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University of Rochester
BME/Optics Building

Technical Report #2

Executive Summary

The goal of this report is to investigate alternative floor systems for the University of Rochester BME/Optics Building in Rochester, NY. Preliminary analysis based on design loads will determine approximate sizes of each alternative system. Each system will then be examined in terms of performance, constructability, and cost to determine which need further investigation and which are not feasible for this building.

The current floor system is composite steel beams with non-composite steel girders. The alternative systems analyzed in this report are:

1. Non-composite steel beams
2. Composite and non-composite steel joists
3. Flat slab cast-in-place concrete
4. Precast double-tee
5. Precast hollow-core plank

The current composite steel system is economical, efficient, and well suited to meet the needs of this unique building. The current system provides adequate strength required for the high design loads, meets all serviceability criteria for the laboratory environments, and is laid out in such a way to meet the architects' spatial challenges.

Some of the alternative systems investigated were simply uneconomical to meet the strength and performance requirements of this building. Fireproofing and vibration damping of steel joists is difficult and expensive. Using larger, non-composite steel beams instead of the current composite design would work, but would be more expensive. Finally, precast double-tee worked fine for the bay analyzed. But when considering the shape and conditions of the entire building, this system was complicated and inefficient. These three alternative floor systems were ruled out as feasible possibilities for this building.

Other systems seemed to work well with this building, and may be investigated further. The inherent fireproofing properties, strength and deflection control with a shallow floor depth, and ease of construction made precast hollow-core plank a viable alternative. Unlike double-tee, this type of system can be economical without extremely long spans. Also, the flexibility of cast-in-place concrete made flat slab construction probably the best alternative floor system. Although more labor intensive than the current steel system, cast-in-place concrete has a short lead time, inherent fireproofing and vibration damping, and is a shallow system. Flat slab and hollow-core plank have been deemed feasible alternatives at this point, and may be investigated further.