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Virginia Commonwealth University Life Sciences Building
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Depth Work- Part I: Lighting Design

The Virginia Commonwealth University Life Sciences Building is a laboratory and classroom building that features a greenhouse, an animal facility, and an aquatics facility. There is a lot of research being performed here along with demonstrations, lectures, and guest speakers. The current lighting design consists of task specific lighting with controls also tailored to the tasks being performed in that space. However, there is room for improvement.

The first space being looked at is the lobby area on the first and second floors of the laboratory building. This is a transition space between the outside and inside on the first floor. It is also a person's first view of the building. The second space is the genetics laboratory on the second floor of the laboratory building. There is a lot of intense research being performed in this space which requires excellent lighting. Lectures and demonstrations can also be performed here. The southern auditorium in the classroom building is the third space. Large lectures and guest speakers using marker boards or the projector screen require flexible light levels so that everyone in the hall can adequately see the presentation. The final space is the exterior space between the classroom and laboratory buildings and also encompasses the main campus entrance to the laboratory building. Since the laboratory building is 3 stories tall and the classroom building 2 stories tall, the space between them is narrow causing a difficult space to adequately light at night.

A schematic design proposal was presented at Lutron to a panel of lighting designers. There was a lot of great feedback received which can be viewed at http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/LCR128/Lutron%20Comments.pdf . The presentation can also be viewed at http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/LCR128/Technical%20Report%203.pdf .

These designs will be further developed with the use of AutoCAD and AGI 32. Three dimensional models will be built in AutoCAD for each of the spaces and then imported into AGI 32. After luminaires and lamps have been selected, the IES files will be inserted into the AGI models to calculate and render the spaces. The results of this will then be analyzed based on the design goals and criteria.

Depth Work- Part II: Electrical Design

The Virginia Commonwealth University Life Sciences Building currently receives power from a utility transformer that feeds into a typical radial system. Emergency power is also generated on-site through the use of a 900kW diesel generator.

The branch circuit distribution will be redesigned for the four lighting spaces that are being redesigned. A protective device coordination study will also be performed. The electrical scope of work will also include the new loads generated during the mechanical breadth. The HVAC system will be redesigned to be a combined heat and power system with a low emissions generator providing power for the building. This generator will provide power to the rooftop units currently in place. Currently there are transformers distributed throughout the building. An analysis will be performed on the difference between this current system and central transformers on each level of the building.

Breadth Work- Part I: Mechanical Design

The current mechanical system for The Virginia Commonwealth University consist of a desiccant system for the greenhouse and eight rooftop units for that serve the rest of the building. Two of these units are dedicated to the animal facility and aquatics facility. They are 100 percent outdoor air and are also connected to the emergency generator. Two more units are 100 percent outdoor air for the laboratory spaces. Finally, there are four units that use re-circulated air, two for the remaining spaces in the laboratory building and two for the classroom building. This system is powered by the utility transformer. There is also an emergency diesel generator onsite that is a 900kW.

For this breadth, I would like to place a low-emissions generator onsite to power all of the rooftop units. An analysis of this system compared to what is in place will then be performed.

Breadth Work- Part II: Construction Management Cost Analysis

After the mechanical redesign takes place, a lifecycle cost analysis will be performed on the new system that is powered by the low-emissions generator. This will help to determine which system would be the most economical.

Spring Semester Schedule

SPRING SEMESTER SCHEDULE	
Week	Task
1/15- 1/20	Finalize fixture selections, layouts, and spacing of luminaires. Collect cutsheets, ballast, and lamp information
1/21- 1/27	Work on AGI 32 models for each space
1/28- 2/3	Finalize AGI 32 renderings.
2/4- 2/10	Redesign branch circuits for lighting spaces and begin analysis of central transformers and protective device coordination study
2/11- 2/17	Finalize central transformer analysis and protective device coordination study
2/18- 2/24	Begin mechanical analysis of low emissions generator
2/25- 3/3	Finalize mechanical analysis of low emissions generator
3/4- 3/9	Perform cost analysis of redesigned lighting and electrical systems
3/10- 3/18	SPRING BREAK!
3/19- 3/24	Perform cost analysis of redesigned electrical and mechanical systems
3/25- 3/31	Write the final report
4/1- 4/7	Write the final report (Final Electrical due 4/6) and begin powerpoint presentation
4/8- 4/12	Complete final report and powerpoint presentation (Final report due 4/12)
4/16- 4/18	Thesis Presentations