

Executive Summary

The purpose of this report is to briefly summarize design works performed for Penn State Architectural Engineering Senior Thesis Project. The project is focused on exploring alternative design options for Perot Museum of Nature and Science, especially its lighting and electrical systems. Additionally, acoustic property, architectural appearance and daylight harvesting strategy are also studied as breadth options.

The following spaces: Classroom, Main Lobby, Theater, Building Façade and Escalator Cartridge were selected for lighting depth study. The target of this study is to develop various design solutions that meet the unique need of each space, yet ensure all designs share a common concept: to make the building itself being an exhibit uniting nature, science and urban elements all together. The classroom space in basement is carved into an underground cave with dark ceiling. A light well located in the center of the classroom becomes the major source of natural light, connecting the cave from the world above ground. The major purpose of lighting system is to provide enough illuminance that allows practice without distract occupant from the light well. Light trespass to the ceiling is also minimized to maintain the dark cave impression. Lighting in the lobby is designed to navigate visitors since it is the major entrance and ticket center of the museum. Plenty of ceiling space allowed a three dimensional placement of luminaires, shaping the space into an underwater world. Façade texture is one of the most iconic elements of this building. Thus the mission of façade lighting is to ensure that its texture can be recognizing in the nighttime while also guarantee the building's nighttime identity as a whole. Unique acoustic panels were used in the theater space, makes lighting design a challenge to maintain space integrity. Lighting systems in the escalator attempts to trick visitors' eye and bring them an exciting escalator riding experience.

Electrical analysis is performed to check influences of new lighting solutions on building's electrical system. Short circuit calculation is also performed to double check the electrical safety. Luminaires are rewired to match new control strategy as well.

Additional breadth studies include acoustic analysis, focus on the evaluation of theater's acoustic quality; Architectural breadth, focus on designing façade texture that resonate with landscape layout and also daylighting breadth exploring higher daylight harvest efficiencies by smart lighting control strategies.