George Mason University
Art & Visual Technology Building

Thesis Proposal

Allen Walker

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Faculty Advisors

Professor Dannerth

Dr. Mistrick

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Executive Summary

The proposed thesis will comprise the redesign of four critical spaces for the building. The main courtyard, entry lobby, exhibit gallery and typical painting studio will be redesigned based on the schematic design which was completed for the third technical report. These spaces will also have the electrical service to them redesigned for the change in lighting with analysis of the panels serving them incorporated as well. In addition, a coordination of the electrical system will be conducted. Finally, analyses of adding a photo voltaic array and use of energy efficient transformers will be done. Each will look at the feasibility of the system along with benefit-cost study for the owner. Breadth work will include a mechanical redesign of the main lobby which went from being an exposed system to having an air plenum. And finally, an acoustical study will be done for the metal workshop studio in the lower level of the building. It will analyze the existing conditions and provide solutions to create a better atmosphere.

Background

The Art & Visual Technology building is a new three-story building to be built on the Fairfax campus of George Mason University. Innovation Hall is located to the North of the site, while Patriot Circle encloses the site to the South & West. A new campus quadrangle and Research I building are located to the east. This new building is to manly house the needs of the different disciplines within the department including drawing, digital arts, graphic design, printmaking, photography, art education, sculpture, and painting. It also consists of a prominent gallery off the main entrance to exhibit student work. The future addition, also three stories, whose program is undetermined, is to be located at the NW corner of the site and will be connected with the original building to function as one building.

This building is to represent the creativity and vision of the department that it shall contain. A large open, flexible plan will accommodate the changing needs and differing teaching styles of the art & visual technology department. In order to create an open industrial feel that is welcoming to the public this building incorporates a combination of brick and corrugated metal paneling. The large curved façade slicing thru the building will comprise of a metal frame with a brushed steel cladding. This combination of the traditional brick with an industrial feel of the metal cladding will tie this building into the campus while giving the Art & Visual technology department the uniqueness they desire.

Depth: Lighting Design Analysis

Problem:

The lighting design of the Art & Visual Technology building needs to be a variety of things. Most importantly, it needs to allow and help the occupants of the building accomplish any necessary task. Next, it needs to be aesthetically pleasing and highlight prominent architectural elements of the building. Along with this, it needs to help create an innovative and creative atmosphere for the students and faculty. Finally, the lighting design needs to be efficient and meet the criteria set within National Electric Code and also ASHRAE. The best lighting design will incorporate and integrate all these factors.

Solution:

With the completion of the Art & Visual Technology building it will mark the first time the department will have a building to call its own. It is critical that the building reflects the vision and goals of the department. With this in mind, four spaces have been chosen for redesign with this in mind; the main courtyard, main lobby, exhibit gallery and painting studio. These four spaces are critical spaces in molding the impression of those spending time in the building.

The main entrance courtyard was selected because for many on campus this is all they will ever see of the building. It is important to develop a creative lighting design that will create a sense of place for the building and highlights major architectural elements. Some of these elements include the curved wall, which slices across the building creating one edge of the main entrance, the ornamental banner and entrance canopy. With this building being located on an university, the feeling of safety at night is critical for those walking past the building. And also provide ample lighting at the stairs for safety. Finally, the lighting design should assist in helping those find their way to the main entrance. In conjunction with way finding, the lighting design should create a prominent and welcoming entrance to encourage pedestrians to enter the building.

Upon entering the building, the main lobby will be the first interior space occupants will see. Since first impressions can only be made once, it is important to impress those entering and set the tone for an innovative and creative atmosphere. The lighting design should give visual cues to new visitors of the building on where to travel by highlighting important areas. The main hallways and connected exhibit gallery are key areas which are connected to the lobby which need to be highlighted.

Connected to the main lobby is the exhibit gallery. If one space would signify the building and department, the exhibit gallery would be it. This space will be used for student and professional exhibits alike. The lighting design needs to effectively highlight a variety of different art work while having a minimal profile to keep the attention on the artwork. The appearance of space is also very important and the lighting design should keep a clean look to avoid a cluttered and distracting ceiling. Finally, the lighting design should allow the inclusion of any custom lighting for the exhibits and do so in a seamless manner.

The fourth and final space to be analyzed is a typical painting studio. The wide variety of studios and classrooms are the real heart of this building. This is where learning happens, ideas are formed, and masterpieces created. The painting studios are located on the second floor along the east façade. An important element to this space is the clerestory that allows light from the northern direction to enter the space. This space needs to address two lighting conditions. First is the modeling of the object to be painted. A flexible design which is able to create a multitude of scenes is needed to allow the students to paint many different lighting conditions. For this to be possible, daylight must be able to be controlled via shades or some other mechanism. Second, the lighting of the work area, easels under most scenarios, needs to be addressed. A uniform and diffuse solution is needed to avoid any shadowing on the easels along with providing high light levels so the artists can easily see their work. Finally, any lighting source to be used must have good color rendering properties so students and objects have a true color appearance to them.

Solution Method:

The schematic design will be refined from the critiques of the design professionals at Lutron. Afterwards, computer modeling programs will be utilized to ensure that the desired appearance can be achieved under real life conditions. Computer modeling (AGI) will also reaffirm that the design is achieving the light levels or other design criteria are being met. Light level goals are going to be determined with the help of the IESNA handbook. And finally ASHRAE and NEC code books will be referenced to ensure that the lighting design will meet the necessary code requirements.

Tasks and Tools:

Task 1. Incorporate design professional comments
Task 2. Build AutoCAD model for use in AGI
Task 3. Select luminaires
a) Based upon appearance
b) Performance
c) Source options
Task 4. Select lamp (if multiple available)
a) Based upon illuminance needed
Task 5. Utilize AGI
1) Import fixtures & associated photometric files
2) Calculate illuminaces on import surfaces
Task 6. Evaluate task 5 and go back to task 3 if deemed necessary
Task 7. Refine AGI renderings to create photo-realistic image

Depth: Electrical Design Analysis

Problem:

The current electrical design within the building was well done and meets the needs of the building. However, it will need to be readdressed within the spaces which are going to be examined for the lighting design depth. With many transformers and long feeder runs the efficiency of transformers and other electrical components is critical.

Solution:

Numerous areas within the electrical distribution will be analyzed. Upon the confirmation of the lighting design the redesign of the electrical service to the spaces will be completed. This includes over-current protection and analysis of the panels for each associated space. Additionally, a coordination study will be done be done analyzing the distribution path of each space, which includes a short circuit current calculations.

The use of a photo voltaic array will be analyzed. This study will analyze the effectiveness and viability of the use of a photo voltaic array including payback period and any scheduling impacts. Also, a study of energy efficient transformers and standard transformers will be conducted. A financial payback period will be calculated to determine the economic feasibility

Solution Method:

The National Electrical Code 2005 edition will be referenced for loads and demand factors for the redesign of the four spaces. Research will be done for the use of photo voltaic arrays and power efficient transformers. Manufacturers, case studies and design professionals will be used as sources of information on these topics.

Tasks and Tools:

Task 1. Determine new lighting loads

a) Per NEC and fixture manufacturer's

Task 2. Redesign branch circuiting to affected spaces

a) Designate new circuits
b) Analyze affected panels & feeders

Task 3. Coordination Study

a) Existing devices verified
b) Size new devices

Task 4. Photo voltaic array

a) Research
b) Feasibility study
c) Benefit-cost study

Task 5. Power efficient transformers

a) Research
b) Feasibility study
c) Benefit-cost study

Breadth: Mechanical Analysis

With the lighting redesign in the main lobby the ceiling system was changed from an open exposed structure to having a drop ceiling. This change allows for the opportunity of adding a return air plenum rather than using return air devices and ducts. This allows the opportunity for the lighting fixtures to serve as the means of return to a newly designed return air plenum. Performance, cost and other impacts will be analyzed between having standard air devices and utilizing the light fixtures. Analysis of the new systems will comprise of performance, cost and any necessary changes to the sizes of equipment.

Breadth: Acoustical Analysis

The program of the building calls out for many different studios within the building. Metal and wood studios are located in the lower level of the building. The machines of in these spaces cause a large amount of noise and create potential for vibrations through the structure. An analysis of the existing acoustical conditions of the metal working studio will be performed. This study will include an overall condition of the space as well as the adjacent general classroom area. From this initial study, the rooms will be redesigned from improved acoustical properties which will create a more comfortable and safer environment for those in the metal studio and adjacent spaces.

Schedule

Week	Objective
Winter Break	Finish computer modeling of spaces. Start Research on Photo voltaic arrays & energy efficient transformers
Jan. 14-20	Determine Fixtures, collect spec sheets, .ies files, ballast information
Jan. 21-27	Import to AGI, determine room surfaces, reflectances. Perform calculations to get correct spacing and orientation of fixtures. Finalize fixtures
Jan. 28- Feb. 3	Calculate new loads, redesign panels and circuits affected by new lighting design. Start transformer study & PV study
Feb. 4-10	Work Week
Feb 11-17	Finish lighting studies
Feb 18-24	Finish electrical studies
Feb. 25-Mar. 2	Begin Mechanical Breadth
Mar. 3-9	Finish Mechanical Breadth & Start Acoustical Breadth
Mar. 10-16	Spring Break
Mar. 17-23	Finish Acoustical and any other miscellaneous Breadth concerns
Mar. 24-30	Begin Report
Mar. 31- Apr. 6	Finish Final Report & Start Presentation
Apr. 7-13	Finish Final Presentation
Apr. 14-18	Thesis Presentations