

Executive Summary

The Depth and Breadth Thesis Proposal will combine the study of multiple systems of the Rio Hondo Library and Learning Resource Center. Being located in California, and striving to achieve LEED status this building is a candidate for becoming as much of a GREEN building as possible through sustainable design.

The Depth Proposal in the lighting design includes the redesign of four spaces. Creating a clean and warm atmosphere, the lighting shall shine forth as a beacon for the Rio Hondo Campus. The design of the lighting systems shall push for the most energy efficient system that still accomplishes the goal of a lantern effect. The lighting design will include an in-depth look into the daylight delivery system and how to save energy by using natural light. The design shall be LEED compliant and meet the standards of ASHRE 90.1.

The Depth Proposal will also include an alternative solution to the electrical system of the building. Rio Hondo currently is comprised of two distribution panels and the alternative would be to try and combine these panels into one distribution panel. This would call for resizing all the components of the electrical system. A cost comparison will be included for the combining into one larger distribution panel compared to two smaller distribution panels. This alternative solution will then be compared to the existing electrical system.

In addition to the lighting and electrical depth work, a breadth work of the mechanical system and the construction management option will be conducted. After the daylight studies are investigated, the effect on the building loads will be adjusted accordingly and the cost evaluated. Window sizing and glazing configurations will be considered for the minimal sizing of the mechanical loads. The use of a daylight system with an electric dimming control system will add to the savings. The payback time will be evaluated compared to the larger upfront cost of the systems.

A total analysis of the spaces will provide alternative solutions to a more GREEN building.

Background

Rio Hondo Library and Learning Resource Center is due to break ground late in 2006. The building is scheduled to open in 2008. The new Library and Learning Resource Center is 93,740 s.f. It is located on the lower quad of the campus and is designed to emphasize the surrounding landscape. Inside the two stories building the library area is located on the second floor while the learning centers are located on the first floor. The learning center is comprised of offices, lecture halls, study rooms, and studios. The second floor consists of more open spaces with the stacks and large reading area. The main function of the building is to educate in a variety of different settings. The overall cost of the project is 27.3 million dollars.

Depth Analysis: Lighting Design

Lighting design is not just the placement of lights, but the concept and feeling it portrays as well. ASHRAE 90.1 and LEED both have to be observed, while creating different atmospheres for different spaces. Rio Hondo Library and Learning Resource Center aims to be a beacon for the campus and shall be emphasized with the light.

In becoming a beacon, a lantern for the community, the library needs to feel warm and inviting, so people feel welcome and want to be in that space. Four spaces were chosen to accomplish these atmospheres: Lobby, Microfilm and Reading Area, Stacks, and Exterior Façade. The redesign of the exterior will highlight the architectural features while providing the lantern effect for the community. The three other spaces will achieve a clean, warm environment that will invite students to learn in a comfortable atmosphere.

After satisfying ASHRAE 90.1 the next goal will be the highest LEED credit possible for the building. The goal of the lighting design will be to achieve the correct light levels while minimizing the power consumption and maximizing the natural daylight.

A full report of the lighting design proposal can be found by viewing the Schematic Design Proposal in the Technical Report Section at <http://www.arche.psu.edu/thesis/eportfolio/current/portfolios/jlm604/tech-assign.htm>.

Tasks and Tools

The lighting design will require the use of AGI32 to calculate the spaces to ensure the correct light levels in the spaces. Daylight studies will also take place using AGI32. The use of hand sketches will portray the schematic lighting design. When the daylight studies integrate with the correct light level and the atmospheres are achieved, the spaces will be rendered in VIZ.

Depth Analysis: Electrical Design

Rio Hondo currently contains a simple distribution system containing two distribution panels that feed multiple panelboards. Several of the panels contain much room for growth and might be able to be combined. After consulting with Mr. Edward Wunderly, it was thought that the two distribution panels may be combined in a cost savings effort. Combining the two panels will save money in the fact that there will only be one distribution panel but will have to be compared to the rise in price due to the one larger distribution panel compared to two smaller. The distribution will have to be resized along

with all the panelboards, protective devices, and feeders in hopes that panels will be able to be combined. After the redesign is completed, a cost/benefit analysis will decide which system is a better choice for the building.

The lighting design will also affect the sizing of the equipment and wiring to run the system. The new loads will be calculated including the new lighting design. All electrical equipment will then be resized for the new design.

A full report of the existing electrical systems can be found by viewing the Existing Electrical Conditions and Building Load Summary at <http://www.arche.psu.edu/thesis/eportfolio/current/portfolios/jlm604/tech-assign.htm>.

Tasks and Tools

NEC 2002 will be used for resizing equipment

Breadth Proposal

All the details of a system need to be investigated to have a complete and better understanding of whole system. The electrical system contains details of different systems that affect the whole electrical system. So to analyze the electrical fully the mechanical system needs to also be investigated. With the redesign of the new lighting systems and daylight integration the loads on the mechanical side will change which could affect the sizing of the mechanical equipment. Resizing the mechanical equipment will cause the electrical to be resized accordingly. As all systems undergo a change the cost of the project will also change. GREEN buildings have a higher upfront cost so a payback time will have to be investigated to see if the changes are worth the cost.

Breadth Analysis: Mechanical Design

Throughout the Rio Hondo building daylight integration is a key feature. However, it is unknown if the existing design systems are the best choice for maximum daylight integration with load minimization. Different glazing and window types will be investigated to try and achieve this daylight maximum and load minimization.

After the best design is complete a more in-depth look into the mechanical loads will be done to see if the equipment needs resizing. Both the lighting and electrical systems combine with this breadth to give the building a more united overall system.

Breadth Analysis: Construction Management

Being that this is a LEED building and is striving to become a GREEN building, the initial costs of the changes in all the systems will be higher. With all the daylight integration and control systems that will have to be placed in most of the spaces of the building the initial cost will have to be compared to the payback period of the energy savings over time. A reasonable payback period will be worth the higher upfront cost of the building. It will not just be money savings over time, but energy savings which will ensure a better environment in the future, a goal of GREEN and LEED buildings.

Schedule: 2006

Week of	Task to be Completed	Duration
1/9/06-1/18/06	(exact) 3d models in CAD for VIZ and AGI	1.5 weeks
1/16/06-2/15/06	Daylight integration system combined with lighting design	5 weeks
2/15/06-3/3/06	Mechanical load calculations and compilation	2.5 weeks
3/4/06-3/11/06	Cruise in the Carribbean	1 week
3/12/06-3/17/06	Redesign of electrical systems	3 days
3/17/06-3/22/06	Construction Management	6 days
3/22/06-3/29/06	Finalize everything	1 week
3/29/06-4/3/06	Write booklet	5 days
4/3/06-4/9/06	Powerpoint	1 week