Executive Summary

The purpose of this report is to evaluate the lateral force resisting system designed for 300 North La Salle as part of AE Senior Thesis. 300 North La Salle is a 60-story office building on the north bank of the Chicago River in Chicago, Illinois. The design will be analyzed under wind and seismic loads for strength and serviceability. The architectural and acoustical impacts of the design will also be investigated as part of the report.

300 North La Salle's current gravity system consists of concrete core walls and exterior steel W-shape columns. The floor system is poured concrete slab on top of composite decking. The slab depth is typically 3" light-weight concrete poured over 3" Type W 20 gage galvanized steel decking. The current lateral system is the concrete core. This core spans 120' East to West through 4 bays, typically dimensioned 28'-5" x 42'-9," between 5 North-South walls and enclosed by 2 East-West walls. The core walls vary in thickness from 2'-3" to 1'-6". The core is stiffened at Levels 41 & 43 by a series of 6 outrigger and 2 belt trusses.

The goal of the new proposed design for 300 North La Salle, was to reduce the length of the current core in order to provide more open rentable square footage. The design is a concrete core wall consisting of 2 bays spanning East to West between three coupled I-shape walls. The design process was iterative based on controlling serviceability limits for drift and acceleration.

ETABS models were made of the existing building and the iterations in order to accurately compare the result of the re-design. In ETABS the walls were modeled as shell elements so that they could not take out of plane shear and accurately portrayed shear wall behavior. The floor levels were modeled as rigid diaphragms to transfer the lateral loads into the concrete shear wall core. In the diaphragms attached to the chords of the outrigger and belt trusses various diaphragm constraints were used to accurately gauge their effect on stiffening the core.

The final re-design consisted of the 3 North-South walls and 2 East-West walls and spans 80'. The thicknesses of the new walls range from 2'-0" to 3'-0" reducing in thickness at varying heights. The original outrigger and belt trusses were maintained from the original design and their configuration was altered according to the new plan. Pier and coupling beam reinforcement was designed based on ACI 318-08 Chapters 11, 14 and 21. Pier reinforcement design was confirmed using PCAColumn.

The new design succeeded in reducing the overall length of the core while passing a wind drift limit of H/400; a seismic drift limit of 0.02 Hsx; and a peak acceleration limit of 30 milli-g's.