HARRY RANSOM CENTER RENOVATION
University of Texas at Austin

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

LIGHTING EXISTING CONDITIONS AND DESIGN CRITERIA
1 November 2006

Executive Summary

The following report summarizes the condition of exiting lighting systems at the renovated Harry Ransom Humanities Research Center, located in Austin, Texas at the University of Texas at Austin Campus. An analysis of key spaces in the Ransom Center is provided, including: exterior site lighting and lighting of the canopy area, Spencer Lobby and entry vestibule, Prothro Family Gallery, a first floor corridor, Prothro Family Theatre, Ransom Reading Room, specialty lighting for the Gutenberg Bible display case, and specialty lighting for the First Photograph area. This report provides a detailed investigation of existing lighting hardware as well as control devices. Information on daylight levels, glass transmittance, power consumption, surface materials and reflectances are also included. A listing of assumed light loss factors, as well as their calculations, is provided in conjunction with the lighting system report for each room. Complimenting the existing systems report is an assessment of key lighting design criteria. This includes recommended illuminance levels, uniformity, and specific design considerations for each space.

Successful lighting design is never an easy task. A myriad of challenges exist, and a balance must be found between aesthetic expectations, desired light levels, lighting functionality, lighting flexibility, and construction coordination issues. That said, each design space was analyzed in key areas defined by the IESNA handbook, and comments are provided in appropriate areas. During design and construction of the Ransom Center renovations, power consumption was required to conform to ASHRAE 90.1-1999 performance recommendations. Standard 90.1-2004 has since been issued, and therefore both guidelines are referenced for each space. Spaces that do not currently conform to the new guidelines will provide an interesting challenge during the redesign study; creating an equally appealing, flexible lighting system while using less energy is exceptionally idealistic. Compromises will have to be made, and the ultimate goal should be to provide a useful lighting system that is environmentally responsible and visually stimulating.

Ralph and Mary John Spencer Lobby (and entry vestibule)

Overview
This room functions as a primary area of circulation and "greets" guests upon entering the building. Occasionally, the space is also used as a lobby for special events. First impressions are always important, and the lobby allows guests to convene, ask for help at the information desk, and transition into the gallery spaces or corridor leading to other rooms. The space is approximately 11'-8" in height and features an opening to the second floor research wing lobby. Additionally, it is entirely open to the adjacent gallery space and circulation corridor. Surfaces include plaster ceiling, wood walls, and honed granite floors.

Figure 1: Lobby Floor Plan

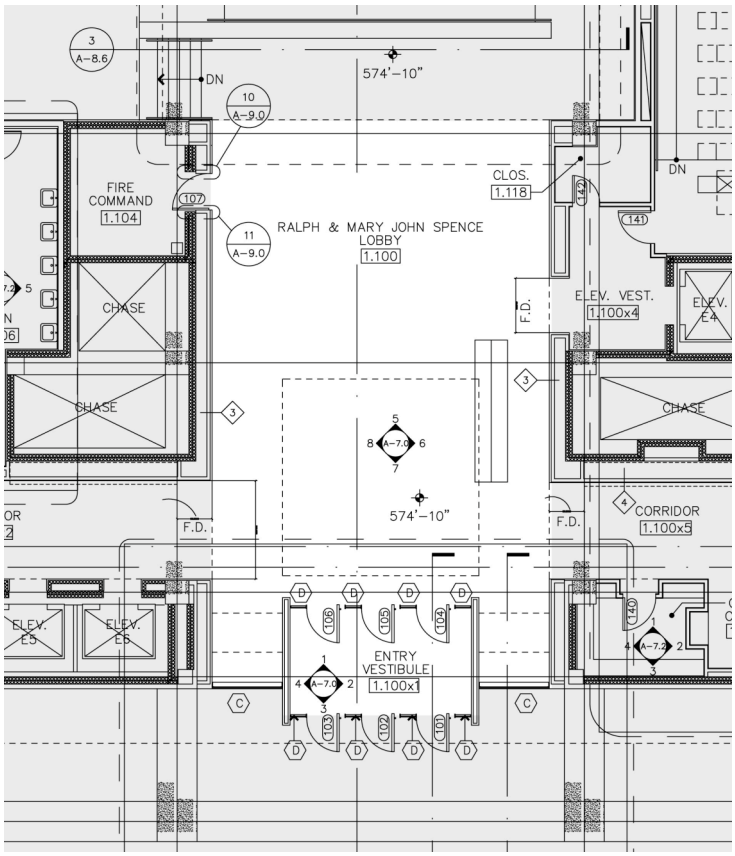
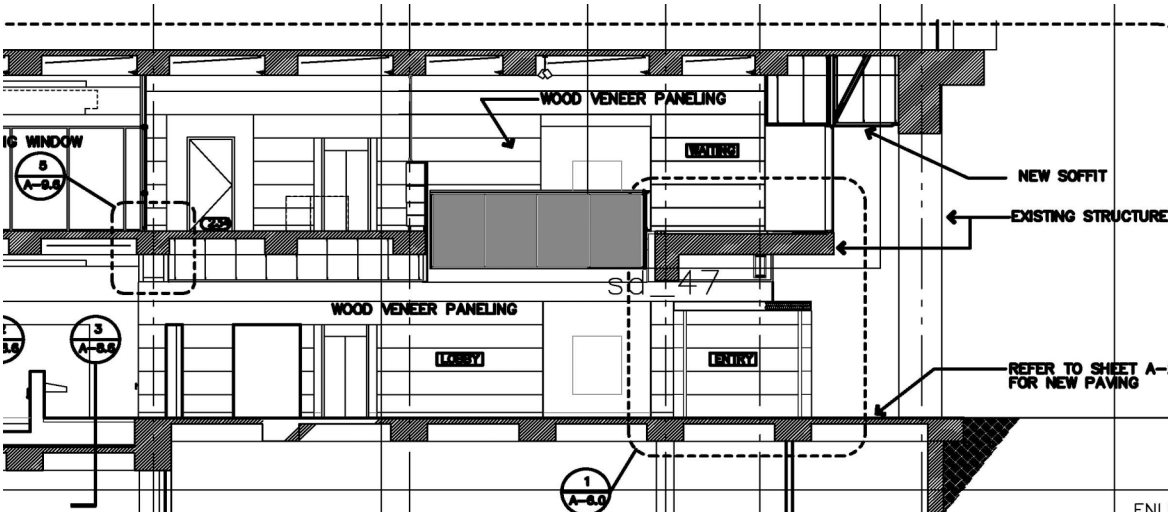


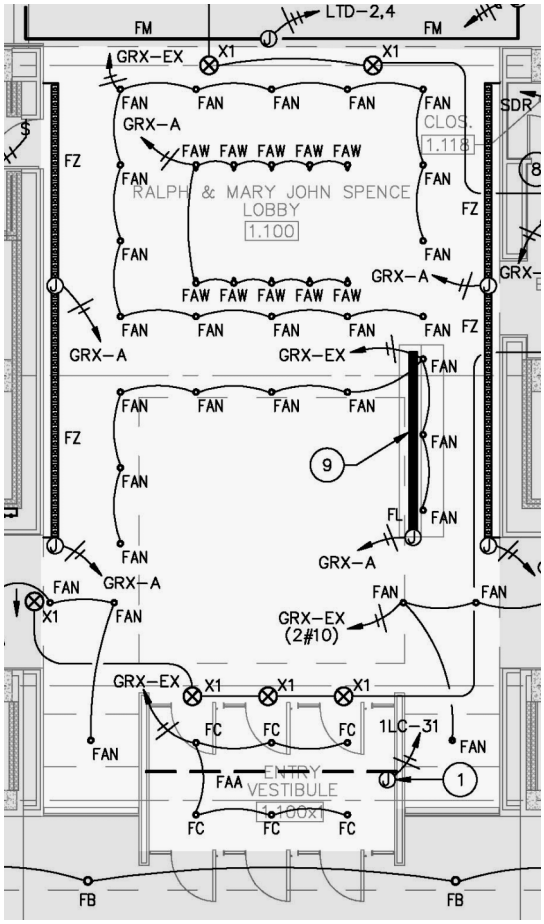
Figure 2: Lobby Section



Lighting Layout
Lighting in the Ransom Center lobby includes a balance of concentrated downlight sources and more diffuse light tucked away in coves. The rich wood walls of the lobby are accented with a series of grazing par lamps recessed into an architectural cove and baffled for protection from direct view of the lamps. Downlights provide floor illumination in the lobby as well as concentrated light on the information desk. Adjustable downlights are used to concentrate light onto the bible display area, and a track lighting system works in a similar fashion to highlight the open atrium area. Supplemental task lighting at the security station is provided with undercabinet linear fluorescent fixtures.

Lighting Equipment Information
Lighting controls for the Ransom Center Lobby are connected to the majority of the building's exterior and public spaces. Two eight scene Lutron Grafix Eye master lighting controls with remote dimmers are located in electrical closet, and two remote four scene wall station controls are mounted at the security desk. The controls are linked to the building management system through a Lutron GRX-AV interface control.

Figure 3: Lobby Lighting Layout



Special Area – Gutenberg Bible Display

The Ransom Center Lobby features a special display area for the Gutenberg Bible. The prominent location of this display draws people further into the lobby and functions as a transition from general public space to the adjacent First Photograph Display and gallery areas. Placement of recessed ceiling luminaries should be sensitive to potential reflected glare created from the glossy glass casing around the bible display table.

Please refer to “Prothro Family Gallery” section of this report for detailed information about design criteria (including desired illuminance of horizontal displays), protection from radiant energy, and other important factors to be considered.

Figure 4: Gutenberg Bible Display Case (Plan View)

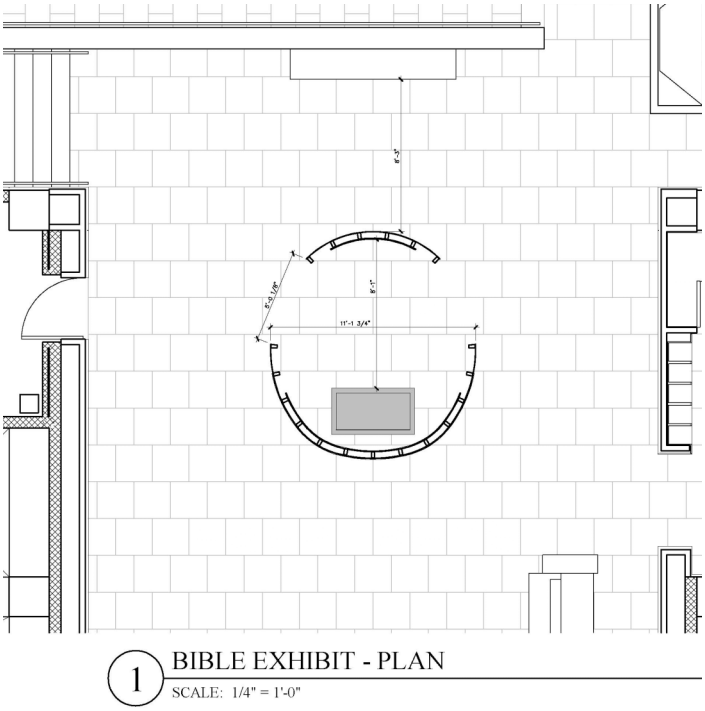


Figure 5: Gutenberg Bible Display Case (Exploded Elevation)

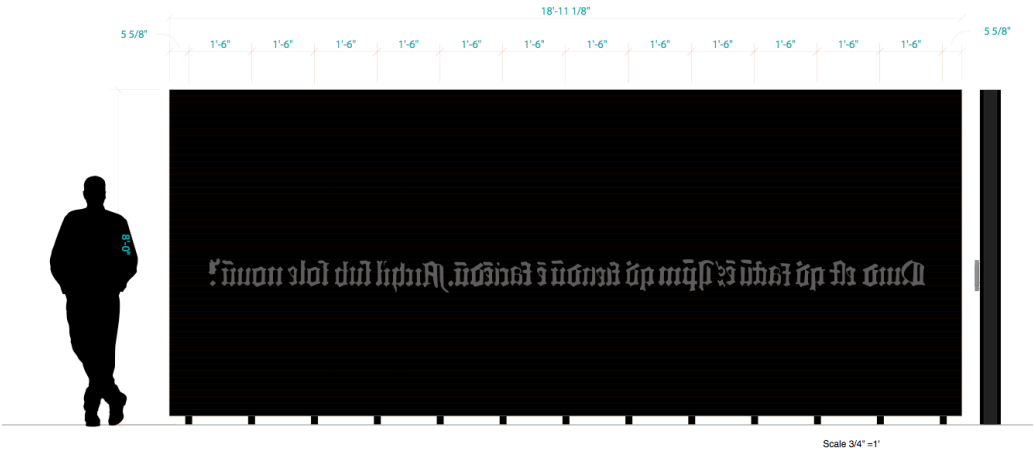
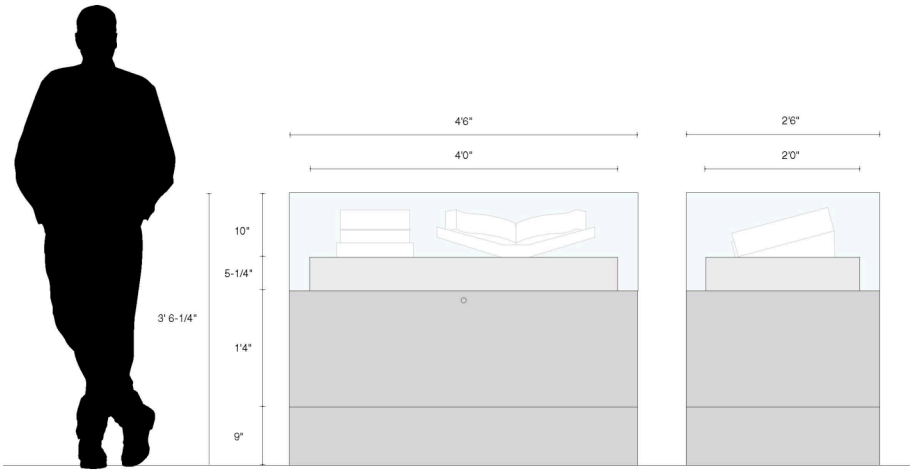


Figure 6: Gutenberg Bible Display Case (Display Case Elevation Detail)



Special Area – First Photograph Display

Please refer to Appendix B, to be posted at a later date, for detailed information about the First Photograph Display and the specific needs of its lighting system.

Room Data

Total area

1,640 square feet

Furniture

Lobby/Reception Desk

Finishes

Glass (doors), transmittance 0.74
Frosted glass (balcony railings), transmittance 0.74
Etched glass (door surrounds), transmittance 0.35 (not including etchwork transmittance)
Wood veneer paneling, reflectance 0.70
Plaster ceiling, reflectance 0.80
Honed granite (floors), reflectance 0.37

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTATY
FC	Recessed metal halide nominal 4-3/4" o.d. open aperture downlight with satin stainless steel trim, perforated reflector, glass lens, overlap trim and integral electronic ballast.	40W	CDM35/PAR30L/M/FL (3000K)	Bega	6940MH/541MH	6
FL	Surface mounted undercabinet task light with difusser and integral electronic ballast	8 W/lf	F32 T8/830 lengths as required	Alkco	Lincs 150/ECB Series	10 lf
FZ	Surface mounte grazing wallwasher located within architectural cove with lampholders and baffles spaced 9" o.c.	120 W/lf	Osram 90PAR/CAP/SPL/SP	Edison Price	SPR38DL/9C	60lf
FAN	Recessed tungsten halogen 6" dia. Open aperture downlight with semi-specular etch clear aluminum reflector and overlap trim.	100W	100PAR38/HIR/FL25	Edison Price	DL 38/6 ECOL	29
FAW	Recessed tungsten halogen 6" dia. Open aperture adjustable downlight with semi-specular etch clear reflector, yoke to allow up to 40 degree vertical tilt and 358 degree horizontal rotation and overlap trim.	100W	100PAR38/HIR/FL25	Edison Price	DL 38/40/6AA ECOL	10
FAY	Pendant mounted 1-circuit track with Autotrack extrusion, extruded housing, rigid 1/2" dia. Stems. Track to be suitable for use with fixture Type FAZ. Mount bottom of track 1'1" from underside of ceiling. Coordinate mounting with ceiling panel construction. Track and hardware finish to be painted to match ceiling structure finish.	1250W (75W/lf)	N/A	Edison Price	Sightline-P Series - CCH (Autotrack)	18 lf
FAZ	Track mounted tungsten halogen PAR-38 accent light with Autotrack adapter, yoke, matte black cross baffle and 55 degree linear spread lens. Track fixture to be compatible with track Type FAY. Housing and hardware finish to be painted to match ceiling structure finish.	250W	Q250PAR38/FL30	Edison Price	Minima 38-XB38-CCH (Autotrack)	5

Daylighting Elements

Glass doors and etched glass windows in the entrance lobby.

Control Devices

(2) Lutron SGRX-4S-NL-WH-E
(2) Lutron GRX-4516-A-WH

Power Density Allowances

ASHRAE 90.1-1999: 1.8 W/sq.ft., plus 1.0W/sq.ft. for artwork
ASHRAE 90.1-2004: 1.3 W/sq.ft., plus 1.0W/sq.ft. for artwork

Total Room Watts: 14,020W
Room Power Density: 8.55 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FC	V	Clean, 12 months	2200	1430	0.65	0.88	0.97	0.90	0.499356
FL	VI	Clean, 12 months	2225	2050	0.921348	0.86	0.97	0.98	0.753217
FZ	III	Clean, 24 months	2200	2095	0.952273	0.84	0.97	1.00	0.775912
FAN	V	Clean, 12 months	2200	2095	0.952273	0.86	0.97	1.00	0.794386
FAW	V	Clean, 12 months	2200	2095	0.952273	0.86	0.97	1.00	0.794386
FAY	N/A - Track for Type FAZ								
FAZ	III	Clean, 12 months	2200	2095	0.952273	0.90	0.97	1.00	0.831334

Illuminance Data

Figure 7: Lobby Illuminance Calculation Grid (Units are in footcandles)

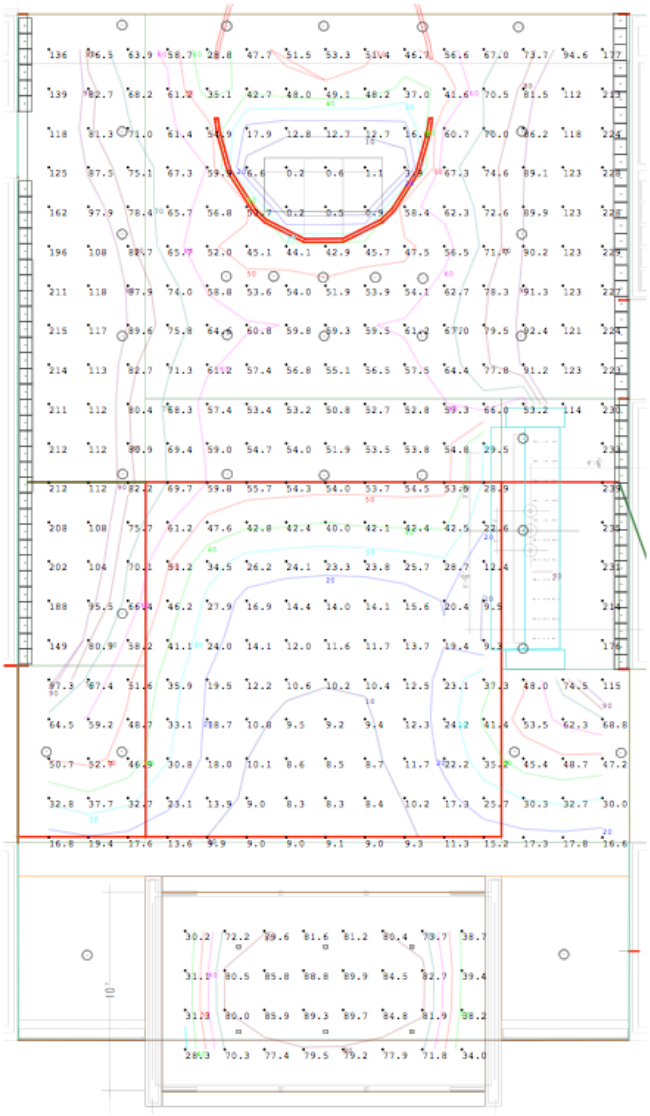
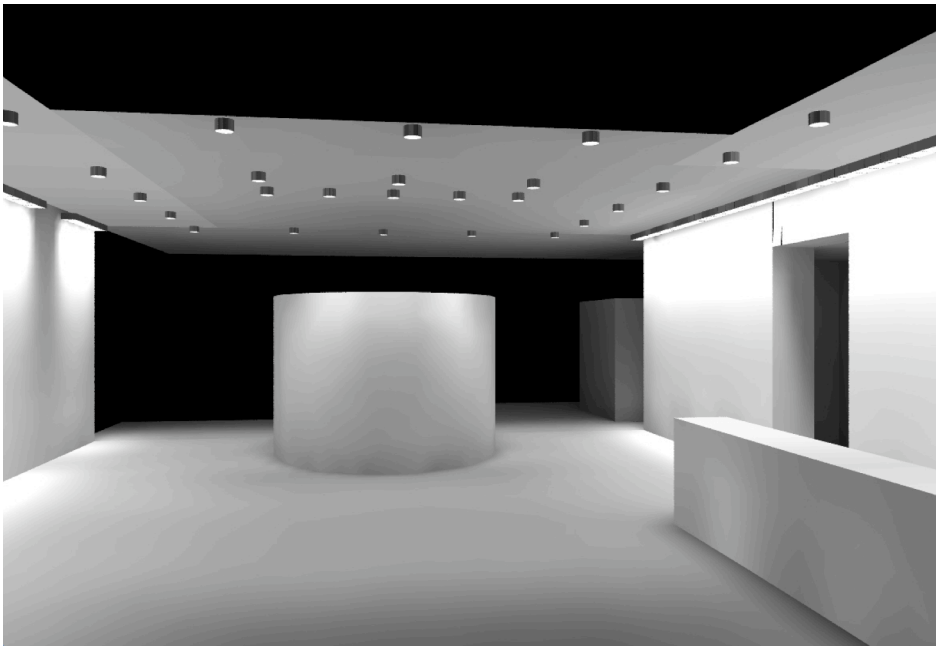


Figure 8: Lobby Simulated Lighting Environment (Radiosity Rendering)



Lobby Floor Illuminance (FC)	
Average	65.5
Maximum	239
Minimum	20
Avg/Min	3.28

Vestibule Floor Illuminance (FC)	
Average	69.4
Maximum	90
Minimum	28
Avg/Min	2.48

Security Counter (at 4ft) Illuminance (FC)	
Average	95
Maximum	105
Minimum	80
Avg/Min	1.19

Security Counter (at 2.5 ft) Illuminance (FC)	
Average	48
Maximum	72
Minimum	20
Avg/Min	2.40

Design Criteria

Horizontal Illuminance (important): 10 fc

Vertical Illuminance (important): 3 fc

The lobby space should provide even, diffuse light that compliments facial modeling by providing adequate levels of vertical illumination. This space is frequently used for social gatherings, and consequently needs quality light rather than excessive, directional brightness.

Appearance of Space and Luminaires (very important)

The lobby should provide an engaging environment for those who enter it. It should also provide an upscale appearance to foreshadow the rare collections that are on display in the proceeding spaces. In contrast to most of the public gallery space which features track lighting, this is an area where luminaries can be neatly tucked away and "invisible." A decorative fixture, if appropriate in design for the space, may provide a focal point; there is no art in the lobby for it to distract from.

Color Appearance and color contrast (somewhat important)

Although this space should maintain a high level of finish and features expensive wood finishes, colored light, including variations of white light and unintentional spectral rainbows created from optic diffraction, should be avoided in this space. Proper lamp and fixture selection will ensure this.

Daylighting Integration and Control (very important)

Personal recommendation: important
Daylighting is always an issue in art galleries; harmful ultraviolet rays will damage precious artwork. That said, the Ransom Center lobby has no artwork oh its walls. The only concern is spill light from the lobby into the adjacent gallery opening and Gutenberg bible display area, which is far enough away to alleviate the need for special concern.

Direct Glare (somewhat important)

The reception desk is the only area of concern; luminaries immediately around the desk attendant should not be glaring or create reflections on work plane surfaces.

Flicker and Strobe (somewhat important)

No special equipment in the lobby warrants concern over flicker and strobe.

Light Distribution on Surfaces (somewhat important)

To create visual interest, intentional variance of light distribution on surfaces is appropriate and acceptable.

Light Distribution on Task Plan/Uniformity (somewhat important)

This is not a concern in the lobby, except at the information desk.

Luminance of Room Surfaces (somewhat important)

Only the information desk needs adequate illuminance. Architectural features should be highlighted.

Modeling of Faces or Objects (important)

Though not critical to this space, receptions are frequently held here and care should be made to make this room compliment facial features.

Points of Visual Interest (very important)

The etched glass entrance and open balcony area are the main architectural features in the lobby. Appearance of the second floor around this open area should be considered; it is in direct view from the lobby.

Reflected Glare (not important)

Personal recommendation: important
The rich wood surfaces through the lobby are a potential source of unsightly lamp image reflections.

Shadows (not important)

Personal recommendation: somewhat important
The etched glass signature wall can provide interesting shadow effects on the lobby floor.

Source/Task/Eye Geometry (somewhat important)

The space should be enjoyable to view, and decorative fixtures may be appropriate.

Sparkle/Desirable Reflected Highlights (not important)

Some sparkle, if appropriate, can be implemented in this space.

Surface Characteristics (important)

Wood and etched glass are unique features to this room.

System Control and Flexibility (somewhat important)

Generally this room serves one use: to greet occupants and allow them a space to convene.

Special Considerations

Any non-recessed luminaries in the lobby may be visible from the balcony on the second floor lobby. Lighting of the Gutenberg bible must be account for potentially harmful ultraviolet rays and heat radiation.

Stair Hall/Corridor and Theatre Lobby/Corridor

Overview

The Ransom Center has a main circulation corridor that spills off of the entrance lobby in both the north and south direction. On the south end, it terminates at the stair hall, which is two stories in height with a winding exposed staircase. The space features beautiful etched glass along its two exterior corner walls. At the north end, the corridor leads to a similar opening with etched glass walls which functions as a lobby space for the Prothro Family Theatre. Because these corridors are large circulation spaces and feature lobbies, for power density requirements it can be argued that the spaces are indeed lobbies, not corridors. This is further justified by the fact that the spaces would be visually unappealing at the recommended illuminace levels of purely functional, back of the house corridors. Materials include, honed granite, veneer wood walls, plaster walls, etched glass, and plaster ceilings.

Figure 8: Stair Hall and Corridor Plan

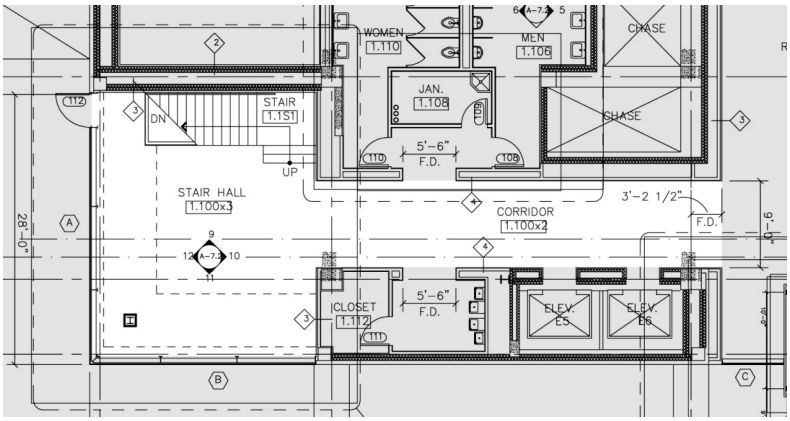
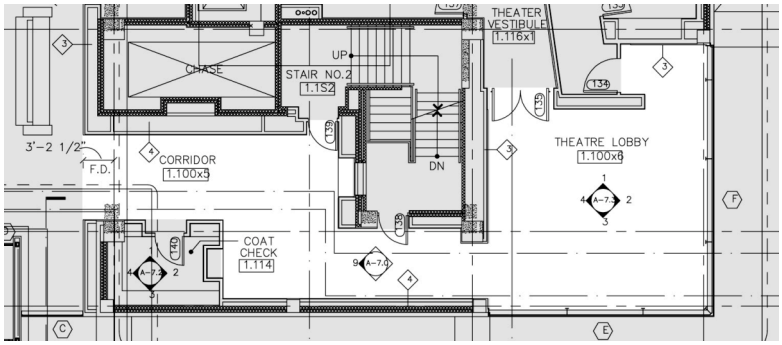


Figure 9: Theatre Lobby and Corridor Plan



Lighting Layout
Lighting in the public corridor and lobbies consists of a simple and effective combination of area downlights and incandescent cove lighting. Fluorescent fixtures are used in select areas, such as the elevator doorway lights. Electric lighting is not placed near the etched glass windows, most likely to prevent undesirable glare. The glass corner windows help create a glowing point of interest at night.

Lighting Equipment Information
Lighting controls for the Ransom Center Lobby are connected to the majority of the building's exterior and public spaces. Two eight scene Lutron Grafix Eye master lighting controls with remote dimmers are located in the lobby coat lobby, and two remote four scene wall station controls are at the security desk. The controls are linked to the building management system through a Lutron GRX-AV interface control.

Figure Stair Hall and Corridor Electrical Plan

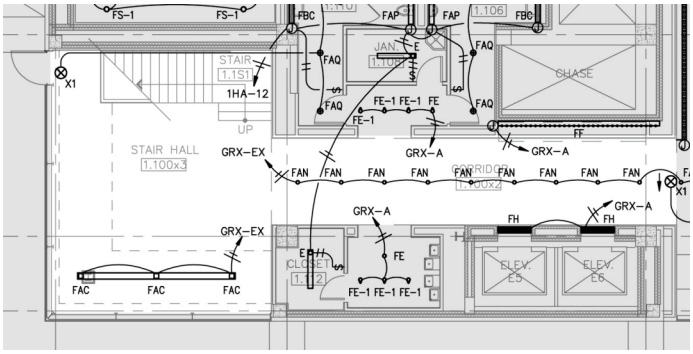


Figure 11: Theatre Lobby and Corridor Electrical Plan

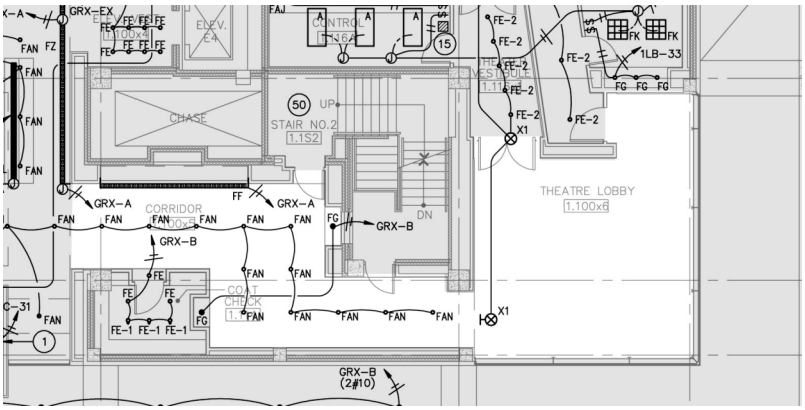


Figure 12: Stair Hall Second Floor Electrical Plan

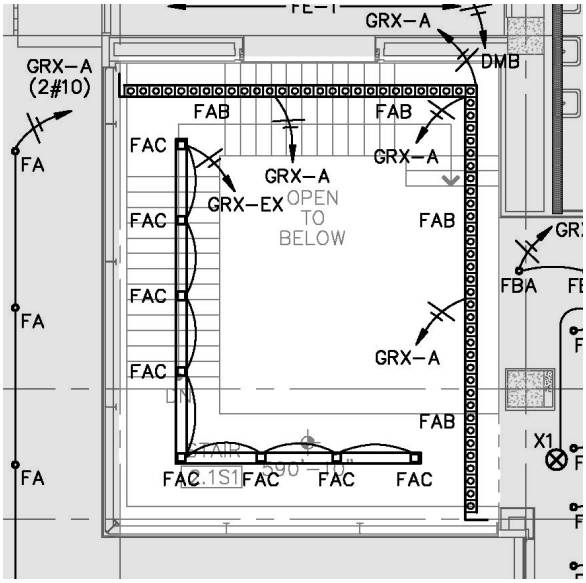
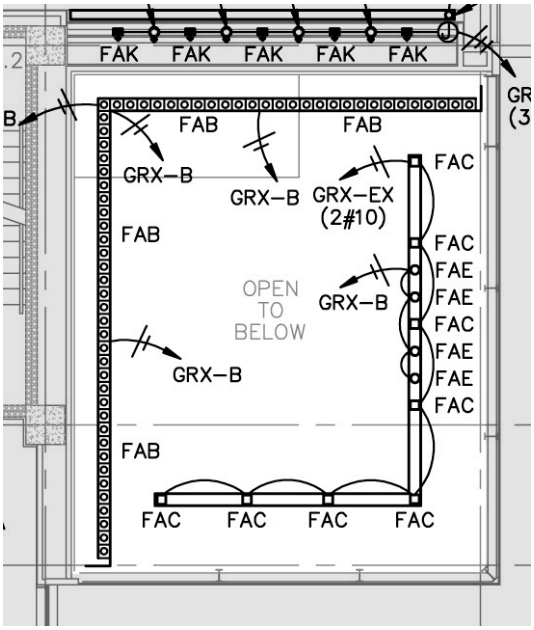


Figure 13: Theatre Lobby Second Floor Electrical Plan



Room Data

Total area

2,026 square feet

Furniture

There is no furniture in this space.

Finishes

Etched glass (doors), transmittance 0.74
Wood veneer paneling, reflectance 0.74
Plaster ceiling, reflectance 0.80
Honed granite (floors), reflectance 0.37
Polished aluminum (elevator doors), reflectance 0.31

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTITY
SOUTH HALL						
FAB	Surface mounted tungsten halogen grazing wallwasher located within architectural cove with lamp holders and baffles spaced 9" o.c.	122 W/lf	100 PAR38/H/SP10	Edison Price	SPR38DL/9C	42.5 lf
FAC	Recessed tungsten halogen 5-7/8"square aperture downlight located within 8" wide ceiling slot with titanium finish reflector and overlap trim. Overlap trim finish to match slot finish.	100 W	100 PAR38/H/FL25	Kurt Versen Lighting	H7830-ST	3
FAN	Recessed tungsten halogen 6" dia. Open aperture downlight with semi-specular etch clear aluminum reflector and overlap trim.	100 W	100 PAR 38/HIR/FL25	Edison Price	DL 38/6 ECOL	13
NORTH HALL						
FF	Adjustable surface mounted incandescent socket strip located within architectural cove with adjustable mounting brackets located at both ends of extrusion, extruded aluminum housing and fixed medium base lamp holders spaced " o.c.	100 W/lf	50W R20	Norbert Belfer Lighting	22250-NX2-6-see RCP reference #2795 with swivel mount	16.75 lf
FG	Recessed low voltage tungsten halogen nominal 3" dia. open aperture downlight with white aluminum reflector and overlap trim.	50 W	50W PAR 20/FL	Capri Lighting	RR4X-R406-KL	2
FH	Surface mounted fluorescent channel located within an architectural enclsure behind diffuse glass with integral electronic ballast.	25 W	F25T8/830	H.E.Williams	Series 75	2
FAB	Surface mounted tungsten halogen grazing wallwasher located within architectural cove with lamp holders and baffles spaced 9" o.c.	133 W/lf	100 PAR38/H/SP10	Edison Price	SPR38DL/9C	42.5 lf
FAC	Recessed tungsten halogen 5-7/8"square aperture downlight located within 8" wide ceiling slot with titanium finish reflector and overlap trim. Overlap trim finish to match slot finish.	100 W	100 PAR38/H/FL25	Kurt Versen Lighting	H7830-ST	8
FAE	Recessed tungsten halogen 6" dia. Open aperture adjustable downlight with etch clear aluminum reflector and overlap trim, yoke to allow up to 40 degrees vertical tilt and 358 degree horizontal rotation and overlap trim.	250 W	Q250PAR38/FL30	Edison Price	DL 38/40/6AA ECOL	4

Daylighting Elements

Two stories, floor to ceiling etched glass windows are located at the ends of both corridor/lobby spaces, providing plenty of daylight. One end is oriented north, and the other south.

Control Devices

(2) Lutron SGRX-4S-NL-WH-E
(2) Lutron GRX-4516-A-WH

Power Density Allowances

ASHRAE 90.1-1999: 1.8 W/sq.ft., plus 1.0W/sq.ft. for artwork
ASHRAE 90.1-2004: 1.2 W/sq.ft., plus 1.0W/sq.ft. for artwork

Total Room Watts: 1,6063 W
Room Power Density: 7.93 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FF	II	Clean, 12 months	380	361	0.95	0.94	0.96	1.00	0.86
FG	IV	Clean, 12 months	520	494	0.95	0.89	0.96	1.00	0.81
FH	V	Clean, 12 months	2225	2050	0.92	0.88	0.96	1.00	0.78
FAB	III	Clean, 12 months	2200	2090	0.95	0.90	0.96	1.00	0.82
FAC	IV	Clean, 12 months	2200	2090	0.95	0.88	0.96	1.00	0.80
FAE	V	Clean, 12 months	2200	2090	0.95	0.88	0.96	1.00	0.80
FAN	III	Clean, 12 months	220	2090	9.50	0.90	0.96	1.00	8.21

Illuminance Data

Figure 14: Theatre Lobby and Corridor Calculation Grid (Units are in footcandles)

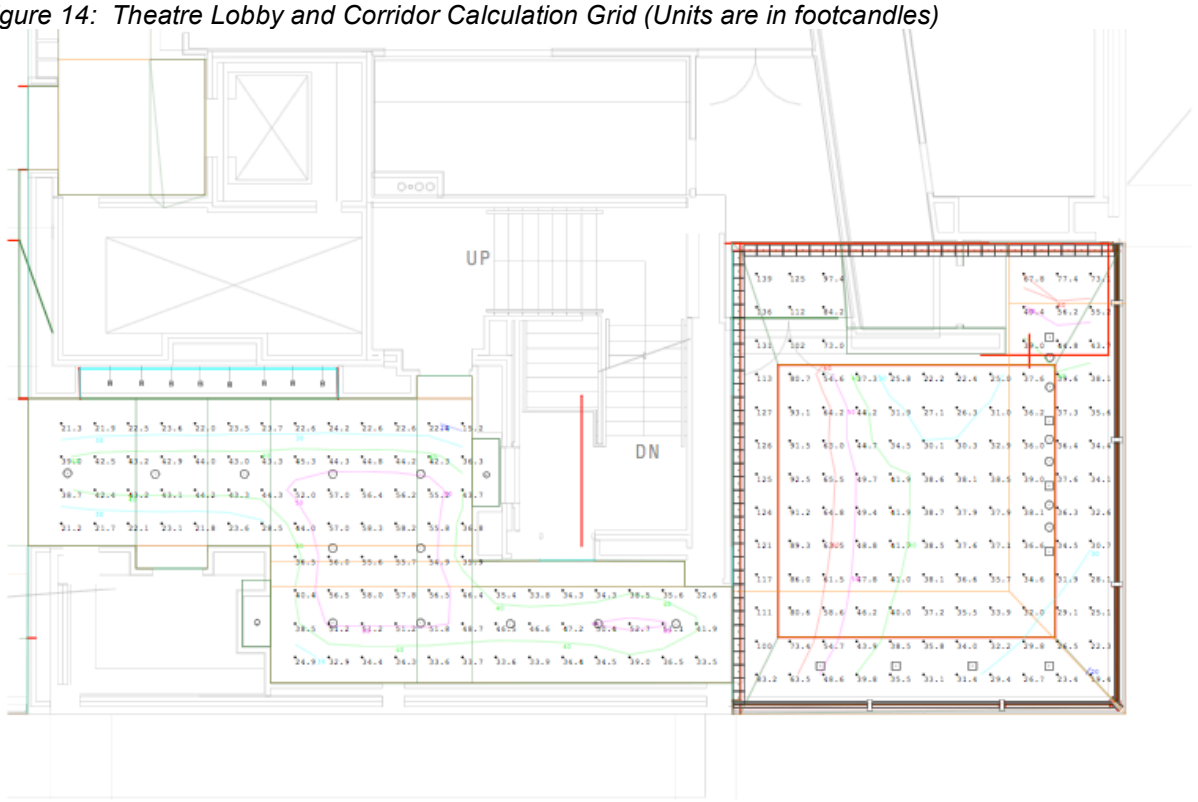


Figure 15: Theatre/North Corridor Simulated Lighting Environment (Radiosity Rendering)

Figure 16: Stair Hall/South Corridor Illuminance Calculation Grid (Units are in footcandles)

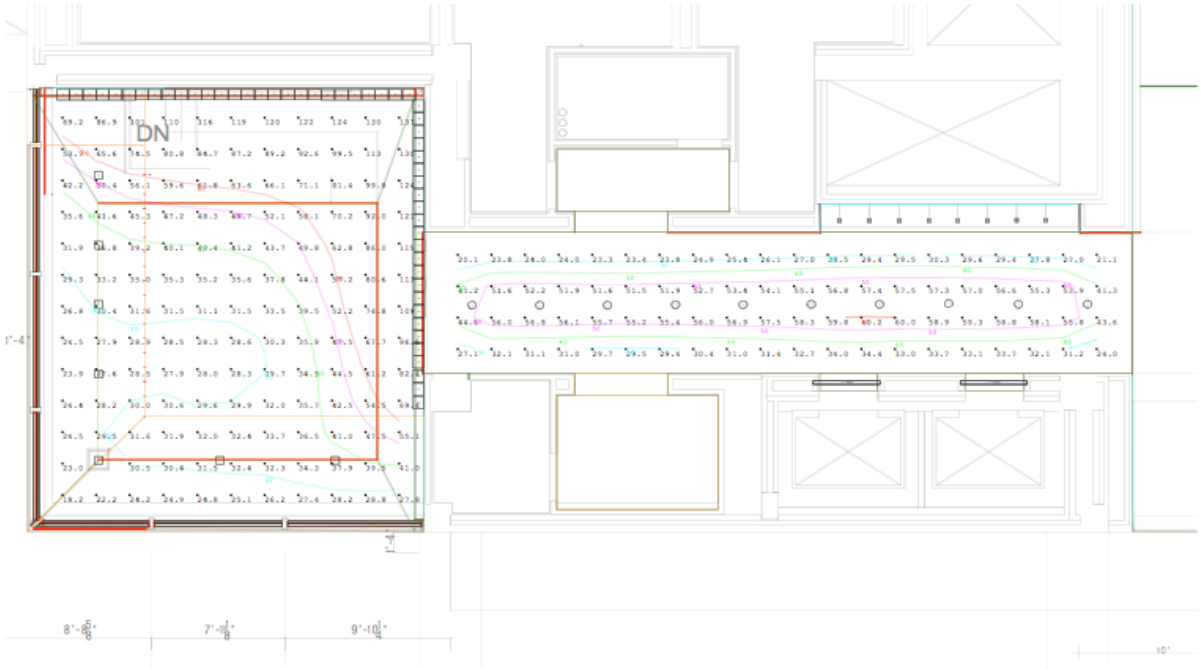


Figure 17: Stair Hall/South Corridor Simulated Lighting Environment (Radiosity Rendering)

Stair Corridor Floor Illuminance (FC)	
Average	41.6
Maximum	60.2
Minimum	20.1
Avg/Min	2.07

North Corridor Illuminance (FC)	
Average	39.8
Maximum	58.3
Minimum	15.2
Avg/Min	2.62

Stair Hall Illuminance (FC)	
Average	53
Maximum	137
Minimum	18
Avg/Min	2.94

Theatre Lobby Illuminance (FC)	
Average	54
Maximum	39
Minimum	19.4
Avg/Min	2.78

Design Criteria

Horizontal Illuminance (important): 10 fc

Vertical Illuminance (important): 3 fc

Appearance of Space and Luminaires (very important)
These spaces are “front of the house” and providing a visually pleasing environment is important.

Color Appearance and Color Contrast (somewhat important)
A lighting system that compliments the natural wood colors should be provided.

Daylighting Integration and Control (very important)
The lobby/corridor area features large daylight spaces at each end. There is no special artwork in this area to protect from harmful rays, but thought should be given into providing a lighting system that can adapt to the varying levels of natural light.

Direct Glare (somewhat important)
Direct glare is not a major concern in this area because no prolonged, visually intensive tasks will be taking place.

Flicker and Strobe (somewhat important)
No equipment in this room should result in flicker or strobe.

Light Distribution on Surfaces (somewhat important)
Even distribution should be achieved on wall surfaces, though varied lighting levels between surfaces may be a desired effect.

Light Distribution on Task Plan/Uniformity (somewhat important)
There are no “task plans” in this space other than normal walking surfaces. These areas should be adequately lit, especially the steep set of stairs. Shadow and/or light intensity changes on the stair treads may be desirable to help occupants identify the edges of each step.

Luminance of Room Surfaces (somewhat important)
Surfaces should be illuminated in a manner that enhances the architecture and makes the space visually pleasing. No strict luminance requirements need to be followed for any of the surfaces in this room.

Modeling of Faces or Objects (important)
Lighting in this space should compliment faces.

Points of Visual Interest (very important)
Areas of visual interest include the large open stairwell, etched glass curtain walls, and veneer wood interiors.

Reflected Glare (not important)
Personal recommendation: important
Reflected glare may be a concern on the glossy wood veneer walls, and the lighting design should plan for this accordingly.

Shadows (not important)
Personal recommendation: important
Large shadows will be cast onto the floors of the spaces with etched glass. This will create interesting images and are a central part of the design.

Source/Task/Eye Geometry (somewhat important)

There are no areas in this space where view of luminaries and/or their may provide an annoying distraction from task work.

Sparkle/Desirable Reflected Highlights (not important)

Personal recommendation: somewhat important
If implemented properly, this space may be able to incorporate sparkle.

Surface Characteristics (important)

There are many interesting surfaces in this space, and a successful lighting system will compliment these features.

System Control and Flexibility (somewhat important)

The use of these spaces on average does not vary. A lighting system that responds to daylight levels may be desirable, but the spaces themselves are generally single-use.

Special Considerations

It is important to determine the best lighting system to compliment the etched glass walls.

Prothro Family Gallery

Overview

The Prothro Gallery is one of the main attractions at the Harry Ransom Center. Rotating exhibits are presented in this space. Additionally, many of the Ransom Center's featured collections are displayed in this area. Items include paintings by Frida Kahlo, Diego Rivera, and the first photograph. Room materials consist of gypsum board, suspended wood panels, plaster, woven wire metal panel, wood flooring, and glass. One of the more unique features of the Prothro Gallery is the Louis I. Kahn / Richard Kelly inspired light well. This light wells serve two functions: to carry indirect natural light into the second floor, and to allow diffuse ambient light down a channel and along the perimeter walls of the gallery.

Figure 17: Prothro Gallery Floor Plan

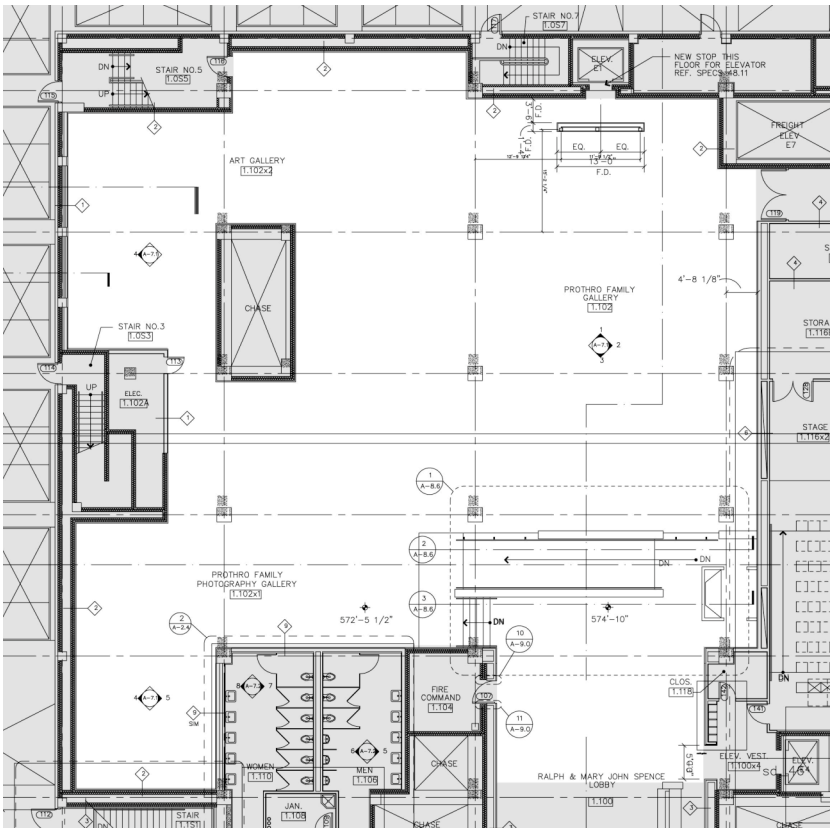


Figure 18: Prothro Gallery Section

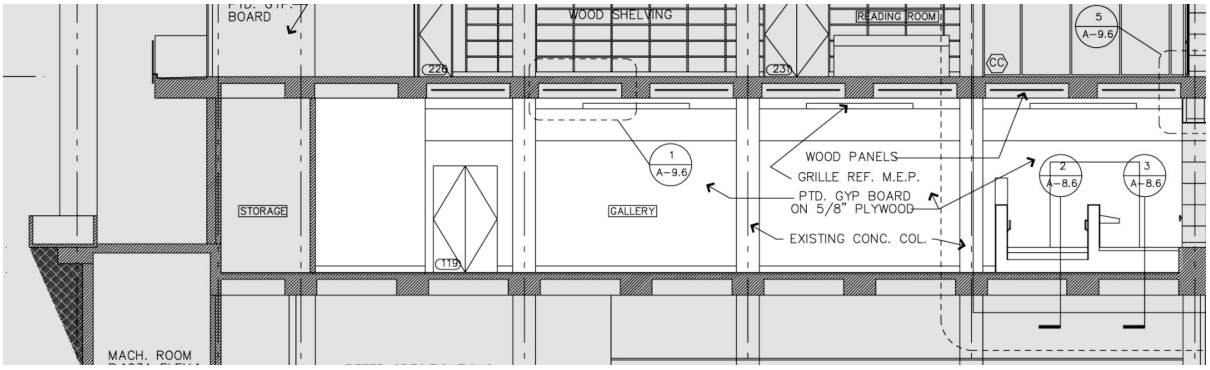
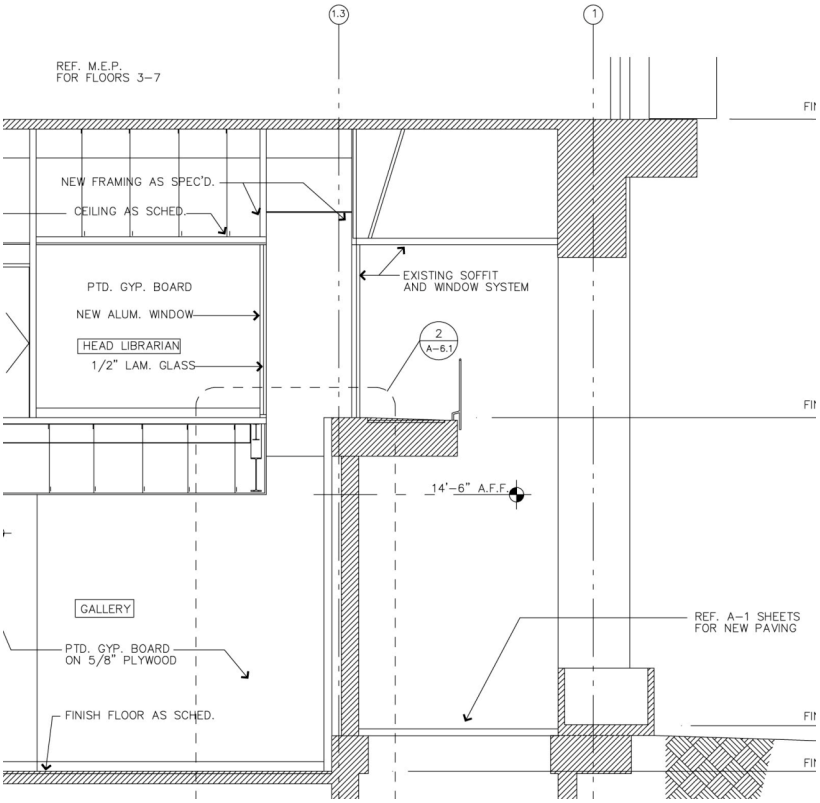
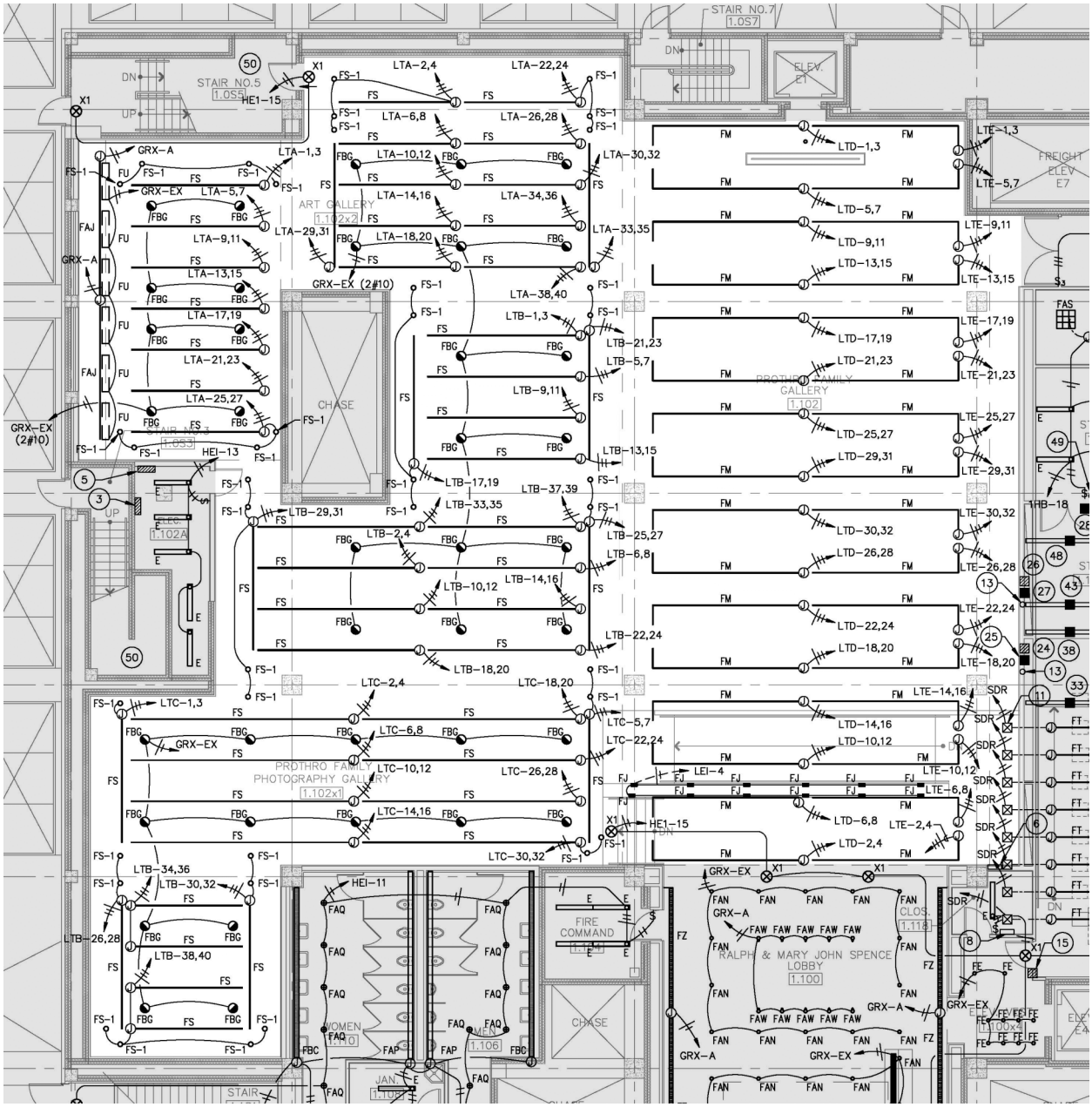


Figure 19: Prothro Gallery Light Well Sectional Detail



Lighting Layout
Lighting in the Prothro family gallery is comprised primarily of track-mounted incandescent fixtures with baffles to shield direct view of the sources from most angles. This track system thoroughly covers all areas of the gallery and was designed to maximize flexibility of the gallery space; display items, and even some walls, change on a regular basis.

Figure 20: Prothro Gallery Electrical Plan



Room Data

Total area

8,360 square feet

Furniture

No furniture is present, although there are some temporary moving walls.

Finishes

Wood veneer paneling, reflectance 0.70
Plaster ceiling, reflectance 0.80
Hardwood floors, reflectance 0.13
White painted gypsum board, reflectance 0.55
Painted concrete columns, reflectance 0.50

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTITY
FJ	Recessed in-wall incandescent 7" square steplight with patterned glass lens, outer overlap trim ring and internal reflector. Architect to confirm trim finish.	60 W	Philips BC-60-B10.5LL (frosted candelabra base, 2000 hr. life)	Luce Plan	D27 15x15 trim finish by architect	12
FM	Surface side-mounted to suspended ceiling panel 2-circuit electrified track with extruded aluminum housing and side mounting points to fasten into ceiling panels. Locate screw sleeves 16" o.c. or maximum allowable to minimize the positions where fixtures cannot be located. Track to be suitable for use with fixture Types FP, FQ, and FR. Provide 90 degrees electrified corners to form complete rectangle of track around each ceiling panel unit. Track to have extruded raw aluminum finish, architect to confirm.	75 W/lf	Varies	Edison Price	Autotrack AUJT Wall mounted	576 lf
FP	Track mounted tungsten halogen accent light with cylindrical housing. Autotrack adapter, stem, matte black cross baffle and 55 degree linear spread lens. Track fixture to be compatible with track types FM and FS. Architect to confirm housing finish. Contractor to initially provide (1) type FP track fixture for every track circuit.	90 W	Osram 90PAR/CAP/SPL/FL	Edison Price	MAX 38 O - finish by architect - Lens/4.75 (Autotrack)	N/A
FQ	Track mounted low voltage tungsten halogen MR-16 accent light with cylindrical housing, Autotrack adapter, stem, matte black conical baffle, 55 degree linear spread lens and integral transformer. Track fixture to be compatible with track types FM and FS.	50 W	Osram 50PAR36/CAP/NSP	Edison Price	MAX 36 - finish by architect - lens/2.75	N/A
FR	Track mounted low voltage tungsten halogen PAR-36 spot light with cylindrical housing. Autotrack adapter, stem, matte black cross baffle, integral 5.5/12V transformer with integral switch and beam smoother lens. Track fixture to be compatible with track Types FM and FS. Architect to confirm housing finish.	50 W	Osram 50PAR36/CAP/NSP	Edison Price	MAX 36 - finish by architect - CLR/4.75 - Lens4.75 (Autotrack)	N/A
FS	Recess mounted 2-circuit electrified track with extruded aluminum housing and trimless flange. Track to be suitable for use with fixture Types FP, FQ and FR. Provide power feeds, end caps and 90 degree corners as required. Refer to architectural RCP's for run length conditions.	75 W/lf	Varies	Edison Price	Autotrack AUBT	736 lf
FS-1	Recess mounted 2-circuit electrified monopoint with extruded aluminum housing and trimless flange. Monopoint to be suitable for use with fixture Types FP, FQ and FR.	Allow 250 W	Varies	Edison Price	Autotrack AUBT - Monopoint	39
FU	Recess mounted fluorescent 2-lamp profile nominal 5" wide x 4' long lightbox with KSH-3EA asymmetric lens to direct light downwards, hinged doorframe assembly and integral electronic ballast. Provide what overlap trim finish.	56 W	(2) F28T5/830	Forum Lighting	FLL-6AB-MOD-LENS	6
FAJ	Recess mounted 2-circuit track with Autotrack adapter, extruded housing and overlap trim. Track to be suitable for use with fixture Types FP, FQ, FR, FAK and FAL.	75 W/lf	Osram 50AR70/25/FL	Edison Price	MW/AR/DGS/2.75 (Autotrack)	30 lf
FBG	Recessed compact fluorescent nominal 2-lamp profile 7" diameter lensed aperture downlight with white reflector, diffuse white impact resistant acrylic lens and white painted overlap trim. Architect to confirm white trim finish, to match gallery ceiling finish.	36 W	(2) 18W double twin tube / 830	Edison Price	SLL 218/7 120 WOL-DX	38

Daylighting Elements

Glass doors and etched glass windows in the entrance lobby provide some daylight that could potentially spill into the gallery area nearest to the lobby.

Control Devices

Normal, non-dimming bus/track system controlled by security desk and timeclock.
Area downlights to supplement track lighting.

Power Density Allowances

ASHRAE 90.1-1999: 1.60 W/sq. ft (general exhibition) plus 1.0 W/sq. ft. for artwork
ASHRAE 90.1-2004: 1.00 W/sq. ft (general exhibition) plus 1.0 W/sq. ft. for artwork

Total Room Watts: 73,437 W
Room Power Density: 8.78 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FJ	V	Very Clean, 12 Months	500	475	0.95	0.93	0.99	1.00	0.87
FM	N/A - Track for Types FP, FQ and FR								
FP	III	Very Clean, 9 Months	1020	969	0.95	0.94	0.99	1.00	0.88
FQ	III	Very Clean, 9 Months	800	740	0.93	0.94	0.99	1.00	0.86
FR	III	Very Clean, 9 Months	400	380	0.95	0.94	0.99	1.00	0.88
FS	N/A - Track for Types FP, FQ and FR								
FS-1	N/A - Electrified monopoint for Types FP, FQ and FR								
FU	V	Clean, 12 Months	5800	5500	0.95	0.88	0.99	0.98	0.81
FAJ	N/A - Track for Types FP, FQ and FR								
FBG	V	Clean, 12 Months	1205	1070	0.89	0.88	0.99	0.98	0.76

Illuminance Data

Figure 21: Prothro Gallery Illuminance Grid (Units are in footcandles)

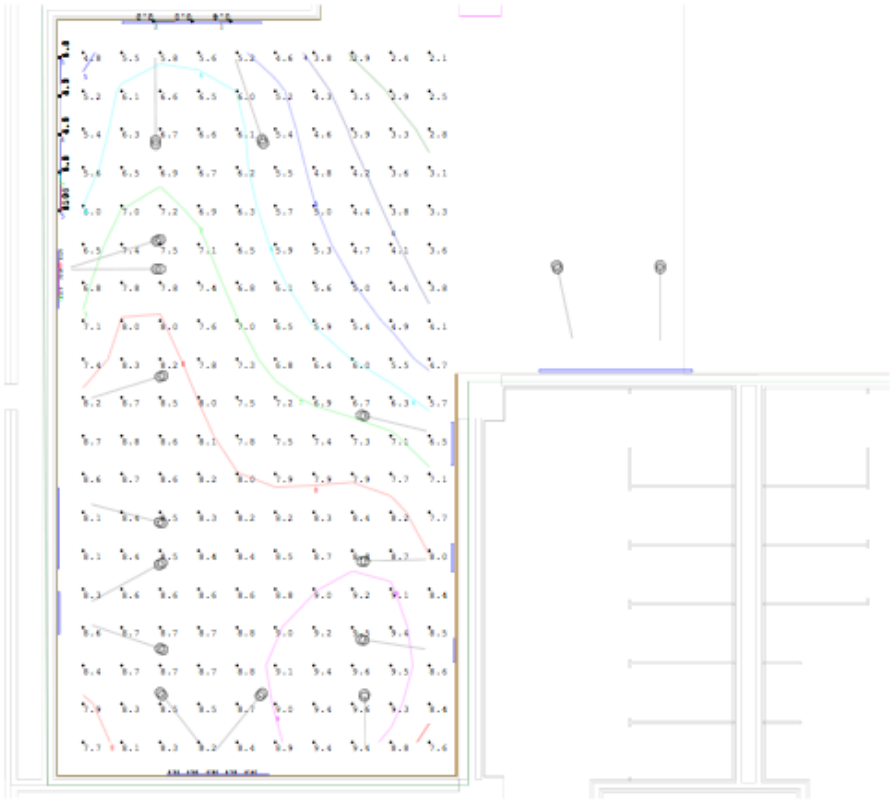
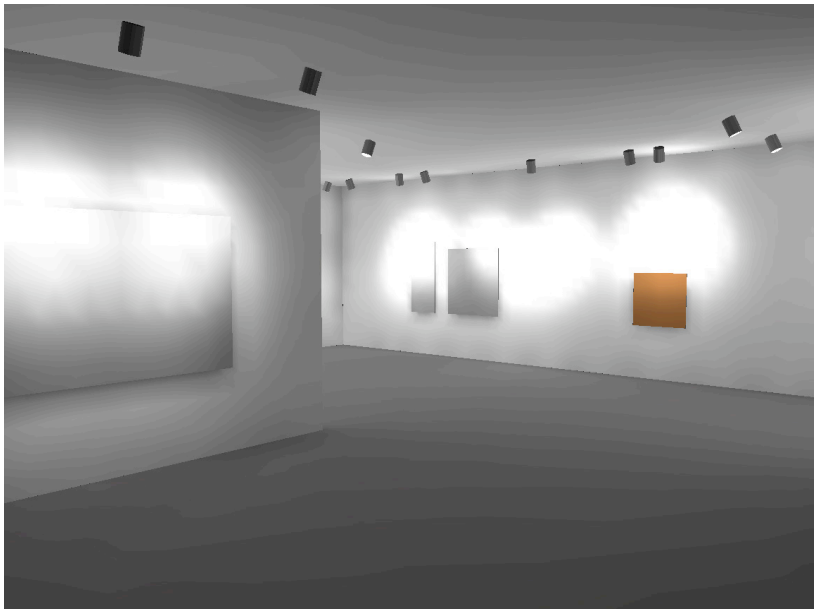


Figure 22: Prothro Gallery Simulated Lighting (Radiosity Rendering)



Painting 1 Illuminance (FC)	
Average	14.3
Maximum	25.8
Minimum	6.9
Avg/Min	2.07

Floor Sample Illuminance (FC)	
Average	7.1
Maximum	9.6
Minimum	2.1
Avg/Min	3.38

Painting 2 Illuminance (FC)	
Average	45
Maximum	142
Minimum	10.5
Avg/Min	4.29

Wall Sample Illuminance (FC)	
Average	5.3
Maximum	15
Minimum	3.3
Avg/Min	1.61

Design Criteria

Criteria for this room are the combined criteria from two categories listed in the IESNA lighting handbook: "general gallery areas" and "flat displays on vertical surfaces." The more stringent of the two assessments was taken for each listed design issue.

Horizontal Illuminance (very important): 10 fc

Vertical Illuminance (very important): 3 fc general areas, 30 fc display walls

Appearance of Space and Luminaires (very important)

The overall appearance of an art gallery is extremely important. The space cannot seem cheap in comparison to the fine art it provides a home for, while on the other hand it should not distract visitors from the very reason they came – the artwork. From a lighting standpoint, this is challenging because often the only solution to gallery lighting is the most flexible choice: a track system. Track lighting is invasive because it protrudes from the ceiling, often conflicting with other architectural elements.

Color Appearance and color (very important)

Artwork must be illuminated perfectly for full appreciation. Perhaps most important to this is color appearance. Sources that provide a full spectrum of color output must be employed.

Daylighting Integration and Control (very important)

Protection of artwork from harmful ultraviolet radiation is imperative. The Prothro Gallery also incorporates a natural light well, and therefore daylight is of particular importance in this building.

Direct Glare (very important)

Direct glare should be reduced in this space to prevent distraction from the artwork.

Flicker and Strobe (somewhat important)

There does not appear to be any particular equipment in the room that will cause undesirable flicker and strobe effect.

Light Distribution on Surfaces (important)

Light in galleries should be dramatic, focusing on the artwork. Distribution on the artwork is important and individualistic to each piece, while light distribution in the room should be secondary to the needs of the artwork.

Light Distribution on Task Plan/Uniformity (very important)

As stated previously, the why light is distributed on each piece of artwork should cater to its specific needs, and the lighting system should be prepared to accommodate different distribution techniques as artwork rotates in and out of the space.

Luminance of Room Surfaces (important)

Display walls and stations should be highlighted, while other architectural features should not be lit in any manner that will compete with the artwork.

Modeling of Faces or Objects (not important)

The importance of lighting for facial recognition should be secondary to providing artwork-generated lighting displays. A silhouette image of people viewing a vibrant artifact is more enticing to the entering occupant than a crowded room of people.

Points of Visual Interest (important)

*T*he gallery lighting should enforce the important role of the artwork.

Reflected Glare (very important)

Reflected glare from any gallery art will both hide the finer details of the piece and prevent viewers from engaging in longer studies of the object.

Shadows (very important)

Shadows should not be cast on artwork unless the artist intended to create such an effect. One of many common and avoidable problems includes improper luminaire focusing, consequently creating cast shadows from bulky art frames.

Source/Task/Eye Geometry (very important)

Luminaire locations should be carefully arranged so the artwork is lit properly from all viewing angles; the viewer should not experience direct or reflected glare, and expected viewing positions should not allow the occupants to cast shadows onto the artwork (unless intended by the artist).

Sparkle/Desirable Reflected Highlights (not important)

Sparkle and desirable reflected highlights are inappropriate in art galleries unless intended by the artist.

Surface Characteristics (important)

Surface characteristics of artwork should be accentuated, with the exception of seams and other unavoidable flaws in the artist's work.

System Control and Flexibility (very important)

The lighting system should incorporate dimming for flexibility. A full set of accessories should be available for interchangeable use in the luminaries, including snoots, ultraviolet shields, spread lenses, light filters, and cross baffles.

Special Considerations (very important)

Supplementing the light well with electrical lighting must be considered. The lighting system must provide adequate ultraviolet protection as well as reduced levels of radiation. Refer to next section for details.

Special Considerations for Artwork Lighting and Presentation

Museum and art gallery lighting requires a special design process encompassing everything from conceptualization to technical execution. Successful art lighting must be dramatic and enhancing to the piece while also preserving the object from damaging heat and ultraviolet radiation.

Design Concept
Before selecting equipment for lighting artwork, the overall design intent must be determined. Generally, light track should be located parallel to the vertical surface to be illuminated. The selection of lamp is largely based upon desired color temperature, rendering, and intensity. Artwork demands a very high color rendering index (CRI), preferably above 80. Incandescent and tri-phosphor fluorescent sources are usually best at provided high levels of CRI, although certain ceramic metal halide sources may also be appropriate.

Accessibility
In 1990, the Americans with Disabilities Act officially required that museum and art galleries provide access for people with disabilities. The renovation of the existing Ransom Center, originally constructed in 1972, was designed to increase disability access to the gallery spaces. Ramps and elevators are located within the center as needed. The lighting designer is obligated to provide enough light for objects to be visible to all visitors. Additionally, labels should be visible to all and glare from cases and labels needs to be considered.

For the lighting designer, there are no strict illumination requirements in galleries. Thirty footcandles is recommended for highlighting artwork, although ultimately the designer may determine some artwork requires less light. This is especially true of valuable and ancient artworks; any increase in light level accelerates the degradation process. Light levels may become extremely low in galleries, and the lighting designer should do his or her best to make viewing spaces safe to navigate. Light and color should combine to produce a clear circulation route in, through, and out of display spaces; clear paths around obstructions must be provided.

Preserving museum objects
Light is radiant energy that can cause permanent damage to valuable artifacts. Light can damage artwork in two ways: radiant heating and photochemical actions. Radiant heating produces an increase in temperature of the illuminated object and may cause the object to expand and lose moisture. Surface cracking, lifting of surface layers, and loss of color may occur. Photochemical actions result in the permanent change in the structure of an object, and for artwork, the result may be fading or darkening of colors, yellowing, brittling, loss of strength, degradation of fabrics, and color changes in certain pigments. Reduced ambient light levels may allow less light to be focused on delicate objects. A dimming system can help in this regard. Additionally, occupancy sensors and timed switches may be helpful in small display areas to allow light on delicate objects only when they are being directly viewed.

Assessing exposure
Two factors are used in assessing the annual extent of exposure of an object to harmful radiation. The first of these two is the reciprocity factor:

Exposure = intensity * time
= $(W/m^2)*(t)$

To elaborate, the overall exposure effect must take into account both the intensity of radiant energy with respect to power density and the length of time it experiences that amount of energy. 25 W/m^2 over (4) hours is equally to the amount of radiant exposure for only (1) hour at 100 W/m^2. The lighting designer must account for both light intensity levels and duration of exposure time. Equally important is an understanding of the spectral power composition of a light source. Infrared and Ultraviolet radiation is usually released from lamps and must be controlled. Incandescent sources release more infrared radiation than visible light. Although fluorescent and mercury lamps introduce less infrared exposure, they also produce far more ultraviolet energy.

Spectral power of ultraviolet (UV) light is measured in two ways: Microwatts of UV per lumen (µW/lm) and UV percent; energy between 300 nm and 400 nm as a proportion of that between 300 nm and 700 nm. Figure 14-3 of the IESNA Handbook (ninth edition) includes a general list of absolute and relative amounts of ultraviolet radiation to be expected from electric and natural light sources. Figure 14-4 provides recommended total exposure limits in terms of illuminance hours per year. These tables, as well as consultation with the conservator, should be used when determining the appropriate lighting for delicate objects. The IESNA handbook recommends as little as 5 fc of illuminance for highly susceptible artifacts, and a mere 3.5 fc for the most precious of artwork. These light levels are low, but provided the viewer has adapted to such illuminance levels, viewing of the artwork should not be difficult.

Prothro Family Theatre

Overview

The Prothro Family Theatre serves various functions, ranging from video presentation to guest lectures. In some cases, the audience may become part of the presentation. The theatre is designed for a capacity of 130. Materials within the space include wood, a suspended (draped) fabric ceiling, exposed concrete structure, vibrant red walls, and carpeted floors. There is also a large waiting lobby with floor to ceiling windows and a transition vestibule leading to the auditorium space.

Figure 23: Theatre Plan

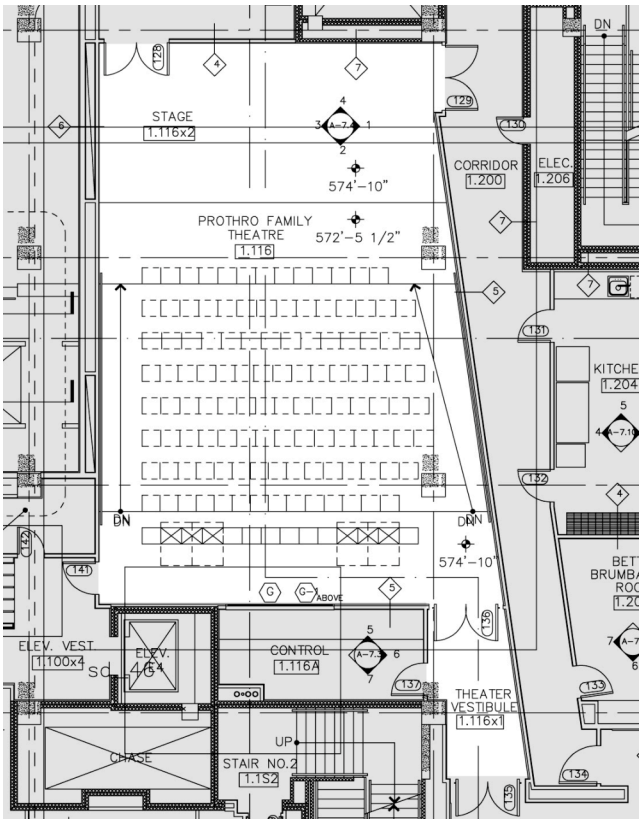
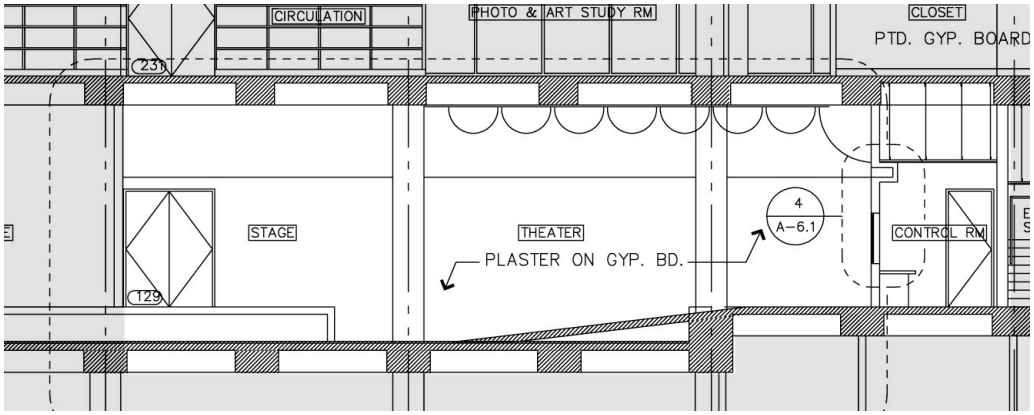


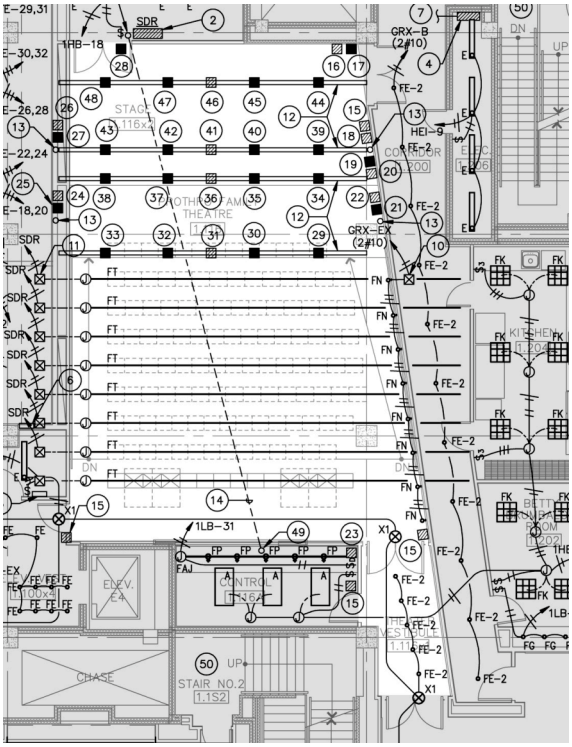
Figure 24: Theatre Section



Lighting Layout
Halogen aluminum reflector downlights serve as the primary source for light in the theatre. They are mounted into a channel located between the draping pieces of fabric ceiling (refer to figure 24 above). Additional lighting from halogen/incandescent sources is provided along the half-wall between the stage and backstage corridor. These lights are mounted to a small pole and provide a scallop effect along the bright red theatre wall.

Lighting Control Information
House lighting in the Ransom Center is placed on two dimming channels, one encompassing the majority of the theatre seating and the second controlling the last two "rows" of halogen lamps.

Figure 25: Theatre Electrical Plan



Room Data

Total area

1,600 square feet (excluding stage area)
460 square feet (stage)

Furniture

Theatre seating

Finishes

Red fabric walls, reflectance 0.45
Carpeted floors, reflectance 0.30
Draped fabric ceiling, transmittance 0.15, reflectance 0.35
Hardwood floors, reflectance 0.20
Painted concrete columns, reflectance 0.25

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTITY
FE-2	Recessed tungsten halogen 4" dia. Open aperture downlight with 1" wide black painted reflector band, clear aluminum reflector and overlap trim.	75 W	Osram 75PAR16/CAP/NFL	Edison Price	HAL 15/4-COL-MOD 1" Wide Black Band	5
FN	Surface mounted to top of wall tungsten halogen downlight with rectangular housing, 1/4" o.c.. stem and monopoint socket. Architect to confirm rigidity of ceiling construction for track fixture installation.	50 W	Q50T4/CL/CD (2-pin. GY6.35 frosted)	Light Project	14040 1728	8
FT	Surface mounted tungsten halogen low voltage socket strip with custom 3-1/4" wide trim plate, extruded aluminum housing, fixed D.C. bayonet lampholder spaced 24" o.c. and remote mounted transformer. Architect to verify trim plate finish.	25 W/lf	Philips 50ALR18/NFL25-GBK	Norbert Belfer Lighting	2791-NX2S-24"-See Plan-MOD Trim Plate	250 lf

Daylighting Elements

No daylighting is present in this space.

Control Devices

Dimming system tied into theatrical dimming equipment.

Power Density Allowances

ASHRAE 90.1-1999: 1.8 W/sq.ft, plus 1.0 W/sq. ft for artwork
ASHRAE 90.1-2004: 2.6 W/sq.ft, plus 1.0 W/sq. ft for artwork

Total Room Watts: 7,025 W

Room Power Density: 4.39 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FV	IV	Clean, 24 months	2950	2800	0.95	0.88	0.95	0.98	0.78
FW	IV	Clean, 24 months	3600	3100	0.86	0.88	0.95	0.98	0.71
FY	VI	Clean, 24 months	7300	6716	0.92	0.78	0.64	0.98	0.45
FAF-1	II	Clean, 24 months	2950	2800	0.95	0.89	0.85	0.98	0.70
FAK	IV	Clean, 24 months	2700	2565	0.95	0.80	0.95	1.00	0.72
FAL	IV	Clean, 12 months	820	800	0.98	0.88	0.95	1.00	0.82

Illuminance Data

Figure 26: Theatre Illuminance Grid (Units are in footcandles)

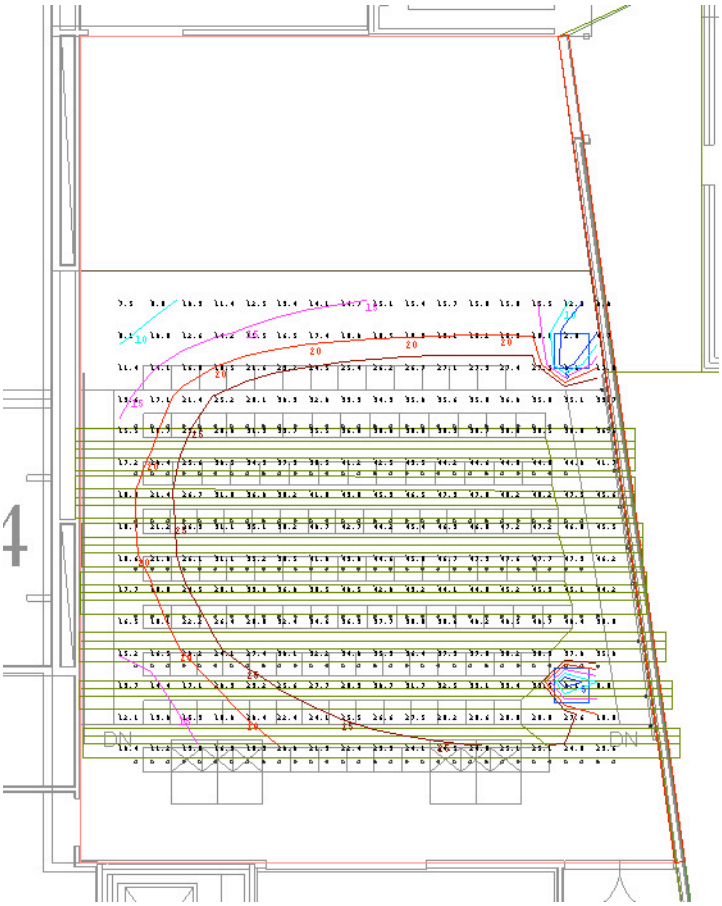
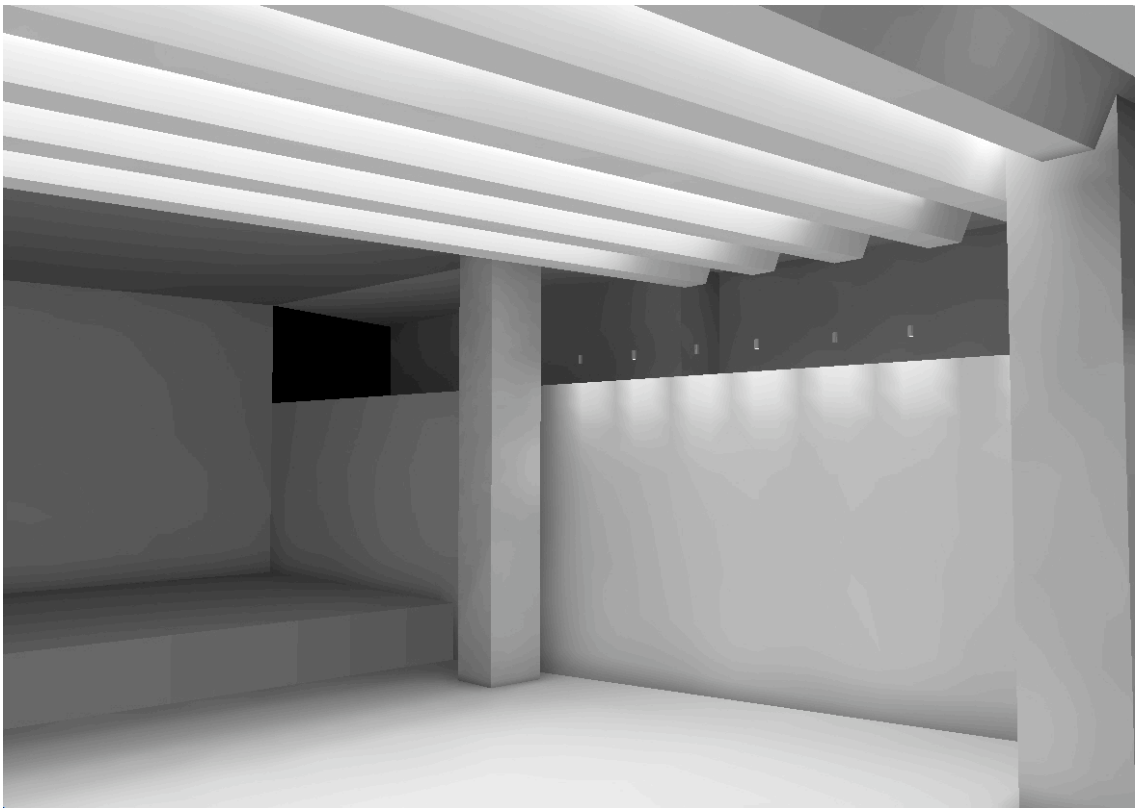


Figure 27: Theatre Simulated Lighting (Radiosity Rendering)



Seating Plane (2.5ft) Illuminance (FC)	
Average	30
Maximum	48.2
Minimum	10
Avg/Min	3.00

*note that lighting in Canopy Area tapers from bright (closest to façade) to 1 footcandle (assumed ambient light level).

Design Critera

Horizontal Illuminance (important): 10-20 fc

Horizontal illuminance should be sufficient enough to provide a clear path of travel down the isles and allow brief periods of paper reading.

Vertical Illuminance (somewhat important): 3 fc

Enough vertical illuminance should be provided to allow facial recognition.

Appearance of Space and Luminaires (somewhat important)

Luminaires should integrate well with the theatre's architecture.

Color Appearance and color Contrast (important)

Quality light should be provided to match the grandeur of the theatre.

Daylighting Integration and Control (important)
No daylight is present in the theatre.

Direct Glare (somewhat important)
Direct glare should be avoided; occupants will be sitting in one place without the ability to move away from glare spots.

Flicker and Strobe (somewhat important)
Luminaires and related equipment should be selected that can easily be dimmed without flicker and strobe effects.

Luminance of Room Surfaces (somewhat important)
Surfaces should be highlighted to compliment the architecture and create visual points of intrigue while the occupants are waiting for their performance.

Modeling of Faces or Objects (somewhat important)
Facial identification should be sufficient enough to hold brief conversations before the performance.

System Control and Flexibility (very important)
System controls should be very flexible; modern theatre performances frequently use the seating area and house lights as part of their set design. All luminaries should be linked to the stage lighting controls and have capability to be dimmed to one per cent.

Design guidelines provided by the IESNA handbook are less specific for theatres than other spaces. During normal use, house lights in the theatre are off or dimmed to low levels. This eliminates the need to investigate many of the technical aspects of a room illumination. Instead, the most important objective is to provide a flexible, easy to use control system.

Hazel Ransom Reading Room

Overview

The Hazel Ransom Reading Room is the largest space on the second floor. Its primary use is study, reading, and temporary display of the center's archives for personal viewing. Computer activity occurs in this area at the circulation desk, and laptops are frequently used at the reading tables. There are also a series of stacks in one end of the room. The Reading Room is a large open space, and it is subdivided into several specialty areas. These include: the Photography & Art Study Room, the Circulation Desk, and N.C. and H.J. Stark Foundation Reference Area.

Figure 28: Reading Room Plan (Including Furniture)

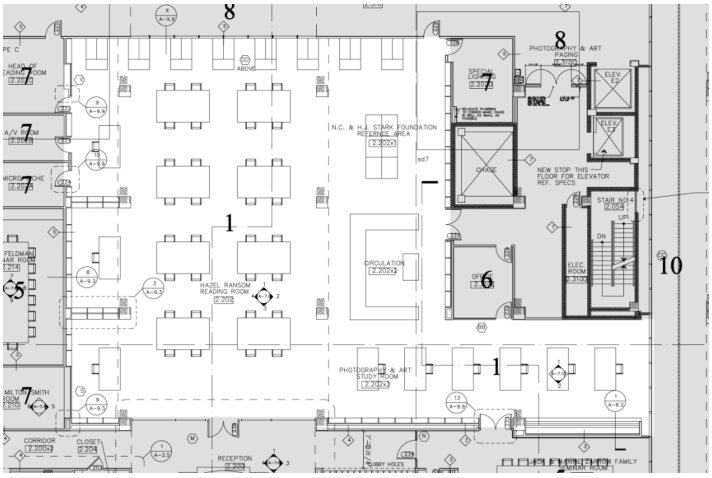
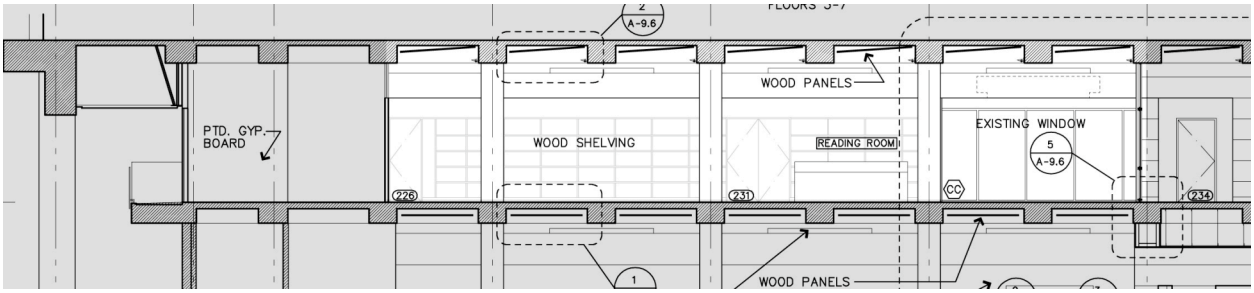


Figure 29: Reading Room Section



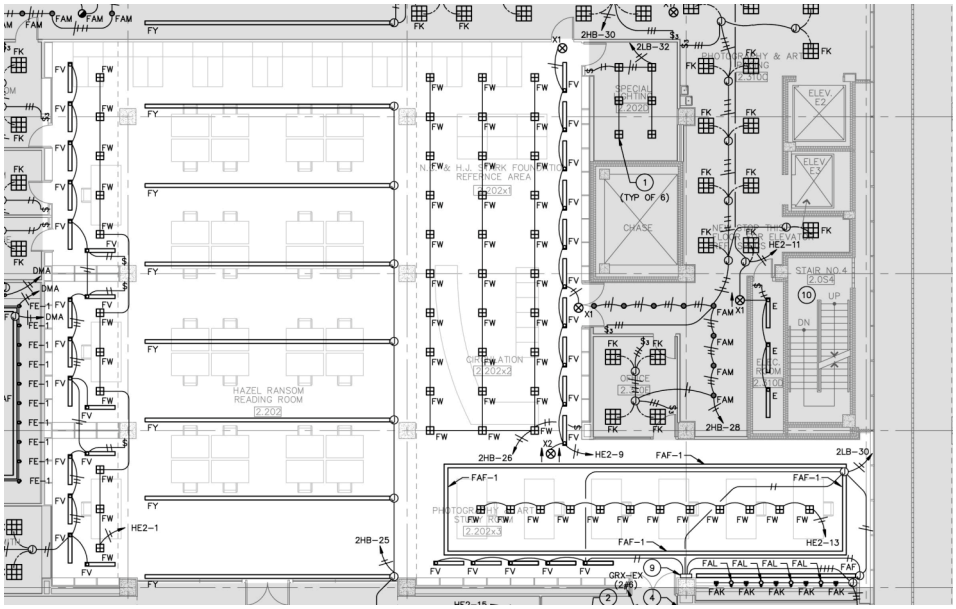
Lighting Layout

General ambient light is provided in the reading room through a cove system in the wood panel ceiling. Areas with lower ceiling heights are illuminated with recessed compact fluorescent fixtures with a cross baffle shield. Those reading in the open desk area have the ability to control standardized university desk lamps with a linear fluorescent source.

Lighting Control Information

Standard switches with a timeclock override control lighting systems in the Ransom Center Library. Wallbox dimming is provided in sub-spaces for personal control, including surrounding display walls.

Figure 30: Reading Room Electrical Plan



Room Data

Total area

6,550 square feet

Furniture

Stacks (veneer wood), reflectance 0.70
Stacks (books), reflectance 0.50
Reading tables (veneer wood), reflectance 0.70
Chairs (wood), reflectance 0.65
Circulation desk (wood), reflectance 0.55
Computers, portable laptops

Finishes

Painted concrete columns, reflectance 0.55
Wood veneer ceilings, reflectance 0.70
Wood veneer walls, reflectance 0.70

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTITY
FV	Recessed fluorescent nominal 4" x 4" downlight with matte aluminum finish louvers, diffusing lens, overlap trim and integral electronic ballast. Provide white overlap trim finish, architect to confirm.	32 W	F32T8/830	Se'lux	M1-1T8-MP-4'-WH-120-EL	31
FW	Recessed compact fluorescent nominal 12" x 12" 4-cell downlight with semi-specular louvers, overlap trim and integral electronic ballast. Provide white overlap trim finish, architect to confirm.	54 W	(2) 27W twin tube / 830	Columbia	T1212-2-27W-F-LD-22-EBTT-120	53
FY	Surface wall mounted nominal 4' long compact fluorescent asymmetric distribution uplight with smooth extruded aluminum reflector, cutoff visor, yoke, continuous wireway channel and integral electronic ballast. Provide continuous wireway channel with individual fixtures spaced 4'9 11/16" on center. Provide single wiring point for each fixture run to minimize visibility of surface mounted conduit locations.	28W/lf	(2) 55W twin tube / 830 (21.2" MOL, 4800 lumens)	Elliptipar	F-102-L-255-S-15-XX-0	229.5 lf
FAF-1	Surface mounted fluorescent single lamp cross-staggered strip location within architectural cove with integral electronic ballast. Provide lengths as required to come within 3" of ends of cove run.	8 W/lf	F25, F32T8/830 lengths as required	H.E. Williams	Series 74-3',4'-1 25, 32-Lutron Hi-Lume dimming ballast-120Reflector 1411	74 lf
FAK	Track mounted tungsten halogen wallwasher with Autotrack adapter, asymmetric reflector, prismatic lens, UV filter and white painted housing. Track fixture to be compatible with track Type FAJ.	150 W	Q150DC-ETF (frosted)	Edison Price	STK 150 (Autotrack) / UVF	5
FAL	Track mounted low voltage tungsten halogen adjustable accent light with autotrack adapter, diffuse glass lens and integral electronic transformer. Track fixture to be compatible with Type FAJ. Provide white painted housing and hardware finish.	50 W	Osram 50AR70/25/FL	Edison Price	MW/AR/DGS/2.75 (Autotrack)	4

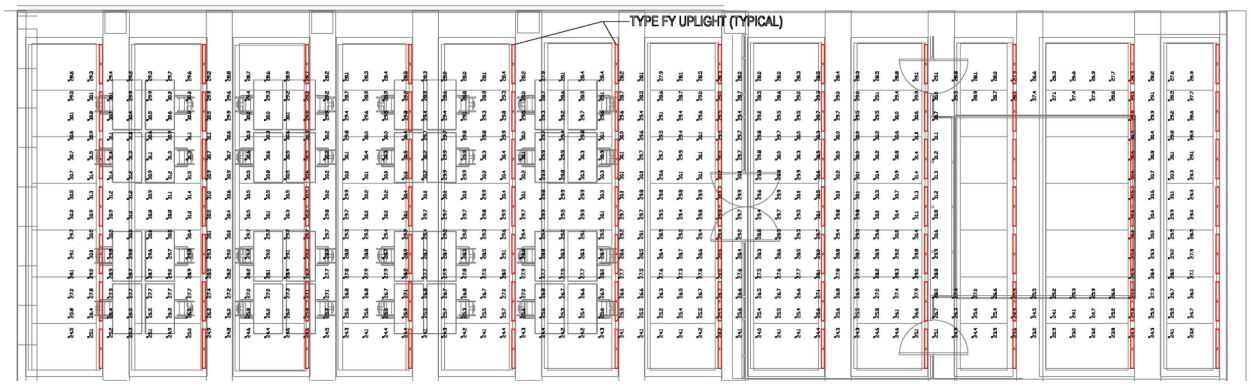
Daylighting Elements
Floor to ceiling windows in the photography and study areas of the library provide daylighting. These windows are north-facing and very little direct exterior sunlight enters the space. Ambient daylighting is transferred into the room through glass opening near the top of the the reading room walls into daylight perimeter offices. Standard toggle switches are provided with timeclock override for energy savings, and dimming switches are provided for wall display areas.
Power Density Allowances
ASHRAE 90.1-1999: 1.8 W/sq.ft., plus 1.0 W/sq.ft. for artwork
ASHRAE 90.1-2004: 1.2 W/sq.ft., plus 1.0 W/sq.ft. for artwork
Total Room Watts: 11,822 W
Room Power Density: 1.8 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FV	IV	Very Clean, 12 Months	2950	2800	0.95	0.94	0.98	0.98	0.86
FW	IV	Very Clean, 12 Months	2500	2250	0.90	0.94	0.98	0.98	0.81
FY	VI	Very Clean, 12 Months	7300	6716	0.92	0.93	0.98	0.98	0.82
FAF-1	I	Very clean, 24 Months	2950	2800	0.95	0.95	0.98	0.98	0.87
FAK	IV	Very Clean, 12 Months	2700	2650	0.98	0.94	0.98	1.00	0.90
FAL	III	Very Clean, 12 Months	950	925	0.97	0.92	0.98	1.00	0.88

Illuminance Data

Figure 30: Reading Room Illuminance Grid (Units are in footcandles)



*please note that consideration for personal task luminaries at reading tables is not included in this calculation.

Figure 31: Reading Room Lighting Simulation (Radiosity Rendering)

Design Critera

Horizontal Illuminance (very important): 30 fc

Horizontal Illuminance should provide sufficient lighting for non-strenuous reading conditions for extended lengths of time.

Vertical Illuminance on stacks (very important) 30 fc

Personal Recommendation: 15 fc

Achieving 30 fc in bookstacks may be unrealistic. Additionally, the sacrifice to architectural design my be too great if a more aesthetic look can be created while achieving 15 footcandles, a comfortable light level for seeking a book and carrying it to a more suitable area to read.

Appearance of Space and Luminaires (important)

This space features rich veneer wood on the ceilings and walls. Luminaires should highlight these features and not intrude unnecessarily on the architectural elements.

Color Appearance and Color (important)

Color appearance may be important for the reading of some materials. Color appearance along the temporary viewing walls is very important.

Daylighting Integration and Control (not important)

Very little daylight exists in this space, and no special controls are warranted for the set of north-facing windows.

Direct Glare (important)

Direct glare should be avoided to create a calm, relaxing environment.

Flicker and Strobe (not important)

No equipment in this space should result in flicker/strobe effects.

Light Distribution on Surfaces (important)

Even distribution of light throughout the room will be most fitting for a library area.

Light Distribution on Task Plan/Uniformity (important)

Even, non-directional light should be provided at reading areas to reduce shadows and decrease eyestrain when reading.

Luminance of Room Surfaces (not important)

Personal recommendation: important

Detailed wood ceilings, walls, and shelving are present in this space. Properly lighting these elements will create a very unique library.

Modeling of Faces or Objects (somewhat important)

Conversation in this space is minimal. Good facial modeling is desirable, but not a primary goal for the lighting system.

Points of Visual Interest (not important)

There are no objects in this space that should be specially featured.

Reflected Glare (very important)

Reflected glare should be reduced in reading areas and on the circulation computer display terminal at the circulation desk.

Shadows (not important)

Source/Task/Eye Geometry (not important)

Sparkle/Desirable Reflected Highlights (not important)

Surface Characteristics (not important)
Wood surfaces throughout should be thoughtfully light.

System Control and Flexibility (not important)
System flexibility is important, especially along viewing walls for archive pieces on temporary display.

Exterior Lighting

Overview
The Harry Ransom Center is a massive, 7-story structure with a natural stone façade. The building is located in the "tower area" of the University of Texas campus, on the southwest edge of the campus property. Over the history of the structure, the landscaping has grown and helps to soften the hard, intentionally monumental feel of this brutalist style building. In many ways, the Ransom Center provides a welcoming to the University of Texas campus; in addition to being located on the corner of campus, it is the main cultural attraction of the university. Visitors are very likely to see this space, and consequently a strong first impression is important. This starts with proper outdoor lighting of the building, canopy area, and adjacent courtyard space.

Figure 31: Exterior Electrical Plan (Second Floor)

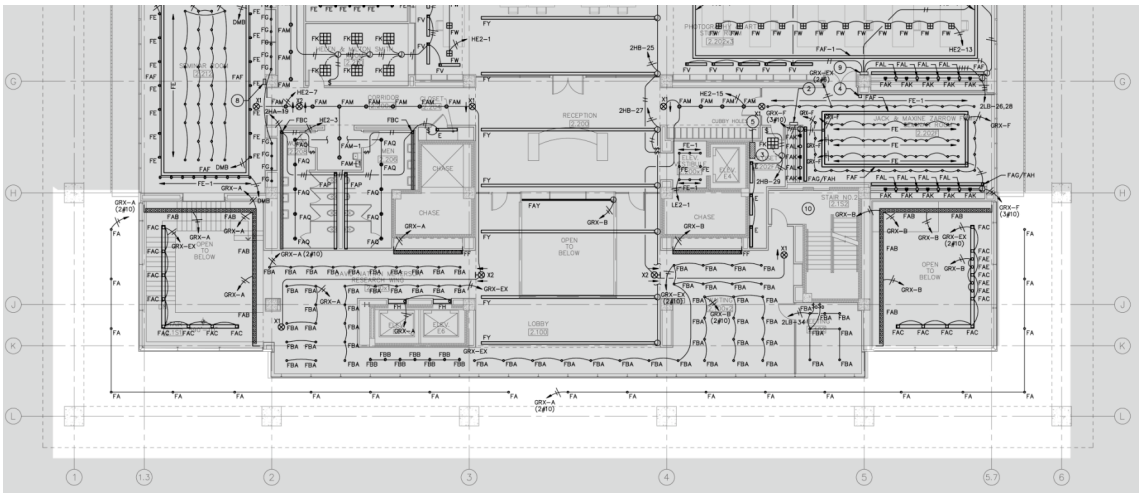
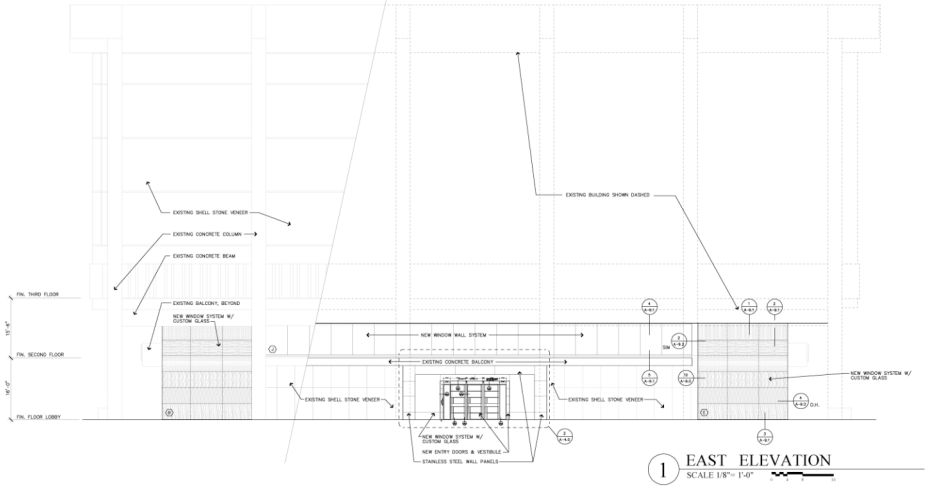


Figure 32: Exterior Front Elevation (East Facade)



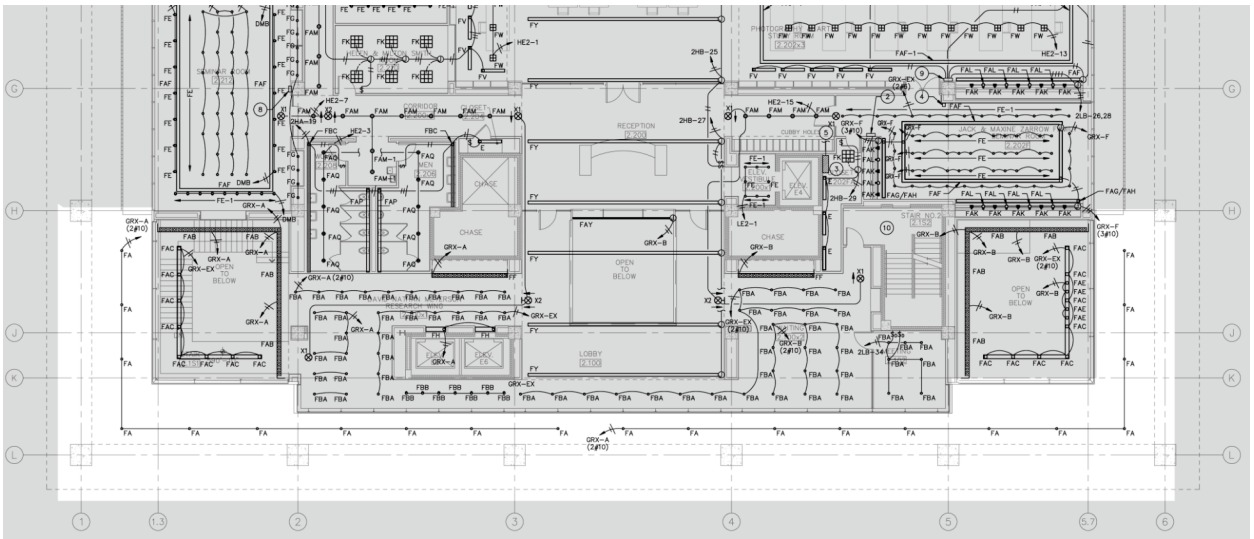
Lighting Layout

Exterior lighting consists of recessed downlights placed in the building canopy as well as the second floor ledge near the entrance façade. Recessed linear uplights in the canopy protrusion highlight the building identification sign.

Lighting Control Information

Exterior lighting is controlled from the lobby security desk as well as the building timeclock.

Figure 33: Exterior Electrical Plan (Second Floor)



Room Data

Total area

5, 880 square feet

Furniture

No furniture is present.

Finishes

Natural stone, reflectance 0.65
Glass (doors), transmittance 0.74
Glass (etched), transmittance 0.74
Stainless Steel, reflectance 0.20

Existing Equipment

TYPE	DESCRIPTION	TOTAL FIXTURE WATTS	LAMP	MANUFACTURER	CATALOG #	QUANTITY
FA	Recessed metal halide 5" dia. Open aperture downlight U.L. listed for damp locations with clear aluminum reflector, overlap trim and integral electronic ballast.	85 W	CDM70/PAR30/M/FL (3000K)	Edison Price Lighting	Arclite 30/5-39-xx-COL	21
FB	Existing downlight to be retrofitted with new recessed metal halide nominal 6-1/2" diameter open aperture downlight for retrofit applications with clear specular anodized aluminum reflector, overlap trim and nearby remote electronic ballast. Fixture to be installed from below the ceiling. Retrofit kit to be U.L. listed for damp locations.	40 W	CDM35/PAR30L/M/FL (3000K)	Lightolier	DL6P35HAE1RM/SUBM	8
FAA	Recessed compact fluorescent nominal 19" x 3.5" wet location uplight with asymmetric distribution reflector, gasketed clear lens and integral electronic ballast.	11W	Osram FM11/H/830	Exterieur Vert	M2-RMA	6

Power Density Allowances

ASHRAE 90.1-1999: 3.0 W/sq.ft. of canopied area, 0.25 W/sq.ft. of illuminated facade
ASHRAE 90.1-2004: 1.25 W/sq.ft. of canopied area, 0.2 W/sq.ft. of illuminated facade

Total Room Watts: 2171 W
Power Density: 0.37 W/sq.ft.

Light Loss Calculations

Luminaire Designation	Maintenance Category	Cleaning Interval	Initial Lumens per Luminaire	Design Lumens per Luminaire	LLD	LDD	RSDD	BF	Total LLF
FA	IV	Dirty, 12 months	5000	3050	0.61	0.73	1.00	0.94	0.42
FB	IV	Dirty, 12 months	2200	1403	0.64	0.73	1.00	0.94	0.44
FAA	VI	Very Dirty, 12 months	750	675	0.90	0.60	1.00	0.98	0.53

Illuminance Data

Figure 34: Exterior Canopy Area Illuminance Grid (Units are in footcandles)

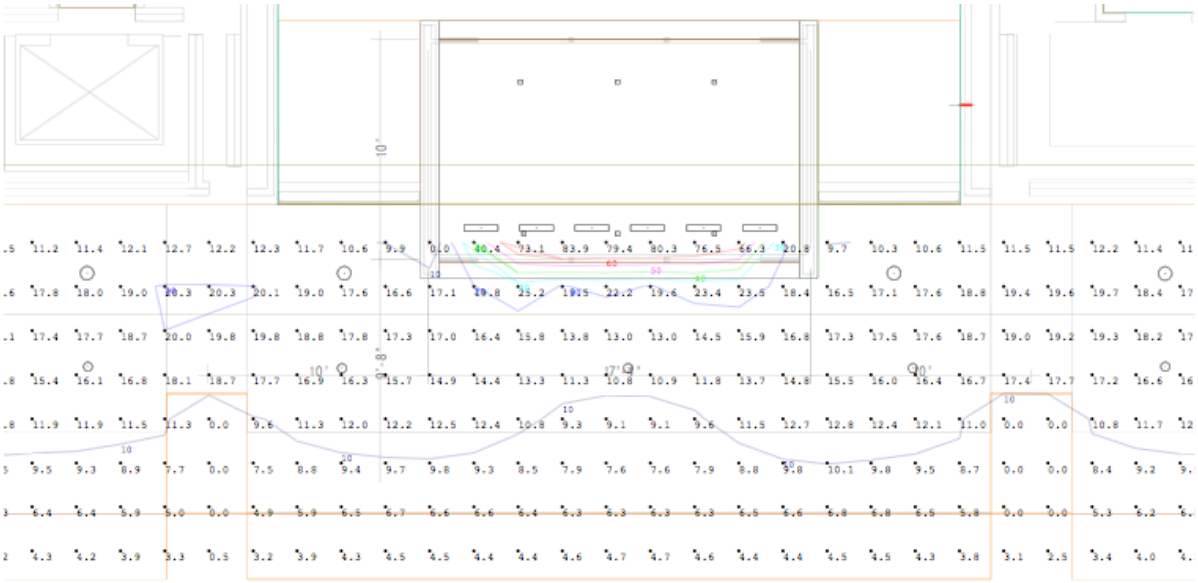


Figure 35: Exterior Canopy Area Lighting Simulation (Radiosity Rendering)

Figure 36: Exterior Canopy Lighting Simulation Showing Etched Glass and Corridor Detail (Radiosity Rendering)

Canopy Floor Illuminance (FC)	
Average	11
Maximum	84
Minimum	1
Avg/Min	11.00

*note that lighting in Canopy Area tapers from bright (closest to façade) to 1 footcandle (assumed ambient light level).

Design Critera

Horizontal Illuminance (very important): 5 fc

Horizontal illuminance should be sufficient enough to provide a clear path into and around the building while also complimenting the architecture of the structure.

Vertical Illuminance (not important): 3 fc

Vertical Illuminance can highlight the building façade, but this structure's modern, Mies van der Rohe inspired base lends itself well to an unlit façade with a glowing canopy overhang to suggest a "lightness" to the structure. Excessive vertical illumination (for example, façade grazing) may also create unnecessary light pollution.

Appearance of Space and Luminaires (very important)

Luminaires should not distract from the natural stone and architecture of the building exterior.

Color Appearance and color Contrast (very important)

Quality of light should compliment the exterior building materials. Luminaires with low color rendering indexes should only be used if they compliment the exterior material.

Direct Glare (very important)

Direct glare from luminaries in the canopy area is aesthetically undesirable and may leave visitors without clear peripheral vision, making them vulnerable to attack.

Flicker and Strobe (somewhat important)

Luminaires, lamps and ballasts should be selected that reduce the possibility of undesirable, annoying flicker.

Light Distribution on Surfaces (important)

Exterior surfaces should be evenly light or highlighted with punches of light as appropriate.

Light Pollution/Trespass (very important)

Light pollution should be minimized in all ways possible.

Modeling of Faces or Objects (very important)

Facial identification should be sufficient enough to recognize those that are approaching.

Peripheral Detection (very important)

Peripheral view should be preserved by reducing luminarie source glare and excessively bright ground illumination.

Points of Interest (very important)

Points of interest should be highlighted as applicable.

Reflected Glare (very important)

Reflected glare should be avoided to prevent excessive contrast between canopy area and the surrounding environment.

Shadows (very important)

Shadows should be reduced to prevent locations that make facial identification difficult.

Source/Task/Eye Geometry (very important)

Geometry should be studied to prevent unsightly views into canopy recessed luminaries and unsafe levels of high contrast.

Sparkle/Desirable Reflected Highlights (important)

Where safe and appropriate, sparkle and highlights may be implemented to enhance the architecture of the building.

Appendix A

Related documents

All files, unless otherwise noted, can be found in the following location on the Penn State Department of Architectural Engineering network drives:

P:\mal351\Technical_Assignment_1

AGI32 Files

Corridors.A32
Exterior.A32
Gallery.A32
Lobbies.A32
Theatre.A32

Radiosity Files

Corridors.rsf
Exterior.rsf
Gallery.rsf
Lobbies.rsf
Theatre.rsf

IES Files

All IES files used for calculations can be found in the following location on the Penn State Department of Architectural Engineering Network Drives:

P:\mal351\Technical_Assignment_1\ies

The appropriate fixture type designation is located in front of the original manufacturer's file name. For example, the .ies file for fixture Type FA is saved as "FA_arc305f.ies".