Executive Summary

La Jolla Commons Phase II Office Tower is a 13 story office building in San Diego, California. Each level is about 40,320 square feet, and the structure reaches 198' -8" from ground level to the top of the penthouse. With two levels of underground parking, the building extends 20'-0" below grade. Serving as an office building for LPL Financial, the building has large open floor plans and large areas of glass curtain wall. La Jolla Commons Tower II received a LEED-CS Gold Certification and is one of the most advanced net-zero office buildings in the country.

The original building structure begins with a mat foundation, two levels below grade. The gravity system consists of two-way, flat plate, concrete slabs on a rectangular column grid. Camber was used for the slab at each level to control deflections. The building's lateral system consists of special reinforced concrete shear walls. Due to high shear forces associated with this Seismic Design Category D structure, collector beams are required to transfer lateral loads at levels below grade in the north-south direction.

The structural depth consists of two main parts. First, the building structure was redesigned in steel, using the original column locations. The deck configuration of 1.5VLR20 with 4.25" light-weight concrete topping was selected based on an initial vibrations control assessment. RAM Structural System was used to design composite beams and steel columns. The final steel design was then verified to meet the AISC *Design Guide 11* requirements for walking induced vibrations and was found to be adequate.

Second, the original lateral system had an extreme torsional irregularity under seismic loading. In an effort to control torsion, steel moment frames were added around the building perimeter, along with the existing core concrete shear walls. These moment frames were designed to meet the requirements of special moment frames in accordance with the AISC *Seismic Design Manual* and *Seismic Provisions*. In addition, the clean column design approach was taken. Column sizes were increased in size in order to eliminate the need for web plates, flange stiffeners, or continuity plates. Ultimately, the moment frames were able to control the torsional irregularity, so torsional amplification of seismic forces was not required.

Two breadth topics are also investigated in this report; one breadth is related to the building architecture and the other construction. The architecture breadth investigates the impact on the building height and the building fire protection as a result of changing from a concrete to a steel structure. The construction breadth compares the cost and schedule of the steel and concrete structural systems. The steel system is about 23% more expensive than the concrete system, and the steel schedule is only about 2 weeks less in duration than the concrete system.

After investigations were complete, it was found that although a steel system is feasible, it may not be the most effective design for La Jolla Commons Phase II Office Tower. The concrete system allows for higher floor-to-ceiling heights, lower costs without a significant schedule increase, and does not require fire-resistive materials. Also, the concrete system will inherently control vibrations. Thus, a concrete structure is probably the most efficient choice for La Jolla Commons Phase II Office Tower.