

Executive Summary:

Energy consumption and environmental pollutants from commercial buildings are becoming more important in the measure of how successful a buildings HVAC system performs. In order to quantify these values before the building is constructed the design engineer should create and analyze an energy model which represents the proposed HVAC system. Once an energy model is created it can not only be used for energy consumption it can also be used to calculate the annual building utility bills. Energy models can play an important role in the design phase when they are used to compare and contrast different system options and to see how different equipment set points affect the whole HVAC system design.

There are many different metrics on how to quantify a buildings proposed system energy savings such as comparing it against ASHRAE Standard 90.1 baseline models, or against the Commercial Building Energy Consumption Survey report. The program that was used to calculate the plant load data as well as the yearly energy consumption was Trane TRACE 700. The data inputs were taken from the building design documents as well as other information provided by the engineer.

After creating a block load energy model for both Building A and B, the resulting total annual energy consumption for heating and cooling loads of 74,010 MMBtu/year was calculated. This block load energy consumption that was calculated is within 7% of the energy consumption determined by the design engineer. The total utility cost that was computed for the consumed electricity and purchased steam is \$1,674,300 or \$2.80/sf. This yearly utility cost is under the average utility cost for buildings of this type by \$0.36/sf which results in a yearly utility savings of \$215,000. Knowing the characteristics of a buildings utility usage can provide insight into areas of improvement within the mechanical system to provide reduced energy consumption and source emissions.