***ANSI Z21.13-2004***
***CSA 4.9-2004***

American National Standard/
CSA Standard For
# Gas-Fired Low Pressure Steam And Hot Water Boilers

AMERICAN NATIONAL STANDARD
ANSI Z21.13-2004

CSA STANDARD
CSA 4.9-2004

# GAS-FIRED LOW PRESSURE STEAM AND HOT WATER BOILERS

Second Edition - 2004

This Standard is based on

Z21.13-2000 • CSA 4.9-2000
Z21.13a-2002 • CSA 4.9a-2002
and
Z21.13b-2003 • CSA 4.9b-2003

APPROVED

June 23, 2004
American National Standards Institute, Inc.

May 18, 2004
Interprovincial Gas Advisory Council
Effective in Canada January 1, 2006

Secretariats

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Published - August 2004

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CSA standards reflect a national consensus of producers and users -- including manufacturers, consumers, retailers, unions and professional organizations, and governmental agencies. The standards are used widely by industry and commerce and often adopted by municipal, provincial, and federal governments in their regulations, particularly in the fields of health, safety, building and construction, and the environment.

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The American National Standards Institute (ANSI), Inc. is the nationally recognized coordinator of voluntary standards development in the United States through which voluntary organizations, representing virtually every technical discipline and every facet of trade and commerce, organized labor and consumer interests, establish and improve the some 10,000 national consensus standards currently approved as American National Standards.

ANSI provides that the interests of the public may have appropriate participation and representation in standardization activity, and cooperates with departments and agencies of U.S. Federal, state and local governments in achieving compatibility between government codes and standards and the voluntary standards of industry and commerce.

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# *Preface*

This publication represents a basic standard for safe operation, substantial and durable construction, and acceptable performance of gas-fired low pressure steam and hot water boilers. It is the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research on gas-fired low pressure steam and hot water boilers designed for utilization of gas. There are risks of injury to persons inherent in appliances that, if completely eliminated, would defeat the utility of the appliance. The provisions in this standard are intended to help reduce such risks while retaining the normal operation 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 gas-fired low pressure steam and hot water boilers, 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 progress takes place, revisions may become necessary. When they are believed desirable, recommendations or suggestions should be forwarded to the Chairman of Accredited Standards Committee Z21/83, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131, or the Chairman of the CSA Technical Committee on Gas Appliances and Related Accessories, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3.

Safe and satisfactory operation of gas-fired low pressure steam and hot water boilers 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 *Natural Gas and Propane Installation Code, CSA B149.1*.

Users of this American National Standard/CSA Standard are advised that the devices, products and activities within its scope may be subject to regulation at the Federal, Territorial, Provincial, 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, Territorial, Provincial, state or local regulation should be followed.

THIS STANDARD IS INTENDED TO BE USED BY THE MANUFACTURING SECTOR AND BY THOSE APPLYING THE EQUIPMENT AND BY THOSE RESPONSIBLE FOR ITS PROPER INSTALLATION. IT IS THE RESPONSIBILITY OF THESE USERS TO DETERMINE THAT IN EACH CASE THIS STANDARD IS SUITABLE FOR AND APPLICABLE TO THE SPECIFIC USE THEY INTEND.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute, Inc., require that action be taken to reaffirm, revise or withdraw this standard no later than five (5) years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, Inc., 11 West 42nd Street, New York, N.Y. 10036, (212) 642-4900.

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. In Canada the Standards Committee and the Interprovincial Gas Advisory Council normally stipulate an effective date for the standard.

# *History Of The Development Of The Standard For Gas-Fired Low-Pressure Steam And Hot Water Boilers*

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

With the onset of the Free Trade Agreement between the United States and Canada on January 2, 1988, significant attention was given to the harmonization of the United States and Canadian safety standards addressing gas-fired equipment for residential, commercial and industrial applications. It was believed that the elimination of the differences between the standards would remove potential trade barriers and provide an atmosphere in which North American manufacturers could market more freely in the United States and Canada. The harmonization of these standards was also seen as a step toward harmonization with international standards. Joint subcommittees were established to facilitate the standards harmonization process between the United States and Canada.

The first draft of this harmonized standard was based on current coverage from the American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers, Z21.13-1991, Z21.13a-1993, Z21.13b-1994, and the Canadian Gas Association Standards CGA 3.3-1976, Industrial and Commercial Atmospherically Fired Vertical Flue Boilers and Hot Water Supply Heaters, and CGA 4.9-1969, Gas-Fired Steam and Hot Water Boilers.

Following reconsideration and modification of the proposed draft standard, in light of comments received, the joint subcommittee at its December 2, 1998 meeting, recommended the proposed draft standard to Accredited Standards Committee Z21/83 and the (Interim) CSA, Standards Steering Committee for approval.

The proposed draft of the harmonized standard for gas-fired low-pressure steam and hot water boilers, as modified by the joint subcommittee, was approved by the Z21/83 Committee at its April 15, 1999 meeting, and by the CSA Standards Steering Committee on Gas Appliances and Related Accessories by letter ballot dated April 9, 1999.

The second edition of the American National Standard/CSA Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers was approved by the Canadian Interprovincial Gas Advisory Council on May 18, 2004, and by the American National Standards Institute, Inc., on June 23, 2004.

The previous edition of the Gas-Fired Low-Pressure Steam and Hot Water Boilers standard, and addenda there to, approved by the Interprovincial Gas Advisory Council and American National Standards Institute, Inc. are as follows:

ANSI Z21.13-2000 • CSA 4.9-2000
ANSI Z21.13a-2002 • CSA 4.9a-2002
ANSI Z21.13b-2003 • CSA 4.9b-2003

The following identifies the designation and year of the second edition of the standard:

ANSI Z21.13-2004 • CSA 4.9-2004

Note: This 2004 edition of Z21.13 • CSA 4.9 incorporates changes to the 2000 edition and addenda thereto. Changes other than editorial are noted by a vertical line in the margin.

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# *Contents*

# *Contents (Continued)*



## Tables

# *Contents (Continued)*

Page

## Figures

***Note***

This standard contains SI (Metric) equivalents to the yard/pound quantities, the purpose being to allow the standard to be used in SI (Metric) units. (*IEEE/ASTM-SI-10* or *CAN/CSA Z234.1* are used as a guide in making metric conversion from yard/pound quantities.) If a value for a measurement and an equivalent value in other units, the first stated is to be regarded as the requirement. The given equivalent value may be approximate. If a value for a measurement and an equivalent value in other units, are both specified as a quoted marking requirement, the first stated unit, or both shall be provided.

# *American National Standard/CSA Standard For Gas-Fired Low Pressure Steam And Hot Water Boilers*

## *Part I: Construction*

### 1.1 Scope

**1.1.1** This standard applies to newly produced gas-fired low-pressure steam and hot water boilers with gas inlet pressure ratings not exceeding $^{1}/_{2}$ psi (3.5 kPa) and having input ratings of less than 12,500,000 Btu per hour (3 663 389 W) (see Part IV, Definitions), hereinafter referred to as boilers*, constructed entirely of new unused parts and materials, for operation at or below the following pressures and temperatures:

Steam heating boilers
15 psi (103.42 kPa) steam pressure

Hot water heating boilers
160 psi (1.10 MPa) water pressure
250°F (121°C) water temperature

Hot water supply boilers
160 psi (1.10 MPa) water pressure
250°F (121°C) water temperature

a. For use with natural gas;

b. For use with manufactured gas;

c. For use with mixed gas;

d. For use with liquefied petroleum gases; and

e. For use with LP gas-air mixtures.

The construction of boilers for use with the above-mentioned gases is covered under Part I.

The performance of boilers for use with the above-mentioned gases is covered under Part II.

**1.1.2** This standard applies to indoor type boilers, of other than the direct vent which are categorized according to vent pressure and temperature as either Category I, Category II, Category III or Category IV (see Part IV, Definitions), and to outdoor type boilers.

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* *See Exhibit E (E2.1) for boilers covered in Canada which exceed the above limits in gas inlet pressure and/or input ratings.*

**1.1.3** This standard also applies to direct vent boilers (see Part IV, Definitions). A direct vent boiler anticipated by this standard is essentially a balanced flue appliance with the air intake and vent outlet in proximity. Other designs shall be subjected to such additional tests as believed necessary at the discretion of the testing agency.

**1.1.4** This Standard covers the method of test to determine combustion efficiency for indoor boilers with input rates of 300,000 Btu/h (87 921 W) or greater and the thermal efficiency for both indoor and outdoor boilers. (See Exhibit E, Items Unique to Canada, for minimum efficiencies of indoor boilers with input rates under 300,000 (87 921 W) for sale in Canada).

**1.1.5** 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.

**1.1.6** All references to pressure throughout this standard are to be considered gauge pressure, unless otherwise specified.

**1.1.7** Exhibit E, Items Unique to Canada, contains provisions unique to, and required by, Canada.

## 1.2 General Construction

**1.2.1** The construction of a boiler, whether specifically covered in this standard or not, shall be in accordance with reasonable concepts of safety, substantiality and durability. Component parts shall be well fitted and not show signs of becoming warped, bent, broken or otherwise damaged during the initial test installation or during any of the tests specified so as to prevent compliance with this standard.

All specifications as to 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** Asbestos shall not be used in the construction of a boiler.

**1.2.3** Every part of the boiler shall be secure against displacement and shall be constructed so as to maintain a fixed relationship between essential parts under normal and reasonable conditions of handling and usage.

**1.2.4** On a boiler having an input rating 400,000 Btu per hour (117 228 W) or less, the leads or terminals of an individual control, in the gas control circuit, that are provided for making electrical connections and which are intended to be disconnected in order to replace or service the control shall be identified by a number (s), letter(s), symbol(s) or combination thereof, in a color which contrasts with the background. This provision does not apply when:

a. The control incorporates means which will physically prevent miswiring; or

b. The control incorporates only two terminals or leads, the interchange of which does not change the operation of the control.