Fraunhofer

CSE Renovation Project
Boston, MA

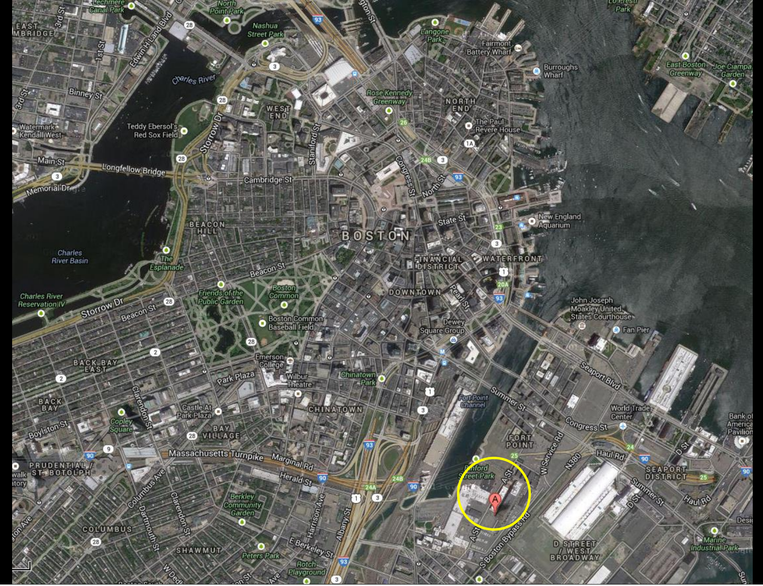
Xiaoyin Wu (Laura)
Lighting/Electrical | Architectural Engineering | Penn State University

PROJECT OVERVIEW | LOBBY LIGHTING DESIGN | OFFICE REDESIGN | ELECTRICAL DEPTH | SUMMARY

Fraunhofer

Project Overview

Building Name-	Fraunhofer CSE
Location-	5 Channel Center Street, Boston, MA
Occupancy Type-	Offices and research laboratories (Group B) Conference room (Group A-3)
Size-	42150SF
Stories above Grade-	6



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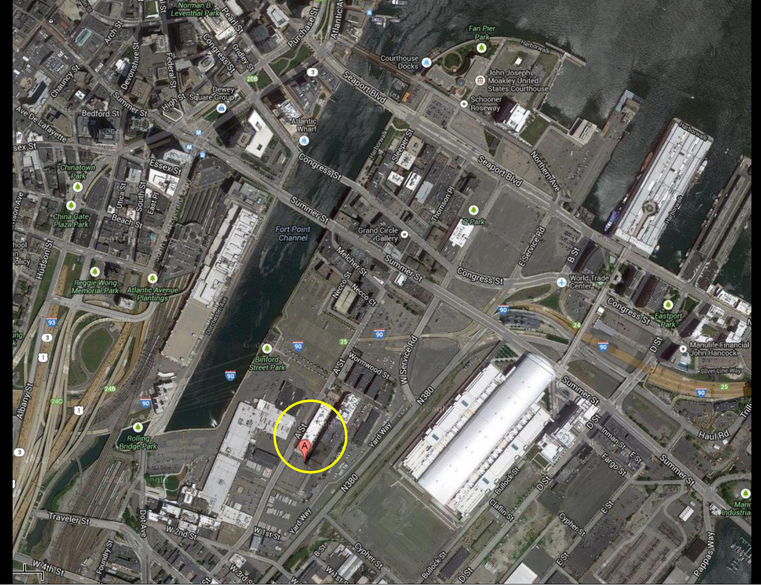

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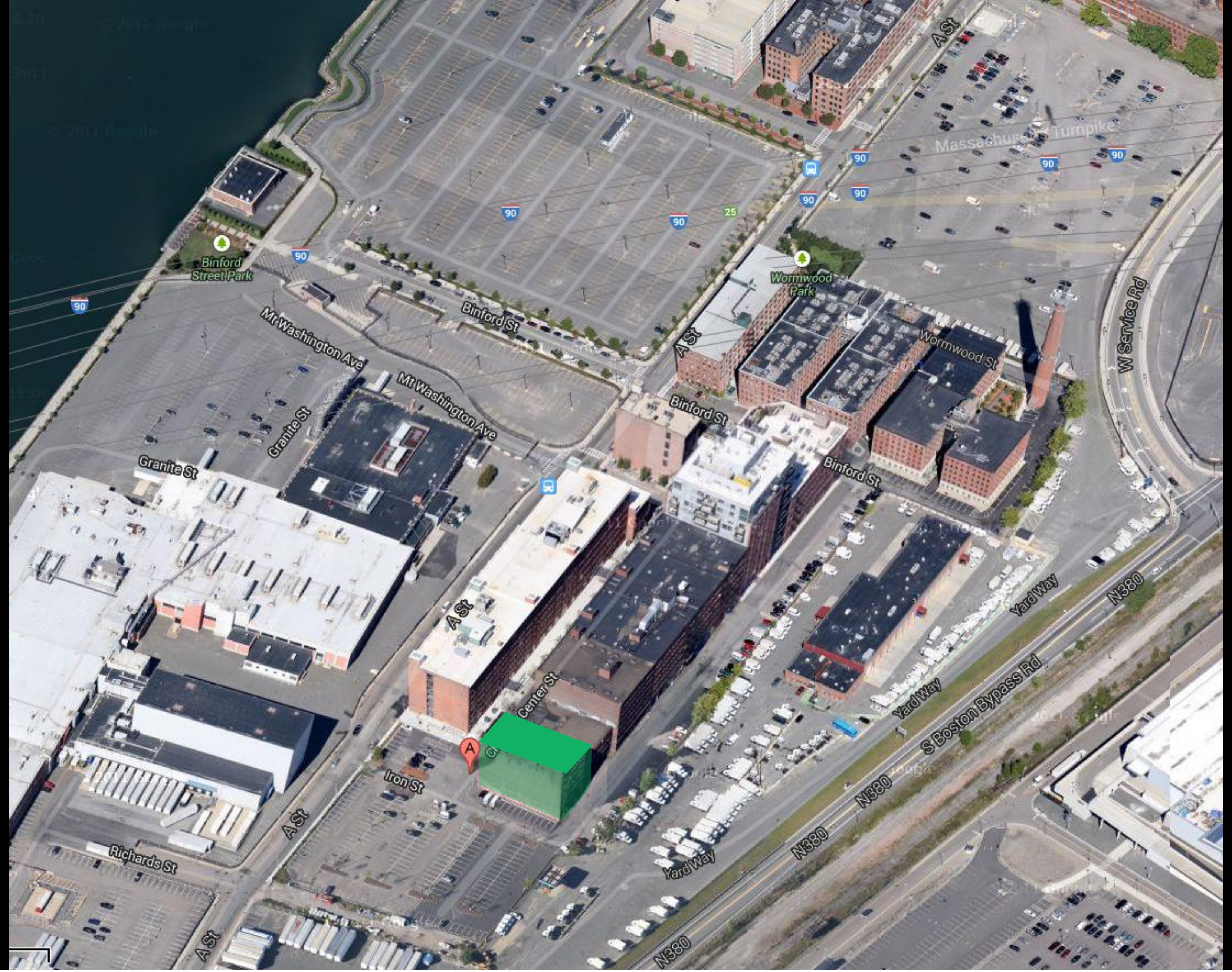

a renovation for a 100-year old **historical** building **classical revival-style** detailing the Fort Point Channel district is marked by an exceptional degree of **visual uniformity** buildings are elegantly proportioned, with classically inspired details concentrated at entrances and cornices the structure is left unchanged in this project to **conserve the significant continuity** throughout the District in terms of massing, scale, and style

Fraunhofer

OUTLINE

Design Concept

scope of work

lobby lighting design

office
- architecture breadth
- lighting design

electrical depth

Based in Boston, MA, the Fraunhofer Center for Sustainable Energy Systems (CSE) is an applied research and development laboratory dedicated to the commercialization of **CLEAN** energy **TECHNOLOGY**. CSE engages in **COLLABORATIVE** research and development with private companies, government entities, and academic institutions, performing research that broadly benefits firms, industries, and society.

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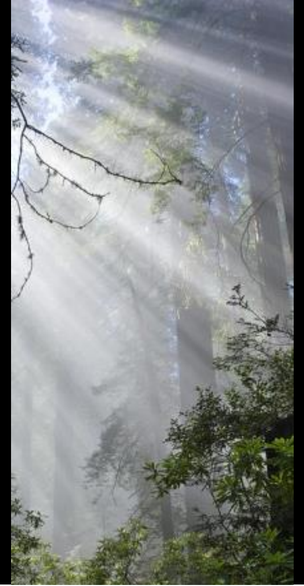

REFRESH

OUTLINE

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What you expect to see before you enter the building
Vs.
What you WILL see when you enter

OUTLINE

design concept

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Lighting Redesign
- **Lobby**
- **Conference Room**
- **Open Office**
- **Façade**

Electrical Depth
- **Branch Circuit Redesign and Feeder Resizing**
- **PV Economical Analysis**

Breadth
- **Architecture**
- **Structure**

OUTLINE

design concept

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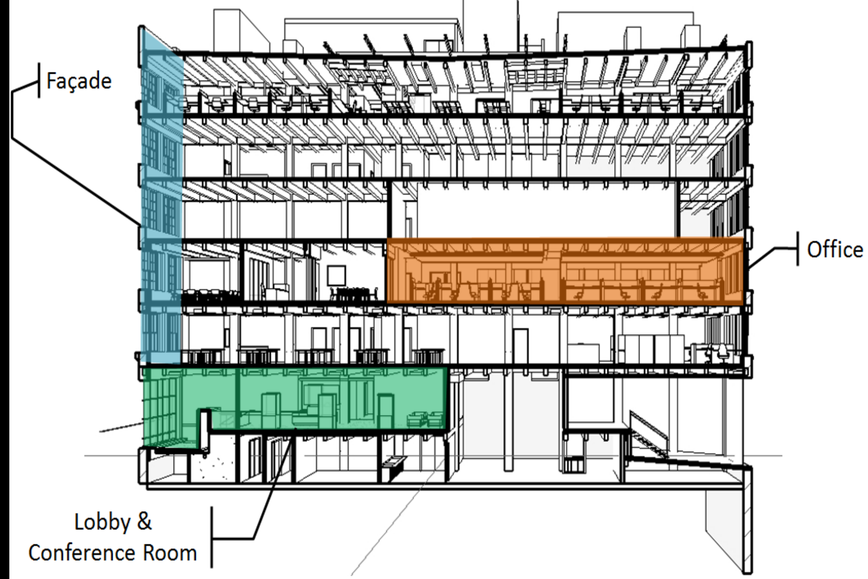
Lighting Redesign
- **LOBBY**
- Conference Room
- **OPEN OFFICE**
- Façade

Electrical Depth
- Branch Circuit Redesign And Feeder Resizing
- **PV ECONOMICAL ANALYSIS**

Breadth
- **ARCHITECTURE**
- Structure



OUTLINE

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Lobby Lighting Design

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LOBBY

Fraunhofer

OUTLINE

design concept

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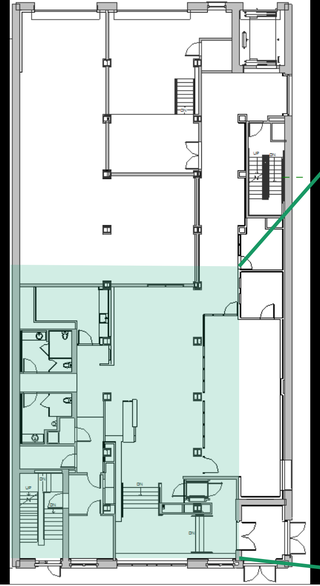
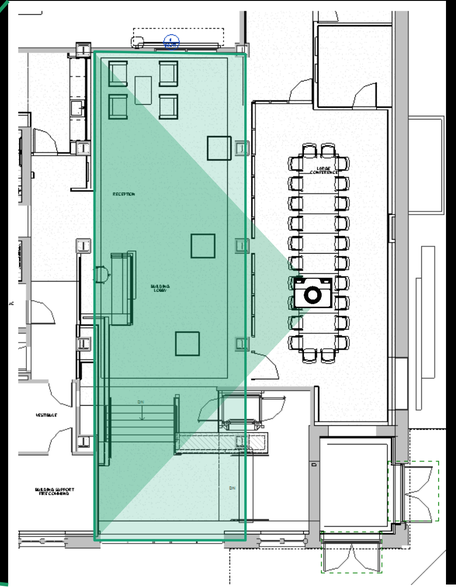
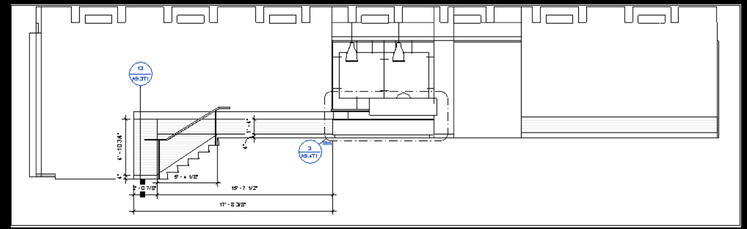
Width: 19’-10”
Length: 47’-8”
Height: 8’-10 ¼







OUTLINE

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Gateway from history to the contemporary

Visual Considerations
- Appearance
- Accenting
- Flexibility
- Way finding/Orientation

Quality Lighting
- 100lux horizontally
- avg:min = 4:1

OUTLINE

design concept

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Lobby Lighting Design

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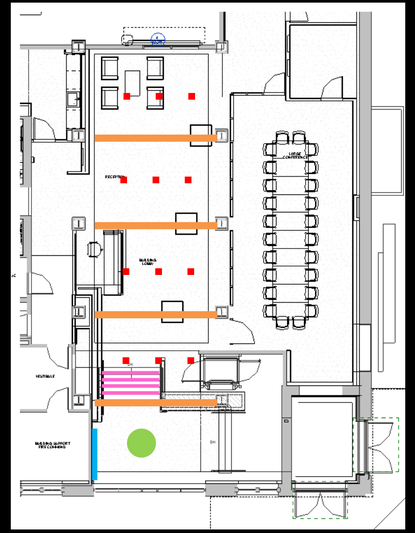

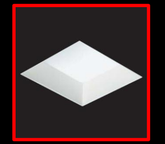

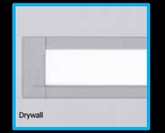

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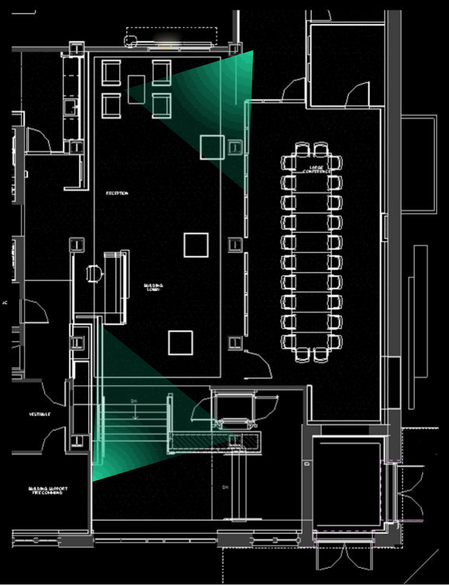

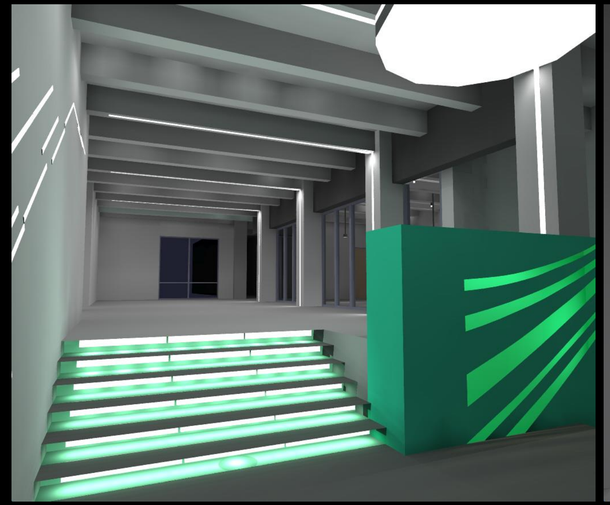

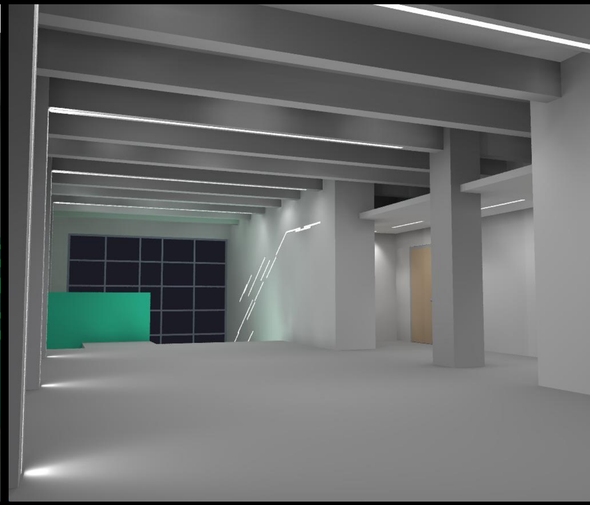

Fraunhofer

RENDERINGS

OUTLINE

design concept

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office

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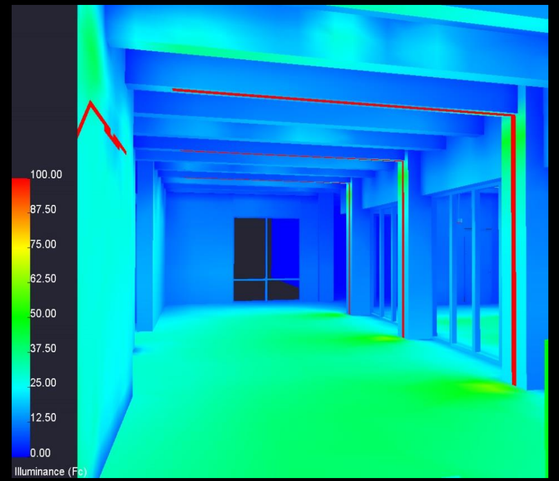
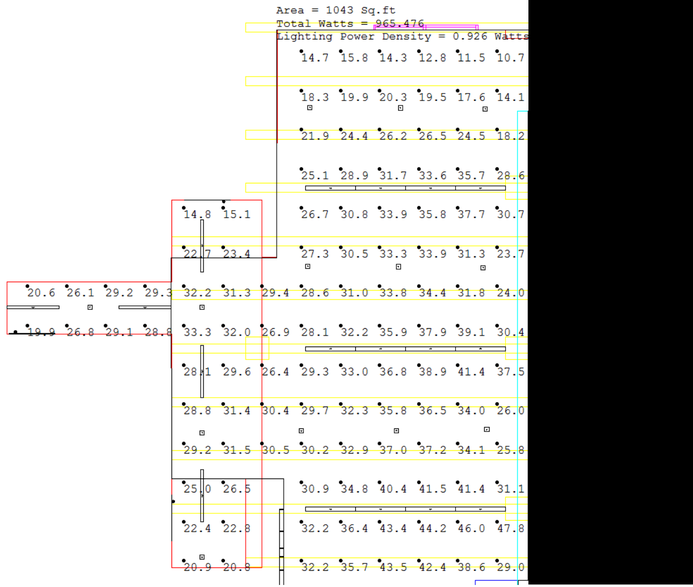
lighting design

electrical depth



Average Illuminance | 29.5Fc
Avg : Min | 2.76



OUTLINE

design concept

scope of work

lobby lighting design

Office
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electrical depth

3rd FLOOR OFFICE

OUTLINE

design concept

scope of work

lobby lighting design

Office

- architecture breadth
- lighting design

electrical depth

OUTLINE

design concept

scope of work

lobby lighting design

Office

- architecture breadth
- lighting design

electrical depth

OUTLINE

design concept

scope of work

lobby lighting design

Office

Architecture breadth

lighting design

electrical depth

open
office

OUTLINE

design concept

scope of work

lobby lighting design

Office

- Architecture breadth
- lighting design

electrical depth

OPEN
office

Brighten Your Everyday

“Practical, aesthetic, and conducive to intended purposes, such as raising productivity, selling merchandise, or improving life style."
-- U.S. Bureau of labor Statistics

Interior design is a practice that responds to changes in the economy, organization, technology, demographics, and business goals of an organization.

OUTLINE

design concept

scope of work

lobby lighting design

Office

Architecture breadth

lighting design

electrical depth

OPEN
office

Brighten Your Everyday

OUTLINE

design concept

scope of work

lobby lighting design

Office

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lighting design

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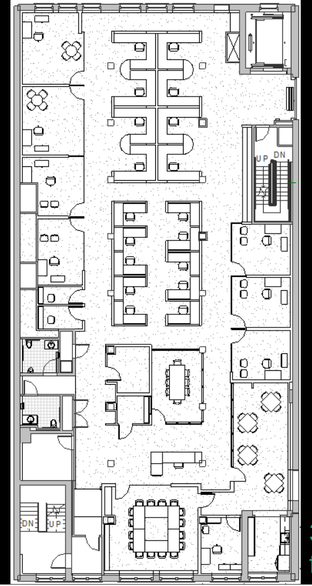
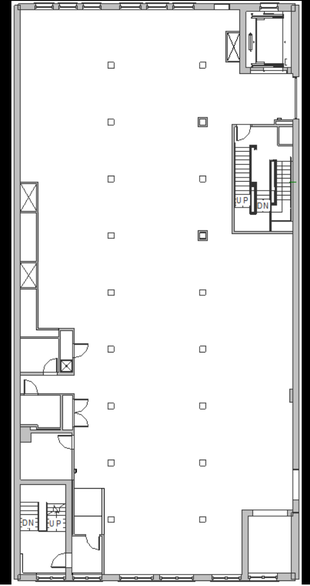
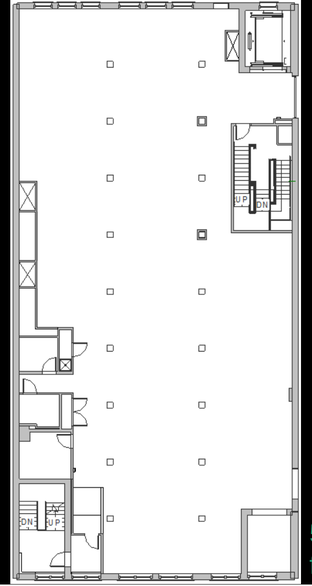


3rd floor



4th floor



5th floor

OUTLINE

design concept

scope of work

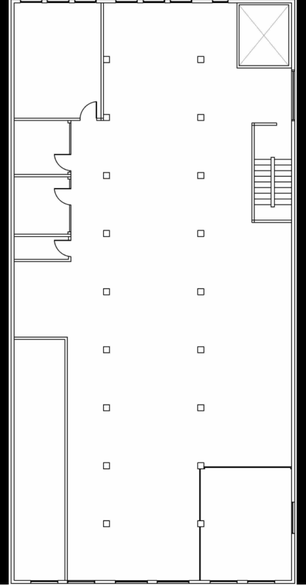
lobby lighting design

Office

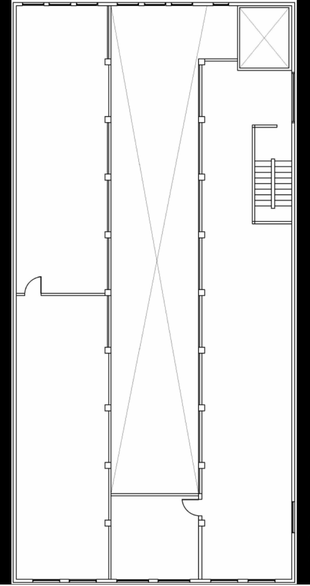
Architecture breadth

lighting design

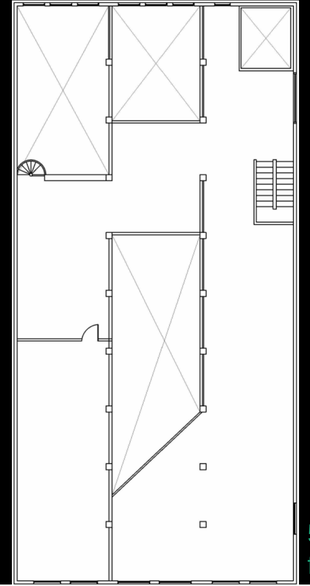
electrical depth



3rd floor



4th floor



5th floor

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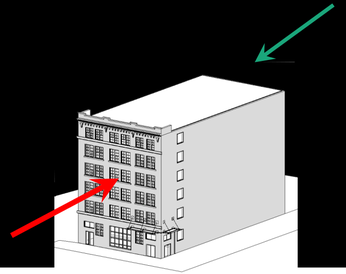
Office

Architecture breadth

lighting design

electrical depth



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- Lighting design

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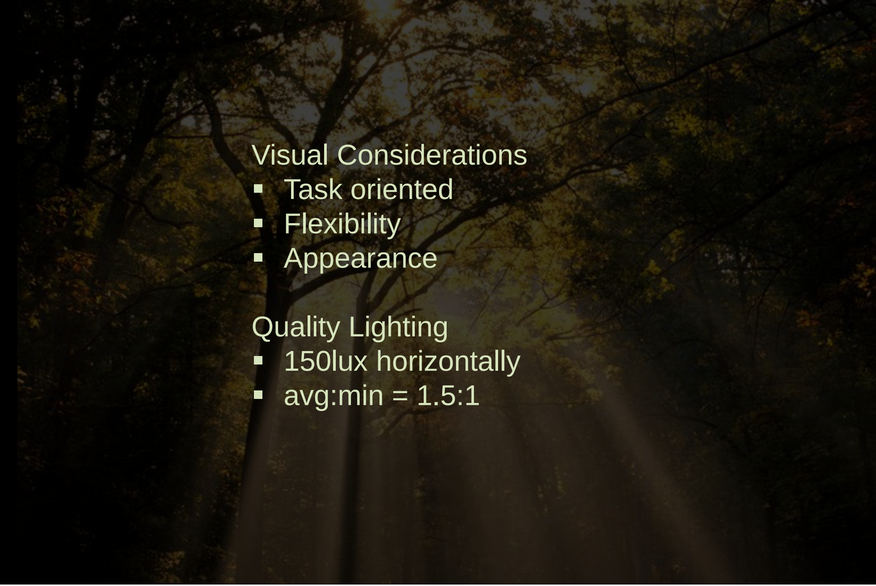
OFFICE LIGHTING REDESIGN



Visual Considerations

- Task oriented
- Flexibility
- Appearance

Quality Lighting

- 150lux horizontally
- avg:min = 1.5:1

OUTLINE

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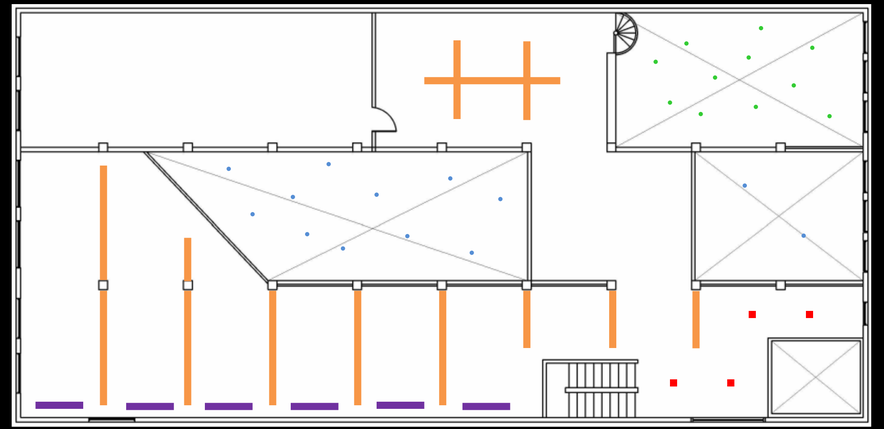

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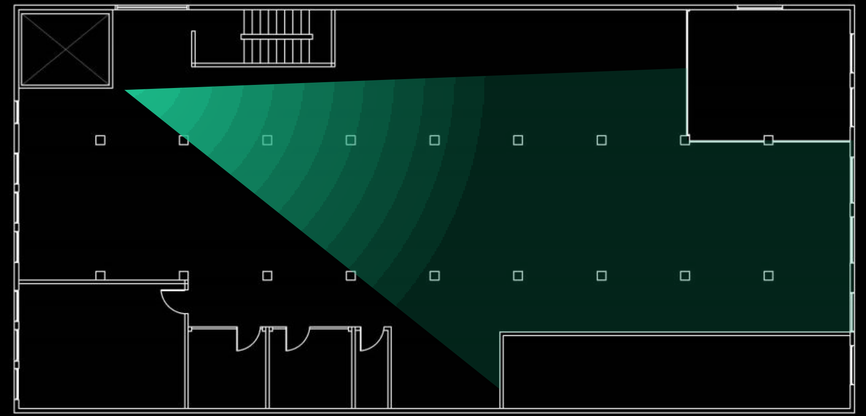

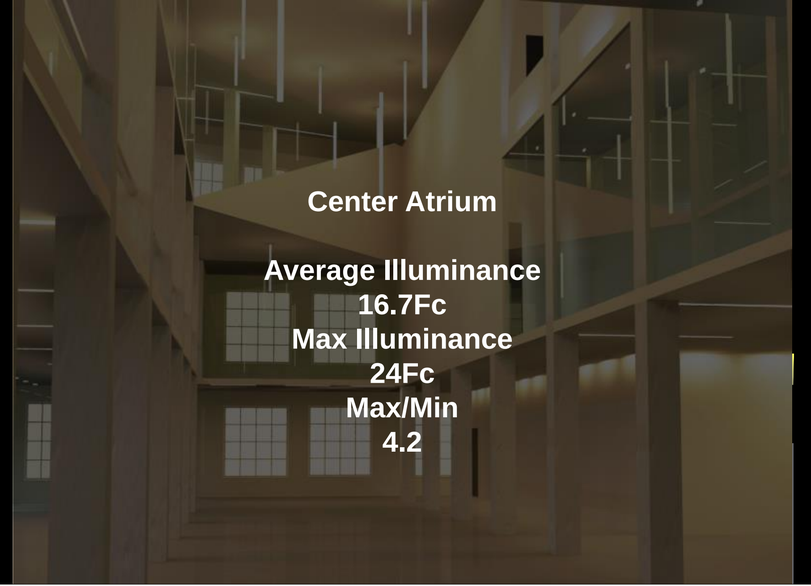

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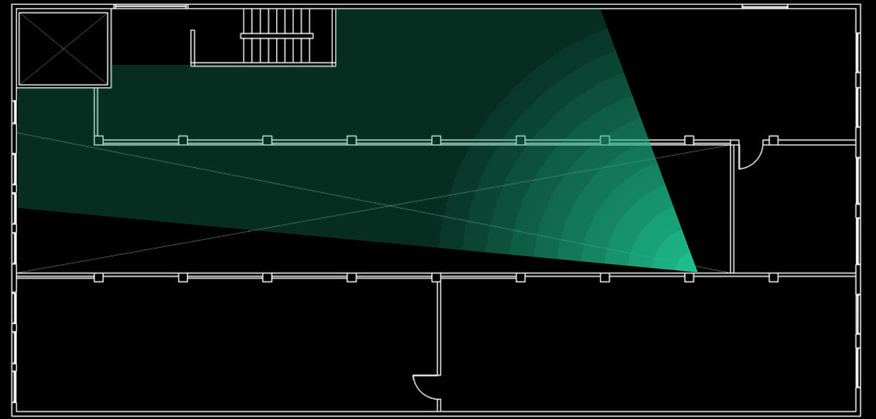

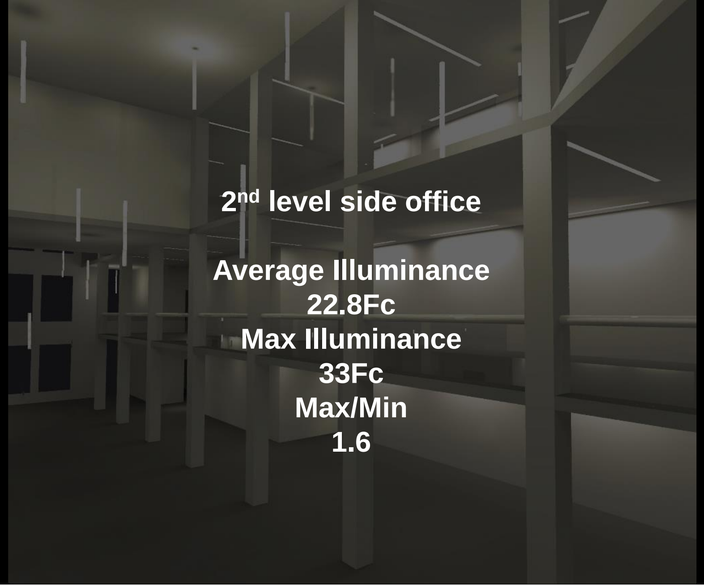

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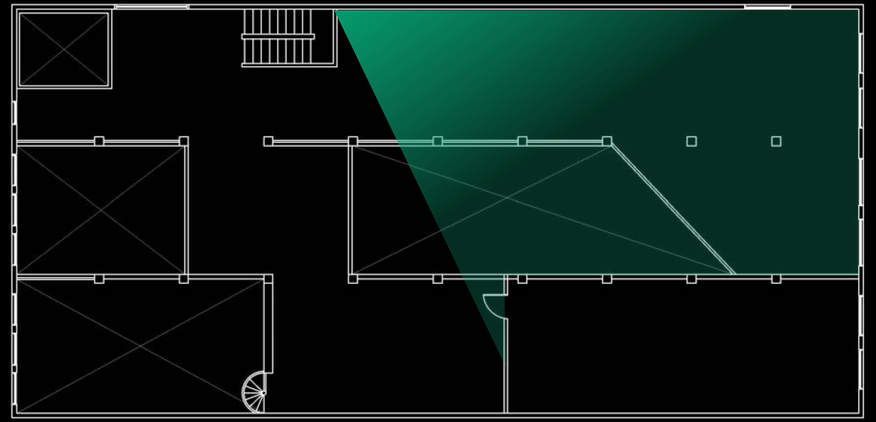

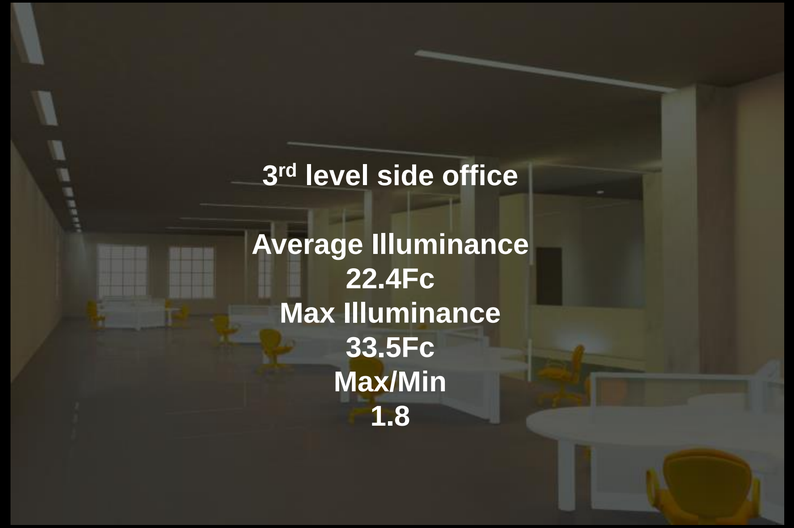

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Electrical Depth

ELECTRICAL SYSTEM

OUTLINE

design concept

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lobby lighting design

office

architecture breadth

lighting design

Electrical Depth

Penal Board	Lighting (VA)	Receptacle (VA)	Equipment (VA)	
P2B	0	27000	4576	
P22	770	31000	15476	
P23	883	21140	24400	
P21B	8233	12140	12504	
P24	4524	800	0	
P25	800	0	2400	
P26	1800	36500	21080	
L42	20920	0	0	
L44	4299	0	0	
P32	0	0	11200	
P22A	0	0	40292	
EP4B	12033	0	92520	
P21A	0	0	600	
P2P	0	1800	8700	
EP2B	1080	1500	6584	
Total (kVA)	55.342	131.88	240.332	427.554

NSTAR
Peak Demand Rate = $28.62/kW (per month)
Electric Rate: $0.08145/kWh
Delivery Charge = $115/month (flat rate)

Array Area	1300 sf
PV rate	100w/sf
Total watt per array	130kw
Total Load usage per year	14.8kw
PV cost/watt	$1.4/w
PV cost per year	$14800
Watt save per year	130kw
Conventional Power	$17619
	($2819)

ACKNOWLEDGEMENTS

SPECIAL THANKS TO:

Fruanhofer CSE
Dr. Kurt Roth

Philips
Ms. Dorene Mannicia
Mrs. Carol Jones
Ms. Meg Smith

DiMella Shaffer
Mr. J. Cruz

Penn State
Mr. Shawn Good
Ms. Leslie Beahm
Dr. Kevin Houser
Dr. Rickard Mistrick
Dr. Charles Cox
Professor Kevin Parfitt

And thanks to my parents, fellow AEs and friends for the best support I could ask for

SUMMARY

Lighting redesign of the spaces achieved the design goals of providing the spaces quality lighting as well as a modern new appearance while saving energy the same time.

The electrical part is altered according to the new design of lighting and control load. Since the building is not completely finished of the retrofit process, the load is slightly higher than the current load due to the vacant of two stories.

The architecture breadth has a cohesive design with the lighting design in the office space. And it accomplished the goal of creating a better working environment.

QUESTIONS?

APPENDICES

Customer (per month) $18.19	Distribution Energy First 2,000 kWh (per kWh) $0.02419	Distribution Energy Next 150 hours of kW (per kWh) $0.01914
Distribution Energy Each additional kWh (per kWh) $0.01727	Distribution Demand Greater than 10 kW (per kW) $9.43	Transition Energy First 2,000 kWh (per kWh) $0.00783
Transition Energy Next 150 hours of kW (per kWh) $0.00783	Transition Energy Each additional kWh (per kWh) $0.00783	Transition Demand (per kW) No Charge
Transmission Demand Greater than 10kW (per kW) $5.54	Transmission Energy First 2,000 kWh (per kWh) No Charge	Transmission Energy Next 150 hours of kW (per kWh) No Charge
Transmission Energy Each additional kWh (per kWh) No Charge	Energy Conservation (per kWh) $0.00250	Renewable Energy (per kWh) $0.00050

Customer (per month) $18.19	Distribution Energy First 2,000 kWh (per kWh) $0.03412	Distribution Energy Next 150 hours of kW (per kWh) $0.02087
Distribution Energy Each additional kWh (per kWh) $0.01776	Distribution Demand Greater than 10 kW (per kW) $20.22	Transition Energy First 2,000 kWh (per kWh) $0.00783
Transition Energy Next 150 hours of kW (per kWh) $0.00783	Transition Energy Each additional kWh (per kWh) $0.00783	Transition Demand (per kW) No Charge
Transmission Demand Greater than 10kW (per kW) $14.68	Transmission Energy First 2,000 kWh (per kWh) No Charge	Transmission Energy Next 150 hours of kW (per kWh) No Charge
Transmission Energy Each additional kWh (per kWh) No Charge	Energy Conservation (per kWh) $0.00250	Renewable Energy (per kWh) $0.00050

APPENDICES

http://www.nrel.gov/