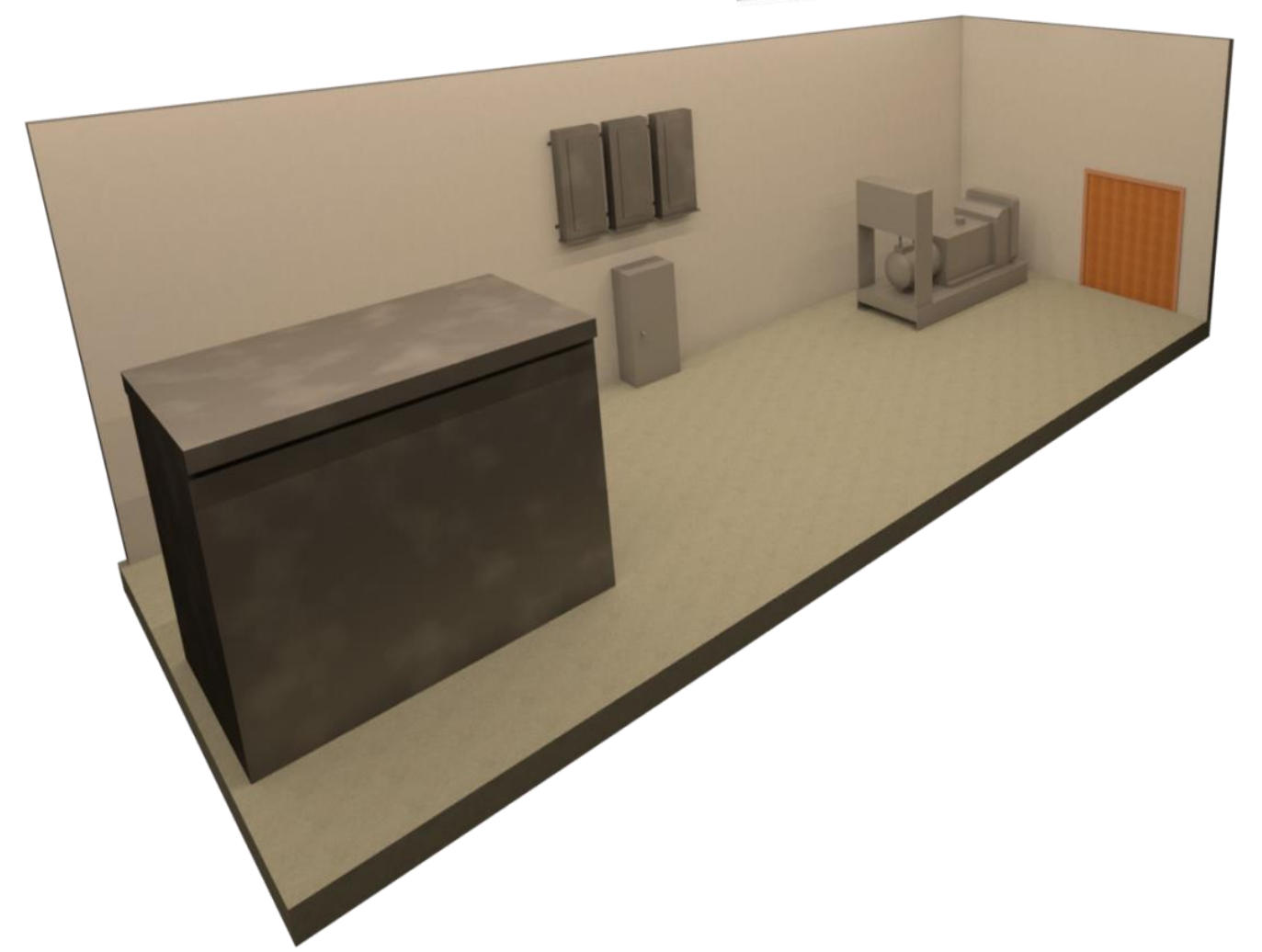
APPENDIX P:  
MAIN ELECTRICAL ROOM



FRONT ELEVATION

Our electrical design utilizes a 4000 amp GE AKD-20 switchgear, located in the building electrical room in the basement. The switchgear and generator (350 kVA Cummins TP-350-T-60) both service the building emergency loads through an automatic transfer switch and three distribution panels. For more information about the electrical distribution system, see drawing E-106, the building Riser Diagram.

Not shown in the rendering below is the Fire Alarm Control Panel (FACP), which is placed on the wall closest to the viewer. See E-103 Lobby and Basement Electrical Plan and E-104 Typical Office Electrical Plan for more details about the fire alarm infrastructure.





**Electrical**

2014 Charles Pankow Foundation  
Annual Architectural Engineering  
Student Design Competition

No.	Description	Date

AEI Team Number  
05-2014

Sheet List and Symbol Legend

E-100

**SHEET LIST**

E-100	SHEET LIST AND SYMBOL LEGEND
E-101	LOBBY LIGHTING LAYOUT AND RENDERINGS
E-102	OFFICE LIGHTING LAYOUT AND RENDERINGS
E-103	LOBBY AND BASEMENT ELECTRICAL LAYOUT
E-104	OFFICE ELECTRICAL LAYOUT
E-105	ROOF ELECTRICAL AND PHOTOVOLTAIC LAYOUT
E-106	ELECTRICAL AND FIRE ALARM RISER

**ABBREVIATIONS**

AFF	above finished floor
TYP	typical
CM	coffee maker
MW	microwave
R	refrigerator
T	toaster
PR	projector
PIR	passive infra-red
US	ultra-sonic

General Notes:

- Pendant luminaires shall be mounted to be compliant with California seismic code requirements
- All enclosed offices to be equipped with single-pole dimming switches
- All dedicated receptacles to be on their own circuit (see E-106 panel schedule for breaker and wire sizing)

**ELECTRICAL SYMBOLS**

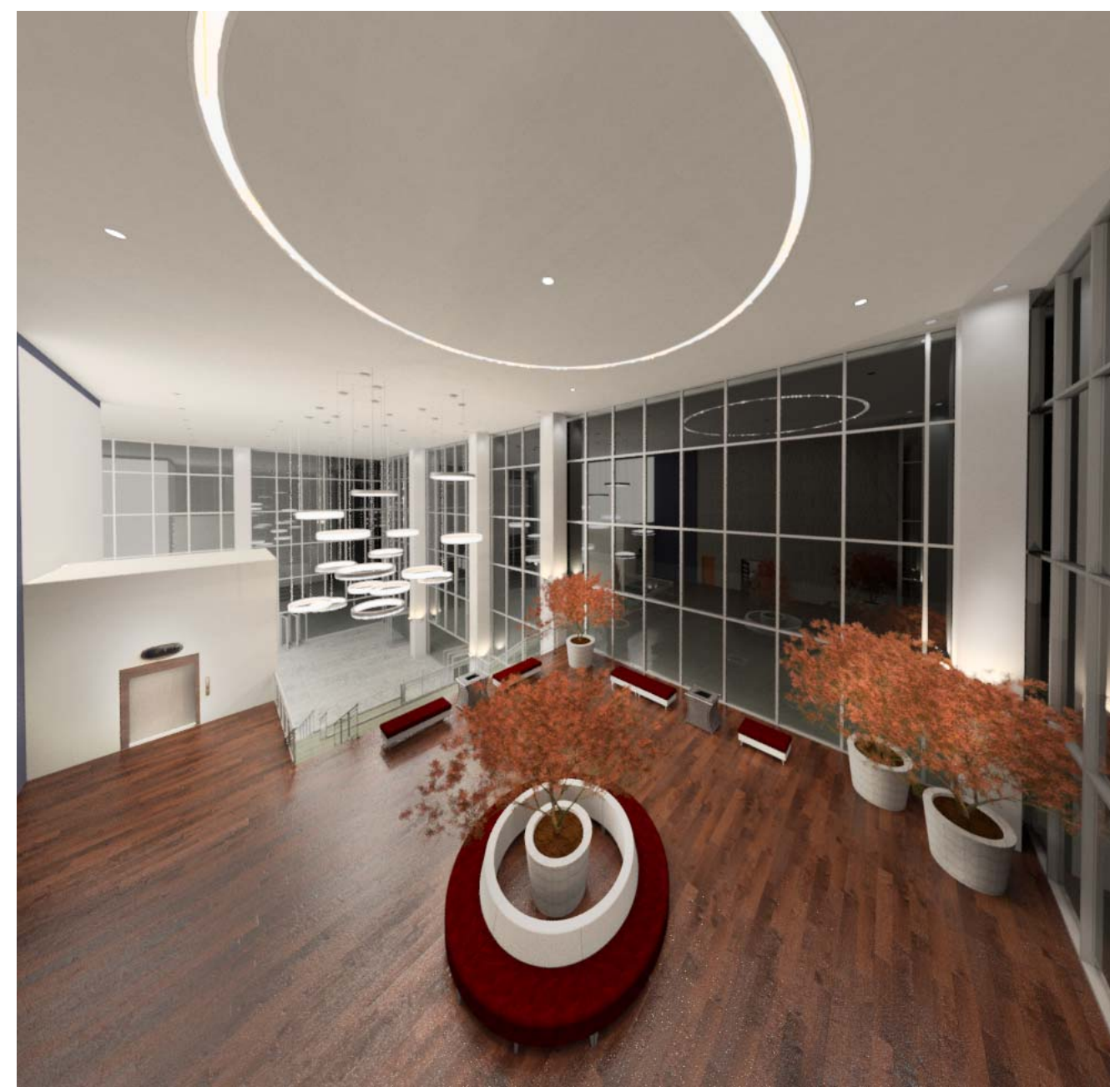
	floor mounted duplex receptacle
	dedicated floor mounted duplex receptacle
	dedicated ceiling mounted duplex receptacle
	floor mounted quadruplex receptacle
	floor mounted data/internet outlet
	junction box
	conduit above finished ceiling
	magnetic card swipe security device
	panelboard
	distribution panelboard
	step down transformer

**FIRE ALARM SYMBOLS**

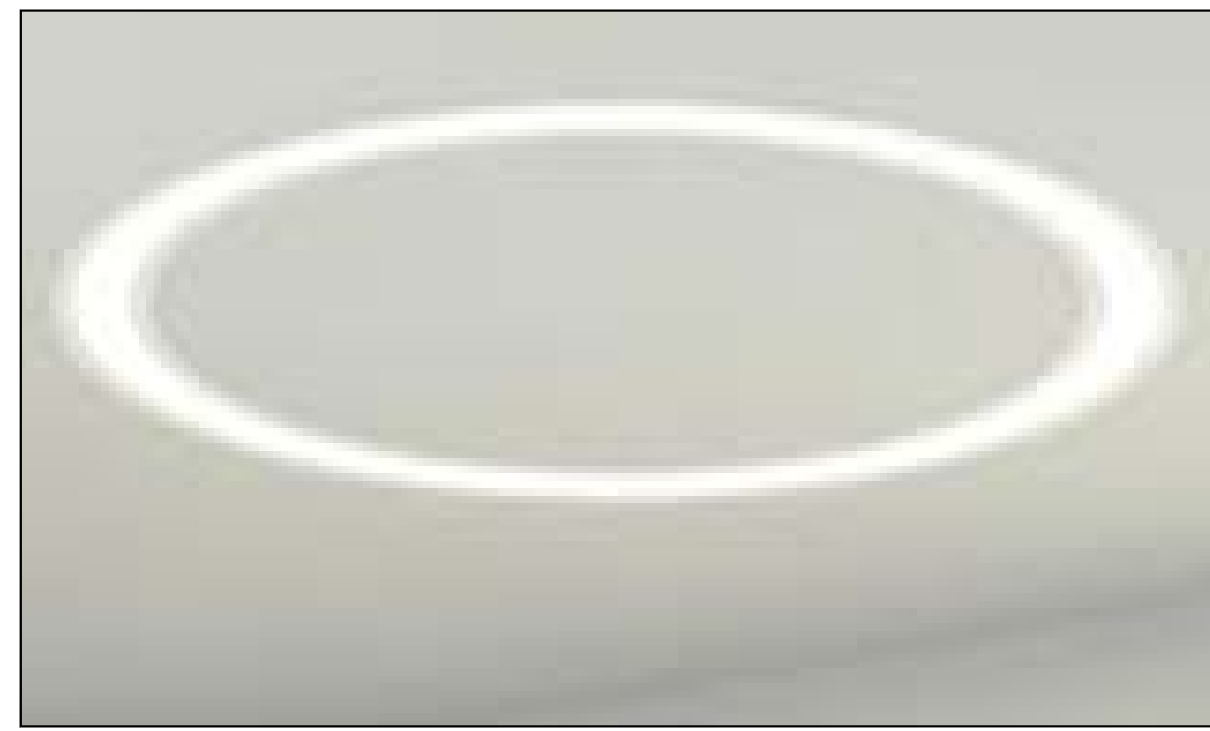
	manual fire alarm pull station
	fire alarm combination speaker/strobe device
	fire alarm warden station
	fire alarm terminal cabinet
	fire alarm annunciator panel

**LIGHTING SYMBOLS**

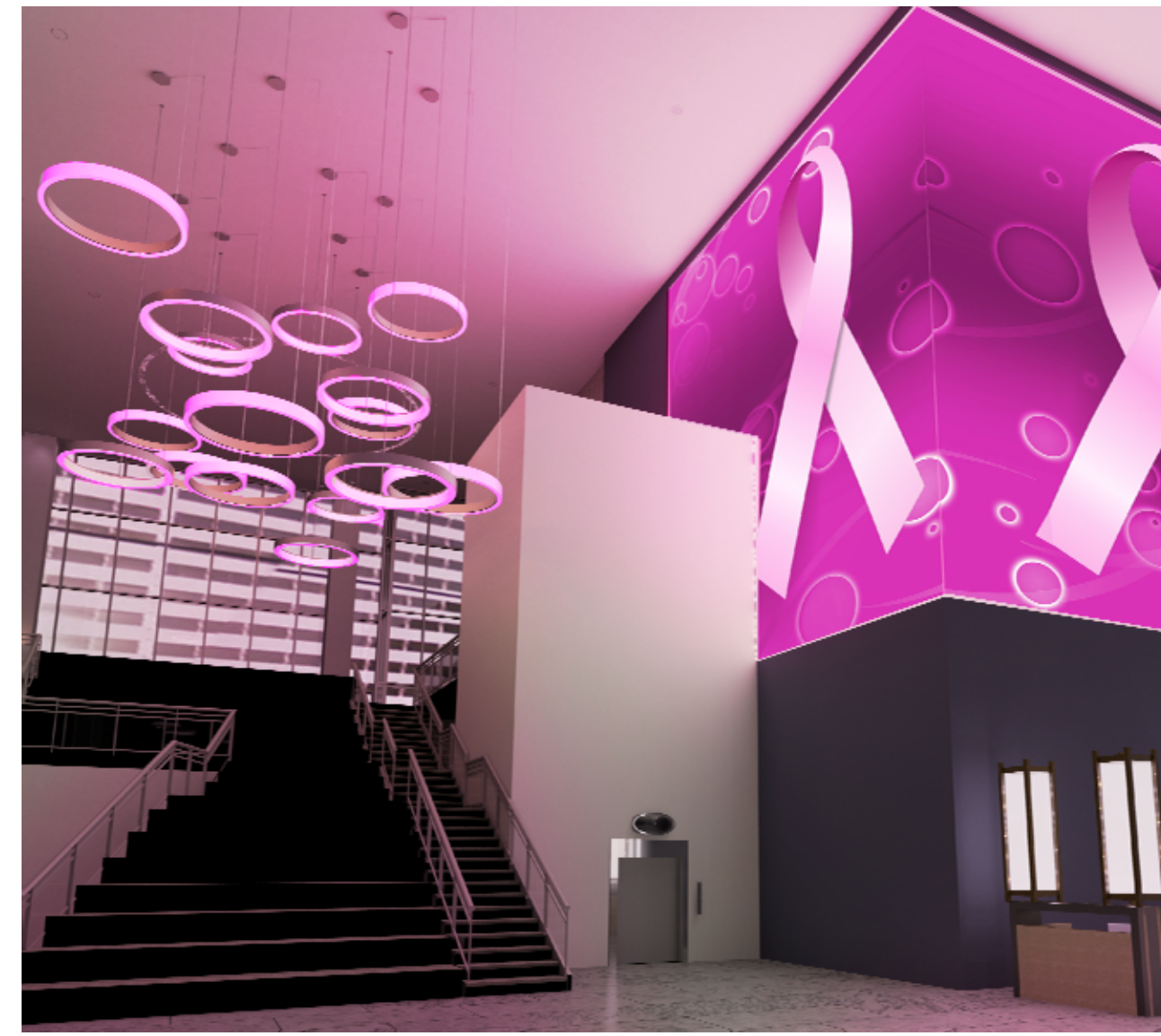
	switch with dual PIR/US vacancy sensor
	dimmer with dual PIR/US vacancy sensor
	grafik eye controlling device
	ceiling mounted PIR/US vacancy sensor
	luminaire type A
	luminaire type B
	luminaire type C
	luminaire type D-1
	luminaire type D-2
	luminaire type D-3
	luminaire type E
	luminaire type M-1
	luminaire type M-2
	luminaire type F
	luminaire type G
	luminaire type H
	luminaire type J
	luminaire type K
	luminaire type L
	luminaire type L-1
	luminaire type N



Upper Lobby



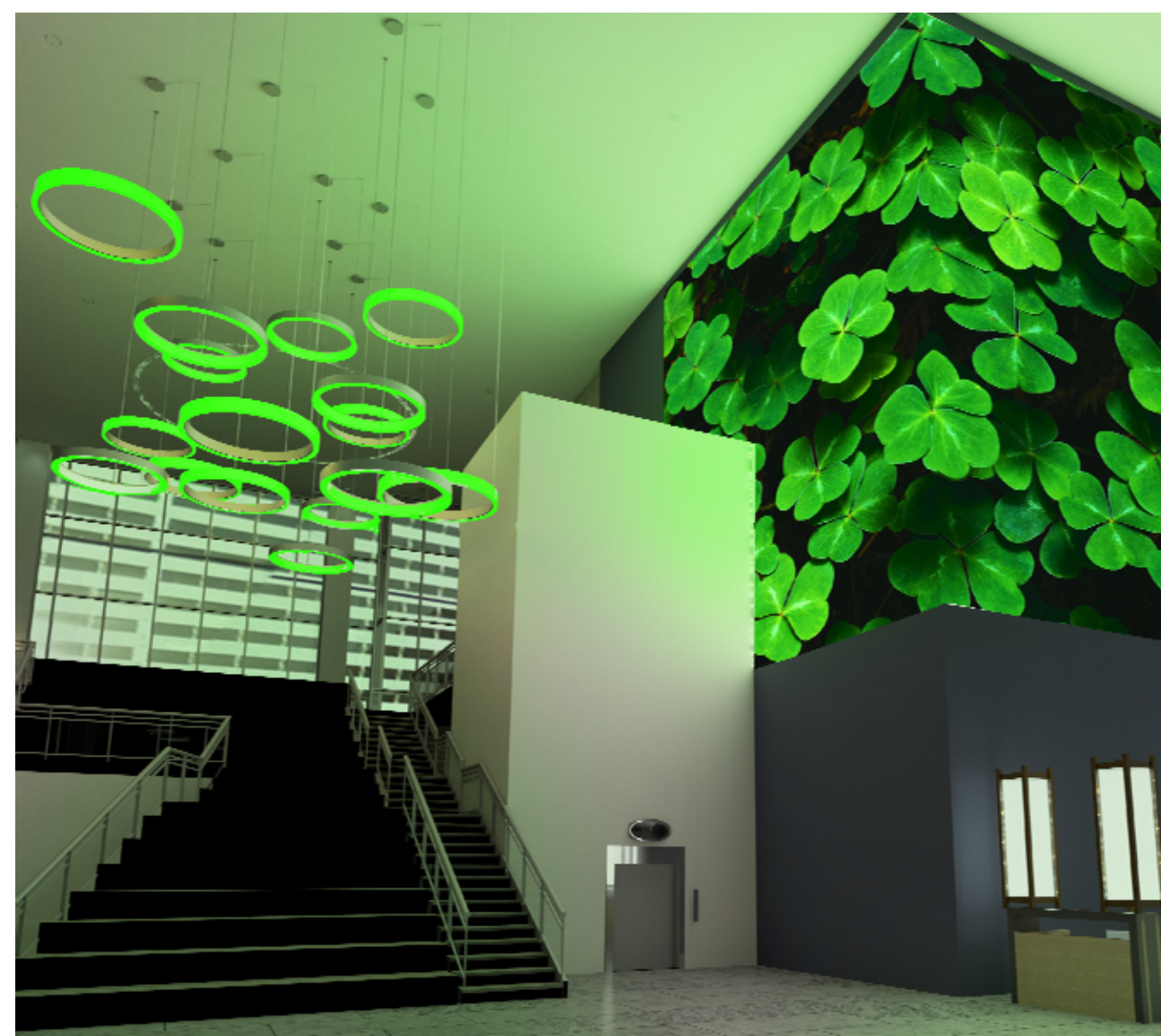
Type N: 12' Radius recessed T5 fluorescent ring



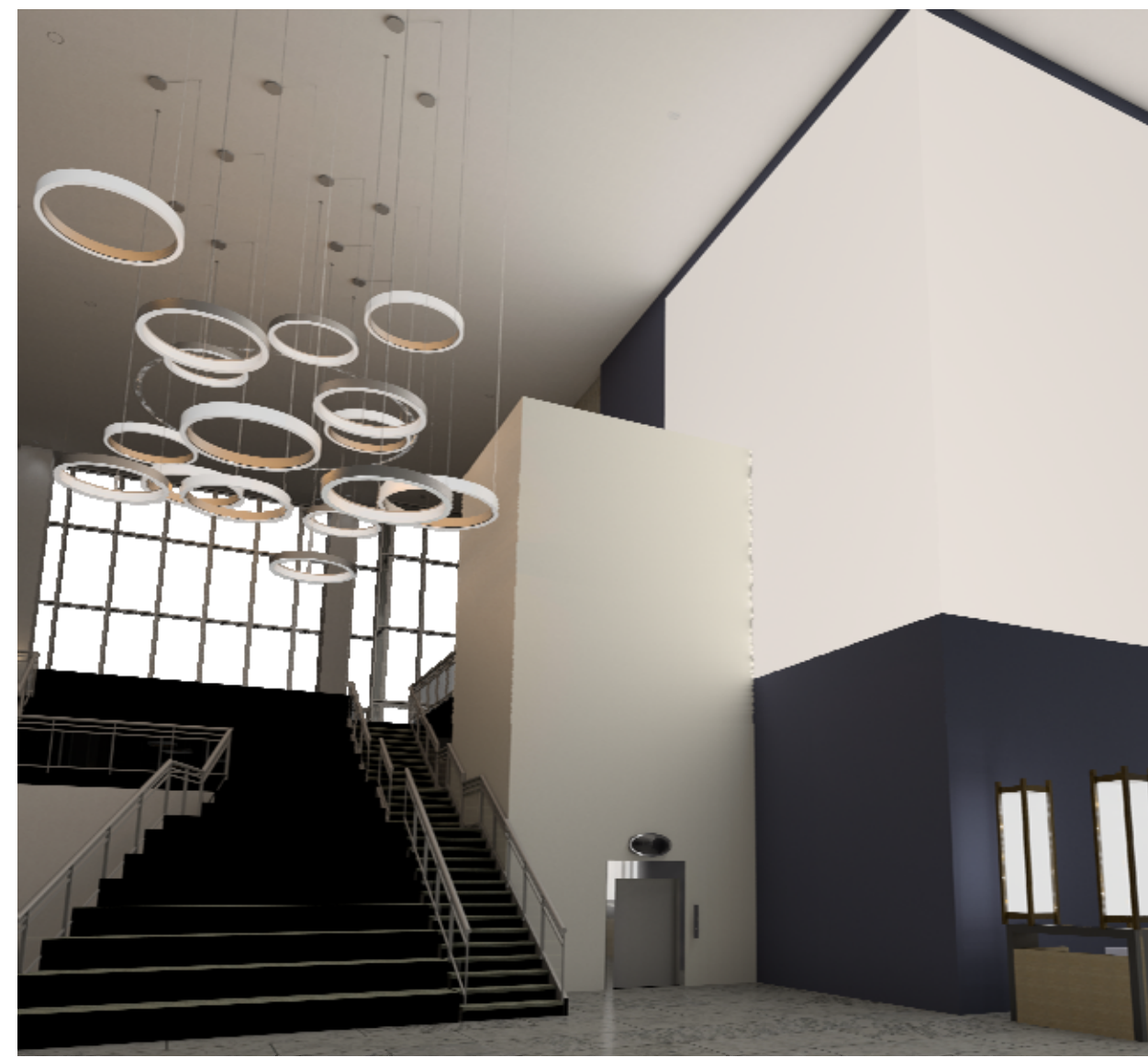
Staircase and M-1 and M-2 Luminaires glowing pink to match event for Breast Cancer Awareness being held in the lobby



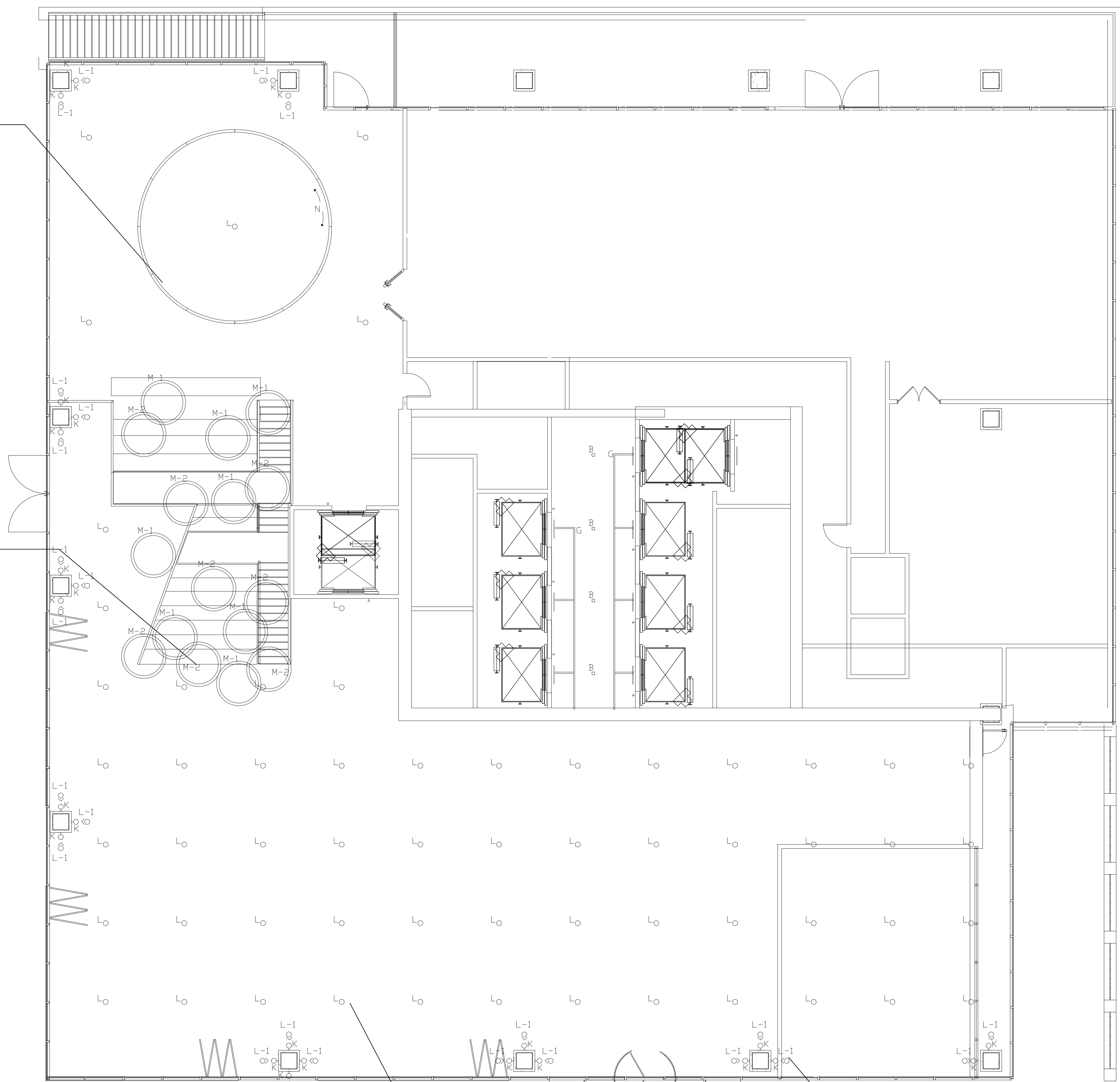
Type M-1 and M-2: RGB Color Changing 5' Diameter circular luminous ring LED pendant



Staircase and M-1 and M-2 Luminaires glowing green to celebrate St. Patrick's Day



Staircase and M-1 and M-2 Luminaires glowing white for everyday use



Exterior Rendering of Lobby as seen from the intersection of Mission St and Fremont St. This is the view of the lobby/building that will be seen by the majority of the commuters who will exit the Transbay Terminal at this intersection.



Interior rendering of the reception desk and elevator lobby to upper floors.



Type L: 7" Round aperture LED downlight



Type L-1: 7" Round aperture LED wallwasher



Type K: RGB Color Changing uplight located on each column, 9' AFF



### Electrical

2014 Charles Pankow Foundation  
Annual Architectural Engineering  
Student Design Competition

No.	Description	Date

AEI Team Number  
05-2014

Lobby Lighting Layout  
and Renderings





# Electrical

2014 Charles Pankow Foundation Annual Architectural Engineering Student Design Competition

No.	Description	Date

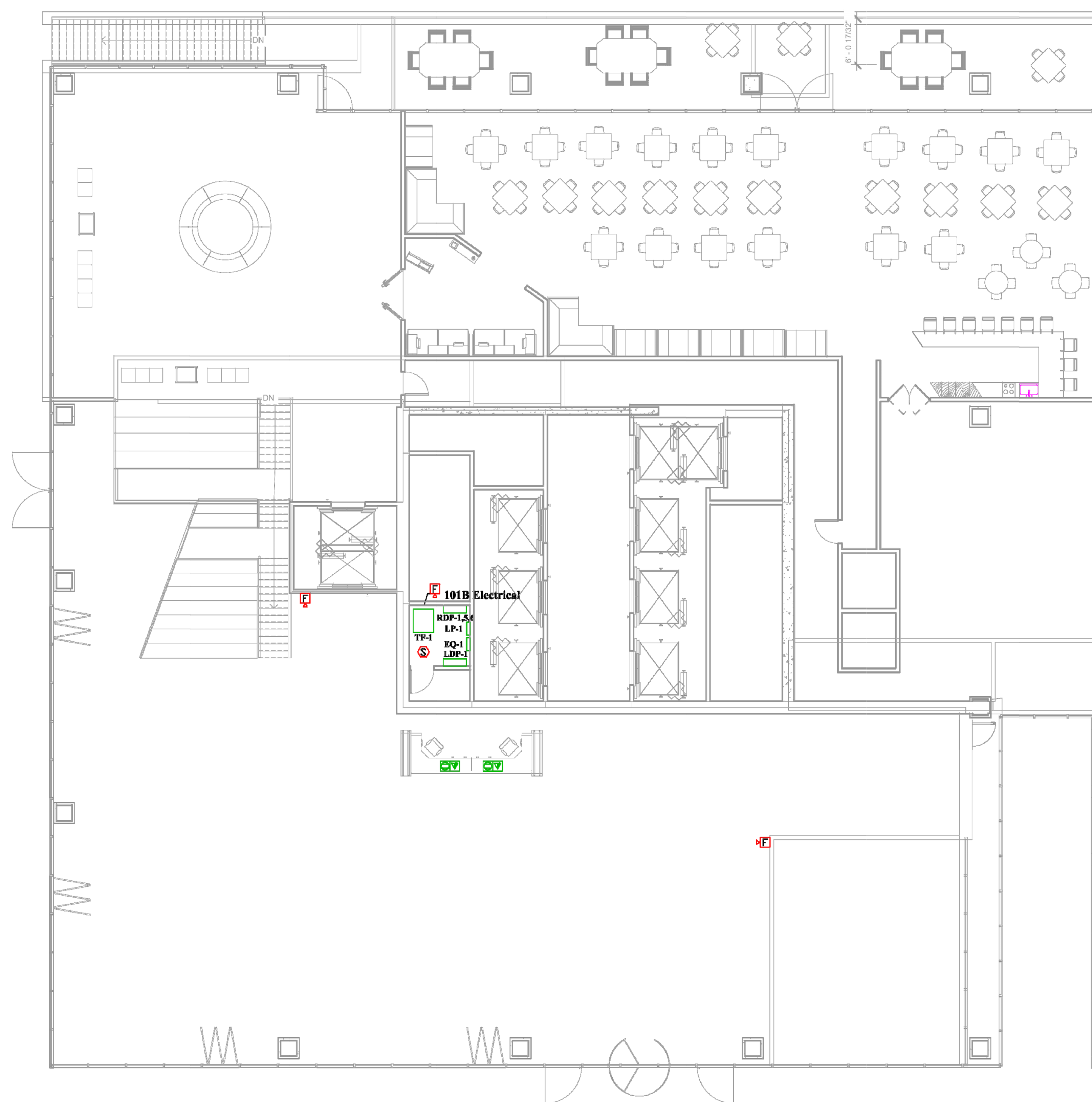
**AEI Team Number  
05-2014**

**Lobby and Basement  
Electrical Layout**

**E-103**



Scale: 1/4" = 1'-0"



Scale: 1/4" = 1'-0"



**Electrical**

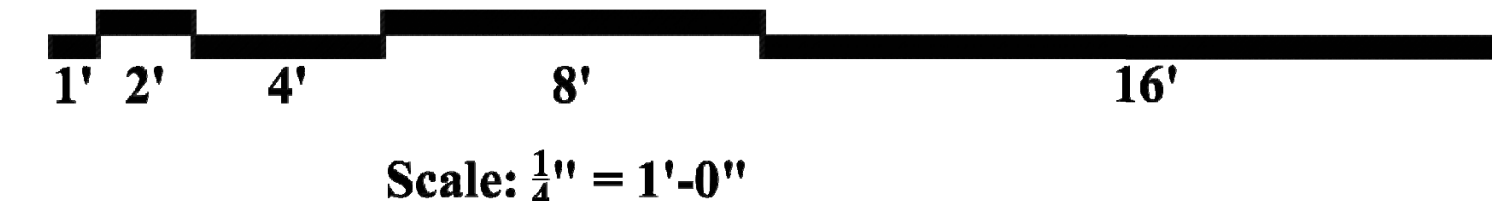
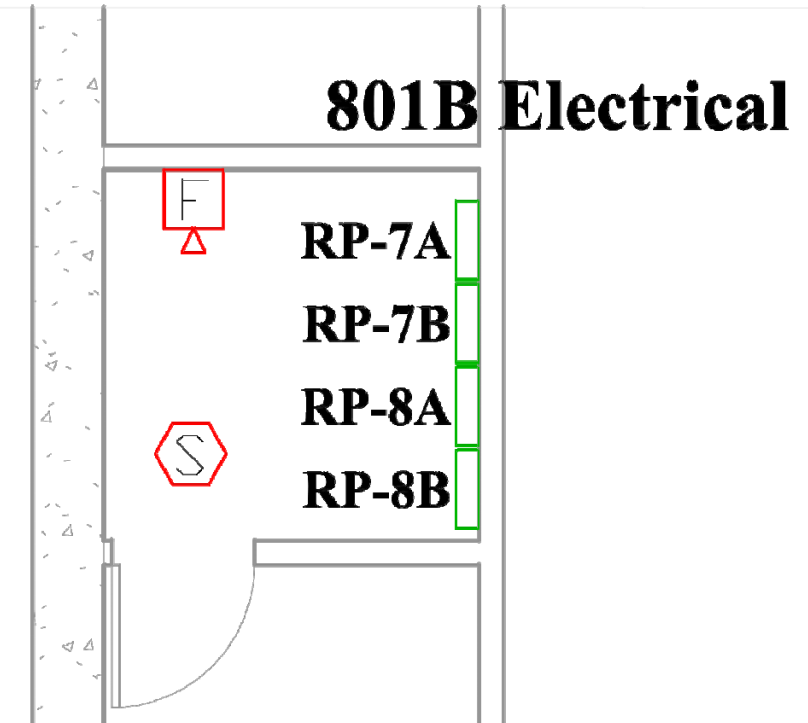
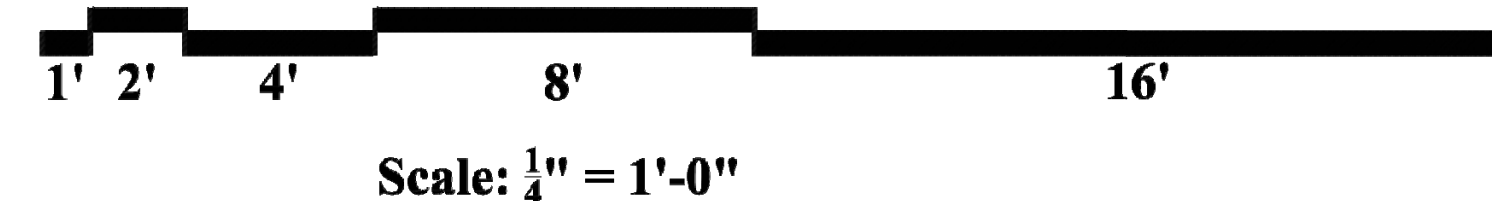
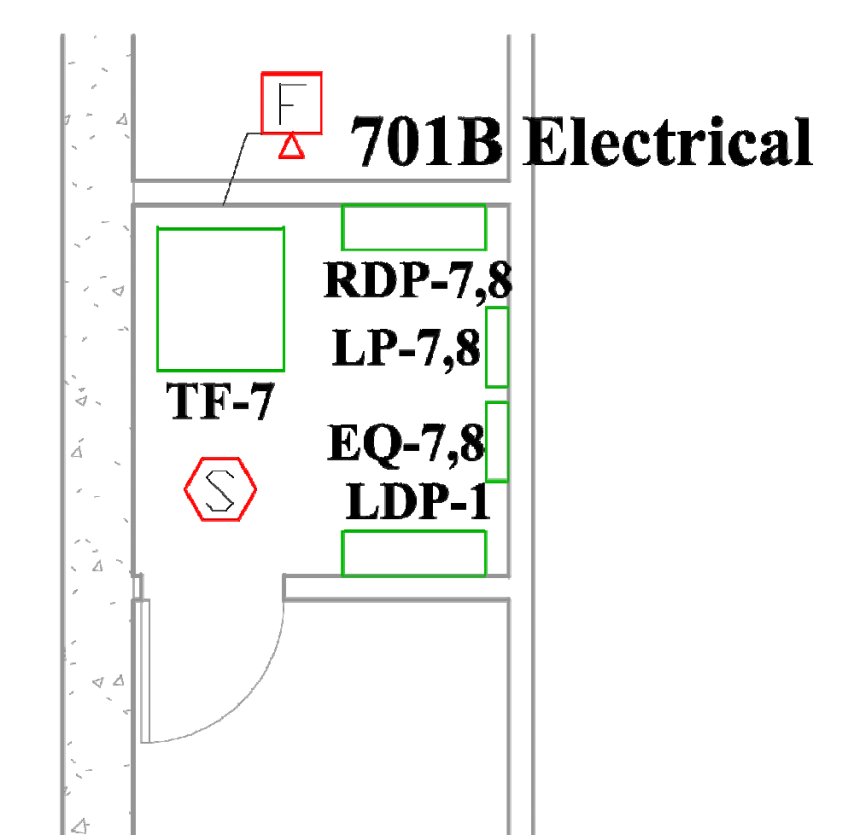
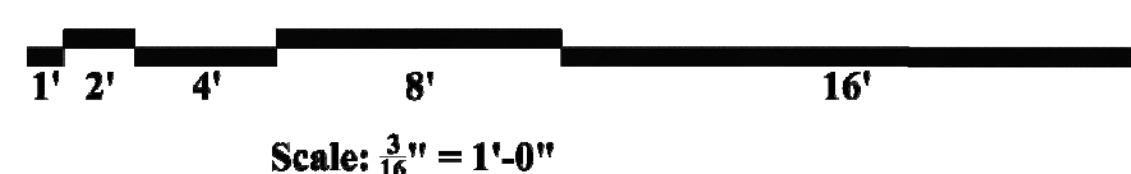
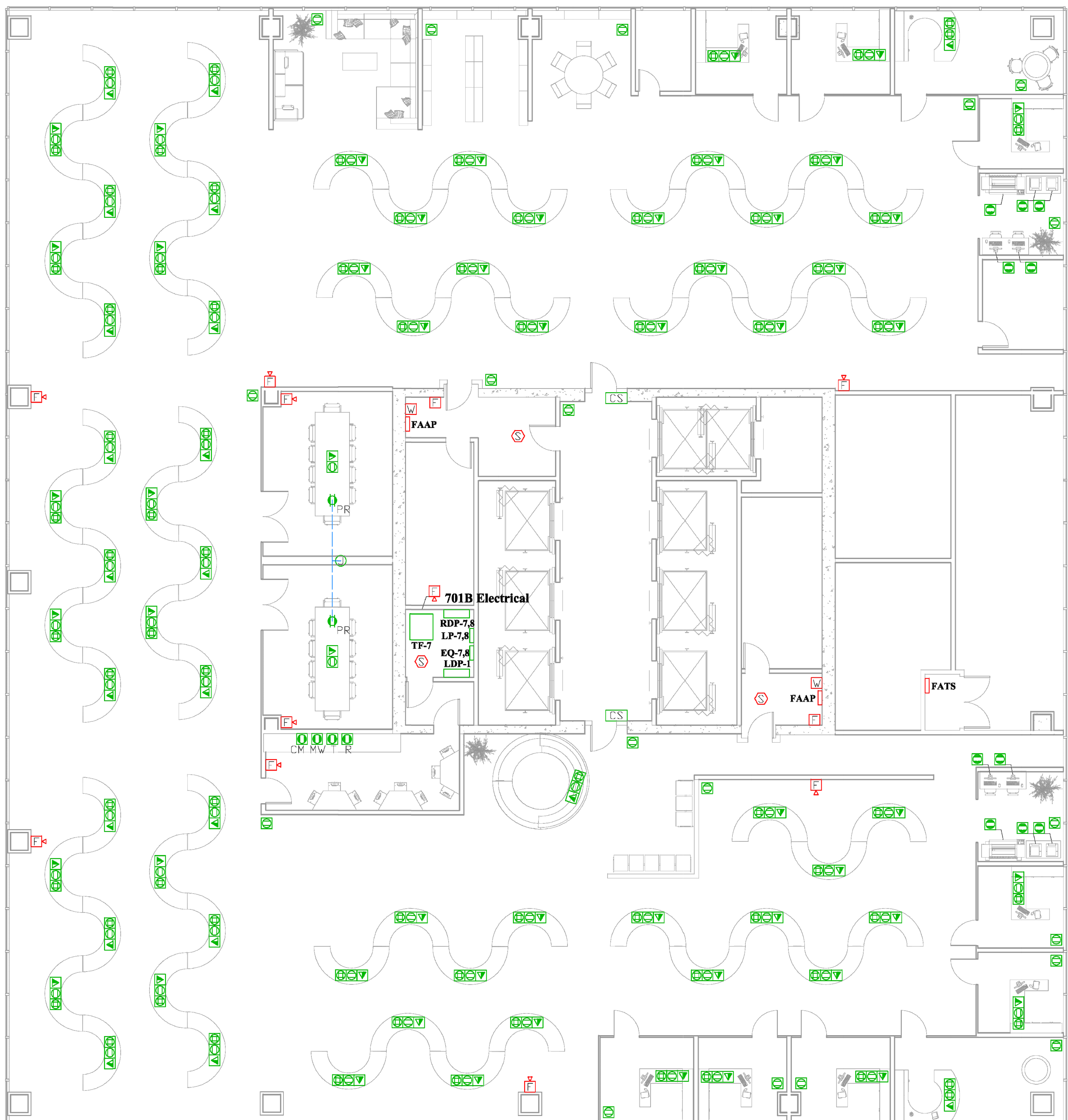
2014 Charles Pankow Foundation Annual Architectural Engineering Student Design Competition

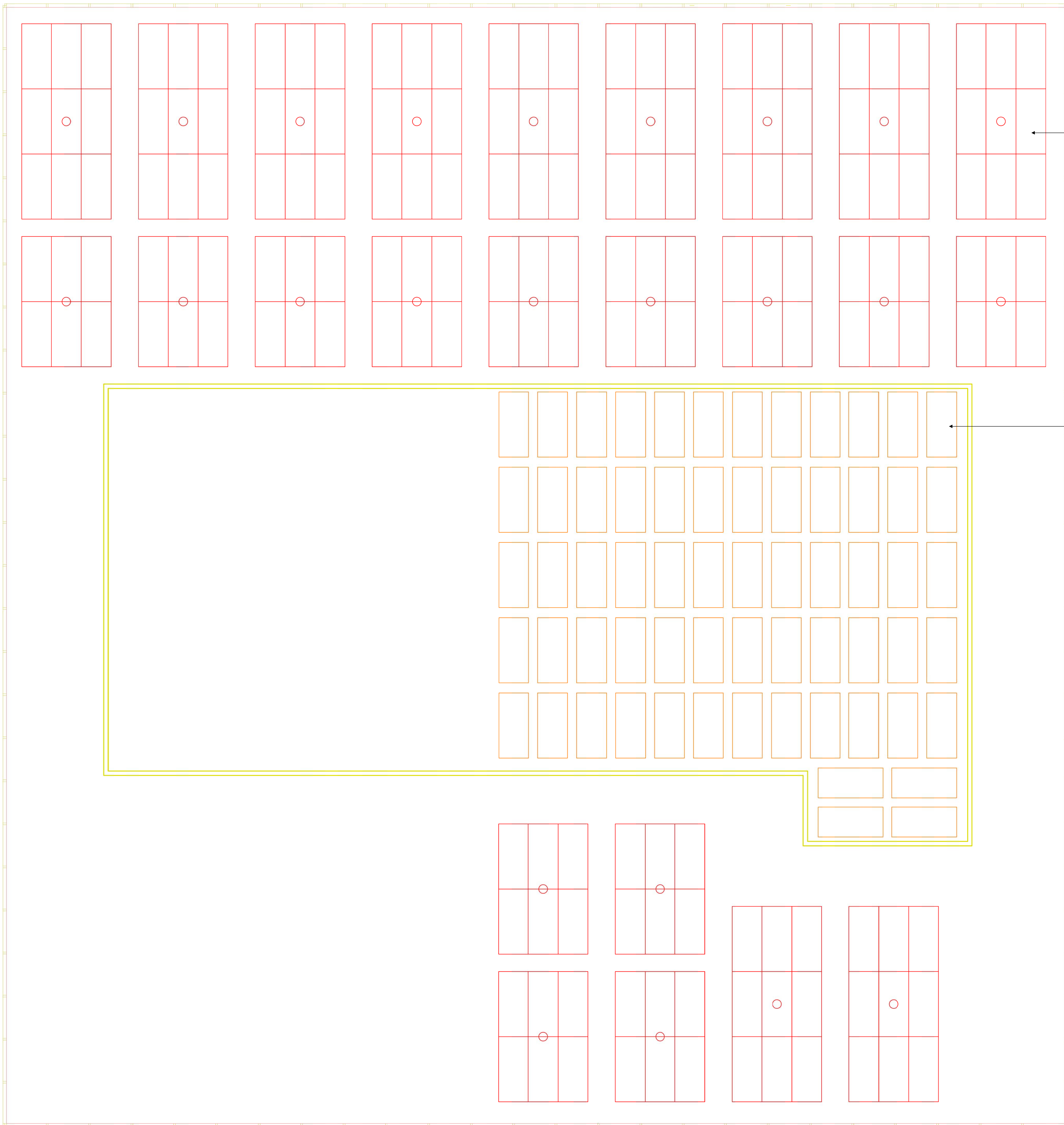
No.	Description	Date

**AEI Team Number  
05-2014**

**Office Electrical Layout**

- NOTES:**
- 1. speaker/strobe devices mounted 80" AFF**
  - 2. speaker/strobe devices to emit  $\geq 150$  cd TYP**
  - 3. four #10 AWG wires shall be run to room 714, in case the client wishes to install a server panel**





Mounting height: 10'  
(typ)

Mounted directly on roof  
(typ)

### Electrical

2014 Charles Pankow Foundation Annual Architectural Engineering Student Design Competition

No.	Description	Date

**AEI Team Number**  
**05-2014**

**Photovoltaic Layout**

# E-105

1' 2' 4' 8' 16'  
Scale: 3/16" = 1'-0"





# Electrical

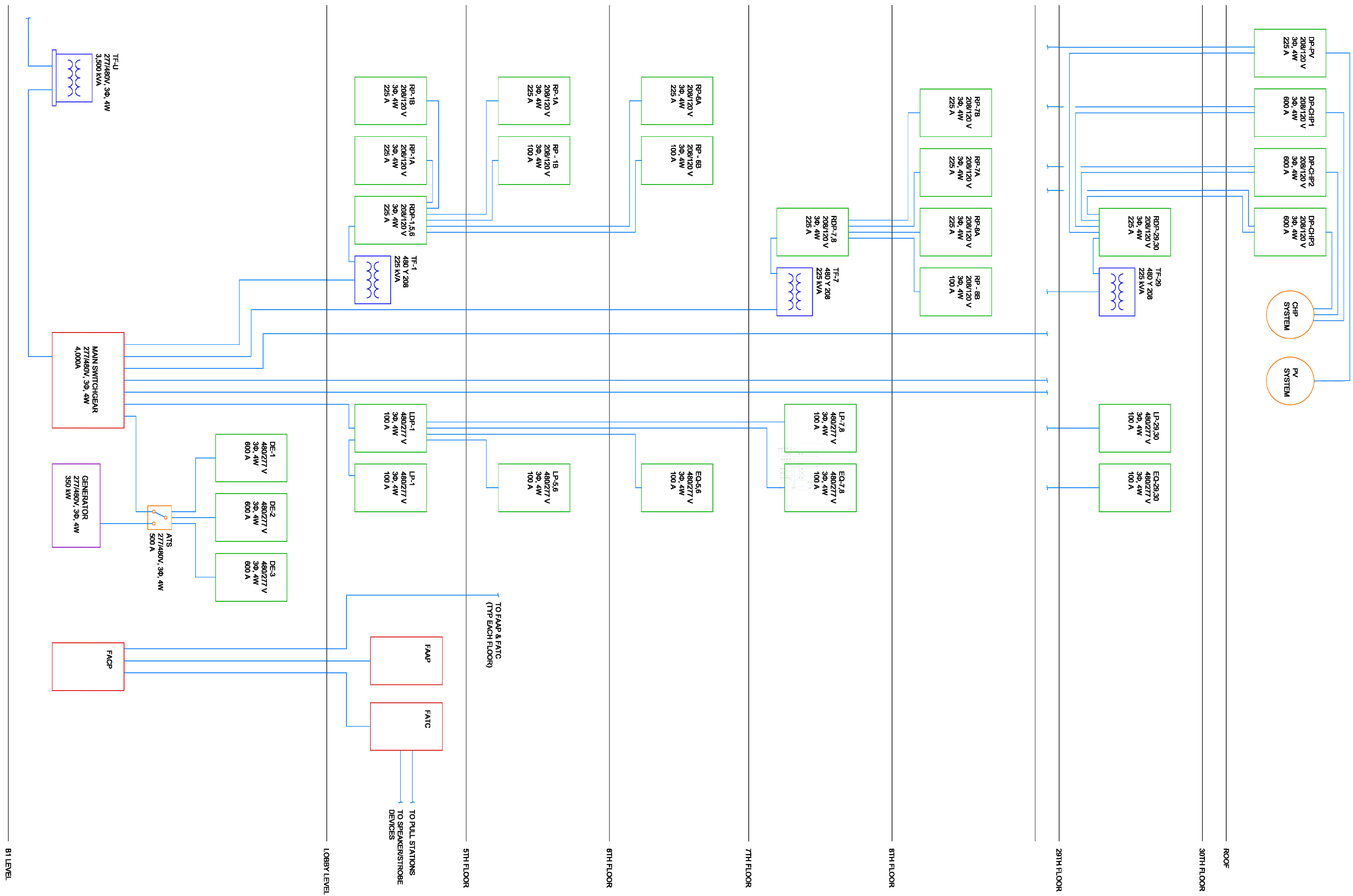
2014 Charles Pankow Foundation Annual Architectural Engineering Student Design Competition

No.	Description	Date

AEI Team Number  
05-2014

Riser Diagram

E-106



B1 LEVEL