

Executive Summary

This report evaluates some potential changes to the structural system of Northside Piers including switching the existing mild reinforced floor slab to a post-tensioned system as well as considering alternative shear wall layouts.

An alternative post-tensioned system was designed for the current gravity loads. Two of the typical floor plans that are repeated throughout the height of the building were redesigned. The new system will consist of a 7" thick slab with ½" unbonded tendons. The tendons will be banded in the North-South direction and uniformly spaced in the East-West direction. This new system will have better control over long-term deflections with an expected decrease of 30% in total deflection. It will perform just as well in terms of sound transmission as the original design and will cost approximately \$2/SF less. In addition, the 1" saved on slab height can be used for a reduction in building height of 30" which would result in a savings of \$36,000 in cladding cost.

Five alternative shear wall layouts were analyzed which determined that a layout with an additional wall off of the central core that goes up 11 stories of the building is the most efficient. This layout should save 5% of the cost of the original layout due to the reduction in required concrete and rebar. It was also found that adding 3" to the depth of the link beams will reduce the torsional deflection by 12%. This is important because the largest acceleration issues in the building come from the torsional deflection of the building.

The schedules for the alternative shear wall layout and post-tensioned slab were determined to be relatively unadjusted due to their similar nature to the original construction processes.

Finally it was determined that the risers used for exhaust in the building should not be adjusted in size. Due to pressure losses in the ducts, a reduction in size of 33% will result in a higher operating cost. An increase in size of 50% will save some in operating cost, but will result in a higher initial cost. When comparing the lifetime costs of these alternatives to today's dollars, the original duct size is the cheapest. While reducing the size of the ducts will result in fewer conflicts with the slab reinforcement and penetrations, the additional expense is not worth it.