

**ENVIRONMENTAL AUDIT  
MASTER FORM  
AND  
ENVIRONMENTAL AUDIT INSPECTION/INSPECTION  
FORM**

The attached documents, Environmental Audit Inspection Form and Environmental Audit Master Form, are designed to work together. Both of the forms are organized as follows:

- I. Building
- II. Grounds
- III. Lighting
- IV. Water and Water Heating
- V. Heating, Ventilation, Air Conditioning (HVAC)
- VI. Operations and Maintenance
- VII. Business Operations

The forms are designed to include all aspects of the organization, including building and grounds but also operations and maintenance and business operations.

**Inspection Form**

The Environmental Inspection is designed for use during the walk-through of the building and grounds, as well as during discussions regarding business operations. For each category, more specific detail is requested such as name, model, age, and Energy Star rating. The amount of additional data varies according to category. It also includes specific questions regarding the use and maintenance of items within the category.

It is important to complete the inspection form in as much detail as possible, as the information is vital to the completion of a comprehensive environmental audit.

**Master Form**

The Master Form includes a general discussion of each category. This may include additional information regarding various energy efficiency alternatives as well as specific product data. Finally, for each category there are links to websites containing more information.

At the end of the form is a list of references to additional websites that provide a variety of additional types of information regarding energy efficiency and/or conservation.

Taken together, the Inspection and Master Forms provide an excellent foundation from which to write the environmental audit.

## ENVIRONMENTAL AUDIT INSPECTION/INTERVIEW FORM

**Organization** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Date:** \_\_\_\_\_  
**Contact Person/Phone No.** \_\_\_\_\_  
**Inspector(s)** \_\_\_\_\_

**Index**

- I. Building**
- II. Grounds**
- III. Lighting**
- IV. Water and Water Heating**
- V. Heating, Ventilation, Air Conditioning (HVAC)**
- VI. Operations and Maintenance**
- VII. Business Operations**

**I. BUILDING**

- 1. Commercial & Industrial Transformers.**
  - Number** \_\_\_\_\_
  - Type** \_\_\_\_\_
  
- 2. Windows, Doors, and Skylights.**
  - Single or double pane Windows and Doors?** \_\_\_\_\_
  - Clear or tinted glass coatings?** \_\_\_\_\_
  - Thickness of air space** \_\_\_\_\_
  - Low e-coatings?** \_\_\_\_\_
  - Edge Savers?** \_\_\_\_\_
  - Multiple Layers of glazing** \_\_\_\_\_
  
- 3. Roof**
  - Type** \_\_\_\_\_
  - Brand Name** \_\_\_\_\_
  - Estimated Life** \_\_\_\_\_
  - Age** \_\_\_\_\_
  
- 4. Insulation**
  - Ceiling Attic Insulation Type** \_\_\_\_\_
  - Ceiling/Attic Insulation "R" Factor** \_\_\_\_\_
  - Type of Wall Insulation** \_\_\_\_\_
  - Wall Insulation "R" Factor** \_\_\_\_\_
  - Basement Walls insulated?** \_\_\_\_\_
  
- 5. Weather stripping, caulking, sealing**

**Doors** \_\_\_\_\_  
**Windows** \_\_\_\_\_  
**Baseboards** \_\_\_\_\_  
**Attic Latches** \_\_\_\_\_  
**Electrical Outlets/Switches** \_\_\_\_\_

6. **Ductwork**  
**Type** \_\_\_\_\_  
**Airtight?** \_\_\_\_\_  
**Sized?** \_\_\_\_\_  
**Sealed** \_\_\_\_\_

7. **AC filters**  
**Cleaning/Replacement Schedule?** \_\_\_\_\_

**II GROUND**

1. **New Plantings Policy/Procedures** \_\_\_\_\_
2. **Native or other low-water plants considered for landscaping?** \_\_\_\_\_
3. **Mowing Schedule (time of day)** \_\_\_\_\_
4. **Grass Cuttings/Leaves Recycled/Composted?** \_\_\_\_\_
5. **Use of Gas-Powered Mowers.** \_\_\_\_\_
6. **New Tree Planting Policy** \_\_\_\_\_
7. **Watering schedule (time of day).** \_\_\_\_\_
8. **Rainwater Harvested?** \_\_\_\_\_
9. **Greywater Irrigation Used?** \_\_\_\_\_

**III. LIGHTING**

**Interior**

1. **Ballast Sizes** \_\_\_\_\_
2. **Light Bulb Type(s)** \_\_\_\_\_
3. **Wattage/Lumens** \_\_\_\_\_
4. **Color Rendering Index** \_\_\_\_\_
5. **Color Temperature** \_\_\_\_\_
6. **Motion Detectors** \_\_\_\_\_
7. **Exit Signs (type)** \_\_\_\_\_
8. **Lens Maintenance** \_\_\_\_\_
9. **Unnecessary lights?** \_\_\_\_\_
10. **Exit signs (type of bulbs)** \_\_\_\_\_
11. **Light levels** \_\_\_\_\_

**Exterior**

12. **Lighting (type)** \_\_\_\_\_
13. **Timers or photocells** \_\_\_\_\_

**V. WATER and WATER HEATING**

**Hot Water Systems O & M Schedule**

- 1. **DHW tank/distribution pipes.  
Inventory of sizes & lengths of  
insulation maintained?** \_\_\_\_\_
- 2. **Insulation for DHW application.** \_\_\_\_\_
- 3. **Insulation on tank/piping** \_\_\_\_\_
- 4. **Water temperature level** \_\_\_\_\_
- 5. **Inspections for Leaks** \_\_\_\_\_
- 6. **DHW pipes insulated?** \_\_\_\_\_
- 7. **DHW turned off to areas not  
needing hot water?** \_\_\_\_\_
- 8. **Water pressure** \_\_\_\_\_

**Flush tank/type water heaters**

- 9. **Burners cleaned/adjusted on  
Gas & oil water heaters** \_\_\_\_\_
- 10. **Electrodes checked on electric  
water heaters** \_\_\_\_\_

**Waterclosets**

- 11. **Type of system** \_\_\_\_\_
- 12. **Inspections for Leaks** \_\_\_\_\_
- 13. **Water budget?** \_\_\_\_\_

**Showerheads & faucet diffusers**

- 14. **Low flow fixtures?** \_\_\_\_\_

**V. HEATING, VENTILIZATION, AIR CONDITIONING (HVAC)**

**Heating**

- 1. **Temperature Setting** \_\_\_\_\_
- 2. **Temperature Set back when the  
building is unoccupied?** \_\_\_\_\_
- 3. **Pilot Light shut off during summer?** \_\_\_\_\_
- 4. **Fans to "auto" rather than "fan"?** \_\_\_\_\_
- 5. **Evaporator coils cleaning schedule** \_\_\_\_\_
- 6. **Filter cleaning/changing schedule** \_\_\_\_\_
- 7. **Condenser rods cleaning schedule** \_\_\_\_\_
- 8. **Equipment inspections** \_\_\_\_\_
- 9. **Equipment lubrication schedule** \_\_\_\_\_

**Boilers.**

- 1. **Water level inspection schedule** \_\_\_\_\_
- 2. **Water quality inspection schedule** \_\_\_\_\_
- 3. **Burner adjustment/cleaning schedule** \_\_\_\_\_
- 4. **Make-up water record maintained  
Daily?** \_\_\_\_\_
- 5. **Oil tank level inspection schedule** \_\_\_\_\_

- 6. Temperature level \_\_\_\_\_
- 7. Daily water temperature checked? \_\_\_\_\_
- 8. Guage plates cleaning schedule. \_\_\_\_\_
- 9. Central settings check schedule \_\_\_\_\_
- 10. Oil filters cleaning schedule \_\_\_\_\_
- 11. Schedule to check for leaks in system components (pipes, steam traps, and couplings). \_\_\_\_\_

**General**

- 12. Heating system efficiency check schedule \_\_\_\_\_
- 13. Radiators, convectors, air intakes, and air diffusers unobstructed? \_\_\_\_\_
- 14. Fans and equipment unobstructed? \_\_\_\_\_
- 15. Install Energy Recovery Ventilator (EVR)? \_\_\_\_\_

**Air Conditioning**

- 1. Name \_\_\_\_\_
- 2. Type \_\_\_\_\_
- 3. Age \_\_\_\_\_
- 4. Temperature Setting \_\_\_\_\_
- 5. Coolant Maintenance Schedule \_\_\_\_\_
- 6. Typical hours of operation \_\_\_\_\_
- 7. Ductwork sealing inspection Schedule \_\_\_\_\_
- 8. Condensation Inspection schedule \_\_\_\_\_
- 9. Seer level \_\_\_\_\_
- 10. Seasonal Maintenance Schedule \_\_\_\_\_
- 11. Humidifiers \_\_\_\_\_
- 12. Space cooling Units \_\_\_\_\_
- 13. Fan direction changed to push warm air down in winter? \_\_\_\_\_
- 14. Programmable Thermostat? \_\_\_\_\_

**VI. OPERATIONS AND MAINTENANCE**

**Doors & Window**

- 1. Doors/windows leak & inspection Schedule. \_\_\_\_\_
- 2. Repair/replace door sweeps? \_\_\_\_\_
- 3. Repair/replace door closers? \_\_\_\_\_
- 4. Repair/replace window gaskets? \_\_\_\_\_

**Light Bulbs/Fixtures**

- 1. Cleaning schedule \_\_\_\_\_
- 2. Lights and equipment turned Off when not in use? \_\_\_\_\_

**Composting**

1. **Organic Kitchen Waste composted?** \_\_\_\_\_

**Water**

1. **Tap Water Shut off Whenever Possible?** \_\_\_\_\_

**Filters**

1. **Maintenance Schedule (Vacuum/wash/replace air handler filters.)** \_\_\_\_\_

**Equipment**

1. **Belts Inspection Schedule** \_\_\_\_\_

**Roofs**

1. **Exhaust registers on rooftop Equipment cleaning schedule** \_\_\_\_\_

**Paint**

1. **Brand** \_\_\_\_\_  
2. **VOC Level** \_\_\_\_\_  
3. **Low VOC Paints Considered?** \_\_\_\_\_

**Cleaning Supplies**

**Purchasing Procedure** \_\_\_\_\_  
**Low Tox/No Tox Products** \_\_\_\_\_

**VII. BUSINESS OPERATIONS**

1. **Computers**  
**Name** \_\_\_\_\_  
**Model** \_\_\_\_\_  
**Number** \_\_\_\_\_  
**Age** \_\_\_\_\_  
**Energy Star rated?** \_\_\_\_\_  
**Enable Energy-Save Option disabled?** \_\_\_\_\_  
**Right Sized Monitor for Needs?** \_\_\_\_\_

2. **Printers**  
**Name** \_\_\_\_\_  
**Model** \_\_\_\_\_  
**Number of printers** \_\_\_\_\_  
**Age** \_\_\_\_\_  
**Automatically switch to standby when not in use?** \_\_\_\_\_  
**Prints 2-sided copies?** \_\_\_\_\_  
**Energy Star Rated?** \_\_\_\_\_

3. **Fax Machines**  
Name \_\_\_\_\_  
Model No. \_\_\_\_\_  
Age \_\_\_\_\_  
Energy Star Rated? \_\_\_\_\_

4. **Scanners**  
Name \_\_\_\_\_  
Model No. \_\_\_\_\_  
Age \_\_\_\_\_  
Energy Star Rated? \_\_\_\_\_

5. **Copiers.**  
Name \_\_\_\_\_  
Model No. \_\_\_\_\_  
Number \_\_\_\_\_  
Age \_\_\_\_\_  
Makes Two-sided Copies? \_\_\_\_\_  
Reduces Copy Size \_\_\_\_\_  
Standby Feature? \_\_\_\_\_  
Energy Star Rated? \_\_\_\_\_

6. **Multifunction Devices**  
Name \_\_\_\_\_  
Model No. \_\_\_\_\_  
Number \_\_\_\_\_  
Age \_\_\_\_\_  
Energy Star Rated? \_\_\_\_\_

7. **Refrigerators**  
Name \_\_\_\_\_  
Age \_\_\_\_\_  
Efficiency Rating \_\_\_\_\_

8. **Range/Ovens**  
Name \_\_\_\_\_  
Age \_\_\_\_\_  
Efficiency Rating \_\_\_\_\_

9. **Dishwashers:**  
Name \_\_\_\_\_  
Age \_\_\_\_\_  
Efficiency Rating \_\_\_\_\_  
Heat-dry, Rinse-hold, Pre-rinse  
Features used? \_\_\_\_\_  
Energy Star Rated? \_\_\_\_\_

10. **Recycling:**  
Office Paper \_\_\_\_\_  
Newspapers \_\_\_\_\_  
Magazines \_\_\_\_\_  
Plastic \_\_\_\_\_  
Aluminum \_\_\_\_\_  
Cardboard \_\_\_\_\_  
Toner Cartridges \_\_\_\_\_
11. **Waste Minimization**  
Original or Recycled Paper \_\_\_\_\_  
Type of Coffee Cups Used \_\_\_\_\_
12. **Energy Efficiency**  
Refrigerated goods combined? \_\_\_\_\_  
Unneeded appliances \_\_\_\_\_  
disconnected? \_\_\_\_\_
13. **Operations**  
Purchasing Procedures \_\_\_\_\_  
\_\_\_\_\_  
Primary Factor in Purchasing \_\_\_\_\_  
Decisions \_\_\_\_\_  
Bills & savings tracked? \_\_\_\_\_



## ENVIRONMENTAL AUDIT (Master Form)

Name of Organization \_\_\_\_\_  
Address: \_\_\_\_\_  
Address: \_\_\_\_\_  
Date: \_\_\_\_\_  
Inspector(s) \_\_\_\_\_

### Index

- I. Building
- II. Grounds
- III. Lighting
- IV. Water Use and Water Heating
- V. Heating, Ventilation, Air Conditioning (HVAC)
- VI. Operations and Maintenance
- VII. Computers and Appliances
- VIII. Summary of Resources

### I BUILDING

\_\_\_ **Choose Clean Power.** Switch to electric companies that provide 50% to 100% renewable energy.

Link: [www.green-e.org](http://www.green-e.org), [www.cimateblz.com/sections/toolsresourecs](http://www.cimateblz.com/sections/toolsresourecs).

\_\_\_ **Arrange for Bulk Purchases of Fuel Requirements.**

If you purchase heating oil, diesel fuel, gasoline, propane, or natural gas for your business, consider negotiating price and payments prior to the beginning of the heating season. Energy companies can help you estimate your requirements, which can result in substantial energy cost savings.

[www.privateschool.about.com](http://www.privateschool.about.com)

\_\_\_ **Install ENERGY STAR Qualified Commercial & Industrial Transformers.**

Commercial and industrial transformers are low-voltage dry-type transformers used to decrease the voltage of electricity received from the utility to the levels used to power lights, computers, and other electric-operated equipment. ENERGY STAR qualified commercial and industrial transformers [are designed](#) to help save money on utility bills and reduce energy waste.

Depending on the size of the transformer, an ENERGY STAR qualified transformer can save \$100-300 each year at an electricity rate of \$0.075 cents per kWh. A typical large commercial facility will have 6-10 low voltage transformers, and thus can save between \$600 and \$3,000 per year. ENERGY STAR qualified transformers are distributed locally and are NEMA TP-1 compliant.

\_\_\_ **Install ENERGY STAR Qualified Windows, Doors, and Skylights.**

Saves money over single-paned and even new double-paned, clear-glass, protect windows from the winter heat and summer sun while reducing condensation and interior fading and keeps the property cooler in the summer and warmer in the winter. May receive up to \$500 in federal tax credits and local rebates.

Consider the following features:

- Multiple Layers of glazing
- Thickness of air space
- Low-conductivity gas fill
- Tinted glass coatings.
- Low e-coatings
- Edge Spacers

\_\_\_ **Install Reflective Roof Products.**

Lower roof surface temperature by up to 100F, decreasing the amount of heat transferred into a building. ENERGY STAR qualified roof products can help reduce the amount of air conditioning needed in buildings, and can reduce peak cooling demand by 10–15 percent.

\_\_\_ **Add or repair insulation to create a continuous blanket around building.**

Insulating basement walls and attic can reduce energy usage by as much as 30%.

\_\_\_ **Install weather stripping, caulking, or seals on openings that create drafts.**

About 1/3 of a property's total heat loss is through windows and doors. Reduce energy costs up to 20% by eliminating drafts & leaks around windows, doors, baseboards, & attic hatches. Seal electrical outlets and switches on outside walls with foam gaskets; on inside walls, use childproof plugs or combination cover plates.

\_\_\_ **Install High Quality Ductwork.**

A high quality duct system greatly minimizes energy loss from ductwork. Leaks in ductwork can contribute 20 to 60% of the air leakage in a house. The system should be airtight, sized and designed to deliver the correct air flow to each room. MADAIR (Mechanical Air Distribution And Interacting Relationships) refer to the principles underlying duct installations. Cost is 5-10% higher than conventional installations. (Regulatory: Section 503.9 and 503.10 of the Model Energy Code address ductwork; CSI Numbers: 157 250, 157 480.

<http://greenbuilder.com/sourcebook/Ductwork.html>).

\_\_\_ **Seal all Ducts.**

About 20 percent of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. The result is higher utility bills and difficulty keeping the house comfortable, no matter how the thermostat is set. Benefits of Duct Sealing. A duct system that is

well-designed and properly sealed can make your home more comfortable, energy efficient, and safer.

— **Clean or Replace the AC filter every month.**

A dirty air filter reduces air flow and may damage the unit. Clean filters enable the unit to cool down and use less energy. For central air conditioners, regularly clean a reusable filter or change the filter at the beginning of the cooling season. <http://www.pepco.com>.

**II GROUND**

— **Select native or other low-water plants for landscaping.**

— **Practice "Grass Recycling"**

Leave grass clippings on the lawn where they quickly break down and add needed nutrients to your lawn, which reduces your need for fertilizers which often contain petrochemicals.

— **Limit the Use of Gas-Powered Mowers.**

— **Plant Trees.**

A well-placed line of evergreens on the north side of the building can shelter it against cold winter winds and reduce the demand for heat. Trees that lose their leaves in the fall can give heat relief in the summer and still let the sunlight warm your home in the winter.

— **Water garden or lawn areas early.**

To reduce losses to evaporation, plan on watering your garden or lawn early in the morning, after the dew has dried. More than half the water applied to lawns and gardens can be lost due to evaporation or run-off because of over-watering. [www.eere.energy.gov/consumer](http://www.eere.energy.gov/consumer).

— **Harvest Rainwater**

Harvested Rainwater is rainwater that is captured from the roofs of buildings on residential property can be used for indoor needs at a residence, irrigation, or both, in whole or in part.

— **Consider Greywater Irrigation.**

**Definition:** Greywater is wastewater produced from baths and showers, clothes washers, and lavatories. (The wastewater generated by toilets, kitchen sinks, and dishwashers is called blackwater). The primary method of greywater irrigation is through sub-surface distribution.

**Considerations:** The use of greywater for irrigation requires separate blackwater and greywater waste lines. Sub-surface distribution systems are required by the local Health Department for greywater. Sub-surface systems are not as effective as above-ground spray systems for turf areas but are highly conserving and effective for providing root zone irrigation of plant beds, shrubbery, and trees. The best applications for greywater will be in conjunction with low water demanding landscapes

**III. LIGHTING**

— **Quality of Lighting Key Factors**

- \* **Minimize Glare**
- \* **Match Illumination**
- \* **Level to Task**
- \* **Keep Light Uniform**
- \* **Color Rendering Index of 80 or greater**  
(Definition: ability of light source to show up the colors of the objects being lit.)
- \* **Color temperature**  
Definition: Color of light from light source itself; warm –hot, white light (less than 3,300K), Intermediate-neutral white light (3300-5300K), Cool—cold, white light (above 5,300K)

— **Replace incandescent light bulbs with compact fluorescent lamps or LED bulbs.**

Select lights with a mid range temperature. This is given in the color temperature K (for Kelvin) shown for lighting products. A range of 3500-5000K is best. This will be the preferable light for a residence. A Color Rendering Index (CRI) is often the only information available for compact fluorescents. Select a CRI closest to 100, which is the best.

Compare the rated life of lights with the above features and select the longest rated life. The efficiency of lights or (efficacy) is measured by the amount of lumens created per watt of electricity expended. For example, fluorescent lights may range from 22-85 lumens per watt.

Triphosphers or multiphosphers lights give off the most light. (Phosphers are the glowing and light creating aspect of fluorescents.)

LED's are equally efficient as CFL's and don't have mercury. However they cost more & won't screw into many standard size light fixtures.

Make sure LUMENS of replacement lamp match LUMENS of the original lamp.

— **Convert exterior lighting to high-pressure sodium or metal halide lighting.**

— **Upgrade fluorescent fixtures with T/2 or T-8 fluorescent lamps and electronic ballasts.**

Select a ballast base that is separate from the bulb. The ballast will outlive the bulb allowing the owner to change the bulb only.

\_\_\_ **Remove or disconnect unnecessary lights.**

\_\_\_ **Convert exit signs to LED**

ENERGY STAR Exit signs operate on five watts or less per sign, compared to standard signs, which use as much as 40 watts per sign. One sign alone can save about \$10 annually on electricity costs and can last up to 10 years without a lamp replacement, compared to less than one year for an incandescent. Signs that have earned the ENERGY STAR are tested for visibility factors, and come with a five-year manufacturer warranty.

\_\_\_ **Lower light levels where appropriate, such as around computer monitors.**

\_\_\_ **Install Appropriate Controls. Occupancy sensors in areas, such as bathrooms that are frequently unoccupied, or "lights out" signs.**

\_\_\_ **Install timers or photocells on outside lights.**

Or consider utilizing motion detectors that switch on automatically when people or wildlife move close to them and switch off again after a few minutes.

\_\_\_ **Wattage. Change from 150 amps to about 60 amps.**

\_\_\_ **Clean lighting lenses.**

#### IV. **WATER USE and WATER HEATING**

\_\_\_ **Common Problems with domestic hot water Systems**

- \* **Temperature Set too low or too high**
- \* **Distribution Losses**
- \* **Sizing DHW Heater**
- \* **Insulation**
- \* **DHW Heater Failure**

\_\_\_ **Get a High-Energy Water Heating Unit.** High efficiency water heater units heat water only when needed, rather than storing hot water in a tank.

\_\_\_ **Install a water heater insulating blanket and wrap the first 3 to 6 feet of hot water supply pipe with pipe insulation.**

For safety, don't place insulation within 6 inches of the exhaust vent at the top of standard natural gas/propane or oil fired water heaters, and never insulate plastic pipes. If you have any electric water heater, insulate the tank for further energy savings. An insulation blanket costs only about \$10 and will pay for itself in a short period of time.

\_\_\_ **Install faucet aerators and efficient showerheads; two flush watercloset systems that use 1.0 gallons of liquid per flush (standard fixtures use 2.5 gallons per flush).**

\_\_\_ **Consider Composting Toilets**

Definition: A waterless composting toilet (approved by the National Sanitation Foundation (NSF) or engineered by a registered Professional Engineer), uses no water and produces a valuable fertilizer. There are some composting toilets that use a very small amount of water or foam. The water using kinds will typically be part of a total wastewater system.

If the property doesn't have central wastewater services, a composting toilet may be practical. Coupled with a sub-surface greywater irrigation system, the composting toilet can avoid the installation of a blackwater septic system. Although kitchen sink wastewater is defined as blackwater along with toilet wastewater the Health Department may permit the discharge of kitchen wastewater with greywater in a sub-surface irrigating system if the site conditions are suitable. CSI Numbers: 027 400, 152 180

\_\_\_ **Find and fix leaks.**

\_\_\_ **Install combination (combo) style Gas Water Heating**

Domestic hot water can be engineered to provide space heating as well as water heating. Known as a combination (or combo) system, a single appliance can perform two functions. The use of gas water heaters is generally considered a positive (although not perfect) environmentally-based choice. The pollutant levels created by natural gas combustion are less than other conventional water heating options except solar. The cost is competitive with conventional heat pumps and electric water heaters.

\_\_\_ **Consider Solar domestic water heaters:**

Are reasonably priced (\$1,000 - \$3,500) and can show pay backs of four to seven years depending upon the fuel displaced (electric or gas).

Fundamental Requirements:

- \* Collectors should have full sun from 9 AM to 3 PM.
- \* Should face south at approximately the same angle as your latitude.

Major Components in active solar water heating systems:

- \* Collectors to capture solar energy
- \* Circulation system to move a fluid between the e

(Sources: Solar Energy International, P.O. Box 715, Carbondale, CO 81623, 970/963-8855, <http://www.solarenergy.org>)

### \_\_\_ **Establish a water budget**

Considerations: The goal of the water budget is to show how much water is used. The flow rates of the fixtures and the appliances provided by the builder (i.e. commodes, faucets, showerheads, dishwashers) and added by the property owner (i.e. clothes washer) can be put in a budget form that helps the owner understand their water use.

The primary exterior demand for water is for watering lawns. The water budget format tells the property owner how much water their turf should require based on size and type of grass. The water budget establishes a baseline of how much water should be expected to be used by the property and where the water goes. Additional conservation strategies can be designed from the water budget information.

## V. **HEATING, VENTILIZATION, AIR CONDITIONING (HVAC)**

(NOTE: ENERGY STAR qualified light commercial HVAC equipment uses 7–10% less energy than standard equipment. These products can save approximately \$3–4 per square foot over the life of the equipment. For example, a 12,000 square foot building using an ENERGY STAR qualified HVAC product, could save \$36,000 to \$48,000.)

### Heating

- \_\_\_ **\*Set back heating, ventilating, and air conditioning (HVAC) systems when the building is unoccupied,**
- \*Shut off the Pilot Light during summer,**
- \*Set fans to “auto” rather than “fan”,**
- \*Raise thermostat to 78° in summer and lower to 68° in winter, maintain chiller;**
- \*Clean evaporator coils,**
- \*Clean & change Filter monthly,**
- \*Clean condenser rods.**
- \*Inspect equipment for wear or damage**
- \*Lubricate Equipment**

For every 2° a thermostat is lowered, the heating bill is reduced 2%. A reduction of 5° at night and when you are away during the day provides optimal savings.

### \_\_\_ **Install Energy Efficient Furnace.**

ENERGY STAR qualified oil and gas furnaces have annual fuel utilization efficiency (AFUE) ratings of 83% and 90%, or higher, making them up to 15% more efficient than standard models. Saves about \$80/year. Can save up to 25% of annual home heating costs with a payback of about seven years.

### \_\_\_ **Boilers.**

- \*Check water level,
- \*Check water quality,
- \*Clean and adjust burners
- \*Record make-up water, daily,
- \*Check oil tank level daily,
- \*maintain temperature (higher levels mean heat is going up the chimney).
- \*Record daily water temperature (above 140° will cause scalding in five seconds).
- \*Clean gauge plates,
- \*Check central settings weekly,
- \*Clean & oil filters monthly.

\_\_\_ **Repair leaks in system components such as pipes, steam traps, and couplings.**

\_\_\_ **Check heating system efficiency. A typical system should have an 80% heat/20% venting exchange ratio.**

(1/16" of soot on a vent surface reduces fuel efficiency 5%.)

\_\_\_ **Make sure radiators, convectors, air intakes, and air diffusers are not obstructed so that air can flow freely.**

\_\_\_ **Reduce water heater settings to the minimum required temperature.**

\_\_\_ **Make sure fans and equipment are not obstructed.**

\_\_\_ **Install Geothermal Heat Pumps.**

Geothermal heat pumps are similar to ordinary heat pumps, but use the ground instead of outside air to provide heating, air conditioning and, in most cases, hot water. Because they use the earth's natural heat, they are among the most efficient and comfortable heating and cooling technologies currently available. ENERGY STAR qualified geothermal heat pumps use about 40-60 percent less energy than a standard heat pump. They are quieter than conventional systems.

\_\_\_ **Install Energy Recovery Ventilator (ERV).**

An energy recovery ventilator (ERV) is a type of mechanical equipment that features a heat exchanger combined with a ventilation system for providing controlled ventilation into a building. An energy recovery ventilator with humidity regulation incorporates a method to remove excess humidity or add humidity to the ventilating air that is being brought into a house. CSI NUMBER: 157 250, 155 620

## **Air Conditioning**

\_\_\_ **Common Problems with Central AC**



- \* **Old (seer 10 or below)**
- \* **Low Freon**
- \* **Running too long (left on)**
- \* **Leakage in Duct Work**
- \* **Condensation creating mold**
- \* **Noisy**
- \* **Dry Air**

**Best Practices and solutions**

- \* **Replace with High Seer (13 or above)**
- \* **Seasonal Maintenance**
  - >Equipment and duct work
- \* **Set controls to cool to 78° F or above**
- \* **In dry climates**
  - >Add humidifier to equipment
  - >Evaporative cooling

\_\_\_ **Install Energy Efficient Central Air Conditioners.**

About one-seventh of all the electricity generated in the US is used to air condition buildings.\* ENERGY STAR qualified central air conditioners have a higher seasonal efficiency rating (SEER) than standard models, which makes them about 8% more efficient.

\_\_\_ **Install Energy Efficient Space cooling.**

Accounts for roughly 15% of electricity used in commercial buildings — second only to lighting. ENERGY STAR qualified light commercial HVAC equipment is designed to reduce energy waste and save money on your utility bills.

\_\_\_ **Change the direction of Fans to push warm air down in winter.**

The traditional method for creating comfort in hot/humid climates is through air movement. The modern home can use this traditional method readily with ceiling fans to move air in individual rooms, and whole house fans to pull in cooler outside air. Particularly helpful for rooms with electric baseboards or high ceilings. **CSI NUMBER(S): Ceiling Fans, 157-290-2500 to 157-290-3300; Whole House Fans, 157-200-3500 to 157-200-3600**

\_\_\_ **Install Programmable Thermostat.**

A programmable thermostat senses the room temperature and controls the HVAC system according to a schedule established by the homeowner. This type of thermostat allows different temperature settings to automatically regulate the HVAC system at different preset times. **CSI NUMBERS: 168 170 9500.**

## **VI. OPERATIONS AND MAINTENANCE**

\_\_\_ **Cooling O & M Checklist**

- \* **Clean or change air filters**
- \* **Clean evaporator coils**
- \* **Clean condenser coils**
- \* **Clean Blower**
- \* **Maintain Chiller**

- \* **Maintain Evaporative Coolers**
- \* **Turn off cooling systems in unoccupied areas**

\_\_\_ **Domestic Hot Water Systems O & M Checklist**

- \* **Annually inspect DHW tank/distribution pipes, making an inventory of sizes & lengths of insulation needed.**
- \* **Obtain appropriate insulation for DHW application.**
- \* **Install Insulation on tank/piping,**
- \* **Lower Water temperature**
- \* **Repair all leaks**
- \* **Insulate DHW pipes**
- \* **Turn off DHW to areas not needing hot water**
- \* **Reduce water pressure**
- \* **Flush tank/type water heaters**
- \* **Clean/adjust burners on gas & oil water heaters**
- \* **Check electrodes on electric water heaters**

\_\_\_ **Lighting O & M Checklist**

- \* **Keep Light Bulbs and Light Fixtures Clean.**  
Dirty fixtures can reduce light intensity by as much as 25%.  
[www.oregon.gov/energy/cons/res/cutbills](http://www.oregon.gov/energy/cons/res/cutbills).
- \* **Turn off lights and equipment when not in use.**  
Natural light saves energy and is easier on your eyes. A computer that runs 24 hours/day uses between \$75 and \$120 worth of electricity each year. You can save about \$15 on your annual energy bill with an energy start – qualified computer in standby mode. [www.greenerchoices.org](http://www.greenerchoices.org).

\_\_\_ **Install Energy Efficient Appliances.**

Refrigerators, dishwashers, and clotheswashers. The most efficient appliance will have certain features that should guide the purchaser to selecting the most efficient model with those features. CSI NUMBER: 114 000, 111 100

\_\_\_ **Recycle All Recyclable Materials.**

Find out what materials can be recycled in your Municipality and make sure those materials don't get thrown in the garbage. Recycling aluminum cans, glass bottles, plastic, cardboard, and newspapers can reduce a typical home's CO2 emissions by 850 pounds per year. [www.epa.gov](http://www.epa.gov).

\_\_\_ **Repair doors and seals so they close tightly.**

\_\_\_ **Pay Attention to Goods and Packaging.**

Evaluate purchases and consider how much they contribute to your household waste. Buy more durable goods and reusable products. And ask for products with less packaging.  
<http://www.ciwmb.ca.gov/BizWaste/FactSheets/Package.htm>.

\_\_\_ **Compost Organic Kitchen Waste.**

Compost makes valuable fertilizer and reduces the amount of waste in landfills, can reduce garbage by 25% and will reduce CO<sub>2</sub> emissions by 1,000 pounds per year.

\_\_\_ **Avoid Running the Tap Whenever Possible.**

Partially fill the sink with water and stop about 80% of that clean water from going down the drain—along with your money.

**Top 10 Checklist for Energy Efficient Operations and Maintenance**

1. **Dust/clean lighting lenses.**
2. **Repair/replace door sweeps.**
3. **Repair/replace door closers.**
4. **Repair/replace window gaskets.**
5. **Vacuum/wash/replace air handler filters.**
6. **Clean exhaust registers on rooftop equipment.**
7. **Check/tighten/replace belts.**
8. **Reduce water heaters to 140°.**
9. **Replace showerheads & faucet diffusers with low flow fixtures.**
10. **Track bills & savings.**

**VII. COMPUTERS AND APPLIANCES**

\_\_\_ **Buy Energy Efficient Computers.**

An ENERGY STAR qualified computer uses 70% less electricity than computers without enabled power management features. If left inactive, ENERGY STAR qualified computers enter a low-power mode and use 15 watts or less. New chip technologies make power management features more reliable, dependable, and user-friendly than even just a few years ago. Spending a large portion of time in low-power mode not only saves energy, but helps equipment run cooler and last longer. Businesses that use ENERGY STAR enabled office equipment may realize additional savings on air conditioning and maintenance.

Over its lifetime, ENERGY STAR qualified equipment in a single home office (e.g., computer, monitor, printer, and fax) can save enough electricity to light an entire home for more than 4 years.

The ENERGY STAR specification for computers, game consoles, and other hardware was revised on October 20, 2006 and is effective starting July 20, 2007. [More about the specification.](#)

\_\_\_ **Enable Energy-Save Option.**

Machines are shipped with this feature disabled. If you buy an Energy Star qualified computer, the power saving feature is automatically set.

\_\_\_ **Buy the Right Sized Computer Monitor for your Needs.**

Generally, the larger the monitor, the more energy it consumes, with the exception of an LCD monitor. Read labels on monitors to compare. Link: [www.energystar.gov](http://www.energystar.gov), [www.dell.com](http://www.dell.com)

\_\_\_ **Buy Energy Efficient Printers.**

Printers that have earned the ENERGY STAR can cut the equipment's electricity use by over 60%. Look for printers that automatically switch to standby when not in use which can reduce electricity consumption by more than 65%.

Earning the ENERGY STAR ENERGY STAR qualified printers automatically enter a low-power "sleep" mode after a period of inactivity. Separate specifications are available for stand-alone printer models depending on paper handling size and color capabilities. Spending a large portion of time in low-power mode not only saves energy but helps printing equipment run cooler and last longer. Many ENERGY STAR qualified machines can print double-sided pages, reducing paper costs by as much as \$30 a year. Businesses that use ENERGY STAR enabled office equipment may realize additional savings on air conditioning and maintenance. Over its lifetime, ENERGY STAR qualified equipment in a single home office (e.g., computer, monitor, printer, and fax) can save enough electricity to light an entire home for more than 4 years. Printers are generally turned on 24 hours a day, so power management features are important for saving energy and are an easy way to reduce air pollution.

\_\_\_ **Buy Energy Efficient Fax Machines.**

\*By powering down, fax machines that have earned the ENERGY STAR can reduce energy costs associated with fax machine use by almost 40%.

\*Spending a large portion of time in low-power mode not only saves energy but helps equipment run cooler and last longer.

\*ENERGY STAR qualified machines may have the capability to scan double-sided pages, reducing both copying and paper costs.

\*Using ENERGY STAR enabled office equipment may realize additional savings on air conditioning and maintenance.

\*Over its lifetime, ENERGY STAR qualified equipment in a single home office (e.g., computer, monitor, printer, and fax) can save enough electricity to light an entire home for more than 4 years.

\_\_\_ **Buy Energy Efficient Fax machines**

Fax machines are generally turned on 24 hours a day, yet are only actually in use for about an hour, so power management features are important for saving energy and are an easy way to reduce air pollution. Last year, ENERGY STAR qualified new home office equipment prevented the release of 19 billion pounds of pollution.

— **Buy Energy Efficient Scanners**

ENERGY STAR qualified scanners:

- \*Can cut the equipment's electricity use by over 50%.
- \* Automatically enter a low-power "sleep" mode after a period of inactivity, which not only saves energy but helps scanner equipment run cooler and last longer.
- \* Cost the same as standard scanners.
- \*May enable Businesses to realize additional savings on air conditioning and maintenance.
- \*Because office equipment is generally turned on 24 hours a day, power management features are important for saving energy and are an easy way to reduce air pollution.

— **Buy Energy Efficient Copiers.**

Copiers are the most energy-intensive type of office equipment because they sit idle for long periods of time.

ENERGY STAR Copier advantages include:

- \*"leep" or power down when not in use, and use 40% less electricity compared to standard models.
  
- \*May feature duplexing units that automatically make double-sided copies, reducing paper costs by about \$60 a month. Using less paper also saves energy because it takes 10 times more energy to manufacture a piece of paper than it does to copy an image onto it.
- \*May realize additional savings on air conditioning and maintenance.
- \*Because most copiers are left on 10 hours a day, power management features are important for saving energy and an easy way to reduce air pollution. Learn about the [copier of the future](#).

— **Install Energy Efficient Multifunction Devices.**

Multifunction devices are the answer to small or cluttered desktop spaces, because they combine printing, scanning, and faxing all into one unit.

**Advantages of an ENERGY STAR qualified multifunction device (MFD) include:**

- \*Saving of about \$220 dollars in electricity bills over its lifetime.
  
- \*By powering down, MFDs reduce energy costs associated with use by almost 40%.
  
- \*Spending a large portion of time in low-power mode not only saves energy but helps multifunction device equipment run cooler and last longer. ENERGY STAR qualified machines may have the capability to print double-sided pages, reducing both copying and paper costs.
  
- \*Enabled office equipment may realize additional savings on air conditioning and maintenance.
  
- \*Office equipment is generally turned on 24 hours a day, so power management features are important for saving energy and are an easy way to reduce air pollution.

— **Combine refrigerated goods and disconnect unneeded appliances.**

— **Install Energy Efficient Dishwashers.**

Replacing a dishwasher manufactured before 1994 with an ENERGY STAR qualified dishwasher can save you more than \$30 a year in utility costs.

**ENERGY STAR qualified dishwashers:**

\*Use at least 41 percent less energy than the federal minimum standard for energy consumption.

\*Use much less water than conventional models.

\*Because they use less hot water compared to new conventional models, an

ENERGY STAR qualified dishwasher saves about \$90 over its lifetime.

(NOTE: Run dishwashers with a full load. Most of the energy used by a dishwasher goes to heat water. Since you can't decrease the amount of water used per cycle, fill the dishwasher to get the most from the energy used to run it. Avoid using the heat-dry, rinse-hold and pre-rinse features. Instead use the dishwasher's air-dry option.)

— **Install Energy Efficient Refrigerators and Freezers.**

**Refrigerators.**

ENERGY STAR qualified refrigerators require about half as much energy as models manufactured before 1993. ENERGY STAR qualified refrigerators provide energy savings without sacrificing the features you want.

\*ENERGY STAR qualified refrigerator models use high efficiency compressors, improved insulation, and more precise temperature and defrost mechanisms to improve energy efficiency.

\*ENERGY STAR qualified refrigerator models use at least 15% less energy than required by [current federal standards](#) [EXIT ↗](#) and 40% less energy than the conventional models sold in 2001.

\*Many ENERGY STAR qualified refrigerator models include automatic ice-maker and through-the-door ice dispensers. Qualified models are also available with top, bottom, and side-by-side freezers.

**Freezers.**

ENERGY STAR qualified freezer models use at least 10% less energy than required by current federal standards. Qualified freezer models are available in three configurations:

- upright freezers with automatic defrost
- upright freezers with manual defrost
- chest freezers with manual defrost only

ENERGY STAR compact refrigerators and freezers use at least 20% less energy than required by current federal standards. Compacts are models with volumes less than 7.75 cubic feet.

**NOTE:**

\* In most households, the refrigerator is the single biggest energy consuming kitchen appliance. Replacing a refrigerator bought in 1990 with a new ENERGY STAR qualified model would save enough energy to light the average household for nearly four months.

\*You can reduce the amount of energy your refrigerator or freezer uses, whether with a standard or an ENERGY STAR qualified model, BY:

- (a) Position your refrigerator away from a heat source such as an oven, a dishwasher, or direct sunlight from a window.
- (b) To allow air to circulate around the condenser coils, leave a space between the wall or cabinets and the refrigerator or freezer and keep the coils clean.
- © Make sure the door seals are airtight.
- (d) Keep the refrigerator between 35 and 38 degrees Fahrenheit and your freezer at 0 degrees Fahrenheit.
- (e) Minimize the amount of time the refrigerator door is open.
- (f) Recycle older or second refrigerators.

## VIII. SUMMARY OF RESOURCES

### **Electrical Power:**

Switch to electric companies that provide 50% to 100% renewable energy.

[www.green-e.org](http://www.green-e.org), [www.cimateblz.com/sections/toolsresourecs](http://www.cimateblz.com/sections/toolsresourecs).

### **Fuel Requirements.**

If you purchase heating oil, diesel fuel, gasoline, propane, or natural gas for your business, consider negotiating price and payments prior to the beginning of the heating season. Energy companies can help you estimate your requirements, which can result in substantial energy cost savings. [www.privateschool.about.com](http://www.privateschool.about.com)

### **Environmental Protection Agency**

Energy Star:

<http://www.energystar.org>

Energy Star Qualified Products:

[http://www.energystar.gov/index.cfm?fuseaction=find a product](http://www.energystar.gov/index.cfm?fuseaction=find+a+product)

On-line bulk purchasing of Energy Star Products: <http://www.bulkpurchases.net>

Calculate building energy savings: <http://rehabadvisor.net>

Get a business Audit:

[www.epa.gov/globalwarming/visitorcenter/smbusiness](http://www.epa.gov/globalwarming/visitorcenter/smbusiness)

**Partnership to Advance Energy Technologies:** <http://www.toolbase.org>

**Energy Efficient Incentives, state by state:** <http://www.dsireusa.org>

**Alliance to save energy/State Energy Efficiency index:** <http://www.ase.org>

**Tax Incentive Assistance Program:** <http://www.energytaxincentives.org>

**Department of Energy, Energy Efficiency and Renewable Energy (DOE / EERE):**

[www.doe.gov](http://www.doe.gov).

<http://www.eere.energy.gov>

<http://www.energysavers.gov>

[www.eere.energy.gov/consumer](http://www.eere.energy.gov/consumer).

Heating and Cooling

[http://www.eere.energy.gov/consumer/your home/electricity/index.cfm/mytopic=12300](http://www.eere.energy.gov/consumer/your+home/electricity/index.cfm/mytopic=12300)

Buying Clean Electricity

[http://www.eere.energy.gov/consumer/your home/electricity/index.cfm/mytopic=10510](http://www.eere.energy.gov/consumer/your+home/electricity/index.cfm/mytopic=10510)

Your Vehicle

[http://www.eere.energy.gov/consumer/information resources/](http://www.eere.energy.gov/consumer/information+resources/)

Energy Savers Booklet Site

<http://www.eere.energy.gov/consumers/tips/>

US Green Builders Council, LEED standards for existing buildings.

<http://www.usgbc.org/>

**Campus Climate Challenge**

Lots of great ideas and initiatives being done on school campuses all over the US (this might also help you to get the youth involved if you publicize it right).

<http://climatechallenge.org/>

**Department of Housing and Urban Development (HUD).**

General assistance: <http://www.hudgov/energy>