

## Appendix C

### Mobile Home Measures

Measure	General Policy
<b>SHELL AND SHELL INTERACTIVE MEASURES</b>	
<i>All shell and shell interactive measures must be completed in the order listed.</i>	
<b>Test and Seal Duct Work</b>	<ul style="list-style-type: none"> <li>◆ Use blower door and pressure pan or duct blaster to guide distribution sealing.</li> <li>◆ Seal and reroute return air system or returns in the belly to furnace compartment door.</li> <li>◆ Seal major supply leaks. 1) furnace to plenum connection; boot to floor and boot to plenum duct, slip joint connections, and crossover connections in doublewide units.</li> </ul>
<b>Repair Holes Belly</b>	<ul style="list-style-type: none"> <li>◆ Repair any holes in the mobile home belly, using a proper repair material.</li> </ul> <p>Note: Seal duct work in the mobile home belly prior to sealing belly.</p>
<b>Floor Insulation</b>	<ul style="list-style-type: none"> <li>◆ Insulate to maximum structurally allowable below the heating ducts.</li> <li>◆ If the cavity allows for less than 2" below the heating ducts, install insulation below the mechanical cavity and the ducts.</li> </ul> <p>Note: Repair holes in the mobile home belly prior to insulation.</p>
<b>Attic Insulation</b>	<ul style="list-style-type: none"> <li>◆ Insulate to R-19, or maximum structurally allowable. Omit if available cavity space is less than 2 inches on average.</li> </ul>
<b>Sidewall Insulation</b>	<ul style="list-style-type: none"> <li>◆ Insulate to R-11. Omit if remaining cavity is less than 2".</li> </ul>
<b>Insider Storm Windows</b>	<ul style="list-style-type: none"> <li>◆ Install insider storms whenever storm window is not present.</li> </ul>
<b>Air Sealing</b>	<ul style="list-style-type: none"> <li>◆ Use Blower Door to guide sealing work, whenever possible</li> <li>◆ Seal all major bypasses and key junctures.</li> <li>◆ Follow WI's Cost Effective Sealing, Depressurization and Building Tightness Guidelines.</li> </ul>
<b>BASELOAD MEASURES</b>	
<i>All baseload measures materials must be an <b>Energy Star®</b> -qualified product, except for domestic water heater materials.</i>	
<b>Lighting.</b>	<ul style="list-style-type: none"> <li>◆ Replace all incandescent light bulbs with Energy Star qualified CFLs, where feasible.</li> <li>◆ Replace all halogen torchieres with CFL torchieres.</li> </ul>
<b>Refrigerator Replacement.</b>	<ul style="list-style-type: none"> <li>◆ Replace automatic defrosts units made before 1990. Properly dispose of old units.</li> </ul>
<b>Domestic Hot Water Treatments</b>	<ul style="list-style-type: none"> <li>◆ Install showerheads, flow restrictors, insulate 6' of pipes from water heater.</li> <li>◆ Reduce water heater temperature to 125 degrees.</li> <li>◆ Install water heater tank insulation on water heaters with &lt;= R-10.</li> </ul>
<b>Freezer Replacement and Removal</b>	<ul style="list-style-type: none"> <li>◆ Meter freezers operating in conditioned spaces to assess replacement eligibility. Freezers operating in garages or on porches are not eligible for replacement.</li> <li>◆ Replace existing freezers that equal to or greater than 14 cubic feet, which have a metered Power Factor less than 0.75. Do not replace freezers that were manufactured during or after 1993. Properly dispose of old unit.</li> </ul> <p>For freezers not replaced:</p> <ul style="list-style-type: none"> <li>◆ Offer a \$50 incentive for removal of additional functional units operating in conditioned spaces and not being replaced. Freezers operating in garages or on porches are not eligible for a bounty. Properly dispose of old unit.</li> </ul>

### MECHANICAL MEASURES

<b>Heating System*</b>  *Gas Furnaces must be replaced with <u>current Energy Star®</u> - qualified product	<ul style="list-style-type: none"> <li>◆ Clean and tune unit. Inspect units for health and safety problems.</li> <li>◆ Health &amp; safety replacements that meet 1.0 BCR, using BCR sheet may be charged as a conservation measure.</li> <li>◆ Note: If heating system is replaced after shell measures are completed assure furnace to plenum and vent stack connection is sealed.</li> </ul>
<b>Programmable Thermostats*</b>	<ul style="list-style-type: none"> <li>◆ Install programmable thermostat when replacing thermostat. Follow guidelines in the Specifications and Standards. Properly recycle the old thermostat.</li> </ul>
<b>Water Heater Replacement</b>	<ul style="list-style-type: none"> <li>◆ Convert electric to gas where possible. Follow guidelines in the Specifications and Standards.</li> </ul>
<b>HEALTH AND SAFETY MEASURES</b>	
<b>Health and Safety*</b>	<ul style="list-style-type: none"> <li>◆ Eliminate hazards that pose an immediate threat to the health and safety of occupants. Follow guidelines in the Specifications and Standards.</li> </ul>
<b>Air Conditioning</b>	<ul style="list-style-type: none"> <li>◆ Install central or room air conditioning based on the health of the customer. Specific statement of conditions from medical professional required.</li> <li>◆ Replacement must be Energy Star eligible.</li> </ul>
<b>Water Heater Replacement</b>	<ul style="list-style-type: none"> <li>◆ Assure natural gas or LP water heaters are properly drafting. See specifications and protocols for options. Options may include the installation of a replacement water heater.</li> <li>◆ Replace or repair electric water heaters that are leaking.</li> </ul>
<b>Mechanical Ventilation</b>	<ul style="list-style-type: none"> <li>◆ Install properly sized mechanical ventilation, when needed, to assure indoor air quality.</li> </ul>
<b>REPAIR MEASURES</b>	
<b>Repair</b>	<ul style="list-style-type: none"> <li>◆ Necessary repairs for the installation and preservation of weatherization materials. Follow guidelines in the Specifications and</li> </ul>
<b>Window Replacement*</b> *must be replaced with <u>current Energy Star®</u> -qualified product.	<ul style="list-style-type: none"> <li>◆ Install replacement windows only when an insider window will not address the problem. Follow guidelines and protocols outlined in the Specifications and Standards</li> </ul>
<b>Door Replacement*</b> *may be replaced with <u>current Energy Star®</u> -qualified product	<ul style="list-style-type: none"> <li>◆ Primary doors may be replaced only when the door cannot be repaired.</li> <li>◆ Replacement doors must either be a standard mobile home replacement door or an R-9 Energy Star qualified product.</li> </ul>

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# **Appendix D**

## **Mobile Home Specifications and Standards**

### **GENERAL SPECS**

- 1) All work will be completed in a professional and lead-safe manner.
- 2) All materials will be installed to manufacturer specifications.
- 3) All materials and labor must carry a one-year warranty from the date of final inspection.
- 4) All debris must be removed from the job site and properly disposed of.
- 5) All work will follow applicable codes and regulations.
- 6) All building permits are the responsibility of the grantee.
- 7) The Energy Assistance Bureau Director or his designate will be the final authority for any questions regarding these specifications and measures.
- 8) Provide a description to occupants of maintenance and operation of measures.
- 9) Energy Star® products are listed as materials specification in several areas. Grantees should make an effort to install Energy Star® products, whenever feasible.
- 10) All materials used must meet the requirements outlined in the Weatherization Manual..
- 11) Document all exception to the Field Guide installation procedures.

### **ATTIC /CEILING INSULATION**

- 1) Insulate mobile home attics to R-19, or the maximum structurally allowable. Omit if available cavity space is less than 2 inches on average.
- 2) Install blown fiberglass insulation in the ceiling. Average insulation densities shall be 1.25 to 1.75 pounds per cubic foot of blown fiberglass insulation. Do not dense-packed or over fill area.
- 3) Vent all exhaust fans to the exterior.
- 4) Attic preparation includes building barriers around fan housings and recessed lighting.

### **FLOOR/BELLY INSULATION**

- 1) Inspect and seal duct work prior to belly insulation. See distribution sealing for more information.
- 2) Inspect belly cavities and the protective barrier for general condition, structural strength, and major air leakage, prior to installing insulation. Necessary belly repairs must be made after ductwork is sealed and before insulation is installed. See distribution sealing for more information.
- 3) Insulate mobile home floors (belly cavity) to maximum structurally allowable with blown fiberglass insulation. Insulate below water pipes and ductwork, if possible. When not possible to get at least two inches of insulation between the pipes and the belly barrier and below ducts, an exterior patch of insulation is allowed.
- 4) Average insulation densities for loose fill insulation installed in mobile home bellies shall be Fiberglass – 1.25 to 1.75 pounds blown fiberglass per cubic foot. . Average insulation densities shall be 1.25 to 1.75 pounds per cubic foot. Do not dense-packed or over fill area. A 6-mil vapor barrier may be installed over exposed earth, based on site conditions.

### **SIDEWALL INSULATION**

- 1) Inspect exterior siding and the interior wall materials must to determine if installing insulation is needed and to assure that conditions allow for insulation installation. Inspect the electrical system. Repair, as needed, based on allowable program repair costs.

- 2) Insulate mobile home walls to R-11, omit if available cavity is less than 2".
- 3) Do not dense-packed or over filled so as to create siding or interior wall structural problems.
- 4) Insulate water heater closets with an exterior wall either at the closet door and associated wall area. Cover air vents if they are present and route combustion air (for gas units) from underneath the belly or through skirting. Note any exceptions.

## INSIDER STORM WINDOW

- 1) Install insider storm windows on windows with primary single pane glass and no storm.

## AIR SEALING

- 1) Air sealing should be completed after the distribution system has been sealed and the return rerouted and insider storms installed.
- 2) Complete any non-guideline sealing, such as missing or broken windows.
- 3) Seal all major bypasses. Replace missing or broken window glass.
- 4) Use blower door guided general sealing guidelines. The mobile home should not to exceed the building tightness limit (BTL<sub>a</sub>) or the final building depressurization limit (DTL), whichever CFM50 limit is the highest.
  - a) Use the ceiling height as both story and building height. The area and volume should be calculated using the "nominal" dimensions (example: 14x66, to exclude the hitch).
  - b) Use depressurization tests ("DTL" in ZipTest Pro software, or equivalent) to guide air sealing, and maximum exhaust ventilation.
- 5) Conduct a worst-case draft and building depressurization tests in all units having atmospherically vented appliances.
  - a) For most units run tests for each combustion zone. Test the heating system first and then test the water heater as necessary.
  - b) When water heater has an exterior door, try to insert testing equipment probe via interior pathways. Run the hose through the exterior only when a interior pathway is not possible. Follow the depressurization guidelines below. Take steps to address depressurization that exceeds the maximum allowed.

<b>Mobile Home Depressurization Guideline</b>			
<b>Maximum Depressurization for Combustion Appliance Zones</b>			
<b>Heating Systems</b>			
Appliance Type:	Natural Draft	Induced Draft	Sealed Combustion
Appliance Type:	5	15	25
<b>Water Heaters</b>			
Appliance Type:	Natural Draft	Direct Vent	
Pascals:	2	5	

## HEATING UNIT REPLACEMENT

- 1) Inspect units not to be replaced for tune and clean or health and safety measures.
- 2) SSE test may be completed, following the manufacturers recommendations. Document the results on all replaced and existing heating system in the dwelling file.
- 3) Replace if the unit poses an immediate health hazard, or is totally inoperable. Gas heating system replacements must be an Energy Star® qualified product. Replacement units can be charged as an energy conservation measure if a 1.0 or greater BCR is met when tested with the BCR spreadsheet. Default efficiencies may be used for the spreadsheet. Base the default on the fuel type and condition of the existing furnace (e.g. oil <79% SSE and gas <80%). Model electric mobile home furnaces using the Electric Fuel Switch Calculator to determine if a furnace change out to switch fuels in cost effective. Fuel switch installations are allowed if

- the Savings to Investment Ratio (SIR) is greater than 1.0.
- 4) The cost of installing a = >90% AFUE mobile home furnace should include the cost of retrofitting the unit into the furnace compartment.
  - 5) Install the condensate lines from the furnace in a manner that guards against freezing. Use a condensate pump when necessary.
  - 6) **Wood:** (as primary system): Replacement units are considered a health and safety measure. All replacement units must meet applicable local codes and EPA requirements. Installations must conform to the NFPA 211.
  - 7) All replacement heating systems except wood burning units must meet the following minimum efficiency standards as listed in the latest edition of the GAMA Directory of Furnace Efficiency: = > 79% AFUE Oil; > 90% AFUE Gas.

## **GENERAL HEATING SYSTEM REPLACEMENT SPECIFICATIONS AS APPLICABLE:**

- 1) Use existing distribution system and gas supply line. See Forced Air Distribution Section for additional information.
- 2) Seal furnace to plenum connection; boot to floor and boot to plenum duct.
- 3) Properly remove and dispose of existing unit.
- 4) Provide an owner's manual with heating system replacements.
- 5) Install properly sized units according to ASHRAE Manual J or an equivalent sizing formula.
- 6) Install a condensate pump where needed to reach an appropriate drain.
- 7) Seal openings in chimneys where atmospheric vented appliances are eliminated.

## **OTHER HEATING SYSTEM WORK**

- 1) Install programmable thermostats. Relocate thermostats to interior walls and instruct occupants regarding operation of setback thermostat. Programmable thermostats are the only allowable replacement thermostats that can be reported as a conservation measure. Every effort should be made to upgrade existing thermostats to a programmable thermostat, which meets the household's needs. In the event the Grantee elects not to use a programmable replacement thermostat, a working thermostat should not be replaced. If the current thermostat is nonfunctional, conventional thermostat may be used but the cost must be treated as a repair. The rationale for this is that there are no associated energy savings with a non-programmable thermostat. Report thermostats separate from heating system replacement costs. Properly recycle old thermostats containing mercury.
- 2) Replace oil filters.
- 3) Provide occupant with a permanent furnace filter or enough replacement filters for one year's maintenance.
- 4) For all heating system work, including replacements, a tag shall be prominently affixed to the heating unit identifying who the customer should call for service. The tag information must have the name, address and telephone number of the service organization.

## **FORCED AIR DISTRIBUTION WORK**

- 1) Distribution sealing work must be done prior to insulation or other sealing measures.
- 2) Supply ducts should be tested for leakage using a blower door and pressure pan or a duct blaster.
- 3) Visually inspected with a mirror and flashlight.
- 4) Seal supply ductwork in mobile home belly so that cumulative reading of all registers is 3 Pascals or less (@ CFM50).
- 5) Convert all belly-return systems to a living space return system by rerouting returns to furnace cabinet door. Assure that there is adequate return air.

## REFRIGERATORS

- 1) Replace units manufactured before 1990.
- 2) Replacement refrigerators must be current Energy Star® qualified products.
- 3) Install 15 cubic foot units in households with one or two persons unless there are special conditions. Install 18 cubic foot units in households with three to five persons. Install 21 cubic foot units in households with more than five persons.
- 4) De-manufacture and properly dispose all refrigerators removed.
- 5) Offer a \$50 incentive for removal of additional functional units not being replaced.

## FREEZERS

- 1) Meter freezers operating in conditioned spaces to assess replacement eligibility. Freezers operating in garages or on porches are not eligible for replacement.
- 2) Replace existing freezers that equal to or greater than 14 cubic feet, which have a metered Power Factor less than 0.75. Do not replace freezers that were manufactured during or after 1993. Properly dispose of old unit.
- 3) Document existing freezer metering information in the customer file and as required on WisWap.
- 4) Replacement freezers must be approximately equal to or less than the size of the existing freezers, based on the following guidelines:

Existing Freezer (Cubic Ft.)	Replacement Freezer (Cubic Ft.)
Any size $\geq 14$	9-12.2
14.1-15	14.8 to 16.5
15.1-19	16.5
19.1-22	20.3 to 21.7

- 5) Replacement models should be chest type freezers with manual defrost.
- 6) Offer a maximum \$50 incentive for removal of additional functional units operating in conditioned spaces and not being replaced. Freezers operating in garages or on porches are not eligible for a bounty. Properly dispose of all freezers removed.

## WATER HEATER REPLACEMENT

- 1) Replace electric water heaters with natural gas units, when there is a gas line to the dwelling, no time of use is present, and existing equipment is greater than 5 years old. The replacement water heater must be rated for mobile home use (direct vent or sealed combustion), with a minimum .59 EF.
- 2) Replace electric water heaters with power vented LP gas units, when there is a gas line to the dwelling, no time of use is present, and existing equipment is greater than 5 years old, and there are four or more persons in the household. The replacement water heater must be rated for mobile home use (direct vent or sealed combustion), with a minimum .59 EF.
- 3) Removal and disposal of the old unit is required.
- 4) Sizing of replacement must consider the number of people in the household.

Note: water heaters may also be replaced based on health and safety conditions. See Health and Safety.

## LIGHTING

- 1) Replace all incandescent bulbs, where feasible, with Energy Star® qualified CFLs.
- 2) Replacement CFL should be appropriate for the intended use.
- 3) Replace all halogen torchieres with fluorescent equivalent fixtures, remove and dispose of old fixture.
- 4) Increase lighting efficiencies in common areas of multi family housing.
- 5) Utilize current Energy Star® qualified products in all cases where product warrants replacement and is available (e.g., items 1–3 above, and including Exit lights).
- 6) All replacement CFLs and fixtures must be installed and inspected prior to the completion of the dwelling unit.

## DOMESTIC HOT WATER TREATMENTS

- 1) Install 2.5 GPM or less showerheads and faucet aerators on every fixture.
- 2) Install R-3 pipe wrap on the first 6 feet of the hot and cold water pipes.
- 3) Reduce water heater temperature to 125 degrees.
- 4) Insulate water heaters in the existing insulation is less than R-10. Insulation installed on existing water heater tanks must be a minimum of an R-10. Mechanical fasteners and tape are required.

## HEALTH AND SAFETY

Health & safety is defined as the cost of materials and labor necessary to eliminate or reduce hazards before, or as a result of the installation of weatherization materials. Current Energy Star® -qualified products must be used when available (e.g., ventilation fans, dehumidifiers, air conditioning, etc.). Examples are:

- 1) Repair unsafe chimneys.
- 2) Vent bathroom and kitchen exhaust fans to the exterior. New and replacement fans installed must be current Energy Star® -qualified products. Unless continuous ventilation requirements require a system not yet rated.
- 3) Install properly sized mechanical ventilation when needed to assure indoor air quality.
- 4) Install smoke detector.
- 5) Install carbon monoxide detectors in units where atmospherically vented appliances, including gas ranges, will remain at completion of the work, and all dwellings with attached garages.
- 6) Complete combustion safety tests on dwelling to assure safe operation of all appliances.
- 7) Assure natural gas or LP water heaters properly draft. Options may include the installation of replacement water heater. Replacement natural gas or LP water heaters must have a minimum .59 Ef and be rated for mobile. Replacement units must be direct vent or sealed combustion.
- 8) Replace or repair water heaters that are leaking.
- 9) Replacement electric water heaters must have a minimum .90 Ef and be rated for mobile.
- 10) Grantees may install an Energy Star qualified central or room air conditioning, based on an occupant's health.
  - a) A physician's statement is required in order to install air conditioning.
  - b) That statement should identify the specific health condition that requires air conditioning and reason why that condition requires air conditioning (e.g., inability to tolerate temperature extremes).
  - c) Grantees are encouraged, when feasible, to create a comfort zone in the home by using Energy Star® qualified room air conditioner(s).

## REPAIR

Repair is defined as items necessary for the effective performance or preservation of weatherization materials. Examples are:

- 1) Repair leaking roofs.
- 2) Repair electrical systems.
- 3) Repair hot and cold water leaks
- 4) Replace deteriorated windows with deteriorated frames or sash that cannot be repaired or addressed with an insider storm window.
  - a) Replacement windows must be Energy Star® qualified windows.
  - b) Photographs should be taken of each window to be replaced. The photograph should document specifically why the window was replaced – e.g., deteriorated frames and sash.
- 5) Replace doors only in the primary heating envelope that cannot be repaired (characteristics include: rotting or holes or cracks occurring in either the door jamb or blank).
  - a) Replacement doors must either be a standard mobile home replacement door or an R-9 Energy Star qualified product.
  - b) Photographs should be taken of each door to be replaced. The photograph should document specifically why the door was replaced.
- 6) Patio doors are not an allowable measure.