

WEATHERIZATION AND MICROCLIMATE

Weatherization and microclimate interventions are some of the easiest, cheapest and effective ways to increase the energy efficiency and indoor air quality in your home. Housing in lower income subdivisions and neighborhoods often have problems of inadequate insulation, duct/window/door air leakage, and poor air circulation.

Weatherization and microclimate interventions minimize these problems by reducing energy loss and the entry of air pollutants (e.g., dust) and moisture. Many weather related C-BHIT home improvements described here are affordable, can be performed with self-help or do-it-yourself labor, and are easy to maintain, meanwhile producing significant energy savings and improving the quality of life of household members.

1 Window Shading

Reflective films and solar screens block UV light and heat from the sun to reduce the temperature of the room, thus reducing the need for air conditioning. Permanent films or tinting are desirable on windows that face the sun for most of the year, while temporary films or tin foil and solar screens can be applied to windows that have heavy summer sun and later removed or stored for the winter when you want heat to enter.

2 Replace Filter

Replacing filters improves indoor air quality and improves the efficiency of heating and cooling.

3 Cross Ventilation

Cross ventilation lowers the concentrations of indoor air pollutants and improves heat/cool transfer throughout the home by increasing and circulating air flow. First by installing screens on existing windows and second by installing secondary through wall vents in opposite walls. As an example, if the winds are predominantly from the South, South and North exterior walls and windows should be targeted first.

4 Kitchen Ventilation Ductless

Installing a kitchen range hood vent improves indoor air quality. Ductless range hoods recirculate the air through a filter back into the kitchen and are the option when the range is not close to an outside wall/roof or when people do not want to install the ducting involved.

5 Kitchen Ventilation Ducted

Installing a kitchen range hood vent improves indoor air quality. Ducted range hoods circulate the air outside and are an option when the range is close to an outside wall/roof and requires installation of the ducting involved.

6 Bathroom Ventilation

Installing kitchen or bathroom vents improves indoor air quality.

7 Shading Devices - Roof Overhang & Porches

External shading devices reduce solar absorption. Shading can be achieved by adding an overhang or installing a pre-made roller shade. A porch and shaded deck area in front of the main door creates recreational (outdoor) space as well as provides shading to the entryway. For those with mobility problems a porch/deck can also be tied into a ramp for wheelchair access to the front door.

8 Replacing Exterior Doors & Windows

Replacing doors and windows with close fitting and energy efficient models can decrease heat and cool exchange between interior and exterior environments.

9 Weatherstripping (Interior)

Interior weatherstripping seals air leaks around windows and doors, thus provides energy savings from heating and air conditioning. It also improves air quality by reducing air pollution and dust as well as moisture from water infiltration.

10 Weatherstripping (Exterior & Interior)

Exterior and interior weatherstripping seals air leaks from connections between physical structures such as between two trailers, between a house and trailer, between a mobile home and trailer, etc. This provides energy savings from heating and air conditioning and improves air quality by reducing air pollution and air dust as well as moisture from water infiltration.

11 Sealing Joints, Ductwork or Holes

Sealing joints, ductwork and holes improves energy savings from heating and air conditioning and improves air quality by reducing indoor air pollution and dust.

12 Spray Foam Insulation

Spray foam insulation is a polyurethane foam that is pumped into the walls, ceilings and other open spaces of wall or roof areas. It is more effective insulation because its fluid nature allows for it to go through tiny open spaces, so provides better energy savings from heating and air conditioning and improves air quality while reducing moisture and mold formation as well as bug infestation. It also lasts longer than other forms of insulation and is not an irritant if accidentally touched. Spray foam is more expensive than any other kinds of insulation in part because it requires professional installation, but the benefits of more effective insulation - longer lasting, lower utility bills and better air quality - may outweigh the initial higher costs.

13 Blow-in Cellulose Insulation

Cellulose insulation is recycled newsprint and/or corrugated cardboard that is treated with a fire retardant. Because it is made from organic material and is environmentally friendly, it is probably the safest among all other kinds of insulation. Cellulose can also reduce noise between rooms and is more economical for use in homes than spray foam insulation, but is less effective than spray foam at reducing mold and improving air quality.

14 Radiant Barrier Roll Insulation

Traditional insulating materials, including spray foam and cellulose, absorb or resist (slow down) convective and conductive heat transfer (as measured by the R-value). Radiant barrier rolls reflect, rather than absorb, electromagnetic radiant heat transfer, which is what you feel from the sun's rays. During the winter, 50-80% of heat loss is radiant, and in the summer, up to 90% of heat gain is radiant. So radiant barrier rolls reflect inward/outward heat loss/gain during the winter/summer. A pure aluminized radiant barrier is unaffected by humidity and can be applied alongside traditional insulating materials to further improve energy performance. Radiant barriers can also be spray painted on the inside of the attic space, or applied to the exterior roof of a manufactured home.

15 Programmable Thermostat

A programmable thermostat maximizes home comfort and energy efficiency.

16 Carbon Monoxide Detector (Battery Operated)

Monitoring carbon monoxide levels in your home is a health and safety issue that cannot be measured with dollar amounts. Detectors are particularly important for homes with a gas range, water heaters inside or chimneys. The detector can be battery operated or attached to the electrical circuit (which may involve some labor costs).

17 Smoke Detector (Battery Operated)

Monitoring for smoke or fires in your home is a health and safety issue that cannot be measured with dollar amounts. Detectors are particularly important for homes that use non-traditional means of heating during winter months. The detector can be battery operated or attached to the electrical circuit (which may involve some labor costs).

18 Full Air Conditioner Unit Replacement

Full AC replacement improves energy savings from air conditioning. While it is a higher initial expense, the benefits of AC include improved home comfort and quality of life, in particular for the elderly and young children. However, the unit can only work effectively if used in conjunction with many of the lower cost weatherization and microclimate applications recommended.

WATER AND WASTEWATER

A significant portion of water consumption is tied to everyday activities, such as showering, washing dishes, and watering the yard. Water consumption can be reduced by buying new water efficient products (e.g., low flush toilets) or by adding simple technologies to existing home hardware (e.g., aerators to faucets and showerheads).

There are also water reuse (e.g., grey water systems) and behavioral (e.g., turning off faucets, or waiting to wash dishes and clothes until you have a full load) strategies that promote water conservation. Even just having a bucket in the shower to catch the cold water as you wait for the water to warm will provide a gallon or two of water for recycling or to water planters. Many water related C-BHIT home improvements are affordable, can be performed with self-help or do-it-yourself labor, and produce significant savings.

1 Sink Aerator

Low flow water products reduce water consumption and the energy cost of heating the water by as much as 50%. Aerators lower water flow by combining air to the spray and reduce hot water use because the water heater has less work to do. The savings in utility bills will pay for the cost within a few months. They are inexpensive and easy to install.

2 Water Efficient Showerhead

Low flow water products reduce water consumption and the energy cost of heating the water by as much as 50%. Water efficient showerheads lower water flow by combining air to the spray and reduce water use because the hot water heater has less work to do (more than two-thirds of water used in a typical shower is hot water). The savings in utility bills will pay for the cost within a few months. They are inexpensive and easy to install.

3 Water Efficient Faucet

Low flow water products reduce water consumption and the energy cost of heating the water by as much as 50%. Water efficient faucets improve water efficiency and quality and reduce hot water use because the water heater has less work to do. The savings in utility bills will pay for the cost within a few months.

4 Water Efficient Toilet

Low flow water products reduce water consumption by as much as 50%. Low flush toilets with the *WaterSense* label conserve water with every flush. The savings in utility bills will pay for the cost within a few months. In addition, placing a filled water bottle or brick in the tank will raise the water level and result in less actual water usage for each flush.

5 Composting Toilet

Composting toilets may be used as an alternative to flush toilets in situations where there is no suitable wastewater or sewage infrastructure, or to conserve water and recycle waste in a safe manner without polluting the environment. The toilet uses aerobic decomposition and evaporation to reduce the human waste to a nutrient rich, hygienically safe soil-like supplement. Only a small percent of the original waste is left over for disposal. Maintenance requires commitment from the owner/user. A correctly installed and operating composting toilet will not smell. Starter mulch is required for the decomposition process but this cost is outweighed by the water savings.

6 Sink-to-Toilet Grey Water Recycling

The AQUUS Greywater Recycling System treats and recycles waste water captured from the bathroom sink to flush the toilet. The system consists of toilet tank components and a vanity tank. The toilet tank components monitor when the toilet flushes and engages and disengages the pump accordingly. A water hose connects the reservoir to the toilet, using gravity, water pressure, and a small electric pump to move water from the vanity tank to the toilet. The system is relatively easy to install.

7 Water Heater Insulation

A water heater blanket makes your water heater more efficient by reducing heat loss and keeping water hotter longer, allowing you to lower the water temperature setting. This reduces energy/gas consumption as well as helps conserve water because the wait for hot water to flow from the faucet or showerhead is reduced.

8 Water Pipe Insulation

Insulating hot water pipes reduces heat loss and raises water temperature, allowing you to lower the water temperature setting. This reduces energy/gas consumption as well as helps conserve water because the wait for hot water to flow from the faucet or showerhead is reduced. Insulating cold water pipes also prevents them from dripping condensation.

9 Garbage Disposal

Garbage disposals provide a practical and environmentally responsible way to dispose of food leftovers.

10 Septic System

In many lower income households replacing or fixing septic tanks is a high priority due to the public health consequences from overflowing, leaking or standing sewage water. While public policy tends to discourage the use of septic systems for concern about the potential pollution of water tables, the fact remains that many communities that are off the drainage grid cannot expect to have access to

wastewater infrastructure. In these circumstances properly installed and well maintained septic tanks are the best alternative. Septic systems usually require periodic pumping (annually or biennially depending upon the tank size, household usage, and presence, size and efficiency of the leach evaporation field). Failure to engage in periodic pumping is the most common reason for systems failing and creating waste back up.

11 Rainwater Harvesting

Rainwater harvesting through complete or partial roof guttering captures and diverts rainwater into a covered barrel where the extra water is stored for garden or yard use. The resultant water conservation can lead to substantial water savings particularly for households that maintain yards with grass. Covered barrels are desirable to avoid insect breeding sites, especially mosquitos.

RECYCLING

In the area of recycling there is most opportunity for self-help application and maintenance. While most recycling is tied to separating trash from recyclables such as plastics, aluminum and paper, composting alternatives recycle waste in a safe manner without polluting the environment. The resultant compost or humus becomes a nutrient rich, hygienically safe soil-like supplement that can be used as fertilizer and as mulch that prevents soil erosion and water loss from plant roots.

1 Active Composting

Composting is a biological process that occurs when bacteria and other organisms break down organic matter such as leaves, grass and food scraps. For composting to occur, a combination of organic waste, heat, air, and moisture must be present. The proper carbon to nitrogen ratio encourages microbial activity and is maintained with a good mix of "green" and "brown" materials. At the end of the process you are left with a dark, nutrient rich, and earthy smelling soil-like compost that can be used to enrich gardens, boost lawn fertility, and prevent soil erosion.

There are many different ways to compost at home, including purchasing an open-sided or enclosed bin, or building your own bin or simply creating an aerated compost pile. Active turning of a well maintained and aerated compost pile eliminates odor and unwanted animals, as well as increases the decomposition process. Enclosed bins or purpose made composting barrels do not attract animal scavenging, but require regular rotation.

2 Vermiculture

Vermiculture is a way of composting using worms to speed up the process. The advantage of worm composting is that this can be done indoors and outdoors while remaining odorless if maintained properly. Worm compost is made in a purchased or built container filled with moistened bedding and worms. Add your food waste for a period of time, and the worms and micro-organisms will eventually convert the entire contents into rich compost that can be used to enrich gardens, boost lawn fertility and prevent soil erosion.

RENEWABLE ENERGY

Interventions in the area of renewable energy, with the exception of compact fluorescent bulbs, are some of the most expensive and require professional installation and maintenance than the other C-BHIT home improvements. Besides bulb replacement, it is recommended to first pursue weatherization strategies to improve energy efficiency. Nonetheless, although tankless and solar water heaters requires a greater initial cost comparable to septic tank and air conditioning replacement, over time the energy savings will pay off.

1 Compact Fluorescent Bulbs

Compact fluorescent bulbs are very energy efficient, using approximately 75% less energy and can last over 10 times longer than standard incandescent bulbs. For example, you can replace a 60 watt bulb with a 13 watt compact fluorescent bulb. The savings in utility bills will pay for the cost within a few months.

2 Tankless Water Heating

Traditional heaters use energy to maintain the water at high temperatures, even when it is not required. By contrast, a tankless water heater will only consume energy whenever you actually turn on the hot water. As soon as you turn on the hot water faucet, a signal is sent to a coil and in a matter of seconds the coil heats up, thus warming up the water flowing through it. The time necessary for the water to heat depends on the distance between the faucet and the heater. Whenever you turn off the water, the heater signals the coil to stop. This is a very effective way of conserving energy and pays for the initial investment in time.

3 Solar Water Heater (Active)

Solar water heaters are a cost-effective way to generate hot water for your home. Active solar water heaters circulate hot water into your home from a well-insulated storage tank. The system usually costs more to purchase and install than conventional water heating systems. However, a solar water heater can usually save you money in the long run because the fuel they use - sunshine - is free. On average, if you install a solar water heater, your water heating bills should drop 50%–80%.