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Structural Option
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BME/Optics Building

Final Report

Executive Summary

This report summarizes and describes a redesign of BMEO as a concrete structure. The redesign consists of a 10" thick concrete flat slab for typical floors, and a similar 12" thick system at the mechanical penthouse/low roof level. Drop panels were used at the western face of the building, where the longer spans and high loads induced high shear forces at columns. The floor system design procedure used finite element analysis computer software to more accurately predict the slab behavior for this uniquely shaped building. The equivalent frame procedure, a more traditional design method, was also completed for comparison. Reinforced concrete shear walls provide lateral stability for the new structural system, located in areas of the building that minimized architectural impact. A few design challenges, such as transfer girders at the second floor, made this concrete redesign difficult. A few unique areas of the building are pointed out where the new concrete system has clear advantages over the original steel system.

In addition to structural work, two other breadth topics are explored. Construction management issues of cost and scheduling are analyzed to provide a comparison between to the original steel design and the concrete redesign. Also, research on BMEO as a green building is described. Rather than listing methods of achieving LEED points for certification, this section analyzes one hypothetical method of an environmentally friendly and energy-saving design, an ETFE foil cushion roof over the atrium.

Upon completion of this project, the following conclusions were made:

- Recent technologies such as finite element analysis make concrete design for more complex structures possible and more efficient
- Although more labor intensive, cast-in-place concrete can be very economical in buildings such as BMEO, that would otherwise require a large quantity of steel
- Technological advancements such as ETFE foil cushion membranes can provide architecturally unique, environmentally friendly, and energy-saving building solutions