

## Executive Summary:

This thesis is presented as a requirement for graduation from the Architectural Engineering department at the Pennsylvania State University. In the summer of 2011, the Montgomery County Equipment Maintenance and Operations Center, Building 1 (EMOC1) was chosen for analysis. Montgomery County will be using this building, upon completion in February of 2013, for the maintenance of their transportation and road repair equipment. It is a 2 story building comprised of 3 major sections. Those sections are the garage and maintenance bays, the lower offices and workspaces, and the upper offices and workspaces. The organization of these spaces can be seen in the following sections of this report.

The existing design of the mechanical system consists of 2 Energy Recovery Units (ERUs) servicing the garage spaces, 3 Rooftop VAV Units (RTUs) servicing the upper and lower office spaces, and various smaller air conditioning units for specific spaces. Heating and cooling for this building are provided by central plants that service the entire complex of which this building is a part of.

The hypothesis of this thesis is to explore the possibilities of using more passive and natural ventilation in the office spaces as well as combining the rooftop units to simplify the system. The possibility of using chilled beams in the upper office spaces will also be analyzed.

The results of the study show that the natural ventilation system and combination of the RTUs works well in reducing energy at a slightly higher initial cost. Natural ventilation is driven by a large courtyard enclosure added to the building. The option of using chilled beams for this building turned out to be impractical due to cost, increased cooling load, and condensation issues.

Along with the changes to the mechanical system, the effect of these changes in terms of Architecture and Acoustics are analyzed. The architecture of the building is changed by adding a much more elaborate break space for the occupants as well as architecturally designating this building to be the "head" building in the complex. Acoustically, this new space adds a buffer zone to the outside noise. It is well placed between a busy street outside and the windows of the office spaces inside.

The goal of this project is to continue the trend of natural ventilation throughout the building. The garage spaces are already 100% cooled by natural ventilation and only require heating in the winter. At the completion on this project, the office spaces also conserve a decent amount of energy due to naturally driven ventilation.