

## Executive Summary

The Student Health Center (SHC) is a five story building on the Penn State campus that serves as a health care services and hospital facility. After completion in the fall of 2008, this building now houses University Health Services and Counseling and Psychological Services, two departments of Penn State's Division of Student Affairs.

The facility is 77 feet in height from the first level and is approximately 64,000 SF in area. It has a brick façade rising from the ground with large curtain wall on the south side the building. The structure is held up primarily by a steel frame. The overall structure sits on a mini-pile foundation through use of pile caps, piers, and grade beams. Composite steel with concrete slab on deck is use for the floor system throughout the SHC.

In this final report, the current building statistics is to be discussed, as well as, the proposed redesign. A comparison of the two structures will then be stated.

The redesign changed the building from a primarily steel structure to a concrete supported structure. This was done for one main reason; to reduce floor thickness and research the plausibility of adding another floor to the structure. A post-tensioned floor was designed, as it would allow for the thinnest floor, and the thickness was determined to be 8". Setting the story heights at 11 feet, this floor system allows for the mechanical equipment to fit as per original design. Ceiling heights currently employed in the SHC were kept intact despite the structure change. Because of this another story could be added without changing the original building's overall height.

Gravity columns were designed at 18"x18"; with (12) #11 rebar and were adequate to carry the load. Foundations were also checked for gravity loading. It was found that (4) piles had to be added to resist the heavy concrete structure's loads. Shear walls were designed to replace steel moment frames to resist lateral loads and minimize lateral drift. These were designed with a width of 18".

A CM study was then done, calculating the plausibility of implementing the design. A cost analysis yielded \$899,153 construction cost for the concrete structure and \$1,358,422 for the steel structure. A schedule estimate yielded 234 days of construction for the concrete superstructure and 177 days for the steel one.

In addition to the structural redesign, a study of shading systems was completed. Two systems were implemented, solar fins and light shelves. The light shelves were then analyzed to determine the effectiveness of light in exterior rooms. This was then converted to show a lighting system savings of \$150 per year.