

### Part 3c: Redesign of Computer Lab and Creative Writing Classroom 233

#### Computer Lab and Creative Writing Classroom 233

**General Description:** See Fig. 62-64

- Split-level space, 14ft ceiling
- Space contains 21 computers and a projection screen

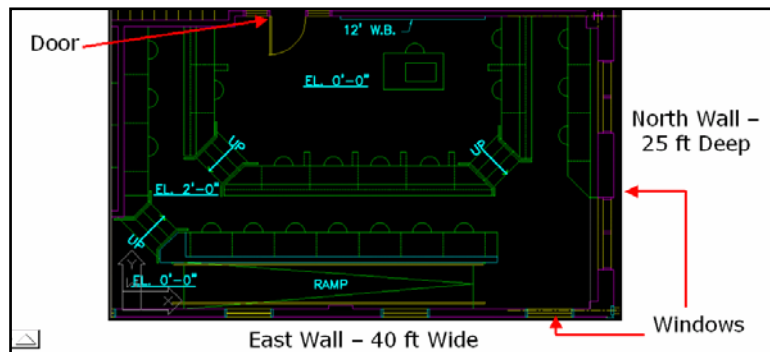
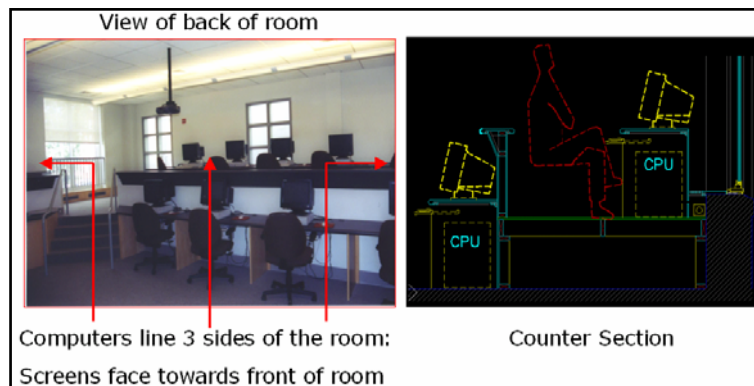


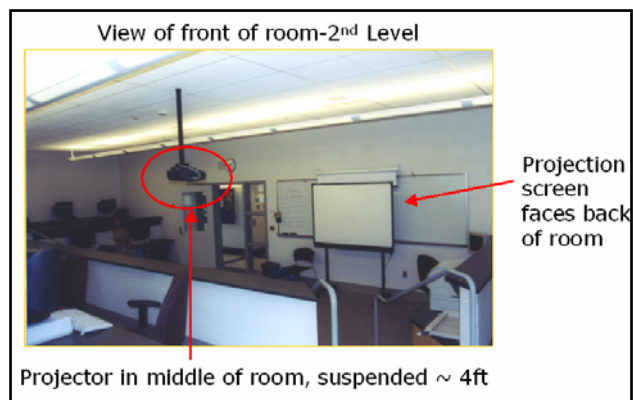
Figure 62: Plan View of Computer room with furniture



Computers line 3 sides of the room:  
Screens face towards front of room

Counter Section

Figure 63: Cross Section of Counter Top



Projector in middle of room, suspended ~ 4ft

Projection screen faces back of room

Figure 64: View of front of room from back

The main goal of the lighting design for this space must be to accommodate VDT screen usage while also providing integration and control of daylight systems with reduced glare. This space contains a pull-down projector screen in the front of the room, and approximately 21 computers throughout the room. Different illumination levels will be needed based on the needs of the activities within the space. For instance, low-level illumination is needed when presentations lectures are given on the VDT screens that will also allow students to take notes. High-level illumination similar to that in a typical classroom is also needed during some lectures.

Daylight control can be provided by use of shades (manual or automatic) or solar-reflecting/reducing glazing materials to compensate for the daily and seasonal changes in sunlight. Also, control of the electric lights should be done in order to achieve different lighting scenes.

Suggested quality and systems performance:  
IESNA Lighting Design Guide in IESNA Lighting Handbook

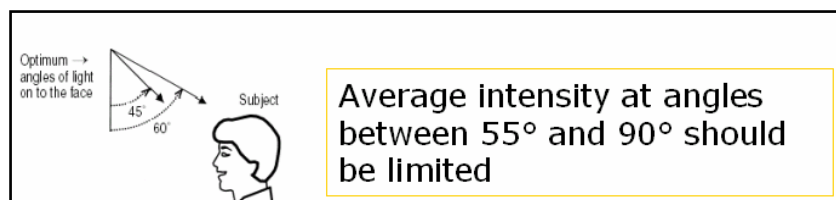
#### *Luminous Environment*

##### VDT Screen Lighting

- Minimize veiling reflections and shadows through using proper geometry between light sources, task, and observer
- Minimize reflected glare through use of matte finishes and low-brightness sources
- Horizontal illuminance of 30fc minimum for reading/writing handwritten tasks
- Good modeling of faces provided
- Good color rendering: 80CRI or greater to provide visual clarity within space
- Recommended vertical and horizontal illuminance of 5fc max on VDT screen when in use
- Minimize direct and reflected glare by using proper geometry between light sources, task, and observer
  - For fixtures that emit light below the horizontal plane, the average intensity in the lengthwise, crosswise, and 45° horizontal planes, at angles between 55° and 90° from the vertical should be limited
- Ambient illuminances should not exceed 50fc where VDT screens are used
- Luminance ratios on task and near background to avoid harmful reflections
  - 3:1 or 1:3 between task and near background
  - 10:1 or 1:10 between task and far background

#### Design Criteria:

- Accommodate VDT usage
  - Minimize direct and reflected glare by using following geometry between light source, task, and observer:



- Provide control of daylight
  - Shades (manual or automatic)
  - Solar-reflecting/reducing glazing materials
- Concentrate light on work areas
  - Level for note-taking, target 25-30 fc
  - Minimized light on projection screen, 5fc max

**Design Concepts:**

1. Direct light distribution to sufficiently light work areas with low light on projection screen.
2. Recessed fixtures to minimize visual clutter and avoid blocking projector view of projection screen.
3. Shielded lamp to eliminate bare bulb brightness.

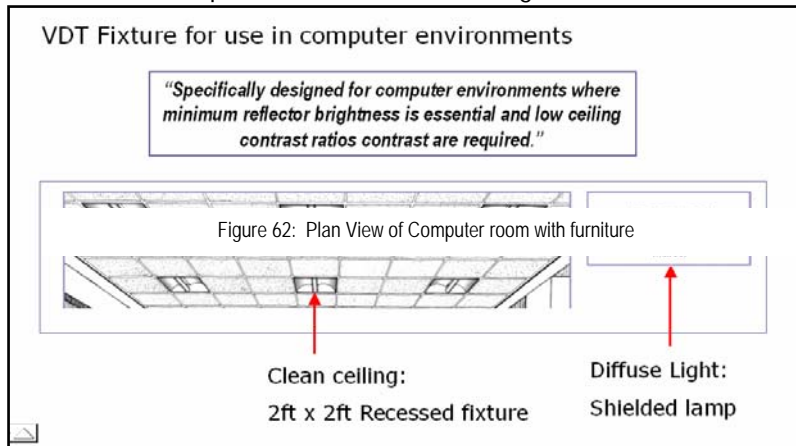


Figure 65: Description of VDT Fixture

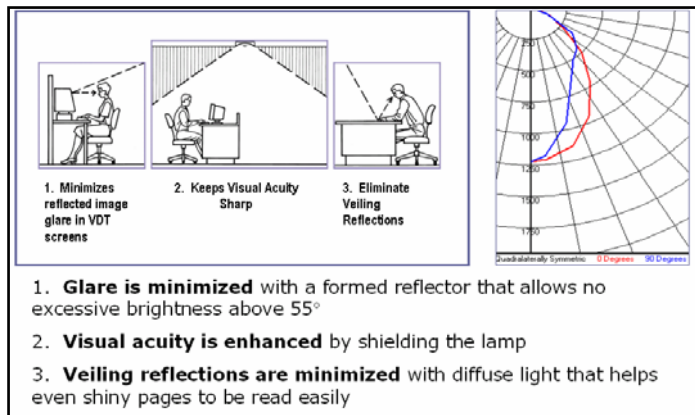
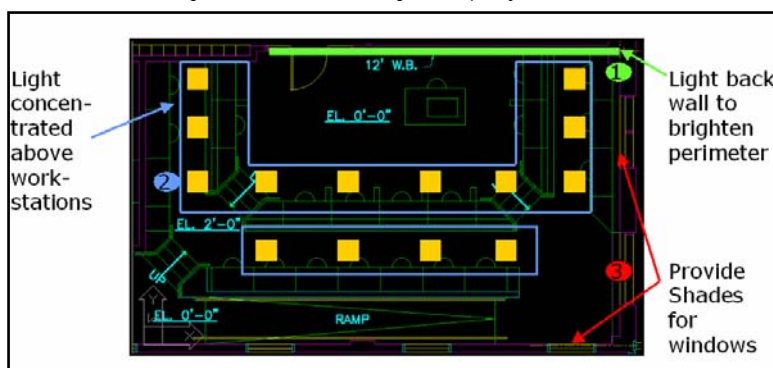


Figure 66: Description of Fixture

Figure 67: Plan View of Design Concept Layout



### Fixture Schedules and Light Loss Factors:

#### Computer Lab and Creative Writing Classroom 233

Fixture Type	Description	Manuf.	Cat #	Lamp	Ballast	Controls	Qty	Watts Fixture	Total Watts
A1	Recessed 2ft x 2ft indirect fluorescent.	Engineered Lighting Products	Model # 165BXID	(2)F24T5/835/HO	ICN-2524@120V	1-way switching.	16	54	864
B1	Recessed 4ft fluorescent wallwash.	Litecontrol	G-D-1014T8-CWM-ELB-120	(1)F32T8/TL835/ALTO PLZ	RCN-132-MC	1-way switching.	7	30	210
C1	7" Recessed mounted downlight. Vertical lamp.	Portfolio	C7726E-7070LI	(1)PL-C261M/835/ALTO...	ICF-2826-H1-LD@120	1-way switching.	3	32	96
								<b>TOTAL WATTS</b>	<b>1170</b>
								<b>POWER DENSITY</b>	<b>1.16 W/ft<sup>2</sup></b>

Luminaire LLF Table							
Label	BF	LLD	LDD	Cleaning Interval	Maint Category	RSDD	Total LLF
A1	0.92	0.9	0.95	9 months	4	0.98	0.77
B1	0.98	0.95	0.95	9 months	4	0.98	0.87
C1	0.98	0.85	0.95	9 months	4	0.98	0.79

Equipment Used: See Appendix 1—Cut Sheets

Shades are provided for all interior and exterior windows in order provide for daylight control and minimize all glare for VDT screen use.

- Mecho Shade System® used on all exterior windows to help reduce glare created by daylight
- A chain-driven manually operated roller-screen system for interior shading.
- Features include removable SnapLoc®; shadecloth mounting spline and SnapLoc fascia.





"Dark colors (left) provide optimal see-through visibility while diminishing interior brightness. Light colors illuminate the interior, lower heat gain and offer daylight opportunity. Appropriate shade cloth densities (1-15%), when matched to the visible light transmittance of the glass, combine to control excess brightness and glare on computer screens while maintaining a view to the outside." (www.mechoshade.com)

Figure 68: Description of Mecco Shades used

Layout:

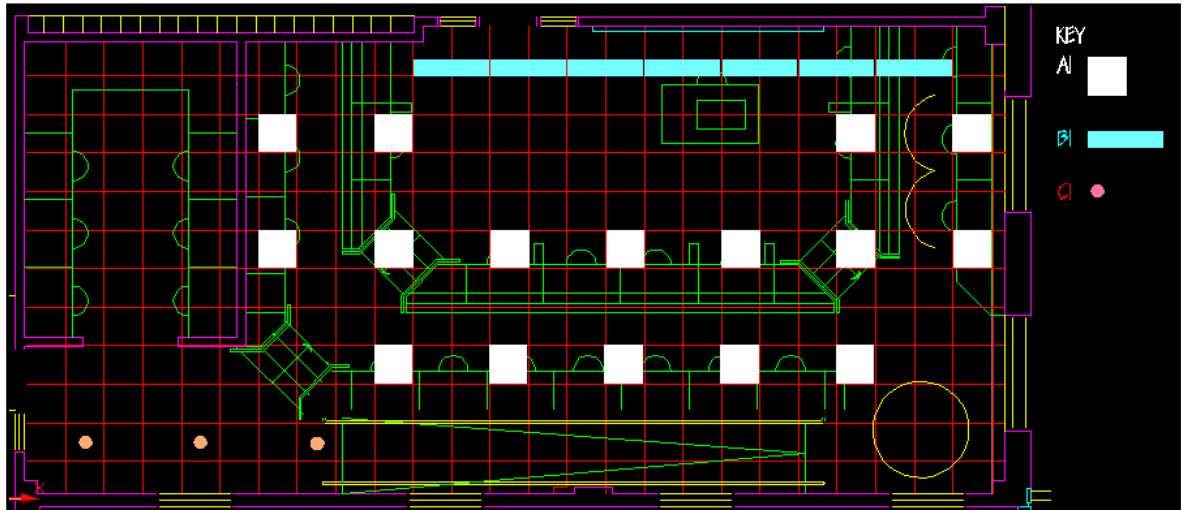


Figure 69: Plan View of Computer Room Layout

2 x 2 Grid Spacing

Circuiting and Controls:

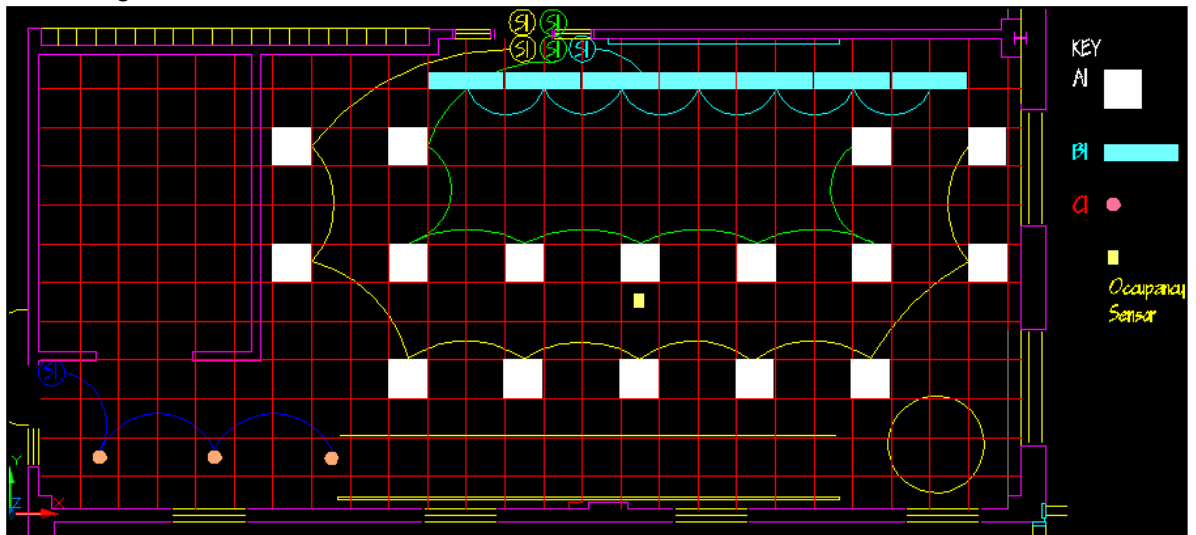


Figure 70: Plan View of Computer room with circuiting

**Switch 1:** All wall washers

7 fixtures \* 0.25 Input Amps = 1.75 A Total on LP1E, 14

**Switch 2:** VDT fixtures for level 1, 1 lamp/fixture

7 fixtures \* 1lamp \* 0.23 Input Amps = 1.61 A Total on LP1E, 15

**Switch 3:** VDT fixtures for level 1, 1 lamp/fixture

7 fixtures \* 1lamp \* 0.23 Input Amps = 1.61 A Total on LP1E, 16

**Switch 4:** VDT fixtures for level 2, 1 lamp/fixture  
7 fixtures \* 1lamp \* 0.23 Input Amps = 1.61 A Total on LP1E, 17

**Switch 5:** VDT fixtures for level 2, 1 lamp/fixture  
7 fixtures \* 1lamp \* 0.23 Input Amps = 1.61 A Total on LP1E, 18

**Switch 6:** All Downlights  
3 fixtures \* 0.57 Input Amps = 1.71 A Total on LP1E, 19

In order to comply with ASHRAE 90.1, placing an occupancy sensor in the middle of the ceiling will provide an automatic shut-off for all lights in the room. Novitas Two-Way Room Sensor Model # 01-082 is used. A relay and transformer is required. 1VA max for each sensor. 8 VA max for each relay. See Appendix 1 for cut sheet.

### Scenes:

Scene 1: General Classroom Lighting—All fixtures on full

For use when the classroom is used more as a typical classroom space where students need to take notes w/o using their computers and read what is written on the whiteboard at the front of the room.

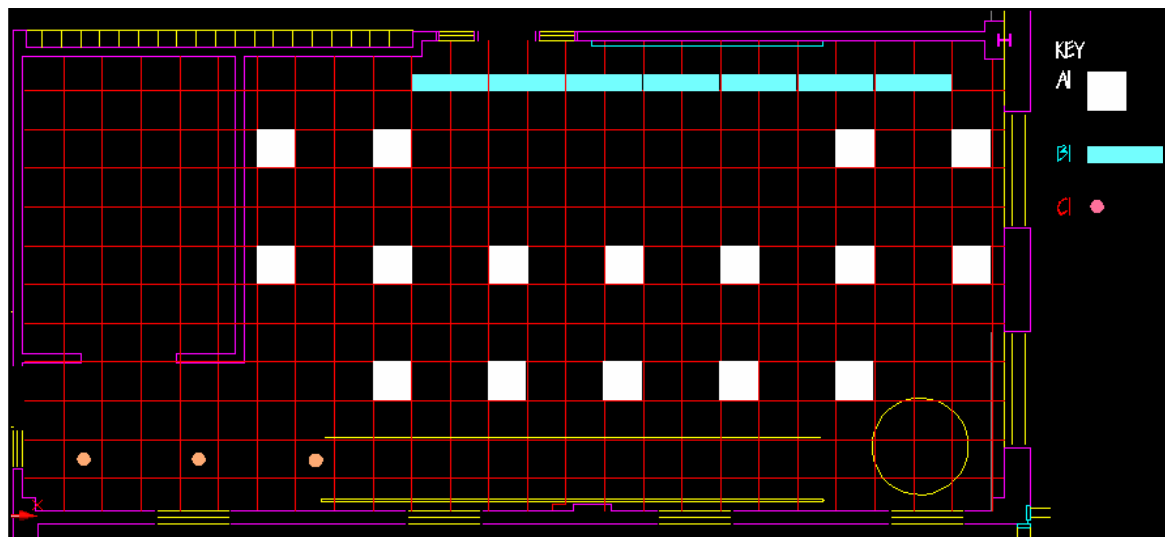


Figure 71: Plan View of Computer Room Scene 1

Scene 2: Presentation Scene 1—Wall washers off and all VDT fixtures on  
For use when the projector screen at the front of the room is being shown while students also need to use their computers. Provides low light on the projection screen (about 5 fc max), while also providing sufficient light levels for note taking at the computer stations if needed (about 25-35 fc).

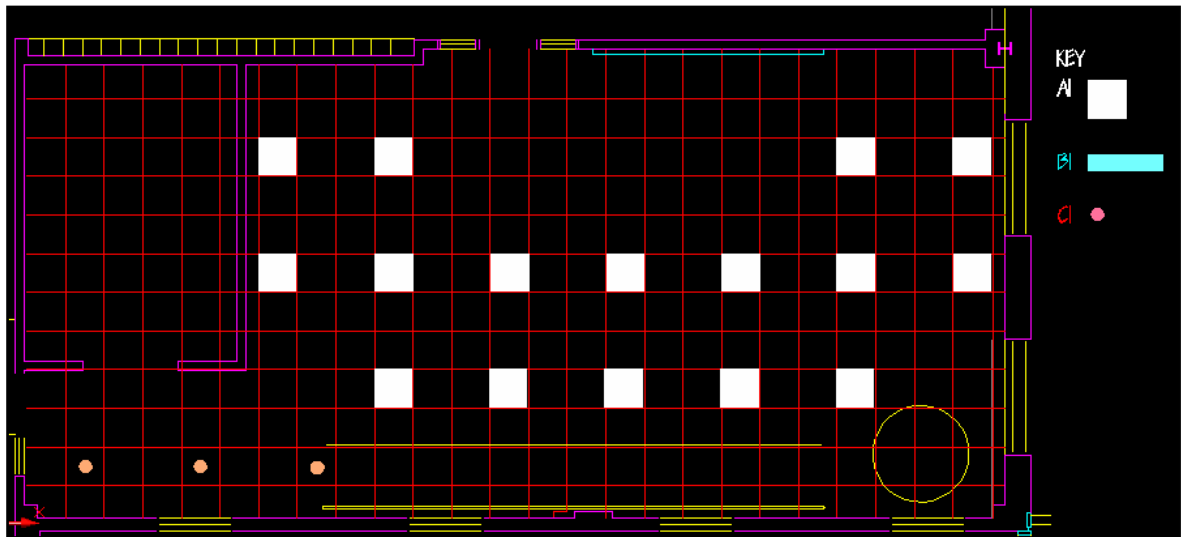


Figure 72: Plan View of Computer Room Scene 2

Other Presentation Scenes: The VDT fixtures were given flexibility in switching so that the light levels in the room would be very flexible depending on what type of lecture/presentation that is taking place. If the lecture/presentation required even lower light levels in the room, but still ability for note taking at all computer stations, half the light in level 2 VDT fixtures can be switched off. If even lower light is desired, half the light in level 1 VDT fixtures can be switched off also.

### Analysis of Systems:

#### Scene 1 Renderings:



Figure 73: View from Back of Room



Figure 74: View of N-E corner



Figure 75: View from sitting at Teacher's Desk

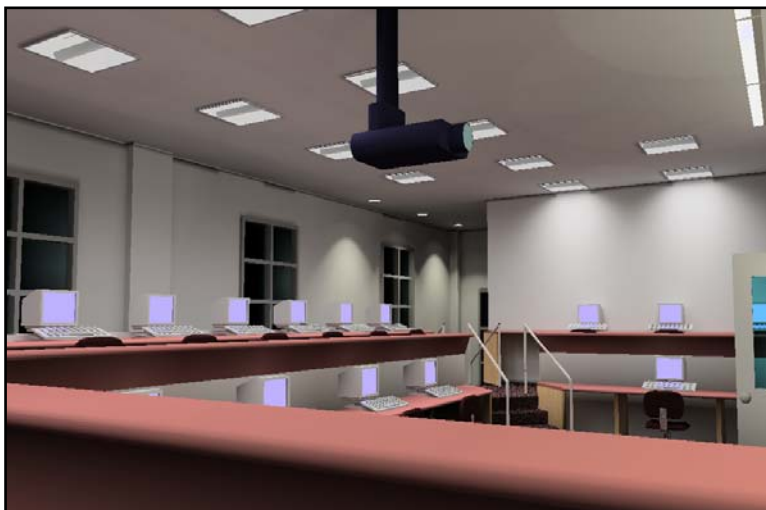


Figure 76: View of S-E corner at eye level sitting on 2<sup>nd</sup> level

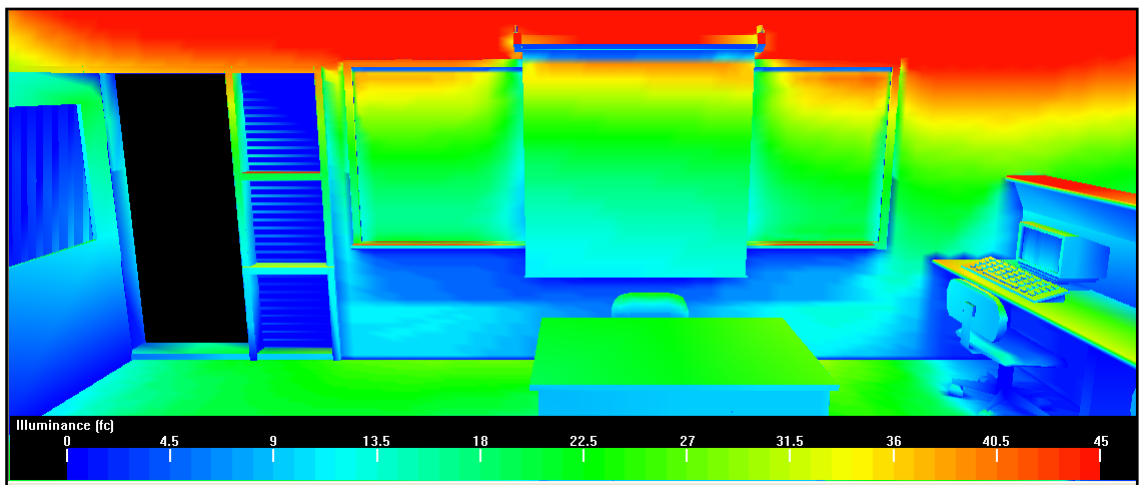
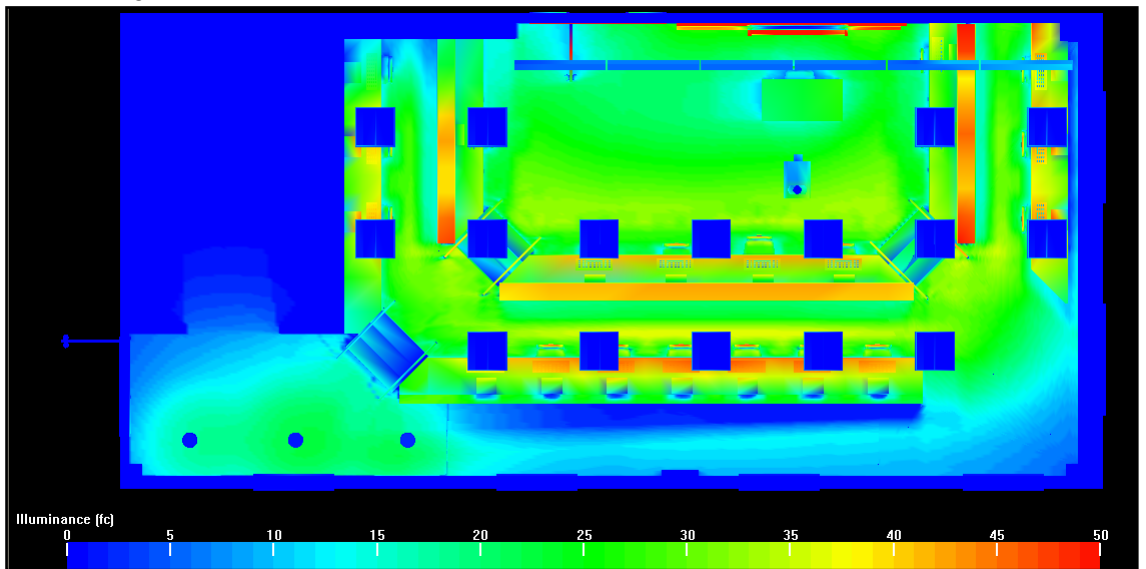


Cherise Rollins  
Lighting/Electrical Option  
The Learning Corridor, Hartford, CT  
Faculty Consultant: Dr. Mistrick  
Submission Date: April 2, 2004



Figure 77: View of White Board area from eye level on level 2

### Scene 1 Light Levels:



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Submission Date: April 2, 2004

Scene 2 Renderings:

Scene 2 Renderings (Presentation Scene):



Figure 78: View of Projection Screen from eye level on level 2



Figure 79: View of Projection Screen from eye level sitting on level 1



Figure 80: View of N-E corner

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Faculty Consultant: Dr. Mistrick  
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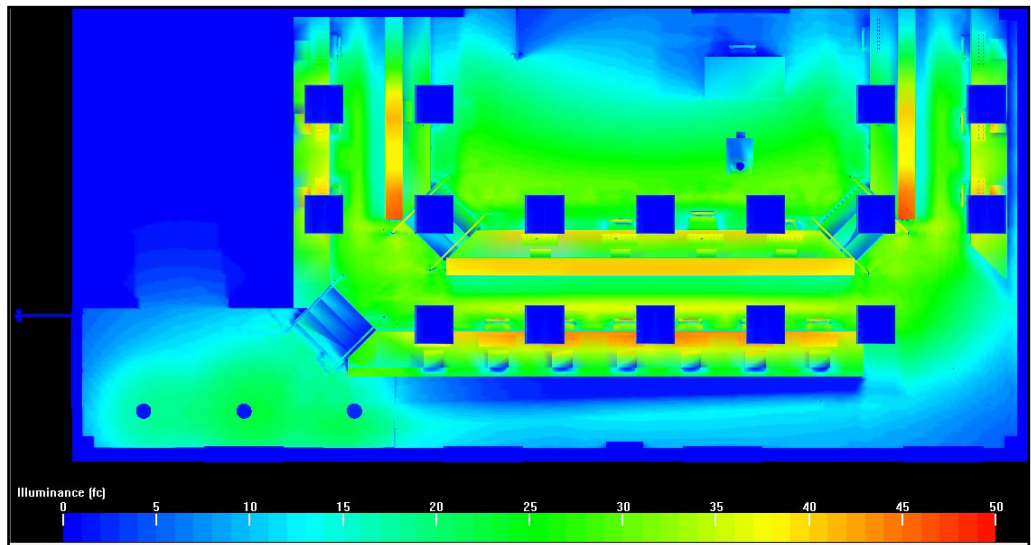


Figure 81: View of N-E corner from sitting at station on level 1



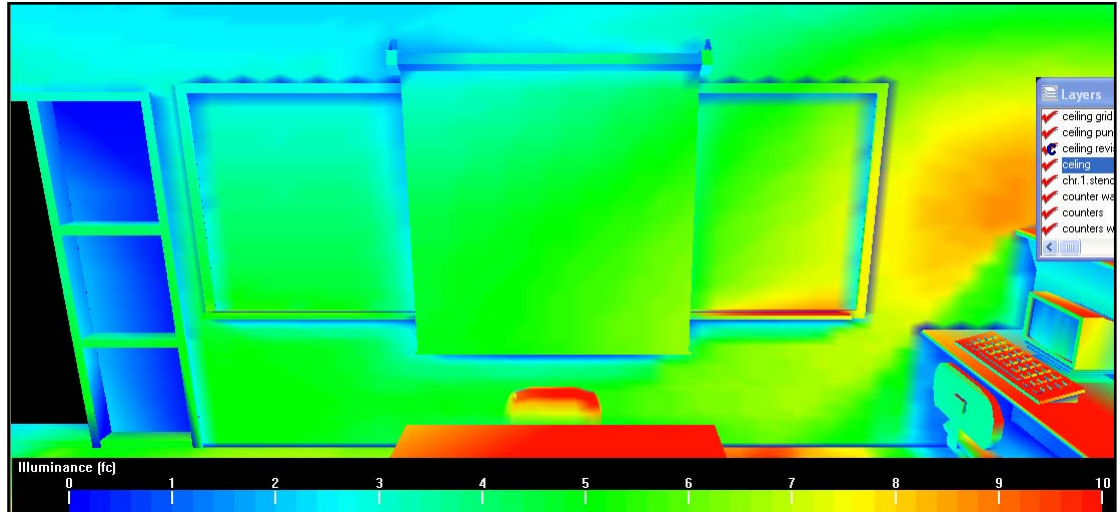
Figure 82: View of S-E corner from sitting at station on Level 2

Scene 2 Light Levels (Presentation Scene):



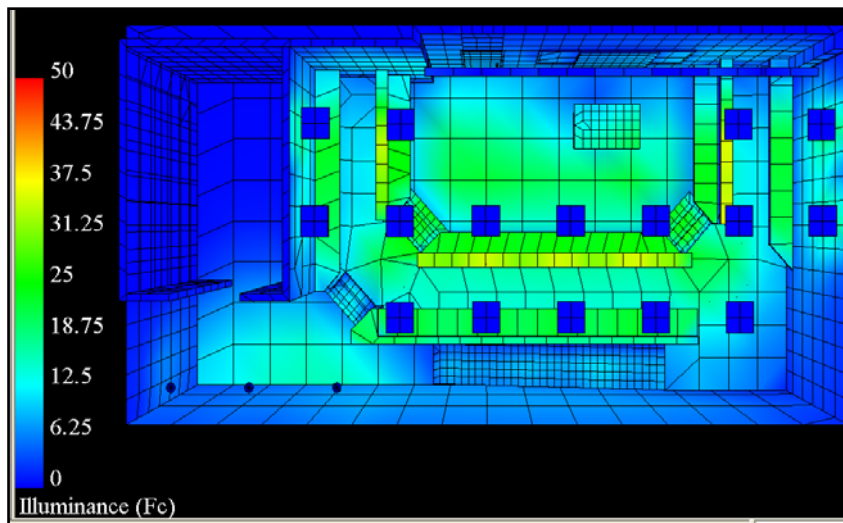
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Floor 1 workstations: about 30 fc av., Floor 2 workstations: about 35-40 fc av.  
Back ramp/hallway: about 10 fc av.

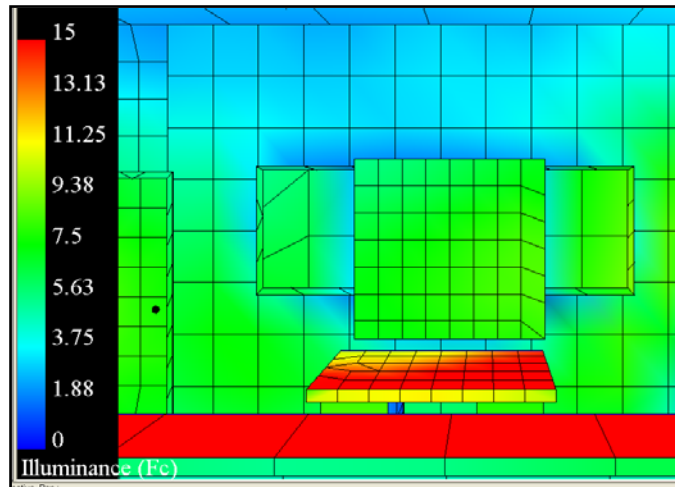


Projection Screen: about 4-6 fc av

Other possible scenes:



All wall washers off, VDT fixtures on level 2 with 1 lamp/fixture switched off:  
About 25-30 fc on level 1 workstation desks  
About 20-25 fc on level 2 workstation desks  
About 10 fc in back corridor/ramp



About 5 fc on projection screen

### Conclusions:

The described lighting solution for the computer lab and creative writing area meets the design goals and established criteria. The scene 1 and scene 2 solutions create an atmosphere comfortable for VDT screen use by using a fixture made specifically for VDT screen use that provides full cut off at 55 degrees and uses a shielded lamp to avoid glare and reflections in the screen. Scene 1 allows for the tasks of reading and writing on the whiteboard area for use during lectures. In addition, the scene 2 solution creates an atmosphere comfortable for projection screen use by minimizing the amount of light on the projection screen and providing sufficient light for critical tasks, such as note taking and computer use, at the workstations. The design also allows for wide flexibility of lighting levels in the space through several switching capabilities that are needed for the variety of tasks ranging from lectures on the white board to presentations on the projection screen.

The design also meets control and power density requirements for ASHRAE/IESNA Standard 90.1 by providing a power density of 1.16 W/ft<sup>2</sup> that is much less than the maximum of 1.6 W/ft<sup>2</sup> for the space. It also utilizes occupancy sensors to meet the automatic shutoff requirements of the space.

The design also provides control of daylight using a manual shade system that will help minimize the effects of direct glare on computer screens and also allow the light level to be lowered in the room when the projection screen is in use.