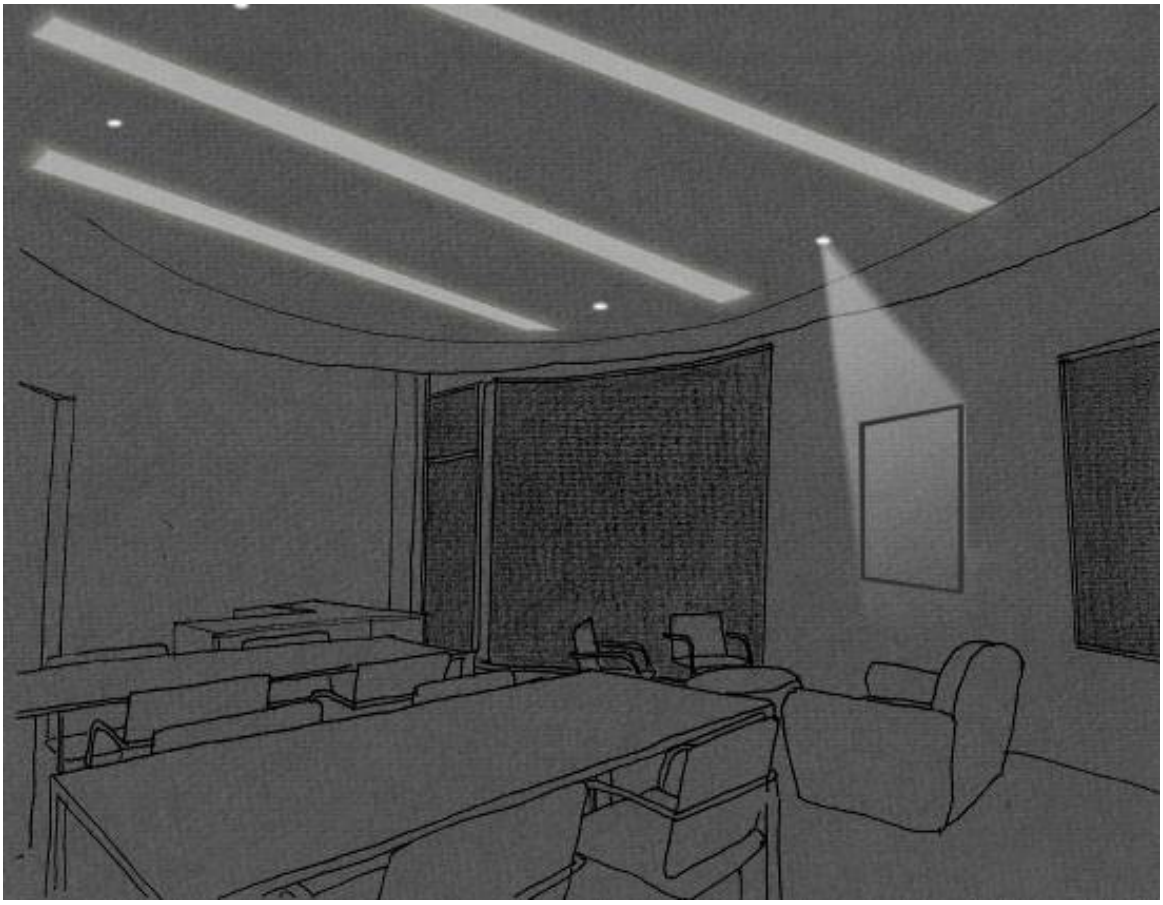
Student Resource Center



(Original schematic)

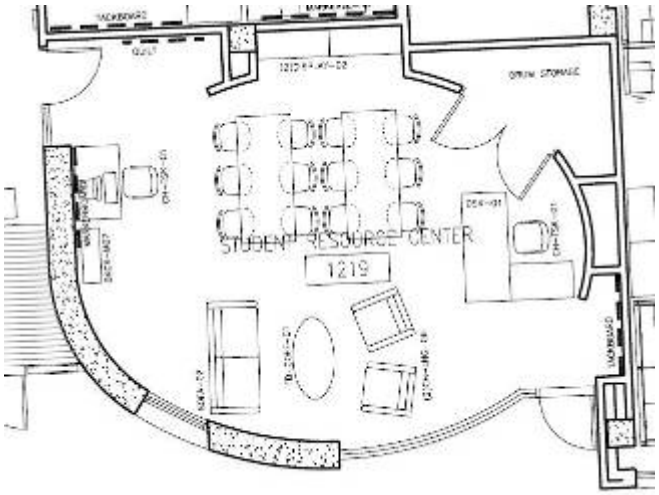
Design Synopsis

As the name suggest, the Student Resource Center serves as an information kiosk for students who desire to get information pertaining to university-wide activities as well as other campus-related information Though there are many offices like this in this building, this one is worth studying because of its elliptical form that resonates that of the Multipurpose room discussed previously.

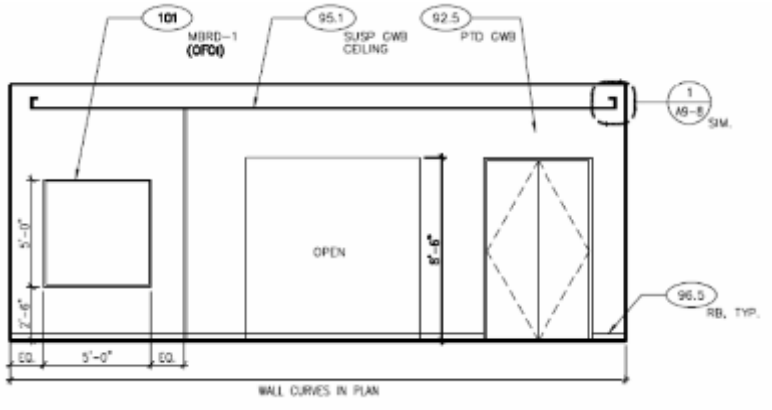
The curved glazing on the southern façade provides a view into the adjacent plaza on the south-east corner of the site. As this space will mostly be in operation during the day, appropriate controls shall be implemented to maximize daylight utilization.

Two alternative solutions for this space has been considered with the second being the final one implemented. It is important to note that the design has been modified since the schematic design presentation.

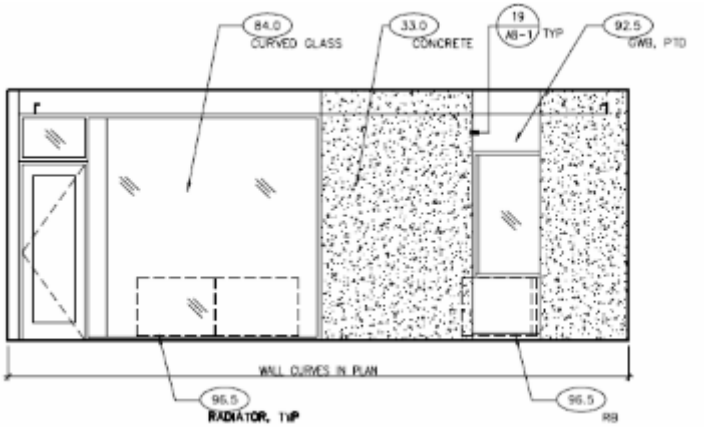
Existing Layout



Proposed Furniture Plan



Interior North Elevation



Interior South Elevation

Design Criteria

Space and Luminaire Appearance

The space is used for serving students who seek campus related information. With that in mind, the space should appear pleasant and inviting. A key architectural feature of this space is its elliptical form which is similar to that of the Multipurpose Room analyzed in the previous section. Another distinctive feature is the curved window on the southern façade of the space. Luminaire selection should fit with the overall design of the room to provide a visually pleasing environment for the occupants.

Color Appearance and Color Contrast

Proper color rendition is crucial satisfy the need for social interaction in this space. Color contrast could also be implemented to add visual appeal to this space.

Daylight Integration and Controls

Daylight illumination of the interior is provided for by the curved window on the southern façade. Careful attention should be made to ensure that excessive daylight does not cause discomfort glare inside as well as an increase in cooling load due to solar radiation. Therefore, dimming systems should be employed that are coupled with a photosensor to adjust the level of artificial illumination as necessary throughout the day. Occupancy sensors should also be installed to prevent wasting excess power to illuminate the space when it is unoccupied.

Glare Considerations

Reflected and direct glare from installed fixtures should also be avoided to maintain a comfortable environment for occupants.

Light Distribution and Uniformity

This is as the furnishing suggests that tasks which require good visual acuity will be performed here. Such tasks would include but not limited to: reading, writing and VDT usage. Therefore ideally, a sufficient level of uniformly distributed illumination will be required on tasks surfaces (i.e. table tops) to meet these needs.

Surface Luminances

In a space like this student resource center, good luminance ratios must be implemented to meet the needs of performing visual tasks. Again, the IESNA Lighting Handbook recommends the following:

3:1 Task and Adjacent Surround
10:1 Task and Non-Adjacent Surfaces

This is particularly important in this room since it is primarily a work space.

Shadows

Harsh/ dark shadows should be avoided as much as possible since this primarily a work space. Luminaires should also be placed as to avoid eye-socket shadows on the people working here.

Source/ Task/ Eye Geometry

It can be assumed that besides VDT usage a lot of written and reading tasks will occur in this space. Therefore, source/ task/ eye geometry is of particular importance to ensure that people are able to perform the tasks required.

IESNA Illuminance Recommendations

Horizontal

Cat. D: Performance of visual tasks of high contrast and large size 300 lx (30 fc)

Vertical

Cat. A: Public Spaces 30 lx (3 fc)

Alternative Design Option

On a purely functional basis, the first design option that will be considered is the use of a single row of luminaires positioned at the center of the room. Given that this building is in California, it is crucial that the strict requirements imposed by Title 24 be followed. This is shown below:

Schedules

Luminaire Schedule
Location: Student Resource Center (Alternative Layout)

Type		Quantity	Catalog No.	Lamping / Ballast	Watts/ Fixture	Ballast/ fixture	Total Watts	Voltage
F8		4	Zumtobel, "Light Fields HE": LFHU-14-2545-MP-DH277 (1 x 4 FT) Recessed Fixture	2 - (L8) GE Lighting 46759 F54W/T5/830	125	1 - (B4) Lutron Eco-10: ECO-T554-277-2	500	277

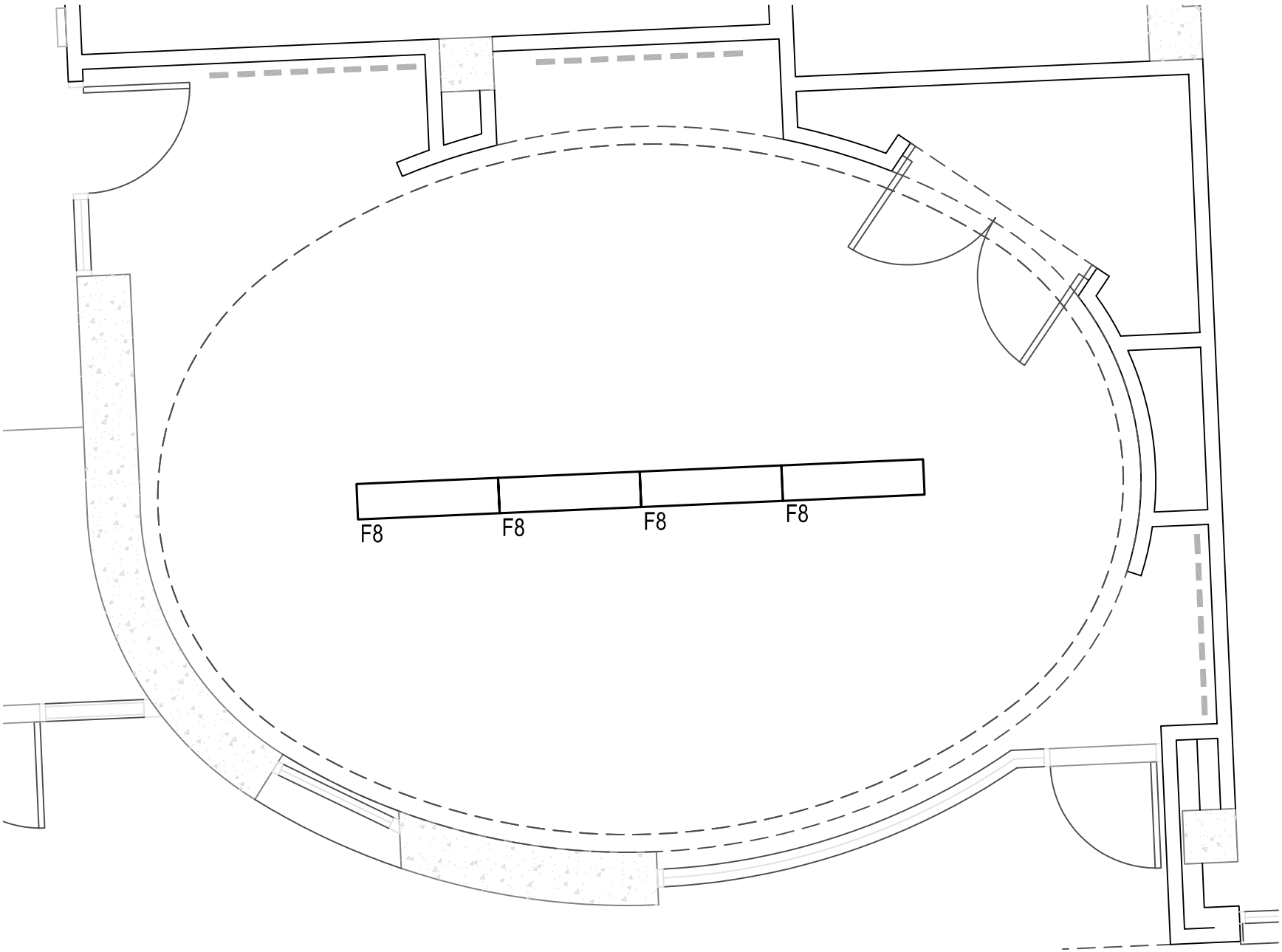
Total Watts:	500	**W**
Space Area:	553	**SF**
Achieved Power Density:	**0.90**	**W/SF**
Allowed Power Density:	1.20	**W/SF**
Status:	Ok	

Based on calculations, the implemented design falls under the 1.20 W/sf allowed for this space as specified by California's Title 24 (2006).

Notes: *Please refer to Lamp and Ballast schedules under "Final Design Option" for more product information.*

Light Loss Factors

Label	IESNA Maintenance Category	Distribution Type	Environment Cleanliness	Cleaning Cycle	LLF				TOTAL
					LLD	LDD	RSDD	BF	
F8	IV	Direct	Clean	12mo	0.94	0.88	0.97	1.00	0.80



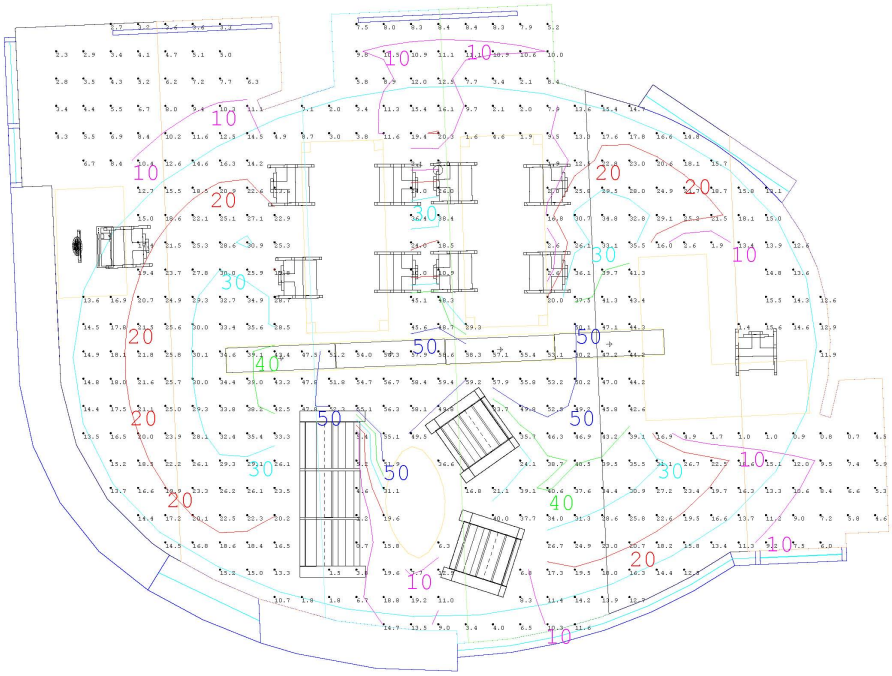
UCSB Student Resource Building

Student Resource Center - Lighting Plan (Alt.)

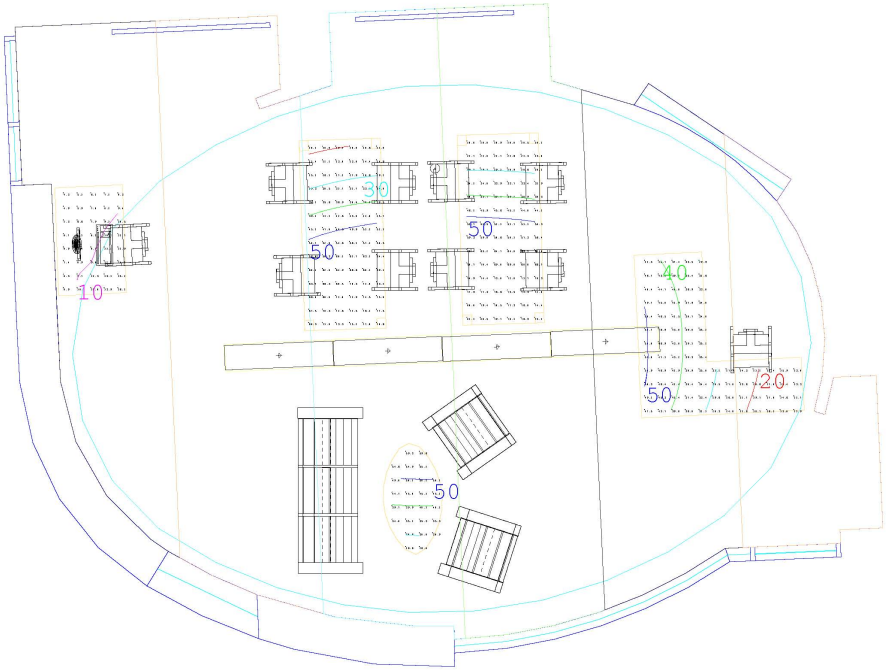
Scale: $\frac{1}{4}$" - 1'-0"

Illuminance Data

(Software used: AGI32 – v1.92)



Floor Plane: Illuminance Contours



Work Surfaces: Illuminance Contours

AGI32-v1.92 Statistical Summary

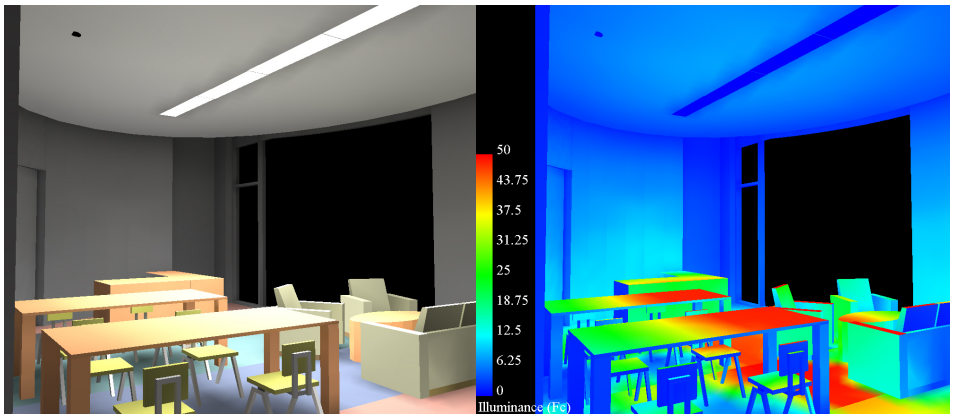
Calculation Area	Average Illuminance (fc)	Max. (fc)	Min. (fc)	Avg/min	Max/min
Floor Plane	21.0	59.4	0.7	30	84.86
Computer Desk*	8.8	16.2	0.7	12.6	23.1
Work Table 1*	50.0	78.6	18.1	12.6	23.1
Work Table 2*	52.9	81.1	20.	2.6	4.0
Help Desk*	34.8	51.0	11.9	2.9	4.3
Coffee Table	42.7	59.6	26.6	1.6	2.2

Notes: *(*) Assumed to be 2.5 ft AFF*

Room surface reflectances are discussed in the following section.

Radiosity Renderings

View from Interior Entrance



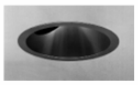
Rendering Pseudo Rendering

Final Design Option

Though the first design is very functional and creates a less cluttered appearance on the ceiling, it was decided that the space deserves additional vertical illumination on the walls to add an additional layer of visual appeal to this space. Given that that there was is still an allowance of 164 W in the first design; additional lights were added to meet this need. After the implementation of downlights in this space, the single row of luminaires was divided into two and re-orientated to create a more balanced appearance on the ceiling. This is shown below:

Schedules

Luminaire Schedule
Location: Student Resource Center

Type		Quantity	Catalog No.	Lamping / Ballast	Watts/ Fixture	Ballast/ fixture	Total Watts	Voltage
F3B		4	Zumtobel, "Spec-3": S3D4360-S2-4660TC	1- (L4) GE Lighting 20826 Q35MR16/C/SP20	35	-	140	12 V
F8		4	**Zumtobel, "Light Fields HE": LFHU-14-2545-MP-DH277** (1 x 4 FT) Recessed Fixture	2 - (L8) GE Lighting 46759 F54W/T5/830	125	1 - (B4) Lutron Eco-10: ECO-T554-277-2	500	277

Total Watts:	640	**W**
Space Area:	553	**SF**
Achieved Power Density:	**1.16**	**W/SF**
Allowed Power Density:	1.20	**W/SF**
Status:	Ok	

Based on calculations, the implemented design falls under the 1.20 W/sf allowed for this space as specified by California's Title 24 (2006).

Lamp Types Schedule
Location: Student Resource Center

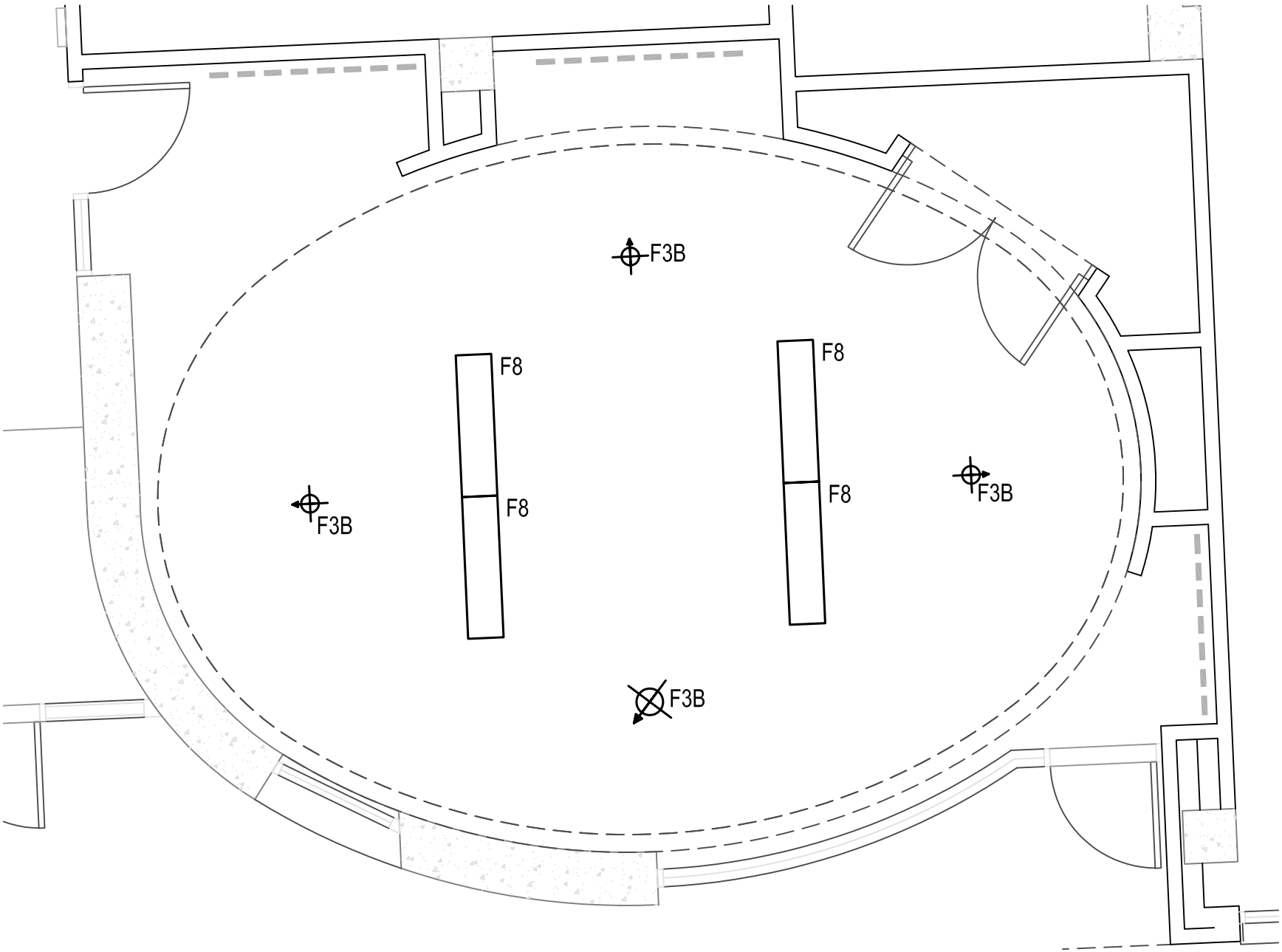
Type	Manuf.	Designation	Rated Wattage	Base	CRI / CCT	Rated Life (hrs)	Initial Lumens	Assoc. Fixture	Assoc. Ballast
L4	General Electric	20826 Q35MR16/C/SP20	35	GX5.3	100 / 3000K	5000	625	F3B	-
L8	General Electric	46759 F54W/T5/830	54	G5	85 / 3000K	20000	5000	F8	B4

Ballasts Schedule
Location: Student Resource Center

Type	Manuf.	Catalog Name	# Lamps	Ballast Type	Start Method	Input Watts	Ballast Factor	Power Factor	THD (%)	Assoc. Fixture
B4	Lutron	Lutron Eco-10: ECO-T554-277-2	2 - (L8)	Electronic Dimming (10%)	Programmed Rapid Start	54	1.00	>0.95	<10%	F8

Notes: *Please see Appendix A for all product cutsheets and complete schedules.*

Lighting control intent is located in the electrical depth.



UCSB Student Resource Building

Student Resource Center - Lighting Plan

Scale: $\frac{1}{4}$" - 1'-0"

Assumptions

Surface Reflectances

Material	Location	Reflectance (%)
Architectural Concrete	Walls and Ceiling	20
Rubber Floor Tiles		
"Blue Skies 702"	Floor	18
"Soft Jade 653"		26
"Arizona Sunset 602"		27
"Slate Gray 766"		9
Gypsum Wall Board (GWB)	Walls	75
Suspended GWB Ceiling	Suspended Ceiling	75
Wood	Furniture	8

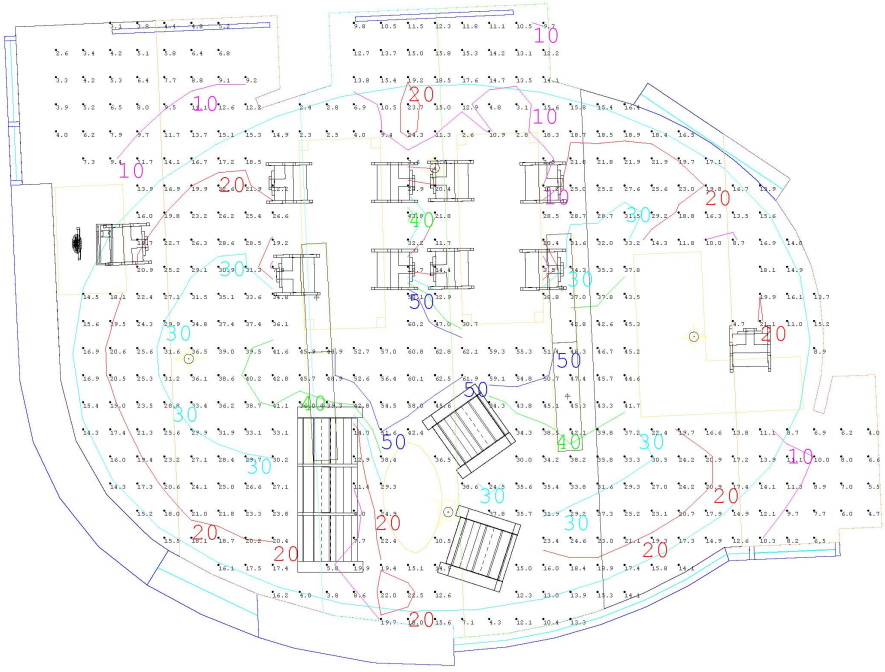
Note: *Refer to Section 1b. for glazing information*

Light Loss Factors

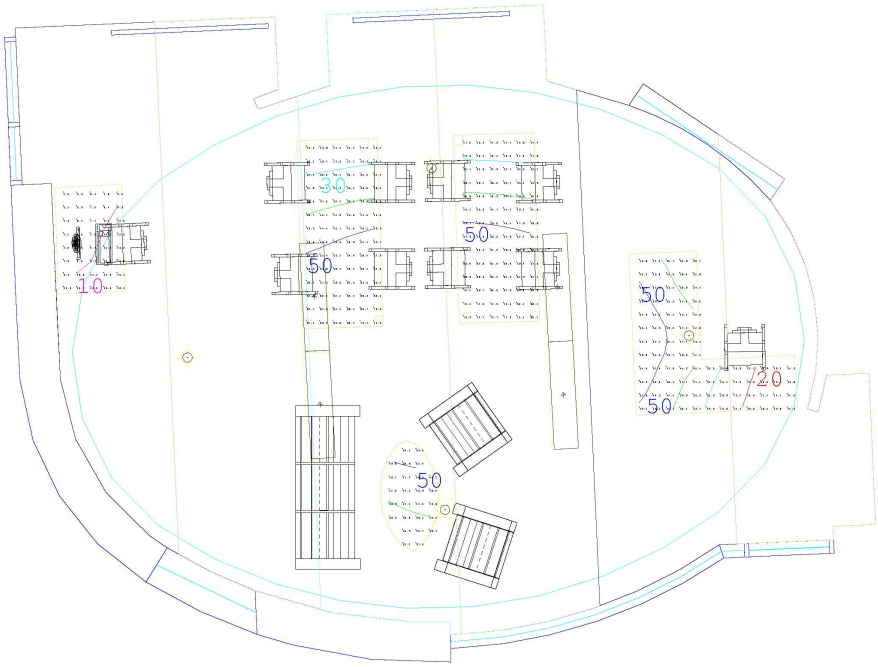
Label	IESNA Maintenance Category	Distribution Type	Environment Cleanliness	Cleaning Cycle	LLF				TOTAL
					LLD	LDD	RSDD	BF	
F3B	IV	Direct	Clean	12mo	0.85	0.88	0.97	1.00	0.73
F8	IV	Direct	Clean	12mo	0.94	0.88	0.97	1.00	0.80

Illuminance Data

(Software used: AGI32 – v1.92)



Floor Plane: Illuminance Contours



Work Surfaces: Illuminance Contours

AGI32-v1.92 Statistical Summary

Calculation Area	Average Illuminance (fc)	Max. (fc)	Min. (fc)	Avg/min	Max/min
Floor Plane	22.0	62.1	2.1	10.5	29.6
Computer Desk*	8.8	15.9	0.9	9.8	17.7
Work Table 1*	46.9	71.9	22.8	2.1	3.2
Work Table 2*	49.5	74.8	24.1	2.1	8.1
Help Desk*	37.4	55.4	11.7	3.2	4.7
Coffee Table	42.8	54.6	30.7	1.4	1.8

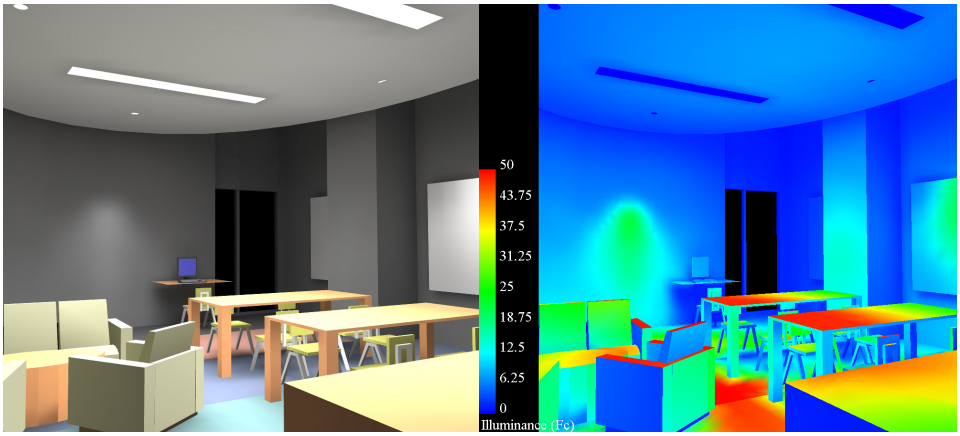
(*) Assumed to be 2.5 ft AFF

Statistical Data Comparison

Based on analysis, it was shown that the final design option created a higher level of uniformity in this space. This was probably due to the fact that more light was delivered to the periphery through the addition of adjustable downlights that throw light along the vertical surfaces. Light level uniformity is a crucial aspect to consider in an interior work space. Average illuminances of the two arrangements are comparable in the two designs with the final option delivering slightly higher levels.

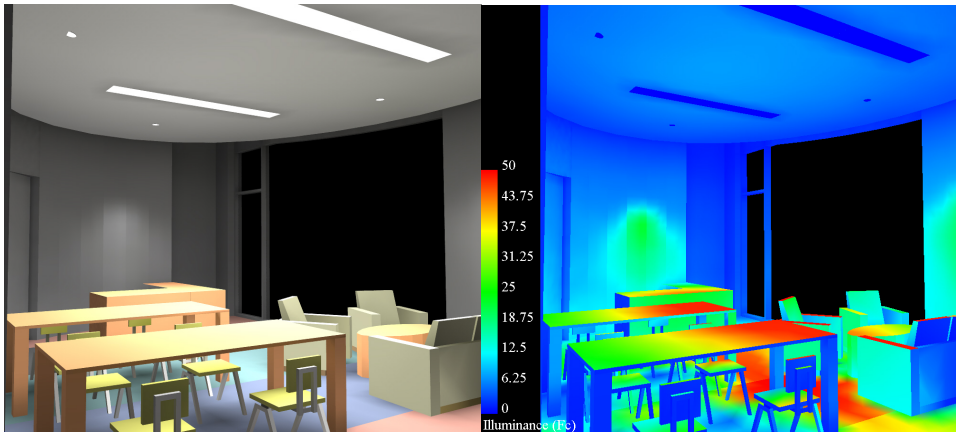
Radiosity Renderings

View from Help Desk



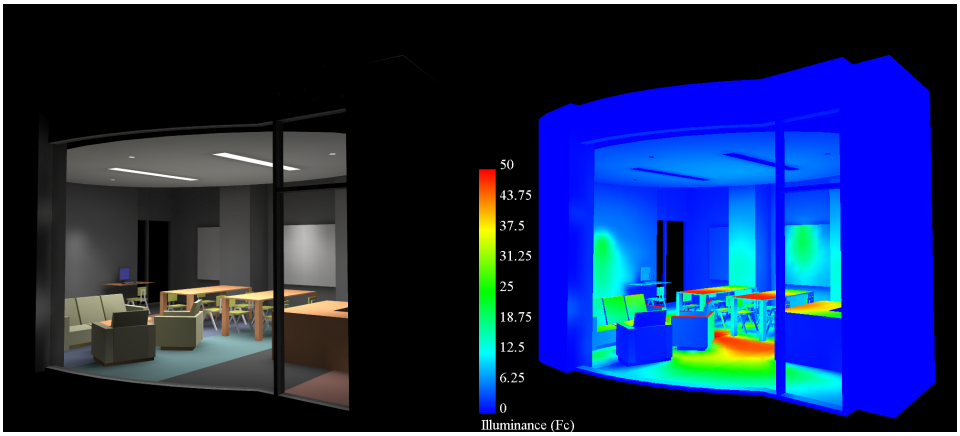
Rendering Pseudo Rendering

View from Interior Entrance



Rendering Pseudo Rendering

View from Exterior



Rendering Pseudo Rendering

Daylight Control

Daylight simulations show that for most days during the year, a large proportion of natural light enters this space through the glazing on the south facing façade. As the building will mostly be used during the regular school year, only the Equinox and Solstice dates were processed. Results show that enough daylight enters the space between the hours of 8am to 4pm after which artificial illumination will be supplemented to achieve the adequate light levels required. Depending on the day's sky condition, typical percentage cost savings during this time frame ranges from approximately 54% to 87%.

If we assume that this room is only in use from 8am to 10pm, no artificial illumination is required for about 60% of the total hours that this room is in operation. That being said, the space can rely on daylight for approximately 9 hours a day and as such represents a considerable amount of energy savings. This is illustrated in the following calculation:

Calculated average savings: 0.32 KW

0.32 KW x 9 hrs x 30 days/month = 86.4 KWH / month

Approximate Average Demand Charge: $0.18321

Therefore: 86.4 KWH/month x $0.18321 = **$15.82 savings per month**

Over the course of a year: $15.82 x 12 = ***$189.95 savings per year***

Again, if we assume the building last 40 years, the system saves approximately $7598.09 during its life time. This value is a conservative estimate as the energy cost can be expected to increase during this period.

Note: *Please consult Appendix D for the dimming analysis results for this space.*

Evaluation

The final lighting solution for this space now provides additional visual interests to the space. In addition to general ambient illumination provided for by the linear lighting system, adjustable downlights provide the necessary vertical illumination on the different surfaces. Both IESNA and Title 24 criteria were satisfied by the proposed design.

In terms of daylight energy savings, since the linear fixtures will all be on one circuit in both options, energy savings will be exactly the same as described in the previous section. The only benefit from the first option was that less luminaires were specified and as such represents a reduction in first cost of the overall system proposed for this space. However, in light of the need to provide a visually appealing space for people to use, the final option takes precedence.