

APPENDIX D: ENERGY CONSERVATION MEASURES AND EXAMPLES

Some examples of energy conservation include the following:

Energy Conservation Measure Descriptions

Lighting

Install new and/or retrofit lighting fixtures

Fluorescent lighting

This measure applies to buildings where existing fluorescent lighting is not up to date. In most cases, existing lighting has T12 lamps and magnetic ballasts. Older buildings have standard magnetic ballasts while newer construction may have energy-efficient magnetic ballasts.

This measure consists of upgrading T12 fixtures to new T8 lamps and electronic ballasts, upgrading exit signs, and lighting controls and installing occupancy sensors where economical. In areas with long burn hours, the fixture retrofit may also include a specular reflector to increase fixture efficiency.

Incandescent Lighting

This measure applies wherever incandescent lighting still exists and has more than "occasional" burn hours. The upgrade consists of either a) replacing the incandescent lamp with a compact fluorescent lamp, or b) installing a new light fixture with an either a compact or linear fluorescent lamp.

Install Occupancy Sensors

This measure consists of installing occupancy sensors in classrooms, laboratories, offices and other areas where lights may be left on while the area is unoccupied. In small rooms, wall switch occupancy sensors may be adequate. In larger rooms, it may be necessary to use ceiling or corner mounting locations.

Install new and/or retrofit exit light fixtures

This measure consists of upgrading all existing incandescent and fluorescent lamp exit signs to newer lamp technology such as an LED light source. The measure can be accomplished by installing new exit signs or retrofitting the existing exit signs with upgrade kits as applicable.

Replace existing HID lighting with high intensity fluorescent technology

Large areas with high ceilings are good candidates for new high-bay light fixtures using the more efficient high output fluorescent lamp technology such as T-5 fluorescents. This upgrade measure will apply gymnasiums, warehouse space, and high bay workshops. Interior spaces such as libraries and atrium areas, which may currently use HID lighting, could also be good candidates for this upgrade. In addition to the lighting energy savings (about 50% vs. metal halide) the new lighting is "instant on" and can be controlled with occupancy sensors and dimming controls to produce even more savings.

Replace existing Parking-lot lighting with high intensity fluorescent technology

This measure should incorporate the latest technology in outdoor florescent lighting fixtures

and controls.

Controls

Install/activate outdoor reset controls

This measure consists of the installation of improved controls, which measure the temperature of outside air. They adjust the boiler water temperature to optimize heating system efficiency by reducing water temperature to the minimum required to provide heat satisfactorily. The upgraded controls also turn off the circulating pumps when the building requires no heat. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or deactivated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install/activate night setback controls

This measure consists of the installation of new temperature controls, which lower temperatures during unoccupied periods in the heating season – primarily nights, weekends and vacation breaks. The same setback controls may also apply to air-conditioning during the cooling season. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or de-activated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install premium efficiency motor(s) and/or variable speed drives

This measure consists of replacing standard efficiency motors with premium efficiency motors and installing variable speed drives on pumps and/or fans, which run at constant speed but have variable loads. The measure is normally limited to motors larger than 2 HP and with run times greater than 2500 hours per year.

Install/activate economizer cooling

This measure applies to those facilities that have air-conditioning systems and lack the capability to cool the facility using outside air. It requires the addition of economizer controls that measure the temperature and humidity of outside air and use it for cooling whenever feasible. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or de-activated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install demand controlled ventilation

This measure consists of installing the equipment necessary to control outside air brought into the building (or a particular area within a building) according to its occupancy. Spaces without demand control ventilation are generally designed to provide ventilation based on the maximum possible occupancy for the space. During periods of lower occupancy, the space may be significantly over ventilated and use unnecessary energy. In most cases, this measure requires an indoor air quality (IAQ) sensor, a variable damper on the outside air inlet and a control system that varies the damper opening according to the real time IAQ. Gymnasiums, auditoriums and other large areas that have widely varying occupancy are good candidates for this measure.

Install intelligent fan controls on kitchen and lab ventilation hoods

This measure consists of installing specialized fan controls or exhaust hoods that can regulate the kitchen or lab hood exhaust fan speed according to the actual cooking or

occupancy activity being performed under the hood. The systems often use variable speed drives on the exhaust fan motors.

Install small energy management system (EMS) with remote access

This measure consists of the installation of a small, microprocessor-based energy-management system (EMS), or the upgrade of an existing EMS system, which will schedule and control the main energy consuming equipment in the building. In addition to optimizing the building's control functions the system will be capable of remote access so its conditions can be monitored from anywhere using a phone or Internet link.

In particular, the system must be capable of remote monitoring of space temperatures and the status of boilers, furnaces, pumps, fans and AC units. The EMS system must be capable of interfacing with existing EMS equipment and controls unless a completely new system is more economical.

HVAC & Plumbing Measures

Install more efficient heating equipment

Most of the heating systems utilize either a warm air furnace or a hot water boiler. Fuel is predominantly oil although gas and propane are available in some locations. This measure consists of replacing the existing furnace or boiler with a new, more efficient unit (based on AFUE) or replacing rooftop units. Multiple modular boilers are preferred over large single units. Also, facilities using natural gas or propane for fuel should consider high efficiency condensing boilers.

Install more efficient Air Conditioning (AC)

Many buildings have areas with air conditioning to ensure student and staff comfort during the summer months. These small AC systems vary in age, size and efficiency. This measure is for the installation of more efficient (higher SEER) new AC units. Many of these new units have dual stage compressors so they operate at lower power (and higher efficiency) for all but the peak summer days.

Install new higher efficiency water heater

This measure consists of replacing an old water heater with a new, higher efficiency water heater or heat pump water heater. Heat pump water heaters are particularly effective in buildings that use a boiler to produce domestic hot water during the heating months. With a heat pump water heater the main boiler can then be shut down. Other improvements in water heaters include units with pilot-less ignition, a flue-gas damper, thick exterior insulation and a high efficiency heat exchanger. The most efficient units use a burner with a forced-draft fan. This measure will also consider the installation of an instantaneous water heater, which may be more applicable for areas that only need hot water for hand-washing type activities.

Install water conserving plumbing fixtures and devices

This measure will replace or retrofit existing inefficient water-consuming plumbing fixtures such as toilets, urinals and faucet aerators with new water conserving lower-flow fixtures, devices and controls. Measures should be considered to control costs and usage of outside watering for landscaping purposes.

Building Envelope

Add additional glazing panel and/or retrofit existing glazing system

This measure consists of adding an interior or exterior glazing panel to the existing window system to boost energy efficiency and reduce air infiltration. Alternatively, a retrofit of the entire existing glazing system should be considered where economically feasible.

Increase ceiling/roof insulation

This measure consists of adding insulating material to the ceiling or roof areas of buildings that presently have little or no ceiling/roof insulation. In most cases it will consist of additional fiberglass bats, rigid panel insulation or blown-in insulation.

Alternative Work Items

Install small high efficient boiler for summer use

This measure consists of the installation of a small "pony" boiler for use during the spring, summer and fall periods. When possible, the unit should be a condensing boiler, which operates at very high efficiency when at low load.

Replace existing rooftop heating/ac units

This measure will investigate the economical replacement of the existing rooftop heating and cooling equipment with higher efficiency units.

Weather-stripping, sealing and caulking

This measure consists of lowering the air infiltration rate of buildings through the application of weather-stripping materials, caulking and sealants around exterior fenestrations. Old and deteriorated materials shall be removed prior to the application of new materials.