Acoustical Design of a Conference Room

Lighting Design of a Conference Room

To further understand how a change in height will impact the building's performance and other systems the lighting design of a conference room was analyzed for the height as-built and the height of the conference room in the redesigned structure. The current steel system has a floor-to-floor height of 14'-0" for a typical story, of which 9'-8" is the clear height to the ceiling. The redesigned system with 12'-0" floor-to-floor only allows an 8'-0" ceiling height. As shown in the study of the conference room's acoustics, this change in height has effects on many of the building's other systems.

In this case, the reduction in height of the room would adversely affect the lighting design of the conference room. This would cause the room to need a different lighting layout from what is currently provided. Since no lighting schematics could be obtained for the Weinberg Center, a lighting system was designed for the steel structure with a ceiling height of 9'-8". This will then be compared to a design of the lighting system for the redesigned concrete system with a ceiling height of 8'-0".

In each case the required number of luminaires would be twelve. This amount of luminaires provides the required 30 footcandles of illuminance at 36" above the floor, the height of a conference room table. Assumptions used in the design include a 12-month cleaning interval in a clean environment. A Phillips compact florescent lamp is used in the design of each conference room. Total lumen output by this luminaire is 3600 lumens. A light loss factor of 0.74 was calculated in each case. This would not necessarily be typical, but the room cavity ratios are close enough to not drastically affect light loss throughout the room. A Coefficient of Utilization (CU) of 0.60 was calculated for the steel structure lighting, while a CU value of 0.64 was calculated for the redesigned concrete structure. This is to be expected because a lower value would be expected for a taller room. More lights would be needed to illuminate a surface that is farther away. This is seen in the exact number of luminaires needed for each system, 11.94 for the original system and 11.17 for the redesigned. However, both these numbers are rounded up so that twelve are needed for each system.

The spacing criterion for each building would be different. The compact florescent downlight has a s/mh value of 1.5. This spacing criterion ensures that a uniform lighting distribution is provided on the surface that needs to be illuminated. This means that for the original system the lamps could be spaced at a maximum of ten feet to achieve a uniform lighting layout. For the redesigned system the spacing changes to 7.5 feet. This is enough of a difference to change the lighting layout of each system. The original system could have a layout very similar to what is shown below in Figure 8.1. The redesigned structure would have a layout similar to what is shown in Figure 8.2. The original system could have a spacing of ten feet and use the required twelve luminaires. The redesigned system would need an additional 4 luminaires to meet the required spacing criteria.

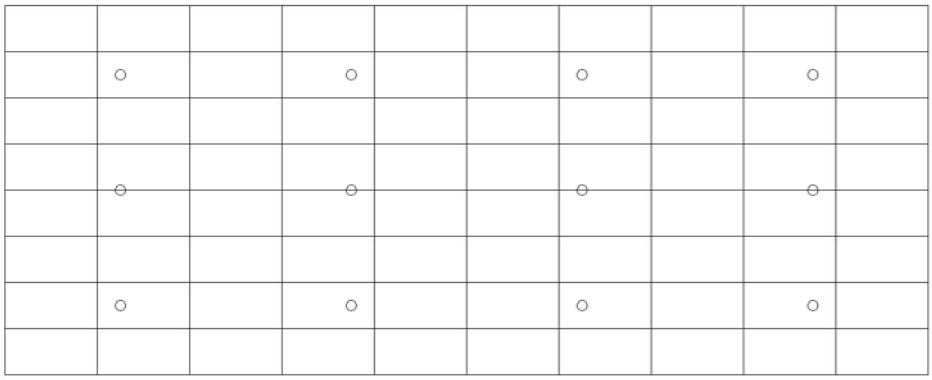

Figure 8.1 shows the original steel system lighting layout. A total of 12 luminaires are provided at a maximum spacing of 10 feet.

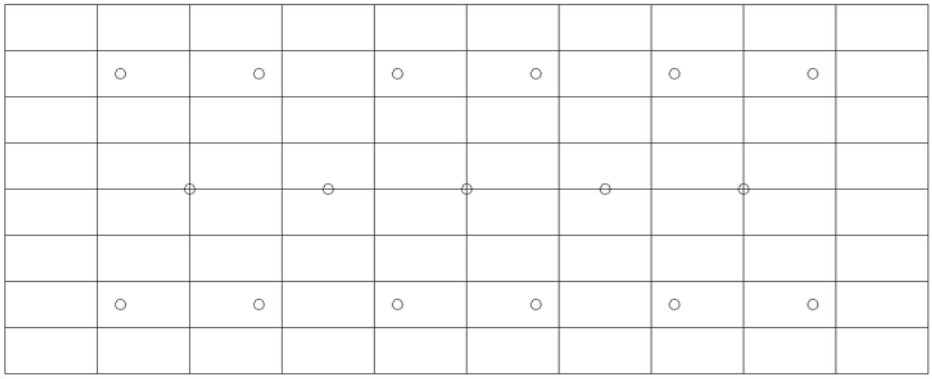

Figure 8.2 shows the redesigned systems lighting layout. A total of 17 luminaires are provided at a maximum spacing of 6 feet.

Assumptions made about each system are outlined in the following spreadsheet as well as the basic calculation outline of the two systems. In general each system's walls, ceiling and floors were kept similar so that a change in height would be the only contributing factor to the systems differences.

Lighting Design of Original System					
L=	40.00	P ceiling=	0.80		
W=	16.00	P walls=	0.60	P window=	0.06
H=	9.67	Pavg walls=	0.51		
H work plane=	3.00	P floor=	0.25		
CCR=	0.00				
RCR=	2.92				
FCR=	1.31				
LLF's					
	Ballast Factor	1.00			
	Lamp Lumen Depreciation	0.86			
	Lumen Dirt Depreciation	IV-Downlight w/ open bottom			
		Clean w/ 12 mo cleaning interval for luminaires			
		0.89			
	RSDD	12 mo cleaning interval			
		0.97			
Total LLF	0.74				
P floor cavity	0.225				
Factor for Pfc=.225		1.02			
	0.59				
CU=	0.60				
	2 lamps per luminaire	3600.00	total lumen output		
	Required Illuminance is 30fc - Cat. D conference Room				
	# luminaires required				
	11.92	Need 12 Lights			
	Spacing Criteria	1.5 s/mh			
		10.01	feet		

Lighting Design of Redesigned System					
L=	40.00	P ceiling=	0.80		
w=	16.00	P walls=	0.60	P window=	0.06
h=	8.00	Pavg walls=	0.49		
hwp=	3.00	P floor=	0.25		
CCR=	0.00				
RCR=	2.19				

FCR=	1.31				
	Ballast Factor	1.00			
	Lamp Lumen Depreciation	0.86			
	Lumen Dirt Depreciation	IV-Downlight w/ open bottom			
		Clean, 12 mo cleaning interval for luminaires			
		0.89			
	RSDD	12 mo cleaning interval			
		0.97			
Total LLFs	0.74				
	P floor cavity	0.225			
	Factor for Pfc=.225			1.02	
			0.63		
	CU=		0.64		
	2 lamps per luminaire		3600.00		
	Required Illuminance is 30fc - Cat. D conference Room				
	# luminaires required				
	11.17		Still Need 12 Lights		
	Spacing Criteria		1.5 s/mh		
			7.50	feet	
				but spacing requirement changes	

Summary

This study was done to determine if the lighting system layout of the conference room would need to be redesigned. The concrete structure with its lower ceiling height would necessitate a different spacing of the luminaries. It can be assumed from the findings that similar changes would need to be made for other rooms. The redesigned system would require lamps placed at smaller intervals which would in turn raise the number of total lamps needed to illuminate each room as well as this conference room.