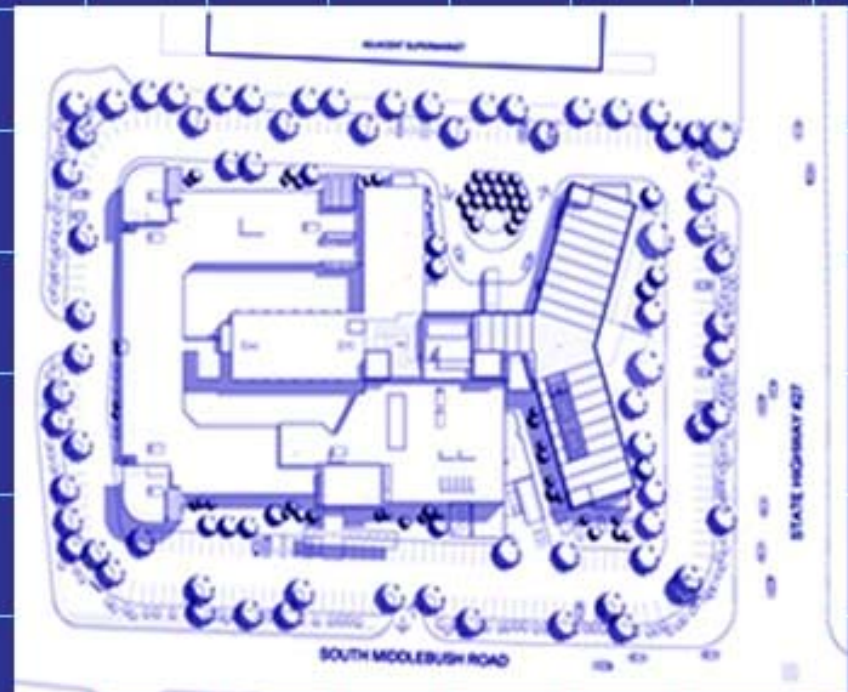


Senior Thesis 2006

Jennifer Curley

Lighting/Electrical Option
The Franklin Care Center
Franklin Lakes, NJ
Faculty Advisor:
Dr. Moeck



FRANKLIN CARE CENTER

Franklin Lakes, NJ

<http://www.arche.psu.edu/thesis/eportfolio/current/portfolios/jpc135/>

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LIGHTING/ELECTRICAL OPTION

▪ Background ▪

Project: The Franklin Care Center: Addition and renovation

Location: Franklin Lakes, New Jersey

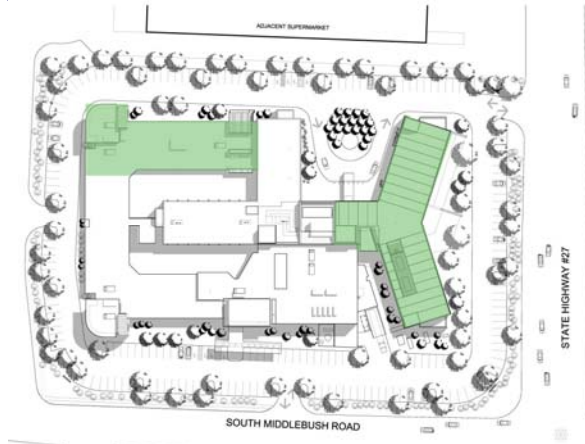
Size: 150,000 sq.ft – 2 stories with cellar

Architect: Beckhard Richland Szerbaty + Associates

Function: Elderly Rehabilitation Facility

Occupancy: Residential, medical, administrative, social

LEED certification anticipated



▪ Outline ▪

Lighting Depth

Main entrance Lobby

Chapel

Courtyard

Physical Therapy Suite

Electrical Depth

208/120V system redesign

Construction Management Breadth

Cost analysis of electrical system

LEED Breadth

Perimeter System to achieve LEED Indoor Environmental Quality Credit 6.1

Non perimeter System to achieve LEED Indoor Environmental Quality Credit 6.2

- Lighting Depth ▪

Visibility Issues that Arise with Age

Problem:

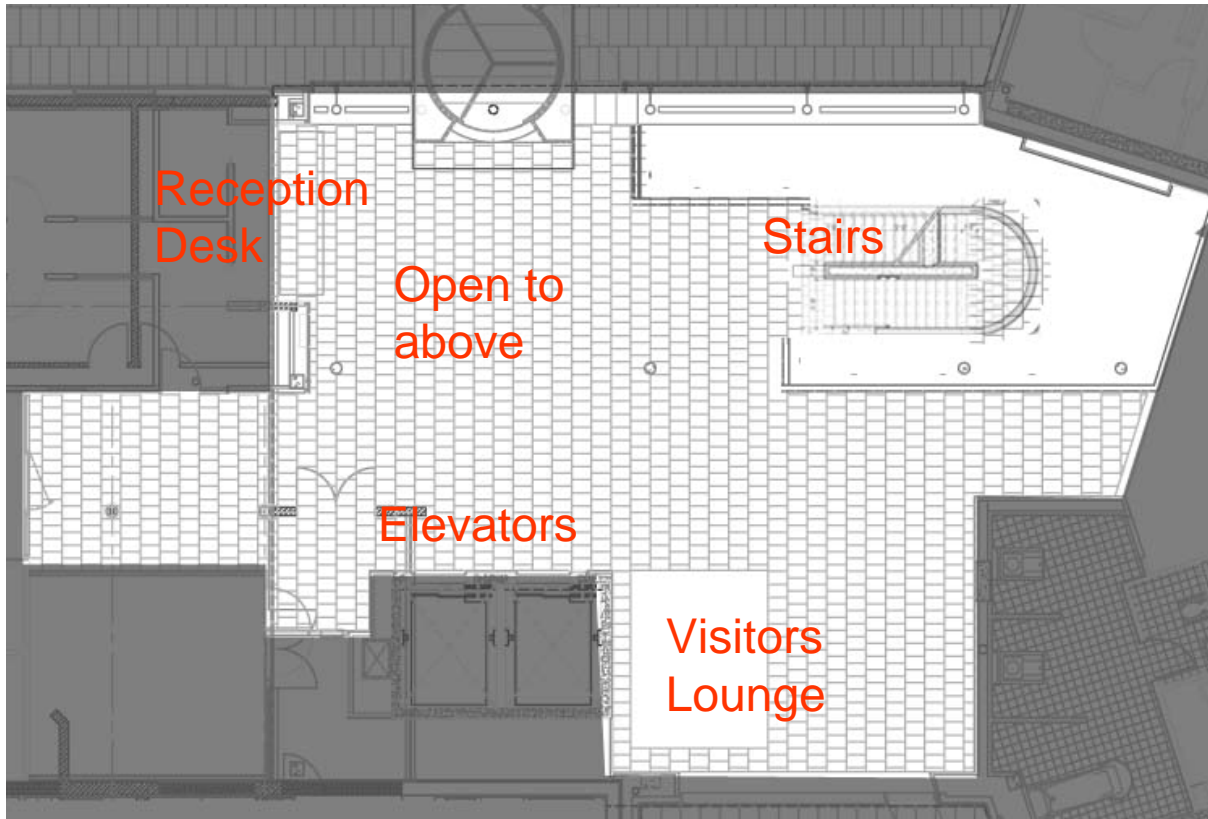
- Reduced pupil size
- Sensitivity to glare
- Sensitivity to contrast
- Increased adjustment time

Solution:

- Provide higher illuminance levels
- Avoid direct lighting from large sources
- No bulbs should be directly visible
- Only use contrast to mark hazardous area such as stair or change in elevation
- Provide transition areas
- Integrate daylight into entrances

- Lighting Depth: Lobby ▪

Main Entrance Lobby Lighting Redesign



Functions:

- Entrance to home
- Reception
- Circulation
- Visitor's Lounge

- Lighting Depth: Lobby ▪

Schematic Sketches

Design Goals:

Enhance the architecture of the lobby

Create and inviting and residential atmosphere

Guide visitors

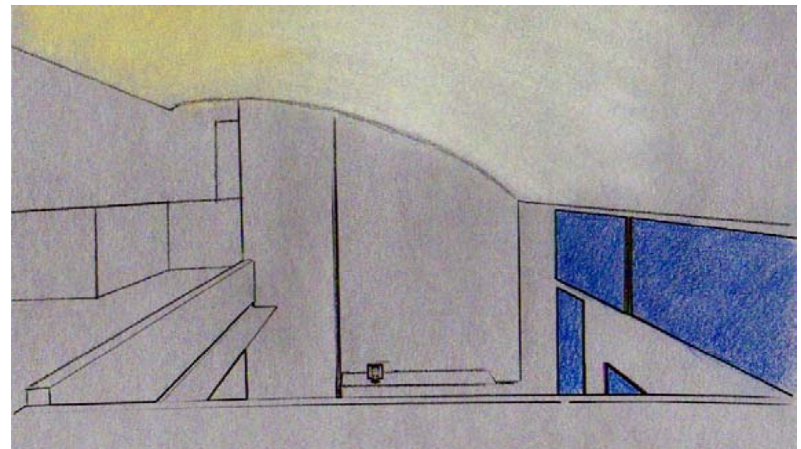
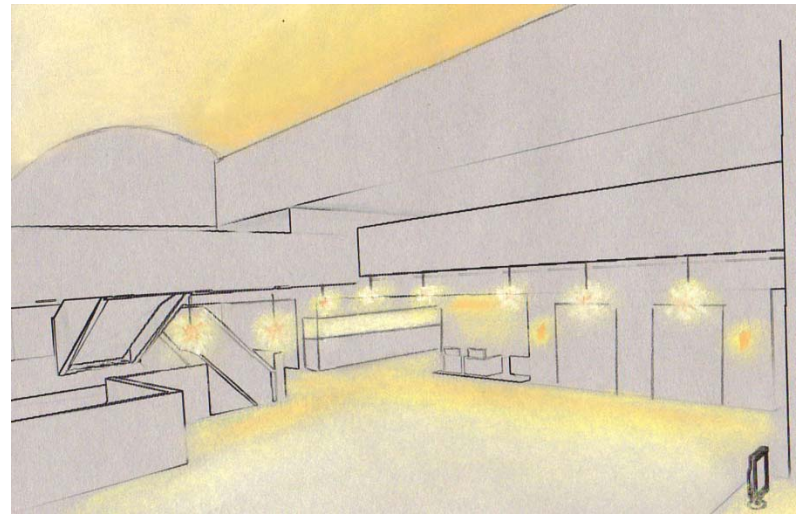
Provide a transition space for the elderly patients eyes to adjust

Illuminance Values:

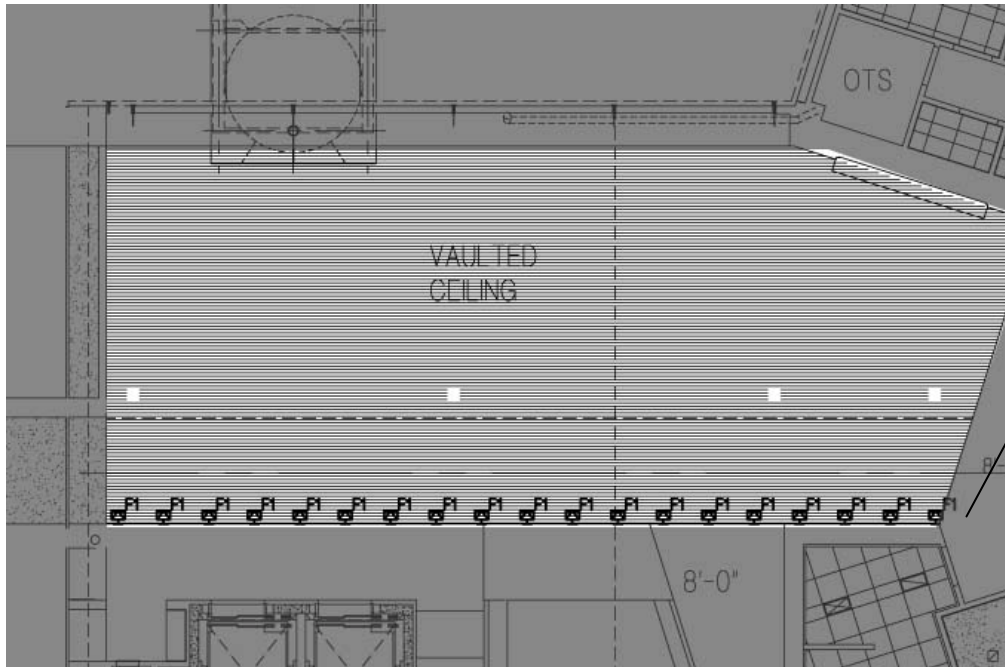
10fc general

30fc visitor's lounge workplane

30fc receptionist desk



▪ Lighting Depth: Lobby ▪



Second floor lobby open to below



F1
Metal Halide Uplight

FRANKLIN CARE CENTER

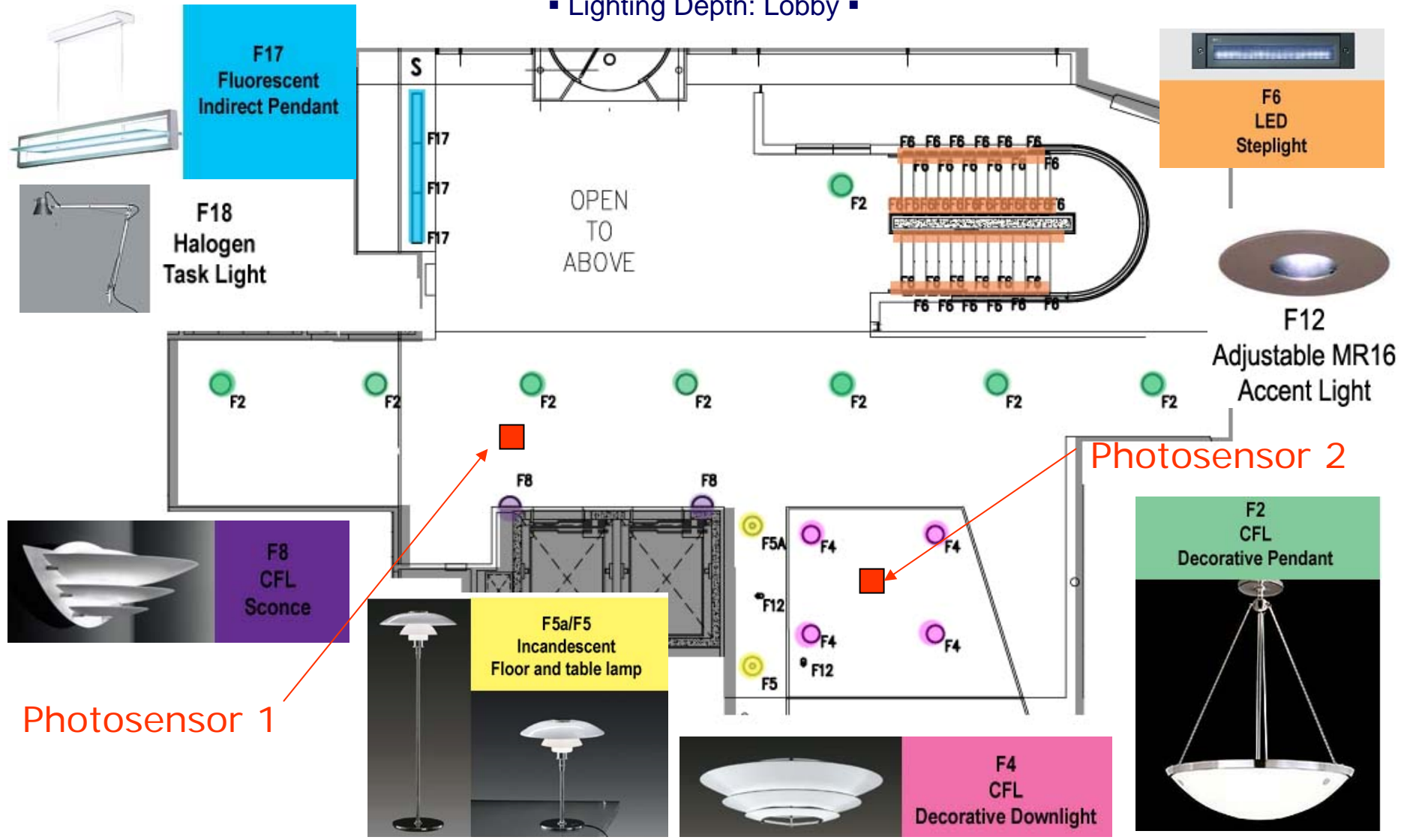
Franklin Lakes, NJ

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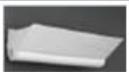




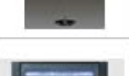

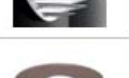


LIGHTING/ELECTRICAL OPTION

Lighting Depth: Lobby



▪ Lighting Depth: Lobby ▪

Solution Summary

Image	Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power
	F1	Wall mounted metal halide uplight	1	ED 17	Electronic	1	19	173	3287
	F2	Compact fluorescent decorative pendant	2	Quad	DALI dimming	2	8	40	320
	F4	Surface mounted decorative downlight	2	Triple Tube	DALI dimming	2	4	70	280
	F5	Incandescent table lamp	1	A19	n/a	n/a	1	100	100
	F5a	Incandescent floor lamp	1	A19	n/a	n/a	1	100	100
	F6	Recessed wall mounted LED step light	1	LED	n/a	n/a	48	2.6	124.8
	F8	Wall mounted compact fluorescent decorative sconce	1	Quad	DALI dimming	2	2	40	40
	F12	Recessed halogen accent light	1	MR16	n/a	n/a	2	20	40
	F17	Suspended indirect fluorescent pendant	2	T5	DALI dimming	2	3	64	192
	F18	Desk task light	1	Capsul	n/a	n/a	1	50	50
ASHRAE 90.1 ALLOWABLE POWER DENSITY = 1.3W/sqft Additional 0.35 W/sqft for VDT use Additional 1.0 W/sqft for decorative					Power Consumption		4533.8	Watts	
					VDT Power Density		0.08	W/sqft	
					Decorative Power Density		0.09	W/sqft	
					Lobby Power Density		1.25	W/sqft	

Illuminance:

General: 10.36fc

Reception: 28.28fc
without task light

Visitor's Lounge: 31.23fc

Stairs: 11fc

Energy Savings:

4% below ASHRAE

Lighting Control

- Lighting Depth: Lobby ▪

Control Equipment

- 1 Timer

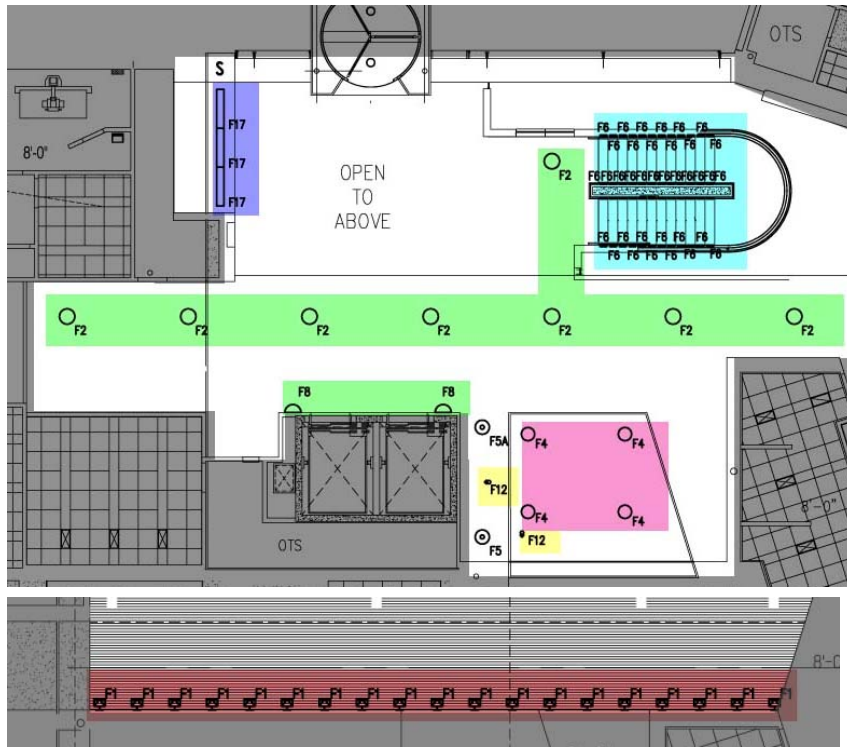
- 2 Photosensors

- 1 DALI Power Supply

- 1 DALI Wallbox group control

- 1 DALI Relay Module

Control Settings:



Dali Group 1	Photosensor 1 Control - maintain 10fc at critical point
Dali Group 2	Controlled by wallbox group controller
Dali Group 3	Photosensor 2 Control - maintain 30fc at critical point
Relay Module 1	On when Dali Group 3 is on, off when Dali Group 3 is off
Control Group 5	Timer - off 9am - 5pm
LED steplights	Remain on at all times

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LIGHTING/ELECTRICAL OPTION

▪ Lighting Depth: Lobby ▪



Lobby Rendering

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LIGHTING/ELECTRICAL OPTION

▪ Lighting Depth: Lobby ▪



Lobby Rendering: Entrance

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LIGHTING/ELECTRICAL OPTION

▪ Lighting Depth: Lobby ▪

: Reception Area



Visitor's Lounge:

Lobby Renderings

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LIGHTING/ELECTRICAL OPTION

- Lighting Depth: Lobby ▪

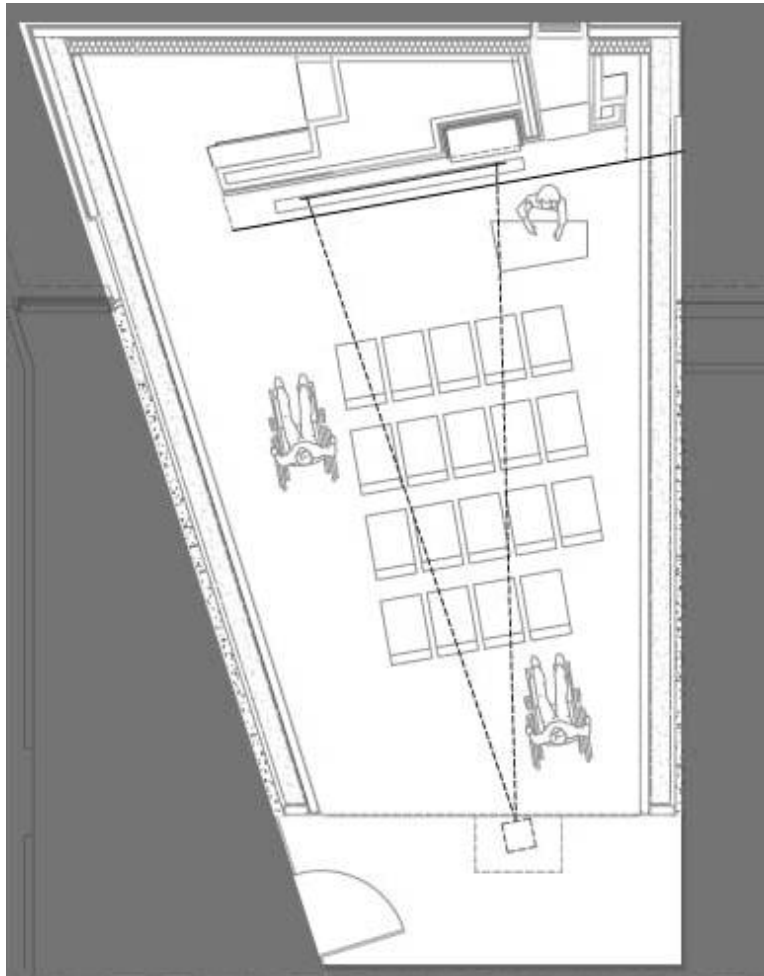
: View from Reception Area



View from Visitor's Lounge:
Lobby Renderings

▪ Lighting Depth: Chapel ▪

Chapel Lighting Redesign



Functions:

Various Services

Individual Prayer

▪ Lighting Depth: Chapel ▪

Schematic Sketches

Design Goals:

Enhance the architecture of the chapel

Create a spiritual atmosphere

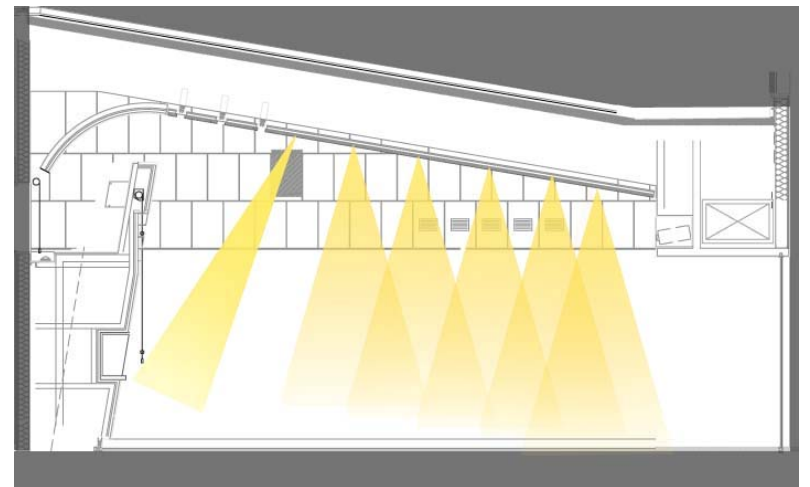
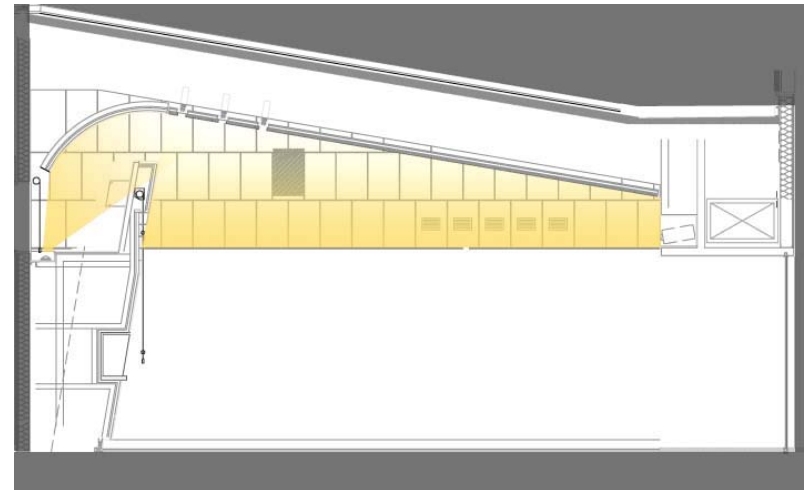
Provide a flexible lighting system for the different uses/times of services

Illuminance Values:

10fc general

30fc for reading

50-75fc on leader when speaking



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LIGHTING/ELECTRICAL OPTION

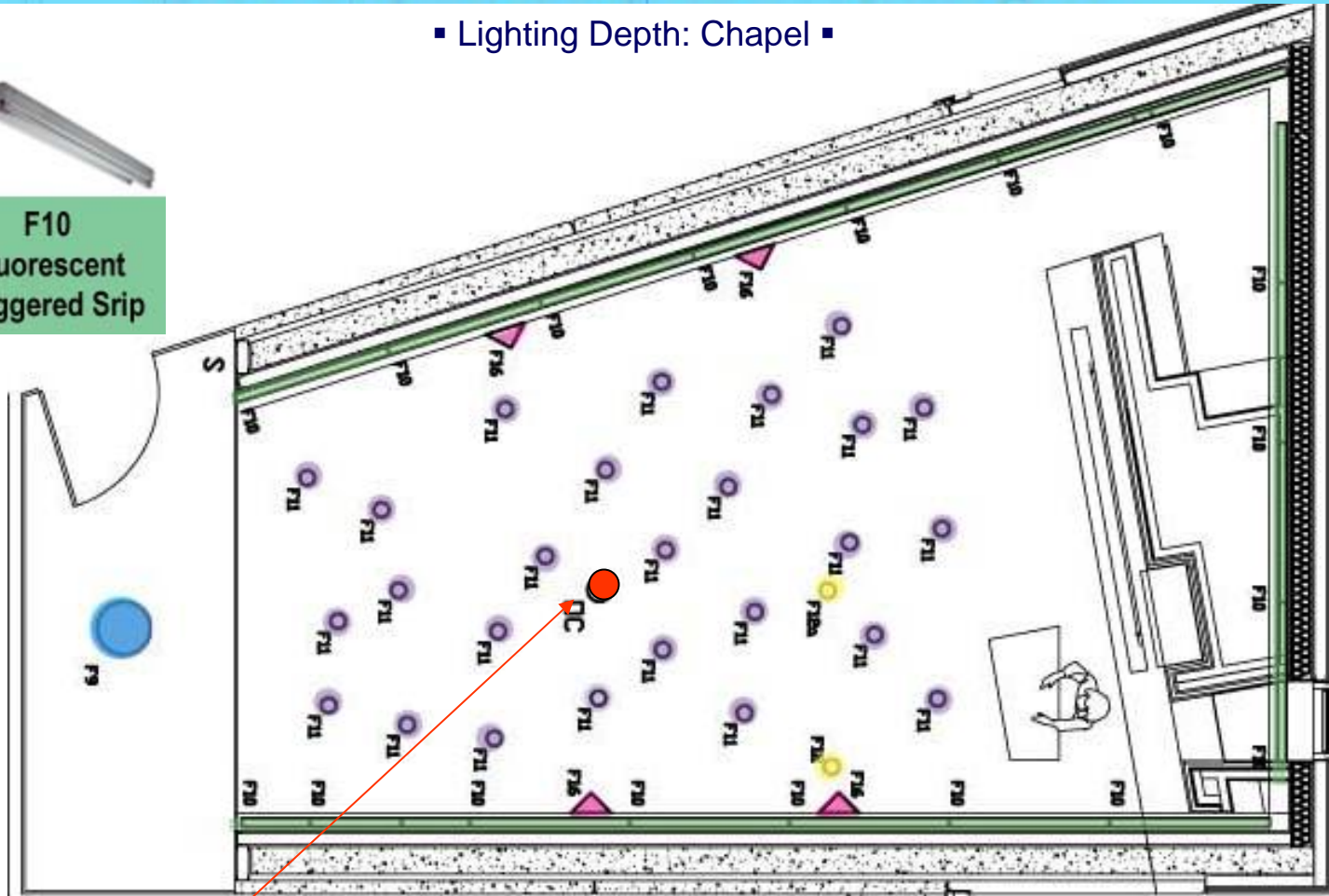
■ Lighting Depth: Chapel ■



F10
Fluorescent
Staggered Strip



F9
CFL
Decorative Downlight



Occupancy Sensor

F11
Halogen
Downlight



F12/F12a
Halogen
Spotlight



F16
CFL
Sconce

- Lighting Depth: Chapel ▪

Solution Summary

Image	Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power
	F9	CFL surface mounted downlight	2	Quad	Dali Dimming	2	1	40	40
	F10	Cove mounted fluorescent striplight	1	T5	Dali Dimming	2	19	64	608
	F11	Recessed halogen downlight	1	MR16	n/a	1	26	20	520
	F12	Recessed halogen spotlight	1	MR16	n/a	1	1	20	20
	F12a	Recessed halogen spotlight	1	MR16	n/a	1	1	50	50
	F16	Wall mounted compact fluorescent sconce	1	Quad	Dali Dimming	1	4	16	64
ASHRAE 90.1 ALLOWABLE POWER DENSITY = 2.4W/sqft					Power Consumption		1238	Watts	
					Chapel Power Density		2.21	W/sqft	

Illuminance:

Congregation: 30.84fc

Entrance: 10.29fc

Podium plane: 54.2fc

Leader face: 74fc

Projection screen: 10fc

Energy Savings:

8% below ASHRAE

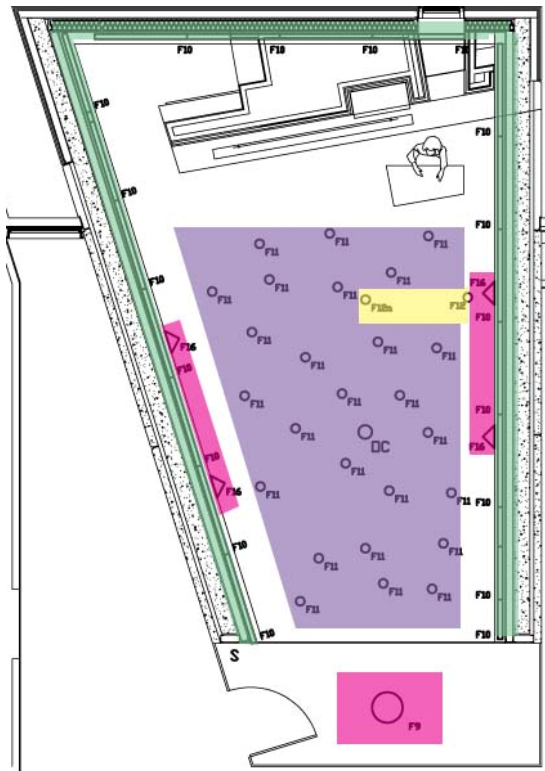
Lighting Control

- Lighting Depth: Chapel ▪

Control Equipment

- 1 DALI Power Supply
- 1 DALI Wallbox group and scene control
- 1 DALI compatible occupancy sensor
- 10 DALI low voltage transformers

Control Settings:



	Service	Before and after service	Visiting Hours	Sermon
Group 1	100%	100%	100%	100%
Group 2	100%	10%	25%	10%
Group 3	100%	Off	Off	100%
Relay Module 1	100%	100%	100%	100%

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LIGHTING/ELECTRICAL OPTION

■ Lighting Depth: Chapel ■



Chapel Rendering

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LIGHTING/ELECTRICAL OPTION

▪ Lighting Depth: Chapel ▪

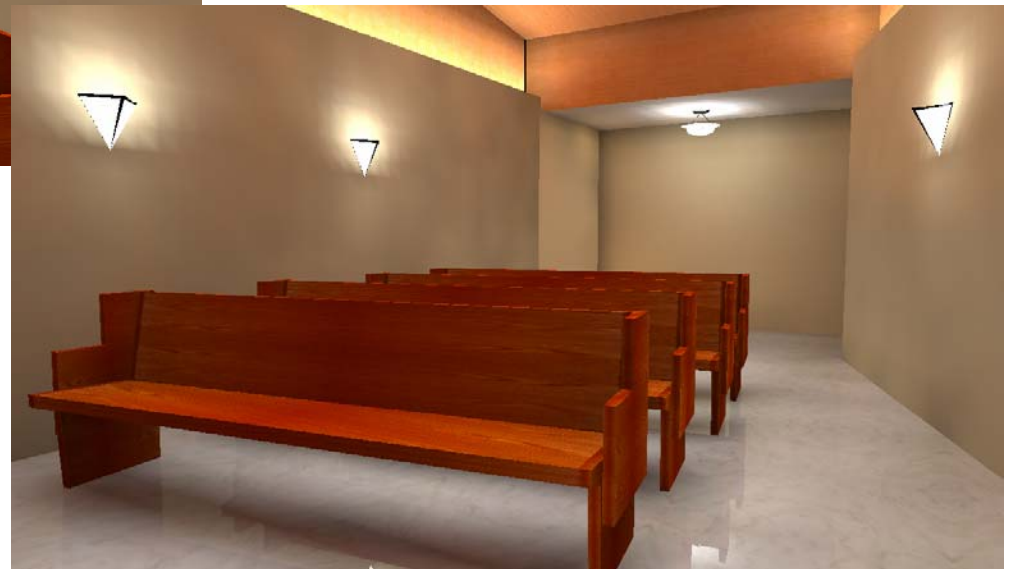


Chapel Rendering

▪ Lighting Depth: Chapel ▪



: View from podium



View from front:

- Lighting Depth: Courtyard ▪

Design Goals:

Safe walkway

Limit light pollution – LEED

Reduce spill light into patient rooms

Illuminance Values:

Minimum of 1fc on walkway

LEED Sustainable Site Credit 8:

Limiting light pollution

Luminaires > 1000 lumens – shielded

Luminaires > 3500 lumens – full cutoff

Limit landscape lighting

Avoid uplighting

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<http://www.arche.psu.edu/thesis/eportfolio/current/portfolios/jpc135/>

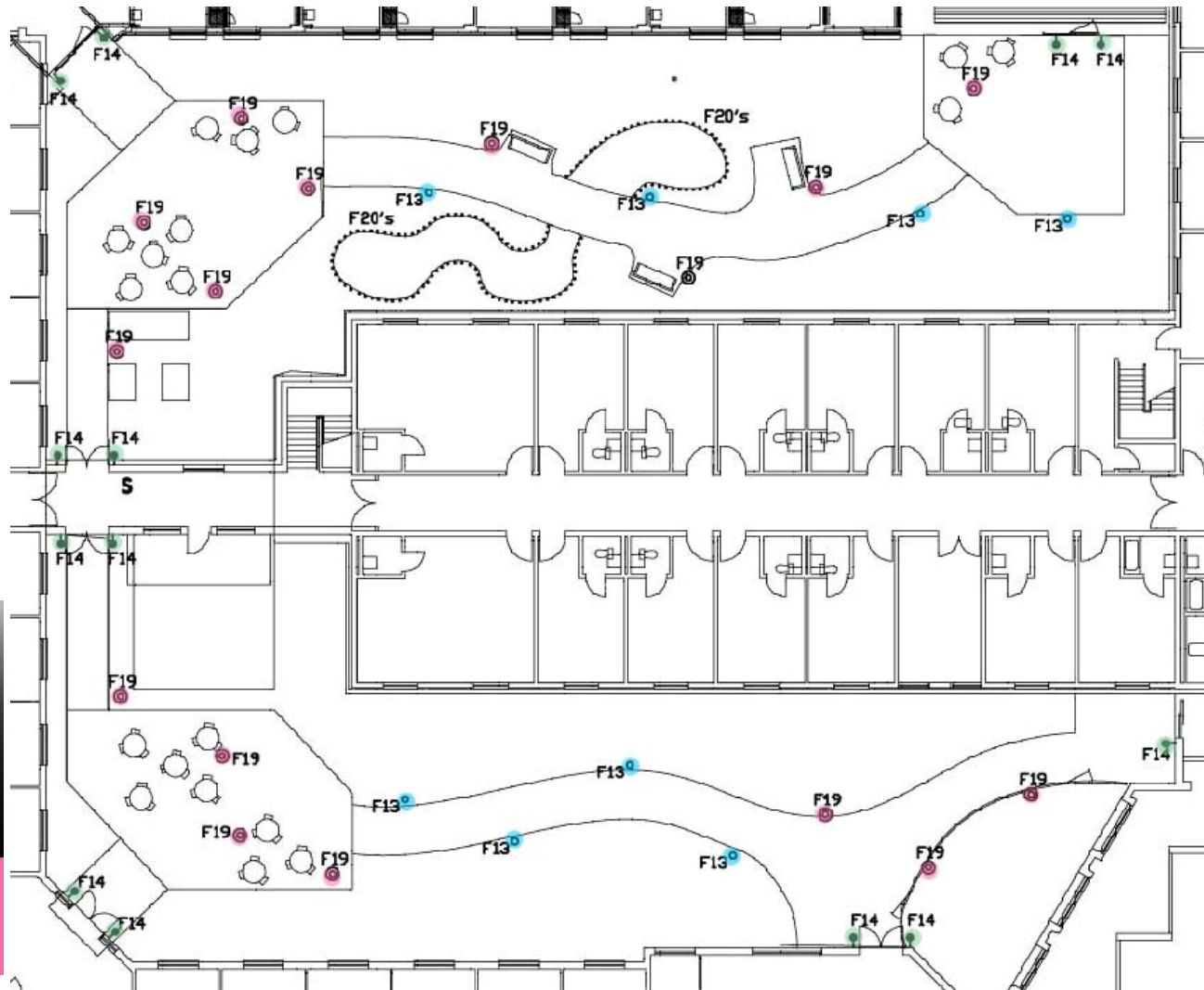
JENNIFER CURLEY

LIGHTING/ELECTRICAL OPTION

■ Lighting Depth: Courtyard ■



F20
LED
Marker



F14
CFL
Shielded sconce







F19
CFL
Shielded pole



F13
CFL
Shielded bollard

- Lighting Depth: Courtyard ▪

Solution Summary

Image	Fixture Label	Description	Lamp #	Lamp Type	Ballast Type	Lamps per ballast	Fixture Quantity	Ballast Watts	power
	F13	Semi direct CFL bollard	1	Triple Tube	DALI dimming	1	8	35	280
	F14	Semi direct CFL sconce	1	Triple Tube	DALI dimming	1	13	35	455
	F19	Semi direct CFL pole mounted fixture	1	Triple Tube	DALI dimming	1	16	35	560
	F20	In grade LED orientation luminaire	1	Dynamic Color changing LED	n/a	n/a	134	0.3	40.2
ASHRAE 90.1 ALLOWABLE POWER= 1553 Watts					Power Consumption= 1355 Watts				

Illuminance:

Walkway: 2.75fc average

Minimum of 1fc

Energy Savings:

14% below ASHRAE

Lighting Control

- Lighting Depth: Courtyard ▪

Control Equipment:

- 1 Photosensor
- 1 DALI Power Supply
- 1 DALI Wallbox group control

Control Settings:



Dali Group 1 F13 Bollards

Dali Group 2 F14 Sconces

Dali Group 3 F19 Poles

*LEDs will remain on at all times

- Electrical Depth▪

208/120V System Redesign

Existing System:

- 2 step down transformers
- 1 for each 208/120V distribution panelboard

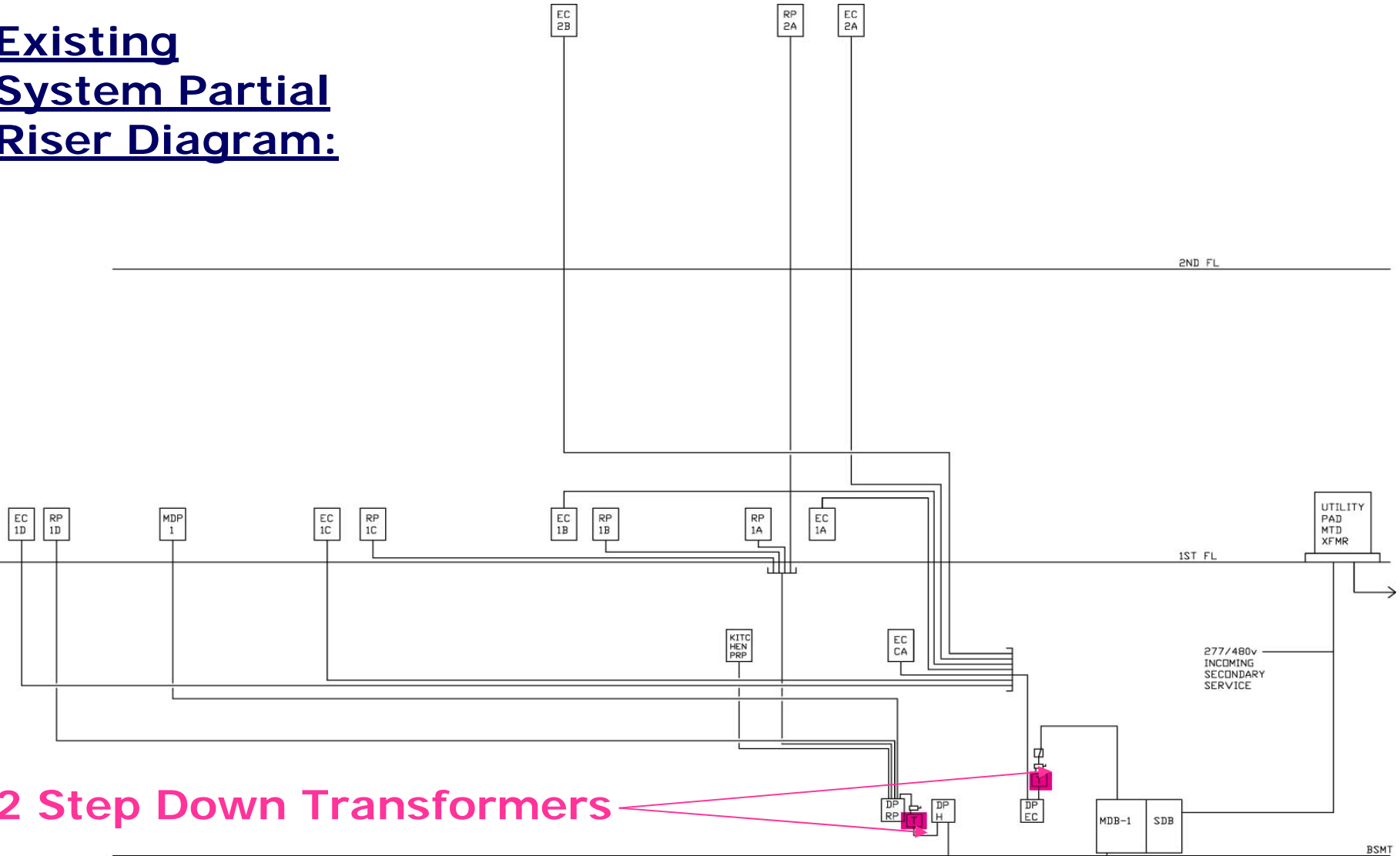
Redesigned System:

- 14 step down transformers
- 1 located before each panelboard

Purpose: To feed the panelboards at 480/277V, reducing the size of the conduits, conductors, and circuit breakers.

Existing System Partial Riser Diagram:

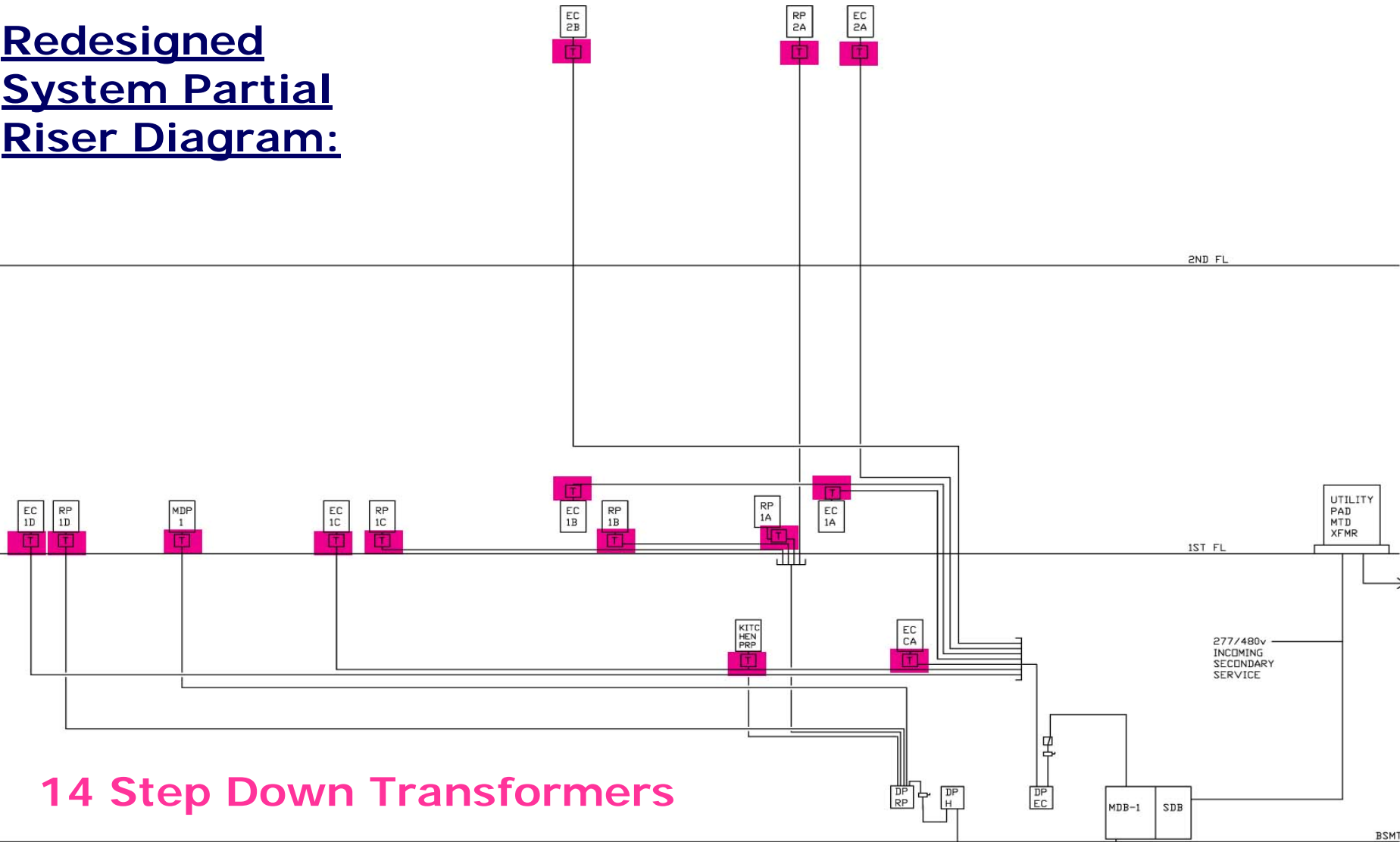
■ Electrical Depth ■



2 Step Down Transformers

Redesigned System Partial Riser Diagram:

■ Electrical Depth ■



14 Step Down Transformers

- Construction Management Breadth▪

Cost Analysis

Includes cost of DP-EC, conductors, conduit, circuit breakers, transformers relevant to redesigned system

	Existing System	Redesign
Conductor	\$95,518.08	\$41,289.63
Conduit	\$53,041.10	\$30,345.17
Circuit breakers	\$4,778.00	\$2,759.00
Transformers	\$26,000.00	\$54,500.00
Resized distribution panel EC	\$3,225.00	\$2,475.00
Total Cost	\$182,562.18	\$131,368.80

Conclusions

- \$51,193.38 saved in redesigned system
- Smaller feeders leave more plenum space
- Additional transformers require more space in closets/electrical rooms

▪ Conclusions ▪

Conclusions

Lighting Depth

Creates a residential atmosphere

Caters to the needs of the elderly eye

Provides flexibility and daylight integration

Meets requirement of LEED Sustainable Site credit 8 – Limiting Light Pollution

Average power density 7% below ASHRAE – towards LEED Optimizing Energy Credits

Electrical Depth and CM Breadth

Provides a feasible alternative to the existing system

Lower cost of equipment



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LIGHTING/ELECTRICAL OPTION

▪ Conclusion ▪

Thank you!

Professionals:

HLB Lighting design

Beckhard Richland Szerbaty + Associates

Edwards & Zuck

Mr. Ted Dannerth

Faculty:

Dr. Moeck

Dr. Mistrick

Professor Parfitt

Personal:

Family

Friends

AE class of 2006