

Unvented Combustion Appliances

Last Updated: 07/24/2017

Scope



Unvented gas fireplaces release combustion byproducts into the living space, they should not be installed.

Do not install unvented combustion appliances within the conditioned space of the home. Unvented combustion appliances include unvented fireplaces, also known as ventless or ductless fireplaces. These gas, propane, or ethanol-burning fireplaces have no vent so they draw combustion air from the room they are in and release toxic combustion byproducts and moisture vapor back into the space in which they are located. Their use is banned in many states and municipalities.

See the [Compliance Tab](#) for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.

Description

For aesthetics, builders today will sometimes install a ventless gas, propane, or ethanol-burning fireplace in the home. These ventless appliances have real flames, providing the ambiance of a traditional fireplace, with convenience and cost savings for the builder because no chimney needs to be installed. Manufacturers report that they burn at nearly 100% efficiency releasing fewer harmful gases into the home than other types of fireplaces. However, because they are ventless, any unburned combustion byproducts are released directly into the living space because there is no chimney to vent them out of the home. Also because no air intake is installed, many manufacturers recommend that homeowners open a window during operation of the fireplace, although there is no way to guarantee homeowners will follow this advice. A ventless fireplace that is burning efficiently will have a primarily blue flame. Defects such as plugged burner ports, a cracked burner, excessive gas input, impurities in the gas, or a gas leak somewhere in the unit can impact performance, reducing the efficiency of the burn and increasing the amount of combustion byproducts released.

In addition to possible combustion byproducts, ventless combustion appliances also release significant amounts of water vapor into the air. These products produce 1 gallon of water vapor for every 100,000 Btus, so a 30,000-Btu appliance would release nearly 1 gallon of water vapor for every 3 hours of operation, adding greatly to indoor humidity levels.

Due to safety, health, and moisture concerns, some building scientists recommend that unvented appliances never be installed in homes ([BSC 2007](#), [Bailes 2013](#)).

ENERGY STAR Version 3.0 permits their installation but requires that the HERS rater test the appliance (using a portable CO monitoring device) and verify that the ambient CO level does not exceed 35 parts per million (ppm). The rater should also confirm that the room size provides a minimum volume of combustion air for safe operation based on the size of the appliance installed, as specified by the manufacturer and/or code. The [National Fuel Gas Code](#) prohibits the installation of ventless combustion heaters in bathrooms or bedrooms.

Some ventless fireplaces come equipped by the manufacturer with an oxygen-detection sensor (ODS) that will automatically shut down the appliance if oxygen levels in the room become too low. It is recommended that the builder install a CO detector in the room near the ventless fireplace ([NACHI 2013](#)).

Because of safety concerns, several states and municipalities have banned the use of ventless combustion appliances. There have been no documented cases of fatalities caused by ODS-equipped ventless fireplaces, according to the U.S. Consumer Product Safety Commission ([NACHI 2013](#)). However, there have been consumer complaints about illness and humidity ([Bailes 2013](#)).

How to test unvented combustion appliances

1. Turn on or light the ventless combustion fireplace.
2. Let the appliance operate for 10 minutes.
3. Use a portable, hand-held CO monitor held in the air within a few feet of the fireplace or other appliance to test the ambient air near the appliance. If the CO level is above 35 ppm, the appliance fails the test and must be serviced and retested, or replaced.



Figure 1 - A ventless combustion fireplace has no chimney; it draws combustion air from and releases combustion byproducts to the room in which it is located.



Figure 2 - A HERS rater uses a portable CO monitor to test for ambient CO near a ventless combustion fireplace.

Ensuring Success

In homes with an unvented combustion appliance such as a ventless gas or propane fireplace, the HERS rater should test the appliance by operating the appliance for at least 10 minutes and verifying that the ambient CO level does not exceed 35 ppm.

Climate

No climate specific information applies.

Training

Right and Wrong Images

None Available

CAD

None Available

Compliance

The Compliance tab contains both program and code information. Code language is excerpted and summarized below. For exact code language, refer to the applicable code, which may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our [webmaster](#) if you find broken links.

[ENERGY STAR Certified Homes](#)

ENERGY STAR Certified Homes (Version 3/3.1, Revision 08), Rater Field Checklist

10. Combustion Appliances

10.3 If unvented combustion appliances other than cooking ranges or ovens are located inside the home's pressure boundary, the Rater has followed Section 805 of RESNET's Standards, encompassing ANSI/ACCA 12 QH-2014, Appendix A, Section A3 (Carbon Monoxide Test), and verified the equipment meets the limits defined within.^{54, 58}

Footnotes:

(54) The pressure boundary is the primary enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to conditioned space would be outside the pressure boundary.

(58) The minimum volume of combustion air required for safe operation by the manufacturer and / or code shall be met or exceeded. Also, in accordance with the National Fuel Gas Code, ANSI Z223.1 / NFPA54, unvented room heaters shall not be installed in bathrooms or bedrooms.

ENERGY STAR Revision 08 requirements are required for homes permitted starting 07/01/2016.

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our [webmaster](#) if you find broken links.

Case Studies

1. [Technology Solutions Case Study: Combustion Safety for Appliances Using Indoor Air](#)

Author(s): NSTAR, PARR

Organization(s): NSTAR, PARR

Publication Date: May, 2014

Case study describing a method for evaluating safe installation and operation of combustion appliances in homes undergoing energy efficiency upgrades where indoor air is used for combustion and venting.

References and Resources*

1. [A Ventless Gas Fireplace Doesn't Belong in Your Home](#)

Author(s): Bailes

Organization(s): Green Building Advisor

Publication Date: January, 2013

Information sheet about unvented fireplaces and combustion safety.

2. [DOE Zero Energy Ready Home National Program Requirements](#)

Author(s): Department of Energy

Organization(s): DOE

Publication Date: April, 2017

Standard requirements for DOE's Zero Energy Ready Home national program certification.

3. [ENERGY STAR Certified Homes, Version 3 \(Rev. 08\) National Program Requirements](#)

Author(s): U.S. Environmental Protection Agency

Organization(s): EPA

Publication Date: December, 2015

Webpage with links to Document outlining the program requirements for ENERGY STAR Certified Homes, Version 3 and 3.1 (Rev. 08).

4. [NFPA 54: National Fuel Gas Code](#)

Author(s): National Fire Protection Association

Organization(s): National Fire Protection Association

Publication Date: January, 2018

Code outlining minimum safety requirements for the design and installation of fuel gas piping systems in homes and other buildings.

5. [READ THIS: Before You Design, Build or Renovate](#)

Author(s): Lstiburek, Brennan

Organization(s): Building Science Corporation

Publication Date: December, 2006

Document with important building science considerations, designed for members of the residential construction and remodeling industries, as well as owners and managers who work in affordable housing.

6. [Ventless Fireplace Inspection](#)

Author(s): Gromicko

Organization(s): International Association of Certified Home Inspectors

Publication Date: January, 2013

Document outlining important safety considerations of ventless fireplaces.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

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