

Executive Summary

The New Library at the University of Virginia's College at Wise, located in Wise, Virginia, will serve as a main link between the upper and lower campus areas, which are currently divided by a steep 60 foot hill. The new 6 story, 68,000 ft², library will be integrated into the hillside, and will provide students with an easier and safer path across campus. Construction on the New Library began in August 2012 and will be completed in August 2015.

The following report contains information on the analysis and redesign of the structural system for the New Library. A structural overview of the existing steel structural system is included in the first portion of the report, while the majority of the report is comprised of the structural redesign along with additional analyses completed during the semester.

The primary structural redesign was completed using a conventionally reinforced two-way concrete flat slab. Deflection issues in the longer span bays were addressed as part of this redesign. There was also an interest to investigate the feasibility of a post-tensioned concrete floor slab, which was completed as a secondary redesign. RAM Concept was used to aid in the design of the floor systems, and the program output was verified by hand.

Since there was an increase in seismic loads due to the increased weight of the structure, the existing lateral system was analyzed to verify that it would still be adequate under the increased loads. ETABS was used to aid in the analysis of the lateral system.

Due to the decision to integrate the building into the existing hillside, water infiltration of the structure was a major concern. To ensure that the foundation wall drainage system was adequate, an analysis and design of the drainage system was completed as part of the first breadth study, along with a study of the water proofing for the foundation walls and basement slab.

As part of the decision as to whether a concrete structural system was a feasible option, a cost and schedule analysis was completed for the second breadth study. Through this study it was determined that the concrete system did offer a significant savings in cost, and would also offer a slight decrease in project duration.

After completing the redesign of the structure it was determined that a concrete structural system was a feasible option for the structure of the New Library. The functionality of the system in terms of floor-to-ceiling heights and column sizes was similar to that of the steel system and in some cases showed improvement. The concrete system was also able to offer a significant cost savings, and would result in decrease in project duration of a little over a week as long as adequate laborers were available.