

# Proposal for spring 2011

City of Green Administration Building

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## **Executive Summary**

This proposal contains work to be completed in the spring semester of 2011 for the class AE 482, Architectural Engineering Senior Thesis. This work includes two depth topics and two breadth topics. The depth topics are within the option chosen during the third year, and the breadth topics are from options not chosen. The lighting and electrical depth requirement is a re-design of the lighting systems in four spaces of the City of Green Administration Building. An analysis of the electrical system will also be included as a depth topic. The breadth topics chosen will focus on the mechanical system as well as an architectural breadth.

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## Building Summary



The City of Green Administration building is located in the City of Green, Ohio, and houses the administrative offices of the local school district and city administration. It is 53,672 square feet and has three total stories; two above grade and one below. It was constructed from August 2008 to October 2009. The premier space within the building is the council chambers, which holds televised meetings viewable on local television. This space and the other three spaces of study within the lighting depth are highlighted in the following floor plans.

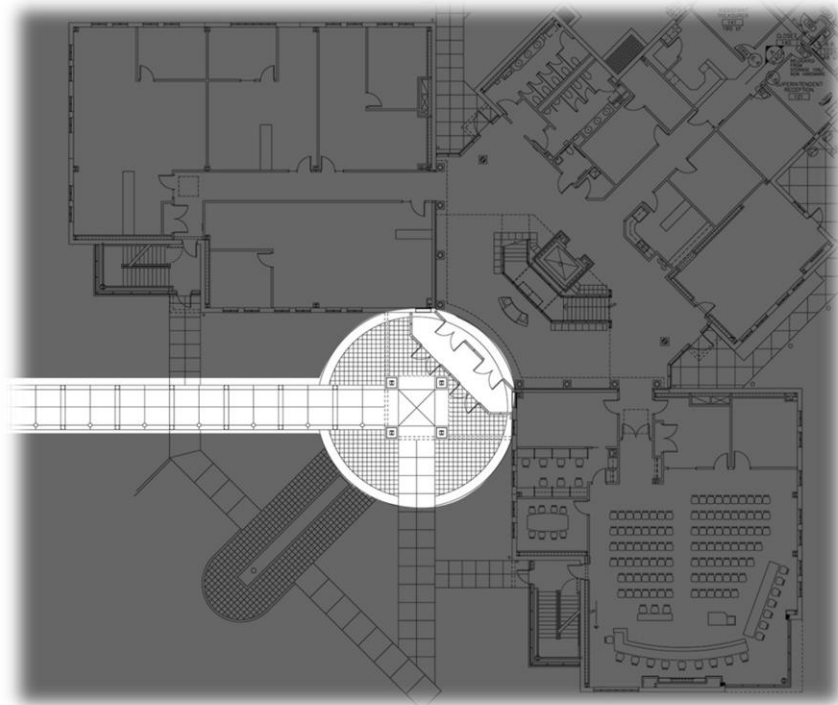


Figure 1: First Floor Plan, Entrance Structure

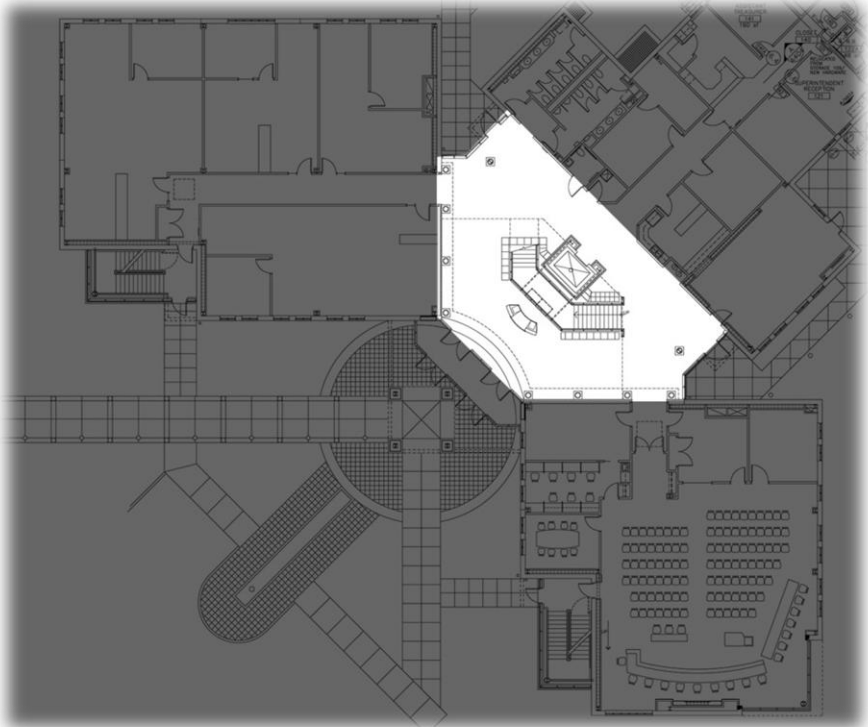


Figure 2: First Floor Plan, Main Lobby

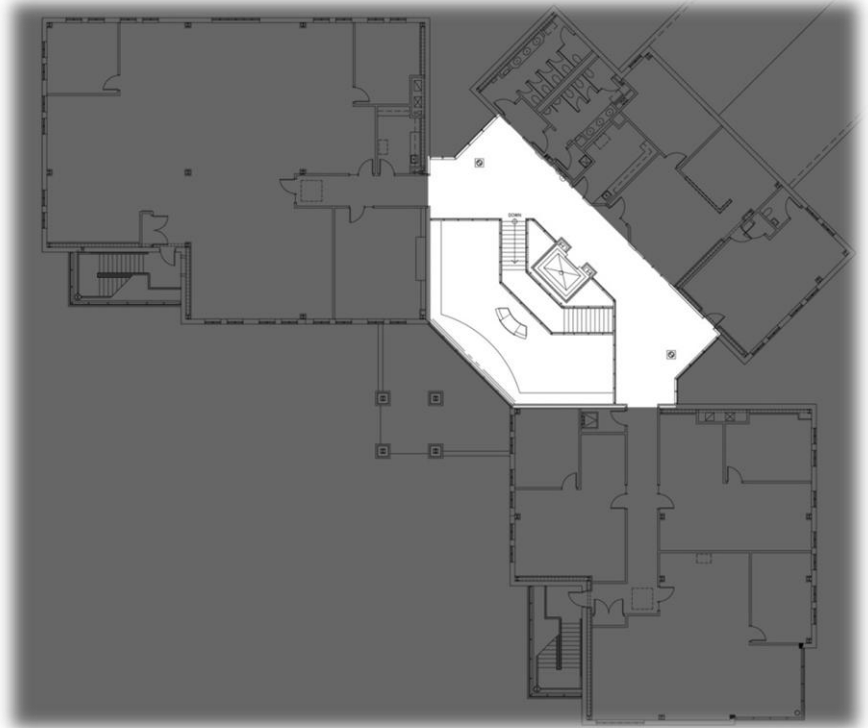


Figure 3: Second Floor Plan, Main Lobby

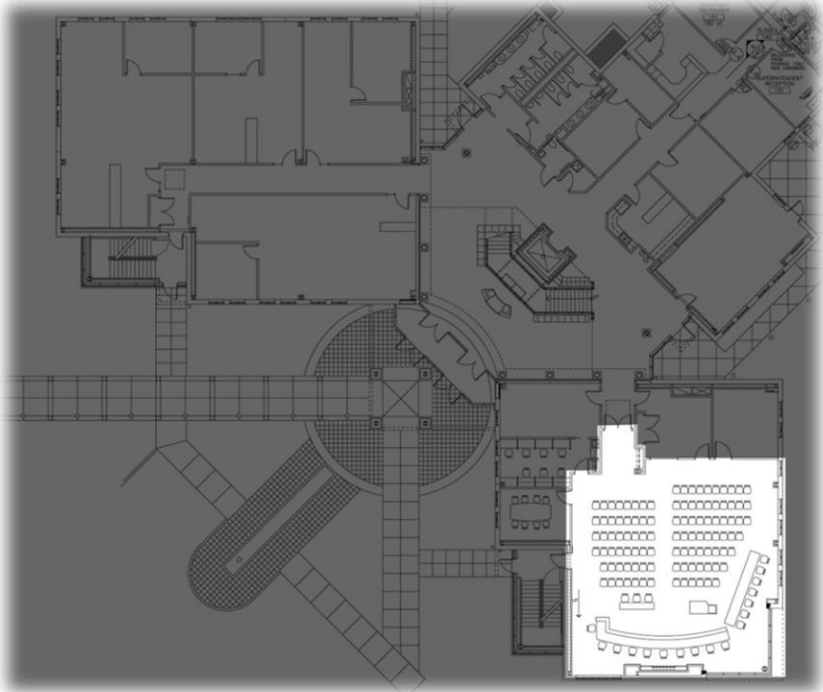


Figure 4: First Floor Plan, Council Chambers

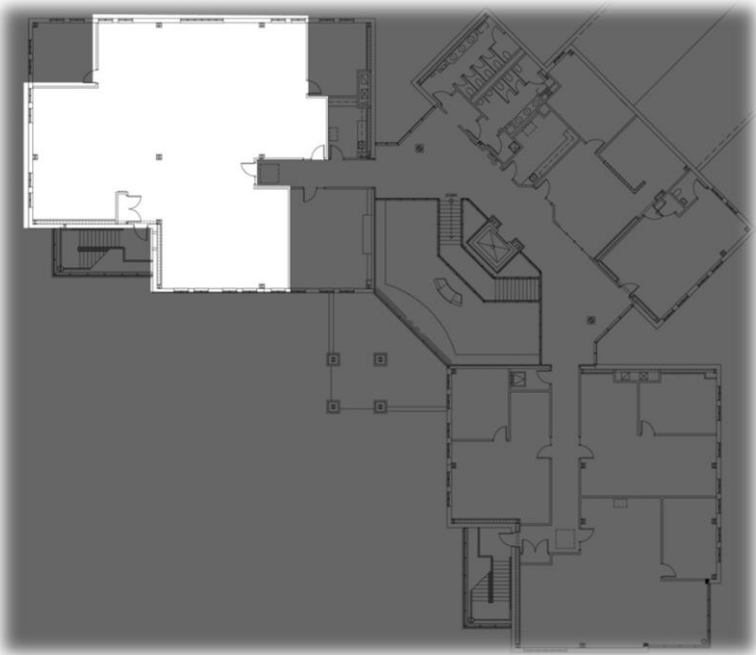


Figure 4: Second Floor Plan, Planning and Engineering Large Work Space

## **Lighting Depth**

This depth topic is a redesign of four spaces of the City of Green Administration Building. These are the Entrance Structure, Main Lobby, Council Chambers, and the Planning and Engineering Department large work space. The entrance structure meets the “exterior structure” requirement. The main lobby meets the “circulation space” requirement. The council chambers meet the “special purpose space” requirement. And the planning and engineering department meets the “large work space” requirement. Technical Report 3 contained the schematic lighting design, and was presented to a panel of lighting design professionals on December 8<sup>th</sup>, 2010. I have included some of the comments from this group of professionals in the proposal. This lighting depth will be completed by doing analysis and design within three dimensional modeling programs such as AutoCAD 2011, and AGI32. All solutions must meet specifications set forth in tech 1 including lighting design criteria and code requirements.

### **Entrance Structure**

As designed, this space is primarily illuminated via bollards located in between the columns on one side of the walkway leading to the clock tower. I believe this structure needs to add interest to the façade and attract visitors to the space below the clock tower and guide them into the building entrance. The existing design does attract attention to the decorative columns supporting the walkway; however the composition of the façade is visually cluttered with varying color temperatures and conflicting gradients. I plan on using a clean design focusing on highlighting the interior of the structure to provide this guidance. This will create contrast highlighting the points of interest on the façade.

### **Main Lobby**

This is the main circulation space that pulls together the three wings of the building. I will be creating an impression of spaciousness by using a uniform gradient on the walls. This will also highlight the decorative columns which match the entrance structure. The remainder of the lobby will create a sense of closure and promote special circulation through the spaces. Also, the central stair structure will be a point of interest due to its key role in circulation. The secretary desk is located between the two paths a user may take on the first floor and the staircase. Because of this, it will be highlighted to draw a new user to the point where a decision must be made regarding where they are going.

## **Council Chambers**

For the special purpose piece of this depth, I will be redesigning the lighting systems in the council chambers. An important focal point of this space will be the control system. The room has many uses, and the lighting system must be able to accompany these. Dimming will be a main consideration, as well as relating the space to the rest of the building architecturally through the lighting. Highlighting the multiple layers of elevation on the ceiling must be another goal of the lighting design. Ensuring that the room is adequate for video presentations is also important. Often the meetings are televised, meaning camera equipment and televisions are commonplace throughout the space. Careful consideration must ensure that glare on the television is eliminated.

## **Planning and Engineering Workspace**

This space must be flexibly lit to allow for many configurations. In my tech 3 presentation, I suggested using an indirect/direct system to allow for this type of uniformity. However, the lighting design professionals suggested that I attempt to form a furniture layout to create a lighting design which will serve the occupants better than a typical uniform array of luminaires. The possibility of raising the ceiling height to better accommodate the type of fixture I wish to use will also be investigated during my structural breadth.

## **Summary of Comments from Tech 3 Presentation**

- Be professional
- Use passion for design to increase motivation and drive to succeed in thesis
- Do not include graphics of poor quality (notably the indirect lighting illustration)
- When presenting, try not to look at the screen and be less timid
- Improve realism of sketch of exterior of the building, specifically the shadows of the columns leading up to the clock tower
- The lobby space is difficult to render, but include some three dimensional illustrations and do not simply use floor plans and sections
- Try to get furniture layout of planning and engineering workspace to form a lighting design better suited for its use.
- Create more detailed schematic designs for the council chambers, as what was presented was more like a single schematic design with multiple components instead of three different schematic designs.



## **Electrical Depth**

Power for the City of Green Administration Building is provided by Ohio Edison via a utility-owned transformer located on site. 480/277V WYE is carried into the lower level of the building to a main distribution panel. Power is distributed from this through automatic transfer switches to four distribution panels of various sizes, and then to branch circuit panels located in electrical closets throughout the building.

The depth of this electrical portion of the senior thesis project is to re-design the branch circuiting for the same four spaces mentioned in the lighting depth. This includes a calculated short circuit analysis and protective device coordination as well as two additional depth topics of my choice.

### **Branch Circuit**

The same four spaces being used for the lighting depth will be used for this electrical depth. This will be a re-design of the branch circuiting used in the spaces. The spaces are as follows: the Entrance Structure, Main Lobby, Council Chambers, and Planning and Engineering Large Workspace.

#### **Entrance Structure**

The current lighting on the Entrance Structure branch circuits includes fluorescent and metal halide sources. The metal halides range from 50 W to 150 W. Because I am not proposing any wall washing of the front façade, these types of large metal halide lamps will not be used. I plan on using smaller metal halide and fluorescent sources to highlight the interior of the entrance structure to create contrast between these interiors and the surrounding spaces, guiding occupants into the building.

#### **Main Lobby**

The current lighting in the Main Lobby branch circuits includes linear and compact fluorescent sources. My design will also use compact and linear fluorescent sources due to their efficiency, but in different configurations.

#### **Council Chambers**

The current lighting in the Council Chambers branch circuits includes linear and compact fluorescent sources. Again, the same fluorescent sources will be used to highlight the spaces multiple ceiling levels and wall material.

### **Planning and Engineering Workspace**

The current lighting in the P & E Workspace branch circuits is a single type of linear fluorescent luminaire. The existing recessed lighting will be replaced by an indirect/direct type luminaire using the same linear fluorescent lamp source.

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

I will be conducting an arc fault, short circuit, and coordination study using SKM software. The changes made to the lighting loads through re-design will be reflected in this study. All equipment will be used by the software to analyze the short circuit current. The SKM evaluation will solidify the ability for the electrical system to perform as the specifications indicate it should by supplying the needed loads to all equipment.

### **Electrical Depth 1: High Efficiency UPS vs. Standard UPS**

Because of the delay between a power outage, and the backup generator supplying the necessary power to the building, UPS systems must be used to ensure the continual operation of many computer systems throughout the building. I propose investigating the use of high efficiency UPS systems vs. the existing standard UPS systems used in the City of Green Administration Building. This will allow for further energy savings. The performance of these systems is extremely important, so any and all differences between the two must be considered for the re-design of the electrical system.

### **Electrical Depth 2: Panel consolidation**

While investigating the existing detailed panel board schedules, it became apparent that the current system has many underutilized panels. I will perform an economic analysis to justify this change in the electrical system. The goal of this is to use fewer panels to save electricity and simplify the system.

## **Breadth 1: Mechanical Systems**

For the mechanical breadth of my thesis project, I will be investigating a change from the existing heat pump system to a variable refrigerant flow system made by Vaiken. This new system would help reduce energy use in the building because it only needs one compressor instead of two, and does not use heat pumps. This is a better way to re distribute heat in the building using less energy.

## **Breadth 2: Architectural Redesign of Entrance Structure**

The second breadth of my thesis project will be an architectural redesign of the existing Entrance Structure, including the covered walkway and clock tower. This redesign will focus on changing the materials used to relate the walkway to the building façade. Horizontal lines of materials are disrupted by the existing design. The clock tower will remain largely unchanged, however the covered walkway leading up to the clock tower will be completely redesigned.