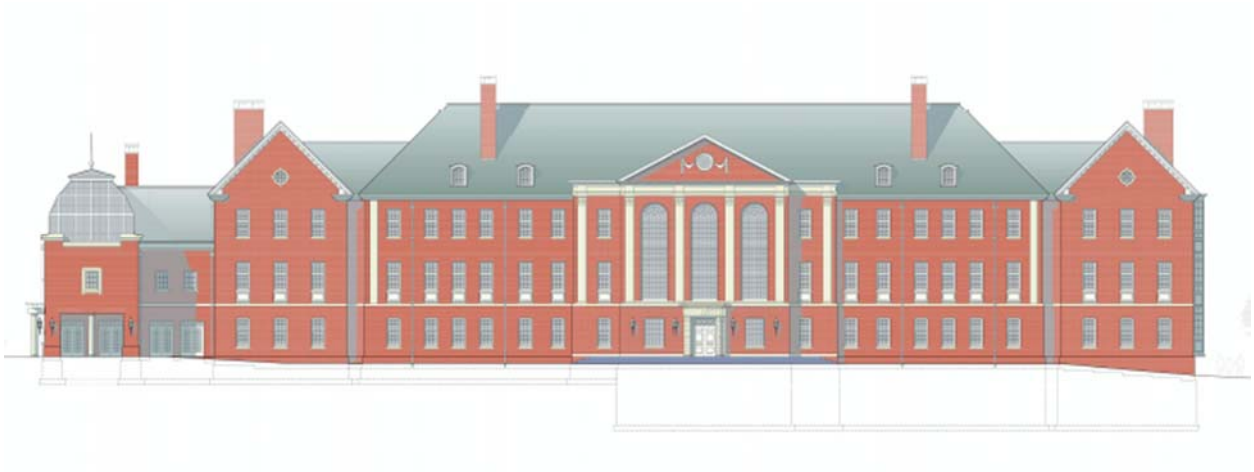
Proposal for Spring Research:

Revision 2



Ann and Richard Barshinger Life Sciences & Philosophy Building
Franklin & Marshall College
Lancaster, PA

Jason Weaver
Lighting Advisor: Dr. Mistrick
Electrical Advisor: Prof. Dannerth
Lighting/Electrical Option
1/20/2008

Executive Summary

The following proposal will detail the means, methods, and points of emphasis in the redesign phase of the thesis project. I have selected some different goals than the original design of the Barshinger Life Sciences & Philosophy Building, but in the end I hope to create spaces that match the quality of the original design, with distinct advantages over that design. This project will involve two depth studies (in lighting systems and electrical systems) as well as two breadth studies (in acoustics and sustainability).

The lighting depth will study four spaces in detail. This includes a lecture hall, laboratory classroom, atrium/lobby, and the main exterior entry. The particular goals of the redesign are to create more exciting spaces (or in the case of the lab, more task-specific lighting throughout the space), to maintain aesthetic appeal, and to be energy and cost-efficient. The lecture hall ceiling will be re-designed to remove the coves, and attention needs to be made to the light distribution on the desks below and the presentation area. The laboratory will be a layout that is more conducive to learning and is more flexible during after hours. In the atrium, another cove will be removed, and a custom chandelier/decorative fixture will be designed specifically for the space. Finally, the entry and façade will emphasize the elements of the building that set it apart from the other buildings at Franklin & Marshall College, and create a secure & pleasing nighttime environment.

The electrical depth will cover two main topics. The first is an analysis on using one or two transformers from 480V to 208Y/120V would be more beneficial than the current layout of multiple transformers per floor. The second will be an analysis of the effects of changing the feeder material from copper to aluminum. In addition, I plan to redesign the branch circuits for the lighting in the four re-designed spaces, and to conduct a protective device coordination study from the main switchboard to the new downlights in the atrium, which will be on an emergency panel.

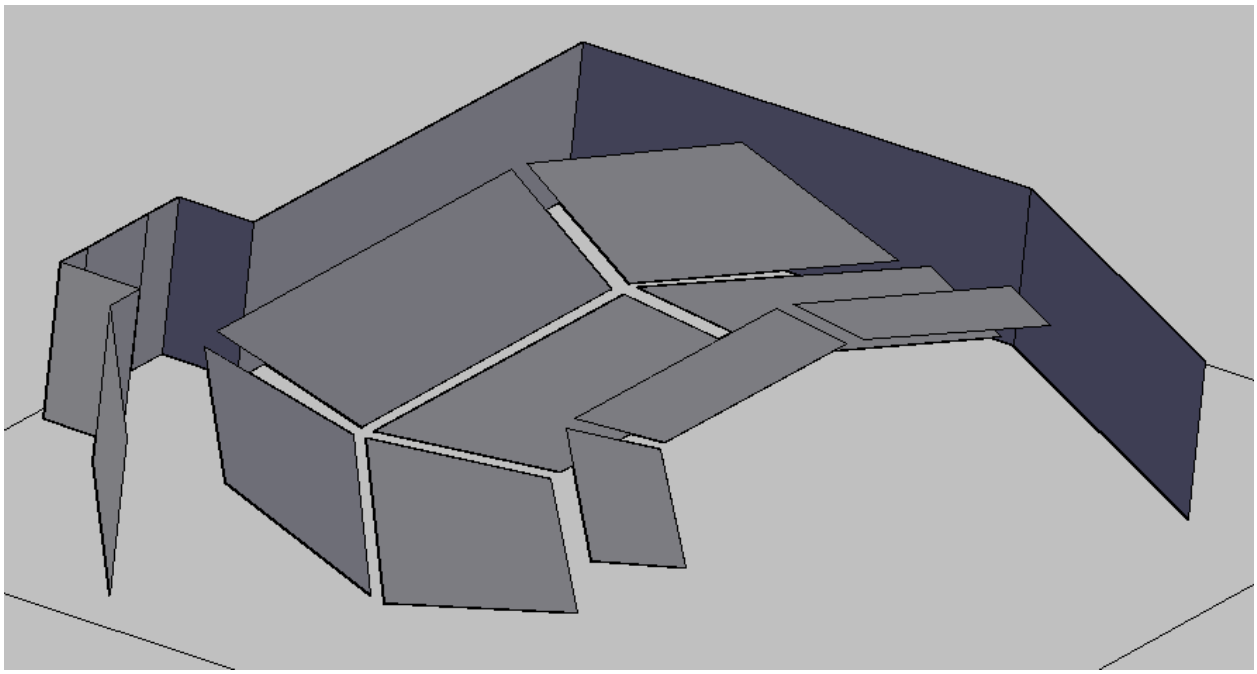
The acoustics breadth will study the impact of the new dropped ceiling in the lecture hall on the acoustical quality of the space. The study will help determine what materials the dropped ceiling needs to be made of, as well as any additional aspects the space to have a reasonable reverberation time.

The mechanical breadth will study the impact of the new dropped ceiling on the layout of the ventilation system in the lecture hall. Because this ceiling is at different heights, and there are plans for gaps in the ceiling where at one point there were diffusers, this becomes a necessary exercise. An analysis will have to be performed to ensure that the environmental quality of the space is the same or better than it was previously.

Lighting Depth

Space 1 – Lecture Hall

The key part of the re-design efforts here will be the change of the ceiling from a linear cove to a dropped ceiling that better matches the layout of the furnishings below. A current schematic of the proposed ceiling is below:



At present, the design will involve downlighting (linear, in line with the furnishings and ceiling) recessed into the dropped ceiling, round downlights over the back paths, ramp, and exits, and directional lights specifically for lighting the speaker and chalkboard. This last one will have to be studied thoroughly, as the light on the projection screen here must be kept to a minimum.

Space 2 – Atrium

The major new design feature of this space will be a chandelier / decorative fixture as the focal point of the space. At present, the design concept involves using luminous discs, with a theme of three coming together as one to represent the departments coming together in one building for the first time. Also in the plans are a layout of HID downlights for 24-hour use, and accent lighting on the artwork and recognition wall.

Space 3 – Laboratory

The basic design here will be fairly simple: recessed/semi-recessed linear downlights over all workstations, wall-washing for the cabinetry, and a chalkboard light in the front.

The key design here will be the switching/zones of the system. The goal is to get a design that can be replicated in all of the labs of the building (which are all of similar size and layout), and that allows a user to turn on a limited zone of lighting rather than every light in the rooms.

Space 4 – Façade/Entry

Here, I want to emphasize the key elements of the façade that set it apart from the other buildings around it (besides the sheer size), as well to focus on the elements that made it a strong example of Georgian-revival architecture. This includes uplighting the pilasters, making the pediment glow, and putting a good amount of light on the main entrance. In addition, I plan to look at a more cut-off luminaire for lighting the paths leading to the building, replicating that on the smaller scale to light the entry area, and recessed linear fluorescent into the ramp side walls for even lighting of the ramp.

Means and Methods for All:

Preliminary analysis of approximate sources and lighting needs will be done using the IESNA Handbook, the print version of the plans, and Excel. Full calculation analysis will primarily be done in AGI, and imaging will be done using AGI32 and Autodesk VIZ. Design of spaces and custom luminaires will be done with sketching and AutoCAD.

For any further details on schematic design or the architecture of the space, please see the Technical Assignments on my website:

http://www.engr.psu.edu/ae/thesis/portfolios/2008/jpw202/tech%20assign.htm

Electrical Depth

Part 1 – Four Spaces to be Redesigned

The four spaces that I will be focusing on will be a 3-story atrium, a first-floor lecture hall, a second-floor laboratory, and the main entry/façade.

Part 2 – Extent of the Short Circuit Anaylsis

I want to perform a protective device coordination and short circuit analysis starting from the main switchboard to the new HID lighting in the atrium. This lighting will be on the emergency system (and will be supported by an HID backup ballast to maintain the arc during the switch from normal to emergency). Therefore, the path will be from the main switchboard to the 400A automatic transfer switch to the emergency distribution panel (EQD4P) to the HID lighting (with the possibility of a lighting panel in between).

Part 3 – Electrical Depth Topics

Topic A – Using Aluminum Feeders vs. Copper Feeders

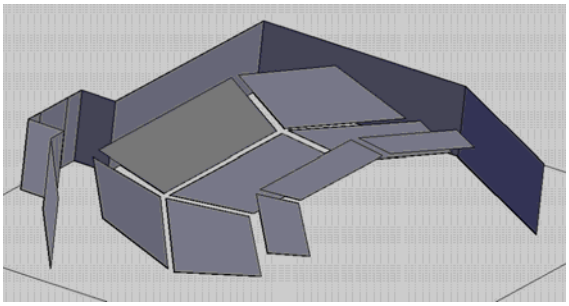
I have decided to analyze changing the copper feeders throughout the building. The sizing of the wire will invariably go up. That said, given the size of the building and the length of some of these runs, there may be the potential to save quite a bit of money overall. Therefore, this exercise will involve re-sizing feeders for every panelboard and will involve a cost analysis study.

Topic B – Using a Central Transformer vs. Distributed Transformers

The current design uses multiple transformers on each floor converting the voltage from a 480V Delta system to a 208Y/120 system. In an attempt to lower costs and simplify the system, I am proposed using only two: one for normal power and one for normal/emergency power. The normal transformer would be located in the main electrical room, and the n/e transformer would be located in the penthouse electrical room. This involved analyzing voltage drop and the main bus ducts more thoroughly.

Acoustics Breadth

The acoustics breadth will study the impact of the new dropped ceiling in the lecture hall on the acoustical quality of the space. This space is critical to the building, as all guest lectures will be heard in this space, as well as many normal lecture courses. Sound waves need to carry to the very ends of the space (overflow seating is along the back wall) and reverberation time needs to be limited to a reasonable amount. The study will help determine what materials the dropped ceiling needs to be made of, as well as any additional aspects the space to have a reasonable reverberation time. A preliminary concept for the ceiling is below.



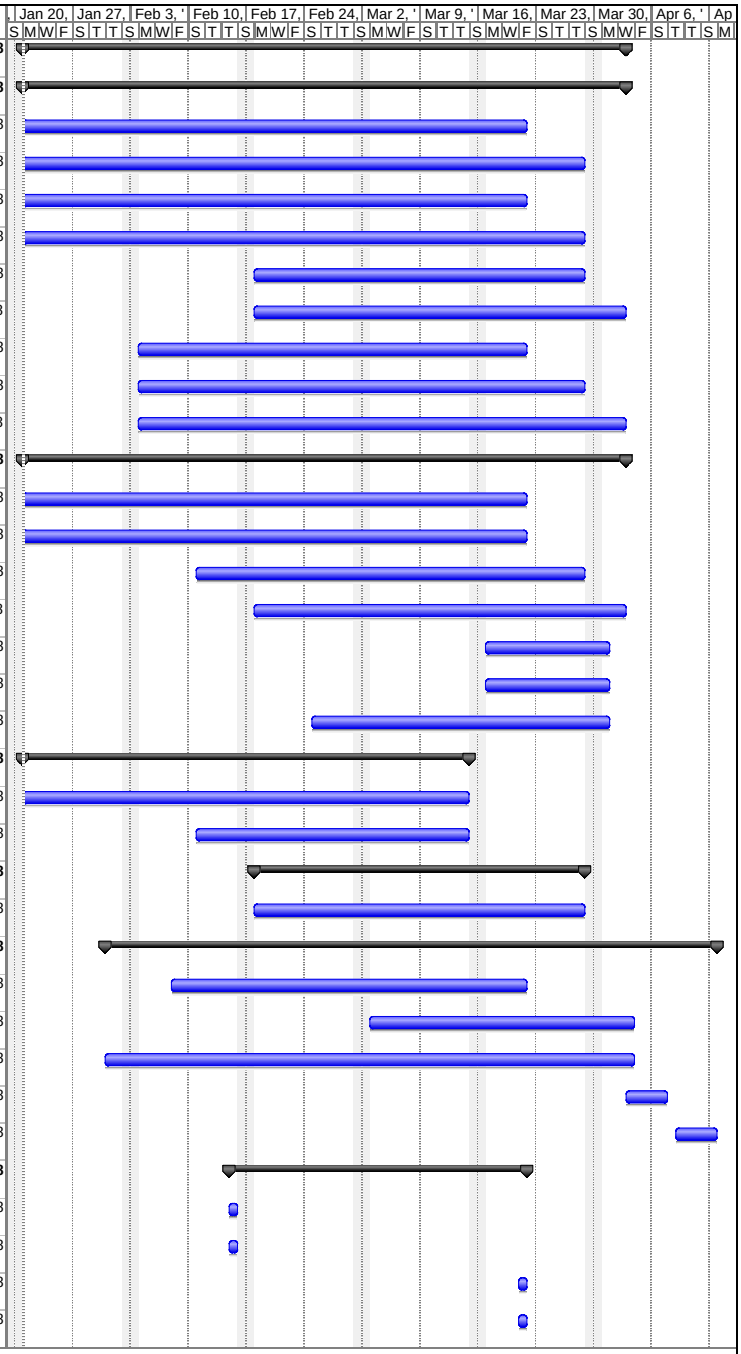
Mechanical Breadth

The mechanical breadth will study the impact of the new dropped ceiling on the layout of the ventilation system in the lecture hall. Because this ceiling is at different heights, and there are plans for gaps in the ceiling where at one point there were diffusers, this becomes a necessary exercise. It may also be necessary to change the location of the main ducts. An analysis will have to be performed to ensure that the environmental quality of the space is the same or better than it was previously.

Appendix A:

Timetable

ID	Task Name	Start	Finish
1	**Depth Work**	**Mon 1/21/08**	**Wed 4/2/08**
2	**Lighting Depth**	**Mon 1/21/08**	**Wed 4/2/08**
3	Lab Lighting Design and Anaylsis	Mon 1/21/08	Fri 3/21/08
4	Lab Images and Graphics	Mon 1/21/08	Fri 3/28/08
5	Façade Lighting Design and Anaylsis	Mon 1/21/08	Fri 3/21/08
6	Façade Images and Graphics	Mon 1/21/08	Fri 3/28/08
7	Lecture Hall Lighting Design and Analysis	Mon 2/18/08	Fri 3/28/08
8	Lecture Hall Images and Graphics	Mon 2/18/08	Wed 4/2/08
9	Atrium Custom Fixture Design	Mon 2/4/08	Fri 3/21/08
10	Atrium Lighting Design and Analysis	Mon 2/4/08	Fri 3/28/08
11	Atrium Images and Graphics	Mon 2/4/08	Wed 4/2/08
12	**Electrical Depth**	**Mon 1/21/08**	**Wed 4/2/08**
13	Façade Circuiting and Controls	Mon 1/21/08	Fri 3/21/08
14	Lab Circuiting and Controls	Mon 1/21/08	Fri 3/21/08
15	Atrium Circuiting and Controls	Mon 2/11/08	Fri 3/28/08
16	Lecture Hall Circuiting and Controls	Mon 2/18/08	Wed 4/2/08
17	Protective Device Coordination Study	Mon 3/17/08	Mon 3/31/08
18	Analysis of Aluminum vs. Copper Feeders	Mon 3/17/08	Mon 3/31/08
19	Analysis of Central vs. Distributed Transformers	Mon 2/25/08	Mon 3/31/08
20	**Breadth 1 - Acoustics**	**Mon 1/21/08**	**Fri 3/14/08**
21	Lecture Hall Ceiling Design	Mon 1/21/08	Fri 3/14/08
22	Acoustical Analysis	Mon 2/11/08	Fri 3/14/08
23	**Breadth 2 - Mechanical**	**Mon 2/18/08**	**Fri 3/28/08**
24	Lecture Hall Diffuser/Equipment Layout	Mon 2/18/08	Fri 3/28/08
25	**Clerical Work**	**Thu 1/31/08**	**Sun 4/13/08**
26	Initial Writings	Fri 2/8/08	Fri 3/21/08
27	Revisions	Mon 3/3/08	Thu 4/3/08
28	Tables and Charts	Thu 1/31/08	Thu 4/3/08
29	Finalization and Binding	Thu 4/3/08	Mon 4/7/08
30	PowerPoint Presentation	Wed 4/9/08	Sun 4/13/08
31	**Interim Presentations**	**Fri 2/15/08**	**Fri 3/21/08**
32	Lighting 1 - Lab and Façade	Fri 2/15/08	Fri 2/15/08
33	Electrical 1 - Lab and Façade	Fri 2/15/08	Fri 2/15/08
34	Lighting 2 - Atrium	Fri 3/21/08	Fri 3/21/08
35	Electrical 2 - Electrical Depths	Fri 3/21/08	Fri 3/21/08



Project: Senior Thesis - Jason P. Wea
Date: Mon 1/21/08

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline