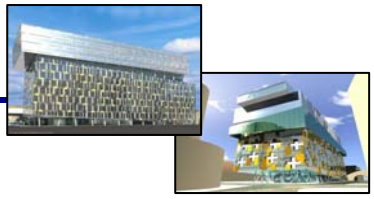
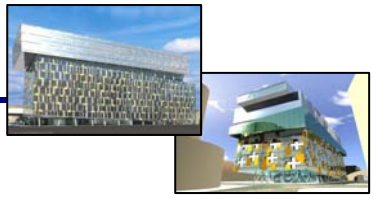


I. Executive Summary

This report studies the energy optimization of The Palestra Office Building in London, England, by analyzing proposed systems such as an IC engine-driven chiller plant, Dedicated Outdoor Air System (DOAS) as well as the integration of Solar PV Cells and Wind turbines and their acoustical impact on the design. This research was carried out while following the guidelines set forth by The Pennsylvania State University Department of Architectural Engineering.

A variety of resources, references, and software programs were utilized to complete the study of the chiller plant, ventilation system, and 'green' technology opportunities, including Trane's™ Trace® 700 program and RETScreen® International Clean Energy Act Analysis Software. These materials were used to create the application of the engine driven chiller plant and Dedicated Outdoor Air System for the Palestra Building. Following the mechanical analysis of these systems it was found that with the addition of the engine driven chiller plant produced 22,886,070 kWh savings in annual energy consumption, and an 8.7% reduction in Life Cycle costs. The analysis of the DOAS design resulted in a 27,776,698 kWh savings in annual consumption, and a 10.31% reduction in Life Cycle costs. Due to the improvements that each system had on the overall efficiency of the building, an analysis was completed with the integration of both designs. This 'hybrid' design resulted in a 28,985,950 kWh annual savings, and a 10.2% reduction in Life Cycle costs. This proves that the proposed designs provide excellent financial savings, as well as a reduced environmental impact, which is the prime focus of the newest building regulations in the UK.

In addition, breadth work was completed on secondary topics, including the acoustic levels of the new chillers, as well as, the addition of green technologies such as Solar PV panels and Wind Turbines. A Composite Noise Rating analysis was completed for both the existing and proposed chiller plants, finding that there was not an increase in the noise level dramatic enough to warrant the installation of additional acoustic barriers at this time.



The Palestra Building
London, England

The study of the Solar and Wind energies provided mixed results. These additions are driven by the newest tenant for the building, and due to the timing of their request so late in the construction phase the layout of the equipment on the roof is already confirmed, creating obstacles for installing equipment that depends so heavily on placement, orientation, and floor area. Combined with the low average wind speed in London, both systems had a less than desirable payback period, 9 years for the Solar panels and over 2000 years for the Wind Turbines. It is strongly recommended that the owner abandon the idea of a wind system and out the additional roof area and funds into improving the efficiency of the Solar system.