

Executive Summary -

Johns Hopkins Graduate Student Housing is a 20 story apartment complex located in Baltimore Maryland. The first floor is comprised of three commercial spaces while the rest of the building is residential. The existing structure is composed of an 8 inch thick post-tensioned concrete slab. Lateral loads are resisted through one foot thick shear walls extending the whole height of the building.

In order to make a problem within the structure, a move to San Francisco was proposed. Moving to a high seismic region would cause the tall shear walls to no longer be code compliant. The proposed solution for this project then was to design a dual system of eccentric braced frames with moment connections capable of resisting at least 25% of the seismic load. These frames were designed according to AISC Seismic Provisions. At the Baltimore location, controlling wind deflections was the greatest challenge and caused the design to incorporate several frames.

In order to reduce seismic weight and prepare the structure for a seismic region, the gravity system was redesigned utilizing composite steel beams. Typical sizes for the beams were found to be W12X19 when sized by hand or Ram Structural Systems. A goal for designing the gravity system was to minimize the structural depth just as the original structure had done. This was achieved through small tributary areas and the composite system.

Once the structure was designed at the current location, the move took place and was analyzed once again. Many of the structural elements, particularly columns, needed to be upsized by 10-20 pounds per foot. Unfortunately, the building was also found to once again be torsionally irregular despite the addition of several frames.

In order to compare and see if the steel system was viable, a cost schedule analysis was done comparing the two structures. It was found that the steel system resulted in an expedited schedule and cost savings, but further investigation of the connections would need to be done to ensure accuracy. An architecture breadth was also performed. Minimizing the architectural impact was a goal throughout the design process but not all conflicts could be avoided. The lounge and fitness room were the locations studied and rendered for this project.