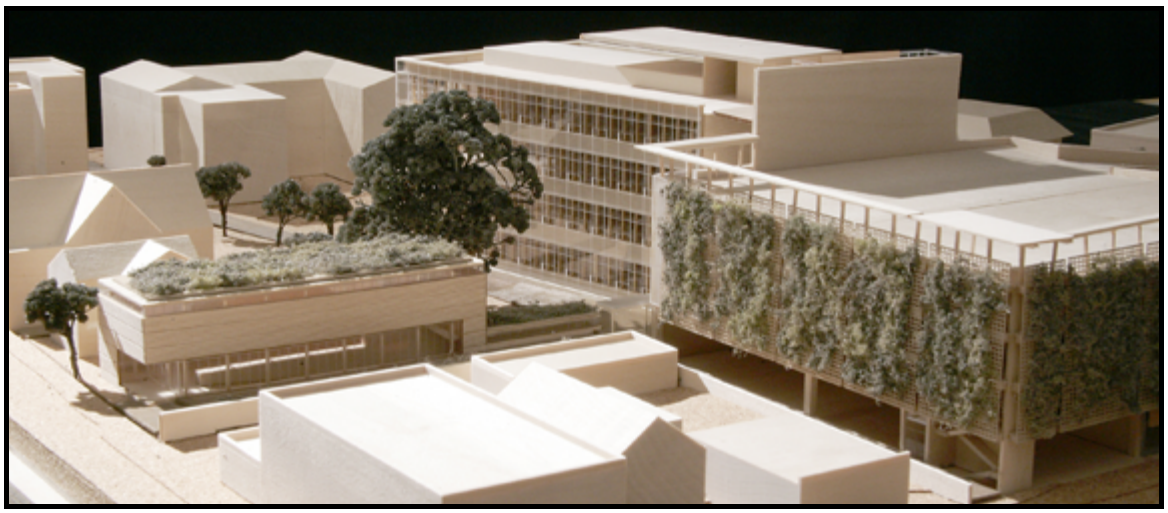
Thesis Proposal

Yale Sculpture Building

New Haven, CT



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http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/KND107

Thesis Proposal

12.20.06

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CC: Ted Dannerth
Date: December 20, 2006

Executive Summary

This proposal will contain changes in the lighting, electrical and mechanical systems. The proposal also contains a proposal for a study on the LEED certification and documentation.

The lighting system will be redesigned to adhere to new requirements and design criteria. Since the lighting system will be redesigned, the electrical system must be modified to account for the changes in the lighting system.

As part of a two part breath proposal, I plan to redesign my mechanical system so it properly operations with the new lighting and electrical systems.

The second part of my breath proposal will analyze the current LEED rating and documentation. Along with this study, I will try to increase the Yale Sculpture Buildings' LEED rating.

Outline

3. Yale Sculpture Building Background

The Yale Sculpture Building consists of three connected buildings. The main Sculpture Building is a four story, 55,000 square foot building for the Sculpture department of the Yale School of Art. The second building is a single floor gallery for exhibition of student work. The last structure is a five story parking garage. The garage has approximately 288 parking spaces and contains a 9,000 square foot area for retail and office space.

The Yale School of Architecture will occupy the Gallery and Sculpture buildings until the renovation of the Art & Architecture Building. The Building has loft-like studio space, classrooms, shop space, faculty and administrative offices, and storage throughout its occupancy.

Landscape improvements include the development of paths from multiple streets to enhance the mid-block location of the building and establish its connection to the campus. Improvements also include courtyards for sculpture display and student work.

Statement of Problem: Lighting Systems

The Yale Sculpture building's lighting system will be redesigned. The existing lighting systems are designed to fit IES and Energy Codes. Although the systems fill all requirements for codes and recommended practices, the lighting design does not "inspirer" the average student. I plan to design a lighting scheme that will stir the creativity of the architectural and sculptural students.

The redesigned lighting system will incorporate daylight harvesting.

The new system will be studied to consider its effects on the existing mechanical and structural systems. A daylighting study and analysis will be done to integrate daylight harvesting. A thorough comparison and critical analysis of the existing and proposed new system will be done. This comparison will include but is not limited to: cost, performance, energy savings, and constructability.

Proposed Solution(s) of the Problem: Lighting Systems

Preliminary design concepts are posted at:

http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/knd107/tech-assign.htm

The preliminary systems described in technical report three are to be revised according to the comments from the Lutron Electronics presentation results.

Solution Method: Lighting Systems

The following method will apply for each of the spaces in the building:

1. Finalize Lighting design concepts and summarize relevant and important design criteria
2. Lighting drawings that will clearly describe the layout of the new system
    a. Lighting drawings will include:
        i. Fixture designations
        ii. Electrical system circuiting
        iii. Controls
        iv. Fixture installation and mounting
3. Calculations that will show the performance of the lighting system (meets design and code requirements)
    a. AGI32 - Lighting calculation program
    b. Radiance – Lighting calculation program – to verify previous findings
    c. Energy modeling
    d. 3d Studio Max – Presentation images to show appearance of spaces
4. Report summary book
    a. Final book will include:
        i. Conceptual images
        ii. Existing lighting system analysis
        iii. New system analysis
        iv. New system data (calculations, layouts, etc.)
        v. Comparison between existing and new systems
        vi. Project Summary
        vii. Fixture Cut sheets
        viii. Lamp Cut sheets
        ix. Ballast Cut sheets

Statement of Problem: Electrical System

The existing electrical power distribution will be modified or redesigned according to the new proposed lighting system.

The electrical system will accommodate for any additional design loads from the redesign of the mechanical system. The mechanical system will be redesigned according to the new lighting system and daylight integration.

Besides the revisions according to the lighting system, I will perform an analysis of several changes to the electrical system that may or may not improve the system's performance or cost. The changes are as follows:

1. 277 volt lighting VS 120 volt lighting
2. Central transformer VS distributed transformers
3. energy efficient loads (lighting and mechanical)

Proposed Solution(s) of the Problem: Electrical system

The existing system will be altered to accommodate for additional loads from the lighting and mechanical systems. The design will follow the National Electrical Code 2005 guidelines and practices.

Solution Method: Electrical system

The design of the electrical system will follow the National Electrical Code 2005. To further verify the performance of the system, a protective coordination study will address a single-path through the distribution system. Short circuit current calculations will be included in the study. I will analyze and design one major distribution panelboard and its associated feeder. Calculations of the design loads for conductors and protective devices, and a description of how quantities were computed will be clearly formatted in a final report.

Breath proposal: LEED rating verification and documentation

The Yale Sculpture Building was designed to have a LEED rating of at minimum silver. I will document the full LEED certification process (create documentation) and asset if the building can achieve more credits (increase its rating level).

Breath proposal: Redesign mechanical system

The existing mechanical system must be changed according to the changes in the lighting systems in part I. Since, the mechanical system will be modified then the electrical system will have to change as well. These three systems are interlinked and must be studied to maintain current design criteria and performance.

I will conduct a study of the existing building systems compared to the newly designed systems. This comparison study will contain but is not limited to; cost, maintenance, performance, energy savings and constructability.

Progress Schedule

Week	Objectives
Break	Make 3D models of Building
01/08/06 – 01/14/06	New Lighting design concepts
01/15/06 – 01/21/06	Lighting Analysis of spaces (AGI32 and Radiance)
01/22/06 – 01/28/06	Research daylighting integration
01/29/06 – 02/04/06	Electrical Work for Dannerth - 2 spaces
02/05/06 – 02/11/06	Work week
02/12/06 – 02/18/06	02/16/06 – Preliminary repot of 2 lighting spaces with electrical requirements (Dannerth)
02/19/06 – 02/25/06	Work week
02/26/06 – 03/04/06	Work week
03/05/06 – 03/11/06	Submit preliminary data for electrical and lighting systems
03/12/06 – 03/18/06	Revisions to systems from comments (Mistrick and dannerth)
03/19/06 – 03/25/06	Start Breath work
03/26/06 – 04/01/06	Work week
04/02/06 – 04/08/06	Work week
04/09/06 – 04/15/06	Finish Thesis Work
04/16/06 – 04/22/06	04/16/06 – Final Report Due 04/16/06 – 04/20/06 Thesis Presentations