

# LEED for Homes version 2008

## EQ 2: Combustion Venting

### Intent

Minimize the leakage of combustion gases into the occupied space of the home.

### Requirements

#### Prerequisites

2.1 **Basic Combustion Venting Measures.** Meet all the following requirements.

- a) No unvented combustion appliances (e.g., decorative logs) are allowed.
- b) A carbon monoxide (CO) monitor must be installed on each floor.
- c) All **fireplaces** and woodstoves must have doors.
- d) Space and water heating equipment that involves combustion must meet one of the following. Space heating systems in homes located in IECC-2007 climate zone 1 or 2 are exempt.
  - i. it must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting);
  - ii. it must be designed and installed with power-vented exhaust; or
  - iii. it must be located in a detached utility building or open-air facility.

#### Credits

2.2 **Enhanced Combustion Venting Measures** (maximum 2 points). Install no **fireplace** or woodstove, or design and install a **fireplace** or woodstove according to the requirements in **Table 1**.

#### Conducting a Back-Draft Potential Test

Using the results from a blower-door test, measure the pressure difference created by the presence of a chimney-vented appliance. To ensure a limited risk of back-drafting, the pressure difference ( $\Delta P$ ) must be less than or equal to 5 Pascals, where

$$\Delta P = (Q/C)^{1/n} \text{ (must be } \leq 5 \text{ Pascals)}$$

and Q is equal to the sum of the rated exhaust provided by the two biggest exhaust appliances in the home, and C and n are both constants produced by the blower-door test results.

**Table 1:** Fireplace and Stove Combustion-Venting Requirements

Fireplace or stove	Enhanced combustion-venting measures	
	Better practice (1 point)	Best practice (2 points)
None	See "best practice".	Granted automatically.
Masonry wood-burning fireplace	Install masonry heater as defined by American Society for Testing and Materials Standard E-1602 and International Building Code 2112.1.	Meet requirement for "better practice", and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "Conducting a Back-Draft Potential Test" below).
Factory-built wood-burning fireplace	Install equipment listed by approved safety testing facility (e.g., UL, CSA, ETL) that either is EPA certified or meets the following: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "Conducting a Back-Draft Potential Test" below).
Woodstove and fireplace insert	Install equipment listed by approved safety testing facility that either is EPA certified or meets following requirement: equipment with catalytic combustor must emit less than 4.1 g/hr of particulate matter, and equipment without catalytic combustor must emit less than 7.5 g/hr of particulate matter.	Meet requirement for better practice, and conduct back-draft potential test to ensure $\Delta P \leq 5$ Pascals (see "Conducting a Back-Draft Potential Test" below).
Natural gas, propane, or alcohol stove	Install equipment listed by approved safety testing facility that is power-vented or direct-vented and has permanently fixed glass front or gasketed door.	Meet requirement for better practice, and include electronic (not standing) pilot.
Pellet stove	Install equipment that is either EPA certified or listed by approved safety testing facility to have met requirements of ASTM E 1509-04, "Standard Specification for Room Heaters, Pellet Fuel-Burning Type."	Meet requirement for better practice, and include power venting or direct venting.

## EQ 2.1: Basic Combustion-Venting Measures

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The leakage of toxic combustion exhaust gases into the home can cause poor indoor air quality and human health impacts, particularly in homes that are well constructed and well sealed. Closed combustion through direct or power venting can dramatically reduce the risk that combustion gases will be drawn into the home under conditions of negative pressure. The best way to block combustion gases from fireplaces and wood-burning stoves is to avoid installing them; fireplace doors provide a minimal reduction in back-drafting. Although closed combustion reduces back-drafting, the use of monitors is an easy and effective way to mitigate the risk of unforeseen exposure to carbon monoxide from leaks, equipment failures, and unanticipated occupant behavior.

### Approach and Implementation

Select fireplaces and woodstoves that are vented and have tight-fitting doors. Install carbon monoxide monitors on each level or floor of the house, in or near any spaces that are above or next to combustion appliances or garages.

Work with the HVAC contractor to identify combustion appliances that suit the needs of the home, meet the energy goals of the project, and are designed for closed combustion or power-vented exhaust. If the project requires appliances that are not direct-vented or power-vented, include plans for a detached or open-air space for the appliances. The common practices of installing a chimney-vented furnace and locating the water heater in an attic or attached garage do not meet the requirements for this credit.

Closed combustion requires that both the supply air and the exhaust air are fully ducted and sealed. Power-vented

exhaust systems use fans to blow air out of the house and prevent back-drafting of combustion gases. Both options eliminate the need for a conventional chimney.

All furnace and water heater manufacturers offer a wide range of direct- and power-vented alternatives. Most high-efficiency furnaces (i.e., 90% AFUE or higher) are direct-vented through sealed plastic pipe. A standard mid-efficiency furnace usually vents into a conventional natural-draft chimney and therefore does not meet the intent of this requirement.

The noise associated with a power-vented water heater may be objectionable if the appliance is installed within the home. Select a power-vented water heater with a quiet motor or install the unit away from living areas. An alternative to closed-combustion furnaces or water heaters is the use of electric heat pumps and electric water heaters, which do not involve combustion.

Kitchen stoves and ovens are not considered unvented combustion appliances, as kitchens are required to have local exhaust under EQ 5.

### Calculations

No calculations are required for this credit.

### Exemplary Performance

No additional points are available for exemplary performance.

### Verification and Submittals

#### Green Rater:

- ☐ Visually verify that all requirements of the prerequisite have been met.



## EQ 2.2: Enhanced Combustion-Venting Measures

Indoor air quality and human health are adversely affected by leakage of exhaust combustion gases into the home. Having no fireplace or stove is the most effective way to reduce the risk associated with combustion gases. Meeting EQ 2.1 for fireplaces and woodstoves provides minimal back-draft protection. Better practice is installation of efficient appliances that achieve a more complete burn and therefore produce fewer pollutants and reduce human health risks. Best practice provides improved appliance efficiency and the highest level of back-draft protection.

### Approach and Implementation

The only way to completely eliminate the risks associated with harmful combustion gases from fireplaces and wood-burning stoves is not to install these appliances. The next best option is to install a system that burns cleanly and minimizes the risk of back-drafting into the house. Natural gas and propane fireplaces that are designed properly with direct-venting pose fairly little risk. Masonry heaters are designed to burn efficiently and are an effective method for space heating.

A conventional site-built open-hearth fireplace is not eligible for points in this credit. Such fireplaces are very inefficient, in part because they draw a large amount of combustion air from within the home. Consequently, they tend to pull air through envelope leaks, making the home cold and drafty.

If a traditional wood-burning fireplace or stove is desired, select a UL-listed factory-built fireplace or factory-built insert that meets EPA standards for particulate matter emissions. Such appliances are designed to burn solid fuel more fully and more cleanly, which means improved efficiency, safety, and indoor air quality.

Fireplaces with 60% to 80% efficiency are readily available in the marketplace.

Provide a source of air to the fireplace or stove and limit the number and size of exhaust fans in the house. Even factory-built wood-burning fireplaces and stoves with tight-fitting doors can result in some back-draft of combustion gases into the home. The greatest risk of back-drafting comes from running large exhaust fans (e.g., kitchen, bathroom, or other ventilation with high cfm ratings), which can depressurize the home and pull air from the fireplace back inside. Back-draft potential tests should be conducted by an energy rater.

For gas fireplaces, use an electronic ignition rather than a continuously operating pilot light to save energy throughout the year.

Seal air leaks at the joint between the chimney and the wall by removing the trim (if necessary) and applying heat-resistant caulking.

Install a carbon monoxide detector near all combustion appliances.

### Calculations

To meet the best practice requirements and earn 2 points, a home with a wood-burning stove or fireplace must pass a back-draft potential test, to be conducted by the energy rater. This calculation requires a blower-door test.

Using the results from a blower-door test, test the pressure difference created by the presence of a chimney-vented appliance. The pressure difference ( $\Delta P$ ) must be less than or equal to 5 Pascals, where

$$\Delta P = (Q/C)^{1/n} (\leq 5 \text{ Pascals})$$

and Q is equal to the sum of the rated exhaust provided by the two biggest exhaust appliances in the house, and C and n are both constants produced by the blower-door test results.

## Exemplary Performance

No additional points are available for exemplary performance.

## Verification and Submittals

### Builder / Project Team:

- ☐ Present any **fireplace** or stove equipment literature (e.g., user manuals, brochures, specifications) to the Green Rater for visual inspection.
- ☐ Include **fireplace** or stove equipment literature in the occupant's operations and maintenance manual.
- ☐ For best practice with a wood-burning stove or **fireplace**, present back-draft calculations to the Green Rater.

### Green Rater:

- ☐ Visually verify that all applicable standards and certifications have been met: check safety listing in the appliance user manual, check EPA

certification on the EPA Web site ([www.epa.gov/woodstoves/index.html](http://www.epa.gov/woodstoves/index.html)) or in the user manual, and check pellet stove compliance with ASTM E1509-04 in the appliance user manual. (See labels, Figure 1.)

- ☐ For best practice with a wood-burning stove or **fireplace**, visually verify that back-draft calculations are completed.
- ☐ Visually verify all applicable equipment in the home.

## Considerations

### Environmental Issues

Inefficient, poorly designed **fireplaces** and stoves not only increase the risk of exposure to combustion gas within the house, they also have higher emissions of harmful particulates and other combustion products. Poorly designed systems can depressurize the home, causing back-draft of gases.

Figure 1. Safety Laboratory and EPA Certification Labels



# D for Homes version 4

## Homes-v4 EQp2: *Combustion venting*

Required

CREDIT LANGUAGE



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### Intent

To limit the leakage of combustion gases into the occupied space of the home.

### Requirements

Do not install any unvented combustion appliances (ovens and ranges excluded).

Install a carbon monoxide (CO) monitor on each floor, hard-wired with a battery backup. In multifamily buildings, install a CO monitor on each floor of each unit.

For all fireplaces and woodstoves inside the building, provide doors that close or a solid glass [enclosure](#). Interior fireplaces and woodstoves that are not closed-combustion or power-vented must pass BPI or RESNET combustion safety testing protocols to ensure that depressurization of the combustion appliance zone is less than 5 Pa.

Space- and water-heating equipment that involves combustion must meet one of the following:

- it must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting);
- it must be designed and installed with power-vented exhaust; or
- it must be located in a detached utility building or open-air facility.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of this prerequisite.

# Homes-v4 EQc5: *Combustion venting*

1-2 points

## CREDIT LANGUAGE



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## Intent

To minimize the leakage of combustion gases into the occupied space of the home.

## Requirements

### Option 1. No fireplace or woodstove (2 points)

Do not install any fireplaces or woodstoves.

OR

### Option 2. Enhanced combustion venting measures (1 point)

For any wood- or pellet-burning stoves, install equipment that is EPA certified. For wood-burning fireplaces, install equipment that is EPA qualified. Provide power or direct venting.

For any natural gas, propane, or alcohol stoves, install equipment listed by an approved safety testing facility. The stove must have a permanently fixed glass front or gasketed door and an electronic pilot. Provide power or direct venting.

Projects that earn the EPA Indoor airPLUS label automatically meet the requirements of Option 2.