HARRY RANSOM HUMANITIES RESEARCH CENTER

Additions and Renovations

MICHAEL ANTHONY LOMBARDI
Lighting/Electrical Emphasis
Dr. Richard Mistrick, Advisor
The Pennsylvania State University

HARRY RANSOM HUMANITIES RESEARCH CENTER

Building Background

University of Texas at Austin Campus

Lake Flato Architects, Inc.

- Originally Constructed 1972
- Renovated 2001-2003
- $9 million Project Cost

- 46,360 ft^2 (Renovated 1st and 2nd floors)
- 7 Above-Grade Floors and Basement

Gallery	Artifact Preservation
Cultural Center	Performance Space
Historic Archives	

36 Million Literary Manuscripts 1 Million Rare Books 5 Million Photographs 100,000 Works of Art

PRESENTATION OUTLINE

TOPICS

Lighting Depth

- Entrance Lobby
  - Lighting Controls Integration
  - Bible and First Photograph Lighting
- North/South Corridors
- Stair Hall, Theatre Lobby
- Prothro Theatre
- Prothro Gallery
- Exterior/Site Lighting

Electrical Depth

- 120/208V to 277/240V Distribution
- Panelboard Redesign
- Copper to Aluminum Feeder Cost Comparison
- Coordination Study

Acoustics Breadth Prothro Theatre

Architectural Breadth Prothro Gallery

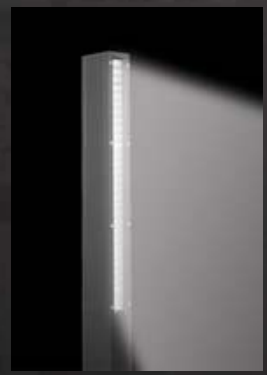
Summary

DESIGN ELEMENTS

Create a lighting system that compliments the architecture of the space and enhance the appearance of the collections.

Visible Luminaires

Simple Geometry



DESIGN ELEMENTS

Create a lighting system that compliments the architecture of the space and enhance the appearance of the collections.

Lamp Selections

General Illumination

CFL

Linear Fluorescent

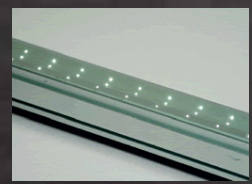
Metal Halide

Accent and Artwork

AR-111

MR-16

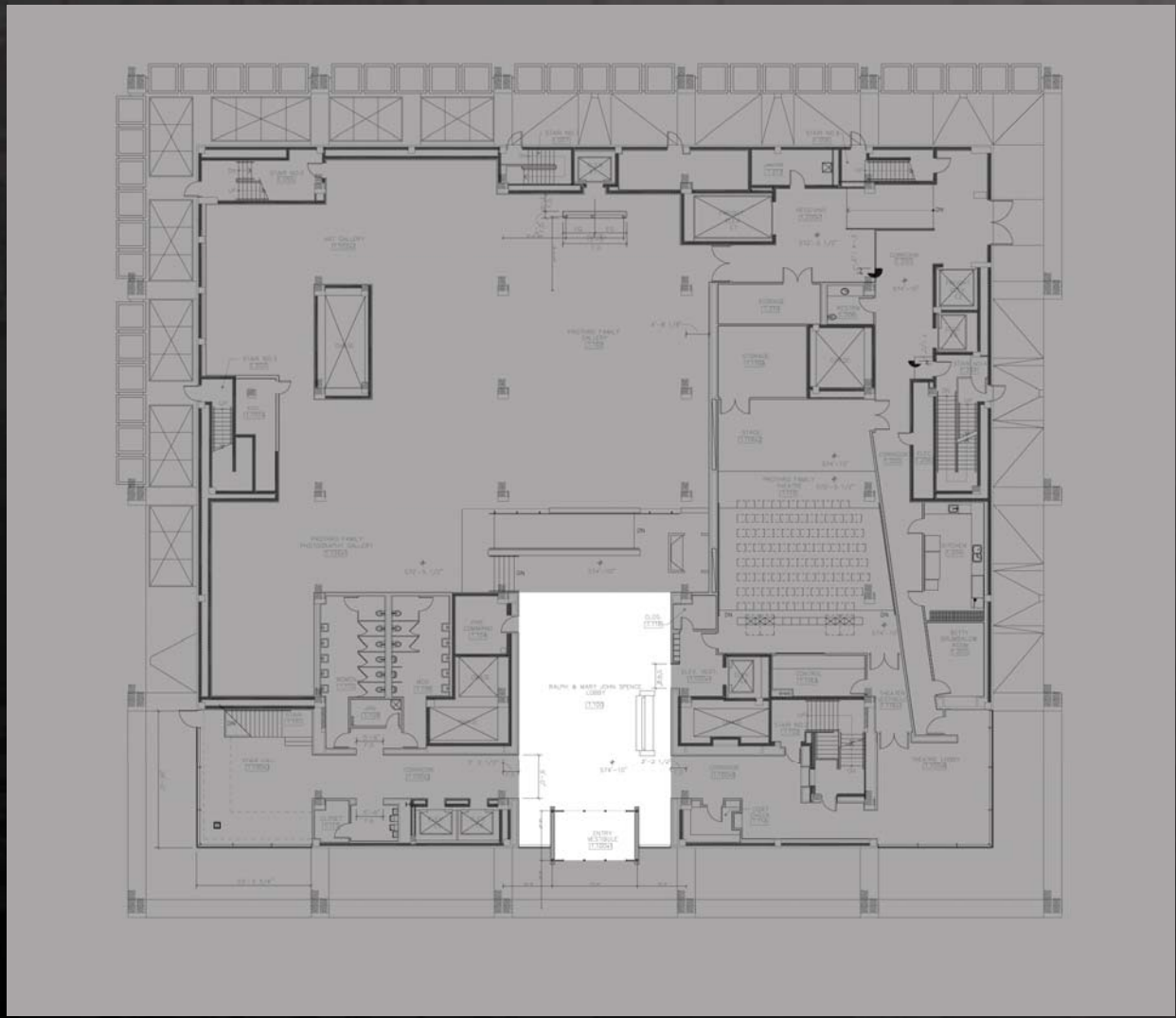
Special Lighting

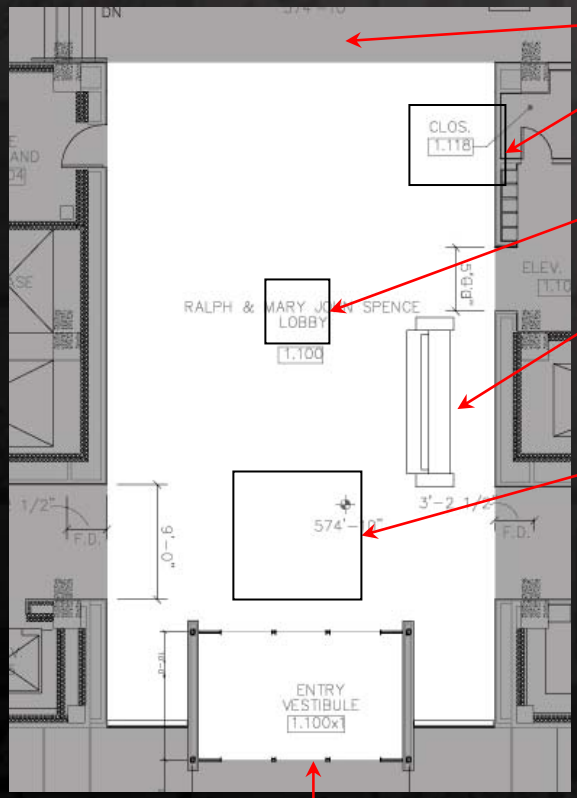


LED and Fiber Optic

LOBBY DESIGN

Lighting Depth





To Gallery

First Photograph Display

Gutenberg Bible

Security Desk

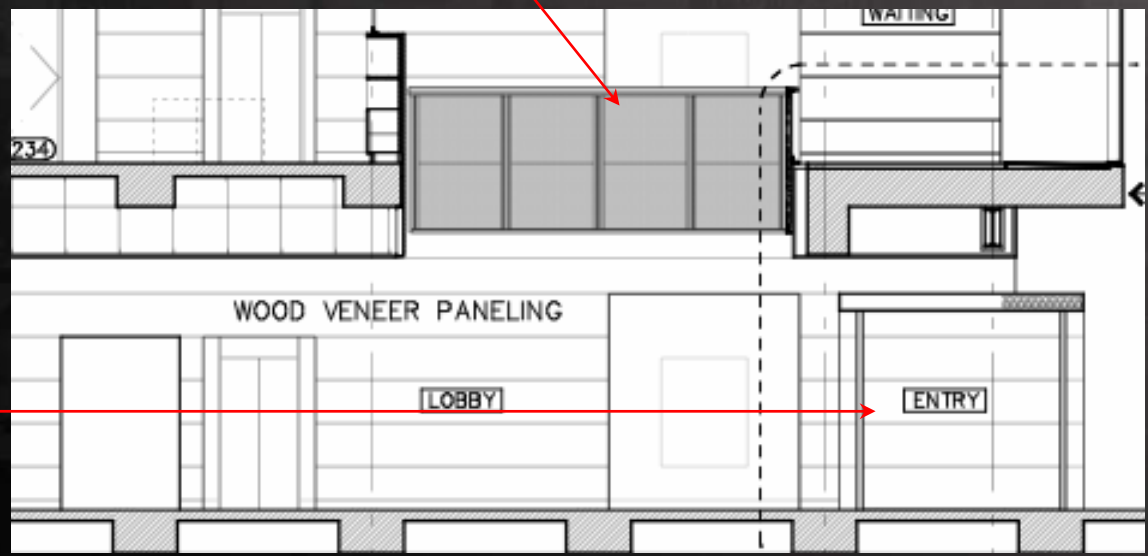
Open to Above

DESIGN GOALS

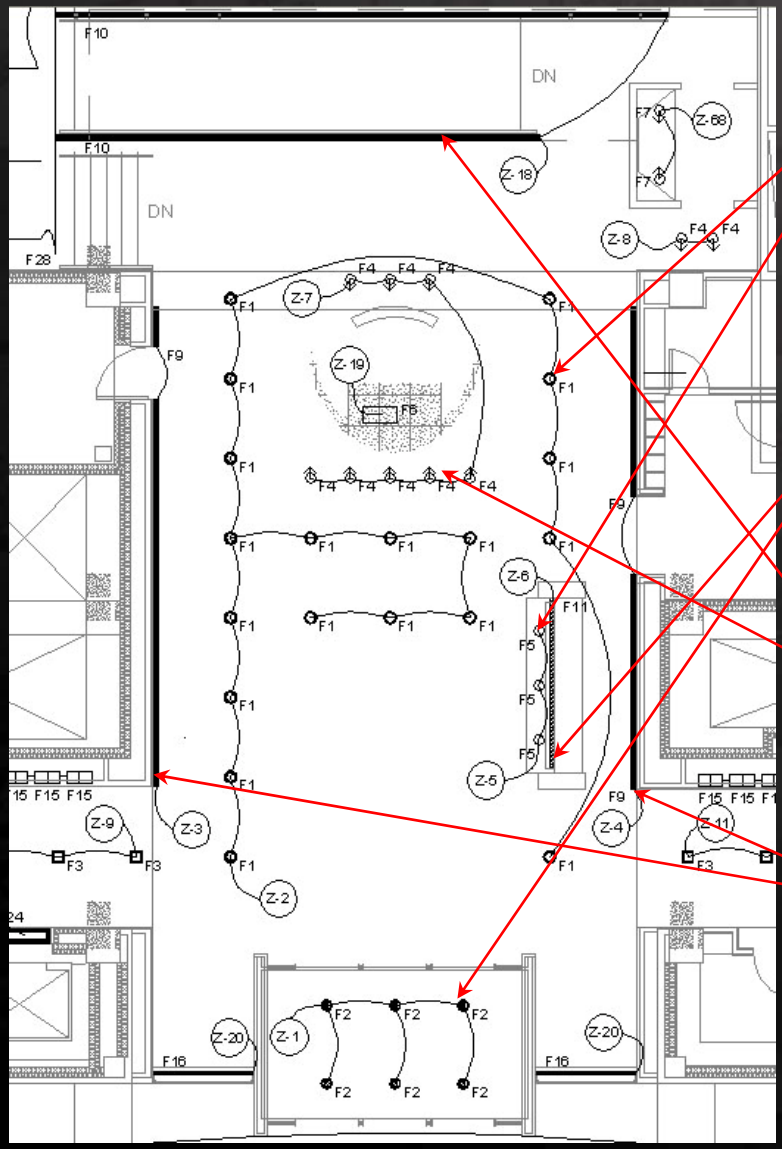
Create a Warm Environment

Highlight Wood Walls

Bring Attention to Bible Display



Entrance Vestibule and Signature Wall

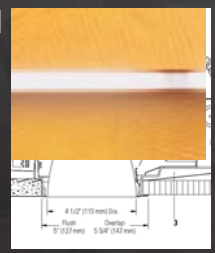


F15

Fully recessed halogen 5" aperture downlight

50 W

F11



Fully recessed compact fluorescent 6" aperture downlight

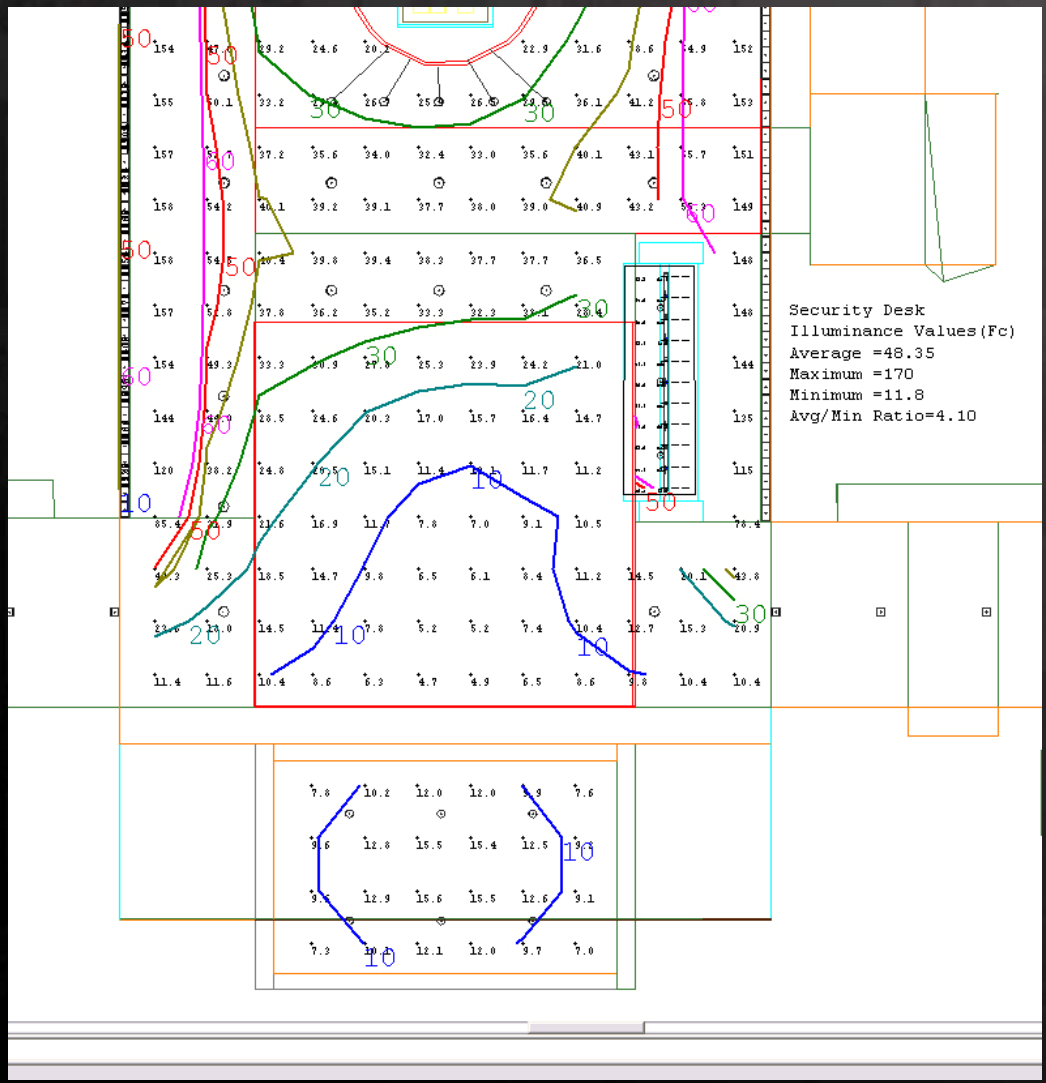
18 W

F10

Fully recessed adjustable accent light

F9

Cove recessed ceramic metal halide wall grazer



Calculations

Average illuminance

10 Fc Vestibule Floor

35 Fc Lobby Floor

48 Fc Security Desk

55 Fc Wood Walls

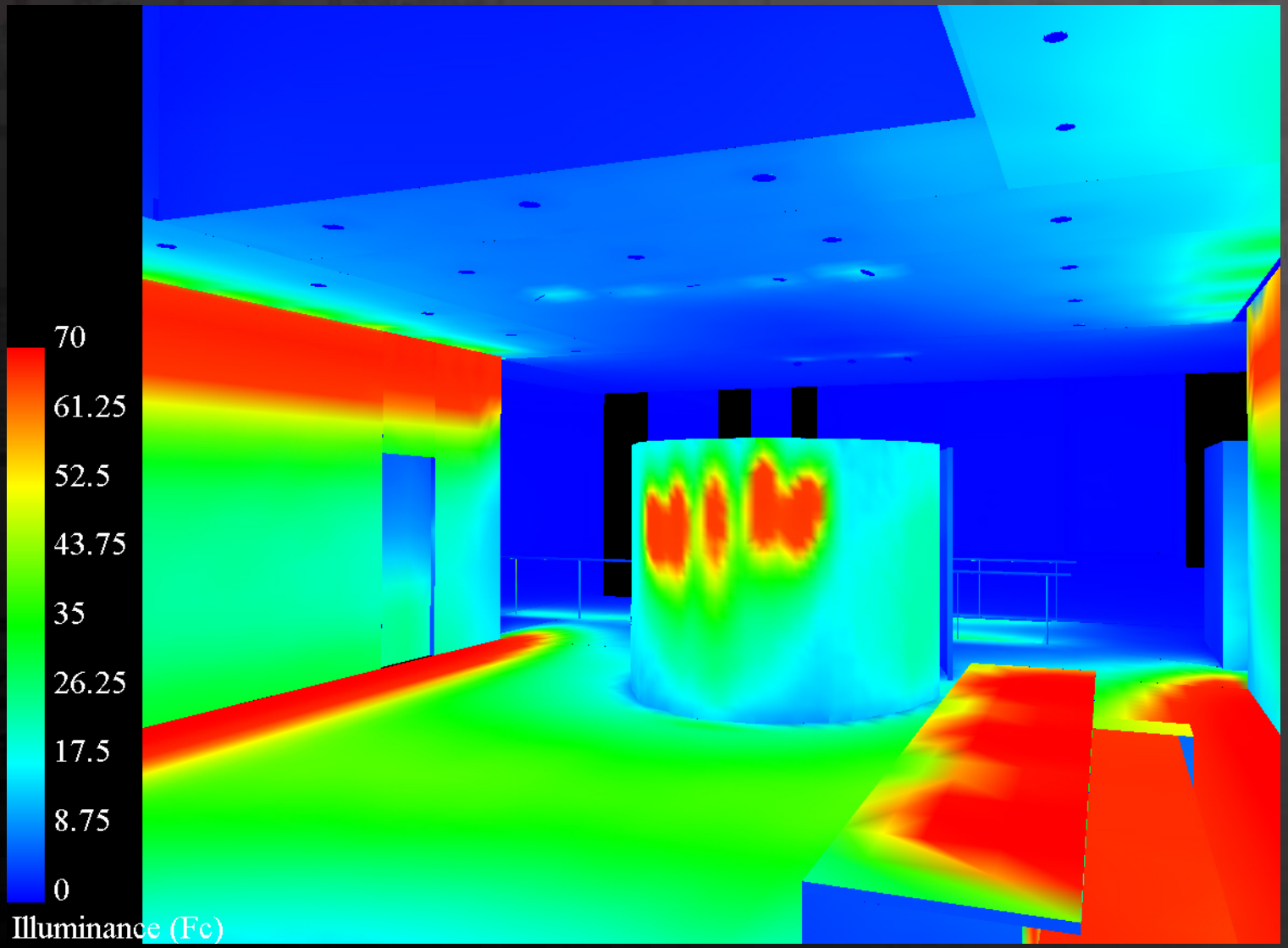
Gradual increase in light intensity from 10 Fc (vestibule) to 35 Fc (Lobby)

Power Density

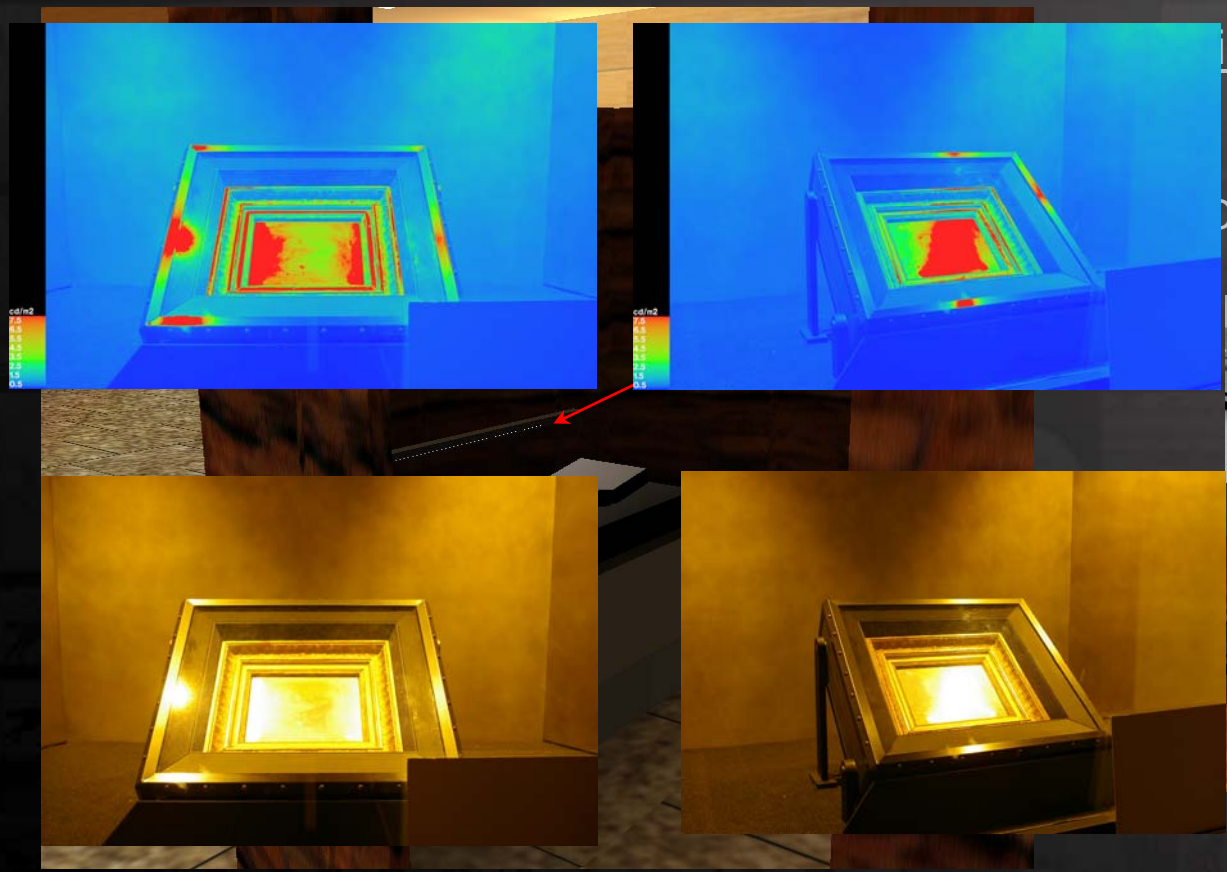
2.13 W/sq.ft. < ASHRAE (1.3 + 1.0 W/sq.ft)

75% reduction in energy consumption

(8.55 W/sq.ft. existing conditions)

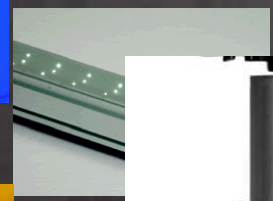

70
61.25
52.5
43.75
35
26.25
17.5
8.75
0
Illuminance (Fc)

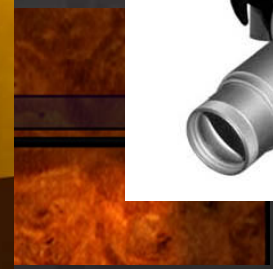
Special Lighting – Not Discussed in Detail



ighting Lamp Comparison
First Photograph Lighting

HDR Imaging
Optic Vs. LED Fixture
Fixture Selection

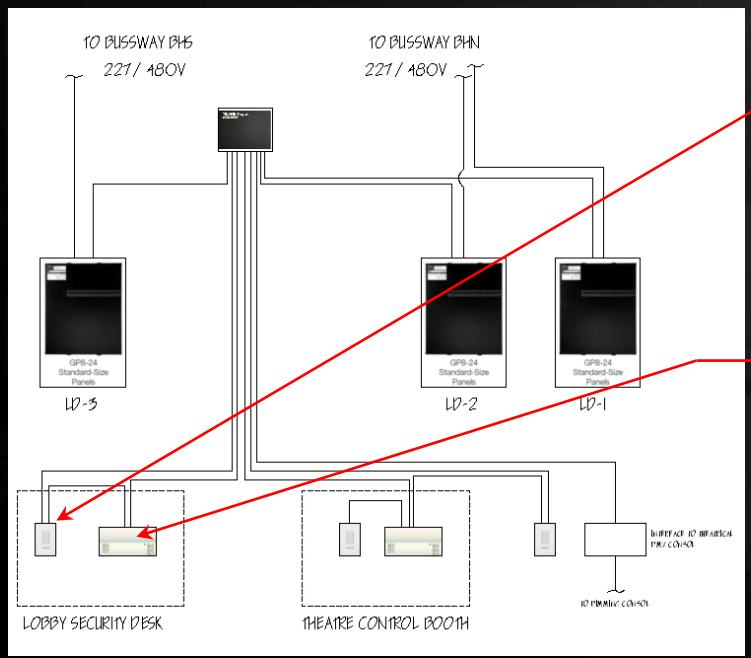


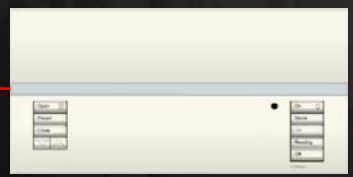


Lighting Controls

Lighting Controls

CONTROL DEVICE	DEVICE	DESCRIPTION	ENGRAVING	CONNECTED ZONE NUMBER
LC-1	Control Interface with 1-gang Scene Pad	Location: Security Desk		
	4 Scene + Off + L/R			
	1	Lobby High	HIGH	All Zones except Z-6, Z-18, Z-20
	2	Lobby Low	LOW	All Zones except Z-6, Z-18, Z-20
	3	Bible Display Toggle On/Off	BIBLE	Zone Z-19
	4	First Photo Display Toggle On/Off	FIRST PHOTO	Zone Z-68
	5	All Zones Off	OFF	All zones
	7	Lower/Raise	▽△	All selected zones
CONTROL DEVICE	**DEVICE**	**DESCRIPTION**	**ENGRAVING**	**CONNECTED ZONE NUMBER**
LC-2	1-gang Scene Pad	Location: Security Desk		
	4 Scene + Off + L/R			
	1	Guest counter area	COUNTER HIGH	Z-5
	2	Guest counter area	COUNTER LOW	Z-5
	3	Workdesk undercabinet lighting	TASK HIGH	Z-6
	4	Workdesk undercabinet lighting	TASK LOW	Z-6
	5	All Zones Off	OFF	All zones
	7	Lower/Raise	▽△	All selected zones





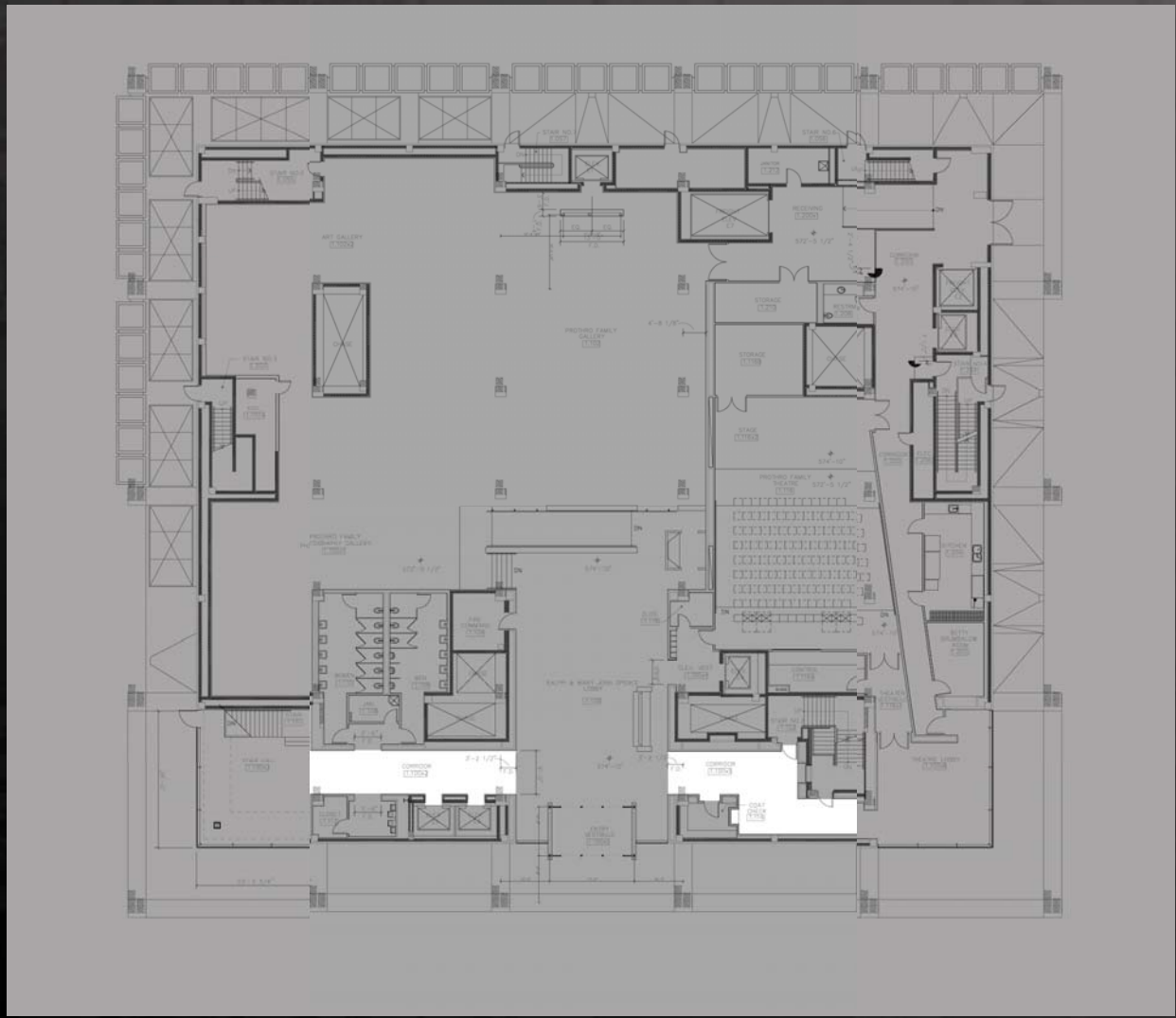
Centralized dimming/switching system with anatomical timeclock.

Simple button controls at lobby security desk.

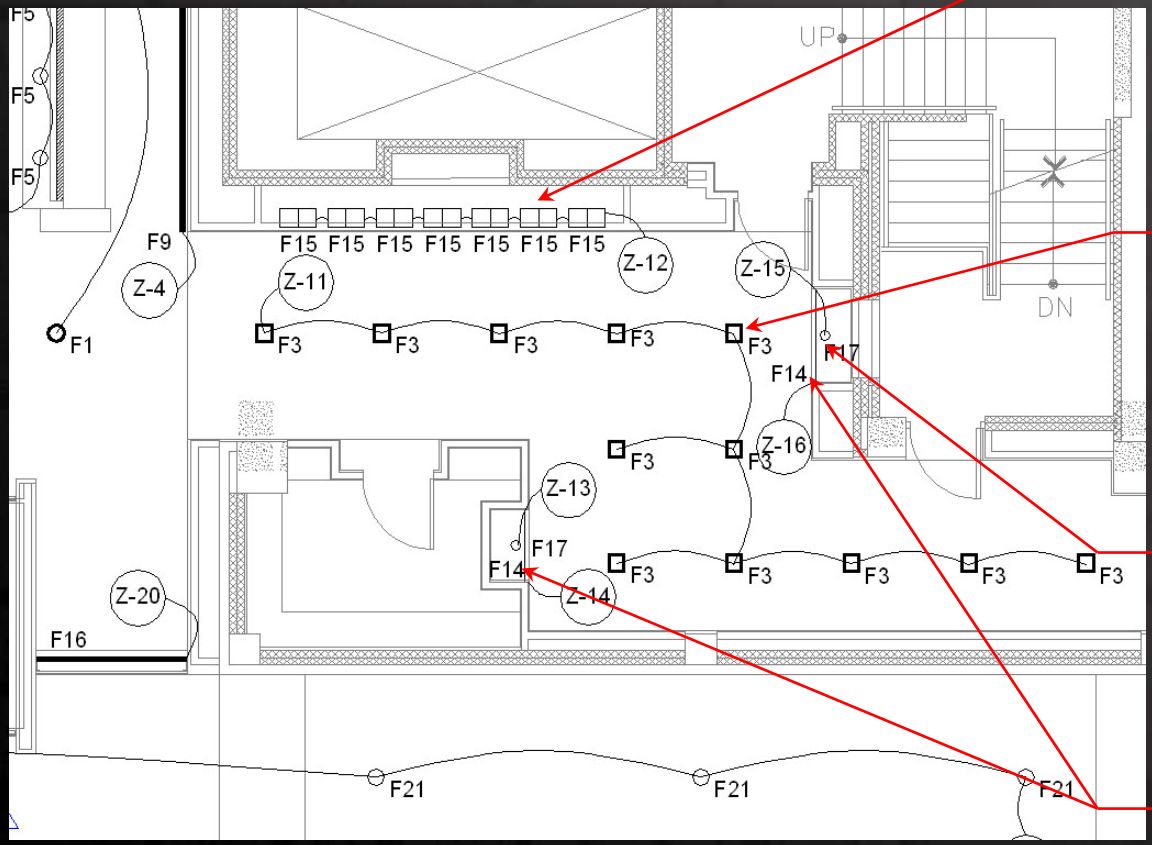
Ability to create “phantom” devices addressable via touch-screen.

NORTH/SOUTH CORRIDOR

Lighting Depth



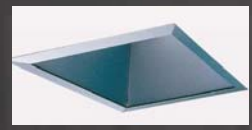
North Corridor



F15

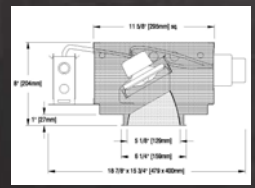
Adjustable accent halogen 2-lamp fixture 150 W

F3



Fully recessed 5-1/2” square aperture downlight 26 W

F17

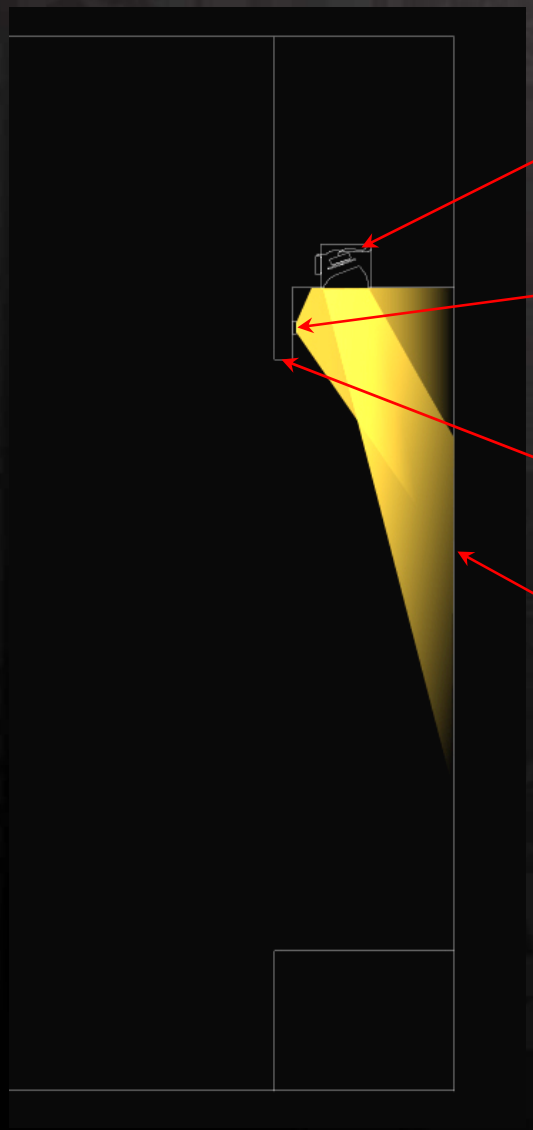


Fully recessed adjustable accent AR-111 downlight 75 W

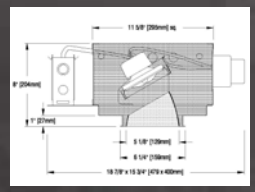
F14

Xenon strip light 5 W/lamp

Art Niche



F17



8 Degree AR-111 Lamp

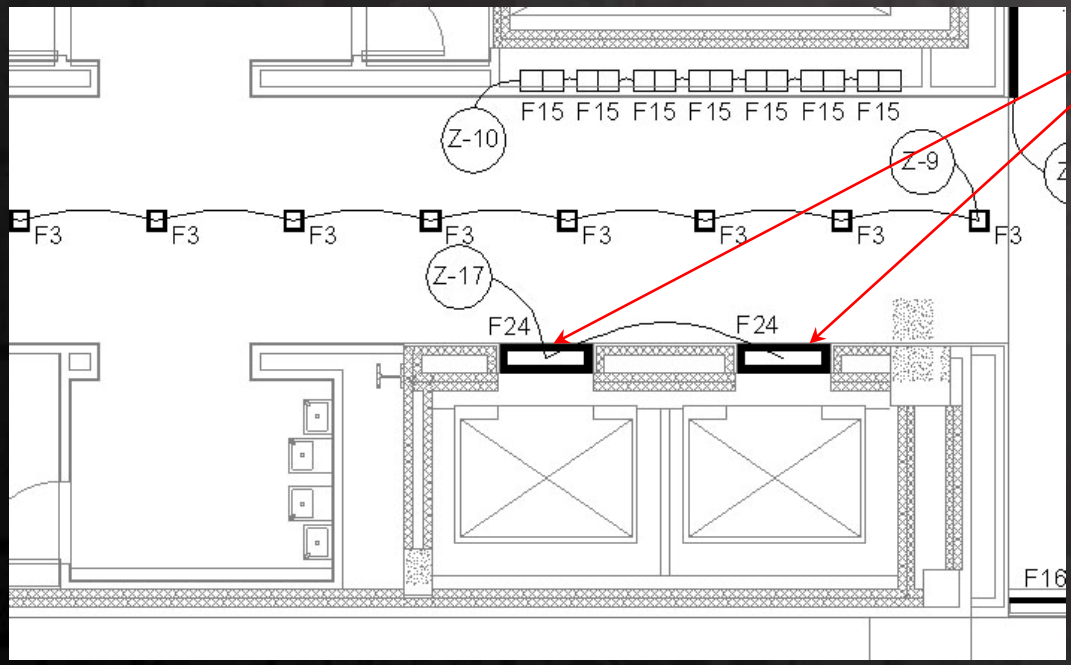
F14

Xenon Festoon Lamp

Valance

Painting Reference

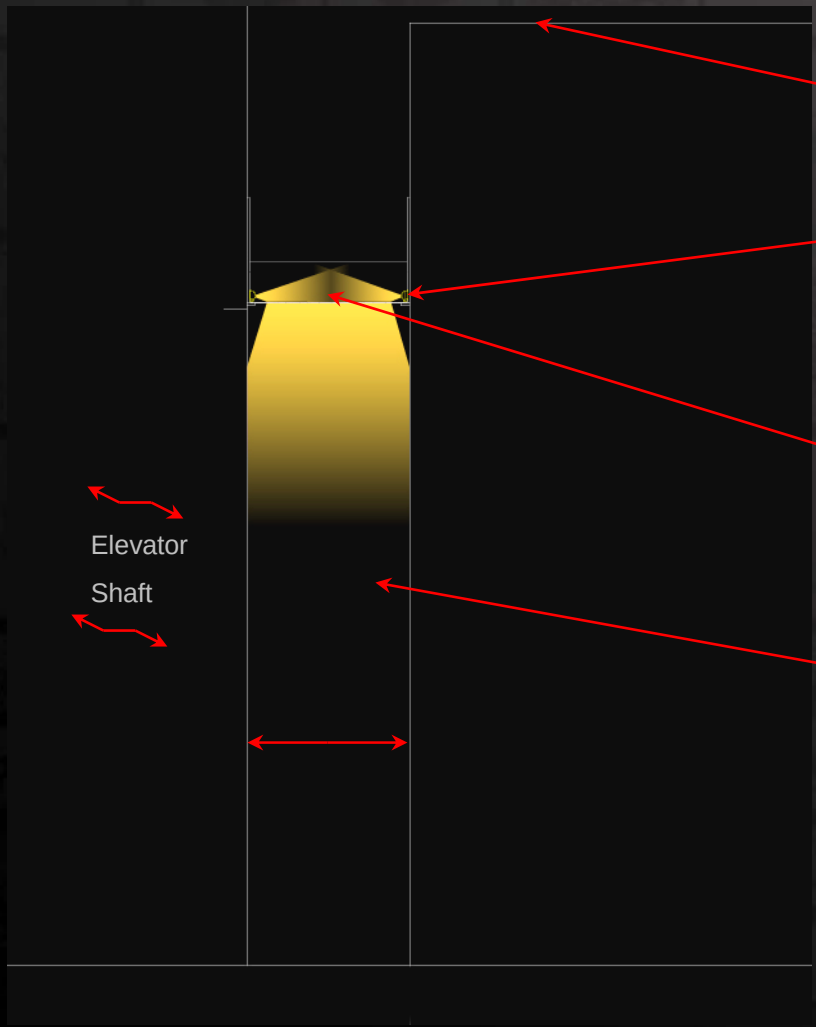
South Corridor



F24

Custom RGB LED fixture recessed in elevator threshold

Elevator Lighting



Ceiling Reference

F24

Diffuse Glass

Aluminum (Threshold)

North Corridor Rendering

Power Density

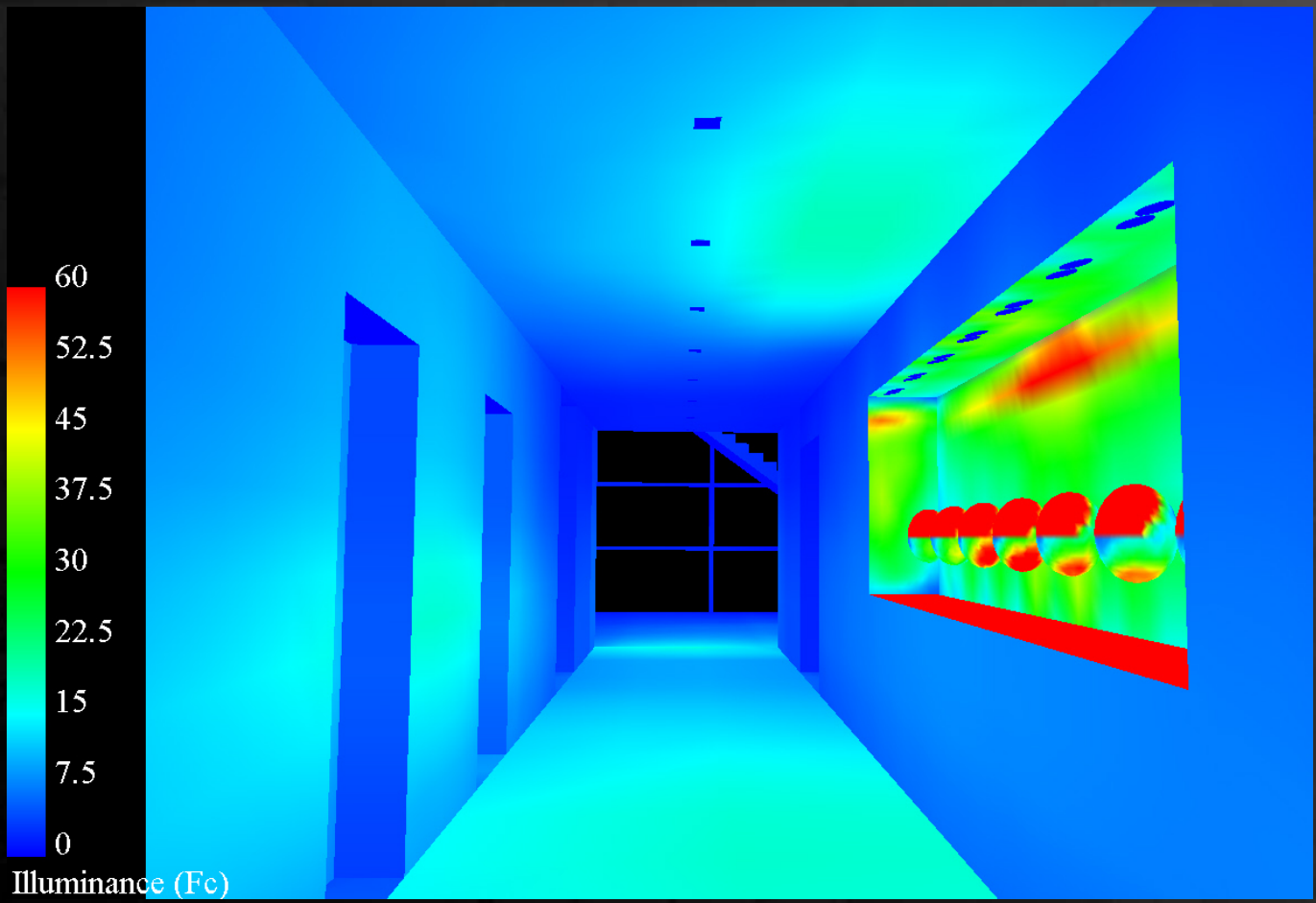
0.8 W/sq.ft.
< 1.2 W/sq.ft. ASHRAE

South Corridor Rendering

Power Density

0.8 W/sq.ft.
< 1.2 W/sq.ft. ASHRAE

South Corridor Pseudo Image



Power Density

0.8 W/sq.ft.
< 1.2 W/sq.ft. ASHRAE

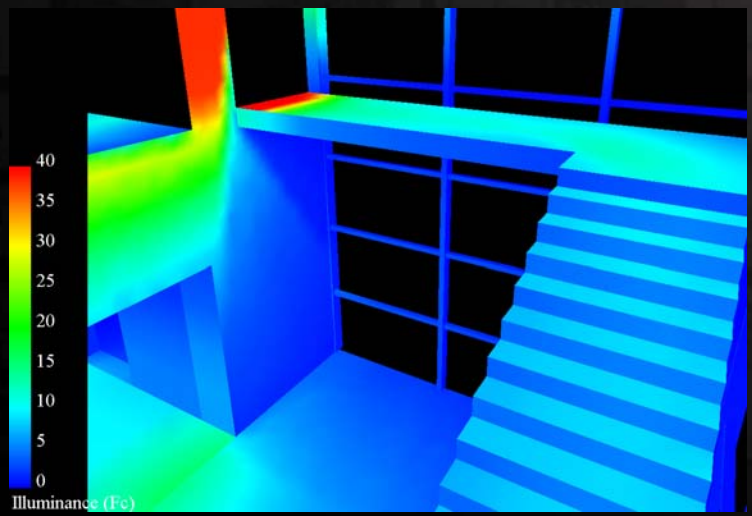
Average Illuminance

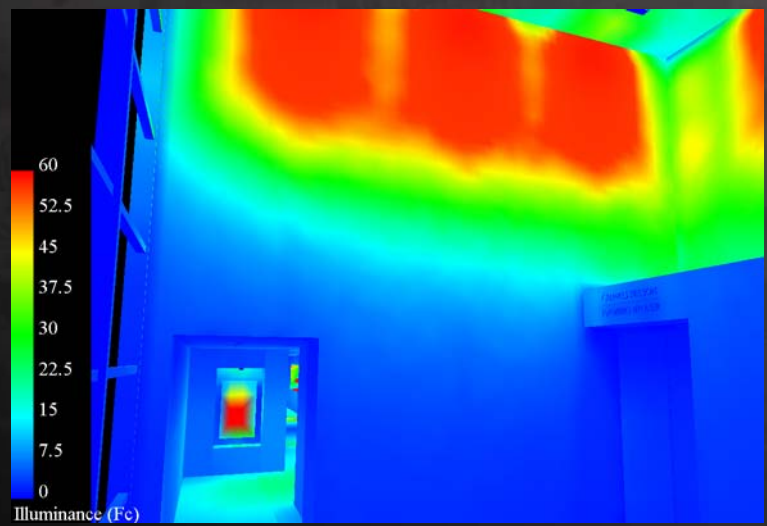
15.5 Fc Floors

26.1 Fc Sculpture Cove Wall

45.6 Fc Art Niche Painting

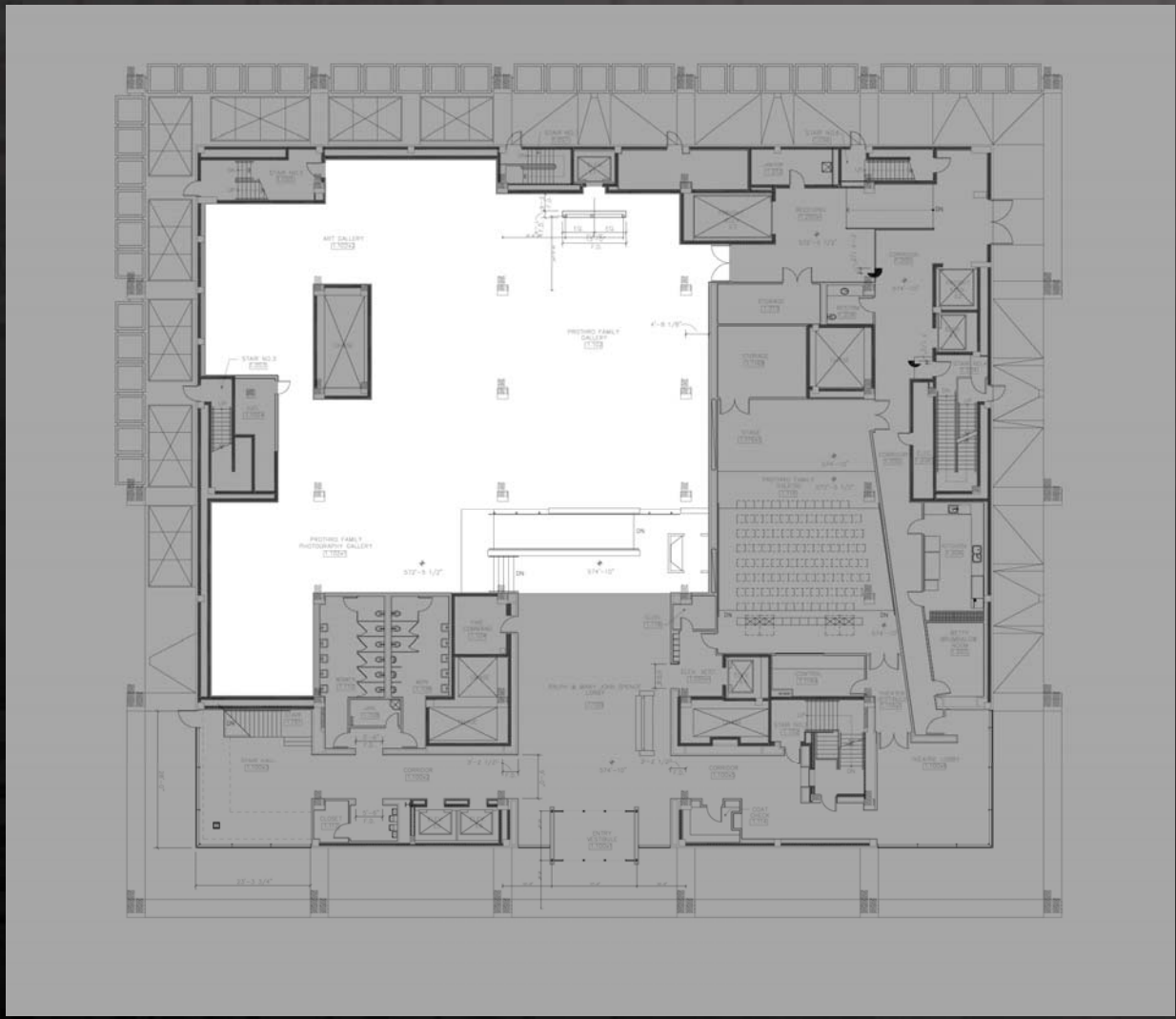
Stair Hall and Theatre Lobby



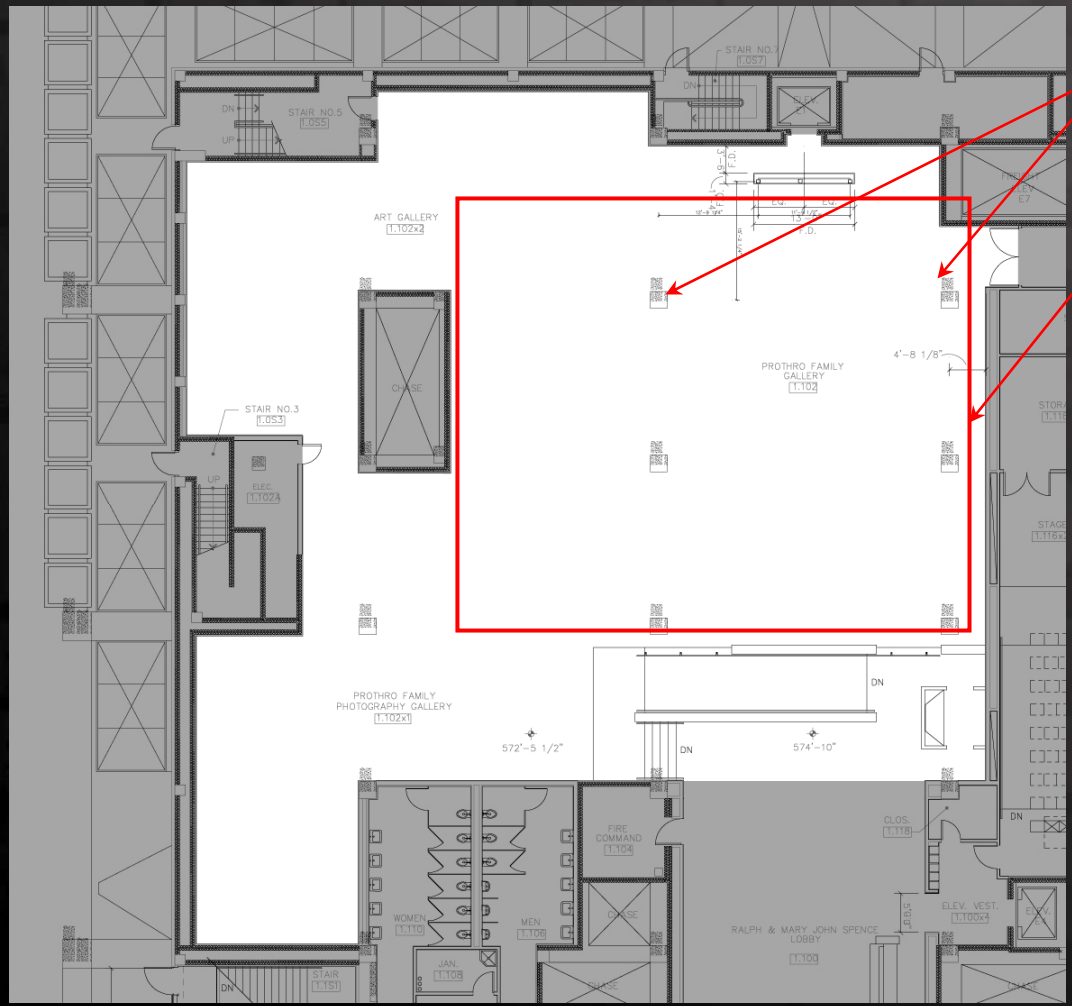


PROTHRO FAMILY ART GALLERY

Lighting Depth



North Corridor



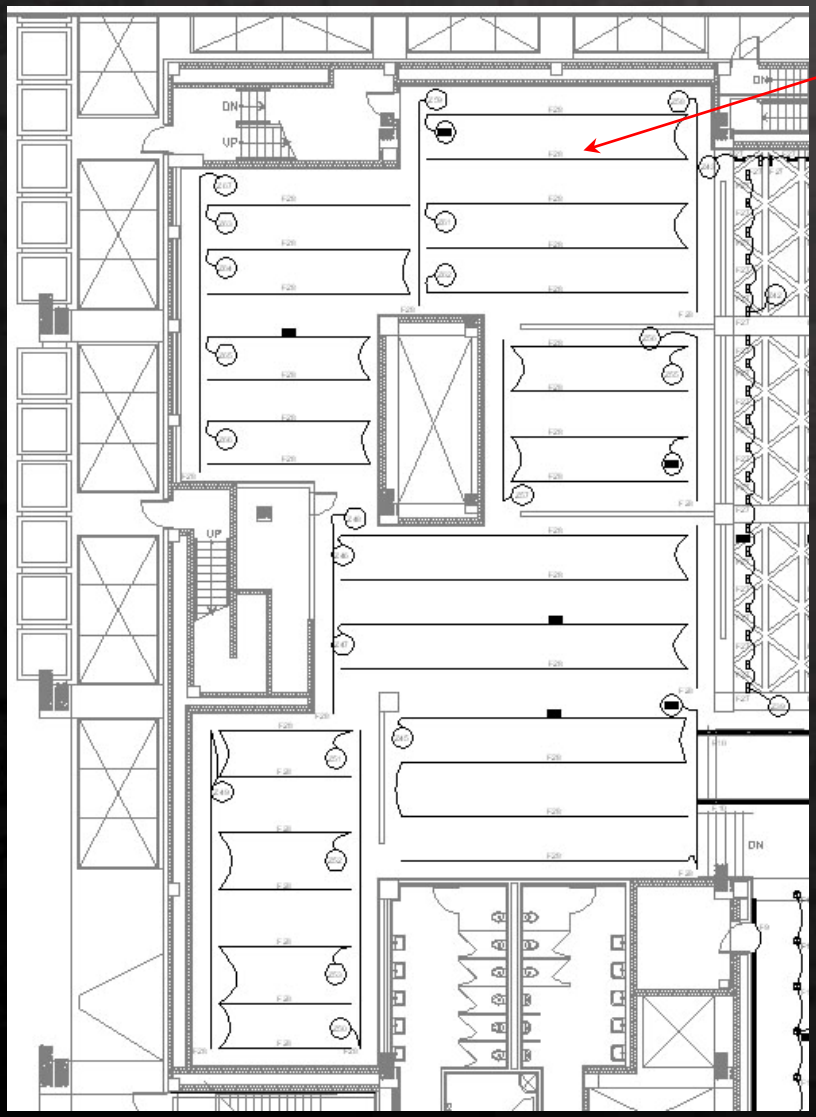
Exposed Columns

Redesigned Ceiling and room partitions (Architecture Breadth)

DESIGN GOALS

- Create a flexible lighting system
- Provide low maintenance fixtures
- Lighting system secondary to artwork
- Minimum 2:1 contrast ratio on art

South Wing



F28

Bus Track System
277 V Recessed track for power, communication devices, and lighting fixtures.

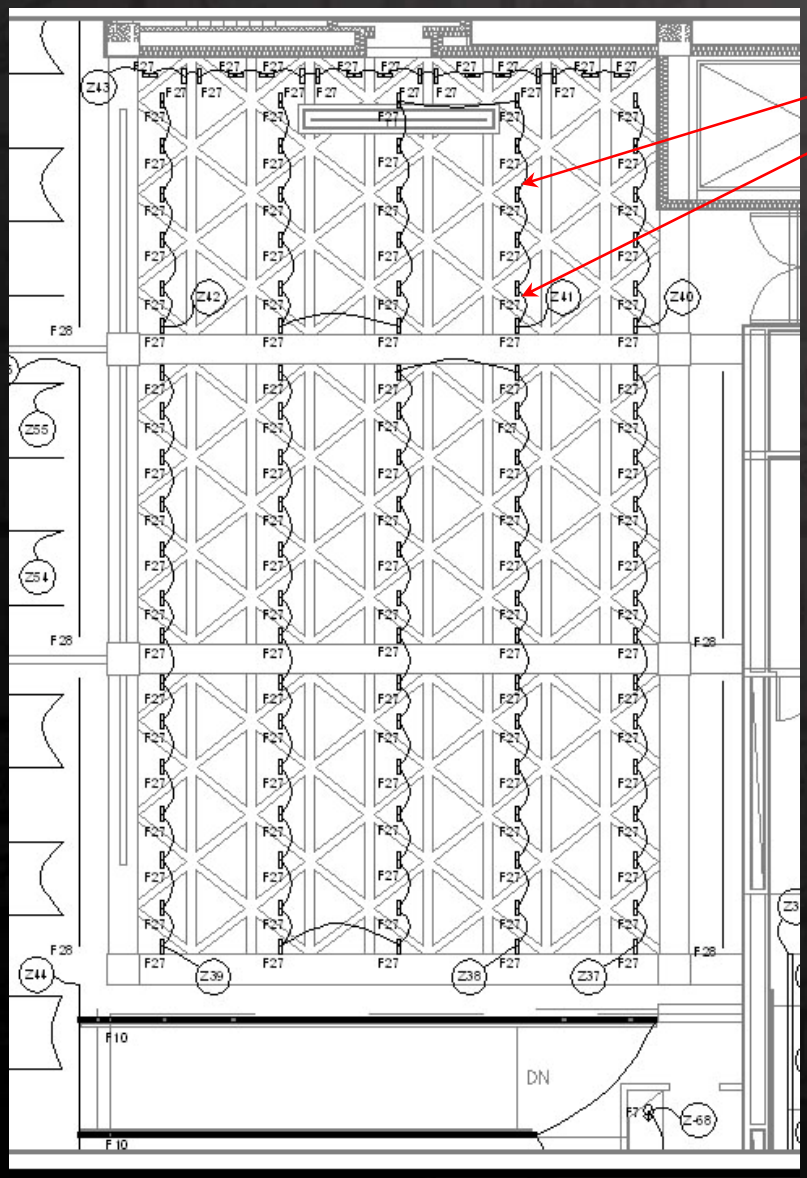
F29

Track mounted MR-16 halogen accent light
50 W

F30

Track mounted MR-16 halogen wallwash
50 W

Redesigned Main Gallery (Architecture Breadth)



F27

Monopoint Track System
120 V Recessed track for power, communication devices, and lighting fixtures.

F29

Track mounted MR-16 halogen accent light
50 W

F30

Track mounted MR-16 halogen wallwash
50 W

BUS TRACK vs. TRADITIONAL TRACK SYSTEM

About Bus Runs

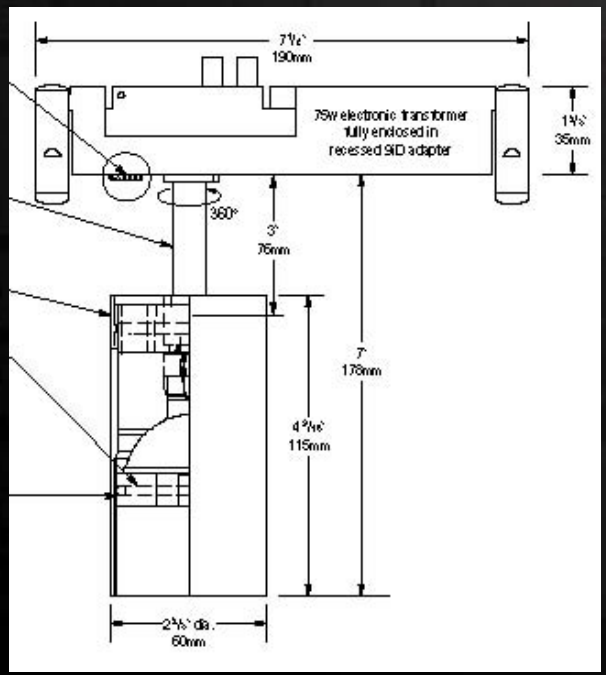
- 120 and 277 V track: more efficient delivery of power

- 60 A power feeds: longer track runs

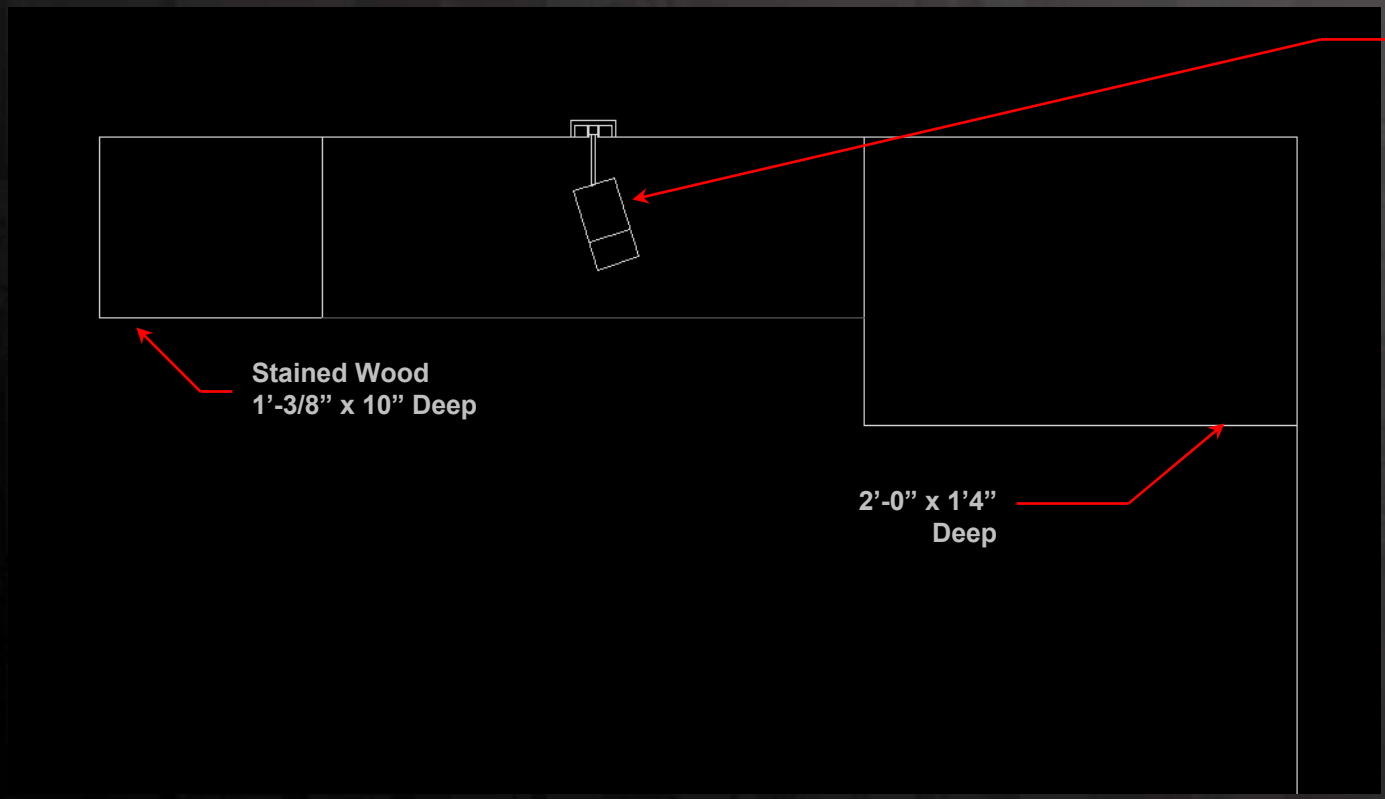
- Less space on Panelboard

- Ability to use track as power/data source

- Concealed 277/12 V or 120/12 V transformer



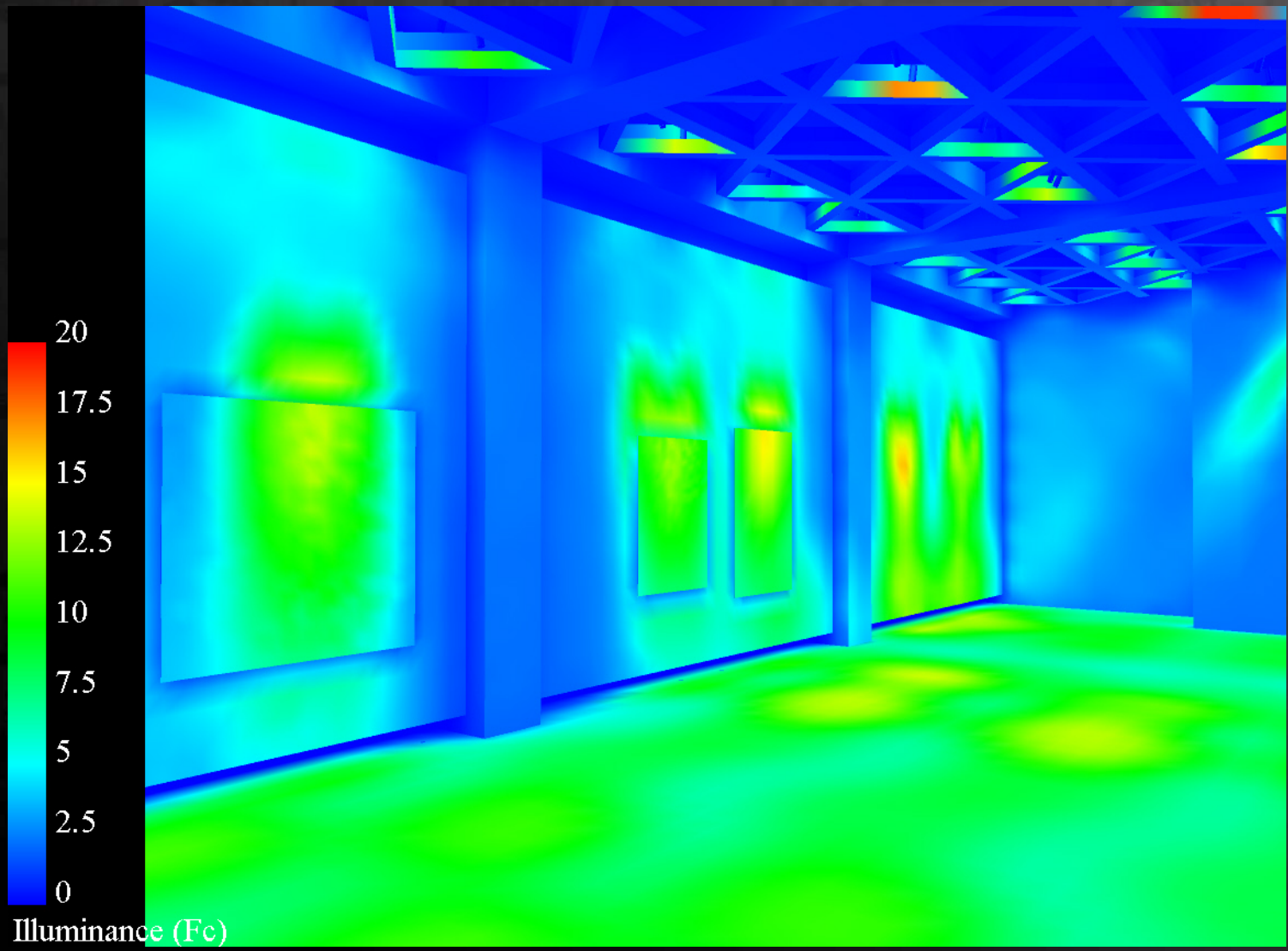
MOUNTING DETAILS



Redesigned Main Gallery Rendering

Rendered View From Lobby

Pseudo Rendering

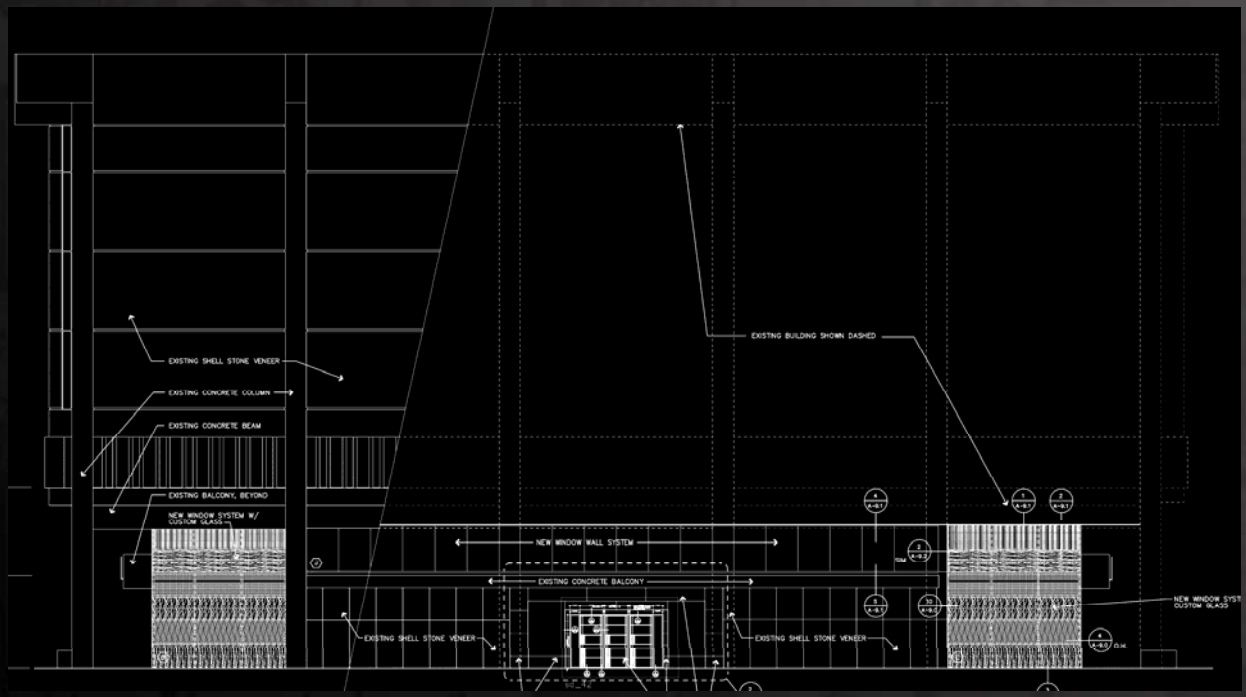


7.5 Fc Walls

16 Fc Max Paintings

15.5 Fc Floors

EXTERIOR LIGHTING



DESIGN GOAL

- Create a hierarchy of light
- Provide rhythmic lines of light through walkway
- Reinforce the building's geometric architecture
- 0.2-2 Fc pathways
- 1-5 Fc min Canopy

DESIGN INSPIRATION

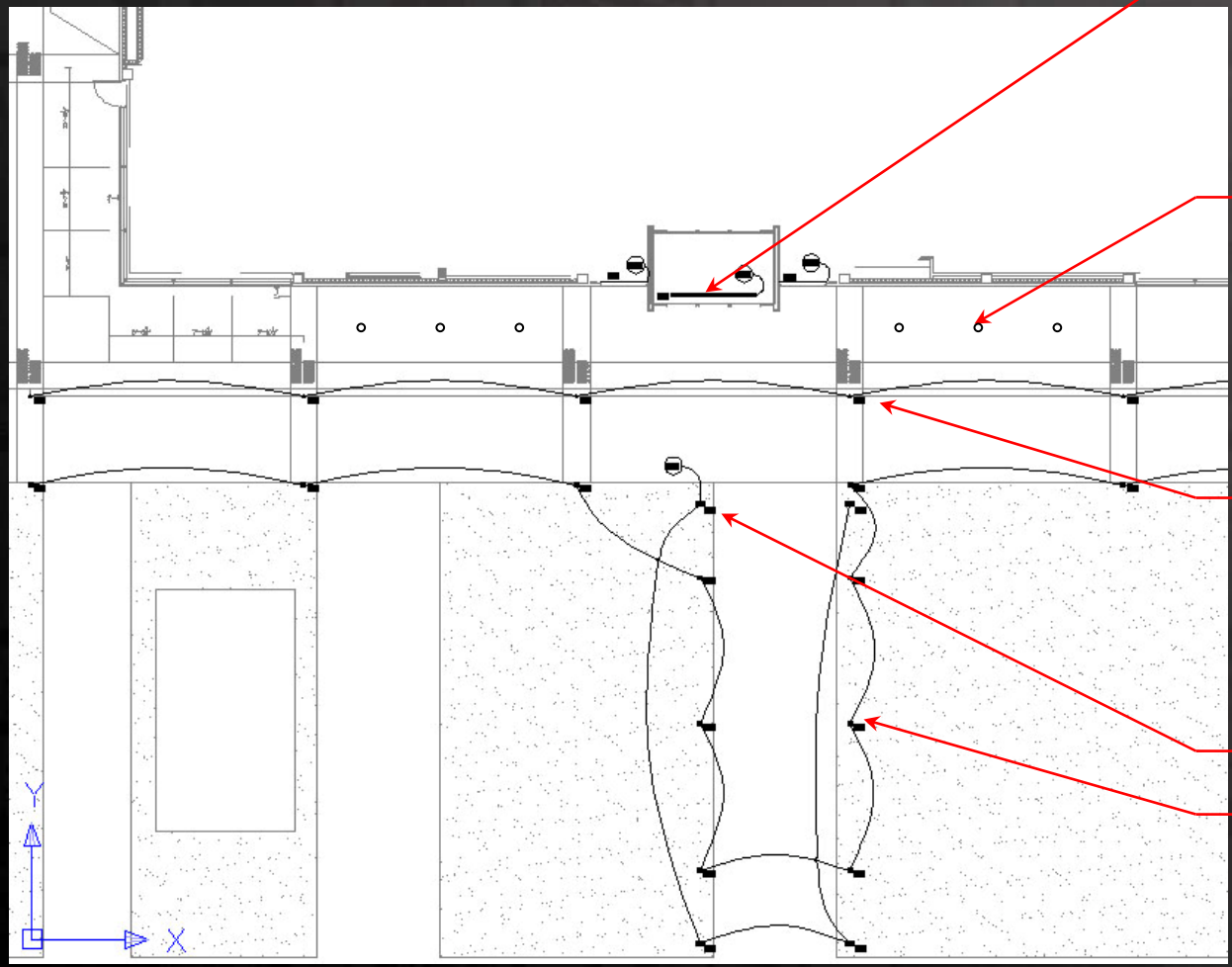
Mies van der Rohe (Architect) / Richard Kelly (Lighting Designer)

Seagram Building, NY

Illuminate the canopy with soft pads of light to provide a 'lightness' to the base of the massive stone façade

Conceptual Rendering

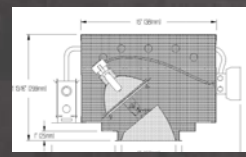
Site Lighting



F23

Recessed Asymmetric Sign Light 54 W T5

F19



Canopy Recessed T5 CMH Adjustable Downlights

F22

Grade Recessed Asymmetric MR16 Accent Light (20 W)

F19

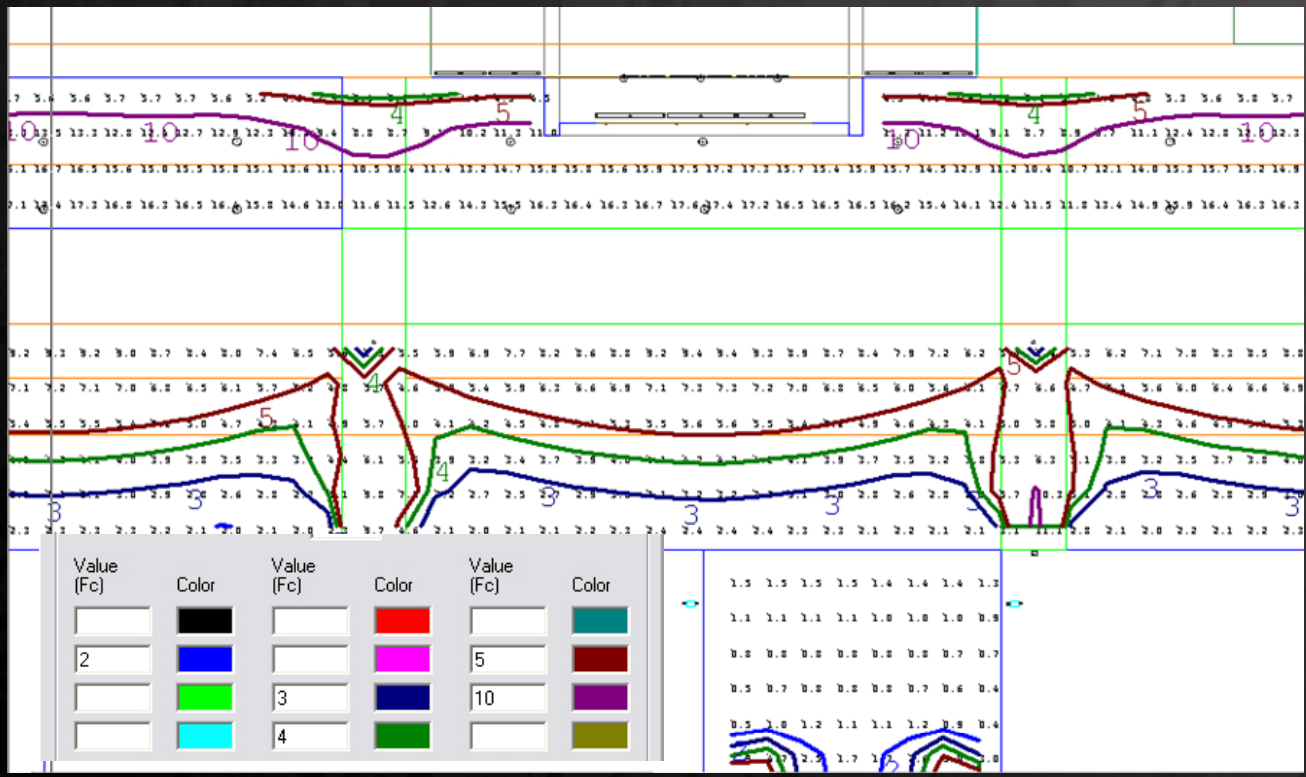
F20

T5 Bollards and Poles

Front Entry

Walkway Rendering

Walkway and Canopy Calculations



Power Density

0.12 W/sq.ft.
< 1.25 W/sq.ft. ASHRAE

Average Illuminance

4.09 Fc Canopy

1.14 Fc Pathway

8.10 Avg/Min Ratio Column

Façade Comparison

Existing Conditions

Redesign

Scallop Patterns reduced significantly with adjustable accent downlight

Light Pollution/Trespass Study

Exterior lighting has minimal impact on surroundings

ACOUSTICS BREADTH

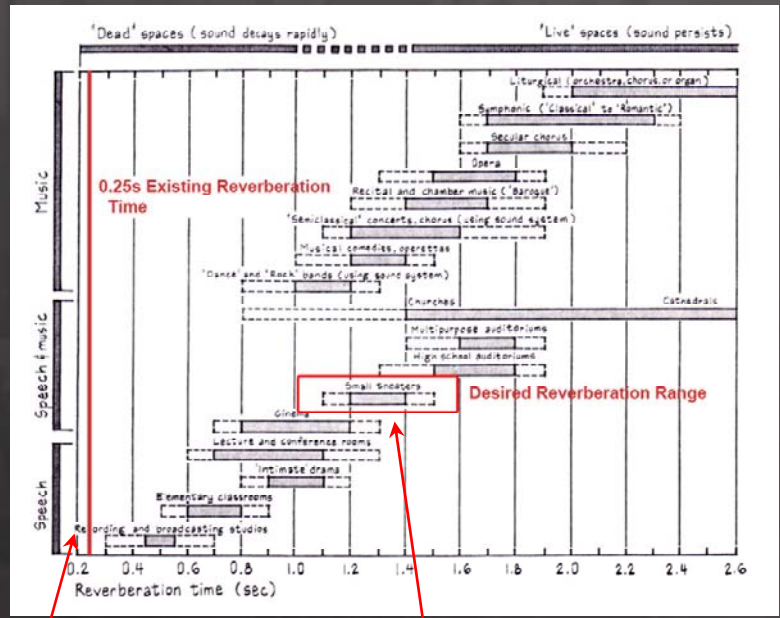
Existing Conditions

Reverberation Time - Existing Conditions

Material	Area (Sq.ft.)	125 Hz α	125 Hz sabins	500 Hz α	500 Hz sabins	4000 Hz α	4000 Hz sabins
Fully Occupied							
Ceiling							
Mesh Ceiling Panels	9037	0.10	904	0.65	5874	0.40	3615
Concrete	772	0.01	8	0.02	15	0.02	15
Glass	27	0.18	5	0.04	1	0.02	1
Side and Rear Walls							
Veneer Plaster	1532	0.14	214	0.06	92	0.03	46
Columns							
concrete, rough	247	0.01	2	0.04	10	0.10	25
Aisles							
Carpet, heavy on Concrete	426	0.02	9	0.14	60	0.65	277
Proscenium Opening	448	0.15	67	0.10	45	0.07	31
Air	1732	-		-		-	220
Doors	175	0.19	33	0.09	16	0.05	9
Audience							
seated in upholstered seats	576	0.39	225	0.80	461	0.87	501
Total Absorption			**1467**		**6573**		**4740**
One-Half Occupied							
Total absorption in auditorium less audience absorption from fully occupied calculation			1242		6113		4238
Seats, upholstered	300	0.19	57	0.56	168	0.59	177
Audience in upholstered seats	350	0.39	137	0.80	280	0.87	305
Total Absorption			**1436**		**6561**		**4720**

Theatre Volume (ft^3) **27770**

Conditions	Reverberation Time (s) 125 Hz	500 Hz	4000 Hz
Fully Occupied	0.95	0.21	0.29
One-half Occupied	0.97	0.21	0.29
500-4000 Hz Average, Fully Occupied	0.25		
500-4000 Hz Average, Half Occupied	0.25		

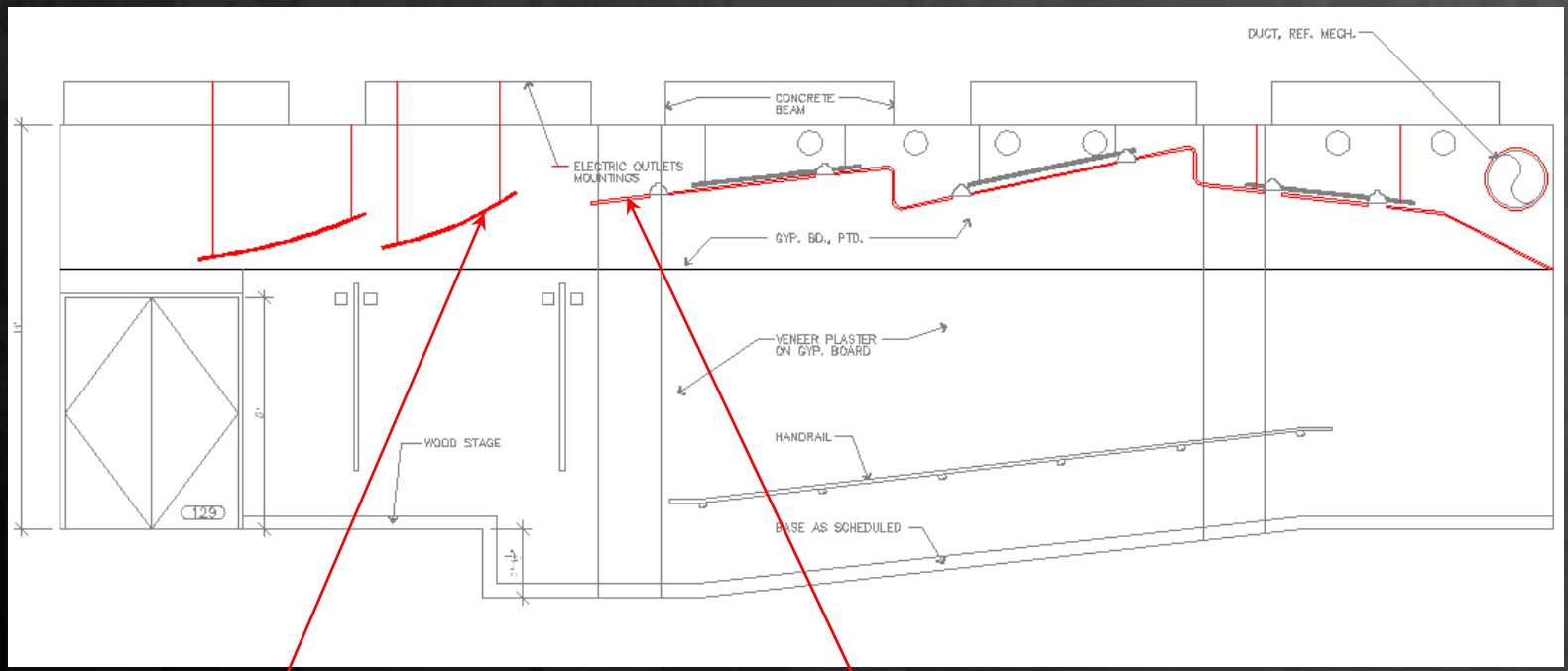


0.25s Reverberation Time

1.30s Target Reverberation Time

T = 0.05 V / a
220 sabins assumed for room air

Redesigned Ceiling With Sound Reflectors (Red)



Reflectors

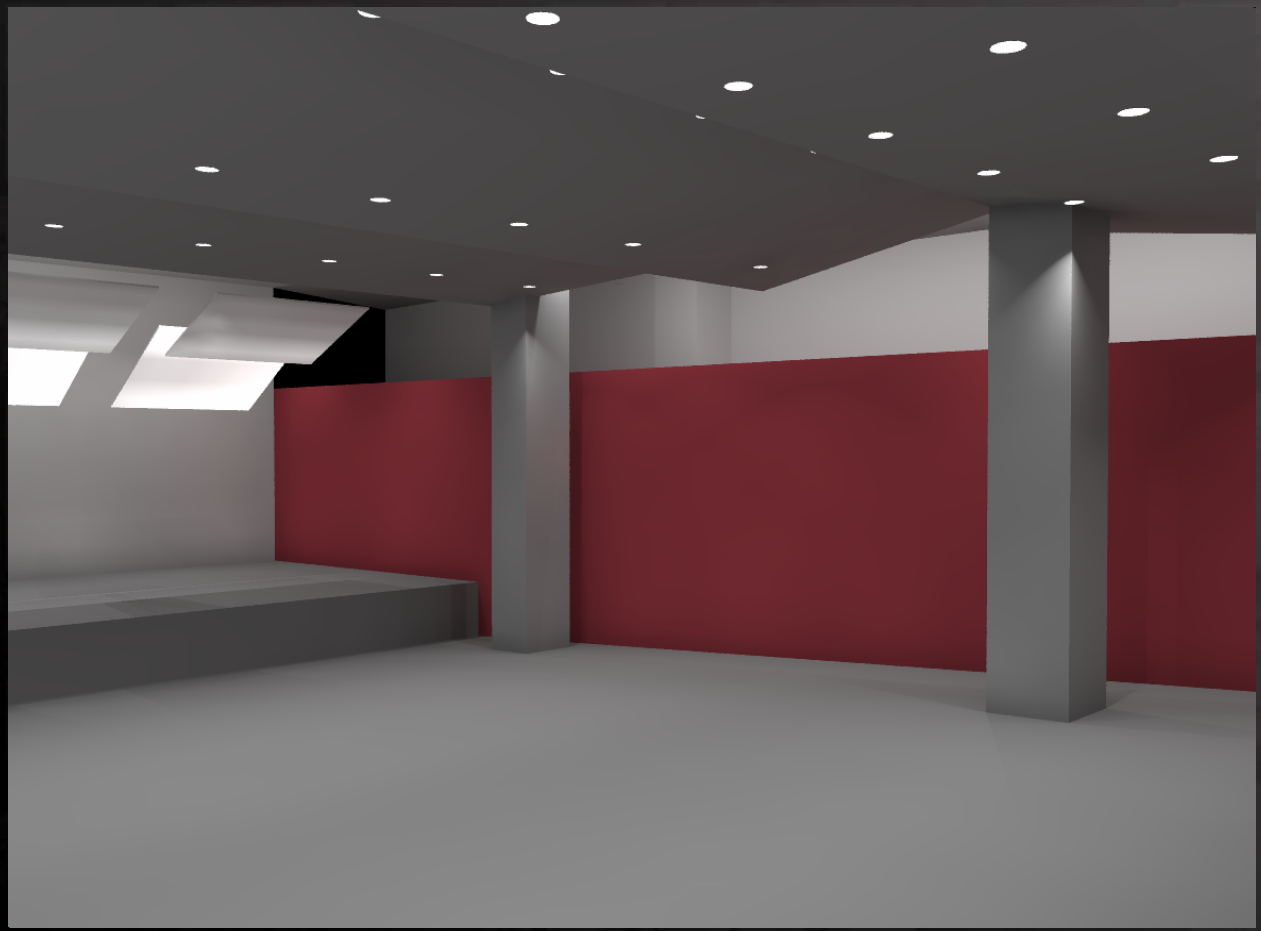
<http://www.erco.com>

Sound Diffusing Ceiling

Octave Band (HZ)							
Finish	125	250	500	1000	2000	4000	N.R.C.
Gel-coat	.23	.43	40	.42	.20	.11	.35

Tested in accordance with ASTM test procedures C-423.
Type "E-400" Mounting.
Actual test data available upon request (Q44).

Rendering with Sound Diffusing Ceiling



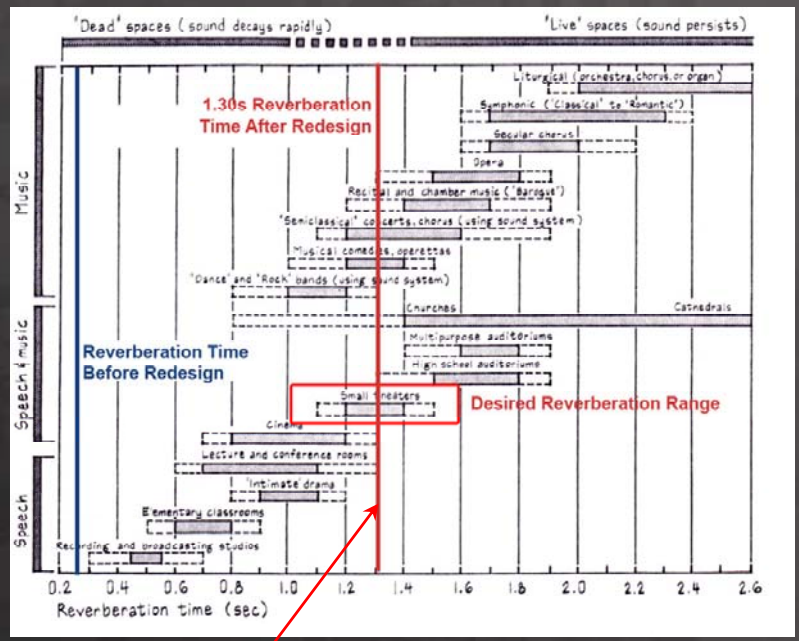
Redesigned Conditions

Reverberation Time - Acoustical Redesign

Material	Area (Sq.ft.)	125 Hz α	125 Hz sabins	500 Hz α	500 Hz sabins	4000 Hz α	4000 Hz sabins
Fully Occupied							
Ceiling							
Mesh Ceiling Panels	1200	0.23	276	0.40	480	0.11	132
Concrete	500	0.01	5	0.02	10	0.02	10
Reflectors	288	0.01	3	0.01	3	0.01	3
Side and Rear Walls							
Glass	27	0.18	5	0.04	1	0.02	1
Veneer Plaster	1532	0.14	214	0.06	92	0.03	46
Columns							
concrete, rough	247	0.01	2	0.04	10	0.10	25
Aisles							
Wood floors	426	0.15	64	0.10	43	0.07	30
Proscenium Opening	448	0.15	67	0.10	45	0.07	31
Air	1732	-		-		-	220
Doors	175	0.19	33	0.09	16	0.05	9
Audience							
seated in upholstered seats	576	0.39	225	0.80	461	0.87	501
Total Absorption			**895**		**1160**		**1007**
One-Half Occupied							
Total absorption in auditorium less audience absorption from fully occupied calculation			670		699		506
Seats, upholstered	300	0.19	57	0.56	168	0.59	177
Audience in upholstered seats	350	0.39	137	0.80	280	0.87	305
Total Absorption			**864**		**1147**		**988**

Theatre Volume (ft^3) **27770**

Conditions	Reverberation Time (s) 125 Hz	500 Hz	4000 Hz
Fully Occupied	1.55	1.20	1.38
One-half Occupied	1.61	1.21	1.41
500-4000 Hz Average, Fully Occupied	1.29		
500-4000 Hz Average, Half Occupied	1.31		



1.30 Avg. 500/4000Hz Reverberation time

***Redesign successfully meets target (exact!)**

PROTHRO THEATRE

Summary

Significant savings in energy consumption (50-75%)

New dimming system simplifies building operations

Gallery lighting/electrical is more efficient

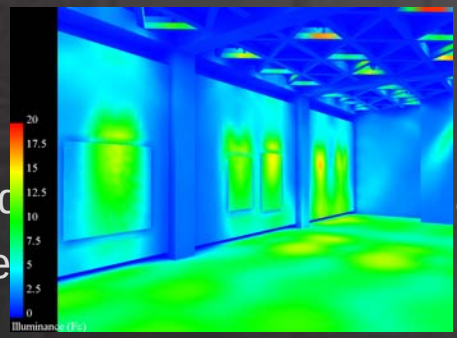
Visibility of gallery fixtures has been minimized

Exterior lighting improved

Room acoustics for Prothro Theatre significantly improved

HARRY RANSOM HUMANITIES RESEARCH CENTER

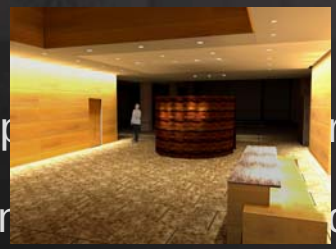
T



listrick, Tec arfitt, Professor H

essor Bowe

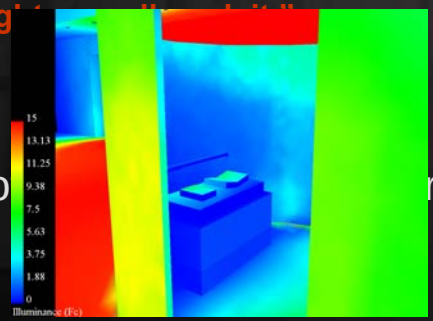
s design advice



and in p re ligl

All of my wonderful frier ose of you in the audience!)

Lauren… my chief AGI model



m, dad, and bro rvive this sem

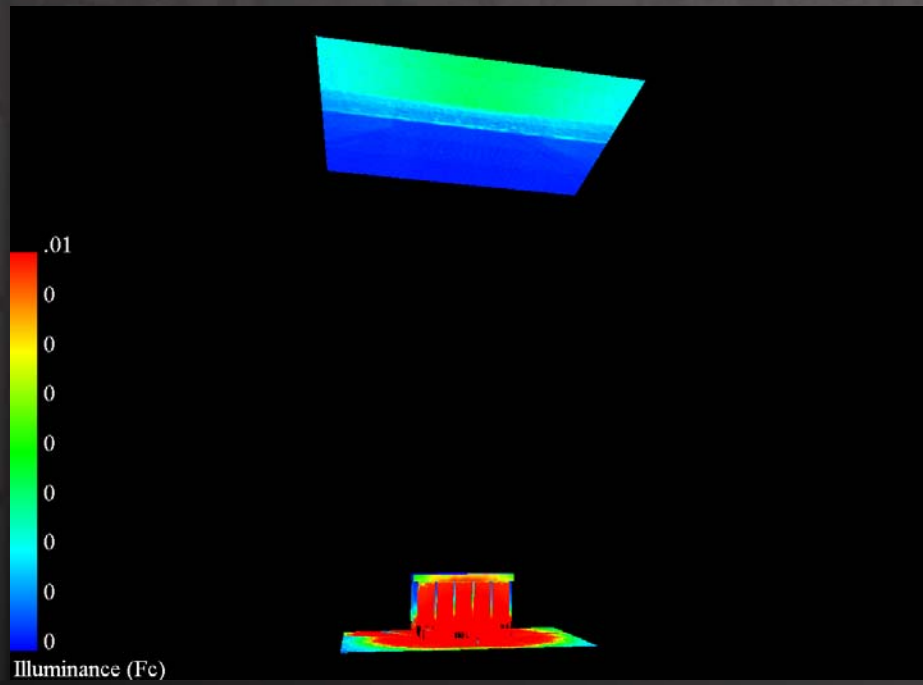
MICHAEL ANTHONY LOMBARDI

2007 SENIOR THESIS

HARRY RANSOM HUMANITIES RESEARCH CENTER

Light Pollution/Trespass Study

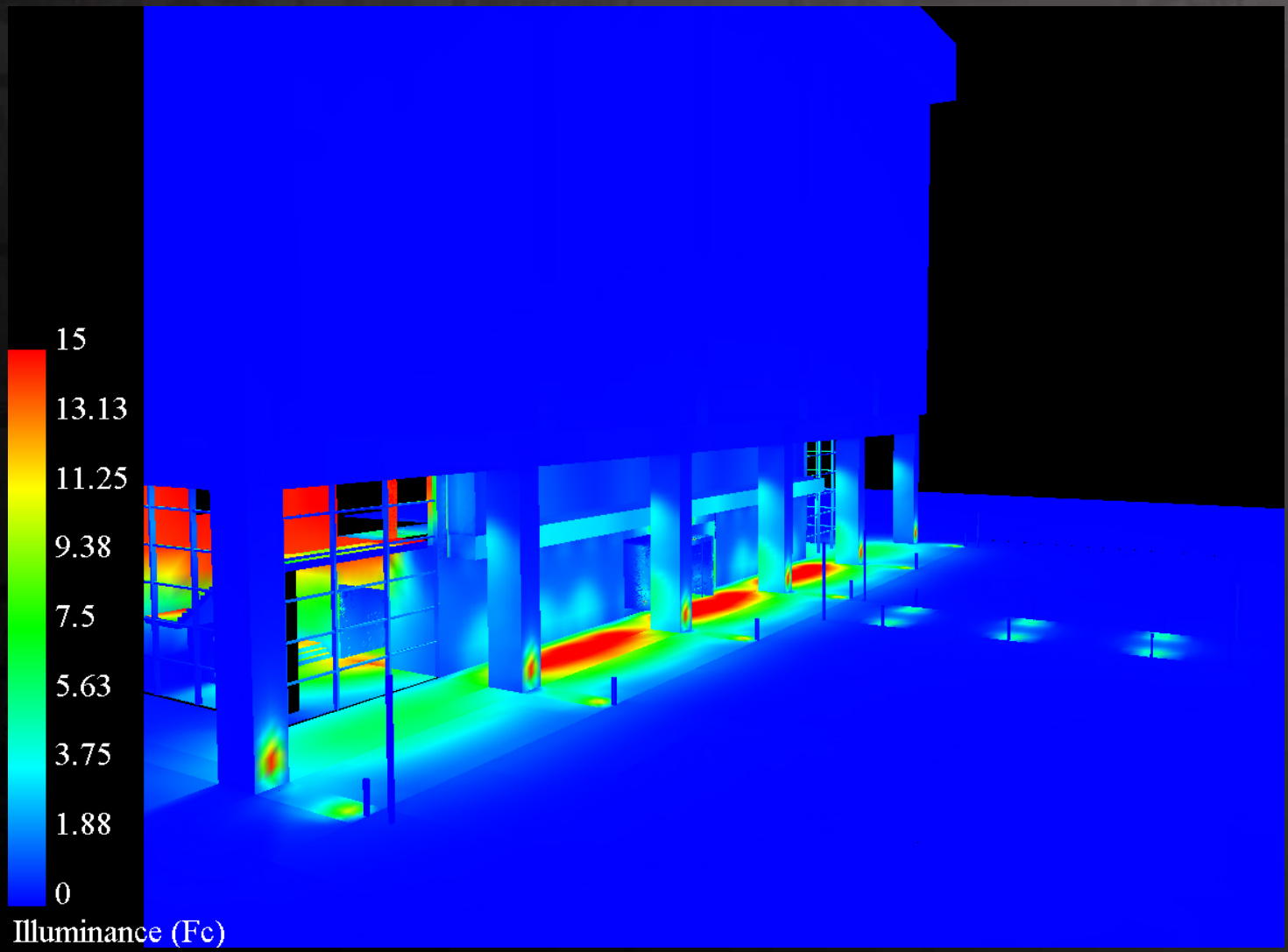
Rendered View



Pseudo Image
<0.005 FC

MICHAEL ANTHONY LOMBARDI

Pseudo Rendering



MOUNTING DETAILS