

EARTH AND ENGINEERING SCIENCES BUILDING

Justin Strauser – Structural option

Advisor: Professor Parfitt

Technical Assignment 2

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Executive Summary

The purpose of this report is to provide an analysis of the existing floor system of the Earth and Engineering Sciences Building at University Park, Pennsylvania, as well as investigating four additional floor systems that will compare and contrast with the original. A typical bay, which will be defined in the report, was used to provide a small scale design for each floor system. All loads were computed in accordance to the International Building Code with the exception of the loading used with the CRSI Handbook. Each design includes a design of the main floor system, accompanied by suggestions for column and girder sizing. The existing system, a steel frame with concrete on metal decking, was analyzed by hand and by RAM structural analysis software.

A comparison of four systems will also be detailed in this report. The four alternate systems considered are as follows:

1. A992 (50 ksi) Grade Steel, w/concrete on metal deck
2. Hollow core plank, w/ steel framing members
3. One way concrete pan joists, w/concrete framing members
4. Open web steel joists, w/steel framing members

Each alternate system involves slightly altered spans, loadings, and directional properties. All of which are defined in the section that explains their design. Various methods were used for each system, as well as multiple references. After analysis each system was compared and contrasted to each other and the existing system in order to determine a suitable alternate. The first alternative is similar to the existing system in design but still provides added benefits. The other three systems are significantly different and added many aspects that needed to be considered.

After evaluating all the pros and cons of all the systems a recommendation for an appropriate alternate system will be made. The A992 grade steel system was discarded due to it's likeness to the original system in depth. It does have the benefit of smaller members and a reduction in weight but does not provide many additional benefits. The open web steel joist system was not considered an option after it was found to be a deeper system than the existing one and would be difficult to fireproof. The two remaining systems were both concrete based systems. The edge in the recommendation went to the hollow core system. The hollow core slabs provide a smaller self weight and a more shallow depth than the one way pan joist. This summarization is provided in greater detail at the end of the report and can be viewed in both written and tabular format. The existing system was an efficient and cost effective system, but upon further investigation it can be determined that both of the alternate concrete based systems can be viable options. The hollow core plank system should be looked at in greater detail as a new option for design of the EES Building at Penn State.