

## Progress Set – 2 Spaces

### Yale Sculpture Building

New Haven, CT

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Architectural Engineering – Lighting | Electrical Option  
<http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/KND107>

## **Progress Set – 2 Spaces**

02.20.07

Prepared for: Dr. Richard Mistrick  
CC: Ted Dannerth  
Date: February 20, 2007

### **Executive Summary**

The following is a progress set for the lighting and electrical design of two (2) spaces; studio and computer lab. This set should be considered only for the progress of design and construction document development. The lighting and electrical design may change further to incorporate new ideas and controls. The final design booklet can be downloaded from the thesis site on April 16, 2007.

Information about the systems were obtained from the construction documents and specs provided by Kieran Timberlake Associates. The space models were built in AutoCAD 2007 and transferred to AGI32 1.9 for lighting performance analysis. Power density and Light Loss Factors were devised by standard IESNA procedures (refer to IES handbook). Panel board calculations were based on the National Electric Code (NEC) 2005 guidelines and practices.

### **Overall Outline per Space**

#### **Space**

##### **Plans**

##### **Materials Reflectance**

##### **Furniture and Equipment**

##### **Lighting Hardware**

##### **Design Criteria**

##### **Lighting System Documentation**

Lighting Plan

Lighting Control Plan

Fixture Schedule

Electrical Power Plan

Panel board Layout

##### **Lighting System Performance**

Light Loss Factors

Power Density

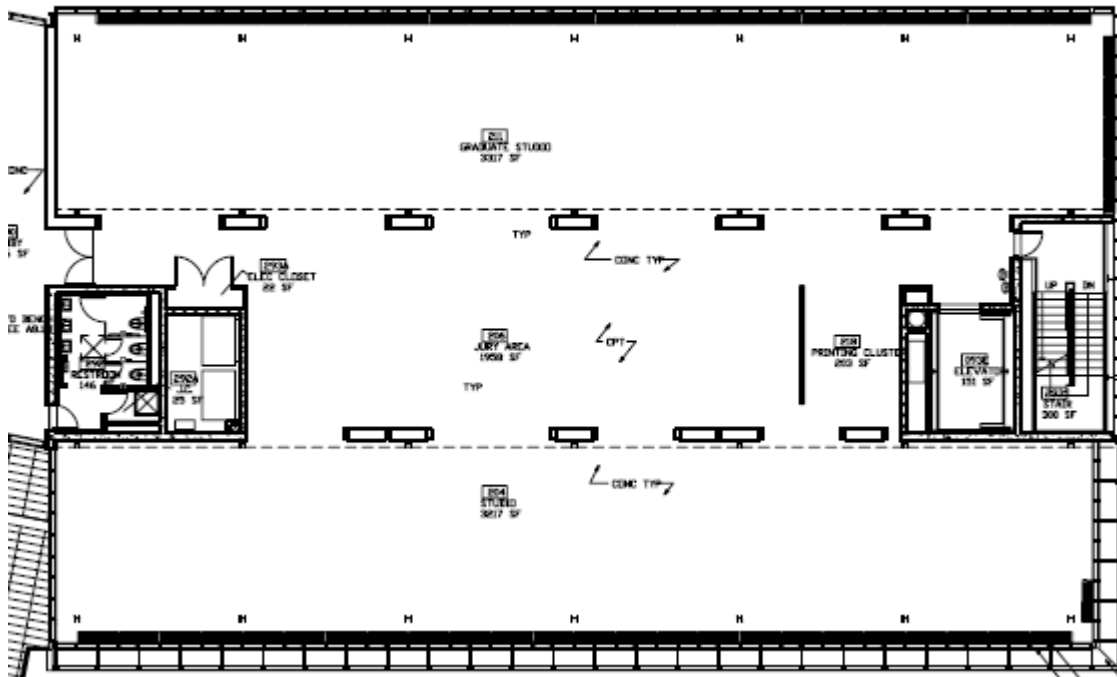
AGI 32 1.9 Software Analysis

##### **Summary**

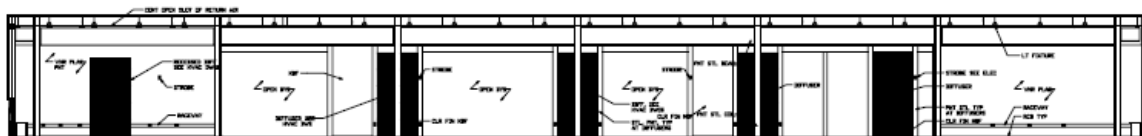
**Space 1 – Undergraduate Studio Space**

**Plans**

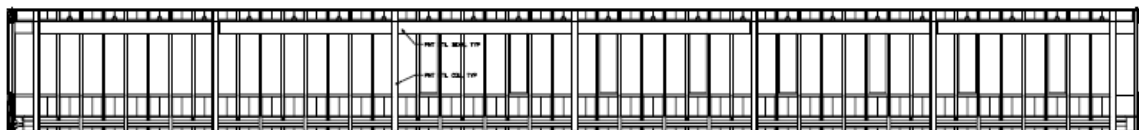
Floor Plan



North Interior Elevation

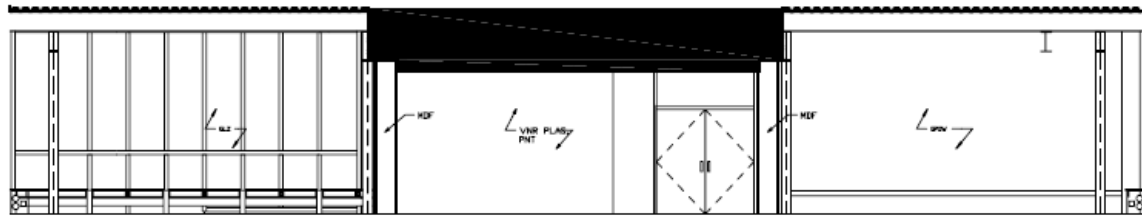


South Interior Elevation

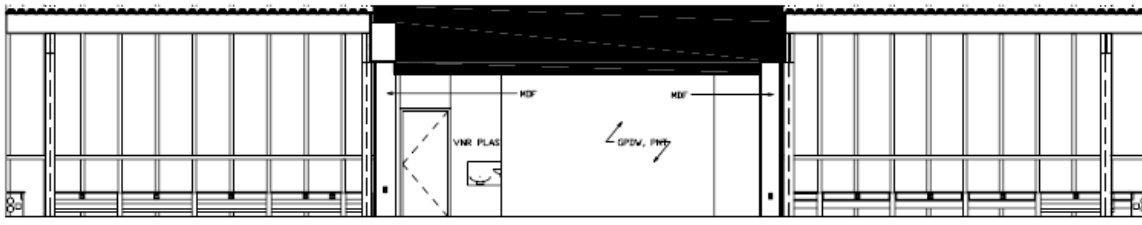


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West Interior Elevation



East Interior Elevation



**Material Reflectance**

Material	Reflectance
Gypsum Board	0.70
Steel (W-Beams)	0.20
Concrete	0.35
CLR FIN (Clearance Finish)	0.80
RCB (Rubber Cove Band)	0.50
Wooden Work Stations	0.40
Mullions (Painted)	0.80
Glazing (double glazed Low-E IGU operable)	0.6

**Furniture/ Equipment**

The studios are arranged as an open space. Desks and work stations are configured depending on occupancy.

**Lighting Hardware**

The lighting system is composed of indirect/ direct pendant fluorescent fixtures. The configuration was formed to have dimming zones from the windows to the interior. The indirect/ direct fixtures present an even wash of ambient lighting in the space and softly light the ceiling cavity. The presentation area is equipped with wall washers to illuminate drawings/ pin-ups for review. These units are controlled independently by the end-user.

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The space utilizes daylight and occupancy sensors. The occupancy sensors are arranged systematically around the space. The daylight sensors are located one-third distance from the glazing system. The controls of this space are still in design phase of development. There will be a critical point and detailed daylight harvesting study preformed for this space.

## Design Criteria

### Daylight Integration

The studios have both a North and South facing windows. Daylight integration is critical for this space for energy savings. If daylight is not taken in account then there might be serve heating/cooling problems and student discomfort.

### Direct/ Reflected Glare

Glare can cause discomfort to students and professors. This can also lead to presentation discomfort.

### Tasks

This area is used by students often during all hours of the day. The lighting system must be able to accommodate for daylight and nighttime situations. This space will be occupied by architect students whom will need quality lighting for modeling and sketching.

### Accent Lighting

Accenting lighting can be important to showcase student's works. It can also be used during presentations or lectures.

### Illuminance

Horizontal and vertical illuminance should be approximately 30-50 fc for desks.

## Lighting System Documentation

See Attachments:

- Lighting Layout
- Lighting Control Layout
- Fixture Schedule
- Electrical Power Layout
- Panel Board Schedules

## Lighting System Performance

### Light Loss Factors

Luminaire	Cat.	Room	Cl.Int.	BF	LLD	RSDD	LDD	LLF
F1	V	Clean	12	1.0	0.95	0.95	0.88	0.79
F1E	V	Clean	12	1.0	0.95	0.95	0.88	0.79
W1	V	Clean	12	1.05	0.86	0.97	0.88	0.77

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## Power Density

Input Watts (max): F1 & F1E 66W  
W1 20W

Number of Fixtures: F1E 95 units  
W1 9 units

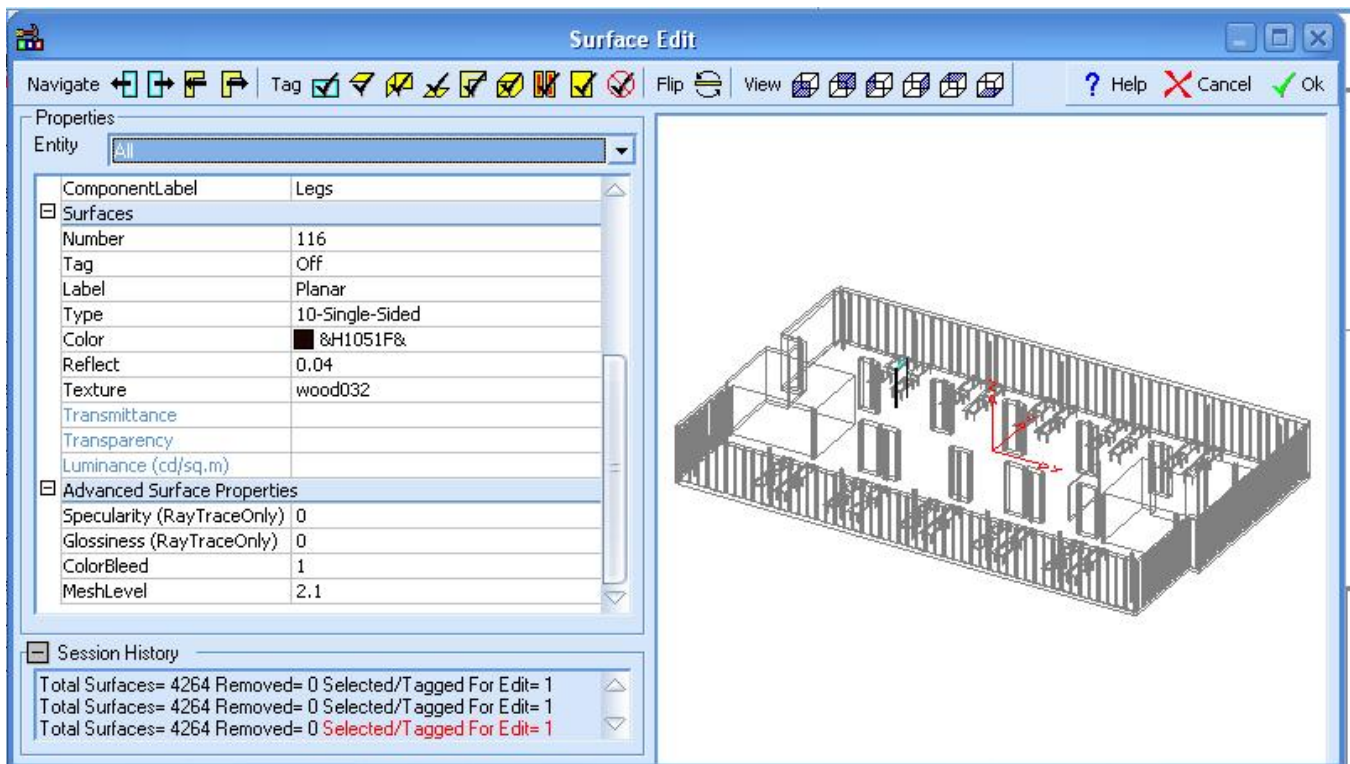
Area: 7923 sf

Power Density: **0.81 W/ft<sup>2</sup>**

ASHRAE/IESNA Standard 90.1 – Classroom/Meeting/Training – 1.4 W/ft<sup>2</sup>

## AGI32 Performance Model

### Verification of Mesh Level

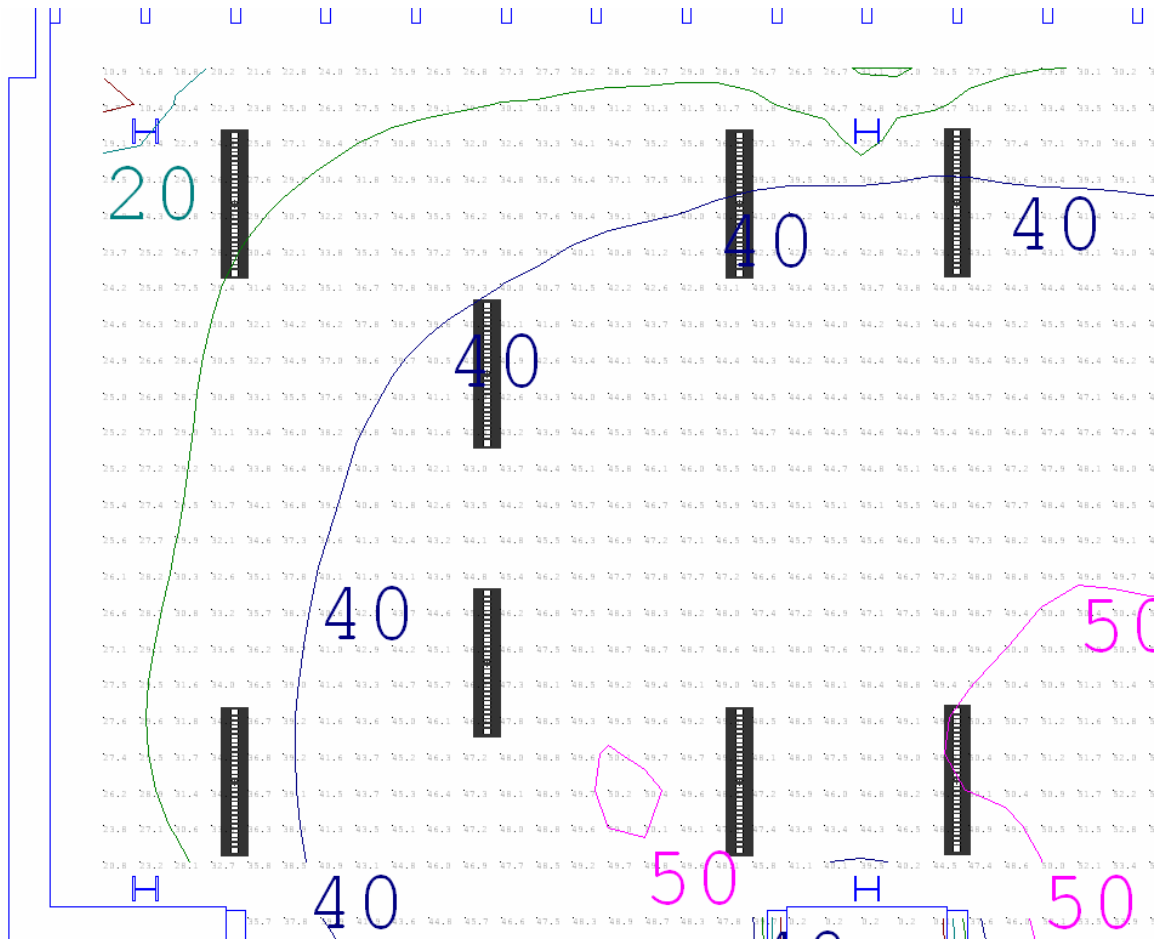


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## Typical Bay

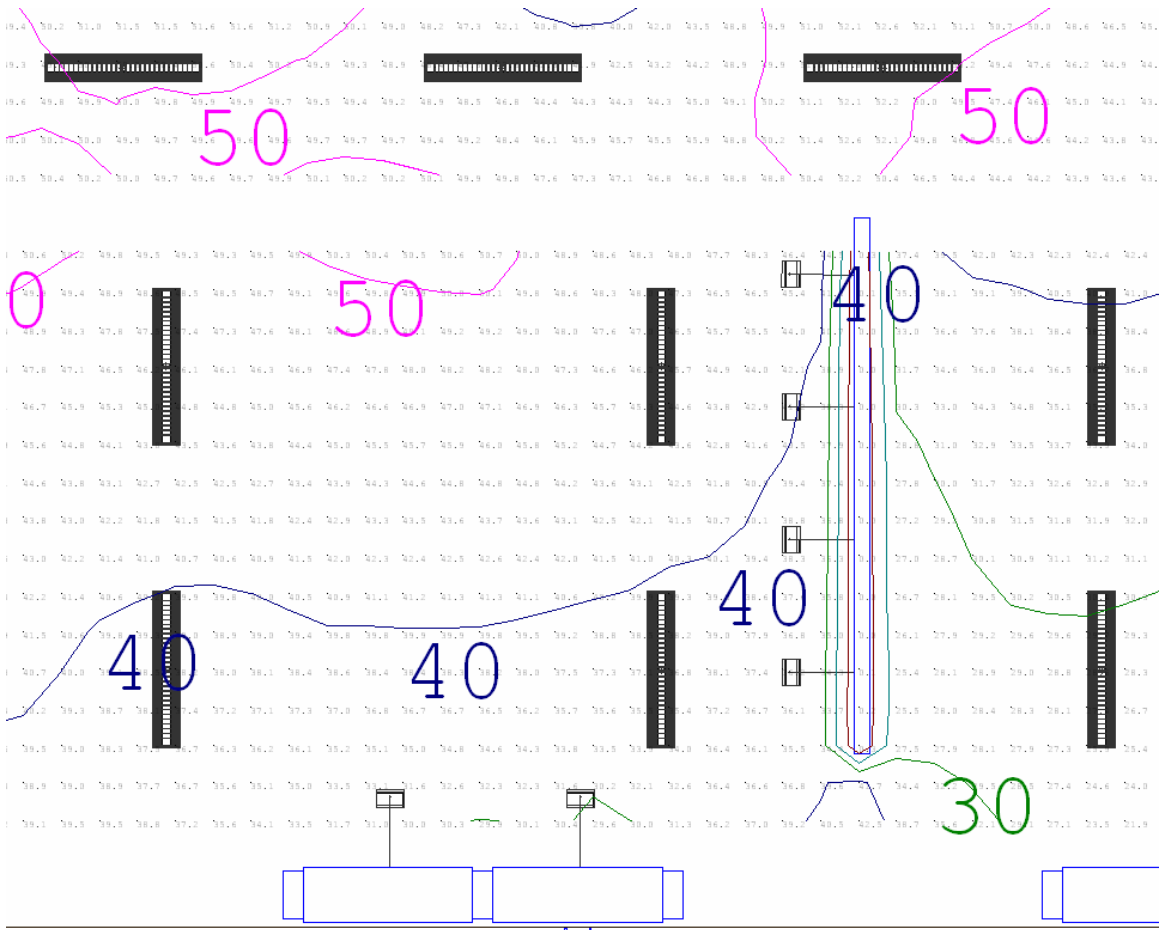


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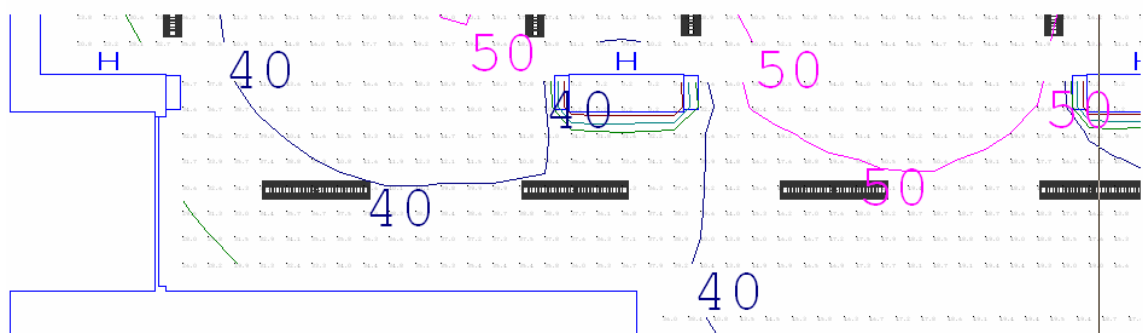
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## Presentation Area



## Transitional Area



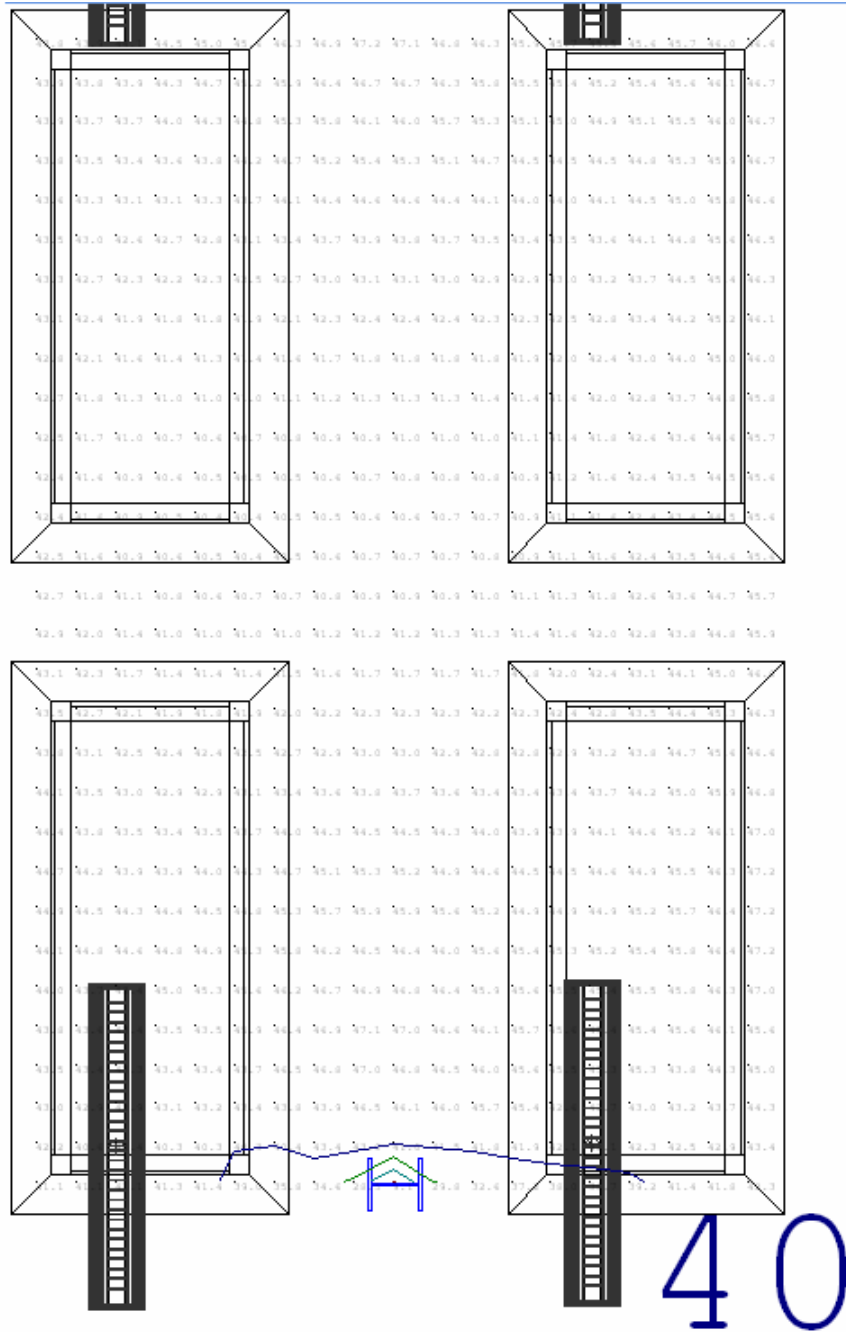
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## Work plane (Desks)



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## Summary

The ambient light is provided by indirect/ direct fixtures to give a uniform illuminance on the work areas. Wall mounted fixtures in the presentation areas accent the walls and presentation pieces. The space is controlled by occupancy and daylight sensors with override controls for additional flexibility.

The luminaires use about 66W per 4 feet and provide a uniform illuminance on the work plane. The ambient lighting is produced by T5 high output lamps. This lamp was chosen since it is more efficient and smaller than the T8 counterpart. This results in fewer fixtures for the space and a thinner luminaire profile.

I will conduct a study of the T5 HO lamp compared to the T8 to determine the performance of one over the other.

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