



Conference Room Lighting Redesign

Space Description

This particular conference room is located in the NICU department of the new hospital addition. The conference room, which is bare below, will contain a typical wooden conference table, a video screen, display boards and a few X-Ray viewers. There are two windows in this space that allow the occupants to look out into the nurses' station and bedding areas of the NICU.



Video screen will be located here.

Surface Properties

<u>Type</u>	<u>Material</u>	<u>Reflectance</u>
Walls	Slow Green paint	65%
Floor	Tan Carpet	30%
Ceiling	White ACT	85%
Glazing	Monolithic Clear Float Glass	8%
Door	Wood	45%

Design Concept

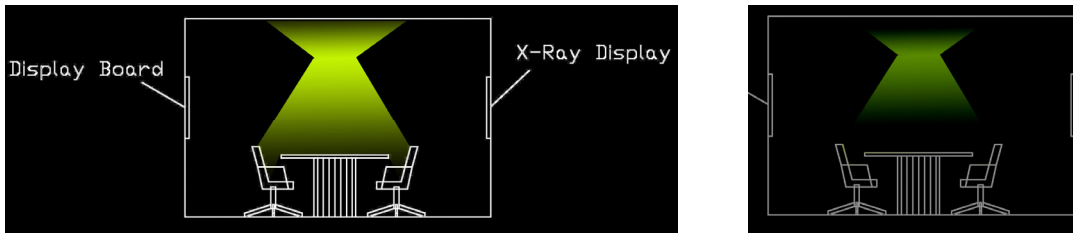
The general design concept for the conference room located in the Neonatal Intensive Care Unit (NICU) of the hospital is to provide a flexible system for formal meetings and presentations. During these conferences, the use of a projection screen, wall-mounted display boards, and X-Ray viewers will be important to the occupant. It is on these surfaces that important information will be displayed that may be critical to a human's well being.

Two different lighting systems shall be used in this area along with a versatile control system to give the space optimal performance.



System 1

A fluorescent dimming system which can provide general lighting needs as well as low level needs for slide show presentations is optimal for this space.



System 2

A wall wash or perimeter system with dimming is needed to give great visual appeal of wall mounted presentations.



Design Criteria

Task Descriptions:

- Reading of paper (notebook, copies, textbook and magazines should be considered)
- Viewing of projection screen
- Viewing of wall mounted displays
- Writing (using pencils and pens)
- Presentation

Illuminance Levels:

- Horizontal illuminance level on conference table.
 Recommended value from IESNA 9th addition is Category D
Category D = 30 fc
 No adjustments necessary
- Vertical illuminance at wall mounted displays.
 Recommended value from IESNA 9th addition is Category E
Category E = 50 fc
 No adjustments necessary

- Vertical illuminance on all other walls.
Recommended value from IESNA 9th edition is Category B
Category B = 5 fc
No adjustments necessary

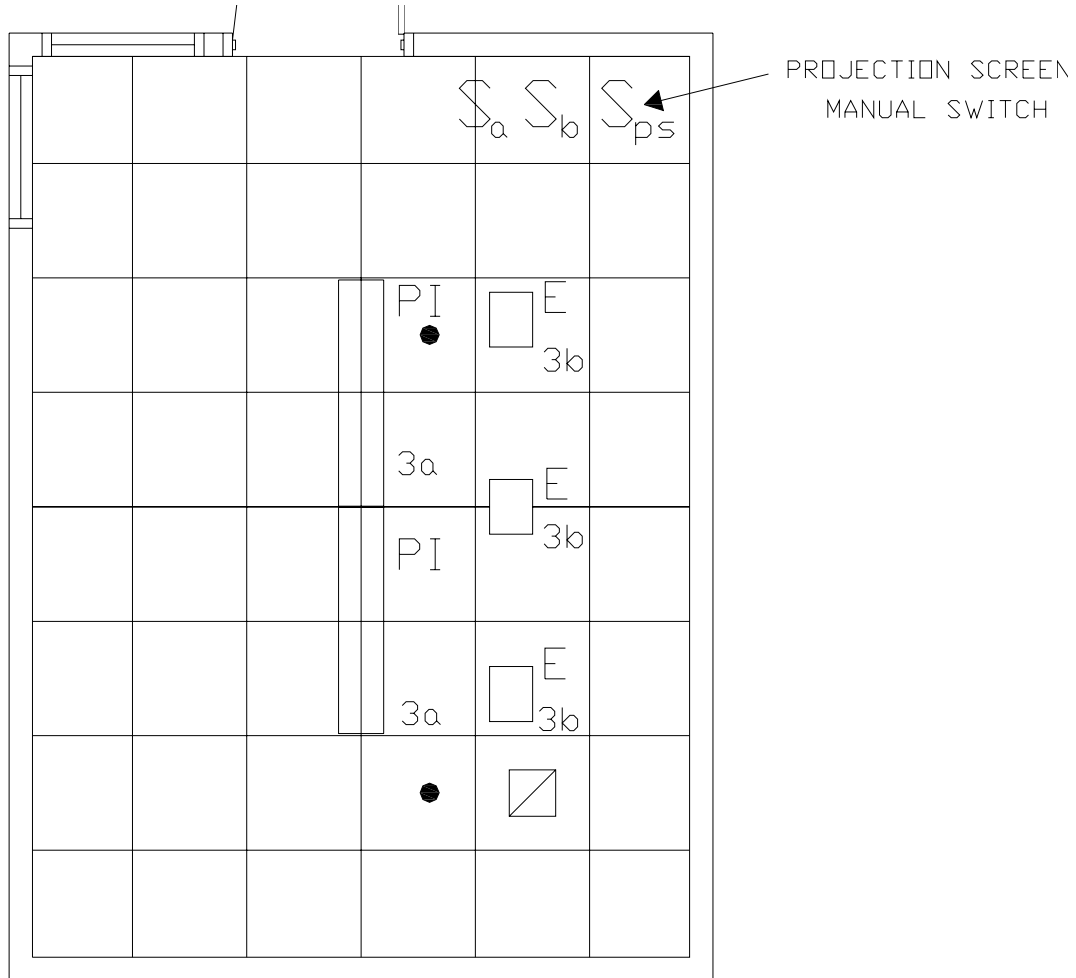
Design Considerations:

- The appearance of the luminaires should not be of a distracting nature.
- Scatter light off walls and surfaces to create good modeling of faces and objects which will give meetings a more comfortable feel.
- Place blinds in windows to help control any unwanted light that might be entering through windows.
- Use high CRI lamps (80 or above) to render faces and presentations well.
- Limit direct and reflected glare by using diffuse surfaces and high reflectances so that the slide show and wall boards can be viewed to the maximum appeal of audience.
- Use area lights over the conference table to eliminate shadows projected onto the table.
- Ceiling and wall luminance ratios should be within 3:1 with just the general fluorescent dimming system at full light output.
- Use a system that will provide a flicker and buzz free environment.

Control System:

The system should have two separate dimming switches with one for the pendant fixtures and the other for the wallwash system. Switches should be located in a convenient location at the entrance of the space.

Luminaire Layout



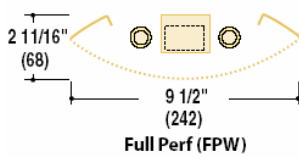
Equipment

Luminaire Schedule

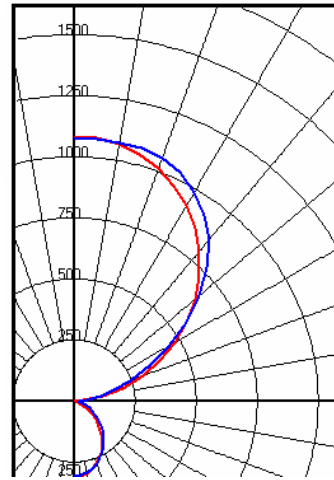
FIXTURE TYPE	LAMP DESIGNATION	NUMBER OF BALLAST	BALLST TYPE	VOLTAGE	MOUNTING	FIXTURE CATALOG NUMBER	LAMP ORDERING CODE	BALLAST CATALOG NUMBER
PI	2-F32 T8 FLUORESCENT	1	ELECTRONIC DIMMING	120	PENDANT	LITECONTROL P-I-9924T8-FPW-LP/ELB	PHILLIPS F32T8/TL835/ALTO	LUTRON HI-LUME FDB-4827-120-2
E	1-F42 COMPACT FLUORESCENT	1	ELECTRONIC DIMMING	120	SURFACE	ELLIPTIPAR F209-H142-L-02-A-000	PHILLIPS PLT42W/835/4P/ALTO	LUTRON HI-LUME FDB-CT42-120-1

****See appendix for fixture, lamp and ballast cut sheets****

Luminaire PI



Vidère™
P-I-9900
Pendant-Mounted Indirect

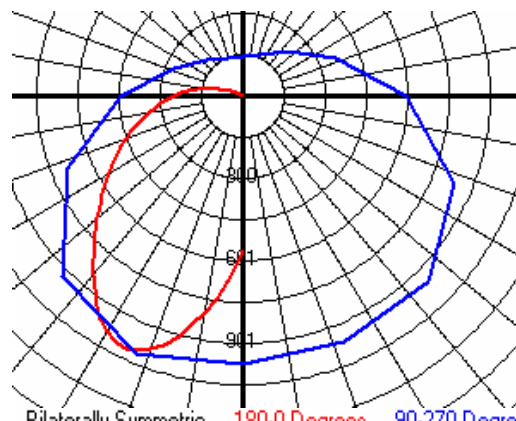


Bilaterally Symmetric 180-0 Degrees 90-270 Degrees

Luminaire	Maint. Category	Cleanliness	Cleaning Cycle	RCR	CIE Category	LDD	RSDD	LLD	BF	Total LLF
PI	II	Very Clean	12 Month	3	Semi/Ind.	0.97	0.95	0.97	0.85	0.74

Luminaire E

elliptipar



Bilaterally Symmetric 180-0 Degrees 90-270 Degrees

Luminaire	Maint. Category	Cleanliness	Cleaning Cycle	RCR	CIE Category	LDD	RSDD	LLD	BF	Total LLF
E	V	Very Clean	12 Month	4.1	Direct	0.93	0.97	0.85	0.95	0.72



Power Density Calculation

Fixture	Quantity	W/Fixture	Watts
PI	2	35	130
E	3	45	135
		Total	265

$$\begin{aligned} \text{Power Density} &= 265\text{W}/(15.74' \times 11.5') \\ &= \mathbf{1.47 \text{ W/ft}^2} \end{aligned}$$

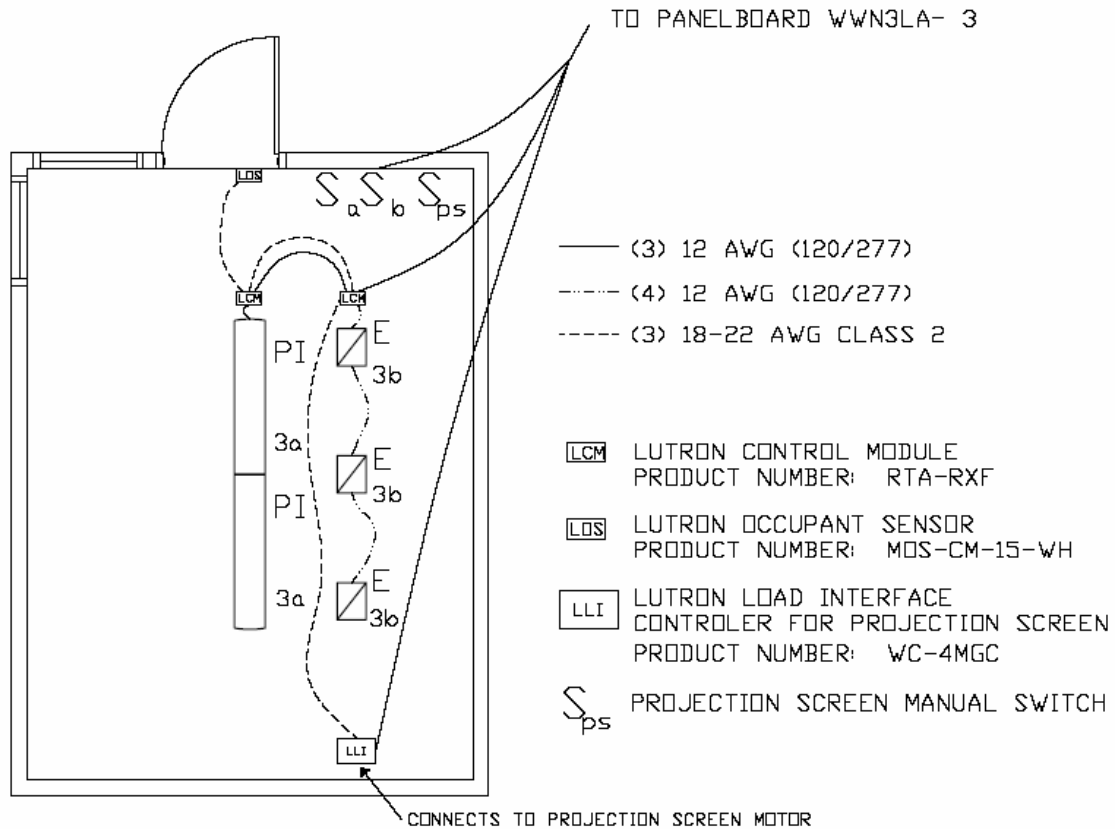
Power Density **DOES** comply with ASHRAE Standard 90.1 that says by using the Space-by-Space method to find your Allowable Power Density in a Hospital Conference Area you can not exceed a power density of 1.5 W/ft².

Control System

For the control system of the conference room I have chosen to use a Lutron RadioTouch system for several reasons. First, this system will provide the user with a wireless control that will make it easy for the occupant to switch from one lighting scene to another. Because of the ease of scene control, conferences will flow better and therefore take less of the doctor's valuable time. Another reason I chose to use the Lutron RadioTouch system, was because of its versatility with many other systems such as a control for the video screen and an integrated occupancy sensor option. Below is a list of products that I have selected to use.

Description	Quantity	Product Number
Control	2	RTA-RXF
Load Interface	1	WC-4MGC
Table Top Transmitter	1	RTA-WX-2B-WA
Wallbox Transmitter	2	RTA-WX-C2LB-WH
Wallbox Screen Control	1	RTA-TX-2L2C-WH
Occupancy Sensor	1	MOS-CM-15-WH

****Refer to Appendix for Product Cut Sheets****



Conference Design Analysis

In order to determine if this lighting system would be appropriate for the conference room, I ran calculations in a computer rendering program called AGI 32. When calculating the model in AGI 32 I tried to think of different scenes that would be used for the space. These different scenes included:

- All On – All luminaires are on at full output for conferences using visual display boards.
- Pendant Only - Scene used when only conversations and tabletop tasks are needed.
- Area 25% - Typical scene for conferences using only the projection screen.
- Area 25% Wallwasher 50% - Typical scene for conferences using the projection screen and wall mounted display boards.

Below are calculation grids taken from AGI 32 to display the performance of the different scene settings. The calculation grids were placed on the conference table, wall-mounted display boards, and on the projection screen. The numbers on each grid represent the different footcandle values for a specific point. Non-detailed renderings are also shown below which provide information on the light distribution during different scenes.

Calculation Results

All Calculations were performed in AGI 32

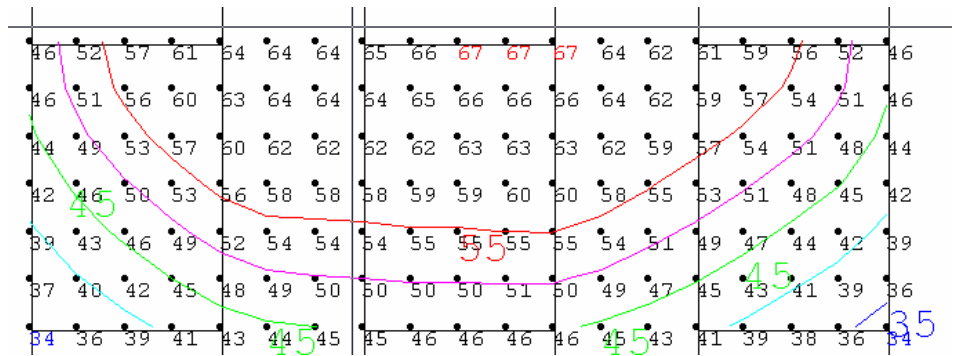
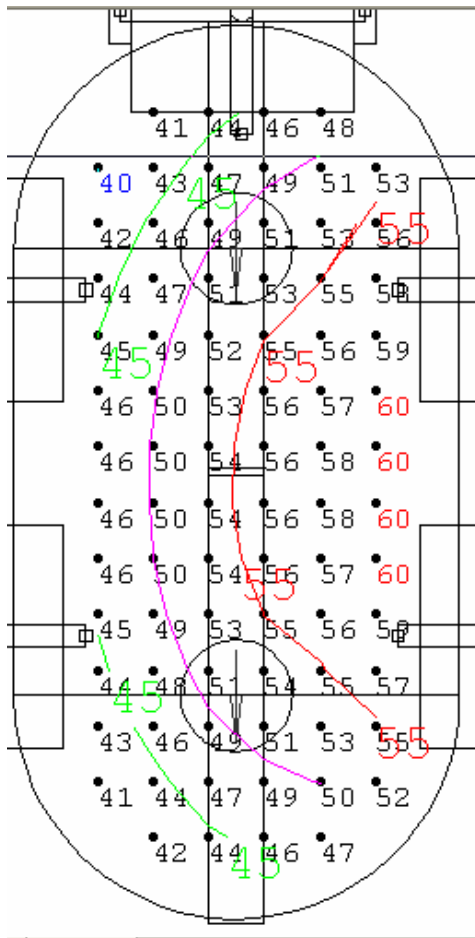
All On

Table Top

Illuminance Values(Fc)
Average=50.76 Maximum=60
Minimum=40 Avg/Min=1.27
Max/Min=1.50

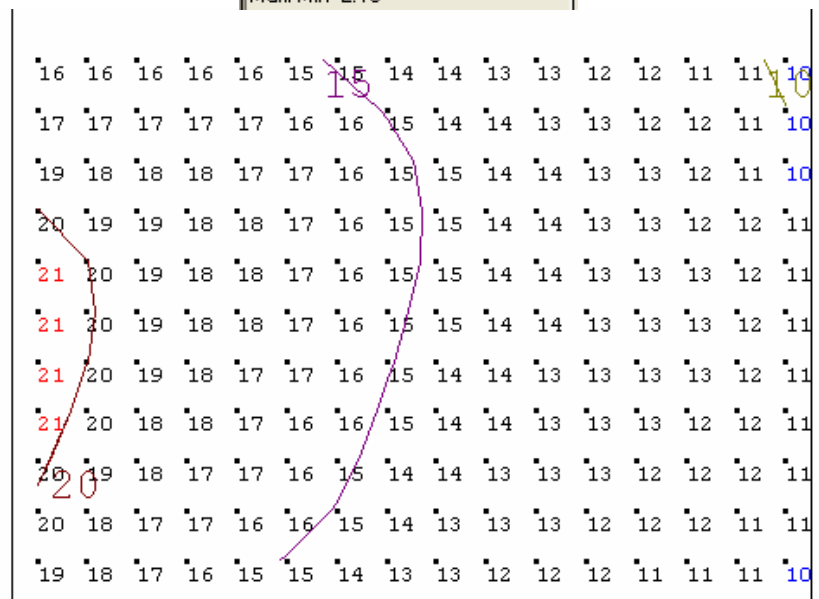
Display Boards

Illuminance Values(Fc)
Average=52.15 Maximum=67
Minimum=34 Avg/Min=1.53
Max/Min=1.97



Projection Screen

Illuminance Values(Fc)
Average=14.82 Maximum=21
Minimum=10 Avg/Min=1.48
Max/Min=2.10





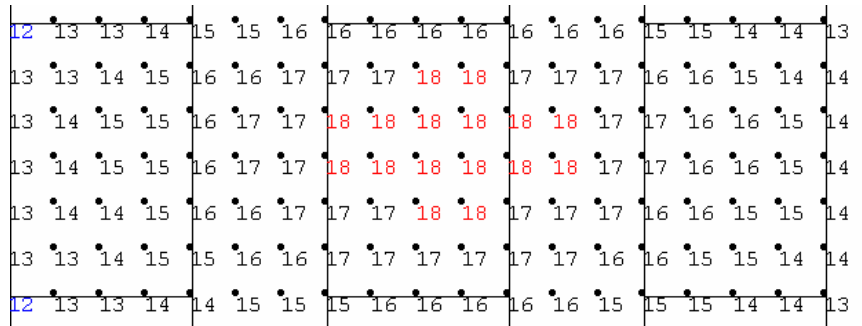
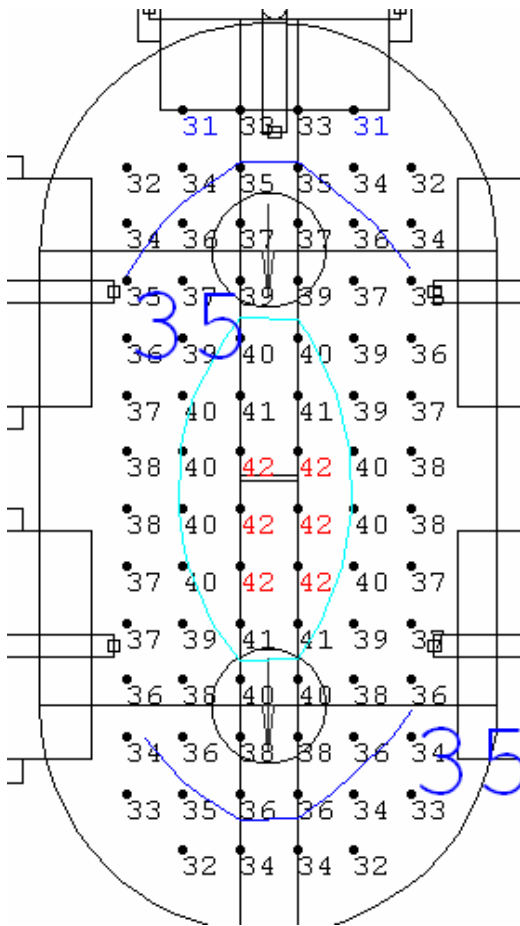
Pendant Fixtures Only

Table Top

Illuminance Values(Fc)
Average=37.08 Maximum=42
Minimum=31 Avg/Min=1.20
Max/Min=1.35

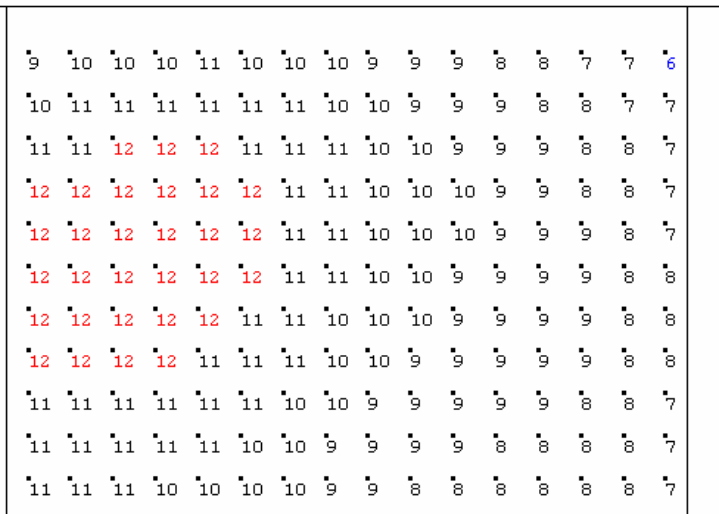
Projection Screen

Illuminance Values(Fc)
Average=9.83 Maximum=12
Minimum=6 Avg/Min=1.64
Max/Min=2.00



Display Boards

Illuminance Values(Fc)
Average=15.59 Maximum=18
Minimum=12 Avg/Min=1.30
Max/Min=1.50

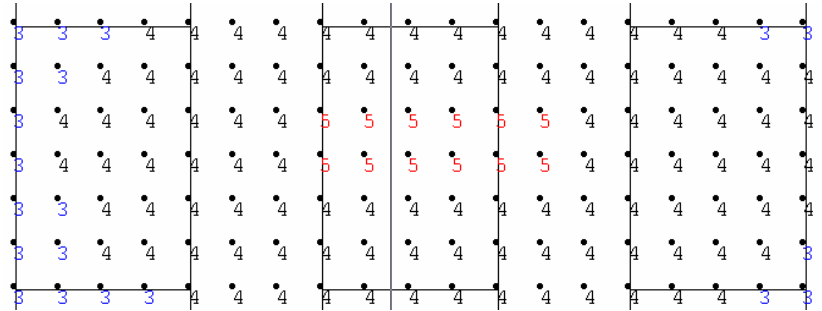
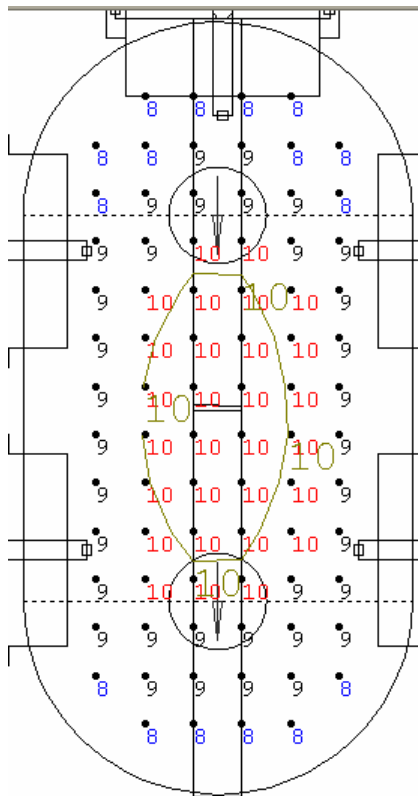




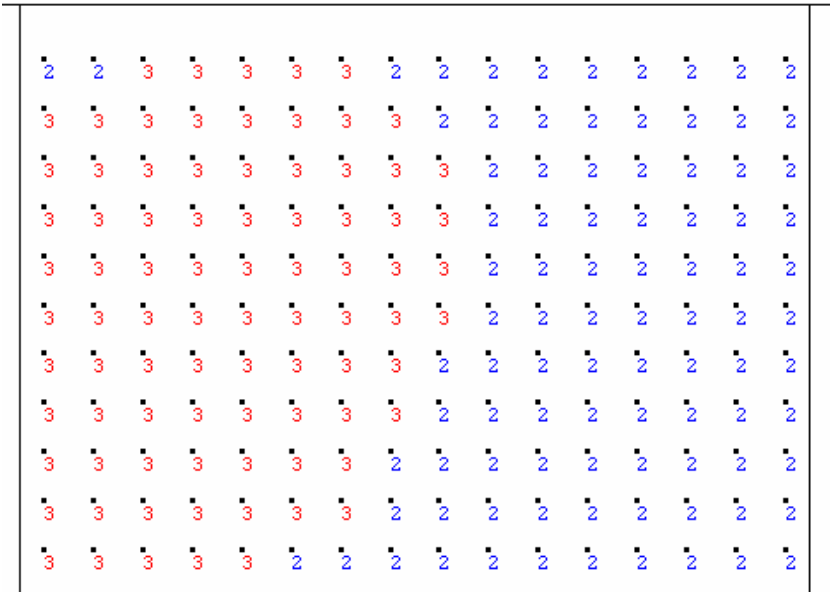
Pendants at 25%

Table Top
Illuminance Values(Fc)
Average=9.16 Maximum=10
Minimum=8 Avg/Min=1.15
Max/Min=1.25

Display Boards
Illuminance Values(Fc)
Average=3.94 Maximum=5
Minimum=3 Avg/Min=1.31
Max/Min=1.67



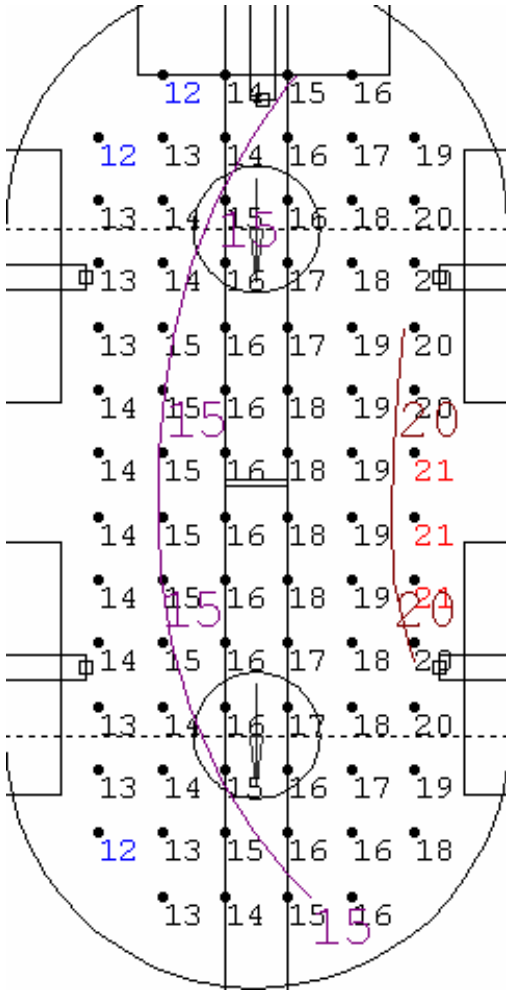
Projection Screen
Illuminance Values(Fc)
Average=2.48 Maximum=3
Minimum=2 Avg/Min=1.24
Max/Min=1.50



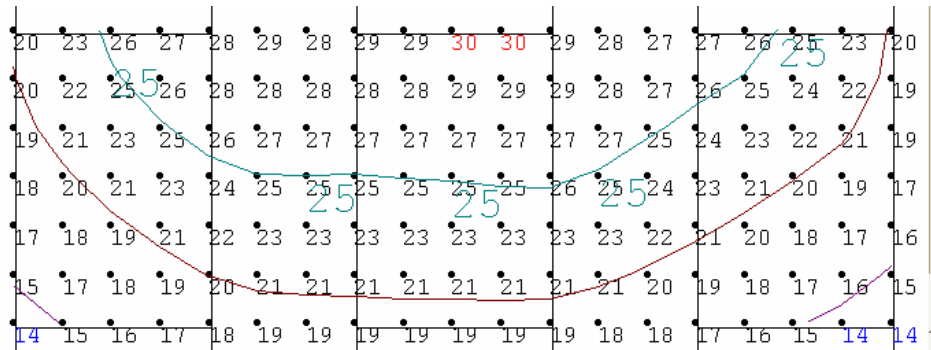


Pendants at 25%, Wallwashers at 50%

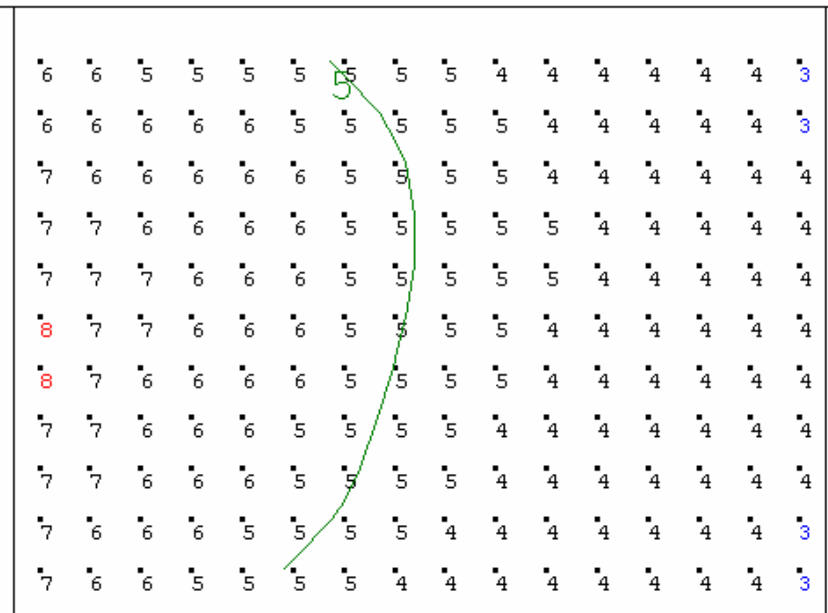
Table Top
Illuminance Values(Fc)
Average=16.16 Maximum=21
Minimum=12 Avg/Min=1.35
Max/Min=1.75



Display Boards
Illuminance Values(Fc)
Average=22.35 Maximum=30
Minimum=14 Avg/Min=1.60
Max/Min=2.14



Projection Screen
Illuminance Values(Fc)
Average=4.98 Maximum=8
Minimum=3 Avg/Min=1.66
Max/Min=2.67





Non-Detailed Renderings

All Luminaires On



Pendant Fixtures Only



Pendant Fixtures at 25%



Pendants at 25%, Wallwashers at 50%



Design Results:

All On:

When all lighting fixtures are turned on to full output, the focus of the conference will mainly be towards the wall-mounted display boards. As you can see from the illuminance map, there is an average of 52 fc on the display boards which meets the design criteria of 50 fc. There is a slight gradient in the light level from the top center of the area to the bottom corners. This gradient is minimal, as shown above in the AGI 32 rendering, and shall not produce any problems.

Pendants Only:

The next calculation run was performed with only the pendant fixtures on at full output and can be used to critique the output for general meetings and paper tasks. The key surface in this area is the table top. The average illuminance on the table is 37 fc and therefore meets the design criteria of 30 fc.

Pendants at 25%:

A relatively low illuminance is required on the conference table when viewing the projection screen. Therefore, a calculation was performed with the wallwashers off and the pendant fixtures at 25% output. Here I was trying to get about a 3:1 ratio between the conference table and the projection screen. You can see this was achieved with AGI 32 showing the average illuminance values of about 9 fc for the conference table and slightly under 3 fc for the projection screen.

Pendants at 25%, Wallwasher at 50%:

Lastly, a lighting scene which can be used for viewing of wall-mounted display boards and the projection screen was calculated. From the AGI 32 output you can see that the 3:1 ratio between the conference table and the projection screen was still achieved while also providing an average of 22 fc on the display board.