Senior Thesis Proposal

Reva and David Logan Center for the Arts, Chicago, IL

Sean Kim Lighting/Electrical option

Faculty Advisor: Professor Kevin Parfitt, Dr. Kevin Houser

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Executive Summary

The purpose of this proposal is to describe the work that will be completed in the spring 2014. It provides two depths which are the lighting and electrical systems of the Logan Center. In addition, the mechanical and acoustical system will be studied as breadth for this proposal.

The lighting depth will be focused on the redesign of four proposed spaces: performance hall, performance penthouse, main lobby, and courtyard. The main concept of lighting design comes from the architect's intent and the mission of the Logan family. The main goal of lighting design aims to provide various lighting scenes with lighting control to support different performance activities. In addition, new lighting design will integrate daylight into the space to increase natural atmosphere along energy saving. The design criteria will be referenced and specified from the IESNA handbook and ASHRAE 90.1.

The electrical depth will be focused on the energy and cost saving by alternate efficiency materials. Emergency generator, main circuit breaker for distribution switchboard, and dry-type transformer will be conducted. In addition, the branch circuits with protective device for the four spaces as re-designed in lighting system will be conducted.

The mechanical breadth will be calculating the heating loads and cooling loads thru the glass of the corridor and the performance penthouse. Also, the cost saving and expenditures will be calculated if the glass type is modified. For the acoustic breath, a reverberation time and Sound Transmission Class (STC) analysis for the performance hall will be conducted to provide better sound system to the audience because the space is critical acoustically for various performances. If the value of STC of some materials is inappropriate, the changes will be made with acoustical equipment such as sound absorbers.

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Building Overview

Reva and David Logan Center for the Arts is a new multidisciplinary arts center located in the University of Chicago. The Logan Center provides a dynamic mix of the spaces to create a rich environment across the artistic spectrum and collaboration at the university.

Building Name: Reva and David Logan Center for the Arts

Location and Site: 915 E 60th St, Chicago, IL, 60637

Building Occupant Name: University of Chicago

Occupancy or function types: Multidisciplinary arts center

Size: 184,000 square foot

Number of stories above grade: 11-story tower with 3-story adjacent building.

Primary project team:

Owner: University of Chicago

Project Manager: Eric Eichler, Senior Project manager at The University of Chicago

Design Architect: Tod Williams Billie Tsien Architects LLP www.twbta.com

Associate Architect: Holabrid & Root www.holabird.com

Structural Engineer: Severud Associates www.severud.com

MEP Engineer: Ambrosino Depinto & Schmieder Consulting Engineers www.adsce.com

Lighting Design: Renfro Design Group www.renfrodesign.com

Landscape Architect: Hargreaves Associates www.hargreaves.com

Civil Engineer: David Mason & Associates www.davidmason.com

LEED Consultant: Steven Winter Associates, Inc www.swinter.com

Construction Manager: Turner Construction, LLC www.turnerconstruction.com

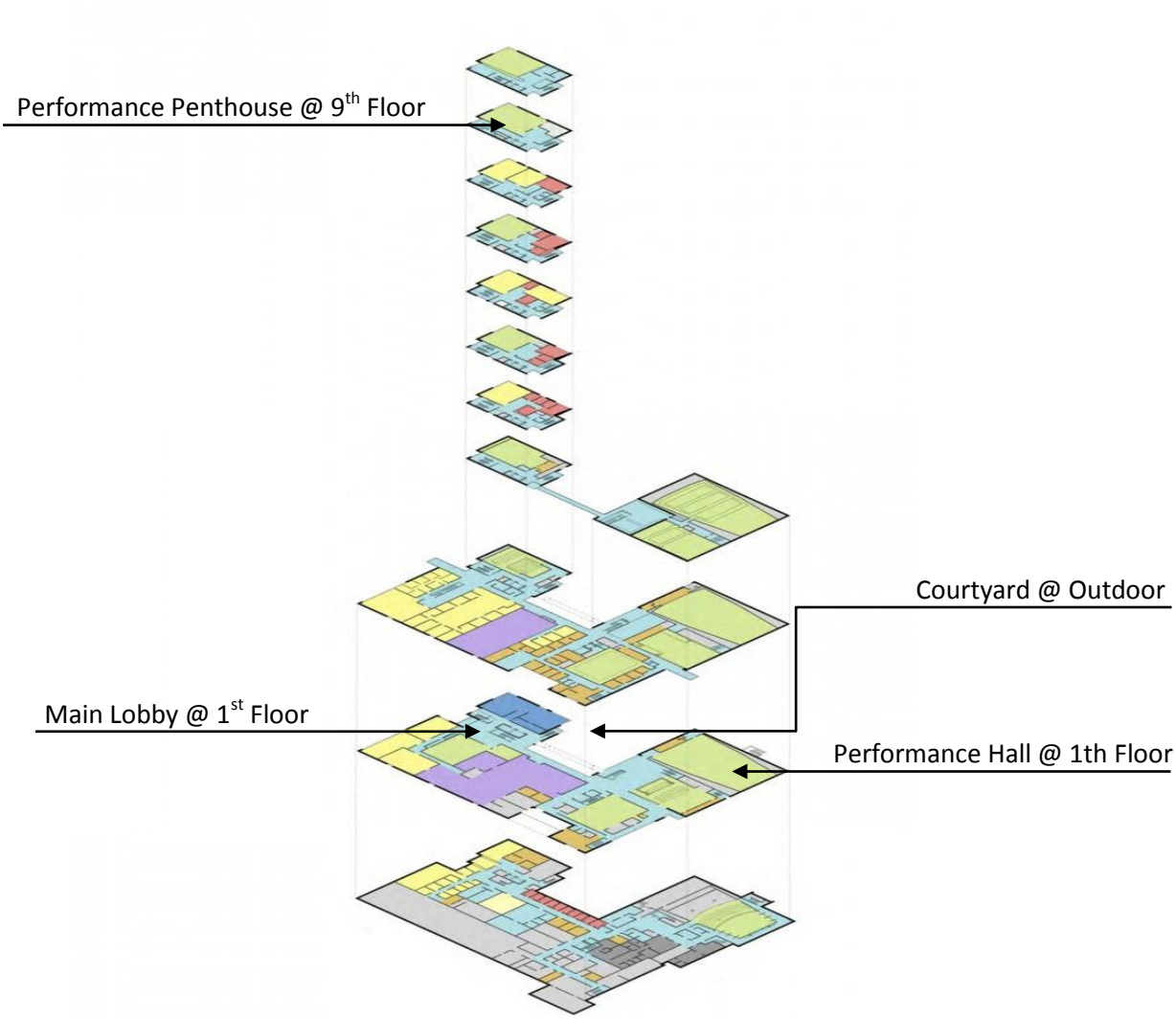
Lighting Depth

The lighting depth will focus on the lighting design of four chosen spaces in the Reva and David Logan Center for the Arts. The proposed spaces are listed as follow:

- Large work space: Performance Hall
- Special purpose space: Performance Penthouse
- Circulation space: Main Lobby
- Outdoor space: Courtyard

The Performance Hall will be analyzed to produce three different design concepts, and the Main Lobby will produce a lighting solution that provides psychological impression.

The main lighting design concept derived from the aspect of architect's idea and the mission of the Logan family. The concept words are artistic, flat prairies of Midwest, cultural, and vibrant, and those concepts will be collaborated as Harmony with providing aesthetic design, integrate daylighting system, and different lighting scenes



Performance Hall

The space of performance hall, located on the first floor, is a largest theater with a 474-seat. This space is used primarily for concert, performance, and full orchestra. For various activities and applications of the theater, three different lighting designs will be developed as artistic concepts which are classical, modernism, and sophisticated. Lighting color with fixtures will be studied to support this concept.

Performance Penthouse

The Performance Penthouse is located on the ninth floor of the tower. This space houses performances, dance, class, seminars and banquets, with reconfigurable seating for up to 100 people. The full-height windows are located on the North-East, and allow daylights into the space. The lighting design aims to integrate daylighting system with lighting control for various activities. Also, flexible lighting system will be considered.

Main lobby

The main lobby is primary access to the building. The stair near the entrance, allows the people to the tower directly. The corridor on the lobby is used for gallery, and exhibition. The public psychological impression will be applied to the lobby. The *flat prairies of the Midwest* will be main inspiration for the lobby to connect the inside and outside of the building. Two horizontal lines will be applied to modify the ceiling to create powerful atmosphere and provide welcoming environment in this space.

Courtyard

The Courtyard is placed at outdoor, and surrounded by Logan Center building, and Midway Studio building. It allows people to access to tower and performance hall directly. This space is provided as a rest area and café for the students; and used for class, exhibition, and outdoor performance sometimes. Providing light for way finding, but light trespass will be considered since this space is surrounded by building. In addition, relaxation feeling will be provided to this space as rest area.

Tasks and Tools

1. Programming
    - The design criteria, and energy code will be referenced from the recommendation by the Illuminating Engineering Society, and ASHREA standard 90.1
2. Schematic Design
    - Schematic Designs will be developed with hand drawing and Photoshop

- Schematic Designs will be modified based on feedback from the lighting designers

3. Design Development
   - AGI32 will be used to construct the 3D models with lighting calculation
   - Revit or 3ds Max will be used to create rendering images
   - Daysim will be used for daylight modeling and analysis
4. Contract Document
   - Presentation will be worked in PowerPoint
   - Report will be worked in Word

Feedback from Lighting Designers

Michael Barber

- Good Concept Connection, but tie in the performance penthouse to your original concept
- Pulled off concept well in most spaces, but not all
- Rearrange concept/slides
- Sketch for performance penthouse is not working at real design
- Custom pendent fixture in the performance penthouse needs sketch or some development
- Rearrange egress lighting slide
- Inspirational images are needed to help conceptualize the design with the concepts
- Don’t show luminaire images on the side

Charles Stone

- Liked varicose quotes, but a little too much
- Design goals should be goals, not methods
- Need scaled person on the sketch of courtyard
- Need captions for application images
- Explain why you have these goals
- Make sure the wall recessed slots will not too bright in performance hall
- Space purpose is a program
- Make sure how you will provide warm color with fixture types in performance hall
- Ending slide is good
- Rigorous thinking will make presentation better

Emad Hasan

- Good use of Architect and owners intent
- Moving too fast between concepts
- Spend a little less time on inspiration
- Courtyard – lighting on ground looks blocky
- Back lighting and Front lighting needed in performance penthouse
- Main lobby should be public impression
- Performance hall – Allow for theatrical lighting by professionals, not by lighting designer
- Performance hall – dim to less than 1%

Electrical Depth

Overview

The electrical depth will involve the redesign of the branch circuits for the four spaces as re-designed in lighting system in the Logan Center. Short circuit analysis with protective device will also be conducted. As was shown in previous technical report, there is potential change in the electrical system to save energy and cost for the Logan Center. Efficiency Transformer types, main circuit break for distribution switchboard and emergency generator size will be studied and analyzed. Additional work or modification will be completed after discussion with electrical consultant.

Efficiency Transformer

Since all electrical equipment is referred to the Illinois Chicago Electrical Code, and the Facilities Services Facility Standards – Electrical System from the University of Chicago, there is no possible change the existing electrical equipment. However, a dry-type transformer could be changed into the high efficiency type. It is less costly in the energy usage than the standard efficiency type, but it requires high initial cost for the equipment.

Main Circuit Breaker for distribution switchboard

There is potential change in the switchboards to reduce the cost. The switch and fuse is used for all main distribution switchboards. It is more costs and space. The size and cost of switchboards could be decreased by using main circuit break if it is not violated the Illinois Chicago Electrical Code, and the Facilities Services Facility Standards – Electrical System from the University of Chicago.

Emergency Generator size

The as-designed emergency power system meets the IBC emergency requirements, and the 600kW diesel-engine generator serves the fire pump, and high-voltage and low-voltage distribution switchboards. However, the generator serves too many loads which are fire pump and LV-EM-LL even if they are served by fire pump and emergency service from the power company. Therefore, the size of generator could be decreased if it is not violated the Illinois Chicago Electrical Code, and the Facilities Services Facility Standards – Electrical System from the University of Chicago.

Mechanical Breadth

Since good estimates of the corresponding heat transfer rates are necessary to design an acceptable air-conditioning system, the heating loads thru the glass of the corridor on the first floor and the performance penthouse will be analyzed because those spaces are applied with large amount of windows. Each space will be conducted for the amount of solar heat gains and cooling loads with different seasons by a graph and table. Also, the cost saving and expenditures will be calculated if the glass type is modified.

Acoustic Breadth

A reverberation time and Sound Transmission Class (STC) analysis for the performance hall will be conducted to provide better sound system to the audience because the space is critical acoustically for various performances. A reverberation time will be determined how the space dose functions acoustically well. The Sound Transmission Class values will be calculated for existing materials in the performance hall. If the value of STC of some materials is inappropriate, the changes will be made with acoustical equipment such as sound absorbers.

Proposed Schedule for spring 2014