

(Preliminary) Thesis Proposal
Increased Seismic Load: Lateral System Analysis and Redesign



Life Sciences Building
The Pennsylvania State University, University Park, Pennsylvania

Executive Summary

This report is a proposal to analyze and redesign the lateral force resisting systems for the Life Sciences Building at The Pennsylvania State University, University Park, Pennsylvania. The building was designed starting in 1999 and was completed in 2004. The building is 'L' shaped, has 6 floors (97' total height) and a mechanical penthouse level, and totals 154,000 GSF.

The gravity framing system consists of concrete slabs on composite steel deck. The composite steel deck is supported by composite steel beams and composite steel girders which frame into steel columns. The building lateral system consists of moment resisting frames, concentrically braced frames, eccentrically braced frames, and frames that are hybrid combinations of moment and braced frames. In the east – west direction there are three moment frames and three hybrid frames that are combinations of moment and eccentrically braced frames. In the north – south direction there are three concentrically braced frames, two eccentrically braced frames, and two hybrid moment / concentrically braced frames.

Previous assignments and experience have shown that the existing composite steel gravity framing system is the best suited of all alternatives to handle the varying spans, varying loads, irregular column placement, and the need to integrate complex lateral systems into the structure. However, Technical Assignment III revealed that the lateral system could be redesigned to be more efficient. Ideas for improving the lateral system include the elimination of and redesign of lateral force resisting frames. In addition, the building was in Seismic Design Category "A" which gave little experience using the seismic loading provisions of ASCE 7-05.

The proposal is to analyze the building lateral system for a location that results in a SDC of "D" and use this seismic loading to investigate the complex lateral system in more detail than was done in Technical Assignment III. The lateral system will then be redesigned to resist lateral forces more efficiently while studies are concurrently undertaken to examine the effects of the redesign on the building architecture and construction costs.