VIRGINIA WEATHERIZATION ASSISTANCE PROGRAM

INSTALLATION STANDARDS

MEASURES NOT SPECIFICALLY CITED IN THESE *INSTALLATION STANDARDS* OR ANY DEVIATION FROM THESE *STANDARDS* MUST FIRST BE APPROVED IN WRITING BY DHCD TECHNICAL MONITOR.

HEALTH AND SAFETY POLICY

Subgrantees are reminded that the primary goal of the Weatherization Program is energy efficiency. Subgrantees are allowed a maximum of ten percent (10%) of contract funds for Health and Safety (H & S) remediation. Once the ten percent allotment has been exhausted, no additional health and safety improvements can be completed. At that point, jobs requiring H & S remediation must be deferred until additional H & S funds are available.

All health and safety remediation must be energy-related and must be necessary for the installation of a weatherization measure.

A. Crew and/or Contractor Health and Safety

Subgrantees must comply with Occupational Safety and Health Administration (OSHA) requirements in all weatherization activities. Some of these requirements include, but are not limited to: respirator protection, techniques for safely lifting heavy objects, electrical equipment safety, ladder safety, and general worker protection.

MSDS information that identifies potential health risks and describes proper use and handling of a wide variety of materials are required in every work vehicle.

B. Client Health and Safety

Subgrantees are required to take all reasonable precautions against performing work on homes that will subject workers or clients to health and safety risks. The agency must take into consideration the health concerns of each occupant, and the possible effect of work to be performed on any particular health or medical condition of the occupants. When a person's health is fragile and/or the work activities would constitute a health or safety hazard, the occupants at risk will be required to leave the home during these work activities.

C. Potential Hazard Considerations

Health & Safety funds may be used if the following conditions must be remedied to allow effective weatherization work.

1. Biologicals Unsanitary conditions, bacteria, odors, pest control

2. Combustion Appliances, Combustion Gases, Fire Hazards Unacceptable carbon monoxide levels, unacceptable draft levels in flues, start-up spillage at flues, adequacy of combustion air, inadequate clearances between combustion appliances and combustible materials, potentially dangerous creosote build-up in chimneys and flues.

3. Asbestos General asbestos abatement is not approved; however, asbestos removal is allowed in order to effectively insulate heating pipes and/or ducts. Any asbestos work activities must be performed by a person with a current DPOR approved Asbestos Worker Certificate.

4. Lead-based Paint Precautions required in addressing lead-based paint are an allowed H & S cost.

5. Building Structure Building rehabilitation is beyond the scope of the WAP; however, minor repairs necessary for the effective performance or preservation of weatherization materials are allowed.

6. Electrical Issues Two primary energy-related electrical safety concerns are insulating homes that contain knob-and-tube wiring and identifying overloaded electrical circuits. The cost to replace knob-and-tube wiring is allowed when insulating materials will be installed. Serious electrical hazards exist when gross overloads are present. Weatherization measures that involve the installation of new equipment, such as heat pumps, furnaces, or water heaters, can exacerbate overload problems. To the extent that these problems prevent adequate weatherization, the agency is allowed to repair them on a case-by-case basis.

7. Refrigerant Issues Replacement of refrigerators requires agencies to reclaim refrigerant per Clean Air Act 1990, 40 CFR 82, 5/14/93. Costs associated with refrigerant disposal are allowed.

8. Mold Mold remediation is not an allowed cost; however, minor mold surface cleaning is allowed in order to perform weatherization activities. When severe mold problems exist, clients should be referred to other programs and the job deferred until a safe environment is attained.

LEAD SAFE WORK REQUIREMENTS

BACKGROUND

Lead was added to paint as early as the 1800's before health risks were identified. In 1978, the Consumer Product Safety Commission banned the sale of lead-based paint for residential use. Lead-based paint may be found on any surface in the home - inside or outside. Lead is especially hazardous to children and pregnant women. It causes damage to the brain and central nervous system and is irreversible.

RULE REQUIREMENTS

Lead Safe Work Practices (LSWP) and Lead Renovation Repair & Painting (RRP) are addressed by DOE in WPN 10-1 section 5.13, WPN 09-6, WPN 08-6 and WPN 02-6. EPA 40 CFR part 745 is the basis for these requirements.

VA WAP LEAD SAFE WORK REQUIREMENTS

LSWP & RRP are a group of techniques that reduce the amount of dust produced by weatherization activities. When used correctly, they make the work area safe for workers and the home safe for residents when weatherization is complete.

1. All pre-1978 single-family dwellings and all pre-1978 mobile homes that have been painted must be tested for lead with an EPA approved test kit.
2. Provide *Renovate Right* pamphlet to occupants before work begins.
3. Obtain signature on Pre-Renovation form before work begins.
4. Provide copy of Pre-Renovation form to occupant within 30 days after work begins. A copy of Pre-Renovation must be on site during weatherization activities.
5. Dwelling work areas meeting the following conditions are exempt from LSWP:
    a. Interior work disturbing less than 6 sq ft per room of painted surface. Cleanup and cleaning verification are also not required, unless the painted surface involves windows and/or doors.
    b. Exterior work disturbing less than 20 sq ft per side of painted surface. Cleanup and cleaning verification are also not required, unless the painted surface involves windows and/or doors.
6. Use LSWP & RRP during weatherization (follow EPA 40 CFR 745.85 attached).
7. Recordkeeping (follow EPA 40 CFR 745.86 attached).
8. For dwellings containing lead, Certified Renovator must complete and sign Certified Renovator compliance form (attached) and maintain in client file.

CERTIFICATIONS

1. Each agency must be approved by EPA as a certified firm and copies of the certificate must be kept in every work vehicle.
2. Each agency must have at least one Certified Renovator on staff and copy of certificate must be kept in every vehicle.
3. All crew workers, including all Certified Renovators, must have a current LSWP training certificate. All crew workers must be trained by a Certified Renovator and documentation of training must be kept in every work vehicle.

EPA 40 PART 745—LEAD-BASED PAINT POISONING PREVENTION IN CERTAIN RESIDENTIAL STRUCTURES

§ 745.85 Work practice standards.

(a) *Standards for renovation activities*. Renovations must be performed by certified firms using certified renovators as directed in §745.89. The responsibilities of certified firms are set forth in §745.89(d) and the responsibilities of certified renovators are set forth in §745.90(b).

(1) *Occupant protection*. Firms must post signs clearly defining the work area and warning occupants and other persons not involved in renovation activities to remain outside of the work area. To the extent practicable, these signs must be in the primary language of the occupants. These signs must be posted before beginning the renovation and must remain in place and readable until the renovation and the post-renovation cleaning verification have been completed. If warning signs have been posted in accordance with 24 CFR 35.1345(b) (2) or 29 CFR 1926.62(m), additional signs are not required by this section.

(2) *Containing the work area*. Before beginning the renovation, the firm must isolate the work area so that no dust or debris leaves the work area while the renovation is being performed. In addition, the firm must maintain the integrity of the containment by ensuring that any plastic or other impermeable materials are not torn or displaced, and taking any other steps necessary to ensure that no dust or debris leaves the work area while the renovation is being performed. The firm must also ensure that containment is installed in such a manner that it does not interfere with occupant and worker egress in an emergency.

(i) *Interior renovations*. The firm must:

(A) Remove all objects from the work area, including furniture, rugs, and window coverings, or cover them with plastic sheeting or other impermeable material with all seams and edges taped or otherwise sealed.

(B) Close and cover all ducts opening in the work area with taped-down plastic sheeting or other impermeable material.

(C) Close windows and doors in the work area. Doors must be covered with plastic sheeting or other impermeable material. Doors used as an entrance to the work area must be covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.

(D) Cover the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater.

(E) Use precautions to ensure that all personnel, tools, and other items, including the exteriors of containers of waste, are free of dust and debris before leaving the work area.

(ii) *Exterior renovations*. The firm must:

(A) Close all doors and windows within 20 feet of the renovation. On multi-story buildings, close all doors and windows within 20 feet of the renovation on the same floor as the renovation, and close all doors and windows on all floors below that are the same horizontal distance from the renovation.

(B) Ensure that doors within the work area that will be used while the job is being performed are covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.

(C) Cover the ground with plastic sheeting or other disposable impermeable material extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering.

(D) In certain situations, the renovation firm must take extra precautions in containing the work area to ensure that dust and debris from the renovation does not contaminate other buildings or other areas of the property or migrate to adjacent properties.

(3) *Prohibited and restricted practices.* The work practices listed below shall be prohibited or restricted during a renovation as follows:

(i) Open-flame burning or torching of lead-based paint is prohibited.

(ii) The use of machines that remove lead-based paint through high speed operation such as sanding, grinding, power planing, needle gun, abrasive blasting, or sandblasting, is prohibited unless such machines are used with HEPA exhaust control.

(iii) Operating a heat gun on lead-based paint is permitted only at temperatures below 1100 degrees Fahrenheit.

(4) *Waste from renovations* — (i) Waste from renovation activities must be contained to prevent releases of dust and debris before the waste is removed from the work area for storage or disposal. If a chute is used to remove waste from the work area, it must be covered.

(ii) At the conclusion of each work day and at the conclusion of the renovation, waste that has been collected from renovation activities must be stored under containment, in an enclosure, or behind a barrier that prevents release of dust and debris out of the work area and prevents access to dust and debris.

(iii) When the firm transports waste from renovation activities, the firm must contain the waste to prevent release of dust and debris.

(5) *Cleaning the work area.* After the renovation has been completed, the firm must clean the work area until no dust, debris or residue remains.

(i) *Interior and exterior renovations.* The firm must:

(A) Collect all paint chips and debris and, without dispersing any of it, seal this material in a heavy-duty bag.

(B) Remove the protective sheeting. Mist the sheeting before folding it, fold the dirty side inward, and either tape shut to seal or seal in heavy-duty bags. Sheeting used to isolate contaminated rooms from non-contaminated rooms must remain in place until after the cleaning and removal of other sheeting. Dispose of the sheeting as waste.

(ii) *Additional cleaning for interior renovations.* The firm must clean all objects and surfaces in the work area and within 2 feet of the work area in the following manner, cleaning from higher to lower:

(A) *Walls.* Clean walls starting at the ceiling and working down to the floor by either vacuuming with a HEPA vacuum or wiping with a damp cloth.

(B) *Remaining surfaces.* Thoroughly vacuum all remaining surfaces and objects in the work area, including furniture and fixtures, with a HEPA vacuum. The HEPA vacuum must be equipped with a beater bar when vacuuming carpets and rugs.

(C) Wipe all remaining surfaces and objects in the work area, except for carpeted or upholstered surfaces, with a damp cloth. Mop uncarpeted floors thoroughly, using a mopping method that keeps the wash water separate from the rinse water, such as the 2-bucket mopping method, or using a wet mopping system.

(b) *Standards for post-renovation cleaning verification* — (1) *Interiors.* (i) A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present. If dust, debris or residue is present, these conditions must be removed by re-cleaning and another visual inspection must be performed.

(ii) After a successful visual inspection, a certified renovator must:

(A) Verify that each windowsill in the work area has been adequately cleaned, using the following procedure.

(1*)* Wipe the windowsill with a wet disposable cleaning cloth that is damp to the touch. If the cloth matches or is lighter than the cleaning verification card, the windowsill has been adequately cleaned.

(*2*) If the cloth does not match and is darker than the cleaning verification card, re-clean the windowsill as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then either use a new cloth or fold the used cloth in such a way that an unused surface is exposed, and wipe the surface again. If the cloth matches or is lighter than the cleaning verification card, that windowsill has been adequately cleaned.

(3*)* If the cloth does not match and is darker than the cleaning verification card, wait for 1 hour or until the surface has dried completely, whichever is longer.

(4*)*After waiting for the windowsill to dry, wipe the windowsill with a dry disposable cleaning cloth. After this wipe, the windowsill has been adequately cleaned.

(B) Wipe uncarpeted floors and countertops within the work area with a wet disposable cleaning cloth. Floors must be wiped using an application device with a long handle and a head to which the cloth is attached. The cloth must remain damp at all times while it is being used to wipe the surface for post-renovation cleaning verification. If the surface within the work area is greater than 40 square feet, the surface within the work area must be divided into roughly equal sections that are each less than 40 square feet. Wipe each such section separately with a new wet disposable cleaning cloth. If the cloth used to wipe each section of the surface within the work area matches the cleaning verification card, the surface has been adequately cleaned.

(*1*) If the cloth used to wipe a particular surface section does not match the cleaning verification card, re-clean that section of the surface as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then use a new wet disposable cleaning cloth to wipe that section again. If the cloth matches the cleaning verification card, that section of the surface has been adequately cleaned.

(2*)* If the cloth used to wipe a particular surface section does not match the cleaning verification card after the surface has been re-cleaned, wait for 1 hour or until the entire surface within the work area has dried completely, whichever is longer.

(3*)* After waiting for the entire surface within the work area to dry, wipe each section of the surface that has not yet achieved post-renovation cleaning verification with a dry disposable cleaning cloth. After this wipe, that section of the surface has been adequately cleaned.

(iii) When the work area passes the post-renovation cleaning verification, remove the warning signs.

(2) *Exteriors.* A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present on surfaces in and below the work area, including windowsills and the ground. If dust, debris or residue is present, these conditions must be eliminated and another visual inspection must be performed. When the area passes the visual inspection, remove the warning signs.

(c) *Optional dust clearance testing.* Cleaning verification need not be performed if the contract between the renovation firm and the person contracting for the renovation or another Federal, State, Territorial, Tribal, or local law or regulation requires:

(1) The renovation firm to perform dust clearance sampling at the conclusion of a renovation covered by this subpart.

(2) The dust clearance samples are required to be collected by a certified inspector, risk assessor or dust sampling technician.

(3) The renovation firm is required to re-clean the work area until the dust clearance sample results are below the clearance standards in §745.227(e) (8) or any applicable State, Territorial, Tribal, or local standard.

(d) *Activities conducted after post-renovation cleaning verification.* Activities that do not disturb paint, such as applying paint to walls that have already been prepared, are not regulated by this subpart if they are conducted after post-renovation cleaning verification has been performed.

[73 FR 21761, Apr. 22, 2008]

§ 745.86 Recordkeeping and reporting requirements.

(a) Firms performing renovations must retain and, if requested, make available to EPA all records necessary to demonstrate compliance with this subpart for a period of 3 years following completion of the renovation. This 3–year retention requirement does not supersede longer obligations required by other provisions for retaining the same documentation, including any applicable State or Tribal laws or regulations.

(b) Records that must be retained pursuant to paragraph (a) of this section shall include (where applicable):

(1) Reports certifying that a determination had been made by an inspector (certified pursuant to either Federal regulations at §745.226 or an EPA-authorized State or Tribal certification program) that lead-based paint is not present on the components affected by the renovation, as described in §745.82(b) (1).

(2) Signed and dated acknowledgments of receipt as described in §745.84(a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A).

(3) Certifications of attempted delivery as described in §745.84(a) (2) (i) and (c) (1) (ii) (A).

(4) Certificates of mailing as described in §745.84(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (c)(1)(i)(B), and (c)(1)(ii)(B).

(5) Records of notification activities performed regarding common area renovations, as described in §745.84(b) (3) and (b) (4), and renovations in child-occupied facilities, as described in §745.84(c) (2).

(6) Any signed and dated statements received from owner-occupants documenting that the requirements of §745.85 do not apply. These statements must include a declaration that the renovation will occur in the owner's residence, a declaration that no children under age 6 reside there, a declaration that no pregnant woman resides there, a declaration that the housing is not a child-occupied facility, the address of the unit undergoing renovation, the owner's name, an acknowledgment by the owner that the work practices to be used during the renovation will not necessarily include all of the lead-safe work practices contained in EPA's renovation, repair, and painting rule, the signature of the owner, and the date of signature. These statements must be written in the same language as the text of the renovation contract, if any.

(7) Documentation of compliance with the requirements of §745.85, including documentation that a certified renovator was assigned to the project, that the certified renovator provided on-the-job training for workers used on the project, that the certified renovator performed or directed workers who performed all of the tasks described in §745.85(a), and that the certified renovator performed the post-renovation cleaning verification described in §745.85(b). If the renovation firm was unable to comply with all of the requirements of this rule due to an emergency as defined in §745.82, the firm must document the nature of the emergency and the provisions of the rule that were not followed. This documentation must include a copy of the certified renovator's training certificate, and a certification by the certified renovator assigned to the project that:

(i) Training was provided to workers (topics must be identified for each worker).

(ii) Warning signs were posted at the entrances to the work area.

(iii) If test kits were used, that the specified brand of kits was used at the specified locations and that the results were as specified.

(iv) The work area was contained by:

(A) Removing or covering all objects in the work area (interiors).

(B) Closing and covering all HVAC ducts in the work area (interiors).

(C) Closing all windows in the work area (interiors) or closing all windows in and within 20 feet of the work area (exteriors).

(D) Closing and sealing all doors in the work area (interiors) or closing and sealing all doors in and within 20 feet of the work area (exteriors).

(E) Covering doors in the work area that were being used to allow passage but prevent spread of dust.

(F) Covering the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater (interiors) or covering the ground with plastic sheeting or other disposable impermeable material anchored to the building extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering, weighted down by heavy objects (exteriors).

(G) Installing (if necessary) vertical containment to prevent migration of dust and debris to adjacent property (exteriors).

(v) Waste was contained on-site and while being transported off-site.

(vi) The work area was properly cleaned after the renovation by:

(A) Picking up all chips and debris, misting protective sheeting, folding it dirty side inward, and taping it for removal.

(B) Cleaning the work area surfaces and objects using a HEPA vacuum and/or wet cloths or mops (interiors).

(vii) The certified renovator performed the post-renovation cleaning verification (the results of which must be briefly described, including the number of wet and dry cloths used).

(c) When test kits are used, the renovation firm must, within 30 days of the completion of the renovation, provide identifying information as to the manufacturer and model of the test kits used, a description of the components that were tested including their locations, and the test kit results to the person who contracted for the renovation.

(d) If dust clearance sampling is performed in lieu of cleaning verification as permitted by §745.85(c), the renovation firm must provide, within 30 days of the completion of the renovation, a copy of the dust sampling report to the person who contracted for the renovation.

DEFERRAL STANDARDS

1. The client has known health conditions that prohibit the installation of insulation and other weatherization materials.
2. The building structure or its mechanical systems, including electrical and plumbing, are in such a state of disrepair that failure is imminent and the conditions cannot be resolved cost-effectively.
3. The house has sewage or other sanitary problems that would further endanger the client and weatherization installers if weatherization work were performed.
4. The house has been condemned or electrical, heating, plumbing, or other equipment has been "red tagged" by local or state building officials or utilities.
5. Moisture problems are so severe they cannot be resolved under existing health and safety measures and with minor repairs.
6. The client is uncooperative, abusive, or threatening to the crew, subcontractors, auditors, inspectors, or others who must work on or visit the house.
7. The extent and condition of lead-based paint in the house would potentially create further health and safety hazards.
8. In the judgment of the energy auditor, any condition exists which may endanger the health and/or safety of the work crew or subcontractor, the work should not proceed until the condition is corrected.

BLOWER DOOR STANDARDS

Auditors must utilize the AECP Assessment Form when performing energy audits.

Follow the procedures and closure targets for using the blower door to address air leakage on pgs 173-177 of the Weatherization Field Guide. A pre-weatherization and a post-weatherization blower door test must be performed on each house. The test readings must be documented on the job report.

Prior approval from DHCD will be necessary for a job to be accepted without a blower door pre-test and post-test for any reason.

Air leakage must be diagnosed by using the blower door, or if the exception applies, then a visual diagnosis must be used. Once the pre-test has been taken, then the closure target must be determined.

THE POST-TEST SHOULD FALL AT OR BELOW THE CLOSURE TARGET. If a submitted job does not meet the closure target, explanation must be provided on the job report, all priority measures must be performed; the job will be accepted, reimbursed, and targeted for monitoring.

IF THE BLOWER DOOR READING FALLS BELOW THE MVR, THEN A HOUSE SPECIFIC MVR MUST BE CALCULATED (BTL and blower door target section of the AECP assessment form using the *n* factor of 20). When the reading is below the MVR, one exhaust fan (at a minimum) must be present with a "smart" timer to ensure the MVR requirements are met. Installed exhaust fans must have a noise rating of one sone or less. The actual cfm of all exhaust fans must be measured and must exhaust a minimum of 30 cfm. DOCUMENTATION OF EXHAUST FAN TESTS MUST BE INCLUDED IN THE CLIENT FILE.

PHOTOS OF JOB SITES

DOE now requires before and after pictures of weatherization jobs. Examples include photos of the house, attic bypasses and insulated attics, installation of wall insulation, duct sealing, heating system repair, etc. These pictures must be maintained in the client file.

SINGLE FAMILY DWELLINGS

THE FOLLOWING APPLICABLE MEASURES MUST BE INSTALLED IN ORDER FOR THE JOB TO BE ACCEPTED FOR REIMBURSEMENT.

I. INSPECT HEATING/COOLING EQUIPMENT AND REPAIR AS NECESSARY (to include duct diagnostics and sealing)

II. SEAL MAJOR AIR LEAKS AND BYPASSES

III. INSULATE SIDEWALLS

IV. INSULATE AND VENT ATTIC

V. INSULATE DUCTS/HEATING PIPES

VI. INSULATE WATER HEATER

I. INSPECT HEATING/COOLING SYSTEM AND REPAIR AS NECESSARY

A. INSPECT HEATING SYSTEM FOR SAFETY PROBLEMS.

A safety inspection involves both a visual inspection and test procedures designed to verify that any operational heating unit is burning fuel and exhausting flue gases in a safe manner. Inspections must be performed by a licensed insured HVAC professional. Refer to the Virginia Heating Systems Training Manual for inspection procedures. Refer also to DOE Program Guidance on space heaters, WPN 08-4, dated March 3, 2008.

All operational combustion appliances shall be included in the safety inspection. These include oil and gas furnaces, wood and coal stoves, boilers, oil and gas space heaters, wood and gas cook stoves, gas dryers and gas and oil water heaters. EXCEPTION: Wood and lump coal units where no fuel is available, or during the hot season, need only be visually checked for the following when applicable: heat exchanger leakage and corrosion, unsafe or improper wiring, venting, and clearances from combustibles.

When problems need to be corrected before proceeding with other work, the standards will explicitly state that requirement. Where remedial work is not required, only written documentation must be provided.

1. <u>Inspect the fuel supply</u>

   a. PROPANE, NATURAL GAS: If gas leakage is detected, verify with bubble test, inform the occupant and leave the dwelling. Shut off the supply valve and have the occupant notify the fuel supplier. The problem must be corrected before the heating system inspection is continued and before any other weatherization is performed.

   b. FUEL OIL: Any fuel leak should be corrected prior to performing weatherization work. In some fuel oil systems, oil can build up in the combustion chamber due to constant pushing of the reset button. The combustion chamber must be checked prior to firing the heating unit to determine whether a build-up of fuel has occurred.

   c. OIL TANK: Tanks must be leak-free and installed as required by NFPA 31. Leaky tanks must be replaced, but no underground tanks may be installed.

2. <u>Inspect the power supply</u>

   The inspector must determine whether the condition of the electrical power supply is adequate for the existing or new heating system. Determine that wiring is safe and properly fused. Check to see that wiring is not in contact with hot surfaces of the heating unit.

   The heating unit may be on a separate electrical circuit. An extension cord

should not be used to supply power to the unit. The condition of the electrical power supply must be documented.

3. Inspect Combustion Air Supply

Adequate air shall be available to the heating system for combustion. Refer to NFPA code unconfined and confined section for proper calculation.

4. Conduct CAZ and Worst Case Draft Test

a. Draft must be measured under Worst Case Combustion Appliance Zone (CAZ) conditions and determined to be acceptable in order to perform weatherization measures. Refer to the Virginia Weatherization Field Guide for procedures including probe placement and acceptable readings (pages 83, 96 – 99) or per manufacturer's specifications. A draft reading of .01 WC (or PMI) is acceptable for a mobile home. This does not preclude the need to conduct a thorough examination of the venting system.

b. When indoor air is used for combustion, depressurization in this zone shall be no greater than negative five (-5) Pascals.

When appliance is direct vent or sealed combustion, depressurization in this zone shall be no greater than negative ten (-10) Pascals.

c. The CAZ and Worst Case Draft Test must be repeated after weatherization work is completed. If the reading does not fall within the acceptable range, the problem must be corrected prior to submitting the job for completion.

5. Carbon Monoxide Testing

Test for the presence of carbon monoxide in the living area. There must be no more than 9-ppm carbon monoxide in the living area. The presence of CO in the living area is a life-threatening emergency situation. If possible, determine the source of the CO. The client must be informed of the risk and advised not to use the appliance until the problem is corrected. This problem must be corrected before any weatherization can be performed.

The test for the presence of carbon monoxide in the flue gases and in the living area must be repeated after weatherization work is completed. If acceptable levels are exceeded, the problem must be corrected before submitting the job for completion.

Carbon monoxide detectors must be installed in all dwellings and must be UL rated. CO detectors may be "plug-in," hardwired, or battery operated. If plug-in or hardwired, the detectors must have a battery back-up. If battery operated, at minimum a 5-year battery must be installed with detector replacement date on device. Location within the dwelling should be according to manufacturer's

recommendation.

6. Inspect the Heat Exchanger

Heat exchanger must be inspected for cracks or holes. The inspector must judge whether the condition of the heat exchanger is hazardous and prohibits further weatherization work on a house. The condition of the heat exchanger must be documented.

In the case of wood and coal stoves, the stove itself is a heat exchanger. Check for cracks and holes that may allow sparks, combustion gases, or smoke to enter the living area.

7. Inspect Vent System

Inspect the entire vent system, including the chimney, to determine whether any sections of the vent are disconnected, loose, leaky, extremely corroded, or missing. The inspector must judge whether the vent system is hazardous enough to prohibit further weatherization work on a house. The condition of the vent system must be documented.

Vent connectors should be properly connected. Single-wall pipe must not pass through combustible materials and should not be used outside or in unconditioned areas. Vent connectors exhausted into a lined or an unlined chimney should be checked for proper draft, obstructions, proper maintenance, and the exhausting of flue gases into the living area. Vent connectors must have at least 1/4" rise for every foot of horizontal run, must meet code requirements, and should have the least number of turns needed to reach the main vent.

When two appliances on the same floor share a common main vent, the appliance with the lower BTU input must be vented above the higher BTU appliance. The size of the common main vent must be large enough to carry the BTU input of both appliances.

Venting requirements are dependent on the type of fuel and type of chimney used. Chimney liners are required for gas, coal and wood fuels. Refer to page 107 of the Weatherization Field Guide for chimney height requirements.

8. Clearance from Combustibles

The inspector must judge whether a heating unit has sufficient clearance from combustible surfaces including walls, ceilings, floors, and framing materials. The inspector should also check for stacks of newspapers, rags, oil, gasoline cans, and other combustibles which may pose a fire hazard. Any problems which are deemed hazardous must be corrected before weatherization work is performed.

9. Safety Controls

The inspector must judge whether the condition of the safety controls poses a safety hazard. Do a visual inspection on these controls. Refer to a private contractor if in doubt due to possible risk involved in manual activation of some controls. Any problems which are deemed hazardous should be documented and corrected before weatherization work is performed.

10. Unvented Space Heaters

Refer to the DOE Program Guidance on space heaters, WPN 08-4, dated March 3, 2008.

If an unvented space heater (for example, a portable kerosene heater) is the only source of heat, weatherization work must not be performed unless a safe heating system is installed. An information sheet should be provided which explains the hazards of unvented space heater use.

If an unvented space heater is used as a secondary heat source, the house may be weatherized. However, the client must be provided an information sheet which explains the hazards of unvented space heater use.

11. Replacing Heating Systems

Heating systems may be replaced as the first priority using the criteria below. Heating system replacement for efficiency is an optional measure (please see Optional Measures section). A NEAT/MHEA audit must be used to determine correct sizing for the replacement unit, taking into consideration weatherization measures performed on the home. A copy of the NEAT/MHEA audit must be maintained in the client file with documented reason for replacement. Care must also be taken to ensure that the flue/vent is properly sized for the new system. **Prior written approval from DHCD is required to switch fuels.** When installing new heating systems, ensure that the return duct and grille are properly sized and that the manufacturer's start-up procedures are followed for fan speed, static pressure, etc.

a. Where any unvented space heater is the only source of heat.

b. Where no operable or safe heating system exists.

c. Where an unacceptable level of carbon monoxide is being created by the heating system and cannot be corrected.

12. Smoke Detectors

Smoke detectors must be installed in each dwelling. Smoke detectors must be UL rated and must be either battery-operated or hardwired. If battery-operated, a 5-year battery must be installed. Detectors must be installed in the following locations:

a. In each sleeping room.
b. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
c. On each additional story of the dwelling, including basements but not including crawl spaces and uninhabitable attics.

B. IMPROVE EFFICIENCY OF FORCED AIR HEATING DISTRIBUTION SYSTEMS

1. Seal plenum, duct and register leaks with mastic. All supply and return registers must have a maximum pressure pan reading of 1 pascal.

2. Provide pressure relief as deemed necessary to address safety comfort and efficiency (refer to page 197 in the Field Guide).

3. When there is an existing forced air distribution system, filter(s) must be installed (if missing) or replaced, and a (6) month supply of appropriately sized filters for each filter location must be provided to the client. Weatherization personnel must teach the client how to change the filter. If a permanent filter is present, the client must be taught to remove, clean and replace the filter. Return grills may be replaced with filter grills for better client accessibility.

4. Clean out squirrel cage blower, coils, inside air handler cabinet, and reachable areas of ducts.

5. Check for appropriately sized ducts, especially returns and return grilles.

6. Conduct heat rise test on all forced air systems.

C. IMPROVE EFFICIENCY OF WINDOW AIR CONDITIONERS.

1. Clean or replace air conditioner filter. The client must be taught how to clean filter by Weatherization personnel.

2. Clean air conditioner cooling fins.

3. Check for proper installation.

II. SEAL MAJOR AIR LEAKS AND BYPASSES

Look for indoor air quality problems (e.g. signs of condensation on the inside of the dwelling) which must be addressed prior to performing air sealing measures. These problems should be diagnosed and addressed at the source.

Use the blower door to diagnose air leakage.

A. PREVENT HEAT LOSS WHICH RESULTS FROM AIR MOVEMENT BETWEEN THE CONDITIONED AND UNCONDITIONED SPACES

In addition to the following requirements, ventilated attics must have a post-test zonal pressure of at least 45 Pascals with reference to the house. (Note: If an attic is unventilated, and neither insulation nor ventilation will be added, do not ventilate for the sole purpose of obtaining a zonal pressure.) A visual inspection must be performed in addition to attaining the zonal pressure required above.

1. Seal bypasses in stud cavities and joist cavities to stop air movement.

2. Seal partition walls at top and bottom to stop air movement.

3. Seal chimney, plumbing, and electrical chases at top and bottom to stop air movement.

4. Seal openings at the sill plate/band joist to stop air movement.

5. Replace missing or broken glass, missing windows, missing doors.

6. Seal holes in ceilings, walls and floors which communicate directly with unconditioned spaces. Drywall repair must be finished with a minimum of two coats of compound, sanding between coats. When floor repair is performed and floor covering has to be removed, floor covering, excluding carpet, may be replaced.

7. Seal non-operational flue openings and fireplaces.

8. Construct a removable door for fireplaces without an operable damper and are used occasionally.

9. Check to insure dryer vents are vented to outside, are non-combustible, clean and have no loops in vent hose. Dryer vents must not be connected with sheet-metal screws or fastening means which extend into the duct.

10. Seal or damper dryer vents, kitchen exhaust fans, utility penetrations, etc.

11. All kitchen and bath fans currently venting into the attic must be vented to the outdoors through roof fittings. Fans without operating backdraft dampers must be repaired, equipped with back draft dampers, or the fan must be replaced. Check new fans for proper damper operation and measure air flow to be certain the fan is exhausting. A sidewall exhaust fan may be used where it is not feasible to install a range hood. Sidewall exhaust fans must have a measured flow of 65 cfm or greater.

12. All exhaust fans must be repaired or replaced when non-operable. When replaced, fans must be vented to the outdoors, and must exhaust at least 30 cfm as measured. Documentation of fan cfm measurement must be maintained in the client file.

13. If there is a working re-circulation fan it may be replaced with one that vents outdoors and must comply with Article 12 above.

14. All gas ranges must have an exhaust fan vented to the outdoors that complies with Article 12 above.

15. Any kitchen range vents that are repaired or replaced must be vented with rigid pipe.

16. Permanently installed window air conditioners must be permanently air sealed from the exterior and a cover must be installed or left with the client. Tape is not allowed.

B. INSTALL VAPOR BARRIER

To control moisture migration into the conditioned space, a continuous vapor barrier with a minimum thickness of 6 mil must be installed in enclosed crawlspaces. Joints of the vapor barrier must overlap by 6 inches. Vapor barriers must be secured at the foundation walls. When openings are cut, vapor barrier must be secured tightly around penetrations (examples – piers, plumbing lines, fuel lines, etc).

III. INSULATE SIDEWALLS

(Reference Weatherization FIELD GUIDE, pgs 66-72.)

1. Fill sidewalls to capacity using the dense-pack method to a minimum density of 3.5 pounds per cubic foot. Anything less than a dense pack should be documented, ex. Weak walls that are packed as tight as possible.

2. Blown fiberglass must be used in a stud cavity adjacent to a chimney or other combustible.

3. All walls between conditioned and unconditioned areas must be insulated.

4. Sidewall insulation must be installed by either removing exterior siding or by drilling holes from the interior of the house.

5. Where incomplete sidewall insulation exists (some walls are insulated but some are not), insulation will be added to provide complete sidewall coverage. The local agency must insure that all exterior walls have complete sidewall coverage.

6. The following exceptions will be allowed, but must be documented, and the burden of proof will lie with the local WAP provider:

    a. Existing sidewall insulation.

    b. No wall cavity.

    c. Knob and tube wiring present in wall cavity, and testing of the wiring indicates unsafe wiring exists and there are insufficient funds available to replace the wiring.

    d. Wall(s) too weak to withstand pressure of sidewall insulation.

    e. Existing moisture problems which cannot be remedied.

IV. INSULATE AND VENT ATTIC

A. Insulation will be installed in attic areas located directly above heated areas to R-38. Reasons for not insulating to R-38 must be documented in the client file. An insulation certificate including date, signature, R-value, and number of bags/rolls installed must be visible from the attic access.

B. A three (3) inch minimum clearance from insulation or other combustible materials must be maintained with permanent non-combustible blocking material around all chimneys and flues. A three (3) inch minimum clearance from cellulose and paper backed fiberglass insulation must be maintained with permanent non-combustible blocking material around recessed light fixtures, transformers, furnaces, and any other heat producing device. Insulation may not cover these devices unless rated for insulation coverage. Chimney chases must be sealed with non-combustible material and high temperature caulk.

C. Permanent blocking will be installed around attic scuttles so as to restrain insulation from falling through these openings.

The attic side of trap doors, scuttles, and pull down staircases must be insulated with a minimum of R-38 fiberglass batt or some other suitable insulation. Attic openings for pull-down stairs that extend into the attic beyond the opening must be sealed and insulated from the house-side.

Weather-strip the trap door or attic scuttle.

D. Markers indicating the thickness of blown insulation must be installed at least one for every 300 sqft throughout the attic space and must be visible above insulation.

E. Weather strip knee wall access doors and insulate to minimum R-13.
Attic side of knee walls must be air sealed and insulated to minimum R-13.
Joist cavities at the knee-wall must be air sealed. Slopes must be insulated.

F. Circulation of air through soffit vents must be ensured through the use of blocking materials.

G. Any pockets or voids in the insulation must be filled so that insulation is of uniform R-value.

H. Venting of attic area must be consistent with established attic ventilation standards (Weatherization FIELD GUIDE pgs 59-61). Louvered vents will be assumed to have Net Free Area (NFA) of ventilation equal to one-half (1/2) the area of the vent opening, unless otherwise indicated and documented (such as a stamp on the vent package).

Non-louvered vents will be assumed to have NFA of ventilation equal to the area of the vent opening, unless otherwise indicated and documented.

I. Vents must be louvered and/or sealed to prevent rainwater from entering the vent opening.

J. If wiring in the attic area appears unsafe due to cracked, blistered, or deteriorated wiring insulation, or if circuits otherwise indicate overloading, the attic shall not be insulated out of consideration for fire hazards until these situations are corrected.

Such exceptions must be documented in the client file. Attics containing knob and tube wiring shall be rewired and inspected by a licensed electrician prior to insulating.

Insure all electrical junction boxes are covered and flagged prior to insulation.

V. INSULATE DUCTS/HEATING PIPES

A. Only ducts or pipes located in unheated areas will be insulated. Return and supply ducts/pipes must both be insulated.

Where ducts or heating pipes are located in unheated areas with plumbing, provisions must be made to hinder the freezing of plumbing pipes prior to insulation.

If a basement has a zonal pressure no higher than 10 Pascals with reference to the house, then the basement may be considered "inside" and duct insulation is not required.

B. Ducts will be insulated to a minimum R-8 using either mineral fiber insulation, two layers of single bubble wrap or one layer of double bubble wrap with spacers, or two-part foam.

Hydronic heating pipes will be insulated with either rigidly closed cell vinyl foam or mineral fiber insulation manufactured for the purpose of insulating pipes. When using mineral fiber insulation, a vapor impermeable wrapping must be applied on the outside of the insulation.

C. Insulation joints will be tightly butted or overlapped so as to completely surround ducts and pipes. An exception to this will be the case of ducts attached to joists, floors or some other obstacle, which prevents wrapping. In this case, insulation will cover the part of the duct exposed to the winter cold side and will be attached to the barrier if possible. Insulation joints will be taped completely with aluminum tape or some other appropriate permanent fastener.

D. Where insulation is applied on rectangular ducts, insulation installed on corners will not be compressed more than 50% of its normal thickness.

E. When ducts and pipes are not completely accessible or reachable, all accessible or reachable ducts and pipes must be insulated.

VI. INSULATE WATER HEATER

A. Water heaters will be insulated with mineral fiber insulation with a protective backing attached or bubble wrap insulation with an R-value of five (5) or better. When bubble wrap is used, R-5 must be achieved either by using spacers between the heater and one layer of wrap OR by using two layers of wrap. Insulation will be applied with the protective backing toward the outside.

B. ELECTRIC WATER HEATERS: Insulation will be applied to the top and sides of the water heater. The overlapped ends of the protective backing should be sealed and banded (bands not required when using bubble wrap) in order to provide an adequate seal.

C. Pressure relief valve shall not be covered. Access panels to thermostat shall be clearly marked.

D. GAS WATER HEATERS: Insulation will be applied to only the sides of the water heater. The overlapped ends of the protective backing should be sealed and banded (bands not required when using bubble wrap) in order to provide an adequate seal.

E. Insulation must not cover any of the following: pilot light, cut-off valve, access panel to thermostat or heating elements, operating instructions, pressure relief valve, drain, any electrical service wiring, hi-limit switch.

F. Insulation will be installed at least three (3) inches off the floor and one (1) inch away from the pressure relief valve.

G. In addition to insulating domestic water heaters, the following measures must be performed:

1. Thermostats will be lowered to a temperature the client is comfortable with (120 deg.F is recommended).

2. The first six (6) feet of the hot water line leading out of the domestic water heater will be insulated and (6) feet of the cold water line to the hot water heater will be insulated in the same manner and under the same standards as hydronic heating pipes. Water pipes located in unheated areas may be insulated in the same manner and under the same standards as hydronic heating pipes.

3. The discharge pipe must be properly installed to a minimum of 6” from the floor.

H. Cabinet type water heaters and water heaters labeled with instructions “Do Not Wrap” should not be insulated.

OPTIONAL MEASURES

AFTER ALL ABOVE REQUIRED MEASURES HAVE BEEN COMPLETED, THE FOLLOWING MEASURES MAY BE INSTALLED IN A SINGLE FAMILY DWELLING (at discretion of local WAP provider). DOCUMENTATION OF EXISTING SITUATIONS AND IMPROVEMENTS MUST B E INCLUDED IN THE CLIENT FILE.

MEASURES A, B, AND C MUST BE VERIFIED BY A NEAT AUDIT

A. FURNACE TUNE-UPS

1. Furnace tune-ups and minor repairs may be performed to increase the efficiency of the heating system.

2. Units must be tested to determine steady-state efficiency prior to performing the work and after the work is performed to document the results of the work.

B. HEATING SYSTEM REPLACEMENTS FOR EFFICIENCY

A heating system may be replaced for efficiency improvement if the cost-effectiveness can be documented by a NEAT Audit. Replacement units must be properly sized in accordance with the NEAT audit. When multiple window air conditioners and electric furnace need to be replaced, a heat pump may be installed. When installing new heating systems, ensure that the return duct and grille are properly sized and that the manufacturer's start-up procedures are followed for fan speed, static pressure, etc. Heat pumps are not permitted to be replaced when the SEER rating is 13 or greater. **Documentation of efficiency of existing unit and a copy of the NEAT audit must be maintained in the client file**.

C. FLOOR INSULATION

1. Floor insulation will only be installed under floors separating a conditioned and unconditioned area.

2. Floor insulation must have a minimum R-value of 19.

3. Insulation will have an attached vapor barrier and will be installed with the vapor barrier towards the heated area.

4. A three (3) inch clearance from heat producing devices will be maintained.

5. Floor insulation will be installed up to and folded onto band joist or joist header.

6. Insulation will be fitted tightly around cross bracing and other obstructions between floor joists.

7. Insulation must be installed to maintain permanent contact with the underside of the subfloor decking.

8. All floor insulation will be securely fastened to the floor joists so as to prevent sagging of the insulation. Staples will not be allowed as fasteners for floor insulation. Suggested fasteners are nylon mesh or wire staves.

9. Where floor insulation is installed over a crawl space and no foundation wall or underpinning is present, insulation must be protected from vermin, and other items that may destroy the insulation. This protection should be done with nylon mesh or some other vapor permeable material.

10. Where floor insulation is pre-existing, no insulation will be installed except to replace voids and damaged insulation.

11. Installation of foundation vents is prohibited except to provide for combustion air appliances.

THE FOLLOWING MEASURES DO NOT REQUIRE NEAT AUDIT:

D. COMPACT FLOURESCENT BULBS

Replace incandescent bulbs with energy-star certified compact fluorescent bulbs. Ensure that CFL output is same as bulb being replaced. Client must be educated on how the cfl bulb operates differently from incandescent bulbs and must be informed of appropriate disposal of cfl bulbs.

E. REFRIGERATOR REPLACEMENTS FOR EFFICIENCY

A refrigerator may be replaced for efficiency improvement if the cost-effectiveness can be documented by DOE approved methods. The Refrigerator Replacement guidance provided on WAPTAC.org under the “Tools” section must be followed. Disposal of the existing units is required. Stand alone freezers or through the door water and/or ice units are not allowed.

F. WATER FLOW REDUCERS

1. Reducers may include low-flow showerheads, faucet aerators, and toilet-tank flush reducers.

2. Water flow reducers are to be installed only when water is supplied to the house on a metered system or pumped from a well.

3. If the condition of the plumbing is such that damage could result from this installation, this optional measure should be attempted only by someone skilled in plumbing work.

G. SETBACK THERMOSTATS

1. Only solid-state setback thermostats with operating instructions attached will be used.

2. Clients must have the effects and operation of the device explained prior to installation.

3. Install setback thermostats on heating systems only. Do not use the setback thermostat on heat pumps or other combination heating/cooling systems.

4. Install setback thermostats in accordance with manufacturer's installation instructions.

MEASURES SPECIFICALLY PROHIBITED

The following measures are specifically prohibited from installation on single-family housing:

A. Skirting/underpinning of crawl spaces, except that airtight underpinning of a crawl space is allowed for the purpose of establishing the thermal barrier in conjunction with the house "envelope" (e.g. where the crawl space is inaccessible).

B. Storm windows.

C. Foundation vents except to provide combustion air to combustion appliances.

MOBILE HOMES

THE FOLLOWING APPLICABLE MEASURES MUST BE INSTALLED IN ORDER FOR THE JOB TO BE ACCEPTED FOR REIMBURSEMENT.

I. INSPECT HEATING/COOLING EQUIPMENT AND REPAIR AS NECESSARY

II. SEAL MAJOR AIR LEAKS

III. FLOOR INSULATION

IV. INSULATE WATER HEATER

V. INSULATE CEILING/ROOF CAVITY

I INSPECT HEATING/COOLING SYSTEM AND REPAIR AS NECESSARY. ALL HEATING SYSTEMS and GAS WATER HEATERS MUST BE UL APPROVED FOR MOBILE/MANUFACTURED HOUSING

REFER TO THE SINGLE FAMILY STANDARDS. THESE SAME STANDARDS APPLY TO MOBILE HOME UNITS with the following exceptions:

When replacing mobile home heating systems, a MHEA audit will be used only when installing an electric furnace or when a mobile home has an addition(s). ORNL (DOE's NEAT/MHEA audit guardian) approved this procedure. For heat pump installation, refer to MHRA's Manufactured Home Cooling Equipment Sizing Guidelines on DHCD's website. Use the "Energy Star" column on the MHRA guideline.

II. SEAL MAJOR AIR LEAKS

Look for indoor air quality problems (e.g. signs of condensation on the inside of the dwelling), which should be addressed prior to performing air sealing measures. These problems should be addressed at the source.

Use the blower door to diagnose air leakage.

Prevent heat loss which results from air movement between the conditioned and unconditioned spaces of the mobile home.

A. Replace missing or broken glass, missing windows, missing doors.

B. Seal holes in ceilings, walls, and floors which communicate directly with unconditioned spaces.

C. Seal the following duct areas: plenum connection to furnace; boot connections to trunk and floor; crossover duct connections; jump/branch duct connections; end caps and all other connecting points.

D. Permanently installed window air conditioners must be permanently air sealed and a cover must be installed or left with the client. Tape is not allowed.

E. Seal or damper dryer vents, kitchen exhaust fans, utility penetrations, etc.

F Check to insure dryer vents are vented to outside, non-combustible, clean and have no loops in vent hose. Dryer vents must not be connected with sheet-metal screws or fastening means which extend into the duct.

G. All exhaust fans must be repaired or replaced if not working. When replaced, fans must be vented to the outdoors, bathroom fans must be 1.5 sone or less, and must exhaust 30 cfm as measured. Documentation of measured cfm must be maintained in the client file.

H. If there is a working re-circulation fan it may be replaced with one that vents to the outdoors and must comply with article G above.

I. All gas ranges must have an exhaust fan vented to the outdoors and must comply with article G above.

J. Any kitchen range vents that are repaired or replaced must be vented with rigid pipe.

K. Marriage walls between sections and add-ons must be sealed.

III. INSULATE FLOOR

A. Prevent conductive heat loss by insulating the cavity between the floor and belly board. MHEA audit must be used to deviate from this measure.

Blown fiberglass is required due to the frequency of water leaks in mobile homes and the damage that can result if cellulose is used.

1. Missing or deteriorated belly board must be replaced or repaired.

2. Where plumbing pipes are located in unconditioned areas with ducts, provisions must be made to hinder the freezing of plumbing pipes.

3. All accessible areas must be insulated. Only specific areas with less than eighteen (18) inches clearance will be accepted as "inaccessible".

4. Exceptions will not be made for plumbing leaks which occur below the belly board.

5. Situations of "health or safety hazard" must be documented in the client file.

C. INSTALL VAPOR BARRIER

A vapor barrier with a minimum thickness of 6 mil must be installed under skirted mobile homes. Joints of the vapor barrier must overlap by 6 inches. Vapor barriers must be secured at the skirting walls. When openings are cut, vapor barrier must be secured tightly around penetrations (examples – piers, plumbing lines, fuel lines, etc).

IV. INSULATE WATER HEATER

A. Water heaters will be insulated with mineral fiber insulation with a protective backing attached or bubble wrap insulation with an R-value of five (5) or better. When bubble wrap is used, R-5 must be achieved either by using spacers between the heater and one layer of wrap OR by using two layers of wrap. Insulation will be applied with the protective backing toward the outside.

B. ELECTRIC WATER HEATERS: Insulation will be applied to the top and sides of the water heater. The Overlapped ends of the protective backing should be sealed, and banded in order to provide an adequate seal.

Pressure relief valve shall not be covered.

Access panels must be clearly marked.

C. GAS WATER HEATERS: Insulation will be applied to only the sides of the water heater. The overlapped ends of the protective backing should be sealed, or banded in order to provide an adequate seal.

Insulation must not cover any of the following: pilot light, cut-off valve, access panel to thermostat or heating elements, operating instructions, pressure relief valve, drain, any electrical service wiring, hi-limit switch.

D. Insulation will be installed at least three (3) inches off the floor and one (1) inch away from the pressure relief valve.

E. Water pipes located below the belly board may be insulated in the same manner and under the same standards as hydronic heating pipes.

F. In addition to insulating water heaters, the following measures must be performed:

1. Thermostats will be lowered to a temperature that the client is comfortable with (120 deg. F is recommended).

2. The first six (6) feet of the hot water line leading out of the domestic water heater and (6) feet of the cold water line coming into the hot water heater will be insulated in the same manner and under the same standards as hydronic heating pipes.

3. The discharge pipe must be properly installed outside of the skirting.

G. Cabinet type water heaters and water heaters labeled with the instructions “Do Not Wrap” should not be insulated.

V. CEILING/ROOF CAVITY INSULATION

Ceiling insulation must be installed using the practices presented during the training by NRCERT. Also refer to pages 209-213 of the Weatherization Field Guide.

OPTIONAL MEASURES

AFTER ALL THE ABOVE REQUIRED MEASURES HAVE BEEN COMPLETED, THEN THE FOLLOWING MEASURES MAY BE INSTALLED IN A MOBILE HOME (at the discretion of the local WAP provider). DOCUMENTATION OF EXISTING SITUATIONS AND IMPROVEMENTS MUST BE INCLUDED IN THE CLIENT FILE.

A. FURNACE TUNE-UPS

1. Furnace tune-ups and minor repairs may be performed by a qualified individual to the efficiency of the heating system.

2. Units must be tested to determine steady-state efficiency prior to performing the work and after the work is performed to document the results of the work.

B. HEATING SYSTEM REPLACEMENTS FOR EFFICIENCY

When multiple window air conditioners and electric furnace need to be replaced, a heat pump may be installed. Use the MHRA Manufactured Home Cooling Equipment Sizing Guidelines on DHCD's website. Use the "Energy Star" column on the MHRA guideline.

C. COMPACT FLOURESCENT BULBS

Replace incandescent bulbs with compact fluorescent bulbs. Ensure that CFL output is the same as the bulb being replaced. Client must be educated on how the cfl bulb operates differently from incandescent bulbs and must be informed of appropriate disposal of cfl bulbs.

D. REFRIGERATOR REPLACEMENTS FOR EFFICIENCY

A refrigerator may be replaced for efficiency improvement if the cost-effectiveness can be documented by DOE approved methods. The Refrigerator Replacement guidance provided on WAPTAC.org under the "Tools" section must be followed. Disposal of the existing units is required. Stand alone freezers or through the door water and/or ice units are not allowed.

E. WATER FLOW REDUCERS

1. Reducers may include low-flow showerheads, faucet aerators, and toilet tank flush reducers.

2. Water flow reducers are to be installed only when water is supplied to the house on a metered system or pumped from a well.

3. If the condition of the plumbing is such that damage could result from this installation, this optional measure should be attempted only by someone skilled in plumbing work.

F. SETBACK THERMOSTATS

1. Only solid-state setback thermostats with operating instructions attached will be used.

2. Clients must have the effects and operation of the device explained prior to installation.

3. Install setback thermostats on heating systems only. Do not use the setback thermostat on heat pumps or other combination heating/cooling systems.

4. Install setback thermostats in accordance with manufacturer's installation instructions.

MEASURES SPECIFICALLY PROHIBITED ON MOBILE HOMES

The following measures are specifically prohibited from installation on mobile homes.

A. Skirting

B. Foundation vents

INSTALLATION STANDARDS

MULTI-FAMILY DWELLINGS

These *Standards* apply ONLY to Multi-Family Buildings of 3 or fewer stories. Prior written approval from DHCD must be obtained to weatherize multi-family buildings of 4 or more stories.
Shelters offering temporary residency may be weatherized but require special reporting. DHCD approval is required prior to working on a shelter.

FOLLOW THE SINGLE-FAMILY STANDARD EXCEPT FOR PROVISIONS BELOW

Replacing heating systems as an optional measure for efficiency is prohibited.

The focus for air sealing and insulation for multi-family weatherization work must be on establishing pressure and thermal boundaries of the building.

MINIMUM BLOWER DOOR STANDARDS

PRE TEST: For each building, single-point tests must be performed in the following manner:
Multiple story buildings: One per floor, alternating locations on each floor.
Single story buildings: One end unit, one interior unit.

POST TEST: 30% of the units in each building must be tested. The units must be different from the pre-tested units. In units where a combustion appliance is present, a blower door test and a CAZ test must be performed.

In addition to the standard blower door, attic, and duct zonal testing, zonal pressures must be measured in party walls and "between-floor" cavities to determine connectivity to the outside. These numbers tend to be high, and every effort should be made to seal points of air leakage at the exterior perimeter of the building. When it is not possible to effectively reduce these zonal pressures ***(to 10 pa or less),*** then individual units must also be air sealed to "compartmentalize" the units within the structure.

For every unit tested, pressure pan readings are required. Zonal pressures are required for duct chases.

Other useful areas to measure zonal pressures are: duct soffits, cantilevers, plumbing walls, wall cavities behind thermostats, mansards.

In most but not all cases, individual units will be air tightened below the minimum ventilation rate (MVR). When residential units are air tightened below the MVR, the MVR worksheet **must** be used. Installed exhaust fans must have a noise rating of one sone or less. The actual cfm of all existing and installed exhaust fans must be post measured and must exhaust a minimum of 30 cfm. DOCUMENTATION OF EXHAUST FAN TESTS MUST BE INCLUDED IN THE CLIENT FILE.

Options for ventilation in residential units include the following:

1. Install exhaust fans with a "smart" timer and adjust for unique characteristics of each unit.
2. Install exhaust fans with a low speed continuous with high speed boost.
3. Install exhaust fans and wire to light switch directly.