

Executive Summary:

This report is the result of a yearlong study of Washington Park Condominiums, which is a 9 story, 148,000 ft² multi-use retail and residential building located in Mt. Lebanon, Pennsylvania. The existing design consists of a precast concrete plank system on the first two floors and a composite steel joist system on the remaining seven floors. Both systems are used to resist the gravity loads on the structure. The composite steel joist system was also used as an architectural element in the building because of its ability to integrate the mechanical systems within the depth of the joists. This proved to be a valuable aspect of the design, which allowed for higher ceiling heights and a more upscale feel to the apartment units. To resist the lateral loads of the structure, steel moment resisting frames were designed. These frames begin on the second floor and continue up through the top of the building. Brace frames were also designed and placed in the basement of the building to help transfer the lateral loads due to wind, seismic and soil pressure to the foundations. Overall, this design effectively resists the gravity and lateral loads of the building.

The purpose of this study is to redesign the existing structural system of the building, while determining whether or not the existing design is the most efficient. The proposed gravity system of the structure consists of a two way flat plate slab supported by reinforced concrete columns. This system allows for little change in the buildings column grid and floor plans. The planned lateral system of the building originally consisted of reinforced concrete shear walls located around the stair and elevator shafts of the building. However, after initial design analysis the design was updated to include exterior concrete moment frames. These moment frames will add stiffness to the building along with reducing the torsional effects of the lateral forces.

The shear walls in the building were designed as ordinary reinforced concrete shear walls because of the seismic design category that the building falls in. In contrast, the concrete moment frames of the building are designed as intermediate moment frames so more in depth detailing, reinforcement and design could be explored as part of the study. Overall, the new lateral system is designed to comply with all code requirements as laid out in ASCE 7-05 and ACI 318-08.

Lastly, two breadth studies will be completed as a way to see how the change in structure impacts other systems within the building. The acoustics study to be performed was requested by the owner because of concerns stemming from the amount of sound transmission that would occur from noisy spaces into the apartment units. Finally, an architectural detailing study will be completed in order to determine the impact that changing the structure has on the placement of the mechanical systems of the building.