

AMERICAN NATIONAL STANDARD/CANADIAN GAS ASSOCIATION STANDARD  
FOR

**AUTOMATIC VENT DAMPER DEVICES  
FOR USE WITH GAS-FIRED APPLIANCES**



**INTERNATIONAL APPROVAL SERVICES - U.S., INC.**  
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**Documents**

AMERICAN NATIONAL STANDARD  
ANSI Z21.66-1996

CANADIAN GAS ASSOCIATION STANDARD  
CGA 6.14-M96

First Edition - 1996

This Standard is a revised edition  
of the former

Standards for

AUTOMATIC VENT DAMPER DEVICES  
FOR USE WITH GAS-FIRED APPLIANCES

ANSI Z21.66-1994

CAN1-2.28-M81  
CAN1-6.14-M86

APPROVED



July 16, 1996  
American National Standards Institute, Inc.

**IGAC**

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Interprovincial Gas Advisory Council  
Effective in Canada February, 1998

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The American Gas Association and Canadian Gas Association have co-sponsored national standards programs in the U.S. and Canada, and the creation or harmonization of Canadian and U.S. binational gas equipment standards. International Approval Services (IAS), formed in 1993, has provided the technical and administrative support required by these activities, on behalf of the co-sponsors.

The Canadian Gas Association remains the sponsor of the gas equipment and installation standards programs in Canada. In the U.S. sponsorship, or the Secretariat, was transferred in May 1996 from the American Gas Association to International Approval Services - U.S., Inc. Although IAS-U.S. acts as secretariat of the Z21 Committee, the actions of the committee are independent of ANSI and IAS-U.S.

IAS also operates a design certification program for fuel-fired products covered by the standards, accredited by the American National Standards Institute and the Standards Council of Canada, and accepted by all Canadian inspection authorities. Through the Gas Research Institute (GRI) and the Canadian Gas Research Institute (CGRI), the gas industry helps pursue the improvement of gas equipment and the development of new products. Data from these projects is available to Standards Committees for review and consideration.

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## CANADIAN GAS ASSOCIATION

The Canadian Gas Association (CGA), has been accredited by the Standards Council of Canada to prepare National Standards of Canada in the area of equipment for use with natural gas and propane. Founded in 1907, its 320 corporate members span the industry spectrum and include natural gas transmission companies, distributors, manufacturers of other gas appliances and equipment, brokers, marketers and producers.

Committees that write the standards include representation from all interests and are so constituted that no one interest may dominate. The interests represented include consumers, manufacturers, utilities, governmental inspection authorities and certification organizations. Standards are prepared using the consensus principle with effort applied to reconcile differing opinions. Government inspection authorities having jurisdiction also ballot on the standards as

members of the Interprovincial Gas Advisory Council (IGAC).

The CGA Standards Advisory Committee (SAC) reviews committee structures and procedures to determine that the standards meets the criteria of the Standards Council of Canada.

This Standard has been accepted by the Standards Committee, IGAC and SAC.

This Standard is intended to be used within the scope of the standard by the manufacturing sector, by those applying the equipment, or those responsible for its proper application. It is the responsibility of the user to determine in each case that the Standard is suitable for the specific application. The Standards Committee and IGAC normally stipulate an effective date for the Standard.

## PREFACE

This publication represents a basic standard for safe operation, substantial and durable construction, and acceptable performance of automatic vent damper devices for use with gas-fired appliances. It is the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research on automatic vent damper devices for use with gas-fired appliances 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 automatic vent damper devices for use with gas-fired appliances, the safety construction and performance of which may exceed the various provisions specified herein. In its preparation, full 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, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131, or the Chairman of the Canadian Gas Association Standards Steering Committee on Gas Burning Appliances and Related Accessories, 55 Scarsdale Road, Don Mills, Ontario, Canada, M3B 2R3.

Safe and satisfactory operation of a automatic vent damper devices for use with gas-fired appliances 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*; the *Natural Gas Installation Code, CAN/CGA-B149.1*; the *Propane Installation Code, CAN/CGA-B149.2*.

Users of this American National Standard/Canadian Gas Association 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.

**NOTICE TO READER:** The Canadian Gas Association (CGA) has been accredited by the Standards Council of Canada to prepare standards in the area of equipment for use with natural gas and propane. Standards are prepared by committees that include representatives from all interests and are so constituted that no one interest may dominate. The interests represented include governmental inspection authorities, certification agencies, manufacturers, utilities, and consumers. Government inspection authorities having jurisdiction review and approve these standards; sitting as the Interprovincial Gas Advisory Council (IGAC).

**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.**

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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. 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 AUTOMATIC VENT DAMPER DEVICES FOR USE WITH GAS-FIRED APPLIANCES

(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.

With the formation of joint subcommittees, a Canadian Gas Association Standards Steering Committee on Gas Burning Appliances and Related Accessories was established to parallel Accredited Standards Committees Z21 and Z83, and to support the formation of joint subcommittees. Operating procedures, in accordance with American National Standards Institute procedures, for joint subcommittees were developed and subsequently approved by ANSI on April 1, 1993.

At its December 16, 1992 meeting, the Joint Damper Device Subcommittee established a working group to develop a comparison document incorporating coverage from ANSI Z21.66, Automatic Vent Damper Devices for Use With Gas-Fired Appliances, CAN1-2.28-M81, Gas-Fired Appliances Equipped with Electrically Operated Automatic Vent Damper Devices Provided as Integral Components and CAN1-6.14-M86, Thermally Actuated Automatic Vent Damper Devices. The comparison document was distributed to the members of the joint damper device subcommittee for review and comment. At its May 10, 1994 meeting, the joint damper device subcommittee adopted the proposed damper device standard for distribution for industry review and comment as a harmonized standard. The first draft harmonized damper device standard was distributed for review and comment during June 1994.

Following reconsideration and revision of the proposed harmonized damper device standard, in light of comments received, the joint damper device subcommittee, at its November 2, 1994

meeting, recommended the proposed standard to the Z21 Committee and the CGA Standards Steering Committee, for approval.

The proposed harmonized standard for damper devices was approved by the Z21 Committee at its April 6, 1995 meeting. The CGA Standards Steering Committee approved the proposed harmonized standard for damper devices by letter ballot dated May 19, 1995.

The first edition of the Z21/CGA Standard for Automatic Damper Devices for Use With Gas-Fired Appliances was approved by the CGA Standards Advisory Committee and the Canadian Interprovincial Gas Advisory Council on October 20, 1995 and by the American National Standards Institute, Inc., on July 16, 1996.

Subsequent revisions to the proposed harmonized damper device standard were adopted for distribution for review and comment by the joint damper device subcommittee at its November 2, 1994 meeting. The proposed revisions to the proposed harmonized damper device standard were distributed for review and comment during February 1995. At its April 19, 1995 meeting, in light of comments received, the joint damper device subcommittee recommended the proposed revisions to the proposed harmonized damper device standard to the Z21 Committee and the CGA Standards Steering Committee, for approval.

The proposed revisions to the proposed harmonized damper device standard were approved by the Z21 Committee by letter ballot dated July 17, 1995. The CGA Standards Steering Committee approved the proposed revisions to the proposed harmonized damper device standard by letter ballot dated November 17, 1995. The IGAC approved the proposed revisions to the harmonized damper device standard by letter ballot dated February 9, 1996.

The first edition of the harmonized Z21/CGA Standard for Automatic Vent Damper Devices for Use With Gas-Fired Appliances replaces present editions of Z21.66 and CAN1-2.28 and CAN1-6.14.

The following identifies the designation and year of the harmonized standard:

ANSI Z21.66-1996•CGA 6.14-M96

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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. (*ASTM E380* 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. Except as noted in Exhibit A, 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.

**HARMONIZED STANDARD FOR  
AUTOMATIC VENT DAMPER DEVICES  
FOR USE WITH GAS-FIRED APPLIANCES**

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**PART I**

**GENERAL CONSTRUCTION**

**1.1 SCOPE**

- 1.1.1** This standard applies to the construction, performance and installation procedures for a newly produced automatic vent damper device (herein after referred to as device) constructed entirely of new, unused parts and materials and designed to form a section of the vent connector from an individually, automatically operated, gas-fired appliance equipped with a draft hood(s) and listed by a nationally recognized testing agency. This device shall not be installed on any appliance converted from solid or liquid fuels.
- 1.1.2** This standard does not apply to a flue damper which is a device installed before (upstream) of the draft hood relief opening(s).
- 1.1.3** A device covered by this standard shall have an inlet and outlet venting area each no greater than that of a vent connector having a nominal 12 inch (305 mm) diameter [113 square inches (729 cm<sup>2</sup>)].
- 1.1.4** Additional provisions specific to electrically operated automatic vent damper devices are outlined under Part III.
- 1.1.5** Additional provisions specific to thermally actuated automatic vent damper devices are outlined under Part V.
- 1.1.6** Additional provisions specific to retrofit automatic vent damper devices are outlined under Part VII (see Exclusion - PART VII).
- 1.1.7** 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.
- 1.1.8** All references to psi throughout this standard are to be considered gage pressures unless otherwise specified.
- 1.1.9** Exhibit D contains provisions that are unique to the United States.
- 1.1.10** Exhibit E contains provisions that are unique to Canada.
- 1.1.11** Exhibit F contains a list of standards specifically referenced in this standard, and sources from which these reference standards may be obtained.

## 1.2 GENERAL

- 1.2.1 The device shall be suitable for installation with the axis of its vent gas passageway at any angle from vertical to horizontal.
- 1.2.2 The construction of the device, 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 any of the tests specified herein 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 by such other construction as will provide at least equivalent performance.
- 1.2.3 Asbestos shall not be used in the construction of a device unless it is contained, protected or combined in a binder material in a manner which will not permit asbestos fibers to become airborne under normal conditions of device use.
- 1.2.4 Every part of the device shall be secure against displacement and shall be constructed so as to maintain a fixed relationship between essential parts under normal and reasonable handling and usage.
- 1.2.5 All parts that may be contacted during normal adjustment or servicing shall be free from sharp projections or edges and projecting screw ends.
- 1.2.6 Bolts, nuts, screws, except sheet-metal screws, and other threaded parts used in the general assembly of the device shall have threads conforming to the Standard for *Unified Inch Screw Threads (UN and UNR Thread Form)*, *ANSI/ASME B1.1*, or other nationally recognized standards.
- 1.2.7 The damper of a device shall be downstream of both the draft hood inlet and the draft hood relief opening and shall not restrict either.
- 1.2.8 When a device is installed in accordance with the manufacturer's installation instructions, any connection to the control system of the related appliance shall not adversely affect that control system.

## 1.3 MATERIALS

- 1.3.1 All parts of a device, including fasteners, shall be corrosion resistant, suitable for the application and temperatures to which exposed and shall not show evidence of deterioration during the tests specified herein.
- 1.3.2 Metal parts in contact with vent gases or subject to condensation shall be at least 0.018 inch (0.457 mm) thick aluminum-coated steel in which the bond between the steel and the aluminum [0.40 ounces per square foot (0.123 kg per square meter) minimum] is an iron-aluminum alloy, or chromium-coated low carbon steel in which the chromium is diffused into the surface of the steel to form an iron-chromium alloy; at least 0.016 inch (0.406 mm) thick Type 1100 aluminum; or other metal having equivalent durability and resistance to corrosion and heat. Cast iron may be used for nonmoving parts if it can be demonstrated that corrosion or heat will not impair the intended function and durability of the device.

- 1.3.3 Any interconnecting section used between the draft hood outlet and the device shall be at least equivalent in durability and resistance to corrosion and heat of 0.0152 inch (0.387 mm) thick galvanized sheet metal.

## 1.4 VENT CONNECTIONS

- 1.4.1 The device shall have a single inlet, a continuous vent gas passageway and a single outlet.
- 1.4.2 A device inlet and outlet connection shall be of the same nominal size and shall accommodate vent connectors of integral inch diameter size or a recognized SI (metric) size.
- 1.4.3 Both the inlet and outlet connections of the device shall have at least a 1<sup>1</sup>/<sub>4</sub> inch (30 mm) lip for attachment. The inlet connection of a device that is an integral part of the draft hood need not have a 1<sup>1</sup>/<sub>4</sub> inch (30 mm) lip for attachment, provided it is securely fastened. The device shall be constructed so that the connections or attachments shall not interfere with the operation of the device.

## 1.5 INTERNAL FREE VENTING AREA

If the manufacturer's installation instructions do not specify that the appliance be equipped with two automatic gas valves to control all main burner gas flow, the minimum internal free venting area with the damper in the closed position shall not be less than 10 percent of the outlet free venting area.

Exception. Devices for installation on an appliance having an intermittent pilot(s) or a direct ignition system, and which is equipped with two automatic gas valves to control all main burner gas flow, shall be exempt from the specifications for a minimum internal free venting area.

## 1.6 INSTRUCTIONS

Each device shall be accompanied by printed instructions and diagrams adequate for its proper field assembly, installation and safe operation. These instructions shall include the following:

- a. Manufacturer's name, address, and the model or type or series number as it appears on the device.
- b. A statement that the device must be installed by a qualified installing agency (see Part X, Definitions).
- c. A statement that the device must be installed after (downstream of) the appliance draft hood, as close to the draft hood as practicable, and without modification of the draft hood.
- d. Instructions that an intermittent pilot(s) or a direct ignition system must be installed when the device does not incorporate a minimum internal free venting area as specified in 1.5.
- e. A statement that the device must be installed only on an appliance connected to a factory built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the authority having jurisdiction.

- f. A statement that the device must be located in a venting system or section of a venting system so that it serves only the single appliance for which it is installed.
- g. Instructions that a minimum clearance of 6 inches (152.4 mm) between the device and combustible construction be maintained and that there be provisions for access for service of the device.
- h. Instructions for periodically examining all flue product carrying areas of the appliance, its vent system, and the device for continued safe operation, with particular attention given to deterioration from corrosion or other sources. These instructions shall indicate the necessity and minimum frequency for these examinations by the homeowner and shall also specify the periodic inspection of the appliance-device combination by a qualified service agency.
- i. A description of how the device operates.
- j. A statement that the device should also be installed in accordance with local codes, or in the absence of local codes, in accordance with the *National Fuel Gas Code, ANSI Z223.1*, or the *Natural Gas Installation Code, CAN/CGA-B149.1* or the *Propane Installation Code, CAN/CGA-B149.2*, where applicable.
- k. The following statements:

“Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.”

«Attention. Étiquetez tous les fils avant de débrancher au moment du dépannage de commandes. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux.»

This statement need not be included when:

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

## 1.7 MARKING

- 1.7.1 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 demonstrate suitable legibility as specified under 2.4.

### Class I. Integral Marking

Marking that is embossed, cast, stamped or otherwise formed in the part. This includes markings baked into an enameled surface.

### Class IIA-1. Permanent Plate

Shall be made of metal having a minimum thickness of 0.012 inch (0.305 mm), shall be securely attached by mechanical means and shall comply with 2.4.

**Class IIA-2. Permanent Plate**

Shall be made of metal having a thickness of 0.006 to 0.012 inch (0.152 to 0.305 mm), shall have mechanical attachment means at all corners with a maximum spacing of 6 inches (152.4 mm) between mechanical fasteners and shall comply with 2.4.

**Class IIA-3. Permanent Plate**

Shall be made of metal having a thickness less than 0.006 inch (0.152 mm). Such plates shall be attached by means of nonwater-soluble adhesive which will comply with 2.4.

**Class IIA-4. Permanent Plate**

Shall be made of pressure-sensitive metal foil requiring no solvent or activator, provided such plates comply with 2.4.

**Class IIIA. Permanent Label**

Shall be made of material not adversely affected by water, shall be attached by means of nonwater-soluble adhesive and shall comply with 2.4.

**Class IIIB. Waterproof Marking**

Shall be printed directly on the part with water-proof marking not adversely affected by a temperature of 175°F (79°C) and shall comply with 2.4.

**Class IIIC. Waterproof Label**

Shall be made of material not soluble in water, and may use water-soluble adhesive for attachment means.

**Class IV. Nonwaterproof Label**

Shall be made of material which may be soluble in water, and may use water-soluble adhesive for attachment means.

**Class V. Printed Marking**

Marking shall be clear and prominent and may be applied directly by any printing means.

**Class VI. Attached Tags**

**1.7.2** Each device shall bear a plate of Class II marking material which shall denote the following:

- a. The manufacturer's name and address.
- b. The manufacturer's model number.
- c. A distinctive number which will identify the individual device or a date code marking.

If a date code marking is used, it shall consist of at least four consecutive digits determined as follows:

1. The first and second digits shall indicate the calendar year in which the device is manufactured (e.g., 96 for 1996).
2. The third and fourth digits shall indicate the week in which the device was manufactured (e.g., 03 for the third week of the year). For purpose of this marking, a week shall begin at 0001 hours on Sunday and end at 2400 hours on Saturday.

A date code may be used for more than one week; however, it shall not be used for more than four consecutive weeks, nor more than two weeks into the next calendar year.

Additional numbers, letters or symbols may follow the four digit number specified in “1” and “2.” If additional numbers are used, they must be separated from the date code.

- d. The minimum clearance to combustible material. This clearance shall not be less than 6 inches (152.4 mm).
- e. The inlet, outlet or direction of vent gas flow in one of the following methods:
  1. A directional symbol;
  2. The word “Inlet” (French translation: «Entrée»); or
  3. The word “Outlet” (French translation: «Sortie»).
- f. The symbol of the organization making the tests for compliance with this standard.

- 1.7.3 A device shall bear a Class III marking attached to the device or a marking on the carton in which it is supplied, stating clearly and legibly: “WARNING - Follow instructions for proper installation.” (French translation: «AVERTISSEMENT - Suivre les instructions pour une installation adéquate.»)

The words “WARNING” (French translation: «AVERTISSEMENT») shall be in letters at least  $\frac{1}{4}$  inch (6.4 mm) high and the remainder of the wording in letters at least  $\frac{1}{8}$  inch (3.2mm) high.

- 1.7.4 See also clause 3.1.3.

- 1.7.5 Any interconnecting section furnished by the manufacturer for use between the draft hood outlet and the device shall bear a Class IIA-1 marking stating: “To be installed without alteration.” (French translation: «A installer sans modification.») Additionally, a Class IIA-1 marking on the interconnecting section or device shall specify the vertical distance between the draft hood outlet and the inlet to the device.

## PART II

### GENERAL PERFORMANCE

#### 2.1 GENERAL

- 2.1.1 The same test sample of the device shall be used to determine compliance with all applicable provisions specified in Part II, and in Parts III, IV, V, VI, VII and VIII, as applicable.
- 2.1.2 Whenever the use of air above room temperature is specified, flue gases from a gas-fired appliance mixed with air to obtain the specified temperature shall be used.
- 2.1.3 When a thermocouple is specified for the measurement of air, flue or vent gas temperatures, a thermocouple or an equivalent temperature measuring device complying with the *Performance Test Codes, Supplement on Instruments and Apparatus, Part 3, Temperature Measurement, ANSI/ASME PTC 19.3*, shall be used.
- 2.1.4 Additional provisions specific to electrically operated automatic vent damper devices are outlined under Part IV.
- 2.1.5 Additional provisions specific to thermally actuated automatic vent damper devices are outlined under Part VI.
- 2.1.6 Additional provisions specific to retrofit automatic vent damper devices are outlined under Part VIII (see Exclusion - Part VIII).

#### 2.2 STRENGTH

- 2.2.1 The device, as received, shall operate properly for 10 cycles when actuated in accordance with the installation instructions.
- 2.2.2 A device mounted vertically shall be sufficiently rigid in construction to support, without significant distortion or impairment of operation, a load equal to 2 pounds per inch (0.036 kg/mm) of outlet perimeter.

#### Method of Test

The inlet of the device shall be attached to a fixed vertical vent pipe. A vertical compression load equal to that specified above shall be applied without impact to the outlet of the device. With this load imposed, the device shall be operated for 10 cycles, shall operate properly and shall exhibit no significant distortion upon visual examination. (Also see 3.1.2 or 6.2 as applicable.)

- 2.2.3 A device mounted horizontally shall be sufficiently rigid in construction to support, without significant distortion or impairment of operation, a 10 foot (3.05 m) length of vent pipe, made of sheet steel not less than 0.0195 inch (0.495 mm)\* thick, of a diameter equal to that of the outlet connection of the device.

\* This corresponds to No. 24 U.S. Standard gage sheet steel with all applicable minus tolerances included.

### Method of Test

The inlet of the device shall be attached to a fixed horizontal vent pipe by  $\frac{3}{16}$  inch (4.8 mm) bolts. One bolt shall be placed in the upper and one in the lower part of the joint. A 10 foot (3.05 m) length of vent pipe, made of sheet steel not less than 0.0195 inch (0.495 mm)\* thick, of suitable diameter shall then be attached in a horizontal position to the outlet connection of the device, the other end of the vent pipe being supported at a point not more than 1 inch (25.4 mm) from its extremity. With this load imposed, the device shall be operated for 10 cycles, shall operate properly, and shall exhibit no significant distortion upon visual examination. (Also see 3.1.2 or 6.2 as applicable.)

## 2.3 SAFETY ANALYSIS

**A failure modes and effects analysis (FMEA) detailing manufacturing defects, parts failure and component failures shall be provided for testing agency review and verification. Single faults are to be evaluated. If the fault does not manifest itself, it shall be left intact and a second fault introduced.**

**Faults which could result in unsafe operation must have reliability data to support the design.**

## 2.4 MARKING MATERIAL ADHESION AND LEGIBILITY

**The adhesive quality of marking materials and the legibility of all marking materials shall not be adversely affected when the marking materials are exposed to heat and moisture as specified in the following Method of Test.**

### Method of Test

These tests shall be conducted following completion of the test specified in 4.6 or 6.5 as applicable. The manufacturer shall have applied the marking materials to the device as they would be applied in production.

Each sample of material shall exhibit:

- a. Good adhesion and no curling at edges,
- b. No illegible or defaced printing by rubbing with thumb or finger pressure, and
- c. Good adhesion when a dull metal blade (as the back of a pocketknife blade) is held at 90 degrees (1.57 rad) to the applied marking and scraped across the edges of the marking.

The manufacturer shall supply evidence that the marking materials and adhesives will not be adversely affected by water.

Good adhesion qualities shall be maintained under all of the above test conditions.

\* This corresponds to No. 24 U.S. Standard gage sheet steel with all applicable minus tolerances included.

**PART III**  
**ELECTRICALLY OPERATED AUTOMATIC**  
**VENT DAMPER DEVICES**

**CONSTRUCTION**

**3.1 DAMPER OPERATION**

- 3.1.1 Damper operation shall effect only a fully open position and a single closed position.
- 3.1.2 The minimum internal free venting area of the vent gas passageway with the damper in the fully open position shall be not less than that of the outlet. (Also see 4.1, 4.5 and 4.6.)
- 3.1.3 An indicator signifying the damper position shall be provided. If this indicator incorporates a label to identify open and closed positions, the label shall be of Class II marking material.
- 3.1.4 The device shall incorporate an integral means which will provide an interlock in the appliance safety control circuit to prove the open position of the damper. This shall be actuated directly by the damper or an assembly of parts securely attached to the damper so as to maintain a fixed relationship to the damper.
- 3.1.5 The device shall be designed to be able to be manually placed in the full open position, without the use of special tools, to permit burner operation. Modification to the electrical circuitry, or operating a switch bypassing a safety function, or disassembly of operating or interlock components, shall not be considered as complying with this provision.

**3.2 INTERNAL FREE VENTING AREA**

The minimum internal free venting area of the vent gas passageway of the vent damper device, with the damper in the closed position, shall have a minimum dimension of not less than  $\frac{1}{4}$  inch (6.4 mm) and not less than 0.05 square inches (0.30 mm<sup>2</sup>), or 1 square inch (6.5 cm<sup>2</sup>) per 6,500 Btu per hour (1905 W) of the total continuous pilot input, whichever is larger.

**3.3 ELECTRICAL EQUIPMENT AND WIRING**

Coverage for electrical components and wiring is contained in Exhibits D and E, Items Unique to One Country.

**3.4 INSTRUCTIONS**

- 3.4.1 Each device shall be accompanied by printed instructions and diagrams adequate for its proper field assembly, installation and safe operation. These instructions shall include, in addition to the items in 1.6, the following: