

EXECUTIVE SUMMARY

The Millennium Hall building is a seventeen story residence hall on the Drexel campus in Philadelphia, PA. Construction completed in 2009. The building's stunning look comes from its fish eye shaped floor plan and its dramatic aluminum and glass curtain wall.

The building used cast in place concrete to create a flat plate structural system. With columns only on the interior of the building, the concrete floor slabs cantilever out fifteen feet to the exterior of the building. All of the buildings vertical circulation and utilities are located in the central core of the building.

The building is very heavy and with such long cantilevered slabs, the floor system has become very thick to accommodate for the high forces it creates. To explore the feasibility of an alternate system, one which could remove the high forces and reduce the overall weight of the building, a steel frame system was examined.

The gravity system was maximized for weight by analyzing the floor system for superimposed dead and live load, and using a composite steel and concrete deck. The height of the floor system was able to remain as thin as possible, while reducing significant weight.

The building was then analyzed for lateral forces of wind and seismic. Braced frames were introduced to replace the heavier shear walls, further lightening the building. The braced frames were analyzed to ensure that the deflections the building would have under these loads would fall within the allowable limits, providing a safe design.

The foundation was checked for adequate strength and it was found that the existing foundation caissons could be reduced in most areas of the building, since the force to each one had been reduced due to the buildings new weight.

The architectural layout and appearance were considered as a way to examine how the structural redesign would impact other systems in the building. It was found that minimal changes to the floor plan would have to be made.

Finally impacts of construction cost and timeline were examined to see if the structural redesign could really be feasible. It was found that although cost of the structural system was increased, the construction timeline was reduced significantly, which in the long run could have added benefits and saving throughout the remainder of construction.