2019-2020 Wisconsin Weatherization Assistance Program Manual

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DEHCR
Division of Energy, Housing and Community Resources

Weatherization Works

8. Energy Audits

8.1 Required Equipment

The Division requires that Agencies and/or their contractors use professional equipment as part of their assessment of buildings. Direct access to computers is required to model jobs with electronic energy audits and to document diagnostic field tests. The following lists of required equipment represent the minimum required of equipment. Other equipment may be necessary to deliver weatherization services effectively and efficiently.

8.1.1 Minimal Required Equipment for Personal Safety

1) Calibrated personal carbon monoxide detector capable of measuring CO levels in ambient air, with an audible alarm.
2) PPE (personal protective equipment) for respiratory, vision, hearing, skin, feet and head protection.

8.1.2 Minimal Required Equipment for Instrumented Air Leakage Measurements

1) Calibrated blower door, Minneapolis Model 3 or equivalent, capable of creating a pressure differential between sections of a building and outdoors.
2) Calibrated pressure and flow gauge, DG-700 or equivalent, capable of measuring pressure differentials and calculating air leakage in CFM50 (cubic feet per minute at 50 pascals).
3) Smoke generating testing equipment.

8.1.3 Minimal Required Heating System Analysis Equipment

1) Calibrated combustion analyzer capable of measuring O_2, CO_2, CO, SSE, stack temperature and net temperature.
2) Smoke test kit capable of measuring relative soot level in flue gases.
3) Calibrated pressure gauges capable of measuring draft in either Pa (pascals) or IWC (inches of water column), gas pressure in IWC and oil pump pressure in PSI.
4) Calibrated thermometers capable of measuring temperature of air in forced air distribution and measuring temperature of water in hydronic distribution.
5) Calibrated air handler flow meter, TEC TrueFlow or equivalent, capable of measuring air flow in forced air system.
6) Timing device capable of measuring seconds for clocking gas meters.

8.1.4 Minimal Required Combustion Safety Testing Equipment

1) Calibrated carbon monoxide or combustion analyzer capable of measuring CO "as measured".
2) Calibrated combustible gas detector capable of identifying gas leaks, with adjustable tick rate and alarm when exceeding 10% of LEL (lower explosive limit).
3) Gas leak detection fluid to confirm leaks identified with electronic detector.
4) Timing device capable of measuring minutes to check for appliance spillage..
5) Mirror or smoke to determine appliance spillage.

6) Borescope.
7) Ladders..

8.1.5 Minimal Computer Equipment and Software

1) PC, Laptop or Tablet with Windows 7 or higher operating system.
2) Excel 2010 or higher.
3) Word 2010 or higher.
4) Modern internet browser (Chrome, Internet Explorer 11 or higher, Firefox).
5) Email capability, Outlook or equivalent.

8.2 Required Building Assessment General

The Division requires that all agency and contracted auditors complete an assessment of all buildings that may be weatherized through the program.

8.2.1 Required Diagnostic Testing (excludes Manufactured Home Measures List (MHML))

1) Overall building air leakage rate in CFM_{50} (As-Is and Final tests). Contact the HE+ Help Desk for guidance if unable to complete an "As-Is" blower door test at audit because of concerns regarding damaged/deteriorated PACM.
2) ZPD (Zone Pressure Diagnostics) for attached garages.
3) CAZ (Combustion Appliance Zone) depressurization to determine worst case.
4) Pressure pan force air distribution leakage testing (mobile home)..
5) Room by room pressurization testing (mobile home).

8.2.2 Required Combustion Safety Testing (excludes MHML)

1) Detection of fuel leaks, primarily for gas and propane, but also oil.
2) Spillage testing under worst case depressurization at required time limit.
3) Draft testing under worst case depressurization for natural draft and fan assisted appliances.
4) CO testing of combustion appliances including kitchen stoves.
5) Continuous monitoring of ambient CO.

8.2.3 Required Heating System Testing (excludes MHML)

1) Combustion Efficiency and CO.
2) Spillage testing under worst case and natural conditions at required time limit.
3) Draft testing under worst case and natural conditions for natural draft and fan assisted appliances.
4) Fuel pressure (gas and oil).
5) Temperature rise.

6) If temperature rise results fall outside of manufacturer's recommendations (PMI), additional testing may be completed. These tests may include Static Pressure and Fan Speed measurements.
7) Smoke test (oil only).
8) BTU input.

8.2.4 Exhaust Fan and Ventilation Testing

1) Air flow of all exhaust fans.
2) Air flow of dryers vented to the outdoors.
3) Air flow of existing balanced mechanical ventilation, ERV or HRV.

8.2.5 Required Documentation of Testing

1) Results of required testing shall be documented in the Diagnostic Workbook on the Auditor worksheet for the appropriate building type.
2) Testing not included in the Diagnostic Workbook shall be documented on a FDCF (Field Data Collection Form).

8.2.6 Shell Measure Assessment

1) All shell components of a building shall be accurately measured and recorded on a FDCF.
2) Insulation levels in all attics, walls, floors or foundations that define the thermal boundary shall be determined and recorded on FDCF.
3) Repairs necessary to protect energy conservation measures shall be identified and recorded on FDCF.
4) Windows and doors shall be evaluated for general condition and for possible replacement and recorded on FDCF.
5) A minimum inspection sample of 8 units or 25 percent, whichever is larger, is required for all buildings with 5 or more units. The inspection sample shall include units from each floor and each building exterior wall orientation (i.e. direction), and shall be representative of each type of unit in the building. All common areas shall be inspected and addressed in the energy audit.

8.3 Electronic Audits and Measures Lists General

The State of Wisconsin utilizes the NEAT (National Energy Auditing Tool) for 1-4 unit and 5-24 multiunit dwellings and MHEA (Manufactured Home Energy Audit) for mobile homes heated with bulk fuels or electricity. The Mobile Home Measures List (MHML) is utilized for mobile homes heated with natural gas. The audits and measures list are used to determine the recommended measures to be completed on weatherized buildings. NEAT and MHEA audits shall be performed according to the instructions in the Weatherization Assistant Guide found on the HE+ WisWAP Information page.

8.3.1 Mobile Home Measures List (MHML)

The Division has developed protocols to use when auditing mobile homes that are heated with a natural gas appliance. Further details on how to use the MHML are available on the WisWAP Information page under the MHML heading.

8.3.2 Weatherization Assistant Audits

At the beginning of each program year, the Division issues a "setup library" database for each Agency to use within Weatherization Assistant energy audit software for analyzing the cost-effectiveness of planned weatherization work. Those default setup libraries are reviewed and adjusted annually. Default values of key analysis parameters, fuel costs, and fuel price indices are determined and updated in the setup library. Measures in the library are enabled according to Division policies, and are updated with projected agency unit costs. Agencies shall use the audit software and database version designated annually by the Division and posted on the HE+ Training and Technical Assistance website.

It is each Agency's responsibility to review and update entries in the supply library for water heaters and refrigerators that are used by program contractors or suppliers. If bid prices change during the program year, the supply libraries shall be customized to reflect the Agency's current replacement equipment models and costs. Agencies may opt to use the additional tabs in the supply library to document material costs and contractor costs for other work.

A single Weatherization Assistant audit is completed for each building. It should fully describe all details for the entire building that are necessary for an accurate energy audit. In accordance with Section 2.2.3 - Customer Files (above), the Weatherization Assistant file associated with the building shall include the list of recommended measures and itemized cost measures actually installed in the building. When actual fuel consumption is utilized to select measures, the "Adjusted" recommended measures list shall be used.

Agencies shall maintain the final electronic version of each completed energy audit. The electronic copy of the energy audit shall, at a minimum, be maintained within the database in which it was created. Energy audits shall be readily available to the Division upon request.

Some weatherization measures are identified in Weatherization Assistant audits, but are not included in the calculations to establish Savings to Investment Ratio (SIR) metrics. In order to generate a Recommended Measures report that is reflective of all the measures and costs, these additional measures shall be selected from the user defined options in the Itemized Cost tab. Building unit audits must have a cumulative SIR of 1.0 or greater before weatherization work may proceed. If, in a 2 to 4-unit building, some but not all units have an SIR of 1.0 or greater, the Agency may request a review of the building via the HE+ Help Desk and shall proceed with weatherization only with prior approval from the Division.

8.3.2.1 General Rules for Data Entry into Weatherization Assistant Audits:

1) Create the audit in accordance with policies and guidance as provided in the Weatherization Assistant Guide.
2) Include all planned measures in the audit.

3) Use the Itemized Cost tab to enter information for measures where energy savings or costs are not included in the cost-effectiveness analysis. Some common examples are:
    - Programmable thermostats.
    - Lighting efficiency improvements
    - Domestic hot water measures (faucet aerators, shower heads, etc.).
    - Refrigerator and freezer replacement, including removal incentives.
    - Installing, sealing and/or insulating forced air distribution.
    - Miscellaneous heating system work, including heating system clean and tunes
    - Exhaust ventilation.
    - Slab-on-grade exterior foundation insulation.
4) All repair measures shall be entered in the Itemized Cost Tab, and included in the cumulative SIR. Repairs are only allowed when necessary for the effective performance or preservation of energy conservation measures or materials.
    - The cumulative SIR including repair expenses shall be greater than 1.0 in order to complete the planned repairs. Buildings that cannot be weatherized without the repairs shall be deferred.
    - Repair costs shall be separated from energy conservation and health and safety measure costs when reporting the completed measure in WisWAP.
5) Health and safety measures shall be identified in the Itemized Cost tab. Health and safety costs are not included in the cumulative SIR. Jobs with a total Health and Safety measures cost of $1,500 per unit or greater shall be reviewed and approved by the Program Manager.
    - If Health and Safety costs end up exceeding $1,500 per unit because of issues that arise during the course of weatherization, the Program Manager shall review and approve the revised job. There shall be documentation in the customer file of the conditions which caused the additional costs, and the reason they were not previously identified.
6) Model all water heater replacements first as an ECM measure on the baseload tab. If the water heater measure is not selected (the water heater is not a cost-effective ECM), but replacement is still necessary, run the model again, with the water heater included as a Health and Safety measure in the Itemized Cost tab.
7) Heating system modifications (repair, distribution replacement or additions) shall be modeled as follows:
    - When modifications to a heating system are required for the proper installation of a replacement heating system, include those costs with the cost of the replacement heating system measure, and model the complete system in the Heating tab. Report the repair costs separately in WisWAP.
    - When modifications to the heating system are required for the proper operation of the existing or replacement heating system, identify the measure and cost separately in the Itemized Cost tab. The cost shall be included in the cumulative SIR, but not in the SIR evaluating the cost of the heating system replacement measure. Report the repair costs separately in WisWAP.
8) Installation, repair or replacement of air conditioners is not an allowed measure. (Furnace replacement may occasionally require installation of a new/compatible A-coil. Prior approval from the HE+ Help Desk is required.) Include sufficient information about existing air conditioners in Weatherization Assistant to model electricity savings that may

result from shell and insulation measures.

9) When the estimated cost of a measure, based on a contractor's bid or the Agency's labor and materials for that job, differs from the Agency's default cost by more than +/- 20 percent, a cost shall be included in the Additional Cost field in the measure's tab.
    - When the estimated cost of a measure is less than the Agency's default cost, enter a negative number in the Additional Cost field in the measure's tab.

NEAT/MHEA Modeling Guidance: For additional modeling guidance see the Weatherization Assistant Guide found on the HE+ Website.

8.3.2.2 Modeling Buildings Using Fuel Consumption

The Agency shall collect and use actual fuel consumption data provided by the WHEAP Referral or by the customer for all buildings where natural gas or electricity is the primary heating fuel. Note that a completed HE+ application includes a release allowing fuel vendors to supply a customer's energy use information for weatherization purposes. All vendors participating in WHEAP have agreed to provide billing information.

Utility usage data for a full year is preferred. Data for a minimum of 4 months that includes the most recent heating season is acceptable. When fuel records cannot be obtained for the heating season of the previous year for all heating systems in the building, actual fuel consumption data is not required to model 1-4 unit buildings.

Customers sometimes attempt to significantly reduce energy expenses with the following practices:

- Closing off at least 50 percent of the rooms in an attempt to only heat part of the building.
- Maintaining the home at a temperature below 65 degrees for more than 12 hours per day during the heating season.

In cases where the customer is attempting to significantly reduce energy expenses in this manner, the Division strongly recommends entering the actual fuel use data available into the audit, then comparing the difference in predicted consumption and available fuel use data, to validate the use of "default" audit values (instead of "adjusted" values). The circumstances justifying the use of the default audit results shall be documented in the customer file.

The date-appropriate Therm Calculator shall be used for 1 to 4-unit buildings and mobile homes. The Therm Calculator is used to weather-normalize the known/actual consumption for average heating degree days. It will also assist energy auditors in estimating the heating fuel consumption when multiple fuels are used and/or when a full 12 months of usage data is not available. The calculator is available on the T&TA site under the "Technical Assistance" tab.

For multifamily buildings, the 5-24 Unit Building Workbook shall be used in conjunction with the NEAT audit. Actual fuel consumption data is required. Use the workbook to weather-normalize the consumption for average heating degree days. The workbook may also be used to estimate space heating usage for units that do not have consumption data available. Multi-family 5-24 unit buildings with a shared/master meter for space heating shall have the fuel consumption

records for the preceding 12 months submitted by the building owner as a part of the certification process.

Buildings with individual mechanical systems in each unit shall have the actual consumption records for each unit for the year. Tenants not certified as HE+ eligible (free riders) will need to provide fuel consumption records to the building owner or the agency. If fuel records are unavailable, free riders will need to sign a release to allow access to their utility records.

8.3.2.3 End-State Planning

The primary goal of the Weatherization Assistance Program is energy cost reduction, and the inclusion of health and safety improvements to the units occupied by low-income persons served shall be limited to such improvements that are related to the energy efficiency work completed.

1) End-state planning is required for all weatherization jobs and shall be conducted prior to proceeding with weatherization work. The Diagnostic Workbook contains a modeling worksheet that assists in predicting air sealing effectiveness and likely post-weatherization ventilation requirements. End-state planning involves conducting tests and analyzing the characteristics unique to each dwelling in order to:
    a. Select and implement the appropriate measures and accurately estimate costs.
    b. Estimate the post-weatherization building CFM_{50} infiltration rate.
    c. Estimate the post-weatherization natural ventilation rate per occupant.
    d. Identify the potential need for post-weatherization local exhaust ventilation and/or whole building mechanical ventilation.
    e. Estimate the post-weatherization worst case depressurization.
    f. Calculate the post-weatherization Depressurization Tightness Limit.
    g. Identify potential post-weatherization combustion safety issues.
    h. Make critical decisions regarding deferral, or prevention and resolution of potential combustion safety issues.
    i. Provide information to plan and manage the job to avoid unexpected delays.

8.3.2.4 In-progress Changes in Measures

Occasionally, valuable energy conservation measures are identified during the job process. Prior to installing an ECM that was not identified or included as part of the original audit, the identified measure details must be entered in the audit and evaluated for cost-effectiveness. If the measure meets the minimum SIR of 1.0, the ECM may be installed. Measures that may be involved include, but are not limited to:

- Refrigerator replacement
- Freezer replacement
- Attic insulation
- Wall insulation
- Floor insulation

- Foundation insulation
- Sill box insulation

It occasionally becomes necessary to add a water heater or heating system replacement measure after work has begun. Before proceeding, the audit shall be updated with the equipment replacement(s) modeled, and the measure and cumulative cost-effectiveness shall be re-calculated. If the job SIR is less than 1.0, work may still proceed. Enter the replacement in the Itemized Cost tab as a Health and Safety measure (not included in the cumulative SIR). If the result Is that total Health and Safety costs then exceed $1,500 per unit, the Program Manager shall review the job and determine if the measure is necessary and the job's costs are reasonable.

8.3.3 Modeling Mobile Homes with MHEA

The MHEA audit is visually similar to the NEAT audit, but there are differences in how data is entered and how the audit models measures. Special areas of concern are identified in Section 8.9.1.1. Mobile homes that have multiple additions and\or a basement may still be classified as a mobile home as long as the HVAC system is set up as a standard mobile home installation. When a combustion appliance zone is located in the basement, it may be more appropriate to treat the mobile home as a site-built structure. The determination should be made at the energy audit. The proposed measures may assist in the decision of which software should be used. Use Table 8.1 below to help guide that decision.

Table 8.1: Guidance for Determining Computerized Audit Software

	What software to use?	
	MHEA	**NEAT**
Building Characteristics to consider when deciding which software is appropriate for the building	Heating system and water heater located on main floor	Heating system and water heater are or will be located in basement or crawlspace
		Ducts and / or plumbing in basement or crawlspace
	Unconditioned basement or crawlspace	Intentionally (or unintentionally) conditioned basement
	Multiple additions that are similar and could be accurately modeled as one	Multiple additions with different wall characteristics
	When belly insulation will be maintained as the thermal barrier	When sill box or foundation insulation is an option

8.3.4 Modeling 5-24 Unit Buildings with Weatherization Assistant

The Division has developed a separate NEAT database for 5-24 unit multi-family buildings. As with the single-family Weatherization Assistant audits, this database includes enabled measures and default set-up libraries. The default database values are reviewed bi-annually and adjusted

at least annually. Agencies shall use the audit software and database version designated annually by the Division and posted on the HE+ website. Agencies may opt to customize their own set-up libraries to reflect local costs. Customized set-libraries shall:

- Use the same default fuel costs and preferences set by the Division annually.
- Only use measures enabled by the Division.
- Conform to the review and update schedule determined by the Division.
- Be reviewed and approved by the Division prior to use.

All electronic or hard copy of the documents shall be readily available to the Division upon request.

8.4 Computerized Audits for Buildings of 25 or More Units

Weatherization of buildings with 25 or more units is suspended until further guidance is issued.

8.5 Audit Requirements and Measure Specifications

1) All work will be completed in a cost effective and professional manner.
2) All materials will be installed to manufacturer specifications. For more specific information on installation procedures and guidance see the Weatherization Field Guide.
3) All debris shall be removed from the job site and disposed of properly.
4) All work will follow applicable codes and regulations of the authorities having jurisdiction.
5) Contractors providing services must be licensed and/or registered to provide those services if required by the authority having jurisdiction.
6) Building permits and any related costs are the responsibility of the Agency.
7) The Division will be the final authority for any questions regarding specifications and measures.
8) A description of maintenance and operation requirements of completed measures shall be provided to occupants.
9) Agencies shall make a reasonable effort to install products that meet ENERGY STAR® standards, whenever feasible. See materials specifications and procurement standards available on the HE+ Procurement SharePoint page.
10) All materials used shall meet the requirements outlined in Chapter 6, “Procurement”.
11) All removed or replaced appliances and materials including but not limited to furnaces, water heaters, refrigerators and freezers, shall become property of the Agency for recycling and proper disposal in accordance with state and federal regulations.

8.5.1 Attic and Kneewall Areas General

Model all ceiling/attic spaces for insulation. For enclosed cavities, model the maximum capacity that the space can accommodate. Add the amount of insulation that the energy audit specified. Determine the effective R-value of existing insulation by assessing the gaps in the insulation coverage. Use the following information to guide effective R-value estimates.

1) Good - One inch of insulation in good condition with unbroken coverage will have an R-value between 2.5 and 3.75 (contingent on the type of product).
2) Fair - One inch of insulation in fair condition (small gaps significant compressed areas) will have an R-value between 1.75 and 2.6 (approximate 30 percent loss in R-value).

3) Poor - One inch of insulation in poor condition (many substantial gaps and compressed areas amounting to 50% if area is uninsulated areas amounting to 5 percent) will have an R- value between 1.0 and 1.5 (approximate 60 percent loss in R-value).

When attic insulation is not being installed but attic prep work needs to be addressed, model the work in the Itemized Cost tab as “Attic Prep-No Insulation” and check “Include in SIR.” Report the work in WisWAP using the related measure, “Attic Prep-No Insulation.” Any insulation “blow over” necessary to restore existing functional insulation levels shall be part of the attic prep cost. Post an insulation certificate in the building upon completion.

8.5.1.1 1-4 Unit and Multi-Family Attic and Kneewall Areas Specifications:

1) Complete air sealing of key junctures and bypasses before adding insulation.
2) Insulate access hatches to the R-value of the attic insulation or maximum structurally allowable, whichever is lower. Box around attic entry to allow for repeated access.
3) Insulate the vertical and sloped areas to the maximum structurally allowable.
4) Vent all exhaust fans to the exterior. Seal and insulate all ducting for exhaust fans, to a minimum of R-8.
    a. Ducts with existing insulation do not have to be re-insulated. Ensure insulation is secure and provides continuous coverage.
5) Prior to insulation, prepare the attic by installing barriers around fan housing, chimneys, access points, and recessed lighting. If live knob and tube wiring cannot be eliminated from the attic, install a barrier to maintain a 3-inch air space around wires.
6) Identify all electrical junction boxes and live knob and tube barriers with flags.
7) If heating system distribution runs through the attic, seal all seams and insulate to an R-11 prior to installing any insulation over the distribution ducts.
8) Install attic ventilation based on applicable code requirements or if there is a potential moisture source that cannot be isolated or controlled by air sealing.

8.5.1.2 Mobile Home Attic and Kneewall Areas Specifications

1) Complete attic preparations including building barriers around fan housing and recessed lighting fixtures, and sealing chimney, key junctures and other obvious bypasses
2) Vent all exhaust fans to the exterior. Insulate exhaust fans ducts when feasible to R-8.
3) Insulate the attic to R-19, or maximum structurally allowable with blown fiberglass insulation. Do not dense-pack or over fill area.

8.5.2 Sidewall Insulation General

Model all uninsulated exterior walls of heated spaces to the maximum structurally allowable. Install insulation if the SIR is greater than or equal to 1.0. Model related repair costs separately in the Itemized Cost tab. Model each sidewall where voids are 10 percent or more of the sidewall area. Install insulation to the R-value allowed by the NEAT audit, using dense pack insulation techniques for loose-fill insulation. See the Weatherization Field Guide for more details on dense pack techniques.

8.5.2.1 1-4 Unit and Multi-Family Sidewall Insulation Specifications

1) Lift or remove the exterior layer of siding to drill through sheathing and any sub-layers of siding.

a. If siding cannot be removed, there shall be documentation in the customer file of the conditions that limited the removal of the siding.

2) Transite (slate) siding shall be removed intact only by persons with appropriate Department of Health Services (DHS) asbestos certification, unless the siding has been tested and does not contain asbestos. (See Chapter 9 for complete asbestos policy).
3) Sidewall insulation shall be installed following Lead-Safe Weatherization (LSW) procedures, under the supervision of a Lead-Safe Renovator when applicable (See Chapter 9 for complete lead policy). Any person who completes this work shall have been trained in LSW procedures.
4) Consider using blown fiberglass in buildings with brick façade

8.5.2.2 Mobile Home Sidewall Insulation Specifications

1) Inspect exterior siding and the interior wall materials to determine if insulating will create any structural problems
2) Insulate walls with complete coverage and uniform density throughout the accessible wall cavity.

8.5.3 Foundation/Floor Insulation General

Model foundation walls or floors that define the heating envelope, including the exterior walls of unintentionally conditioned crawlspaces, sill boxes, and slab-on-grade assemblies, for insulation with an energy audit. Install insulation only if the measure SIR is greater than or equal to 1.0.

Model related repair cost into the Itemized Cost tab.

8.5.3.1 1-4 Unit Foundation/Floor Insulation Specification

1) Complete air sealing prior to insulating, unless spray foam is being used for both purposes.
2) Model uninsulated sill box areas for installation of faced fiberglass batts or 2-part foam.
3) Model floors for insulation where they define the heating envelope to the maximum R-value structurally allowable.
    a. Install a minimum 6-mil vapor retarder over exposed earth floors, unless it presents a tripping or slipping hazard. Walk boards may be installed for access to mechanical systems.
4) Model accessible crawlspace walls for R-12 2-part foam insulation or R-19 fiberglass batt insulation in unintentionally conditioned areas. Other products including R-11 fiberglass, R- 19 2-part foam, or rigid insulation may be modeled and installed if the measure meets a minimum SIR of 1.0.
    a. Note: 2-part foam insulation may be used to insulate crawlspaces only when the area may be isolated from the interior of the building by a thermal barrier, such as half-inch drywall or plywood, from the interior of the building. For more information see Wisconsin Uniform Dwelling Code (UDC) SPS 321.11.
    b. Install a minimum 6-mil vapor retarder over exposed earth floors.
    c. A laminated sign (minimum size of 8 1/2” by 11”) shall be posted inside of the crawlspace access. The sign shall include contact information of the installer and shall caution those entering the crawlspace not to damage the air barrier, ground moisture barrier, insulation, or mechanical components specific to the

crawlspace. It shall prohibit storage of hazardous and flammable materials, and shall instruct those entering to contact the agency if damage occurs to any materials in the crawlspace. An optional “Crawlspace Sign Template” is available on the HE+ WisWAP Information page under the “Field Forms” heading.

5) Model exterior insulation of all accessible slab-on-grade foundations, inaccessible heated crawlspace foundations, and conditioned basements having an average above-grade exposure of 30” or more on the exterior surface of the exterior wall.
    a. If the model indicates a measure SIR of 1.0 or greater, Insulate exposed foundations with extruded R-5 foam board, with a durable weather resistant coating, to a minimum of 6” below grade.

8.5.3.2 Mobile Home Foundation/Floor Insulation Specifications

1) Prior to insulating the belly: Seal duct work and repair holes in the belly
    a. A 6-mil vapor barrier may be installed over exposed earth, based on site conditions.
    b. Belly repair shall be modeled as a repair measure in the Itemized Cost tab.
2) Insulate floors to the maximum the structure allows.
3) If installing blown fiberglass: Install at a density of 1.25 to 1.75 pounds per cubic foot.
4) Do not dense-pack or over-fill area.
5) Install a minimum of 2” of insulation between water pipes and the belly barrier and below ducts.

8.5.3.3 Multi-Family Foundation/Floor Insulation Specifications

1) Where they define the heating envelope, insulate floors to the maximum R-value the structure allows.
2) Insulate the accessible areas of slab-on-grade foundations to a minimum of R-5, and to a maximum of 6” below grade. Use extruded foam board with a durable weather resistant coating.
3) Seal and insulate accessible crawlspace walls to a minimum of R-12 and to a maximum of R-19. Typical applications include fiberglass insulation, 2-part foam, or rigid insulation.
    a. Install a vapor retarder over exposed earth in limited-access crawlspaces.
    b. Do not install a vapor retarder in any traffic area.
4) Seal and insulate sill box areas using faced fiberglass, rigid board, or 2-part foam up to a maximum of R-19. The sill box area shall be air-sealed prior to insulating.
5) Do not install insulation if it will cause or worsen an existing moisture problem.

8.5.4 Windows

All windows modeled for replacement shall be in the primary heating envelope. To consider a window for replacement, it shall meet both of the following conditions:

1) The window(s) shall be located in the primary heating envelope.
2) The window(s) shall have rotted or deteriorated frames or sashes.

Photographs are required for **each** window to be replaced. The photograph shall document specifically why the window was replaced, e.g., rotted frame or rotted sash, rotted frame and

rotted sash with deteriorated paint film. The photo(s) shall be available upon request by the Division (see 2.2.3 Customer Files).

The work shall be done in a lead-safe manner under the supervision of a certified Lead-Safe Renovator (see Chapter 9 Health and Safety for complete lead policy). Replace a window as an energy conservation measure if the measure meets a minimum 1.0 SIR when tested with the NEAT/MHEA audit.

Window replacement is categorized as:

1) An Energy Conservation Measure when the measure is modeled as a shell measure and meets a minimum 1.0 SIR.
2) A Repair Measure when windows do not have a measure SIR of 1.0 or better. Enter the measure into the "Itemized cost" tab and the cumulative SIR for the building is a minimum 1.0 SIR. Check "Include in SIR."

Basement windows may or may not be located in the primary heating envelope depending on the conditioning of the foundation. When a basement is an unheated (unconditioned) area, the windows are not in the primary heating envelope and may not be replaced. Basement windows may only be installed as a repair measure. Basement windows are exempt from the general requirement that windows meet ENERGY STAR® standards.

8.5.4.1 1-4 Unit and Multi-Family Windows and Specifications

1) Cloudiness inside existing insulated glass (IG) units because of seal leakage does not constitute “failure” of the window or of the IG unit.
2) Re-weather stripping of existing windows is allowed as an air sealing measure.
3) A window with a cracked or broken pane of glass, but where degradation of the frame and or sash is not occurring, will have only the glass repaired or replaced as an air sealing measure.
4) Window replacement in pre-1978 buildings shall be completed using lead-safe work practices, under the supervision of a certified Lead-Safe Renovator. For more information see the Weatherization Manual Chapter 9 – Lead-Safe Weatherization and – Minimum Standards for Lead-Safe Weatherization (LSW).
5) Window replacements in buildings that are 50 years old or older are subject to historic review by the Wisconsin Historical Society if the building work incorporates any DOE or LIHEAP funding.

8.5.4.2 Mobile Home Windows Specifications

Insider storms on windows with primary single pane glass and no storm may be installed as a repair measure if MHEA doesn’t select the measure as an ECM, provided the building has a minimum cumulative SIR of 1.0. Replace damaged insider storm windows on windows with primary single pane glass as a repair and if the cumulative SIR is 1.0 or greater. Repair or replace storm window glass when the glass is cracked or broken, but there is no degradation of the storm windows frame.

8.5.5 Air Sealing General

Use a blower door to guide air sealing work. Seal probable heat bypasses and key junctures. Repair or replace glass as needed. Whenever feasible, based on site-specific conditions, use

diagnostic tools such as depressurization, infrared scanners, and smoke testing equipment to determine the appropriate sealing locations in the building, specific units, and common areas. Provide sealing work that will improve the thermal boundary of the building and address the tenant comfort zone. Complete air sealing to all building types based upon specific Wisconsin protocols. See the Field Guide for more guidance on air sealing.

All air sealing work, depressurization testing, and worst-case draft tests shall be documented in the Diagnostic Workbook. If zone diagnostics are completed, document the results on the appropriate tab in the Diagnostic Workbook.

8.5.5.1 1-4 Unit Air Sealing Specifications

1) Seal all major attic bypasses, the sill box area if air leakage is identified and key junctures, as guided by the blower door. Replace missing or broken window glass and gross holes in the building envelope. Seal chases that may be open to the outside of the thermal boundary. Examples of these heat bypasses are open interior walls, garbage chutes, plumbing and heating chases, etc. These measures are classified as Major Air Sealing. Complete Major Air Sealing work prior to installing any other shell measures. Air sealing can be completed whether or not blower door testing is performed.
2) As a general rule for sealing "all major attic bypasses", conditioned air leaking into attics should be no greater than 10 percent of the total CFM50 of the final blower door test.
3) Conduct zone-pressure-diagnostic testing on homes with an attached garage, and in other homes as appropriate.
4) When a blower door test cannot be completed, perform Major and Minor Air Sealing. Minor Air Sealing air sealing targets drafts, to improve occupant comfort, and is limited to one hour.
5) If recommended by the Diagnostic Workbook, Agencies may use depressurization tests to guide forced air distribution system work, air sealing, and the maximum exhaust ventilation. Take steps to address depressurization that exceeds the guidelines.

8.5.5.2 Mobile Home Air Sealing Specifications

1) Seal all major attic bypasses. Replace missing or broken window glass and gross holes in the building envelope. Seal chases that may be open to the outside of the thermal boundary. Air Sealing measures are completed on the building prior to installing any other shell measures. Air sealing shall be completed whether or not blower door testing is performed.
2) As a general rule for sealing "all major attic bypasses", conditioned air leaking into attics should be no greater than 10 percent of the total CFM50 of the final blower door test.
3) Conduct building depressurization tests in all units.
4) When a blower door test cannot be completed, perform Major and Minor Air Sealing. Minor Air Sealing air sealing targets drafts, to improve occupant comfort, and is limited to one hour.
5) Use depressurization tests utilizing the Diagnostic Workbook to guide forced air distribution system work, air sealing, and the maximum exhaust ventilation. Take steps to address depressurization that exceeds the guidelines.

8.5.5.3 Multi-Family Air Sealing Specifications

1) Prior to insulating, air seal as follows:

a. Use the Multi-family Building Air Sealing Checklist to check and air seal typical air leakage locations, including but not limited to, heat bypasses between party walls and between the building and buffer zones, and building's key junctures.
b. Whenever feasible, use depressurization, infrared scanners, and smoke pencils as diagnostic tools to guide air sealing of attic bypasses, the sill box area, and key junctures.
c. Replace missing or broken window glass and seal gross holes in the building envelope.

2) After insulating, provide sealing work that will improve conditions in the tenant's comfort zone.
3) All air sealing shall be completed using materials with the proper fire rating.
4) Where appropriate, follow the basic air sealing procedures in the WI Weatherization Field Guide.

8.6 Mechanical Systems Measures

8.6.1 Heating System Replacement General

8.6.1.1 Modeling Replacement Heating Systems

Not all heating systems will be replaced. Follow the protocol below to determine if the system will be replaced.

Replacement heating systems modeled in the NEAT Heating System tab with a minimum SIR of

1.0 are considered energy conservation measures (ECMs). Fuel switching is allowed when the replacement meets a minimum 1.0 measure SIR and the job meets a minimum 1.0 cumulative SIR. Model all heating systems as an ECM first, unless otherwise indicated. A secondary heating system may be left in place only when it is properly modeled, meets the SIR requirements and is operating safely. See Weatherization Assistant Guide 6.0.8 for further details on modeling secondary heating systems.

If the heating system replacement has an SIR of less than 1.0, model the replacement in the Itemized Cost tab as a Health and Safety Replacement for each job.

8.6.1.2 Heating System Replacement

All heating system replacements shall meet the minimum specifications in the Wisconsin Weatherization Materials and Specifications and applicable procurement templates available on the HE+ Procurement SharePoint page.

A Heating Systems Checklist shall be completed on every heating system installation or clean and tune job by the technician performing the work. Heating System Checklists, inspection forms and efficiency and safety test results on all heating systems (existing or replacement) shall be maintained in the customer file.

1) Natural Gas and LP Forced Air Furnaces:

a. Inspect and test all furnaces for safety and efficiency.
b. Model all furnaces for replacement as an ECM by selecting “Evaluate All”.
c. For unsafe furnaces that have a measure SIR of less than 1.0.
    i. Replace the heating system if the job has a cumulative SIR of 1.0 or greater when modeled with the Health and Safety replacement.
d. If a system has less than 5 years of useful life and estimated repair costs greater than $500, replace the system if the job has a cumulative SIR of 1.0 or greater when modeled with the Health and Safety furnace replacement.

2) Oil Forced Air Furnaces:
    a. Inspect and test oil furnaces for safety and efficiency.
    b. Model all furnaces for replacement as an ECM by selecting “Evaluate All”.
        i. With agreement from the building owner, model fuel switching to gas for oil furnaces that are candidates for replacement. Proceed with the fuel switch if the measure SIR is 1.0 or greater.
        ii. Oil tanks placed out of service by the weatherization Agency in conjunction with a heating system fuel switch shall be sealed off or removed in accordance with Wisconsin Administrative Code ATCP 93. When performed with a fuel switch, report oil tank capping and removal in WisWAP measure ZRHS035 Fuel Switching.
        iii. Existing oil tanks placed out of service prior to the weatherization energy audit may be sealed or removed in accordance with ATCP 93 only if a documented health and safety reason exists at the time of the energy audit. When sealed or removed for health and safety reasons and not in conjunction with a fuel switch, report all oil tank costs in WisWAP measure XHAQ035 Other Remediation (see Appendix D WisWAP Reporting Guide).
        iv. In properties other than 1 and 2-unit buildings, the contractor performing tank cleaning and tank removal shall be certified in accordance with SPS Chapter 305.
    c. Unsafe furnaces that have a measure SIR of less than 1.0 may be replaced only if the job has a cumulative SIR of 1.0 or greater when modeled as a Health and Safety replacement.

3) Boilers:
    a. Inspect and test boilers for safety and efficiency.
    b. Model all boilers for replacement by selecting “Evaluate All”. First, model only a high efficiency gas boiler. If the computerized audit does not select the high-efficiency replacement boiler, then rerun the audit and model the standard efficiency boiler.
        i. With agreement from the building owner, model fuel switching oil to gas.
    c. Unsafe boilers that have a measure SIR of less than 1.0 may be replaced only if the job has a cumulative SIR of 1.0 or greater when modeled as a Health and Safety replacement.

4) Vented Space Heaters (non-wood):
    a. Inspect and test all space heaters for safety and efficiency.
    b. Model all space heaters for replacement as an ECM by selecting “Evaluate All”.
    c. Unsafe space heaters that have a measure SIR of less than 1.0 may be replaced

only if the job has a cumulative SIR of 1.0 or greater when modeled as a Health and Safety replacement.

d. Direct vented wall space heaters shall be sealed combustion.
    i. With agreement from the building owner, model fuel switching oil to gas and convert room heaters to direct vent wall heaters, where feasible. Proceed with the fuel switch if the measure SIR is 1.0 or better.

e. Oil space heater replacement shall be approved on a case-by-case basis. Submit information for review to the HE+ Help Desk.
    i. Include the Building ID# of the job, the reason for replacement, the reason why no heater fuel conversion is planned, and the manufacturer's specifications for the replacement unit, including the AFUE.

5) Other Space Heaters:
    a. Stand-Alone Electric: Repair, replacement, and installation are not allowable costs.
    b. Un-Vented Space Heaters: A home with an unvented space heater in the living space/inside the pressure boundary shall be deferred unless the space heater is to be removed as part of the required weatherization work, or the homeowner has the unit removed as part of the deferral.

6) Electric Conversion: Replace furnaces or baseboard heaters when there is an SIR of ≥1.0 for both the measure and the job.
    a. Modify the heating system type in the Heating tab to reflect planned replacement of the system, and include the AFUE of the new system.
    b. Use the Electric Fuel Switch Calculator Worksheet to determine the energy savings to be entered into the NEAT audit.
    c. To determine the SIR for the measure and the job, enter the conversion information generated by the calculator into the NEAT Itemized Cost tab.
        i. The required information includes the correct WisWAP measure line identification, the savings as predicted by the calculator, the fuel type saved, and the lifetime and the cost of the conversion.
        ii. Proceed if the replacement system if the measure and the job have an SIR of 1.0 or better.
    d. The Electric Fuel Switch Calculator Worksheet is available on the HE+ website. The completed worksheet results shall be printed and retained in the customer file.
    e. Existing baseboard heaters may be left in place. Unless not feasible (for example, units serving a space with no other heating supply), disconnect the baseboard heaters to prevent continued use of the units.

7) Wood (as primary system): Contact the HE+ Help Desk if switching from Wood to Natural Gas or LP to obtain how to calculate energy savings. Wood to wood replacements shall be performed as a Health and Safety measure. Do not model as an ECM.

8) Non-electric secondary heating systems may be replaced if the system is a safety hazard and cannot be eliminated with the replacement of a primary system with prior approval from the HE+ Help Desk.

8.6.1.3 Fuel Switching

Heating system replacements shall maintain the existing fuel type unless:

1) Natural gas or LP gas is available, and the fuel switch replacement measure has a minimum SIR of 1.0 when tested with the NEAT audit as an energy conservation measure; or
2) The existing system is electric and the conversion models with an SIR of 1.0 or better when the projected savings are calculated using the Electric Heat Conversion Worksheet and entered into the NEAT Itemized Cost tab; or
3) There are systems using different fuels exhausting into the same chimney.

If fuel switching is an option due to one of the conditions above, the Agency may convert heating systems or water heaters with the customer's consent.

Additional installation charges apply for winter installs of natural gas laterals. Agencies are encouraged to coordinate projects as to not incur additional charges for winter rates when practical.

1) If particular job circumstances dictate that winter rates cannot be avoided, the minimum cumulative job SIR to proceed with the fuel switch must be 1.5 or greater.
2) If job circumstances dictate that winter rates cannot be avoided and the cumulative job SIR is greater than 1.0 and less than 1.5, submit the .wdz file and other relevant information to the HE+ Help Desk for review. Prior approval by the Division is required.

All costs associated with fuel conversion shall be included with the heating system replacement measure when modeling the primary heating system for replacement with Weatherization Assistant. See the Weatherization Assistant Guide for additional information on modeling fuel switches using NEAT and MHEA.

In WisWAP, report the heating system bid costs to the appropriate WisWAP heating system measure. Additional costs of fuel switching such as exterior lateral installation and oil tank treatments shall be included in measure ZRHS035 – Fuel Switching. If performing an LP to Natural Gas fuel conversion only (no replacement), report all costs using WisWAP measure ZRHS035 – Fuel Switching. Include the total linear feet of exterior natural gas lateral installed and the type of fossil fuel switch (Oil to LP; Oil to NG; LP to NG) in the comments, when applicable.

The maximum allowable expenditure for measure ZRHS035 is $1,500. If the fuel switching costs are estimated to exceed $1,500 the agency shall contact the HE+ Help Desk and receive approval from the Division prior to proceeding with the fuel switch.

See the Fuel Switch Policy heading on the HE+ WisWAP Information page for additional guidance. Agencies shall notify the HE+ Help Desk and receive prior approval before proceeding with large-scale fuel switch projects (e.g. entire mobile home parks, neighborhoods or communities).

8.6.1.4 1-4 Unit Heating System Replacement and Mobile Home Specifications

All replacement heating systems except for space heaters and wood space heaters shall meet the minimum Wisconsin weatherization program efficiency standards and listed in the AHRI Directory of Certified Product Performance. Replacement wood space heaters shall be AHRI listed appliances. Wood heater installation shall conform to the requirements of NFPA 211.

1) Use the existing distribution system and gas supply line whenever safe and feasible.
2) Properly remove and dispose of existing unit. In electric conversions, the Division recommends disconnecting existing electric baseboard units at the service panel and leaving them in place.
3) New installations require a dedicated electrical circuit rated or fused to match the amperage of the new system's requirements for overcurrent protection.
4) Provide an owner's manual with a heating system replacement on or near the heating system. The manual shall be attached in a durable device that allows for repeated customer access.
5) Properly size replacement heating systems units using an accurate analysis through REScheck™, ACCA Manual J, or an equivalent industry-accepted sizing procedure.
    a. When sizing boiler systems, consider the capacity of the existing terminal devices and whether or not domestic hot water will be heated with the boiler. If the load is too high or too low for the house, make the necessary adjustments to the distribution system.
6) Space heaters (non-wood) require:
    a. An air circulating fan (not applicable to electric baseboard).
    b. A properly grounded duplex receptacle for electrical service.
    c. A fire-rated floor protector if required PMI, sized to the width and length of the space heater.
7) Install a condensate pump where needed to reach an appropriate drain. Condensate pipes generally may drain to 1) laundry standpipe; 2) a new standpipe, indirect or local waste pipe; or 3) a floor drain when the pipe can be properly secured and does not pose a hazard to the occupants. All installations require an air break. Condensate lines cannot be drilled directly into any drainpipe or drain to grade or to a sump pit. For the more information see Wisconsin Uniform Dwelling Code (WI UDC) SPS 323.156. Local jurisdictions may vary on acceptable options.
8) Condensate pumps may be installed using an existing (non-GFCI) receptacle accessible without an extension cord, a new GFCI receptacle, or directly wired in accordance with pump and furnace manufacturer's recommendations and the requirement of the authority having jurisdiction.
9) Gas pipe will be installed, supported, and electrically bonded (if required) in accordance with NFPA-54 and the WI Uniform Dwelling Code. Follow the manufacturer's specifications for installation. For more information see NFPA-54 and WI SPS 316.250.
10) When improperly bonded CSST is present in the building at audit and no fuel system work will be completed as part of the weatherization job, the agency may bond the existing CSST properly, per NFPA 54 (sec 7.13.2), 2015 IFGC (sec 310.1.1), and NFPA 70 (NEC).
11) Verify that flue-gas oxygen, temperature, draft, and carbon monoxide levels are within the manufacturer's specifications. Make adjustments as necessary.
12) Ensure that all remaining naturally vented combustion appliances are drafting properly.

13) Seal openings in chimneys where naturally vented combustion appliances are eliminated. A written notice on the chimney where sealed, that the chimney is no longer functional, is recommended.
14) Remove furnace humidifiers (with owner's permission) and seal water line whenever possible.
15) Ensure existing programmable thermostats are compatible with the furnace. Configure two-stage systems so that stages are controlled by the thermostat (building temperature), not the furnace (cycle time).
16) If the existing thermostat can't control multiple furnace stages based on air temperature, install a two-stage (or multi-stage) programmable thermostat compatible with the furnace.
17) Only if existing wiring cannot support the multi-stage thermostat, run new wiring.
18) Only if necessary, move the thermostat to another interior wall location that offers a straight wiring run. Leave the existing thermostat in place, and label it as having been disabled.

8.6.1.5 Multi-Family Heating System Replacement Specification

Building owners may opt to replace existing heating systems that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. Miscellaneous heating system repair measures that are required for the heating system to function properly shall be modeled separately in the Itemized Cost tab. The owner's contribution shall be equal to or exceed the buy-down amount to generate an SIR equal to or greater than 1.0. Note: as stated in the General Policy and Specifications, the buy-down of measures shall not result in other cost-effective measures being dropped from the improvement package. All measures that were cost-effective after the initial energy audit is conducted shall remain on the list of measures to be completed at the property.

Replacement heating systems shall meet ENERGY STAR® standards whenever possible. Replacement heating systems that are not addressed in these specifications are subject to review and approval by the Division. All replacement heating systems shall meet the requirements of the Wisconsin Commercial Building Code, SPS 364 and the International Mechanical Code, as referenced by SPS 364 or any other commissioning requirements of the authority having jurisdiction.

1) Gas Heating Systems - Natural Draft: Model all gas-fired heating systems for replacement. Inspect fan-assisted systems for potential safety issues and model for replacement if safety issues cannot be repaired.
2) Gas Heating Systems - Sealed Combustion: Inspect systems for potential safety issues and model for replacement if safety issues cannot be repaired.
3) Oil Heating Systems: Model for replacement if the existing system is 10 years or older in age. Inspect systems less than 10 years old for potential safety issues and model for replacement if safety issues cannot be repaired.
4) Space Heaters: Model for replacement if the existing space heater is 10 years or older in age. If necessary, use the 5-24 Unit Workbook to generate savings information for multiple space heaters, incorporating the savings information and costs into NEAT's Itemized Cost section. Include all of the costs associated with the fuel switch in the replacement costs. Inspect systems less than 10 years old for potential safety issues

and model for replacement if safety issues cannot be repaired.

5) Electric Furnace Conversion: Model for replacement with gas furnace with the energy audit or the Electric Heating System Conversion Calculator. Include all costs associated with the fuel switch in the replacement costs. Inspect all units that will not be replaced for potential energy conservation measures and safety issues.

All replacement heating systems, except wood burning units, shall meet the minimum Wisconsin weatherization program efficiency standards and the AHRI Directory of Certified Product Performance standards. The type of efficiency standard varies based on the fuel type and the heating system type (commercial versus residential).

1) Use existing distribution system and gas supply line.
2) Properly remove and dispose of existing unit. In electric conversions, the Division recommends disconnecting the existing baseboard units at the service panel and leaving them in place.
3) Provide an owner's manual with heating system replacements. Ensure that the owner or building manager receives training regarding effective operation, and procedures for start- up, operation, maintenance, and seasonal shut-down.
4) Install properly sized and commissioned units following the requirements of the Wisconsin Commercial Building Code or the authority having jurisdiction.
5) Install a condensate pump where needed to reach an appropriate drain. Condensate pipes generally may drain to 1) a laundry standpipe; 2) a new standpipe, indirect or local waste pipe; or 3) a floor with a floor drain when the pipe can be properly secured and does not pose a hazard to the occupants. All installations require an air break. Condensate lines cannot be drilled directly into any drainpipe. For the more information see the Wisconsin Plumbing Code SPS 382.33. Condensate pumps may be installed using existing receptacles, new GFCI receptacles, or directly wired per manufacturer's recommendations.
6) When required, an approved gas pipe type will be installed, supported, and electrically bonded in accordance with NFPA-54. Follow the manufacturer's specifications for installation. For more information see NFPA-54/International Fuel Gas Code Chapter 4.
    a. When CSST is present in the building and not correctly bonded, bond the gas piping system.
7) Seal openings in chimneys where atmospheric vented appliances are eliminated. When sealed, a written notice on the chimney that the chimney is no longer functional is recommended.
8) The installer shall guarantee materials and labor for heating system replacement for a period of one year, starting from the date of satisfactory installation.

8.6.2 Other Heating Systems Work General

Order a clean and tune measure for natural gas and LP heating systems that will not be replaced, only when diagnostic tests indicate that efficiency can be improved, or excessive CO production can be reduced to safe levels. Perform a clean and tune on all primary oil heating systems that will not be replaced.

Evaluate and test distribution systems. Seal major return and supply leaks. Seal and insulate ducts in unheated areas. Model system repair costs separately in the Itemized Cost tab. Programmable thermostats may be installed when the existing thermostat must be replaced,

and the occupant is willing and able to program the replacement thermostat. Programmable thermostats are not recommended for boilers.

8.6.2.1 1-4 Unit, Mobile Home and Multi-Family Other Heating Systems Work Specifications

1) Clean and tune primary oil furnaces or oil boilers that will not be replaced. Secondary systems may receive a clean and tune as determined by the auditor, when the work is likely to improve efficiency or reduce CO production to acceptable levels.
2) When improperly bonded CSST is present in the building at audit and no fuel system work will be completed as part of the weatherization job, the agency may properly bond the existing CSST to comply with NFPA 54 (sec 7.13.2), 2015 IFGC (sec 310.1.1), and NFPA 70 (NEC).
3) When performing a clean and tune, upgrading a shared electrical circuit to a dedicated circuit is not required. However, if the circuit is rated for higher amperage than is required by the heating system, provide a properly sized fuse or breaker at the appliance or at the service panel.
4) For sealed combustion heating systems installed as a one-pipe (exhaust only) system, convert the appliance to a two-pipe (intake and exhaust) system. Comply with manufacturer's instructions and NFPA 54 for location of intake pipe.
5) Inspect and test forced-air heating systems for temperature rise, airflow, and for Health and Safety problems
6) Seal all gross holes, and seal distribution leakage as directed by the Worst Case Depressurization test recommendations in the Diagnostic Workbook when naturally drafting appliances are present in the building and when negative indoor air quality conditions exist in the basement CAZ. (Note: see the Field Guide for additional guidance).
7) Take corrective action if a building CAZ is excessively depressurized or is otherwise negatively impacting natural-draft appliances.
8) Measure the heating system’s temperature rise to confirm that it meets manufacturer’s specifications. (Note: see the Field Guide for additional guidance).
9) Seal and insulate ductwork in unheated areas with a minimum of R-11 foil-faced insulation. Ducts may be insulated with two-part foam products that meet the federal specification for duct insulation.
10) Install dampers and ensure a proper temperature rise reading where ductwork is added.
11) Adjust fan speed levels as necessary to ensure customer comfort and to verify that the temperature rise for the heating system meets manufacturer specifications for new furnace installations. If adjusting fan speed levels does not bring temperature rise levels within manufacturer’s specifications, consider performing ductwork modifications. When feasible, install cold air returns to second floor rooms as needed (especially where electric space heaters are used to condition the second floor). See the Field Guide for modification specifications.
12) In rooms other than kitchens and bathrooms with limited or no return air, consider adding a return duct, undercut the door, or install a transfer grille or jumper-duct to improve the return airflow, with the owner’s permission and when feasible.
13) Return grills are not allowed in the combustion appliance zone and shall not be installed in unconditioned areas or unintentionally conditioned areas.
14) Consult with customers about the removal of existing supply grills on the plenum. A new

supply register may be installed to replace plenum grilles at a location where conditioning is needed (e.g., a laundry area or work bench).

15) Boiler distribution systems shall be inspected for proper operation.
    a. Flush the existing distribution system according to manufacturer's instructions. If instructions are not available, flush until water runs clear and free of sediment. For zoned systems, flush each zone separately.
    b. Bleed air from the entire system.
    c. Install an automatic fill valve and back-flow preventer if they are not present.
    d. On compression (bladder style) expansion tanks, install an air excluding device if not present. Systems with standard (non-compression) style expansion tanks should not have automatic air excluding devices installed.
    e. Install a compression tank or fill the existing expansion tank and the system to the correct level.
    f. Ensure all safety systems are operational. If a low-water cutoff and pressure relief valve are not present or not functioning properly, install compatible controls.
    g. Where feasible. Install electric vent damper on atmospherically vented boilers.
    h. Where feasible, install thermostatically controlled radiator valves on the major radiators.
    i. Install outdoor reset and boiler controls, if feasible.
    j. Inspect radiators. Repair or replace as necessary.
    k. Install automatic and manual air bleed valves to eliminate air from each high point in the distribution system if they are not present and functioning properly.
    l. Inspect supply and return lines and connections and repair leaks.
    m. Insulate supply and return piping outside conditioned spaces with foam or fiberglass pipe insulation.
    n. Model for extending new piping and radiators to conditioned areas like additions and finished basements that are currently heated by space heaters if feasible.
    o. Insulate pipes in the circulating loop between the boiler and an indirect domestic water heater.

16) Outdoor reset controls
    a. High efficiency boiler: Install an outdoor air temperature sensor and boiler controls to improve efficiency. Include outdoor reset for all boilers and warm weather shut-down, unless it affects domestic hot water.
    b. Non-high efficiency boiler: Consider implementing the requirement identified in 15) a. above.

17) Consider installing programmable thermostats with forced air systems. Relocate thermostats to interior walls and instruct occupants regarding the operation of setback thermostat. Programmable thermostats are the only allowable replacement thermostats that can be reported as an energy conservation measure. A reasonable effort shall be made to upgrade existing thermostats to a programmable thermostat that meets the household's needs. Properly recycle any thermostat that has been replaced. Many locations have designated collection facilities for household hazardous waste or conduct annual or occasional "clean sweeps." Contact the nearest DNR regional office for local options.

18) In the event the Agency elects not to install a programmable replacement thermostat, a working thermostat shall not be replaced. If the current thermostat is non-functional, a

conventional thermostat may be used but the cost shall be treated as a Repair Measure since energy savings are not associated with a non-programmable thermostat. Report thermostats separately from heating system replacement costs. Properly recycle any thermostat that has been replaced.

19) Replace oil filters.
20) For forced air units that receive a clean and tune or replacement, provide the occupant with one of the following MERV 6 or higher filters:
    a. One deep pleated (3" depth or more) disposable furnace filter, or
    b. Six 1"-2" disposable filters (one installed; five replacements), or
    c. One permanent cleanable filter.
21) Special filters for air cleaning may only be installed as a Health and Safety measure, based on building occupant medical conditions.
22) All forced air systems shall have a filter cover. Magnetic filter covers are allowable only if they provide an adequate seal to the ductwork to prevent air leakage.
23) For all heating system work, including replacements, a tag shall be prominently affixed to the heating unit identifying the date of installation and who the customer should call for service. The tag information shall include the name, address, and telephone number of the service organization.

8.6.3 Water Heater Replacement General

Model water heater conversion or replacement as an energy conservation measure with the audit based on the criteria listed in the specifications. All replacement water heaters shall meet the minimum Wisconsin Weatherization Material Specifications, unless otherwise specified below. The specifications are available on the HE+ Procurement SharePoint page under the "Policy" heading.

8.6.3.1 1-4 Unit and Mobile Home Water Heater Replacement Specifications

1) Fuel switch water heater conversions: Model water heater conversion from electric to gas, LP to natural gas, or oil to gas as an energy conservation measure when the following conditions are met:
    a. Gas is available.
    b. The customer agrees to the conversion.
    c. If the existing electric water heater is load controlled (time of use), the Agency shall contact the HE+ Help Desk for approval prior to proceeding with a fuel switch.

   Replace the water heater if selected by the audit as an ECM. The replacement water heater shall be power vented.
2) Replacement without fuel switching. Model electric to electric or gas to gas water heater replacement as an energy conservation measure with the audit if the existing water heater is over-sized for the household or the water heater needs to be replaced as a Health and Safety Measure. Replace the water heater if the measure is selected by the audit as an ECM. See Weatherization Assistant Guide Chapter 4 for modeling guidance.
3) If the unit is a mobile home the replacement water heater shall be rated for mobile home use and meet the following efficiency standards as listed in the latest editions of the AHRI Directory of Product Performance.
4) Indirect water heaters may be installed when the building has, or will have, a high

efficiency boiler and the water heater is selected as an energy conservation measure with the audit (a minimum 1.0 SIR). See Weatherization Assistant Guide Chapter 4 for additional details on modeling the indirect water heater.

a. When an existing indirect water heater must be replaced because of health and safety conditions model the replacement as indicated above.
b. Removal and disposal of the old water heater is required.
c. Follow manufacturer's instructions when installing indirect water heaters.

5) The sizing of replacement water heaters shall consider the number of people in the household.
6) Replacement based on Health and Safety: If the water heater replacement measure SIR is 1.0 or greater, report it in WisWAP as an ECM. If it is less than 1.0, model the replacement as an itemized cost, and report it as a Health and Safety replacement. Note: Replacement water heaters of the same type, with higher EF/UEF are allowed when a leaking water heater is replaced as a Health and Safety measure and there are acceptable draft and combustion appliance zone (CAZ) depressurization test values.
7) Affix a tag to the water heater identifying the date of installation and who the customer should call for service. The tag shall be prominently displayed and include the service provider's name, address, and telephone number.

8.6.3.2 Multi-Family Water Heater Replacement Specifications

When needed to model multiple water heater replacements, use the 5-24 Unit Workbook to generate savings information. Incorporate the savings information and costs into NEAT's Itemized Cost tab. Building owners may opt to replace existing domestic hot water heating systems that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. The owner's contribution shall be equal to or exceed the buy-down amount needed to reach an SIR of 1.0. The replacement system shall be properly sized. All work will follow the Wisconsin Commercial Building Code, any commissioning requirements that apply, or other codes and regulations by the authority having jurisdiction.

1) Gas to gas replacements or system conversion: Replace the water heating system if the replacement has a minimum 1.0 SIR when modeled with the energy audit. The replacement water heater shall be one of the following:
    a. Power-vented and have a minimum .67 EF or .64 UEF (for 40 and 50 gallon units).
        i. 30 gallon water heaters shall have a minimum .63 EF or .60 UEF, and may be installed only when the unit cannot be upgraded to a 40 gallon unit.
    b. An indirect water heater working with a high-efficiency boiler system.
    c. A heat pump water heater with an EF of 2.0 or greater.
    d. One of the units listed above with a solar component. Solar water heaters shall be modeled in the NEAT itemized Cost tab.
2) Fuel switch water heater conversions**:** Fuel Switching water heating systems from electric to gas or LP to natural gas is allowed when the total cost for fuel switching the system is modeled with the energy audit, the measure meets a minimum 1.0 SIR, and the building owner agrees to the conversion.
3) Building owners may opt to replace (at their cost) existing water heating systems that do

not meet a weatherization program measure SIR of 1.0 or better, with the actual cost counted as part of their contribution toward the weatherization of the building. The replacement system shall be properly sized and represent an increase in efficiency of at least 5 percent over the existing water heating system. The replacement shall be completed prior to the final inspection of the weatherization measures.

4) Electric to electric: Model the existing water heater system for replacement if the system is not properly sized, the water heater needs to be replaced based on safety concerns, or there is the potential to maximize energy efficiency. Replace the water heating system if the replacement has a minimum 1.0 SIR when modeled with the energy audit. The replacement water heater shall meet one of the following standards:
    a. An electric storage water heater with a minimum .95 EF or .93 UEF.
    b. A heat pump water heater with an EF of 2.0 or greater.
    c. One of the units listed above with a solar component. For solar water heaters, contact the HE+ Help Desk for assistance in calculating the savings costs.
5) All replacement water heater(s) shall be sized properly for their intended use.
6) Removal and proper disposal of the old water heater is required.
7) Affix a tag to the water heater identifying the date of installation and who the customer should call for service. The tag shall be prominently displayed and include the service provider's name, address, and telephone number.

8.7 Baseload Measures

8.7.1 Lighting

Replace the most frequently used incandescent light bulbs with CFLs or LEDs. In general, this includes all existing incandescent light bulbs except those in areas where lights are rarely or never used. Existing CFLs shall not be replaced with LEDs. LED bulbs do not operate in all styles of dimmable fixtures, Agencies shall install LED bulbs in dimmable fixtures at their discretion. Replace all halogen torchieres with CFL or LED torchieres, and remove and dispose of old torchieres. Replacements shall be appropriate for the intended use and shall be installed and inspected prior to completion of the unit.

All lighting shall meet ENERGY STAR® standards. Agencies may use https://www.energystar.gov/productfinder/ to check for availability of ENERGY STAR® certified lightbulbs, and use non-certified lightbulbs when ENERGY STAR® is not available, documenting this in the customer file.

8.7.1.1 1-4 Unit and Mobile Home Lighting Specifications

1) See Weatherization Assistant Guide Section 4.5 for modeling instructions.
2) CFL or LED dedicated replacement fixtures may be used, if appropriate.
3) Increase lighting efficiencies in common areas of 2-4 Unit buildings.
4) Provide CFL disposal and clean-up instructions to customers with Guidebook.

8.7.1.2 Multi-Family Lighting Specifications

Convert incandescent lighting to more efficient fluorescent (CFL), LED or induction lighting as a single improvement package or measure as identified in the specifications. Replace exit lighting

with LED replacements. When needed, use the 5-24 Unit Workbook to generate the savings for lighting packages, incorporating the savings information and costs into NEAT's Itemized Cost section. Individual lighting may be modeled with Weatherization Assistant.

1) Package lighting ECMs for the common area of the building in the following locations and conditions:
    a. Exterior lighting that operates from dusk until dawn or longer.
    b. Lighting in corridors and common areas, with occupancy sensors where feasible.
    c. Model tenant lighting that is used most frequently for the longest duration.
2) The use of induction lighting to replace exterior mercury vapor or high-pressure sodium lighting is allowed.

8.7.2 Domestic Water Heater Measures

Install showerheads and flow restrictors. Reduce water heater temperature to 120 degrees, where feasible. **Do not** model domestic hot water measures with Weatherization Assistant. Identify measures in the Itemized Cost tab and **do not** check "Include in SIR."

8.7.2.1 1-4 Unit and Mobile Domestic Water Heater Measures Specifications

1) Install 1.5 GPM or less showerheads and faucet aerators on every fixture.
2) Reduce water heater temperature to 120 degrees.
3) Insulate 6' of hot and cold water pipes from water heater if water heater is located in a water heater closet with only an outdoor access in a mobile home.
4) Insulate all pipes on the circulating loop between the boiler and a sidearm water heater.

8.7.2.2 Multi-Family Domestic Hot Water Heater Measures Specifications

1) Install 1.5 GPM or less showerheads and faucet aerators on every fixture.
2) For central boiler water heaters, insulate all accessible pipes within the boiler room, including the pipes in the circulating loop between the boiler and the water heater.
    a. For hot water systems install one and a half-inch fiberglass insulation on all pipes less than or equal to one and a half inches and two inches of fiberglass insulation on all pipes greater than one and a half inches in diameter.
    b. For steam systems install one and a half-inch fiberglass insulation on all pipes less than or equal to one and a half inches and three inches of fiberglass insulation on all pipes greater than one and a half inches in diameter.
3) Reduce water heater temperature to 120 degrees.
4) Where a recirculating pump is present, install an aquastat control on the return end of the loop to shut off the pump when the line is hot. Set the aquastat to turn on the pump when the line temperature drops to 110 degrees. Set the control to provide a deadband of 5 degrees or more.

8.7.3 Refrigerator Replacement and Removal

Model the refrigerator for replacement. The replacement unit shall meet Wisconsin weatherization program specifications. Replacement refrigerators are limited to one per household and shall be a top freezer automatic defrost model with no through the door ice or water and no automatic ice maker. The unit being replaced shall be the least energy efficient

one. A removal incentive may be offered for additional units not being replaced based on the specifications below.

Bottom-freezer and side-by-side refrigerator units shall be considered on a case-by-case basis for households with accessibility considerations. Model the unit with the energy audit. If the audit generates an SIR of 1.0 or greater, document the reasons for installation of the specialty unit in the customer file. If the replacement does not have an SIR of 1.0 or greater and the agency has determined an install is warranted, the agency shall submit a waiver request to the HE+ Help Desk and receive approval prior to installation of the specialty unit.

8.7.3.1 1-4 Unit, Mobile Home and Multi-Family Refrigerator Replacement and Removal Specifications

1) Follow the guidelines in Table 8.2 to size the replacement refrigerator.

Table 8.2: Refrigerator Sizing

Existing Size	Modeled Size*	Example Exceptions
14.5 – 19.4 cu. ft.	17.5 – 19.4 cu. ft.	Large households, dimensions of opening
19.5 – 21.4 cu. ft.	19.5 – 21.4 cu. ft.	

*When exceptions apply, model the appropriate size for the household. Use 16 cu. ft. refrigerator models rather than 15 cu. ft. whenever feasible.

2) Offer a $100 incentive for removal of additional functioning units manufactured prior to 2003 or units with R12 refrigerant listed on the label.
    a. Incentives to remove a unit may be paid for a maximum of two refrigerators per household.
    b. Units must be plugged in at the time of the audit and in use continuously for a majority of the year to be eligible.
3) Additional units that do not qualify for an incentive may be removed with customer approval. Report disposal costs in WisWAP with a comment about the additional unit disposal.
4) De-manufacture and properly dispose of all refrigerators removed.

8.7.4 Freezer Replacement and Removal

Functioning freezers equal to or greater than 7 cubic feet may be modeled for replacement. The replacement unit shall meet the Wisconsin weatherization program specifications in and be a

manual defrost freezer of comparable or smaller size than the existing freezer. Replacement freezers are limited to one per household. Existing chest type freezers may be replaced with chest type freezers and existing upright freezers may be replaced with a chest freezer. A removal incentive may be offered for additional units not being replaced based on the specifications below.

8.7.4.1 1-4 Unit, Mobile Home and Multi-Family Freezer Replacement and Removal Specifications:

1) Document existing freezer information in the customer file and as required in WisWAP.
2) Both chest and upright freezers may be considered for replacement. Model freezers in NEAT using values obtained from the Freezer Replacement Calculator to determine if the freezer has an SIR of 1.0 or more. Maintain a copy of the completed Freezer Replacement Calculator in the customer file.
3) Replacement freezers shall be approximately equal to or less than the size of the existing freezers. In situations where downsizing is not feasible, consider the size of the family and the way they use the freezer in selecting a replacement freezer.
4) Offer a maximum $100 incentive for removal of additional functioning units that are not being replaced, are ≥ 7 cubic foot or larger and were manufactured prior to 2003 or have R12 refrigerant listed on the label.
    a. Incentives to remove a unit may be paid for a maximum of two freezers per household.
5) Additional existing units that do not qualify for an incentive may be removed with customer approval. Report disposal costs in WisWAP with a comment about the additional unit disposal.
6) Consolidation: When two freezers are present, with the owner's permission model the combined total consumption for the two units with a single replacement unit of comparable volume up to 19 cubic feet.
7) De-manufacture and properly dispose of all freezers removed.

8.8 Health and Safety Measures

Health and Safety measures are defined as the cost of materials and labor necessary to eliminate or reduce hazards existing prior to, or potentially resulting from, the installation of weatherization materials. Resolution of Health and Safety hazards using Weatherization Program funds shall be done in conjunction with the installed ECM. Products meeting ENERGY STAR® standards shall be used unless otherwise indicated. When using modeling, include the Health and Safety measures in the Itemized Cost section.

NEAT/MHEA Modeling Guidance: Model Health and Safety measures using the Itemized Cost tab. Select the measure from the drop-down menu. Do not check "Include in SIR" box.

8.8.1 Depressurization and Worst Case Draft Testing

Test the building's Combustion Appliance Zone (CAZ) for depressurization under worst case conditions. A Worst Case Draft (WCD) test shall be completed in every CAZ that has naturally vented combustion appliances, including gas or wood fireplaces, or space heaters. Each atmospherically vented appliance shall have an adequate draft and no spillage under Worst Case Draft (WCD) conditions. The depressurization tightness limits, testing procedures and adequate draft standards are outlined in the Weatherization Field Guide. See Air Sealing Specifications for specific approaches to building CAZ configurations.

NEAT/MHEA Modeling Guidance:

1) List Worst Case and Makeup Air measures using the Itemized Cost tab.

2) Do not check the "Include in SIR" box.

8.8.1.1 Building is Below Depressurization Tightness Limit

This section applies to buildings with wood burning appliances or other appliances that cannot be tested for Worst Case Draft. When the final CFM_{50} is below the DTL CFM_{50} a multi-point series of blower door readings shall be completed. The multi-point test will provide a more accurate flow exponent for the building. For most buildings the default exponent of 0.65 provides an acceptable model for calculating building depressurization limits. On very tight buildings a change in the flow exponent will impact on the amount of ventilation needed and the depressurization limit for the building. Flow exponents usually vary between 0.5-0.9. Generally multi-point test numbers with exponents that are greater than 0.65 indicate the remaining air

leaks are smaller and more diffuse, generating a higher DTL CFM_{50}; the test results with an exponent around 0.5 indicate larger leaks, generating a lower DTL CFM_{50}. The Diagnostic Workbook provides a worksheet to document the multi-point test and calculate the flow exponent.

When the Diagnostic Workbook generates a warning notice to add make-up air to a dwelling, agencies shall enter the actual cfm flow rates of the exhaust appliances. This is necessary as the estimates for the amount of make-up air to add are based on the cfm flow rates documented in the workbook.

8.8.1.2 1-4 Unit and Mobile Home Depressurization and Worst-Case Draft Testing Specifications

1) Complete depressurization testing on all buildings with combustion zones before and after weatherization is completed.
2) Complete combustion safety tests on all buildings with natural draft or fan assisted combustion appliances to ensure safe operation.
3) Confirm that the final CFM50 in buildings with solid fuel burning appliances present or with appliances that cannot be tested for WCD are above the DTL. Install makeup air in buildings that are below DTL or document existing make-up is already present.
4) Remedies for poor draft may include modifications to the flue or chimney, repairs or modifications to the furnace distribution system, or elimination of other negative pressures in the combustion zone.

8.8.1.3 Multi-Family Depressurization and Worst-Case Draft Testing Specifications

1) When feasible, isolate the CAZ from the rest of the building. Use fire-stopping materials as required by code.
2) Complete combustion safety tests on buildings to ensure safe operation of all atmospheric vented appliances.
3) Ensure natural gas or LP water heaters and heating systems draft properly. Remedies for poor draft may include modifications to the flue or chimney, repairs or modifications to the furnace distribution system, or elimination of other negative pressures in the combustion zone.
4) In buildings with central heating systems, isolate the mechanical room (CAZ) from the rest of the building.

   a. Provide properly sized combustion air as needed.
   b. Seal forced air distribution leaks in the CAZ.
5) In buildings with individual heating systems in each unit and/or common areas, identify the CAZ in each unit or area.
   a. Ensure that there is adequate combustion air for each appliance.
   b. Test naturally drafting combustion appliances to ensure there is adequate draft under worst case depressurization conditions.
6) In buildings that incorporate an enclosed garage, determine the control methodology for managing combustion by-products.
   a. Ensure that the mechanical exhaust ventilation is controlled effectively, operates properly, and is properly sized.
   b. Where needed, install a carbon monoxide monitoring system that activates the garage ventilation equipment.
   c. Where feasible, use diagnostic testing to ensure that there are no air pathways between the garage and occupied areas.
7) All air sealing shall be completed using materials with the proper fire rating. See the Appendix C (below) regarding Weatherization Materials, for more information.
8) Install carbon monoxide alarms in all units that have gas appliances.

8.8.2 Mechanical Ventilation

Install properly sized mechanical ventilation when needed to ensure indoor air quality. Unless superseded by local codes, use the appropriate ASHRAE 62.2-2016 standard to calculate the requirements for continuous ventilation beyond the local exhaust ventilation requirements.

Ventilation upgrades are not required unless the individual living unit requires more than 15 cfm of continuous ventilation.

If a customer refuses ventilation required by ASHRAE 62.2-2016, the Agency shall use discretion when proceeding with weatherization and may defer the building if there is a documented health and safety concern. If weatherization proceeds without the required ventilation, DOE funds shall not be used. All measures in the building must be invoiced to PB or EAP only.

Follow the Diagnostic Workbook instructions regarding continuous ventilation. See the Weatherization Field Guide for detailed ventilation specifications.

8.8.2.1 1-4 Unit and Mobile Home Mechanical Ventilation Specifications

The installation of mechanical ventilation is not required in buildings requiring 0 CFM or buildings with a calculated 20 CFM natural ventilation per occupant, or greater, as determined by the Diagnostic Workbook. Install whole house ventilation only in buildings requiring more than 15 CFM continuous ventilation. Exceptions include:

1) Install local exhaust ventilation for spot moisture control in buildings requiring 1 CFM or more, where the existing spot ventilation is not operated by the occupants for a reasonable amount of time per day. Provide the customer with education on proper use of spot ventilation.

2) Install local exhaust ventilation for spot moisture control in buildings requiring 1 CFM or more, where there is no ventilation. Provide the customer with education on proper use of spot ventilation.
3) Agencies may install local exhaust ventilation in any buildings where there is documented evidence of moisture or indoor air problems. Use ASHRAE 62.2-2016 to determine the needed ventilation and utilize a controller that best meets the customer's needs.

Ventilation controllers shall have a labeled on/off control option for customers. This may be accomplished by installing a controller with an on/off switch or a separate switch. Customers shall be provided with information on the current controller settings, ventilation needs and spot moisture control. This information is included in the Customer Guidebook.

8.8.2.2 Multi-Family Mechanical Ventilation Specifications

1) Whole building ventilation systems shall be properly commissioned when required by the local authority having jurisdiction.
2) Ensure that each unit has functional local exhaust ventilation for the main bathroom. This local exhaust ventilation shall operate at a minimum of 50 cfm under customer operation.
3) Install continuous mechanical ventilation as required by ASHRAE 62.2-2016 or WI Commercial Building Code SPS 364 (Table 364.0403), as applicable. When using the ASHRAE standard, the Diagnostic Workbook may be used to calculate whole building and individual unit ventilation requirements.
4) Install ventilation only in units requiring more than 25 cfm continuous ventilation. Exceptions include:
    a. Install continuous local exhaust ventilation for moisture control in each unit requiring 1- 25 CFM, where the existing ventilation is not operated by the occupants for a sufficient length of time per day. Provide the customer with education on proper use of local ventilation.
    b. Install local exhaust ventilation, either customer operated or continuous, for moisture control in each unit requiring 1-25 CFM, where there is no ventilation. Provide the customer with education on proper use of local ventilation.
    c. Install local exhaust in each unit requiring 1-25 CFM and whole building ventilation in any building where there is documented evidence of indoor air problems.
    d. Document the exception conditions that generated the installation of the ventilation.
5) Install (or restore existing) whole building supply ventilation in any building where there is documented evidence of indoor air problems.
    a. Base whole building or individual unit ventilation requirements the number of bedrooms plus one or the number of occupants, whichever is greater (ASHRAE 62.2), or the persons or cfm per square feet.
    b. Document the exception conditions that justify the installation of the ventilation.
    c. Utilize a controller which allows for an adjustment to the fan cfm based on changes to the household size. Ventilation controls shall give a labeled on/off option for customers. The building owner or maintenance staff shall be supplied with the equipment manufacturer’s information and instructions for the adjustment of fan cfm.
6) In buildings that incorporate a garage, determine the control methodology for managing combustion by-products. If present, ensure that the exhaust ventilation is properly

operating and properly sized. See Commercial Building Code SPS 364.0403 for the minimum sizing requirements.

8.8.3 Replacing Wood Heaters General

All replacement wood space heaters shall be listed appliances. All wood heaters shall meet applicable local codes and EPA requirements. All installations shall conform to NFPA 211. All other applicable requirements shall be followed when replacing a wood stove.

8.8.3.1 1-4 Unit and Mobile Home Replacing Wood Heaters Specifications

1) All installations shall comply with manufacturer's specifications.
2) All wood heating units shall be certified to meet EPA emission standards or local standards, whichever is most restrictive.
3) Installed units are certified and labeled by:
    a. National Fire Protection Association under 211; or
    b. International Conference of Building Officials; or
    c. Other equivalent listing organization.
4) Visually inspect chimney for safe operation in accordance with NFPA 211.
5) Install a stack thermometer where appropriate on all wood space heater installations. Follow the manufacturer's recommendation for proper installation.
6) Follow the manufacturer's recommendations for providing outdoor combustion air.
7) All customers shall receive in-home operation instructions to include proper wood-burning practices, proper maintenance and safety recommendations including the need for fire extinguishers.

It is important that customers understand the potential impact of exhaust ventilation on wood heater operation.

8.8.4 Other Health and Safety Measures General

Examples of other Health and Safety measures include:

1) Asbestos treatments, as necessary. The cost of asbestos work shall be modeled as an itemized cost and included in the SIR using the electronic energy audit or calculator required for the building type. See the Weatherization Assistant Guide.
2) When not present or when existing smoke detectors are non-functional, install a smoke detector in the basement and on each floor in the thermal envelope. When feasible, locate the alarms in the vicinity of the sleeping area(s). See Weatherization Field Guide Chapter 5.
3) When not present or when existing carbon monoxide alarms are non-functional, install a carbon monoxide alarm in the vicinity of sleeping area(s). If the sleeping areas cannot be monitored with one detector more than one detector shall be installed. See Weatherization Field Guide Chapter 5.

8.9 Repairs

Repairs are measures necessary for the effective performance or preservation of energy conservation measure materials. All repair measures shall be modeled in the Weatherization

Assistant Itemized Cost tab and included in the SIR (see Weatherization Assistant Guide 4.5 Itemized Costs). Report the repair costs under the appropriate Repair category in WisWAP (see Appendix D WisWAP Reporting Guide). If the repairs reduce the cumulative SIR to below 1.0, and the building cannot be weatherized without the repairs, the building shall be deferred. Examples of repairs include minor repair of leaking roofs, major pressure boundary repairs, repair of electrical systems, or repair of hot and cold water leaks.

8.9.1 Door Replacement

Model door replacements in NEAT. Primary exterior doors may be replaced ***only*** as a repair measure. Replace doors as a repair measure when there is a deteriorated door that cannot be repaired. Photographs shall be taken to document specifically why the door was replaced.

8.9.1.1 1-4 Unit, Mobile Home and Multi-Family Door Replacement Specifications

1) Premanufactured replacement doors shall be a minimum of R-5.
    a. Field-fabricated basement doors may be insulated to a minimum of R-5.
2) Replacement of patio doors is not an allowable measure.
3) Door replacements in buildings that are 50 years old or older, may be subject to historic review by the Wisconsin Historical Society if the building utilizes any federal funding (see 2.2.4 Historic Review).
4) Doors may be replaced only if the door is in the primary heating envelope and has any of the following characteristics:
    a. Rotting occurring on either the door jamb or the door blank;
    b. Holes or cracks in the door jamb or door blank that cannot be repaired; or
    c. Door repair is not feasible that will still allow the door to operate correctly.

All door replacement and/or repair shall be completed using Lead-Safe Weatherization procedures, under the supervision of a Lead-Safe Renovator. Any person who completes this work shall have been trained in Lead-Safe Weatherization procedures.

8.10 Code Compliance

It is the policy of the Wisconsin Weatherization program to minimize Health and Safety and Repair Costs and to use alternative (non-weatherization program) funding to address code compliance issues whenever feasible. Repairs and health and safety measures that are excessive in cost are cause for deferral. Occasionally a preexisting code compliance issue is triggered by an energy conservation measure and paid for with weatherization program funds. Table 8.3 below provides citations for some commonly installed measures.

Table 8.3: Weatherization Measures and Associated State Building Codes

WisWAP Measure Category	Code Citation	Notes
XHHW005 Water Heater Replacement	SPS 323.04/382.30(11)/384.20(5)(p)	Health and Safety Water Heater replacement
XHHW007 Water Heater Replacement	SPS 323.04/382.30(11)/384.20(5)(p)	Gas power vent from conventional gas (natural draft)
MWHC010 Water Heater Conversion	SPS 322.38(2),323.04/382.30(11)/384.20(5)(p)	Fuel Switch, electric to gas
MWHC035 Water Heater Conversion	SPS 323.04/382.30(11)/384.20(5)(p)	Indirect fired
MWHC05/XHHW020 Gas mobile home direct vent	SPS 323.04/382.30(11)/384.20(5)(p)	Replacement
MWHC025 Electric upgrade (MH)	SPS 323.04/382.30(11)/384.20(5)(p)	Mobil Home electric to electric water heater replacement
Flue Liners	SPS 321.30(7)(9)	Draft (orphaned water heaters)
Air Sealing	322.37(3)(b)	Air sealing of Electrical Switches and Receptacles Boxes
Air Sealing	SPS 322.37(4)(c)	Non-IC rated lights in insulated ceilings
Knob and Tube Replacement	SPS 316.003(3)(4)	Attics and walls
Condensate pump drains	SPS 323.156	Furnace replacement
Fuel Switch Oil to Gas	ATCP 93.315	Fuel oil tank removed from service
Ventilation	SPS 321.05(2)	Ventilation Termination

9. Health and Safety

9.1 General Policy

An Agency shall identify existing Health and Safety (H&S) hazards during the energy audit, notify the property owner and occupants of these hazards, and, depending on their severity, treat the identified hazards prior to, or during, weatherization activities. Elimination of H&S hazards, if using weatherization program funds, shall be done in conjunction with the installation of energy conservation measures (ECMs). No H&S measures shall be performed in a home unless ECMs are also part of the scope of work. Do not include H&S costs in the NEAT or MHEA audit. Health and Safety costs are limited to $1,500 per unit, unless the Program Manager has reviewed the entire audit and approved the complete work order.

All work performed shall conform to program requirements and all applicable codes and standards. An Agency shall not install measures or complete work solely to correct code violations that do not present a Health & Safety hazard (as defined in weatherization policy) to the occupants or are not required to be addressed by local ordinance. Agencies may complete work solely to resolve a pre-existing code violation only if local ordinance would require the violation to be addressed by any contractor completing repairs or maintenance similar to the weatherization work performed.

9.1.1 Health and Safety Checklist

A Health and Safety Checklist shall be completed as described in Table 9.1 below. The weatherization Health and Safety Checklist includes three parts and is available on the HE+ WisWAP Information page under the Field Forms heading. The Health and Safety Checklist shall be maintained per 2.2.3 Customer Files.

1) **Health and Safety Existing Conditions**
   This includes the general areas inspected and documents the existing conditions at the time of the energy audit. If visual evidence of standing water, mold growth or other moisture issues exists, the Moisture Audit shall also be completed.
2) **Moisture Audit**
   The Moisture Audit documents areas where moisture and/or mold are present at the time of the energy audit. If visible mold growth is encountered, complete the Mold Areas checklist. See Section 9.3 Mold Guidelines for additional information.
3) **Indoor Air Quality**
   This section is designed to provide customer education on mechanical ventilation and radon prior to the start of weatherization work. Additional information specific to the installed ventilation is provided after the completion of weatherization work in the Customer Guidebook.
4) **Customer Signature**
   The customer signature is designed to achieve compliance with state and federal requirements to verify the unit occupant received related educational documents and understands the risks associated with any identified health and safety hazards.

Table 9.1: Health and Safety Checklist Requirements

Housing Type	When Required	Notes	Signature Required By	Provide Signed Copy To
Single Family Home	A checklist is required for each home weatherized or deferred due to a health and safety hazard.	All hazards shall be documented on a single form with hazard location in comments.	Occupant	Owner, if different from occupant
2 to 4 Unit	A checklist is required for each unit in every building weatherized or deferred because of a health and safety hazard	All hazards shall be documented with hazard location, including common area hazards, in comments.	Occupant[1]	Owner, if different from occupant
5+ Unit Multi-family	A single checklist is required for each building when a hazard is identified by an Agency representative.	All hazards shall be documented on a single form with location, including units, in comments.	Owner	Occupants[2]
Manufactured Home[3]	When a hazard is identified by an agency representative.	All hazards shall be documented on a single form with hazard location in comments.	Occupant	Owner, if different from occupant

[1] If unable to obtain occupant signature, document attempt on the checklist.

[2]The Agency may require the property owner provide notification to occupants.

[3] Checklist is not required for Measure List Homes.

If conditions noted on the Health & Safety Checklist are severe, it may be necessary to defer weatherization services. See Section 3.6 Deferral of Weatherization Services information.

9.1.2 Health and Safety Hazards

Potential or actual threats to Health and Safety vary by degree. Health and Safety hazards which are not an immediate threat to the occupants may be described as non-serious conditions. Health and Safety hazards that are an immediate threat to the occupants may be described as a serious condition.

1) **Non-serious** conditions may be addressed in part or full at the discretion of the local Agency. At a minimum, the occupants shall be informed of the concern and shall be provided with recommendations or information on how to address the concern. Examples of non-serious conditions may include minor electrical problems, maintenance problems, or a “potential” for indoor air problems.
2) **Serious** conditions shall either be addressed by the building owner prior to the weatherization work or by the Agency as a part of the weatherization work. Elimination of Health and Safety hazards using weatherization program funds shall be done in conjunction with the installation of energy conservation measures. Some “serious conditions” may be hazards that can be tied to weatherization measures, such as heating system, chimney or water heater failure, carbon monoxide leaks, or other treatable indoor air quality problems.
3) **Other serious conditions** will exceed the scope of the weatherization program. Major structural failure, lead paint contamination, major electrical overload, or faulty sewer systems

are examples of conditions that exceed the scope of the weatherization program. A reasonable effort shall be made to refer building owners to other sources, such as HOME and CDBG, which may help address the hazards. Weatherization services shall be coordinated with other funding sources, where possible. If the Health and Safety hazards cannot be eliminated, the building shall be deferred until the hazards can be addressed.

9.1.3 Worker Safety

Worker safety is the responsibility of the Agency. In contracting with Agencies, the Division assumes Agency compliance with all applicable federal, state, and local safety and health regulations. The Agency is responsible for enforcing all work rules to ensure a safe working environment.

Safety Data Sheets (SDS) shall be available to workers in printed or digital format, the information contained in them shall be readily accessible from a work site and shall be kept up-to-date with products currently in use.

Weatherization field staff are required to take the OSHA 10-hour training. The Division recommends Production Supervisors and Crew Leaders take the OSHA 30-hour training. OSHA 30 may be substituted for OSHA 10; the trainings are not a progression (OSHA 10 is not a prerequisite). The OSHA training requirements do not apply to contractors.

The Agency is responsible for ensuring their personnel are properly trained and certified when certification is required (e.g., Lead-Safe Renovator), including required respirator training and fit testing.

Contractors are responsible for their own safety plans and training their workers. Agencies shall verify their contractors have obtained required certifications (e.g., Lead-Safe Renovator).

Table 9.2 below outlines the required trainings for various Agency field staff.

Table 9.2: Required Health and Safety Trainings for Agency Employees

Training	Auditor	Crew Leader	Crew Worker	Final Inspector	Hazardous Materials Coordinator
Lead Safe Renovator	Yes	Yes	Yes	Yes	Yes
Asbestos O&M and annual refresher	Yes	Yes	Yes	Yes	n/a
Asbestos Supervisor	Optional[2]	Optional[2]	Optional[2]	Optional[2]	Yes
Asbestos Inspector	Optional[2]	Optional[2]	Optional[2]	Optional[2]	Yes
Mold Awareness	Yes	Yes	Yes	Yes	Yes
OSHA 10-Hour	Yes	Yes	Yes	Yes	Yes
OSHA 30-Hour	Optional	Optional[2]	Optional	Optional	Optional[2]
Respirator Medical	Yes	Yes	Yes	Optional	Yes

Respirator Fit Test	Yes	Yes	Yes	Optional	Yes
Blood Lead Level Test[3]	Yes	Yes	Yes	Optional	Yes

Notes:

[1] Most Agencies train all field staff to Renovator level.

[2] This training is optional for these staff but recommended by the Division.

[3] Blood lead level test shall be performed annually for any staff that would come in contact with painted surfaces in a customer's home.

9.1.4 Occupant Pre-Existing Health Conditions

Agencies shall notify the customer that occupants with pre-existing health conditions may be adversely affected by installed weatherization materials or measures. If an occupant may be sensitive to certain weatherization materials or measures.

The Agency shall devise ways of installing materials to reduce exposure of the occupants so that weatherization work may be performed safely. Possible approaches may include temporary containment areas, HEPA filtered equipment, temporary removal or relocation of occupants that may be adversely affected, or alternative installation methods or materials that meet the specifications of the weatherization program.

An optional Release of Liability form is available for Agency use on the HE+ WisWAP Grantee Information page under the Field Forms heading. Use of this form can assist Agencies in meeting federal requirements to 1) inform customers of potential health risks, and 2) require customers to notify the weatherization agency of any occupant health issues that may be affected by weatherization activities.

9.1.5 Building Units Receiving HUD Funding

Local Agencies shall determine if a building unit referenced in an application for weatherization services is enrolled in a HUD funded program and if the HUD funded program requires meeting the standards of rule 24 CFR Part 35 (Subpart R), issued under sections 1012 and 1013 of Title X, the Residential Lead-Based Paint Hazard Act of 1992.

Enrollment in a HUD funded program for these purposes shall be defined as a building unit which has had HUD funds invested within the prior twelve months from the date of application for weatherization services, or will have HUD funds invested before the completion of the weatherization project.

Building units receiving HUD funds shall meet the standards established in HUD's Lead-Based Paint Poisoning Prevention in Certain Residential Structures rule (referenced above).

Weatherization funds may *not* be used to meet the HUD standards. Energy conservation measures, which as a by-product meet some or all of the HUD standards, are permitted.

An Agency shall make a reasonable effort to identify resources that would enable a unit that receives HUD funding to be completed under the weatherization program and meet the HUD standards.

9.2 Radon and Weatherization

Weatherization program funds shall not be used to perform radon testing and mitigation. According to U.S. Department of Energy studies, certain allowable health and safety measures may reduce the risk of increasing radon levels in weatherized homes. These measures include installing mechanical ventilation, covering exposed dirt floors, and covering and sealing sump pits. For general information on radon in Wisconsin see the Wisconsin Department of Health Services Radon Information website.

9.3 Mold Guidelines

9.3.1 Background

Mold is a potential health and safety hazard that agency personnel and contractors may encounter when working in buildings. Improperly completed weatherization work may create or exacerbate conditions conducive to the development of mold. An agency shall ensure that workers, occupants, and owners are made aware of existing mold hazards and/or conditions that may allow for mold to develop.

9.3.2 Notification and Inspection

To every extent possible, the source of any encountered mold shall be identified. Customers shall be notified of the discovery of mold, the potential conditions causing the mold, and possible remedies. The EPA pamphlet, "A Brief Guide to Mold, Moisture and Your Home", shall be given to customers at the time of audit.

9.3.3 Training for Mold and Moisture

All Agency field staff (crews, auditors and inspectors) and all contracted auditors and inspectors shall receive Division-approved training in awareness and identification of the presence of mold, the likely causes of mold outbreaks, and appropriate methods to address mold issues.

9.3.4 Testing

Weatherization program funds shall **not** be used for routine testing in every unit to determine the presence or strain of mold before weatherization work starts or after work is completed.

9.3.5 Treatment

The purpose of the weatherization program is to install energy conservation measures in eligible units. Program funds may be used to minimize and/or eliminate mold causing conditions in conjunction with the installation of energy conservation measures. Identified mold areas that comprise in total less than 10 square feet are not required to be addressed as a part of weatherization work.

9.4 Lead and Asbestos Policy

Agencies shall follow all policy requirements of the authorizing jurisdictions when disturbing possible asbestos and lead materials. Table 9.2 provides a summary of the minimum requirements. See sections 9.5 and 9.6 for additional details.

Table 9.3: Lead and Asbestos Hazards - Summary of Policy Requirements

	Lead		**Asbestos**	
	Minor Repair & Maintenance *DHS 163.03(85m)*	**Renovator *DHS 163.10***	**Operations and Maintenance (O&M)**	**Regulated Abatement Activity**
Customer Education	Health and Safety Checklist EPA Renovate Right Booklet Deferral Notification, when applicable		Health and Safety Checklist Deferral Notification, when applicable	
Testing	Optional	Optional but recommended	Optional but strongly recommended	
Regulated Work Threshold	Less than or equal to 6 SF per room interior and 20 SF exterior No windows	More than 6 SF per room interior and 20 SF exterior All windows	No more than one waste bag (60" by 60" properly filled & sealed)	More than one waste bag (60" by 60" properly filled & sealed)
Required Worker Certifications	n/a	Lead-Safe Renovator Lead-Safe Company	n/a (O&M training required)	Worker Inspector Supervisor Asbestos Company
Required Work Practices	Dust control HEPA vacuum	Dust control HEPA vacuum Containment Visual inspection	Dust control HEPA shrouded tools HEPA vacuum Containment when disturbing presumed asbestos containing material or tested material is greater than or equal 1% asbestos	
Photograph Requirements	n/a	At least three photos showing containment and warning sign, goose necked trash bag and post-renovation cleaning card	At least two photos showing containment and warning sign, and goose-necked hazardous material bag	
Additional Required Documentation (see also 2.2.3 Customer Files)	n/a	HE+ Renovation Recordkeeping Checklist	n/a	Project log DHS Notification Occupant Plan

9.5 Lead-Safe Work

9.5.1 General Policy

Lead-based paint is a potential health hazard that crews may encounter in housing constructed before 1978. Unless a building is certified as "lead-free" (as in DHS 163.40) or painted surfaces to be disturbed have tested free of lead, all weatherization activities conducted on buildings constructed prior to 1978 shall utilize techniques that contain dust and debris to protect workers and customers from lead paint hazards, including:

- Using wet methods and tool shrouds to control and capture dust;
- Never dry sweep dust and debris from disturbed painted surfaces;
- Always using a properly operating and maintained HEPA vacuum; and,
- Always clean and inspect work areas to ensure all dust and debris is removed.

Program funds may be used to minimize the potential hazard associated with disturbing painted surfaces through the course of installing energy conservation measures. Program funds shall **not** otherwise be used for the abatement, stabilization, or control of lead-based paint hazards that may exist in a unit. Program funds shall **not** be used for routine clearance testing after work is completed.

9.5.2 Regulatory Authority

U.S. Department of Energy (DOE) Weatherization Program Notice 17-7 requires compliance with the U.S. Environmental Protection Agency (EPA) Lead Renovation, Repair and Painting (RRP) program. The State of Wisconsin is authorized by the EPA to administer its own RRP program, DHS Chapter 163. There are some areas where Wisconsin's rule is more restrictive than EPA's requirements. EPA regulations also allow cities to have more restrictive definitions for lead than the state. Weatherization work shall follow the most restrictive requirements of the authorities having jurisdiction.

The authorities having jurisdiction over working with lead in Wisconsin include:

- **Wisconsin Department of Health Services** (DHS) for certifications and lead-safe work activities.
- **Wisconsin Division of Energy, Housing and Community Resources** (DEHCR) for state and federal regulations in weatherization and housing programs.
- **U.S Department of Energy** (DOE) for federal regulations related to the weatherization program.
- **OSHA** and **WI Department of Safety and Professional Services** regulations for worker safety.
- **Wisconsin Department Natural Resources** (DNR) for regulation of waste disposal.
- **U.S. Department of Housing and Urban Development** (HUD) for lead-safe work activities in HUD-funded housing programs.
- **U.S. Environmental Protection Agency** (EPA) for lead-safe work activities in buildings on Tribal Lands.
- **Local Municipalities** for the definition of lead. As of January 2018, the cities of Eau

Claire, Fond du Lac, Kenosha, Milwaukee, Racine and Beloit have more restrictive (lower) definitions of lead-based paint than the EPA and State of Wisconsin. Local authorities are responsible for enforcing the more restrictive regulations. State regulations and requirements still apply. Testing results and clearance reports must reflect whether a surface coating is lead-based paint and if it is a hazard based on state regulations**.**

9.5.3 Client Education

Documentation that the occupant and/or owner received the EPA pamphlet "The Lead-Safe Certified Guide to Renovate Right" shall be maintained for every building weatherized. When a potential lead hazard is identified by the energy auditor, the weatherization file shall contain a Health and Safety Checklist that documents the hazard, testing performed, if applicable (see 9.1.1 Health and Safety Checklist). If testing is performed and a positive test causes the building to be deferred, a written description of the test result shall be included in the Deferral

Notification provided to the building owner. The agency shall provide any test results requested by the customer.

Agencies shall comply with DHS 163.14(10)(b) when regulated renovation activities are required in 5+ unit rental buildings.

9.5.4 Testing for Lead

Wisconsin Department of Health Services (DHS) approved lead test kits may be used when cost-effective. Testing shall be limited to building components that will be disturbed. Note that the approved test kit must be used by a person with Certified Renovator credentials at minimum and requires the building owner's permission. See the DHS website for detailed test kit information and requirements. Agencies shall maintain documentation of all lead test results (see 2.2.3 Customer Files).

The Division strongly encourages testing for lead when the test has the potential to reduce the amount of labor required to complete weatherization work. The following basic guidelines shall be considered in determining when to test for lead:

- Houses built from 1978 on may be assumed to be free of lead-based paint.
- In houses built prior to 1930, it is logical to assume the presence of lead-based paint.
- In houses built between 1930 and 1978, testing may not be warranted if the area to be disturbed is small.

9.5.5 Recordkeeping

Using the Wisconsin Weatherization Assistance Program Health and Safety Checklist, the weatherization agency shall identify the applicability of Lead-Safe Renovator requirements to ensure customer and worker safety. The weatherization agency is responsible for ensuring that contractors are notified in advance of lead-safe requirements (such as in the Request for Bid), are trained in and practice lead-safe work, and that Certified Renovators are present and complete a Renovation Recordkeeping Checklist when required.

When Lead Renovation requirements apply, a Wisconsin Weatherization Assistance Program Renovation Recordkeeping Checklist shall be completed and maintained in the customer file for review. Documentation shall be maintained for a minimum of three years (see 2.2.5 Record Retention and DHS 163.13(3)(c)).

9.5.6 Lead Renovation Requirements

Unless a building is certified as "lead-free" (DHS 163.40) or painted surfaces to be disturbed have tested free of lead, Lead Renovation requirements apply to all work where paint will be disturbed in pre-1978 buildings and when at least one of the following is true:

- More than six square feet of interior paint per room will be disturbed
- More than twenty square feet of exterior paint will be disturbed (total paint on building)
- Window(s)are removed, replaced or repaired
- A prohibited work practice is used (see DHS 163.14(11)(h) and reference below).

Agencies shall comply with DHS 163.14(11)(h) requirements to minimize exposure of customers and workers to lead hazards. To meet these standards, crews and contractors shall follow the general principles of working clean and working wet. Best practices for working clean and working wet are covered in the joint EPA-HUD curriculum document "Steps to Lead-Safe Renovation, Repair, and Painting."

9.5.6.1 Individual Certification Requirements

Weatherization Program agencies shall have a Certified Lead-Safe Renovator assigned to every job where Lead-Safe Renovator requirements apply. The Certified Lead-Safe Renovator:

- Shall be present at the work site while warning signs are being posted, work area containment is being established, and work area cleaning is being performed.
- Shall ensure establishment of appropriate containment areas and use of lead-safe work practices during the renovation.
- Shall be readily available to workers throughout the lead-safe renovation process. Readily available means reachable by phone and able to return to the work site within thirty minutes of being contacted.
- Shall complete a Renovation Recordkeeping Checklist for the lead-safe work performed.
- Shall document lead-safe work with photographs to be retained in job file.
- Shall provide training on lead-safe work practices to uncertified workers, if such workers are left on-site performing work subject to the Certified Lead-Safe Renovator Requirements.
- Shall have a valid Lead-Safe Renovator certification card on-site.
- May provide pre-renovation education materials to customers.
- May conduct pre-renovation component testing using a DHS-recognized test kit.
- Shall conduct post-renovation cleaning verification.

9.5.6.2 Company Certification Requirement

Weatherization Program agencies shall be certified as a Lead-Safe Company by DHS. The EPA refers to Lead-Safe Companies as “firms.” A Lead-Safe Company has at least one certified Lead-Safe Renovator on staff.

For each employed or contracted worker of a Lead-Safe Company **who is not a certified lead-safe renovator**, the Lead-Safe Company shall maintain documentation of the training provided, including the worker’s name, specific topics taught to the worker, the name and department certification number of the instructor for each topic, and the training date for each topic.

9.5.6.3 Lead-Safe Certification for Tribal Lands

Weatherization program agencies that perform work in buildings on Tribal Lands shall be certified as Lead-Safe Certified Renovation Firms by EPA. Agencies can become certified by applying with EPA online at www.epa.gov/lead/lead-renovationabatement-firm-certification-application-or-update. Individual Lead-Safe Renovator certifications for each employed or contracted worker are valid on Tribal Lands.

9.5.6.4 Customer Notification Requirements

For work in common areas of multi-unit buildings (two or more units), and any child occupied housing, the agency shall either provide written notice to each affected household or post clearly visible informational signs that include:

- The general nature and locations of the planned renovation activities.
- The expected starting and ending dates.

If the scope, location, or expected starting and ending dates of the renovation activities change after the initial notification to occupants, the company performing the renovation activities shall provide further updated notification to the occupants by one of the above methods.

DHS 163.14(4) requires a signed and dated statement recording steps taken to notify customers of upcoming paint disturbing activities in these housing types. The Renovation Recordkeeping Checklist can be used to document how customer notification was completed.

Within ten business days after any renovation work, the agency shall provide a copy of each renovation document to the renovation contractor and to any occupants affected by the renovation work. This includes the completed Renovation Recordkeeping Checklist and a copy of the Work Agreement, which is provided to all customers prior to the start of any weatherization measures being installed (per the Customer Bill of Rights). All documents related to the renovation work shall be kept on file for three years.

9.5.6.6 Containment

Containment means physical measures taken to prevent any dust or debris from spreading beyond the work area to non-work areas. The level of containment shall be determined by the auditor/inspector or supervisor before work is assigned to a crew or contractor.

Every home and each weatherization measure is unique; therefore, the level and type of containment required will be based on the hazards present, the scope of work activities, and any customer health issues. Containment shall always be used when window repair or replacement will disturb a painted surface.

Containment may require the covering of all horizontal surfaces, constructing barrier walls, sealing doorways, covering HVAC registers with approved materials, and closing windows to prevent the spread of dust and debris. In addition, the following containment measures shall be followed:

- Crews and contractors shall take steps to protect occupants from lead-based paint hazards while the work is in progress by using appropriate containment measures.
- Occupants, especially young children or pregnant women, may not enter the work site. Occupants are allowed to return only after the work is complete and the home has passed a visual inspection.
- Occupant's belongings shall be protected from lead contamination. This can be done by removing them from the work area or covering them in protective bags and sealing to prevent dust from getting on the items.
- The work site shall be set up to prevent the spread of lead dust and debris.
- Warning signs shall be posted at entrances to the work site, at the main and secondary entrances to the building, and at exterior work sites. The signs shall be readable 20 feet from the edge of the worksite. Signs shall be in the occupant's primary language, when practical.
- If containment of the work area cannot be achieved with occupants in the unit (e.g., work will take several days and involves the kitchen, bathrooms, or bedrooms that cannot be sealed off from use), occupants shall temporarily move out of the unit or the work shall be deferred until containment can be achieved.
- Ensure that containment does not interfere with occupant and worker egress in an emergency.
- Bag and gooseneck-seal all waste in heavy duty poly bags and safely dispose of all waste in accordance with federal, state, and local regulations.

The following prohibitions related to containment shall always be observed:

- NEVER allow occupants and pets access to the work area while work is in progress.
- NEVER open windows and doors allowing lead dust to migrate into other parts of the building or outside.
- NEVER allow furniture and other objects to remain in the weatherization work area while work is being performed unless they are covered and sealed in polyethylene sheeting or bags.

9.5.6.7 Prohibited Work Activities

The following work activities and methods are prohibited when performing lead-safe work in pre-1978 homes:

- Reusable cloth or fabric, such as a painter's drop cloth, as protective containment sheeting. Polyethylene and garden fabric (in some exterior cases) are the only acceptable protective containment sheeting and shall never be reused.
- Brooms and shop vacuums for cleanup. Wet cleaning and HEPA-designed vacuums are the only acceptable methods for cleanup.
- Conventional shop vacuums with HEPA filters – only HEPA-designed vacuums are acceptable.
- Dry scraping, sanding (unless needed around electrical outlets), grinding, or using abrasive blasting or planning.
- Open-flame torch or heat gun (above 1100°F) to remove paint or window glazing.
- High-pressure washers unless they contain a HEPA filter for exhaust control and water collection.
- Methylene chloride paint strippers.

9.5.6.9 Cleaning and Visual Inspection

Checking the quality of lead renovation worksite cleaning is a two-phase process:

1) **Phase 1: Cleaning**
   This phase includes worker cleaning of any visible paint chips, dust, or debris using proper techniques. Proper techniques include:
   - Clean high to low
   - Clean two feet beyond containment
   - HEPA vacuum
   - Wash and rinse (use of a dusting mop with removal pad is acceptable).

2) Phase 2: Visual Inspection

In this phase, a visual inspection for remaining dust or debris shall be performed after work is complete. A Certified Lead-Safe Renovator shall conduct the visual inspection using the Post-Renovation Cleaning Verification Card and note the results on a Renovation Recordkeeping Checklist. There should be no evidence of settled dust following a cleanup effort. If dust is observed, the weatherization crew shall be required to repeat the cleaning process.

If work is done outside the house, the grounds around the building, and all exterior horizontal surfaces, shall also be examined visually to make certain that all dust and debris have been removed and that paint chips were not left behind.

9.5.7 Weatherization Worker Protection

At a minimum, workers shall follow these work procedures and safety precautions:

- Wear personal protective equipment specifically suited for the particular measure.
- Use National Institute for Occupational Safety and Health (NIOSH) approved respirators (covering at least half of the face) with HEPA filters.

- Use disposable overalls (with hood or a disposable painter's cap), gloves (cloth, plastic, or rubber as appropriate), goggles, and disposable shoe/boot covers.
- Keep dust to a minimum and confine dust and paint chips to the work area.
- Clean up work area during and after the work.
- Properly post a notification at all areas where lead-safe work is taking place.
- During weatherization work, wash your hands and face frequently, particularly when leaving the work area, and especially before leaving the area for the purpose of eating, drinking, or smoking.
- Before leaving the work area, remove your protective clothing and protective shoe/boot covers to avoid exposing others.
- Before leaving the work area, and before returning tools and equipment to vehicles, clean all tools to avoid exposing others and creating a lead-hazard at the next weatherization job.
- Get annual medical exams to check blood lead levels. Only perform non-lead related work if your blood lead level becomes too high.
- Inform your employer if you develop any signs of lead poisoning.

9.6 Asbestos-Containing Materials (ACM)

9.6.1 Background

Agency field staff and contractors whose work may lead to contact with known or suspect asbestos-containing materials (ACM), including vermiculite insulation, shall be protected from potential asbestos exposure and shall minimize disturbance of the material. Agencies shall provide employees with training and equipment to minimize worker and customer exposure to ACM and shall adhere to the regulations of all authorities having jurisdiction over ACM.

Program funds may be used to minimize the potential hazard associated with disturbing known or suspect ACM through the course of installing energy conservation measures. Program funds **shall not otherwise be used** for the removal of vermiculite, abatement, stabilization, or control of ACM hazards unrelated to diagnostic testing and installation of energy conservation measures. Program funds **shall not be used** for routine clearance testing of buildings after work is completed without prior approval from the Division.

When deferral is necessary due to asbestos and the building owner performs asbestos abatement to correct the deferral, prior to proceeding with weatherization the owner must provide written documentation showing that the building passed a clearance test following completion of work, and that the clearance test was performed by a contractor certified by the Department of Health Services (WPN 17-7 and DHS 159). Follow the protocols below related to asbestos deferrals:

1) Provide a written Deferral Notification per 3.6.1 Deferral Notification Requirements.
    a. The required template available on the HE+ WisWAP Grantee Information page shall be edited to address the specific deferral reason in the home.
    b. The agency may assist the customer in locating a certified contractor. The clearance test shall not be performed by the weatherization agency.

2) Change the WisWAP unit status to deferred and enter deferral reason.
3) Verify the clearance test results.
    a. Verify the contractor that performed the clearance test is certified by the Department of Health Services per DHS 159.
4) If the customer is not able to provide proof that the building passed a clearance test, contact the HE+ Help Desk for approval prior to proceeding with any work.
5) After clearance test is verified and all deferral reasons have been corrected, edit unit status in WisWAP and proceed with weatherization.

Agencies shall meet the following requirements related to asbestos:

1) Agencies shall have at least one person on staff who maintains Department of Health Services (DHS) certification as Asbestos Supervisor and Asbestos Inspector. This person is referred to as the Hazardous Materials Coordinator.
2) All field workers who may encounter or disturb known or suspect ACM shall be trained in asbestos Operations and Maintenance (O&M) with annual refresher training at a minimum.

9.6.2 Regulatory Authority

Department of Energy policy requires state weatherization programs to comply with protocols regarding asbestos-containing materials (ACM) that may be disturbed during weatherization work. This policy does not supersede the regulations of other authorities having jurisdiction over ACM or worker safety in Wisconsin.

The authorities having jurisdiction over working with ACM in Wisconsin include:

- **Wisconsin Department of Health Services** (DHS) for regulated asbestos work activities (DHS Chapter 159).
- **Wisconsin Department Natural Resources** (DNR) enforces regulations for waste disposal and transport. Note: An individual or business that transports less than 20 tons per year of solid waste (including asbestos) is exempt under section NR 502.06(2)(b) of Wisconsin Administrative Code from the requirement to have a solid waste transportation license.

  Other asbestos transport and disposal requirements still apply.
- **OSHA** and **Wisconsin Department of Safety and Professional Services** issue regulations for worker safety in the private and public sectors, respectively.
- **Wisconsin Division of Energy, Housing and Community Resources (DEHCR)** maintains policies for Weatherization Assistance Program funded weatherization work completed in conjunction with asbestos abatement or standard Operations and Maintenance procedures.
- **Department of Energy** policies regulate use of all DOE funds used in the Weatherization Assistance Program.
- **Department of Housing and Urban Development** policies apply to all HUD housing.

9.6.3 Weatherization Requirements

9.6.3.1 General Policy

Weatherization Assistance Program customers and on-site workers shall be protected from asbestos exposure when ACM may be disturbed during the course of weatherization activities. On-site workers, including energy auditors, inspectors, supervisors, installers, and contractors that inspect or complete weatherization work shall minimize the disturbance of known or suspect ACM.

When work exceeds Operations and Maintenance (O&M) limits, and is determined to be cost effective, the work shall be performed by appropriately certified staff or contractors. Agencies and contractors shall comply with all applicable regulations and ensure that any asbestos related work is performed by individuals with the appropriate training and current certifications when required.

For attics containing vermiculite insulation, the determination of whether work will exceed O&M limits shall be made on a case-by-case basis. Removal of vermiculite insulation is not allowed.

The Agency is responsible for determining how the requirements of this policy will be met, including designation of responsibilities within an Agency, whether certified staff or contractors will be used for work that exceeds O&M, and how contractor and crew performance and worker safety requirements are monitored.

9.6.3.2 ACM and Weatherization

Agency Wx staff and contractors may encounter ACM in the following building components, materials, equipment, or circumstances:

- **Attic Insulation** – Some attic insulation materials including vermiculite insulation, when inspecting or insulating attics, air sealing attics, boxing mechanical penetrations through the attic floor, or extending exhaust ventilation through the attic to the roof.
- **Siding** – Transite (slate) siding, stucco' when testing sidewalls for insulation or insulating sidewalls.
- **Heating Systems** – Insulation on boilers and forced air systems (primarily on the distribution systems) which must be addressed to seal or modify the distribution system or replace the equipment.
- **Roofing** – Some roofing materials, when installing roof ventilation or performing minor roof repair.
- **Sidewalls** – Some sidewall insulation materials including vermiculite insulation, when testing sidewalls for insulation, insulating sidewalls, or installing windows and doors.
- **Drywall** – Some older drywall or plaster applications, when testing sidewalls for insulation or insulating sidewalls from the interior, installing doors and windows, or completing minor demolition work. Some new drywall products from foreign suppliers have been found to contain asbestos.

- **Miscellaneous Materials** – Including, but not limited to, flooring, textured paints, electrical wiring insulation, older construction mastics, caulk and putty, which may be cut,

drilled, removed, or otherwise disturbed in the process of weatherizing a home.

All building components, except for metal, glass, wood, and fiberglass, shall either be assumed to contain asbestos or proven not to contain asbestos through bulk sampling by a certified Asbestos Inspector and analysis performed by an accredited laboratory. Vermiculite insulation is always assumed to contain asbestos as there is currently no EPA-approved testing method to demonstrate the presence or absence of asbestos in vermiculite insulation.

9.6.3.3 Training and Certification

Training and certification includes both required and optional activities.

1) **Training and Certification Requirements**

   Agencies shall meet the following requirements related to asbestos:

   - Agencies shall have at least one person on staff who maintains DHS certification as Asbestos Supervisor and Asbestos Inspector. For the purposes of this policy, this person is referred to as the Hazardous Materials Coordinator.
   - All field staff that may encounter or disturb known or suspect ACM shall be trained in asbestos Operations and Maintenance (O&M) with annual refresher training at a minimum.

2) **Training and Certification Options**

   Work that exceeds O&M limits and is determined to be cost effective by an energy audit shall be performed by appropriately certified agency staff or contractors. All such "regulated asbestos activities" shall be performed by persons who are employed by a certified Asbestos Company. Disturbance of ACM beyond O&M limits, taking bulk samples of suspect ACM, and performing air sampling are designated "regulated asbestos activities."

   Removal of transite (slate) siding is limited by the amount of tiles that would fit in a single glove or disposal bag that is no larger than 60 inches by 60 inches properly filled and sealed. If more tiles are removed than what would fit in the disposal or glove bag, or if transported the bag would puncture it is considered an abatement activity that requires certification and notification to DHS. Slate siding exceeding O&M may be removed only by an Asbestos Supervisor, an Exterior Asbestos Supervisor, or an Asbestos Worker or Exterior Asbestos Worker while under the supervision of an Asbestos Supervisor or Exterior Asbestos Supervisor. Stucco may only be disturbed by an Asbestos Supervisor or Asbestos Worker. Exterior Asbestos Workers and Supervisors are not trained or allowed to disturb stucco.

   Agencies may choose to use Training and Technical Assistance (T&TA) funding to:

   - Train and certify employees in asbestos disciplines (outlined in DHS Chapter 159) including Asbestos Worker, Asbestos Supervisor, Asbestos Inspector, Exterior Asbestos Worker, and Exterior Asbestos Supervisor.
   - Obtain and maintain certification as an Asbestos Company. When employees perform a DHS "regulated asbestos activity," the employer shall be a DHS certified Asbestos Company.
   - Provide air sealing and insulation training to a certified Asbestos Company to complete work on Wisconsin Weatherization Assistance Program eligible homes

where disturbance of ACM will exceed O&M limits. Training, but not certification as a Company, or maintenance of certifications, may be provided to contractors meeting Program retention requirements.

9.6.3.4 Limitations of Operations and Maintenance Work

Weatherization staff trained only in Operations and Maintenance shall limit their activities to working with known or suspect ACM that falls under O&M limits. This is defined as work that:

- Disturbs or incidentally removes no more suspect ACM than would fit in a single glove bag or disposal bag no larger than 60 inches by 60 inches, properly filled, sealed and transported (i.e., integrity of bag is not compromised by volume or weight).
- Is non−repetitive.
- Is not a series of small jobs that, if performed sequentially, would require certification.
- Is conducted by an individual or individuals with documented proof of completing at least a 16-hour Operations and Maintenance training course and any required annual refresher trainings, as described in 40 CFR 763.92(a).

9.6.3.5 Competent Person

On all worksites with asbestos operations, OSHA requires that employers designate a "competent person" who can identify asbestos hazards in the workplace and has the authority to correct them. For O&M work, the competent person is someone who is O&M trained at a minimum.

For all work exceeding O&M limits, the competent person is a DHS certified Asbestos Supervisor. For work disturbing ACM on the exterior of a home, either a certified Asbestos Supervisor or a certified Exterior Asbestos Supervisor may be the designated competent person.

9.6.3.6 Identification of Suspect ACM

The agency shall inform the customer of the existence and location of any suspect ACM *that is friable or otherwise presents a hazard* by documenting it on the Health and Safety Checklist. Any suspect ACM *that will be disturbed* during the weatherization work shall be identified and documented on the Health and Safety Checklist as well as in the Work Agreement.

Whenever weatherization work involving known or suspect ACM may exceed O&M limits, the Hazardous Materials Coordinator shall be notified. The Hazardous Materials Coordinator shall make a determination if the work falls within or will exceed O&M limits. If the work exceeds O&M limits, the Hazardous Materials Coordinator shall ensure that the work is performed by persons and organizations with the required asbestos certifications (see Section 9.6.4.4 Hazardous Materials Coordinator Role).

9.6.3.7 Testing for Asbestos

When weatherization work will involve disturbance of suspect ACM, agencies may elect to have the material tested. Testing is an allowable program cost and may be charged to support (if building is deferred) or health and safety operations using measure code XHAS030 (see

Appendix D WisWAP Reporting Guide). Bulk sampling may only be performed by a certified Asbestos Inspector who is employed by a certified Asbestos Company, as this is a DHS "regulated asbestos activity."

Testing for asbestos is an allowable cost. Analysis of bulk samples shall be performed by a National Voluntary Laboratory Accreditation Program (NVLAP) listed laboratory, using EPA approved test methods. There is no EPA recognized method to test vermiculite insulation for the presence or absence of asbestos, therefore vermiculite insulation shall always be assumed to contain asbestos.

If testing results determine that the material contains asbestos, as defined by DHS 159.04, agencies may consider proceeding with the asbestos work following the modeling guidelines outlined in Chapter 8 and the Weatherization Assistance Guide. The agency shall retain the results of testing in the customer file regardless of the outcome (see 2.2.3 Customer Files). If a positive asbestos test results in a deferral of weatherization work, then the test result shall be communicated in writing in the Deferral Notification provided to the building owner. The agency shall provide any test results requested by the customer.

9.6.4 ACM Work Procedures

9.6.4.1 General Guidance

Employers are subject to OSHA regulations which require training, protective measures, and engineering controls for workers who may be exposed to asbestos on the job. Publication OSHA 3096 outlines these requirements; therefore, agencies should review this document to become familiar with the applicable regulations. Note that agencies are responsible for ensuring that contractors follow applicable requirements while on a job site performing work under a weatherization contract.

An agency's Implementation Plan shall identify how they meet exposure protection requirements. The plan shall also include a process to be implemented when suspect ACM is encountered after the start of the weatherization work. Photographs of asbestos containment measures shall be taken to demonstrate safe work practices are used and shall be retained in the customer file.

A summary of asbestos work classifications and related protective measures is found in the tables on pages 37-42 of the OSHA publication #3096, "Asbestos Standard for the Construction Industry". Agencies shall provide personal protective equipment to all employees that may encounter, or work with, suspect ACM. Equipment shall include:

- Respirators that are NIOSH approved for asbestos.
- Disposable protective clothing.
- HEPA vacuums for fiber containment and decontamination.

Power tools shall be HEPA shrouded whenever materials (other than wood, metal, glass or fiberglass) are being cut, drilled, or similarly disturbed, **unless** the material has been tested for asbestos and the test result is 0% asbestos-containing material. This requirement is to protect

the health and safety of workers and customers by controlling lead dust and suspect or confirmed ACM fiber emission.

Agencies shall follow all relevant OSHA regulations pertaining to the use of such equipment, including the required respirator fit testing, and a medical surveillance program for employees, as applicable.

Personal air monitoring may be performed, following regulations outlined in OSHA #3096. Air sampling can only be performed by a certified Asbestos Supervisor employed by a certified Asbestos Company, as this is a DHS “regulated asbestos activity.”

If air sampling is not performed to establish a Permissible Exposure Limit (PEL) or Negative Exposure Assessment, then employers shall assume worker exposure will exceed the PEL and workers shall use personal protective equipment. The equipment shall include HEPA filtered respirators with a Protection Factor (PF) sufficient to prevent exposure to any level of fiber concentration that may be present in the asbestos work area. Positive pressure Supplied Air or Powered Air Purifying Respirators (PAPR) have the highest PF followed by Full Face, then Half Mask negative pressure type respirators.

9.6.4.2 Energy Audit Procedures

Energy audit procedures are described in two steps:

1) **Identifying and Documenting Suspect ACM**

   Energy auditors shall routinely look for suspect ACM during each energy audit. When suspect ACM is found, the auditor shall:

   a. Avoid or minimize disturbance of suspect ACM while performing an energy audit (see next section, Blower Door Testing).
   b. Document the location of suspect ACM *that is friable or otherwise presents a hazard* on the Health and Safety checklist.
   c. Document any suspect ACM *that will be disturbed* during weatherization work on the Health and Safety Checklist and on the Work Agreement.
   d. Inform the customer about suspect ACM verbally during the energy audit process whenever possible.
   e. Provide information about suspect ACM that would be disturbed during weatherization to the Hazardous Materials Coordinator (including the Building ID number, type of building material or component, and related measure or measures to be performed).
   f. Notify the Hazardous Materials Coordinator whenever disturbance of suspect ACM during weatherization work may exceed O&M limits.

2) **Work Orders with Operations and Maintenance**

   All O&M work shall be referenced in the work order as part of the ECM. The following information, at minimum, shall be detailed and included with the work order:

   a. Only O&M trained workers may perform work that may disturb or remove known or suspect ACM.

b. A description and the specific location(s) of known or suspect ACM that will be disturbed.
c. A determination of whether blower door tests may be completed by installers, and whether tests should be performed depressurized or pressurized.
d. Instructions to use the appropriate personal protective equipment.
e. Instructions to minimize disturbance of the known or suspect ACM.
f. Instructions to use appropriate safety procedures and to use containment barriers if needed.
g. Instructions to perform proper clean-up and disposal of any waste generated.

9.6.4.3 Blower Door Testing

Blower door testing should be utilized to measure and identify air leakage, to complete effective weatherization of all buildings (see also Section 8.2.1). If a building is being deferred due to a serious asbestos hazard, do not run a blower door test. Agencies shall contact the HE+ Help Desk for guidance if damaged/deteriorated PACM prevents completing an “As-Is” blower door test at audit.

Perform blower door tests based on the type of ACM present in the building, as follows:

- When no confirmed ACM is present within the pressure boundary (as confirmed by testing) or only intact, stable PACM is present within the pressure boundary, the blower door test may be conducted in “depressurize” or “pressurize” mode.
- When vermiculite that may contain asbestos is present in an attic and/or walls, test only with the blower door in “pressurize” mode.
- When deteriorating or damaged PACM is present inside the pressure boundary and at risk of becoming airborne during blower door testing, eliminate or minimize the hazard prior to utilizing a blower door. If a blower door test cannot be completed at audit, the identified hazard should be addressed prior to starting weatherization, so that crews may complete effective blower door-guided air sealing work. When air sealing work is completed, a final blower door test is required to calculate the natural ventilation rate, so that the flow rate of installed mechanical ventilation is reduced to the minimum necessary.

9.6.4.4 Hazardous Materials Coordinator Role

Agencies shall have at least one person who maintains DHS certification as Asbestos Supervisor and Asbestos Inspector. For the purposes of this policy, this person is referred to as the Hazardous Materials Coordinator. This individual shall perform or maintain oversight of the completion of tasks, and implementation of the policy in general related to this assigned role.

The assignment of responsibilities identified in this policy shall be outlined in the agency’s Implementation Plan.

he primary responsibilities of the Hazardous Materials Coordinator shall be:

- Establish whether suspect ACM may be addressed using O&M procedures during installation of various energy conservation measures (ECMs).

- Ensure that all field staff who may encounter or disturb ACM have received O&M training or have appropriate DHS asbestos certification.
- Establish a process for determining when work will exceed O&M limits.
- Identify control options based on an assessment of the hazards involved with each type of measure, taking into account potential site-specific factors.
- Ensure that whenever a contractor performs work in which suspect ACM may be disturbed (such as siding, plumbing, electrical, or HVAC), they have O&M training or required DHS certification, and are performing the work appropriately.
- Ensure that consistent procedures are used for estimating costs of asbestos-related work for the purpose of modeling.
- Ensure that when "regulated asbestos activities" are performed, DHS notifications are submitted and that all other DHS requirements are being met.
- Ensure that records of asbestos abatement or management activities are maintained as required by DHS 159.19(7) and OSHA 1926.1101(n).

9.6.4.5 Work Procedures when Asbestos is Disturbed

1) **General Procedures**

All workers who may disturb known or suspect ACM while weatherizing homes shall have completed O&M training at a minimum, and shall adhere to all appropriate asbestos work protocols. Only workers trained and certified as Asbestos Worker or Asbestos Supervisor (or Exterior Asbestos Worker or Supervisor) may conduct asbestos work that exceeds O&M limits.

The following procedures shall be followed when performing weatherization work related to known or suspect ACM:

- An indication of what type of blower door test may be completed by installers shall be included on the work order. If a special situation dictates that a blower door test cannot be completed, use an infrared scanner when conditions permit, to identify heat bypasses and key junctures that may require air sealing. Perform non-blower door guided major air sealing and minor air sealing.
    - Major air sealing work is limited to probable attic bypasses and key junctures, glass repair or replacement. Seal major air leaks first. Stop when the major air leaks have been sealed. Minor air sealing is miscellaneous sealing that will affect the customer's comfort and is limited to one labor hour.
- Utilize containment methods to limit the spread of ACM that is being disturbed.
- Use wet methods whenever possible when disturbing known or suspect ACM.
- Verify wall stability and seal all cracks and holes prior to installing sidewall insulation.
- When insulating over vermiculite insulation (suspect ACM) in an attic:
    - Seal ceiling and wall fixtures, openings, and penetrations to isolate vermiculite from the living area.
    - Minimize entry into and exit from the attic.
    - Utilize an exterior access to the attic when possible (such as a large gable end or roof vent) to limit movement of workers and equipment through the living area of the home.

- Set up poly containment barriers to prevent migration of asbestos fibers into the living area.
- Limit the movement of the existing vermiculite insulation when completing air sealing.
- Utilize a HEPA vacuum with an extended hose to collect dust when disturbing vermiculite insulation.
- For enclosed cavity attics, do not dense pack entire attic floor. Dense pack key junctures by drilling and using the bag method. HEPA vacuum attic floor prior to drilling and use HEPA vacuum to collect dust during drilling.
- Utilize walk planks to minimize disturbance for air sealing and to blow insulation, and leave the planks in attic.
- Do not dense-pack floor cavity junctures where knob and tube is present.
- In un-floored attics, blow attic insulation so that existing insulation disturbance is minimized.
- Install sign in attic near the entrance to alert owners and maintenance or emergency workers of the presence of potential ACM.
- Take photographs of the final insulation application and retain or reference in the customer file.

- Ensure work area is cleaned thoroughly to remove asbestos fibers that might remain.
- Decontaminate work tools, disposable protective suits, and the outside of respirators prior to leaving work area by use of a HEPA vacuum and disposable wet wipes.
- Do not remove respirator until disposable protective suit is fully removed and disposed.
- Dispose of protective suit and any tools that cannot be cleaned in a plastic containment bag sealed with duct tape.
- Label and dispose of any asbestos waste, in accordance with applicable regulations.

2) **Knob and Tube Wiring and Asbestos**

When knob and tube wiring work is performed which will disturb ACM, the following procedures shall be followed:

- Any contractors involved in the work shall have the appropriate asbestos credentials for the planned work.
- See General Procedures above and coordinate with weatherization crew so that work may be done simultaneously.
- Locate knob and tube wiring by removal of fixtures within the unit, or by sight in the attic whenever possible.
- Place locater through fixture box into the attic from inside the unit to minimize the need to move insulation to locate fixtures.
- Use proper containment.
- Leave abandoned knob and tube wiring in place. Do not remove knob and tube under floors of floored attics.
- Install junction boxes where wiring enters floor. Replace knob and tube wiring

around perimeter of attic floor whenever possible.

- Seal all openings in fixture boxes from inside the unit and note location of sealed boxes for weatherization crews.

9.6.4.6 Final Inspection

At any weatherization job where ACM or suspect ACM has been disturbed, the final inspection shall be conducted according to the following guidelines:

- Review audit and completed work for compliance with asbestos O&M or abatement work procedures.
- Review photographs of any work area control methods used during asbestos work.
- Review photographs of the final insulation application to be retained in the customer file.
- Inspect typical heat by-passes and key junctures where possible to determine that proper comfort sealing was completed. If feasible, use an infrared scanner to inspect the completeness of the air and thermal barrier.
- All other aspects of the final inspection can be performed according to standard policies and practices (see Section 2.1.7 Final Inspections).

9.7 Spray Polyurethane Foam

Spray Polyurethane Foam (SPF) is a frequently used weatherization product. Given SPF's chemical components and potential to cause adverse health effects, it is important for weatherization agencies and workers to understand and practice safe use of SPF.

Based on EPA and OSHA guidelines, agencies shall address the following issues related to the use of Spray Polyurethane Foam:

- Hazard Communication – It is important that anyone who works with SPF be made aware of the health risks associated with isocyanates, a chemical component of SPF, which include the potential for causing occupational asthma. Safe storage and handling procedures shall be used according to the manufacturer's instructions and Safety Data Sheet (SDS). Customers shall be notified when SPF is being used and notified of safety precautions to prevent exposure.
- Limit Access to Area – The work area shall be contained to prevent occupants, or others not equipped with personal protective equipment, from entering the area during or directly after product application, per the Safety Data Sheet. Warning signs shall be posted at entrances to the work area when occupants are present. The signs shall be readable and shall be in the occupants' primary language, when practical.
- Personal Protective Equipment – Anyone applying SPF, or occupying an area where SPF is being applied, shall use appropriate PPE. It is recommended that workers wear a supplied air respirator, gloves, and protective clothing to prevent breathing vapor or other direct exposure to SPF. Access to the work area shall be restricted to those wearing appropriate PPE.
- Ventilation – It is necessary to properly ventilate an area where SPF is being applied and to maintain ventilation until the SPF has fully cured. Consult the SDS for estimated curing time as a guide to how long ventilation should be continued. Various products may have different curing times. Use air exhaust techniques to move air out of areas

where SPF is being applied.

- Flammability – SPF can be flammable and shall not be used in the vicinity of any open flame or operating combustion appliance that may increase the hazard of fire.
- Cleanup – The area where SPF is applied shall be cleaned thoroughly so that building occupants are not exposed to particulates or dust, especially when SPF has been trimmed or cut. Restrict access to the affected area until sufficient cleanup has been done.

9.8 Cooking Stoves

Gas ovens shall be tested for carbon monoxide levels. See the Weatherization Field Guide for testing requirements and guidance on providing instruction to customers regarding cleaning ranges to reduce carbon monoxide leaks. If a gas leak is detected, repair of gas leaks is an allowable measure. Weatherization funds shall not be used to repair or replace cooking stoves, ovens or ranges with carbon monoxide emissions. If the unit is not repairable or the cost of the repair is excessive, the unit shall be deferred until the issue is resolved.

Appendix A: Summary of Changes

The table below shows significant program and policy changes for Fiscal Year 2018-2019. The effective date for all revisions is July 1, 2019.

Section	Topic	Revision
General - Especially sections 3.6, 5.3.4, 8.3.2, 8.8 and 9.1	Health & Safety Costs	H&S expenses are no longer modeled into cumulative SIR. Removes requirement for a cumulative SIR of 1.0 with H&S expenses included. Creates a new requirement that units with H&S expenses > $1,500 shall be approved by Program Manager prior to job start.
2.2.3	Building Files	Removes requirement to complete an “Accrual of Benefits” form for multifamily buildings with owner-paid space heating.
3.4.1	Manufactured Homes	Allows title searches through DSPS “ESLA” web site.
4.2.1	Refrigerator Replacement	Clarifies the manufacture data of any unit automatically eligible for removal/replacement – changes “on or before December 31, 2003” to “prior to 2004”.
4.2.2	Freezer replacement	Clarifies the manufacture data of any unit automatically eligible for removal/replacement – changes “on or before December 31, 2003” to “prior to 2004”. Allows consolidation replacement of two small existing freezers with one larger freezer.
4.3	Baseload program tracking	Clarifies that buildings served in the Baseload program should be tracked in WisWAP as “deferred”.
5.1	Financial Standards	Describes Contract Planning Workbook process Describes DEHCR Quarterly Review initiative
5.1	Financial Standards	Describes DEHCR monitoring as required in 10 CFR 440.15 and 10 CFR 440.23
5.1	Financial Standards	Requires agencies to inform DEHCR of turnover in senior managerial staff.
5.1.4	Financial Audits	Requires agencies to immediately forward to the Division action plans created to respond to financial audit findings.
5.2	Disallowed Costs	No WAP fund lines are allowed to be used for payment of interest expenses, except as allowed by 2 CFR 200.
5.3(8)	Allowable Costs	Clarifies requirement that unit production and expenditures are aligned. Clarifies that monthly invoicing of Operations and Program Support funds should be proportional to Operations expenditure.
5.3(9)	Allowable Costs	Provides that incentive compensation plans must meet the provisions of 2 CFR 200.430, and shall be funded only with Administrative funds. Provides that all use of program

Section	Topic	Revision
		funds for incentive plans will be disallowed as of July 1, 2020.
5.3(10)	Allowable Costs	All costs expensed to a contract must be incurred in that contract period, except for financial audit expenses.
5.3.3.2	Transportation	Requires that cost allocation of large vehicle expenses between programs reflects actual acquisition and operations costs. Cost allocation of passenger vehicles may use the standard IRS mileage rate.
5.3.3.3	Tools and Equipment	Requires that cost allocation of expenses for tools and material between programs reflects actual acquisition, operations and maintenance costs.
5.3.4	Health and Safety	Removes requirement to justify H&S expenditures in building's cumulative SIR. Provides that Program Manager approval is required for any unit in which H&S expenditures exceed $1,500.
5.3.5	Liability Insurance	Payment of liability insurance deductibles is not an allowable cost.
5.3.7.1	T&TA Labor Costs	Allows payment from T&TA funds for labor costs incurred for training of workers who are otherwise paid solely from Operations allocation
5.3.9	Average Unit Cost	Updates DOE Average Unit Cost value from $7,261 to $7,541.
6.6	Procurement Methods	Agency decisions regarding RFPs and RFBs shall be final. DEHCR documents will be edited accordingly.
6.6 and 6.7	Procurement Methods	Raises maximum limit for a best judgement procurement ("micropurchase") from $3,500 to $5,000.
6.15	Payment Bonds	Clarifies requirements defining when payment bonds are required and how they are structured.
7.2	Compensation for Use of Property	Clarifies property expensing to contracts, and management of excess property and idle capacity, to conform to 2 CFR 200.
8.3.2 (all)	Weatherization Assistant Audits	Significantly edited to improve clarity.
8.3.2.1	General Rules for Data Entry into Weatherization Assistant Audits	H&S costs no longer included in cumulative SIR. Requirement for Program Manager to review jobs in which H&S costs exceed $1,500. Requirement for Program Manager to review jobs where H&S costs exceed $1,500 after work is started. Clarifies water heater modeling as ECM vs. H&S. Clarifies modeling of heating system modifications.

Section	Topic	Revision
8.3.2.2	Modeling Buildings Using Fuel Consumption	Clarifies use of Therm Calculators, including for buildings with less than 12 months space heating energy use. Requires use of the 5-24 Unit Building Workbook (in addition to the 5-24 Diagnostic Workbook).
8.3.2.3	End State Planning and Informational Modeling	Informational modeling is no longer required when natural draft water heaters may need H&S replacement at the end of a job.
8.3.2.4	In-Progress Changes in Measures	Clarifies process for evaluation of measures not apparent at the energy audit.
8.6.1.2	Heating System Replacement	Specifies use of the Heating System Checklist, to conform to current practice.
8.6.1.2 (5)B	Heating System Replacement	Clarifies that unvented space heaters must be removed/replaced only if they are inside the living space or the house pressure boundary.
8.6.1.2 (6)e	Heating System Replacement	Allows existing electric baseboard heaters to be disabled and left in place.
8.6.1.4	1-4 Unit Heating System Replacement	Incorporates specifications to allow installation of two-stage furnaces and compatible thermostats. Allows, but does not require, agencies to bond existing CSST found at audit. Allows removal of existing humidifiers.
8.6.2	Other Heating Systems Work General	Clarifies policy on ordering clean and tune measures for existing heating systems.
8.6.2, 8.6.3.1 and 8.6.3.2	Other Heating Systems Work General	Adds requirement that appliance labels applied by installer include the date of installation.
8.7.4.1	Freezer replacement	Allows replacement of a chest freezer with an upright freezer when that will better suit occupant needs.
8.7.1	Lighting	Allows DOE funds for LED lighting, removes 1.5 hour estimated burn time requirement, and allows LED torchieres.
8.7.4	Freezer Replacement and Removal	Allows replacement (when cost-effective) of freezers as small as seven (7) cubic feet in size.
9.1	Health & Safety	Work solely to resolve code violations is allowed only when required in program policy as a weatherization Health & Safety measure.
Appendix B, 4.10	Water Heater standard	Updated to cite the current (2017) ANSI standard.
Appendix D	Measures	Removes DOE as an allowable funding source for JHSM035 Duct Sealing measure.

The table below is a comprehensive list of the Division administered and endorsed resources referenced throughout the Program Manual. Secured resources require a user account and password. Contact the appropriate administrator for access to these resources:

Appendix B: Home Energy Plus Resources

DEHCR Administered Resources: heat@wisconsin.gov

Slipstream Administered Resources: he+training@Slipstreamusa.org

Resource	Type	Content Summary	Secured?	Admin
WisWAP System	Website	WHEAP Referrals, Weatherization Jobs and Invoicing	Yes	DEHCR
HE+ System	Website	HE+ Applications, Furnace Program Jobs	Yes	DEHCR
WisWAP Grantee Information	Website	Program Manual, Field Guide, Weatherization Assistant Guide, Field Forms	No	DEHCR
HE+ Program Information	Website	HE+ Furnace Program Manual and Forms, Application Forms, Non-Disclosure Agreement, LIEAC Information, Public Benefits Report	No	DEHCR
WHEAP Grantee Information	Website	WHEAP Program Manual	No	DEHCR
HE+ Training and Technical Assistance (T&TA)	Website	Training calendars, online registration, and training reports; technical tools; Customer Guidebook; Workbooks and calculators, training modules, SDS search	Yes	Slipstream
HE+ Agency Transfer Site	SharePoint	Administrative Review uploads	Yes	DEHCR
Procurement Toolkit	SharePoint	Required and optional templates, material specifications	Yes	DEHCR
WisWAP Transmittals	SharePoint	Archived Information Transmittals FY 2016-2017 to present	Yes	DEHCR
WisWAP Work Group	SharePoint	Documents related to the WisWAP rewrite work group	Yes	DEHCR
Slipstream SharePoint	SharePoint	Agency Databases; TDWG; WORCS	Yes	Slipstream

Appendix C: Wisconsin Weatherization Material Specifications

1. General

Installation of materials shall follow required health and safety protocols and shall be of professional quality in order to ensure the effectiveness of the measure. Materials shall be installed to meet manufacturer's specifications. All work will meet applicable codes and regulations. Products shall be designed and rated for their intended use. Materials used shall meet the requirements outlined in this appendix. All materials and workmanship shall be warranted for at least one year. Any manufacturer's warranty of longer term shall also apply. See also Chapter 6.16 Warranty Requirements.

2. Insulation Fact Sheets and Information

The Federal Trade Commission rule "Trade Regulation Rules: Labeling and Advertising of Home Insulation: (16 CFR Part 460) requires that Grantees:

1) Retain the manufacturers' fact sheets for insulation the agency installs.
2) Provide the customer with a contract or receipt for the insulation installed.
   a. The receipt shall be dated and signed by the installer.
   b. To figure out the R-value of the insulation, use the data that the manufacturer provides.
   c. If insulation is installed in more than one part of the house, put the data for each part on the receipt. Do this on one receipt, as long as it does not add up the coverage areas or R-values for different parts of the house.
   d. Do not multiply the R-value for one inch by the number of inches installed.
   e. For loose-fill insulation, the receipt shall show the coverage area, initial installed thickness, minimum settled thickness, R-value installed, total R-value, and the number of bags used.
   f. For aluminum foil, the receipt shall show the number and thickness of the air spaces, the direction of heat flow, and the R-value.

Grantees shall provide a certificate, including the information outlined above, for each building or mobile home. Agencies shall affix the certificate (more than one, if necessary, for multi-units) near an attic hatch, electrical panel, or other visible location. An Insulation Labeling Template is available on the HE+ WisWAP Information page under the Field Forms heading.

3. Recycled Insulation Products

A Grantee that meets the criteria listed in Section 3.1 below, shall comply with the Environmental Protection Agency (EPA) regulations dealing with the purchase of building insulation products, as specified in EPA regulations 40 CFR Part 247. These regulations implement Section 6002 of the Resource Conservation and Recovery Act (RCRA), which encourages recycling of materials. The regulations cover insulation products used in commercial, industrial and residential applications. They apply to insulation products used to improve the thermal effectiveness of building envelopes, but do not apply to insulation for air handling units, insulation for acoustic purposes, or cold storage insulation. Commercially available insulation products that can contain recycled materials include cellulose, fiberglass,

Perlite, composite board, plastic foams and boards and rock wool. There are EPA recommended minimum recovered materials standards for all of these products except fiberglass.

3.1 Criteria for Use of Recycled Products

The EPA recycling regulations apply to all direct purchases of products from vendors or suppliers or contractors of:

1) At least $10,000 worth of insulation products in the previous fiscal year, or
2) A single purchase in excess of $10,000 of a covered product in the current fiscal year.

When a Grantee meets these criteria, the Grantee shall comply with the regulations in the current and following fiscal years.

A Grantee that meets the criteria shall comply with the following:

1) Specifications for insulation products shall allow for the purchase of items containing recovered materials, and
2) Establish an affirmative procurement program to facilitate procurement of insulation products containing recovered materials.

4. Weatherization Standards for Materials

A Grantee shall purchase weatherization materials and use the installation procedures that meet or exceed the standards prescribed in this chapter. Weatherization material standards include any of the following Government standards listed here. The following Government standards are produced by the Consumer Product Safety Commission, and are published in title 16, Code of Federal Regulations.

Thermal Insulating Materials for Building Elements Including Walls, Floors, Ceilings, Attics, and Roofs Insulation: Organic Fiber.	Safety Standard in 16 CFR part 1209;1404
Fire Safety Requirements for Thermal Insulating Materials According to Insulation Use – Attic Floor – insulation materials intended for exposed use in attic floors shall be capable of meeting the same flammability requirements given for cellulose insulation.	16 CFR part 1209
Enclosed spaces – insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting smoldering combustion requirements.	16 CFR part 1209

The following standards not otherwise set forth in part 440 are incorporated by reference and made part of part 440. The following standards have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR

part 51. These materials are incorporated as they exist on January 3, 2002 and a notice of any change in these materials will be published in the Federal Register. [The standards incorporated by reference are available for inspection at the Office of the Federal Register Information Center, 800 North Capitol Street, Suite 700, Washington, DC 20001] The standards incorporated by reference in part 440 can be obtained from the following sources:

- Air Conditioning and Refrigeration Institute, 4301 N. Fairfax Drive, Suite 425, Arlington VA 22203: 1-703-534-8800 http://www.ahrinet.org
- American Architectural Manufacturers Association, 1827 Walden Office Square, Suite 104, Schaumburg, Illinois 60173-4268; 1-847-303 5664 http://www.aamanet.org
- American Gas Association, 400 N. Capitol Street, NW, Washington DC 20001; 1-202-824-7000 http://www.aga.org
- Americana National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036; 1-212-642-4900 http://ansi.org
- American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990; 1-212-591-7722 www.asme.org
- American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; 1-610-832-9585 www.astm.org
- Association of Home Appliance Manufacturers, 1111 19th Street, Suite 402, NW Washington, DC 30036; 1-202-872-5955 http://www.aham.org
- Federal Specifications, General Services Administration, Federal Supply Service, Office of the CIO and Marketing Division, Room 800, 1941 Jefferson Davis Hwy., Arlington VA 22202; 1-703-305-6288 http://www.gsa.gov/
- Gas Appliance Manufacturers Association, 2107 Wilson Boulevard, Suite 600, Arlington, VA 22201; 1-703-525-7060
- National Association of Manufacturers,1331 Pennsylvania Avenue, NW Washington, DC 20004-1790; 1-202-637-3000 http://www.nam.org
- National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; 1-617-770-3000 http://www.nfpa.org
- Sheet Metal and Air Conditioning Contractors Association, 4201 Lafayette Center Drive, Chantilly, Virginia 20151-1209; 1-703-803-2980 http://www.smacna.org
- Solar Rating and Certification Corporation, c/o FSEC, 1679 Clearlake Road, Cocoa FL 32922-5703; 1-321-638-1537 http://solar-rating.org
- Steel Door Institute, 30200 Detroit Road, Cleveland, OH 44145-1967; 1-440-899-0010 www.steeldoor.org
- Steel Window Institute, 1300 Sumner Avenue, Cleveland, OH 44115-2851; 1-216-241-7333 http://www.steelwindows.com
- Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591; 1-914-322-0040 http://www.tema.org
- Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096; 1-847-272-8800 http://www.ul.com
- Window & Door Manufacturers Association, 1400 East Touhy Avenue, Suite 470, Des Plains, IL 60018; 1-800-223-2301 http://www.wdma.com

More information regarding the standards in this reference can be obtained for the following sources:

- Environmental Protection Agency, 401 M Street, NW Washington, DC 20006; 1-202-554-1080 http://www.epa.gov
- National Institute of Standards and Technology, U.S. Department of Commerce, Gaithersburg, MD 20899; 1-301-975-2000 http://www.nist.gov
- Weatherization Assistance Program, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, https://www.energy.gov/eere/wipo/weatherization-and-intergovernmental-programs-office

4.1 Thermal Insulating Materials for Walls, Floors, Ceilings, Attics and Roofs

Insulation – mineral fiber: Blanket insulation Roof insulation board Loose-fill insulation	ASTM[1] C665-98 ASTM C726-00a ASTM C764-99
Insulation – mineral cellular: Vermiculite loose-fill insulation Perlite loose-fill insulation Cellular glass insulation block Perlite insulation board	ASTM C516-80 (1996) e1 ASTM C549-81 (1995) e1 ASTM C552-00 ASTM C728-97
Insulation – organic fiber: Cellulose fiber insulating board Cellulose loose-fill insulation Cellulose wet-spray insulation	ASTM C208-95 ASTM C739-00 ASTM C1149-97
Insulation – organic cellular: Preformed block-type polystyrene insulation Rigid preformed polyurethane insulation board Polyurethane or polyisocyanurate insulation board faced with aluminum foil on both sides Polyurethane or polyisocyanurate insulation board faced with felt on both sides	ASTM C578-95 ASTM C591-00 FS[2] HH-I-1972/1 (1981) FS HH-I-1972/2 (1981) and Amendment 1,10/03/85
Insulation – composite boards: Mineral insulation board Perlite board Gypsum board and polyurethane or polyisocyanurate composite board Materials used as a patch to reduce infiltration through the building envelope	ASTM C726-00a ASTM C728-97 FS HH-I-1972/4 (1981) Commercially available

[1] ASTM indicates American Society for Testing and Materials

[2] FS indicates Federal Specifications

4.2 Thermal Insulating Materials for Pipes, Ducts, and Equipment such as Boilers and Furnaces

Insulation – Mineral fiber: Pre-formed pipe insulation Blanket and felt insulation (industrial type) Blanket insulation and blanket type pipe insulation (metal-mesh covered, industrial type)	ASTM[1]C547-00 ASTM C553-00 ASTM C592-00

Block and Board Insulation Spray applied mineral fiber thermal and sound absorbing insulation High-temperature fiber blanket insulation Duct work insulation	ASTM C612-00 ASTM C1014-99ae1 ASTM C892-00 ASTM C1290-00
Insulation – Mineral cellular: Calcium silicate block and pipe insulation Cellular glass insulation Expanded Perlite block and pipe insulation	 ASTM C553-95 ASTM C552-00 ASTM 610-99
Insulation – organic cellular: Preformed flexible electrometric cellular insulation in sheet and tubular form Unfaced preformed rigid cellular polyurethane insulation	ASTM C534-99 ASTM C591-00
Insulation Skirting	Commercially available

[1] ASTM indicates American Society for Testing and Materials

4.3 Fire Safety Requirements for Insulating Materials According to Insulation Use

Attic floor:	Insulation materials intended for exposed use in attic floors shall be capable of meeting the same smoldering combustion requirements given for cellulose insulation in ASTM[1] C739-00
Enclosed space:	Insulation materials intended for use within enclosed stud or joist spaces shall be capable of meeting the same smoldering combustion requirements given for cellulose insulation in ASTM C739-00
Exposed interior walls and ceilings:	Insulation materials, including those with combustible facings, which remain exposed and serve as wall or ceiling interior finish, shall have a flame spread classification not to exceed 150 (per ASTM E84-00a)
Exterior envelope walls and roofs:	Exterior envelope walls and roofs containing thermal insulation shall meet applicable local government building code requirements for the complete wall or roof assembly
Pipes, ducts, and equipment:	Insulation materials intended for use on pipes, ducts, and equipment shall be capable of meeting a flame spread classification not to exceed 150 (per ASTM E84-00a)

[1] ASTM indicates American Society for Testing and Materials

4.4 Storm Windows and Window Replacements

Storm windows: All storm windows Aluminum frame storm windows Frameless plastic glazing storm Movable insulation systems for windows	 AAMA/NWWDA [1] 101/I.S.2-97 AAMA [2] 1002.10-93 ASTM[3] D4726-00 Required minimum thickness for windows is 6 mil (0.006“)[4] Commercially available

Replacement windows: All windows Steel frame windows Rigid vinyl frame windows	Replacement windows shall meet ENERGY STAR® standards[4] AAMA/NWWDA 101/I.S 2-97 Steel Window Institute recommended specifications for steel windows, 1990 ASTM D4726-00

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window and Door Association (Now the Window and Door Manufacturers Association)

[2] AAMA indicates American Architectural Manufacturers Association

[3] ASTM indicates American Society for Testing and Materials

[4] Wisconsin Weatherization Specifications

4.5 Storm Doors and Door Replacements

Storm (glass) doors: All storm (glass) doors Aluminum frame storm doors Sliding glass storm doors	AAMA/NWWDA[1] 101/I.S.2-97 AAMA 1102.7-97 AAMA 1002.10-93
Rigid vinyl storm doors:	ASTM [2] D3678-97 and D4726-00
Vestibules: Materials to construct vestibules	 Commercially available
Replacement doors: All replacement doors Steel doors Wood doors Flush doors Stile and rail door	Replacement doors shall have a minimum value of R-5. For mobile homes a commercial mobile home replacement door is acceptable.[3] AAMA/NWWDA[5] 101/I.S 2-97 ANSI[4] A250.8-98 ANSI.NWWDA[5] I.S, 1-97 (Amendment, exterior door provisions) ANSI/NWWDA[5] I.S. 6-97

[1] AAMA/NWWDA indicates American Architectural Manufacturers Association/National Wood Window and Door Association (now the Window and Door Manufacturers Association)

[2] ASTM indicates American Society for Testing and Materials

[3] Wisconsin Weatherization Specifications

[4] ANSI indicates American National Standards Institute

5 ANSI/NWWDA indicates American National Standards Institute/National Wood Window and Door Association (now the Window and Door Manufacturers Association)

4.6 Caulks and Sealants

Caulks and Sealants: Glazing compounds for metal sash Oil and resin based caulks Acrylic (solvent types) sealants Butyl rubber sealants Chlorosulfonated polyethylene sealants Latex sealing compounds Elastometric joint sealants (normally considered to include polysulfide, polyurethane, and silicone) Preformed gaskets and sealing materials Duct sealing mastic	 ASTM[1] C669-00 ASTM C570-00 ASTM C920-98e1 FS[2] Commercial Item Description A-A-272 (6/7/95) ASTM C920-98e1 ASTM C834-00e1 ASTM C920-98e1 ASTM C509-00 UL[3] 181A-M Second Edition, 1994 and UL 181B-M First Edition, 1995

[1] ASTM indicates American Society for Testing and Materials

[2] FS Indicates Federal Specifications

[3] UL indicates Underwriters Laboratory

4.7 Weather Stripping and Vapor Retarders

Weather stripping: Vapor retarders:	Commercially available Selected according to the provisions cited in ASTM[1] C755-97. Permeance rating not greater than 1 perm when determined according to the desiccant method described in ASTM E96-00. Ground moisture vapor retarders shall meet tear and puncture resistance standard ASTM[1] E1745.
Items to improve attic ventilation	Commercially available

[1] ASTM indicates American Society for Testing and Materials

4.8 Heat Exchangers

Heat exchangers, water-to-water and steam-to-water: Heat exchangers with gas-fired appliances[2]	ASME[1] Boiler and Pressure Vessel Code, 1998, Sections II, V, VIII, IX, and X, as applicable to pressure vessels. Standards of Tubular Exchanger Manufacturers Association, Eighth Edition, 1999 ANSI/UL[3] 462, Ninth Edition, approved by ANSI February 28, 1997

[1] ASME indicates American Society for Mechanical Engineers

[2] The heat reclaimer is for installation in a section of the vent connector from appliances equipped with draft hoods or appliances equipped with powered burners or induced draft and not equipped with a draft hood

[3] ANSI/UL indicates American National Standards Institute/Underwriters Laboratories

4.9 Boiler/Furnace Control Systems

Automatic set-back thermostats: Line voltage or low voltage room thermostats Automatic gas ignition systems Energy management systems Hydronic boiler controls Other burner controls	Listed by UL[1] Conformance to NEMA [2] DC3-2013 NEMA DC3-2013 ANSI[3] Z21.21-2000 AGA Certification Seal Listed by UL Listed by UL Listed by UL

[1] UL indicates Underwriters Laboratory

[2] NEMA indicates National Electrical Manufacturers Association

[3] ANSI indicates American National Standards Institute

4.10 Water Heater Modifications

Insulate tank and distribution piping Install heat traps on inlet and outlet piping	(See insulation section of this chapter) Applicable local plumbing code
Install/replace water heater heating elements	Listed by UL [1]
Electric, freeze-prevention tape for pipes Install stack damper, gas-fueled	Listed by UL ANSI[2] Z21.10.1-2017/CSA 4.1-2017 and ANSI Z21.10.3-2017/CSA 4.3-2017
Install stack damper, oil-fueled	UL 17, Third Edition, 1994, NFPA 31-2001, NFPA, 211-2000 (same as ANSI A52.1), and ANSI/NFPA 70-21999 (same as IEEE[4] National Electrical Code)
Install water flow modifiers	Commercially Available

1 UL indicates Underwriters Laboratories

2 ANSI indicates American National Standards Institute

3 NFPA indicates National Fire Prevention Institute

4 IEEE indicates Institute of Electrical and Electronics Engineers

4.11 Replacement Water Heaters

See also Section 5 (below) - Additional Minimum Requirements for Replacement Mechanical Equipment

Electric (resistance) Water Heaters Heat Pump Water Heaters Gas Water Heaters	10 CFR[1] 430 and UL[2] 174. Minimum .95 EF/ .93 UEF rated.[3] UL 1995, Second edition, 1995. Electrical components to be listed by UL.
Rated ≤75 kBtu/hr Rated ≥75 kBtu/hr	<u>Non-mobile home</u>: 30 gallon – minimum .63 EF / .60 UEF[3] (only if 40 gallon upgrade not feasible) 40 and 50 gallon - minimum .67 EF / 0.65 UEF[3] <u>Mobile homes</u>: All replacements shall be mobile-home rated. 30 gallon – minimum .63 EF / .60 UEF[3] 40 gallon – minimum .62 EF / .59 UEF[3] 50 gallon – minimum .60 EF / .57 UEF[3]
Oil Water Heaters	10 CFR 430 and ANSI[4] Z21.10.1-1998 ANSI Z21.10.3-1998 UL 732, Fifth Edition, 1995, Revised 2/3/05

1 CFR indicates Code of Federal Regulations

2 UL indicates Underwriters Laboratories

3 Wisconsin Weatherization Specifications

4 ANSI indicates American National Standards Institute

4.12 Solar Water Heating Systems

Solar water heating systems, including forced circulation, integral collector storage, thermo-siphon, and self-pumping systems:	System shall be certified per SRCC[1] OG 300, July 16, 1998

[1] SRCC indicates Solar Rating and Certification Corporation

4.13 Waste Heat Recovery Devices

Desuperheater/water heaters: Condensing heat exchangers	ARI [1] 470-1995 and UL[2] 1995, Second Edition
Heat pump water heating heat recovery systems	Commercially available components installed per manufacturers' specification. NFPA[3] 211-2000 (same as ASSI A52.1) may apply in certain instances. See also Heat Exchangers section of this appendix.
Energy recovery equipment	UL 1995, Second Edition, 1995. Electrical components to be listed by UL Energy Systems Analysis and Management, 1997 (SMACNA[4])

[1] ARI indicates Air Conditioning and Refrigeration Institute

[2] UL indicates Underwriters Laboratories

[3] NFPA indicates National Fire Prevention Association

[4] SMACNA denotes Sheet Metal and Air Conditioning Contractors' National Association

4.14 Boiler Repair and Modifications/Efficiency Improvements

See also Section 5 (below) - Additional Minimum Requirements for Replacement Mechanical Equipment

Install gas conversion burners	ANSI[1] Z21.8-1994 (for gas or oil fired systems), ANSI Z21.17-1998, and ANSI Z223.1-1999 (same as NFPA 54-1999). AGA[2] Laboratories Certification Seal
Replace oil burner	UL[3] 296, Ninth Edition, 1994 and NFPA [4] 31-2001
Install burners (oil/gas)	ANSI Z223.1-1999 for gas equipment and NFPA 31-2001 for oil equipment
Re-adjust boiler water temperature or install automatic boiler temperature reset control	ASME[5] CSD-1-1998, ANSI Z223.1-1999, and NFPA 31, 2001
Replace/modify boilers	ASME boiler and Pressure Vessel Code, 1998, Section II, IV, V, VI, VIII, IX, and X. Boilers shall be Hydronics Institute Division of AHRI equipment.
Clean heat exchanger, adjust burner air shutter(s), and check smoke number on oil-fueled equipment. Check operation of pump(s) and replacement filters.	Per manufacturer's instructions
Replace combustion chambers	Refractory linings may be required for conversions

Replace heat ex-changers, tubes	Protection from flame contact with conversion burners by refractory shield.
Install/replace thermostatic radiator valves	Commercially available. One-pipe steam systems require air vents on each radiator; see manufacturers' requirements.
Install boiler duty cycle control system	Commercially available. ANSI/NFPA 70-1999 (same as IEEE National Electrical Code) and local electrical code provisions for wiring.

[1] ANSI indicates American National Standards Institute

[2] AGA indicates American Gas Institute

[3] UL indicates Underwriters Laboratories

[4] NFPA indicates National Fire Prevention Association

[5] ASME indicates American Society for Mechanical Engineera

4.15 Heating and Cooling System Repairs and Tune-ups/Efficiency Improvements

Install duct insulation	ASTM[1] C612-00 (see insulation sections of this chapter)
Reduce input of burner; de-rate gas-fueled equipment	Local utility company and procedures if applicable for gas-fueled furnaces and ANSI[2] Z223.1-1999 (same as NFPA[3] 54-1999 including Appendix H
Repair/replace oil-fired equipment.	NFPA 31-2001
Replace combustion chamber in oil-fired furnaces or boilers	NFPA 31-2001
Clean heat exchanger and adjust burner; adjust air shutter and check CO2 and stack temperature. Clean or replace air filter on forced air furnace	ANSI Z223.1-1999 (same as NFPA 54-1999) including Appendix H
Install vent dampers for gas-fueled heating systems	Applicable sections of ANSI Z223.1-1999 (same as NFPA 54-1999) including Appendix H, I, J, and K. ANSI Z21.66-1996 and Exhibits A&B for electrically operated dampers
Install vent dampers for oil-fueled heating systems Reduce excess combustion air: A. Reduce vent connector size of gas-fueled appliances Adjust barometric draft regulator for oil fuels	Applicable sections of NFPA 31-2001 for installation and in conformance with UL[4] 17, Third Edition, 1994 ANSI Z223,1-1999 (same as NFPA 54-1999) part 9 and Appendices G&H NFPA 31-2001 and per furnace and boiler manufacturers' instructions
Replace constant burning pilot with electronic ignition device on gas-fueled furnaces or boilers	ANSI Z21.71-1993
Readjust fan switch on forced air gas-or oil-fueled furnaces	Applicable sections and Appendix H of ANSI Z223.1-1999 (same as NFPA 54-1999. for gas furnaces and NFPA 31-2001 for oil furnaces.
Replace burners	See install burners (oil/gas)[5]
Install/replace duct furnaces (gas) Install/replace heat pumps	ANSI Z223.1-1999 (same as NFPA 54-1999). ARI[6] 210/240-1994. UL 1995, Second Edition, 1995. (See 11.4.16 Replacement Furnaces)

Replace air diffusers, intakes, registers, and grilles	Commercially available
Install/replace warm air heating metal ducts	UL 181, Ninth Edition, 1996, including UL 181A, Second Edition, 1994 and 181B, First Edition, 1995
Filter alarm units	Commercially available

[1] ASTM indicates American Society for Testing and Materials

[2] ANSI indicates American National Standards Institute

[3] NFPA indicates National Fire Prevention Association

[4] UL indicates Underwriters Laboratories

[5] Wisconsin Weatherization Specifications

[6] ARI indicates Air Conditioning and Refrigeration Institute

4.16 Replacement Furnaces, Boilers and Wood Stoves

See also Section 5 (below) Additional Minimum Requirements for Replacement Mechanical Equipment

Chimneys, fireplaces, vents and solid fuel burning appliances	NFPA[1]211-2000 (same as ANSI[2] A52.1).
Gas-fired furnaces	ANSI Z21.47-1998 and ANSI Z223.1p1999 (same as NFPA 54-1999).
Oil-fired furnaces	UL[4] 727, Eighth Edition, 1994 and NFPA 31-2001.
Liquefied petroleum gas storage Ventilation fans; Including electric attic, ceiling and whole-house fans	NFPA 58-2001 Shall meet ENERGY STAR® standards[3], UL 507, Ninth Edition, 1999.

[1] NFPA indicates National Fire Prevention Association

[2] ANSI indicates American National Standards Institute

[3] Wisconsin Weatherization Specifications

[4] UL indicates Underwriters Laboratories

4.17 Air Conditioning and Cooling Equipment

Air Conditioners: Central air conditioners Room size units	ARI [1] 210/240-1994, SEER rating of 13 ANSI/AHAM[2] RAC 1-1992
Other cooling equipment including evaporative coolers, heat pumps, and other equipment	UL[3] 1995, Second Edition, 1995

[1] ARI indicates Air Conditioning and Refrigeration Institute

[2] ANSI/AHAM indicates American National Standards Institute/Association of Home Appliance Manufacturers

[3] UL indicates Underwriters Laboratories

4.18 Screens, Window Films, and Reflective Materials

Insect screens	Commercially available
Window films	Commercially available
Shade screens:	
	Commercially available
Fiberglass shade screens	Commercially available
Polyester shade screens	
	Commercially available
Rigid awnings:	Commercially available
Wood rigid awnings	Commercially available
Metal rigid awnings	Commercially available
	Commercially available
Louver systems:	
Wood louver awnings Metal louver awnings	
Industrial-grade white paint used as a heat-reflective measure on awnings, window louvers, doors, and exterior duct work (exposed)	

4.19 Refrigerators and Freezers

Refrigerators/Freezers	Technical specifications are available on the HE+ Procurement SharePoint page in Refrigerator/Freezer Attachment 4. ***Refrigerators only:*** Preference may be given to ENERGY STAR® rated products.

4.20 Lamps and Fixtures

Compact fluorescent lamps (CFLs) and fixtures	Shall meet ENERGY STAR® standards:[1] https://www.energystar.gov/sites/default/files/ENERGY%20STAR
Light-emitting diode (LED) lamps	%20Lamps%20V1%201_Specification.pdf
Note: Grantees may use https://www.energystar.gov/productfinder/ to check for availability of ENERGY STAR® rated lamps and use non-rated lamps when ENERGY STAR® is	When applicable and feasible, LED lamps installed in enclosed fixtures shall be suitable for enclosed locations. LED lamps installed in exterior locations shall be rated for wet or damp environments.

not available, documenting this in the customer file.	

[1] Wisconsin Weatherization Specifications

5. Additional Minimum Requirements for Replacement Mechanical Equipment

Equipment	ENERGY STAR® Required	AHRI Rating Required	Minimum AFUE, EF or Thermal Efficiency	Other Specifications
Heating Systems: 1 to 4 Unit Buildings				
Gas Forced Air	No	Yes	≥ 95%	Condensing sealed combustion.
Oil Forced Air	No	Yes	≥ 83%	
High Efficiency Gas Boilers	No	Yes	≥ 90%	Modulating boiler.
Standard Efficiency Gas Boilers	No	Yes	≥ 84%	Based on energy audit modeling protocol.
Oil Boilers	No	Yes	≥ 83%	
Direct Vent Gas Space Heaters	No	Yes	≥ 80%	Air circulating fan required. Electronic Intermittent Pilot or Electronic Ignition. No Standing Pilot Lights. No vent free units.
"B" Vent/Inside Wall Gas Space Heaters	No	Yes	≥ 75%	Air circulating fan required. Electronic Intermittent Pilot or Electronic Ignition. No Standing Pilot Lights. No vent free units.
Condensing Gas Space Heaters	No	Yes	≥ 90%	Installer shall implement a means to drain condensate (or deliver condensate to an approved drain). An evaporator pan is not an acceptable condensate management system. Air circulating fan required. Electronic Intermittent Pilot or Electronic Ignition. No Standing Pilot Lights. No vent free units.
Oil Space Heaters	No	No	NA	Air circulating fan required.
Heating Systems: Mobile Homes (all equipment shall be rated for manufactured housing)				
Forced air gas	No	Yes	≥ 95%	Condensing sealed combustion; shall fit footprint of existing system and door should close fully.
Forced air oil	No	Yes	≥ 79%	Shall fit footprint of existing system and door should close fully.

Forced air electric	No	NA	NA	Repair only; conversion recommended.
Other	NA	NA	NA	Default to 1-4 unit space heaters.
Water Heaters: **Mobile Homes** (all equipment shall be rated for manufactured housing)				
Gas: 30 gallon	No	Yes	.63 EF / .60 UEF	
Gas: 40 gallon	No	Yes	.62 EF / .59 UEF	
Gas: 50 gallon	No	Yes	.60 EF / .57 UEF	
Electric: 30 to 50 gallon	No	Yes	.95 EF / .93 UEF	
Water Heaters: **1 to 4 Unit Buildings**				
Gas: 30 gallon	No	Yes	.63 EF / .60 UEF	Natural vent allowed for Health & Safety replacements of leaking water heaters with no draft issues; commercially available.
Gas: 40 and 50 gallon	Yes	Yes	.67 EF / .65 UEF	Power vented.
Electric: 30 to 50 gallon	No	Yes	.95 EF / .93 UEF	
Water Heaters: **5+ Unit Buildings** (Commercial Equipment exempt from Energy Star requirements; shall be properly commissioned)				
Gas: 30 gallon	No	Yes	.63 EF / .60 UEF	When serving a single unit, see 1 – 4 unit specifications.
Gas: 40 and 50 gallon	Yes	Yes	.67 EF / .64 UEF	When serving a single unit, see 1 – 4 unit notes.
Electric: 30 to 50 gallon	No	Yes	.95 EF / .93 UEF	When serving a single unit, see 1 – 4 unit notes.
Gas: 75+ gallons or FHR>75 gallons	No	Yes	.88 UEF	For units serving multiple apartments; “High” UEF usage rating
Indirect water heater	No	No	NA	Follow manufacturer instructions when installing indirect water heaters.
Heat Pump Water Heater	Yes	No	≥ 2.0	
Heating Systems: 5+ Unit Buildings (Residential Systems)				
Gas Forced Air	No	Yes	≥ 95%	Condensing/ sealed combustion.
Oil Forced Air	No	Yes	≥ 83%	

Gas Boilers	No	Yes	≥ 92%	Condensing/ sealed combustion.
Oil Boilers	No	Yes	≥ 83%	
Heating Systems: 5+ Unit Buildings (Commercial Systems)				
Furnace (including rooftop units)	N/A	Yes	≥ 80% EF	
Gas Boilers	N/A	Yes	≥ 94% EF	Condensing/ sealed combustion.
Light Oil Boilers	N/A	Yes	≥ 85% EF	
Heavy Oil Boilers	N/A	Yes	≥ 83% EF	

Appendix D: WisWAP Reporting Guide

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
ENERGY CONSERVATION MEASURES (ECMs)				
ABD Air Sealing				
ABD016	Multi 5+ Sealing	Includes blower door setup and all minor and major air sealing. Does not include auditor or final inspection blower door setup. Enter the As Is CFM50 Test and total CFM50 reduction in the Actual "Qty" (Quantity) field. The unit of measure for costs is CFM50 Reduction. Include the reason for no blower door test in the comments box.	Report crew labor and materials with measure. Examples of materials include: rigid insulation board, replacement glass (missing), foam, caulk, silicone, weather-stripping, etc. Include the cost of minor blown insulation used to repair damage from air sealing when attic insulation will not be included in the job.	EAP, PB
ABD035	7/1/16 Non-Guideline Sealing – MHML	Air sealing completed on natural gas mobile homes being treated with the Mobile Homes Measures List (MHML). Enter the total cost of performing air sealing for homes that are treated with the use of the MHML. Limited to 3 total labor-hours or $450, whichever comes first.	Report crew labor and materials with measure.	EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
ABD040	Air Sealing – Mobile Home	Air sealing completed on bulk fuel mobile homes modeled with Weatherization Assistant. Includes blower door setup and all minor and major air sealing. Does not include auditor or final inspection blower door setup. Enter the As Is CFM50 Test and total CFM50 reduction in the Actual “Qty” (Quantity) field. The unit of measure for costs is CFM50 Reduction. Include the reason for no blower door test in the comments box.	Report crew labor and materials with measure. Examples of materials include: rigid insulation board, replacement glass (missing), foam, caulk, silicone, weather-stripping, etc. Include the cost of minor blown insulation used to repair damage from air sealing when attic insulation will not be included in the job.	EAP, PB
ABD045	Air Sealing	Air sealing completed on 1 to 4 unit modeled with Weatherization Assistant. Includes blower door setup, all minor and major air sealing, and Pressure Diagnostic testing. Does not include auditor or final inspection blower door setup. Enter the As Is CFM50 Test and total CFM50 reduction in the Actual “Qty” (Quantity) field. The unit of measure for costs is CFM50 Reduction. Include the reason for no blower door test in the comments box.	Report crew labor and materials with measure. Examples of materials include: rigid insulation board, replacement glass (missing), foam, caulk, silicone, weather-stripping, etc. Include the cost of minor blown insulation used to repair damage from air sealing when attic insulation will not be included in the job.	DOE, EAP, PB
PCFL Lighting				
PCFL005	CFL Bulb	Replacement of incandescent bulb with a compact fluorescent lamp.	Report the number of bulbs installed and total cost. WisWAP will calculate the cost per bulb. All bulbs regardless of style can be reported in one measure.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
PCFL010	Halogen Torchiere Replacement	Replacement of a halogen torchiere with a compact fluorescent floor lamp.	Report the number of lamps installed and total cost.	EAP, PB
PCFL015	LED Exit Light	Replacement or installation of an LED Exit Light in a multi-family building.	Report the number of lamps installed and total cost.	EAP, PB
PCFL030	Fixture Replacement	Replacement of existing incandescent lighting fixture with a light emitting diode fixture. LED fixtures shall only be installed if participating in a Division approved pilot project.	Report the number of fixtures installed and total cost.	PB
PCFL035	CFL Bulb – Mobile Home	Replacement of incandescent bulb with a compact fluorescent lamp.	Report the number of bulbs installed and total cost. WisWAP will calculate the cost per bulb. All bulbs regardless of style can be reported in one measure.	EAP, PB
PCFL040	Halogen Torchiere Replacement – Mobile Home	Replacement of a halogen torchiere with a compact fluorescent floor lamp.	Report the number of lamps installed and total cost.	EAP, PB
PCFL055	LED Bulb – Mobile Home	Replacement of incandescent bulb with a light emitting diode lamp.	Report the number of bulbs installed and total cost. WisWAP will calculate the cost per bulb. All bulbs regardless of style can be reported in one measure.	EAP, PB
PCFL070	LED Bulb	Replacement of incandescent bulb with a light emitting diode lamp.	Report the number of bulbs installed and total cost. WisWAP will calculate the cost per bulb. All bulbs regardless	EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
			of style can be reported in one measure.	
PCFL085	LED Can Light Insert	Replacement of existing can light with a light emitting diode insert. LED can lights shall only be installed if participating in a Division approved pilot project.	Report the number of can lights installed and total cost.	PB
DIA Attic Insulation				
DIA	Attic Insulation	The cost of attic insulation and standard attic preparation for insulation. Attic preparation includes the proper boxing and damming of the access, electrical junction boxes and other hazards, vent stacks including chimneys, and the insulating and sealing of the attic access. Include the cost of attic access insulation and air sealing of attic access with the insulation of the attic.	When installing additional insulation, all associated attic costs are reported with the attic insulation measure. This includes materials used to prepare the attic for the installation of insulation. Material examples are: Insul-shield; wood boards; plywood.	DOE, EAP, PB
DIA120	Attic Prep - No Attic Insulation	The cost of attic prep and attic access when no insulation is installed. Attic preparation includes the proper boxing and damming of the access, electrical junction boxes and other hazards, vent stacks including chimneys, and the insulating and sealing of the attic access.	Material examples are: Insul-shield; wood boards; plywood.	DOE, EAP, PB
DIF Floor Insulation				

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
DIFL	Floor Insulation (MH)	Belly insulation installation. Includes belly repairs unless the SIR is <1. Also includes board insulation installed under ducts and plumbing.	See Weatherization Program Manual Chapter 8 and Weatherization Assistant Guide for MHEA modeling and measure options. Report repairs separately when modeled separately. See also ZRRS040	EAP, PB
JBM Boiler Modifications				
JBM	Boiler Modifications	All required modifications that are not included with a basic boiler installation. Reported modifications may occur with or without a boiler replacement.	Examples include outdoor reset, auto fill valves, distribution system work, and compression tanks.	DOE, EAP, PB
JHSM Heating System Modifications				
JHSM	Heating System Modifications	Includes all modifications needed aside from what would be included with basic furnace installation. These may occur with or without a furnace replacement.	Examples for existing forced-air systems include ductwork modifications, insulating ducts and filters. Do not include ductwork costs associated with electric conversions in this measure category.	DOE, EAP, PB
JHSM005	Clean and Tune	Includes primarily cleaning surfaces, adjusting burners, oxygen, diaphragms, gas pressure; it also includes work needed to increase the efficiency while reducing carbon monoxide as part of a Clean & Tune.	Do not include other modifications or repairs to the balance of the heating system (e.g. ductwork) with the clean and tune. Report those measures separately.	DOE, EAP, PB .
JHSM015	Setback Thermostat	Limited to programmable thermostats only.	Conventional thermostats are reported in ZRHS030 Thermostat Replacement.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
JHSM020	Repair/ Replace/ Add Ductwork - First Floor	Includes ductwork that is installed to improve the heating system distribution. Includes filter covers and filter racks.	Ductwork completed primarily to address CAZ pressure is reported under Health & Safety as XHHS030 Ducts repair or replace. Report the ductwork repair or replacement separately from the heating system in WisWAP (exception: electric conversions).	DOE, EAP, PB
JHSM025	Repair/ Replace/ Add Ductwork - Second Floor	Includes ductwork that is installed to improve the heating system distribution.	Report the ductwork separately from the heating system repair or replacement activity in WisWAP (exception: electric conversions).	DOE, EAP, PB
JHSM035	Seal Ducts	Includes sealing ductwork to improve the heating system distribution. Duct sealing should be limited to the following conditions: distribution is outside of the heating envelope, distribution leaks are causing excessive negative or positive pressure in the CAZ, and large leaks in the distribution system are causing heat to not reach the intended occupiable space. DOE funds may not be used for this measure.		EAP, PB
JHSR Heating System Replacement				
JHSR	Heating System Replacement	Heating systems reported under this category have been modeled as an ECM and have an SIR ≥1.0. The exception is the conversion of electrical heating systems in 1-4 unit buildings. See	Does not include replacements that are done due to Health and Safety problems. Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
		JHSR060 for additional information.		
JHSR060	Electric Conversion	All electric conversions that are not Health and Safety. Use the Electric Fuel Switch calculator to generate the savings information.	The total cost of the electric conversion, including ductwork, shall be reported in this measure.	DOE, EAP, PB
HEALTH AND SAFETY MEASURES (H&S)				
XHAR Ventilation				
XHAR005	62.2 Ventilation	Includes whole building mechanical ventilation running continuous or intermittently. Also known as whole house or continuous.	The Diagnostic Workbook summary page will indicate when this measure is required and the job is eligible for use of DOE funds. DOE funds shall not be used if customer refuses 62.2 ventilation.	DOE, EAP, PB
XHAR007	Local Exhaust Ventilation	An exhaust fan controlled with a switch or motion sensor.	Local exhaust or spot ventilation is turned on and off by the customer. It may include a timer to allow the fan to run for a certain period of time after use.	DOE, EAP, PB
XHAR009	Venting Existing Exhaust	Venting existing fans to the outside of the building.	Includes correcting incorrect venting.	DOE, EAP, PB
XHAR013	Make Up Air	Installation of makeup air for combustion safety.		DOE, EAP, PB
XHAP Health and Safety Appliance				
XHAP015	Appliance Repair	Gas leak repair only.	Cannot be used to repair high CO in cook stoves.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
XHAS Health and Safety Asbestos				
XHAS005	Attic with Vermiculite	The additional cost to follow procedures (O&M or certified supervisor and workers) when vermiculite insulation is present in the attic.	Model the additional asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAS010	Attic with Non-Vermiculite ACM	The additional cost to follow procedures (O&M or certified supervisor and workers) when suspect or confirmed ACM (non-vermiculite) was present in the attic.	Model the additional asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAS015	Sidewalls with Vermiculite	The additional cost to follow procedures (O&M or certified supervisor and workers) when vermiculite insulation was present in the sidewalls.	Model asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAS020	Sidewalls Slate/ Stucco Siding	The additional cost to follow procedures for certified supervisor and workers to remove and re-install slate side or disturb stucco.	Model additional asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAS025	HVAC/ Distribution	The additional cost to follow procedures (O&M or certified supervisor and workers) when suspect or confirmed ACM was present on HVAC/distribution.	Model additional asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAS030	Miscellaneous ACM	The additional cost to follow procedures (O&M or certified supervisor and workers) when suspect or confirmed ACM (not vermiculite, slate, stucco, or HVAC/ distribution) was disturbed during weatherization.	Model additional asbestos costs with the related measure(s). Report the costs separately.	DOE, EAP, PB
XHAQ Health and Safety Air Quality				

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
XHAQ005	Worst Case Draft Test	Standardized test procedures that include an appliance draft test under worst case depressurization conditions. Complete worst case depressurization tests on every dwelling with natural draft or assisted draft appliances.	The Worst Case Draft (WCD) test includes both a worst case depressurization measurement of all of a structure's CAZs and a draft test of naturally drafting combustion appliances under those worst case conditions.	DOE, EAP, PB
XHAQ006	Worst Case Depressur-ization w/o Draft	Standardized test procedures that determine the depressurization of building. No draft test is taken. This test is important to determine the impact of ventilation on a building. Complete worst case depressurization tests on every dwelling.	With Category I natural draft and fan assisted draft appliances, this measure cannot be used. See Worst Case Draft Test. Use this measure with sealed combustion appliances only.	DOE, EAP, PB
XHAQ010	Health and Safety Dryer Venting	Installation of UL listed materials for ducting and necessary supplies or hardware (i.e., hose clamp) to address an existing moisture or combustion gas hazard. See Field Guide Section 5.9.11.	Effective July 1, 2018 dryer venting shall be reported as a Health and Safety measure, not a repair.	DOE, EAP, PB
XHAQ025	Dehumidifier New or Replace	Installation of a dehumidifier to address an existing moisture problem which cannot be addressed in any other way.	This is not a baseload measure.	DOE, EAP, PB
XHAQ035	Other Remediation	Measures performed to decrease indoor air quality pollutants in the home. Includes sealing of open core blocks and installing 6 mill poly in crawlspaces not receiving an insulation measure. Can also include oil tank capping or removal when a documented health and safety issue was identified during the energy audit	Report crew labor and materials with measure.	EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
		and the oil tank work is not associated with a heating system fuel switch.		
XHAQ045	Gas Leak Repair	Gas leak repair throughout the building. Natural gas leaks on the utility side of the meter should be addressed by the utility or the building owner. Limited repair is allowed when the LP tank and distribution are owned by the low-income customer.		DOE, EAP, PB
XHEL Health and Safety Electrical				
XHEL015	Upgrade or Repair Electric	Includes necessary weatherization related electrical wiring installation and upgrades. Includes separate circuit for the heating system when required, the installation of GFCI receptacles, wiring for condensate pumps, the proper bonding of the electrical systems to gas service, or repairs to correct unsafe wiring, including junction box covers in attics to be insulated.	The replacement of knob and tube wiring is reported as a repair. Charge service repair or upgrade to ZREL005. Charge knob and tube wiring replacement to ZREL015 (attic) or ZREL020 (walls).	DOE, EAP, PB
XHHS Health and Safety Heating System				
XHHS	Heating System Replacement	Generally limited to the replacement of unsafe heating systems that do not have an SIR ≥1.0 and where the job has a cumulative SIR ≥1.0.	Note for all Health and Safety heating system replacements: DOE funds shall not be used on in- progress replacements when the cumulative SIR<1.0. See Program Manual 8.3.2.3 End- State Planning. Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
XHHS005	Boiler Replace	Limited to the replacement of unsafe boilers that do not have an SIR ≥1.0 and where the job has a cumulative SIR ≥1.0.	Report heating system modifications separately. Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB
XHHS010	Boiler Repair	Includes miscellaneous boiler repair not included in JBM Boiler Modifications category or XHHS015.	Including, but not limited to venting modifications, condensate pumps, and repairs to improve high CO level.	DOE, EAP, PB
XHHS015	Boiler Radiators, Repair or Replace	Includes repairs to address a safety problem.	Including, but not limited to distribution system leaks and repair or replacement of radiators.	DOE, EAP, PB
XHHS020	Furnace Replace	Limited to the replacement of unsafe heating systems that do not have an SIR ≥1.0 and where the job has a cumulative SIR ≥1.0.	Report heating system modifications separately. Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB
XHHS025	Furnace Repair	Includes repairs to address a safety problem.	Includes miscellaneous furnace repair such as condensate pump or plumbing, venting modifications, items not listed in JHSM Heating System modification category.	DOE, EAP, PB
XHHS030	Ducts Repair or Replace	Includes duct repairs that are linked directly to health and safety measures.	Includes ductwork for health and safety heating system replacement or duct repair based on worst-case depressurization tests (Can include filter covers when natural draft appliances will remain in the CAZ.)	DOE, EAP, PB
XHHS035	Space Heater or Wall Furnace Replace	Limited to the replacement of unsafe space heaters that do not	Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
		have an SIR ≥1.0 and where the job has a cumulative SIR ≥1.0.		
XHHS040	Space Heater or Wall Furnace Repair	Includes repairs to address a safety problem, where no space heater replacement or other ECM heating system repair is planned.		DOE, EAP, PB
XHHS055	Electric Replace	Includes the replacement of electrical heating systems with electrical heating systems. This must be a health and safety measure based on unsafe conditions. When possible convert electric heating systems to another fuel.	Report conversions as an ECM, using JHSR060.	DOE, EAP, PB
XHHS060	Electric Repair	Includes the repair of an existing electrical heating system.		DOE, EAP, PB
XHHW Health and Safety Hot Water				
XHHW	Health and Safety Hot Water	Limited to unsafe or leaking water heater replacements that do not have an SIR ≥1.0 and where the job has a cumulative SIR ≥1.0.	Items that are bid with the base installation cost can be included in this measure.	DOE, EAP, PB
XHHW003	Electric to Electric Mobile Home .90	For the replacement of an unsafe mobile home electric water heater with an electric water heater of higher efficiency which is rated for mobile home installation.		EAP, PB
XHHW004	Electric to Electric .94	Includes the replacement of an unsafe electric water heater with an electric water heater of higher efficiency.		DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
XHHW005	Water Heater Replace	Includes the replacement of an unsafe or leaking water heater that doesn't fit into the other health and safety water heater replacement categories.	May include the cost of electric circuit installation and interior gas piping.	DOE, EAP, PB
XHHW007	Gas power vent from conventional gas	Includes the conversion of an unsafe atmospheric gas water heater with a power vented gas water heater.	Can include the cost of electric circuit installation and interior gas piping.	DOE, EAP, PB
XHHW008	Gas power vent from electric	Includes the conversion of an unsafe electric water heater with a power vented gas water heater.	Can include the cost of electric circuit modifications and interior gas piping. Verify this water heater was initially modeled as an ECM. Most electric to gas water heaters modeled as an ECM have an SIR ≥1.0.	DOE, EAP, PB
XHHW010	Water Heater Repair	Includes the repair of an unsafe water heater.		DOE, EAP, PB
XHHW015	Plumbing Repair or Replace	Includes plumbing repair that is linked directly to an unsafe or leaking water heater.	Includes installing TPR valve and pipe on a water heater when tank insulation is installed.	DOE, EAP, PB
REPAIR MEASURES				
ZREL Repair Electric Service				
ZREL	Repair Electric Service	Measures in this category are meant to protect an ECM.		DOE, EAP, PB
ZREL005	Upgrade or Repair Electric Service	Upgrade or repair of the electric system that is directly linked to protecting or assuring the effectiveness of a weatherization measure.		DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
ZREL015	Knob and Tube Replace Attic	Replacement of knob and tube wiring to allow for the proper air sealing and the installation of attic insulation.	Model the wiring replacement in the itemized cost tab.	DOE, EAP, PB
ZREL020	Knob and Tube Replace Walls	Replacement of knob and tube wiring to allow for the proper the installation of sidewall insulation.	Model the wiring replacement in the itemized cost tab.	DOE, EAP, PB
ZRHS Repair Heating System				
ZRHS030	Thermostat Replacement - Non-programmable	Installation of a non-programmable thermostat.	Report programmable thermostats under JHSM015 Setback Thermostat. Non-programmable thermostats can only be installed as a repair.	DOE, EAP, PB
ZRHS035	Fuel Switching	Costs related to fuel switching that are not part of the base bid price for installing a heating system. Allowable activities include oil tank capping or removal when performed in conjunction with an oil to gas heating system replacement, installation of exterior gas lines (lateral), and orifice replacement for LP to natural gas conversions.	For heating system replacements report the bid costs with the appropriate heating system measure and all additional costs in ZRHS035. For heating system conversions where existing system is not replaced report all costs in ZHRS035. Include the total linear feet of natural gas lateral (utility + weatherization) and the type of fuel switch (Oil to NG/LP; LP to NG) in comments.	DOE, EAP. PB
ZRHW Repair Hot Water				
ZRHW	Repair Hot Water	Measures in this category are meant to protect and ECM.		DOE, EAP, PB
ZRHW005	Water Heater Repair	Repairs to the water heater that are not for health and safety, but protect ECMs.	This could include items such as a replacement of a sacrificial anode, controls,	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
			clean and tune, replacement elements.	
ZRHW010	Plumbing Repair or Replace	Repairs to the hot water plumbing system that are not for health and safety, but protect ECMs.	Examples might include resizing intake and output pipes, repairing leaks, repairing dripping tub spouts, and modifying distribution to accommodate related measures.	DOE, EAP, PB
ZRRS Repair Structure				
ZRRS	Repair Structure	Measures in this category are solely to allow installation of an ECM or to assure that other weatherization measures are effective.		DOE, EAP, PB
ZRRS005	Chimney	Repairs to the chimney to improve performance or structural integrity.		DOE, EAP, PB
ZRRS030	Door Replacement R5	Door replacement.	Exterior doors, including field fabricated wood doors for basements.	EAP, PB
ZRRS035	Window Replacement Energy Star Rated	Includes window replacement that is a repair not an ECM.	Includes basement window replacements that are not Energy Star rated.	EAP, PB
ZRRS040	Repair Structure Other	Cost of repairs not covered by other measures.	Includes belly repairs that are modeled as Itemized Costs, cold water plumbing repairs that affect ECM's.	DOE, EAP, PB
ZRRS045	Ventilation - Soffit/Roof/ Gable	Ventilate the attic based on local code requirements or if unsealed bypasses remain in the attic.	Includes passive ventilation added to the attic via roof, gable end or soffit.	DOE, EAP, PB

Code	Name	Measure Detail	Reporting Tips	Allowable Funds
ZRRS085	Major Pressure Boundary	Costs associated with addressing substantial air barrier holes; repairs roughly the size of a walk door or larger, that are expected to result in a large (but unpredictable) change in the infiltration rate.	Includes work such as installing drywall or an interior door between living space and a tuck-under garage or walk-up attic, repairing a failed ceiling in a closet to seal off attic from house, or installing a sheet of plywood to seal off an open crawl space from a basement. Indicate in comments box what portion of the home is receiving this measure. Examples; tuck-under garage, attic, kneewall.	DOE, EAP, PB