

Executive Summary

Building Description

Northside Piers, a 29-story condominium tower located in Brooklyn, New York, is being built with a concrete structure. It consists of two-way flat plate slabs, shear walls around the central core, and a pile foundation. The floor system is designed to have an exposed finish over the bedroom and living rooms. The columns follow an irregular grid. They are located around the perimeter of the building with a few interior columns.

Proposal

An alternative floor system will be studied that must be 8" thick or less in order to match the existing depth. The floor must meet all strength and serviceability criteria determined by ACI 318-05.

A post-tensioned slab system will be studied as a possible alternative to the current design. Factors considered will include varying slab thickness, load balancing percentages and directions, concrete strength, and tendon strength. Punching shear will be dealt with by altering column scheme, adding drop panels, or adding shear reinforcement.

The system will be designed using RAM Concept, which will be verified by hand calculations. With a new slab thickness, the lateral loads and gravity loads must be recalculated, and the other structural components must be redesigned. The columns and foundation will be redesigned using hand calculations. The shear wall will be redesigned using ETABS, while looking for any possible optimization of the existing design.

Construction Schedule and Cost Breadth

Switching the floor systems from conventional reinforcing to post-tensioning will create major changes in the construction schedule and overall cost of the building. This study will involve creating a construction schedule and performing a cost analysis for the original system and the new post-tensioned system.

Mechanical Risers Breadth

The sizes of mechanical ducts are often constrained by the structure and the architecture's allowances for openings. This is why it is important to have an understanding of how much duct size relates to the overall efficiency and cost of the mechanical system. In this study, the size of the major risers of the building will be increased in order to see how much the size of the fan exhaust system will decrease. If the change is significant, it may be a more efficient to modify the architecture in order to accommodate the larger riser size.