

# STATE of MICHIGAN

## TECHNICAL WEATHERIZATION POLICY MANUAL

Effective Date: 07/1/2015

Issue Date: 5/1/2015

### INTRODUCTION AND OVERVIEW

The Technical Weatherization Policy (TWP) manual contains policies and requirements for the Michigan Weatherization Assistance Program. Community Action Agencies (CAAs) and Limited Purpose Agency (LPA) receiving funding from the State of Michigan for local administration of the weatherization program shall follow the guidelines contained in the TWP relative to technical and program requirements. Procedures and Best Practices may be found in the Retrofitting Michigan Field Guide or on-line at the National Renewable Energy Laboratory Standard Work Specification (NREL-SWS) website. [sws.nrel.gov](https://sws.nrel.gov) (<https://sws.nrel.gov/node/190>).

This manual contains the technical weatherization policies and requirements for the Michigan Weatherization Program, including measures guidelines/policies (which include "incidental repairs"), inspection/testing and energy audit requirements, standards and specifications for weatherization measures, manufactured home weatherization requirements, health and safety requirements, and testing requirements (which include blower door testing, carbon monoxide testing, combustion appliance inspection/testing, and infrared scans). The policy items identify any NREL-SWS items that are relevant to the policy.

### **1100 MANDATORY WEATHERIZATION MEASURES**

The following measures are required:

- Bypasses/Infiltration, as determined by blower door testing
- Duct Sealing, Repair and/or Replacement
- Blower Compartment Sealing - Ensure that the blower compartment is sealed (e.g., openings sealed, properly fitting door, a filter rack cover is in place, etc.).
- Duct and Pipe Insulation (if located in unheated areas) - Air distribution ducts and water pipe insulation shall comply with SOM Construction Code. Duct and pipe insulation shall comply with DOE/WAP program Requirements.

### **1101 MEASURE(S) COMPLETION BY ORDER of SUCCESSION**

Measures installation shall be completed in the following sequence:

1. Health and Safety measures to correct hazards identified on the audit that directly affect the health and safety of occupants (WAP staff and workers included).
2. Bypass/Air sealing
3. Insulation measures.
4. Remaining audit measures

NOTE: Incidental Repair measures shall be completed with the measure they are with.

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#### 2100 HEALTH AND SAFETY

The health and safety of clients, local weatherization operator (grantee) staff, and contractors is of primary concern. Health and safety hazards specifically not to be abated under the Michigan Weatherization Program shall include hazards presented by asbestos, radon, lead, mold and moisture, or toxic chemicals. Weatherization funds may be used for the elimination of energy related health and safety hazards that are necessary before or because of the installation of weatherization materials.

Each home weatherized must be assessed to detect the existence of potential hazards to workers or clients. If unsafe conditions exist that would endanger the health and safety of the clients or weatherization workers, and those conditions cannot be corrected, no weatherization work may be started on that home.

The audit shall include, but is not limited to, a health and safety inspection and discussion with the client relative to the following:

- Gas leak testing
- CO Ambient Air
- CAZ Testing
- ZPD for an attached or “tuck-under” garage
- Blower Door testing
- Evaluations of the duct system (e.g., return air properly ducted and air-tight).
- A complete evaluation of existing and potential moisture problems using Form DHS-552.
- A review for the presence of hazardous substances (asbestos, lead paint, volatile organic compounds) in the home.
- A review of the need and/or existence of smoke detectors.
- Evaluate clothes dryers for proper venting.
- Evaluate ventilation requirements for ASHRAE 62.2 2013 or later compliance
- A review for structural safety.
- A review for means of egress.
- A review for electrical hazards.
- A review for fire hazards.
- A SOM approved field audit completed with respect to the above health and safety issues.

To ensure that the weatherization work that was completed does not create potential problems, the inspection shall include, but is not limited to, a health and safety inspection and discussion with the client relative to the following:

- Gas leak testing
- CO Ambient Air
- CAZ Testing
- ZPD for an attached or “tuck-under” garage

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- A final blower door test after all work has been completed. This test must be consistent with ASHRAE 62.2 to ensure that building tightness recommendations have not been exceeded
- An evaluation of the moisture conditions in the dwelling
- A review of all weatherization work completed with respect to health and safety (e.g., structural damage as a result of weatherization work).

If the inspection indicates that weatherization work resulted in a health and safety problem, the agency must correct the problem prior to submitting the unit as a completion.

#### **2101 MANDATORY HEALTH AND SAFETY MEASURES**

- Smoke Detectors - Smoke detectors shall be provided
- Clothes Dryer Venting – Un-vented clothes dryers shall be vented outside
- Carbon Monoxide (CO) Alarm/Detector – CO Alarm/Detectors shall be provided
- Compliance with ASHRAE 62.2 – 2013 or later standard

\*Carbon monoxide alarms shall be installed by the Energy Auditor during the audit ~~on~~ in a dwelling under the following circumstances:

- Whenever a local agency must defer work and the dwelling unit contains an unsafe combustion appliance
- A combustion appliance is emitting unsafe levels of CO that cannot be immediately remedied
- A combustion appliance has minimal draft and/or spillage and **no** CO is being produced
- The dwelling contains a fireplace or wood burning stove that draws combustion air from inside the dwelling.

Weatherization work measures (except mechanical work orders to resolve the above) shall not be installed until unsafe appliances have been repaired, replaced, or removed.

#### **2101-1 SMOKE DETECTOR**

Smoke detectors are required as a health and safety measure. Smoke detectors shall be battery powered, installed in accordance with the manufacturer's recommendations, following state and local code requirements. New batteries may be installed in existing working smoke detectors. (Alkaline are recommended) Client education on appropriate test procedures and intervals to replace the batteries shall be documented.

<https://sws.nrel.gov/spec/203011>

#### **2101-2 CLOTHES DRYER VENTING**

Clothes dryers shall be vented directly to the exterior. Clothes dryers shall be vented using aluminum or galvanized sheet metal or approved aluminum flex duct (UL labeled) and in

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accordance with SOM Construction Code. Outdoor dryer vent caps shall have a backdraft damper that closes when the dryer is not being used.

<https://sws.nrel.gov/spec/660051>

<https://sws.nrel.gov/spec/660053>

#### **2101-3 CARBON MONOXIDE (CO) ALARM /DETECTOR**

Carbon Monoxide (CO) alarms shall be installed in each dwelling unit in compliance with NFPA 720. CO alarms shall be installed in all residences containing a combustion appliance or an attached garage. Standard for the installation of CO Detection and Warning Equipment shall be consistent with the requirements of applicable laws, codes, standards, and manufacturer's installation guidelines (reference ANSI/UL 2034-09).

Potentially unsafe CO levels determined during the audit shall be documented and written notice shall be provided to the client/landlord/property owner and documented electronically on the SOM approved field audit. A copy of the notice shall be maintained in the client/job file, Notice of Unsafe Conditions (DHS-4288) is located in the forms section at the end of this manual. Carbon monoxide alarms shall be installed by the Energy Auditor during the audit on in a dwelling under the following circumstances:

- Whenever a local agency must defer work and the dwelling unit contains an unsafe combustion appliance
- A combustion appliance is emitting unsafe levels of CO that cannot be immediately remedied
- A combustion appliance has minimal draft and/or spillage and no CO is being produced
- The dwelling contains a fireplace or wood burning stove that draws combustion air from inside the dwelling.

<https://sws.nrel.gov/spec/203012>

#### **2101-4 ASHRAE 62.2 Compliance**

All dwellings weatherized shall be evaluated for ASHRAE 62.2 2013 or later ventilation requirements. Compliance requirements (e.g. testing, calculations, fan sizing, fan Sone rating, Whole-home fan flow verification, continuous vs. intermittent fan specifications, file documentation, etc.) shall be performed by a certified person. SOM IWC venting calculations shall be used to determine mechanical sizing requirements. When calculations indicate 15 CFM or less, goals will be considered met and additional mechanical ventilation shall not be added. Method of compliance shall be documented on the 62.2-2013 tab of the IWC.

#### **2106 INSULATING IN AREAS WITH WIRING**

To minimize risks with wiring:

- Workers must demonstrate caution when working around wiring.

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- Verify proper wiring connections and proper fusing.
- Verify proper blocking out of insulation around heat-producing sources.

Inspection prior to installing insulation is critical to insure there are no potential hazards relative to the wiring.

- If knob and tube wiring exists in wall cavities to be insulated, it must be in good condition.
- Breakers or “S” type fuses must be installed in the fuse box (fuses appropriate to the wire size).

Otherwise such areas shall not be insulated and the file properly documented.

Insulating over knob and tube wiring is prohibited in some areas by code.

Any evidence of problems with wiring in the attic shall be inspected and corrected. If the correction is completed using WAP funding, the work must be completed by a licensed electrician.

<https://sws.nrel.gov/spec/20601>

**2107 SPACE HEATERS**

Compliance with the DOE Space Heater Policy is required. Un-vented space heaters as the primary heat source must be replaced with vented space heaters prior to any weatherization activities. The purchase/installation of un-vented space heaters is prohibited.

<https://sws.nrel.gov/spec/202021>

**2108 COMBUSTION APPLIANCE ZONE (CAZ) TESTING**

Perform this test on natural draft or category 1 appliances that have draft hood or barometric draft controls and are connected to natural draft venting system. The Energy Auditor and QC Inspector shall perform and document those test results on SOM approved audit. Combustion appliances shall be tested under the worst case depressurization of the combustion. All vented combustion appliances shall be CAZ tested after air sealing measures are installed, including sidewall dense pack insulation.

<https://sws.nrel.gov/spec/202011>

**3100 MINIMUM LEVELS OF AIR SEALING**

Each home shall be evaluated for minimum sealing levels based on current occupants and dwelling construction. Bypass/Infiltration is identified through blower door testing. The objective

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of air sealing is to establish an effective air barrier at the thermal boundary of the home while maintaining a cost effective  $SIR \geq 1$  as determined by the WA 8 audit.

Blower door testing shall be utilized to identify leakage. When identified on a work order as Bypass/Infiltration/Exfiltration, blower door driven air sealing shall be completed by a contractor (or grantee crew). Infiltration reduction that is a consequence of performing SIR driven Energy Conservation and/or H&S Measures (e.g., dryer vent hood, dense pack sidewall insulation, attic preparation, boxesill foam insulation, etc.) shall not be charged to infiltration reduction. "Blower Door Driven Air Sealing" costs shall be equal to or less than one (1) hour labor charge and shall be calculated in the NEAT/MHEA Infiltration Reduction (\$) as  $SIR \geq 1$ .

The infiltration/exfiltration bypass measures will be considered fulfilled when blower door calculations determine the dwelling is at the minimum air change level for occupant safety conditions, as required by ASHRAE 62.2-2013 or newer.

If blower door testing cannot be completed, a detailed explanation shall be documented on the SOM Approved Audit.

<https://sws.nrel.gov/spec/3>

#### **3101 CLOSING OFF FIREPLACES**

Unused fireplaces with no damper or a poorly fitting damper and no other existing means of sealing shall be closed off to stop infiltration/exfiltration/bypass.

- Blocking shall not be of a permanent nature (shall be removable).
- Blocking shall be flagged
- Documented electronically on the SOM approved field audit and with client's signature on DHS 4288 Potentially Unsafe Conditions Notice in file (e.g., red tagged, noting blocking).

Fireplaces which are used and cannot be effectively closed off by the damper, fireplace doors or other means, shall be repaired or otherwise corrected to allow closure when not in use.

#### **3102 CLOSING OFF AREAS**

Portions of dwellings not necessary for client use, which would require heat, shall be closed off to the maximum extent possible (as is acceptable to the client/owner). New interior doors may be installed where none exist in order to separate heated from unheated areas. Interior walls between heated and unheated areas shall be insulated in accordance with the WA 8 audit.

Unused, unheated second and third floor areas may be closed off by insulating floor-ceiling areas between heated and unheated floors and  $SIR \geq 1$ . In such cases, appropriate attic preparation and ventilation is required.

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**3103 SEALING NEW WOOD/WEATHERIZATION MATERIALS**

Wood and similar materials requiring a sealer shall be so protected whenever moisture may affect these materials. This includes all new wood doors and sash even when they may be protected by a storm window/door.

**3104 DECAY RESISTANT WOOD REQUIREMENTS**

Code requirements for use of pressure treated or other approved decay-resistant wood shall be complied with. Generally any wood within 8" of exposed earth must be pressure treated or otherwise approved for use.

**3140 FOUNDATION VENTILATION**

Proper and adequate ventilation must be included to ensure the effectiveness of the insulation and guard against deterioration caused by moisture accumulation. If vents exist they shall not be removed, covered, or otherwise disabled. When installing new vents they shall comply with SOM Construction Code.

<https://sws.nrel.gov/spec/314011>

**3160 DUCT/PIPE INSULATION & DUCT/SEAL REPAIR/REPLACEMENT**

All ducts and pipes (excluding drain pipes), located in unheated areas or areas which are being insulated and ventilated, (e.g., attics and crawl spaces) shall be insulated.

All ducts and pipes shall be thoroughly inspected for leakage and proper support.

Seal, repair and/or replace all supply and return air ducts, including furnace filter rack cover, as required insuring the integrity of the systems. New duct work shall be sized in accordance with the SOM Mechanical code.

Where possible, problems related to the fit of ductwork shall be corrected regardless of location of ductwork (both in heated and unheated areas). Typical problems include ducts disconnected at joints, holes in ducts, seams in ducts open and bent ducts.

New duct work shall be sized in accordance with the SOM Mechanical code

<https://sws.nrel.gov/spec/316011>

<https://sws.nrel.gov/spec/316021>

<https://sws.nrel.gov/spec/41601>

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**3300 STORM WINDOWS**

When called for by the NEAT/MHEA audit, storm windows shall be installed over existing single-glazed prime windows. Storm windows shall be compatible with the operation of prime windows (e.g., double-hung storms for double hung prime windows.) Storm windows must meet the applicable building code requirements relative to egress and shall not restrict open area of bedroom egress window. Operative prime windows shall remain operable without removal of storm window frame.

**4100 ATTIC INSULATION:**

Install ceiling insulation at the level determined by the NEAT/MHEA audit. Depth markers shall be uniformly placed for every 300 Sq/Ft of attic area and visible from the attic access. Depth markers shall be in contact with the ceiling and indicate the full depth of all insulation.

Install ceiling insulation at the level determined by the NEAT/MHEA audit.

**4101 PRECAUTIONS AND ATTIC PREPARATION REQUIREMENTS**

Prior to insulation, all by-passes between heated and unheated areas shall be air-sealed (e.g., ceiling penetrations, balloon frame construction, floor cavity below knee wall) and all venting and attic prep requirements shall be completed.

Inspect the areas to be insulated to identify potential safety hazards. Inspect the ceiling and roof for structural soundness and ability to support additional loads. Inspect for moisture problems. In the case of wiring that is cracked, frayed, deteriorated, or otherwise in question, do not add insulation to this area. Any evidence of problems with wiring in the attic shall be inspected and corrected. If the correction is completed using WAP funding, the work must be completed by a licensed electrician.

Identify and provide noncombustible (e.g. metal) barriers for all heat producing devices where cellulose insulation is to be installed. Maintaining a minimum 3" clearance from cellulose insulation (clearance of insulation from attic furnaces and other heat producing sources must be provided in accordance with the governing code). All barriers shall extend at least 4" above the height of the settled insulation.

Attic ceiling access barriers are to be made of a rigid material (e.g. plywood, pine, etc.). In cases where existing attic access has less than 30 inches of unobstructed headroom, fiberglass batts (extending 15" minimum from perimeter of access) may be used in ceiling accesses where occupants do not use the area for storage purposes. Barriers shall extend 2" above loose fill insulation without gaps.

Dryer, kitchen, and bath fan vents shall be extended to the outside. Vents shall be equipped with a water-proof cap and back damper. Ducts shall be aluminum or galvanized sheet metal,

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or a labeled aluminum flex duct. Exposed exhaust fan ducts in unconditioned spaces shall be insulated. Heat ducts and pipes passing through unheated attic areas shall be insulated. Before insulating, ducts and pipes shall be inspected. Ducts shall be sealed, and supported.

Proper and adequate ventilation must be included to ensure the effectiveness of the insulation and guard against deterioration caused by moisture accumulation. Ventilation shall be installed to meet SOM Construction code requirements.

<https://sws.nrel.gov/spec/4100>

**4102 CEILING INSULATION APPLICATION**

All insulation material shall be installed in accordance with requirements of the governing code and the manufacturer's recommendations. It shall be kept dry and free of extraneous materials.

<https://sws.nrel.gov/spec/41003>

**4103 KNEEWALL INSULATION APPLICATION**

When called for by the NEAT/MHEA audit all knee walls between heated and unheated areas shall be insulated. All insulation material shall be installed in accordance with requirements of the governing code and the manufacturer's recommendations.

<https://sws.nrel.gov/spec/41004>

**4104 BAND JOIST (SILL BOX) INSULATION**

When called for by the NEAT audit, all band joist pockets located between heated and unheated areas shall be insulated.

<https://sws.nrel.gov/spec/41401>

**4105 FLOOR INSULATION**

When called for by the NEAT audit, floors between heated and unheated areas shall be insulated.

<https://sws.nrel.gov/spec/413011>

**4106 FOUNDATION/PERIMETER INSULATION**

When called for by the NEAT audit, all foundation walls between heated and unheated areas shall be insulated.

Perimeter insulation shall be installed based upon the existing following conditions:

1. Furnace located below the floor level and within the foundation area.

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2. Extensive duct work located below the floor joists.
3. Plumbing located below the floor joists (which may be susceptible to freezing).
4. Client usage of below floor areas which requires heat.
5. Pumps, water heaters, or other equipment located below the floor level (which may be susceptible to freezing).
6. Situations where portions of the floor are not accessible to do floor insulation (but the Perimeter is accessible).

Prior to insulation, all by-passes between heated foundation areas and unheated areas shall be air sealed (e.g., foundation wall penetrations, cores of block opening into heated areas, gaps at sill plate).

When floor or perimeter insulation is required, and a dirt floor(s) exists, the dirt floor shall be covered with a minimum six mil polyethylene film held in place with rocks, boards, earth, or sand.

<https://sws.nrel.gov/spec/41402>

**4107 WALL INSULATION**

When called for by the NEAT/MHEA audit, walls between heated and unheated areas shall be insulated.

<https://sws.nrel.gov/spec/411>

**5100 FURNACE/BOILER/SPACE HEATER REPLACEMENT**

New heating systems may be installed in units when called for as a HEALTH AND SAFETY measure or based on SIR as determined NEAT/MHEA. The NEAT Audit and/or complete Manual "J" shall be used for sizing purposes.

Installation shall be completed by a licensed mechanical contractor. Installation shall be in accordance with the requirements of the governing code and manufacturer's recommendations. A mechanical permit shall be obtained from the code authority having jurisdiction.

New forced air heating systems shall have a filter rack with a cover, installed in the return air plenum, in an accessible location.

Once the unit has been installed, the mechanical contractor must place identification on the appliance in plain view. The identification shall indicate the date of installation and the name and phone number of the mechanical contractor.

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The mechanical permit number shall be stated on the SOM approved field audit and/or a copy of the permit attached on new installations. All installations are subject to jurisdiction verification.

#### **5101 FURNACE/BOILER/SPACE HEATER TUNE-UP/REPAIR**

Furnace, boiler, and space heater tune-up and repairs shall be conducted by licensed mechanical contractors.

- A tune-up involves a visual inspection, testing procedures, cleaning, and adjustments to improve the combustion and seasonal efficiency of the heating system.
- Repairs involve the replacement or reconstruction of defective or unsafe parts for the purpose of ensuring the safe operation of the heating system.

Tune-Up/Repair shall be completed by a licensed mechanical contractor. Tune-Up/Repair shall be in accordance with the requirements of the governing code and manufacturer's recommendations. A mechanical permit shall be obtained from the code authority having jurisdiction when repairs or jurisdiction rules require.

#### **5102 FURNACE FILTERS**

Dirty or non-existent furnace filters shall be evaluated for replacement. Clients shall be instructed in proper intervals for replacement of the filters as a part of the Client Education portion of Michigan's Weatherization Assistance Program. Furnace filter installation and replacement shall be charged as appropriate to "Duct" as an itemized cost in WA 8 and supported by cumulative SIR $\geq$ 1.

<https://sws.nrel.gov/spec/53003>

#### **5300 CLOCK SETBACK (SMART) THERMOSTAT**

Clock setback thermostats shall only be installed in dwellings where clients have agreed to utilize.

Thermostat shall be clock-operated type designed to provide a minimum of one setback period per 24 hours. Thermostat shall be compatible with existing furnace system. All thermostats installed shall display current room temperature.

Clients shall be instructed on the setting and operation of new clock thermostats and the replacement of batteries for thermostats utilizing batteries.

<https://sws.nrel.gov/spec/530037b>

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**7800 COMPACT FLUORESCENT LIGHT BULBS**

When SIR justified by NEAT/MHEA audit, incandescent bulbs shall be replaced with compact fluorescent light bulbs (CFL). An inspection shall be conducted to determine the retrofit of incandescent light bulbs with CFLs. Only one labor fee can be charged for each fixture regardless of the number of bulbs (e.g., 4 bulb ceiling fixture: 4 bulbs @\$3.00 + 1 labor @ \$5.00 = \$17.00). The replacement CFL wattage shall be determined by the usage and suitability for the client. WA 8.6 (Or current Weatherization Assistant Audit) Setup Library shall list only material charges. Labor costs per fixture shall be entered in the Baseloads>Lighting Systems>Additional Cost cell of the NEAT/MHEA Audit. Physical CFL installation is required. LEAVING CFL's WITH THE CLIENT FOR CLIENT INSTALLATION IS NOT ACCEPTABLE

<https://sws.nrel.gov/spec/780031>

**7801 REFRIGERATORS**

An audit shall be conducted of the existing refrigerator(s). If the Savings to Investment Ratio (SIR) is 1 or greater, the existing refrigerator(s) may be replaced at the time of weatherization with a single refrigerator that meets or exceeds the 2001 federal energy standards. Refrigerators may not be installed where none exist.

The replacement of only one refrigerator is allowed. Households which utilize more than one refrigerator and/or freezer shall be encouraged to eliminate additional units. Costs of disposal/recycling all units are allowable. If the appliance(s) identified for replacement are not available or present at the time of delivery the new refrigerator shall not be delivered. This shall be documented on the SOM Approved Audit and the refrigerator replacement shall be eliminated as a WAP measure for this dwelling unit.

- The audit can be a NEAT/MHEA evaluation or by entering metered data into the SOM Approved Audit
- A minimum of 10% of the units evaluated will be subject to live metering to determine actual watt-hour consumption.
- Refrigerators assessed using data base evaluation must match the model number.
- Refrigerators assessed using labeled consumption evaluation must include age and door seal condition
- The duration for metering is one (1) hour or greater.

If it is determined that a defrost cycle has occurred during the metering interval, one of the following shall be required:

- The metering interval shall be extended to 24 hours.
- The data shall be discarded, the meter reset and the one (1) hour interval begun again.

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Disposal requirements will include, removing the existing appliance(s) identified for replacement from the client's home and certified destruction (including recapture of CFC's as required by section 608 of the "Clean Air Act", as amended by Final Rule, 40 CFR 82, May 14, 1993).

A Certificate of Disposal from the scrap yard/recycler shall be available for all appliances removed from service and a copy placed in the client/job file.

<https://sws.nrel.gov/spec/780011>

#### **7810 DOMESTIC HOT WATER TANK (DHW)**

New water heaters may be installed in units when called for as a HEALTH AND SAFETY measure or based on SIR as determined NEAT/MHEA. Agencies may change fuel type if it is determined as merited based on cost/savings considerations (costs included in SIR). Funds cannot be used to convert to an electric water heater from another fuel source. Water heaters shall be installed by a State Of Michigan licensed contractor in accordance with the requirements of the governing code. The permit (where required) shall be obtained from the responsible code enforcement authority with copy or documentation maintained in the client file. Once the unit has been installed, the contractor must place the information on the appliance, in plain view, certifying that the system has been properly installed in accordance with governing code requirements. The information shall indicate the date of installation and the name and phone number of the mechanical contractor.

Water heaters shall be thoroughly inspected to determine whether they shall be insulated using the following guidelines:

1. Tanks which leak or have leaking pipes shall not be insulated.
2. If manufacturer's directions/warning labels indicate insulation is not recommended, tank shall not be insulated.
3. An operable temperature/pressure relief valve must be mounted to the tank (within the top 6") with the discharge directed downward and terminating within 6" of floor. If not the tank shall not be insulated.
4. Combustion type water heaters must have their own exhaust vent directly to the chimney or outside properly installed with a minimum 1/4 inch/foot positive pitch; if not, the tank shall not be insulated.
5. Combustion type water heaters must have a cover plate attached, covering the burner opening; if not, the tank shall not be insulated.
6. Combustion type water heaters with a vent damper shall not be insulated.

<https://sws.nrel.gov/spec/781021>

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<https://sws.nrel.gov/spec/78102>

**7810-1 LOW FLOW SHOWER HEAD**

Shower heads shall be examined for flow rate. Shower heads exceeding maximum two-and one-half gallons per minute at normal residential water pressures (20-40 psi) may be replaced with low flow shower heads. Replacement must be able to withstand temperatures of 160 degrees F.

<https://sws.nrel.gov/spec/781011b>