



---

# Health and Safety Information for Missouri Home Energy Auditors

---

Division of Energy fact sheet

11/2010

## **Health and Safety**

Health and safety issues are an important part of a Home Energy Audit Program. When a health or safety hazard is detected, it is the policy of the Department of Natural Resources' Energy Center that Home Energy Auditors should address the hazard. This policy is tempered by recognition that the primary goal of the audit program is energy conservation and that the department is not setting audit standards. Although balance is needed between these competing issues, the health and safety of the building, occupants and auditors or contractors should not be compromised by any retrofit material, technique or practice.

The following sections highlight areas of concern that may affect the health and safety of the workers and the clients. In most cases, the best approach to limiting the health and safety risk is to minimize their exposure to the hazard.

### ***A. Crew/Contractor Safety***

The department recognizes that auditors may work either as individuals or as part of a crew. An auditor is responsible for complying with Occupational Safety and Health Administration (OSHA) requirements in all audit activities that involve staff personnel. When contractors are employed by auditor, those contractors also are required to comply with OSHA. For detailed information on worker health and safety, refer to [Construction Industry OSHA Safety and Health Standards \(29 CFR 1926\)](#).

The department expectation is for crews, contractors and auditors to be able to work under conditions that do not jeopardize their own health and safety.

### ***B. Building/Occupant Safety***

To ensure appropriate consideration for health and safety, relevant procedures and assessments should be conducted as part of the building analyses. Each home audited should be individually assessed to determine the existence of potential hazards to workers or clients. When conditions within the home are such that the health and safety of the client, crew, or contractor will be jeopardized prior to providing assistance, the audit should not proceed until such problems are remedied.

## **1. Carbon Monoxide**

When combustion appliances are present in the dwelling, or where there is reason to suspect a



significant level of carbon monoxide (CO) present in the ambient air (such as with an attached garage) the ambient air should be tested for CO at the initial part of the building audit

CO alarms should be installed in all homes where a furnace return air could backdraft a space heater, wood stove, fireplace, or water heater.

Smoke alarms should be in every home and should be installed if not present in a home receiving weatherization services. A smoke alarm should be installed near combustion zone(s) and one near bedrooms.

## **2. Combustion Systems**

Dwellings with unvented or vent-free combustion appliances, with the exception of gas ranges, should not be audited until such appliances are properly vented (according to the appropriate code) to the outdoors or removed from the home.

All conventionally vented (this excludes direct-vent appliances) combustion appliances should be tested for proper draft using the worst-case draft procedures.

Worst-case draft testing should always be done after all audit measures are installed.

Worst-case draft testing is suggested before audit work begins in dwellings where:

- (a) There is ductwork installed in a Combustion Appliance Zone (CAZ); or
- (b) The auditor has reason to believe that worst-case draft testing would reveal useful information.

Carbon monoxide testing of space and water heating appliances should be done with a digital carbon monoxide meter before dilution air enters the vent system. If there is a flue opening for each burner, the test should be done in each flue opening individually.

A heat shield should be installed when it is determined that a venting system is too close to combustible materials or the venting system should be moved to ensure proper clearance.

All visible fuel lines should be tested for fuel leaks both outdoors and indoors, starting at the meter or LP tank.

Recommend removal of non-functioning humidifiers from forced air furnace systems with prior client approval.

All gas valves should have at least a single safety. If a gas valve has no safety, then the client should replace the gas valve with the most cost-effective replacement:

- A 100% safety millivolt gas valve.
- A 100% safety 24 volt gas valve.
- A remote bulb gas valve.

When there is a suspicion that the pilot safety system is not functioning properly, auditors



should perform a simple test of the pilot safety device to ensure that it is functioning properly. Procedures for this test are:

- Light pilot and let it warm the thermocouple for at least one minute. Do not operate the heater during this time.
- Observe the second hand on a watch or clock, then either blow out the pilot flame or put controller to the off position.
- Count the number of seconds from when the pilot is shut off until you hear the sound of the electromagnet valve closing shut.
- A good drop out time is usually 20 to 30 seconds; longer is better. Heaters equipped with power vents have drop out times of 10 to 15 seconds.
- Repeat the test to confirm it is consistent.

Auditors should use a non-contact voltage sensor to ensure that the main switch will properly turn off the electricity to a space heating unit.

All 110 volt wiring connections should be secured with wire nuts and electrical tape, and enclosed in an electrical junction box or other appropriate enclosure.

The proper size and type of wire should be used. The wire should have the correct rating for voltage, amperage, and heat exposure.

Flexible gas connectors should be installed so that they do not pass through the appliance body.

All direct vent (sealed combustion) water heating and space heating appliances with visual indicators of a potential carbon monoxide problem, such as carbon build-up, should be tested for carbon monoxide.

### **3. Response to Combustion Appliance Problems**

The auditor should determine if it is best to contact the local gas company or oil dealer to correct these problems. Gas utilities always have their own emergency response protocols and these should be respected. The items listed below are not intended to interfere with gas utilities emergency protocols (often called tagging procedures).

In each of the situations in Subsection 3, the auditor should evaluate the client's situation, for the purpose of determining if:

- The client can safely remain in the home if an alternative source of heat (portable electric space heaters) can be obtained or whether the should to be relocated for a short time.
- If the auditor believes the client cannot safely remain in the home, the client should be advised to make arrangements to stay with family or friends until the unit can be



occupied again.

#### **4. Emergency Situations, Immediate Follow-up Required**

Some safety problems may warrant a discontinuing of the combustion appliance testing or shutting off the appliance until the repairs can be made. When this situation occurs for a space heating appliance, the client should be left with an alternative source of heat. Examples of this type of situation are:

- *Major Natural Gas Leak:* Gas can be smelled more than two feet from the gas line.
- *Major Propane or Natural Gas Leak:* Propane can be smelled more than three feet from the leaking fitting.
- *Clogged or Disconnected Flue:* A clogged or disconnected flue that cannot be fixed, causing significant spillage of combustion products into a heated space, or working area of the auditor.
- *Backdrafting or Significant Spillage:* Any backdrafting of combustion products in combination with carbon monoxide indications, which cannot be fixed.
- *Cracked Furnace Heat Exchanger:* Any visually identified cracked heat exchanger leaking combustion products in combination with positive carbon monoxide or others.
- *Other Hazards:* Any other situation or combination of situations which the auditor judges hazardous to the health of the client or others.

#### **5. Non-Emergency, One-day Follow-up Required**

Some situations may not warrant discontinuing testing or shutting down the heating system, but are serious enough to require attention within twenty-four hours. Examples of this type of situation are:

- *Cracked Heat Exchanger:* Visually identified cracked heat exchanger that is leaking combustion products, with no carbon monoxide indications.
- *Spillage:* Spillage but no carbon monoxide indications in a heated space.
- *Propane or Natural Gas Leak:* Propane can be smelled, but not more than three feet from the leaking fitting.
- *Carbon Monoxide:* Measured carbon monoxide levels should comply with Table III-3 in Subsection III, and there should be an adequate draft and no spillage.
- *No Limit Switch:* A furnace with no limit switch that poses a safety issue or a limit switch that is disconnected.

#### **6. Non-Emergency, Five-day Follow-up Required**

All other safety related follow-up should begin within five days unless the system or service can be shut-off until repairs are made. Examples of this type of situation are:



- *Draft*: Unacceptable draft with spillage in an unheated area.
- *Propane or Natural Gas Leak*: Gas can be smelled, but not more than two feet from the gas line.
- *Limit*: A furnace limit switch that does not shut the gas off by 225<sup>o</sup> F.
- *Suspicion of a Cracked Furnace Heat Exchanger*: A cracked heat exchanger is suspected, but there are no other apparent problems with the furnace.

## 7. Blower Door Safety

If a dwelling is tightened to a CFM50 level less than the calculated Building Airflow Standard for that dwelling, actions to remedy the situation should be taken and may include properly sized, continuously operating mechanical ventilation. Refer to the calculated Building Airflow Standard CFM50 value for the home.

Do not conduct a depressurization blower door test while a wood stove, fireplace, or a vented space heater is operating. If one of these appliances is operating, it **will not** be considered sufficient reason for never conducting a blower door test. Auditor personnel are expected to shut down the appliance to conduct the test or revisit the dwelling at a time when the appliance is not operating.

Do not conduct a depressurization blower door test when any combustion appliance is operating. Standard practice is to positively shut off conventionally vented combustion appliances before the blower door test is conducted. A procedure should be in place to ensure that the appliance is returned to the pretest condition. Exceptions to appliance shut down include:

- Direct-vent (sealed combustion) appliances.
- Unvented gas appliances, such as most gas ranges.

## 8. Moisture

All homes should be checked for previous or existing moisture problems. Repair of moisture problems that might:

- Result in health problems for the client, 2) damage the structure over the short- or long-term, or 3) diminish the effectiveness of the efficiency measures, should be done before the audit job is completed.

The moisture assessment should pay special attention to the following:

- Evidence of condensation on windows and walls indicated by stains or mold.
- Standing water, open sumps, open wells, dirt floors, water stains, etc. in basements. Also, check to see if firewood is stored in the basement and whether laundry is hung to dry during the winter months.
- Leaking supply or waste pipes.



- Attic roof sheathing shows signs of mold or mildew.
- Identification of existing or potential moisture problems should be documented.
- If existing moisture problems are found, no air sealing should be done unless the source of the moisture can be substantially reduced or effective mechanical ventilation can be added to cost-effectively remove the moisture. In some cases, air sealing should be done in order to reduce the source of the moisture (i.e. sealing off crawlspaces from the house, or sealing attic leakage to eliminate condensation on the roof deck).
- Because air tightening may cause an increase in relative humidity, client education should include information about moisture problems and possible solutions.
- In the course of an audit, any low-cost measures that help reduce the humidity levels in the house should be considered. Examples of these activities are venting dryers, venting existing bath or kitchen exhaust fans or installing moisture barriers on dirt floors.
- A dwelling that has a CFM50 greater than the Building Airflow Standard (BAS) is no guarantee that moisture will not be a problem in that home.

## **9. Hazardous Conditions & Materials**

Auditors should minimize or restrict the use of materials that may be hazardous to the client, however if the auditor should utilize hazardous materials, including chemicals, such use should be discussed with the client prior to using.

If strong smelling chemicals, such as formaldehyde, are detected in the client's home, auditors should not perform any efficiency measures that would reduce the natural air leakage of the dwelling.

The installation of hazardous materials that should be used for effective energy efficiency should be done used in well-ventilated areas.

### *Asbestos Inspection Procedures*

Prior to performing work or conducting tests, the auditor should conduct an inspection for materials suspected of containing asbestos if there is the possibility that they may be disturbed during the testing or work.

Decisions on approaches to audit work where asbestos is present should be based on the judgment of the most qualified individual available to the auditor.

When major energy saving measures might be sacrificed as a result of suspected asbestos-containing materials, the auditor may have the suspected material tested for asbestos content.

All auditors should wear high quality respirators any time asbestos is worked with.

When materials containing asbestos are worked with, the asbestos materials should be dampened with water whenever possible to reduce the risk of airborne asbestos fibers.



Materials containing asbestos may not be cut, drilled, or disturbed in any manner that may cause asbestos fibers to become airborne.

## **10. Electrical Safety**

### Knob-and-Tube Wiring

If knob-and tube wiring is active in an attic, any insulation should be kept at least three inches from the wiring. Blown insulation should be appropriately dammed to keep the insulation from advancing closer than three inches from the knob-and-tube wiring.

If active knob-and-tube wiring is found in a dwelling attic, walls, or basement, the walls of the dwelling should not be insulated.

If knob-and-tube wiring has been deactivated and the dwelling has been rewired with BX, Romex, or other approved electrical cable, the attic and walls may be insulated without special precaution.

### Ground-Fault Interrupt Circuits

Ground-fault circuit interrupter (GFCI) devices should be tested to ensure that they are working properly in dwelling bathrooms and kitchens.

## **11. Additional Safety**

Special precautions should be taken if the occupant of the home has respiratory ailments, allergies, is pregnant, or has unique health concerns. Auditors should try to protect all clients from respirable particles, such as paint or insulation dust, during the audit process.

At minimum, auditors and crewmembers should inform property owners of safety problems, code problems and other health and safety issues. For problems that are life threatening or otherwise serious, the auditor should contact the jurisdiction having responsibility for the observed problem.

