

# Hunter's Point South Intermediate School and High School



Tony Esposito

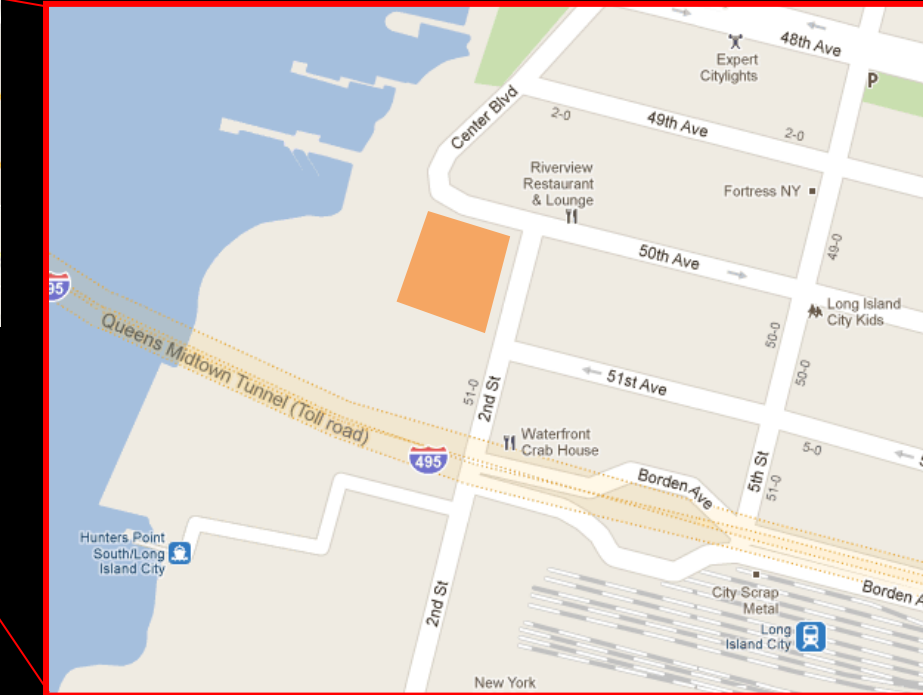
# introduction | overview

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# statistics

<b>Name</b>	Hunter's Point South Intermediate School and High School
<b>Location</b>	Queens, New York
<b>Size</b>	154,000 Sq. Ft.
<b>Occupancy</b>	(E) Education
<b>Cost</b>	\$61,000,000
<b>Architect</b>	FXFOWLE Architects
<b>GC</b>	Skanska Construction

# site



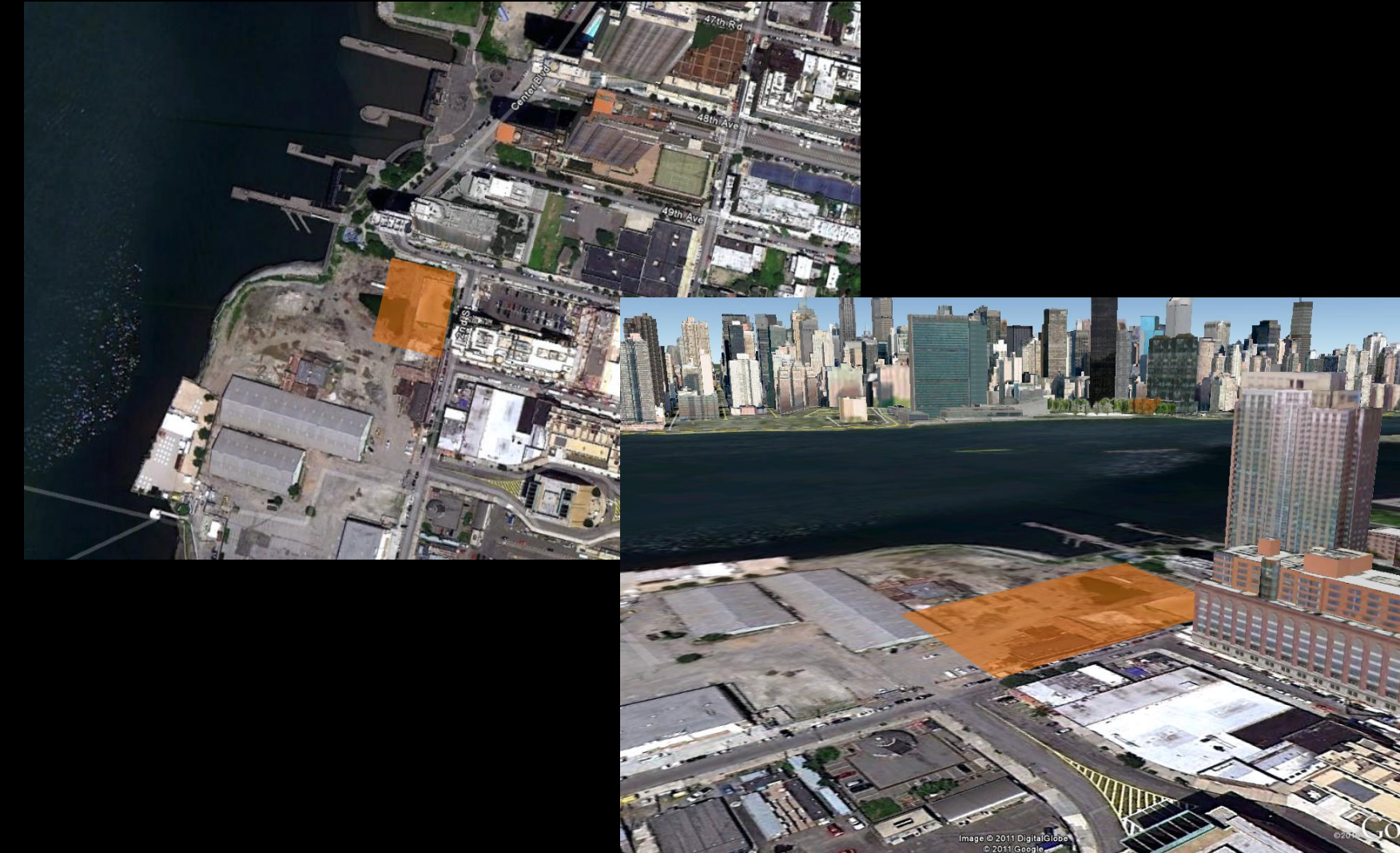
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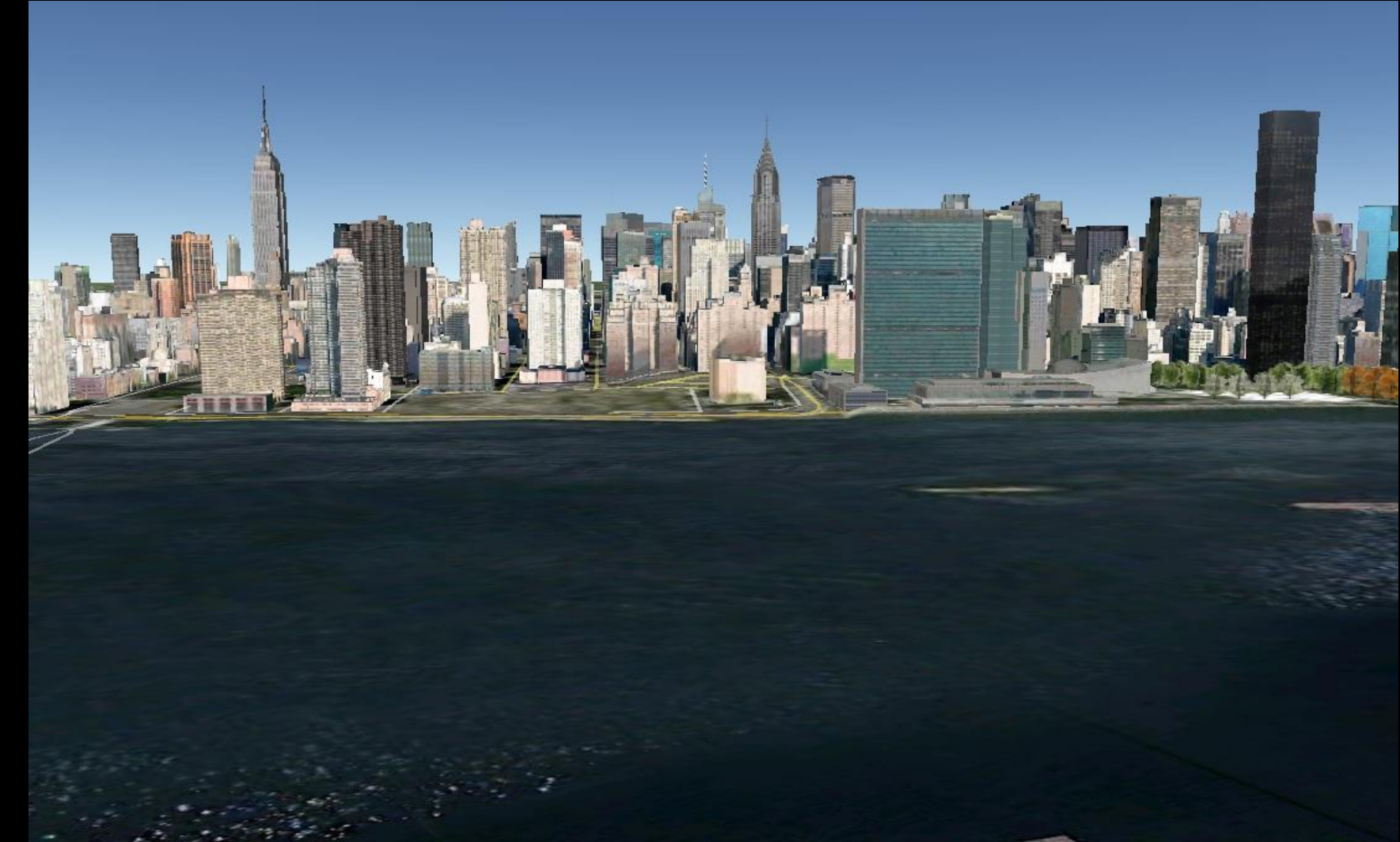
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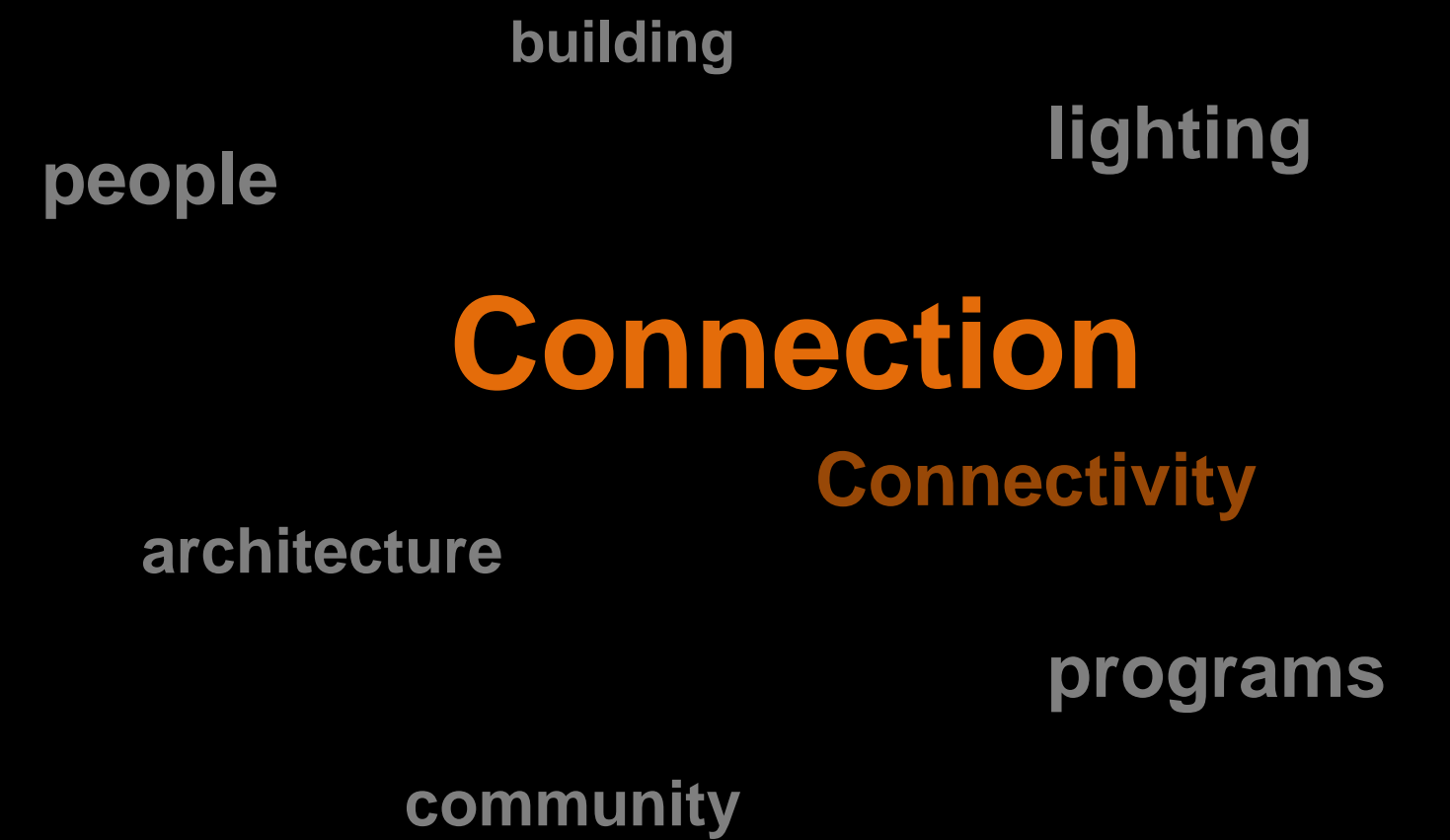
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“FXFOWLE's design will create distinct learning environments that **allow each program to function independently, while sharing common resources.** Of particular importance, the orientation and configuration of spaces will capitalize on light, air, and views. Major assembly spaces are clustered in the southwest wing of the building, while the auditorium is located as an "object" in the center of the third and fourth floors, straddling the I.S. and H.S. The project's top floor is literally its crowning feature, with dining spaces located adjacent to a large outdoor terrace, affording sweeping views of Manhattan and the East River.”

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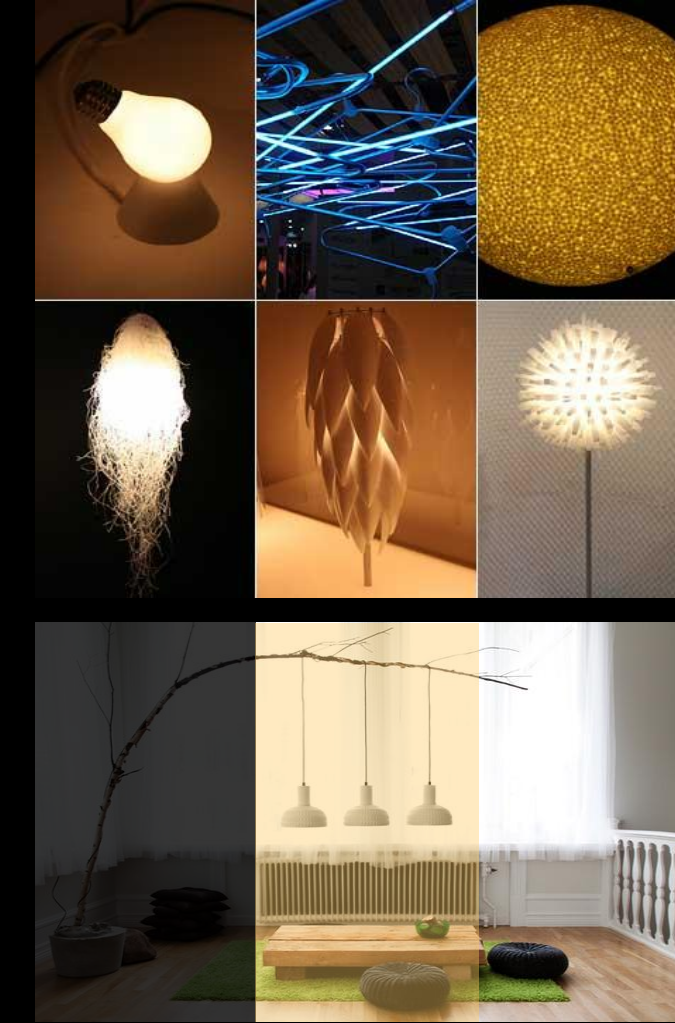
# introduction | overall design goals

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# connect | people + programs



# connect | lighting + architecture



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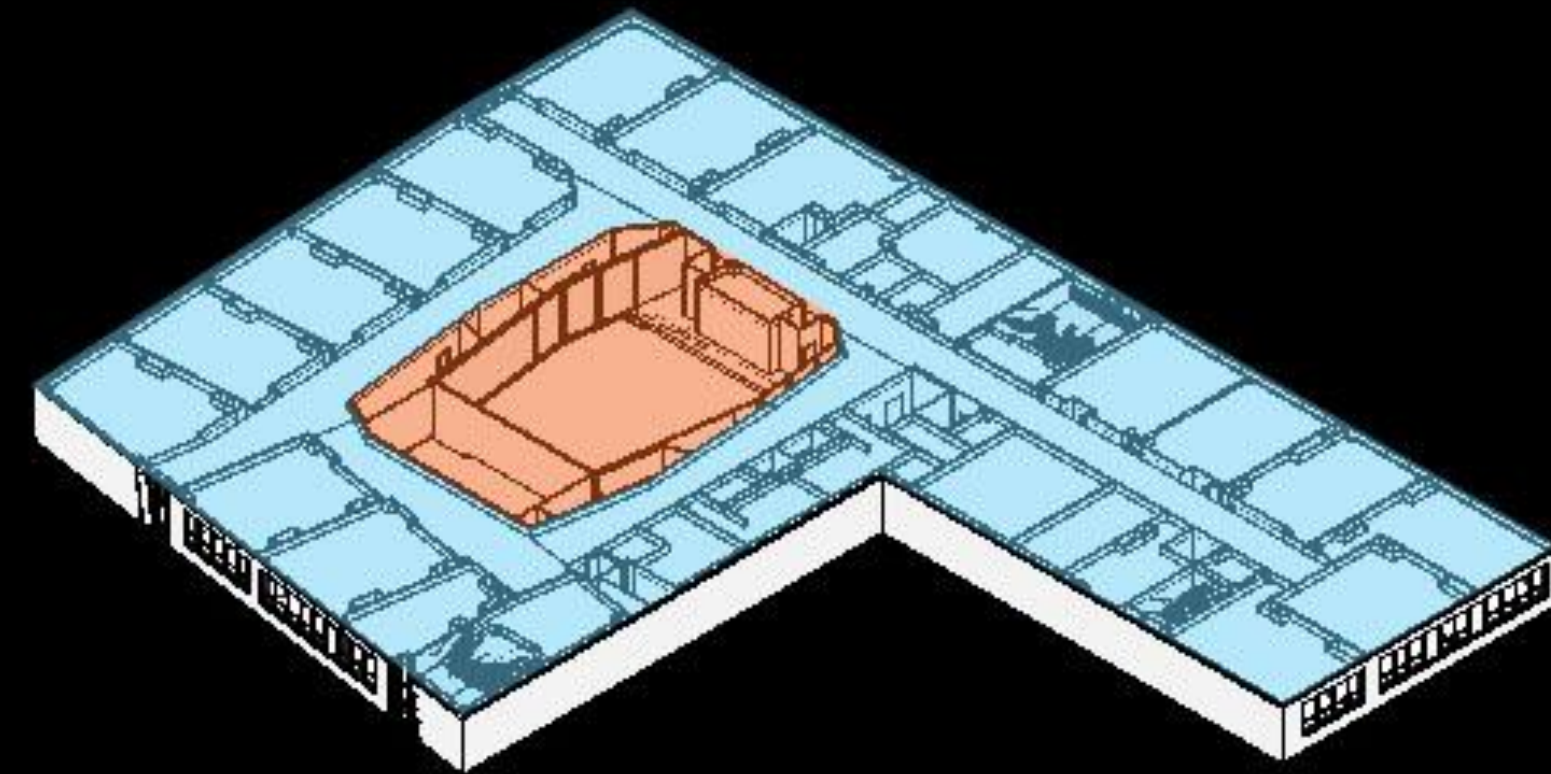
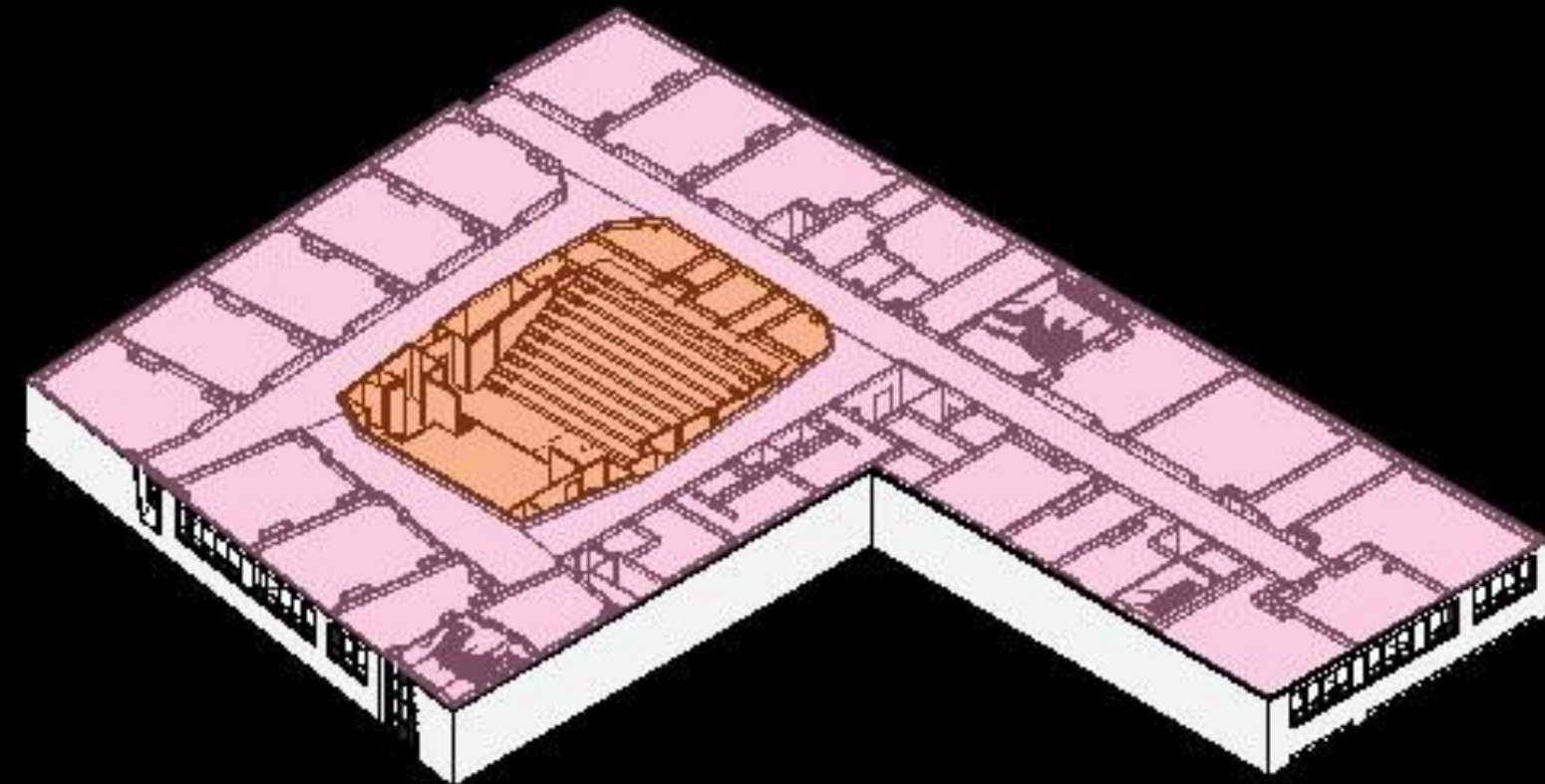




| auditorium

## auditorium | space description

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# auditorium | design goals

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# public



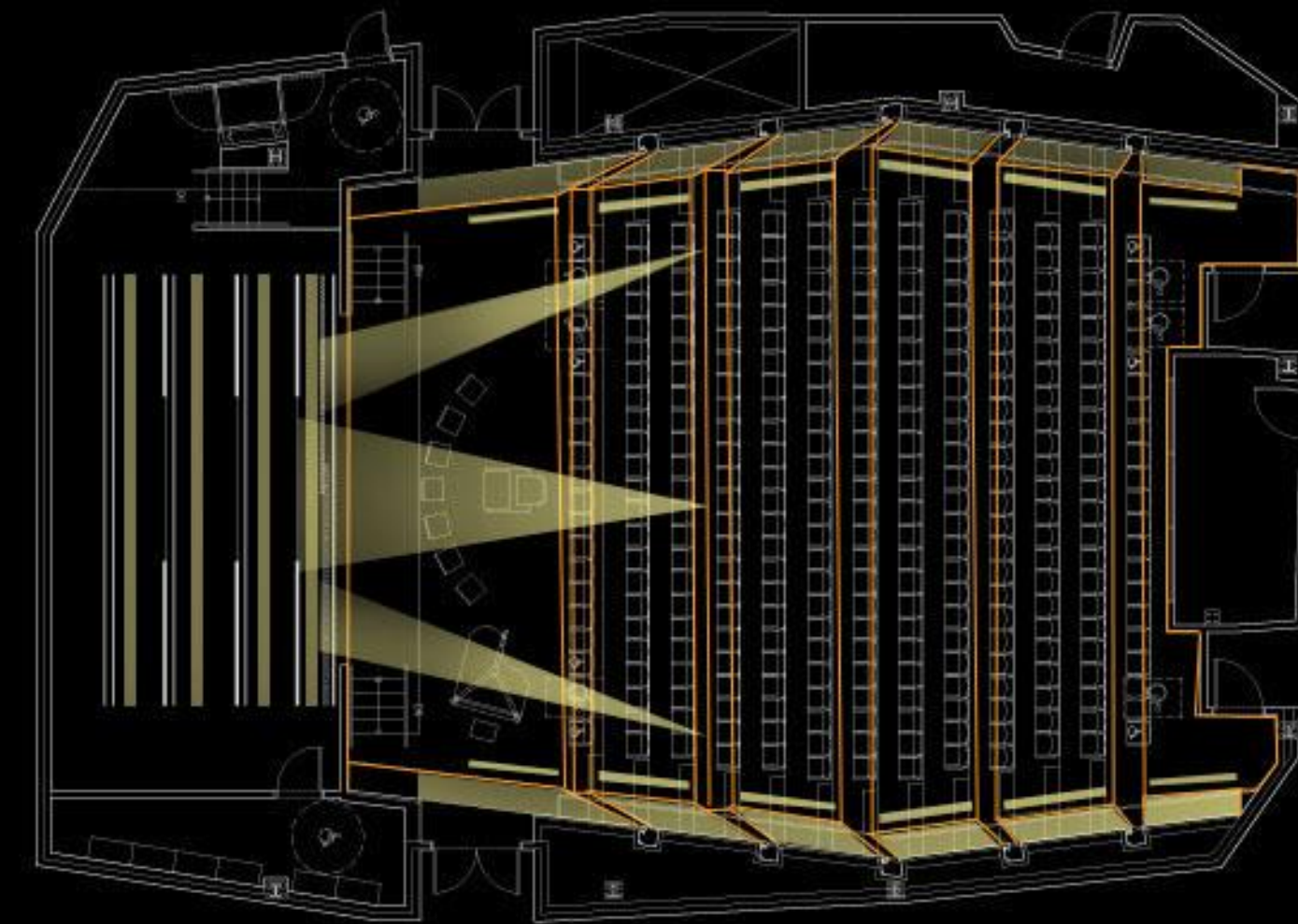
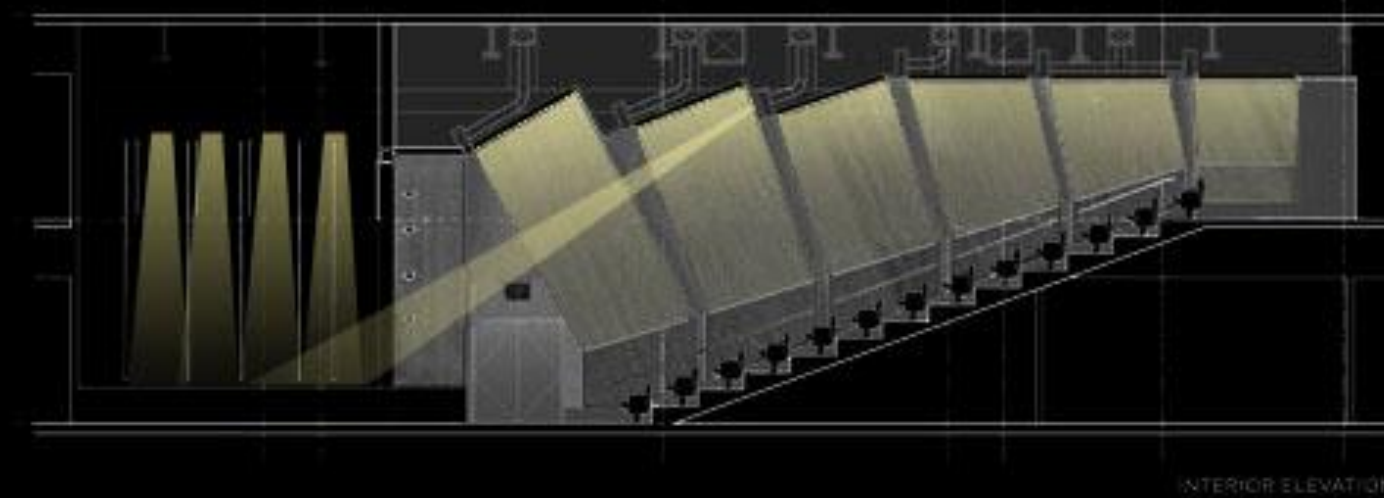
# private



## auditorium | design

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## private



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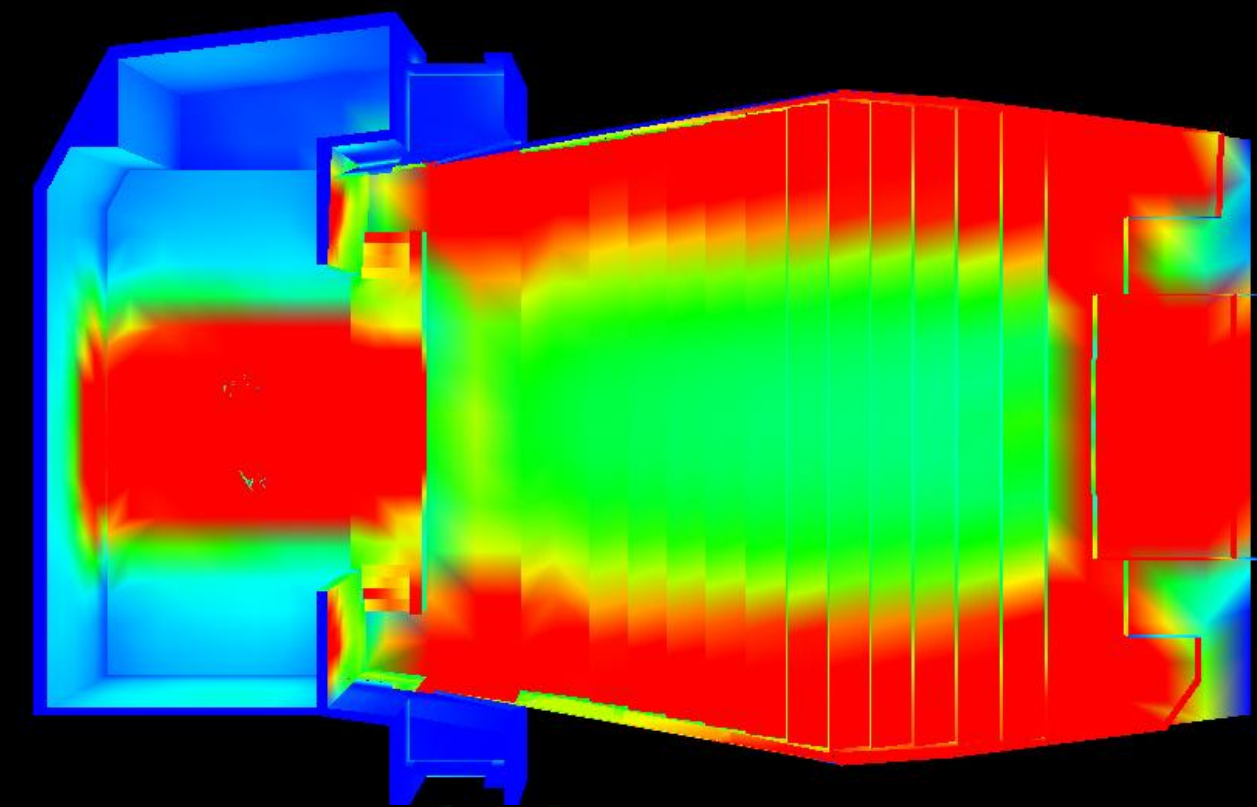
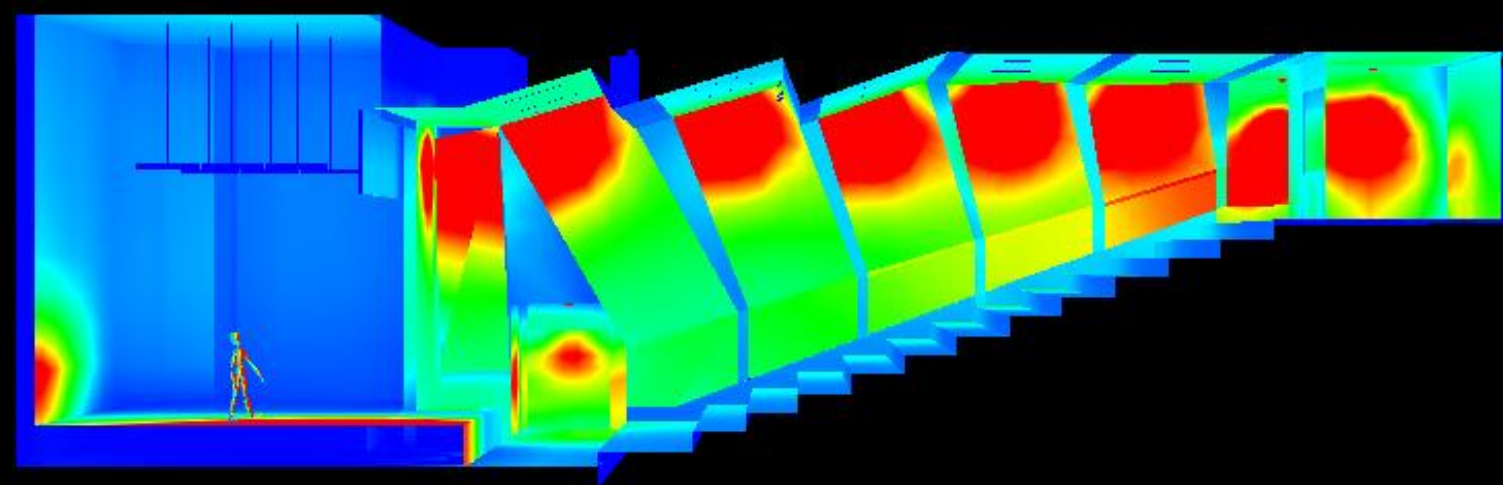
## private



## auditorium | design

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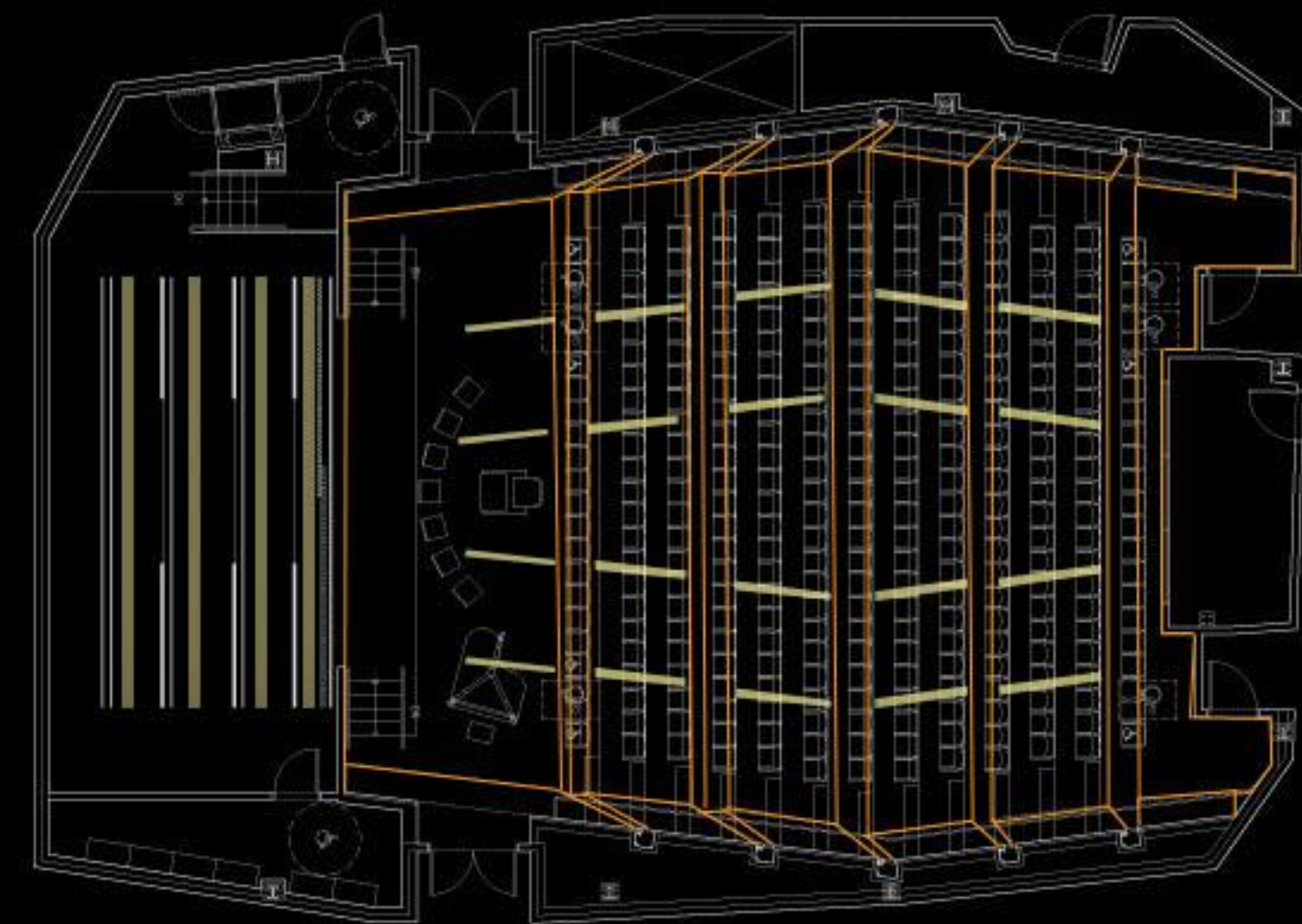
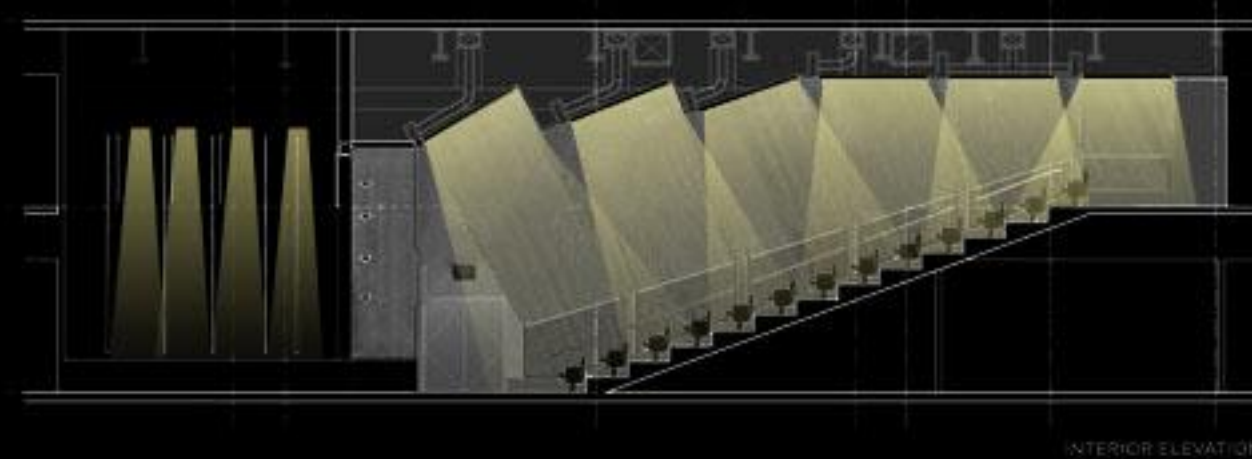
## private



# auditorium | design

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- | **auditorium**
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# public



## auditorium | design

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## public

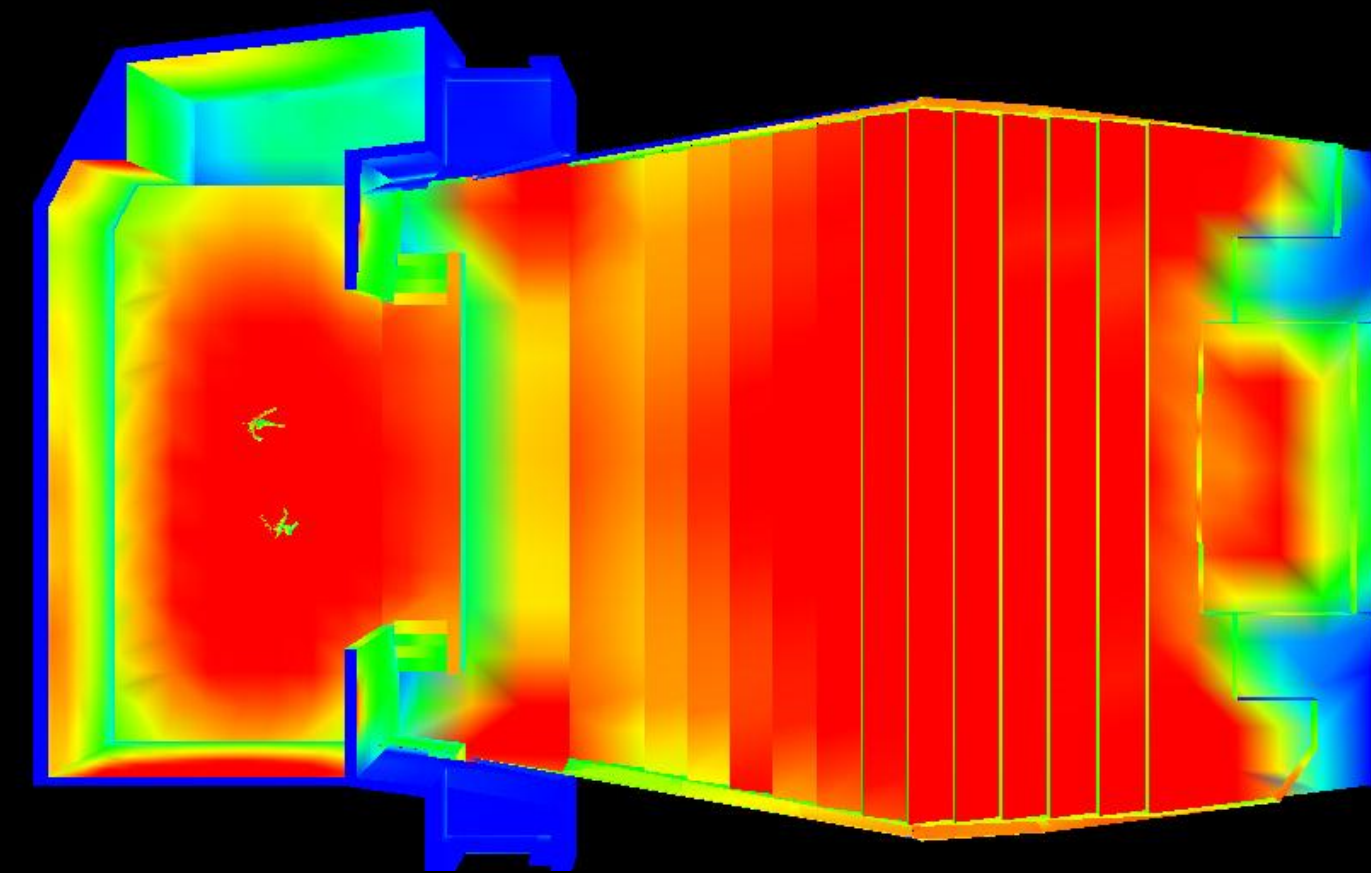
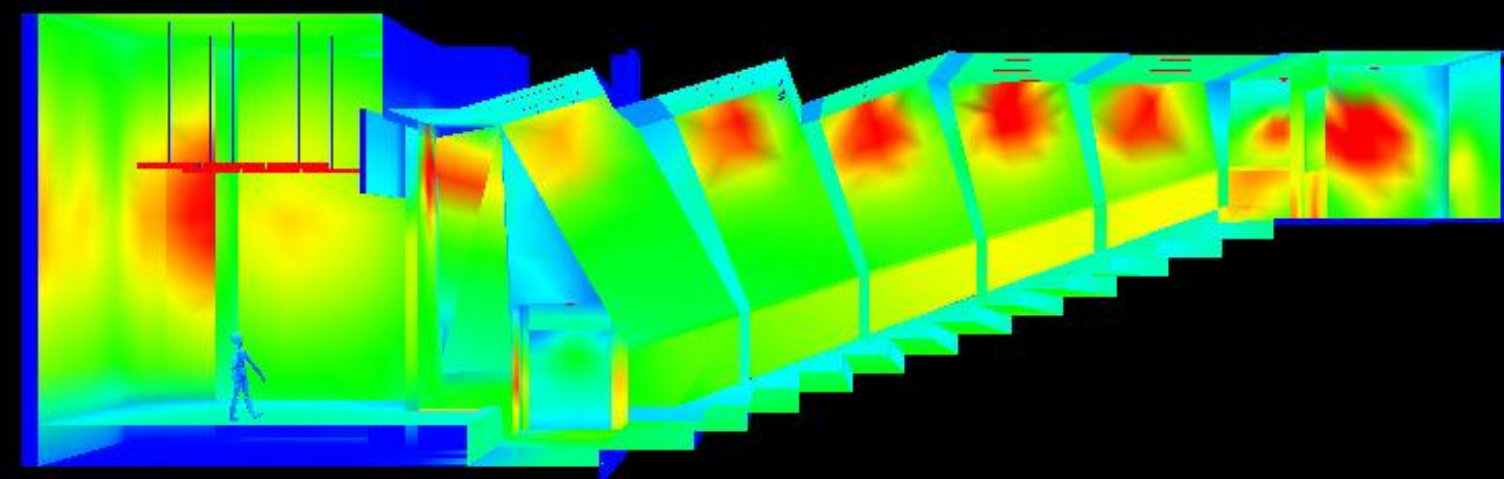


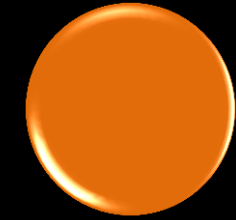


## auditorium | design

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## public





| high school art room

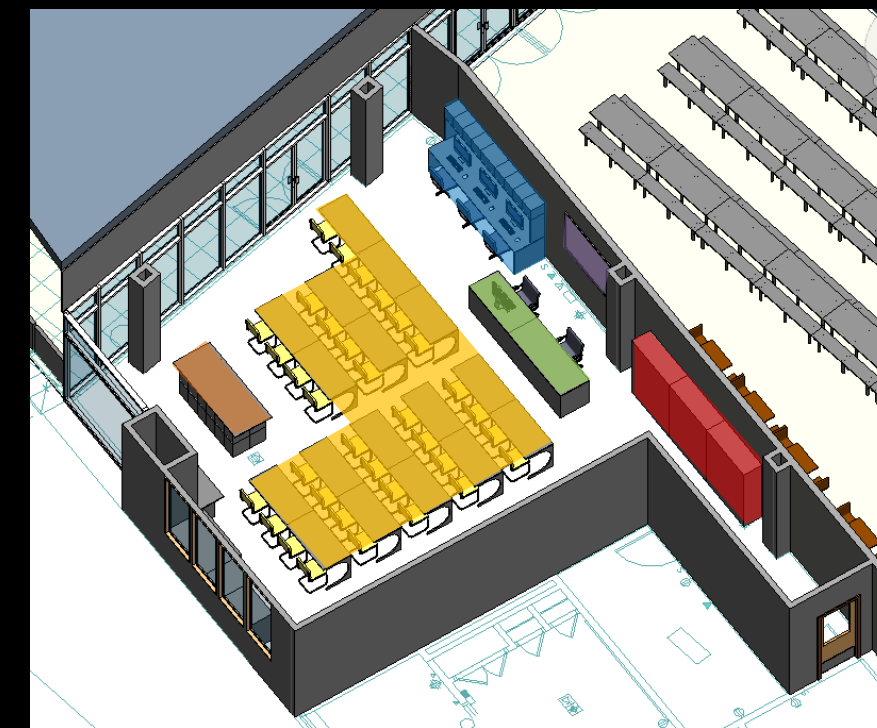
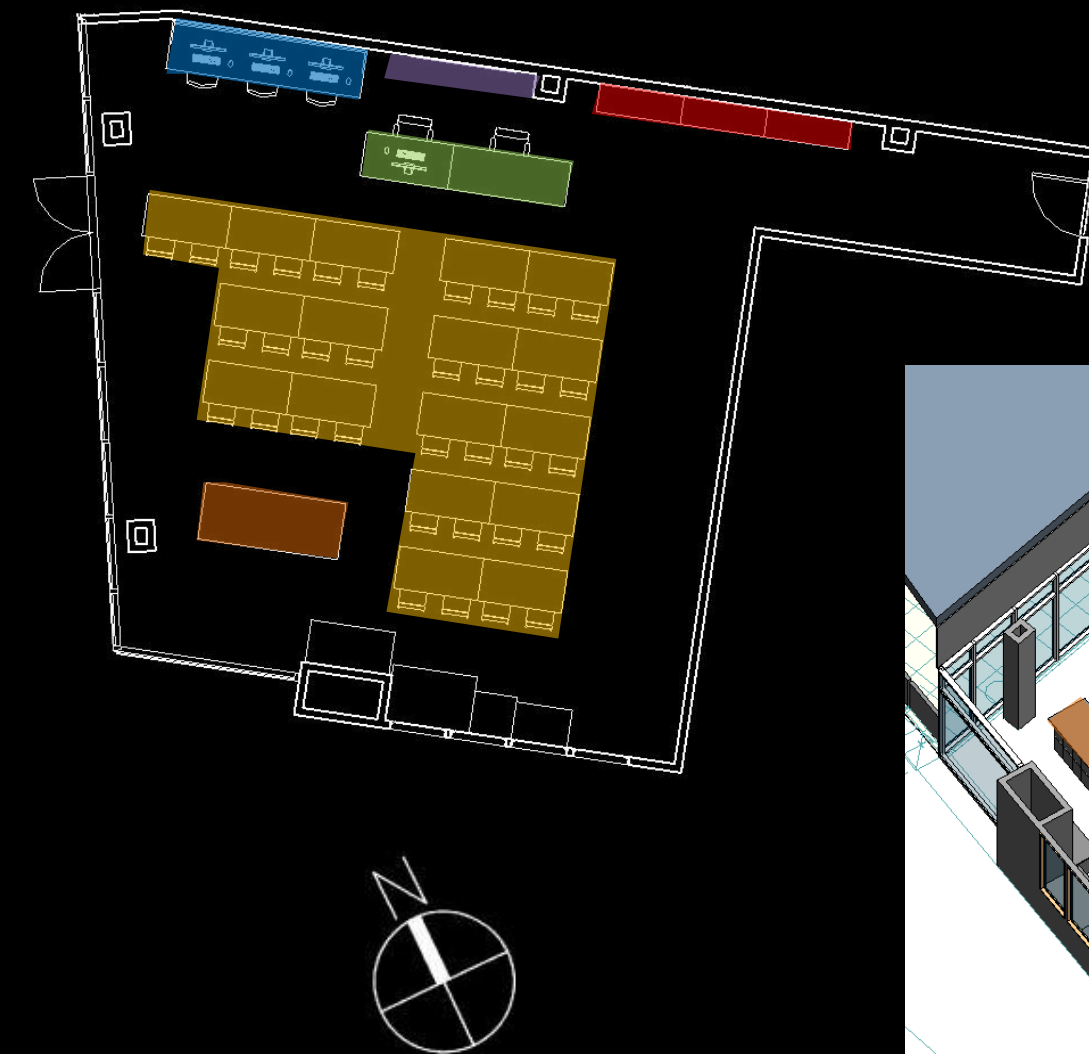
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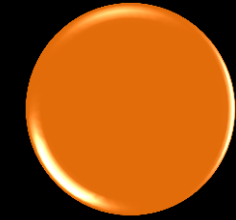
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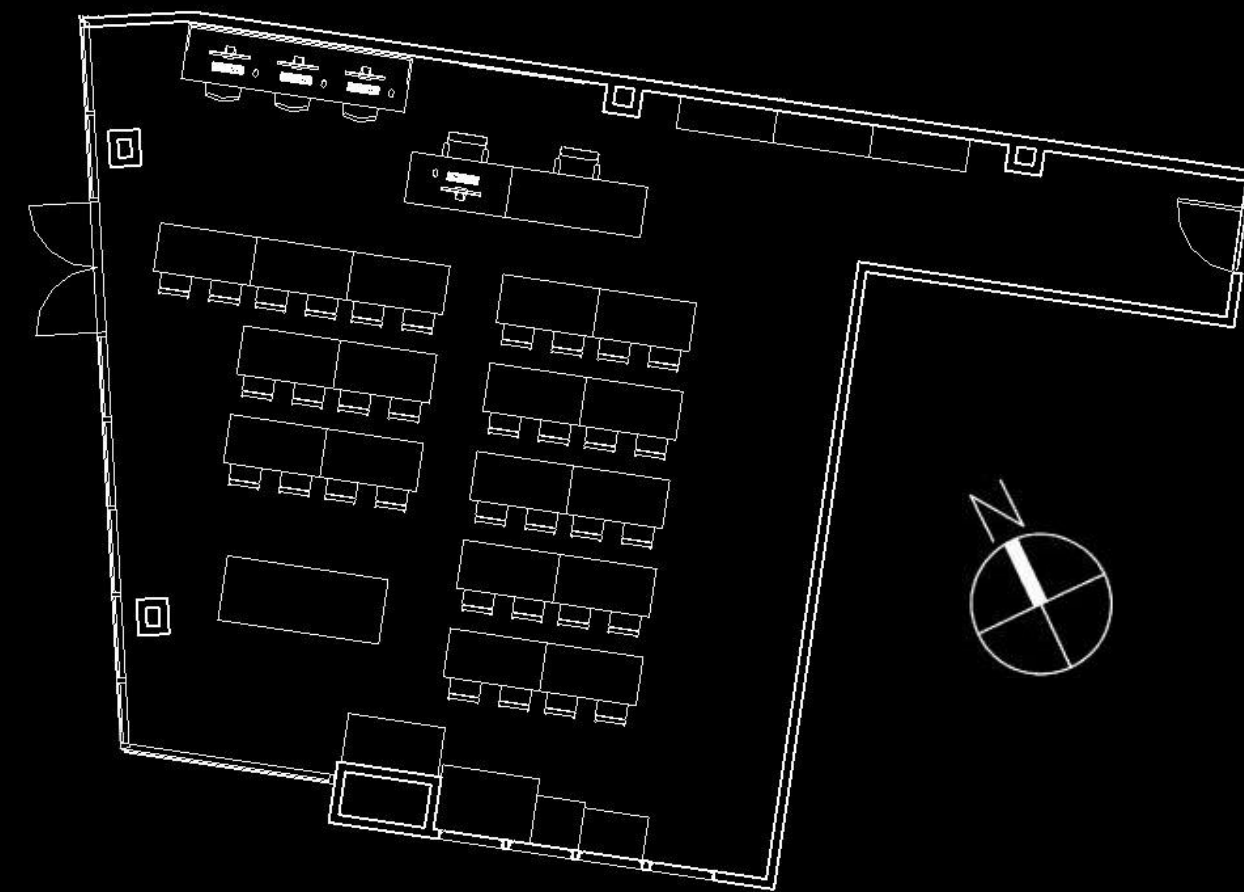
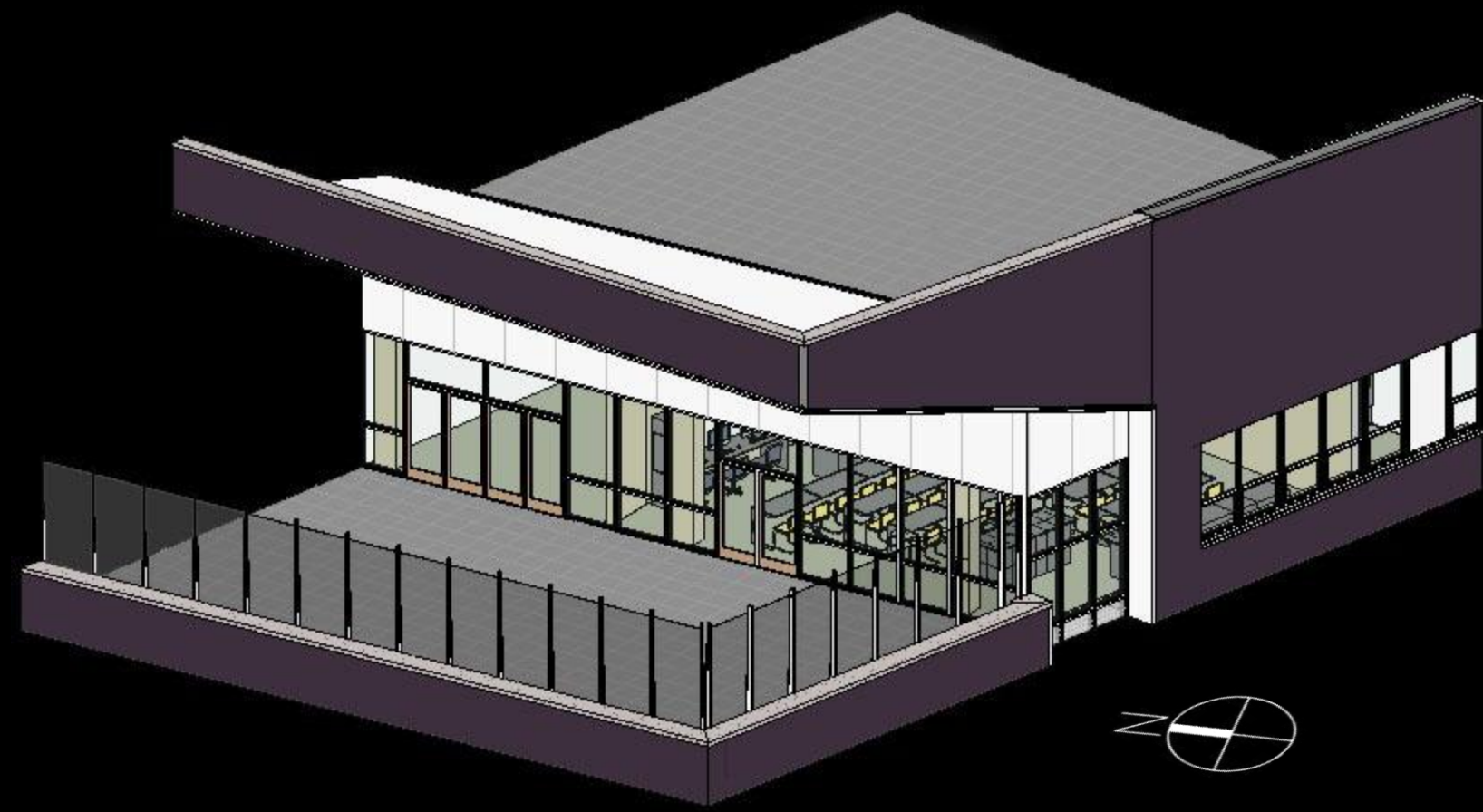




| daylighting analysis

# daylighting | shade location

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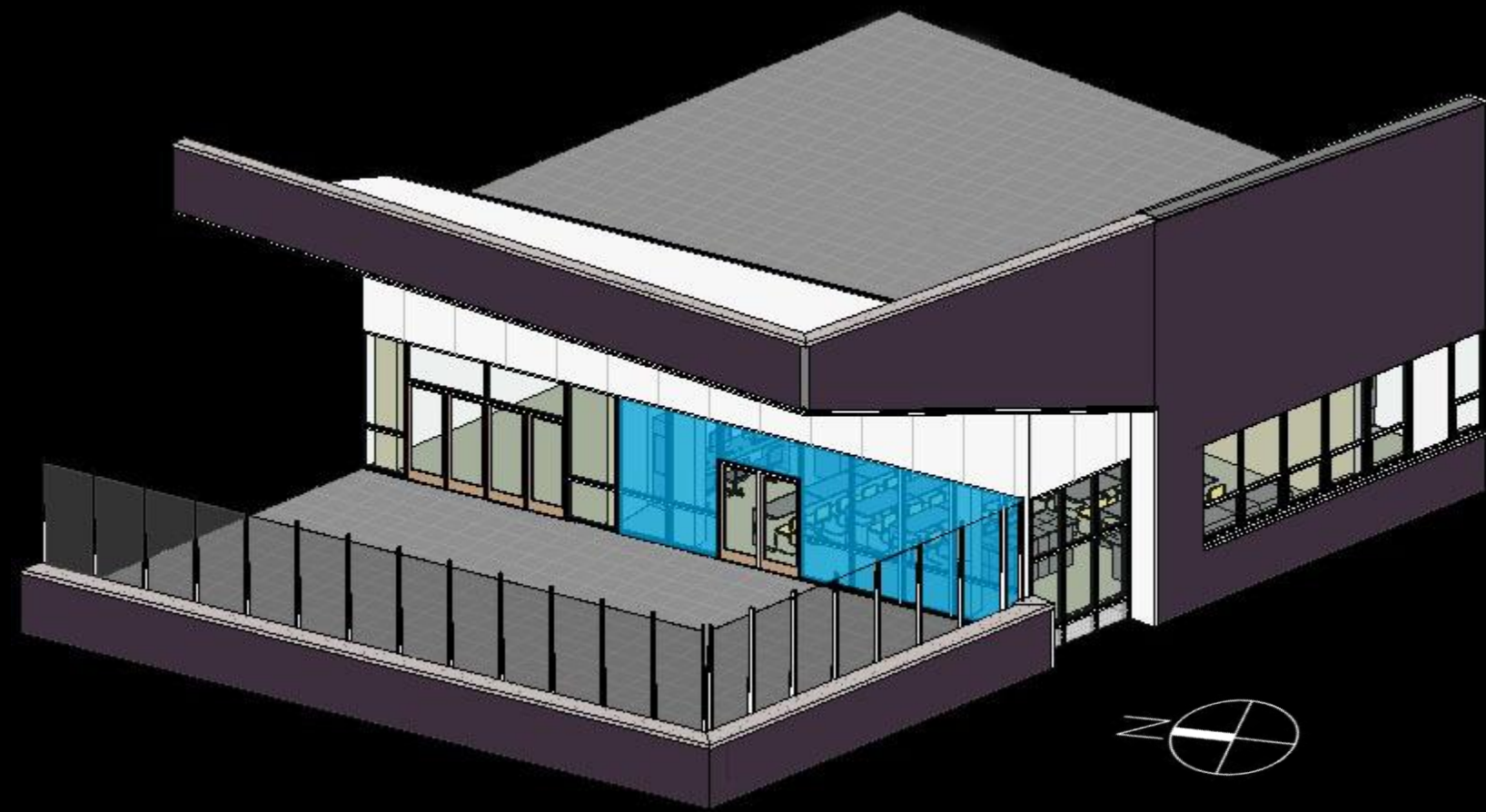
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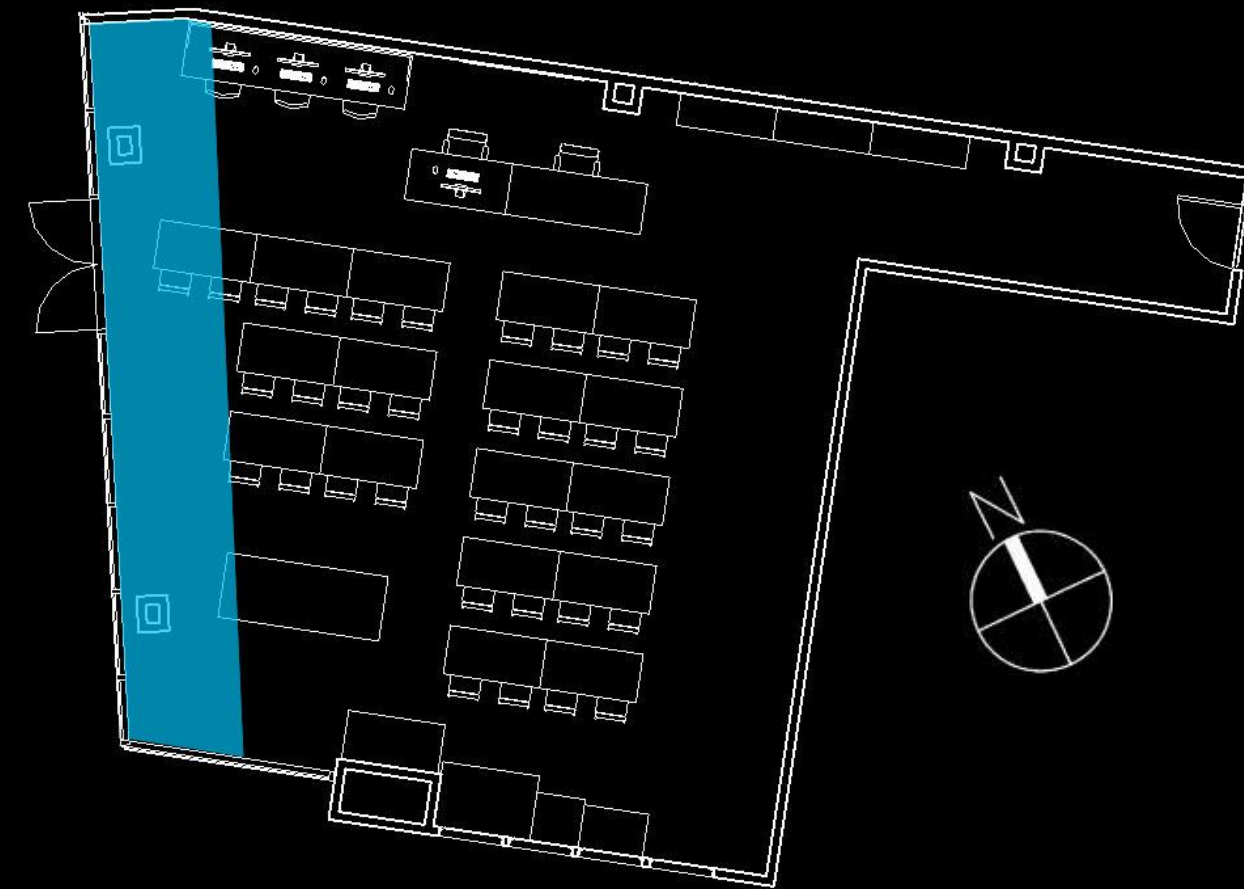


# daylighting | shade location

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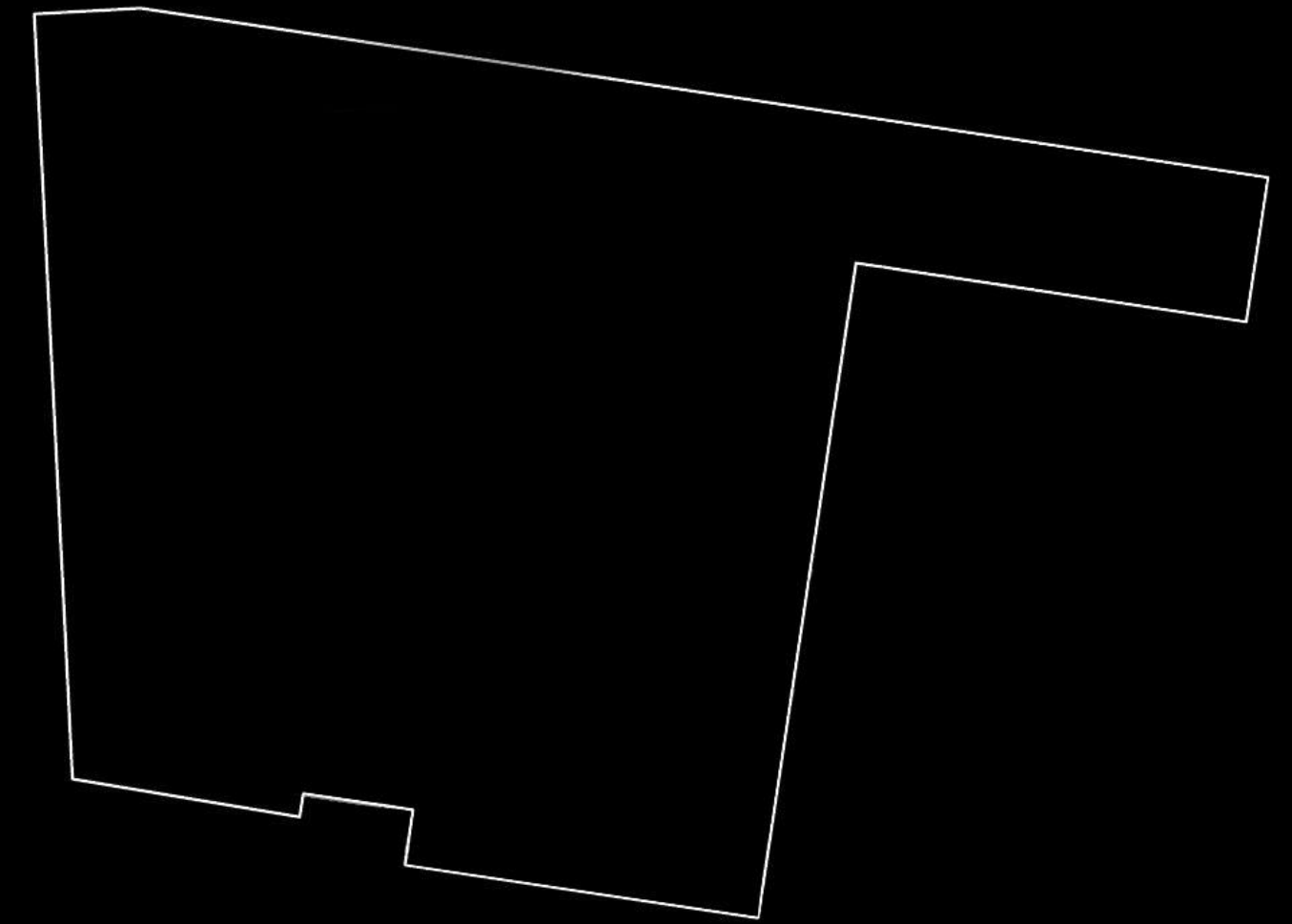
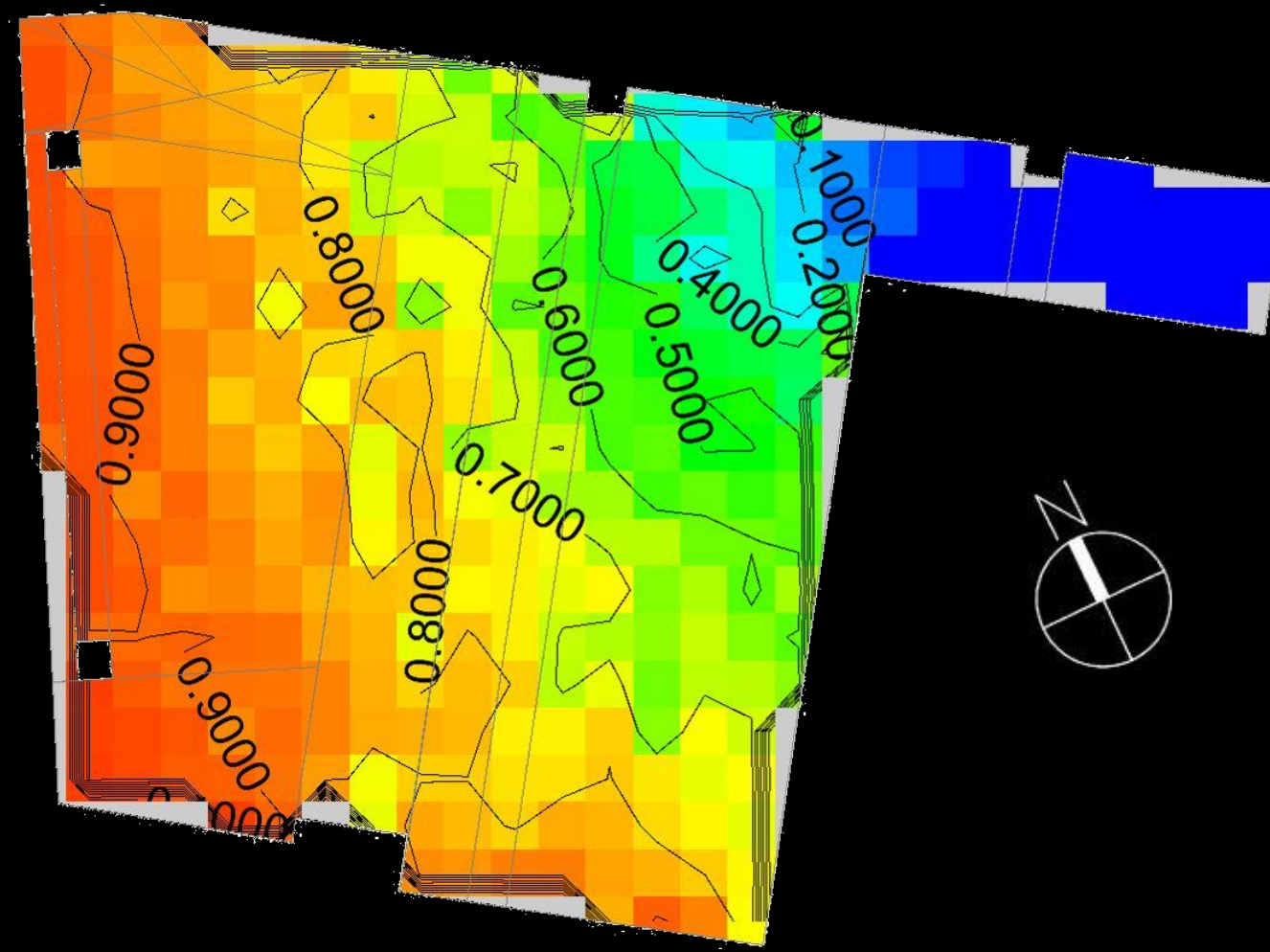
Shade 2





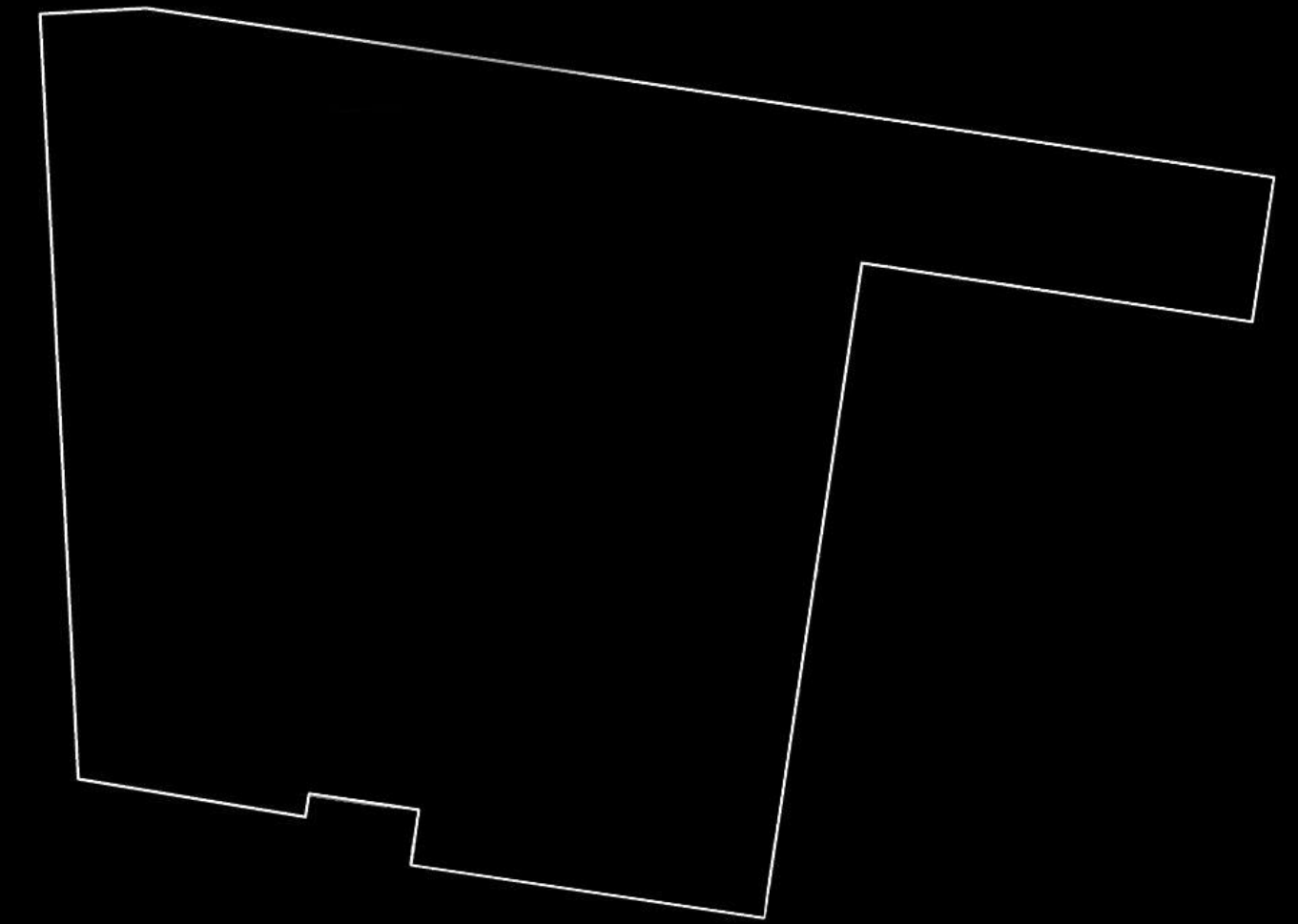
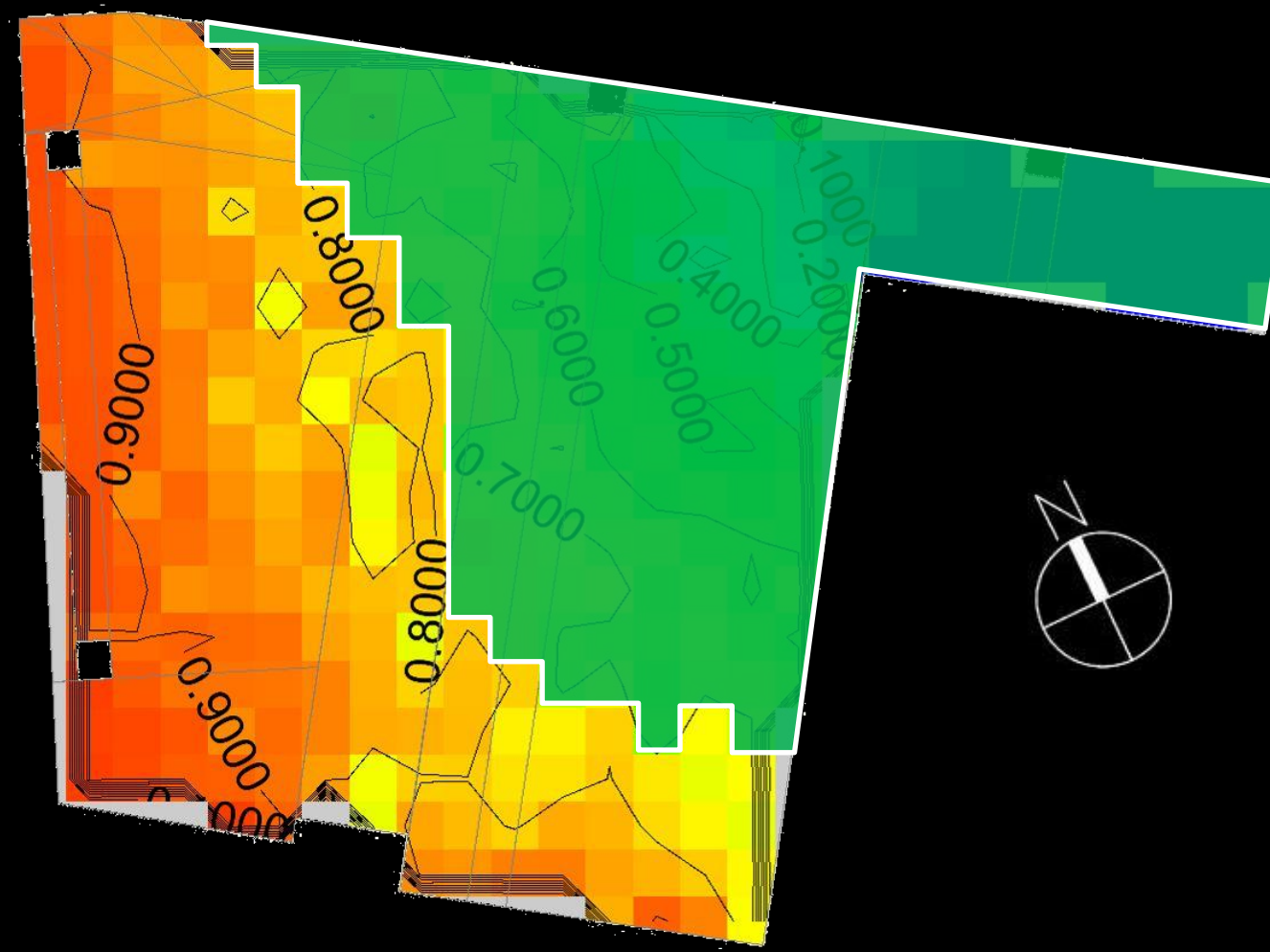
# daylighting | skylight placement

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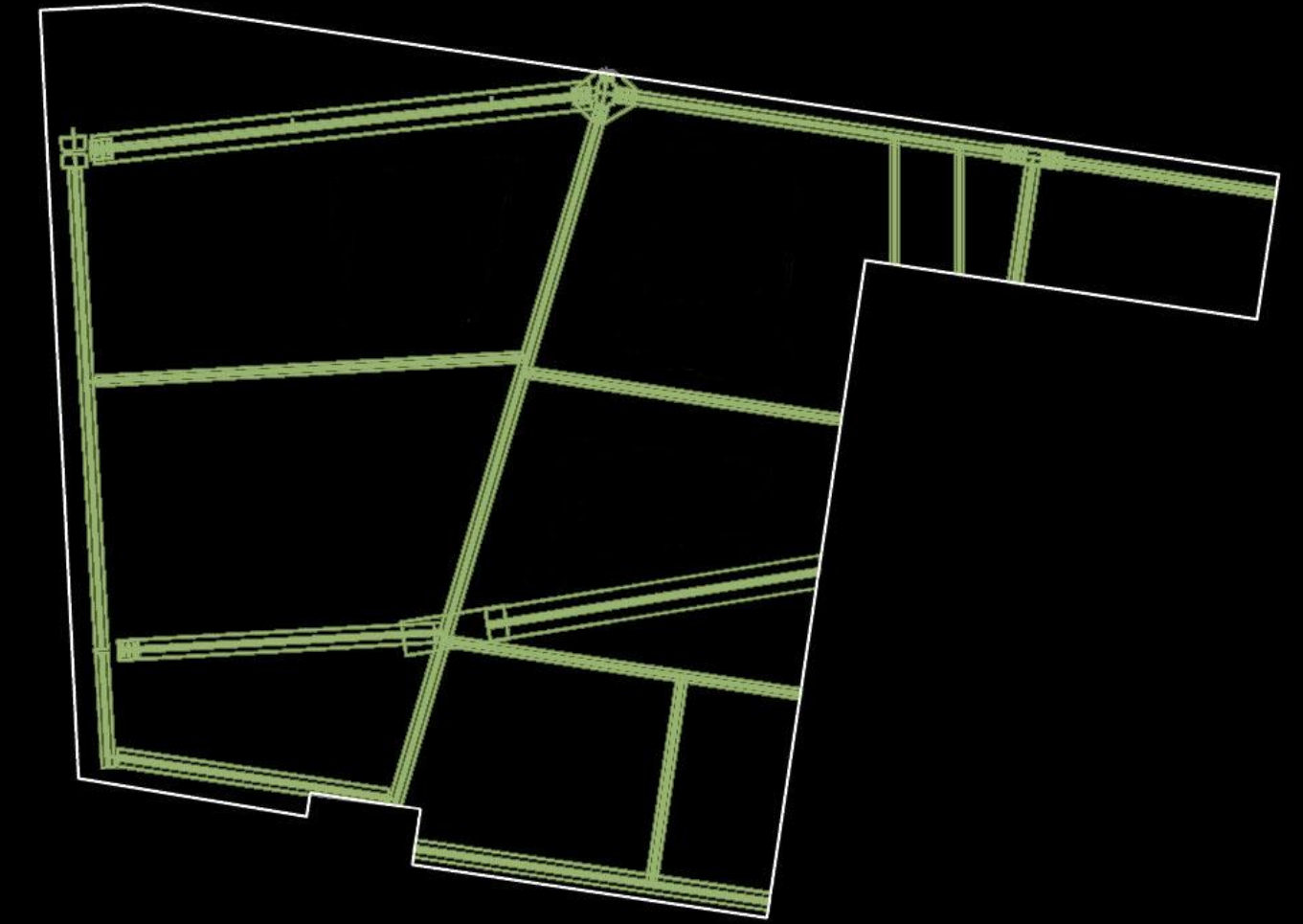
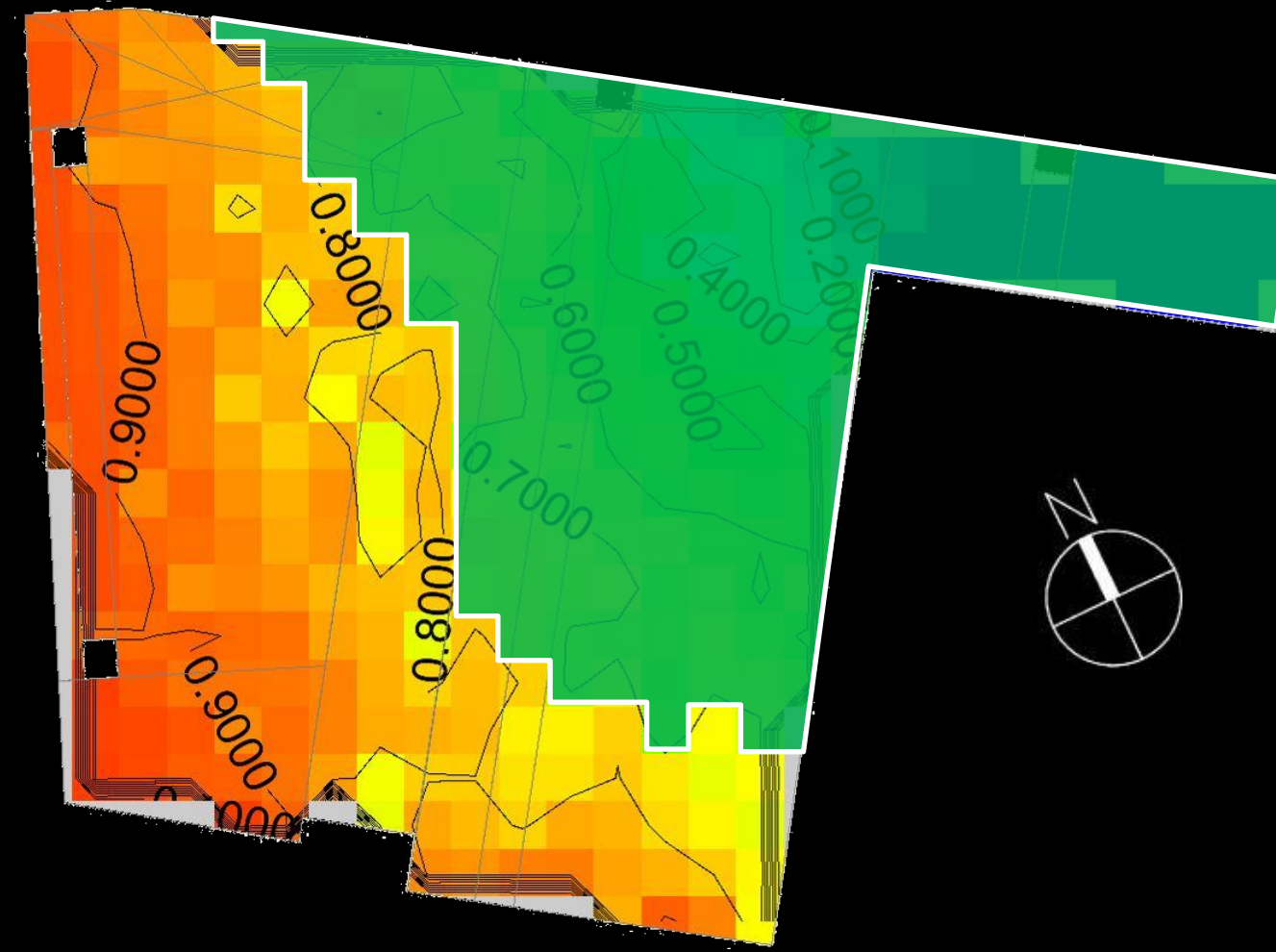
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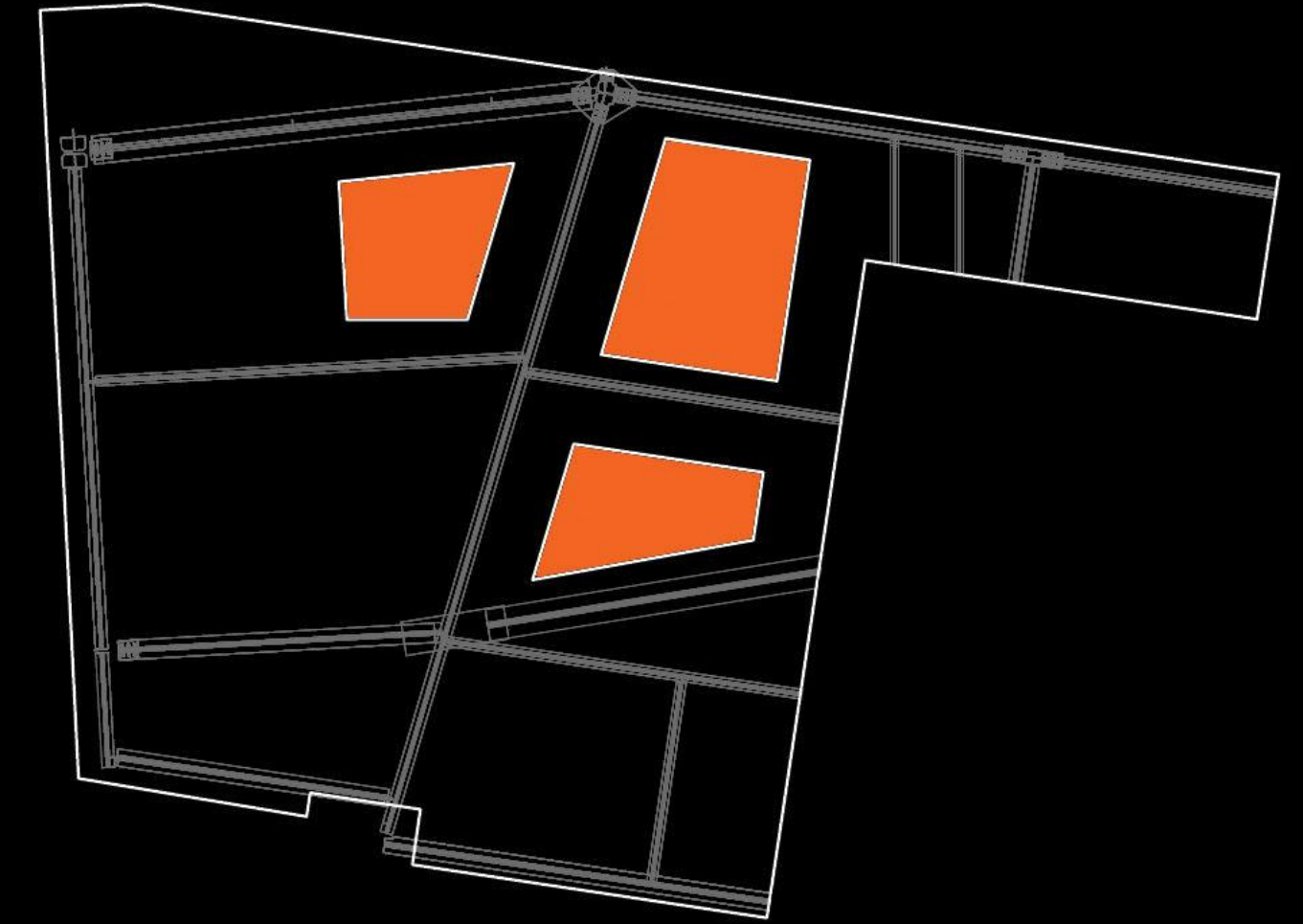
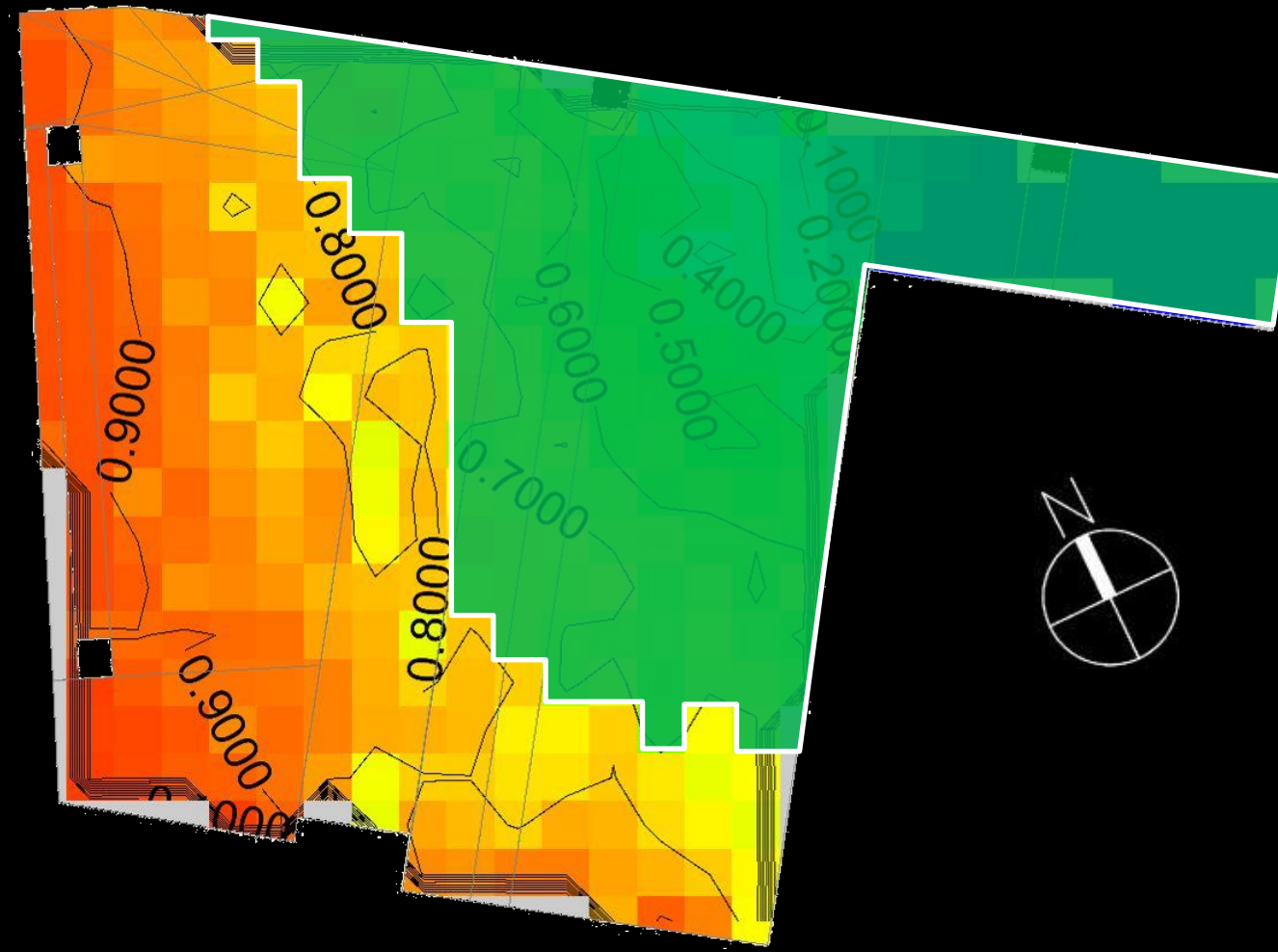
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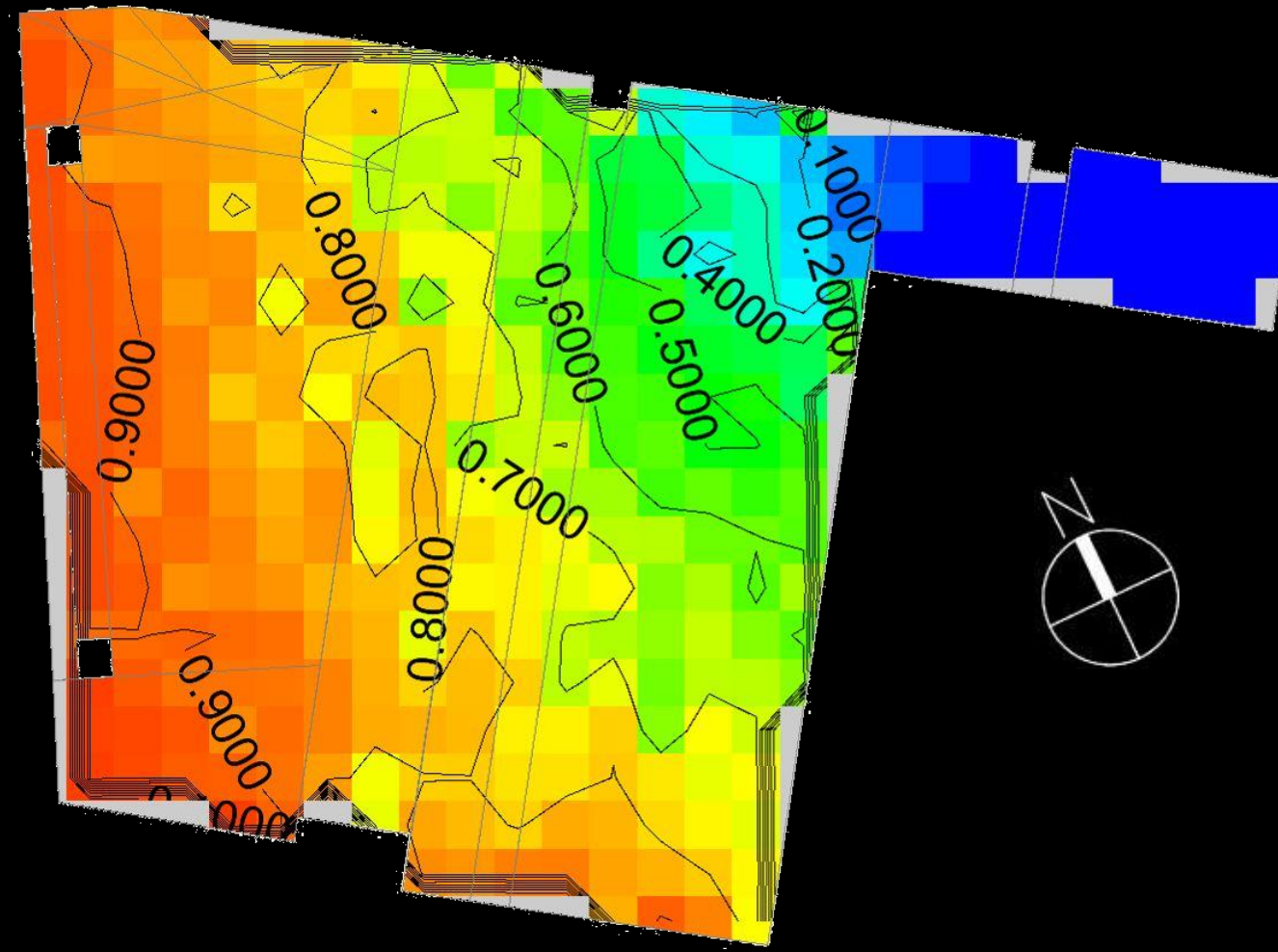
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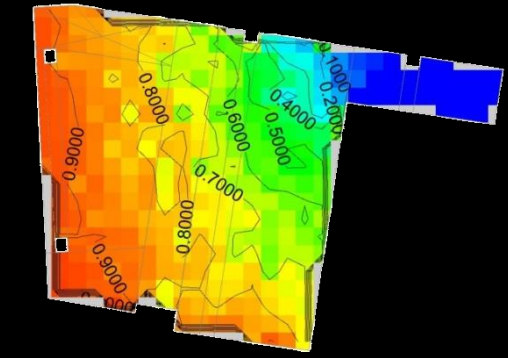


# daylighting | system evaluation

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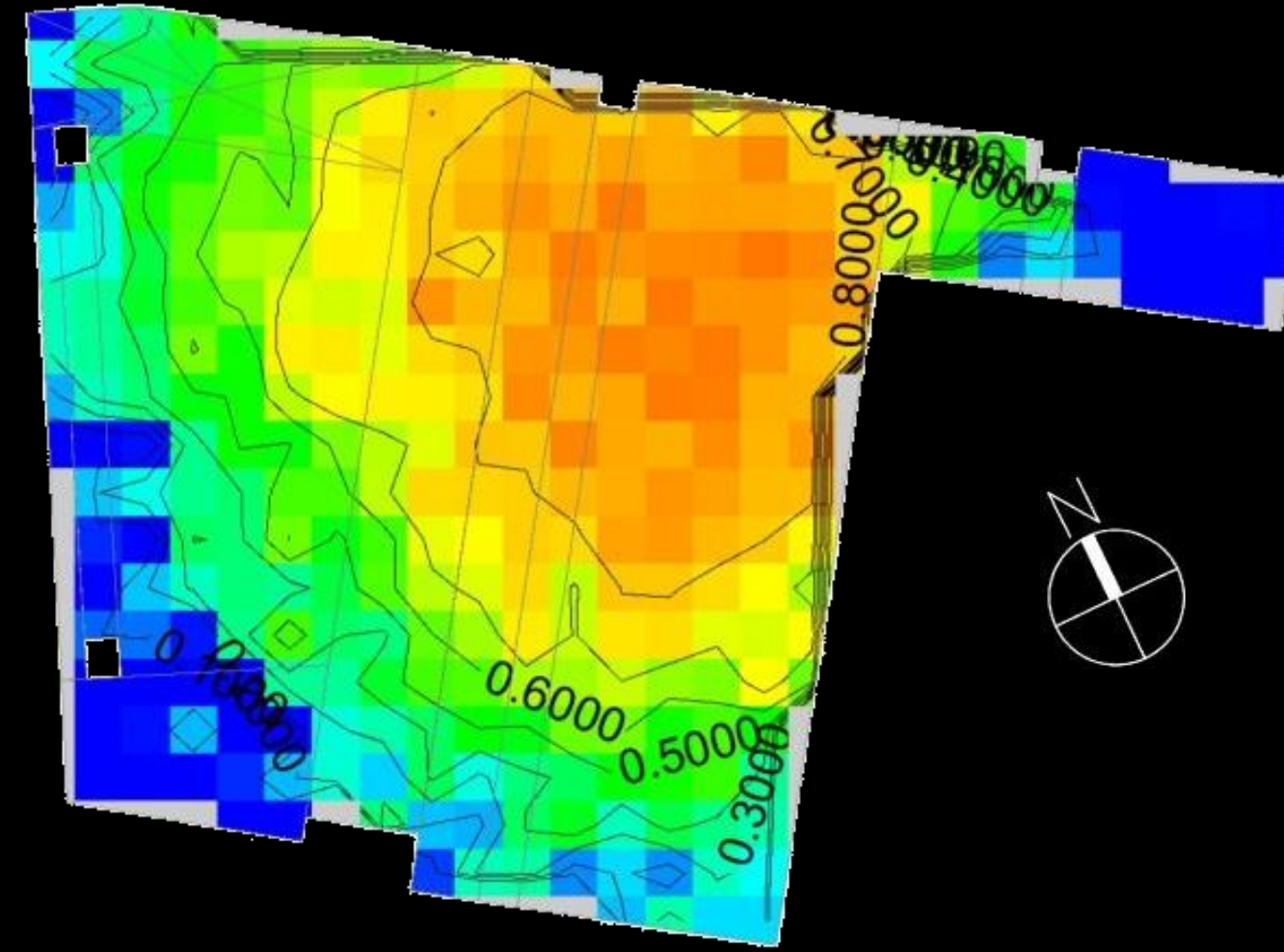
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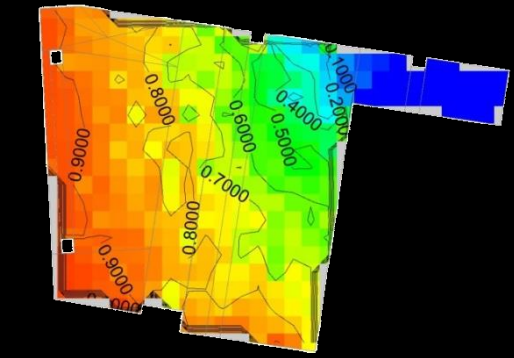
Shades only

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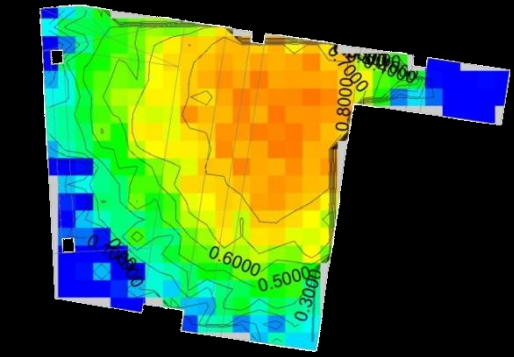
$$SDA_{250,50\%} = 80.95$$



**Shades only**

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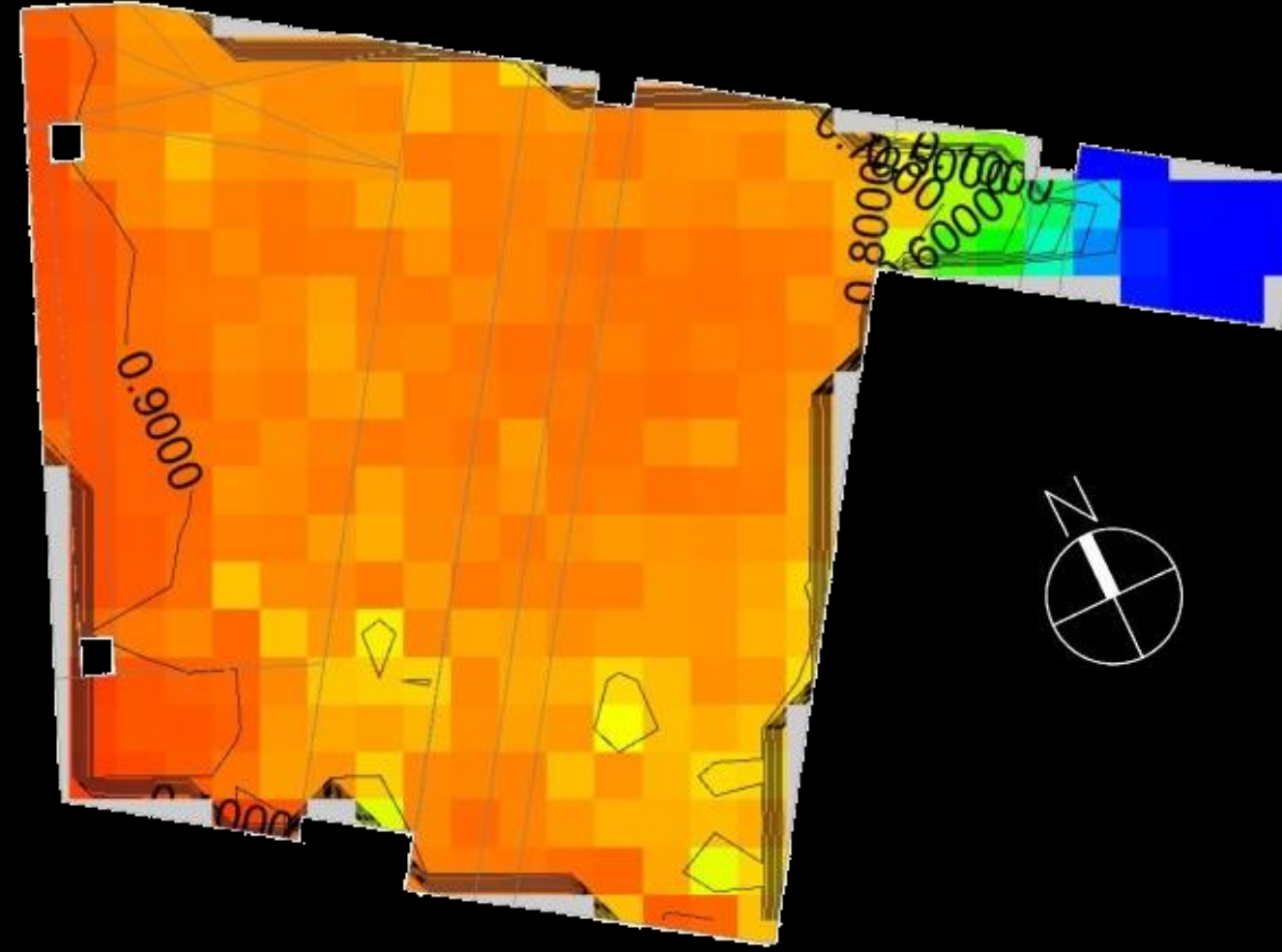
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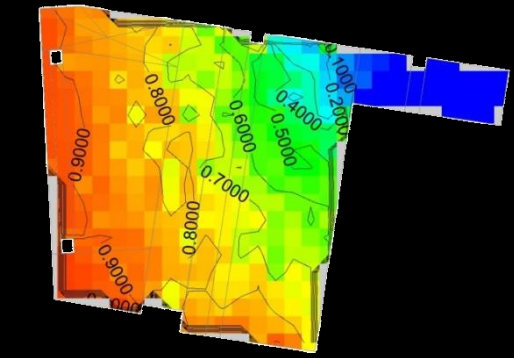
**Skylights Only**

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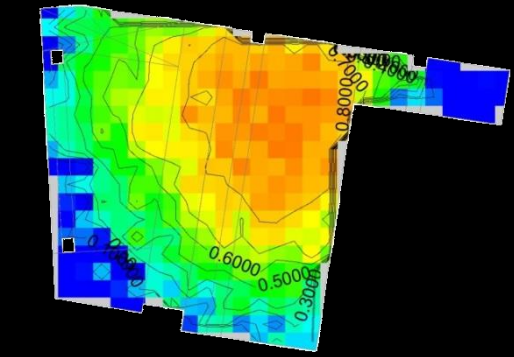
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**Shades only**

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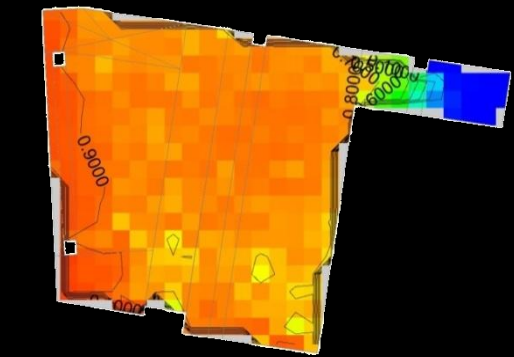
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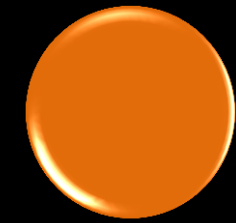
**Skylights Only**

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$$SDA_{250,50\%} = 94.60$$



**Shades and Skylights**



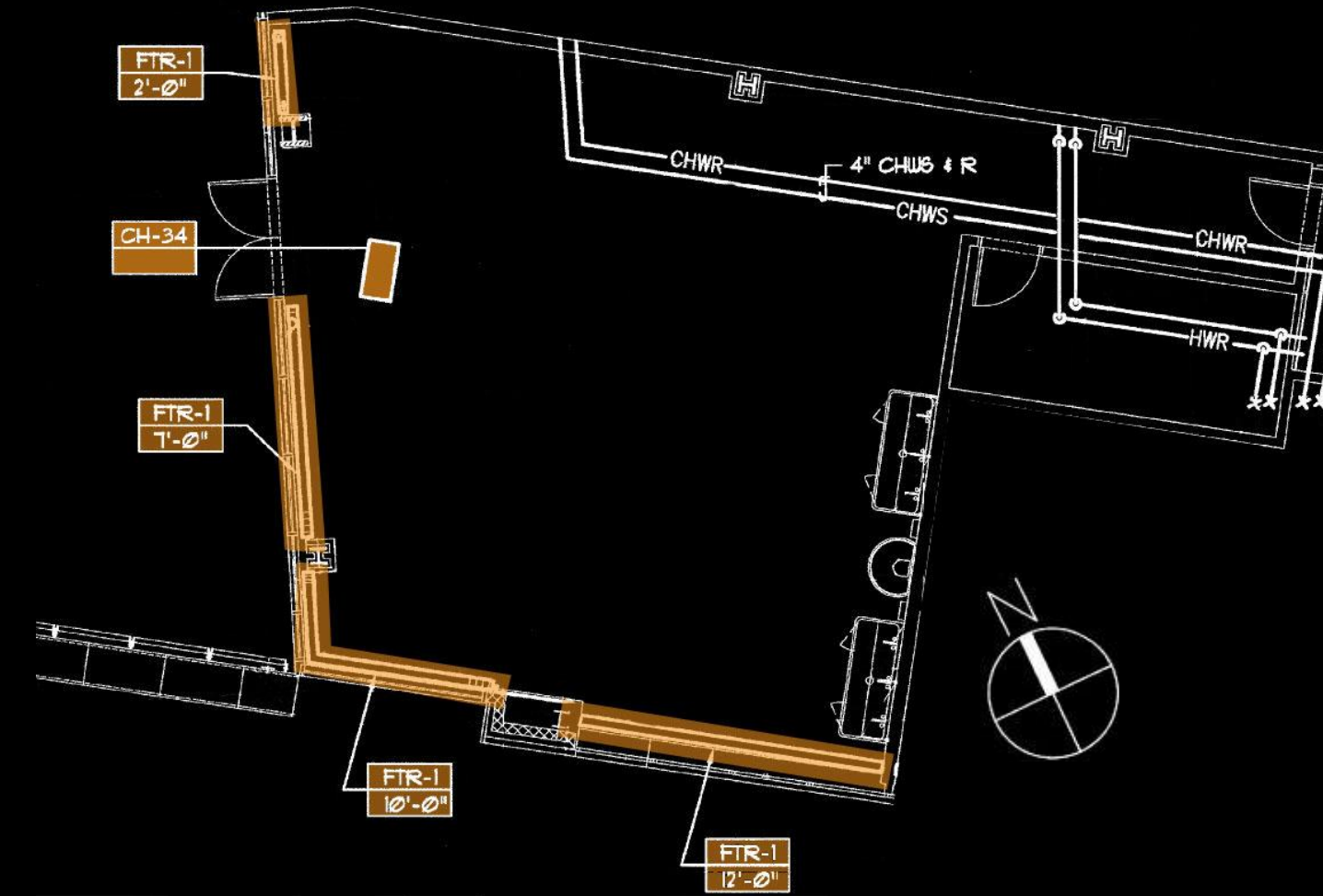
| mechanical load



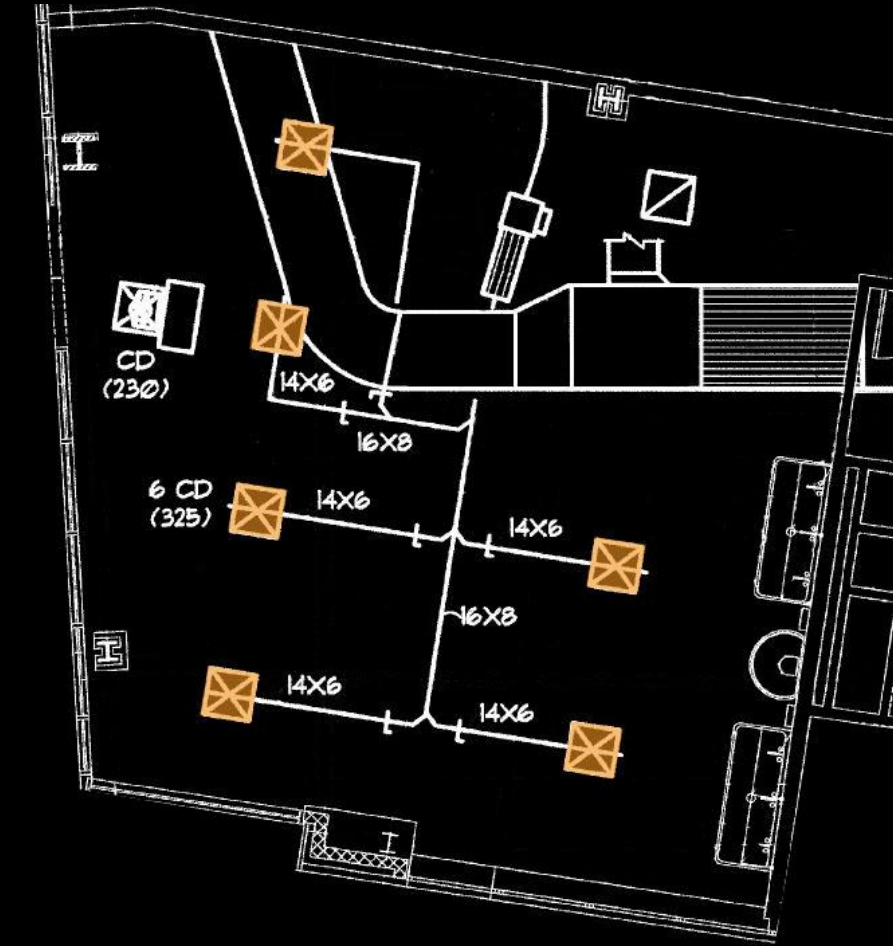
# mechanical load | systems

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# heating



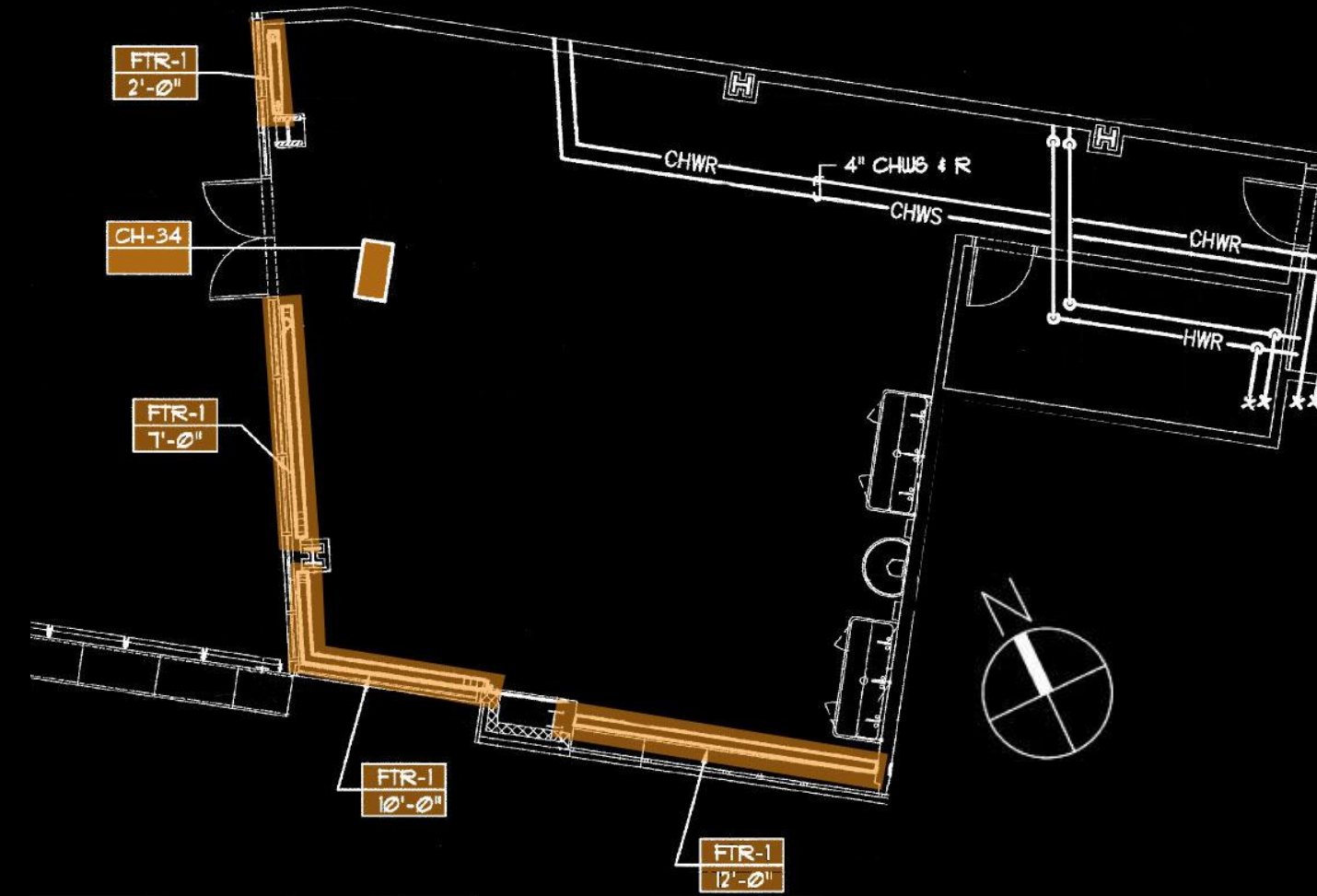
# cooling



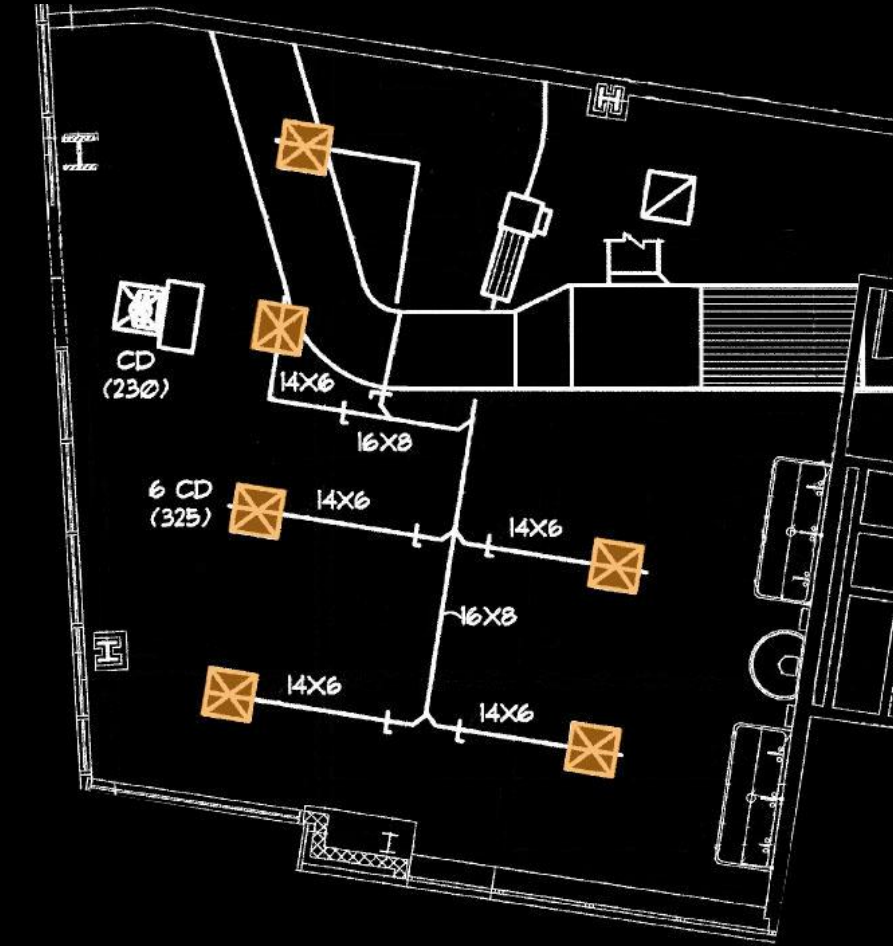
**mechanical load** | capacity

- | introduction
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**heating** | 29,290 BTU/hr



**Cooling** | 22,955 BTU/hr



**mechanical load** | load calculation

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**heating**



**cooling**

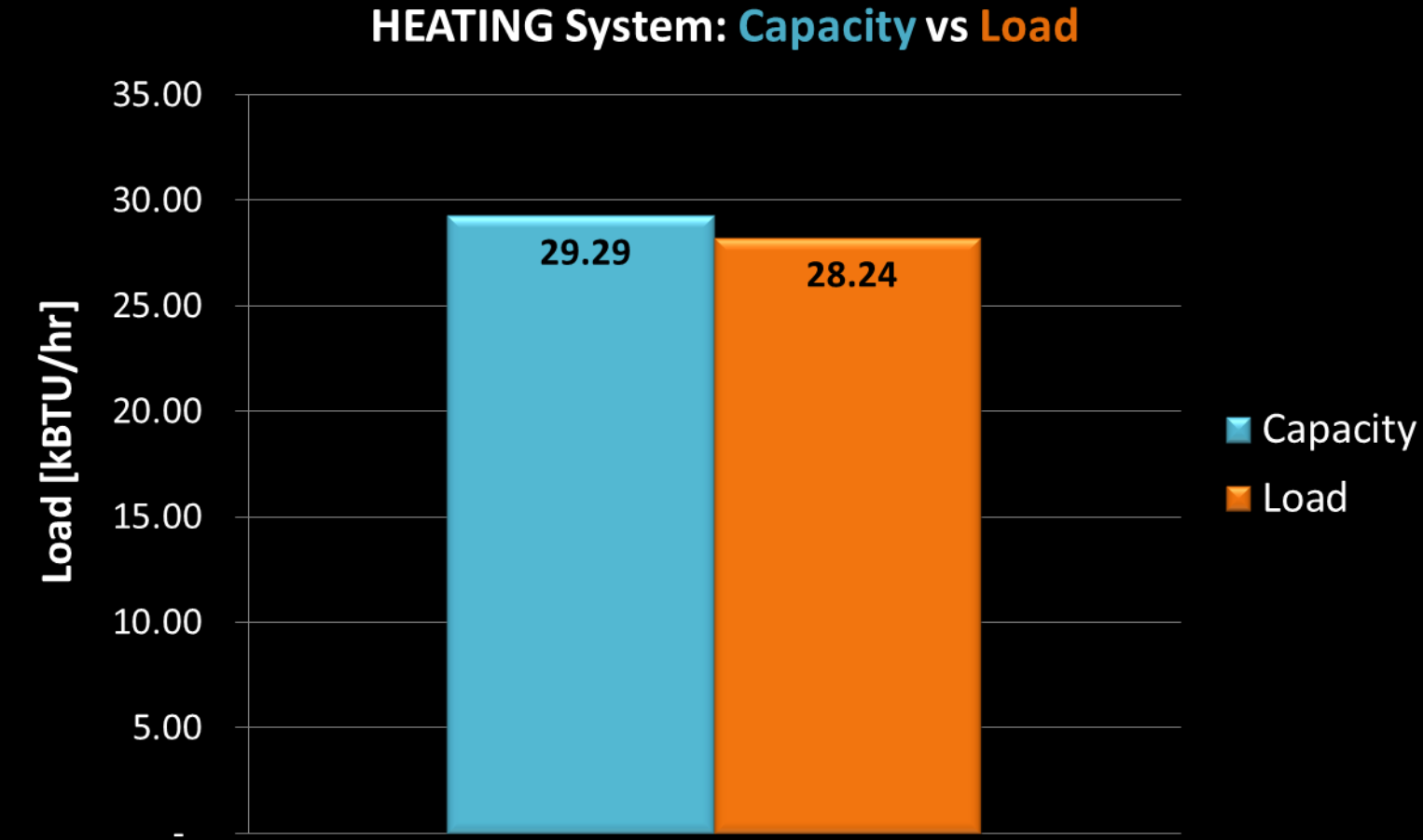


mechanical load | skylight load

heating

cooling

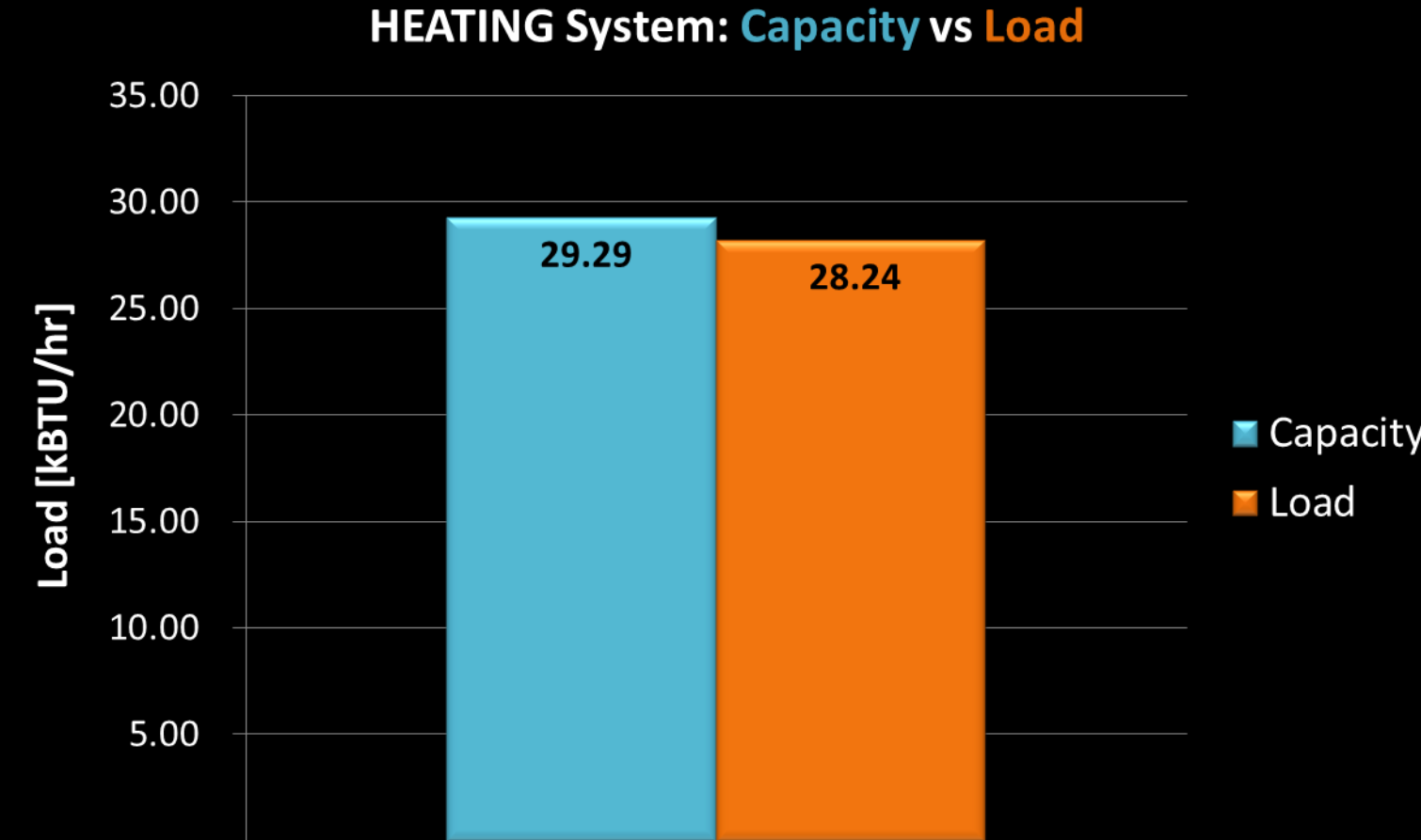
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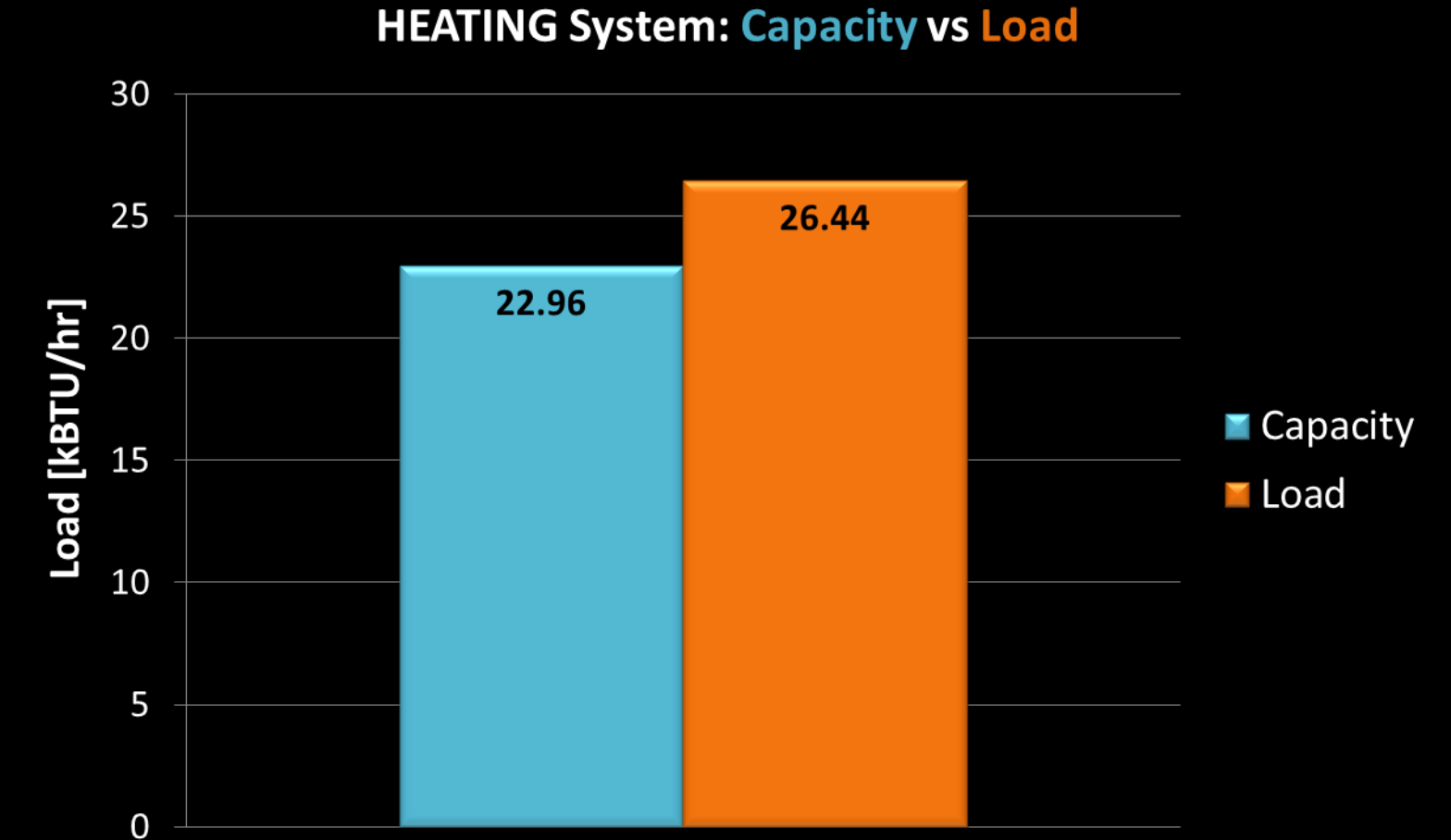
mechanical load | skylight load

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heating



cooling



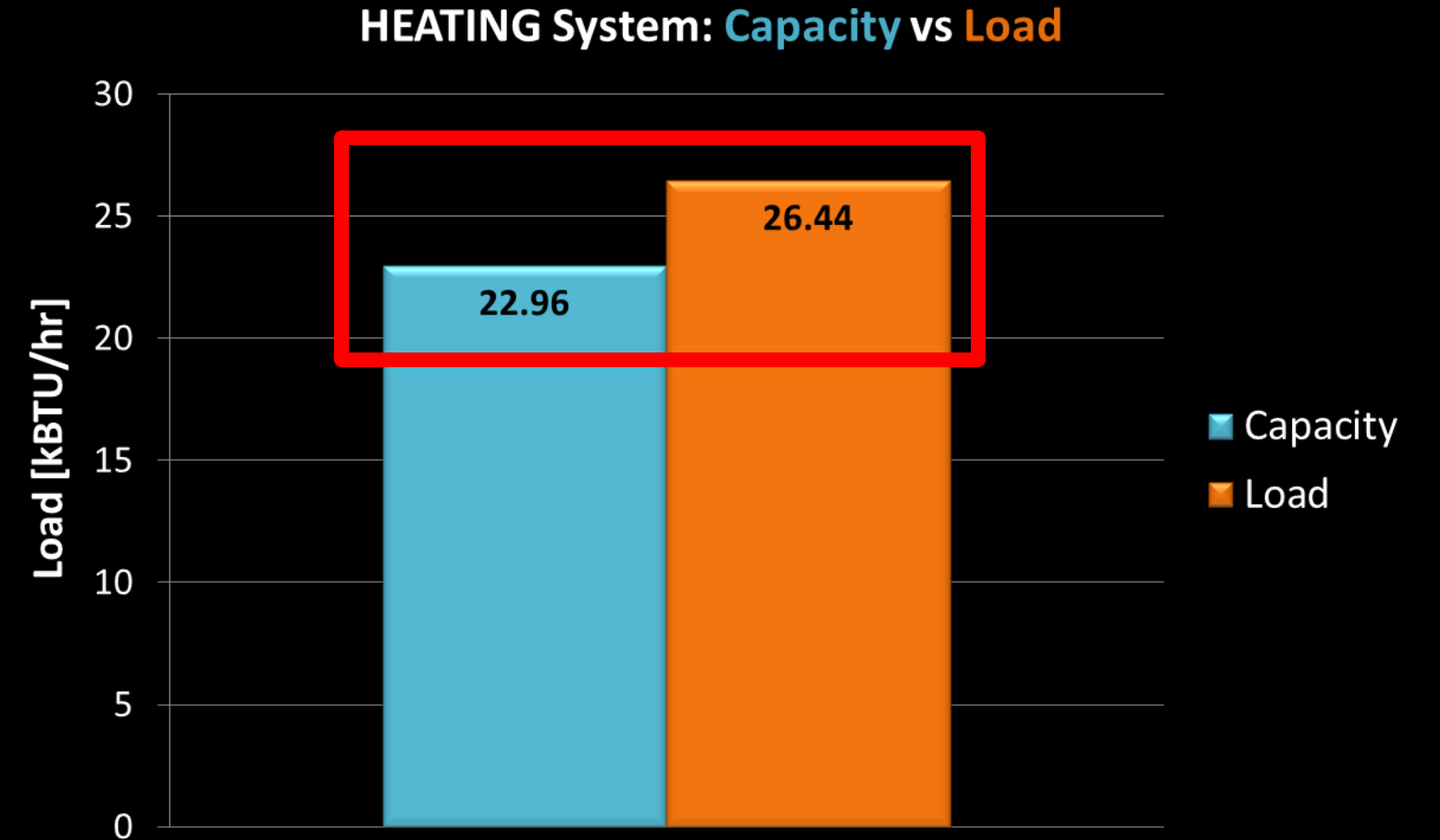
mechanical load | skylight load

heating

cooling

296 CFM

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mechanical load | skylight load

heating

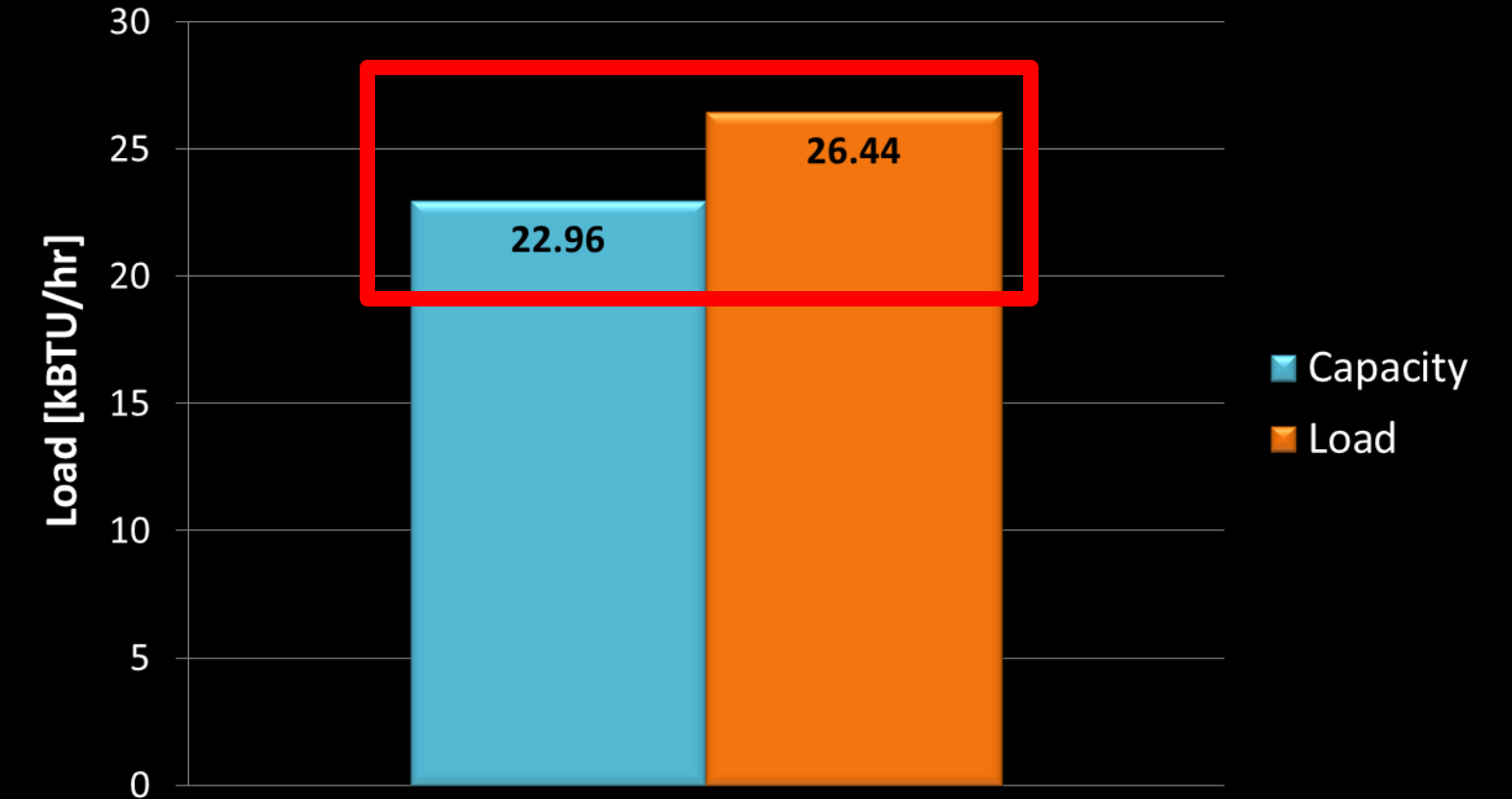
cooling

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296 CFM

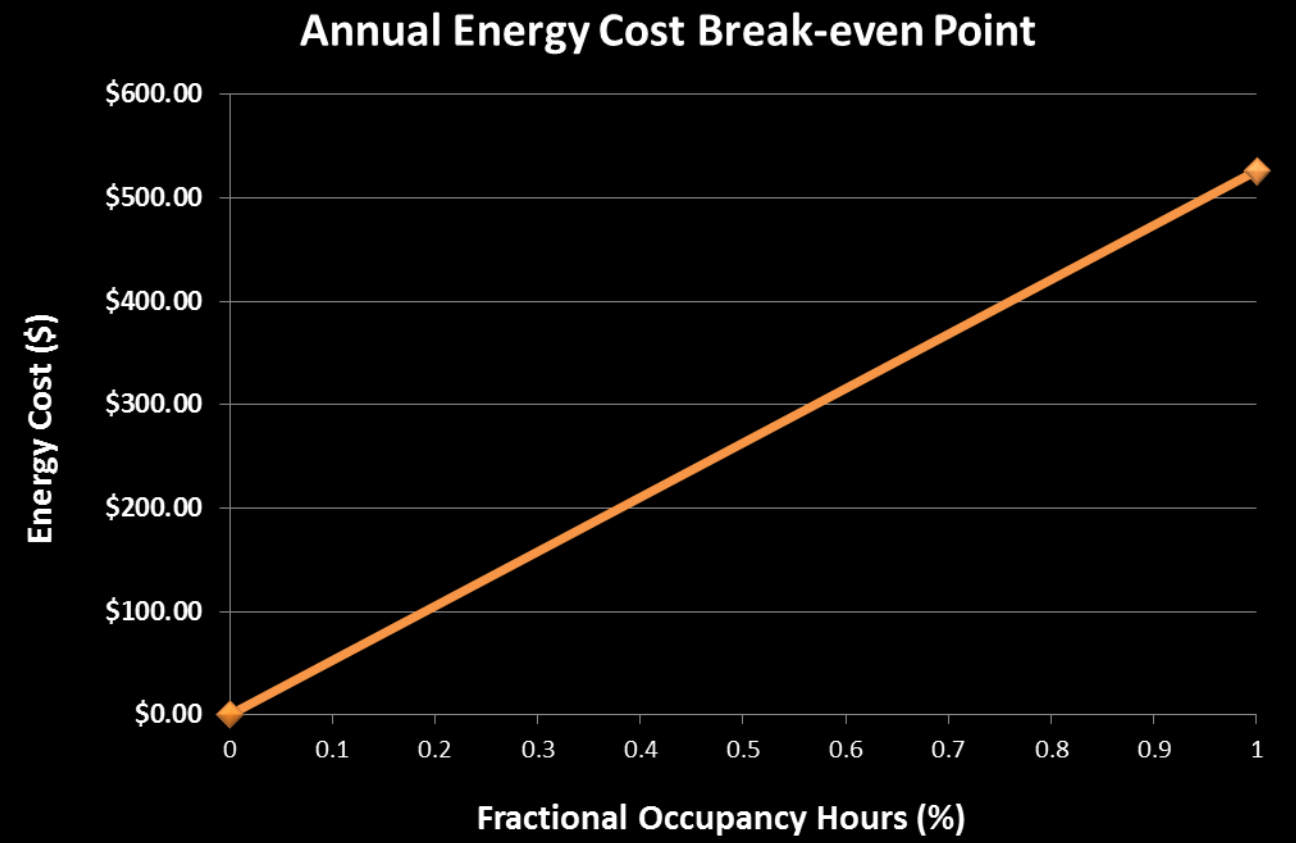
\$ 246.50

HEATING System: Capacity vs Load



# mechanical load | energy cost

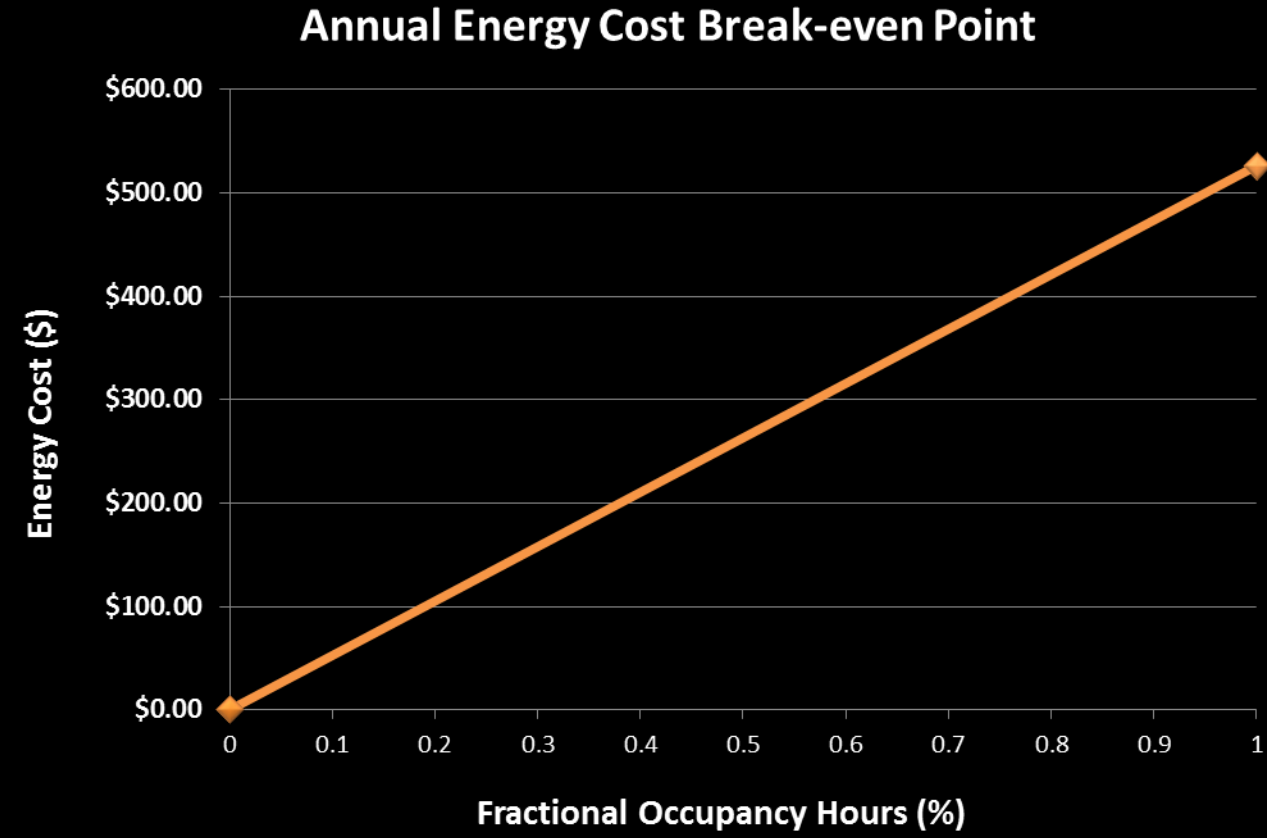
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# mechanical load | energy cost

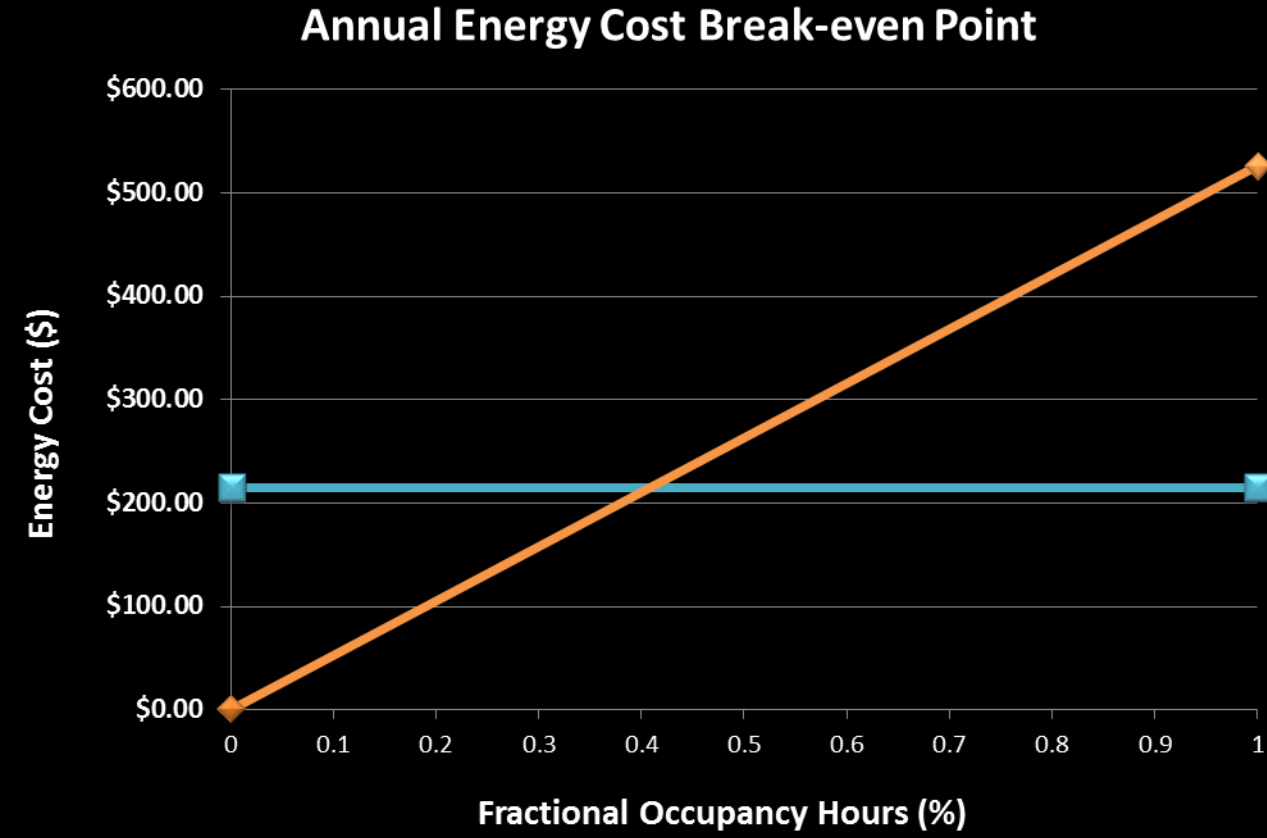
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Heating/Cooling Cost: **\$ 214.32**

# mechanical load | energy cost

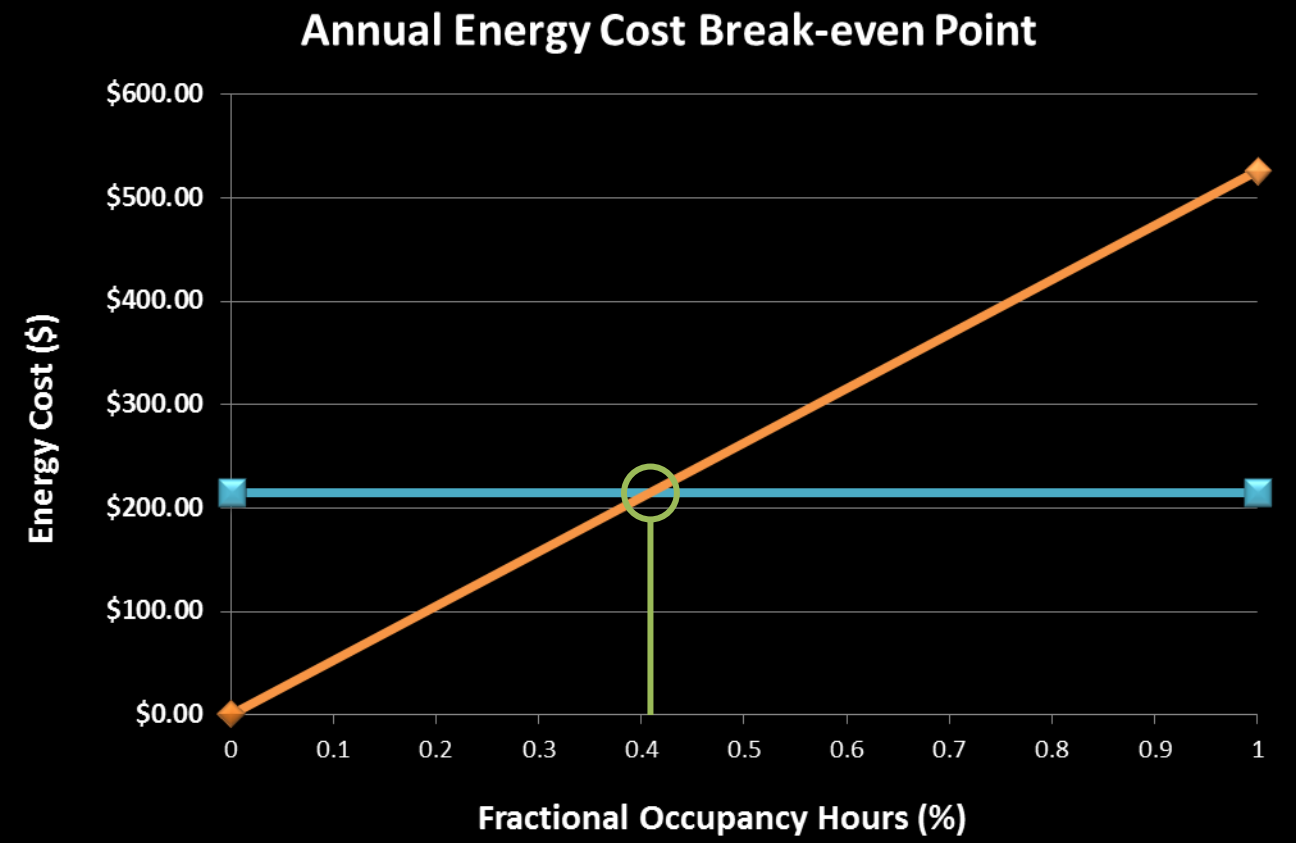
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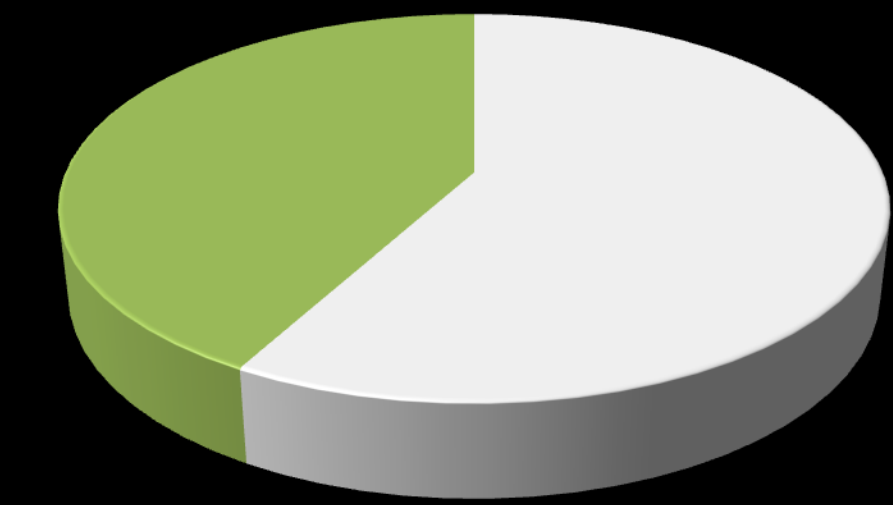
Heating/Cooling Cost: **\$ 214.32**

# mechanical load | energy cost

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- | electrical distribution
- | conclusion



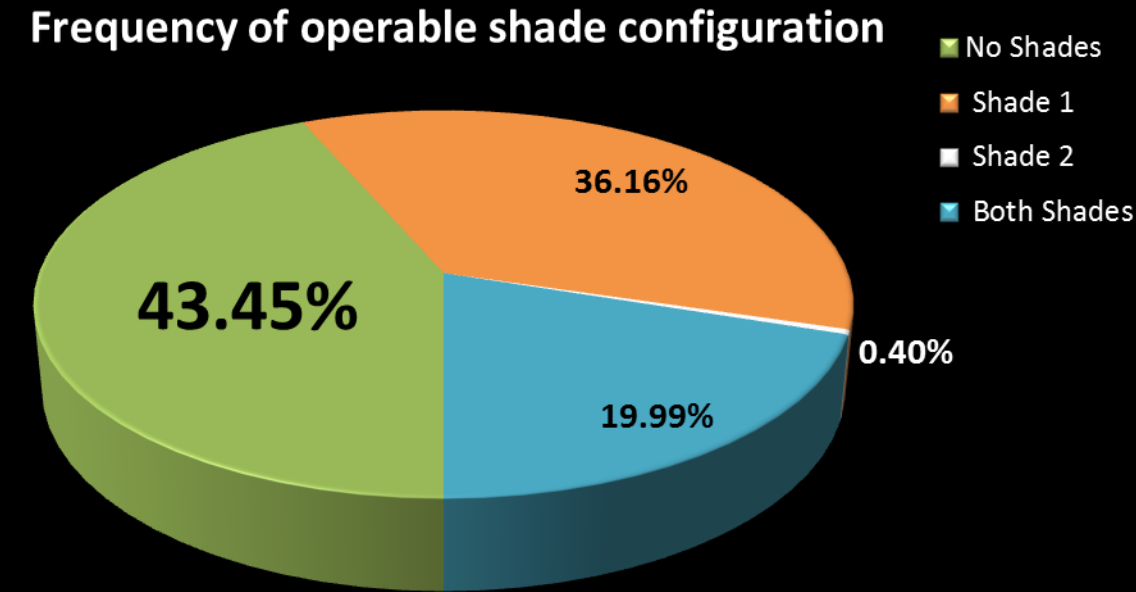
40%

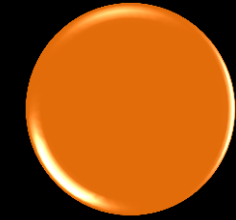


# mechanical load | energy cost

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | **mechanical load**
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# feasible?



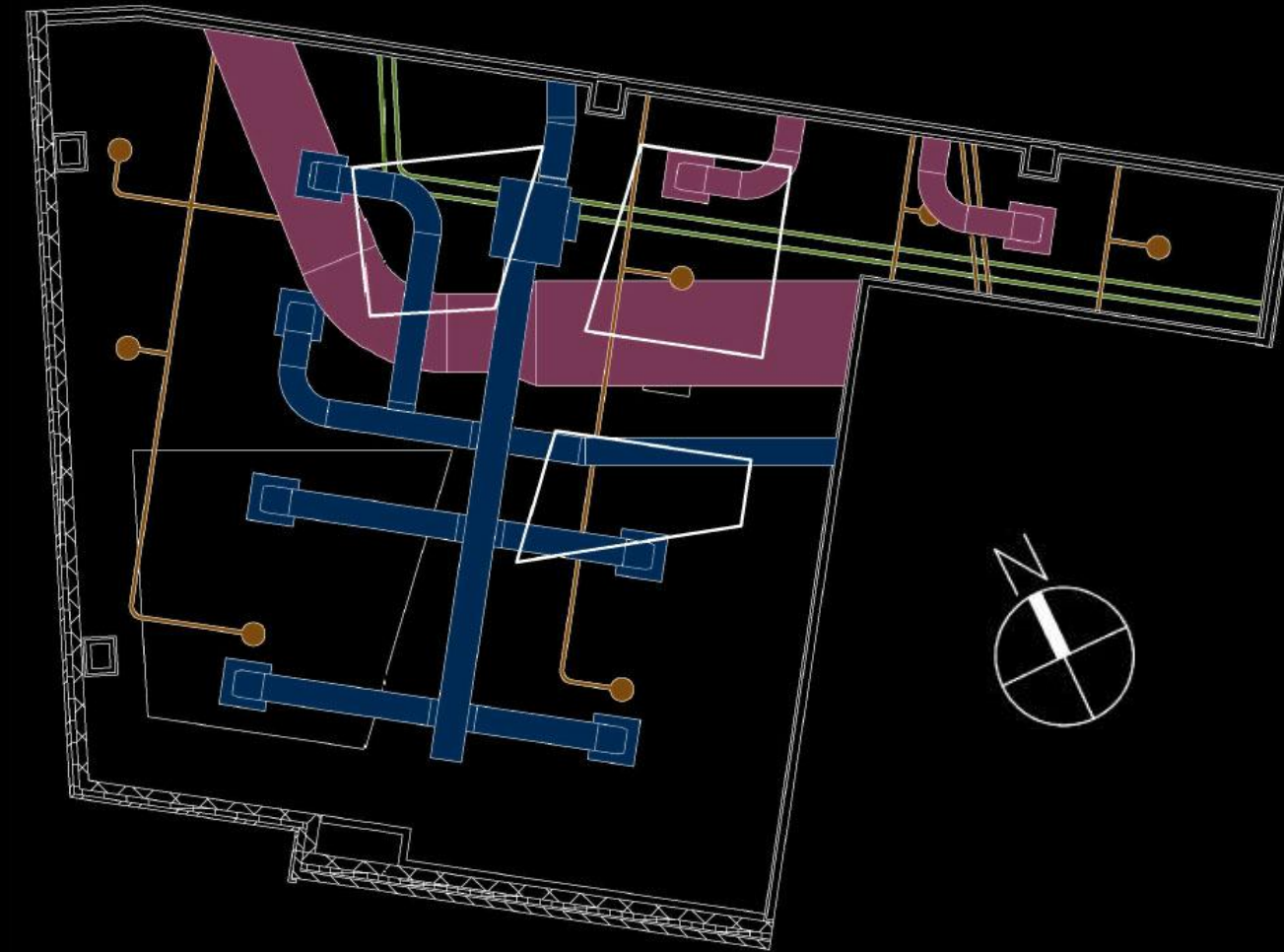


| ceiling coordination

# coordination | plenum layout

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# existing



# proposed

# coordination | plenum layout

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## existing



## proposed



**coordination | skylight coverage**

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

**existing**



**proposed**





**coordination** | skylight coverage

**existing**

**proposed**

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

46.47%

**coordination** | skylight coverage

**existing**

**proposed**

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

46.47%

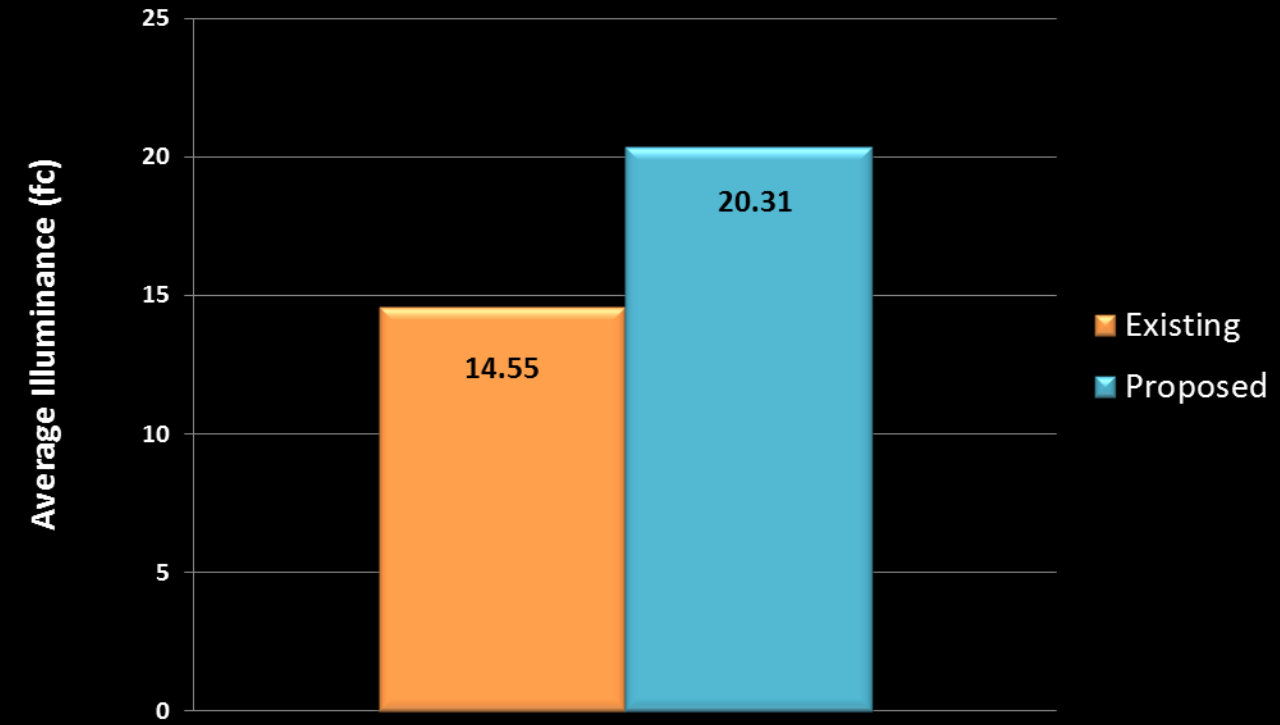
9.10%

## coordination | other impacts

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## illuminance

Skylight Average Illuminance

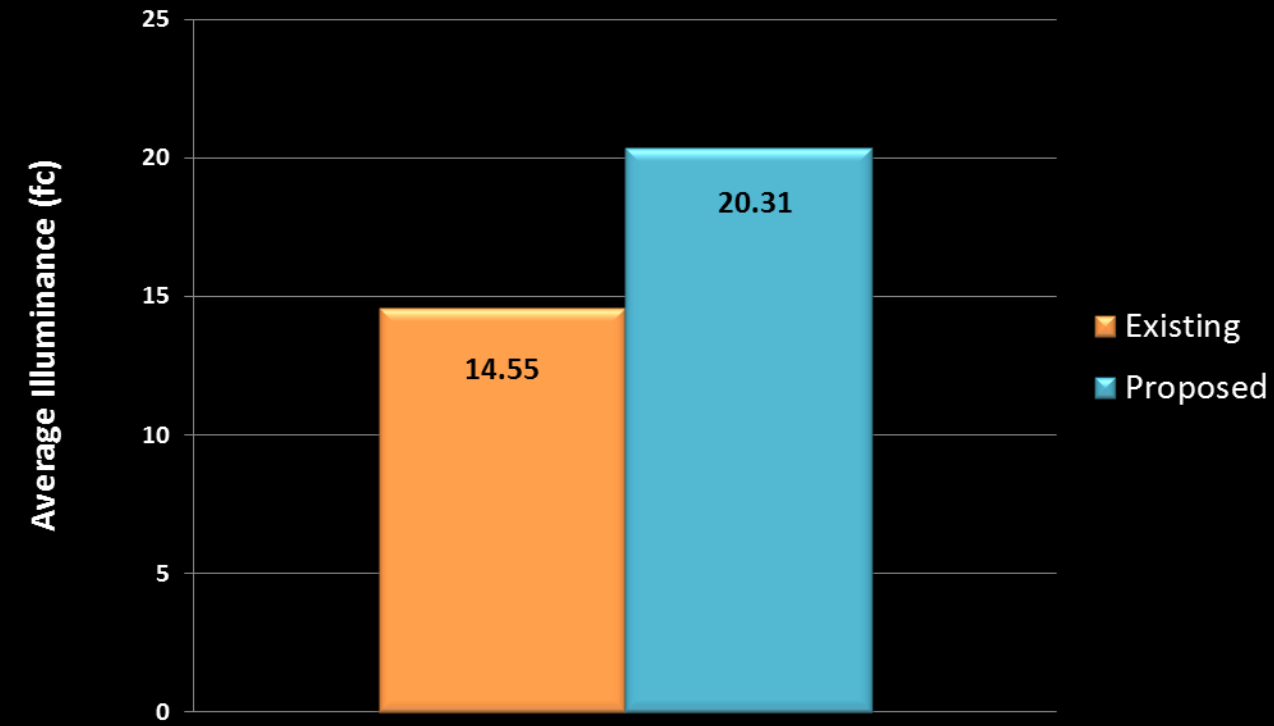


## coordination | other impacts

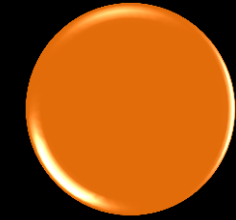
- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## illuminance

Skylight Average Illuminance



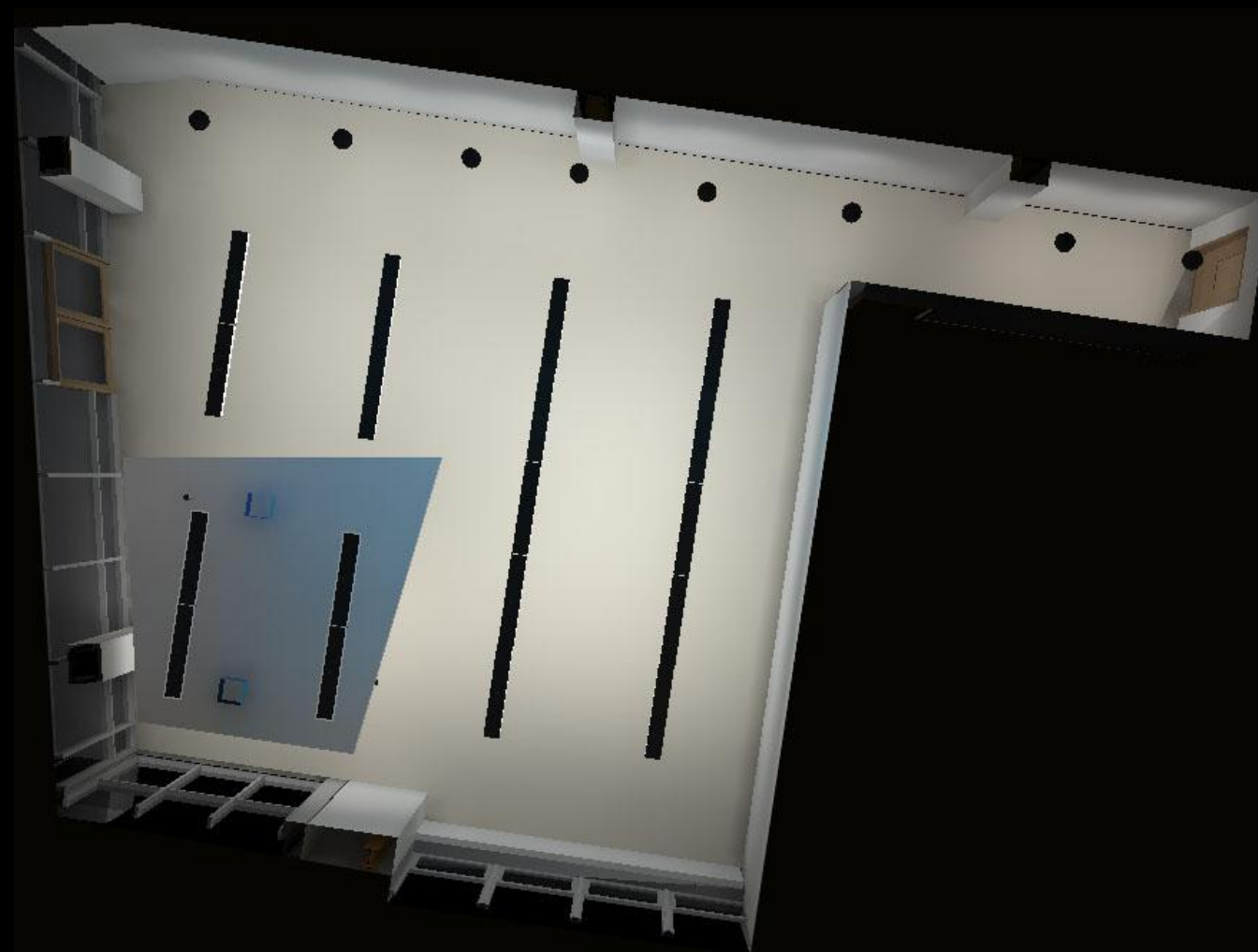
39.6%



| lighting

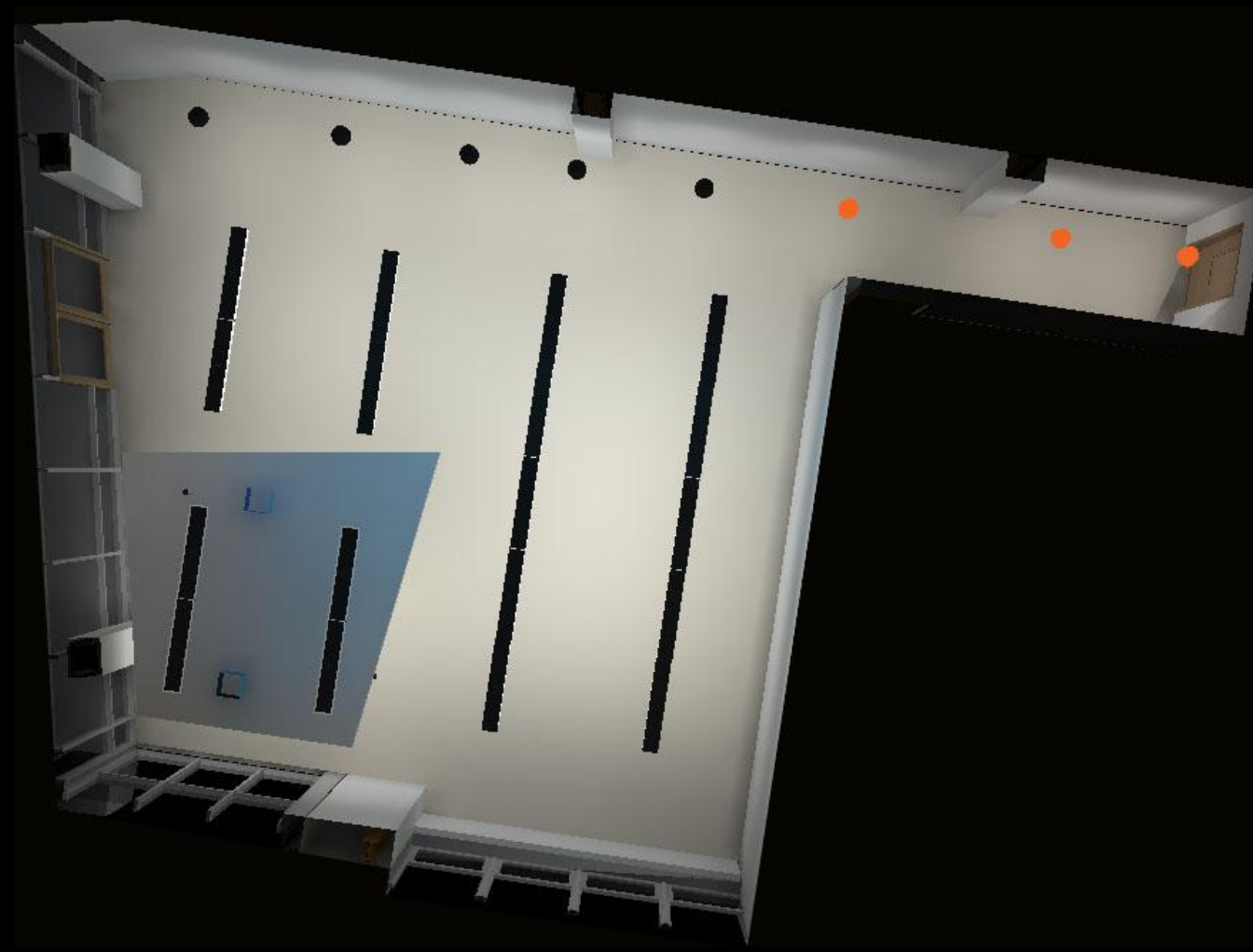
## lighting | zone a

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion



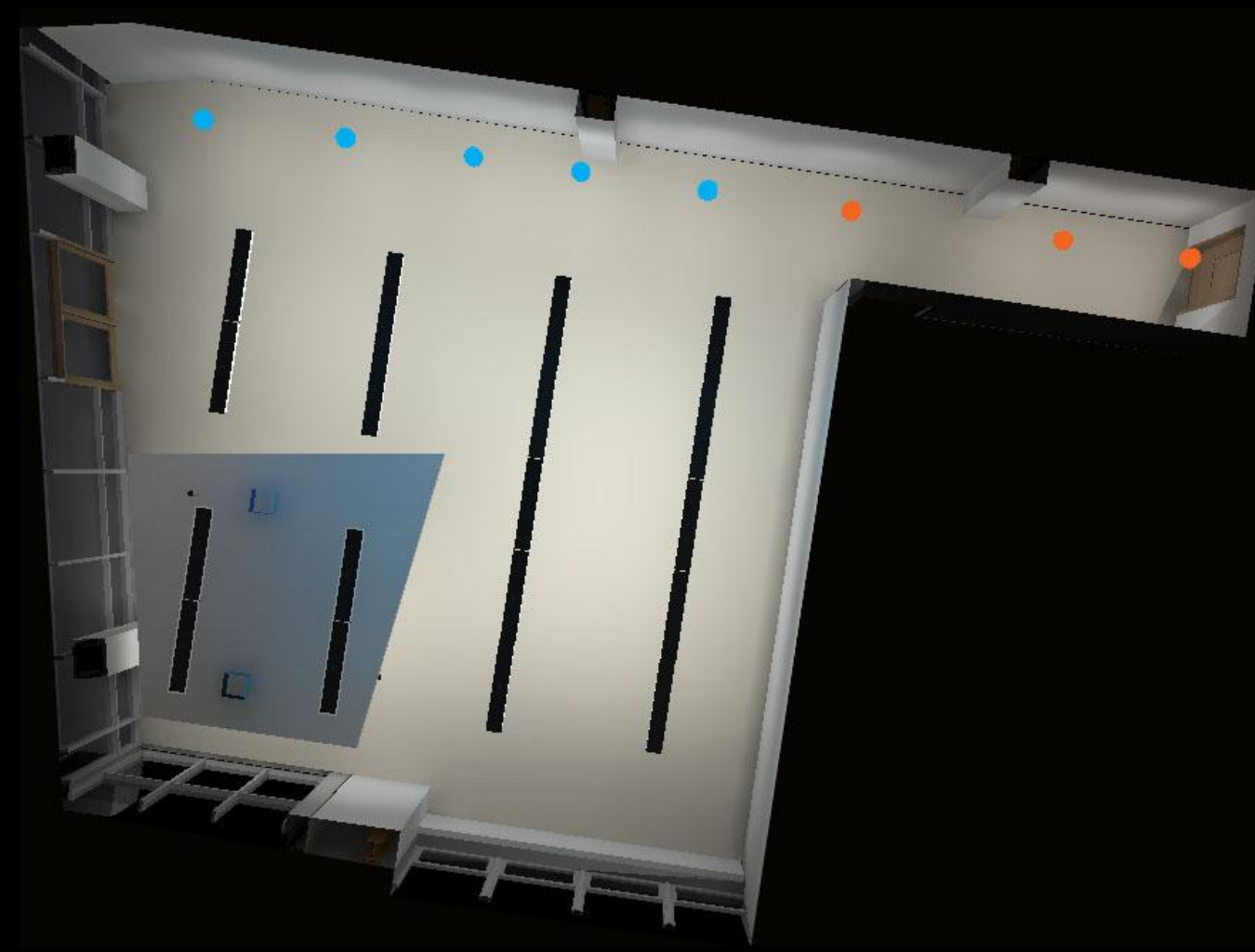
## lighting | zone a

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion



## lighting | zone b

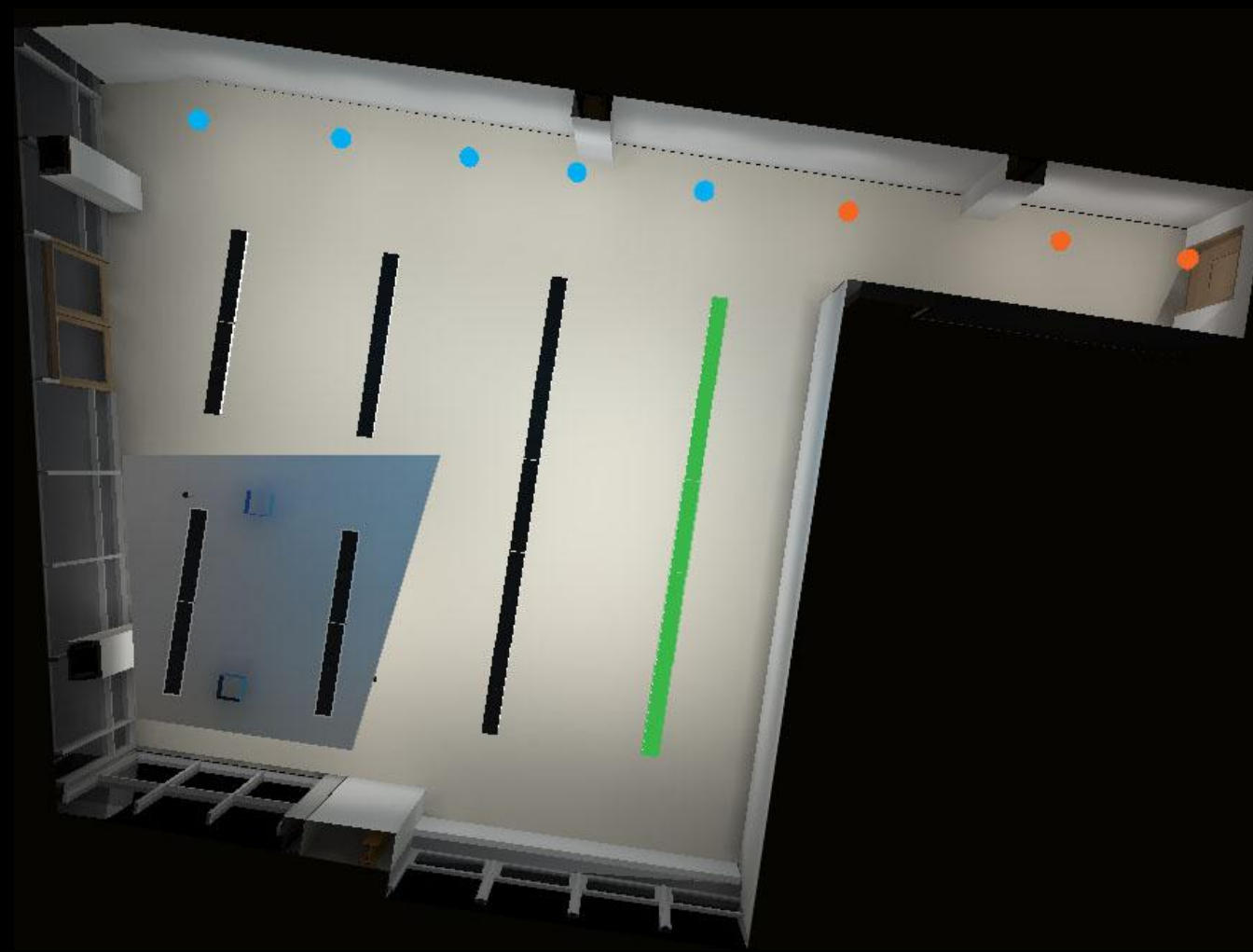
- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion





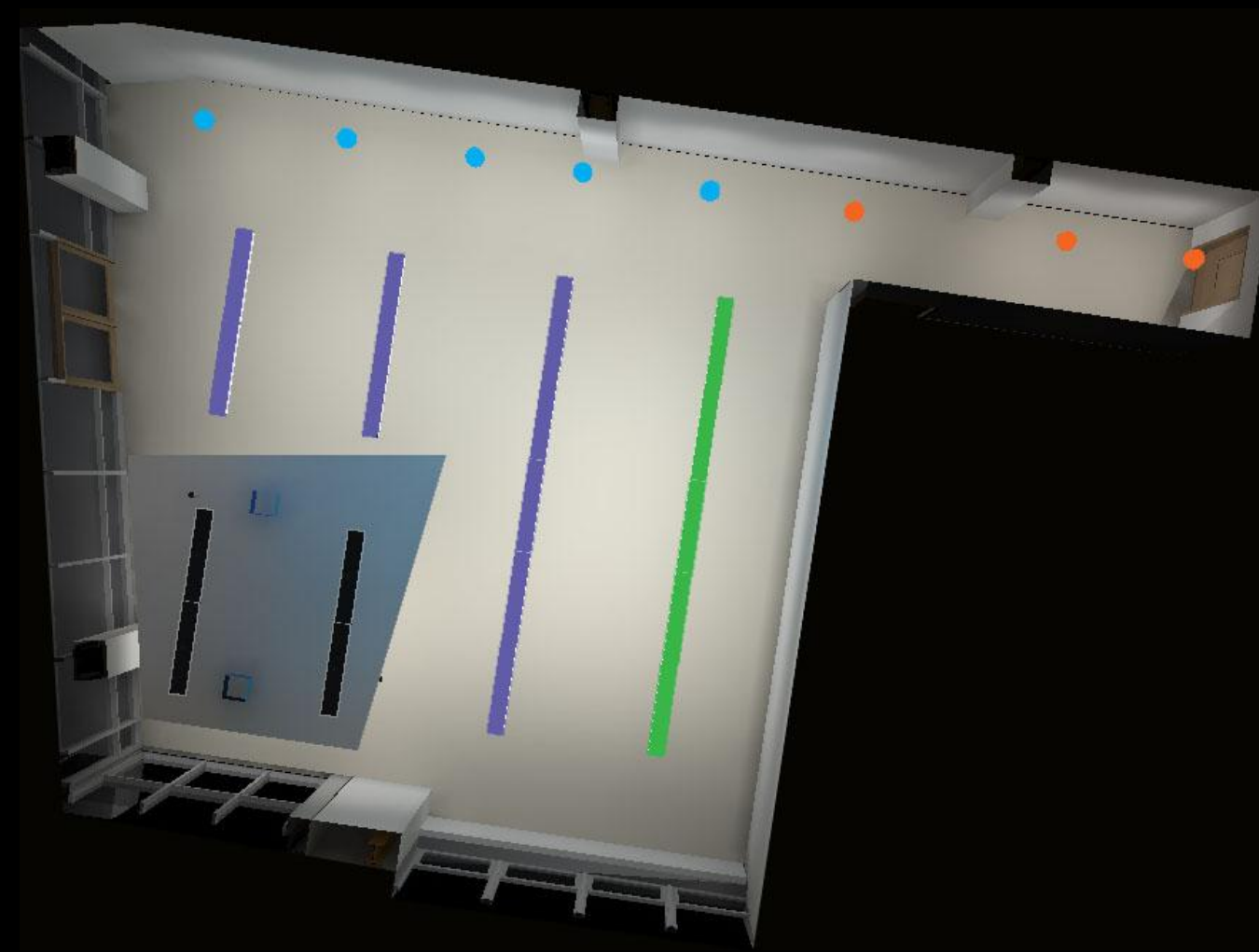
## lighting | zone c

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion



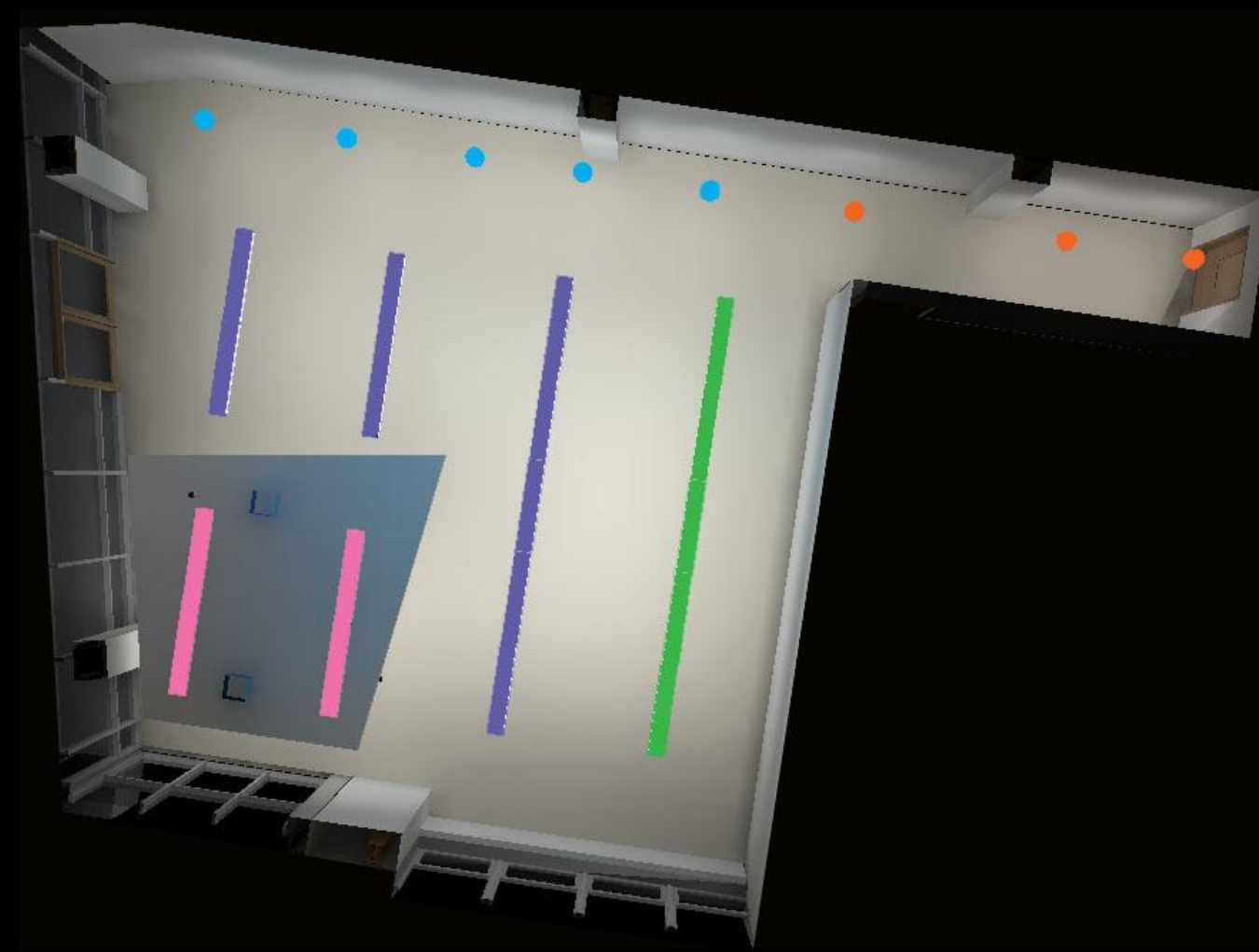
## lighting | zone d

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion



## lighting | zone e

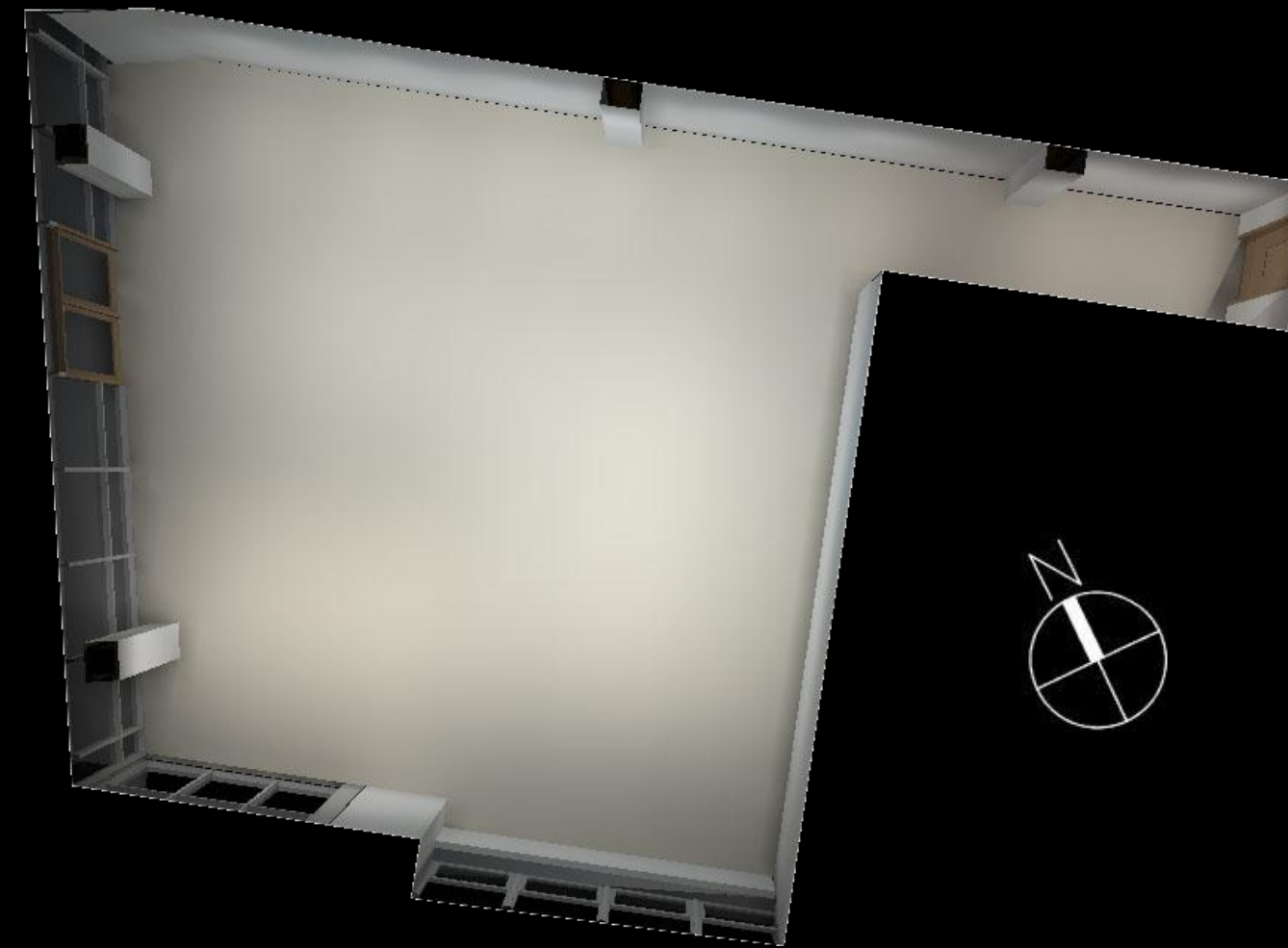
- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion



## lighting | performance

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

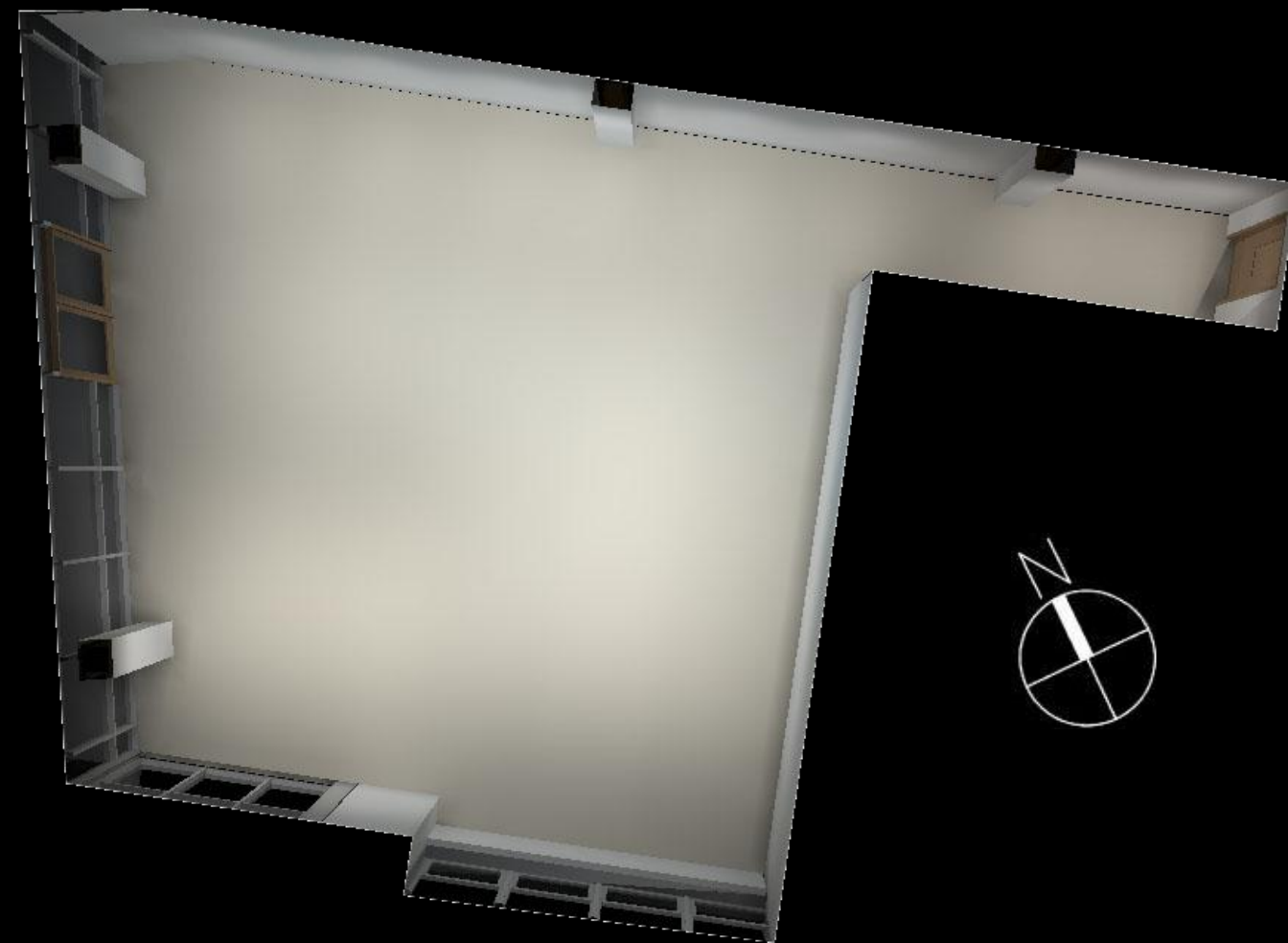
## real color



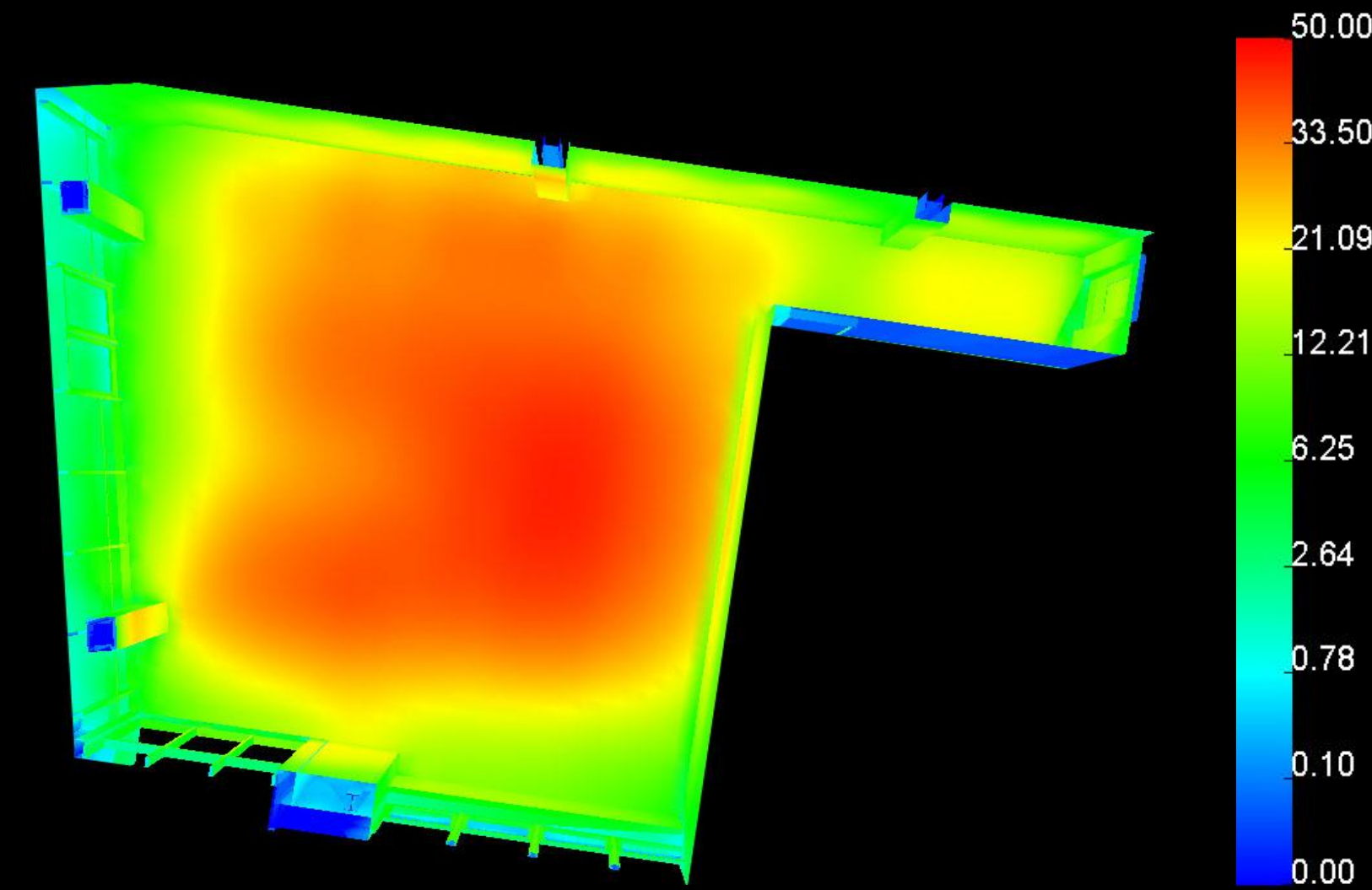
## lighting | performance

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## real color



## false color

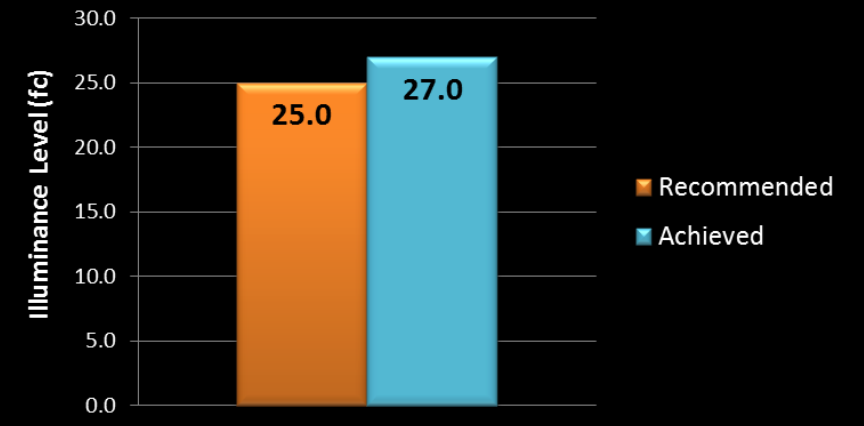


# lighting | performance

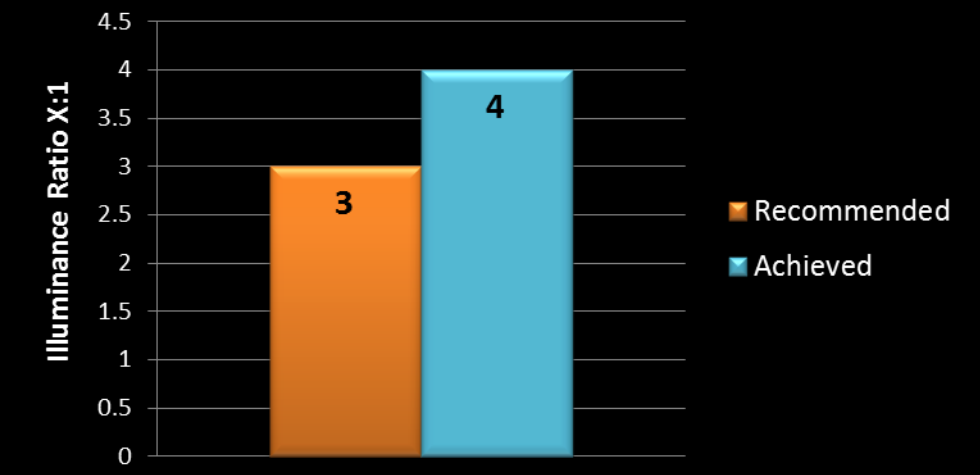
- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# illuminance

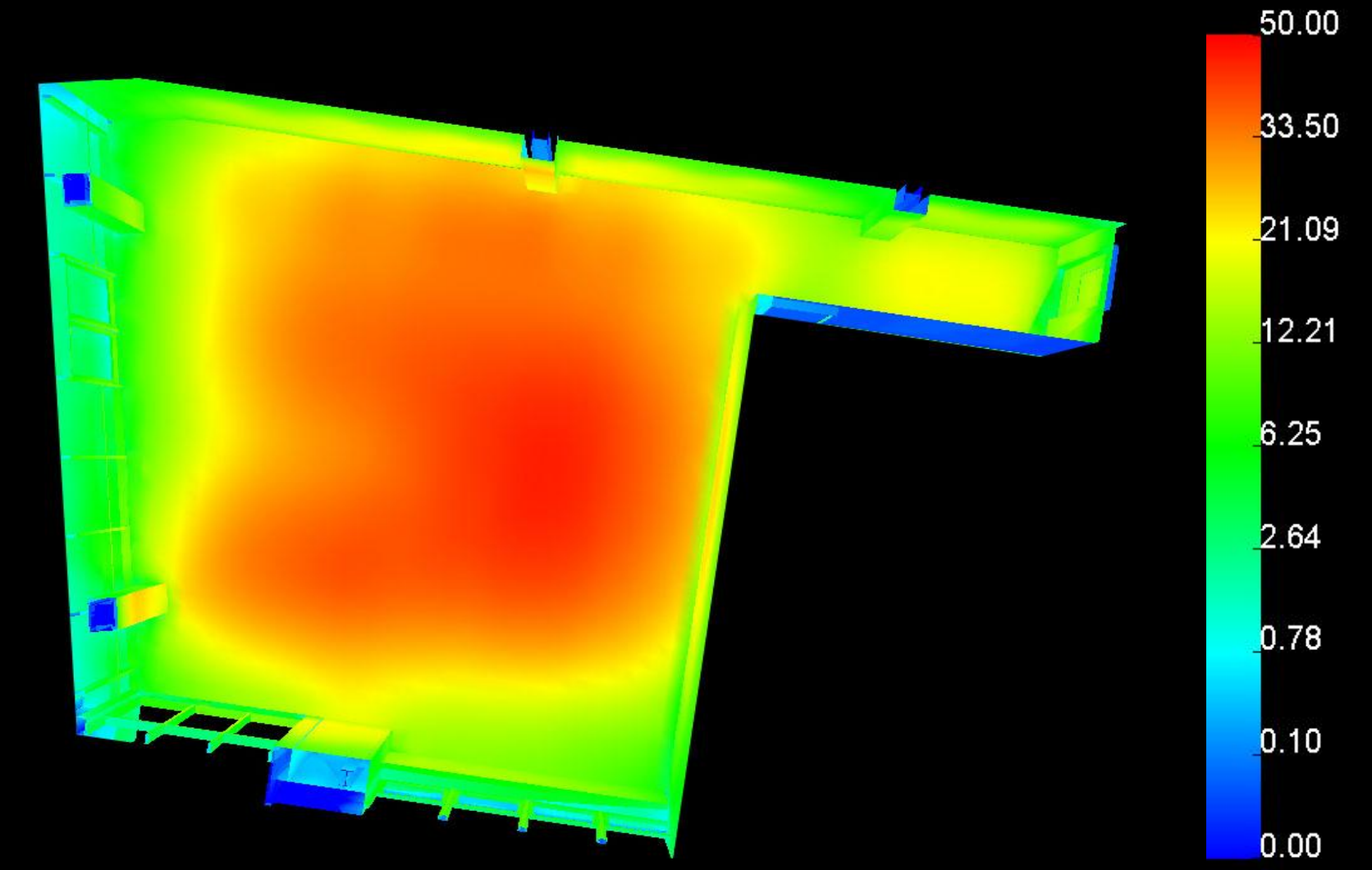
### Average Illuminance

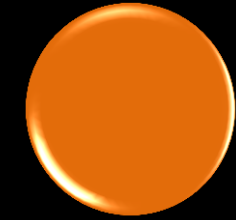


### Avg / Min



# false color





| renderings

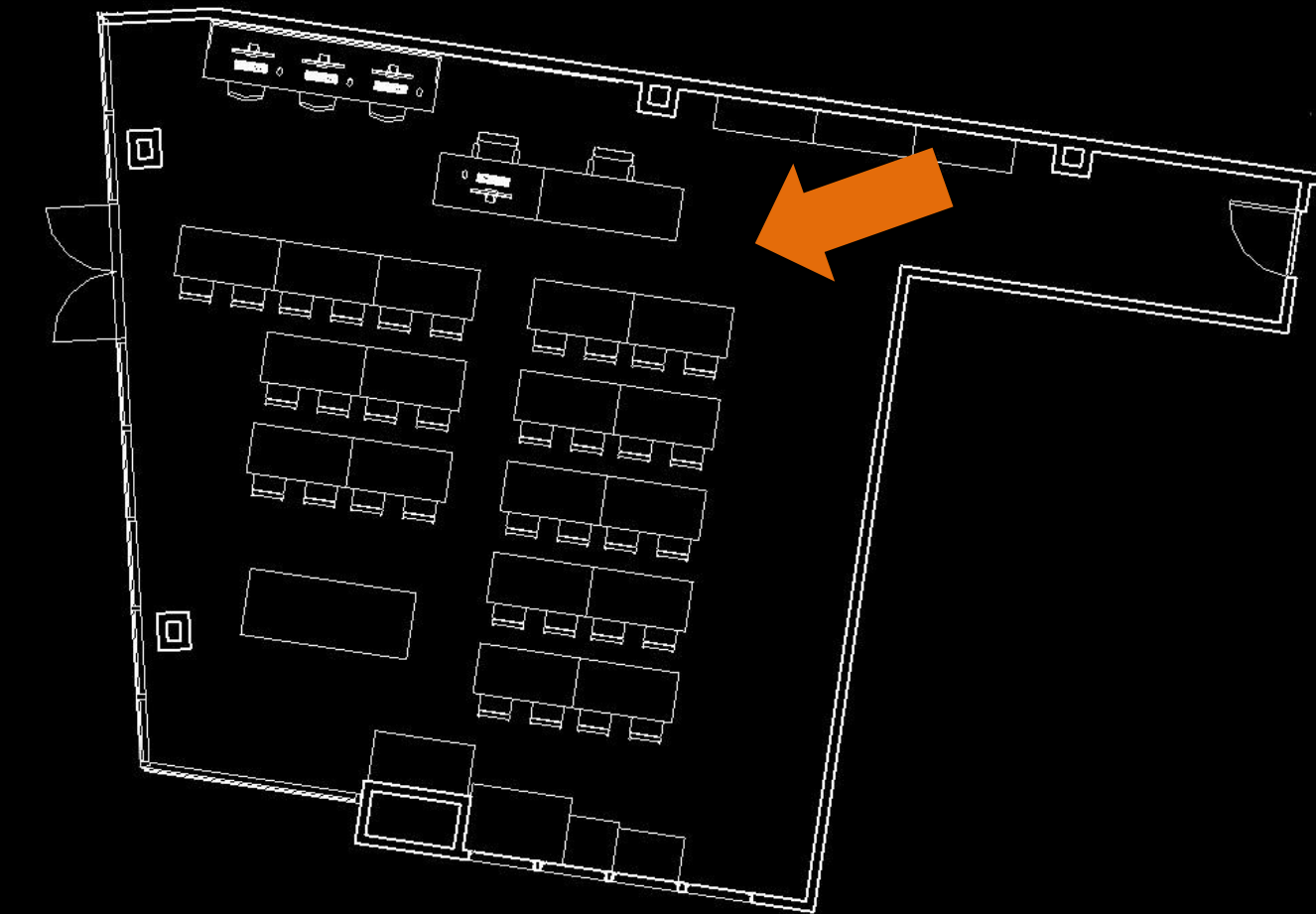
## lighting | renderings

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## image



## plan





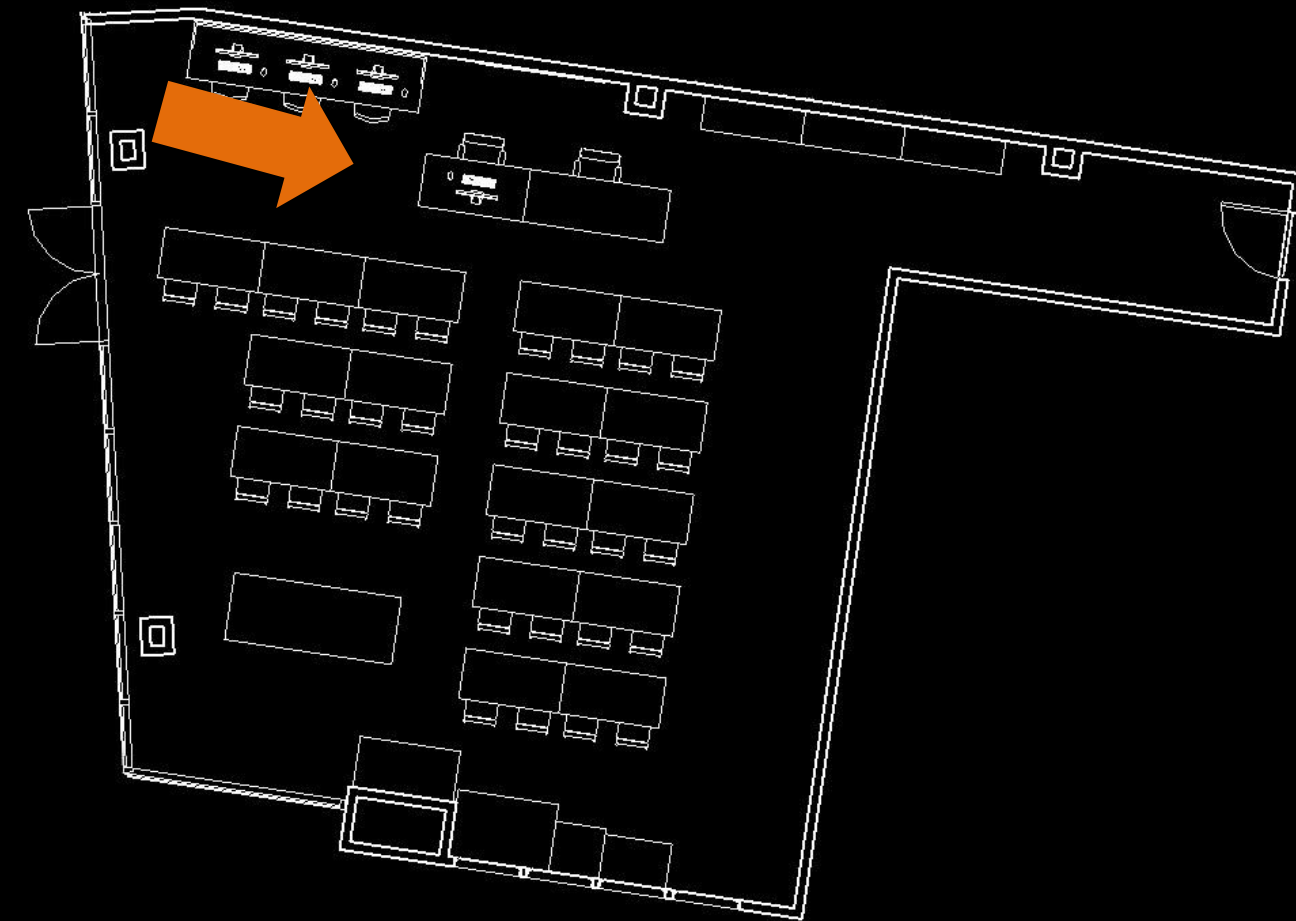
# lighting | renderings

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# image



# plan



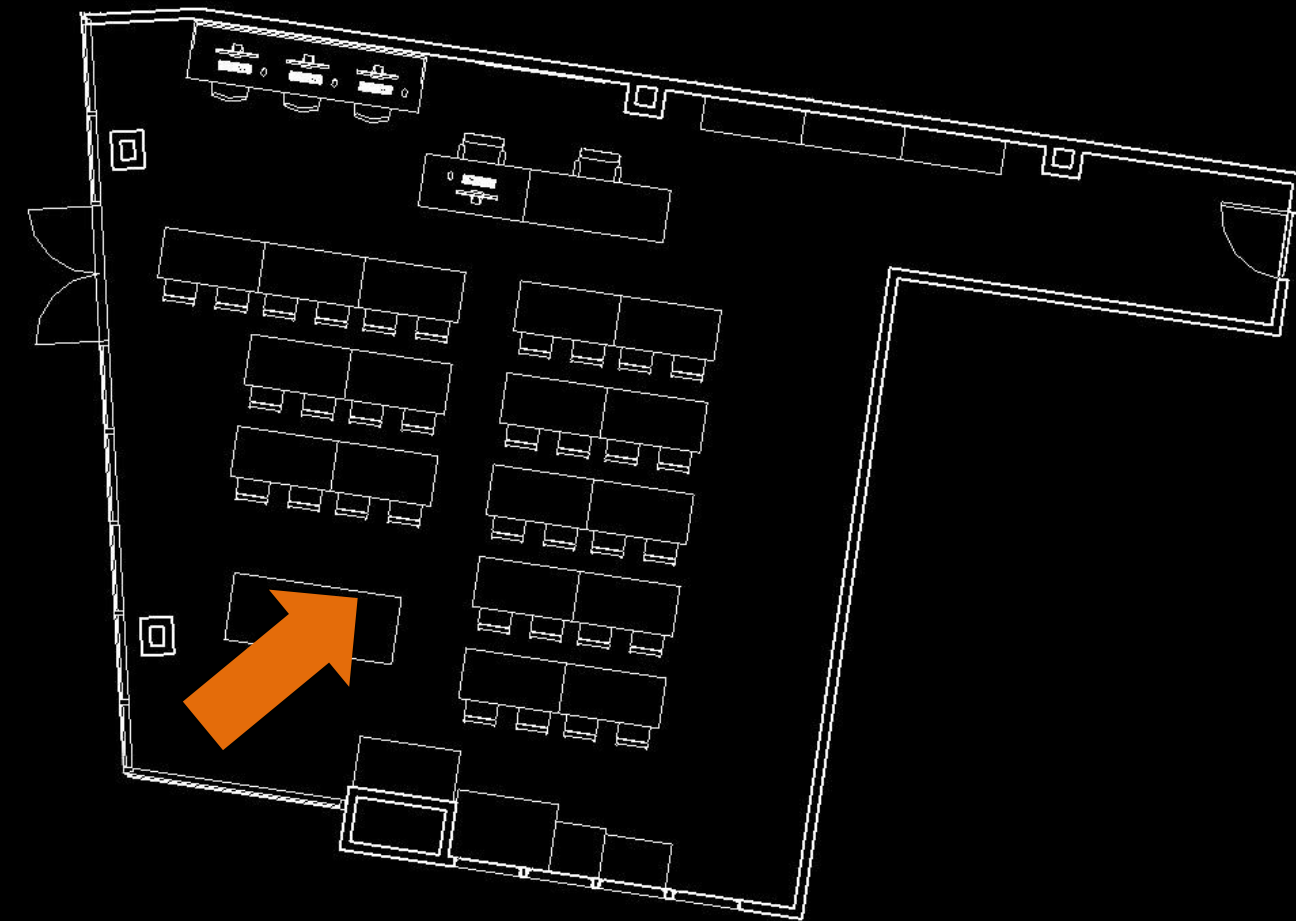
# lighting | renderings

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# image



# plan



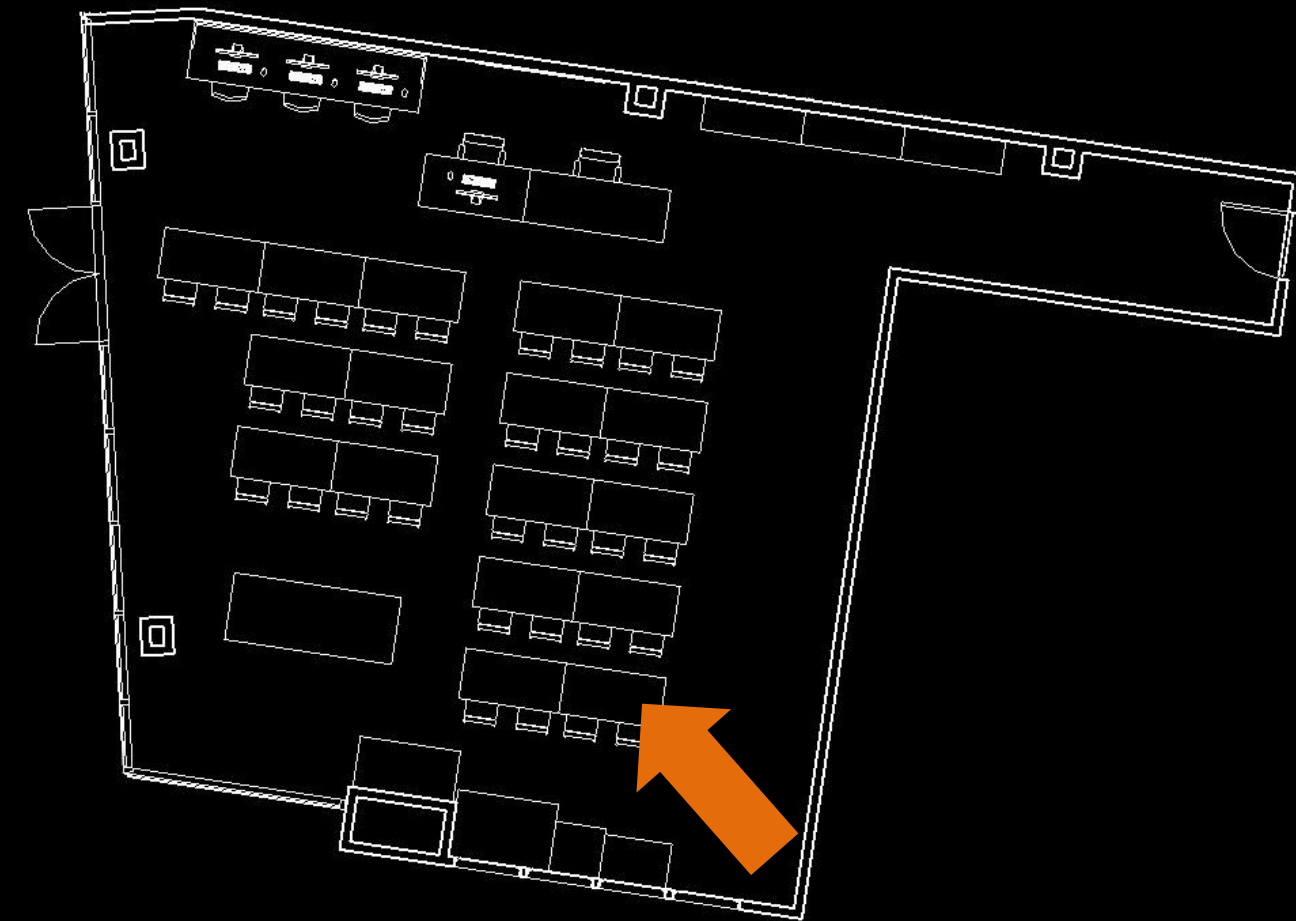
# lighting | renderings

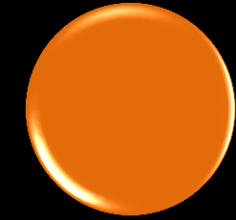
- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

# image



# plan



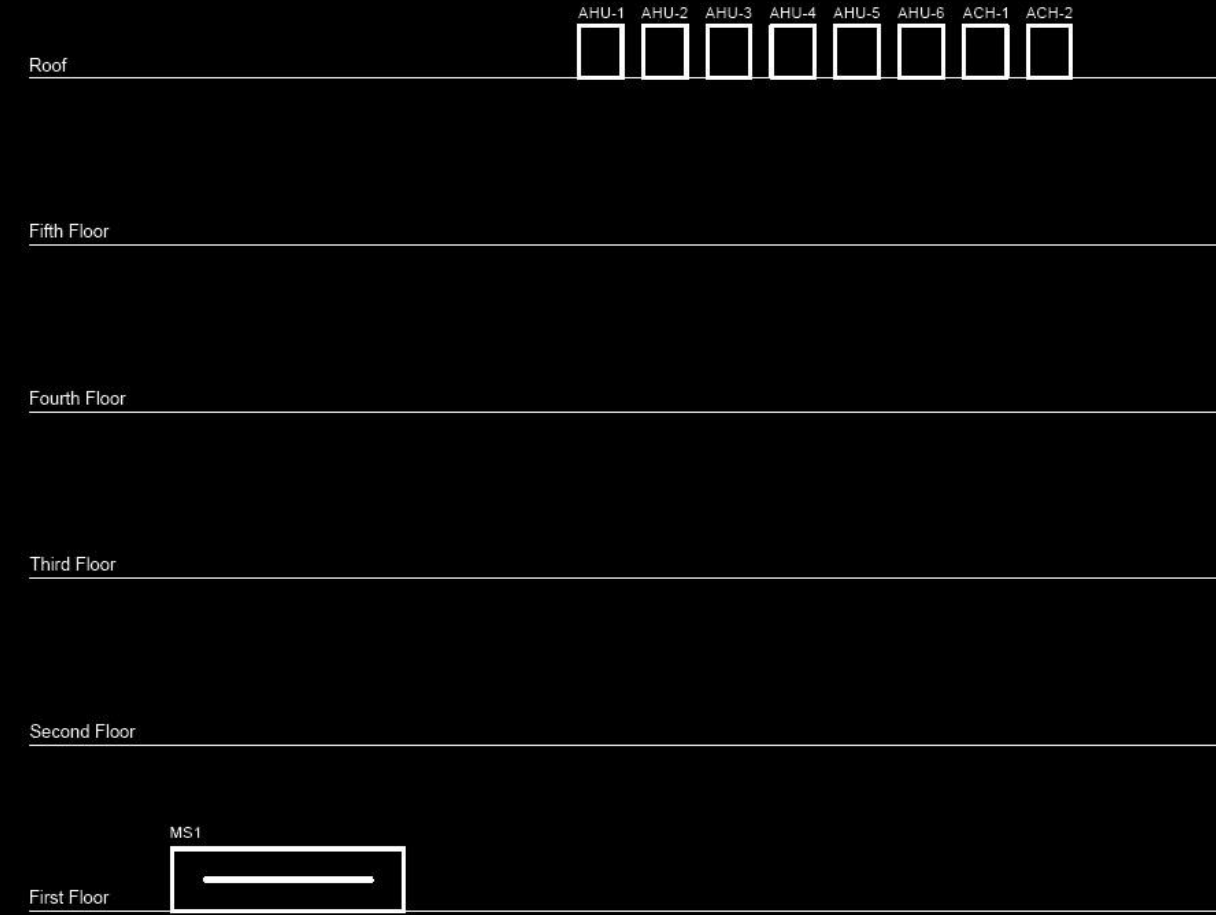


| electrical distribution

# electrical distribution | systems

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## existing



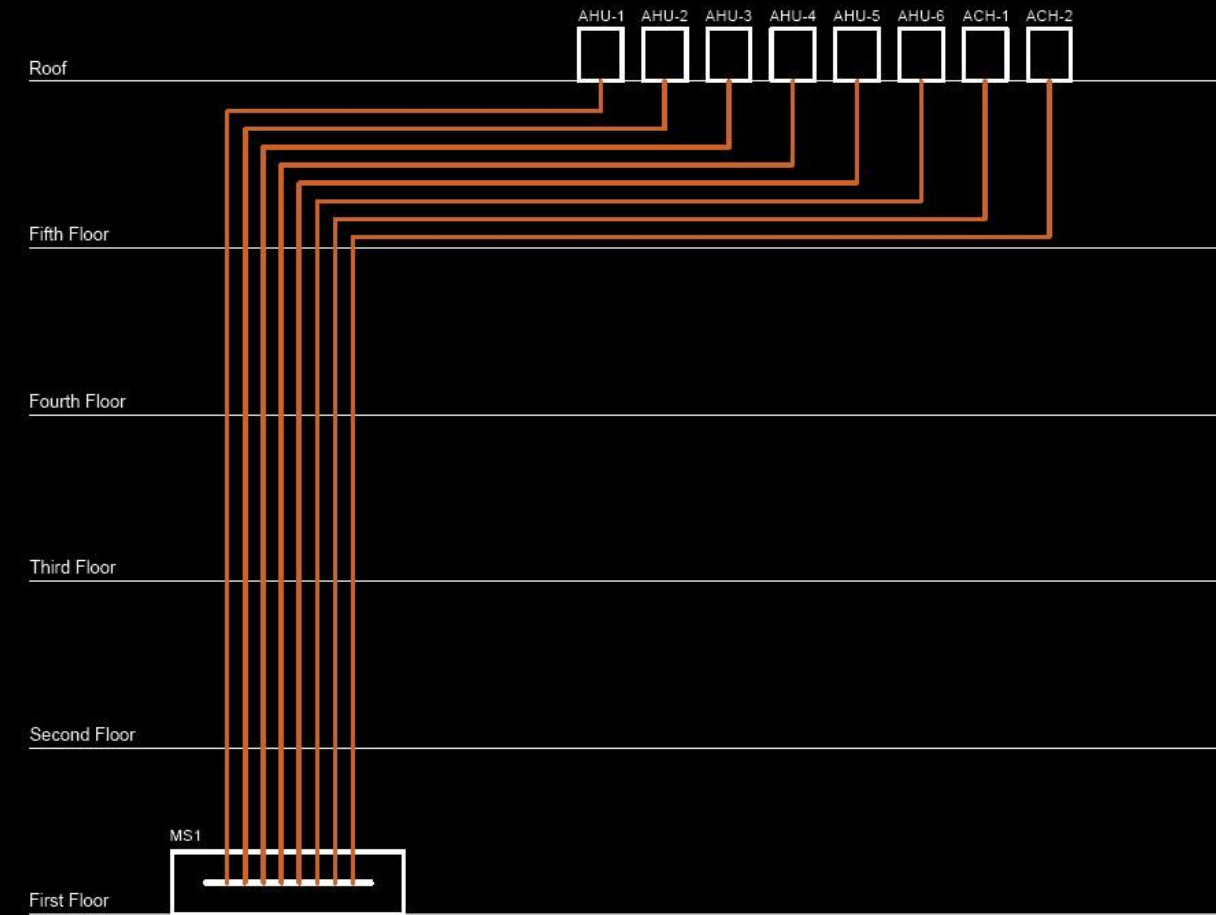
## proposed



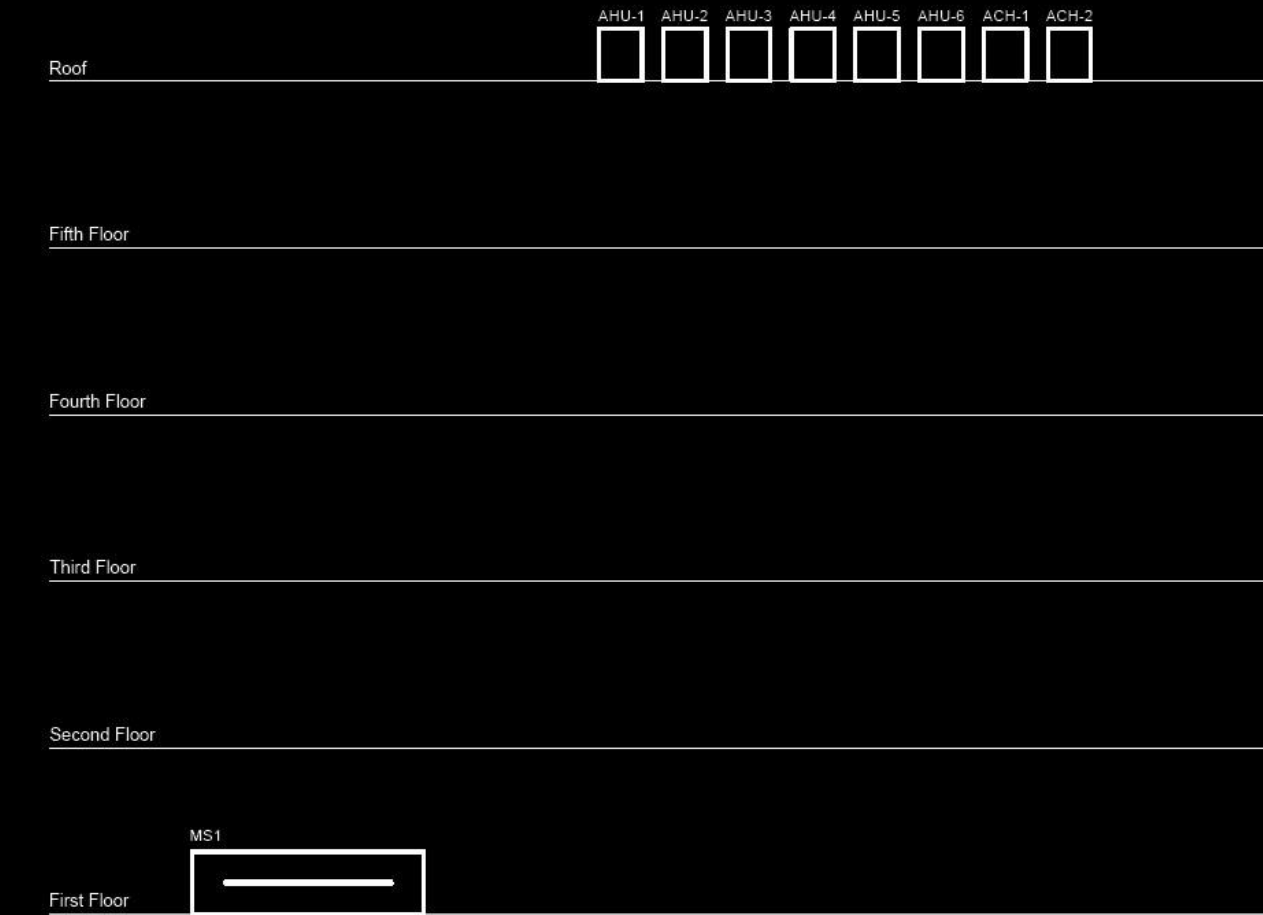
# electrical distribution | systems

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## existing



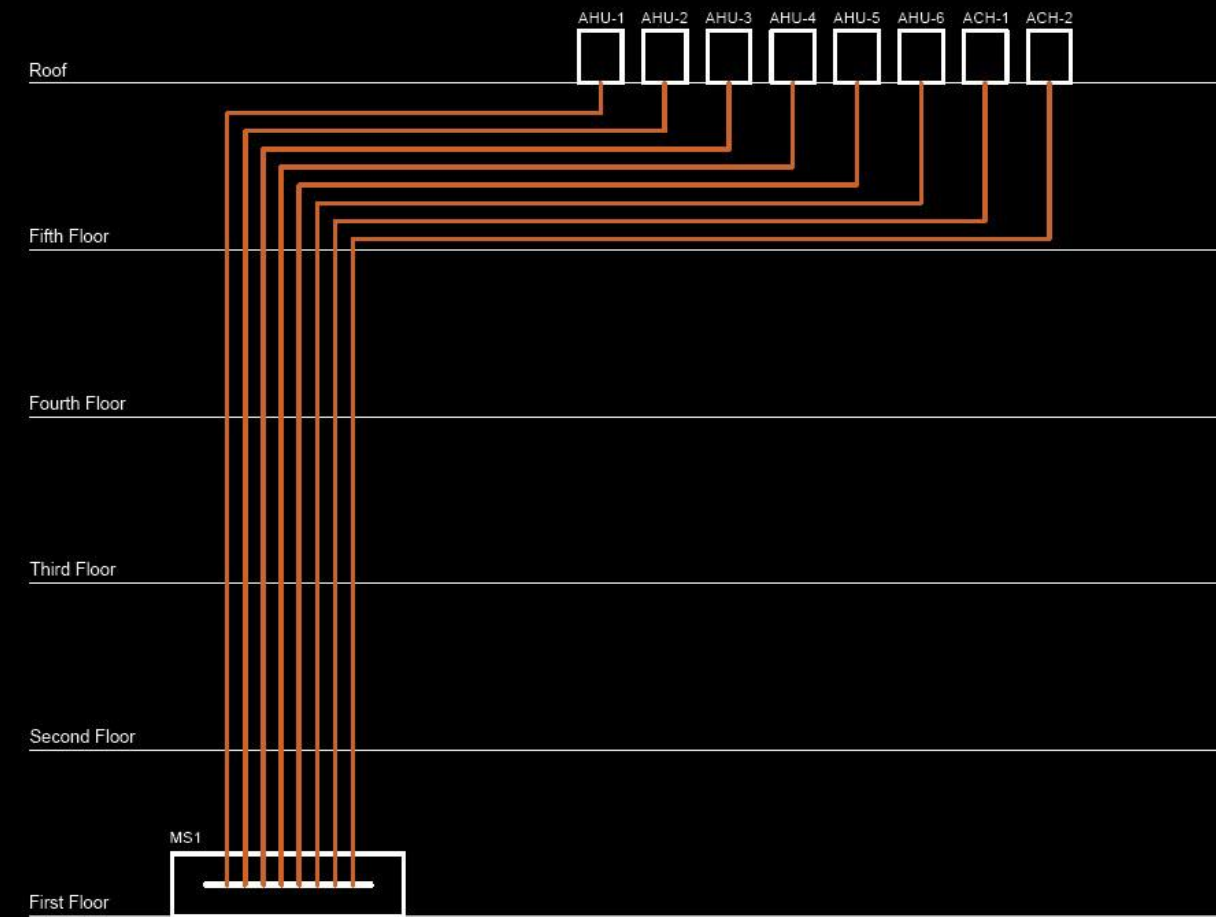
## proposed



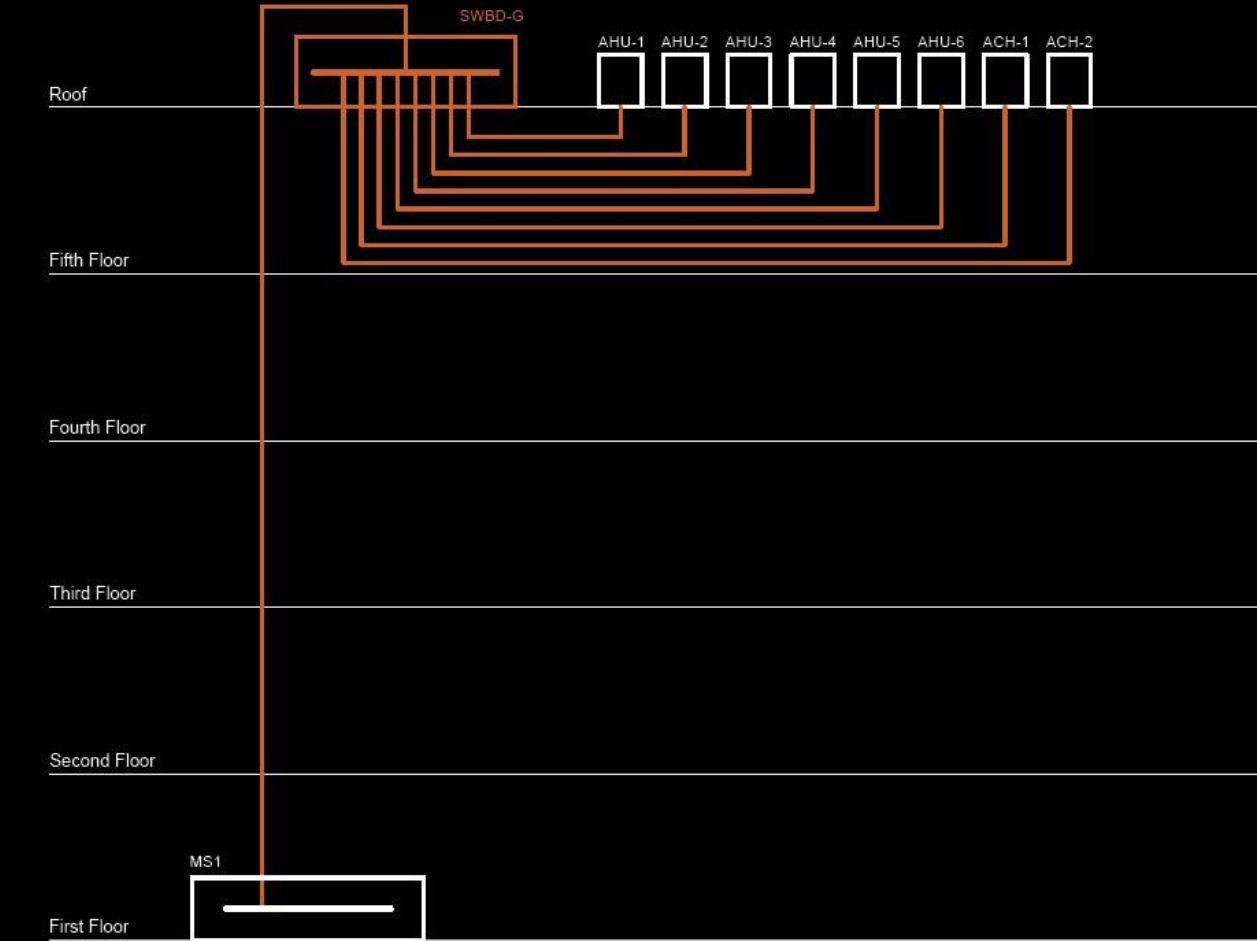
# electrical distribution | systems

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## existing



## proposed



# electrical distribution | systems

## existing

## proposed

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

material | \$ 198,015.43  
labor | \$ 78,688.27

material | \$ 42,107.63  
labor | \$ 29,055.24



# electrical distribution | systems

## existing

## proposed

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

material | \$ 198,015.43  
labor | \$ 78,688.27

total | \$ 276,703.70

material | \$ 42,107.63  
labor | \$ 29,055.24

total | \$ 71,162.87

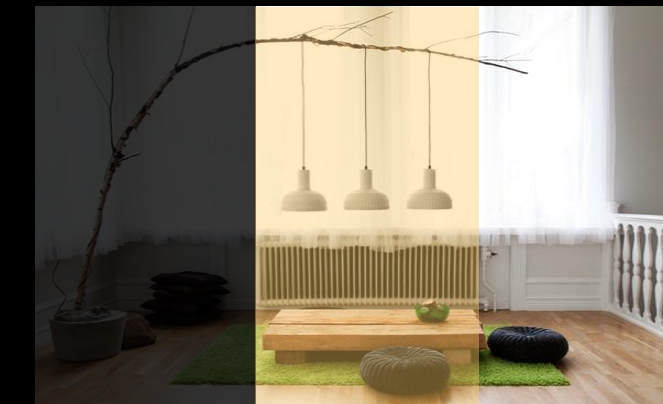
## conclusion | design

- | introduction
- | auditorium
- | high school art room
- | daylight analysis
- | mechanical load
- | ceiling coordination
- | lighting
- | electrical distribution
- | conclusion

## connect | people + programs



## connect | lighting + architecture



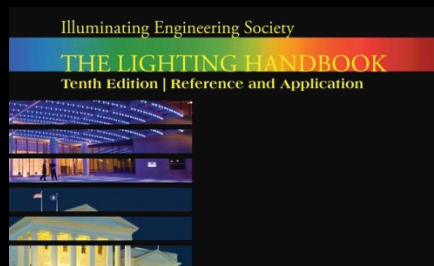
## Thank you



Audience



Penn State AE Department



Professors:  
Dr. Houser  
Dr. Mistrick  
Professor Ted Dannerth



Skanska



**THANK YOU!**

**QUESTIONS?**

### Electrical Assumptions

All existing wire is stranded copper, THWN

All proposed wire is stranded aluminum, THWN

All electrical cost data was taken from RS Means 2010

RS Means Conduit prices include 2 terminations, 2 elbows, 11 beam clamps, and 11 couplings per 100 LF

It was assumed that these inclusions were sufficient, and none were added in addition

Pull boxes are NEMA 1, sheet metal, 12"x12"x6"

Hanger price includes, hanger, bolt, and 12" rod

Hanger estimates include only standard hangers, no specialty hangers included

appendices | electrical

COMPARISON			
EXISTING	FEED FROM MS1 TO EQUIP.	MATERIAL	\$ 198,015.43
		LABOR	\$ 78,688.27
	<b>TOTAL:</b>		<b>\$ 276,703.70</b>
PROPOSED	FEED FROM MS1 TO SWBD-R	MATERIAL	\$ 13,921.20
		LABOR	\$ 9,940.53
	FEED FROM SWBD-R TO EQUIP.	MATERIAL	\$ 23,911.43
		LABOR	\$ 17,914.71
	1600A SWBD PRICE	MATERIAL	\$ 4,275.00
		LABOR	\$ 1,200.00
	<b>TOTAL:</b>		<b>\$ 71,162.87</b>

SAVINGS: **\$ 205,540.83**

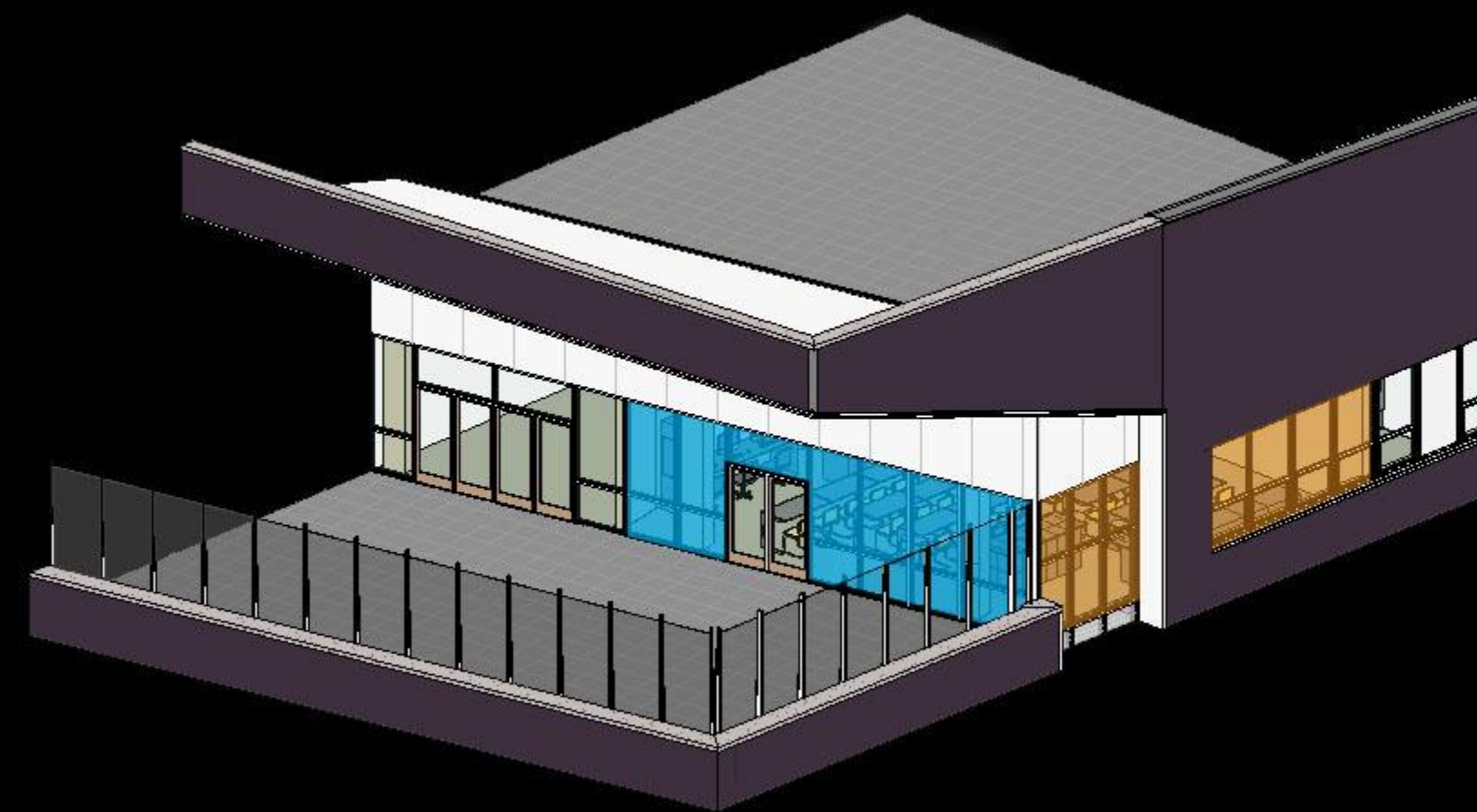
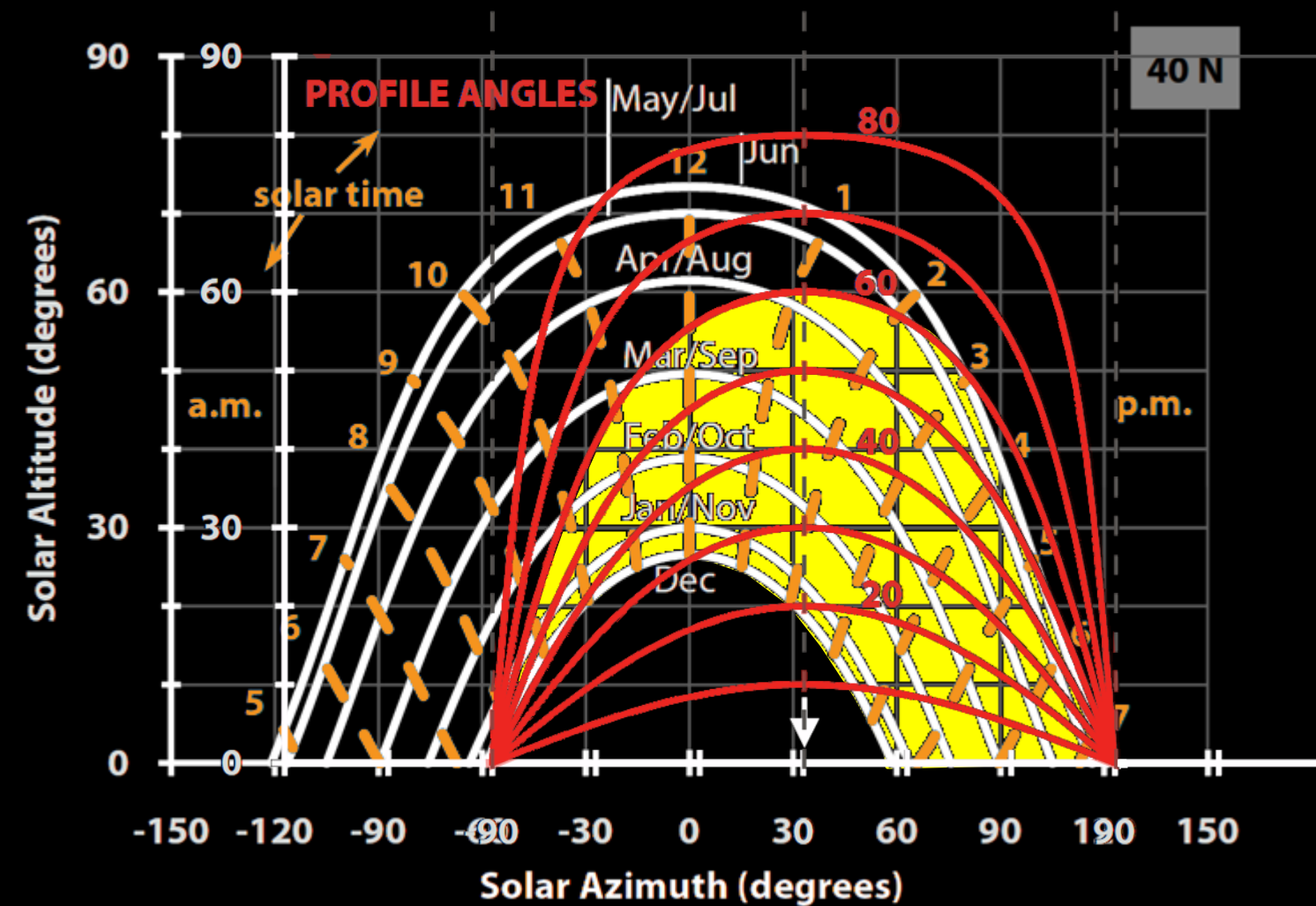
$$Q = 1.08 * CFM * dT$$

$$Q = 1.08 * (1950) * (75 - 64.1) = 22,955$$

	208/120 V	480/277 V
Material	\$23,911.43	\$10,933.21
Labor	\$17,914.71	\$9,739.67
<b>Total:</b>	<b>\$41,826.14</b>	<b>\$20,672.88</b>

# appendices | daylighting

## Facade 1



# appendices | daylighting Facade 2

Statistics

**Project 1**  
**Calc Pts**

CalcPts  
Illuminance (Fc)  
Average=27.32 Maximum=48.5  
Minimum=6.8 Avg/Min=4.02 Max/Min=7.13  
No.Points=287 %Pts.Range(22.5-27.5)=16.03%

