

## Executive Summary

As the culminating proof of the development of knowledge in the architectural engineering field, this analytical document provides an in-depth research study on the existing conditions in the Williams College Center for Theatre & Dance's lighting and electrical systems and suggests possible alternative design solutions to create an overall successful project, whether that success be measured in dollars or beauty. The Williams College Center for Theatre & Dance is a 126,000 sq.ft., \$50 million theatre & performing arts building, boasting two large professional theatres (shared by students and the community), a state of the art black box theatre, a dance rehearsal studio, and many classrooms and support spaces. Located in Williamstown, Massachusetts, Williams College is a small liberal arts campus in the middle of the rolling Berkshire hills. Also covered in this report are topics on sustainable design and the feasibility of the installation of a green roof onto the Center, taking into account both cost and structural feasibility.

My designs for the lighting in the building, paramount to the visual impact of architecture, have centered around the impression of a single person having control over the inanimate natural environment that surrounds them. Metaphorically, this speaks of the immense power we have to conserve energy and natural resources and to preserve the world we live in. As people walk in and through the building, little hints of this idea are subtly expressed. Although compact fluorescents have had trouble becoming a standard in lighting, due to issues with color temperature, the technology for compact fluorescent lamps has become much better and rivals the very need for incandescent lamps at all. Almost all lighting throughout the building has been specified in my design as compact fluorescent or LED.

Electrical support for the building was designed with safety in mind. With two transformers, rated at double the necessary capacity and a tie-breaker in the main switchgear, any emergency power losses from a single transformer can be picked up by the other and, as they say in the theatre, the show can go on. Energy efficiency and economic utilitarianism was in mind during the design of the systems for this building, making the lighting systems only a small fraction of the total necessary power. Mechanical systems to combat the harsh Massachusetts climates take almost 65% of the total power in the building with a 35ton air cooled liquid chiller and radiant heating in floors and windows. Several coordination studies have been performed, verifying the safety of the system.

Sustainable design, although a buzz word right now, is the future of the building industry. With an earth unable to support the exponential human growth, energy is becoming a delicate commodity. With building using 70% of the total energy produced in the U.S., an enormous potential exists for building engineers to make a fight against energy depletion. The green roof study performed in this analysis is only one aspect of sustainable design, but with a 7 year payback and over \$1 million saved over the lifecycle of the building, 'only one aspect' sounds pretty good. We can just image the possibilities as technology and methods improve.