

ASHRAE Level 1 Energy Audit: A Tool for Success

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Many educational institutions need a prioritized management strategy to reduce energy consumption and to develop refined capital plans that move from the no cost to major capital expenditures. An ASHRAE Level 1 audit is a great place to start. These audits have been used for years to identify lower cost strategies that in many cases can be completed with available staff.

The Level 1 audit requires a Professional Engineer or an Energy Engineer to bring the right experience on costing and savings to refine the plan. The Level 1 could be run in parallel with the Energy Star program for greater efficiency if a designation is desirable. If the Level 1 calls for higher capital expenditures, that would then feed into a Level 2 or Level 3 audits that are investment grade audits for large capital expenditures. Using the ASHRAE energy audit allows the institution to use a stepped process to achieve the goals of their improvement plans.

A CASE IN POINT

The National City Tower located in downtown Louisville, Kentucky, is a 38-story office building containing approximately 871,507 gross square feet (SF) that was constructed in 1972.

The building has a perimeter induction and terminal-reheat heating, ventilating, and air conditioning (HVAC) system, utilizing chilled water for cooling and electric resistance and hot water for heating. Chilled water, generated by

centrifugal water chillers, is circulated to air handling units that provide conditioned air to the induction units and suspended ductwork and air grilles. Heat is rejected from the chillers through cooling towers located on the roof.

Heating for the induction units and terminal reheat system is provided by natural gas-fired boilers. The building HVAC systems utilize pneumatic controls. Domestic hot water is provided by electric tank-type water heaters located on three levels throughout the building. Fluorescent lighting is provided on all levels by type T-12 and T-8 lamps.

The building engineering staff had previously improved the energy efficiency of the building. These strategies included reflective coatings on portions of the exterior glass, replacing water chillers, converting lighting to high-efficiency type T-8 fluorescent lamps, upgrading the cooling towers, and converting elevator controls to digital type and variable speed drives.

The owner prioritized options for improvement in energy efficiency and reduced energy costs at the Tower. The strategy needed to address feasibility, installed cost, payback, and rate of



return. The desired strategy would boost the competitiveness of the building in energy costs when compared to similar buildings and increase the building's overall value.

To do this, the owner requested the assistance of a mechanical consultant in developing the strategies for improvement in energy efficiency, who then conducted a Level 1 Energy Audit to assess the current energy efficiency of building envelope, mechanical, electrical, and lighting systems at the National City Tower.

THE LEVEL 1 AUDIT

An ASHRAE Level 1 Energy Audit typically includes a site visit to obtain visual information and diagnostic information on the building's energy consuming systems; obtains one to three years of energy billings for evaluation and estimating potential energy savings of opportunities identified; develops recommendations for energy cost reduction measures (ECRMs); and develops preliminary cost estimates, approximate payback, and rates of return for the ECRMs. The Level 1 audit identifies and provides a savings and cost analysis of energy conserving measures. The audit also provides a listing of potential capital improvements that merit further consideration and provides opinions on potential installed costs and energy savings.

The Level 1 energy audit analyzes the utility usage and costs, and then BISDSISD determines an annual Energy Utilization Index (EUI) and Energy Cost Index (ECI) for the building. The EUI depicts the total annual energy consumption per square foot of building, and is expressed in British Thermal Units (Btus). Energy records reviewed from the subject building indicated that the annual Btu usage is within the typical range of buildings of similar age, size, and physical location in this geographic area.

In this case, the consultant developed ten opportunities for ECRMs, estimated the installed costs, and estimated



their payback and rates of return. The ECRMs included installing premium efficiency motors on pumps and air handling units, re-commissioning the HVAC system, installing heat recovery equipment, installing high-efficiency burners at the boilers, installing variable speed drives at the chillers, completing a lighting retrofit, and retrofitting the perimeter induction units. The estimated savings were considered incremental and exclusive as individual ECRMs are completed.

OTHER OBSERVATIONS

Other building systems that could represent additional opportunities for energy reduction included installing digital controls and variable speed drives on the remaining elevators, converting the HVAC systems to variable air volume systems, installing a high-performance coating on the remaining exterior glass, and installing a high-efficiency cooling tower. Due to the potential installed cost and complexity of estimating energy savings with these options, further analysis was recommended, such as conducting an ASHRAE Level 2 or 3 energy audit.

A Level 1 Energy Audit provides an institution with a prioritized list of energy cost reduction measures that may



be implemented during general maintenance activities and provide an immediate impact on energy costs. Other measures identified during the audit may be implemented within existing capital improvement budgets and represent more significant reductions in energy costs. An ASHRAE Level 1 Energy Audit can further be utilized to develop to long-term plan for upgrade of a facility's energy consuming systems. It is a powerful tool for institutional facility managers to support their energy improvement agenda. ☞

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