Executive Summary

The information depicted in this report relates to the Penn State Hershey Data Center which is an ongoing construction project located in Hummelstown, Pennsylvania. This is the project that I chose to analyze for my Architectural Engineering Capstone Thesis Project here at Penn State University. The purpose of this project is to analyze the construction processes as a whole. This report contains information including, but not limited to, the project introduction and background, site information, systems information, four depth topic analyses, and two breadth topic analyses. The focus of this report is the four main analyses that identify problems or opportunities with the current design or construction process of the building.

The first analysis adds and utilizes a raised access floor system in the white space data hall of the data center. This will sit on the concrete slab and the data racks will sit on top of the raised floor. This system will add quality to the building and the owner will save money in the long run though maintenance and flexibility as the electrical conduit and mechanical piping can run under it. The analysis will compare initial costs, schedule, and the benefits and problems with both designs. As a result, the raised flooring added a cost of $144,130 and 12 schedule days to the project along with many prominent advantages. This analysis also introduces a mechanical breadth which will analyze a new air flow distribution design and evaluate cooling efficiencies across the AHU coil in different design scenarios.

The second analysis changes the built-up asphalt roof with a gravel protective layer to a single-ply thermoplastic roof system. The original design is expensive and is overkill for a building like this. Using value engineering, the design can change to a less expensive roof, but still as efficient and effective. The analysis will compare costs for both systems, schedule, and the benefits and problems with both designs. As a result, the single-ply roof would save the project $675,921 and 16 schedule days, while the built-up roof has many advantages such as durability. This analysis also introduces a structural breadth which will analyze a potential re-roofing and evaluate if the roof will exceed the structural design loads or not.

The third analysis changes the sealed concrete floors in all exposed areas to a polished concrete. This design change will improve the quality of the building as a whole for the owner. The exposed concrete will have less imperfections due to the method of applying, is extremely long-lasting, and will reduce maintenance costs for the floor. The analysis will compare costs for both floor finished, costs, schedule, and the benefits and problems with both designs. As a result, the sealed concrete saved the project $36,030 and 8 schedule days compared to the proposed polished concrete.

The fourth and final analysis will look at BIM education for owners and their expectations for the project. This is a research analysis focusing on a critical issue in the construction industry. The BIM education topic was discussed among industry leaders at the PACE conference held at Penn State. This problem causes contractors to not understand the BIM expectations that are set in the contract by their client and inaccurate estimates are developed because of this, causing the contractors to lose money when they add BIM methods later in the process. The solution and response to the problem presented is to educate clients that lack the knowledge and resources to understand BIM and its processes on an in-depth basis. This analysis will rely on surveys to gather the valued opinions of owners, contractors, and designers on the matter, along with research on BIM costs and education methods. The research determined that the premise of the analysis was correct and the most effective way to educate people on BIM, and essentially save money in the long-run, is by holding training sessions taught by the contractor.