

3AMFisher

321 Ashland Pl, Brooklyn NY

TECH REPORT ONE

MFGANgrant

Lighting | Electrical

Advisor—Dr. Kevin Houser

September 25th, 2015



Existing Lighting Conditions Study

EXECUTIVE SUMMARY

The Brooklyn Academy of Music's BAM Fisher building is an addition to the prestigious higher education program. The following technical report focuses on the Fisher building, analyzing existing conditions of the space. In addition, this report will provide in depth analysis of existing lighting conditions and provide design criteria and considers of a new lighting design.

This building is truly unique as it was the first theater in the Manhattan area to achieve a LEED gold rating in new construction. The building also celebrates history by preserving the façade of the salvation army building that existed on the site from 1927. BAM is a program committed to allowing college students to grow and express themselves freely. This space provides performance and rehearsal spaces such as the Judith and Alan Fisherman Space Black-box Theater, Rita K. Hillman Dance Studio, and Max Leavitt Theater Workshop. The building is also home to several offices and classrooms.

The following report concentrates on the spaces below as the focus of the redesign throughout the course of the year:

- Education & Humanities Offices
- Rita K. Hillman Dance Studio
- Peter Jay Sharp Lobby
- Geraldine Stutz Rooftop Gardens

Throughout the course of the lighting design, it is important to consider several things. The lighting power density and illuminance levels are key for energy usage analysis. As this building achieved a LEED certification, it is clear that energy was a main consideration in the design. However, the Fisher building was completed in 2012 using many MR16 and fluorescent lamps. Since then, LEDs have improved dramatically and may be able to achieve the correct values using less energy. Some areas rely heavily on daylight, such as the Rita K. Hillman Dance studio which has large windows on the west façade allowing a large amount of daylight to enter the space. The offices also have a good amount of windows, but the cubical height limits the light sharing in the space and extra task lighting is needed. The lobby has implemented large glass arches in exiting brick sealed arches to create a more welcoming entrance. However, the varying heights in the ceiling causes a challenge for lighting. The rooftop gardens are an excellent space but will be used often at night so the lighting is a major factor of the emotion felt in the space. Each one of these spaces has the opportunity to ignite the students' creativity and passion through architecture and light.

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References

The following links are available on the Technical Reports page of the CPEP site

AGI files of large work space and special purpose space

Additional photos of BAM Fisher

Architectural and Lighting plans

BUILDING OVERVIEW

Building Name	BAM Fisher
Location and Site	321 Ashland Place, Brooklyn NY
Building Occupant	Brooklyn Academy of Music
Occupancy/Function	Theater (A-1), Offices (B), Classroom (B), Dance Studio (A-1)
Size	40,000SF
Number of Stories	1 below ground, 7 above ground
Construction Dates	10/1/2010-5/1/2012
Cost Info	Construction Cost \$25.2 million Total Project Cost \$52 million
Project Delivery Method	Design Build with CM at Risk with a GMP

Key Players in Lighting Design

- Architect | H3 Hardy Collaboration www.h3hc.com
- Lighting Designer | Cline Bettridge Bernstein Lighting Design www.cbld.com
- MEPF Engineers | ICOR Associates, LLC www.icorassociates.com
- Environmental Consultant | Ambrosino DePinto Schmieder www.adsce.com
- Code Consultant | Milrose Consultants, Inc www.milrose.com
- Theater Consultant | Auerbach Pollack Friedlander www.auerbachconsulatants.com

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Spatial Description

The open office space is a collaborative area for the administration employees of BAM Education and Humanities department. The majority of tasks are completed using a computer at a predetermined station (cubical).

Dimensions | 30'-4" x 24'-9" | 750.75 ft²

Tasks | Desk work, computer work, copying

Furnishings | Cubical work stations, desks, office chairs, copy machine, storage units.



Floor Plans

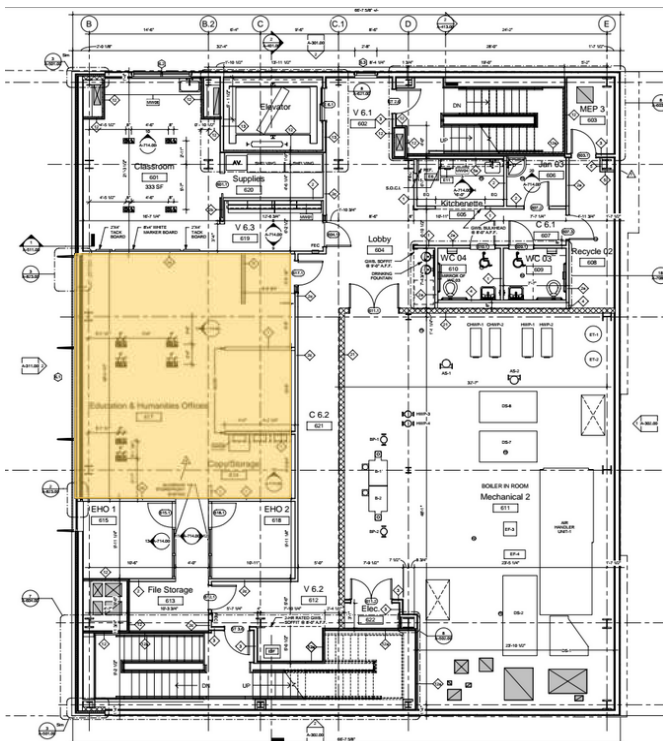


Figure 1.1 6th Floor Plan

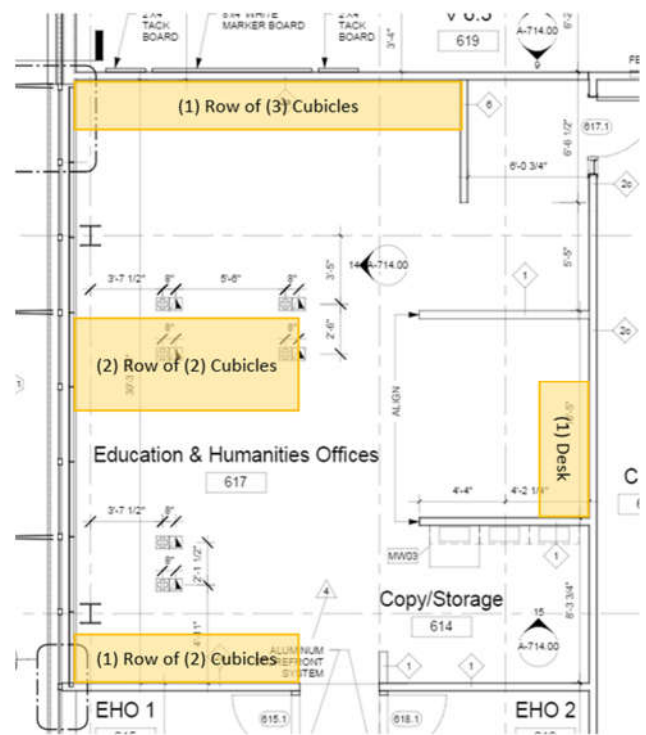


Figure 1.2 Enlarged Floor and Furniture Plan Rm 617

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

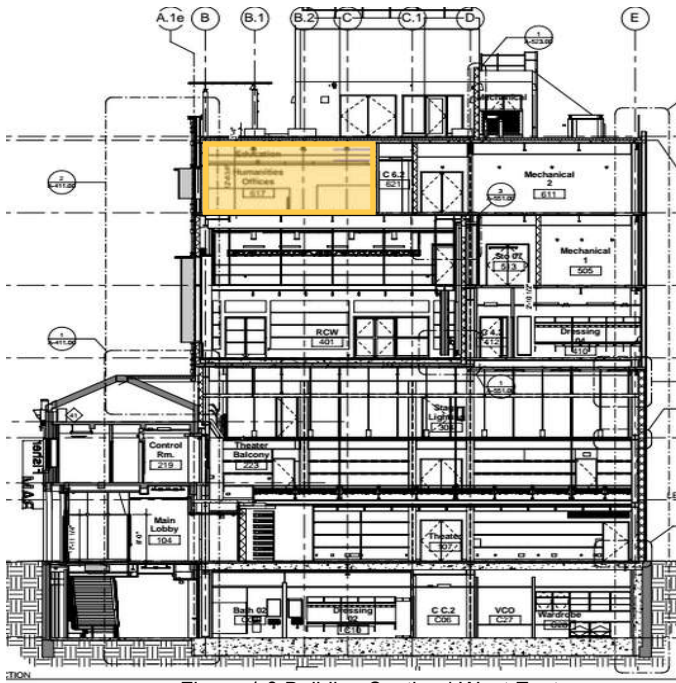


Figure 1.3 Building Section | West East

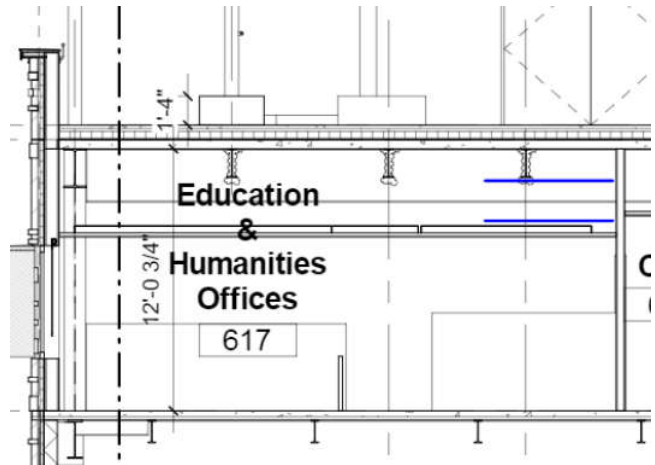


Figure 1.4 Room 617 Section | West East

Existing Lighting Conditions

The plan shown in figure 1.5 shows the existing lighting layout for the Education and Humanities Offices. The space consists of varying lengths of a recessed fluorescent linear slot. The slot provides ambient lighting in the space, but task lighting may also be needed at each individual work station. The recessed nature of the slot is ideal for the space which has a relatively low ceiling height at 8'. A run of windows on the west face allow daylight to enter the space and shading devices are integrated with control. See the following page for fixture specifics.

ALLOW FOR TASK LIGHT
AT EACH WORKSTATION
IN EDUCATION AND
HUMANITIES OFFICES

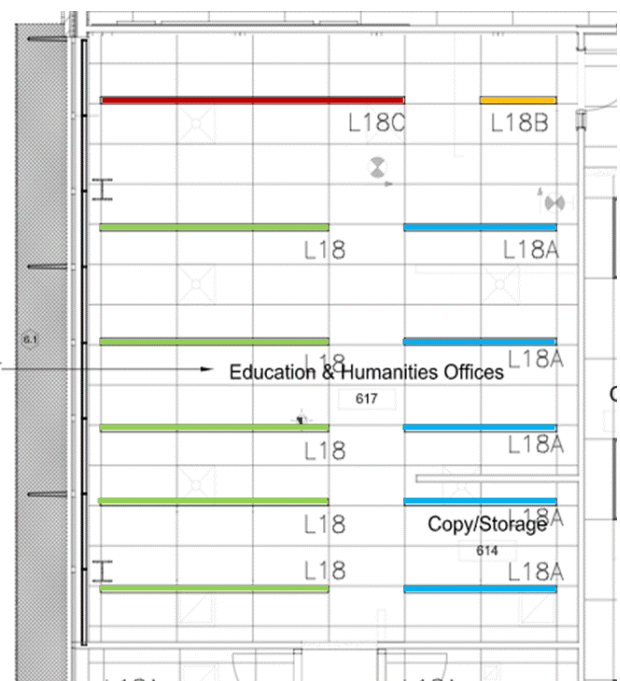


Figure 1.5 Lighting Plan Rm 617

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Table 1.1 | Existing Lighting in Education & Humanities Offices

Color	Type	Manufacturer	Fixture Name	Lamp	Input Watts	Ballast	Description	Qty
	L18	Mark Architectural Lighting	Slot 6 Series	(5) FP21/830/ ECO (3')	124W	Universal Electronic Ballast (1.00 BF)	Recessed 1-lamp staggered cross section linear fluorescent T5 slot with regressed extra diffuse lens, 12' overall length. White housing finish	5
	L18A	Mark Architectural Lighting	Slot 6 Series	(3) FP21/830/ ECO (3')	75W	Universal Electronic Ballast (1.00 BF)	Recessed 1-lamp staggered cross section linear fluorescent T5 slot with regressed extra diffuse lens, 8' overall length. White housing finish	5
	L18B	Mark Architectural Lighting	Slot 6 Series	FP28/830/ ECO (4')	33W	Universal Electronic Ballast (1.00 BF)	Recessed 1-lamp staggered cross section linear fluorescent T5 slot with regressed extra diffuse lens, 4' overall length. White housing finish	1
	L18C	Mark Architectural Lighting	Slot 6 Series	(6) FP21/830/ ECO (3')	147W	Universal Electronic Ballast (1.00 BF)	Recessed 1-lamp staggered cross section linear fluorescent T5 slot with regressed extra diffuse lens, 16' overall length. White housing finish	1

Finishes

The office space has primarily white or cream matte finishes apart from the carpet which is navy and gray. This aids in creating diffuse reflections off surfaces to evenly illuminate the space. For the purpose of this study all ceilings are assumed 80% reflectance as the ceiling finish is not called out in the finish schedule. See table 1.2 below for exact finishes.

Table 1.2 | Finishes of Education & Humanities Offices

		Code	Description	Manufacturer	Style/Color	Finish	Size	Comments	Reflectance
Floor		CPT-1	Carpet Tile	Lees Commercial	Tokyo GT028, 348 Nautica	N/A	50cm x 50cm	Gray and navy patterned	Assumed 20%
Walls	Base	RB-1	Rubber Base	Bruke	BurkeBase Type-TS, 727 Thunder	N/A	4"	General wall base. Use cover base & straight base when applicable	Assumed 50%
	North	PNT-4	Paint	Benjamin Moore	Aura, OC-47 Ashwood	Off-White	N/A	General wall color. Low to zero VOC's, low	67.89%
	East	PNT-4	Paint	Benjamin Moore	Aura, OC-47 Ashwood	Off-White	N/A	General wall color. Low to zero VOC's, low	67.89%
	South	PNT-4	Paint	Benjamin Moore	Aura, OC-47 Ashwood	Off-White	N/A	General wall color. Low to zero VOC's, low	67.89%
	West	PNT-4	Paint	Benjamin Moore	Aura, OC-47 Ashwood	Off-White	N/A	General wall color. Low to zero VOC's, low	67.89%

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Design Criteria

The Education & Humanities offices function as an open office space. According to the IES Lighting Handbook 10th edition, the task illuminances are as follows:

Table 1.3 Task Illuminances for Education & Humanities Offices				
Space Type	Task	E _h (lux)	E _v (lux)	Uniformity Avg:Min
Office	Reading/Writing-VDT Screen and Keyboard	300	150	2:1

The lighting power density is also an important factor to consider in design. ASHRAE 90.1 2013 provides the following requirements for an office space:

Table 1.4 Lighting Power Density Allowance		
Space Type	LPD (W/ft ²)	RCR Threshold
Office, Open Plan	0.98	4

Controls

At the entrance to the space from the north east corner, there are two wallboxes immediately on the left. This space has a Lutron Maestro Series 7 button scene control to work with lighting zones to create specific scenes. The control also works with a countdown timer switch to automatically turn off the lights after hours as employees work a typical work day. In addition, the room is equip with the Lutron Claro series 15A single pole on-off switch to control all lighting together. The minimum control requirements according to ASHRAE 90.1 2013 are:

Local Control | There shall be one or more manual lighting controls in the space that controls all the lighting in the space.

Bilevel Lighting Control | The general lighting in the space shall be controlled so as to provide at least one intermediate step in the lighting power or continuous dimming in addition to full on and full off.

Automatic Daylight Responsive Controls for Sidelighting | In any space where the combined input power for all general lighting completely or partially within primary side-lighted areas is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Automatic Daylight Responsive Controls for Toplighting | In any space where the combined input power for all general lighting completely or partially within daylight areas under skylights and daylight areas under roof monitors is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Either restricted to manual on or partial automatic on | Either none or no more than 50% of the lighting power for general lighting shall be allowed to be automatically turned on.

Either automatic full off or scheduled shut off | Either all lighting shall be automatically shut off within 20 minutes of all occupants leaving the space or lighting shall be automatically shut off during periods when the space is scheduled to be unoccupied

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Daylight Elements

There are motorized shading devices on the windows on the west façade. However, they do not operate automatically through a photosensor but manually by user preference. On the exterior, the windows are fit with a continuous overhang and vertical louvers to eliminate direct light at peak hours and effectively shade the glazing as seen in the image on the right

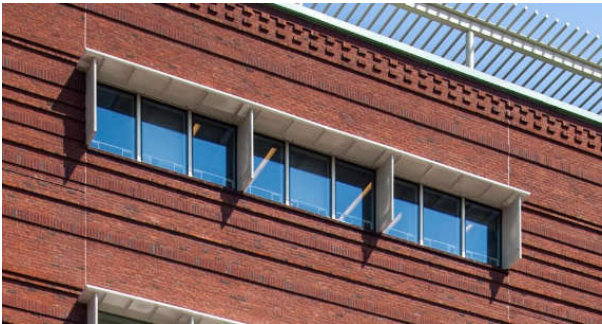


Table 1.5 Glazing for Education & Humanities Offices								
Mark	R.O. Width	R.O. Height	Frame Material	Glazing Type	Fire Rating	Sill Height	Comments	Transmittance
6.1	64'-2"	5'-2 1/2"	Aluminum	IGU-VIRACON VE 1-85	N/A	2' - 4 7/8"	Clear Anodized Finish. Low-E Coating	85%

Design Criteria Prioritized:

- 1. Horizontal Illuminance Levels, Average
- 2. Uniformity
- 3. Lighting Power Density
- 4. Controls

Design Considerations

Color Temperature | In North America, lamps tend to have a warmer color temperature than Asian countries. Temperatures between 3000K and 3500K are ideal for office environments. The color temperature must be consistent across all lamps as well. The image below shows different color temperature likely due to incorrect replacement

Color Rendering Index | The color rendering index must at least 90 CRI for LED sources to ensure that skins tones, R13, R15, R 16 are accurately represented. If fluorescent sources, a CRI of 85 or higher is acceptable.

Glare | with large windows on the west façade, glare must be considered. The exterior shading system and interior shades accomplish this and should be retained. Lamps can also produce glare, especially LEDs with poor lens quality. In the current design, the lenses do avoid glare but they have a major flaw. The staggering of the fixtures can clearly be seen in image left.



PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Calculations & Renderings

Figure 1.6 Illuminance Values (Fc) at Task Height, 2'-6"

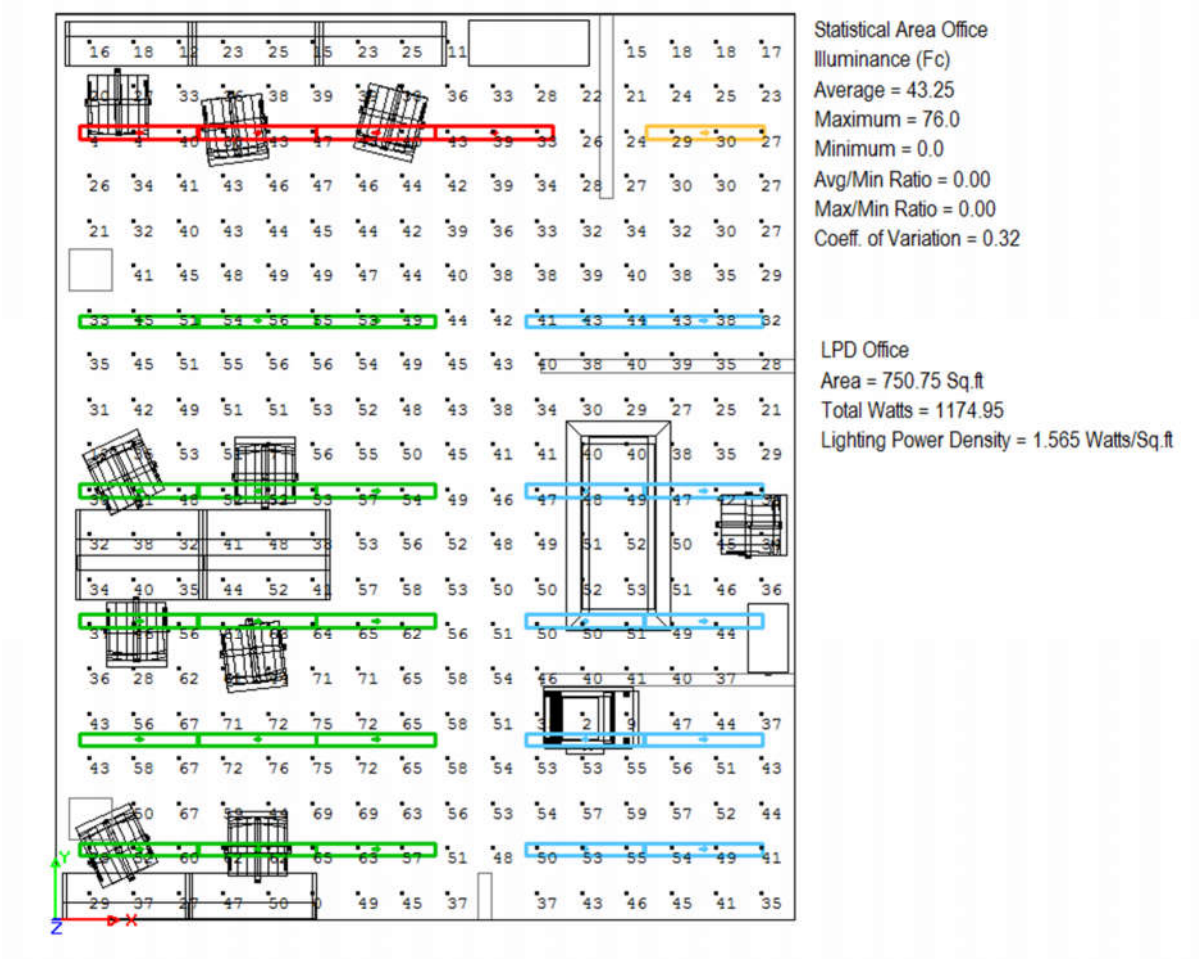


Table 1.6 Light Loss Factors For Office Calculations						
Color	Type	LLD	LDD	BF	UDF	Total
	L18	0.93	0.9	1.0	0.566	0.474
	L18A	0.93	0.9	1.0	0.510	0.427
	L18B	0.95	0.9	1.0	0.500	0.428
	L18C	0.93	0.9	1.0	0.510	0.427

- Lamp Lumen Depreciation** | Mean lumens divided by initial lumens
- Lamp Dirt Depreciation** | Clean environment, open/unvented, 24mn cleaning period
- Ballast Factor** | Given in spec
- User Defined Factor** | Used to modify IES file to replace with specified lamp type and number per 4' section

PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Calculations & Renderings

Figure 1.7 Pseudo Color Illuminance Plan

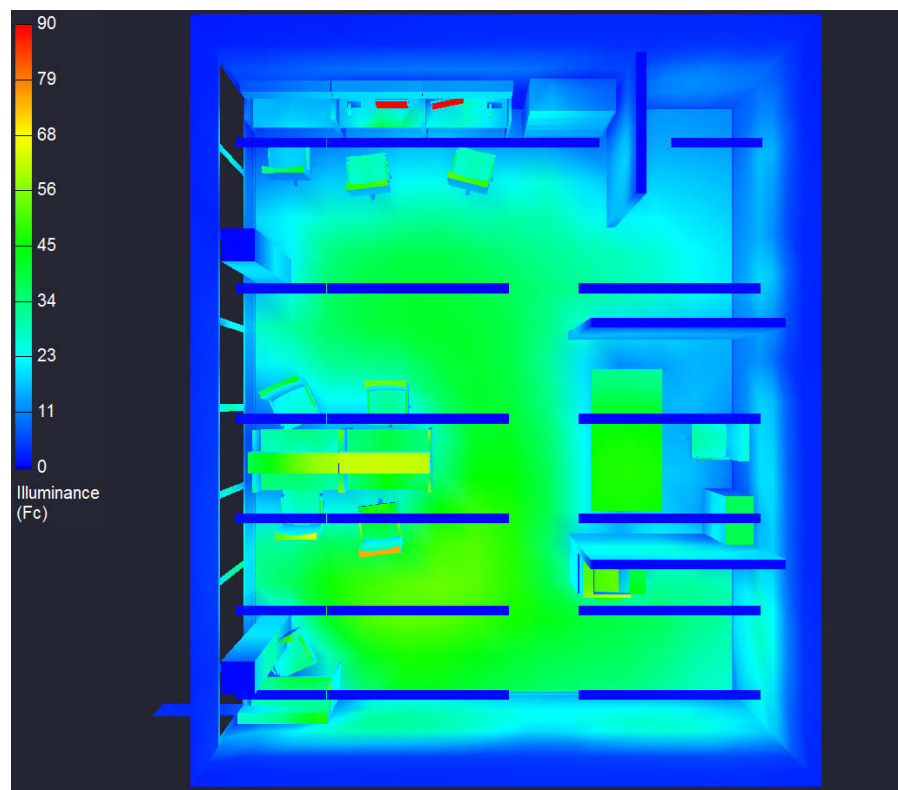


Figure 1.8 Rendered View of AGI Model



PROPOSED AREAS OF STUDY

LARGE WORK SPACE | Education & Humanities Offices 617

Evaluation

The lighting in this area is uniform and functional. It's main purpose is to light the desks to allow ease of work for the employees of BAM Fisher. However, there are some aspects that could be adjusted in redesign.

From the AGI calculations, we see that we have an average illuminance of 43.25 Fc, (approx. 433 lux). This exceeds the IES recommendation of 300 lux. The coefficient of variation is also very low at 0.32. The uniformity, average to minimum is 43.25/16 which corresponds to 2.7:1, this is above the IES recommended 2:1. In addition the LPD is much higher than the ASHRAE 2013 value of 0.98w/sf; this will need to be corrected during redesign. The center of the space has very even illumination, except for a hotspot due to fixture spacing near the south wall. However, through site visits it was clear that the cubical top shelf caused major shadow on the desk and additional task lights should be implemented in redesign. As shown below, the original cubicles did not have to extra shelving atop and allowed for a more open atmosphere with light sharing. The walls are not lit in any particular fashion rather than from spill light from the fixtures, but due to the nature of the space and the introduction of daylight, it is not a major issue.



Credit: brownstoner.com

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Spatial Description

The dance studio, named the Hillman Studio, is a large performance space in BAM Fisher. The studio is used as a working and rehearsal space for the BAM students and for local and visiting artists. Large windows on the plan west, main façade provide ample daylight year round. The task level is at floor level, however vertical illuminance levels should be considered so artists can visualize their work in the mirrors.

Dimensions | 43'-7" x 37'-1" | 1616.22 ft²

Tasks | Visual performance, dance class/rehearsal

Furnishings | Ballet barre in front of large mirrors on east wall



Floor Plans

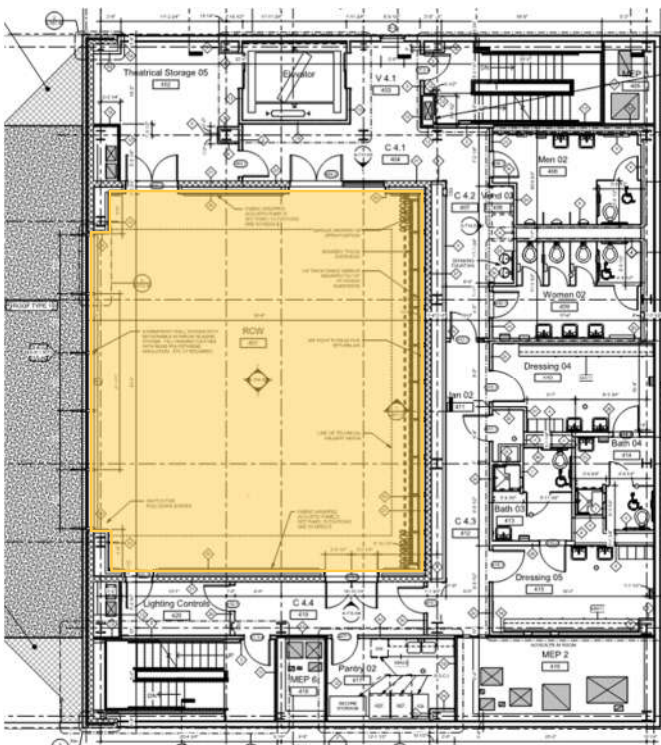


Figure 2.1 4th Floor Plan

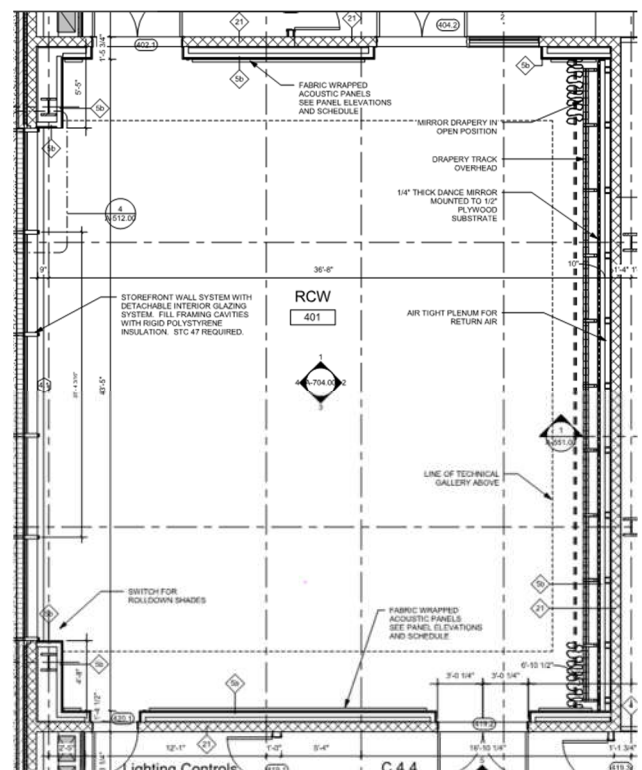


Figure 2.2 Enlarged Floor Plan Rm 401

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

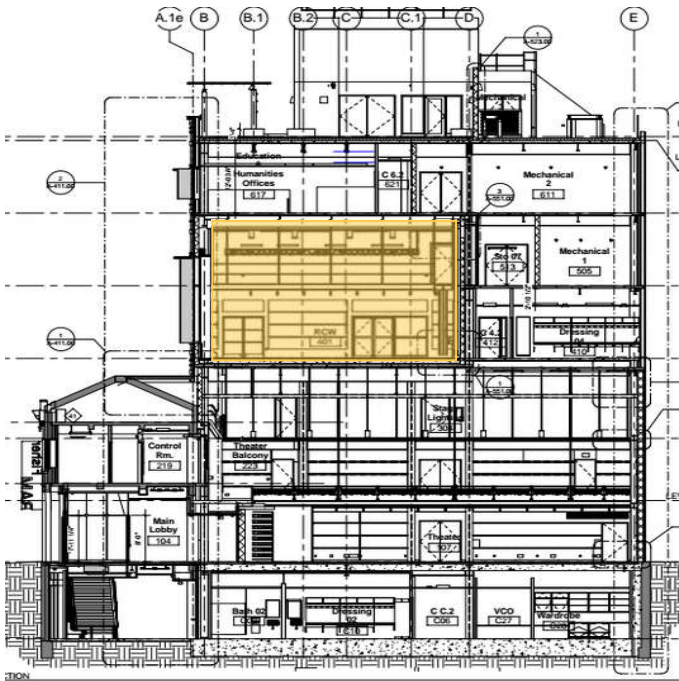


Figure 2.3 Building Section | West East

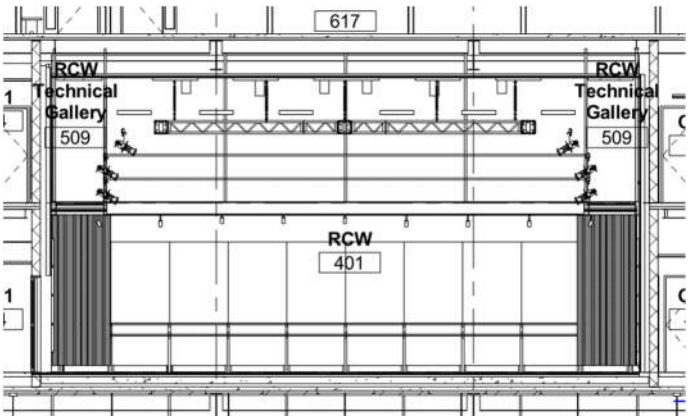


Figure 2.4 Room 401 Section | North South

Existing Lighting Conditions

The plans shown in figures 2.5 & 2.6 show the existing lighting layout for the Hillman Dance Studio. The space is double height, 21'-8", with a small catwalk along the perimeter of the upper level. The central upper ceiling consists of general down-lighting. Below the catwalk, track lighting illuminates the lower walls and mirrors and is mounted at 11'-8" AFF. In addition to the general lighting, the space consists of a theatrical truss with theatrical lights to be used if a performance is being conducted in the space. The theatrical lighting is not in this scope. The west façade has large windows letting daylight into the space. See the following page for fixture specifics.

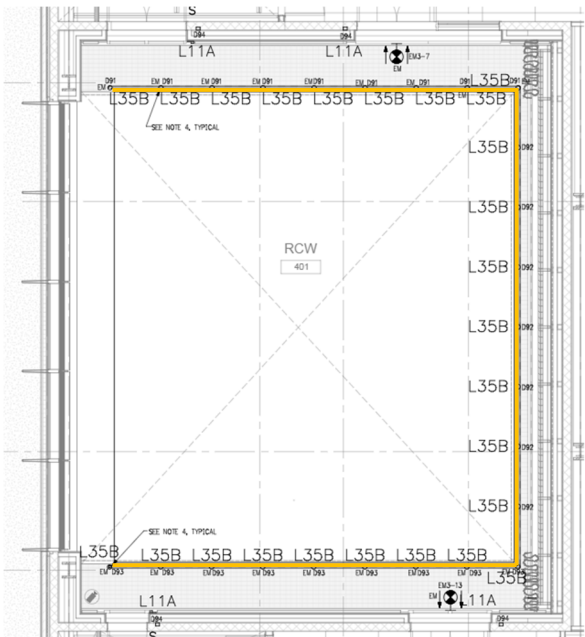


Figure 2.5 Lower Lighting Plan Rm 401

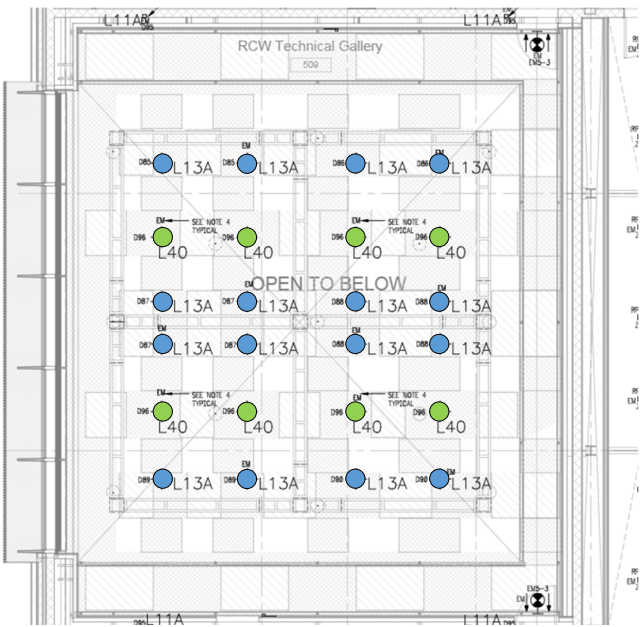


Figure 2.5 Upper Lighting Plan Rm 401

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Table 2.1 | Existing Lighting in Hillman Dance Studio

Color	Type	Manufacturer	Fixture Name	Lamp	Input Watts	Ballast	Description	Qty
	L13A	Kurt Versen	L395	(1) 150Q/C/ MC	150W	N/A	Surface mounted cylinder with 8" diameter dimmable line voltage halogen downlight with medium beam distribution and Solite lens. Black housing.	16
	L35B	Lighting Services Inc.	230 Seires	(1) PAR30/ CAPIR/FL40	40W	N/A	Track mounted dimmable line voltage PAR30 adjustable accent light, for use with L38 track	25
	L40	Kurt Versen	S38 Series	(1) CDM100/ PAR38/FL/3K/ ALTO	100W	Advanced Electronic Ballast	Surface mounted cylinder with 8" diameter metal halide PAR38 downlight and Solite lens. Black housing.	8

Finishes

The dance studio has cream walls with acoustical tiles. The east wall is primarily mirrors with drapes on either side. The floor is a typical sprung hard wood dance surface with a specular finish. For the purpose of this study all ceilings are assumed 80% reflectance as the ceiling finish is not called out in the finish schedule. See table 2.2 below for exact finishes.

Table 2.2 | Finishes of Hillman Dance Studio

		Code	Description	Manufacturer	Style/Color	Finish	Size	Comments	Reflectance
Floor		WD-1	Wood Flooring	Allegheny Mountain Hardwoods	Maple	Glossy	4"W x varies	Sprung theater floor. Forest stewardship council certified.	Assumed 60%
Walls	Base	WDB-1	Wood Base	Allegheny Mountain Hardwoods	Maple	N/A	4"	Forest stewardship council certified.	Assumed 50%
	North	PNT-5	Paint	Benjamin Moore	Aura, AF-95 Hush	Cream	N/A	Low to zero VOC's, low odor	57.92%
	East	PNT-5	Paint	Benjamin Moore	Aura, AF-95 Hush	Cream	N/A	Low to zero VOC's, low odor	57.92%
	South	PNT-5	Paint	Benjamin Moore	Aura, AF-95 Hush	Cream	N/A	Low to zero VOC's, low odor	57.92%
	West	PNT-5	Paint	Benjamin Moore	Aura, AF-95 Hush	Cream	N/A	Low to zero VOC's, low odor	57.92%
	MISC 1	FWP-2	Fabric Wrapped Panel	Maharam	Milestone 403901, 069 Lychee	Teflon	54" w	Acoustic panels on north and south walls	Assumed 40%
	MISC 2	N/A	Mirror	N/A	Aura, OC-47 Ashwood	N/A	N/A	1/4" thick dance mirrors on east wall	100%
	MISC 3	DP-2	Drapery	Innovations	Normandy Velvet, 2207 Hazel	N/A	N/A	Theatrical Drapery around mirrors	Assumed 20%

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Design Criteria

The Hillman Dance Studio functions as an open office space. According to the IES Lighting Handbook 10th edition, the task illuminances are as follows:

Table 2.3 Task Illuminances for Hillman Dance Studio				
Space Type	Task	E _n (lux)	E _v (lux)	Uniformity Avg:Min
Dance Rehearsal Room	Educational Stage (Dance)	300	500	1.5:1

The lighting power density is also an important factor to consider in design. ASHRAE 90.1 2013 provides the following requirements for an classroom space:

Table 2.4 Lighting Power Density Allowance		
Space Type	LPD (W/ft ²)	RCR Threshold
Classroom/Lecture Hall/Training Room	1.24	4

Controls

Currently, the only controls implemented for the dance studio are for the theatrical lighting equipment, which is outside the scope of this assessment. The minimum control requirements according to ASHRAE 90.1 2013 are:

Local Control | There shall be one or more manual lighting controls in the space that controls all the lighting in the space.

Bilevel Lighting Control | The general lighting in the space shall be controlled so as to provide at least one intermediate step in the lighting power or continuous dimming in addition to full on and full off.

Automatic Daylight Responsive Controls for Sidelighting | In any space where the combined input power for all general lighting completely or partially within primary side-lighted areas is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Automatic Daylight Responsive Controls for Toplighting | In any space where the combined input power for all general lighting completely or partially within daylight areas under skylights and daylight areas under roof monitors is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Either restricted to manual on or partial automatic on | Either none or no more than 50% of the lighting power for general lighting shall be allowed to be automatically turned on.

Automatic full off | All lighting shall be automatically shut off within 20 minutes of all occupants leaving the space.

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Daylight Elements

Like the office space on the floor above, the windows for the dance studio have an exterior shading system to reduce direct exposure during peak hours. The image on the right shows the exterior shading system which consists of a continuous horizontal overhang and vertical louvers placed at the mullions. This glazing does not have any interior shading.



Table 2.5 Glazing for Hillman Dance Studio								
Mark	R.O. Width	R.O. Height	Frame Material	Glazing Type	Fire Rating	Sill Height	Comments	Transmittance
4.1	34'-2"	14'-11"	Aluminum	IGU-VIRACON VE 1-85	N/A	2'-7 1/2"	Clear Anodized Finish. Low-E Coating	85%

Design Criteria Prioritized:

1. Horizontal Illuminance Levels, Average
2. Uniformity
3. Vertical Illuminance Levels, Average
4. Lighting Power Density
5. Controls

Design Considerations

Color Temperature | In North America, lamps tend to have a warmer color temperature than Asian countries. Temperatures between 3000K and 3500K are ideal for classroom environments. The color temperature must be consistent across all lamps as well.

Color Rendering Index | The color rendering index must at least 90 CRI for LED sources to ensure that skins tones, R13, R15, R 16 are accurately represented. If fluorescent sources, a CRI of 85 or higher is acceptable.

Glare | with large windows on the west façade, glare must be considered. The exterior shading system should accomplish this and should be retained. Lamps can also produce glare, especially LEDs with poor lens quality.

PROPOSED AREAS OF STUDY
SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Calculations & Renderings

Figure 2.6 Illuminance Values (Fc) at 0'-0"

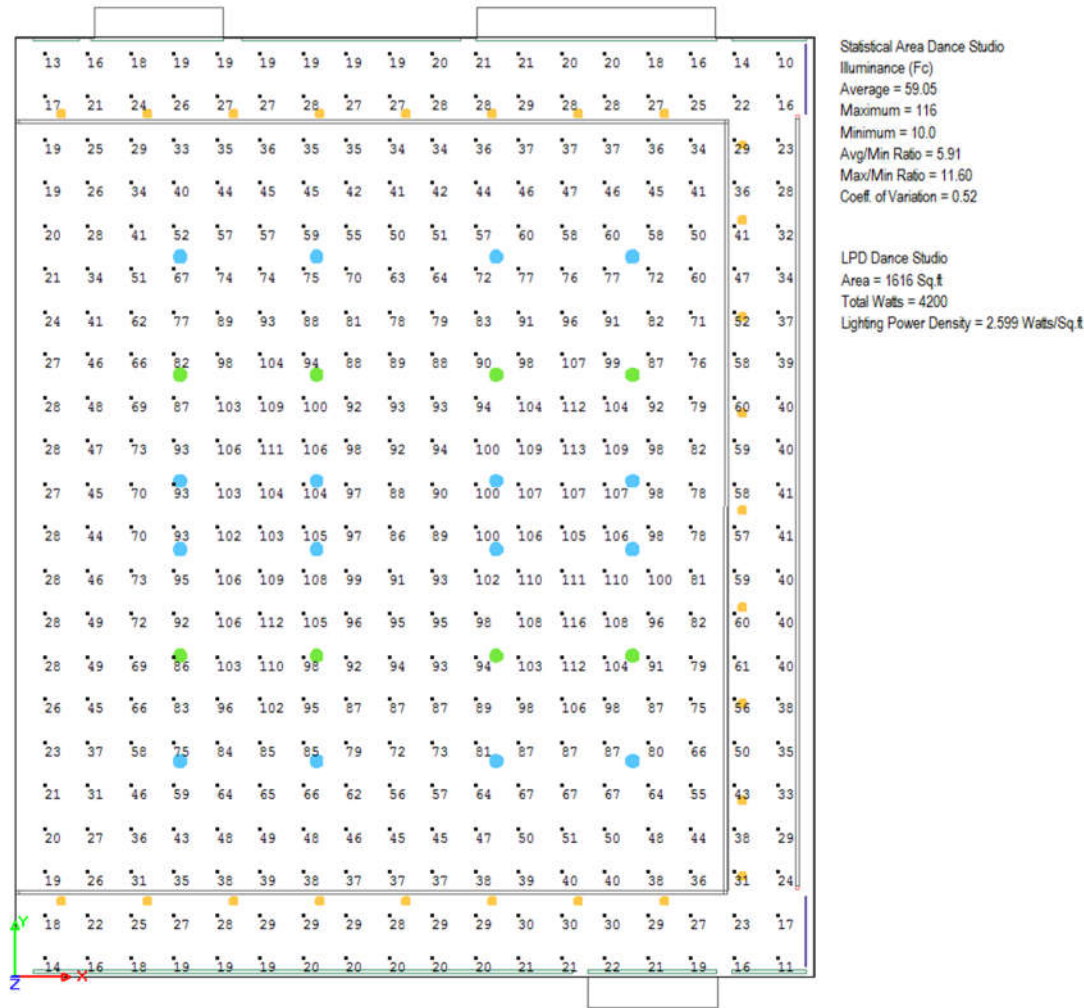


Table 2.6 Light Loss Factors For Dance Studio Calculations						
Color	Type	LLD	LDD	BF	UDF	Total
	L13A	0.98	0.9	N/A	N/A	0.882
	L35B	0.98	0.9	N/A	N/A	0.882
	L40	0.98	0.9	N/A	N/A	0.882

- Lamp Lumen Depreciation | Based off 40% lamp life
- Lamp Dirt Depreciation | Clean environment, open/unvented, 24mn cleaning period
- Ballast Factor | N/A
- User Defined Factor | N/A

PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Calculations & Renderings

Figure 2.7 Vertical luminance Values (Fc) South to North

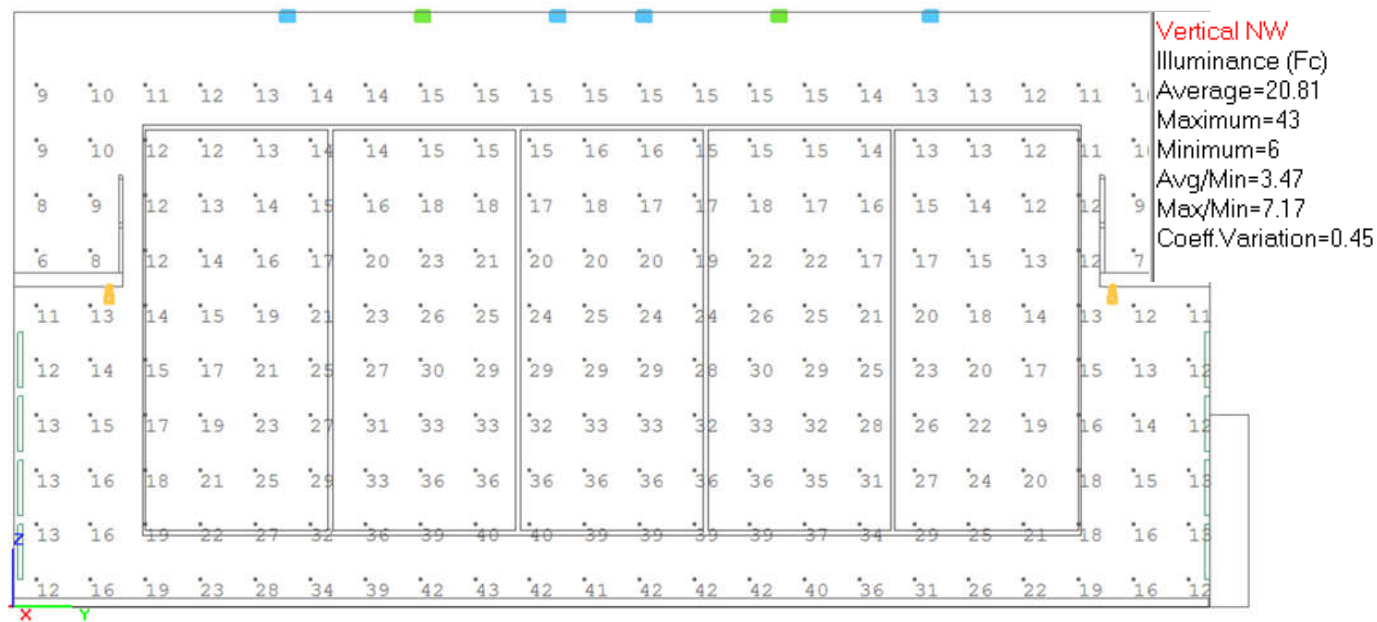
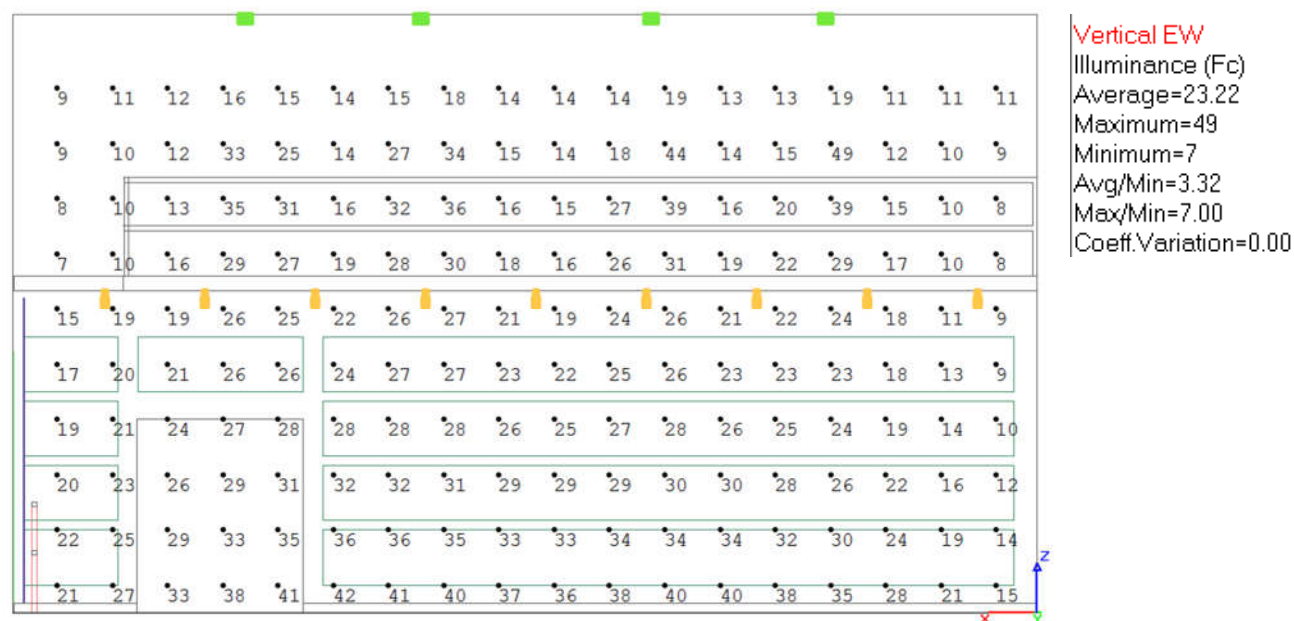


Figure 2.8 Vertical luminance Values (Fc) East to West



PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Calculations & Renderings

Figure 2.9 Pseudo Color Illuminance Plan

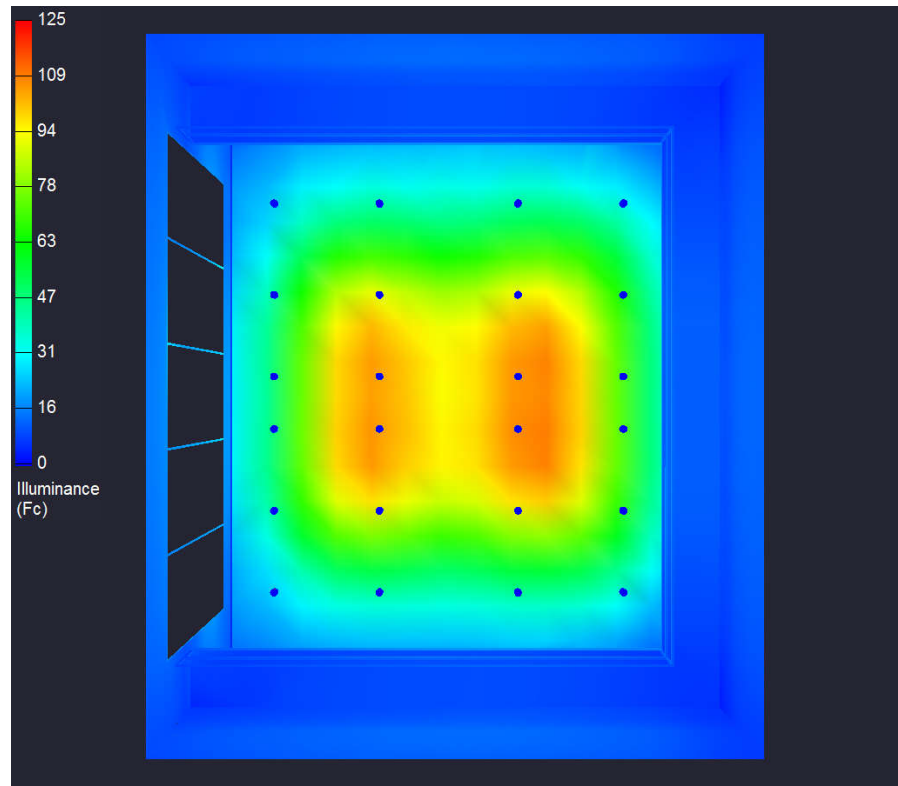


Figure 2.10 Rendered View of AGI Model



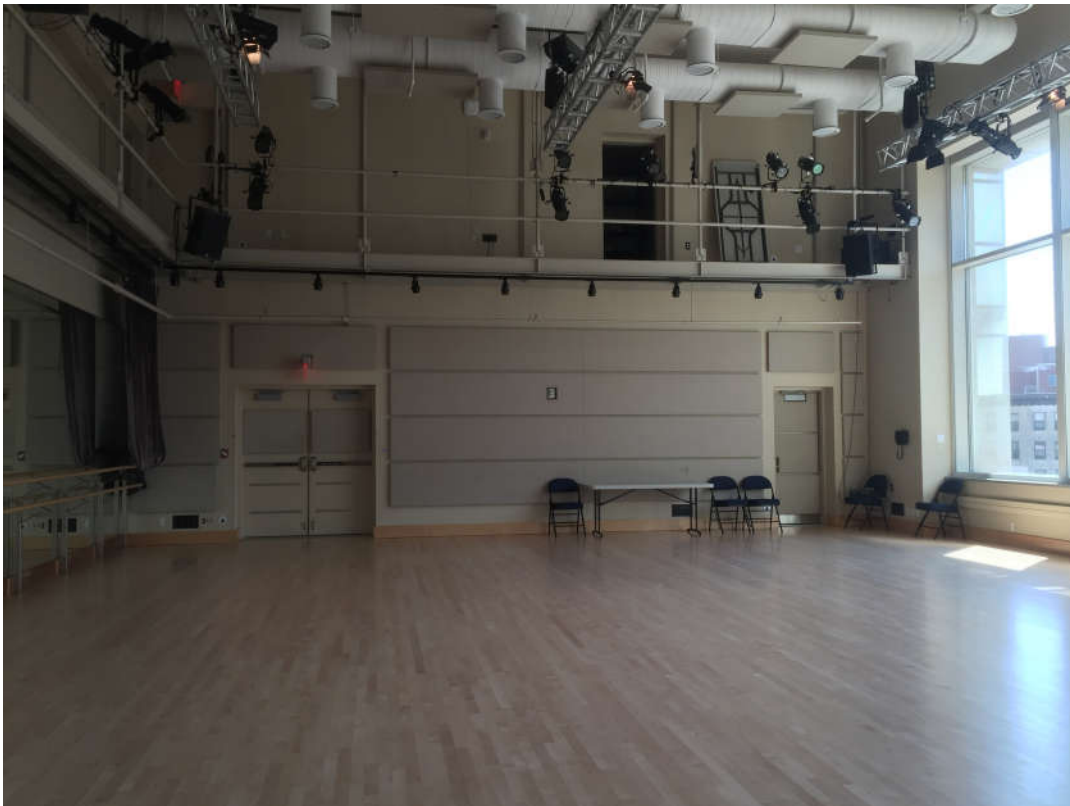
PROPOSED AREAS OF STUDY

SPECIAL PURPOSE SPACE | Rita K. Hillman Dance Studio 401

Evaluation

The lighting in this space is very bright in order to allow the dancers to excel at their work and benefit from seeing their reflections in the mirror on the east wall. Due to unavailability of IES files, several modifications had to be made in order to run the existing lighting calculations. That being said, the shown calculations may not be 100% true to the existing conditions, but give a close estimate. Integrating the lighting with the theatrical lighting in this space is an interesting aspect as the two lighting designs do not fall under the same scope of work. It is assumed the theatrical lighting is likely not used during everyday use and used primarily for special event performances when lighting level recommendations need not apply.

From the AGI calculations, we see that we have an average illuminance of 59.05 Fc, (approx. 591 lux). This exceeds the IES recommendation of 300 lux. The coefficient of variation is also low at 0.52. The uniformity, average to minimum 5.91:1, this is above the IES recommended 1.5:1. In addition the LPD is more than twice higher than the ASHRAE 2013 value of 1.24w/sf; this will need to be corrected during redesign. The center of the space has large hotspots while the perimeter drops off significantly. This could be due to the modification of the IES files of similar fixtures to imitate the fixture in the spec. Also, the specified fixture calls out the addition of a diffusing lens which was not available in IES files. As this space may be used for performance, the vertical illuminances are important. At around 5'6" we see the vertical illuminances are about 20-30fc (200-300lux) in both directions. This falls short of the IES standard of 500 lux. However, the additional theatrical lighting in the space and daylight is likely to make up for this difference. The large windows will also let in daylight so it is likely the lights will be dimmed or off during daytime rehearsal. In redesign, the walls could look to be brightened to open up the space more if desired.



PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Spatial Description

The Peter Jay Sharp Lobby is used as a circulation area within the building. The space must be inviting and must allow the guests to easily navigate to the ticket counter, lounge area, and eventually through to the theater for a performance. The area also features a security desk for visitors during non-show times, such as students checking in for class. The lower portion houses a bar and lounge area for visitors to enjoy prior to or at intermission of a show. There is a row of benches along the exterior wall and several standing height tables. The floor, desks, and tables should all be considered in task level analysis. The east wall on both floor also houses local art pieces. In addition the lobby acts as an introduction to the building and to the Brooklyn Academy of Music as a whole and is to reflect their enthusiasm for the arts.

Dimensions | 67'-3" x 25'-0" | 1636 ft² per floor

Tasks | Circulation, Reception, Lounge, Gathering Space

Furnishings | Upper: Security and check-in desks

Lower: Seating, standing tables, adjustable bar

Floor Plans | Lower Lobby

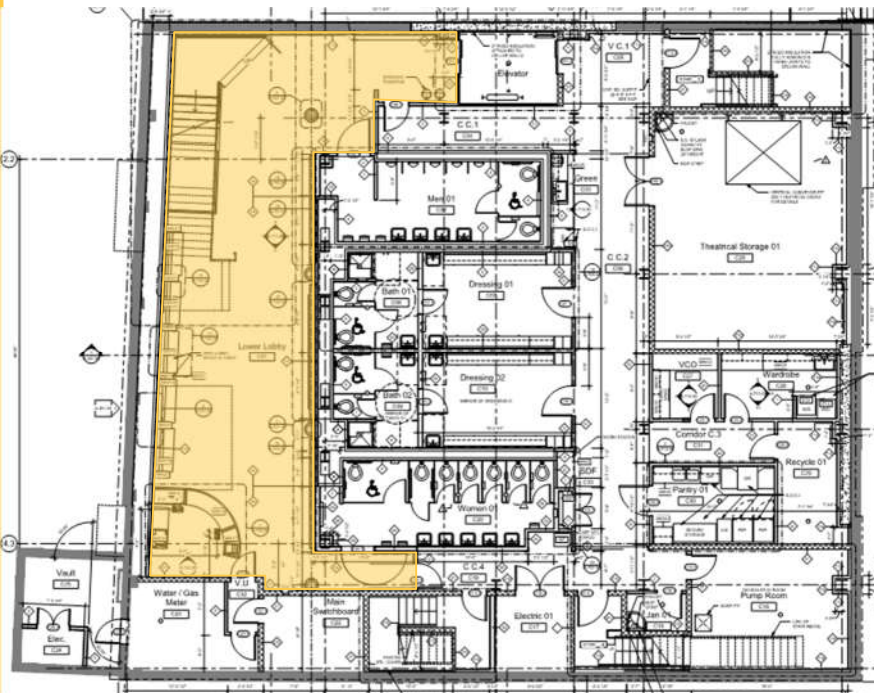
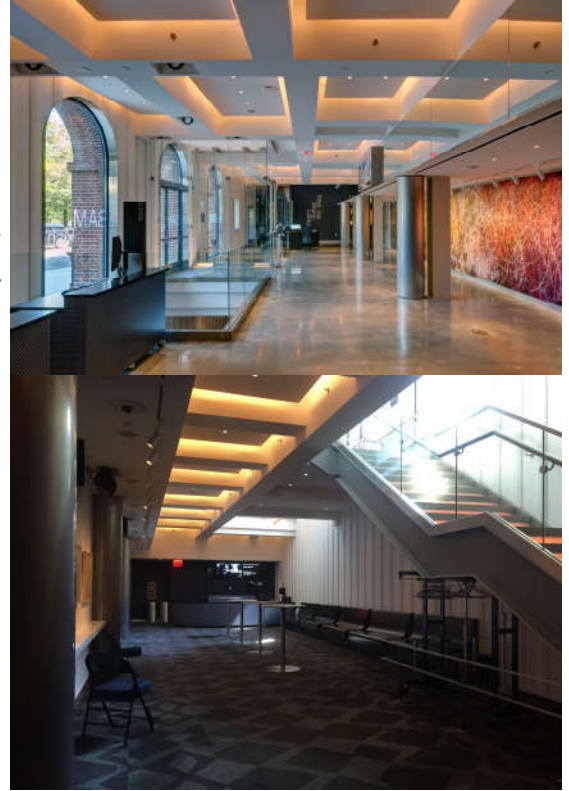


Figure 3.1 Cellar Floor Plan

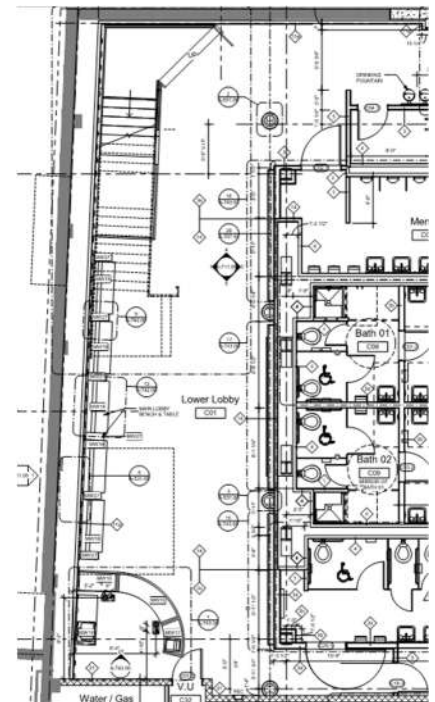


Figure 3.2 Enlarged Floor Plan Rm C01

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Floor Plans | Main Lobby

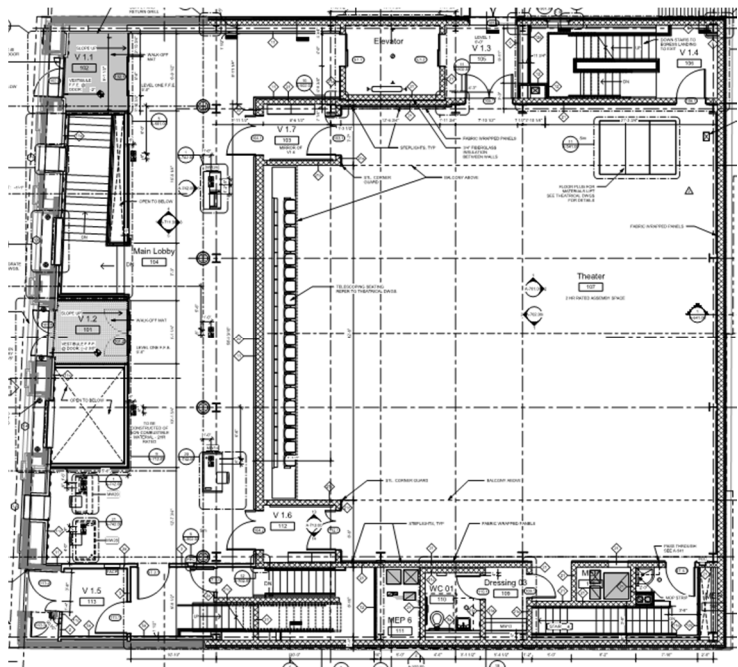


Figure 3.3 First Floor Plan

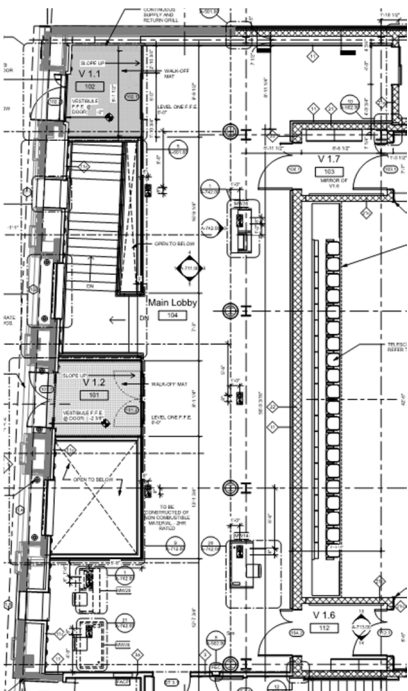


Figure 3.4 Enlarged Floor Plan Rm 104

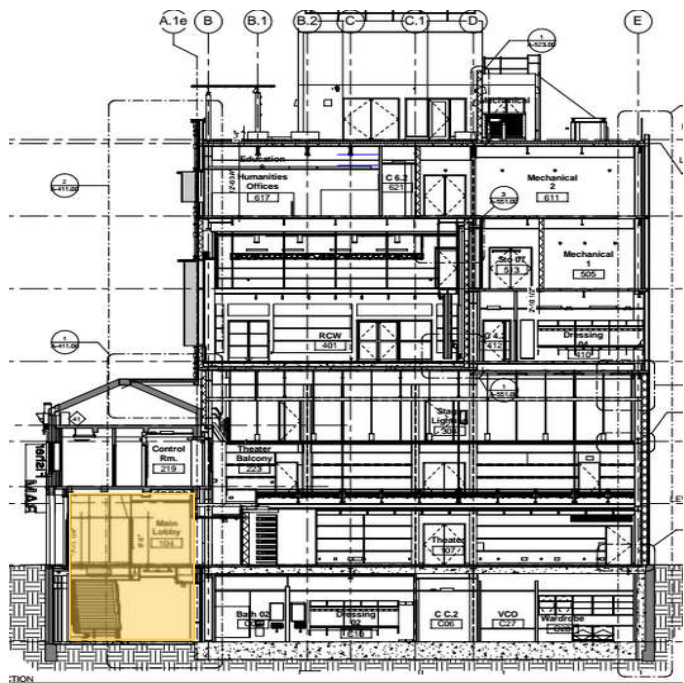


Figure 3.5 Building Section | West East

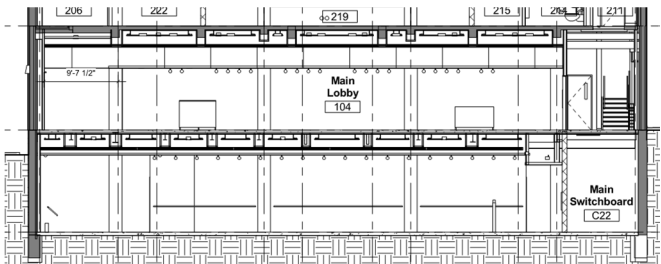


Figure 3.6 Lobby Section | North South

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Existing Lighting Conditions

The plans shown in figures 3.7 & 3.8 show the existing lighting layout for the lower and main lobby. The ceiling in both lobbies varies in height with rectangular reliefs set into the ceiling. The max ceiling height is 13'-0" in both spaces with the 2'-0" depth of the setbacks. The general lighting is provided by small downlights placed in the acoustical tiles in the ceiling recesses with linear lighting to create a cove affect. Both floors also have track lighting along the east side to light artwork. The lower lobby does not have any windows but a large open to below area allows for some daylight from the upper floor to travel down to the lower space. The main lobby has arched windows and entrances that allow a daylight to enter the space.

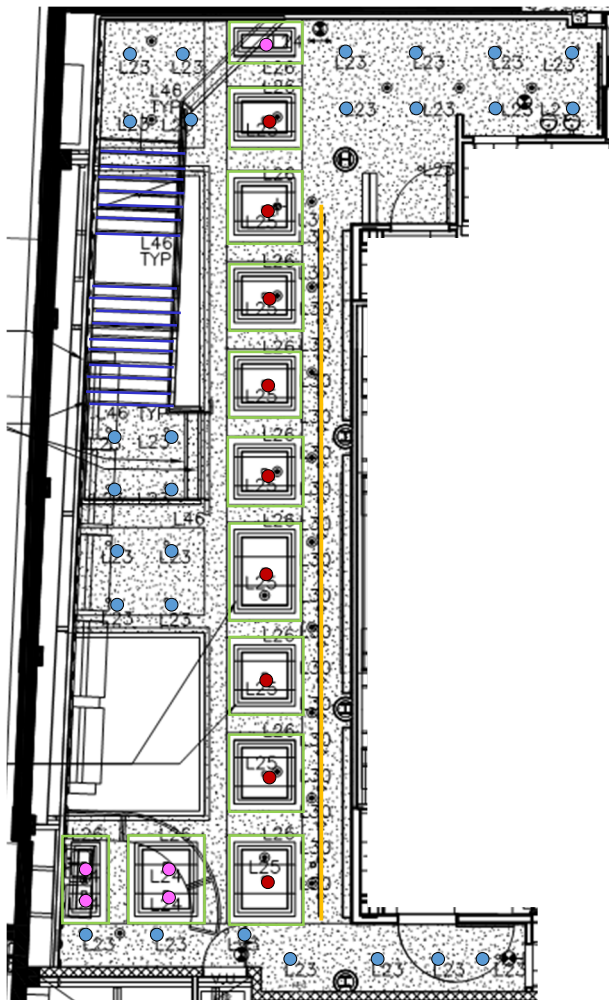


Figure 3.7 Lower Lobby Lighting Plan Rm C01

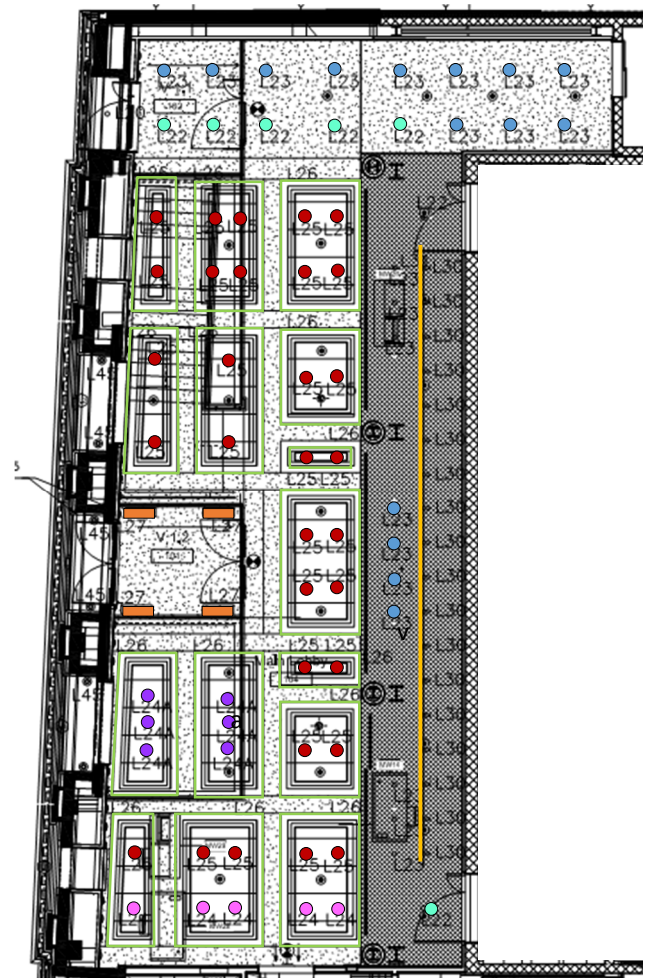


Figure 3.8 Upper Lobby Lighting Plan Rm 104

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Table 3.1 | Existing Lighting for Lobbies

Color	CBB Type	Manu- facturer	Fixture Name	Lamp	Input Watts	Ballast/Transformer	Description	Qty
	L22	Lucifer	DL1ZP	(1) 37MR16/IR/ NFL25/C	37W	Dimmable Electronic Transformer	Recessed dimmable low voltage MR16 round pinhole downlight with white trim finish	7
	L23	Lucifer	DL2RZP	(1) 37MR16/IR/ NFL25/C	37W	Dimmable Electronic Transformer	Recessed dimmable low voltage MR16 adjustable round pinhole accent light with white trim finish	49
	L24	Lucifer	DL38ZP	(1) 37MR16/IR/ NFL25/C	37W	Dimmable Electronic Transformer	Recessed dimmable low voltage MR16 adjustable square pinhole accent light with white trim finish	9
	L24A	Lucifer	DL38ZP	(1) 37MR16/IR/ SP10/C	37W	Dimmable Electronic Transformer	Recessed dimmable low voltage MR16 adjustable square pinhole accent light with white trim finish	6
	L25	Lucifer	DL31ZP	(1) 37MR16/IR/ NFL25/C	37W	Dimmable Electronic Transformer	Recessed dimmable low voltage MR16 square pinhole downlight with white trim finish	40
	L26	Philips Color Kinetics	eW Cove PowerCore Series	LED (2800K)	4.5W/ FT	Integral dimmable driver	Surface mounted dimmable line voltage warm white line voltage LED strip light integrated into architectural cove	N/A
	L27	Mark Architectural Lighting	B13505- 27"	(2) FP14/830/ ECO	29W	Universal Ballast (0.89 BF)	Recessed in-grade 2-lamp cross section linear fluorescent T5 walkover uplight. 2.75' overall length	4
	L30	Lighting Services INC.	CX16	(1) 37MR16/IR/ NFL25/C	37W	Dimmable Electronic Transformer	Track mounted dimmable low voltage MR16 adjustable accent light, supply with Solite beam softener lense and UV blocking filter	37
	L46	Philips Color Kinetics	iColor Cove MX Powercore	RGB LED	12W/FT	N/A	Surface mounted dimmable line voltage RGB color changing LED strip light integrated into stair risers to be controlled using iPlay- er 3	N/A

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Finishes

The lobby has many different finishes and colors. The east and west walls are off-white while the north and south walls are a very dark navy blue and look almost black. The large mural in the main lobby should also be considered as it covers the majority of the east wall. The floors have a polished concrete and now black carpets have been placed down for safety. The accent pieces in the space, such as the lettering, columns, and desk fronts are a brushed aluminum.

Table 3.2 | Finishes of Lower Lobby

		Code	Description	Manufacturer	Style/Color	Finish	Size	Comments	Reflectance
Floor		CPT-3	Carpet Tile	Lees Commerical	Tokyo GT028, 348 Nautica	N/A	50cm x 50cm		Assumed 20%
Walls	Base	AB-1	Aluminum Base	N/A	Aluminum	Satin	1/8" guage x 4"		Assumed 50%
	North	PNT-2	Paint	Benjamin Moore	Aura, HC-154 Hale Navy	Hale Navy	N/A	Low to zero VOC's, low odor	0.07
	East	PNT-3	Paint	Benjamin Moore	Aura, Atrium White	Eggshell	N/A	Low to zero VOC's, low odor	0.857
	South	PNT-2	Paint	Benjamin Moore	Aura, HC-154 Hale Navy	Hale Navy	N/A	Low to zero VOC's, low odor	0.07
	West	PNT-11	Paint	Zolatone	Polomyx Naturals, PLX NL33-3317	Standard	N/A	To be spray applied over log siding	Assumed 85%

Table 3.3 | Finishes of Main Lobby

		Code	Description	Manufacturer	Style/Color	Finish	Size	Comments	Reflectance
Floor		CONC-1	Concrete, Polished	N/A	N/A	Polished	N/A		Assumed 20%
Walls	Base	AB-1	Aluminum Base	N/A	Aluminum	Satin	1/8" guage x 4"		Assumed 50%
	North	PNT-2	Paint	Benjamin Moore	Aura, HC-154 Hale Navy	Hale Navy	N/A	Low to zero VOC's, low odor	0.07
	East	PNT-8	Paint	MDC Wallcoverings	Liqua Pearl LP1044	Pearlescent	N/A	Water-based formula, low odor.	Assumed 20%
	South	PNT-2	Paint	Benjamin Moore	Aura, HC-154 Hale Navy	Hale Navy	N/A	Low to zero VOC's, low odor	0.07
	West	PNT-11	Paint	Zolatone	Polomyx Naturals, PLX NL33-3317	Standard	N/A	To be spray applied over log siding	Assumed 85%

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Design Criteria

The Peter Jay Sharp Lobby acts as a circulation space, assembly space, and lounge space. According to the IES Lighting Handbook 10th edition, the task illuminances are as follows:

Table 3.4 Task Illuminances for Main and Lower Lobby						
Space Type	Task	Day E_h (lux)	Night E_h (lux)	Day E_v (lux)	Night E_v (lux)	Uniformity Avg:Min
Lobby	Transition Space, Circulation	100	50	30	20	4:1
Lounge	Social/Waiting Area	40	40	15	15	2:1

The featured walls with art are suggested to be a 10:1 ratio of focal point from the IES Lighting Handbook 10th edition section on accent illuminance ratios.

The lighting power density is also an important factor to consider in design. ASHRAE 90.1 2013 provides the following requirements for a lobby space:

Table 3.5 Lighting Power Density Allowance		
Space Type	LPD (W/ft ²)	RCR Threshold
Lobby in Performing Arts Theater	2	6

Controls

Currently, the Lobbies have the lighting controls housed in room 113, one the main level. The lobbies have the lighting separated into zones and each zone can be controlled with a Lutron Maestro switch or using a Lutron 7 button control for preset scene selects. The stairs have color changing lights controlled by the Philips Color Kinetics DMX controller. The lower lobby also has a Lutron power module for the art lighting.

Local Control | There shall be one or more manual lighting controls in the space that controls all the lighting in the space.

Automatic Daylight Responsive Controls for Sidelighting | In any space where the combined input power for all general lighting completely or partially within primary side-lighted areas is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Automatic Daylight Responsive Controls for Toplighting | In any space where the combined input power for all general lighting completely or partially within daylight areas under skylights and daylight areas under roof monitors is 150W or greater, general lighting in the daylight area shall be controlled by photocontrols.

Automatic Partial Off | The general lighting power in the space shall be automatically reduced by at least 50% within 20 minutes of all occupants leaving the space.

Either Automatic full off or Scheduled Shutoff | Either all lighting shall be automatically shut off within 20 minutes of all occupants leaving the space or lighting shall be automatically shut off during periods when the space is scheduled to be unoccupied

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Daylight Elements

The several types of glazing on the main lobby. The cellar does not have any as it is underground. The arches from the existing façade were originally closed off for safety reasons. However, now they have been opened up and allow much more light to enter the space.

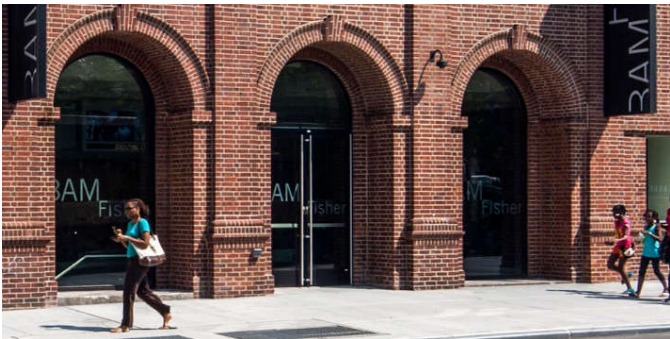


Table 3.6 Glazing for Main Lobby							
Mark	R.O. Width	R.O. Height	Frame Material	Glazing Type	Fire Rating	Sill Height	Transmittance
1.1	3'-0"	4'-10"	Steel	SG- Security Glazing	N/A	3'-0"	Assume 90%
1.2	5'-11"	11'-9"	Steel	SG- Security Glazing	N/A	0"	Assume 90%
1.4	5'-11"	11'-9"	Steel	SG- Security Glazing	N/A	0"	Assume 90%
1.5	3'-0"	4'-10"	Steel	SG- Security Glazing	N/A	3'-0"	Assume 90%

Psychological Impression

The lobby will work to achieve the psychological impression of festiveness as described by John Flynn. This will be accomplished through the use of colored and kinetic lighting. In addition, the impression of pleasantness is ideal. This is achieved by using nonuniform lighting with a peripheral emphasis.

Design Criteria Prioritized:

1. Horizontal Illuminance Levels, Average
2. Psychological Impression
3. Lighting Power Density
4. Controls

Design Considerations

Color Temperature | In North America, lamps tend to have a warmer color temperature than Asian countries. Temperatures between 3000K and 3500K are ideal for classroom environments. The color temperature must be consistent across all lamps as well.

Color Rendering Index | The color rendering index must at least 90 CRI for LED sources to ensure that skins tones, R13, R15, R 16 are accurately represented. If fluorescent sources, a CRI of 85 or higher is acceptable.

Glare | with large windows arches on the west façade, glare must be considered. The exterior shading system should accomplish this and should be retained. Lamps can also produce glare, especially LEDs with poor lens quality.

PROPOSED AREAS OF STUDY

CIRCULATION SPACE | Peter Jay Sharp Main Lobby 104 & Lower Lobby C01

Evaluation

This space has a lovely existing lighting solution. The use of cove lighting above the acoustical panels ties the architectural function and lighting together seamlessly. There is still room for improvement in the design. Implementing the Flynn mode of festiveness and pleasantness will allow for an creative solution. The unique ceiling arrangement also can be utilized to implement a interesting lighting layout. In addition, the varying space type as one moves from the main lobby to the lower lobby will allow for different lighting approaches in a cohesive space. The art on both walls is hugely important to consider and must remain a focal point in the space. The dark walls on the north and south sides of the lobby poses an intriguing challenge as the dark color will not reflect light.

From observing the lamp types and quantities and following trends throughout the rest of the building, this space is likely to exceed the most updated version of ASHRAE power density allowance in it's current state. However, some of the art lighting may be exempt as it is used for accent and not general illumination. It is also likely that the space is over lit and the Lutron dimming system dims the light.



PROPOSED AREAS OF STUDY

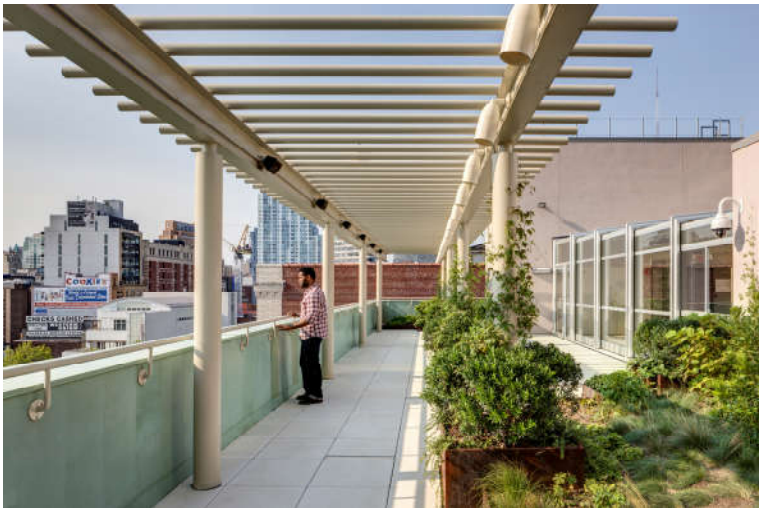
OUTDOOR SPACE | Geraldine Stutz Rooftop Gardens 713

Spatial Description

The terrace is used as an event space for either private or public use. BAM will also use this space to entertain its donors and benefactors. One side of the terrace is covered with glass creating a greenhouse look with small standing height tables, while the other area is uncovered and has benches and greenery. The floor and table surfaces are the main task levels in the space. This will be the space with 3 schematic design solutions.

Dimensions | Exposed: 78'6" x 20'-4" | 1508 ft²
Covered: 30'-0" x 26'-2" | 593 ft²

Tasks | Reception, Lounge, Gathering Space



Floor Plans | Lower Lobby

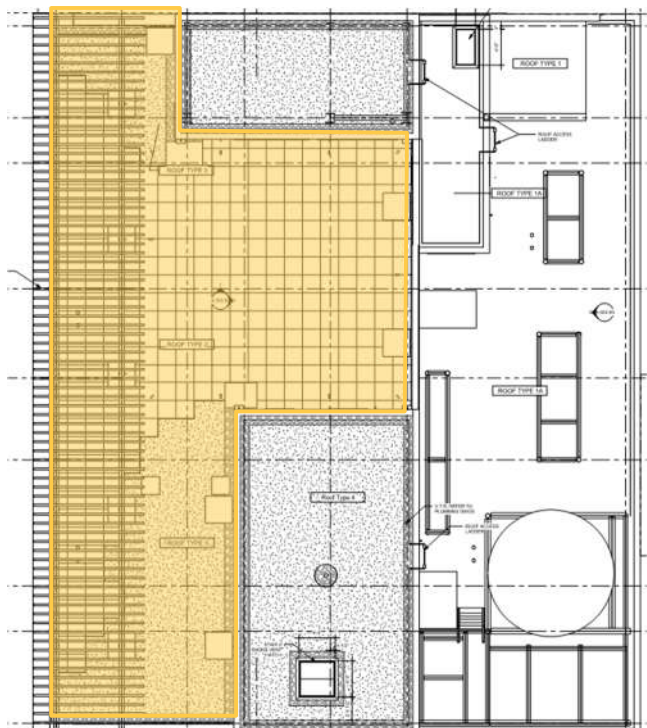
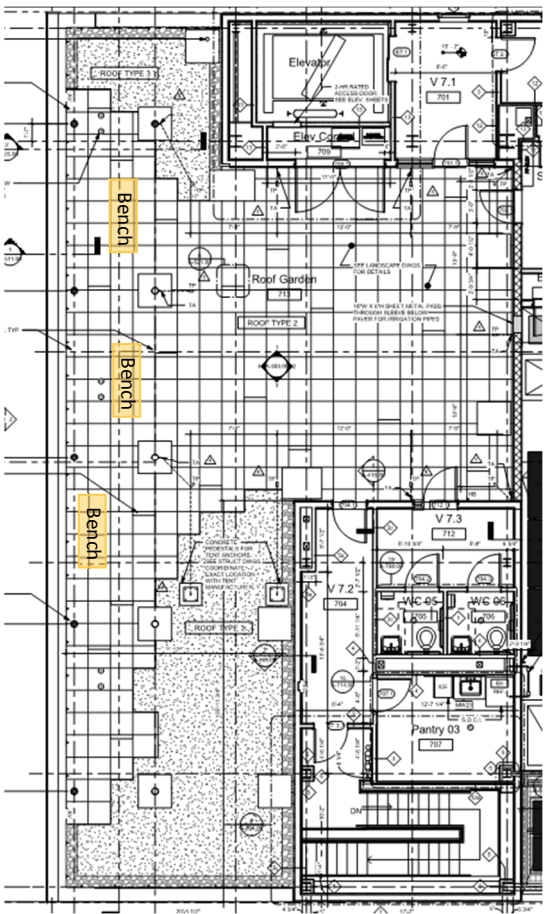


Figure 4.1 Roof Ceiling Plan



PROPOSED AREAS OF STUDY

OUTDOOR SPACE | Geraldine Stutz Rooftop Gardens 713

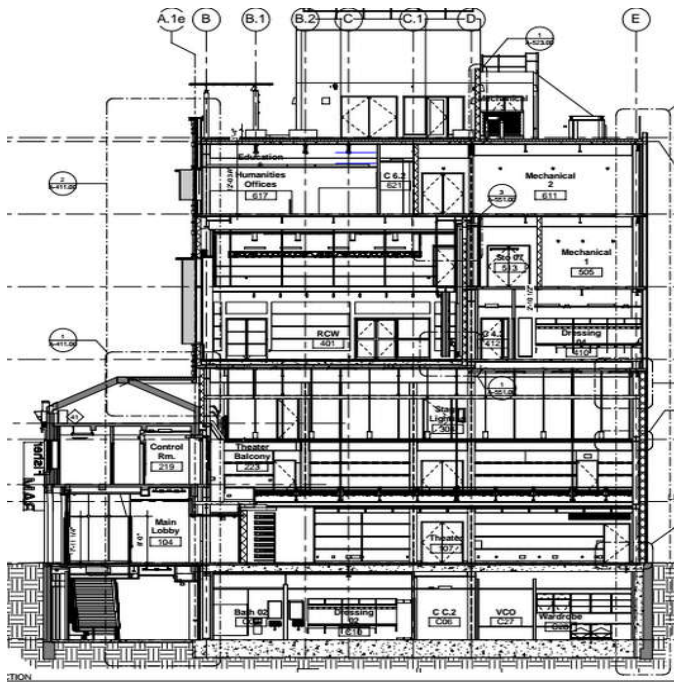


Figure 4.3 Building Section | West East

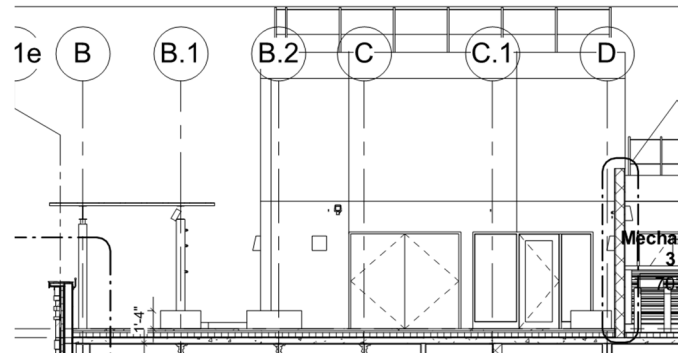


Figure 4.4 Roof Section | West East

Existing Lighting Conditions

The plan shown in figure 4.5 show the existing lighting layout for the roof terrace. To avoid the use of bollards, the main source light comes from inground fixtures. On the trellis, there are downlights mounted to the east side. In the plan these fixtures are shown in the center, however from a site study it was shown the fixtures were mounted to the east. For the purpose of this study, the lights will be placed to coordinate with the plan. The occupant added Edison bulb stings in the covered section to add another layer of ambiance. However, since it was not part of the original design scope it will not be analyzed in this study. There are also a few wall mounted fixtures around the exterior perimeter.

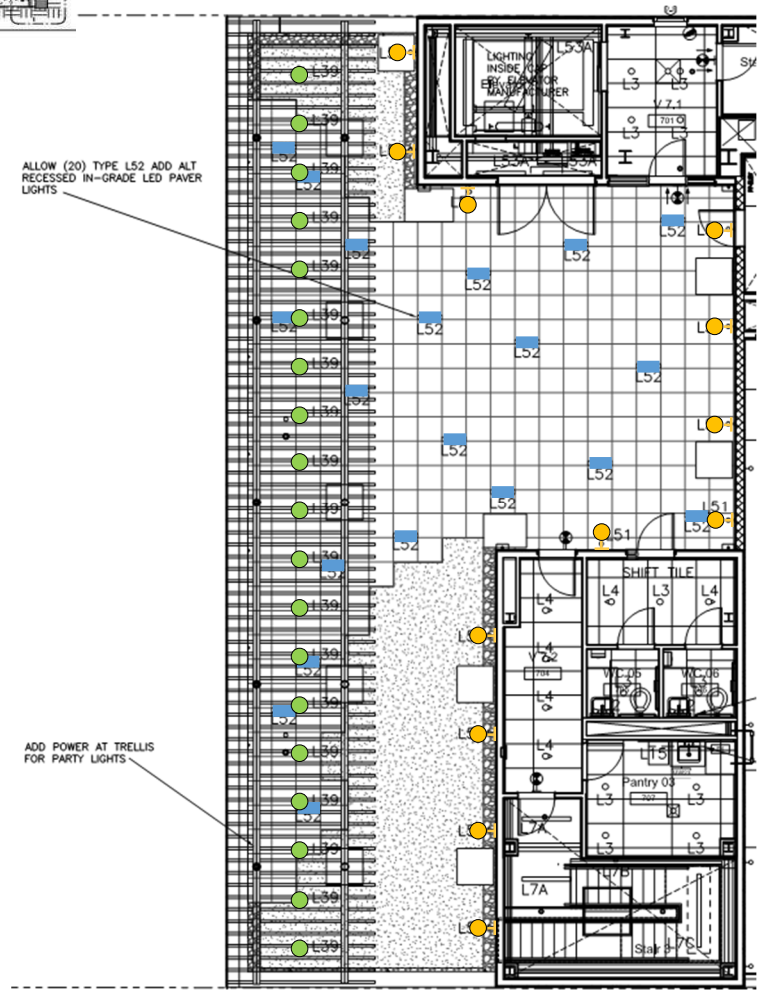


Figure 4.5 Lighting Plan Rm 713

PROPOSED AREAS OF STUDY

OUTDOOR SPACE | Geraldine Stutz Rooftop Gardens 713

Table 4.1 | Existing Lighting in Rooftop Terrace

Color	Type	Manufacturer	Fixture Name	Lamp	Input Watts	Ballast	Description	Qty
	L39	Winona	Weston	(1) 40PAR30/ CAPIR/FL40	40W	N/A	Exterior wet location surface wall mounted dimmable PAR30 downlight mounted to trellis	19
	L51	Visa Lighting	Avatar-Metro	(2) FP14/830/ ECO	33W	Universal 0° F Electronic Ballast (1.00 BF)	Exterior wet location wall mounted 2-lamp cross section linear T5 fluorescent sconce, mounted horizontally	12
	L52	Lightwild	LW Tile	LED (3000K)	11W	Remote Driver located inside	Exterior wet location recessed walkover, non-dim LED paver	20

Finishes

The Geraldine Stutz Rooftop Garden is not included in the finish schedule. The following finishes are all from observation from site visit and images. The cream ground tiles and cream exterior walls have a matte finish. The planters are bordered with a rusted brown finish. The trellis is painted metal with a smooth eggshell color. The small wall around the border is a an aqua blue.

Table 4.2 | Finishes of Rooftop Terrace

		Description	Style/Color	Finish	Comments	Reflectance
Floor		Tile Floor	Eggshell	Matte	Outdoor tiled floors	Assumed 30%
Walls	Exterior Building Walls	Paint	Dusty pink`	Matte	Exterior walls on east side	Assumed 45%
	MISC 1	Small border Wall	Aqua	Matte	4' wall borders west side	Assumed 40%
	MISC 2	Planter	Rust	Matte	Planter bases	Assumed 20%

PROPOSED AREAS OF STUDY

OUTDOOR SPACE | Geraldine Stutz Rooftop Gardens 713

Design Criteria

The Hillman Dance Studio functions as an open office space. According to the IES Lighting Handbook 10th edition, the task illuminances are as follows:

Table 4.3 Task Illuminances for Rooftop Terrace				
Space Type	Task	E _h (lux)	E _v (lux)	Uniformity Avg:Min
Plaza	Circulation– Medium Activity	6	2	5:1

The lighting power density is also an important factor to consider in design. ASHRAE 90.1 2013 provides the following requirements for an outdoor plaza in zone 3.

Table 4.4 Lighting Power Density Allowance		
Space Type	LPD (W/ft2)	RCR Threshold
Building Grounds—Plaza Areas	1.6	N/A

Controls

Currently, there are no controls for the rooftop terrace. ASHRAE 90.1 2013 does not provide specific control requirements for exteriors. dimming will likely not occur as the lights will be set to meet the minimum required footcandles. Scene control is a possibility moving forward with design. The space will not operate on a timeclock because it will not be used every evening and thus would waste energy is programmed in such a manner.



PROPOSED AREAS OF STUDY

OUTDOOR SPACE | Geraldine Stutz Rooftop Gardens 713

Daylight Elements

There is no glazing as this space is outdoors. The covered portion does use glass but the information is not provided in the documents as to its glazing type or transmittance. It's assumed a 90% transmittance.

Three Schematic Designs

This is the chosen space for creating three different schematic designs. In the technical assignment #3 this will be addressed further.

Design Criteria Prioritized:

1. Horizontal Illuminance Levels, Average
2. Lighting Power Density
3. Three schematic designs

Design Considerations

Color Temperature | In North America, lamps tend to have a warmer color temperature than Asian countries. Temperatures between 3000K and 3500K are ideal for classroom environments. The color temperature must be consistent across all lamps as well.

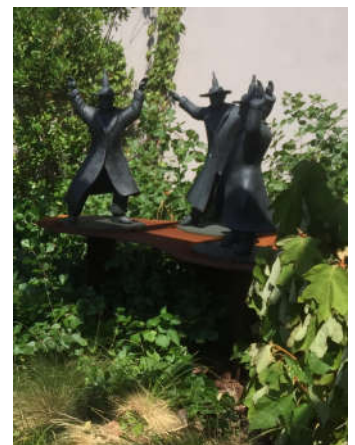
Color Rendering Index | The color rendering index must at least 90 CRI for LED sources to ensure that skin tones, R13, R15, R16 are accurately represented. If fluorescent sources, a CRI of 85 or higher is acceptable.

Glare | with the large contrast expected between the darkness of the night and the light sources, glare is a major consideration. LED sources can easily cause discomfort glare if they are not lensed properly.

Evaluation

The minimalistic lighting design on the roof provides a relaxing atmosphere to the guests. In addition, lighting on the trellis provides extra illumination on the ground in the exterior. The covered portion allows a dim atmosphere. However, the occupants chose to add Edison bulb string lights. In redesign, a more festive and summer feel will be utilized to meet the occupants' desires while still providing a beautifully lit space. The current lighting design also does not light the vegetation or the small statue in the planters. In redesign, that is to be addressed as a request by the client.

A lighting power density calculation yields a 0.66w/sf LPD on the rooftop terrace for both portions. This is below the ASHRAE code of 1.6w/sf. This will allow for a bit of extra cushion when designing the outdoor space to add more fixtures and create a more visually intricate lighting design.



SUMMARY

The existing conditions of the lighting in the BAM Fisher building are very well done, but there are still some areas of improvement. Most lighting used halogen or metal halide since it was constructed in 2012. Since that time, LEDs have improved to a point that they are the main source for high performance energy efficient lighting. Moving forward with redesign, mainly LED sources will be implemented.

The office space can be improved by working to find a different lighting solution that does not expose the bulbs through the lens. Also, additional task lighting should be integrated into the cubical configuration to allow ease of use and individual control.

The dance studio has simple house lighting and perimeter lighting. However, there is no control for the existing lighting in the space. Integrating lighting control with occupancy and daylight sensing in addition to dimming would be an effective way to improve the existing lighting condition and work with the architecture of the space and the large windows.

The lobby has a sleek design that works well with the existing architecture. Through redesign, the focus will shift to embracing the Flynn modes of pleasantness and festiveness. In addition, with the space being a performing arts assembly area, there is potential for more innovative and intensive lighting design that plays off the function of the space.

The rooftop garden uses inground fixtures for the main source of lighting. Through redesign, the lighting of the planters and the small statues will be considered further. Also, additional lighting and control will be added to the covered portion to create a relaxed feel. This space will have three schematic designs further in the process.