

# ENERGY CONSERVATION

## Strategies for Success

### Canon City School District Energy Management Program Operation and Maintenance Guidelines / Best Practices

This set of guidelines was developed as a joint partnership of the Colorado Governor's Office of Energy Management and Conservation ([www.colorado.gov/rebuildco](http://www.colorado.gov/rebuildco)) and the Colorado Association of School District Energy Managers ([www.casdem.org](http://www.casdem.org)).

These guidelines are based on years of successful energy and facilities management work in schools and are intended to serve as a template for helping implement a successful energy management program at your school district. You are encouraged to modify these guidelines as necessary to suit the needs of your individual district.

This set of guidelines includes the following:

- 1. Management Strategies
- 2. Common Misconceptions Regarding Energy Use
- 3. Custodians
- 4. Kitchen Staff
- 5. Teachers and Staff
- 6. Groundskeeping
- 7. HVAC Operating Schedules
- 8. Lighting
- 9. Computers & Equipment
- 10. Preventative Maintenance
- 11. Equipment Purchasing

## Strategies for Success

### Canon City School District Energy Management Program

## 2. Common Misconceptions Regarding Energy Use

**Misconception #1:** It costs less to leave LED lights on when leaving the room for a short period of time because it requires more energy to turn it back on. Therefore, leave your lights on to save money on your electric bill.

**Reality:** When you turn on a LED light bulb (correctly called a "lamp"), there is a very brief jump in current when the ballast charges the cathodes and causes the lamp to start. This inrush of current can be many times greater than the normal operating current of the lamp. However, the spike of current draw normally lasts no longer than 1/10th of a second, and draws the equivalent of about 5 seconds of normal operation. So, if you turn your LED lamp off and on more frequently than every 5 seconds, you will use more power than normal, otherwise you'll be saving energy.

**Misconception #2:** Turning LED lamps off and on wears them out right away.

**Reality:** Electric lights have a published rating for expected life. This rating is in the hundreds of hours for many incandescent lights, and in the thousands of hours for most LEDs. LED lights have a life rating based on how many hours they are left on every time they are turned on. This is usually referred to as "burn time", and for LED lights the burn time is three hours.

Every time a LED light is turned on, a tiny amount of the coating on the electrodes is burned off. Eventually, enough coating is burned off, and the lamp fails to start. Most full-size LED lamps are rated to last 20,000 hours when left on for 3 hours every time they are turned on. This means that the lamp has roughly 6,667 starts available to use up. ( $20,000/3 = 6,667$ )

**Misconception #3:** Screen savers save energy.

**Reality:** Screen savers are energy wasters. Most computers use about twice as much energy lighting up the screen as they do for processing. Originally, screen savers were designed to stop screens being burnt by a constant image, but they are not needed for modern screens. Not only can screen savers use as much energy as a full screen of work, but many require considerable processing energy as well. If you want to save energy you can set your saver to 'none' or 'blank screen'. If you want to use your screen saver in conjunction with monitor power management, set the screen saver "wait time" to less than the period of inactivity before the monitor shuts off automatically.

**Misconception #4:** Turning a computer off each day is bad for the computer system and shortens the life of the equipment.

**Reality:** Contrary to popular belief, turning on and off the computer doesn't shorten its life. The belief that frequent shutdowns of PCs are harmful persists from the days when hard disks did not automatically park their heads when shut off; frequent on-off cycling could damage such hard disks. Modern hard disks are not significantly affected by frequent shut-downs. Shutting down computers at night and on weekends saves significant energy without affecting the performance. If you are going to be away from the computer for several hours, turn it off. Leaving a computer on overnight may not use a lot of electricity, especially if your computer and monitor support the "Energy Saver" features that are standard on most new computers. But make no mistake, over the course of months and years, quite a lot of electricity is wasted. It's

probably okay to put your PC in a "sleep" mode during the day, but it's best to turn it off during evenings and weekends. This allows the database to restart during the next turn-on allowing startup to correct any problems that may have occurred during the operating day.

**Misconception #5:** Turning the heat down (or cooling up) at night does not save energy, since you have to heat the building back up (or cool down) again the next morning.

**Reality:** Heating and cooling uses more energy and drains more energy dollars than any other system in your school. Typically, over 1/3 of your utility bill goes for heating and cooling. Heating and cooling systems in the United States together emit over a half billion tons of carbon dioxide into the atmosphere each year, adding to global warming. They also generate about 24% of the nation's sulfur dioxide and 12% of the nitrogen oxides, the chief ingredients in acid rain. By turning down the thermostat at night you will generally save 1%-2% of your heating bill for each degree lowered.

**Misconception #6:** Periodic inspection and tune-up of heating, ventilating and air conditioning systems is a waste of money.

**Reality:** As they say in medicine, prevention is nine tenths of the cure, and with building maintenance, the same holds true. Preventative maintenance can save you time and money in the long run. The maintenance department is one of the greatest levers of profitability for any capital-intensive organization. Maintenance is often an organization's largest single controllable expense. Preventative maintenance is essential to prevent an energy system from using more energy than necessary; keep the system effective in doing its intended job; prevent problems that can lead to reduction in productivity; and help prevent early equipment failure. Staff training on common maintenance and repair items is also time and money well spent. Preventative maintenance software programs, including PM checklists and work order forms are available to assist in implementing preventative maintenance.

## Strategies for Success

### Canon City School District Energy Conservation Activities

#### 3. Custodial Staff

- ❑ Be a leader in energy conservation. Lead by example.
- ❑ Instruct others on common misconceptions about energy use.
- ❑ Be alert for energy waste at all times (lights, computers, heating and cooling systems left on when not needed are biggest energy wasters).
- ❑ Perform a shutdown checklist at the end of each day to make certain that the building systems are shut down in an energy conservative manner.
  
- ❑ Light only the room being cleaned. Turn lights off when leaving the room.
- ❑ Work with fewer lights turned on when possible (areas with ample daylight such as corridors, entryways, commons).
- ❑ Turn off lights when possible throughout the day (i.e. in classrooms and offices when no one is in the room). Notice and thank teachers and staff that do their part to make your school energy efficient.
- ❑ Make sure outside lights are off during the day.
  
- ❑ Heating and cooling systems:
  - ❑ Advise maintenance if you think a time or temperature schedule change is needed.
  - ❑ Keep the heat inside. Close blinds at night to keep in the heat. Open during the day to let sun shine through and warm the inside of the building. Do the reverse during the cooling season.
  - ❑ Keep exterior doors and windows closed while heating or cooling systems are operating.
  
- ❑ Recycle paper, cardboard, plastic, glass, and metal where possible.
- ❑ Use recycled products such as paper and other environment-friendly products such as water-based paints, and non-toxic floor and desk cleaners.
  
- ❑ Report all leaking faucets and pipes as well as running toilets.
- ❑ Report heating and air conditioning problems to maintenance.
- ❑ Report damaged doors and windows to reduce the need for heating and cooling in the building.
  
- ❑ Use dry cleanup before using water/spray washing. Minimize water washing.
  
- ❑ Make suggestions to maintenance staff and administration to improve energy and operational efficiency.

## Strategies for Success

### School District Energy Conservation Activities

#### 4. Kitchen Staff

- ❑ Turn lights off when leaving the room.
- ❑ Work with fewer lights turned on when possible (i.e. keep cafeteria area off until 1<sup>st</sup> lunch group arrives).
- ❑ Run exhaust fans only when needed.
- ❑ Turn on kitchen equipment only when necessary and turn off as soon as finished.
- ❑ Use microwave oven in place of conventional ovens where possible.
- ❑ Run dishwasher only with full loads.
- ❑ Don't use tap water to thaw frozen vegetables or other food.
- ❑ Use hot water only when necessary.
- ❑ Install high pressure/low flow spray rinsers with auto shut off.
- ❑ Use dry cleanup before using water/spray washing. Minimize water washing.
- ❑ Report all leaking faucets and pipes as well as running toilets.
- ❑ Report damaged doors and windows to reduce the need for heating and cooling in the building.
  
- ❑ Keep refrigerators and freezers full. A full refrigerator and freezer operates more efficiently than an empty one. Use plastic bottles of water to take up space if necessary.
- ❑ Consolidate refrigerators and freezers to run only the minimum number needed.
- ❑ Defrost refrigerators and freezers regularly.
- ❑ Keep refrigerators at 34°F -37°F and regular use freezers at 5°F. Keep long-term storage freezers at 0°F.
- ❑ Turn off refrigerators/freezers for periods of non-use.
- ❑ Turn computers on to start each day and off each night.
  
- ❑ Heating and cooling systems:
  - ❑ Don't tamper with controls. Don't use "hold" or "override" setting for programmable thermostats.
  - ❑ Advise maintenance if you think a time or temperature schedule change is needed.
  - ❑ Keep the heat inside. Close blinds at night to keep in the heat. Open during the day to let sun shine through and warm the inside of the building. Do the reverse during the cooling season.
  
- ❑ Recycle paper, cardboard, plastic, glass, and metal where possible.
  
- ❑ Make suggestions to maintenance staff and administration to improve energy and operational efficiency.

## Strategies for Success

### Canon City School District Energy Conservation Activities

## 5. Teachers and Staff

- ❑ Teach energy efficiency to students. Lead by example and get students involved.
- ❑ Turn lights off when leaving the room for any period of time.
- ❑ Work with fewer lights turned on when possible (e.g. when students not in room). Use task lighting and or day lighting when possible.
- ❑ Turn computers on to start each day and off at end of each day.
- ❑ Turn off electrical equipment and appliances when not in use and at end of each day.
- ❑ Portable electric heaters, compact refrigerators, microwave and toaster ovens, coffee brewers, hot plates and other personal electrical equipment and devices shall only be used:
  - ❑ In Convenient areas for communal use of refrigerators and cooking equipment shall be designated at each building.
  - ❑ For instructional purposes
- ❑ Report all leaking faucets and pipes as well as running toilets.
- ❑ Report damaged doors and windows to reduce the need for heating and cooling in the building.
  
- ❑ Heating and cooling systems:
  - ❑ Don't tamper with controls. Don't use "hold" or "override" setting for programmable thermostats. Do not use any devise to manipulate the thermostat temperature reading to increase or decrease the room temperature.
  - ❑ Advise maintenance if you think a time or temperature schedule change is needed.
  - ❑ Keep the heat inside. Close blinds at night to keep in the heat. Open during the day to let sun shine through and warm the inside of the building. Do the reverse during the cooling season.
  - ❑ Keep exterior doors and windows closed while heating and cooling systems are operating.
  - ❑ Keep books, etc. off of heating and cooling equipment, especially where it blocks airflow.
  
- ❑ Recycle paper, cardboard, plastic, glass, and metal where possible.
  
- ❑ Make suggestions to maintenance staff and administration to improve energy and operational efficiency.

## Strategies for Success

### School District Energy Conservation Activities

## 6. Groundskeeping

- Create natural landscapes, with native trees and shrubs. Trees and shrubs provide shade from harmful UV rays; natural filtration of air and noise pollution; and niches that offer food and shelter to wildlife. They also require less water, chemicals and maintenance and subsequently reduce long-term upkeep costs. Ask a local nursery if they will work with you to provide native plants on school grounds.
- Use a minimal amount of fertilizers on school grounds or try finding natural alternatives to fertilizing. Fertilizers can migrate into water bodies and harm aquatic ecosystems.
- Use sand on icy walks instead of salt which pollutes water and can harm plants. Do not pour hazardous materials, such as science class chemicals down the drain because they can eventually be released into drinking water sources.
- Dispose of all litter in recycle bins or trash cans so that the litter does not get washed into nearby storm sewers.
- Encourage employees or contractors to use integrated pest management.
- Only spray pesticides when children are out of school.
- Follow pesticide label instructions and wear protective equipment such as gloves and a face mask. The person applying pesticides should be a registered technician or certified applicator.
- Do not purchase excess pesticides.
- Store pesticides in a secure place.
- Do not (1) mix pesticides with everyday trash, (2) wash them down sewers or drains, or (3) dump them on the ground.
- Practice water-efficient landscaping. If school grounds must be watered, do so in the morning or evening so water will soak into root systems and not be lost to evaporation. Also, school grounds should not be watered more than every third day and not on windy days.
- Use drip and other high efficiency irrigation systems in lieu of sprinklers.
- Water plants at the roots, not the leaves or trunk.
- Use mulch around landscape plants to reduce evaporation and weed growth.
- Use dry cleanup before using water/spray washing. Minimize water washing.
- When mowing lawns and playing fields, set the mower blades to 2-3 inches high to help shade the soil and improve moisture retention.
- Do not keep vending machines outside. If necessary, place them on the north side of buildings or provide them with total shielding from the sun year-round.

## Strategies for Success

### School District Energy Conservation Activities

## 7. HVAC Guidelines

### General

- Buildings should be at operating temperatures at the scheduled school starting times.
  - Air handling equipment is set up on a Start Stop Time optimization program for heating operation. The program starts the equipment at the latest possible time based on the outside air temperature and the building temperature and still insures the building is at the occupied setting when students arrive.
  - Air handling equipment will start at a set time for air conditioning. The equipment will start at the set time for student building occupation
- For school related after hour activities contact the building secretary the month prior to the event so arrangements may be made with the district energy manager
- After hour usage by parties from out side the district is based on the availability of the facility and contractual agreements with the District. For information on after hour use contact Business Services Assistant.
- After hour usage for district functions are based on the availability of the facility and a facilities use form. For information an the facilities use form contact the Business Services Assistant.5706

### Cooling

- Buildings with air conditioning units will be set to maintain an operating temperature of 78 degrees for the cooling season. A range of 1 to 2 degrees above or below the target set point may occur as a normal part of the HVAC equipment operation.
  - Room temperatures will be set and measured at the HVAC equipment control thermostat
- Cool outside air will be ventilated into all schools through the air handling systems during the early morning hours to provide “free” cooling, HVAC systems permitting.
- Cooling setback temperatures will go into effect each school night one half hour after the end of the school day. System shall remain in setback mode until the beginning of the next school day. System shall be in setback mode during extended breaks.
- Cooling thermostats in all district buildings will be programmed to the following setback temperatures: 90 degrees F
- People in buildings without air conditioning will maintain indoor climate control using window shades, portable fans, etc.
- Air conditioning will not be utilized during the summer break except under the following circumstances:
  - The building is climate controlled with out operable windows. Under these conditions the air conditioning will operate while the custodians are working. The air conditioning will be set to operate in the areas the work is being performed, not in the building as a whole.
  - The classrooms are occupied for summer school.
- Unnecessary equipment will not be set to operate during the summer break

## Heating

- Central heating controls and programmable thermostats are set to:
  - 70 degrees in academic and common areas
  - 66°F to 68°F in gymnasiums and kitchens.
    - A range of 1 to 2 degrees above or below the target set point may occur as a normal part of the HVAC equipment operation.
    - Room temperatures will be set and measured at the HVAC equipment control thermostat
- Heating setback temperatures will go into effect each night one half hour after the end of the school day and shall remain in setback mode until the beginning of the next school day. . System shall be in setback mode during extended breaks.

## Domestic Hot Water

- Domestic hot water heaters are set to 110°F to 125°F. Water heaters with temperature markings such as "WARM", "HOT", "VERY HOT" or "A", "B", "C" shall be set on the ▲ symbol equal to 120°F. Water temperatures over 125°F can cause severe burns instantly.
- Domestic hot water heaters serving kitchen shall be set to 140°F (with dishwasher booster).
- Domestic water heaters will be shut off during extended breaks of two weeks or more in areas where use of domestic water is not needed.
- Domestic water re-circulating pumps shall be off during unoccupied hours.

## Strategies for Success

### School District Energy Conservation Activities

## 8. Lighting Guidelines

### Before the School Day

- From the time the custodian arrives until 15 minutes before the students arrive – lighting in the corridors, restrooms and commons should be kept to a minimum, enough for people to safely move around. All other lights in unoccupied areas should be turned OFF.
- Custodian should not turn classroom, auditorium, gym or office lights on. Teachers and staff can do this when they arrive.
- 15 minutes before students arrive – all necessary lighting should be turned ON.
- Teachers can use partial lighting when students are not present in the classrooms.
  - Task lighting should be used as much as possible.

### During the School Day

- On sunny days, areas (entryways, commons, corridors, etc.) with ample daylight should have interior lights turned OFF.
- Teachers (or assigned students) and office staff should turn lights OFF when leaving classrooms and offices.
- Be sure all outside lights are OFF. Portable classrooms have a manual switch. If outside building security lights are on, please notify maintenance.
- PE teachers can use less than the full bank of gym lights when holding classes outside.
- Teachers using the stage for classes should not use auditorium house lighting unless needed.

### After the School Day

- Each staff member should turn lights OFF when leaving their classrooms or offices to attend meetings or before leaving for the day.
- Daytime custodian should brief substitute custodians of lighting control procedures.
- Custodial staff should do classroom trash and check for lights OFF.
- Custodial staff should vacuum corridors with lights ON while staff and students are still present.
- Soon after staff and students are noticeably gone, corridor lights should be turned OFF.

### Nighttime

- Lights should be OFF except in the immediate area where custodial staff is working, or where school or community events are being held.
- Staff or community members hosting events should be held responsible for lighting control in that area of the school.
- Campus blackouts should be in effect within 15 minutes after the custodian is scheduled to leave.

## Strategies for Success

### Operation and Maintenance Guidelines

## 9. Technological Equipment

**Did You Know?** Contrary to popular belief, turning on and off the computer doesn't shorten its life.

### Computers

- Turn your desktop or instructional computers and peripheral equipment ON when you are ready to first use them for any given day.
- Computers and equipment in labs and on desktops should be left ON throughout the instructional day, and then turned OFF at the end of each instructional day unless there are special circumstances related to system maintenance by personnel.
- When leaving for a period of three or more hours, you should turn your personal computers OFF.
- Computers regularly used by specific employees are sometimes left on at night while performing automatic functions. Before turning off someone else's computer, you should contact them.

### File Servers: DO NOT TURN FILE SERVERS OFF AT ANY TIME

- Only the manager of a file server knows that it can be turned OFF and when is the right time to do so. No one else should attempt to power down file servers.
- In many situations these servers are located in closets along with network equipment. Do not turn OFF network equipment either! That also can interrupt important server functions, and it can create other problems which are much more costly to resolve than the electrical energy being consumed.
- Administrative/office fileservers may be left ON at all times.

### Peripheral Equipment

- All computer peripheral equipment, i.e. scanners, CD ROMS, back-up hard drives, etc., should be left OFF until needed. (Exceptions are devices which require one to restart the computer if powered up after computer power-up.) Turn all peripheral equipment OFF when it is no longer needed for that day.

### Monitors

- As an alternative to turning OFF your entire system, some monitors may be turned OFF when not being used for an hour or more. Screen savers do not save energy.
- A computer monitor (unless the computer is an all-in-one model such as an iMac) should never be left ON overnight. If you notice a user's or server's monitor still on after hours,

please turn only the monitor OFF. The monitor, except the flat panel liquid crystal or similar type displays, is a computer's biggest electricity-consuming component.

## **Strategies for Success**

### Operation and Maintenance Guidelines

## **9. Technological Equipment (continued)**

### **Printers**

- Keep all personal dot matrix and ink jet printers OFF until ready for use, unless they are networked. Those printers may be powered-up with the lab or network. Laser printers may be turned ON when ready for first use of the day, and left on for remainder of the day. All printers should be turned OFF at the end of the workday unless after-hours printing will occur.

### **Library Automation Systems**

- Library Automation Systems should be shutdown at night. Only library/media staff should perform these shutdowns.

### **Office Machines**

- All photocopy machines are to be shut down at the end of the normal workday. If your school or office has night programs or scheduled meetings where the copier is needed, it may be left on until after the meeting. The copier should be turned on when needed the next day. The exception would be any networked printer/copier combination machine which is routinely used after closing time by a computer user on the site's network.
- All other office equipment should be turned on only when needed, and they should be turned off at the end of each workday, with the exception of fax machines which routinely receive important documents after regular work hours.

## Strategies for Success

### School District Energy Conservation Activities

## 10. Preventative Maintenance

Institute preventative maintenance plan including as a minimum:

- Maintain central heating equipment. Perform annual tune-up on furnaces, boilers and/or domestic hot water heaters as dictated by the owner's manual. This will maintain peak operating efficiency and lengthen service life.
- Clean or replace furnace and air-conditioner filters quarterly or as needed. Use minimum 40% efficient filters.
- Clean/vacuum air-conditioning condenser coils on refrigerators and comb condenser fins on all air conditioning equipment as needed.
- Annually oil or grease pump and fan motors that have oil or grease fittings.
- Exercise newer piping shut-off valves annually. For older valves it may be best to leave them alone, as exercising older valves may cause the valves to start leaking.
- Maintain and upgrade as needed the School Dude Computerized Maintenance Management System (CCMS)
  - Revise and update the Preventative Maintenance module PM Direct as necessary
  - Revise and update the Work Request module Maintenance Direct as necessary
  - Investigate new CCMS that may be more efficient and provide better features.

## Strategies for Success

### School District Energy Conservation Activities

## 11. New Equipment Purchasing

- When purchasing new appliances and office equipment, select products that are Energy Star rated. Visit [www.energystar.gov](http://www.energystar.gov) for more information.
- When purchasing new heating and cooling equipment, purchase equipment that are Energy Star rated.
- When purchasing replacement electric motors, purchase premium efficiency models.
- When replacing plumbing fixtures such as toilets, urinals and faucets, install water efficient equipment such as flow restrictors in faucets and low gallonage toilets (1.6 gallons per flush) and urinals (1.0 gallons per flush). Waterless urinals are now available.
- When replacing failed LED lighting ballasts, replace with electronic ballasts and T-8 lamps. When replacing exit sign lamps, replace with LED screw-in lamps. When replacing high use incandescent lamps, replace with compact LED lamps.
- When replacing exterior lights, replace timeclock controlled exterior lights with photocell control.
- Evaluate and upgrade irrigation and control systems to ensure best watering practices or replace turf with drought resistant vegetation requiring less water.