

NEW YORK LAW SCHOOL

New Community Facility

185 West Broadway
New York, NY



Technical Assignment 1: Existing Lighting Conditions

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Lighting / Electrical

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Executive Summary

This report describes and evaluates the lighting systems of New York Law School's New Community Facility. For this analysis, four representative spaces were chosen based on their prominence, large size, and qualities typifying the rest of the facility. These spaces, in their order of analysis, are:

1. Entry Lobby (Level 1)
2. Auditorium (Level B1)
3. Exterior/Interior Roof Terrace and Dining Area (Level 5)
4. Library (Level B4)

The analysis of each space is broken up into the following three sections:

1. Existing Conditions
2. Design Criteria
3. Evaluation of Lighting System

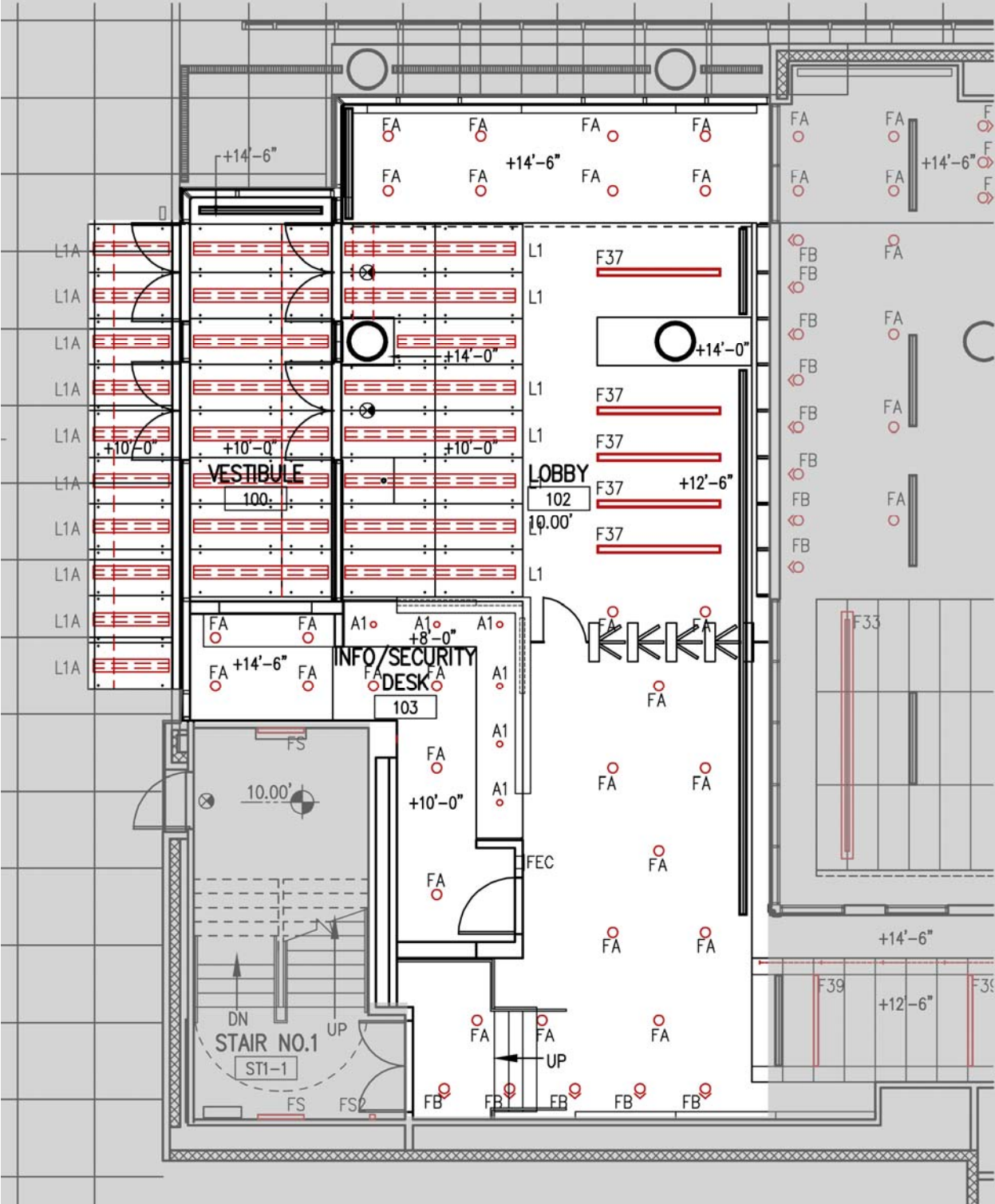
Information used for this report comes from 100% construction documents and not the as-built conditions. Currently under addendum reviews, the final design may not be totally consistent with the systems described in this report.

The results of this report conclude that the lighting design meets design criteria in most cases, but some aspects could be improved.

Computer files used in the analysis may be found on:

- My P drive (adk165) under P/Thesis/AGI/
- My CPEP website, <http://www.engr.psu.edu/ae/thesis/portfolios/2008/adk165/>

1. Space 1 – Lobby – Level 1 – Circulation Space



Area of analysis left unshaded.
 Note that fixture types F5 and L3 do not appear in the plan.

Scale: 1/8" = 1'-0"

1. Lobby: Existing Conditions

Space Description

The main entry lobby serves as a security and information checkpoint between the building and the outside. People first enter the vestibule, then the lobby, where they may either proceed through turnstiles or approach a security/information counter. Once occupants pass through the turnstile, they continue through the lobby past a coffee bar to a corridor that branches off to stairways and other rooms. A glass wall lets people look into the reading room once past the turnstiles. The main lobby flows into other spaces, such as the elevator lobby, and has no clear boundary. The main lobby is the only entry point that most people will use. Other building entries and exits are for service or emergency.

Space Geometry

Dimensions are approximately 65' x 28'. Area is approximately 2000 ft². Ceiling heights range from 8' to 14'-6".

Materials and Finishes

Location	Material	Manufacturer	Color	Reflectance or transmittance*	Specularity*
Floor	Synthetic terrazzo	Terroxy	Light grey	50%	Medium
Floor accents	Synthetic terrazzo	Terroxy	Black	10%	Medium
Wall	Paint	Benjamin Moore	"Simply White"	85%	Matte
Wall base	Painted MDF wood	N/A	Matches adjacent wall	N/A	Matte
Ceiling	Painted gypsum board	N/A	White	85%	Matte
Columns	Aluminum cladding	N/A	True to material	90%	High
Vestibule floor	Stainless steel mat	Kaydee	True to material	40%	Low
Glass façade	Insulated glass	N/A	N/A	65%	N/A
Canopy glass	Fritted	N/A	N/A	50%	N/A
Interior glass partitions	Single pane	N/A	N/A	80%	N/A

*Based on assumptions in most cases.

Daylight

The northern side of the lobby has a glass façade. Due to the northern orientation, exterior canopies, and the dense urban environment of downtown Manhattan, significant direct sunlight is not expected.

Furniture

The lobby is open, with no furniture shown in the design other than the built-in security/information desk and the turnstiles that lead into the main corridor.

Lighting System

The main entry lobby treats visitors to a highly decorative lighting design. Etched glass panels cover much of the ceiling and walls, backlit by color-changing LEDs. These panels begin at the exterior canopy and continue into the interior space. Etched into the glass are the words of the U.S. constitution. Recessed compact fluorescent downlights and linear lensed fluorescent fixtures supplement the LED lighting and highlight the security/information desk. Linear fluorescent fixtures mounted vertically to the millwork further accent to the desk.

Luminaires

Label	Description	Lamp(s)	Manufacturer*	Model*	Volts
A1	Recessed open downlight	(1) 32W PL-T CFL 3500K	Lightolier	8021/CCDLW/6132BU	120
F5	Surface-mounted accent fixture	(1) T5 per cross section	Delta Light	274/13/24/US11	120
F37	Recessed linear lensed fluorescent	(4) 28W T5 3500K	Se'lux	M1R1S/2T5/SD/8/WH/DM	120
FA	Recessed open downlight	(1) 42W PL-T CFL 3500K	Lightolier	8037CCDW/7142BU	120
FB	Recessed open wall washer	(1) 32W PL-T CFL 3500K	Lightolier	8087CCDW/7132CU	120
L1	RGB LED fixture (interior, ceiling)	LEDs, 12W per foot	Color Kinetics	iColor Cove MX	24
L1A	RGB LED fixture (exterior)	LEDs, 30W per foot	Color Kinetics	Colorcast 14	24
L3	RGB LED fixture (interior, wall)	LEDs, 8W per foot	Color Kinetics	iColor Accent	24

*The specifications list alternate manufacturers of products with similar performance.

Light Loss Factors

Assumptions:

- Interior lobby: Clean environment, 12-month cleaning cycle
- Exterior canopy: Dirty environment, 12-month cleaning cycle
- RCR = 1.3
- Percent expected dirt depreciation: 12%

Label	Maintenance Cat.	Distribution	LLD	LDD	BF	RSDD	Total LLF
A1	IV	Direct	0.85	0.89	0.88	0.98	0.65
F5	VI	Indirect	0.95	0.87	0.88	0.90	0.65
F37	V	Direct	0.95	0.88	0.88	0.98	0.72
FA	IV	Direct	0.85	0.89	0.88	0.98	0.65
FB	IV	Direct	0.85	0.89	0.88	0.98	0.65
L1	IV	Direct	1.00	0.89	1.00	0.98	0.87
L1A	V	Direct	1.00	0.77	1.00	1.00	0.77
L3	IV	Direct	1.00	0.89	1.00	0.98	0.87

Ballasts

All fluorescent ballasts have a minimum 0.95 power factor and minimum 0.88 ballast factor. Ballasts for the F5, A1, and FA fluorescent luminaires must be electronic. Approved manufacturers for non-dimming ballasts are Advance, Osram/Sylvania, and Universal.

The F37 linear fluorescent fixtures have dimming ballasts. The specifications list Lutron, Advance, and Universal as approved manufacturers.

Color Kinetics PDS-500e units supply data and power to the LED fixtures. Each PDS-500e supports two 30-foot fixture runs. The PDS-500e receives power at 120V AC, and outputs power to the fixtures at 24V DC.

Controls

The F37 linear fluorescents and the FB wall washers are dimmable, while the F5, FA, and A1 fixtures are not. Wallbox dimmers and preset panels are also located behind the information/security area.

The LED fixtures are controlled by a Color Kinetics iColor2 DMX controller. The iColor2 control box is located behind the information/security desk. The fluorescent fixtures are on a six-zone system.

All lighting in the lobby is on a single relay. The relay zone is controlled by an astronomical time clock that operates 365 days a year, with daily and weekly schedules of on/off events. The lights blink as a warning five minutes prior to an "off" event. The lighting can be turned

on for two-hour periods during off hours via a manual override switch or through a phone-activated dial-up control.

Emergency Systems

A number of the F37 linear fluorescent and FA compact fluorescent fixtures operate under emergency conditions. A generator provides emergency power.

2. Lobby: Design Criteria

Summary of Important Design Criteria

One important factor for this space is the need for facial recognition. People meet and socialize in the lobby, but more importantly this is the main entry point for the building and has a security checkpoint and cameras. High vertical light levels are required to identify people on security video.

The architecture in this space is impressive. Etched glass panels cover much of the room's surfaces. The lighting system needs to highlight these features.

The main points of interest are the information/security desk, and the turnstiles. Visitors need to be guided to one of these locations; people should not gather idly in the lobby. Light should be used to move people to these locations.

Tasks

- Facial recognition (social and for security)
- Face-to-face communication (at information/security desk)
- Brief reading/writing (at information/security desk)

IESNA Design Categories

Closest IESNA category: Office lobby/lounge/reception

Appearance of space and luminaries

- IESNA recommendation: Very important
- Design recommendation: Very important, since the lobby gives a first impression of the entire building interior.

Color appearance / Color contrast

- IESNA recommendation: Important
- Design recommendation: Somewhat important, for the quality of the space. However, no major artwork is being lit.

Daylight integration and control

- IESNA recommendation: Somewhat important
- Design recommendation: Important, due to large windows. However, windows face north, and daylight is limited due to urban environment, canopies, and window tints.

Direct glare

- IESNA recommendation: Important
- Design recommendation: Somewhat important, for visual comfort. No critical tasks are being performed.

Flicker and strobe

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important, for visual comfort. No moving or rotating machinery, so stroboscopic effect is not an issue.

Light distribution on surfaces

- IESNA recommendation: Important
- Design recommendation: Very important, to highlight the etched glass panels on wall and ceiling surfaces.

Uniformity of light distribution on task plane

- IESNA recommendation: Not important
- Design recommendation: Not important, since no critical tasks are being performed.

Luminance of room surfaces

- IESNA recommendation: Not important
- Design recommendation: Somewhat important

Modeling of faces or objects

- IESNA recommendation: Important
- Design recommendation: Very important, for security identification, general social interaction, and face-to-face communication at the information/security desk.

Points of interest

- IESNA recommendation: Not important
- Design recommendation: Important, to highlight the information/security desk.

Reflected glare

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important.

Shadows

- IESNA recommendation: Somewhat important
- Design recommendation: Generally not important, since task visibility will not be affected. Somewhat important at the security/information desk where brief reading or writing may occur.

Source/task eye geometry

- IESNA recommendation: Not important
- Design recommendation: Not important, due to lack of VDT and significant reading tasks.

Sparkle / Desirable reflected highlights

- IESNA recommendation: Not important
- Design recommendation: Important, to highlight decorative etched glass panels.

Surface characteristics

- IESNA recommendation: Important
- Design recommendation: Important, since the lobby is a high-quality space.

System control and flexibility

- IESNA recommendation: Not important
- Design recommendation: Not important. The space has the same function at all times.

Special considerations

- IESNA recommendation: None
- Design recommendation:
 - o Etched glass panels along ceiling and walls
 - o Security video cameras

Target Illuminance Levels

Illuminance (horizontal)

- IESNA recommendation: Category C: 10fc
- Design recommendation: 10fc

Illuminance (vertical)

- IESNA recommendation: Category A: 3fc
- Design recommendation: 5fc, to enhance facial recognition.

Target Moods, Flynn Impressions, and Psychological Aspects

The lobby should be a high-quality space with plenty of visual interest in order to provide a positive first impression for the building. The most important Flynn impression to convey is “public.” The space should be comfortable and welcoming to make visitors feel at ease. The design should set the theme for the rest of the building.

Control Criteria

Since the function of the space does not vary, a complex control system is unnecessary. Daylight should be taken into consideration and accounted for. The overall control should be consistent with the building’s hours of operation. ASHRAE 90.1-2004 requires the space to have an automatic shut-off mechanism.

Power Density Criteria

The space is classified as a “Lobby” in ASHRAE 90.1-2004. The space is allowed 1.3W/ft² for general lighting, plus an additional 1.0W/ft² for decorative lighting.

Building Code Criteria

The Building Code of the City of New York requires a minimum of 2 footcandles at ground level for all circulation and egress pathways.

3. Lobby: Evaluation of Existing Lighting System

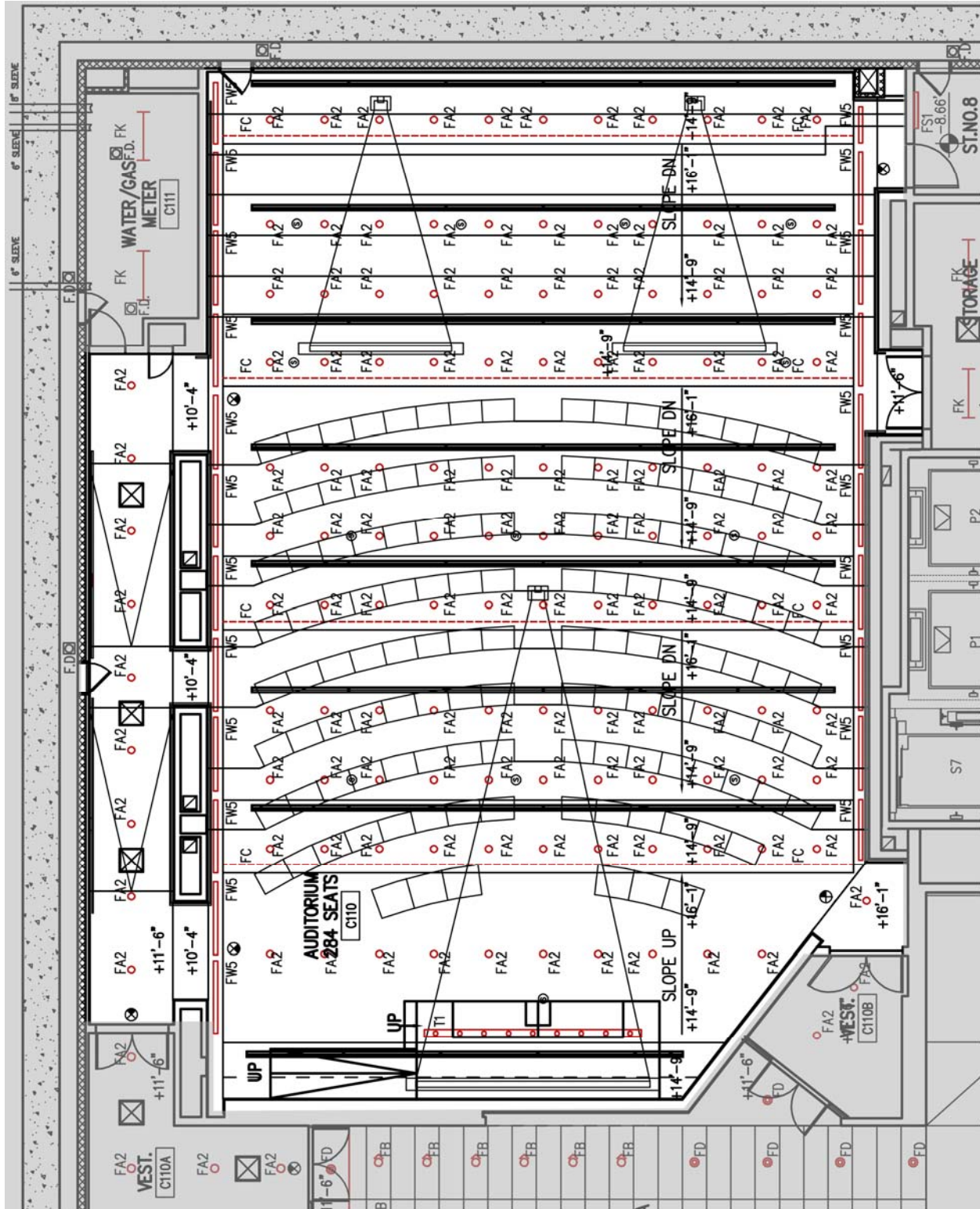
The use of color-changing LEDs draws attention to the etched glass features, but the use of color is perhaps overkill. The architecture alone is impressive, and the words etched into the glass will draw people’s attention regardless of whether the light source is white or colored. If color is desired, the glass can be tinted to filter light.

The lighting successfully highlights the information desk, both by creating higher illuminance levels at this area and through fixtures integrated into the millwork. Light levels should be high enough at the countertop to perform any reading or writing task.

All of the fixtures in this space are direct, which limits the amount of vertical illuminance in the space. LED fixtures are mounted vertically on one wall behind glass, but this only provides light from one direction, and the light may have very poor color rendering. More indirect light should be provided in the space.

The dimming system is a good idea, since daylight levels will vary depending on time of day and weather. The dimming system can compensate for these changes in daylight.

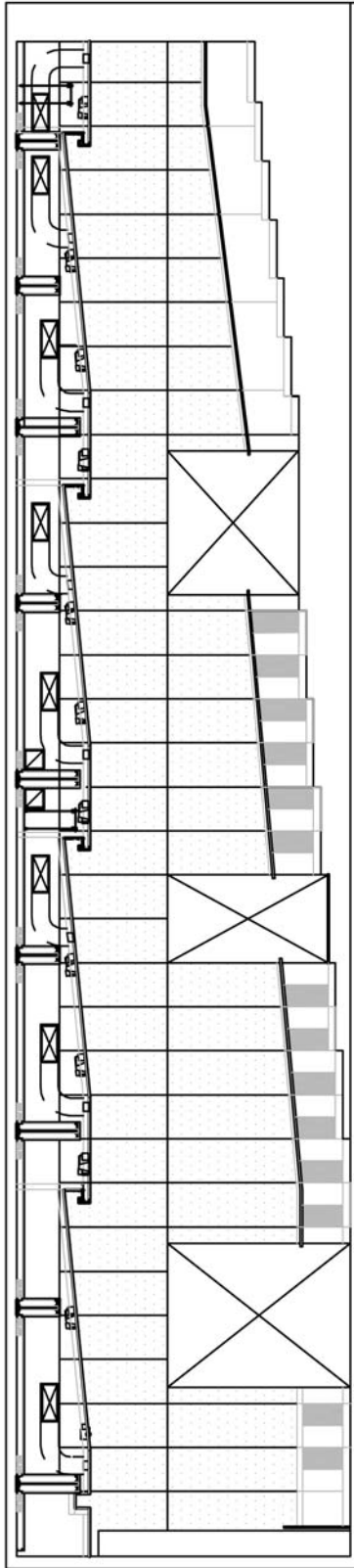
Space 2 – Auditorium – Level B1 - Special Purpose Space



Area of analysis left unshaded.

Note that fixture type S does not appear in the plan.

Scale: 3/32" = 1'-0"



North elevation of auditorium.

1. Auditorium: Existing Conditions

Space Description

NYLS has several large presentation spaces, but the B1 level auditorium is the largest. The space slopes upward from front to rear in order to ensure good visibility from any seat. The auditorium has a large amount of A/V equipment. At the front is a raised area with a podium for a presenter to stand. The room will likely be used for classes, speakers, and other types of presentations.

Space Geometry

Dimensions are approximately 84' x 54'. Area is approximately 4500 ft². Ceiling heights range from 14'-9" to 16'-1".

Materials and Finishes

Location	Material	Manufacturer	Color	Reflectance*	Specularity*
Floor	Carpet	Atlas	TBD	20%	Matte
Wall base	Painted MDF wood (glossy)	N/A	TBD	40%	Medium
Wall	Acoustic panel	Knoll	TBD	40%	Matte
Wall	Makore wood veneer	N/A	True to material	35%	Matte
Wall	Paint	Benjamin Moore	"Simply White"	85%	Matte
Ceiling	Painted gypsum board	N/A	White	85%	Matte

*Based on assumptions in most cases.

Daylight

No daylight enters the auditorium.

Furniture

The auditorium has 284 seats, with each row progressively higher from front to back. Towards the front of the auditorium, the seats are arranged somewhat concentrically around the front podium. Towards the rear, the seats are in straight rows. The front of the space has a raised area with a podium for presentations. There is no chalkboard at the front; only video screens.

Video Equipment

One video unit projects onto the front wall, while two others project onto screens mounted slightly to the left and right in the middle of the space. This allows both the front and rear audience to clearly see video presentations.

Lighting System

The auditorium is lit primarily by compact fluorescent downlights. A large number of these fixtures cover the ceiling. Linear fluorescent wall washers illuminate the walls of the space. Additionally, a series of coves run along the ceiling to give a staggered effect as the ceiling height rises from the front to rear of the space. Halogen downlights provide additional light at the front of the auditorium, where presentations occur. Step lights illuminate the steps for increased safety during video presentations during with the main lighting system is turned off.

Luminaires

Label	Description	Lamp(s)	Manufacturer*	Model*	Volts
FA2	Recessed open downlight	(1) 42W PL-T CFL 3500K	Lightolier	8037CCDW/7142CU	120
FC	Fluorescent cove 6" staggered	(1) T8 per cross section 3500K	Legion	1500/117/125/132/DIM	120
FW5	Recessed linear lensed asymmetric	(2) 21W T5 3500K	Se'lux	M1RA1S/1T5/SD/WH	120
S	Recessed step light	(1) 9W PL-S CFL 3500K	Bega	2219P	120
T1	Recessed halogen downlight	(1) 50W 55° MR16 (GE)	RSA	CCADMR16/BK/TR/ELC/24/LN21SP	12

*The specifications list alternate manufacturers of products with similar performance.

Light Loss Factors

Assumptions:

- Clean environment, 12-month cleaning cycle
- RCR = 0.9, Expected dirt depreciation: 12%

Label	Maintenance Cat.	Distribution	LLD	LDD	BF	RSDD	Total LLF
FA2	IV	Direct	0.85	0.89	0.88	0.98	0.65
FC	I	Direct	0.95	0.93	0.88	0.98	0.76
FW5	V	Direct	0.95	0.88	0.88	0.98	0.72
S	V	Direct	0.90	0.88	0.88	0.98	0.68
T1	IV	Direct	1.00	0.89	1.00	0.98	0.87

Ballasts

All fluorescent ballasts have a minimum 0.95 power factor and minimum 0.88 ballast factor. Ballasts for steplight luminaires must be electronic. Approved manufacturers for non-dimming ballasts are Advance, Osram/Sylvania, and Universal.

The FA2, FW5, and FC fluorescent fixtures have dimming ballasts. The specifications list Lutron, Advance, and Universal as approved manufacturers.

The T1 low-voltage halogen fixtures require a transformer to step down the voltage from 120V to 12V. This transformer, made by Q-Tran, is located remotely.

Controls

Each luminaire type is on a separate control zone. Aside from the step lights, the entire lighting system is dimmable. Two dimming preset control boxes are found behind the front podium. All lighting is on a single relay with an astronomical timeclock, as described in section 1.

Emergency Systems

A number of the FA2 compact fluorescent fixtures operate under emergency conditions. A generator provides emergency power.

2. Auditorium: Design Criteria

Summary of Important Design Criteria

The auditorium is a multi-function space that needs two main modes of operation. One design should provide high light levels on the work plane throughout the space, where students will perform reading and writing tasks. The front podium area also needs high light levels, especially in the vertical plane to see the speaker properly. In the second mode, low light levels should allow people to clearly see video projection displays throughout the space.

Tasks

- Presentations from speakers at front podium
- Video projections onto screens
- Reading and writing at desks

IESNA Design Categories

Applicable IESNA categories

- Educational-Lecture Hall-Audience
- Reading-Copied Tasks-Photocopies
- Reading-Writing Tasks-#2 Pencil

Appearance of space and luminaries

- IESNA recommendation: Somewhat important
- Design recommendation: Important, since the auditorium will be the location for the largest and most public presentations.

Color appearance / Color contrast

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important, for visual displays.

Daylight integration and control

- IESNA recommendation: Important
- Design recommendation: Not important, due to absence of daylight.

Direct glare

- IESNA recommendation: Important
- Design recommendation: Important, to ensure comfortable viewing of presentations.

Flicker and strobe

- IESNA recommendation: Important
- Design recommendation: Very important, since flicker may cause fatigue during extended reading/writing tasks.

Light distribution on surfaces

- IESNA recommendation: Important
- Design recommendation: Important, to ensure that front displays are visible and that work may be done at desks.

Uniformity of light distribution on task plane

- IESNA recommendation: Somewhat important
- Design recommendation: Important, since reading/writing tasks are being performed at desks.

Luminance of room surfaces

- IESNA recommendation: Important
- Design recommendation: Somewhat important

Modeling of faces or objects

- IESNA recommendation: Somewhat important
- Design recommendation: Very important at the front of the space where speakers stand. Not important in seating areas.

Points of interest

- IESNA recommendation: Important
- Design recommendation: Important, to keep attention on the presentation area.

Reflected glare

- IESNA recommendation: Important
- Design recommendation: Somewhat important.

Shadows

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important, since writing tasks occur at desks.

Source/task eye geometry

- IESNA recommendation: Important
- Design recommendation: Important at the front of the room where video displays are used. Somewhat important at desks, since work will be primarily with matte surfaces.

Sparkle / Desirable reflected highlights

- IESNA recommendation: Not important
- Design recommendation: Not important

Surface characteristics

- IESNA recommendation: Important
- Design recommendation: Somewhat important.

System control and flexibility

- IESNA recommendation: Somewhat important
- Design recommendation: Important, because the space has multiple functions. (Classroom, speaker presentations, video presentations)

Special considerations

- IESNA recommendation: None
- Design recommendation: Video projections.

Target Illuminance Levels

Illuminance (horizontal)

- IESNA recommendation: Category D: 30fc
- Design recommendation: 30fc

Illuminance (vertical)

- IESNA recommendation: None
- Design recommendation: 5fc at podium. As low as possible on video screens.

Target Moods, Flynn Impressions, and Psychological Aspects

The most important Flynn Impression for this space is the sense of “visual clarity.” It is important for people to clearly see the presentations. The Flynn Impression “tense” should be conveyed more than “relaxed,” to keep people attentive. The lighting design should promote visual comfort, since occupants may be in the space for long periods of time.

Control Criteria

The auditorium should have two main scenes: one for a person speaking at the podium, and one for video presentations on the projection screens. A dimming system would provide enough flexibility for any mode of operation. The lighting at the front of the space and near the screens should be controlled separately from the general lighting. ASHRAE 90.1-2004 requires the space to have an automatic shut-off mechanism.

Power Density Criteria

The space is classified as a “Classroom/Lecture/Training” in ASHRAE 90.1-2004. The space is allowed 1.4W/ft².

Building Code Criteria

The auditorium is classified as a “Place of Assembly.” The Building Code of the City of New York requires a minimum of one-half footcandle for all aisles and cross aisles. Additionally, at least five footcandles, measured on the ground, must be provided during emergencies throughout the entire space.

3. Auditorium: Evaluation of Existing Lighting System

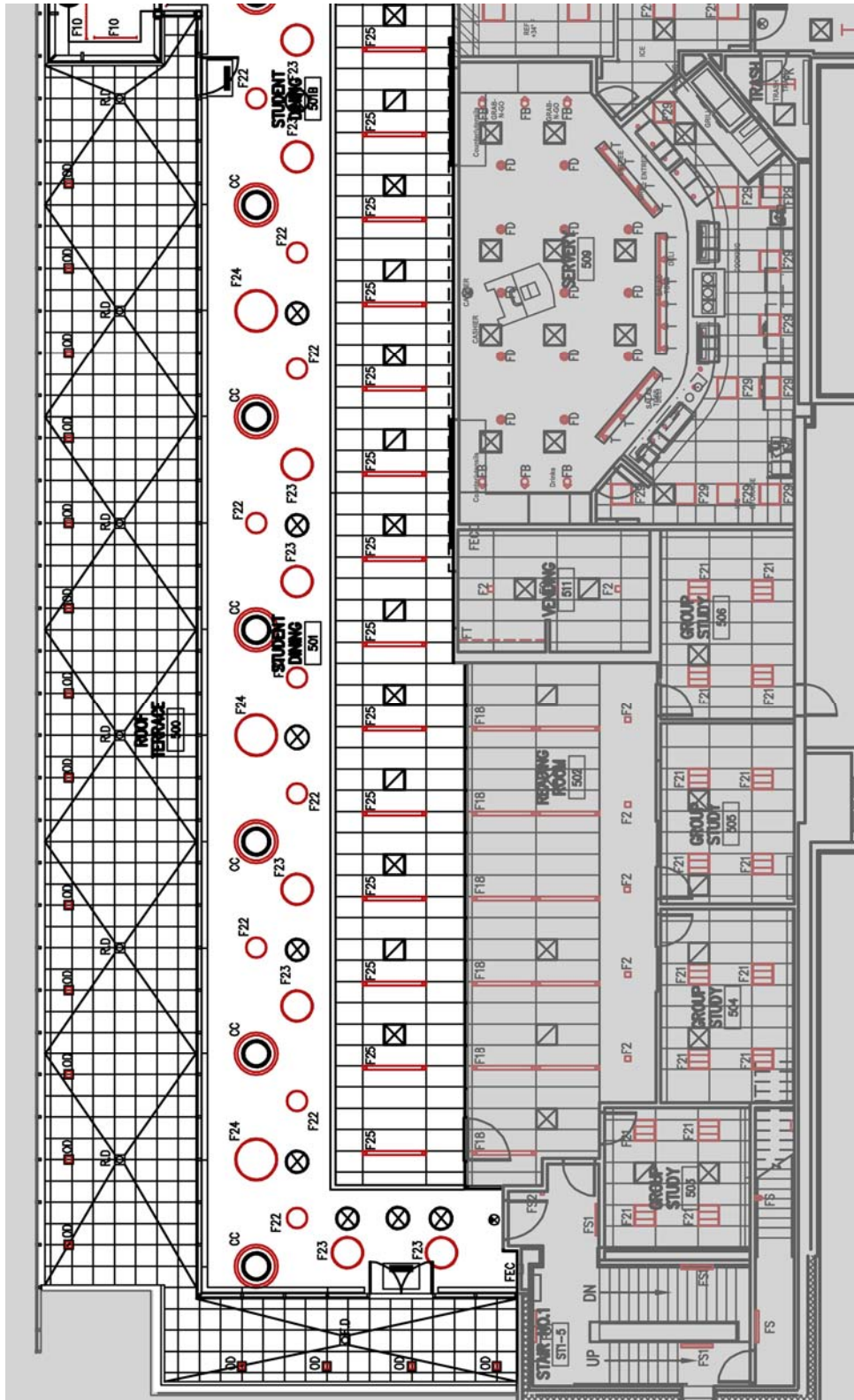
The auditorium's existing lighting system meets most of the design criteria. The system is highly adjustable through the dimming system and different zones of control. All fixtures are recessed to avoid interference with the video projectors. The step lights add a level of safety for navigation during times of low ambient light levels.

The overall lighting is provided by small compact fluorescent downlights. The downlight holes disrupt the otherwise smooth flow of ceiling planes and coves. The use of so many downlights seems to suggest the lighting as an afterthought. A better choice would be a larger source, to match the scale of the space and provide more even illumination on the workplane.

Vertical illumination at the front of the room is low. No chalk board is indicated in the furniture plans, but one could always be added in the future since the wall is bare. The lighting system should anticipate this possibility and provide vertical illumination on the front wall. The only extra light source at the front are the MR16 downlights. These may help the presenter to read his notes, but they will only add undesirable facial shadows instead of allowing the occupants to better see the speaker. The podium area should be lit more indirectly rather than from directly above.

The use of a halogen source is questionable, since more efficient sources can perform the same function while saving money, energy, and maintenance time. Maintenance is important in this space, since the ceiling is relatively high.

Space 3 – Roof Terrace and Student Dining – Level 5 - Exterior Space



Area of analysis left unshaded. Fixture F7 does not appear in plan. Scale: 1/16" = 1'-0"

1. Interior/Exterior Dining: Existing Conditions

Space Description

Occupants enter the fifth floor roof terrace from the student dining area. The exterior space has no overhead obstructions and is long and narrow. Overlooking the corner of West Broadway and Leonard Street, the terrace is on the north end of the building. From the floor of the terrace, the rest of the building rises an additional two stories. The exterior space serves as an extension of the dining area, which is visible through full-height glass windows. A stairway enclosed entirely in glass connects the dining area to Level 4.

Space Geometry

The exterior terrace is L-shaped and approximately 116' x 14' plus 34' x 8'. The interior dining area is approximately 187' x 28'. The exterior terrace is about 1900 ft², while the interior space is about 5500 ft². Interior ceiling heights range from 10' to 11'.

Materials and Finishes

Location	Material	Manufacturer	Color	Reflectance or Transmittance*	Specularity*
Exterior floor	Precast concrete paver	Hanover	Grey	30%	Matte
Interior floor 1, stairway floor	Synthetic terrazzo	Terroxy	Light grey	50%	Medium
Interior floor 2	Synthetic terrazzo	Terroxy	Black	10%	Medium
Walls 2	Paint	Benjamin Moore	"Simply White"	85%	Matte
Walls 2	Paint	Benjamin Moore	"Dill Pickle"	47%	Matte
Wall base	Painted MDF wood	N/A	Matches adjacent wall	N/A	Matte
11' ceiling, stairway ceiling	Painted gypsum board	N/A	White	85%	Matte
10' ceiling	Acoustical ceiling tile 2' x 6'	Armstrong Optima	White	80%	Matte
Stairway walls	Paint	Benjamin Moore	TBD	50%	Matte
Glass facade	Fritted glass	N/A	N/A	65%	N/A
Glass partitions	Clear glass	3M	N/A	80%	N/A

Daylight

The exterior terrace is open to sunlight, and therefore receives large amounts of daylight. The dining area has a glass façade facing north, and will also receive plenty of daylight. The long, narrow geometry of the space allows daylight to penetrate the majority of the space.

Furniture

Some areas of the exterior terrace have tables for dining, while others have no furniture. The interior dining area has two zones, one primarily for eating and the other for sitting. The dining area has large tables, while the seating area has more chairs and smaller tables.

Lighting System

The exterior terrace is lit only by fluorescent bollards around the perimeter. However, light also spills over through the glass from the student dining area and from the stairway. The dining space is lit by a non-uniform pattern of fluorescent circle-domes of varying size. Traveling inward, a grid ceiling appears with recessed linear fixtures that use both fluorescent and halogen sources. Cold cathodes encircle the tops of columns in the dining area. Fluorescent wall washers accent the fritted façade glass around the stairway and along the Leonard Street side of the building. Linear lensed fluorescent fixtures are recessed vertically into the railings of the stairwell.

Luminaires

Label	Description	Lamp(s)	Manufacturer*	Model*	Volts
CC	Recessed cold cathode	11.7W/ft, White 3500K	National Cathode Corp.	RRB/H/NPF/E	120
F7	Lensed fixture recessed into railing	(1) T5 per cross section 3500K	Se'lux	M60/1T5/SF/4/WH	120
F10	Surface-mounted fluorescent linear wall washer	(2) T5 per cross section 3500K	Elliptipar	F106/T14/T21/T28/S/00	120
F22	Recessed circular fluorescent 2'	(3) 40W PL-L CFL 3500K	Mark Lighting	MG/2/3/40-BX/EB	120
F23	Recessed circular fluorescent 3'	(4) 25W T8 3500K	Mark Lighting	MG/3/4/25-T8/EB	120
F24	Recessed circular fluorescent 4'	(6) 32W T8 3500K	Mark Lighting	MG/4/6/32-T8/EB	120
F25	Recessed linear lensed fluorescent with MR16 downlights	(1) 21W T5 3500K, (2) 50W 55° MR16 (GE)	Se'lux	M1R1/1T5/SD/5/WH/MEOF	T5: 120V MR16: 12V
F33	Pendant-mounted direct/indirect fluorescent	(1) 28W T5 3500K	Focal Point	FTWS/PB/1T5/S/J12 /WH/	120
OD	Exterior bollard	(1) 50W PL-L CFL 3500K	Hess	FR780/50/CF/D/SG	120

*The specifications list alternate manufacturers of products with similar performance.

Light Loss Factors

Assumptions:

- Interior: Clean environment, 12-month cleaning cycle
- Interior: RCR = 0.8, Expected dirt depreciation: 12%
- Exterior: Dirty environment, 12-month cleaning cycle

Label	Maintenance Cat.	Distribution	LLD	LDD	BF	RSDD	Total
CC	I		1.00	0.93	0.88	0.98	0.80
F7	V	Direct	0.95	0.88	0.88	0.98	0.72
F10	I	Direct	0.95	0.93	0.88	0.98	0.76
F22	V	Direct	0.90	0.88	0.88	0.98	0.68
F23	V	Direct	0.92	0.88	0.88	0.98	0.70
F24	V	Direct	0.95	0.88	0.88	0.98	0.72
F25 (T5)	V	Direct	0.95	0.88	0.88	0.98	0.72
F25 (MR16)	IV	Direct	1.00	0.89	1.00	0.98	0.87
F33	II	Semi-indirect	0.95	0.94	0.88	0.94	0.74
OD	V	Deriect/Indirect	0.90	0.77	0.88	1.00	0.61

Ballasts

All fluorescent ballasts are electronic and have a minimum 0.95 power factor and minimum 0.88 ballast factor. The ballasts for the OD exterior bollards are rated for at least 0 degree Fahrenheit starting temperature. Approved manufacturers for fluorescent ballasts are Advance, Osram/Sylvania, and Universal.

The cold cathode ballasts are dimmable and located remotely.

The low-voltage halogen components of the fixtures require a transformer to step down the voltage from 120V to 12V. This transformer, made by Q-Tran, is located remotely.

Controls

The exterior lighting resides on one relay zone. The interior student dining area is broken into three separate relay control zones. Two of these zones have no local manual switches, and all fixtures must be either on or off. In the third zone, local switches control the wall washers around the stairs separately from the fluorescent circle-domes.

Emergency Systems

A number of the fluorescent dome fixtures and F25 linear fluorescents operate under emergency conditions. A generator provides emergency power.

2. Interior/Exterior Dining: Design Criteria

Summary of Important Design Criteria

The lighting in the dining area should promote socialization. The space should be comfortable, and a high-CRI source should be used to make the food look appealing.

The exterior space serves as an extension of the interior dining area, and should have design criteria similar to the interior. Additionally, safety is a concern outside. The edge of the roof and the railing should be clearly visible.

Tasks

- Dining
- Socializing (face-to-face communication)

IESNA Design Categories

Applicable IESNA categories

- Exterior: Garden-Terrace
- Interior: Food Service Facilities-Dining

Appearance of space and luminaries

- IESNA recommendation (Exterior): Very important
- Design recommendation (Exterior): Very important, since the terrace will be visible from the street.
- IESNA recommendation (Interior): Important
- Design recommendation (Interior): Important

Color appearance / Color contrast

- IESNA recommendation (Exterior): Important
- Design recommendation (Exterior): Not important, since nothing is on display and no critical tasks will be performed.
- IESNA recommendation (Interior): Very important
- Design recommendation (Interior): Very important, to make food look appealing.

Daylight integration and control

- IESNA recommendation (Exterior): Very important
- Design recommendation (Exterior): Very important, since the space is exterior.
- IESNA recommendation (Interior): Somewhat important
- Design recommendation (Interior): Important, due to the large number of windows.

Direct glare

- IESNA recommendation (Exterior): Very important
- Design recommendation (Exterior): Very important, since sources will be in contrast with a relatively dark background.
- IESNA recommendation (Interior): Important
- Design recommendation (Interior): Somewhat important, for visual comfort.

Flicker and strobe

- IESNA recommendation (Interior): Not important
- Design recommendation (Interior): Somewhat important, for visual comfort.

Light distribution on surfaces

- IESNA recommendation (Exterior): Very important
- Design recommendation (Exterior): Important, for safety reasons.
- IESNA recommendation (Interior): Somewhat important
- Design recommendation (Interior): Somewhat important.

Uniformity of light distribution on task plane

- IESNA recommendation (Interior): Somewhat important
- Design recommendation (Interior): Somewhat important

Light pollution / trespass

- IESNA recommendation (Exterior): Important
- Design recommendation (Exterior): Somewhat important, since light pollution is already rampant in New York City.

Luminance of room surfaces

- IESNA recommendation (Interior): Not important
- Design recommendation (Interior): Not important

Modeling of faces or objects

- IESNA recommendation (Exterior): Very important
- Design recommendation (Exterior): Important, for socialization. Security is not an issue since the location is closed to the public.
- IESNA recommendation (Interior): Somewhat important
- Design recommendation (Interior): Important, for socialization.

Peripheral detection

- IESNA recommendations (Exterior): Somewhat important
- Design recommendations (Exterior): Not important. No moving hazards.

Points of interest

- IESNA recommendation (Exterior): Important
- Design recommendation (Exterior): Not important, since no major points of interest exist.
- IESNA recommendation (Interior): Important
- Design recommendation (Interior): Important, to guide occupants to locations.

Reflected glare

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important

Shadows

- IESNA recommendation (Exterior): Important
- Design recommendation (Exterior): Not important, since no critical tasks are performed.
- IESNA recommendation (Interior): Not important
- Design recommendation (Interior): Not important, since no critical tasks are performed.

Source/task eye geometry

- IESNA recommendation (Exterior): Somewhat important
- Design recommendation (Exterior): Not important, since no critical tasks are performed.
- IESNA recommendation (Interior): Not important
- Design recommendation (Interior): Not important, since no critical tasks are performed.

Sparkle / Desirable reflected highlights

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important

Surface characteristics

- IESNA recommendation (Exterior): Important
- Design recommendation (Exterior): Important, for safety reasons (railing).
- IESNA recommendation (Interior): Not important
- Design recommendation (Interior): Not important

System control and flexibility

- IESNA recommendation (Exterior): N/A
- Design recommendation (Exterior): Important, since the space could have multiple functions.
- IESNA recommendation (Interior): Important
- Design recommendation (Interior): Somewhat important, since the space will generally only be used for its main purpose.

Special considerations

- IESNA recommendation (Exterior): Hazards
- Design recommendation (Exterior): Safety hazards (edge of terrace)
- IESNA recommendation (Interior): None
- Design recommendation (Interior): None

Target Illuminance Levels

Illuminance (horizontal)

- IESNA recommendation (Exterior): Category B: 5fc
- Design recommendation (Exterior): 5fc
- IESNA recommendation (Interior): Category C: 10fc
- Design recommendation (Interior): 30fc, since students may bring work or reading material to the dining area.

Illuminance (vertical)

- IESNA recommendation (Exterior): Category A: 3fc
- Design recommendation (Exterior): 3fc
- IESNA recommendation (Interior): Category A: 3fc
- Design recommendation (Interior): 5fc, for improved facial recognition.

Target Moods, Flynn Impressions, and Psychological Aspects

The lighting design should encourage the Flynn Impression of “relaxation.” The terrace and dining areas are places for students to take a break from work, and relax or socialize. The lighting in the dining area should be somewhat decorative to avoid an institutional appearance. High light levels can help give the space a clean feeling.

Control Criteria

The exterior lighting should correspond to the presence of daylight. Photocell sensors could account for both weather and time-of-day changes. The interior lighting does not require a complex control system, since the space only has one main function. Daylight could also play a role in the interior lighting controls due to the large amount of window area.

Power Density Criteria

The exterior space is classified as a “Plaza” in ASHRAE 90.1-2004. The space is allowed 0.2W/ft². The interior space is classified as a “Dining Area” in ASHRAE 90.1-2004. The space is allowed 0.9W/ft², plus an additional 1.0W/ft² for decorative fixtures.

Building Code Criteria

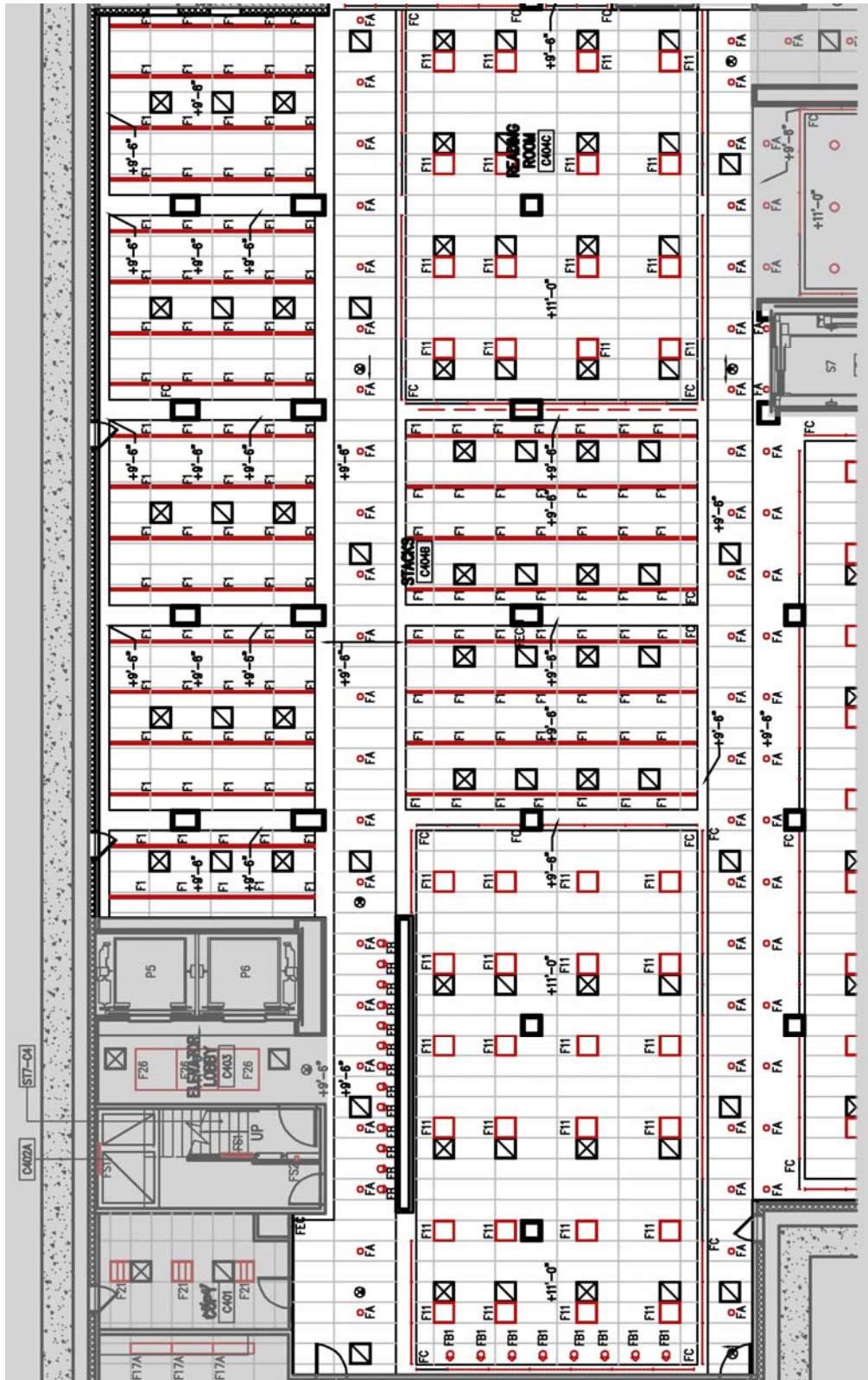
The Student Dining Area is considered a “Place of Assembly.” The Building Code of the City of New York requires a minimum of five footcandles at ground level throughout the space during emergencies.

3. Interior/Exterior Dining: Evaluation of Existing Lighting System

The interior dining area fulfills the design criteria very well. The use of different sized fixtures in a disorderly arrangement makes the space seem informal and lively. The cold cathodes add additional visual interest to the space. Horizontal should be high enough for people to see their food clearly, as well as allow people to perform reading and writing tasks at the tables. Since all of the fixtures are direct, vertical illuminance will be low. This should be increased, since face-to-face interaction occurs in the dining area.

The exterior area is really only useful during daylight hours. The lighting system is very limited, consisting only of bollards that outline the edge of the roof. These are primarily for safety purposes. There is no reason why the space can't have additional lighting to make it useful as a dining area during night hours.

Space 4 – Library Stacks and Reading Room – Level B4 - Work Space



Area of analysis left unshaded.

Scale: 1/16" = 1'-0"

1. Library: Existing Systems

Space Description

The lowest level of the building is devoted almost entirely to the library. Level B3 also has some library space, but the majority of the library resides even deeper underground on level B4. The library has several areas, including stacks of reading materials, sitting areas for individual study, tables for group study, and locations for computer use.

Space Geometry

Dimensions are approximately 120' x 85'. Area is approximately 10,000 ft². Ceiling heights range from 9'-6" to 11'.

Materials and Finishes

Location	Material	Manufacturer	Color	Reflectance or Transmittance*	Specularity*
Floor	Carpet	Atlas	TBD	20%	Matte
Reading room floor	Carpet	Atlas	TBD	20%	Matte
Corridor floor	Synthetic terrazzo	Terroxy	Black	10%	Medium
Wall base	Tite-Loc panels	Johnsonite	TBD		Matte
Reading room wall base	Painted MDF wood	N/A	Matches adjacent wall	N/A	Matte
Walls	Paint	Benjamin Moore	"Simply White"	85%	Matte
Partition wall	Paint	Benjamin Moore	"Gingerbread Man"	36%	Matte
11' ceiling	Painted gypsum board	N/A	White	85%	Matte
9'-6" ceiling	Acoustical ceiling tile 2' x 6'	Armstrong Optima	White	80%	Matte

*Based on assumptions in most cases.

Daylight

No daylight enters the library.

Furniture

The stack areas have high shelves with about three feet for walkways between rows. The rest of the library has tables of various size for studying, reading, and computer use.

Lighting System

In the area of the library with stacks, linear fluorescent pendants provide direct illumination. These fixtures are mounted continuously between rows of shelves. The reading areas are lit primarily by direct/indirect 2'x2' fluorescent pendants. Recessed compact fluorescent downlights light the corridors that run through the library. Coves run throughout the entire space, and selected walls are washed by compact fluorescent wall washers.

Luminaires

Label	Description	Lamp(s)	Manufacturer*	Model*	Volts
F1	Linear fluorescent pendant	(1) 32W T8 3500K	Lightolier	CCM2047/4/E	120
F11	2'x2' fluorescent pendant	(4) F14T5 3500K	Energie	SCO-22	120
FA	Recessed open downlight	(1) 42W PL-T CFL 3500K	Lightolier	8037CCDW/7142BU	120
FB1	Recessed open wall washer	(1) 32W PL-T CFL 3500K	Lightolier	8087CCDW/7132CU	120
FC	Fluorescent cove 6" staggered	(1) T8 per cross section 3500K	Legion	1500/117/125/132/DIM	120

*The specifications list alternate manufacturers of products with similar performance.

Light Loss Factors

Assumptions:

- Clean environment, 12-month cleaning cycle
- RCR = 0.4
- Percent expected dirt depreciation: 12%

Label	Maintenance Cat.	Distribution	LLD	LDD	BF	RSDD	Total LLF
F1	IV	Direct	0.95	0.89	0.88	0.98	0.73
F11	V	Direct/Indirect	0.95	0.88	0.88	0.94	0.69
FA	IV	Direct	0.85	0.89	0.88	0.98	0.65
FB1	IV	Direct	0.85	0.89	0.88	0.98	0.65
FC	I	Direct	0.95	0.93	0.88	0.98	0.76

Ballasts

All fluorescent ballasts have a minimum 0.95 power factor and minimum 0.88 ballast factor. All ballasts must be electronic. Approved manufacturers for ballasts are Advance, Osram/Sylvania, and Universal.

Controls

The library is broken up into nine zones on separate relays, plus two additional relay zones for the corridors that flow through the space. No local manual switches are provided. All lights on a single zone must be either on or off. The relays operate on an astronomical timeclock as described in section 1.

Emergency Systems

A number of the F11 pendants and FA compact fluorescent downlights operate under emergency conditions. A generator provides emergency power.

2. Library: Design Criteria

Summary of Important Design Criteria

The reading areas of the library need high horizontal illuminance on the workplane. Students will be performing reading and writing tasks at desks, and need proper light levels to do so comfortably. Vertical illuminance should be kept to a minimum to prevent interference with VDT tasks.

Tasks

- Reading and writing at desks
- Computer use
- Reading small print from storage shelves

IESNA Design Categories

Applicable IESNA category

- Library-Reading stacks
- Reading-Printed tasks-6pt type

Appearance of space and luminaries

- IESNA recommendation: Important
- Design recommendation: Somewhat important

Color appearance / Color contrast

- IESNA recommendation: Important
- Design recommendation: Somewhat important, since color is not critical in law-related readings.

Daylight integration and control

- IESNA recommendation: Not important
- Design recommendation: Not important, since no daylight enters space.

Direct glare

- IESNA recommendation: Very important
- Design recommendation: Very important, to maintain visual comfort while reading.

Flicker and strobe

- IESNA recommendation: Not important
- Design recommendation: Important, to maintain visual comfort while reading.

Light distribution on surfaces

- IESNA recommendation: Important
- Design recommendation: Important

Uniformity of light distribution on task plane

- IESNA recommendation: Important
- Design recommendation: Important

Luminance of room surfaces

- IESNA recommendation: Not important
- Design recommendation: Important, to compensate for total lack of natural light.

Modeling of faces or objects

- IESNA recommendation: Somewhat important
- Design recommendation: Somewhat important, for studying in groups.

Points of interest

- IESNA recommendation: Not important
- Design recommendation: Not important

Reflected glare

- IESNA recommendation: Very important
- Design recommendation: Very important, to avoid glare in VDT tasks.

Shadows

- IESNA recommendation: Somewhat important
- Design recommendation: Important, since some of the furniture has partitions between individual desks that could block light.

Source/task eye geometry

- IESNA recommendation: Very important
- Design recommendation: Very important, to avoid glare in VDT tasks.

Sparkle / Desirable reflected highlights

- IESNA recommendation: Not important
- Design recommendation: Not important

Surface characteristics

- IESNA recommendation: Not important
- Design recommendation: Not important

System control and flexibility

- IESNA recommendation: Not important
- Design recommendation: Not important, since the space has the same function at all times.

Special considerations

- IESNA recommendation: None
- Design recommendation: Illuminate room surfaces to compensate for lack of natural light

Target Illuminance Levels

Illuminance (horizontal)

- IESNA recommendation (reading areas): E (50fc)
- IESNA recommendation (stacks): D (30fc)
- Design recommendation: Same as IESNA

Illuminance (vertical)

- IESNA recommendation: None
- Design recommendation: Same as IESNA, since all tasks take place on a horizontal surface.

Target Moods, Flynn Impressions, and Psychological Aspects

The most important impression in the library is the sense of “visual clarity.” People have to be able to clearly read any type of material, including small font and glossy paper. A mood of privacy should be set, to encourage people to talk quietly and study efficiently.

Control Criteria

Since the function of the space does not vary, a complex control system is unnecessary. ASHRAE 90.1-2004 requires the space to have an automatic shut-off mechanism.

Power Density Criteria

The space includes the ASHRAE 90.1-2004 classifications of “Library Reading Area” and “Library Stacks.” The reading area is allowed 1.2 W/ft², and the stacks are allowed 1.7W/ft² for lighting.

Building Code Criteria

The library is considered a “Place of Assembly.” The Building Code of the City of New York requires a minimum of 5 footcandles at ground level during emergencies, and at least 2 footcandles for corridors and circulation areas during normal operation.

3. Library: Evaluation of Existing Lighting System

The lighting system in the library meets the design criteria very well. Average horizontal illuminance levels are almost exactly as specified in the design requirements. Vertical illuminance in the stacks area is sufficient, though the levels drop fairly low (to about 10fc) on the bottom row. The coves and indirect pendants throughout the space help hide the fact that the library is four levels underground by creating a bright ceiling. This is important for a space that receives no natural light.

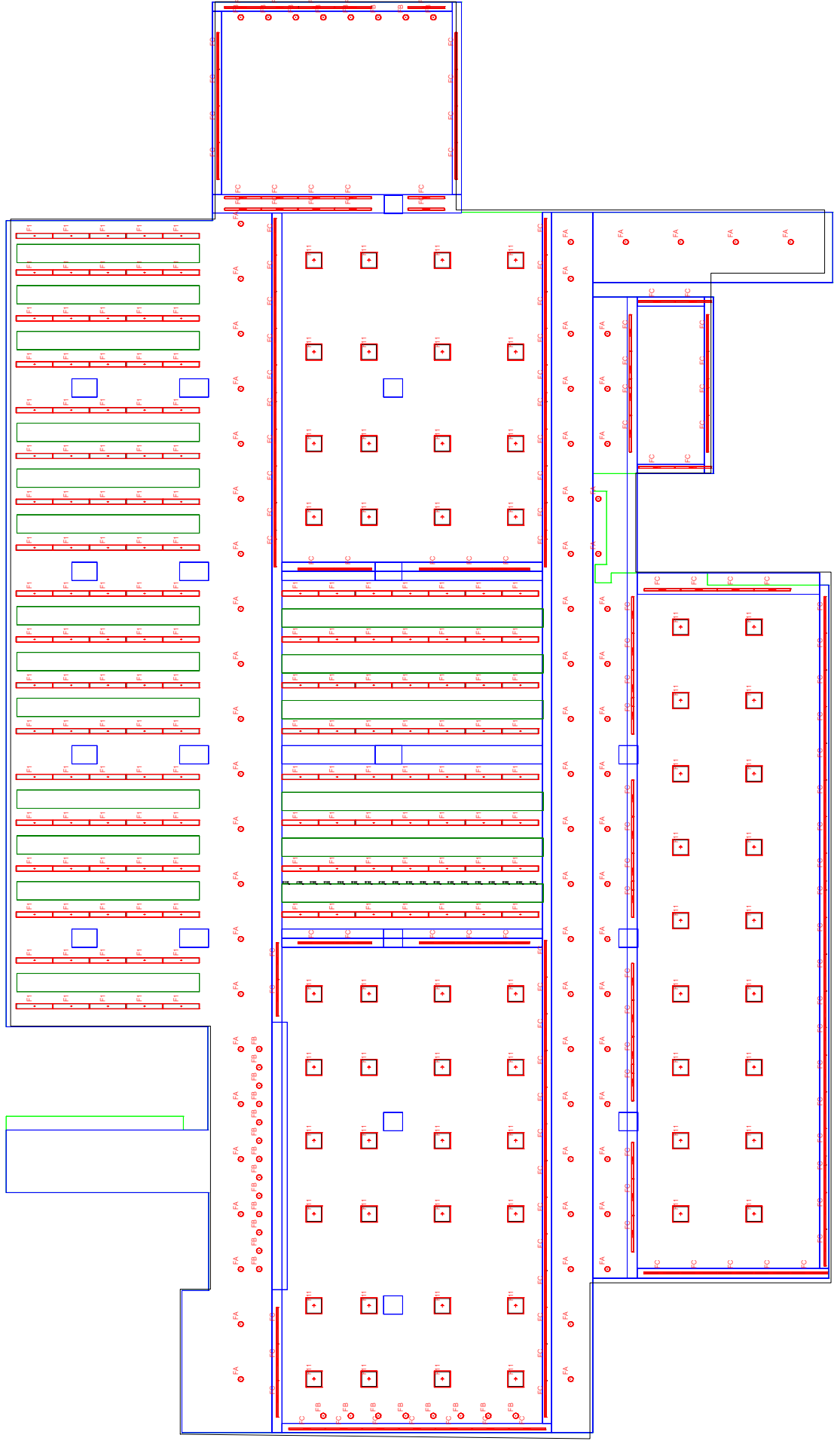
The lighting power density is over 2 watts per square foot, which is significantly higher than the amount allowed by ASHRAE. This extra power usage must be made up for by other spaces in the building with power densities lower than the allowance. A better solution could be to use a task/ambient system, which would keep general ambient light relatively low but workspaces high. The task lighting could be built into the furniture, both the reading desks and the stacks, and possibly even light those areas more uniformly and to higher levels using less energy.

AGI Analysis: Library: Full View

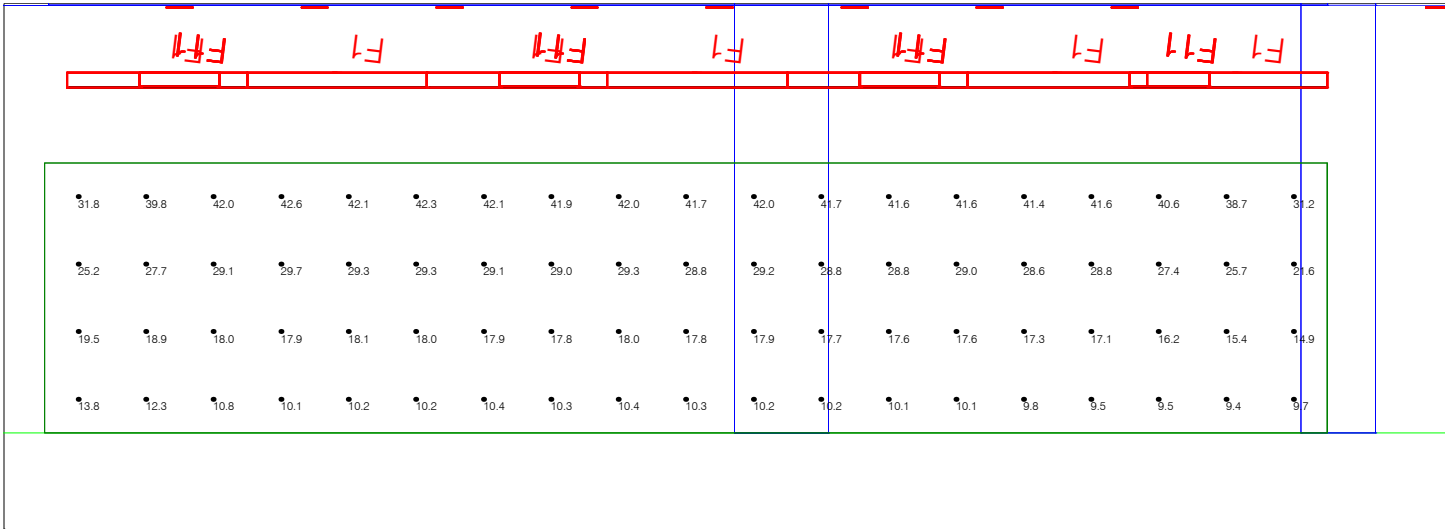
Luminaire Schedule				
Symbol	Label	Qty	Lumens	LLF
	F1	146	1475	0.730
	F11	58	1350	0.690
	FA	66	3200	0.650
	FB	29	2400	0.730
	FC	133	2950	0.760

Numeric Summary						
Label	Units	Avg	Max	Min	Max/Min	
Room_Floor-WP	Fc	52.18	102	17.4	3.00	5.86
Stacks_12_Side_2	Fc	24.13	42.6	9.4	2.57	4.53

LPD Area Summary		
Label	Area	Total Watts
Library	10662	22884
		LPD
		2.146



AGI Analysis: Library



(Above) Typical stack (vertical plane)

(Below) Enlarged view of horizontal illumination

