EARTH AND ENGINEERING SCIENCES BUILDING

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Thesis Proposal
December 12, 2005

Executive Summary

The Earth and Engineering Sciences building at University Park, Pennsylvania is a four story educational and laboratory facility. It was designed by Herbert Beckhard and was intended to be a part of his architecture legacy. The building itself is a pleasant site to the eye as it mixes the traditional Penn State brick theme with precast concrete panels and glass. A total floor area of 106,000 square feet is provided for multiple uses and is utilized primarily as an educational facility. The building features several class room spaces, computer and research labs, as well as a small auditorium. One of the signature points in the design is a lobby that ties the East and West wings of the building together.

The purpose of this thesis will be an attempt at correcting a flaw in the initial planning of the structure. The building was originally scheduled to house all mechanical equipment at the roof level and mask this equipment with parapets that would give an appearance of an added floor. However, as the planning stages progressed it was determined that the overall height needed to accomplish this feat would impose on restrictions set forth by local zoning authorities. This problem was corrected by adding extra basement space and moving the equipment into this additional space. An alternate floor system will be designed to correct this issue and allow the mechanical equipment to remain on the roof.

RAM and ETABS are two structural design software packages that will be utilized in the redesign of the structural system of the EES building. Three systems are under review as alternatives for the existing system. Multiple systems could be selected, but for this study a hollowcore plank floor, flat plate slab, and an A992 steel composite system will all be investigated. In order to complete the necessary analysis several references will need to be used. The AISC Manual for Steel Construction, ACI 318-05, IBC 2003, and ASCE7-02 will all be employed as guidelines for proper design of the aforementioned alternate systems. R.S. Means will also be referenced, as it will be needed to perform a detailed cost estimate of the alternative systems.

Three breadth topics will be researched and reported as part of the final solution to the problem being approached. The first will be to look at each floor system from the viewpoint of a construction manager. Each system will be rated on its' ease of constructability and overall cost of materials and labor. From this a comparison can be made on another level than strictly structural performance. The second topic will be to investigate the impact on mechanical systems and their operation in respect to the new floor system. Lastly, each system will be analyzed as to its' effects on architectural acoustics. Moving mechanical equipment will bring into play issues with noise and vibrations that will need to be considered when selecting a suitable floor and structural system.