Executive Summary

The purpose of this report is to present the investigations conducted on Helios Plaza as part of its redesign. Helios Plaza is an office building that houses the IST and oil trading divisions of its owner BP. The plaza is located in Houston, Texas in an area zoned for office buildings and suburban housing. The overall building height is 113' with a typical floor-to-floor height of 15'.

With respect to the structural system of Helios Plaza, the gravity system mainly consists of a one-way concrete pan joists system supported on concrete columns, but certain areas are composite steel deck supported on long-span, castellated steel wide flanges. Lateral forces in the building are resisted by concrete moment frames and some steel moment frames composed of HSS beams welded to concrete filled steel pipe columns. The overall effect of this design results in a relatively high building self-weight, requiring the use of large spread footing foundations and seismic loads controlling design in one direction.

In an attempt to remedy the large building weight, a composite steel system was designed as an alternative to the existing system. Prior investigations had shown that a composite steel system was feasible in strength design and had potential to reduce the weight of the building. The redesign successfully reduced the weight of the building.

The entire structure was redesigned in RAM and ETABS and checked with hand calculations. Steel pipe braces were used as the lateral resisting system and were chosen for their aesthetic and strength properties. A typical brace was chosen to be representative of the brace to beam to column connection and was designed by hand.

Two depths are presented in this report that are related to the lateral braces in particular. Architectural considerations of the braces will be addressed and analyzed. The analysis shows why certain decisions were made in placing the braced frames in the building.

The second breadth presented deals with construction management principles. The cost and schedule of the redesign were compared with the original structure. The findings showed that the redesign was more expensive, but was able to be constructed much quicker.

As part of the MAE requirements, coursework from Computer Modeling of Building Structures was utilized in creating the computer models. Additionally, principles from Earthquake Resistant Design of Buildings were used to design the lateral bracing system and the braces' connections were designed using Design of Steel Connection course notes.