

Executive Summary

The controlling factor of this thesis project is the architecture of the building. The existing building was structurally designed to accommodate the architecture, which resulted in the two-way flat plate post-tensioned system. There is currently a height restriction on the building which limits the alternative choices for a redesign let alone a chance to save money. In a previous technical report it was found that the precast girder-slab system would be the best alternative solution if the column layout could be altered.

A breadth study of architecture was conducted and a completely new column layout was generated. This new layout consisted of typical bays of 17' X 28' and was consistent to the shape of the existing residential tower. All of the apartments in the proposed building had to be redesigned to accommodate the column layout. The architecture of the individual units not only complied with the square footages of the existing building, but maintained the same style, shape, and overall quality. On top of maintaining the quality, the proposed layout provided a floor plan with more variety, i.e. non-typical apartments and an option of a 3 bedroom.

An in depth study of the structural system was performed for the proposed building. The gravity system consisted of precast 8" X 4' 7- ½ " strands hollow core planks with a 2" topping. The planks were supported by D-Beams on all of the levels except the main roof which was supported by conventional steel framing due to the high live load of the mechanical equipment. Rolled W12 shaped columns supported the girders and beams and were redesigned and spliced every four levels throughout the building. The lateral system changed from shear walls to braced frames. The building period increased in both directions and the North-South wind continued to be the controlling factor of base shear and the seismic loads controlled the maximum moment as in the existing structure.

A breath study of the construction of the two buildings was investigated. The proposed system was found to be approximately 25% more expensive than the existing post-tensioned system. However when the schedules were investigated it was found that the girder-slab system would result a reduction of four months of construction. The average revenue per month generated from rent of the tenants offset the 25% cost of the girder-slab system and actually resulted in a savings of approximately \$750,000 not including future income based on the additional apartments added to the building within the proposed layout.