Executive Summary

The Margaret M. Alkek Building for Biomedical Research is an 8 story research tower being constructed by the Baylor College of Medicine (BCM). The spaces within the tower will be made up of office space, laboratories, and vivarium space. The tower is intended to increase Baylor College of Medicine's appeal in recruiting top researchers and research programs. The research tower like most laboratory spaces uses a large amount of energy. The reason that laboratories consume so much energy is because they are designed for 100% outdoor air which means it takes more energy to condition the air to desired supply conditions. This report looks to revisit the original design of the building's mechanical systems to make design changes that will save energy while maintaining indoor air quality.

The first redesign suggestion that was made was to implement some form of energy recovery. The report discusses the different forms of energy recovery that are appropriate for laboratory and vivarium spaces. The report determined that heat pipes and runaround loops are the most appropriate type of energy recovery due to cross contamination not being a factor in either system. To implement a heat pipe system the exhaust and outdoor air streams would have to be placed close together. A study was done into the structural implications of moving the mechanical systems from the existing 3rd floor to the 8th floor so that the intake was near the exhaust on the roof. It was found that the existing structure would be able to handle the redistribution of the loads. However, the move would cause ductwork and piping to have to be extended for several systems which would increase the cost of the heat pipe recovery installation. The effectiveness of heat pipes and runaround loops are similar to ach other so it was determined that a runaround loop would be used for the vivarium and laboratory air systems.

The second design suggestion was to install a CO_2 based Demand Control Ventilation system in the office side of the building. CO_2 sensors were installed in the 5 conference rooms to monitor the amount of ventilation that is need. The reasons why CO_2 is used to determine ventilation is discussed in the report. In the upper laboratory spaces a setback based on occupancy of the space was investigated. The rooms already have occupancy sensors installed in the laboratory space to control

the lighting. The occupancy sensors would now send an occupied/unoccupied signal back to the building automation system. When the building was unoccupied the system would cut the air change rate in half.

The building was modeled in Trane's TRACE program both with the original design and the suggested redesigns. It was shown that the redesign suggestions would save approximately 20% in annual energy use. The first cost for both systems was fairly similar with the redesign being slightly higher. The 20% energy savings resulted in a short payback period of .18 years which is very attractive. Another study was done into the energy savings associated with the occupancy sensors installed to control lighting.

Building Background & Introduction

Baylor College of Medicine recently laid out their "strategic plan" in which they plan to expand at a rate comparable to other top research schools in the country. They felt as if they were not doing enough to stay competitive in research and want to remain as one of the top schools. Their plan is to expand their research programs to retain the quality researchers they have and allow them to recruit other talented researchers. The first part of their "strategic plan" was to construct a new research tower.

The Albert and Margaret Alkek Foundation donated $31.25 million dollars to the college for construction of the new tower. For their donation the research tower shall be known as the Margaret M. Alkek Building for Biomedical Research. This is the largest donation Baylor College of Medicine has ever received to fund biomedical research. The research tower promises to have top of the line facilities that can accommodate the following programs; cardiovascular sciences, diabetes and metabolic disease, cancer, pharmacogenomics, imaging, informatics, and proteomics.