

## Chapter 4: Base Load Measures

Base load measures are energy-conservation measures that affect non-space heating energy usage. These measures may include, but are not limited to:

1. Water heater replacement
2. Domestic hot water treatments
3. Refrigerator and freezer replacement or removal
4. Lighting retrofits

### 4.1 Water Heater Replacement

Energy conservation water heater replacements typically occur by completing conversions to natural gas from another fuel type or by replacing the existing inefficient water heater.

Observe the following standards for all water heater replacements or removals:

1. Remove existing water heater and dispose of properly.
2. Size the replacement water heater properly, based upon the number of people in the building.

Observe the following standards for water heater installations:

1. Install water heater per manufacturer's instructions on a level and stable location. Provide strapping to secure the water heater, if needed.
2. Install a temperature and pressure-relief (TPR) valve with piping as required by code or local jurisdiction.
3. Ensure venting meets NFPA 54 for gas units.
4. Install a dedicated shut-off valve on the inlet side for future servicing, if none exists.
5. Ensure water lines do not leak after connection to water heater.
6. Fill tank with water before turning water heater on.
7. Measure and adjust temperature settings to 120° F. Check delivered temperature and adjust as necessary.
8. Affix a tag to the water heater identifying whom the customer should call for warranty service. Display the tag prominently, and confirm that it includes the service provider's name, address and telephone number.

#### 4.1.1 ENERGY STAR® Gas Power-Vented Water Heater Installations

1. Follow the manufacturer's instructions to ensure proper venting of the new water heater.
2. If an existing outlet does not exist, install a GFCI outlet for electrical
3. Confirm no gas leaks exist in any of the gas piping.
4. Install a proper sediment trap on gas line, if none exists.

5. Ensure bonding of Corrugated Stainless Steel Tubing (CSST) gas piping system meets NFPA 54.
6. Install properly sized gas piping.
7. A UL-listed appliance connector may be used to connect gas valve to gas piping.
8. Measure and adjust gas pressure to meet manufacturer's instructions.
9. Follow manufacturer's instructions for the proper removal of condensate.
10. Test for carbon monoxide (CO) level in the exhaust vent to confirm the CO level is less than 100 ppm as-measured or 200 ppm airfree (or meets manufacturer's specifications, if they are different).

## 4.2 Domestic Hot Water Treatments

### 4.2.1 Water Saving Showerheads and Aerators

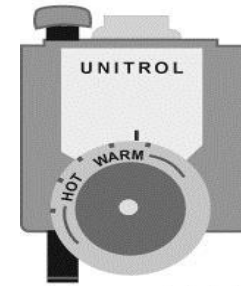
1. Remove and replace existing showerheads and aerators rated or tested above 1.5 gallons per minute, and recycle replaced items appropriately.
2. Install new showerheads using thread-seal tape or other pipe sealant to prevent leakage. Avoid over-tightening the new showerhead.
3. Protect the curved chrome showerhead nipple from damage during installation, using cloth or leather between the jaws of the pipe wrench or pliers.
4. When replacing faucet aerators, be careful to avoid scratching or deforming them.
5. Be cautious when significant deposits exist on the devices as this could lead to fixture damage and additional costs.

### 4.2.2 Water Heater Pipe Insulation

1. **FOR MOBILE HOMES ONLY:** For water heaters located in a closet with exterior access, insulate all water piping in the closet.
2. Insulate all pipes on the circulating loop between a boiler and an indirect domestic hot water storage tank.
3. Use properly-sized pipe insulation rated at R-2 or better. Insulate elbows, unions, and other fittings to the same thickness the straight pipe runs are insulated.
4. Keep pipe insulation at least six inches away from combustion vent pipe, unless the insulation has a fire-safety rating for closer clearance.
5. Secure seams, joints, and ends of pipe sleeves.

### 4.2.3 Setting or Reducing Water Temperature

1. Measure the hot water temperature at the faucet nearest to the water heater, and set or reduce the water heater temperature to 120° F, with customer permission.
2. Mark the current setting on the thermostat, and move the control to a lower temperature. Note the difference between electric and gas controls shown here.
3. On electric water heaters, set the upper thermostat and lower thermostat to the same temperature. Shut off power to the water heater before opening thermostat access panels.



Gas water heater control



Electric water heater control

## 4.3 Refrigerator or Freezer Replacement and Removal

Prior to installing a replacement unit:

1. Install replacement units only in locations allowed per manufacturer's instructions. Units can be installed in a non-conditioned space if allowed by the manufacturer.
2. Confirm the replacement unit will fit in the existing opening without modifications. Modify the opening only with agency and customer approval.
3. Verify door openings are wide enough to accommodate a new unit installation.
4. For units that do not meet Wisconsin Weatherization Program replacement guidelines, confirm the required waiver documentation is in the customer file.

When replacing a refrigerator or freezer:

1. Install the replacement unit level for proper operation. Raise the front of a refrigerator slightly to allow the doors to close slowly and without assistance or with limited assistance from the customer.
2. Unless limited by the existing installation space, install all the parts and trim per the manufacturer's instructions.
3. Plug the unit into the nearest receptacle to confirm the unit functions. Do not plug into an extension cord. The outlet should not be on a ground fault interrupter circuit.
4. Change the swing on doors, if necessary to meet the needs of the customer.
5. Verify the doors are properly aligned and seal tightly with a positive gasket seal.
6. De-manufacture and properly dispose of existing units being removed or replaced. Do not disable the existing unit until you install the replacement and confirm it works properly.

## 4.4 Lighting

Compact fluorescent lamps (CFLs) and Light Emitting Diode (LED) bulbs typically use 75 percent less electricity than a standard incandescent bulb. To prevent customer removal and promote efficiency, replacement CFL and LED bulbs should be selected to provide light output (lumen, efficacy, and color) equivalent to existing incandescent bulbs.



Spiral-style CFL



Globe-style LED

Halogen torchiere lamps pose a health and safety risk due to the heat generated by the halogen bulb. Replacing these lamps with a fluorescent or LED model eliminates the health and safety risk and reduces electrical usage.



Torchiere-style CFL

When replacing lighting:

1. Demonstrate CFL and LED lighting. Explain the related electric savings potential for customers unsure about replacing incandescent bulbs with CFLs or LEDs.
2. Select replacement CFL or LED bulbs with wattage that matches the lumen output and functionality of the existing incandescent bulb. Confirm customer satisfaction for task lighting and background lighting.
3. Install all CFLs or LEDs. CFLs or LEDs shall not be left for the customer to install.
4. Install CFLs by grasping the plastic base, never by the glass tubing.
5. Turn on each CFL or LED lighting replacement after installation to confirm it works properly.
6. Replace halogen torchiere lamps with fluorescent or LED torchiere lamps when appropriate, and remove halogen torchiere lamps from residence. Properly dispose of halogen torchiere lamps.
7. Existing CFLs shall not be replaced with LEDs.
8. Provide CFL disposal and clean up instructions to customers.

If a CFL breaks, take care in cleaning up. Even though the amount of mercury is very small, EPA recommends the following steps:

1. Open nearby windows to disperse any vapors and leave the room for 15 minutes.
2. Carefully scoop up the fragments and powder with stiff paper or cardboard and seal them in a plastic bag.
3. Wipe the area clean with damp paper towels and place in the plastic bag.
4. Do not use a vacuum or broom to clean up the broken bulb on hard surfaces.
5. Place all clean up materials in a sealed plastic bag.

6. Place the bag in a second sealed plastic bag and place it in an outdoor trash container.  
Note: Broken and unbroken CFLs should be taken to a recycling center if possible.
7. Wash your hands after disposing of the bag.

If a fluorescent bulb breaks on a rug or carpet, do your best to remove all visible materials using the steps above. Use sticky tape such as duct tape to help pick up the small pieces and powder. If you need to vacuum, once all visible materials have been removed, remove the vacuum bag (or empty and wipe the canister) and place the bag or vacuum debris in two sealed plastic bags and dispose of at your local hazardous waste site.

## **Final Inspection and Quality Assurance Standards**

Acceptable installations shall meet the following standards.

### **Water Heater Replacement**

1. Replacement is ENERGY STAR rated where applicable and meets the required Energy Factor (EF) or Uniform Energy Factor (UEF).
2. Follows Wisconsin Weatherization Program protocol for water heater replacement and was properly modeled with the energy audit.
3. Unit is properly sized for the household.
4. Follows manufacturer's instructions for installation including venting, pressure relief, drain tube, and electrical connection.
5. New outlet (receptacle) is GFCI as required by code.
6. Temperature measured is 120-125° F, unless an owner request for a higher temperature is documented. Do not set the water heater temperature below 120° F.
7. Replacement unit is not leaking or back drafting.

### **Water-Saving Devices**

1. Installation follows Wisconsin Weatherization Program policies and protocol.
2. New aerators and showerheads do not leak.
3. Recycle or properly dispose of replaced showerheads and faucet aerators.

### **Refrigerators**

1. Installation meets the manufacturer's instructions.
2. All parts and trim are present and installed as designed.
3. Unit is properly sized for the household.
4. Doors are properly aligned and there is a positive gasket seal.
5. The new refrigerator is installed as close to level as possible.
6. The unit consuming the most electricity (pre-weatherization) was replaced.
7. The refrigerator replaced was removed from the dwelling and disposed of properly.
8. Replacement refrigerator follows Wisconsin Weatherization Program policies and protocol.
9. The customer file contains a waiver for any unit that falls outside of replacement guidelines.

### **Freezers**

1. Installation meets the manufacturer's instructions.
  - a. Unit is not installed in a non-conditioned space (garage, porch) unless allowed by the manufacturer.

2. All parts and trim are present and installed as designed.
3. Replacement freezer size is equal to or less than unit or units replaced.
4. Lid is properly aligned and there is a positive gasket seal.
5. The unit consuming the most electricity (pre-weatherization) was replaced.
6. The freezer replaced was removed from the building and disposed of properly.
7. Replacement freezer follows Wisconsin Weatherization Program policies and protocol.
8. Additional functional units were removed and bounty offered per program policy with owner's permission.

**Lighting: CFLs and LEDs**

1. Follows Wisconsin Weatherization Program protocol and policies.
2. Replacement bulbs are appropriate for the intended use.
3. No uninstalled CFLs or LEDs were left at job site.
4. All halogen torchiere lamps were replaced.