

The Difference Between ASHRAE Level 1, 2 & 3 Energy Audits

ASHRAE Level 1 – Walk-Through Analysis/Preliminary Audit

The Level 1 audit alternatively is called a “simple audit”, “screening audit” or “walk-through audit” and is the basic starting point for building energy optimization. It involves brief interviews with site operating personnel, a review of the facility’s utility bills and other operating data, and an abbreviated walk-through of the building. The ASHRAE Level-1 audit is geared toward the identification of the potential for energy improvements, understanding the general building configuration, and defining the type and nature of energy systems. The audit should result in a preliminary, high-level, energy-use analysis for the entire facility, and a short report detailing the findings, which may include identifying a variety of recognizable efficiency opportunities. Usually this report does not provide detailed recommendations, except for very visible projects or operational faults.

The ASHRAE Level-1 audit is intended to help the energy team understand where the building performs relative to its peers; establish a baseline for measuring improvements; deciding whether further evaluation is warranted; and if so, where and how to focus that effort. The Level-1 also will outline the range of potential financial incentives available from Federal, State, Local, and Utility sources.

ASHRAE Level 2 – Energy Survey and Analysis

The next step for most facilities is the ASHRAE Level-2 audit/assessment. The Level-2 project starts with the findings of the Level-1 audit, and evaluates the building energy systems in detail to define a variety of potential energy-efficiency improvements. This should include the Building Envelope, Lighting, Heating, Ventilation, and Air Conditioning (HVAC), Domestic Hot Water (DHW), Plug Loads, and Compressed Air and Process Uses (for manufacturing, service, or processing facilities). This study starts with a detailed analysis of energy consumption to quantify base loads, seasonal variation, and effective energy costs. From there, the study should include an evaluation of lighting, air quality, temperature, ventilation, humidity, and other conditions that may affect energy performance and occupant comfort. The process also includes detailed discussions with the building Ownership, Management, and Occupants to explore potential problem areas, and clarify financial and non-financial goals of the program.

The Level-2 audit should result in a clear and concise report and briefing with the Owner and Management Team describing a variety of Energy Efficiency Measures (EEMs) including no- and low-cost measures, modifications to system controls and building automation, operational changes, and potential capital upgrades. The findings should include general costs and performance metrics, as well as a means for the Owner to evaluate the EEMs and decide how to proceed with implementation.

Many of the EEMs revealed during the ASHRAE Level-2 audit can be implemented quickly with rapid or immediate financial payback for the Owner. Other EEMs will require more detailed analysis of benefit and cost and the other goals that are important to the Owner. The audit should define next steps to accomplish this analysis and decision making. Sometimes it is through

discussion with manufacturers or suppliers or other relatively simple means. For other EEMs, involving complex interaction among building systems and potentially large financial investments, it may be necessary to dig deeper into the building operation and also the human factors influencing performance. This is where the ASHRAE Level-3 audit becomes essential.

ASHRAE Level 3 – Detailed Analysis of Capital Intensive Modifications

Some of the system upgrades or retrofits revealed by the Level-2 audit may require significant investments of capital, personnel, and other limited resources. Before making this level of investment, the Owner will want to have a much more thorough and detailed understanding of the benefits, costs, and performance expectations. This is the purpose of the “investment-grade” Level-3 ASHRAE audit. There may be only a few capital-intensive EEMs exposed by the Level-2 audit, or there may be dozens for larger facilities. Investment levels can range from tens of thousands to tens of millions of dollars. In most cases, since this cannot be clearly determined or accurately estimated in advance, the recommendation and scope definition for a Level-3 audit usually is an outcome of the Level-2 process.

The ASHRAE Level-3 audit focuses on a “whole-building computer simulation”, where a computer program is used to very accurately model the way the brick-and-mortar building would respond to changes in the energy systems, whether those are major HVAC retrofits or architectural modifications to walls, windows, and roof. The ASHRAE Level-3 audit involves much more detailed data collection over the course of weeks or months. Data loggers typically will be placed temporarily to monitor the operation of pumps and motors, temperatures of affected spaces, lighting levels, switching behavior, and other factors. These data are used to calibrate the computer model of the facility, so that the computer model responds to inputs and changes the same way the building could be expected to respond. This calibration is checked and validated by simulating a year or more of past, minute-by-minute climate conditions to see if power and energy usage in the model mirrors actual energy power and energy usage.

Once the three-dimensional computer model is responding like the real building, changes to energy systems can be simulated with very accurate results. Combining that process with construction-grade cost estimating supports informed investment decisions.