

AE 481W: Penn State Architectural Engineering Senior Thesis

Salamander Hospitality Resort and Spa



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AE 482: Lighting/Electrical Proposal  
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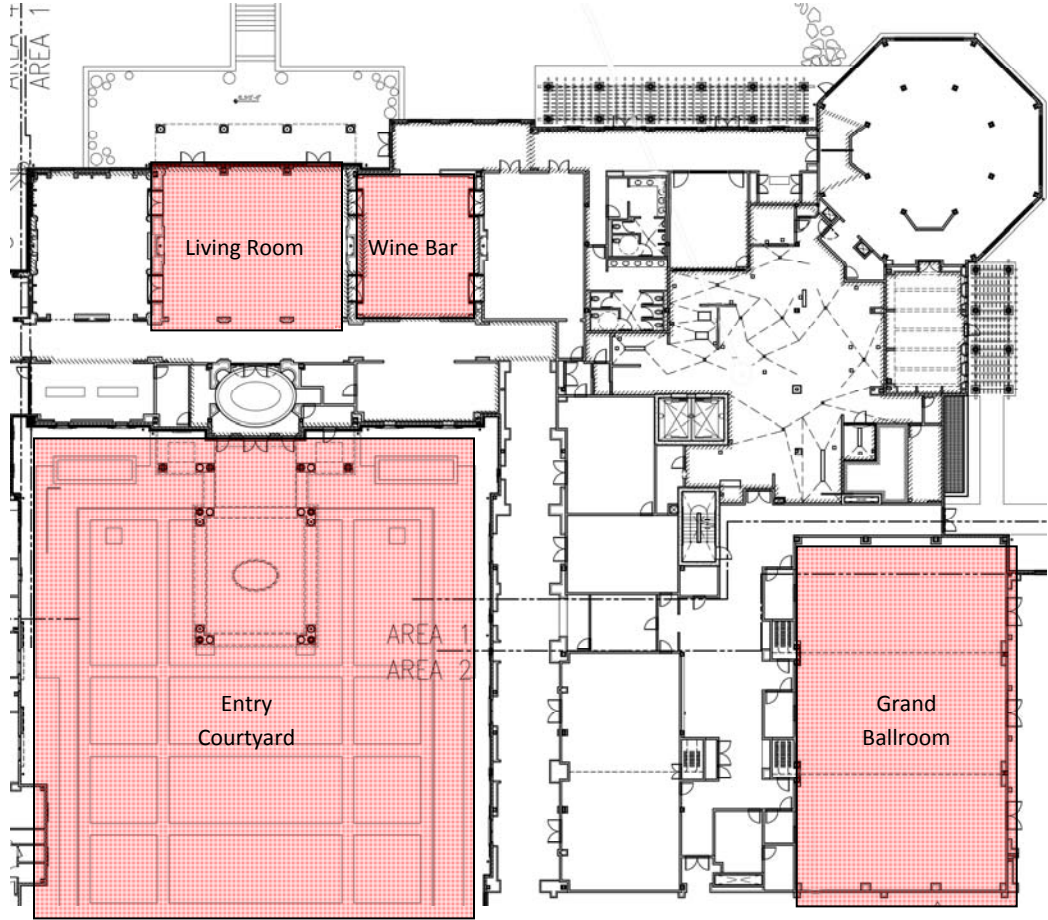
## Executive Summary

The following proposal includes the work to be completed in the spring 2010 semester for AE 482 – Architectural Engineering Senior Thesis. The spring thesis requirements are to complete two depth subjects and two breadth subjects. I will also complete an additional analysis to fulfill honors requirements for the Schreyer Honors College thesis. The first depth subject, lighting, will be a complete redesign of the lighting systems and controls in four different spaces within the Salamander Resort and Spa. The second depth subject, electrical design, includes a protective device coordination study that addresses a single-path through the distribution system. Calculations for short circuit current will be included. Also, completion of two depth studies on electrical system comparisons will be documented. The breadth topics I propose to complete involve the mechanical engineering design and architectural design of the fireplaces located throughout the resort.

To satisfy honors requirements for graduation from the Schreyer Honors College, I will complete an additional study for the lobby space, called the Living Room, within the Salamander Resort and Spa. I will perform a daylighting analysis within the Living Room. I will study the energy savings of the daylighting control integration with the lighting systems in the space.

# Background

Located on a 340-acre site in the heart of Virginia horse and wine country, the Five Star, Five Diamond Salamander Hospitality Resort and Spa will be a luxurious and relaxing retreat for all visitors, especially those in the Washington, DC region. The exterior of the resort resembles historical Virginian horse country architecture, with a mixture of stucco and rubble stone veneer and is surrounded by rural landscaping. The interior of the resort is full of elegant spaces, such as the 30,000 square foot spa area, equestrian-themed restaurant, ballroom, wine bar, cooking studio, indoor pools, and 168 luxury guest rooms, including a 2,000 square foot Presidential Suite. All interior spaces are provided with great views out to the countryside and access to outdoor function spaces including the Stallion Barn, Pavilion at the Pond, Grand Lawn, poolside settings, and Herb Garden. Salamander Hospitality owner Sheila Johnson has been dedicated to make the Salamander Resort and Spa the pinnacle of her luxury resort and hotel enterprise. The building is approximately 230,000 square feet in size and is a total cost of \$93 million. Construction is scheduled to finish in the spring of 2011.



## **Depth Proposal – Lighting**

The scope of the lighting re-design to be completed in the spring 2010 semester includes the lighting design of four different spaces: the Entry Courtyard, the Living Room, the Wine Bar, and the Grand Ballroom. In each space, the lighting equipment, controls, and other technologies will be designed and specified to the level of construction documents. The schematic design phase of this re-design was completed for Tech 3 requirements in the fall 2009 semester, culminating with a presentation to a panel of professional lighting designers on December 9<sup>th</sup>, 2009. Their comments are included in this proposal. The lighting design in the spring 2010 semester will be completed through the use of various types of computer software such as AGI32, AutoCAD, and Autodesk 3D StudioMax for calculations and presentation documents.

### Lighting Design: General Concepts/Themes

The re-design of lighting equipment for AE 482 will be tailored to specific tasks and aesthetics of each of the four spaces; however, there are a few overall concepts and themes that will be conveyed through lighting. Lighting design throughout the Salamander Resort and Spa must fit in the context of the traditional/regional architecture of Middleburg, VA. The architecture and interior design takes a conservative, yet elegant approach with equestrian features paying respect to the horse-country of the region. The second general concept is relaxation. Dimming capability, warm color temperature light sources, and careful placement of light will be essential to successfully create this impression. Finally, the elegance and high quality standards that Salamander Hospitality stands for must be promoted through lighting.

### Lighting Design: Entry Courtyard

Guests of the Salamander Resort and Spa will enter the building through this main courtyard, which is bordered by the spa wing and ballroom/restaurant wing. The entrance façade is a The landscaping is made up of a central courtyard with bordering planter beds, benches, and two fountain features.

The proposed lighting design will provide safety to those walking along the sidewalks and pathways at night, accentuate the architecture of the façade, accentuate the materials of the façade, and accentuate the landscaping throughout the courtyard and planting beds. The porte cochere that acts as a car port

must have adequate lighting for guests to gather their bags before entering the resort. The entrance itself is an important focal point for lighting, as the guests must be directed to the main entrance doors. The façade lighting will utilize a grazing technique that will be uniform and symmetric to mask the architecture and create texture to accentuate the stone veneer façade. Uplighting for landscaping, such as trees in the planting beds will be utilized to express the landscape architecture at night.

#### Lighting Design: Living Room

The Living Room, which acts as a general lobby or gathering space near the entrance of the resort, does not have any specific tasks other than general seating. Furniture is also moveable; therefore, specific seating areas will not be lighted. Rather, a general uniform distribution of light will be applied to horizontal surfaces in the room. Other than the entry vestibule, the Living Room is actually the first interior space that guests will see; therefore, it is important that the lighting expresses the general resort themes like relaxation, high quality, and elegant conservative architecture. The light sources must be of warm color temperature and have the ability to be dimmed.

#### Lighting Design: Wine Bar

The Wine Bar is an area where guests may eat small foods/appetizers and sample wine from all over the world as well as products from some of the region's vineyards. Lighting in this space must be relaxing and functional. People must be able to read a menu and the bartender must be able to read wine bottle labels. The custom-painted wall mural on each wall will be accented from above, as will the horizontal surface of the bar itself, which is made on an old barn door. The back-bar area, made up of shelving and wine racks will likely be lighted with an LED product, as to reduce the exposure of heat to the wine. Lighting in this space will have scene control to contrast the space with a daytime scene and a night dining scene.

#### Lighting Design: Ballroom

The Grand ballroom 5,000 square feet in size, is a multifunctional space which can be partitioned into three smaller gathering spaces. Lighting obviously must provide different scenes for such activities as dances/balls, conventions, dinners, etc. The lighting will also have the ability to be controlled separately in each third of the ballroom in the case of the partitions being used. Uniform ambient lighting from the

20 ft. high ceiling above will be important for public functions, while dim, non-uniform and carefully-placed lighting will be designed for dining functions.

The existing lighting design primarily utilizes incandescent and halogen light sources to provide a warm glow of light to guests. I will perform a study on alternate light source technologies that still provide a warm color temperature and dimming capability but use less energy. Specifically, LED products will be studied as alternative solutions to the design goals in each space.

### **Designer Comments from Lutron Presentations (12/9/09)**

#### **Lee Brandt:**

- Make sure dormer lighting does not go through the dormer windows, causing glare
- Courtyard steplights may not provide enough light, consider uplighting for facial rendering
- Living room lighting may not be able to compete with daylighting, so cove lighting may have to be really bright to preserve feeling of intimacy; Consider also adding light to corners of Living Room
- Make sure to “ground” the wine bar itself; you don’t want it to seem like it’s floating
- If she was the client she would like option 1 or 2 with the wine bar. Be careful with heat and wine

#### **Kari Nystrom:**

- Be careful with the way you show your lighting concepts – light is not perfectly distributed from equipment in actuality
- Show where light is coming from to achieve your design
- If backlighting the wine racks, consider what happens when a bottle is taken out
- Consider how spill light from within the resort affects the courtyard lighting

#### **Luke Tighe:**

- Make sure you really focus on how you meet your overall design goals for Middleburg, VA/relaxation/high quality
- The courtyard needs some definition to it. Consider it a separate room. It must have a sense of boundary.
- Study how the Living Room windows look at night. Do you see reflections from Living Room lighting or outdoor terrace lighting?
- In the Wine Bar, understand that the lighting should be about the wine bottles, not the light itself.

## **Depth Proposal – Electrical**

The scope of the electrical portion of this senior thesis includes re-design of branch circuits where new lighting loads will be applied, a short circuit analysis and protective device coordination, and two depth topics. The depth topics I wish to analyze will be a comparison of the use of bus duct with conduit and wires as well as the comparison of a rotary UPS vs. a static UPS system.

### **Four Spaces to be Re-Lighted**

1. The Entry Courtyard (Resort main entry – between Areas 1,2, and 3 of the building)

Guests of the Salamander Resort and Spa will enter the building through this main courtyard, which is bordered by the spa wing and ballroom/restaurant wing. The landscaping is made up of a central courtyard with bordering planter beds, benches, and two fountain features. The existing types of lighting loads include MR16 sources for landscape lighting and incandescent sources for façade wall sconces and decorative lighting under the car port/entrance. Proposed lighting loads will be of lower energy consumption.

2. The Living Room (Open to entrance vestibule)

The Living Room acts as a lobby/gathering space for guests arriving or waiting to check in. General lighting is primarily required. Existing lighting loads are mainly incandescent and halogen sources. Proposed lighting loads will be of lower energy consumption.

3. The Wine Bar (adjacent to Living Room)

The Wine Bar, adjacent and plan-east of the Living Room is a bar area, where appetizers are served with world class and local wines. The lighting is highly decorative and of primarily incandescent loads. Proposed lighting loads will utilize a mixture of incandescent sources for decorative purposes as well as low energy LED products.



#### 4. The Ballroom (Area 2 of building)

The Grand Ballroom is a 5,000 square foot multipurpose space, which can be partitioned into three smaller rooms. Existing lighting loads are mostly halogen downlighting, neon cove luminaires, and incandescent decorative sconces and chandeliers. Proposed lighting loads will be of lower energy consumption.

#### **Protective Device Coordination Study and Short Circuit Analysis**

I will be conducting a protective device coordination study that addresses a single-path through the distribution system. The path extends from the utility to the main switchboard to panel MSB. The coordination of protective devices for the redesigned system components along this path will be provided, and short circuit calculations will also be included.

#### **Electrical Depth Topic #1 – Bus duct vs. conduit and wires**

A comparison study will be performed to determine whether changing long runs of conduit and wires to bus duct would be advantageous. The problem addressed is the fact that long runs of conduit and wires run from the main electrical room of Area 2 of the resort to considerable long distances. I will analyze the method to size bus duct and calculate cost and energy data. This will be compared to the existing feeder materials to determine if the change is advantageous.

#### **Electrical Depth Topic #2 – Static UPS vs. Rotary UPS**

The Salamander Resort and Spa is designed to withstand a power outage with the use of an uninterruptable power source (UPS). I will complete a comparison study on whether a Rotary UPS should be used instead of the specified Static Double Conversion UPS. This study will be based on performance, application, and economics.

### **Breadth Proposal #1 – Mechanical**

It was brought to my attention during a site visit of the Salamander Resort and Spa that there were problems with the constructability of the fireplaces throughout the building. Lack of architectural space in the chimneys led to poor designs for fireplace exhaust systems. I will provide a redesign for the fireplace exhaust and perform a study involving heat recovery that could be used for domestic water heating.

### **Breadth Proposal #2 – Architectural**

I again will focus on the fireplace design. In order to provide more space for the mechanical exhaust system, I will redesign the general specification for fireplaces throughout the resort. This re-design will be an improvement in functionality, constructability, and aesthetics.

### **Honors Supplemental Study – Daylighting Analysis for the Living Room**

To complete my Schreyer Honors College requirements for honors credit on my thesis project, I will perform an additional study on the daylighting within the Living Room. The majority of the north wall is covered with large glass doors leading out to an outdoor terrace. These glazing components will provide a dynamic environment for the space aesthetically, and could also provide energy savings. I will use daylighting software to complete this analysis in which daylighting controls may be integrated with the lighting equipment to dim or shut off luminaires when the daylight contribution reaches a target light level.

## Schedule

AE 482 Spring 2010 Thesis Schedule		
Week	Discipline	Activity
1/18/2010	Lighting	Revise schematic design
		Start Modeling spaces in AutoCAD
1/25/2010	Lighting	Continue Modeling
		Import spaces into AGI32 and 3D StudioMax
2/1/2010	Lighting	Begin Selecting luminaires
		Import luminaires into lighting software
2/8/2010	Lighting	Continue importing luminaires
		Run Space Calculations
2/15/2010	Lighting/ Electrical	Continue space calculations
		Begin electrical depth study #1
2/22/2010	Lighting/ Electrical	Lighting Catch-up/renderings
		Begin SKM analysis
3/1/2010	Electrical	Continue SKM analysis
		Lighting branch circuit redesign/Coordination studies
3/8/2010	(Spring Break)	Lighting Renderings
		Finish branch circuit redesign/coordination studies
3/15/2010	Mechanical/ Architectural	Complete Breadth Studies
3/22/2010	Daylighting/ Lighting	Complete Daylighting Study for Living Room
		Lighting Renderings
3/29/2010	All	Finish Documentation
		Complete Lighting Renderings/Presentation materials
4/5/2010	All	Powerpoint Presentation
4/7/2010	All	Final Reports Due
4/12/10-4/15/10	All	Final Presentations