



Mike Steehler

Structural Option
Advisor: K. Parfitt

University of Rochester
BME/Optics Building

Technical Report #1

Executive Summary

The purpose of this report is to outline the structural system of the University of Rochester BME/O building and analyze the procedures used in its structural design.

The Institute of Optics at the University of Rochester was founded in 1929 as the first optics education program in the United States. Almost 80 years later, it remains a cutting edge program, and one of the finest educational and research institutions in the country. The Institute of Optics, along with the Biomedical Engineering Department, are currently obtaining a new facility to cater to the needs of these highly regarded programs. The facility, currently known as the BME/O Building, began construction in January of 2005, with a scheduled completion of December 2006.

It is strategically located on the south end of the U of R River Campus, across the street from the Medical Center, and adjacent on two sides to the current Biomedical and Optics facility, the Wilmot Building. A second floor pedestrian bridge connects the new BME/O Building to the nearby CSB Building to provide access to computer lab and library services. Key architectural features of the building include channel glass façade at stairways and an 80' atrium inside the main entrance to be lit by skylights. The structure is 5 stories plus a mechanical penthouse and partial basement, and consists of laboratory, classroom, and office space.

This report provides a detailed description of the structural system used in this building, as well as the codes and design guides used. The BME/O building is a steel framed structure, using composite beams in a majority of the floor systems. Strict vibration and deflection criteria in laboratory spaces were an important design consideration in the floor systems. Steel columns transfer the floor and roof loads down to the foundation – steel H-piles driven to bedrock in various configurations. Another important design consideration was the existing steam and utility tunnel running under the building's footprint. Grade beams frame around the tunnel, as there is a strict requirement to keep the tunnel fully operational throughout construction.

The lateral system resists wind and seismic loads through braced frames in the east-west direction, and moment frames in the north-south direction. Since the BME/O Building is adjacent to Wilmot Hall on two sides with isolation joints, accurate lateral deflection calculations were necessary to determine proper clearance.

In order to better understand the design concepts used in this building, several calculations were made in this report. Gravity loads, both live and dead, were determined and used to spot check beams and columns. Also, wind and seismic loads, along with their distributions, were calculated and are displayed in various charts and diagrams. They were then used to analyze the design of a lateral element. In performing these calculations, several conclusions were made in regards to the structural design. It was determined that the design methods and calculations were similar to those I used, although some conservative assumptions were made.