

American National Standard for
Ventless Firebox Enclosures
For Gas-Fired Unvented
Decorative Room Heaters

Second Edition - 2007



Approved
February 28, 2007
American National Standards Institute, Inc.

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Preface

This publication represents a basic standard for safe operation, substantial and durable construction, and acceptable performance of ventless firebox enclosures for gas-fired decorative type unvented room heaters. It is the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research on unvented gas-fired heating appliances designed for the utilization of gas. There are risks of injury to persons inherent in some appliances that, if completely eliminated, would defeat the utility of the appliance. The provisions in this Standard are intended to reduce such risks while retaining the normal function of the appliance.

Nothing in this standard is to be considered in any way as indicating a measure of quality beyond compliance with the provisions it contains. It is designed to allow compliance of ventless firebox enclosures for gas-fired decorative type unvented room heaters, the safety construction and performance of which may exceed the various provisions specified herein. In its preparation, recognition has been given to possibilities of improvement through ingenuity of design. As technical advances take place, revisions may become necessary. When they are believed desirable, recommendations or suggestions should be forwarded to the Chairman of Z21/83 Committee, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131. A proposal form is provided in the back of this document.

Safe and satisfactory operation of ventless firebox enclosures for gas-fired decorative type unvented room heaters depends to a great extent upon its proper installation, use and maintenance. It should be installed, as applicable, in accordance with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*; the (U.S.) *Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280*, or when such standard is not applicable, *Manufactured Home Installations, ANSI/NCSBCS A225.1* or the Standard for *Manufactured Home Installations, Sites, and Communities, ANSI/NFPA 501A*, manufacturers' installation instructions, and local municipal building codes.

Users of this American National Standard are advised that the devices/products/activities within its scope may be subject to regulation at the Federal, state or local level. Users are strongly urged to investigate this possibility through appropriate channels. In the event of a conflict with this standard, the Federal, state or local regulation should be followed.

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EFFECTIVE DATE: An organization using this standard for product evaluation as a part of its certification program will normally establish the date by which all products certified by that organization should comply with this standard.

History Of The Development Of The Standard For Ventless Firebox Enclosures For Gas-fired Unvented Decorative Room Heaters

(This History is informative and is not part of the standard.)

At its May 19, 1998 meeting, the Z21 Subcommittee on Standards for Unvented Gas-Fired Heating Appliances considered the development of a new standard for ventless firebox enclosures for gas-fired unvented decorative room heaters, and approved to distribute it for public review and comment, August 1999.

The first draft ventless firebox enclosures for gas-fired unvented decorative room heaters standard was based on current coverage from IAS Requirement 2-97, Ventless Firebox Enclosures for Gas-Fired Decorative Type Unvented Room Heaters.

Following reconsideration and modification of the proposed draft standard, in light of comments received, the unvented heater subcommittee at its December 2, 1999 meeting, recommended the proposed draft standard to Accredited Standards Committee Z21/83.

The proposed draft standard for ventless firebox enclosures for gas-fired unvented decorative room heaters, as modified by the subcommittee, was approved by the Z21/83 Committee on July 18, 2000.

The first edition of the American National Standard for Ventless Firebox Enclosures for Gas-Fired Unvented Decorative Room Heaters was approved by the American National Standards Institute, Inc., on January 9, 2001.

This edition of the American National Standard for Ventless Firebox Enclosures for Gas-Fired Unvented Decorative Room Heaters was approved by the American National Standards Institute, Inc., on February 28, 2007.

The previous editions of the ventless firebox enclosures standard, and addenda there to, approved by the American National Standards Institute, Inc. are as follows:

Z21.91-2001
Z21.91a-2002
Z21.91b-2004

The following identifies the designation and year of this standard:

ANSI Z21.91-2007

Note: This edition of Z21.91 incorporates changes to the 2001 edition and addenda there to. Changes, other than editorial, are denoted by a vertical line in the margin.

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American National Standard for Ventless Firebox Enclosures For Gas-Fired Unvented Decorative Room Heaters

Part I: Construction

1.1 Scope

1.1.1

This standard applies to newly produced ventless firebox enclosures (see Part IV, Definitions), herein after referred to as fireboxes, for unvented decorative room heaters.

1.1.2

Fireboxes covered by this standard are intended for use with unvented decorative room heaters, which comply with *ANSI Z21.11.2* for installation in solid fuel-burning fireplaces.

1.1.3

If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated value is to be regarded as the specification.

1.2 General Construction & Assembly

1.2.1

The construction of all parts of the firebox, whether specifically covered in this standard or not, shall be in accordance with reasonable concepts of safety, durability and maintainability.

All specifications as to the construction, set forth herein, may be satisfied by the construction actually; prescribed or such other construction as will provide at least equivalent performance.

1.2.2

All components used in the firebox shall be assembled in such manner so as to be secure against distortion, warping or other damage, and shall be supported to maintain a fixed relationship with each other.

1.2.3

All parts which may be contacted during normal use shall be free from sharp projections or edges.

1.2.4

Asbestos shall not be used in the construction of a firebox.

1.2.5

All parts which may require cleaning, repair or replacement in the field, shall be accessible with the firebox installed in accordance with the manufacturer's installation instructions and shall not require the use of special tools.

1.2.6

Fasteners used to attach any part which must be adjusted or removed for servicing, shall be of corrosion-resistant material or have a corrosion-resistant finish.

1.2.7

Doors shall not be permitted as part of the firebox design. Fireplace screens, or equivalent means designed to prevent unintentional access into the firebox interior, must be provided.

1.2.8

The construction of the firebox shall be substantial to the extent it will support without damage 300 lbs. of weight uniformly applied to the top of the firebox. Fireboxes designed for recessed installation only need not comply with this provision.

1.2.9

A freestanding firebox shall be designed so it cannot be tipped over as determined by the following method of test. This test does not apply to fireboxes which are provided with means (including necessary screws, bolts or both) and instructions for attaching it to the floor or wall.

Method of Test

Fireboxes when tipped in any direction at a 15 degree angle (0.26 rad) from the vertical shall not tip over when released.

1.2.10

Parts of the firebox that are intended to be installed into combustible construction shall be suitable for 0 inch clearance to combustible construction. This may be accomplished by use of spacers provided as an integral part of the equipment by the manufacturer.

1.2.11

Any circulating fan or blower intended for use with the firebox shall be provided with the firebox submitted for test. Complete electrical wiring means shall be provided as part of the fan or blower assembly.

1.3 Materials

1.3.1

The manufacturer shall supply evidence acceptable to the testing agency that all materials have been evaluated and found to be acceptable for their intended usage. Test data based on ASTM or other appropriate test procedures, certification or historical data may be submitted for this purpose. The evidence shall show that the materials have been evaluated, as appropriate, for resistance to moisture, corrosion, temperature, the effects of fuel gases and any other compounds or conditions to which the materials may be exposed. Non-metallic sealing materials shall also be suitably resistant to the effects of ozone.

1.3.2

Materials used in the construction of those portions of the firebox that are likely to be exposed to the products of combustion shall be constructed of materials having the durability and resistance to fire and heat equivalent to Series 300 or 400 stainless steel, aluminum-coated steel, cast iron or 0.042 inch thick unprotected or painted steel. The minimum metal thickness shall be as specified below:

Aluminum-coated Steel	0.018 in (.046 mm)
Cast iron	0.125 in (3.18 mm)
Stainless steel	0.012 in (0.30 mm)
Brass-plated Steel	0.012 in (0.30 mm)
Steel (uncoated or painted)	0.042 in (1.07 mm)

1.4 Electrical Equipment And Wiring

1.4.1

Electrical equipment and wiring, if provided, shall be listed or certified by a nationally recognized testing agency qualified to certify or list electrical equipment or wiring.

1.4.2

Electrical equipment and wiring shall be suitable for the temperatures to which they are exposed and the service to which they are subjected. Maximum allowable temperature rises of some typical wires and components are shown in Table I, Maximum Allowable Rise Above Room Temperature for Various Component Parts.

Method of Test

The firebox shall be operated as specified in 2.4, Wall, Floor and Ceiling Temperatures. Temperatures of electrical equipment, controls and wiring shall be determined for each component at points subjected to maximum temperatures by means of thermocouples not larger than No. 24 AWG (0.20 mm²) placed in good thermal contact with the material. At the option of the manufacturer the temperatures of motor windings and coils may be measured by the resistance method. Observed temperatures shall not be in excess of those for which wires or components are approved.

1.4.3

Fireboxes shall be constructed so all noncurrent-carrying metal parts are electrically continuous to the point of connection of the equipment grounding means. This provision shall be deemed met when the electrical resistance between the point of connection of the equipment grounding means and any noncurrent-carrying metal part is not more than 0.1 ohm.

Method of Test

The electrical resistance between the point of connection of the equipment grounding means and each noncurrent-carrying metal part shall be determined by either a Wheatstone bridge or by measuring the potential drop between the two points when an alternating current of 20 amperes, derived from a power supply of not more than 12 volts, is passed between the two points and dividing the measured potential drop by the current. The electrical resistance shall not be more than 0.1 ohm. (Insulating resistant finishes may be scraped from the test points.)

1.4.4

The leakage current measured on a firebox tested in accordance with the following Method of Test shall not exceed the limits specified below.

Method of Test

When connected in the manner intended to a supply circuit of rated voltage and frequency, the firebox shall be operated as specified in 2.4, Wall, Floor and Ceiling Temperatures.

At the conclusion of the operating period specified, and with continued application of rated voltage and frequency, leakage current between each of the supply terminals and all noncurrent-carrying metal parts (ungrounded) which might become energized shall be measured using the instrumentation specified in the Standard for *Leakage Current for Appliances, UL C101*. The leakage current shall not exceed 0.5 milliamperes, except that for fireboxes equipped with capacitor-type motors, leakage current shall not exceed 1.15 milliamperes.

1.4.5

Adequate dielectric shall be interposed between ungrounded current-carrying parts and those external surfaces which can be contacted.

Method of Test

When connected to a supply circuit of rated voltage and frequency, the firebox shall be operated as specified in 2.4, Wall, Floor and Ceiling Temperatures. At the conclusion of the operating period specified, the applicable dielectric test(s) outlined below shall be conducted.

During conduct of the dielectric withstand tests, a 500 volt-ampere or larger transformer, having an essentially sinusoidal output voltage which can be varied, shall be used. The applied potential shall be increased gradually from zero until the required test voltage is reached and shall be held at that value for 1 minute. The use of a 500 volt-ampere or larger transformer is not necessary if the high potential testing equipment used maintains the specified high potential voltage at the appliance during the test.

- a. The firebox shall be capable of withstanding, for 1 minute without breakdown, the application of a 60 hertz potential between high-voltage live parts and dead-metal parts, and between live parts of high- and low-voltage circuits. The test potential shall be 1000 volts plus twice rated voltage.
- b. A low-voltage circuit shall be capable of withstanding, for 1 minute without breakdown, a 60 hertz potential of 500 volts applied between low-voltage live parts of opposite polarity and between low-voltage live parts and dead-metal parts.

The dielectric withstand test between low-voltage parts of opposite polarity need not be conducted on the complete assembly if the components have been separately subjected to this test condition.

The arrangement of the test circuit shall be such that if the dielectric material breaks down, a positive signal shall be obtained rather than depending upon a visual inspection of the material.

1.4.6

The surface of an insulated lead intended solely for the connection of a grounding conductor shall be finished in a continuous green color or a continuous green color with one or more yellow stripes, and no other lead shall be so identified.

1.4.7

A soldering lug, a push-in, screwless connector, or a quick-connect or similar friction-fit connector shall not be used for the grounding terminal intended for the connection of field supply connections.

1.4.8

A wire-binding screw intended for the connection of an appliance grounding conductor shall have a green colored head that is hexagonal, slotted, or both. A pressure wire connector intended for connection of such a conductor shall be plainly identified such as by being marked "G", "GR" "Ground" or "Grounding" or marking a wiring diagram provided on the product.

1.4.9

Wiring shall be done with insulated conductors having current-carrying capacity, voltage and temperature ratings consistent with their use. A conductor, other than an integral part of a component, shall not be smaller than No. 18 AWG (0.82 mm²).

1.4.10

Switches shall have current and voltage ratings not less than that of the circuit loads they control.

1.4.11

A switch or similar device shall be mounted securely and prevented from turning.

1.4.12

A low-voltage circuit shall be supplied by an energy limiting transformer or a combination of transformer and overcurrent protection device suitable for an NEC Class 2 circuit or by a combination of transformer and fixed impedance having output characteristics suitable for a Class 2 circuit.

When an overcurrent protection device is used it shall be an integral part of the transformer or be located at the point where the circuit to be protected receives its supply, shall not be of the automatic-reclosing type and shall be trip-free from any reclosing mechanism. The device shall be inaccessible to tampering, except for a replaceable fuse which is not interchangeable with a device of a higher current rating.

When a combination of transformer and fixed impedance is used, the electrical interconnection between the two shall be made with wiring materials suitable for Class 1 circuits, unless the two components are incorporated in a single enclosure and located in a normally closed compartment.

A low-voltage supply shall not be obtained from a power source above 30 volts by the use of voltage-dropping resistors.

1.4.13

An enclosure for uninsulated live parts is acceptable if the accessibility probe shown in Figure 1, Accessibility Probe, cannot contact uninsulated high-voltage live parts. The probe shall be applied, (1) with a force of 2.5 lb (11.1 N), and (2) in any possible configuration and to any depth that the size of an opening will permit. The probe shall be rotated or angled to any possible position before, during or after insertion through the opening. If necessary, the configuration shall be changed after the probe has been inserted through the opening.

Such live-metal parts as indicated above shall not be located where contact could reasonably be made during normal servicing.

1.5 Wiring Methods

1.5.1

All electrical equipment, wiring, and accessories built in or supplied by the manufacturer for direct attachment to the firebox shall be submitted for examination with the enclosure.

1.5.2

The wiring of the fan assembly shall consist of wires of a type or types that are acceptable when considered with respect to the temperature, ampacity, voltage, and conditions of service to which the wiring may be subjected.

1.5.3

Unless supplied with insulation suitable for the highest voltage involved, insulated conductors of different circuits shall be separated by barriers or shall be separated or segregated from uninsulated current-carrying parts connected to different circuits.

1.5.4

A splice in wiring shall be located only in a junction box or the equivalent. A splice shall be made mechanically and electrically secure and shall be soldered, unless a wire connector is used. A joint shall be covered with insulation equivalent to that on the conductors.

1.5.5

Detachable plug connectors shall not be used in circuits when disconnection of the circuit may allow unsafe operation of the device, unless means are provided to prevent accidental disconnection.

1.5.6

Electrical connections which need to be broken to service any controls shall be made in such a manner that they may be disconnected and reconnected without breaking a soldered connection and without breaking or cutting the wires.

1.5.7

Electrical installation and service connection leads or terminals of an individual component shall be identified by a number, letter, symbol or combination thereof, except when:

- a. The component incorporates means which will physically prevent miswiring; or
- b. The component incorporates only two terminals or leads, the interchange of which does not change the operation of the component.

1.6 Motors And Blowers

1.6.1

Electrical motors shall be designed for continuous duty and shall be provided with overcurrent protection in accordance with the *National Electrical Code, ANSI/NFPA 70*. Fractional horsepower motors may be protected with temperature or current-sensitive or temperature and current-sensitive devices which will prevent motor winding temperatures from exceeding those specified in Table II, Maximum Allowable Motor Winding Temperatures. If the impedance of the motor windings is sufficient to prevent winding temperatures in open motors or enclosure temperatures on totally enclosed motors of over 302°F (150°C) with the rotor locked, no additional motor protection is required, but the motor shall bear a Class III marking indicating it is impedance protected.

1.6.2

Motor, blower or fan bearings shall be either permanently lubricated or provided with accessible means for lubrication.

1.6.3

It shall be possible to oil the motor, blower or fan bearings, which require lubricant to be added, when the firebox is installed in accordance with the manufacturer's instructions and without removing the unvented room heater from the firebox.

1.6.4

Bearings of motors, blowers or fans shall be of a type suitable for the temperatures to which subjected in normal operation.

1.7 Instructions

Each firebox shall be accompanied by printed instructions and diagrams, stated in terms clearly understandable to the consumer, adequate for proper field assembly, installation, safe use and operation.

The safety-related items included in the instructions shall be prominently displayed and shall precede the instructions concerning the functional use of the firebox.

The instructions shall be reviewed by the testing agency for comprehensibility, accuracy and compatibility with the results of test.

1.7.1

The front cover or the first page of the instructions shall bear the following boxed warnings:

They shall be boxed as shown:

FOR USE ONLY WITH
A LISTED GAS-FIRED UNVENTED
DECORATIVE ROOM HEATER
NOT TO EXCEED
40,000 BTU/H.

DO NOT BUILD A WOOD FIRE.

Carefully review the instructions supplied
with the decorative type unvented room heater
for the minimum fireplace size requirement.

DO NOT INSTALL AN APPLIANCE IN
THIS FIREBOX UNLESS THIS FIREBOX
MEETS THE MINIMUM DIMENSIONS REQUIRED
FOR THE INSTALLATION.

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

INSTALLER: Leave this manual with the appliance.
CONSUMER: Retain this manual for future reference.

The letters used for the boxed statements above shall be boldfaced type having a minimum uppercase letter height of 0.120 in (3.05 mm). The minimum vertical spacing between lines of type shall be 0.046 in (1.17 mm)*. Lowercase letters shall be compatible with the uppercase letter size specification.

1.7.2

The instructions accompanying the firebox shall include:

- a. A statement that the installation must conform with local codes, or in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*.

* This letter height and line spacing correspond to 12 point type.

- b. The installation instructions for a firebox for installation on combustible flooring shall specify that when the firebox is installed directly on carpeting, tile or other combustible material, other than wood flooring, the firebox shall be installed on a metal or wood panel extending the full width and depth of the enclosure. This statement need not be included in the instructions if the bottom of the firebox is sheet metal and in full contact with the floor.
- c. The minimum integral inch clearances to combustible construction. For fireboxes that are intended to be recessed, the instructions shall give specific directions on the placement of combustible framing and construction of the enclosure around the firebox. A warning against filling the spaces around the firebox with insulation or other materials shall be included. If the firebox employs spacers to inhibit contact of parts of the firebox with combustible construction, the instructions shall include a specific warning against notching of framing or alteration of the spacers. The instructions shall include details on the installation of a firebox canopy and/or trim.
- d. A statement that, "The firebox canopy must not be modified or replaced with a canopy that may be provided with the unvented decorative room heater."
- e. If an external electrical source is utilized, a statement that the device, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the *National Electrical Code, ANSI/NFPA 70*.
- f. Instructions to close the fireplace screens before operation of the decorative unvented room heater.
- g. A statement that information on provisions for adequate combustion and ventilation air are located in the unvented room heater's installation instructions.
- h. Information for obtaining replacement parts and source where they are available.

1.7.3

When a fan or blower is provided as optional equipment, complete electrical diagrams and fan or blower installation instructions shall be provided with the fan or blower kit.

1.7.4

Electrical diagrams, if applicable, shall be provided and conform to the Standard for *Electrical and Electronics Diagrams, ANSI Y14.15*.

1.7.5

Unidentified graphical symbols used for electrical diagrams shall conform with the Standard for *Graphic Symbols for Electrical and Electronics Diagrams (including Reference Designation Class Designation Letters), ANSI/IEEE 315*.

1.7.6

If wire other than that conforming with the temperature limitation of 63°F (35°C) rise has been specified for use, the following statement shall appear on all electrical diagrams: "If any of the original wire must be replaced, it must be replaced with Type ____ wire or its equivalent."

1.8 Marking

1.8.1

Marking material shall be identified by class number and shall meet the following specifications. All metal marking materials shall be rustproof. All markings shall be suitable for application to surfaces upon which applied and shall comply with *IAS Requirements for Marking Systems and Labels, 4-88*, or demonstrate suitable legibility as specified under 2.7, Marking Material Adhesion and Legibility. The designation of any class of marking shall not preclude the use of a lower number class.