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Mechanical Option  
**Philadelphia School District Administration Headquarters**  
Technical Assignment #2

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**Executive Summary**

A plant and energy analysis was done on the Philadelphia School District (PSD) Administration Headquarters in Philadelphia, PA. The building was evaluated against the LEED Certification requirements and also against the American Society of Heating, Refrigeration, and Air-Conditioning Engineers' Standard 90.1-2004. LEED design is based on sustainability of the whole building design and Standard 90.1 contains standards on building envelope and building lighting requirements. More calculations were done to analyze building energy usage and system operating characteristics. Lost rentable space and mechanical system first cost was also analyzed.

The PSD building was constructed in 1948 as a printing facility so the thought of LEED design wasn't "officially" present in the original design. As for the renovations, they weren't designed for LEED so the building did not receive many points in this analysis. For the building envelope compliance, the walls and windows complied but the roof did not. Also the window area is less than 50% which complies, but the skylight area for the atrium is not less than 5% which does not comply. Lost rentable space due to MEP systems in the building amounted to 5.68% and mechanical system first cost was \$4,456,500.00.

Trane's Trace program was used to assess the building's energy usage and operating cost. The total kilowatt-hours used by the building was calculated to be 9,963,009 per year. The following chart gives the distribution of energy use by different components of the building.

Energy Consumption Breakdown	
primary heating	0.23%
primary cooling	31.06%
supply fans	5.25%
lighting	63.47%
Total	100.00%

Energy consumption was used to calculate the emissions per year by the mechanical system. A summary of the calculations is provided below. The most emissions by the system turned out to be CO<sub>2</sub> with 13,744,649 lbm.

Pollutant	lbm
Particulates	6400
SO <sub>2</sub>	75082
NO <sub>x</sub>	44207
CO <sub>2</sub>	13744649

The total energy cost for the year in the Administration building is \$419,177.84. Mechanical system operating cost is \$153,137.97 per year, about 36.53% of the total operating cost.

The loads within the building were analyzed using Trace. By trying to match what actually exists in the building after design, it was noticed that the air handling units were sized about 10% larger than estimated by the program, a common design practice.