WHEELOCK COLLEGE CAMPUS CENTER AND STUDENT RESIDENCE
200 THE RIVERWAY, BOSTON, MA 02215

Thesis Proposal

Depth and Breadth Studies for AE 482

Anne Cheney

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Advisors: Prof. Dannerth, Prof. Holland, Dr. Houser

WHEELOCK
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EXECUTIVE SUMMARY

This proposal explains the work to be completed for AE 482 in the spring semester of 2009. The alterations to be considered are breadths in architecture and acoustics, and depths in lighting and electrical systems. The lighting depth will cover five spaces which will be redesigned. These spaces include the student lounge, conference room, cafeteria serving space, third floor roof deck and typical dorm room. The electrical depth will redesign the panelboards for the 5 spaces where the lighting will be redesigned, complete a protective device coordination study, analyze the feasibility of changing the lighting from 120V to 277V and complete an analysis of the electrical system including a short circuit analysis, protective device coordination and arc fault study. The architecture breadth will comprise of redesigning the glazing on the first floor of the building to provide better daylight control. The acoustical breadth will be comprised of a reverberation and STC analysis for the lounge on the first floor. After analyzing the space I will consider changing the materials based on the results.

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BACKGROUND

THESIS OVERVIEW

The architectural engineering thesis will be completed as part of a Bachelor of Architectural Engineering degree from The Pennsylvania State University.

BUILDING OVERVIEW

The Wheelock College Campus Center and Student Residence is currently under construction in Boston, Massachusetts. The project site is on the Wheelock College Campus on The Riverway. This 60,000 square foot addition to the campus is the first construction in 40 years and will cost $23 million. The building is a multi-use facility that will serve as a dormitory, cafeteria, student lounge, office space, café and conference room. The modern architecture makes this building stand out against the other buildings on the Wheelock campus. Construction began in September 2007 and is expected to be completed by January 2009.

DEPTH PROPOSAL: LIGHTING

COMMENTS FROM LUTRON

Andrea:

- Said "um" too many times
- Keep projecting voice to reinforce design so speech is not distracting
- Had some fun with the design (good)
- Try not to get nervous so they can hear the words
- Show details and refine the design

Mike:

- Trailed off words, too quiet at some points
- Flow and consistency of presentation were off
- Overall the design was very good
- Vertical and horizontal light levels are not necessary
- Add details to show how things will be lit (ex. Columns)
- The color is cool in the conference room
- Wall grazing on the marker board- feasibility
- Look at a piece of the serving space area- blow it up
- Add bits of text and imagery
- How do the areas tie together?
- Ambient glow to the roof deck- how will that happen?
- The light low on the roof deck was a good idea- draw in bigger trees
- Show how the dorm room will be homey
- Students will break things- the design has to be durable
- Don't need two slides for the serving area because it is the same design.
- Emphasize the low ceiling more
- Orient more in the serving area

Shawn:

- Be passionate when presenting
- Presentation- each section with design space with all information is unnecessary

- Considerations and criteria - don't need illuminance levels
- Slow down when going through the lounge slides
- Light in the right places, but need hierarchy
- Design considerations – conference room visual clarity
- Roof deck- great concept
- Technical issue with recessed fixtures on the roof deck
- No north arrows

CURRENT SYSTEM

The existing lighting system in the Wheelock College Campus Center and Student Residence building utilized mostly fluorescent lighting to create adequate light levels while producing a visually appealing space. Some of the spaces require different scene settings, and the current lighting solution does little to address this.

One of the key elements of my building is a curving sense of flow, and the lighting does not reflect this feeling. This element of flow and curving is apparent not just in the shape of the building, but also in the café on the first floor and in the cafeteria serving space on the second floor. The current lighting is very structured and orderly, which doesn't fit with the whimsical theme of the building.

PROPOSED REDESIGN

The lighting will be redesigned for five spaces in the Wheelock building. The spaces are the lounge and conference room on the first floor, the cafeteria serving area on the second floor, the outdoor roof garden on the third floor, and a typical two-bed dorm room on the 4th floor. Although the existing system satisfies the majority of the requirements outlined in the first technical report, alternative solutions to the design challenges will be examined. Overall, the new lighting system will provide the building with a modern feeling to match its architecture.

Student Lounge: The student lounge will be redesigned to combine the softly curving feeling of the space with an effective lighting solution. The wood panels on the walls will be accentuated with a warm wash of light curving through the space, while the columns across from the wall will have sconces to mirror light on both sides

of the space. Ambient light will be maintained throughout the space with a series of downlights. LED handrail lights will lead students up the large staircase to the rest of the building.

Conference Room: The conference room will be lit in a way that helps to promote visual clarity. There will be uniform illumination on the task plane (in this case the conference table). Special attention will also be paid to the wood paneled wall on the west side of the room. There are windows to three sides of the room, so daylight from the north and east should be taken into account.

Cafeteria Serving Area: The lighting for the cafeteria serving space should lead students to the serving counters, as well as promote circulation throughout the space. There should also be adequate light levels in the preparation areas. The serving counters will be the highlighted portion of the room, both with grazing along the front, and with suspended pendant fixtures illuminating the food.

Roof Deck: The roof deck will emphasize the interesting shape of the building. Path lights will lead occupants out onto the main portion of the deck, while horizontally oriented luminaires spread light throughout the space. Some plants will also be illuminated throughout the space to bring about a feeling of relaxation and nature within the space.

Typical Dorm Room: The main lighting in the dorm rooms will be functional and durable as well as visually comfortable. Task lights will emphasis the task planes on the desk as well as in the closet.

TASKS AND TOOLS

Tasks:

1. Schematic Design:
   The schematic design phase will be completed at the end of the fall semester. The designs will be presented at Lutron and review by professionals. The designs will be modified based on the feedback of the professionals.
2. Construct 3D Models:
   The spaces will all be modeled three dimensionally using AutoCAD 2008.
3. Fixture Selection

Appropriate fixtures and equipment will be chosen based on the requirements of the spaces and the schematic designs. Custom fixtures will be designed when applicable.

4. AGI-32 Renderings:

   I will use AGI-32 to create renderings and perform lighting level calculations on the spaces with specified fixtures. A comprehensive analysis will be performed on the lighting levels and criteria, and adjustments will be made to the final designs as necessary.

5. Documentation:

   Documentation for this thesis will include lighting plans, fixture schedules, calculations and fixture cut sheets.

Tools:

This thesis will be designed within the regulations of ASHRAE Standard 90.1. The IESNA Handbook will provide guidelines for the lighting designs in this building. Justification will be provided if the design differs from the IESNA recommendations. Design criteria outlined in Technical Report I and Technical Report III will be utilized to evaluate the redesigns. Schematic designs will be created using Adobe Photoshop. AGI-32 will be used to provide renderings and verify calculations.

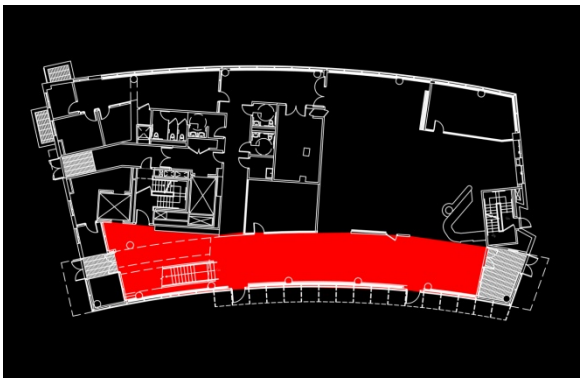
DEPTH PROPOSAL: ELECTRICAL

CURRENT SYSTEM

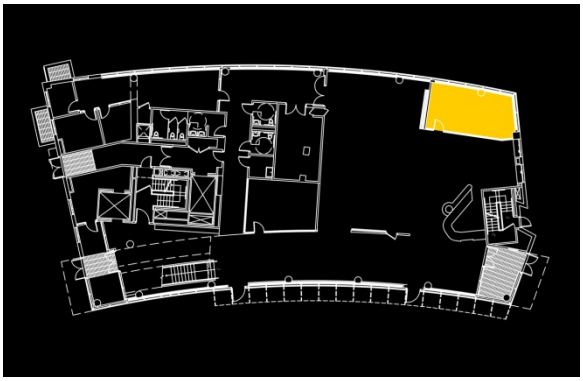
The building runs on a 480/277V, 3 phase, 4 wire system and is connected to the NSTAR distribution system. The lighting for the building is a combination of 120V and 277V. The transformer supplies a main switchboard which distributes power to the rest of the building. A diesel generator provides emergency power to the building through an automatic transfer switch.

SOLUTION

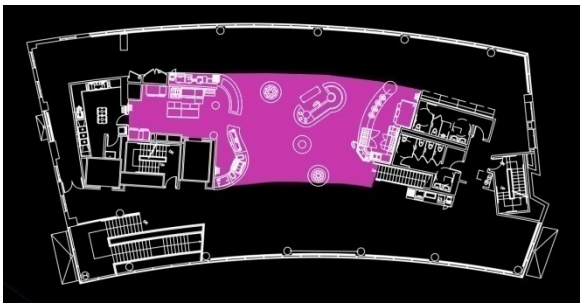
The branch circuits will be redesigned for the 5 spaces for which the lighting will be redesigned. Those spaces are the student lounge and the conference room on the first floor, the cafeteria serving area on the second floor, the outdoor roof deck on the third floor, and a typical dorm room on the fourth floor.



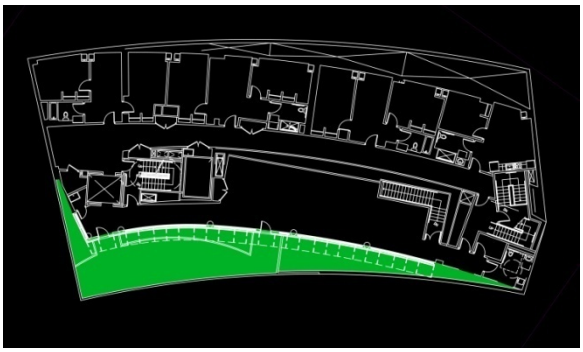
Conference Room



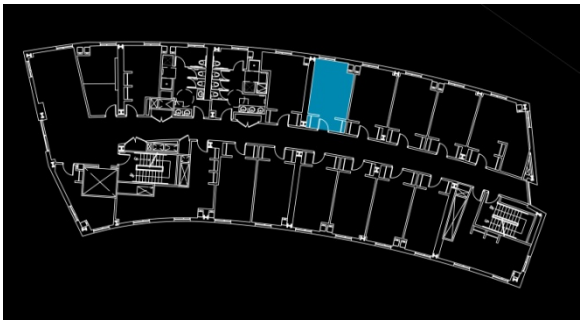
Conference Room



Serving Area



Third Floor Roof Deck



Typical Dorm Room

A protective device coordination study will also be performed to address a single-path through the distribution system. Calculations for a short circuit analysis will be included.

An analysis will be performed based on the benefits of changing from a mixture of 120V and 277V lighting system to only a 277V lighting system throughout the building. Converting the lighting system to a higher voltage will require smaller wire sizes and may reduce the building cost.

An in depth short circuit analysis, protective device coordination and arc fault study will also be performed for the entire distribution system. This study will begin at the service entrance and cover all panelboards in the building.

TASKS AND TOOLS

Tasks:

1. Redesign the electrical panelboards in the 5 spaces where the lighting was redesigned
2. Complete a protective device coordination study
3. Analyze the feasibility of changing the lighting from 120V to 277V.
4. Complete an analysis of the electrical system including short circuit analysis, protective device coordination and arc fault study.

Tools:

The electrical system will be designed to the specifications of ASHRAE 90.1 and the 2008 version of the NEC code. The short circuit analysis, protective device coordination and arc fault study will be performed using SKM software. AutoCAD 2008 will be utilized for electrical drawings.

BREADTH PROPOSALS

ARCHITECTURE

The architectural breadth study will comprise mainly of the south facing façade on the first floor of the building. The glass materials will be redesigned with an alternative material to provide better daylight control to the first floor lounge. The sun shades, which currently help to control the daylight entering the space, will also be studied and redesigned. Both of the redesigns will involve daylight calculations and cost analysis for new materials. The final report will include design documentation and renderings.

ACOUSTICS

Acoustics in a large gathering space is very important to maintain a level of comfort and intelligibility of intimate conversations. I will complete a reverberation time analysis for the lounge on the first floor of the building. The lounge is a main circulation space for the building, but also a place for students to study and do homework. After analyzing the spaces I will decide if alternative materials and changes are needed. If the acoustical results are undesirable, products will be selected and the layout may be altered to optimize acoustical performance.

Anne Cheney
Time Schedule
Lighting|Electrical
January 10, 2009

Wheelock College
Campus Center and Student Residence
200 The Riverway, Boston, MA 02215
Dannerth/Houser

TIME SCHEDULE																
	WEEK 1 1/11-1/17	WEEK 2 1/18-1/24	WEEK3 1/25-1/31	WEEK 4 2/1-2/7	WEEK 5 2/8-2/14	WEEK 6 2/15-2/21	WEEK 7 2/22-2/28	WEEK 8 3/1-3/7	WEEK 9 3/8-3/14	WEEK 10 3/15-3/21	WEEK 11 3/22-3/28	WEEK 12 3/29-4/4	WEEK 13 4/5-4/11	WEEK 14 4/12-4/18	WEEK 15 4/19-4/25	WEEK 16 4/26-5/2
Schematic Design									S					P		
Construct 3D Models									P					R		
Fixture Selection									R					E		
AGI-32 Renderings									I					S		
Redesign Panelboards									N					E		
Protective Device Coordination									G					N		
Change Lighting from 120V to 277V														T		
Complete SKM Analysis									B					A		
Acoustics									R					T		
Architecture									E					I		
Documentation									A					O		
Write report									K					N		
Write presentation																
ABET Assessment Chart																
Reflection																
Complete CPEP Site																