



# SCHOOL ENERGY AUDIT BEST PRACTICES



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# BEGINNING AN ENERGY AUDIT

Conducting an energy audit can be a great way to identify how energy in the form of electricity is used in your school building and learn ways that you can conserve or reduce your energy consumption. This guide will help you get the most out of your energy audit and help you identify energy conservation strategies for your school.

For the best success, it is helpful to get everyone on board. Include your building and grounds manager, custodians, kitchen staff, administrators, office staff, teachers, and students so you can understand how different people use energy throughout the building. Plus, the more stakeholders you bring on board, the more excited people are about the potential savings from identifying high energy-consuming practices.

When conducting your energy audit, you will examine three areas of high energy consumption: lighting, temperature, and appliances. This guide will go through these areas and point out where conservation actions may have a measurable impact on school energy savings.

The information you will find in this guide was provided by Wisconsin's K-12 Energy Education Program (KEEP) and Focus on Energy®.

## **SCHOOL BUILDINGS**

Before you begin, it is important to understand your school building. The building size and age are not the only indicators of energy use. The operation of the building has a more significant effect on energy use than the size or age of the building. For example, on average, schools with pools use 12% more energy than schools without. Even the type of school has a more significant effect on the overall energy use than the size and age.

Elementary Schools – Likely to have less-efficient heating systems and tend to keep the rooms warmer during the heating season.

Middle Schools – Tend to have the lowest heating and electricity consumption, on average.

High Schools – Use more electricity because they are most likely to have additional equipment or systems such as air conditioning. They also tend to host more events, such as sports practices, summer camps, and community events, which add to their electricity use.

## **SETTING GOALS**

This guide contains tips, tricks, and tool instructions to help you with your school energy audit. Once you have finished, it is time to set some energy-saving goals. It is important to set SMART goals that are Specific, Measurable, Attainable, Relevant, and Time-based. Make sure to work with the school staff, students, facilities, IT, and custodians when making these goals for the best results.

# S.M.A.R.T. GOALS

# LIGHTING

Lighting is one of the first things to look at during a school energy audit, as it is one of the quickest and most cost-effective energy improvements that can be made in a school. Things to keep in mind when you are looking at lighting; Are any rooms over lit? Can some lights be replaced with more efficient bulbs? Can natural light be used? And are there any "fun" lights used for decoration that use a lot of electricity?

## TOOLS – Light Meter



- **What is it?** A light meter is a device that measures the amount of light in an area. This can help identify over lit and underlit regions of the school building. Depending on the light meter, it will either read lighting levels in foot candles or lux; both are units for measuring the intensity of light.
- **How does it work?** Remove the cap over the light sensor, turn on the light meter, and set it on a flat surface. The light meter will read how much light is given off in that area.
- **How does this help with School Energy Audit?** The light meter helps you identify areas that are over lit and areas where natural lighting may be sufficient without additional lights. During the energy audit, take measurements around the room and compare them with the recommended lighting level charts (next page). Is the room over lit or underlit, or can natural lighting help supplement some of the lighting in the room?

## SOLUTIONS

1. Switching to LED lighting. LED lighting produces light approximately 90% more efficiently than incandescent light bulbs and 50% more efficiently than fluorescent technology. LED lights are also predicted to last two to five times longer than fluorescent lighting.
2. Scale back over lit areas by re-lamping and de-lamping. Both are inexpensive ways to cut energy costs and require lower investments to start realizing energy savings.
  - o Re-Lamping: refers to removing less efficient lamps and replacing them with lower wattage lamps.
  - o De-Lamping: refers to removing unnecessary light fixtures or lamps, scaling back over lit areas by removing individual lamps or entire fixtures. Retest lighting levels after de-lamping to ensure appropriate lighting levels.
3. Install motion sensors, timers, and dimmers that adjust or switch lights on and off based on occupancy, room's ambient light level, or time of day. For example, hallway lights only need to be at full lighting levels in-between classroom periods when students use the hallway.
4. Turning off lights when no one is in the room or use natural light whenever possible by opening blinds and turning off overhead lights.
5. Multi-level switches allow varying number of lights to turn off while maintaining adequate light levels. For example, gymnasiums have different lighting requirements for various activities (class periods, athletic events). Having multi-level switching can help save money in this type of situation.

Application	Foot-candles
Administrative Offices	50
Auditorium	
Assembly	10
Social activities	5
Reading	30-50
Bathrooms	
Grooming	30
Lavatory	15
Cafeteria	
Dining area	30
Kitchen	50
Classrooms	50
Computer Lab	
Keyboards	30
Monitors	3
Reading printed material	50
Drafting Room	75
Gymnasium	
General exercising and recreation	30
Basketball/Other games	50
Hallway	30
Library	
Stack, audiovisual, checkout areas	30
Open study areas	50
Shop Areas	30-75

Source: Illuminating Engineering Society Lighting Handbook and Industry Practices, 2015

Room Type	Light Level
Cafeteria	200-300
Classroom	300-500
Classroom (Lab)	500-750
Computer Room	300-400
Hallway	50-100
Gymnasium	200-300
Kitchen (Food Prep)	300-750
Library (Work Area)	300-500
Library (Stacks)	200-500
Lobby/Offices	200-300
Locker Room	100-300
Private Office	100-300
Restroom	100-300
Stairway	50-100
Storage Room	50-200
Teacher's Office	300-500
Workshop	300-750

# HEATING AND COOLING

Every school must balance its heating and cooling needs throughout the year. With many occupants and fluctuating outdoor temperatures, keeping the building at a specific temperature can be very energy intensive. By doing a school energy audit, you can get a better sense of the heating and cooling needs of the building and identify areas that could conserve energy.

Unfortunately, teachers do not have much control over the temperature of their classrooms; however, there are things they can do to make the heating system work better. A suitable temperature to aim for is 70-75 °F.

## TOOLS – Infrared Thermometer



- **What is it?** An infrared thermometer is a device that allows you to take surface temperatures throughout the building to help you better understand the temperature throughout the space.
- **How does it work?** Point the infrared thermometer roughly 6 feet away from the object you are trying to measure the temperature. Press the trigger of the thermometer, and the laser pointer will appear on the object, measuring the temperature, which will read on the thermometer screen. Do not point this laser at someone's eyes.
- **How does this help with a School Energy Audit?** The infrared thermometer helps you identify areas of the building that might be letting in cold air. When doing the school energy audit, be sure to take multiple measurements all around each room. Take measurements of the floor, walls, corners of windows, etc., to get a good feel for the comfort of the room. After several rooms have been audited, you can see if you notice any problems, such as rooms that are too warm or cold. Your findings can be shared with the building's facilities manager or head custodian. They might be able to help make energy-saving adjustments to the school building.

## SOLUTIONS

1. School buildings are designed to have all the doors in the building closed for heating and cooling systems to operate as intended. Leaving doors open makes it more difficult for the heating and cooling system to work efficiently. Encouraging teachers and staff to keep their doors closed can help save the school energy as it allows the heating and cooling to run more efficiently.
2. Reduce building warm-up periods (the hour before occupancy) and cool-down periods (last hour of occupancy) to achieve the most significant space temperature setback or set-up possible and increase energy savings.
3. Keep thermostats free and clear of obstructions and heat-generating equipment.
4. Ensure that heating/cooling vents are unobstructed (supply or return).
5. Encourage students and staff to dress in layers for comfort as heating/cooling systems adjust throughout the day.
6. Keep your water setpoint to 140°F. This temperature setting efficiently limits the amount of cold water missing and is hot enough to prevent legionella bacteria from growing.
7. Consider installing low-flow fixtures and appliances as it reduces water consumption and water heating costs significantly.

# APPLIANCES

One of the easiest ways to being saving energy is by auditing your appliances. By knowing what appliances you have, how much electricity they consume, and how frequently you use them, you can now identify areas where you can conserve energy.

When thinking about appliances, think about computers, printers, charging stations, coffee makers, lamps, microwaves, refrigerators, string lights, etc.

## TOOLS – Kill-O-Watt Meter

- **What is it?** A Kill-O-Watt Meter is a device that allows you to plug in an appliance, and it will tell you how much electricity the appliance consumes.
- **How does it work?** Unplug the appliance you are measuring and plug the Kill-O-Watt meter into the outlet. The Kill-O-Watt meter will read a number before you plug in the device, which is how much electricity the outlet can provide in watts. Then plug the appliance into the Kill-O-Watt meter and press the “watts” button, and it will tell you how much power the device consumes.
- **How does this help with a school energy audit?** By understanding how much electricity appliances in the school use, you can identify ways to conserve energy. Some devices will consume electricity even when they appear to be turned off. This is called a Phantom Load or Vampire Load, as the appliance is sucking electricity even when it's not on. You can create easy energy conservation strategies by unplugging items that draw a phantom load and minimizing the use of devices that consume large amounts of electricity.



## SOLUTIONS

1. Avoid screen savers as they use twice as much power as when the computer is in use. Use sleep mode instead of a screen saver and set the monitor to sleep mode after 5-15 minutes of inactivity. After 30-45 minutes of inactivity, have the hard drive turn off to save energy.
2. Adjust the monitor display brightness below 50%, as the brightest setting consumes twice as much power as the dimmest settings.
3. Make sure computers are turned off at night and over weekends. If computers need remote access, sleep mode is an acceptable alternative.
4. Make sure to enable similar energy-saving settings for smart boards, copiers, and printers.
5. Projectors and Smartboards can be high-energy consumers. Ensure they are only used when necessary and turned off when they are not needed.
6. Utilize power strips to avoid phantom loads. Some have timers, which allow printers, copiers, and laminators to be turned off at the end of every day.
7. Unplug TVs, DVD players, gaming consoles and other electronics when not in use.
8. Charge laptops and other electronic devices during off-peak hours (typically 10 PM – 7 AM)
9. Vending machines use roughly \$380 worth of electricity annually. Vending Miser systems power down the vending machine when the area around it is vacant while maintaining the temperature of the products. The Vending Miser can cut electricity consumption in half and pay for itself within two years.

# TIPS FOR SCHOOL ROOMS

## CLASSROOMS

Projectors use a lot of electricity; turn off when not in use. Make sure computers are in sleep mode or turned off. Does your teacher have a mini refrigerator? Do they have lamps or additional lights? Is there natural lighting that can be utilized? Are the doors open or shut? Any cracked windows?

## LIBRARY

Is there ample natural lighting that can be used instead of electric lights? Are computers put into sleep mode when not in use? Are there power strips that can help save energy? Can the printer/copier go into sleep mode in between uses?

## TEACHER'S LOUNGE

How many microwaves are there? How many coffee machines? Can these appliances be plugged into a power strip to save on phantom load energy costs?

## CAFETERIA

Are there monitors in the cafeteria that are on all the time? Are the vending machines on and plugged in all the time? Can they be on a timer or turned off at the end of the day? Are vending machines emptied and unplugged during summer vacation?

## SCIENCE LABS

Microscopes consume electricity. Make sure they are unplugged when not in use. Disinfecting cabinets also consume electricity to clean the supplies. Ensure there is no phantom load associated with service cabinets; if so, plug in only when needed for disinfecting.

## GYMNASIUM & POOLS

Utilize multilevel light switches to avoid over lighting the gym when not needed. Automate lights in locker rooms to turn on only when locker rooms are occupied. For pools, consider installing a pool cover. It provides insulation and a barrier to reduce heat loss and evaporation, thereby saving energy and chemicals.

## KITCHEN

If your school is looking to buy new appliances, they should look for Energy Star® appliances and determine if Focus on Energy® offers rebate incentives for energy efficient equipment. Stocked refrigerators use less energy than empty ones. Make sure that refrigerators are full or consolidated to conserve energy. Fill water jugs if needed or consolidate. Only run the dishwasher with full loads. Use cooking equipment to capacity. Unplug coffee pots, toasters, microwaves, and other items that use phantom loads, or install power strips for easy on/off. Use kitchen ventilation only when cooking conditions warrant it.

## ART ROOM

Kilns for pottery consume a lot of electricity. Operate them on weekends or during off-peak hours (10 PM – 7 AM) when electricity costs are the lowest.

## HALLWAYS

Hallways do not need to be fully lit all day long. They only need full lighting during passing periods when they are used the most and at peak occupancy.