

## Definitions

**Competency** means:

- The possession of a minimum level of knowledge and proficiency required to collect appropriate information, make informed decisions, and physically take the needed actions to deliver the high-quality weatherization service in question.

**Possess a working knowledge of** means to:

- Know how a particular topic impacts the weatherization process;
- Have the relevant information committed to memory or be able to locate it in readily available sources; and
- Use the knowledge to make informed decisions and guide weatherization work.

**Demonstrate the ability to** means to:

- Physically conduct a test, procedure, or technique on an actual house, a prop, or in a training lab in the presence of someone qualified to assess the particular competency.

Depending on the position of the weatherization worker, the following Core Competencies help ensure the delivery of effective weatherization services.

## SAFE WORK PRACTICES

All field workers must exhibit safe work practices by possessing the following competencies.

- Possess a working knowledge of:
  - U.S. Department of Energy (DOE) program regulations/policy and Environmental Protection Agency (EPA) guidelines for asbestos, lead, mold, and other health hazards;
  - Material Safety Data Sheets; and
  - Occupational Safety and Health Act (OSHA) standards:
    - Ladder safety;
    - Fall protection;
    - Personal protective equipment;
    - Respiratory protection;
    - Motor vehicles;
    - Power-operated hand tools;
    - Fire prevention;
    - Permit-required confined spaces;
    - Other worker-related OSHA standards.
- Demonstrate the ability to:
  - Select, fit, and use the appropriate Personal Protection Equipment for a particular task;
  - Safely use basic hand and power tools;
  - Use a basic first aid kit to treat common job-site injuries;
  - Work lead safe;
  - Identify serious mold conditions; and

- Assess work area safety hazards.

## **INSTALLER**

The following competencies are required by workers that install weatherization measures.

### ***Prerequisites***

- Possess *Safe Work Practices* competencies

### ***Air Sealing***

- Possess a working knowledge of:
  - Proper materials selection based on location of leakage areas
  - Minimum ventilation rates;
- Demonstrate the ability to:
  - Use the blower door to locate leakage sites within the building;
  - Seal attic and floor bypasses at penetrations for plumbing, electrical wiring, flue vents, ducts; dropped soffits, and balloon-framed walls;
  - Seal typical bypasses in kneewalls and finished attic spaces;
  - Seal basement band joists;
  - Properly apply caulk and spray foam insulation;
  - Identify, select, and install weatherstripping on doors, windows, and attic hatches;
  - Cut glass, replace broken window panes, and apply glazing compound;
  - Repair plaster and sheetrock (drywall); and
  - Modify or install mechanical ventilation to ensure acceptable indoor air quality for post-air-sealing conditions.

### ***Duct Sealing***

- Demonstrate the ability to:
  - Properly seal duct connections with mastic and fiberglass mesh tape or other
  - approved material; and
  - Repair or modify duct systems as specified in a work order.

### ***Insulation***

- Possess a working knowledge of:
  - Properties and appropriate application of different insulation materials; and
  - Potential hazards of insulating around knob-and-tube wiring.
- Demonstrate the ability to:
  - Install blown and batt attic insulation;
  - Access closed wall cavities and properly install dense-packed cellulose wall
  - insulation including removing and replacing siding;
  - Install blown insulation and batt insulation in a floor;
  - Install water heater installation blankets;
  - Install insulation on ducts, hydronic distribution pipes, and domestic hot water
  - pipes; and

- o Safely operate and properly maintain insulation blowing machines and
- o generators.

### ***Base-Load Measures***

- Demonstrate the ability to:
  - o Replace incandescent light bulbs with compact fluorescent lamps while maintaining or improving lighting levels; and
  - o Install low-flow showerheads and faucet aerators;
  - o Assess the existing condition of plumbing pipes and faucets that may prohibit these measures.

## **CREW CHIEF**

Personnel that supervise field workers such as *Installers* must possess the following competencies.

### ***Prerequisites***

- Possess *Safe Work Practices* and *Installer* competencies.
- Possess a working knowledge of building science principles.

### ***Project Management***

- Demonstrate the ability to:
  - o Manage a crew of *Installers* so weatherization work is conducted safely, effectively, and efficiently;
  - o Ensure that the job site and *Installers* comply with the *Safe Work Practices* described previously;
  - o Maintain quality control of weatherization work and ensure it meets program standards;
  - o Understand a work order;
  - o Order and obtain materials, supplies, and equipment in time to avoid delays and wasted time on the job site; and
  - o Warehouse materials as necessary to avoid delays in completing weatherization work.

### ***Inspection and Measurement***

- Possess a working knowledge of:
  - o Air and heat flow in buildings;
  - o Factors that affect building heat loss;
  - o Construction features and critical junction points of common housing types;
  - o Insulation R-values;
  - o Different insulation materials and installation techniques;
  - o Various air-sealing techniques and appropriate materials;
  - o Causes of and remedies for existing and potential moisture problems;
  - o Causes of and remedies for other existing and potential indoor air quality problems;
  - o Residential mechanical ventilation systems;

- o Minimum ventilation rates/building tightness limits based on the appropriate ASHRAE 62 standard; and
- o Electric base-load usage.
- Demonstrate the ability to:
  - o Measure the dimensions of floors, walls, ceilings, windows, and doors, and compute surface areas;
  - o Compute the volume of conditioned space of a building;
  - o Define the thermal envelope of a building; and
  - o Assess the effectiveness of existing insulation and the effective R-values.

### ***Diagnostic Testing***

- Blower door
  - o Possess a working knowledge of:
    - Principles of air movement and how they relate to building heat loss;
    - Typical air leakage problems in common housing types; and
    - Minimum ventilation rates.
  - o Demonstrate the ability to:
    - Set up a blower door;
    - Prepare a building for a blower door test; and
    - Take blower door reading and interpret results.
- Zone pressure diagnostics
  - o Possess a working knowledge of:
    - The air barrier of a building and the importance of aligning it with the thermal barrier; and
    - Primary and intermediate zones of a house.
  - o Demonstrate the ability to:
    - Conduct zone pressure diagnostics and interpret results; and
    - Determine the location and effectiveness of the air barrier of a house.
- Duct testing
  - o Possess a working knowledge of:
    - Problems associated with different types of duct leakage.
  - o Demonstrate the ability to:
    - Determine dominant duct leakage;
    - Determine the amount of duct leakage or least the existence of significant duct leakage by conducting pressure pan, duct blaster, or delta Q tests.
    - Measure room pressure imbalances in houses with forced-air systems.
    - Resolve room pressure imbalances.

### ***Combustion Appliance Safety***

- Possess a working knowledge of:
  - o CO action levels;

- o Common code requirements related to:
  - o Vent system sizing, materials, clearances, and installation;
  - o Safety shut-off devices;
  - o Gas line sizing; and
  - o Combustion air;
  - o Causes of and remedies to common vent system problems.
- Demonstrate the ability to:
  - o Measure the CO level in ambient air;
  - o Measure the CO level of vented and unvented combustion appliances;
  - o Measure the CO levels of gas- or propane-fired cook stoves (oven and burners) and remedy high CO levels through basic cleaning and adjustments;
  - o Understand the difference between as-measured and air-free CO readings;
  - o Detect gas, propane, and fuel oil leaks; and
  - o Conduct a worst-case draft test of a combustion appliance zone; and
  - o Measure the steady-state efficiency of a vented combustion appliance.

### ***Insulation***

In addition to the insulation-related *Installer* competencies, possess a working knowledge of:

- Local codes relating to attic ventilation.

### ***Training***

- Possess a working knowledge of:
  - o Adult learning concepts; and
  - o Benefits of cross training on-site personnel.
- Demonstrate the ability to:
  - o Provide on-site training to *Installers* in a positive environment to strengthen competency in existing skills and increase the number of skill areas.

## **CONTRACTOR**

*Contractors* hired by local weatherization agencies to perform weatherization work must possess the following competencies. See *HVAC Installer/Contractor* for the competencies required of these specialty contractors.

### ***Prerequisites***

- Possess *Safe Work Practices, Installer, and Crew Chief* competencies.
- Possess a working knowledge of building science principles.

### ***Business Management***

- Demonstrate the ability to:
  - o Maintain the licenses required by the state and local jurisdiction for the type of work the *Contractor* is hired to perform;
  - o Possess adequate insurance;

- o Employ U.S. citizens or properly documented aliens; and
- o Bid, negotiate, and sign contracts, as necessary.

### ***Project Management***

- Demonstrate the ability to:
  - o Manage a crew of *Contractor*-employed *Installers* so weatherization work is conducted safely, effectively, and efficiently;
  - o Ensure that the job site and *Contractor*-employed *Installers* comply with the *Safe Work Practices* described previously;
  - o Understand a work order;
  - o Maintain quality control of weatherization work and ensure it meets program standards;
  - o Order and obtain materials, supplies, and equipment in time to avoid delays and wasted time on the job site; and
  - o Warehouse materials as necessary to avoid delays in completing weatherization work.

Depending on the type of work the *Contractor* is hired to perform, the following inspection, diagnostic testing, combustion appliance safety, and/or insulation competencies may be required.

### ***Inspection and Measurement***

- Possess a working knowledge of:
  - o Air and heat flow in buildings;
  - o Factors that affect building heat loss;
  - o Construction features and critical junction points of common housing types;
  - o Insulation R-values;
  - o Different insulation materials and installation techniques;
  - o Various air-sealing techniques and appropriate materials;
  - o Causes of and remedies for existing and potential moisture problems;
  - o Causes of and remedies for other existing and potential indoor air quality problems;
  - o Residential mechanical ventilation systems;
  - o Minimum ventilation rates/building tightness limits based on the appropriate ASHRAE 62 standard; and
  - o Electric base-load usage.
- Demonstrate the ability to:
  - o Measure the dimensions of floors, walls, ceilings, windows, and doors, and compute surface areas;
  - o Compute the volume of conditioned space of a building;
  - o Define the thermal envelope of a building; and
  - o Assess the effectiveness of existing insulation and the effective R-values.

### ***Diagnostic Testing***

- Blower door
  - o Possess a working knowledge of:
    - Principles of air movement and how they relate to building heat loss;
    - Typical air leakage problems in common housing types; and
    - Minimum ventilation rates.
  - o Demonstrate the ability to:
    - Set up a blower door;
    - Prepare a building for a blower door test; and
    - Take blower door reading and interpret results.
    - Zone pressure diagnostics
  - o Possess a working knowledge of:
    - The air barrier of a building and the importance of aligning it with the thermal barrier; and
    - Primary and intermediate zones of a house.
- Zone Pressure Diagnostics
  - o Demonstrate the ability to:
    - Conduct zone pressure diagnostics and interpret results; and
    - Determine the location and effectiveness of the air barrier of a house.
- Duct testing
  - o Possess a working knowledge of:
    - Problems associated with different types of duct leakage.
  - o Demonstrate the ability to:
    - Determine dominant duct leakage;
    - Determine the amount of duct leakage or least the existence of significant duct leakage by conducting pressure pan, duct blaster, or delta Q tests;
    - Measure room pressure imbalances in houses with forced-air systems; and
    - Resolve room pressure imbalances.

### ***Combustion Appliance Safety***

- Possess a working knowledge of:
  - o CO action levels;
  - o Common code requirements related to:
    - Vent system sizing, materials, clearances, and installation;
  - o Safety shut-off devices;
  - o Gas line sizing; and
  - o Combustion air;
  - o Causes of and remedies to common vent system problems.
- Demonstrate the ability to:
  - o Measure the CO level in ambient air;
  - o Measure the CO level of vented and unvented combustion appliances;

- o Measure the CO levels of gas- or propane-fired cook stoves (oven and burners) and remedy high CO levels through basic cleaning and adjustments;
- o Understand the difference between as-measured and air-free CO readings;
- o Detect gas, propane, and fuel oil leaks;
- o Conduct a worst-case draft test of a combustion appliance zone; and
- o Measure the steady-state efficiency of a vented combustion appliance.

## **HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

### **INSTALLER/CONTRACTOR**

#### ***Heating and Cooling Equipment***

##### Prerequisites:

- Possess *Auditor/Combustion Appliance Safety and Safe Work Practices* competencies;
- Possess the HVAC certifications and licenses required by the state and local jurisdiction.
- Possess a working knowledge of:
  - o The components of typical steam and hot water distribution systems and the characteristics of their proper operation.
- Demonstrate the ability to:
  - o Maintain quality control of weatherization work and ensure it meets program standards;
  - o Repair or replace heating and cooling equipment in a code-compliant manner;
  - o Estimate the heating and/or cooling load of a dwelling per Manual J to ensure proper sizing of replacement heating or cooling systems;
  - o Repair or replace vent systems of combustion appliances in a code-compliant manner;
  - o Repair or replace a water heater in a code-compliant manner (some states may require a licensed plumber to replace a water heater);
  - o Ensure proper sizing of gas lines;
  - o Assess the adequacy of supply and return plenum and duct sizes for forced-air systems;
  - o Add return and supply plenums and ducts as required;
  - o Determine dominate duct leakage;
  - o Conduct duct pressure tests, which could include:
    - Pressure pan;
    - Duct Blaster; and
    - Delta-Q;
  - o Measure and solve room pressure imbalances in houses with forced-air systems;

- o Test air vents, steam traps, thermostatic radiator valves, and hot water zone valves;
- o Bleed unwanted air from a hot water distribution system;
- o Estimate the energy impacts of existing overheating problems in steam and hot water heating systems;
- o Warehouse materials as necessary to avoid delays in completing weatherization work; and
- o Test out to assure system is operating properly and safely.

### ***Combustion Appliance Safety***

- Possess a working knowledge of:
  - o CO action levels;
  - o Common code requirements related to:
    - Vent system sizing, materials, clearances, and installation;
  - o Safety shut-off devices;
  - o Gas line sizing; and
  - o Combustion air;
  - o Causes of and remedies to common vent system problems.
- Demonstrate the ability to:
  - o Measure the CO level in ambient air;
  - o Measure the CO level of vented and unvented combustion appliances;
  - o Measure the CO levels of gas- or propane-fired cook stoves (oven and burners) and remedy high CO levels through basic cleaning and adjustments;
  - o Understand the difference between as-measured and air-free CO readings;
  - o Detect gas, propane, and fuel oil leaks;
  - o Conduct a worst-case draft test of a combustion appliance zone; and
  - o Measure the steady-state efficiency of a vented combustion appliance.