

EARTH AND ENGINEERING SCIENCES BUILDING

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Final Report

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Executive Summary

This report will examine the Earth and Engineering Sciences building and document the various systems within its walls. The purpose is to demonstrate how alternate floor systems affect the entire structure. While problems may occur from these changes, great benefits can also be achieved and will be discussed.

The primary focus of this report is to attempt to resolve an issue that may have occurred during the original design. In the original design of this building, it was believed that the mechanical equipment could be placed at the roof level; however, due to height restrictions this could not be done. It will be shown throughout this report how the roof height could be lowered by using a shallower floor system.

The floor system selected for design is prestressed hollow core plank flooring. Hollow core plank is capable of carrying high loads, while remaining relatively light weight and thin. The hollow core will allow the same floor to ceiling height, while minimizing the mean roof height. It is this characteristic that will allow mechanical equipment to be placed on the roof.

The entire structural system will be changed to 50 ksi steel and redesigned based on new loadings. All of the loadings, required for design, are produced according to ASCE 7-02 code and reflect a redistribution of the weight from the mechanical system. The design of the steel within the structural system will be done with the aid of a structural analysis program. Software selected for use in this analysis was the *RAM Structural* analysis program. The hollow core was sized according to design specifications from the *PCI Handbook* and the Nitterhouse Concrete Products website.

The final part of the investigation is to determine how the new structural system will affect the mechanical systems. A cost analysis and time schedule was also created in order to compare the new construction sequence to that of the original. From these studies and the structural study, it was determined whether the new design was feasible.

The new design proved to be less costly and more time efficient than the original design. There were a few issues in moving the mechanical equipment, but they were adequately dealt with and will be explained in the report. All of the results within this investigation suggest a fairly successful solution.