Half Moone

Cruise and Celebration Center
Norfolk, Virginia

Thesis Proposal
12/15/08
Lighting Consultant – Dr. Mistrick
Electrical Consultant – Professor Dannerth

Jonathan Walker
Lighting/Electrical Option
jcw5009@gmail.com

Thesis Website:
http://www.engr.psu.edu/ae/thesis/portfolios/2009/jcw5009/

Executive Summary

This document describes the work that I will perform on Half Moone Cruise and Celebration Center for the spring semester of my senior thesis. The scope of my work will include:

- the lighting design of four spaces
- daylighting analysis of the Waiting Area / Ticket Queuing space
- showing a reduction of power consumption and lighting levels in the Waiting Area / Ticket Queuing space
- adjusting the electrical system to accommodate the proposed lighting design
- electrical coordination studies
- electrical system analysis with SKM software
- solar heat gain analysis due to skylights (breadth topic #1)
- roof structure analysis due to skylights (breadth topic #2)
- generating a coherent report which explains my findings

The four spaces to be redesigned for the lighting component are:

- Façade
- Lobby
- Waiting Area / Ticket Queuing
- Conference Room

The lighting design of these spaces will be tied together by an aquatic theme because of the building's water-related purpose and the nature of the Norfolk community. The design will strive to address the tasks in each space, and will accommodate different building uses in the public spaces. In addition to the task-related criteria established in the Technical Assignment #3 and presented at Lutron, the proposed design will specifically address comments by the lighting designers such as a coherent theme and a sense of entertainment.

Background

Half Moone Cruise and Celebration Center is designed to enhance the cruise passenger experience and create a large multipurpose space in downtown Norfolk, Virginia. The terminal is a riverfront building which is adjacent to a heavily-used community park.

The building is roughly 89,000 square feet, and features a large, circular lobby space, conference rooms, and a large waiting area. Cruise ship passengers use both levels, but most social gathering events occur in the lobby and waiting area, both of which are on the second level.

Depth Proposal: Lighting

Problem

Though the existing lighting design is functional, it does not meet the power density guidelines in ASHRAE 90.1. Also, the current design does not represent all of my design criteria. More could be done to tie all the public spaces together with a lighting theme.

Solution

The proposed lighting design in my Technical Report #3 meets much of my functional design criteria. This includes some psychological impressions (such as spaciousness), illuminating wall-mounted displays to create visual interest, providing higher Illuminance values where needed to complete particular tasks, and other considerations. However, I will respond to the lighting designer comments from Lutron by reexamining each of the four spaces. I seek to solidify a lighting concept which ties all four of my spaces together.

Since an integral part of the Norfolk community is water, my lighting concept will incorporate more aquatic themes. As a cruise terminal, the public spaces should reflect a fun and entertaining mood. For social gatherings, the public spaces should meet a new set of criteria, and have the potential to be transformed into a slightly more elegant setting. Different light levels, sparkle, kinetic light, LEDs, different accenting techniques, and other factors will all be considered beyond the criteria established in my Technical Report #3.

In addition, I will evaluate the feasibility of incorporating daylight into the Waiting Area / Ticket Lounge with skylights.

Solution Method

Lighting calculations and lighting software will be used to ensure that my design criteria is met and that certain IESNA recommendations are considered. Each of the four spaces will be modeled using computer software. Then, fixtures and other equipment including controls will be chosen so that the design is likely to meet the design criteria. Calculations will be performed to ensure that the design criteria are met. If the criteria are not fully met, I will fine-tune the design and perform additional

calculations. When I am satisfied that the criteria are met, higher-quality computer renderings will be generated and I will show that my quantitative design criteria are satisfactory.

Additionally, daylight studies will be performed on the Waiting Area / Ticket Lounge.

The following list shows specific deliverables which will be generated:

- Design concept summary for each space, including design criteria
- Drawings which show the layout of new systems
- Specification of lighting and control hardware
- Switching and circuiting layouts
- Calculations that show the design criteria is met
- Light loss factors
- Power density
- Photorealistic computer renderings for two spaces
- A CD of relevant computer files
- Copies of equipment/manufacturer cut-sheets including lamps, ballasts, luminaires and controls

Lighting Designer Comments from Lutron

In general, the comments from the professional lighting designers were encouraging. The main criticism was the lack of a well-defined overall concept. Though each of the four spaces was coherent and addressed specific appropriate tasks, it is important to tie all of the spaces together. For more complete comments from the lighting designers, please see the "Lutron Comments" on my "Tech Assignments" webpage.

Depth Proposal: Electrical

Problem

The existing power distribution design meets the needs of the cruise terminal. However, since the proposed lighting design changes the loads, circuit breakers panels and other electrical equipment will need to be resized accordingly.

Solution

New loads will be calculated according to my lighting design. Specifically, the panels that provide power for my four spaces will need to be investigated and possibly altered. A protective device coordination study will be done, and calculations of short circuit will be included. In addition, I will perform a short circuit analysis, protective device coordination, arc fault study for the entire distribution system, starting at the service entrance and covering all panelboards. Analysis will be performed using SKM software.

The current lighting design for the large Waiting Area / Ticket Lounge space does not use energy efficiency according to ASHRAE 90.1. I plan to redesign the lighting for this space and show a reduction in power consumption and lighting levels.

Solution Method

The solution involves following the NEC and referencing ASHRAE 90.1. Excel spreadsheets will help when calculating loads on panelboards and generating new schedules. SKM software will be used to perform additional analysis. Lighting software such as AGI32 or 3D Studio Max will be used to determine Illuminance levels in the Waiting Area / Ticket Lounge. I also will refer to lamp, luminaire, ballast, controls, and other manufacturers' websites to obtain accurate information on hardware performance.

Additional Information

My electrical depth proposal is designed to satisfy the following requirements:

- #1: Redesign the branch circuit distribution
- #2: Protective device coordination study, including short circuit analysis
- #3.a.vii: Redesign all lighting for a reduction in lighting levels, where the large Waiting Area / Ticket Lounge space would qualify.
- #3.e: Analysis with SKM software

Breadth Overview

The Waiting Area / Ticket Lounge space is roughly 11,500 square feet. In addition to a gather space for cruise passengers before departure, this room is capable of supporting large social gatherings due to its unobstructed floor plan. It could be advantageous to incorporate daylight into the space by using skylights. Incorporating skylights into the large Waiting Area / Ticket Lounge space will alter the roof design and increase solar heat gain.

Breadth Proposal: Structural

I propose to analyze if the existing structural elements will support skylights. If skylights will not be supported, I will propose adjustments to the design so that skylight additions could be realized.

Breadth Proposal: Mechanical

With the addition of these skylights, it is anticipated that daylight would be the main source of illumination during the day. Electrical light consumption would be reduced, but there would be a change in the mechanical loads due to solar heat gain. I propose to investigate the solar heat gain in the Waiting Area / Ticket Lounge.

Spring Semester Planned Schedule

AE 482 Schedule	
Week	**Description of Activities**
Winter Break	Begin CAD modeling of spaces
Jan. 11th – 17th	
Jan. 18th – 24th	
Jan. 25th – 31st	Complete first lighting space
Feb. 1st – 7th	Start Structural and Mechanical Breadth
Feb. 8th – 14th	
Feb. 15th – 21st	
Feb. 22nd – 28th	Finish Structural and Mechanical Breadth
March 1st – 7th	Complete second lighting space
March 8th – 14th	Spring break
March 15th – 21st	Complete third and fourth lighting spaces
March 22nd – 28th	Complete Branch Circuit Redesign (#1 on electrical requirements paper). Complete Coordination study (#2 on electrical requirements paper).
March 29th – April 4th	Complete “reduction in light levels” electrical option (#3.a.vii on electrical requirements paper). Complete SKM option (#3.e on electrical requirements paper).
April 5th – 7th	Miscellaneous
April 8th	Final Summary Reports due
April 9th – 12th	Miscellaneous
April 13th – 17th	Faculty Jury