Franklin Square Hospital Center

Patient Tower and Emergency Department Addition

Cassandra Watson | Lighting + Electrical | April 14, 2010

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot	Exterior Space
Gift Shop	Special Purpose Space
Lobby + Waiting Area	Circulation Space
	Mechanical Breadth *
	Acoustical Breadth
Team Station	Work Space *

Electrical Depth

Copper vs. Aluminum Feeders *

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

* Not included in presentation

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Building Information

Building Name	Franklin Square Hospital Center Patient Tower and Emergency Department Addition Emergency
Location	9000 Franklin Square Drive, Baltimore, MD 21237
Building Occupant Name	MedStar Health Facilities
Function	Medical
Size	356,000 sq. ft.
Number of Stories	7 stories
Dates of Construction	Fall 2007 - Summer 2010
Overall Project Cost	$175 million
Project Delivery Method	Design - Bid – Build

Primary Project Team

Owner	Franklin Square Hospital Center
Project Manager	Lillibridge Healthcare Services, Inc.
Architect	Wilmot/ Sanz Inc
MEP Engineer	Leach Wallace Associates
Structural Engineer	Rathgeber/Goss Associates
Civil Engineer	Dewberry & Davis

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth
Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Design Concept

Franklin Square Hospital Center, a member of MedStar Health, provides the highest quality healthcare and education to our communities.

-FSHC Mission Statement

S ervice
P atient First
I ntegrity
R espect
I nnovation
T eamwork

Presentation Outline

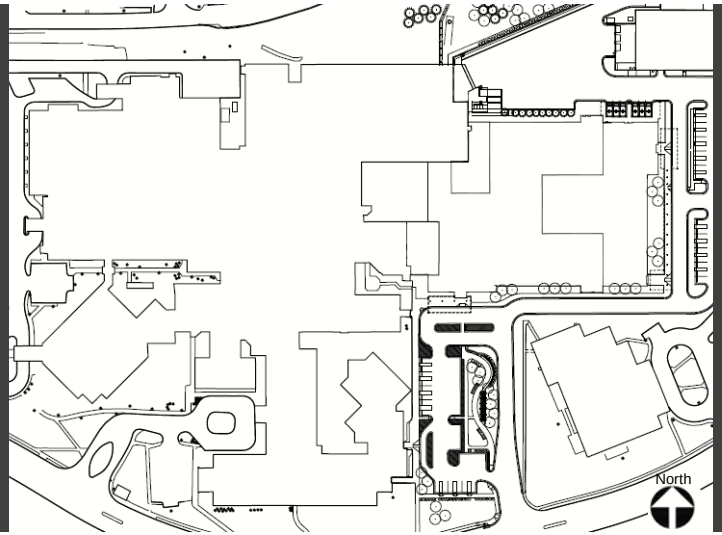
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



Site Plan

Presentation Outline

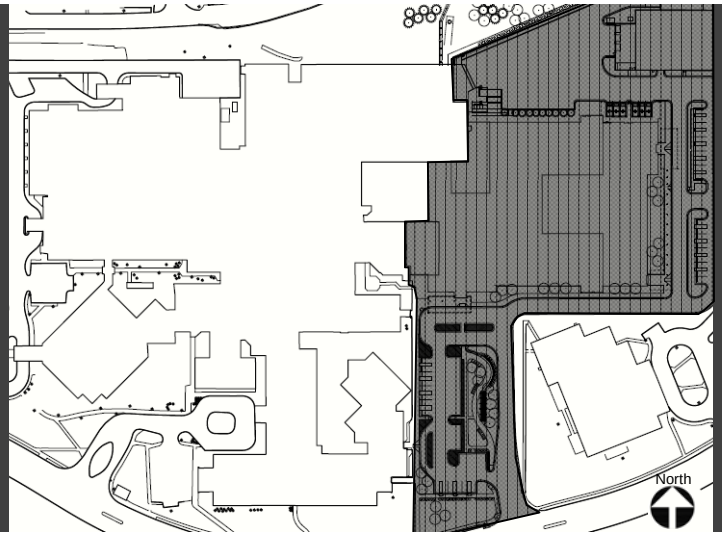
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



Site Plan

Patient Tower + Emergency Department Addition

Presentation Outline

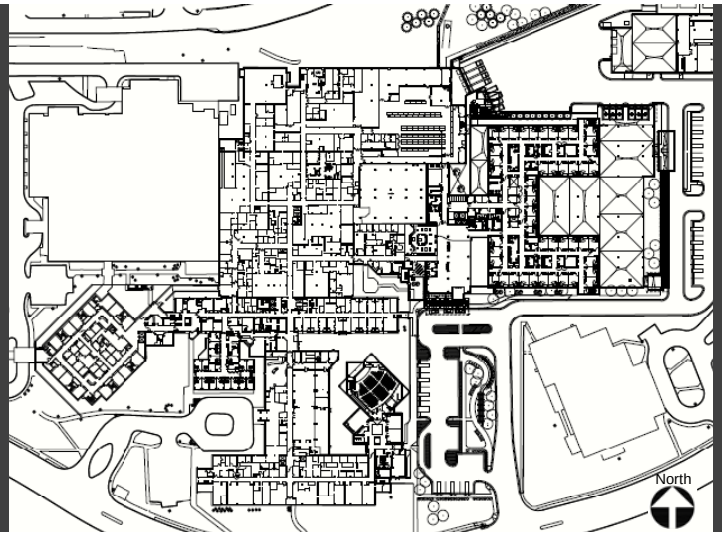
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



First Floor

Presentation Outline

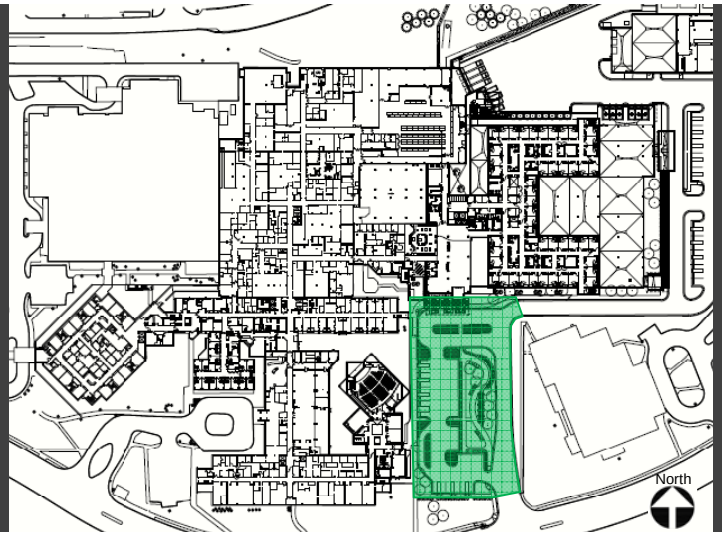
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth
Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



First Floor

Main Entrance + Parking Lot | Exterior Space

Presentation Outline

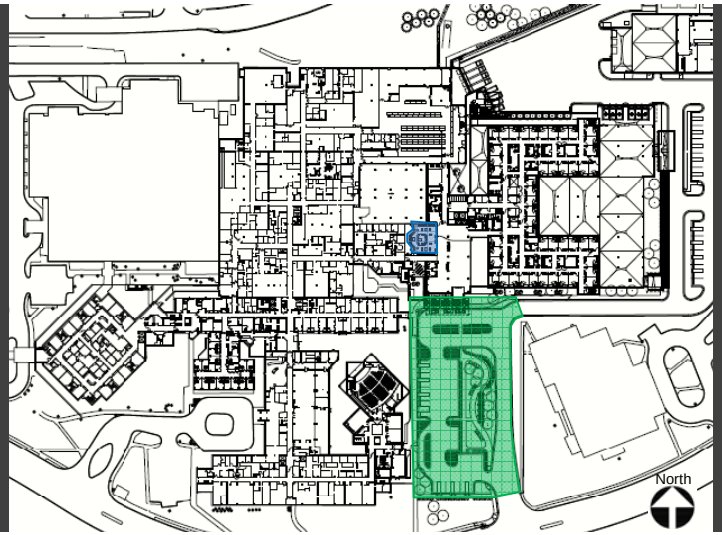
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



First Floor

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Presentation Outline

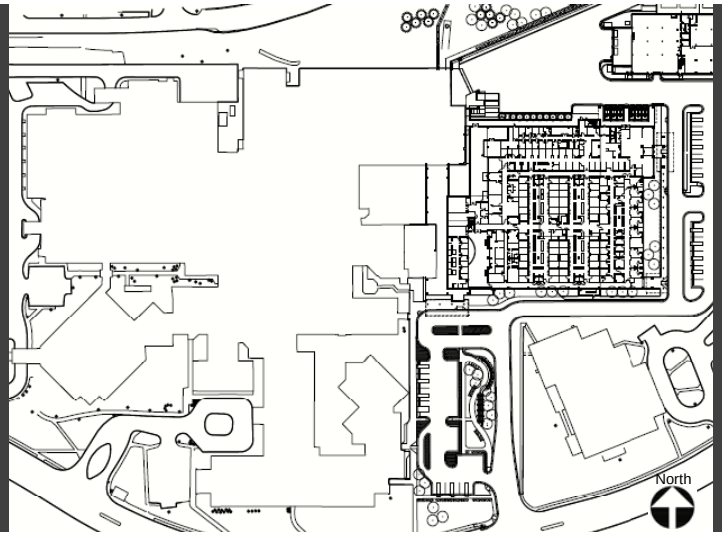
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



Ground Floor

Presentation Outline

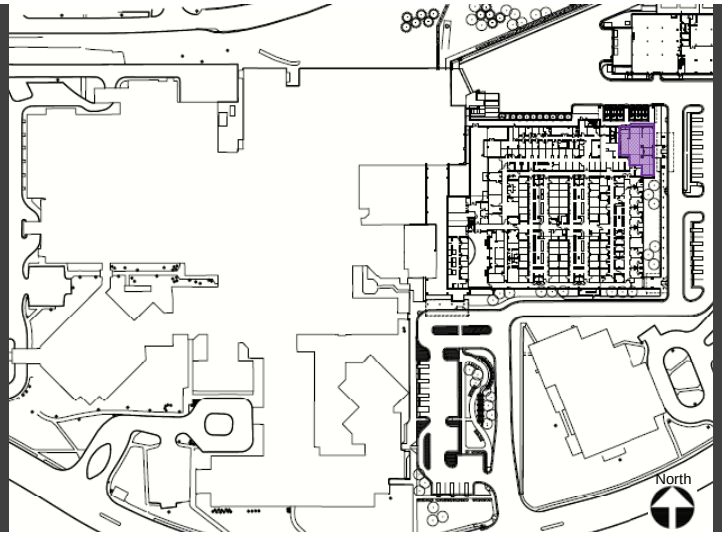
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



Ground Floor

Lobby + Waiting Area | Circulation Space

Presentation Outline

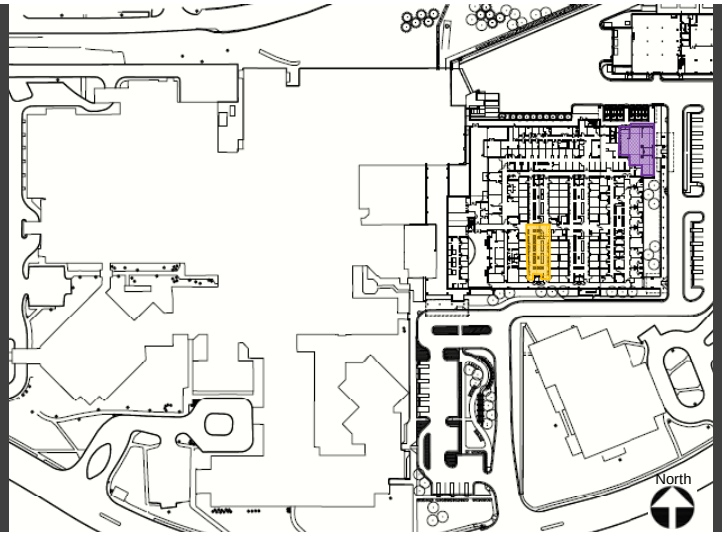
Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements



Ground Floor

Lobby + Waiting Area | Circulation Space

Team Station | Work Space * not included in presentation

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

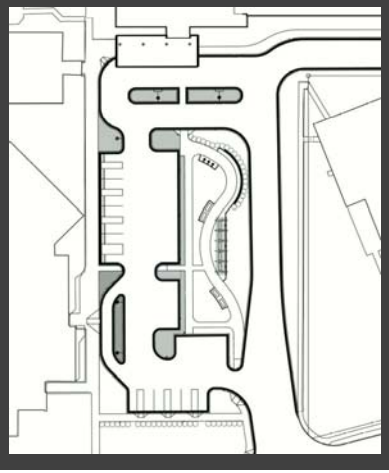
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Main Entrance + Parking Lot | Exterior Space



Key Features

- Main entrance canopy
- Central plaza with wooden terrace and seating area
- Central walkways

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

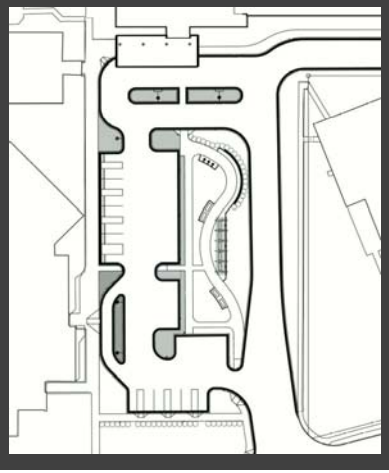
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Main Entrance + Parking Lot | Exterior Space



Design Goals

- Create an inviting night time environment
- Attract and guide visitors to the main entrance
- Meet IESNA recommendations and ASHRAE Standard 90.1 Lighting Power Density Code
- Direction, safety, visual interest

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

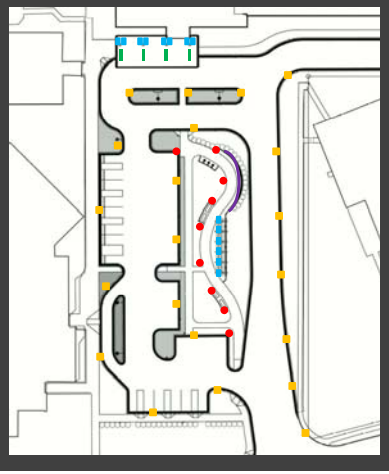
Team Station | Work Space

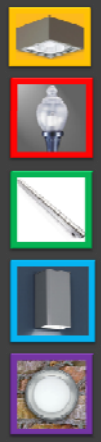
Electrical Depth — Copper vs. Aluminum Feeders

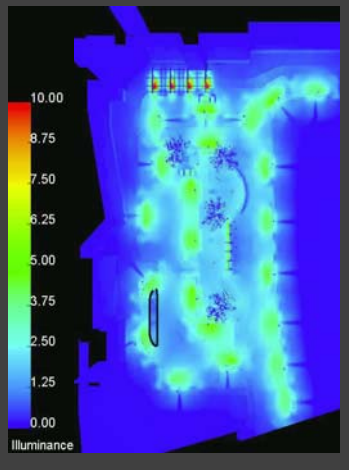
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Main Entrance + Parking Lot | Exterior Space







Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Main Entrance + Parking Lot | Exterior Space

Design Summary

-Plaza seating area highlighted to provide visual interest

-Walkways lead visitors to main entrance and canopy

-Design meets IESNA recommendations

	Roadway	Walkways
Avg. Illuminance	2.4 fc	2.1 fc
IESNA Criteria (min)	0.5 fc	1.0 fc
Compliance	**YES**	**YES**

-Design meets ASHRAE Standard 90.1 Lighting Power Density Code

	LPD
Design	0.08 W/SF
ASHRAE Criteria	0.15 W/SF
Compliance	**YES**

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

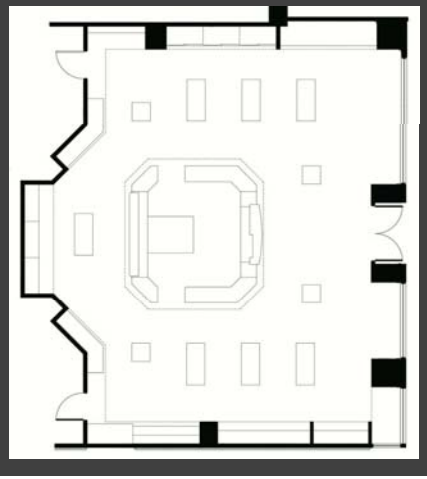
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Gift Shop | Special Purpose Space



Key Features

- Vertical Display Cases around perimeter of shop
- Franklin Square Hospital Center Logo
- Store Front Display Areas

Presentation Outline

Introduction + Building Statistics + Concept

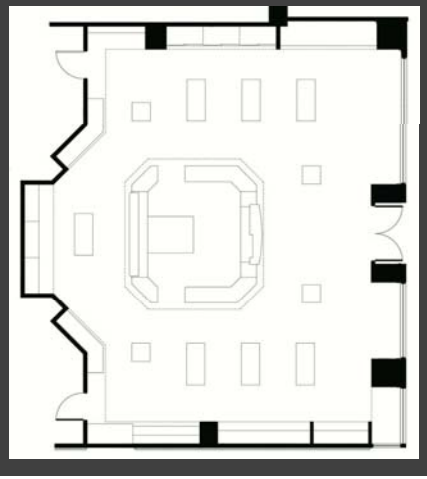
Lighting Depth

- Main Entrance + Parking Lot | Exterior Space
- Gift Shop | Special Purpose Space
- Lobby + Waiting Area | Circulation Space
  - Mechanical Breadth
  - Acoustical Breadth
- Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders; Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Gift Shop | Special Purpose Space



Design Goals

- Create a pleasant environment for browsing
- Attract visitors from adjacent atrium space
- Meet IESNA recommendations and ASHRAE Standard 90.1 Lighting Power Density Code
- Inviting, focal points, highlight merchandise

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

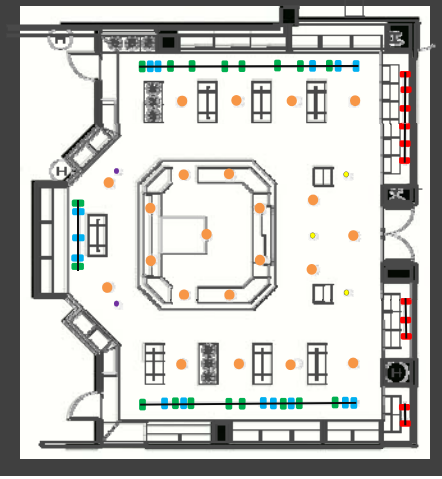
Team Station | Work Space

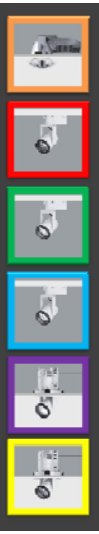
Electrical Depth — Copper vs. Aluminum Feeders

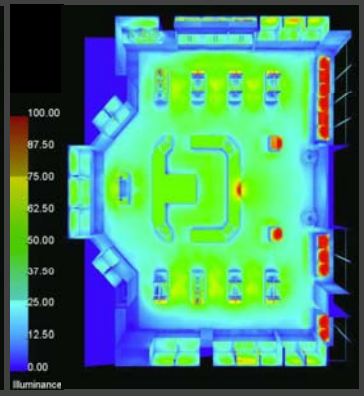
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Gift Shop | Special Purpose Space







Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

- Main Entrance + Parking Lot | Exterior Space
- Gift Shop | Special Purpose Space
- Lobby + Waiting Area | Circulation Space
- Mechanical Breadth
- Acoustical Breadth
- Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders; Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Gift Shop | Special Purpose Space

Design Summary

-Vertical accent lighting on merchandise and FSHC logo

-Non-uniform lighting throughout space providing visual interest

-Design meets IESNA recommendations

	Horizontal	Vertical
Avg. Illuminance	34.6 fc	19.8 fc
IESNA Criteria	30 fc	10 fc
Compliance	**YES**	**YES**

-Design meets ASHRAE Standard 90.1 Lighting Power Density Code

	LPD
Design	1.0 W/SF
ASHRAE Criteria	1.7 W/SF
Compliance	**YES**

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

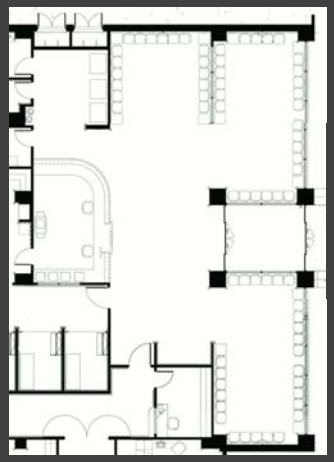
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Circulation Space



Key Features

- Reception / Security desk
- Emergency and pediatric emergency waiting areas
- Store front façade and vestibule

Presentation Outline

Introduction + Building Statistics + Concept

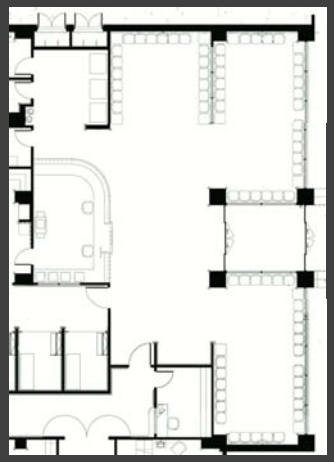
Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Circulation Space



Design Goals

- Create a relaxed non-uniform setting for visitors
- Uniform illumination on desk task plane
- Meet IESNA recommendations and ASHRAE Standard 90.1 Lighting Power Density Code
- Relaxation, uniform illumination on task plane

Presentation Outline

Introduction + Building Statistics + Concept

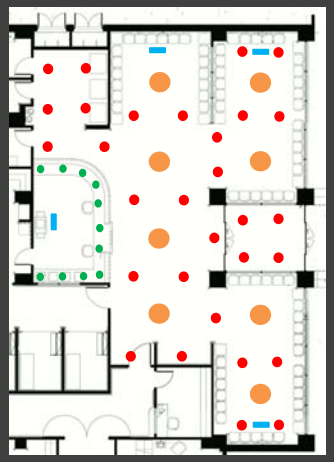
Lighting Depth

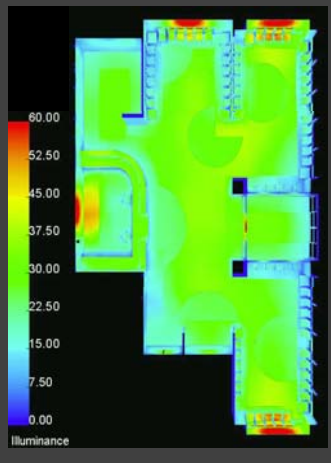
Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Circulation Space





Presentation Outline

Introduction + Building Statistics + Concept

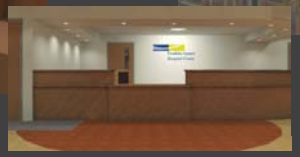
Lighting Depth

- Main Entrance + Parking Lot | Exterior Space
- Gift Shop | Special Purpose Space
- Lobby + Waiting Area | Circulation Space
  - Mechanical Breadth
  - Acoustical Breadth
- Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders; Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Circulation Space



Design Summary

-Uniform illumination on desk work plane

-Indirect and direct lighting to provide relaxation

-Design meets IESNA recommendations

	Desk	Floor
Avg. Illuminance	31.2 fc	27.9 fc
IESNA Criteria	30 fc	20 fc
Compliance	**YES**	**YES**

-Design meets ASHRAE Standard 90.1 Lighting Power Density Code

	LPD
Design	1.3 W/SF
ASHRAE Criteria	1.7 W/SF
Compliance	**YES**

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth

Design Goals

- Evaluate existing acoustical conditions of the pediatric emergency waiting area
- Propose scenarios to improve acoustical environment
- Target reverberation time between 0.65 and 0.75 seconds

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

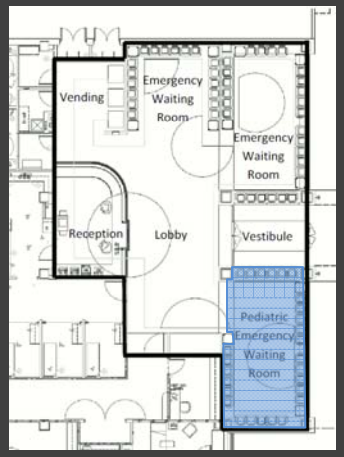
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Conditions

Existing Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Linoleum on Concrete	513.3	0.02	0.03	0.03	0.03	0.03	0.02
Walls	5/8" GWB on 2x4 Studs	358.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Ceiling	Gypsum Board	214.7	0.29	0.10	0.10	0.10	0.07	0.02
Ceiling	Acoustic Tile 3/4"	351.0	0.72	0.84	0.70	0.79	0.76	0.81
Opening	N/A	90.0	0.75	0.75	0.75	0.75	0.75	0.75
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	15.40	15.40	15.40	15.40	10.27
103.88	35.82	17.91	14.33	25.07	32.24
187.50	85.23	61.36	40.91	23.86	13.64
62.26	21.47	21.47	21.47	15.03	4.29
252.72	294.84	245.70	277.29	266.76	284.31
67.50	67.50	67.50	67.50	67.50	67.50
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

$a = \sum S\alpha$	699.51	550.22	474.70	491.17	463.04	460.03
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.33	0.42	0.49	0.47	0.50	0.51

Average T_{60} 0.46

Target Reverberation Time $0.65 \leq T \leq 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

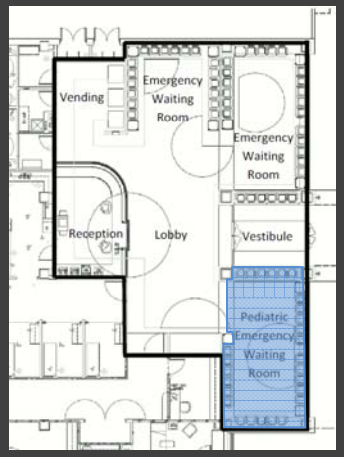
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Conditions

Existing Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Linoleum on Concrete	513.3	0.02	0.03	0.03	0.03	0.03	0.02
Walls	5/8" GWB on 2x4 Studs	358.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Ceiling	Gypsum Board	214.7	0.29	0.10	0.10	0.10	0.07	0.02
Ceiling	Acoustic Tile 3/4"	351.0	0.72	0.84	0.70	0.79	0.76	0.81
Opening	N/A	90.0	0.75	0.75	0.75	0.75	0.75	0.75
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	15.40	15.40	15.40	15.40	10.27
103.88	35.82	17.91	14.33	25.07	32.24
187.50	85.23	61.36	40.91	23.86	13.64
62.26	21.47	21.47	21.47	15.03	4.29
252.72	294.84	245.70	277.29	266.76	284.31
67.50	67.50	67.50	67.50	67.50	67.50
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
$a = \sum S\alpha$	699.51	550.22	474.70	491.17	463.04	460.03
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.33	0.42	0.49	0.47	0.50	0.51

Average T_{60} 0.46

Target Reverberation Time $0.65 \leq T \leq 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

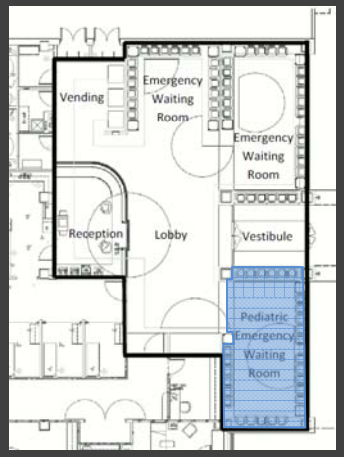
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Existing Conditions

Existing Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Linoleum on Concrete	513.3	0.02	0.03	0.03	0.03	0.03	0.02
Walls	5/8" GWB on 2x4 Studs	358.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Ceiling	Gypsum Board	214.7	0.29	0.10	0.10	0.10	0.07	0.02
Ceiling	Acoustic Tile 3/4"	351.0	0.72	0.84	0.70	0.79	0.76	0.81
Opening	N/A	90.0	0.75	0.75	0.75	0.75	0.75	0.75
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	15.40	15.40	15.40	15.40	10.27
103.88	35.82	17.91	14.33	25.07	32.24
187.50	85.23	61.36	40.91	23.86	13.64
62.26	21.47	21.47	21.47	15.03	4.29
252.72	294.84	245.70	277.29	266.76	284.31
67.50	67.50	67.50	67.50	67.50	67.50
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

$a = \sum S\alpha$	699.51	550.22	474.70	491.17	463.04	460.03
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.33	0.42	0.49	0.47	0.50	0.51

Average T_{60} 0.46

Target Reverberation Time $0.65 \leq T \leq 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

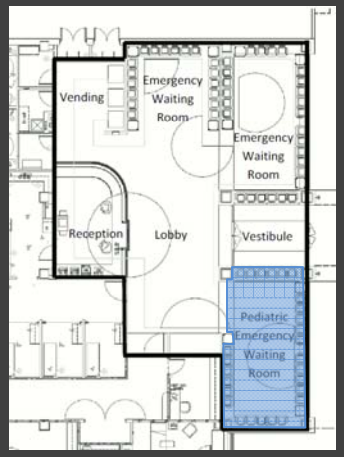
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Proposed Scenario 1

Proposed Scenario 1 - Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient					
			125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Carpet, heavy, on concrete	513.3	0.02	0.06	0.14	0.37	0.60	0.65
Walls	5/8" GWB on 2x4 Studs	420.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Doors	Solid core wood panel, 1 3/4"	28.0	0.10	0.07	0.05	0.04	0.04	0.04
Ceiling	Gypsum Board	565.7	0.29	0.10	0.10	0.10	0.07	0.02
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα					
125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	30.80	71.86	189.92	307.98	333.65
121.86	42.02	21.01	16.81	29.41	37.82
187.50	85.23	61.36	40.91	23.86	13.64
2.80	1.96	1.40	1.12	1.12	1.12
164.05	56.57	56.57	56.57	39.60	11.31
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

$a = \sum S\alpha$	501.86	246.54	257.56	359.60	451.39	445.32
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.46	0.95	0.91	0.65	0.52	0.52

Average T_{60} **0.67**

Target Reverberation Time $0.65 \leq T \leq 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

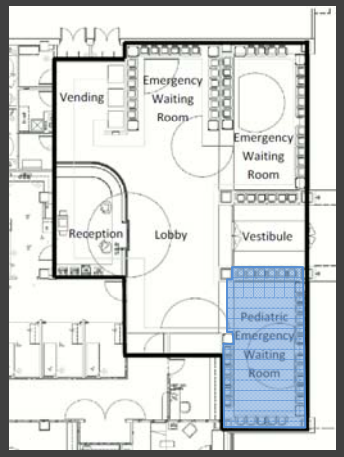
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Scenario 1 | 0.67 s

Proposed Scenario 1

Proposed Scenario 1 - Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Carpet, heavy, on concrete	513.3	0.02	0.06	0.14	0.37	0.60	0.65
Walls	5/8" GWB on 2x4 Studs	420.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Doors	Solid core wood panel, 1 3/4"	28.0	0.10	0.07	0.05	0.04	0.04	0.04
Ceiling	Gypsum Board	565.7	0.29	0.10	0.10	0.10	0.07	0.02
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	30.80	71.86	189.92	307.98	333.65
121.86	42.02	21.01	16.81	29.41	37.82
187.50	85.23	61.36	40.91	23.86	13.64
2.80	1.96	1.40	1.12	1.12	1.12
164.05	56.57	56.57	56.57	39.60	11.31
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
$a = \sum S\alpha$	501.86	246.54	257.56	359.60	451.39	445.32
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.46	0.95	0.91	0.65	0.52	0.52

Average T_{60} = 0.67

Target Reverberation Time: $0.65 \leq T \leq 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

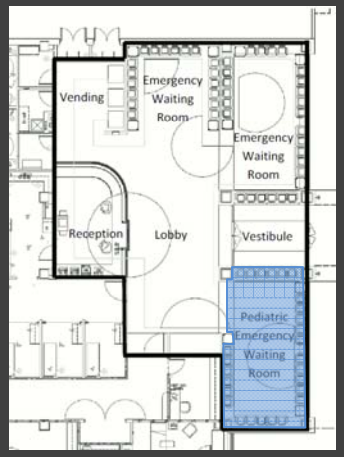
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Scenario 1 | 0.67 s

Proposed Scenario 2

Proposed Scenario 2 - Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Carpet, heavy, on concrete	513.3	0.02	0.06	0.14	0.37	0.60	0.65
Walls	5/8" GWB on 2x4 Studs	358.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Ceiling	Gypsum Board	565.7	0.29	0.10	0.10	0.10	0.07	0.02
Opening	N/A	90.0	0.75	0.75	0.75	0.75	0.75	0.75
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	30.80	71.86	189.92	307.98	333.65
103.88	35.82	17.91	14.33	25.07	32.24
187.50	85.23	61.36	40.91	23.86	13.64
164.05	56.57	56.57	56.57	39.60	11.31
67.50	67.50	67.50	67.50	67.50	67.50
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
$a = \sum S\alpha$	548.58	305.88	320.56	423.50	513.43	506.12
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.43	0.76	0.73	0.55	0.45	0.46

Average T_{60} = 0.56

Target Reverberation Time: $0.65 \le T \le 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

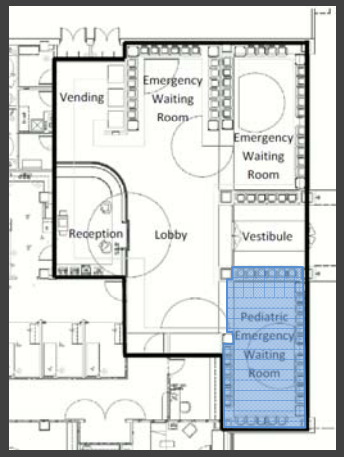
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Scenario 1 | 0.67 s

Scenario 2 | 0.56 s

Proposed Scenario 2

Proposed Scenario 2 - Pediatric Waiting Room Reverberation Time

Surface	Material	Area (ft^2)	Absorbtion Coefficient 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Floor	Carpet, heavy, on concrete	513.3	0.02	0.06	0.14	0.37	0.60	0.65
Walls	5/8" GWB on 2x4 Studs	358.2	0.29	0.10	0.05	0.04	0.07	0.09
Storefront Walls	Glass 3/32"	340.9	0.55	0.25	0.18	0.12	0.07	0.04
Ceiling	Gypsum Board	565.7	0.29	0.10	0.10	0.10	0.07	0.02
Opening	N/A	90.0	0.75	0.75	0.75	0.75	0.75	0.75
Chairs	Fabric upholstered seats, unoccupied	81.0	0.19	0.37	0.56	0.67	0.61	0.59

Sα 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
10.27	30.80	71.86	189.92	307.98	333.65
103.88	35.82	17.91	14.33	25.07	32.24
187.50	85.23	61.36	40.91	23.86	13.64
164.05	56.57	56.57	56.57	39.60	11.31
67.50	67.50	67.50	67.50	67.50	67.50
15.39	29.97	45.36	54.27	49.41	47.79

Volume = 4663.3 ft^3

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
$a = \sum S\alpha$	548.58	305.88	320.56	423.50	513.43	506.12
$T_{60} = .05\,V/a = .05\,V/\sum S\alpha$	0.43	0.76	0.73	0.55	0.45	0.46

Average T_{60} = 0.56

Target Reverberation Time: $0.65 \le T \le 0.75$

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

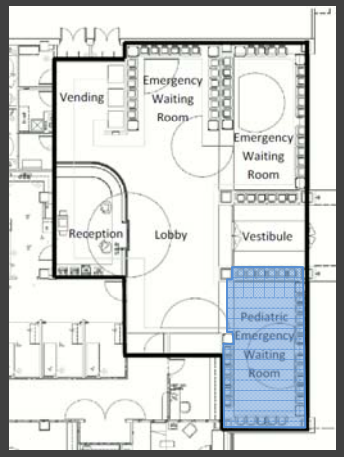
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Lobby + Waiting Area | Acoustical Breadth



Existing Condition | 0.46 s

Scenario 1 | 0.67 s

Scenario 2 | 0.56 s

Summary

- It is recommended to enclose the space as in Scenario 1 to achieve within the preferred reverberation time range
- Scenario 2 increases the reverberation time by implementing different material properties and not changing the architecture

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Electrical Depth | Energy Savings vs. Increased Feeder Size

NON-SUMMER GENERATION RATE (OCTOBER 1 - MAY 31)				
	RATE ($/kWh)	HOURS PER DAY	HOURS PER YEAR	COST PER YEAR ($/kWh)
PEAK	0.10797	8	1944	$209.89
INTERMEDIATE-PEAK	0.10734	6	1458	$156.50
OFF-PEAK	0.08803	10	2430	$213.91

* GENERATION RATES ARE FROM MARCH 1 - MAY 31, 2010

SUMMER GENERATION RATE (JUNE 1 - SEPTEMBER 30)				
	RATE ($/kWh)	HOURS PER DAY	HOURS PER YEAR	COST PER YEAR ($/kWh)
PEAK	0.10797	10	1220	$131.72
INTERMEDIATE-PEAK	0.10734	6	732	$78.57
OFF-PEAK	0.08803	8	976	$85.92

* GENERATION RATES ARE FROM MARCH 1 - MAY 31, 2010

TOTAL COST PER YEAR ($/kWh)	$876.52

Method

- Increase existing feeder sizes by 1, 2 and 3 sizes and produce a cost comparison
- Determine the energy loss by finding the feeder lengths, voltage drop across each conductor
- Use utility generation rates to estimate energy costs

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

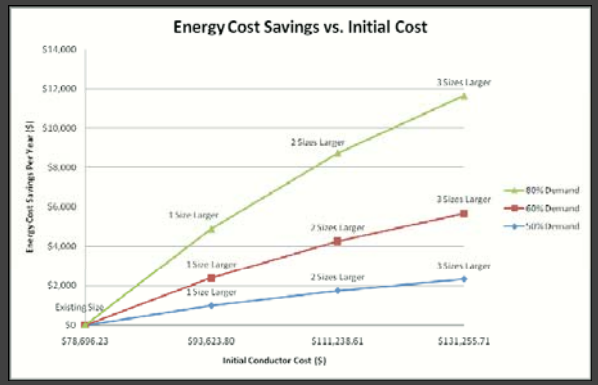
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Electrical Depth | Energy Savings vs. Increased Feeder Size

SUMMARY OF ENERGY SAVINGS PER YEAR - 50% DEMAND LOAD ($)					
	INITIAL CONDUCTOR COST ($)	INITIAL COST DIFFERENCE ($)	ENERGY LOSS PER YEAR ($)	ENERGY COST SAVINGS PER YEAR ($)	SIMPLE PAYBACK PERIOD (YRS)
EXISTING SIZE	$78,696.23	-	$6,727.93	-	-
1 SIZE LARGER	$93,623.80	$14,927.57	$5,751.86	$976.08	15.3
2 SIZES LARGER	$111,238.61	$32,542.38	$4,981.20	$1,746.74	18.6
3 SIZES LARGER	$131,255.71	$52,559.48	$4,401.26	$2,326.67	22.6

Summary



Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space
Gift Shop | Special Purpose Space
Lobby + Waiting Area | Circulation Space
Mechanical Breadth
Acoustical Breadth
Team Station | Work Space

Electrical Depth
Copper vs. Aluminum Feeders
Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Summary

Lighting Depth

- Improved the overall quality and aesthetic conditions for visitors and employees
- Met recommended light levels and power density requirements

Acoustical Breadth

- Enhanced the pediatric emergency department waiting area by changing material absorption conditions

Electrical Depth

- Increasing feeder sizes may be a viable solution to reduce energy loss and save money

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot | Exterior Space

Gift Shop | Special Purpose Space

Lobby + Waiting Area | Circulation Space

Mechanical Breadth

Acoustical Breadth

Team Station | Work Space

Electrical Depth — Copper vs. Aluminum Feeders

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

Acknowledgements

Faculty

Dr. Richard Mistrick
Dr. Kevin Houser
Professor Ted Dannerth
Professor Robert Holland
Professor Kevin Parfitt

Leach Wallace Associates, Inc.

Phil Mackey
Nick Nucci

Friends, Family and especially my fellow AE Students

Presentation Outline

Introduction + Building Statistics + Concept

Lighting Depth

Main Entrance + Parking Lot	Exterior Space
Gift Shop	Special Purpose Space
Lobby + Waiting Area	Circulation Space
	Mechanical Breadth *
	Acoustical Breadth
Team Station	Work Space *

Electrical Depth

Copper vs. Aluminum Feeders *

Energy Savings vs. Increased Feeder Size

Summary + Acknowledgements

* Not included in presentation

Questions + Comments