NEW YORK LAW SCHOOL

New Community Facility

185 West Broadway

New York, NY

Proposal

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Lighting / Electrical

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Executive Summary

This proposal outlines the scope of research for the re-design of New York Law School's New Community Facility. Two depth and two breadth topics of study are proposed for Spring 2008. There are no obvious shortcomings of the existing building systems, but some systems will be re-designed and approached from a different direction. All of the topics are linked to some degree; the results of one design will impact other areas of study.

The first depth study focuses on the lighting systems in four spaces. These spaces were described in Technical Report 1, and schematic designs were created for Technical Report 3. The depth study will further develop the schematic design using comments from professional designers and further study of the spaces. Equipment will be selected to meet the design goals.

The electrical depth study addresses four issues. The branch circuits for the four spaces in which lighting will be re-designed must be changed to reflect the new loads. Secondly, a protective device coordination study will be conducted through a new pathway. A third study will re-design the lighting system to utilize 277V and determine whether this change is advantageous. Finally, the feasibility of installing photovoltaics for energy generation will be determined.

The first breadth study will determine the feasibility of achieving LEED certification. The changes required will be discussed. The second breadth study will examine the building façade system. Solar gains and heat losses will be calculated, and an improved system will be designed if warranted.

A timeline lists progress goals throughout the semester.

Background

New York Law School's New Community Facility is currently under construction in downtown New York City. This new building seeks to consolidate the functions of various aging New York Law School structures. The building will house a library, auditoriums, dining areas, classrooms, administrative offices, and a large multi-purpose space. The 207,000 SF structure has six floors above grade and, with the assistance of a deep slurry wall, four full floors below grade.

The electrical distribution system is typical of a building of its size in New York City. Two feeders deliver power to the building from an underground transformer vault, each supplying a 4000A switchgear. The entire system is 208Y/120V 3P 4W, with no significant transformers in the building. Emergency systems include a 700KW oil-fueled generator, a 130KVA UPS system. Major loads include the kitchen and HVAC equipment, although the building receives its heat from the Con Edison steam system.

Lighting Depth Study: Re-design of Four Spaces

Comments from Designers at Lutron Presentation (12/13/07)

Andrea Hartranft:

- Where are architectural renderings from?
- Liked the layering of graphics
- Glass curtain wall is not a major part of your presentation so should not be first design criteria
- Light on information desks to mirror turnstile should stand out and be different from turnstile lighting
- Lobby entrance fluorescent fixtures could have cold temperature issues
- Library roof diamond needs to protect from dark edges at end details and could have maintenance issues
- Auditorium needs highlight on back wall for speaker
- Chair rail up-light in auditorium needs to be considered for issues of looking into, grabbing, and dropping stuff into the gap
- Dining area: big round down lights with the columns, the pendants, and sconces are discordant
- Roof terrace design somewhat unclear

Sandra Stashik:

- Doesn't like the black background
- Liked the large images

- Liked sections and the layering of light
- Liked many shades of blue on library panels
- Think of stacks occupancy sensors
- Put light on visible walls in library to give an even more open exterior feel to the room
- Linear down light (lensed) ceiling by the cove is working against you in the auditorium
- Dimming controls
- Really nice and well thought out

Mike Barber:

- Stacks the lighting off the stacks create black hole on roof add some uplight
- Dining area: liked the big circles, but space them out, remove the pendants, and make the wall sconces circular
- Visually strong and reads well

Overall Design

The lighting will be re-designed in four selected spaces: the main entry lobby, the auditorium, the library, and the student dining area / roof terrace. Although the existing systems meet most of the design criteria established in Technical Report 1, different solutions to the same problem can always be reached in lighting design. Overall, the new lighting design will work with the architecture to give the building a modern, professional aesthetic. The lighting equipment will be efficient, and assist in obtaining a LEED certification in coordination with a breadth topic.

Main Entry Lobby

The lighting in the main entry lobby is important since this space will create a first impression for most building visitors. The lighting should link the interior with the exterior, drawing people into the building. The lobby is a transition from a public, transparent space to a more private building interior. As a circulation space, light will be used to guide the flow of people to their destination.

Library Stacks and Reading Room

Located in basement level B4, no daylight enters this space. Therefore, lighting is the only opportunity to add life to this space. A luminous ceiling over the reading area will simulate an outdoor experience. Task lighting both in the reading area and stacks area will direct light where necessary while keeping energy density low. Occupancy sensors will be employed to conserve energy in the stacks, which may not be accessed frequently. The details of the luminous ceiling system will be determined, and different sources (LEDs vs.fluorescent) will be analyzed for performance and efficiency.

Auditorium

The auditorium is a multi-function space, with both speakers and video projections. Different modes of operation are required for this room. Therefore, controls and dimming are critical. The lighting should create layers of light that can be turned on or off, or dimmed appropriately. The light should provide a comfortable setting to view both speakers and video projections, in addition to providing enough horizontal illumination to perform writing tasks at desks. The lighting should also highlight the architecture, which features overlapping ceiling panels.

Student Dining and Roof Terrace

The student dining area and roof terrace perform the same function and are only separated by glass walls. This space differs from the rest of the building, since students here come to relax and eat rather than to learn and study. The lighting in the dining area should be more relaxed and playful than the rest of the building. Daylight sensors will be employed to reduce the need for electric lighting during daytime hours. The lighting of the roof terrace, visible from the street, should integrate with the building façade's lighting scheme and architecture. Lighting should be used to establish a perimeter around the space at the railing. No general lighting is required since enough light will spill out from the dining area during night operation.

Solution Method

The design, already in a preliminary conceptual design phase, will be developed further with the help of the comments from designers and additional 3D computer studies and renderings. Once a final design is established, the equipment required to achieve the goals will be determined and specified.

Tools

Computer programs will be used to visualize the space and assess performance. AGI32 will be used to calculate light levels in the spaces, and AutoCAD combined with VIZ will be used to create three-dimensional renderings showing how the light interacts with the surfaces and materials. Two-dimensional lighting plans will be created with AutoCAD. AGI32 will also be used to analyze daylight opportunities in the student dining area.

To assess energy density requirements, ASHRAE 90.1 2004 will be used. The New York City Building Code will be used to ensure that the design meets emergency egress guidelines.

Tasks

1. Finalize design with the help of comments from designers and further studies of the spaces.

2. Select equipment to accomplish both the aesthetic and technical goals.

3. Perform calculations using AGI32 to ensure that lighting levels are appropriate.

4. Perform LPD analysis to ensure that the design meets ASHRAE and possibly LEED certification in coordination with a sustainability breadth topic.

5. Create final renderings of the spaces using AutoCAD and VIZ.

6. Document the design with all appropriate support material.

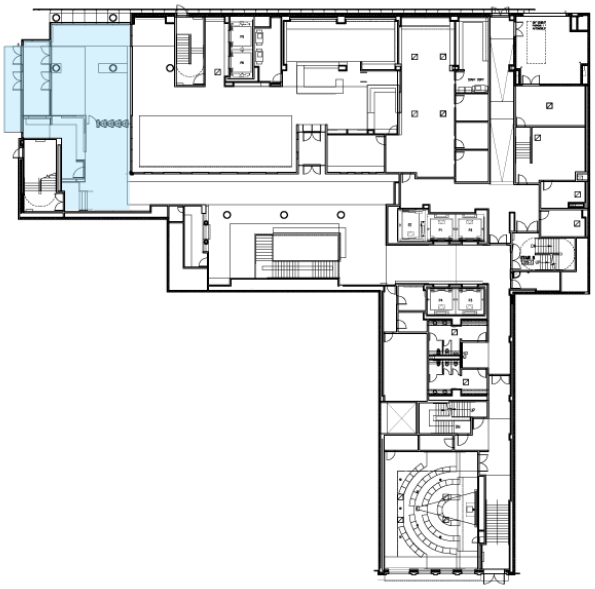
Electrical Depth Study

Four Spaces of Lighting Re-Design

The branch circuit distribution will be re-designed for all spaces that will be re-lighted. The four spaces of lighting re-design are as follows:

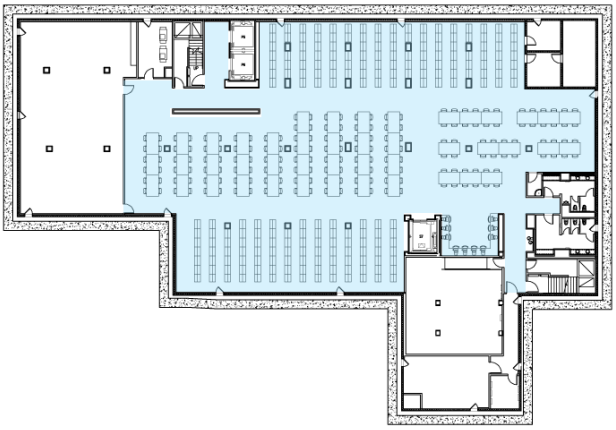
1. Main Entry Lobby (Circulation Space) – Level 1

Approximate size: 65’ x 28’ (~2000 SF)



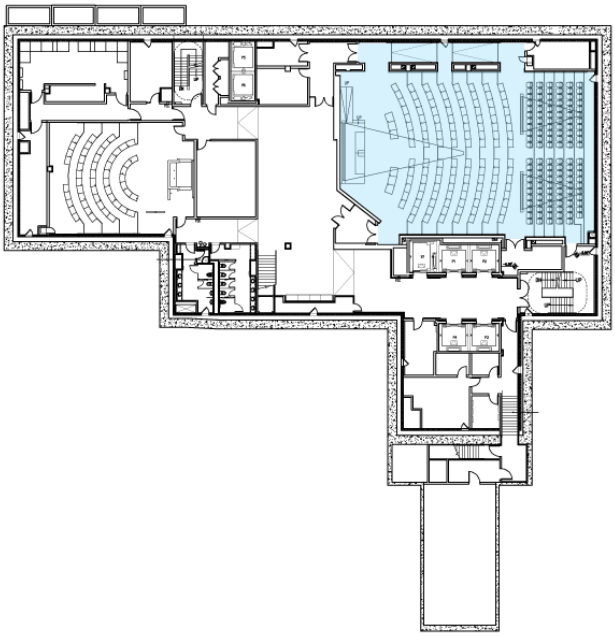
2. Library Stacks & Reading Room (Work Space) – Level B4

Approximate size: 120’ x 85’ (~10,000 SF)



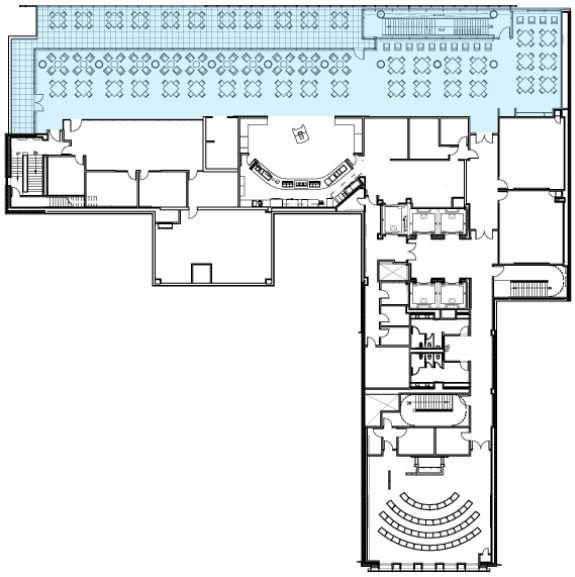
3. Auditorium (Special Purpose Space) – Level B1

Approximate size: 84’ x 54’ (~4500 SF)



4. Student Dining & Roof Terrace (Exterior Space) – Level 5

Approximate size: ~2000 SF (exterior)
~5500 SF (interior)



Protective Device Coordination Study / Short Circuit Analysis

A protective device coordination study will be performed for one path in a re-designed system. The path will be from a new 277V lighting load branch circuit (see Depth Topic 1) through the panel, distribution panel, feeders, and the switchboard service entrance. Short-circuit current will also be calculated along this path.

Selected Electrical Topic 1: Change Lighting from 120V to 277V

NYLS's New Community Facility currently uses a 208Y/120V system throughout the entire building. A building of this size may warrant a separate 480Y/277V system to serve lighting loads. Advantages could include decreased electrical distribution equipment size, fewer branch circuits, and lower voltage drop.

In order to achieve this new design, a transformer must be selected to step up the voltage. A distribution panel would also be needed at the new voltage. Lighting panels, branch circuit conductor sizes, and overcurrent protection devices also need to be reconfigured for the new design. Finally, 277V ballasts must be chosen for fluorescent fixtures.

After the system is redesigned, the advantages and disadvantages due to the changes will be analyzed. A recommendation will be made to keep the lighting at 120V or change it to 277V based on the cost and efficiency of each system.

Selected Electrical Topic 2: Energy Generation From Photovoltaic Arrays

Despite NYLS's New Community Facility's location in one of the densest urban environments in the world, energy generation from photovoltaics may be feasible due to building height restrictions in the immediate area. The building was designed to its height limit for its zone, so nearby buildings should not be tall enough to block significant amounts of sunlight.

A photovoltaic system will be designed, along with the distribution equipment necessary to integrate it into the building's existing electrical system. An optimal location will be chosen based on solar patterns and, potentially, shade from surrounding buildings. After the equipment is designed, electrical savings will be estimated. A payback period for the system will be calculated. Also, the number of potential LEED points will be determined, in coordination with a breadth topic of attaining a LEED rating for the building.

In order to perform the analysis, solar data for the geographic location will be used in AGI-32 computer models. This data will be used to calculate available light energy striking the building's roof area.

Breadth Topic 1: Sustainability

NYLS's New Community Facility is not designed with the goal of obtaining LEED certification. The building will be analyzed to determine ways of increasing sustainability and the feasibility of obtaining LEED certification. The changes additional to the lighting and electrical depth studies will be determined. If LEED certification is reasonable, a target level of certification will be recommended.

Breadth Topic 2: Façade System and Solar Loads

NYLS's New Community Facility features large areas of glass façade. In addition to allowing light into the building, this glass also creates solar heat gains and possibly heat losses due to poor insulation. The façade system will be studied to determine if a better system is available. The solar gains and heat losses of both the existing system and a re-designed façade will be calculated.

Timeline

Week	Focus	Goals
Winter Break	Lighting	Create 3D AutoCAD models of the four spaces Visit and photograph building sight
1.14 – 1.20	Lighting	Finalize design
1.21 – 1.27	Lighting	Choose equipment, calculate energy density
1.28 – 2.03	Lighting	Perform AGI32 calculations
2.04 – 2.10	Lighting	Document equipment and procedures
2.11 – 2.17	Electrical	Complete branch circuit redesign, short circuit calculations
2.18 – 2.24	Electrical	Complete 480Y/277V study
2.25 – 3.02	Electrical	Complete photovoltaic study
3.03 (Spring Break)	None	No work
3.10 – 3.16	Breadth	Begin work on breath topics
3.17 – 3.23	Breadth	Complete breadth topics
3.24 – 3.30	Lighting	Complete final renderings
3.31 – 4.06	All	Complete any remaining work
4.07 – 4.13	All	Finalize report and presentation
4.14 – 4.20		Prepare for final presentation