EXECUTIVE SUMMARY

The North Shore Equitable building is a 6 story, 180,000 square foot low rise commercial office building located on Pittsburgh's North Shore. The existing structure consists of composite steel beams and girders oriented in a rectangular grid pattern. The lateral system consists of braced frames spanning in the transverse direction and steel moment frames running in the longitudinal direction. The foundation consists of a combination of auger cast piles and steel H piles.

Since the existing composite steel design is such an excellent design choice for this particular building, it is hard to find design aspects that leave room for improvement. One such design aspect, however is the light rail transit line extension that is currently being built below the existing foundation of the building and could potentially introduce unwanted noise and vibrations into the building work space. Therefore, for the purpose of this thesis, the building was redesigned as a one way concrete pan joist and beam system. The goal of this redesign is to improve the building's noise control while maintaining the current grid layout.

The redesigned gravity system of this building consists of pan joists running in both transverse and longitudinal directions to reduce large tributary areas found in exterior bays. A reduction in floor system thickness reduced the height of each story by 10 inches, resulting in a new building height of 81' 9" (a reduction of 5' 4"). The redesigned lateral system of this building consists of concrete moment frames supplemented with 24" x 48" rectangular and L-shaped columns along exterior grid lines to increase stiffness. Framing of the stairwells and elevator shafts using concrete shear walls was avoided due to unwanted torsion that would be introduced into the design. Due to an increase in building weight, the foundation of the building was evaluated and the auger cast pile caps were redesigned to support an increased axial load.

In order to most effectively compare the new and existing structural system, a cost and schedule analysis was performed as well. The results of this analysis showed that the building cost will decrease slightly due in part to the decrease building height but the project schedule length increased due to the use of concrete rather than steel.

Finally, an acoustic analysis was performed to compare the new and existing systems from a noise reduction standpoint. This analysis showed that noise control was improved in the redesigned structure in the foundation, the ground level floor systems and in the roof systems.

The purpose of this thesis was to improve noise control while maintaining the current building layout. The results of this report show that a one way concrete pan joist and beam system will improve noise control, decrease building cost, and maintain an adequate gravity and lateral system to support all applied loads.