EXECUTIVE SUMMARY

The SOHO High Rise is a 15 Story luxury condominium complex located in the culturally distinct neighborhood of downtown Manhattan. Two below grade levels provide parking and fitness areas for the residents housed in the 13 stories above. The current structural system resisting gravity loading consists of reinforced concrete flat plate floors and cast in place columns. Thickness of the existing floor slabs is governed by double cantilevers located at all four building corners throughout the height of the building. To resist imposed lateral loads, a shear wall double core located at the rear center of the high rise provides significant stiffness and strength to exceed maximum deflection requirements.

This report describes and summarizes the in depth study of changing the existing flat plate from normal weight concrete to lightweight concrete and its implications on slab design, lateral system function and project cost. To effectively use light weight concrete in the high rise slab, a design strategy was required that would limit the usage of structural materials and offset the premium of light weight concrete. An aggressive slab design was undertaken using deflection equations derived by R.I. Gilbert to minimize slab thickness. Additionally, edge beams were added at all building corners, removing the requirement of the slab to span the double cantilever locations without support. As a result of reduced gravity loads in the SOHO High Rise, the layout and design of the lateral system also required modification. Shear wall elements that were more efficient in bending were created to limit the impact of reduced axial forces on the system.

In conjunction with this in depth analysis two breadth studies were investigated. The first of these studies compares the thermal efficiency and cost savings of the existing façade system with a system composed of higher performance glazing. The second breadth study investigates the LEED accreditation system as it applies to high rise residential construction. The cost and design modifications required to gain LEED certification by acquiring 26 credits were analyzed and compared to the existing design.