The Tower at PNC Plaza

314 Fifth Avenue, Pittsburgh, PA 15222

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Thesis Proposal

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Executive Summary

The following report is a proposal for an improved design of the Tower at PNC Plaza. In the report, an electrical and lighting depth will be broken down, along with two breadths.

The lighting depth of this report, focuses on four key spaces within the Tower. Each space was developed from the lighting concept of how the building is breathable through nature. The concept is represented in each space by being an inhale or exhale space or both, that was developed from quantitative and qualitative criteria. The quantitative criteria is found from the IES Lighting Handbook and ASHREA 90.1 standard. The spaces that were redesigned are as follow:

Main Lobby
Prefunction + Auditorium
Cafeteria
Neighborhood

The report also includes professional feedback from the Lutron presentation along with personal comments. Responsibilities for the spring semester are outlined as well as split into phases in this report.

With the addition to the lighting changes, the branch circuiting of the electrical system will be modified appropriately and specific controls will be implemented. Additionally the electrical depth will include an overview of the energy usage from the electrical changes. Each of these topics will be studied for cost and benefits to determine practicality.

The two breadths that are being studied are acoustical and construction related. An acoustical analysis will be performed in the auditorium. The analysis will confirm that if the new lighting design effects the acoustical properties of the space, additional paneling will be utilized. The construction breadth will be a cost analysis of the new electrical system and of the shading systems that will be integrated into the auditorium. The energy savings potential will be also be considered with this study.

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Building Overview

The Tower at PNC Plaza is a 32 story high-rise office complex in downtown Pittsburgh. This new headquarters for PNC was designed to set a new standard for skyscrapers. With its sustainable design of innovation, the strategy of low-energy to heat and cool the tower is the reason to why the tower will be more than the world's greenest skyscraper. For the redesign of the four spaces, will focus on all of the sustainability features that PNC strived for, as well as the commitment to respect and reflect the community of the city of Pittsburgh.

Building Name

The Tower at PNC Plaza

Location + Site

314 Fifth Avenue | Pittsburgh Pennsylvania

Building Occupant Name

The Tower at PNC Plaza

Occupancy or Function Types

Auditorium [A3] | Office Complex [B] | Retail [M] | Parking Garage [S-2]

Size [Total square feet]

800,000 sq ft

Number of Stories above Grade | Total Levels

32 Stories | 37 Total Levels with Penthouse and Underground Parking

Lighting Significant Project Team

Architect: Gensler | http://www.gensler.com/
MEP + Structural Engineer : Buro Happold | http://www.burohappold.com/
Sustainability Consultant: Paladino & Company | http://www.paladinoandco.com/
Lighting Consultant: The studioi company | http://studioilighting.com/
Acoustical Consultant: Pin Drop Acoustics | http://www.pindropacoustics.com/
Façade Consultant: Heintges | http://www.heintges.com/

Dates of Construction

Spring 2012 – Fall 2015

Cost Information

Total Construction – ≈ $240 million

Project Delivery Method

CM at Risk

Lighting Depth

Concept

The Tower had a design and mission of 3 strategies that were used as a base point for the proposed concept. The first strategy was to make the Tower a community builder by creating an iconic landmark, reflect and respect Pittsburgh's city context, and engage the street level. Next, one of the biggest was for the Tower to be a climate responder by it being expressive of its sustainability, limiting the impact on demand for power and water, and maximize what nature has to offer. And finally, for the Tower to be a workplace innovator with it reflecting PNCs culture, have an access to views and daylight, and allow for organizational change. Because of the Tower's design and mission strategies, the building itself is breathable. With air being able to go into the Tower through poppers on the double skin façade that are activated by optimized day conditions. The solar chimney in the Tower is able to draw out warm air in the building for these optimized day conditions. Hence, the concept of **inhale** and **exhale** as continuous cycle in the building, making it breathable through nature.

Lobby

Being the first space that is visible from the street level, the main lobby should be very pleasing to the eye. The main purposes of this space are it is the primary entrance to the Tower, it allows circulation to get to the elevators and auditorium, and it is a security access point to use the elevators. Architecturally, the lobby has a two-story glass façade that allows visibility from the outside, in which a large pendant can be seen along with warm wooden architectural features.

The design goal of this space was to have the lobby be an inhale space, meaning a space that inspires and draws in people. To evoke this response and have the space feel welcoming, the back walls on the first and second level are illuminated to provide uniformity. Next, slots of light are in the doorways to the elevator lobbies and at the wooden slots near the pendant fixture in order to imitate cracks of light seeping into the lobby. Finally, the large pendant fixture is representation of the halo effect that comes from when looking at the sun's rays, along with a line of light surrounding the facade, to continue the halo effect.

Prefunction + Auditorium

On the south side of the lobby, there is a staircase that will take occupants to the second level that has another elevator lobby and the prefunction and auditorium spaces. Because these two spaces are connected, they are treated as one space for the overall analysis of the thesis, but are separated with design.

The prefunction space serves as an entrance to the auditorium and a seating or waiting area, but also it acts a gathering space for functions that are held by PNC and involve catering. In this space, the architectural details will be enhanced and guidance to the auditorium will be achieved with the overall design. To do this, an array of downlights will be implemented into the ceiling for ambient lighting. To create a focal glow, a linear line of light will be placed along the corridor that runs from the coat check room near the back to the front of the space. The purpose of this, is to guide people towards the auditorium. Another way this will be done, is by outlining the large wood paneled wall that is the entrance to the auditorium. Finally, over the tables that are utilized for catering purposes, pendants will be featured for a sparkling effect. With all of these layers together, the prefunction space is meant to serve as an exhale space. A place to calm the nerves of a presenter and to be an overall relaxing environment.

Lighting Depth

After being guided through the prefunction space, one would enter the auditorium that is meant for gatherings of speeches and large company meetings. In order to fulfill the purpose of the space, the design goals consisted of creating flexibility within the space by implementing a shading system that will maximize control for daylighting purpose and presentations. The lighting design that will allow flexibility and continue the concept of the Tower being breathable through nature is to softly illuminate the ceiling with fiber optics that will run through the grain of the wood on the ceiling. An image of a tree will be created from the fiber optics that instills this nature aspect. Illuminance will be provided for egress and seating with the use of downlights implemented into parts of the tree-like image. This design creates a representation of an inhale space, as the audience is meant to be concentrated on the presenter and be inspired by the overall room's design when there is no presentation.

Cafeteria

On the third floor, most of the space is used for the cafeteria and dinning. The space serves as an eating, gathering and lounging area that should be relaxing. The design will implement ways to create a more relaxing environment and make the servery area less confusing by providing guidance throughout the space. To do this, the half walls of each servery station is illuminated with recessed slots that represent veins and consist of PNC's colors and green for the impression of healthy food. More guidance will be provided with halo pendants that will be above each servery station, which continue the impression of a halo effect from the sun that was previously discussed in the main lobby. With this design, occupants will not be as overwhelmed as to where to go in this space, thus creating an exhale or relaxed environment.

Neighborhood

Floors 4 through 27 consist of 2 – story neighborhoods that are used as a lounging and gathering area but also they each consist of a 10 – person conference room. Since the neighborhoods are both public and private, this space will be analyzed with the intent of having a psychological impression of public in part of the space and private in the conferencing area. To do this, the open space will have uniform lighting throughout with an array of downlights. In order to achieve the concept within this space, an interactive lighting system will be on the graphic wall by the staircase. When part of the wall is illuminated with a blue glow, this will mean that the poppers on the façade are opened and the building is breathing so that the occupants can go out into the façade to feel fresh air. When part of the wall glows orange, this will indicate that it is not an optimized day and the poppers are not opened. Due to the separation in the space, the neighborhood represents both inhale and exhale spaces. The more public area is represented as an exhale space, as it is an area to relax. The conference area is an inhale space as it is a place to concentrate on what is happening in the space.

Lighting Depth

Professional Feedback

Lee Waldron

Confusion about real rendering of when beginning each space introduction.
Liked the idea of showing the end-result, and then explaining how it was done by layers.
Enjoyed third schematic design of auditorium the most.
Asked why third schematic of the veins were not feeding the other way.
Stage lighting levels seemed to be too low being only 2 fc.
Clarification needed for what the stage is used for functionally.

Ken Douglas

Really liked tree concept in auditorium.
Spot lights used for the seating in auditorium would be uncomfortable, need another solution.
Enjoyed how the building would interact with you with it inhaling and exhaling.

Shawn Good

Prefunction space looks like harsh lighting
Wanted elaboration of possible gobo effect in prefunction space
Auditorium tree could have pinhole downlights to introduce general lighting
Consideration of using LED sculptural pendant in existing lobby, or why not.

Personal Review

Reconsider sculptural pendant in lobby, or to what could be added to it.
Revise prefunction slots on wood paneling, on how to integrate more elegantly.
Analyze if PNC colors are appropriate and where placement would be pleasing.
Work on how to incorporate pinhole downlights into the fiber optic tree in auditorium.
If pinhole idea for tree in auditorium is not feasible, research for another solution.
Graphically find a better way to represent ambient lighting in prefunction and cafeteria spaces.

Lighting Depth

Tasks + Tools

Schematic

Use a combination of hand sketches, computer graphics such as Photoshop renderings and architectural plans to visually convey conceptual design in all spaces.
Revise designs based on professional feedback.

Design Development

Select the preliminary luminaires to be used and create any custom fixtures in AutoCAD.
Locate all IES files.
Create 3D models of all spaces in AutoCAD or Revit.
Implement models into AGI 32 and Revit Elumtools for lighting calculations.
Adjust layouts and fixtures based on calculations found to achieve appropriate and desired values.

Construction Documents

Draw lighting fixture layouts in a reflected ceiling plan in AutoCAD.
Collect all fixture cutsheets.
Produce fixture schedules.
Generate renderings in Revit and finalize them in Photoshop.

Submittal

Create final report.
Design final PowerPoint presentation.

Electrical Depth

Branch Circuit Redesign

With the installation of new fixtures, new loads will be the result that will have an effect on the panelboards. A redesign of the branch circuit will be the solution of this change in the lobby, prefunction + auditorium, cafeteria, and neighborhoods. An analysis of the effect on the panelboards, feeders, and wiring will be done to ensure that new loads can be managed efficiently.

Energy Usage Analysis

An analysis of the electrical changes will be done in accordance to the usage of energy and how these changes will either increase or decrease costs. The purpose of this analysis will guarantee that all electrical modifications will keep the design mission consistent with PNC's intent of being economical and efficient.

Breadths

Acoustical

By redesigning the systems and layouts of fixtures in the auditorium, the acoustical properties will be effected as well. To ensure that the space has the correct reverberation time and any other acoustical properties, an acoustical study will be implemented. A closer look at if the fiber optics in the ceiling will have any affect will be one consideration, along with which shading system will be the best acoustically for the space. In order to perform this study, information will come from AE 309.

Construction

A cost analysis will be performed for the second breadth. With the addition and changes made to the electrical system, a cost analysis will show if these modifications will have savings in cost and also energy savings as well. Included in this analysis will be on the different shading systems that might be implemented into the auditorium. Finally, an analysis of the cost schedule will be included that will show all the changes made to this schedule, as well as the adjustments to the critical path.

Proposed Spring Schedule