

ANSI Z83.8-2009
CSA 2.6-2009

American National Standard/
CSA Standard for
**Gas Unit Heaters,
Gas Packaged Heaters,
Gas Utility Heaters and
Gas-Fired Duct Furnaces**

AMERICAN NATIONAL STANDARD
ANSI Z83.8-2009

CSA STANDARD
CSA 2.6-2009

Fourth Edition - 2009
This Standard is based on the Standard for
Gas Unit Heaters And Gas-Fired Duct Furnaces
ANSI Z83.8-2006 • CSA 2.6-2006
and Addenda ANSI Z83.8a-2009 • CSA 2.6a-2009

APPROVED



December 15, 2009
American National Standards Institute, Inc.

IGAC

December 29, 2009
Interprovincial Advisory Council
Effective in Canada August 1, 2010

Standard Developer

CSA AMERICA INC.
8501 East Pleasant Valley Road
Cleveland, Ohio 44131

CANADIAN STANDARDS ASSOCIATION
5060 Spectrum Way, Suite 100
Mississauga, Ontario, Canada L4W 5N6

Published - January 2010

Copyright © 2009
Canadian Standards Association

Permission is granted to republish material herein in laws or ordinances, and in regulations, administrative orders, or similar documents issued by public authorities. Those desiring permission for other republication should consult Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

Copyright © 2009
CSA America, Inc.

Permission is granted to republish material herein in laws or ordinances, and in regulations, administrative orders, or similar documents issued by public authorities. Those desiring permission for other republication should consult CSA America, Inc., 8501 East Pleasant Valley Road, Cleveland, Ohio 44131.

Canadian Standards Association

The Canadian Standards Association (CSA), under whose auspices this National Standard has been produced, was chartered in 1919 and accredited by the Standards Council of Canada to the National Standards system in 1973. It is a not-for-profit, nonstatutory, voluntary membership association engaged in standards development and certification activities.

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.

Individuals, companies, and associations across Canada indicate their support for CSA's standards development by volunteering their time and skills to CSA Committee work and supporting the Association's objectives through sustaining memberships. The more than 7000 committee volunteers and the 2000 sustaining memberships together form CSA's total membership from which its Directors are chosen. Sustaining memberships represent a major source of income for CSA's standards development activities.

The Association offers certification and testing services in support of and as an extension to its standards development activities. To ensure the integrity of its certification process, the Association regularly and continually audits and inspects products that bear the CSA Mark.

In addition to its head office and laboratory complex in Toronto, CSA has regional branch offices in major centres across Canada and inspection and testing agencies in eight countries. Since 1919, the Association has developed the necessary expertise to meet its corporate mission: CSA is an independent service organization whose mission is to provide an open and effective forum for activities facilitating the exchange of goods and services through the use of standards, certification and related services to meet national and international needs.

L'Association canadienne de normalisation (CSA), sous les auspices de laquelle cette Norme nationale a été préparée, a reçu ses lettres patentes en 1919 et son accréditation au sein du Système de Normes nationales par le Conseil canadien des normes en 1973. Association d'affiliation libre, sans but lucratif ni pouvoir de réglementation, elle se consacre à l'élaboration de normes et à la certification.

Les normes CSA reflètent le consensus de producteurs et d'utilisateurs de partout au pays, au nombre desquels se trouvent des fabricants, des consommateurs, des détaillants et des représentants de syndicats, des consommateurs professionnels et d'agences gouvernementales. L'utilisation des normes CSA est très répandue dans l'industrie et le commerce, et leur adoption dans les ordres de législation, tant municipal et provincial que fédéral, est chose courante, particulièrement dans les domaines de la santé, de la sécurité, du bâtiment, de la construction et de l'environnement.

Les Canadiens d'un bout à l'autre du pays témoignent de leur appui au travail de normalisation mené par la CSA en participant bénévolement aux travaux des comités de la CSA et en appuyant ses objectifs par leurs cotisations de membres de soutien. Les quelque 7000 volontaires faisant partie des comités et les 2000 membres de soutien constituent l'ensemble des membres de la CSA parmi lesquels ses administrateurs sont choisis. Les cotisations des membres de soutien représentent une source importante de revenu pour les services de soutien à la normalisation volontaire.

L'Association offre des services de certification et de mise à l'essai qui appuient et complètent ses activités dans le domaine de l'élaboration de normes. De manière à assurer l'intégrité de son processus de certification, l'Association procède de façon régulière et continue à l'examen et à l'inspection des produits portant la marque CSA.

Outre son siège social et ses laboratoires à Toronto, la CSA possède des bureaux régionaux dans des centres vitaux partout au Canada, de même que des agences d'inspection et d'essai dans huit pays. Depuis 1919, l'Association a parfait les connaissances techniques qui lui permettent de remplir sa mission d'entreprise, à savoir la CSA est un organisme de services indépendant dont la mission est d'offrir une tribune libre et efficace pour la réalisation d'activités facilitant l'échange de biens et de services par l'intermédiaire de services de normalisation, de certification et autres, pour répondre aux besoins de nos clients, tant à l'échelle nationale qu'internationale.

For further information on CSA services, write to

**Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario, Canada L4W 5N6**

*Pour plus de renseignements sur les services de
la CSA, s'adresser à
Association canadienne de normalisation
5060, Spectrum Way, bureau 100
Mississauga, Ontario, Canada L4W 5N6*

American National Standards Institute

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.

ANSI represents the interests of the United States in international nontreaty organizations such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The Institute maintains close ties with regional organizations such as the Pacific Area Standards Congress (PASC) and the Pan American Standards Commission (COPANT). As such, ANSI coordinates the activities involved in the U.S. participation in these groups.

ANSI approval of standards is intended to ensure that the principles of openness and due process have been followed in the approval procedure and that a consensus of those directly and materially affected by the standards has been achieved. ANSI coordination is intended to assist the voluntary system to ensure that national standards needs are identified and met with a set of standards that are without conflict or unnecessary duplication in their requirements.

Responsibility of approving American National Standards rests with the

***American National Standards Institute, Inc.
25 West 43rd Street, Fourth Floor
New York, NY
10036***

Preface

This publication represents a basic standard for safe operation, substantial and durable construction, and acceptable performance of a gas unit heater, gas packaged heater, gas utility heater, or gas-fired duct furnace. It is the result of years of experience in the manufacture, testing, installation, maintenance, inspection and research on a gas unit heater, gas packaged heater, gas utility heater, or gas-fired duct furnace 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 a gas unit heater, gas packaged heater, gas utility heater, or gas-fired duct furnace, 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 CSA America, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131, or the CSA Technical Committee on Gas Appliances and Related Accessories, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

Safe and satisfactory operation of gas unit heater, gas packaged heater, gas utility heater, or gas-fired duct furnace 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*; or 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., 25 West 43rd Street, Fourth Floor, 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.

History Of Development Of The Standard For Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, And Gas-Fired Duct Furnaces

(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 equipment.

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.

A Z83/CGA joint Subcommittee on Standards for Heavy Duty Heaters was then established, based on memberships of the Z83 subcommittee for Gas-Fired Heavy Duty Forced Air Heaters, and the CGA committees for Unit Heaters/Duct Furnaces, Make-up Air Heaters, and Door Heaters.

Membership on the joint heavy duty heaters subcommittee encompasses representatives from the U.S. and Canadian manufacturing industry, gas suppliers (natural and LP), regulatory authorities and general interest.

To facilitate the reporting structure of joint subcommittees, a CGA Standards Steering Committee on Gas Burning Appliances and Related Accessories was established to parallel Accredited Standards Committees Z21 and Z83.

The first meeting of the Z83/CGA joint heavy duty heaters subcommittee was held on July 14-16, 1992 in Toronto.

During the standards development process, a total of four drafts were circulated for public review.

The fourth draft of the proposed harmonized standard was issued for public review in March 1994. All comments relating to the fourth draft were duly considered by the joint heavy duty heaters subcommittee at its meeting of June 21-22, 1994. The resulting fifth draft of the proposed harmonized standard (fourth draft as revised at the June 21-22, 1994 subcommittee meeting) was submitted for approval by the Z83 Committee and the CGA Steering Committee.

The first edition of the harmonized Z83/CGA standard for Unit Heaters and Gas-Fired Duct Furnaces was approved by the Interprovincial Gas Advisory Council on June 7, 1996, and by the American National Standards Institute, Inc. on August 29, 1996.

The second edition of the harmonized Z83/CSA Standard for Gas Unit Heaters and Gas-Fired Duct Furnaces was approved by the Interprovincial Gas Advisory Council on February 8, 2002 and by the American National Standards Institute, Inc., on April 24, 2002.

The third edition, was approved by the Interprovincial Gas Advisory Council on January 13, 2006 and by the American National Standards Institute, Inc. on October 7, 2005.

With this, the fourth edition, the title of the Standard for Gas Unit Heater and Gas-Fired Duct Furnace was changed. The American National Standard/CSA Standard for Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, or Gas-Fired Duct Furnaces was approved by the International Gas Advisory Council on December 29, 2008, and by the American National Standards Institute on December 15, 2009.

The previous editions of the gas unit heaters and gas-fired duct furnaces, and addenda thereto, approved by the Interprovincial Gas Advisory Council and American National Standards Institute, Inc. are as follows:

Z83.8-1996 (R2001) • CGA 2.6-M96
Z83.8a-1998 (R2001) • CGA 2.6a-M98
Z83.8b-2000 • CGA 2.6b-2000

Z83.8-2002 • CSA 2.6-2002
Z83.8a-2003 • CSA 2.6a-2003
Z83.8b-2004 • CSA 2.6b-2004

Z83.8-2006 • CSA 2.6-2006
Z83.8a-2009 • CSA 2.6a-2009

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

ANSI Z83.8-2009 • CSA 2.6-2009

NOTE: *This edition of Z83.8 • CSA 2.6 incorporates changes to the 2006 edition and addenda thereto. Changes, other than editorial, are denoted by a vertical line in the margin.*

Interprovincial Gas Advisory Council

(March, 2009)

S. Cooke	Technical Standards & Safety Authority	<i>(Chair)</i>
E.W. Bachellier	Government of Nunavut	
M. Davidson	New Brunswick Department of Public Safety	
W. Drover	Government of Newfoundland and Labrador	<i>(Alternate)</i>
D. Eastman	Government of Newfoundland and Labrador	
Z.J. Fraczkowski	Technical Standards & Safety Authority	<i>(Alternate)</i>
E.J. Hurd	British Columbia Safety Authority	<i>(Alternate)</i>
W.C. LaRose	Alberta Municipal Affairs	
W. Lock	British Columbia Safety Authority	
R. McRae	Government of the Northwest Territories	
J. Melling	SaskPower	<i>(Alternate)</i>
V. Pao	Manitoba Department of Labour and Immigration	
B.W. Reid	Dept. of Community Services & Attorney General	
J. Renaud	Régie du bâtiment du Québec	
D.C. Stewart	Nova Scotia Department of Environment and Labour	
I.R. Tilgner	Human Resources and Social Development Canada	
G.L. Williams	SaskPower	
C.E. Wolfe	Government of Nunavut Community & Government Services	<i>(Alternate)</i>
D. Young	Yukon Government	
T. Cautillo	Canadian Standards Association	<i>(Secretary)</i>

Z21/83 Committee on Performance and Installation of Gas Burning Appliances and Related Accessories

DARYL L. HOSLER, Chairman

PAUL E. BEACH, Vice Chairman

REPRESENTING AIR CONDITIONING, HEATING AND REFRIGERATION INSTITUTE:

Charles W. Adam
Paul Beach

Mark Diesch
Allen Kessler

Frank Myers
Gary J. Potter

REPRESENTING AMERICAN ASSOCIATION OF FAMILY AND CONSUMER SCIENCE:

JoAnn Emmel

REPRESENTING AMERICAN GAS ASSOCIATION:

Jim Ranfone

REPRESENTING ASSOCIATION OF HOME APPLIANCE MANUFACTURERS:

Mathew Williams

REPRESENTING ATMOS ENERGY:

Ronnie Ray Frazier

REPRESENTING BURNER TECHNOLOGY UNIT LIMITED, INC.:

Carl Suchovsky

REPRESENTING CONSUMERS:

Amy Sherwin

Hall Virgil

REPRESENTING CRANE ENGINEERING:

Matthew W. Wilber

REPRESENTING DIRECT ENERGY CORPORATION:

Geoff Adkinson

REPRESENTING HEARTH, PATIO & BARBEQUE ASSOCIATION:

Thomas Stroud

Z21/83 Committee on Performance and Installation of Gas Burning Appliances and Related Accessories (Continued)

REPRESENTING INDIVIDUAL MEMBERS:

Daryl L. Hosler (Non-voting) Issac Sargunam

REPRESENTING NATIONAL GRID:

Edward J. Angelone

REPRESENTING NATIONAL PROPANE GAS ASSOCIATION:

Bruce J. Swiecicki

REPRESENTING NORTH AMERICAN ASSOCIATION OF FOOD EQUIPMENT MANUFACTURERS:

Charlie Souhrada Terry Wiseman (Alternate)

REPRESENTING SOUTHERN CALIFORNIA GAS COMPANY:

Lance DeLura Ron Caudle (Alternate)

REPRESENTING UNDERWRITERS LABORATORIES:

Robert Wozniak Travis F. Hardin (Alternate)

REPRESENTING U.S. CONSUMER PRODUCT SAFETY COMMISSION:

Donald W. Switzer Ronald Jordon (Alternate)

REPRESENTING U.S. DEPARTMENT OF ENERGY:

Cyrus Nessari

CSA Technical Committee On Gas Appliances And Related Accessories

(March, 2009)

Z.J. Fraczkowski	Technical Standards & Safety Authority	<i>(Chair)</i>
D. Baxter	Enbrigde Gas Distribution	<i>(Vice Chair)</i>
G.L. Williams	SaskPower	<i>(Vice Chair)</i>
M. Binet	Gaz Métro Inc.	
J. Boros	Rheem Manufacturing Company	
C. Gibbs	Consumers' Association of Canada	
A. Gould	Union Energy	
E. Grzesik	Ontario Ministry of Energy	
D. Jamieson		
J.M. Jones	JM Jones Consulting Inc.	
C. Jorgenson	British Columbia Safety Authority	
T. Poulin	GSW Water Heating A Div. of GSW Water Products Inc.	
G.B. Prociw	Union Gas Limited	
H. Prosper	Natural Resources Canada	
T. Cautillo	Canadian Standards Association	<i>(Secretary)</i>

Joint Technical Advisory Group On Standards For Gas-Fired Heavy-Duty Forced Air Heaters

Zenon Fraczkowski, Chairman

Kevin Alphs	Modine Manufacturing Company	
Peter Baker	Maxitrol Company	<i>Alternate</i>
Richard Blasko	Reznor	
Kevin Carlisle	Karl Dungs, Inc.	
Ron Christenson	Titan Air Inc.	
David Delaquila	Air Conditioning, Heating, and Refrigeration Institute	
Ray Donhauser	Intertrk Testing Services	
Zenon Fraczkowski	Technical Standards & Safety Authority	
Ed Grzesik	Ontario Ministry of Energy	
Skip Hayden	Integrated Energy Systems	
Susana Katz	S. Katz and Associates, Inc.	
Philip Lengauer	Reznor	<i>Alternate</i>
Bruce Mickelson	Honeywell Inc.	
Brandon Phelps	Titan Air Inc.	<i>Alternate</i>
Gary Potter	Cambridge Engineering	
Verne Quiring	Engineered Air	
Stephen Richter	Roberts Gordon LLC	
John Schlachter	Maxitrol Company	
Terrance Slaby	Heatco Inc.	
Frank Stanonik	Air Conditioning, Heating, and Refrigeration Institute	<i>Alternate</i>
Mike Strande	Modine Manufacturing Company	
Carl Suchovsky	Burner Technology Unlimited, Inc.	
George Tate	Karl Dungs, Inc.	<i>Alternate</i>
Martin Thomas	Natural Resources Canada	
John Tomlinson	LB White Co., Inc.	
David Wolff		
David Wynnich	Lennox Industries, Inc.	

Contents

Page

Part I Construction

1.1	Scope	1
1.2	General Construction	2
1.3	Assembly	5
1.4	Accessibility	6
1.5	Combustion Air And Ventilation	7
1.6	Main Burners	8
1.7	Primary Air Adjustment Means	9
1.8	Orifice Spuds And Orifice Fittings	10
1.9	Automatic Gas Ignition Systems	11
1.10	Flame Spreaders	14
1.11	Manual Gas Valves	14
1.12	Gas Supply Lines	15
1.13	Bleeds And Vents	17
1.14	Automatic Valves	18
1.15	Gas Appliance Pressure Regulators	19
1.16	Adjustment Of Minimum Input Rating	20
1.17	Pilot Gas Filters	20
1.18	Limit And Fan Controls	20
1.19	Thickness Of Materials	22
1.20	Joints In Heating Elements	24
1.21	Heater Openings	24
1.22	Protection Of Service Personnel	25
1.23	Motors And Blowers	27
1.24	Flue Connections And Integral Venting Systems	28
1.25	Draft Hoods	29
1.26	Automatic Vent Damper Devices	30
1.27	Vent-Air Intake Pipes Of Separated Combustion Systems	32
1.28	Air Filters	32
1.29	Condensate Disposal	33
1.30	(Optional) Appliances For Installation Downstream	33
1.31	Instructions	34
1.32	Marking	40
1.33	Electrical Equipment And Wiring	47

Part II Performance

2.1	General	49
2.2	Test Gases	53
2.3	Test Pressures And Burner Adjustments	54
2.4	Category Determination	55
2.5	Combustion	57
2.6	Burner Operating Characteristics	58
2.7	Pilot Burners And Safety Shut-Off Devices	60
2.8	Direct Ignition Systems	66
2.9	Proved Ignition Systems	68
2.10	Efficiency	70
2.11	Main Burner And Flame Spreader Temperatures	72
2.12	Nonload-Bearing Flue Gas Baffle Temperatures	74

Contents (Continued)

	Page
2.13	Flame Rollout Safety Shut-Off System 74
2.14	Filters 75
2.15	Allowable Air Temperature 76
2.16	Gas Appliance Pressure Regulators 78
2.17	Manual Valves 78
2.18	Automatic Valves 78
2.19	Manifold And Control Assembly Capacity 78
2.20	Wall, Floor And Ceiling Temperatures 78
2.21	Flue Gas Temperature 85
2.22	Blocked Vent Shut-Off System 85
2.23	Draft Hoods 86
2.24	Automatic Vent Damper Devices 89
2.25	Draft Tests For Appliances Not Equipped With Draft 92
2.26	Horizontal Category Appliances 93
2.27	Condensate Disposal System(s) 93
2.28	Venting Systems For Category II, III Or IV Appliances 94
2.29	Separated Combustion Systems And Appliances Vented By Means Other Than Conventional Venting Systems 95
2.30	Allowable Heating Element And Load-Bearing Flue Gas Baffle Temperatures 100
2.31	Heating Element Cyclic Test 102
2.32	(Optional) High-Static Appliances For Installation Downstream From Refrigeration Systems 103
2.33	Appliances For Outdoor Installation 103
2.34	Burner Durability 105
2.35	Safety Circuit Analysis 105
2.36	Electrical Power Failure 106
2.37	Marking Material Adhesion And Legibility 106

Tables

Table I	Minimum Acceptable Wall Thickness For Non-Ferrous Semi-Rigid Tubing 110
Table II	Maximum Tubing And Fitting Temperatures 110
Table III	Minimum Corrosion Protection Of Ferrous Materials Used In The Construction Of Unit Heaters and Duct Furnaces For Outdoor Installation 111
Table IV	Maximum Allowable Motor Winding Temperatures 112
Table V	Characteristics Of Test Gases 112
Table VI	Inlet Test Pressures 113
Table VII	Determination Of Category 113
Table VIII	Maximum Safety Control Timings 114
Table IX	Maximum Flame Spreader Temperatures 115
Table X	Maximum Nonload-Bearing Flue Gas Baffle Temperatures 116
Table XI	Time For Heating Element To Attain Minimum Temperature 117
Table XII	Maximum Heating Element And Load-Bearing Flue Gas Baffle Temperatures 117

Figures

Figure 1	Accessibility and Protection 124
----------	--

Contents (Continued)

	Page
Figure 2 Piezo Ring and Details of Typical Construction.	124
Figure 3 Chart for Determination of Appliance Category	125
Figure 4 Air Restrictor for Air Temperature Tests	126
Figure 5 Sealing Annulus Around Vent Connector	126
Figure 6 Test Enclosure for Appliances for Outdoor Installations Only	127
Figure 7 Arrangement of Sandbag and Vent Terminal or Vent-Air Intake Terminal for Impact Test	127
Figure 8 Chart for Determination of Minimum Allowable Heating Element Temperatures on Appliances Equipped for Modulated Operation	128
Figure 9 Arrangement of Spray Heads and Associated Piping for Simulated Rainstorm Test	129
Figure 10 Spray Head Assembly and Details of Construction	129
Figure 11 Probe	130
EXHIBIT A Flue Loss Calculations	131
Flue Loss Calculations (Metric Units)	132
EXHIBIT B Jacket Loss Calculations	137
EXHIBIT C (Optional) Provisions For Listed Gas Appliance Conversion Kits	141
EXHIBIT D (Optional) Provisions For Listed Gas Appliance Ignition Conversion Kits	145
EXHIBIT E Items Unique To Canada	151
EXHIBIT F Items Unique To The United States	159
EXHIBIT G List Of Reference Standards	167
Part III Manufacturing And Production Tests	171
Part IV Definitions	173
APPENDIX A Pertinent References to ANSI Y14.15	183
APPENDIX B Wire color designations	184
APPENDIX C Recommended wire color usage	185
APPENDIX D Preferred graphic symbols of commonly used Items, extracted from Standard ANSI/IEEE 315, Graphic symbols for electrical and electronics diagrams, and abbreviations for these items	186
APPENDIX E Sample Failure Modes and Effects Analysis For Component Miswiring	188
APPENDIX F Table of Conversion Factors	189

American National Standard/ CSA Standard for Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, and Gas-Fired Duct Furnaces

Part I: Construction

1.1 Scope

1.1.1

This standard applies to newly produced gas fired-duct furnaces, packaged heaters, utility heaters with inputs up to and including 400,000 Btu/hr (117 228 W), and unit heaters with input rates up to and including 10,000,000 Btu/hr (2 930 712 W) and constructed entirely of new, unused parts and materials:

- a. For use with natural gas with inlet gas pressures up to and including 5.0 psi (34.5 kPa); unit heaters, packaged heaters, and duct furnaces with burners having input rates over 400,000 Btu/hr (117 228 W) may have higher inlet pressures;
- b. For use with liquefied petroleum gases; and
- c. Convertible for use with natural gas and liquefied petroleum gases, when provision is made for the conversion from one gas to the other.

1.1.2

The term “appliance,” when used herein, applies to gas-fired duct furnaces, packaged heaters, utility heaters and unit heaters.

1.1.3

Duct furnaces, unit heaters, and packaged heaters may be factory-built as a single unit or as a package system intended to be disassembled for shipping and reassembled for installation, and may be combined with a cooling unit. (See Part IV, Definitions).

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

1.1.5

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

1.1.6

This Standard applies to Category I, Category II, Category III and Category IV Appliances. (See Part IV, Definitions.)

1.1.7

This standard covers self-contained, automatically controlled, vented unit heaters, packaged heaters, utility heaters and duct furnaces. These appliances are intended for installation in locations where flammable gases or vapors are not generally present.