Plaza – Lighting Redesign

Description of Space

The main entrance to the Dorrance H. Hamilton Building faces a grassy plaza where students and faculty can meet and interact informally. The facilities curved façade will feature large expanses of glass that will open on the plaza outside. The transparency of the building carries through the entire ground floor, allowing people on the street to look into the lobby, through the building and out to the plaza. The plaza includes walkways, a statue, seating areas, and an open grass area. The plaza is approximately 60,000 ft^2.

Site Plan

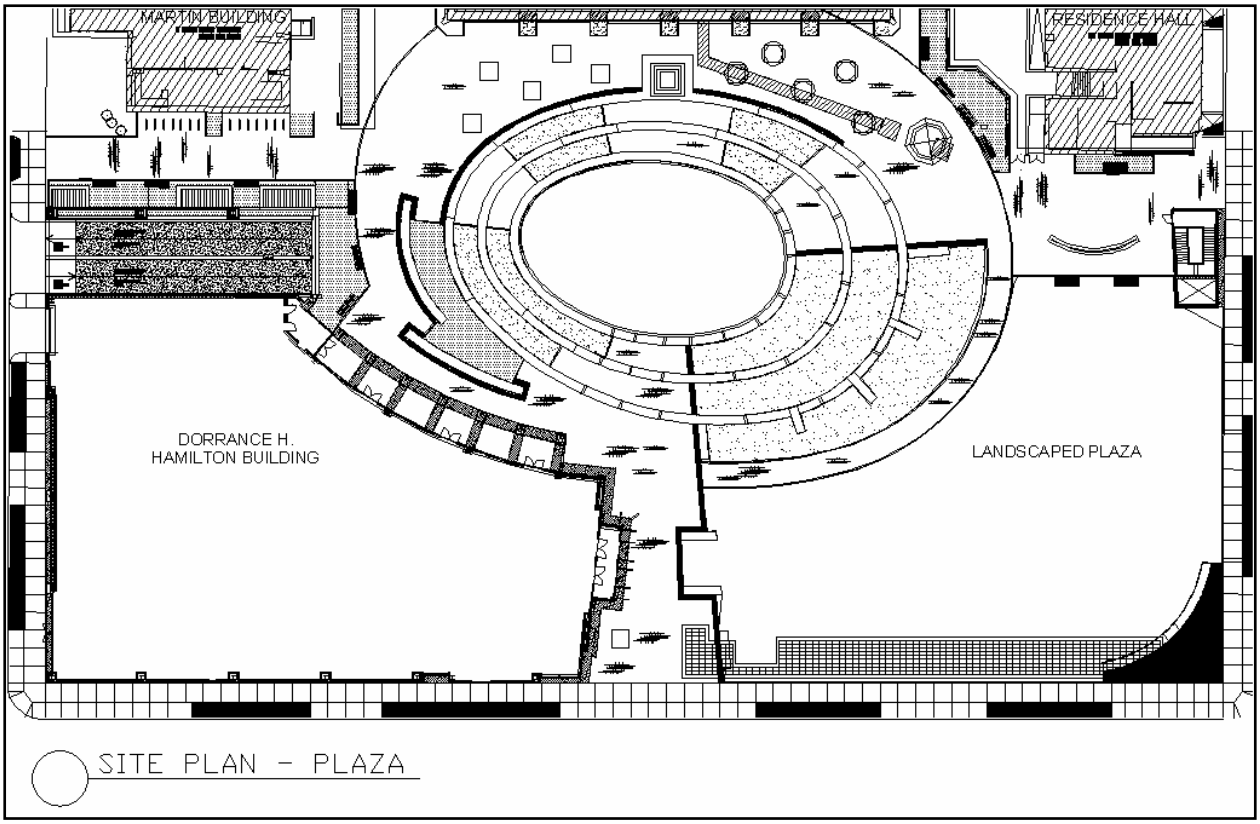


Figure 1: Plaza Site Plan

Design Concept

The design concept of the plaza is to provide sufficient illumination for circulation for buildings surrounding the Dorrance H. Hamilton Building. The main areas of interest are the walkways, stairways, the statue, and seating areas.

Design Criteria

Appearance of Space and Luminaires

The appearance of the space and luminaires is extremely important when lighting a plaza to this new "new heart of campus". The appearance of the space and luminaires has to be aesthetically appealing. The statue, walkways, and seating areas need to be lighted.

Point(s) of Interest

The points of interest in the space include the entrances and exits of buildings, walkways, statue, and grassy plaza. The points of interest will prosper with a higher illuminance due to the fact that they will stand out, such as the entrances and exits to the surrounding buildings, the statue, and walkways. The grassy area of the plaza does not need to be illuminated as high as the other points of interest. A number of luminaires surrounding the space may be a good idea instead of lighting the whole grassy area.

Illuminance (Horizontal)

The IESNA handbook calls for a horizontal illuminance of 5 lux (0.5 fc) for walkways distant from roadways and 6 lux (0.6 fc) for intermediate roadside sidewalks.

Illuminance (Vertical)

The IESNA handbook recommends a vertical illuminance of 1 lux (0.1 fc) for this space. The entrances and exits of the buildings should be at 30 lux (3 fc) for this space.

Power Allowances from ASHRAE 90.1 Standards

The power allowance in Table 9.4.5 of the ASHRAE 90.1 Standards is 0.2 W/ft^2 for the building grounds. The building grounds will include walkways 10 feet wide or greater and plaza areas. For walkways less than 10 feet wide, the power allowance is 1.0 W/ft^2. The main building entrance and exit has a power allowance of 30W/linear foot of door width.

Fixture Schedule

Label	Description	MH	Lamps	Ballast/ Transformer	Watts	Voltage	Mfr.	Catalogue No.
F-A1	18' High Pole Mounted Area Source 8-Sided Lantern Opal Text Lens with Black Finish	18'	1 – 175 Watt MH	IMH-175-C – Advance - e-Vision Electronic Ballast for MH Lamps	175	277	Allscape	AA-01-22-175MH-E-17-277-OA-BK-PCB
F-A2	6" Diameter Bollard with Spherical Variform Reflector with 42" Overall Height	3.5'	1 – 70 Watt MH	IMH-70-A-BLS-ID - Advance – e-Vision Electronic Ballast for MH Lamps	70	277	Allscape	LL-02-70MH-E-17-277-O-42-BK
F-A3	SP-108 Metric Series Cutoff Step Light Luminaire	2'	2 – 18 Watt CFL	ICF-2S18-H1-LD – Advance – Smartmate Electronic Ballast	36	277	Allscape	SP-108-2(18)CFL-277-BK-PL
F-A4	SL-50 Die-Cast Aluminum Floodlight	1'	1 – 50 Watt MR16	N/A	50	277	Allscape	Sl-50-50LV-MR-16-277-BK-UD
F-A5	BL-49 Cast Aluminum Wall Mount Black Fixture	6'	1 – 70 Watt MH	IMH-70-A-BLS-ID - Advance – e-Vision Electronic Ballast for MH Lamps	70	277	Allscape	BL-49-70MH-277-OP-BK-EMG

Table 1: Plaza Fixture Schedule

Light Loss Factors

The assumed space cleaning period for this space is 12 months and the space has a medium dirt condition. For fixture F-A4, a LLD of 0.80 was assumed for the MR-16 lamp.

Label	Maintenance Category	LLD	RSDD	LDD	BF	LLF
F-A1	V	0.75	-	0.82	1.00	0.62
F-A2	V	0.72	-	0.82	1.00	0.59
F-A3	V	0.85	-	0.82	1.05	0.73
F-A4	V	0.80	-	0.82	-	0.82
F-A5	V	0.72	-	0.82	1.00	0.59

Table 2: Plaza Light Loss Factors

Ballast Information

Label	Type	Ballast Watts	Ballast Factor	Voltage	Max THD %	Mfr.	Catalogue No.
B-A1	Electronic	191	1.00	277	15	Advance – e-Vision	IMH-175-C
B-A2	Electronic	84	1.00	277	18	Advance – e-Vision	IMH-70-A-BLS-ID
B-A3	Electronic - Programmed Start	39	1.05	277	10	Advance – Smartmate	ICF-2S18-H1-LDGE
B-A5	Electronic	84	1.00	277	18	Advance – e-Vision	IMH-70-A-BLS-ID

Table 3: Plaza Ballast Information

Lamp Information

Label	Type	CRI	CCT	Watts	Initial Lumens	Mean Lumens	Mfr.	Ballast
L-A1	GE Constant Color CMH ED17	90	4200	175	12000	9000	GE	IMH-175-C – e-Vision Electronic Ballast for MH Lamps
L-A2	GE Protected Constant Color PulseArc CMH ED17	80	3000	70	5700	4100	GE	IMH-70-A-BLS-ID – e-Vision Electronic Ballast for MH Lamps
L-A3	GE Ecolux Biax T4 CFL	82	4100	18	1200	1020	GE	ICF-2S18-H1-LD – Advance – Smartmate Electronic Ballast
L-A4	GE MR16 – Q50MR16/HI R/CG40	-	3000	50	2600	-	GE	N/A
L-A5	GE Protected Constant Color PulseArc CMH ED17	80	3000	70	5700	4100	GE	IMH-70-A-BLS-ID – e-Vision Electronic Ballast for MH Lamps

Table 4: Plaza Lamp Information

Power Density

Label	Ballast Watts	No. of Fixtures	Total Watts	
F-A1	191	6	1146	
F-A2	84	11	924	
F-A3	39	72	2808	
F-A4	50	28	1400	
F-A5	84	15	1260	
			7538	Watt Total
			41,500	Square Foot Total
			0.18 W/ft^2	

Table 5: Plaza Power Density

Therefore, the power density is slightly below the target IESNA value of 0.20 W/ft^2. The value is conservative because the building entrance and exit values and the walkways less than 10 feet wide are calculated into the total value. The space is at an appropriate illuminance level, so the power density is sufficient. Note: The square foot total of the plaza is 60,000 ft^2; however, the grassy of the plaza is 18,500 ft^2. Therefore, the total square foot total of the plaza is 41,500 ft^2.

Lighting Plan

The lighting site plan for the plaza is too large to view with one drawing. Therefore, the lighting site plan is cut into four sections: lower left, upper left, upper right, and lower right. All of the fixtures are labeled with their respected panelboard location on the drawing. The lights will be controlled by a timer during the year.

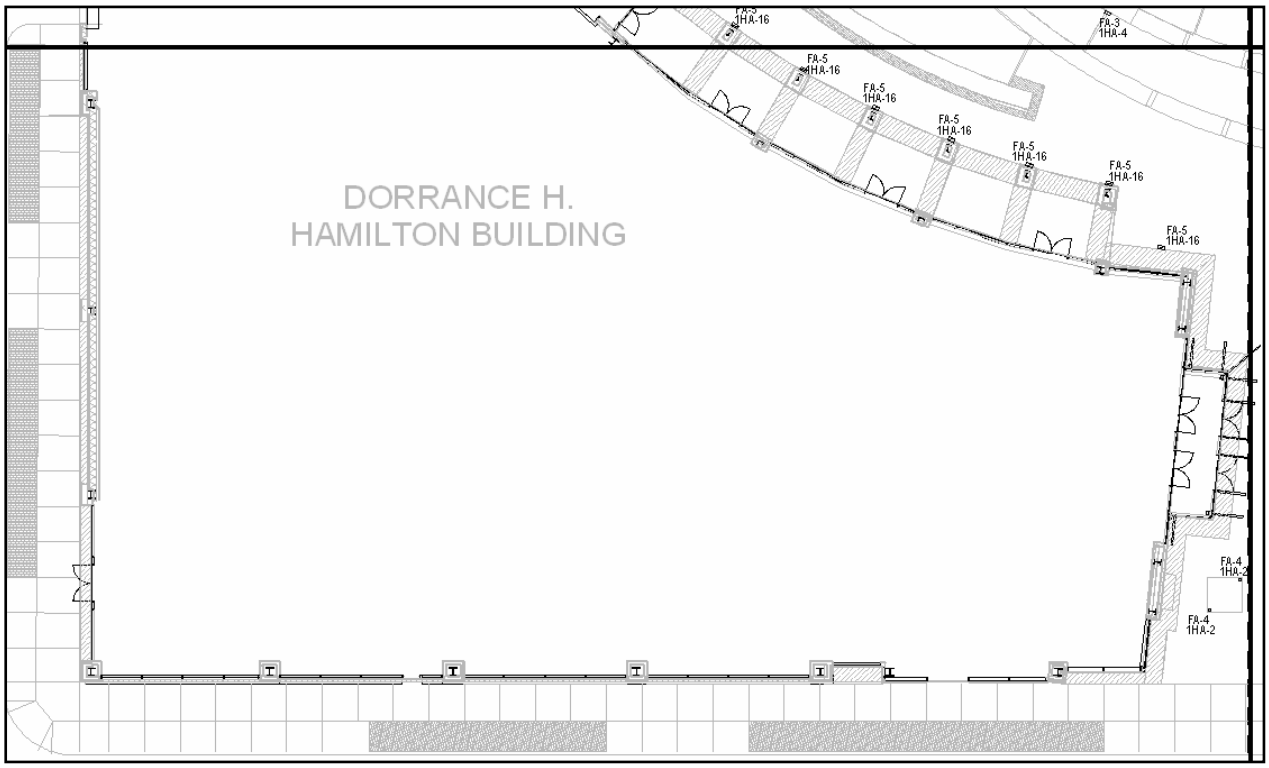


Figure 2: Plaza Lighting Plan (Lower Left)

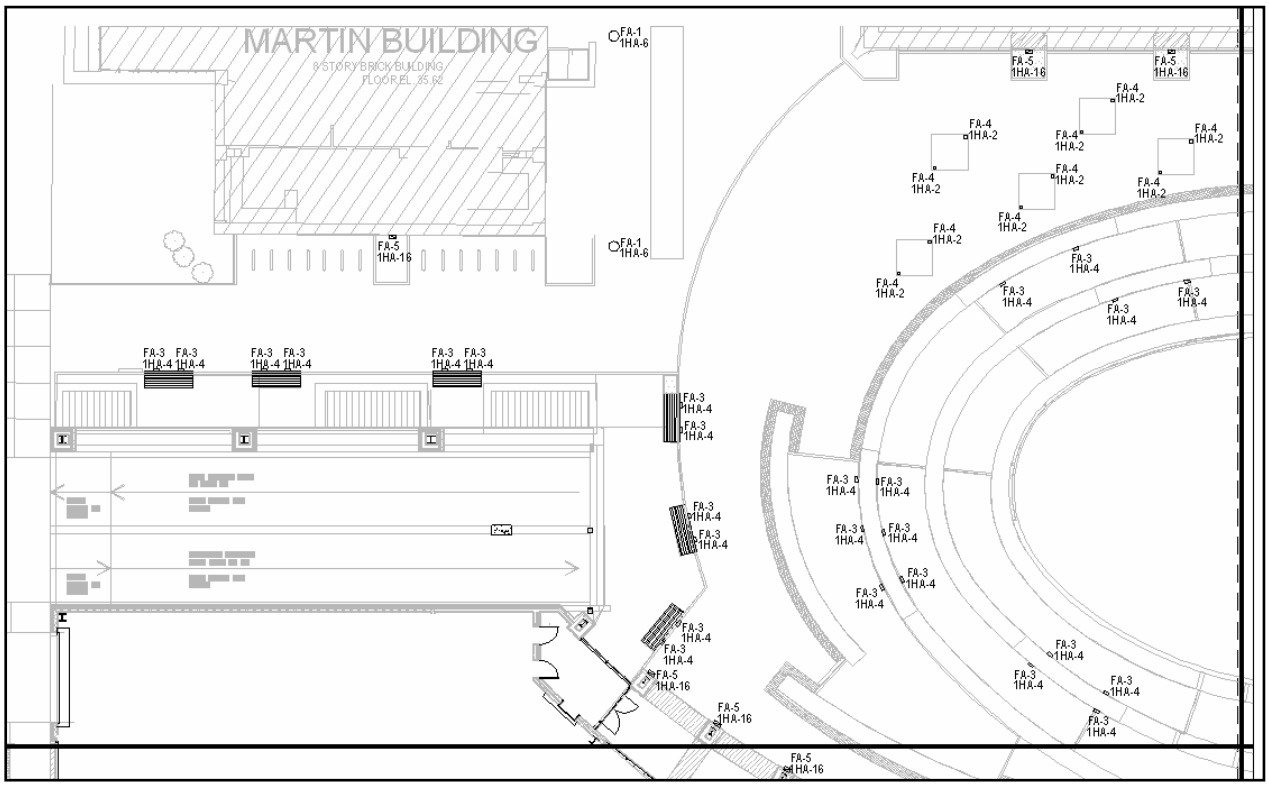


Figure 3: Plaza Lighting Plan (Upper Left)

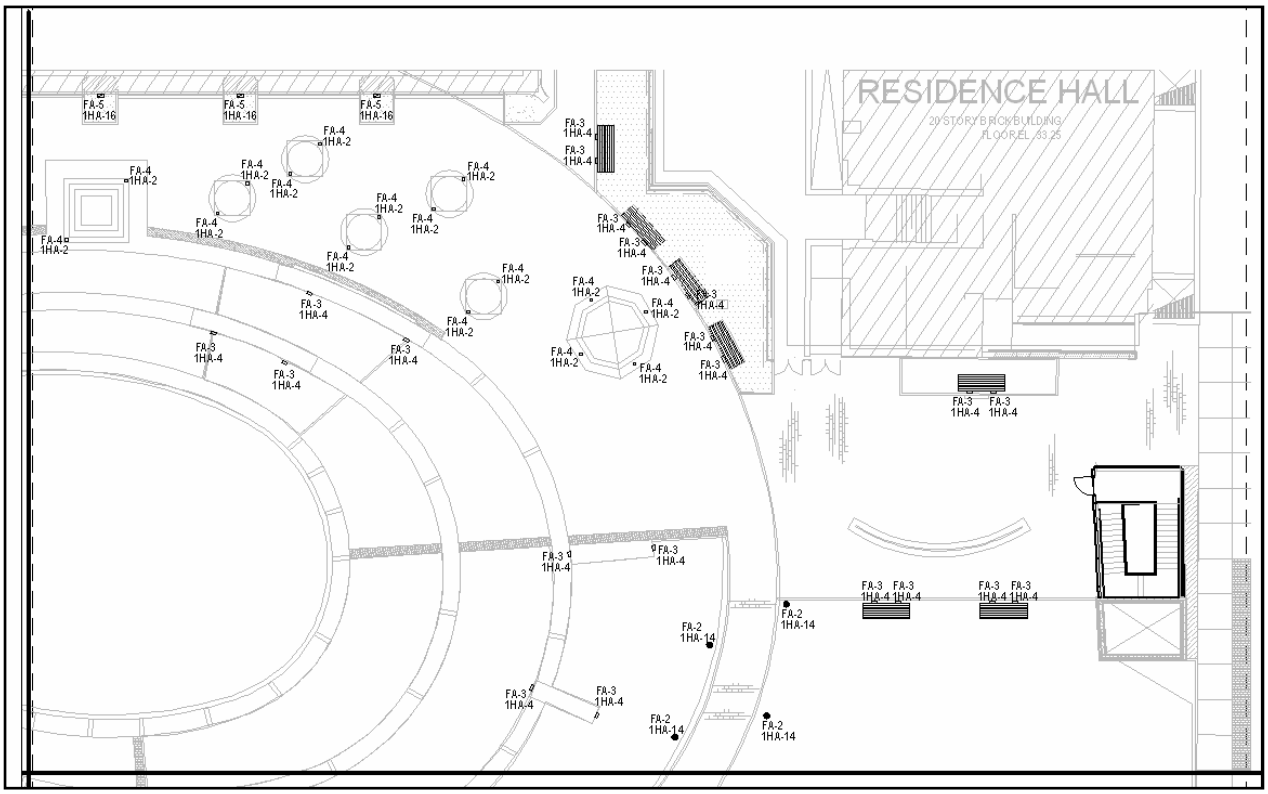


Figure 4: Plaza Lighting Plan (Upper Right)

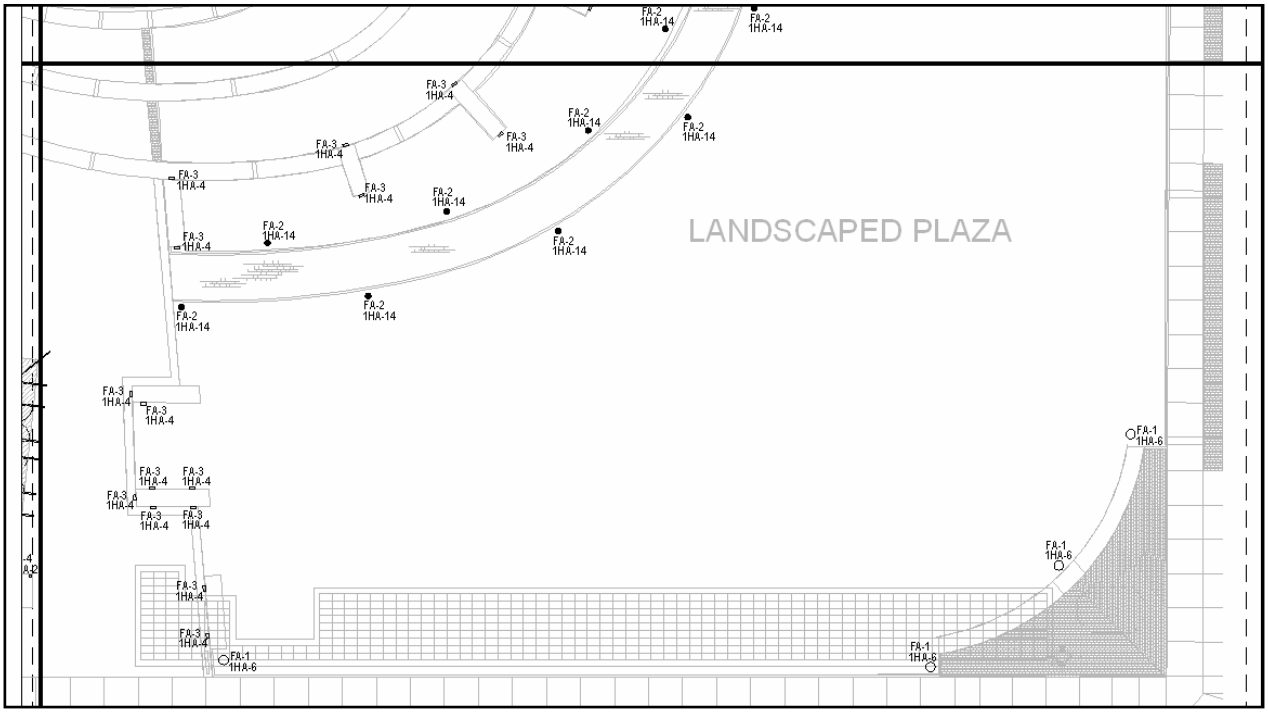
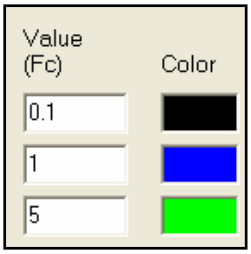


Figure 5: Plaza Lighting Plan (Lower Right)

Isometrics

The isolines from AGI32 were analyzed on the work plane height of 0.0'. The average illuminance throughout the walkways of the plaza was 0.99 fc.



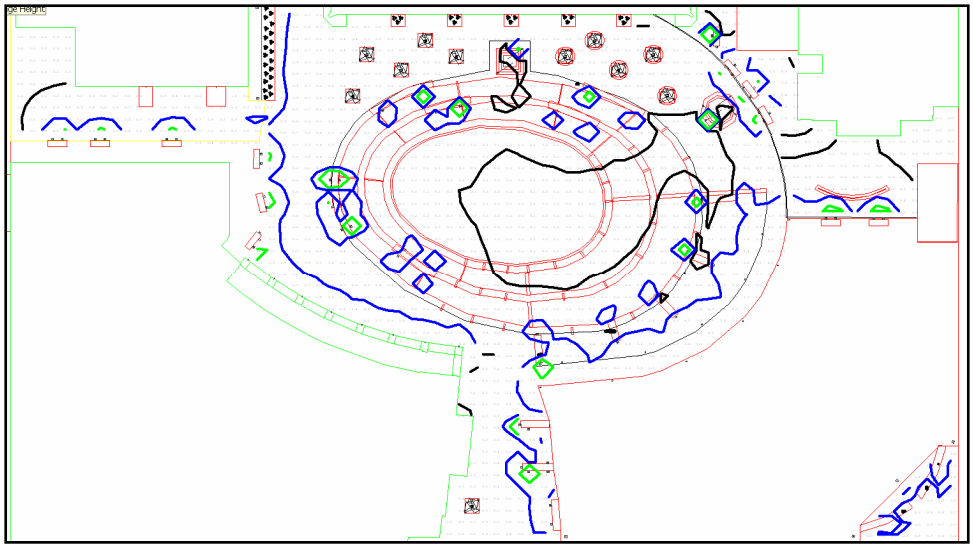


Figure 6: View of Isolines of Plaza

The isolines from AGI32 were analyzed on the work plane height of 0.0'. Figure 7 is a close-up view of the isolines of the center of the plaza.

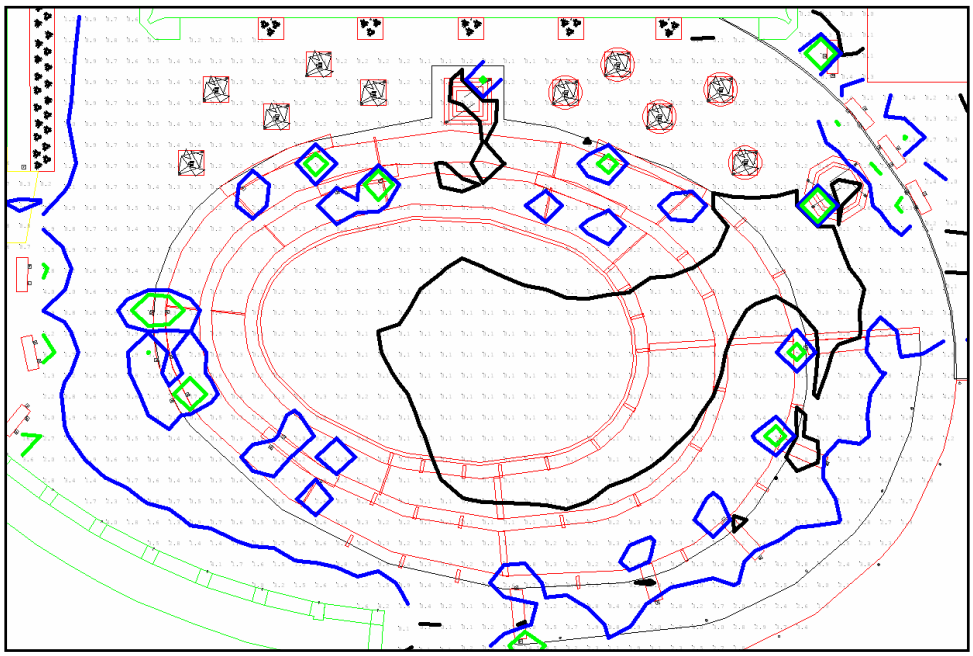


Figure 7: Close-up View of Isolines of Plaza

Conclusion

Overall, the lighting design achieved the space design goals. The step lights were inserted into the various benches around the plaza. The step lights provided the area with a luminaire source without cluttering the space. The middle of the plaza is used for a large tent, so fixtures were not permitted to be placed in the center of the ovals. The walkway closest to the grassy area was illuminated nicely by the bollard fixtures placed along the walkway. Outdoor wall sconces were placed on the columns of the DH Hamilton Building and above the planters of the Scott Library and Administrative Building. The trees, statue, and fountain outside of the Scott Library Building were accentuated by directional spotlights, which provided aesthetic appeal to the space. A few 18' high architectural area source luminaires were used at various places throughout the design.

The average illuminance on the work plane was 0.99 fc, which was high for the IESNA value for a plaza of 0.50 fc. The trees, statue, and fountain were accentuated; therefore, the average illuminance was higher. The power density was 0.16 W/ft^2, which was under the ASHRAE 90.1 Standards of 0.20 W/ft^2 for outdoor walkways/plaza.