Executive Summary

The HITT Contracting Headquarters is a four story, 135,000 square foot office building located next to the Capital Beltway in Falls Church, Virginia. The building consists of a variety of spaces including office space, conference rooms, server space, café space, a fitness center and covered, under building parking.

The mechanical system is comprised of seven VAV direct expansion (DX) rooftop units with electric resistance heating that supply the floors below. Three split systems serve the fitness and café areas. Shutoff and series VAV boxes provide the final stage of heating and supply the air to the individual zones throughout the building. The existing system does an excellent job of meeting the thermal comfort and ventilation requirements, while meeting the base energy efficiency standard of 90.1-2007. This study is intended to develop unrealized designs that can contribute to an increase indoor air quality, energy efficiency and life cycle cost savings without the added constraints of the original project.

The following proposal describes the methods and systems that will be studied for the mechanical redesign of HITT Contracting Headquarters. The mechanical redesign proposal will replace the existing direct expansion rooftop units with a centralized heating and cooling plant that consists of a gas fired chiller-heater and air handling unit.

Two breadth areas will also be investigated in addition to the mechanical depth. The first breadth will be the structural breadth. The addition of a cooling tower and the removal of the seven original rooftop units merit a study of the roof structure. The second breadth area will be the sustainability breadth. The addition of a cooling tower the building system increases the amount of potable domestic water used to cool the building. Since rainfall is between 40-50 inches in the Northern Virginia area, a rainwater harvesting system will be designed and used to provide a portion of the cooling tower makeup water.

The mechanical depth and the breadths will be analyzed using a variety of programs. Trane Trace 700, Microsoft Excel, and Engineering Equation Solver will be used in both the mechanical redesign and breadths of HITT Contracting Headquarters. A timeline is also included as a schedule the workload as evenly as possible throughout the semester and to gauge progress.