

**Sallie Mae Headquarters
Reston, VA**

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Structural Option
Technical Assignment #3
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Executive Summary

Sallie Mae HQ is an office / parking structure that is located in Reston, Virginia. The office building is a steel tower structure that extends 9 stories above ground level and is approximately 25,000 SF in area per floor. The steel tower braced frames line up with the parking garage shear walls. The connection between the shear walls and the braced frames are considered pinned connections and keep a continuous load path all the way down to the foundation. The foundation must be designed to resist uplift, and therefore a continuous footing along the shear wall length is the appropriate design.

To determine the lateral forces on the building I used ASCE 7-02. The wind and seismic forces were relatively close, and each one had to be analyzed separately to determine which one caused the larger internal forces and drifts.

I began analyzing the structure by assuming that the 8 braced frames took all the lateral loads in the building. Even though other factors may contribute to the lateral stability of the system, Sallie Mae mainly consists of leaning columns and this approach is conservative. Each of the 8 frames with all their member sizes were drawn into ETABS to determine the relative stiffness between each frame at each floor level. After these relative stiffness' were found, then a series of calculations were made to determine the final story shears in each braced frame at each floor level. Due to the fact that the center of mass (seismic) and the center of area (wind) match up reasonably well with the center of rigidity, the moment caused by a 5% eccentricity had to be considered. Furthermore, both counterclockwise and clockwise moments had to be considered due to this eccentricity. So the final story shears considered both seismic and wind, for both types of moments. Then the largest shears for each frame were reverted back to story forces so a determination of drift and strength could be made by using ETABS again with the new loading.

According to reasonable judgment the drift standards for Sallie Mae were made out to be $H/400$. With the outstanding height of the building being about 137', the deflection limit comes out to be 4.11 inches. Also the usual practice for multistory building is to keep the drift index within .0015 and .0030 radians for the worst lateral cases.

The effect of the shear walls and braced framing allows for leaning columns throughout the structure; which allows for great simplification of the column loads, and the foundation loads. Overall the lateral system of the existing building is acceptable in the E-W direction. However, in the N-S direction a more in depth analysis needs to be considered.