



Senior Thesis Final Report

University of California, Riverside Student Recreation Center
Riverside, CA

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Lighting/ Electrical Option
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Executive Summary

This report is a summary of the analyses and design work that was completed during the Penn State Architectural Engineering's Senior Thesis Capstone course. It includes the redesign of four lighting spaces, three topics of study concerning the electrical system and three breadth topics outside of the lighting/electrical field of study. These redesigns and analyses were solely for the purpose of investigating other design alternatives that were not used in the original design of the building.

The four spaces in which the lighting was redesigned are the entrance and courtyard space, the lobby, the rock wall space and the gymnasium. These spaces were chosen in because they are close in proximity to each other and in some cases the lighting from one space affects the lighting in another space. These spaces were also selected to create a common theme throughout the spaces. The entrance is the first space that occupants will encounter so it is important that they feel comfortable in the space. A random placement of bollards in the courtyard and downlights under the breezeway create an organic pattern with pools of light. This organic pattern is continued inside in the lobby and circulation spaces with a random pattern of downlights along with a recessed slot design inspired by a network of capillaries above the workout area. The downright pattern flows into the rock wall space, where the climbing surfaces are lit by wall washers and flood luminaires. Finally the gymnasium is illuminated by high bay fluorescents, allowing for the incorporation of glazing and a daylight harvesting system.

The loads on the lighting panelboards required analysis to see if any additional panelboards would need to be added due to the redesigned lighting. The new luminaires were circuited in such a way that they are located near existing luminaires that use the same circuit to minimize wiring requirements. A generator analysis was performed to investigate if it would be worthwhile to use a single generator for the expansion and the existing building rather than a battery bank. The last electrical topic was a photovoltaic analysis. A photovoltaic array was sized for the roof of the building and determined that it would be beneficial to install.

A daylighting analysis of the gymnasium was performed with skylights, along with a mechanical analysis to determine the impact of the skylights on the mechanical loads. These studies revealed that the savings from electricity were greater than the increase in energy due to cooling loads, making the system profitable. The last topic of study was a structural study to confirm that the structure could support the weight of the solar panels.