ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

DATE: July 28, 2022

TO: Technical Committee on National Fuel Gas Code (ASC Z223/NFPA 54)

FROM: Frank Mortimer, Chairman

SUBJECT: Committee Meeting Notice and Preliminary Agenda – October 24-25, 2022

MEETING LOCATION AND DATE: The National Fuel Gas Code Committee will convene at the Kimpton Hotel Monaco in Pittsburgh, PA on October 24-25, 2022.

MEETING AGENDA: A preliminary meeting agenda is attached. Final meeting materials will be provided to committee members and other registrants in a timely fashion as the meeting date approaches.

HOTEL INFORMATION & REGISTRATION: The Kimpton Hotel Monaco Pittsburg (620 William Penn Pl, Pittsburgh, PA 15219). A block of rooms is reserved for $189.99 per night. Please click here to make your room reservations **by October 2, 2022**. Otherwise, you may contact the hotel directly at 1-800-368-2544 and reference the "American Gas Association Room Block" to obtain the discount rate.

> **Note:** There is a limited number of rooms reserved at a reduced government rate for employees of a federal or state agency; first come-first-served. Government employee identification required at check-in.

MEETING REGISTRATION: There is no registration fee but we request you register for planning purposes. Register online by October 3rd at this registration link (NFPA 54 webpage).

BREAKFAST, LUNCH AND RECEPTION: Breakfast will be provided each morning. Lunch will be provided on Monday, October 24th; lunch on remaining days will be on your own. You and your guests are welcome to an AGA-hosted reception on October 24th at the Rialto Rooftop and Suite.

Please contact Luis Escobar with any questions or comments you may have at 202-824-7058 or lescobar@aga.org.

We look forward to seeing you in Pennsylvania.

ASC Z223/NFPA 54 Secretary
Luis Escobar ♦ American Gas Association ♦ 400 N. Capitol Street, N.W. ♦ Washington, DC, 20001
Tel.: 202.824.7058 ♦ Email: lescobar@aga.org ♦ Fax: 202.824.9122

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

AGENDA

NFPA 54 / ANSI Z223 Committees
2024 NFGC Second Draft Meeting

October 24-25, 2022
8 a.m. – 5:00 p.m. Eastern Time
Hotel Monaco Pittsburgh
Sheffield Ballroom

1. **Call to order.** Frank Mortimer.
2. **Introductions.** See committee roster attached.
3. **Chair report.** Frank Mortimer.
4. **Staff liaison report.** Alex Ing and Luis Escobar.
5. **Previous meeting minutes.** September 2021 Web/Teleconference. See attached.
6. **NFPA 54 Second Draft.**
   a. **Public Comments.** See attached.
   b. **Task group report(s).**
      i. **Combustion Air and ACH**. John Puskar.
      ii. **Industrial Coverage**. Franklin Switzer.
      iii. **Multi-Requirements and Exceptions**. Diane Jakobs. (See Attachment 1)
   c. **Committee Inputs.** See attached.
7. **Other Business.**
8. **Future meetings.**
9. **Adjournment.**

ASC Z223/NFPA 54 Secretary
Luis Escobar ♦ American Gas Association ♦ 400 N. Capitol Street, N.W. ♦ Washington, DC, 20001
Tel.: 202.824.7058 ♦ Email: lescobar@aga.org ♦ Fax: 202.824.9122

Address List No Phone

07/27/2022
Alex Ing
NFG-AAA

National Fuel Gas Code

Frank J. Mortimer **I** 07/29/2013
Chair **NFG-AAA**
American Property Casualty Insurance Association (APCI)
/EMC Insurance Company
717 Mulberry Street
PO Box 712
Des Moines, IA 50303-0712
Alternate: Kody N. Daniel

Luis Romeo Escobar **IM** 04/02/2020
Recording Secretary (NV) **NFG-AAA**
American Gas Association (AGA)
400 N. Capitol Street NW
#450
Washington, DC 20001

Thomas J. Andrews **SE** 04/03/2019
Principal **NFG-AAA**
Michigan Training & Education Center
235 S. Grand Avenue, #1105
Lansing, MI 48909

Michael W. Bethany **SE** 04/02/2020
Principal **NFG-AAA**
Gas Piping Safety Services (GPSS)
1088 Brookpoint Drive
Medina, OH 44256

Jonathan Brania **RT** 12/08/2015
Principal **NFG-AAA**
UL LLC
12 Laboratory Drive
Research Triangle Park, NC 27709-3995
Alternate: Travis F. Hardin

James P. Brewer **IM** 01/01/1990
Principal **NFG-AAA**
Rooftop Safety USA LLC
1812 Haby Lane
Virginia Beach, VA 23464
National Chimney Sweep Guild

Charles R. Brown **SE** 08/11/2020
Principal **NFG-AAA**
Advanced Engineering Investigations Corporation (AEI)
8197 W. Brandon Drive
Littleton, CO 80125
Alternate: Zachary John Jason

Ted Bukowski **RT** 04/12/2022
Principal **NFG-AAA**
Gas Technology Institute (GTI)
1700 South Mt Prospect Road
Des Plaines, IL 60018

Chris Dale Byers **U** 12/06/2019
Principal **NFG-AAA**
Duke Energy/Piedmont Natural Gas
1712 Three and Twenty Road
Easley, SC 29642

Jeremy R. Conjura **U** 08/08/2019
Principal **NFG-AAA**
Corning Incorporated
11773 Lower Drive
Corning, NY 14830

Gerald G. Davis **IM** 8/9/2012
Principal **NFG-AAA**
Williams Meter Company
7930 Cryden Way, Suite 100
Forestville, MD 20747

Marvin Evans **RT** 12/07/2021
Principal **NFG-AAA**
CSA Group
178 Rexdale Boulevard
Toronto, ON M9W 1R3 Canada
Alternate: Colin Moorhouse

Pennie L. Feehan **M** 10/20/2010
Principal **NFG-AAA**
Pennie L. Feehan Consulting
611 S. Palm Canyon Drive
#7226
Palm Springs, CA 92264
Copper Development Association Inc.

Alberto Jose Fossa **SE** 10/4/2001
Principal **NFG-AAA**
NEWEN Creative Engineering
Rua Caropá 72
Vila Madalena, SP 05447-000 Brazil
NFPA Latin American Section

Address List No Phone

07/27/2022
Alex Ing
NFG-AAA

National Fuel Gas Code

Richard L. Gilbert — **IM** 1/10/2002
Principal — **NFG-AAA**
Texas Propane Gas Association
705 North Jackson Avenue
Livingston, TX 77351
Alternate: Jean L. McDowell

Enrique Trejo Gonzalez — **E** 04/04/2017
Principal — **NFG-AAA**
International Association of Plumbing & Mechanical Officials (IAPMO)
Senior Code Development Administrator
4755 East Philadelphia Street
Ontario, CA 91761
International Association of Plumbing & Mechanical Officials
Alternate: Hugo Aguilar

Mike Gorham — **IM** 1/1/1991
Principal — **NFG-AAA**
Northwest Gas Company
1608 NW 4th Street
Grand Rapids, MN 55744
National Propane Gas Association
Alternate: Bruce J. Swiecicki

Gregg A. Gress — **E** 04/15/2004
Principal — **NFG-AAA**
Retired-International Codes Council ICC PEI, LLC
8448 S. 100W
North Judson, IN 46366
Alternate: LaToya Carraway

Roger W. Griffith — **U** 08/03/2016
Principal — **NFG-AAA**
Griffith Engineering
P.O. Box 702
Jefferson City, TN 37760

Adam Habegger — **M** 04/14/2021
Principal — **NFG-AAA**
Van-Packer Company
302 Mill Street
Buda, IL 61314

Steen Hagensen — **M** 1/16/1998
Principal — **NFG-AAA**
ENERVEX
1685 Bluegrass Lakes Parkway
Alpharetta, GA 30004

Peter T. Holmes — **E** 9/30/2004
Principal — **NFG-AAA**
Maine Fuel Board
35 State House Station
Augusta, ME 04333-0035

Nasir Hussain — **SE** 04/02/2020
Principal — **NFG-AAA**
Combustion Science & Engineering, Inc.
8940 Old Annapolis Road
Suite L
Columbia, MD 21045

Zuhair M. Ibrahim — **SE** 04/02/2020
Principal — **NFG-AAA**
Ibrahim & Associates LLC
22647 Ventura Boulevard #432
Woodland Hills, CA 91364

Diane Jakobs — **M** 04/03/2019
Principal — **NFG-AAA**
Rheem
5600 Old Greenwood Road
Fort Smith, AR 72921
Air-Conditioning, Heating, & Refrigeration Institute
Central Heating
Alternate: Robert Torbin

James Kendzel — **U** 08/08/2019
Principal — **NFG-AAA**
American Supply Association
1200 N. Arlington Heights Road
#150
Itasca, IL 60143

Address List No Phone

07/27/2022
Alex Ing

National Fuel Gas Code

NFG-AAA

Jeff Kleiss **M** 04/03/2019
Principal **NFG-AAA**
Lochinvar
300 Maddox Simpson Parkway
Lebanon, TN 37090
Air-Conditioning, Heating, & Refrigeration Institute
Water Heating
Alternate: Phillip W. Stephens

Marek Kulik **E** 08/17/2015
Principal **NFG-AAA**
Technical Standards and Safety Authority
Fuels Safety Program
345 Carlingview Drive
Toronto, ON M9W 6N9 Canada

Theodore C. Lemoff **SE** 10/18/2011
Principal **NFG-AAA**
TLemoff Engineering
13821 Callisto Avenue
Naples, FL 34109-0574
Alternate: John R. Puskar

Timothy McNulty **M** 08/08/2019
Principal **NFG-AAA**
RM Manifold Group Inc., dba US Draft Company
220 South Sylvania Avenue
Suite 207
Fort Worth, TX 76111

Tung Nguyen **M** 04/11/2018
Principal **NFG-AAA**
Emerson Automation Solution
3200 Emerson Way
McKinney, TX 75071

Andrea Lanier Papageorge **IM** 7/23/2008
Principal **NFG-AAA**
Southern Company Gas
Manager, Codes and Standards
10 Peachtree Place
Location 1367
Atlanta, GA 30309
American Gas Association
Eastern
Alternate: Ralph Euchner

George Ragula **SE** 12/07/2021
Principal **NFG-AAA**
RagulaTech
161 Sun Valley Way
Morris Plains, NJ 07950

Phillip H. Ribbs **L** 10/23/2003
Principal **NFG-AAA**
PHR Consultants
206 Cypress Park
Santa Cruz, CA 95060
California State Pipe Trades Council

April Dawn Richardson **E** 12/08/2015
Principal **NFG-AAA**
Railroad Commission of Texas
1701 North Congress Avenue
PO Box 12967
Austin, TX 78711
Alternate: Kent Lowery Thompson

Jon Scott Russell **U** 12/02/2020
Principal **NFG-AAA**
Clearwater Gas System
777 Maple Street
Clearwater, FL 33755
American Public Gas Association

Brian Ryglewicz **M** 08/08/2019
Principal **NFG-AAA**
Chimney Design Solutions Inc.
649 Lafayette Avenue, Suite 3
Hawthorne, NJ 07506

Joel E. Sipe **SE** 08/24/2021
Principal **NFG-AAA**
Exponent, Inc.
3824 Ardley Avenue
Oakland, CA 94602

Address List No Phone

07/27/2022
Alex Ing

National Fuel Gas Code

NFG-AAA

Eric C. Smith **E** 03/07/2013
Principal **NFG-AAA**
State of Nevada
Nevada LP-Gas Board
PO Box 338
Carson City, NV 89702
International Fire Marshals Association

Jason Stanek **IM** 04/05/2016
Principal **NFG-AAA**
Metropolitan Utilities District (MUD)
3100 South 61st Avenue
Omaha, NE 68106
American Gas Association
Southwest

Franklin R. Switzer, Jr. **SE** 8/5/2009
Principal **NFG-AAA**
S-afe, Inc.
P.O. Box 404
Big Flats, NY 14814-0404

Andy John Thielen **SE** 04/03/2019
Principal **NFG-AAA**
Engineering Systems Incorporated (ESI)/Crane Engineering
2355 Polaris Lane North
Suite 120
Plymouth, MN 55447
Alternate: Matthew W. Wilber

Calvin Timmons **M** 04/12/2022
Principal **NFG-AAA**
Willbanks & Associates, Inc.
735 Buffalo Run
Missouri City, TX 77489

Brian K. Williams **M** 12/07/2021
Principal **NFG-AAA**
Ferguson Enterprises
6603 Fosque Lane
Hayes, VA 23072

Ted A. Williams **SE** 12/07/2021
Principal **NFG-AAA**
Natural Gas Direct, LLC.
1101 South Forest Drive
Arlington, VA 22204

Bob Carpenter **M** 04/12/2022
Voting Alternate **NFG-AAA**
Viega, LLC.
585 Interlocken Boulevard
Broomfield, CO 80021

Hugo Aguilar **E** 04/03/2019
Alternate **NFG-AAA**
International Association of Plumbing & Mechanical Officials (IAPMO)
5001 East Philadelphia Street
Ontario, CA 91761
Principal: Enrique Trejo Gonzalez

LaToya Carraway **E** 12/07/2021
Alternate **NFG-AAA**
International Codes Council ICC PEI, LLC
3507 Birchwood Drive
Hazel Crest, IL 60429
Principal: Gregg A. Gress

Kody N. Daniel **I** 04/08/2015
Alternate **NFG-AAA**
American Property Casualty Insurance Association (APCI)
/EMC Insurance Companies
717 Mulberry Street
Des Moines, IA 50309-3810
Principal: Frank J. Mortimer

Ralph Euchner **IM** 12/07/2018
Alternate **NFG-AAA**
PSNC Energy
800 Gaston Road
Gastonia, NC 28506
American Gas Association
Eastern
Principal: Andrea Lanier Papageorge

Address List No Phone

07/27/2022
Alex Ing
NFG-AAA

National Fuel Gas Code

Travis F. Hardin **RT** 04/03/2019
Alternate **NFG-AAA**
UL LLC
12 Laboratory Drive
Research Triangle Park, NC 27709-0163
Principal: Jonathan Brania

Zachary John Jason **SE** 08/24/2021
Alternate **NFG-AAA**
Advanced Engineering Investigations Corporation (AEI Corporation)
8197 West Brandon Drive
Littleton, CO 80125
Principal: Charles R. Brown

Jean L. McDowell **IM** 04/03/2019
Alternate **NFG-AAA**
McDowell Owens Engineering Inc.
740 East 13th Street
Houston, TX 77008
Texas Propane Gas Association
Principal: Richard L. Gilbert

Colin Moorhouse **RT** 12/07/2021
Alternate **NFG-AAA**
CSA Group
178 Rexdale Boulevard
Toronto, ON M9W 1R3 Canada
Principal: Marvin Evans

John R. Puskar **SE** 08/17/2017
Alternate **NFG-AAA**
Prescient Technical Services LLC
2078 Ridge Road
Hinckley, OH 44233
Principal: Theodore C. Lemoff

Phillip W. Stephens **M** 04/03/2019
Alternate **NFG-AAA**
Weil Mclain
500 Blaine Street
Michigan City, IN 46360
Air-Conditioning, Heating, & Refrigeration Institute
Water Heating
Principal: Jeff Kleiss

Bruce J. Swiecicki **IM** 1/1/1995
Alternate **NFG-AAA**
National Propane Gas Association
19530 Southfield Lane
Tinley Park, IL 60487
National Propane Gas Association
Principal: Mike Gorham

Kent Lowery Thompson **E** 12/07/2018
Alternate **NFG-AAA**
Railroad Commission Of Texas
Po Box 12967
Austin, TX 78711-2967
Principal: April Dawn Richardson

Robert Torbin **M** 04/03/2019
Alternate **NFG-AAA**
Omega Flex, Inc.
70 Flanagan Drive
Framingham, MA 01701
Air-Conditioning, Heating, & Refrigeration Institute
Central Heating
Principal: Diane Jakobs

Matthew W. Wilber **SE** 03/05/2012
Alternate **NFG-AAA**
ESi
2355 Polaris Lane North
Suite 120
Plymouth, MN 55447
Principal: Andy John Thielen

Alex Ing
Staff Liaison **NFG-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169

ASC Z223 Interest Category Balance
June 1, 2022

	Cat.	Member Status	First Name	Last Name	Representing
1	M	PV	Eric	Adair	Hearth, Patio & Barbecue Association
2	SE	PV	Thomas	Andrews	Michigan Technical Education Center
3	SE	PV	Michael	Bethany	Gas Piping Safety Service
4	AR-TL	PV	Jonathan	Brania	Unerwriters Laboratories:
5	I-M	PV	James P.	Brewer	National Chimney Sweep Guild
6	I-M	PV	Daniel	Buuck	National Assoc. of Home Builders
7	ES	PV	Christopher	Byers	American Gas Association
8	M	PV	Bob	Carpenter	Viega
9	EA	PV	John	Doucette	State of CT - Office of State Fire Marshal
10	ES	PV	Ralph	Euchner	American Gas Association
11	AR-TL	PV	Marvin	Evans	CSA Group
12	M	PV	Pennie	Feehan	Copper Development Association
13	ES	PV	Richard	Gilbert	Texas Propane Gas Assocaiiton
14	EA	PV	Enrique	Gonzalez	International Assoc. of Plumbing & Mech. Officials
15	ES	PV	Michael R.	Gorham	The National Propane Gas Association
16	EA	PV	Gregg	Gress	International Code Council
17	M	PV	Steen	Hagensen	ENERVEX, Inc.
18	EA	PV	Peter	Holmes	Maine Fuel Board
19	M	PV	Diane	Jakobs	Air Conditioning, Heating, and Refrigeration Institute
20	M	PV	Jeff	Kleiss	Air Conditioning, Heating, and Refrigeration Institute
21	SE	PV	Theodore	Lemoff	Self
22	I	PV	Frank	Mortimer	EMC Insurance Companies
23	ES	PV	Andrea	Papageorge	American Gas Association
24	EA	PV	April Dawn	Richardson	Railroad Commission of Texas
25	ES	PV	Jon	Russell	American Public Gas Association
26	EA	PV	Eric C.	Smith	International Fire Marshals Association
27	ES	PV	Jason	Stanek	American Gas Association
28	M	PV	Phillip	Stephens	Air Conditioning, Heating, and Refrigeration Institute
29	SE	PV	Franklin	Switzer	S-afe, Inc.
30	SE	PV	Andy	Thielen	Crane Engineering
31	M	PV	Robert	Torbin	Air Conditioning, Heating, and Refrigeration Institute
32	M	PV	Matthew	Williams	Association of Home Appliance Manufacturers
1	EA	A	Hugo	Aguilar	International Assoc. of Plumbing & Mech. Officials
2	EA	A	LaToya	Carraway	International Code Council
3	I	A	Kody	Daniel	EMC Insurance Companies
4	ES	A	Paul	Gugliotta	American Gas Association
5	AR-TL	A	Travis	Hardin	Underwriters Laboratories:
6	M	A	Andy	Kireta	Copper Development Association
7	I-M	A	Vladimir	Kochkin	National Assoc. of Home Builders
8	ES	A	Jean	McDowell	Texas Propane Gas Assocaiiton
9	AR-TL	A	Colin	Moorhouse	CSA Group

10	SE	A	John	Puskar	Technical Services LLC
11	ES	A	Stan	Smith	American Gas Association
12	ES	A	Bruce	Swiecicki	The National Propane Gas Association
13	EA	A	Kent	Thompson	Railroad Commission of Texas
14	SE	A	Matt	Wilber	Crane Engineering

COUNT	%	
2	6	(AR-TL) Applied Research/Testing Laboratory
7	22	(ES) Energy Supplier
6	19	(EA) Enforcing Authority
2	6	(I-M) Installer/Maintainer
1	3	(I) Insurance
9	28	(M) Manufacturer
5	16	(SE) Special Expert
32	**100**	**TOTAL**

Membership by Category: To ensure a substantial balance of interests on the Committee, not more than one third of the membership shall come from any one classification.

MEMBERSHIP: PV =Principal Voting Member
A = Alternate

Minutes

National Fuel Gas Code Committee

Virtual Teams Meeting

September 13-22, 2021

Approval Pending

1. Call to Order and Attendance: Chair, Frank Mortimer, called the meeting to order and staff, Alex Ing and Luis Escobar, conducted a roll-call attendance of both committees (see Attachment A – Meeting Attendance).
    a. Luis Escobar noted that two members of the Z223 (Dmitry Antanov of Intertek Testing Services and Sharon Corcoran of AHRI) were no longer with their previous employers and he has reached out to their companies to ascertain their replacements.
2. Adoption of Agenda: The agenda was approved.
3. Announcements:
    a. AGA and NFPA Antitrust Guidelines: Participants were made aware of the antitrust guidelines.
4. NFPA Revision Process Overview: Alex Ing provided a presentation on the NFPA Revision Process for attendees noting the general schedule of events.
5. Business:
    a. Public Inputs: The committee reviewed and acted on the public input. The committee actions that result in a first revision or committee input will be the standing action on the letter ballot. Approved actions from the letter ballot will be incorporated into the First Draft Report that will be placed out for public comment in 2022. Refer to Attachment B – Summary of Actions on Public Input.

        See the NFPA website for full details on Public Inputs (PIs), Committee Inputs (CIs), and First Revisions (FRs).

    b. Task Groups:
        i. Combustion Air and ACH –Task Group Chair Tom Andrews presented recommended tables that address the conversion of ACH_{50} to $ACH_{natural}$ that take into account a building's weather and shielding factor (wsf) and its heigh

correction factor $(H/Hr)^Z$. The committee requested that the TG continue developing the concept and approved the inclusion of a performance test method. New members joined the Task Group, which will now be chaired by John Puskar. See Committee Input 46 in Attachment B.

ii. Industrial Coverage – The committee approved the continued development of installation requirements for industrial applications separately from residential and commercial requirements. See Committee Input 47 in Attachment B.

c. Safety Recommendation P-19-007 from NTSB: The committee developed a response to the NTSB recommendation on the inclusion of residential methane detectors (RMD) in the National Fuel Gas Code. See Committee Input 48 in Attachment B.

d. New Business:

i. Future Meeting – The committee discussed proposed 2022 meeting dates (Attachment C). A straw poll of committee members indicated that the majority would be able to travel in 2022. Staff was requested to poll for dates that do not conflict with other industry meetings.

6. Adjourn: the meeting was adjourned at 3:01 pm on September 22, 2021.

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

Attachment A

Committee Meeting Attendance
2024 NFGC First Draft Meeting
Virtual Teams Meeting
September 13-22, 2021

NFPA 54 Committee

Name	Company	P / A	Day 1 9/13	Day 2 9/16	Day 3 9/17	Day 4 9/20	Day 5 9/21	Day 6 9/22
Frank Mortimer	EMC Insurance Rep. American Property Casualty Insurance Association (APCI)	Principal	yes	yes	yes	yes	yes	yes
Luis Escobar	AGA	Recording Secretary	yes	yes	yes	yes	yes	yes
Tom Andrews	Michigan Technical Education Center	Principal	yes	yes	yes	yes	yes	yes
Michael Bethany	Gas Piping Safety Service	Principal	yes	yes	yes	no	yes	yes
Jonathan Brania	UL	Principal	yes	yes	yes	yes	yes	yes
Jim Brewer	Rooftop Safety USA Rep. National Chimney Sweep Guild	Principal	yes	yes	yes	no	no	no
Charles Brown	AEI Corporation	Principal	no	yes	no	no	no	no
Christopher Byers	Piedmont Natural Gas	Principal	yes	yes	yes	yes	yes	yes
Tom Crane	ESI	Principal	yes	yes	yes	yes	yes	no
Gerald Davis	Williams Meter Company	Principal	no	yes	yes	yes	yes	no
Mark Fasel	Viega	Principal	yes	yes	yes	yes	no	yes
Alberto Fossa	NEWEN Creative Engineering Rep. Latin American Section	Principal	yes	no	no	no	no	no
Richard Gilbert	Texas Propane Gas Association	Principal	yes	no	yes	yes	yes	yes
Enrique Gonzalez	IAPMO	Principal	yes	yes	yes	yes	yes	yes
Michael Gorham	Northwest Gas Company Rep. National Propane Gas Association	Principal	no	yes	no	no	no	yes
Roger Griffith	Griffith Engineering	Principal	yes	yes	yes	yes	yes	yes
Adam Habegger	Van-Packer Company	Principal	no	no	no	no	no	no
Steen Hagensen	ENERVEX	Principal	no	yes	no	yes	yes	no
William Hamilton	UGI Utilities	Principal	no	no	no	no	no	no
Peter Holmes	Maine Fuel Board	Principal	yes	yes	yes	yes	yes	no
Nasir Hussain	Combustion Science & Engineering	Principal	yes	yes	yes	yes	yes	yes
Diane Jakobs	Rheem Rep. Air Conditioning, Heating Refrigerating Institute	Principal	yes	yes	yes	yes	yes	yes
James Kendzel	American Supply Association	Principal	yes	no	yes	no	no	no
Jeff Kleiss	Lochinvar Rep. Air Conditioning, Heating Refrigerating Institute	Principal	yes	yes	yes	yes	yes	yes
Marek Kulik	Technical Standards and Safety Authority	Principal	no	no	no	no	no	no
Theodore Lemoff	TLemoff Engineering	Principal	yes	yes	yes	no	no	no
Timothy McNulty	RM Manifold Group., dba US Draft Company	Principal	yes	yes	no	yes	yes	yes
William Murray	Corning Incorporated	Principal	yes	no	no	yes	no	no
Tung Nguyen	Emerson Automation Solution	Principal	no	yes	yes	no	yes	yes
Andrea Papageorge	Southern Company Gas	Principal	yes	yes	yes	yes	yes	yes

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

	Rep. AGA							
Phillip Ribbs	PHR Consultants Rep. California State Pipe Trades Council	Principal	yes	yes	yes	yes	yes	yes
April Dawn Richardson	Railroad Commission of Texas	Principal	no	no	no	no	no	no
Jon Russel	American Public Gas Association	Principal	yes	yes	yes	yes	yes	yes
Brian Ryglewicz	Chimney Design Solutions	Principal	yes	no	yes	yes	yes	yes
Eric Smith	State of Nevada Rep. International Fire Marshals Association	Principal	yes	yes	yes	yes	yes	yes
Jason Stanek	Metropolitan Utilities District Rep. AGA	Principal	yes	yes	yes	yes	yes	yes
Franklin Switzer	S-afe Inc.	Principal	yes	yes	yes	yes	no	yes
Pennie Feehan	Pennie L. Feehan Consulting Rep. Copper Development Association	Voting Alternate	yes	no	yes	yes	yes	yes
Fred Grable	ICC	Voting Alternate	no	no	no	no	no	no
John Kory	CSA America	Voting Alternate	no	no	no	no	no	no
Alternates								
Hugo Aguilar	IAPMO	Alternate	no	no	no	no	no	no
Jeremy Conjura	Corning Incorporated	Alternate	yes	yes	yes	yes	yes	yes
Kody Daniel	EMC Insurance	Alternate	yes	yes	yes	yes	yes	no
John Doucette	State of CT Department of Administrative Services	Alternate	no	no	no	no	no	no
Ralph Euchner	AGA - PSNC Energy	Alternate	yes	yes	yes	yes	yes	yes
Travis Hardin	UL	Alternate	no	no	no	no	no	no
Jean McDowell	Texas Propane Gas Association	Alternate	yes	yes	no	no	no	no
John Puskar	Prescient Technical Services	Alternate	yes	yes	yes	yes	yes	yes
Lisa Reiheld	Viega	Alternate	yes	yes	yes	yes	no	no
Phillip Stephens	Weil McLain Rep. Air Conditioning, Heating Refrigerating Institute	Alternate	yes	no	yes	yes	yes	no
Bruce Swiecicki	National Propane Gas Association	Alternate	no	yes	yes	yes	yes	no
Kent Thompson	Railroad Commission of Texas	Alternate	yes	yes	yes	yes	yes	yes
Andy Thielen	ESI	Alternate	yes	yes	yes	yes	yes	yes
Bob Torbin	OmegaFlex Rep. Air Conditioning, Heating Refrigerating Institute	Alternate	yes	yes	yes	yes	yes	yes
Guests								
Eric Adair	Hearth Patio & Barbecue Association (HPBA)	Guest	yes	yes	yes	yes	yes	no
Daniel Buuck	National Association of Homebuilders	Guest	yes	yes	yes	yes	no	no
LaToya Carraway	ICC	Guest	yes	yes	yes	no	no	no
Bill Chapin	Valstar	Guest	yes	yes	yes	no	no	no
Mark Felger	Watts Water	Guest	yes	yes	yes	yes	yes	yes
Gregg Gress	ICC	Guest	yes	yes	yes	yes	yes	yes
Andrew Klein	Representing Valstar	Guest	yes	yes	yes	no	no	no
Lane Miller	TRC	Guest	yes	yes	yes	no	no	no
Brett Readout	-	Guest	no	no	yes	no	no	no
Jonathan Sargeant	OmegaFlex	Guest	no	no	yes	yes	no	no
Stan Smith	AGA - Oak Ridge Utility District	Guest	no	yes	yes	yes	yes	yes
Marco Versace	Ferguson	Guest	no	no	yes	no	no	no
Matt Wilber	ESI	Guest	yes	yes	yes	yes	yes	yes
Brian Williams	Ferguson	Guest	no	no	yes	no	no	no

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

Z223 Committee

Name	Company	P / A	Day 1 9/13	Day 2 9/16	Day 3 9/17	Day 4 9/20	Day 5 9/21	Day 6 9/22
Frank Mortimer	EMC Insurance	Principal	yes	yes	yes	yes	yes	yes
Eric Adair	Hearth Patio & Barbecue Association (HPBA)	Principal	yes	yes	yes	yes	yes	no
Tom Andrews	Michigan Technical Education Center	Principal	yes	yes	yes	yes	yes	yes
Dmitry Antonov	Intertek Testing Services	Principal	Replacement TBD					
Michael Bethany	Gas Piping Safety Service	Principal	yes	yes	no	no	no	yes
Shannon Corcoran	AHRI	Principal	Replacement TBD					
Jonathan Brania	UL	Principal	yes	yes	yes	yes	yes	yes
Jim Brewer	National Chimney Sweep Guild	Principal	yes	yes	yes	no	no	no
Dan Buuck	NAHB	Principal	yes	yes	yes	yes	no	no
Christopher Byers	AGA - Piedmont Natural Gas	Principal	yes	yes	yes	yes	yes	yes
Tom Crane	Crane Engineering	Principal	yes	yes	yes	yes	yes	no
John Doucette	State of CT Office of State Fire Marshal	Principal	no	no	no	no	no	no
Ralph Euchner	AGA - PSNC Energy	Principal	yes	yes	yes	yes	yes	yes
Marvin Evans	CSA Group	Principal	no	no	no	no	no	no
Mark Fasel	Viega	Principal	yes	yes	yes	yes	no	no
Pennie Feehan	Copper Development Association	Principal	yes	no	yes	yes	yes	yes
Richard Gilbert	Texas Propane Gas Association	Principal	yes	yes	yes	yes	yes	yes
Enrique Gonzalez	IAPMO	Principal	yes	yes	yes	yes	yes	yes
Michael Gorham	National Propane Gas Association	Principal	no	yes	no	no	no	yes
Gregg Gress	ICC	Principal	yes	yes	yes	yes	yes	yes
Steen Hagensen	ENERVEX	Principal	no	no	no	yes	yes	no
Peter Holmes	Maine Fuel Board	Principal	yes	no	yes	yes	yes	no
Diane Jakobs	AHRI - Rheem	Principal	yes	yes	yes	yes	yes	yes
Jeff Kleiss	AHRI - Lochinvar	Principal	yes	yes	yes	yes	yes	yes
Theodore Lemoff	Ted Lemoff	Principal	yes	yes	yes	no	no	no
Andrea Papageorge	AGA - Southern Company	Principal	yes	yes	yes	yes	yes	yes
April Dawn Richardson	Railroad Commission of Texas	Principal	no	no	no	no	no	no
Jon Russel	American Public Gas Association	Principal	yes	yes	yes	yes	yes	yes
Eric Smith	International Fire Marshals Association	Principal	yes	yes	yes	yes	yes	yes
Jason Stanek	AGA - Metropolitan Utilities District	Principal	yes	yes	yes	yes	yes	yes
Phillip Stephens	AHRI - Weil McLain	Principal	yes	no	yes	yes	yes	no
Franklin Switzer	S-afe Inc.	Principal	yes	yes	yes	yes	no	yes
Bob Torbin	AHRI - OmegaFlex	Principal	yes	yes	yes	yes	yes	yes
Mathew Williams	Association of Home Appliance Manufacturers	Principal	no	no	no	no	no	no
Hugo Aguilar	IAPMO	Alternate	no	no	no	no	no	no
LaToya Carraway	ICC	Alternate	yes	yes	yes	no	no	no
Kody Daniel	EMC Insurance	Alternate	yes	yes	yes	yes	yes	no
Paul Gugliotta	AGA - National Grid	Alternate	no	no	no	no	no	no
Travis Hardin	UL	Alternate	no	no	no	no	no	no
Vladimir Kochkin	NAHB	Alternate	no	no	no	no	no	no
Andy Kireta	Copper Development Association	Alternate	no	no	no	no	no	no
Jean McDowell	Texas Propane Gas Association	Alternate	yes	yes	no	no	no	no
Colin Moorhouse	CSA Group	Alternate	no	no	no	no	no	no
John Puskar	Ted Lemoff	Alternate	yes	yes	yes	yes	yes	yes
Stan Smith	AGA - Oak Ridge Utility District	Alternate	no	yes	yes	yes	yes	yes
Bruce Swiecicki	National Propane Gas Association	Alternate	no	yes	yes	yes	yes	no
Kent Thompson	Railroad Commission of Texas	Alternate	yes	yes	yes	yes	yes	yes
Andy Thielen	Crane Engineering	Alternate	yes	yes	yes	yes	no	yes

Z223 Guests: Charles Brown, Bill Chapin, Jeremy Conjura, Mark Felgar, Alberto Fossa, Roger Griffith, Nasir Hussain, Zuhair Ibrahim, Jim Kendzel, Andrew Klein, Tim McNulty, Lane Miller, Laura Moreno, William Murray, Tung Nguyen, Lisa Reiheld, Phillip Ribbs, Brian Ryglewicz, John Sargeant, Marco Versace, Matt Wilber, Brian Williams,

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE

Attachment B

Preliminary Summary of Actions on Public Input
2024 NFGC First Draft Meeting

The summary table below captures the actions of the Committees during the meeting. The preliminary First Revision (FR) numbers may change during the editorial process. See the First Revision Report for final details.

PI No.	FR or CI No.	Section - Topic; Proposed Action	Comm. Action †
21	33	1.1.1.1(E) – adds purging to piping system requirements	FR
22	34	1.1.1.1(F) – editorial change	FR
23	-	1.1.1.2 – LNG installations revised, add maintenance of appliances	R
116, 118, 124	1	2.2, 2.35 – editorial change, adding "edition" to each standard; adds NFPA 715 Standard; revises UL Standards listings	FR
87	-	2.3.2 ASTM Publications – adds ASTM F1281 standard for PEX-AL-PEX	R
24	-	3.3.4.4.1 Baking and Roasting Oven – revised	R
25	35	3.3.4.4.2 Gas Counter Appliance – revised definition	FR
26	36	3.3.4.5 Gas Counter Appliance – deletes section	FR
27	37	3.3.4.6 Household Cooking Appliance – deletes subsections	FR
28, 29	-	3.3.24 Copper Alloy – deletes section	R
30	38	3.3.48 Gas Convenience Outlet – changes "permanently mounted" to "permanently installed"	FR
33	-	3.3.56.7 Water Heating – changed "domestic" to "residential"	R
32	39	3.3.58 Hot Plate – revised	FR
34	20	New Section after 3.3.60 – new section on interruption of service	FR
17	40	3.3.64.2 Noncombustible Material – align definition of non-combustible materials	FR
126, 127	41	3.3.84.1 [Excluding any Sub-Sections], New Section after 3.3.84.1 – revised; adds section on draft control regulator	CI
35	42	3.3.97 Tubing – revised	FR
94	-	3.3.97 Tubing – addition of PEX-AL-PEX	R
36	-	4.1 Qualified Agency - revised	R
31	3	5.1.1 Installation of Piping System – isolation valves location and purging requirements	FR
39	-	5.1.2 Addition to Existing System – revised	R
42	5	New Section after 5.1.2 – minimum gas pressure for additional appliances	FR
43	-	5.4.4 Maximum Operating Pressure in Buildings – revised	R
44	-	5.5.1.2 User Materials – revised	R
96	-	5.5.2.2 Steel, Stainless Steel, Wrought Iron – revised, added ASME B36.10M	R
11	-	New Section after 5.5.3.6 – new section on multi-layer piping	R
88	-	5.5.4.1 Standard and Marking – new section for PEX-AL-PEX	R
121	-	5.5.4.2 Regulator Vent Piping – revised	R

† FR (First Revision), R (Resolved – no change to section), CI (Committee Input)

37	-	5.5.4.3 Anodeless Risers – revised	R
97	-	5.5.4.3 Anodeless Risers – revised	R
45	6	5.5.5 Workmanship and Defects – revised	FR
98	-	5.5.6 Metallic Pipe Threads – revised	R
46, 47	7	5.5.6.2, New Section after 5.5.6.2 – revision and weld opening	FR
54	8	5.5.7 [Excluding any Sub-Sections] Piping Joint – revised	FR
75, 76, 77	15	5.5.7.5 Metallic Pipe Fittings – revised; 7.3.5.2 Other Occupancies – revised; 8.1.1.3 – repairs or additions following pressure test, revised	FR
7	-	New Section after 5.5.8 – new section on multi-layer piping fittings	R
78	-	5.5.9.1 Flange Specifications – adds Annex A.5.5.9.1	R
48	9	New Section after 5.5.10.4 – when flanges are separated	FR
55	10	5.6.2.2 –gas meter placement, revised	FR
56	11	5.6.3 Supports – revised	FR
99	-	5.6.3 Supports – revised	R
18	-	5.7.2 Listing – revised	R
38	-	5.7.2 Listing – revised	R
13	16	New Section after 5.7.6 – new section on regulator removal	FR
19	12	5.14 Pressure Regulator and Pressure Control Venting – new exception	FR
10	13	6.1 [Excluding any Sub-Sections] –reference to sizing tables, revised	FR
5	-	6.1.3 Hybrid Pressure –sizing methods for hybrid pressure systems, revised	R
100	-	7.1.1.2 – clearance or insulation from sources of heat, adds anodeless risers	R
101	-	New Section after 7.1.1.2 – prohibits anodeless risers installed in firepits	R
103	-	7.1.3 [Excluding any Sub-Sections] – editorial change, section number	R
104	-	7.1.3.1 – editorial change, section number	R
57	-	7.1.3.2 – underground piping requirements, revised	R
105	-	7.1.3.2 – editorial change, section number	R
106	-	7.1.3.3 – editorial change, section number	R
107	-	7.1.3.4 – editorial change, section number	R
108	-	7.1.3.5 – editorial change, section number	R
109	-	7.1.3.6 – editorial change, section number	R
110	-	7.1.3.7 – editorial change, section number	R
111	-	7.1.3.8 – editorial change, section number	R
112	-	7.1.3.9 – steel risers, revised	R
102	-	New Section after 7.1.3 – design and approvals	R
90	-	7.1.7.1 Connection of Plastic Piping – addition of PEX-AL-PEX	R
119	44	7.1.7.3.1 – tracer wire, adds UL 2989	FR
12	-	New Section after 7.1.8 – new section on multi-layer piping	R
91	-	New Section after 7.2 – new section on PEX-AL-PEX	R
92	-	7.3.2 Fittings in Concealed Locations – addition of PEX-AL-PEX	R
93	-	7.5.2 Plastic Pipe – revised	R
58	-	7.7.2.1 – gastight plugging of disconnected piping, revised	R
59	14	7.11.5.2 Electrical Requirement – revised	FR
8	17	7.12.1 Piping and Tubing Other Than CSST – revised	FR
9	18	7.12.3 Arc-Resistant Jacketed CSST – revised	FR

† FR (First Revision), R (Resolved – no change to section), CI (Committee Input)

60	-	7.14.1 – electrical connections requirements, revised	R
61	19	7.14.2 – electrically powered safety controls requirements, revised	FR
80	43	New Section after 8.1.1 – new section on Abandoned Fuel Gas Piping	FR
62	21	8.1.4.2 – test pressure, revised	FR
63	22	8.1.5.2 – locating leaks with gas detector, revised	FR
1	-	8.2.3 Leak Check – new definition for "readily accessible"	R
64	-	8.2.3 Leak Check – revised	R
50	-	9.1.6.1 – corrosive or flammable process fumes or gases, revised	R
49	23	9.1.6.2 – chemicals that generate corrosive or flammable products, revised	FR
53	-	9.1.7 Process Air – move to section 9.3	R
81	-	9.1.8.1 – structural loading, revised	R
82	-	New Section after 9.1.8.1 – new section on floor loads	R
83	-	9.1.8.2 – static equipment loads, revised	R
51	-	Sections 9.1.10,Â 9.1.11,Â 9.1.12 – moving sections to end of chapter 10	R
65	24	9.1.15 Extra Device or Attachment – revised	FR
52	-	9.1.16 Avoiding Stain on Gas Piping – revised	R
84	-	9.1.21 Protection on Outdoor Appliances – revised	R
66, 85	25	9.2.1 Accessibility for Service – revised	FR
86	-	9.3.1.5 – combustion air systems acceptance test, revised	R
113	-	New Section after 9.6.1 – disconnected open connector protection	R
67	26	9.7.3 Electrical Circuit – revised	FR
70	-	10.11.2 Clearance for Listed Appliances – revised	R
71	27	10.12.3 Clearance for Appliances – revised	FR
68	-	10.17.2 Protection Above Domestic Units – revised	R
69	28	10.26.5 Temperature Limiting Devices – revised	FR
114	29	11.6 Checking the Draft – revised	FR
72	-	12.3.2 [Excluding any Sub-Sections] – "residential" cooking units need not be vented	R
115	-	New Section after 12.4.3 – induced draft systems	R
128	30	New Section after 12.7.4.3 – total BTU input	FR
123	-	New Section after 12.14.2 – balancing baffle	R
74	31	12.15 Automatically Operated Vent Dampers – revised	FR
73	-	A.5.3.2.1 Approximate Gas Input for Typical Appliances – revised table	R
117, 125	32	New Section after D.1 – adds reference to NFPA 715	FR
120	2	K.1.2.8 UL Publications – revised	FR
95	-	New Section after K.3 – new annex L for repair renewal of existing gas house piping systems	R

† FR (First Revision), R (Resolved – no change to section), CI (Committee Input)

ASC Z223 NFPA 54

COMMITTEE ON NATIONAL FUEL GAS CODE
Attachment C

Future Meeting Schedule

Date: September 24, 2021

Subject: 2022-2024 Meetings: Z223/NFPA 54 Committees

The Z223 and NFPA 54 Committees meet jointly to maintain and develop the National Fuel Gas Code. For your planning purposes the National Fuel Gas Code Committees' 2022-2024 preliminary meeting schedule is proposed as follows:

2024 EDITION: PUBLIC INPUT DUE BY JUNE 1, 2021

Date:	August 12, 2021
Meeting Type:	Pre-First Draft Meeting
Purpose:	Organize and to get Task Group updates from previous cycle
Location:	Virtual, Microsoft Teams

Date:	September 13 - 28, 2021
Meeting Type:	First Draft Meeting, Full Committee
Purpose:	Act on Public Input
Location:	Virtual, Microsoft Teams

2024 EDITION: PUBLIC COMMENTS DUE BY MAY 31, 2022

Date:	October 2022, pending poll
Meeting Type:	Full Committee
Purpose:	Act on Public Comments
Location:	To Be Determined

2024 EDITION: PUBLISHED OCTOBER 2023

OPTIONAL OFF CYCLE MEETING

Date:	November 2023
Meeting Type:	Full Committee
Purpose:	Complete unfinished business & planning on 2027 edition
Location:	To Be Determined

Timely meeting notices will be sent to you as each meeting date approaches. Meting information will also be available on the AGA and NFPA website. Please contact Luis Escobar with any questions or comments you may have at lescobar@aga.org.

Public Comments

Public Comment No. 3-NFPA 54-2022 [Section No. 1.1.1.2]

1.1.1.2

This code shall not apply to the following items:

(1) Portable LP-Gas appliances and equipment of all types that are not connected to a fixed fuel piping system

(2) Installation of appliances such as brooders, dehydrators, dryers, and irrigation equipment used for agricultural purposes

(3) Raw material (feedstock) applications except for piping to special atmosphere generators

(4) Oxygen–fuel gas cutting and welding systems

(5) Industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen

(6) Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants

(7) Large integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions

(8) LP-Gas installations at utility gas plants

(9) Liquefied natural gas (LNG) ~~installations~~ installations other than fuel gas systems within the scope of NFPA 54

(10) Fuel gas piping in electric utility power plants

(11) Proprietary items of equipment, apparatus, or instruments such as gas generating sets, compressors, and calorimeters

(12) LP-Gas equipment for vaporization, gas mixing, and gas manufacturing

(13) LP-Gas piping for buildings under construction or renovations that is not to become part of the permanent building piping system — that is, temporary fixed piping for building heat

(14) Installation of LP-Gas systems for railroad switch heating

(15) Installation of LP-Gas and compressed natural gas (CNG) systems on vehicles

(16) Gas piping, meters, gas pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas

(17) Building design and construction, except as specified herein

(18) Fuel gas systems on recreational vehicles manufactured in accordance with NFPA 1192

(19) Fuel gas systems using hydrogen as a fuel

(20) Construction of appliances

Statement of Problem and Substantiation for Public Comment

This comments attempts to coordinate the requirements of low pressure, non-liquefied, natural gas in LNG facilities. This need was brought to my attention by members of the NFPA 59A committee to exempt non-liquefied natural gas in LNG facilities from the exemption of NFPA 54 at LNG facilities

The committee rejected this recommendation in PI 23 stating, “The maintenance of appliances is

covered within the code. Fuel gas appliances in LNG plants are under NFPA 54 where they fall into the scope of NFPA 54 and is the proposed text is unnecessary".

This ignores the fact that NPFA excludes in 1.1.1.2 (9) LNG installations, which is reasonably interpreted by many code users to mean the entire LNG installation, including all natural gas in the vapor state, including low pressure uses, such as heating buildings and cooking. This clarification is needed to provide requirements for gas appliances and related piping in LNG plants. NFPA 59A provides no such requirements.

Related Item

• PI 23

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 01 13:27:13 EDT 2022
Committee: NFG-AAA

Public Comment No. 40-NFPA 54-2022 [New Section after 2.3.3]

2.3.4 ISO Publications

ISO 17484-1, Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) - Part 1: Specifications for systems.

2.3. 4 5 MSS Publications.

2.3. ~~5~~ 6 UL Publications.

2.3. ~~6~~ 7 US Government Publications.

2.3. ~~7~~ 8 Other Publications.

Statement of Problem and Substantiation for Public Comment

PEX-AL-PEX has been used for gas service and distribution for over 15 years under numerous ISO, EU, and Australian standards. ISO 17484-1 includes allowance for use with gases that are compatible with the pipe and fittings. Based on committee feedback from the first draft meeting, we are referencing ISO 17484-1.

Related Item

• Public Input No. 87-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering, PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 30 22:51:13 EDT 2022
Committee: NFG-AAA

Public Comment No. 4-NFPA 54-2022 [Section No. 3.3.4.4.1]

3.3.4.4.1 Baking and Roasting Oven.

An oven primarily intended for volume food ~~preparation that is composed of one or more sections or units of the following types:~~ preparation

Add a new A.3.3.4.4.1 to read:

A.3.3.4.4.1 The types of baking and roasting ovens are:

(1) cabinet oven, an oven having one or more cavities heated by a single burner or group of burners

~~;~~

(2) reel-type oven, an oven employing trays that are moved by mechanical means

~~; or~~

(3) sectional oven, an oven composed of one or more independently heated cavities.

Statement of Problem and Substantiation for Public Comment

The committee rejected my PI 24 to move the types of baking and roasting ovens to Annex A stating: "The list of ovens that fall under baking or roasting ovens is helpful to the understanding of the definition". The simplified definition explains what baking and roasting ovens are and including "types" – which are not used in the code does not improve the definition.
The NFPA Manual of Style requires that definitions "only describe the term being Defined" (MOS-23.2.1). The terms Cabinet Oven, Reel-Type Oven, and Sectional Oven are not used in NFPA 54.
It is proposed to relocate the 3 oven types to Annex A so that they will remain available to Code users.

Related Item

• PI 24

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 01 13:37:25 EDT 2022
Committee: NFG-AAA

Public Comment No. 15-NFPA 54-2022 [Section No. 3.3.4.5 [Excluding any Sub-Sections]]

An appliance for ~~domestic~~ food preparation, providing at least one function of (1) top or surface cooking, (2) oven cooking, or (3) broiling.

Statement of Problem and Substantiation for Public Comment

The definition is revised by deleting "domestic". As the term being defined is inherently a residential appliance the revised definition remains clear. The subsidiary definitions of various household appliances to not include the term "domestic".

Related Item

• PC 11

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 07 11:00:59 EDT 2022
Committee: NFG-AAA

Public Comment No. 42-NFPA 54-2022 [New Section after 3.3.21]

3.3.22 Composite Pipe.

Pipe consisting of two or more different materials arranged with specific functional purpose to serve as pipe.

Statement of Problem and Substantiation for Public Comment

PEX-AL-PEX composite piping systems have characteristics of both metallic and plastic systems and can be construed as either metallic or plastic pipe depending on the familiarity of the system. Proven as a safe system to supply gas appliances in buildings for over 15 years, this system should not be classified as just another "plastic pipe." The definition presented here is consistent with that in ASTM F412 and is necessary for the proper categorization of PEX-AL-PEX.

Related Item

• Public Input No. 88-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 30 23:41:41 EDT 2022
Committee: NFG-AAA

Public Comment No. 5-NFPA 54-2022 [Section No. 3.3.24]

~~**3.3.24** – Copper Alloy.~~

~~A homogenous mixture of two or more metals in which copper is the primary component, such as brass and bronze.~~

Statement of Problem and Substantiation for Public Comment

This definition is not needed as alloy is a commonly used word that is adequately defined in dictionaries. One dictionary definition is, “a metal made by combining two or more metallic elements, especially to give greater strength or resistance to corrosion”.

Related Item

• PI 28

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 01 13:45:06 EDT 2022
Committee: NFG-AAA

Public Comment No. 6-NFPA 54-2022 [Section No. 3.3.56.7]

3.3.56.7 Water Heater.

An appliance for supplying hot ~~water for domestic or commercial purposes.~~ water

Statement of Problem and Substantiation for Public Comment

PI 33 proposing the substituting of “residential” for “commercial” in this definition was rejected by the Committee with the statement:
Residential occupancies are broader than what the committee intends for these appliances. The appliance listing standard also refers to these appliances as domestic of household appliances and not residential.
This comment is similar, but simplifies the definition to apply to all appliance that supply hot water for any purposes. A water heater is a water heater no matter what the use of the heated water is.

Related Item

• PI 33

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 01 13:47:39 EDT 2022
Committee: NFG-AAA

Public Comment No. 7-NFPA 54-2022 [Section No. 3.3.83]

3.3.83 Qualified Agency.

Any individual, firm, corporation, or company that either in person or through a representative is engaged in and is responsible for (1) the design, installation, testing, or replacement of gas piping or (2) the connection, installation, testing, repair, or servicing ~~of appliances and~~ of equipment; that is experienced in such work; that is familiar with all precautions required; and that has complied with all the requirements of the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

The committee rejected PI 36 stating, “Servicing of the appliances needs to be done by qualified agencies”.

It is noted that the scope of NPFA 54 in 1.1.1.1 states: “This code is a safety code that shall apply to the installation of fuel gas piping systems, appliances, equipment, and related accessories as shown in 1.1.1.1(A) through 1.1.1.1(F).

It is agreed that servicing of appliances must be done by qualified technicians. This qualification is in part the design and construction of appliances, which are not within the scope of this Code. Therefore, appliance repair is outside the scope of this Code.

Related Item

• PI 36

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 12:57:30 EDT 2022
Committee: NFG-AAA

Public Comment No. 37-NFPA 54-2022 [Section No. 3.3.85.3]

3.3.85.3 Line Pressure Regulator.

A pressure regulator placed in a gas line between the service regulator and the appliance ~~regulator~~ .

Statement of Problem and Substantiation for Public Comment

The scope of piping in NFPA 54 covers the piping from the point of deliver to the appliance. An appliance regulator is part of the appliance, and is outside the scope of the Code.

Related Item

• FR-12

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 20 13:35:17 EDT 2022
Committee: NFG-AAA

Public Comment No. 41-NFPA 54-2022 [New Section after 5.5.4]

5.5.5. Composite Piping

5.5.5.1 Standard and Markings

5.5.5.1.1 Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) composite pipe and fittings used to supply fuel gas shall conform to ISO 17484-1. Such pipe shall be marked "Gas" and "ISO 17484".

Statement of Problem and Substantiation for Public Comment

This proposal ensures PEX-AL-PEX piping systems are properly listed and marked.

Related Item

• Public Input No. 88-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 30 23:15:43 EDT 2022
Committee: NFG-AAA

Public Comment No. 46-NFPA 54-2022 [Section No. 5.5.4.2]

5.5.4.2* Regulator Vent Piping.

Plastic pipe and fittings used to connect regulator vents to remote vent terminations shall be PVC conforming to UL 651, *Schedule 40 and 80 Rigid PVC Conduit and Fittings*. ~~PVC vent piping shall not be installed indoors.~~

Statement of Problem and Substantiation for Public Comment

Since the 2001 edition, NFPA 58 “LP-Gas Code” has allowed the use of PVC conforming to ANSI/UL 651 to be exposed to the indoors where used to vent second stage regulators that are installed indoors. This practice is currently prohibited in the National Fuel Gas Code, but there is good reason to reconsider this prohibition.

- Using black iron or galvanized pipe or larger diameter copper tubing could impose excessive stresses on the regulator housing. When regulators had 1/4-inch vent openings, small diameter tubing used to extend vents imposed minimal stress on the regulator. However, regulators now install 1/2-, 3/4-, and 1-inch vent openings which lead to much greater stresses on the housing.
- UL 651 PVC conduit is tested for limited resistance to fire. However, LP-gas second stage and line pressure regulators, which are both approved for use inside buildings, are not required to be fire resistant. Regulators contain components which have low melting points. Plastic regulator vent caps and adjusting screws will melt at temperatures as low as 225°F, and the elastomer materials of regulator diaphragms and seat discs will fail at approximately 400°F. Therefore, there is no enhancement of safety in mandating fire-resistant vent piping, when the regulator assembly itself is not tested for fire resistance.
- A related concern is that in a large structure involved in fire, regulator vent piping may be exposed to fire while the regulator itself may not be. It is important to note that under most circumstances, regulator vent piping does not contain gas—it only carries gas when the regulator is in vent discharge mode. If the regulator itself is not involved in a fire, there is no reasonable expectation to believe that it will vent and therefore involvement of the vent piping alone in a fire does not pose any additional safety risk.

Related Item

- PI No. 121

Submitter Information Verification

Submitter Full Name: Bruce Swiecicki
Organization: National Propane Gas Associati
Affiliation: NPGA Technology, Standards and Safety Committee
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 13:04:21 EDT 2022
Committee: NFG-AAA

Public Comment No. 24-NFPA 54-2022 [Section No. 5.5.9.1.3]

5.5.9.1.3

Non-ferrous flanges shall be in accordance with ANSI/ASME B16.24, *Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600. 900, 1500, and 2500*, except listed components using aluminum flange connections shall be permitted to be constructed in accordance with the dimensional specifications of ANSI/ASME B16 . 5 or ANSI/ASME B16.1.

Statement of Problem and Substantiation for Public Comment

This paragraph requires that listed components using aluminum flanges to be constructed to have flat face flange connections according a standard that applies to copper. Many listed components today use aluminum flanges, and they are made with either B16.1 (flat face) or ASME B16.5 (raised face) flanges. Additionally, the paragraph is in conflict with UL 429 for safety shutoff valves. UL 429 allows for aluminum flange connections to be ASME B16.1 (flat face) or ASME B16.5 (raised face), and this reflects also what the industry is doing today for listed components.

Related Item

• PI 78

Submitter Information Verification

Submitter Full Name: Kevin Carlisle
Organization: Karl Dungs, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 19 16:00:54 EDT 2022
Committee: NFG-AAA

Public Comment No. 17-NFPA 54-2022 [New Section after 5.5.10.5]

A5.5.10.5

ASME PCC-1, Guidelines for Pressure Boundary Bolted Flanged Joint Connections, contains information and guidelines for evaluating flange face defects.

Statement of Problem and Substantiation for Public Comment

This annex material helps to support this new requirement.

Related Item

• PI 48

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 15 18:36:23 EDT 2022
Committee: NFG-AAA

Public Comment No. 16-NFPA 54-2022 [Section No. 5.5.10.5]

5.5.10.5

When flanges are separated and before gaskets are replaced, the following shall be met:

(1) Flange surfaces shall be inspected for pitting, corrosion, and other surface defects.

(2) Flanges that contain pitting, corrosion, and other surface defects on faces shall be repaired or replaced.

(3) Flange faces shall be cleaned and restored to meet new gasket surface requirements.

Statement of Problem and Substantiation for Public Comment

It's not enough to say that flanges need to be inspected for pitting and corrosion, when gaskets are removed some of the old gasket remains embedded into grooves that are installed into the flange surfaces to created sealing. If these grooves are not re-established the new gasket will not seal properly.

Related Item

• PI 48

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 15 18:31:36 EDT 2022
Committee: NFG-AAA

Public Comment No. 27-NFPA 54-2022 [Section No. 5.6.3.2]

5.6.3.2

Where flexible connectors are used to connect a gas meter to downstream piping at manufactured homes in manufactured home parks and mobile home in mobile home parks , the meter shall be supported by a post or bracket placed in a firm footing or by other means providing equivalent support.

Statement of Problem and Substantiation for Public Comment

A mobile home is a prefabricated structure, built in a factory on a permanently attached chassis. Mobile homes are permanently or semi-permanently in one place, but can be moved, and may be required to move from time to time for legal reasons.

Manufactured homes are built entirely in the factory under a federal building code administered by (HUD). Manufactured homes may be single or multi-section and are transported to the site and installed on a permeant foundation and are not moveable.

Related Item

• Section 5.6.3.2

Submitter Information Verification

Submitter Full Name: Pennie Feehan
Organization: Pennie L. Feehan Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 02 17:31:25 EDT 2022
Committee: NFG-AAA

Public Comment No. 25-NFPA 54-2022 [Section No. 5.7.2]

5.7.2– _ Listing.

Line pressure regulators shall either

1) be listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, where the outlet pressure is set to 2 psi or less, or

2)* incorporate a high and low gas pressure device downstream that shutdown the appliance served when high and low pressure is detected .

A.5.7.1(2) Each appliance downstream require a high and low gas pressure device if there are no high and low gas pressure devices located on the gas piping system serving those appliances.

Statement of Problem and Substantiation for Public Comment

Listed line pressure regulators are limited in their scope for industrial applications and large commercial applications for two reasons.
1) The maximum allowed outlet pressure for a listed line pressure regulator is 2 PSI. There are some industrial applications and large commercial applications that require 10 PSI at the burner.
2) There are some industrial applications and large commercial applications where the delivery pressure is less than 2 PSI, but the regulators used in these applications will not comply with ANSI Z21.80, Standard for line pressure regulators, for the following reasons.

- the standard for line pressure regulators ANSI Z21.80 requires that regulator be capable with flowing a minimum of 0.15CFH of natural gas. Many regulators used on industrial applications and large commercial applications today can be in the 5” – 8” pipe size, and these regulators cannot flow this small rate.

- the standard for line pressure regulators ANSI Z.21.80 requires that regulator be capable with passing a 100,000 life cycle test. Many regulators used on large industrial applications and large commercial applications today are big. To move the mechanical parts within a big regulator means bigger forces, and this leads to mechanical failure long before reaching 100,000 cycles.

- the standard for line pressure regulators ANSI Z.21.80 requires that regulator be capable of a lockup pressure of 150% of the setpoint or +5"WC, whichever is greater. Many regulators used on industrial applications and large commercial applications are pilot loaded, and thus cannot pass this ANSI Z.21.80 requirement. The pilot loaded regulator are much slower reacting than the typical, “direct acting” spring loaded regulators that are currently certified to ANSI Z21.80.

The proposed solution is good for all code users. Not only is it easy to enforce and reflects what these industries are currently doing, the requirement for high and low gas offers as-good-as or greater safety for these two reasons:
1. The devices are “safety” devices, subjected to the stringent safety requirements of UL 353 or UL 60739-2-5.
2. Regulator can fail because: a diaphragm fails, debris gets into the regulator mechanisms and causes the regulator to stick, a regulating disc breaks, there is a condition where there is too high or too low of an inlet pressure which causes significant droop, or there is an improper field adjustment or incorrect installation of a spring. These risks are all greatly mitigated when a line pressure regulator certified to ANSI Z21.80. However, those same risks are mitigated even more when using a high and low gas pressure device. These devices continuous monitor the outlet pressure of the upstream regulator during operation of the appliance, and any condition (for whatever reason) that causes the regulated pressure to exceed the settings of the devices, the appliance shuts down.

Related Item

• PI 18

Submitter Information Verification

Submitter Full Name: Kevin Carlisle
Organization: Karl Dungs, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 21 14:35:15 EDT 2022
Committee: NFG-AAA

Public Comment No. 28-NFPA 54-2022 [Section No. 5.8.3.1]

5.8.3.1

Overpressure protection devices shall be one of the following:

(1) Pressure relief valve.

(2) Monitor regulator.

(3) Series regulator installed upstream from the line regulator and set to continuously limit the pressure on the inlet of the line regulator ~~to the maximum values specified by 5.8.2.1 or less.~~ .

(4) Automatic manually reset shutoff device installed in series with the line pressure regulator ~~and set to shut off when the pressure on the downstream piping system reaches the maximum values specified by 5.8.2.1 or less. This device shall be designed so that it will remain closed until manually reset.~~ .

Statement of Problem and Substantiation for Public Comment

The requirement is revised editorially.

1. 5.8.3 1 is revised to remove the reference to 5.8.2.1 (the previous paragraph) as it is applicable and does not need to be restated.

2. 5.8.3.1 (3) is revised to delete reference 5.8.2.1 which is applicable and does not need to be restated.

3. 5.8.3.1 (4) is restated to delete reference to 5.8.2.1 as 5.8.2.1 does not need to be restated, and to combine the 2 sentences into one sentence.

Related Item

• CI 46

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Thu May 12 04:26:32 EDT 2022
Committee: NFG-AAA

Public Comment No. 29-NFPA 54-2022 [Section No. 5.8.3.2]

5.8.3.2

~~The devices in 5.8.3.1 shall be installed either as an integral part of the service or line pressure regulator or as separate units. Where separate overpressure protection devices are installed, they shall comply with 5.8.4 through 5.8.9 .~~

1. Be constructed so that the operation of the device is not impaired by corrosion of external or internal parts by the gas

2. Be designed and installed so that they can be operated to determine that the valve components are free to operate as designed.

3. Prevent unauthorized operation.

Statement of Problem and Substantiation for Public Comment

5.8.3.2 is revised to incorporate the requirements of 5.8.4 thru 5.8.7 which are no longer needed.

Related Item

• CI 46

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Thu May 12 04:30:35 EDT 2022
Committee: NFG-AAA

Public Comment No. 30-NFPA 54-2022 [Sections 5.8.4, 5.8.5, 5.8.6, 5.8.7]

Sections 5.8.4, 5.8.5, 5.8.6, 5.8.7

~~**5.8.4** – Construction and Installation.~~

~~All overpressure protection devices shall meet the following requirements:~~

(1) ~~Be constructed of materials so that the operation of the device is not impaired by corrosion of external parts by the atmosphere or of internal parts by the gas.~~

(2) ~~Be designed and installed so they can be operated to determine whether the valve is free. The devices shall also be designed and installed so they can be tested to determine the pressure at which they operate and be examined for leakage when in the closed position.~~

~~**5.8.5** – External Control Piping.~~

~~External control piping shall be designed and installed so that damage to the control piping of one device does not render both the regulator and the overpressure protective device inoperative.~~

~~**5.8.6** – Setting.~~

~~Each pressure limiting or pressure relieving device shall be set so that the gas pressure supplied to the connected appliance(s) does not exceed the limits specified in 5.8.2.1 and 5.8.2.2 .~~

~~**5.8.7** – Unauthorized Operation.~~

~~Where unauthorized operation of any shutoff valve could render a pressure relieving valve or pressure limiting device inoperative, one of the following shall be accomplished:~~

(1) ~~The valve shall be locked in the open position. Instruct authorized personnel in the importance of leaving the shutoff valve open and of being present while the shutoff valve is closed so that it can be locked in the open position before leaving the premises.~~

(2) ~~Duplicate relief valves shall be installed, each having adequate capacity to protect the system, and arrange the isolating valves or three-way valve so that only one relief valve can be rendered inoperative at a time.~~

Statement of Problem and Substantiation for Public Comment

Removed per PC 28. These are now no longer needed with the revisions made to 5.8.3.1. These requirements are now incorporated into 5.8.3.2

5.8.6 is deleted as reference to 5.8.2.1 and 5.8.2.2 which are in the same Section are not needed.

Related Item

• CI 46

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:

City:	
State:	
Zip:	
Submittal Date:	Thu May 12 04:34:57 EDT 2022
Committee:	NFG-AAA

Public Comment No. 31-NFPA 54-2022 [Section No. 5.8.8.2]

5.8.8.2

The discharge stack or vent line shall be:

a) at least the same size as the outlet of the pressure relieving device.

b) designed and installed to prevent the entry of insects, water, or other foreign materials that could cause blockage.

Statement of Problem and Substantiation for Public Comment

The additional requirements addresses an important factor in the design and installation of discharge piping to enhance safety.

Related Item

• fr 25

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Thu May 12 04:39:47 EDT 2022
Committee: NFG-AAA

Public Comment No. 32-NFPA 54-2022 [Section No. 5.8.9]

5.8.9 Size of Fittings, Pipe, and Openings.

The fittings, pipe, and openings located between the system to be protected and the pressure relieving device shall be sized to prevent hammering of the valve and to prevent ~~impairment of~~ reduction of relief capacity.

Statement of Problem and Substantiation for Public Comment

Impairment can mean many things, reduction speaks more directly to the actual condition we are looking to address with this item.

Related Item

• fr 25

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Thu May 12 04:44:13 EDT 2022
Committee: NFG-AAA

Public Comment No. 26-NFPA 54-2022 [Section No. 5.14]

5.14– Pressure Regulator and Pressure Control Venting.

5.14.1 Protection Against Discharge.

The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be

~~in accordance with all of the following:An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided~~
p rovided where the location of a device is such that a discharge of fuel gas will cause a hazard.

~~For devices other than appliance regulators, vents shall not be required to be independent where the~~

5.14.2 Installation of Pressure Control Venting.

Where installed, pressure control venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be in accordance with this section.

5.14.2.1 The vent shall be independent, excluding approved vent designs for devices that are other than appliance regulators whose vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure

~~and such design is approved.A regulator~~
.

5.14.2.2 The vent pipe shall vent to the outdoors, excluding regulators and vent limiting means

~~combination~~
combinations listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators,*

~~shall not be required to be vented to the outdoors.A~~
listed gas appliance

~~regulator~~
regulators factory equipped with

~~a~~
vent limiting

~~device is not required to be vented to the outdoors.A listed~~
devices and listed gas pressure limit

~~control~~
controls that

~~is factory~~
are factory equipped with

~~a~~
vent limiting

~~device~~
devices and in accordance with UL 353, *Limit Controls,* or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2*

~~, shall not be required to be vented to the outdoors.Materials~~
.

5.14.2.3 The vent pipe shall be sized in accordance with the device manufacturer's instructions.

5.14.2.4 Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.

5.14.2.5 Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

5.14.3 Vent Materials.

Materials for vent piping shall be in accordance with Section 5.5 .

5.14.4 Vent Terminations.

5.14.4.1 The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.

- ~~Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.~~

5.14.4.2 Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

5.14.4.3 At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.

- ~~Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.~~

Additional Proposed Changes

File Name	Description	Approved
PC_on_FR_No._12_-_Final.docx		

Statement of Problem and Substantiation for Public Comment

In FR No. 12, Item (1) and new Item (5) do not work together logically. This PC breaks up the section into individual requirements and avoid conflicts. The attached document provides a clean version of the PC and shows where each provision from the original language was moved. The text was worded to include only one "shall" in each clause and to incorporate exceptions into the main requirement. This was done to coordinate this section with work the Editorial Task Group had already done.

Related Item
• Public Input No. 19 • FR No. 12

Submitter Information Verification

Submitter Full Name: Daniel Buuck
Organization: National Association of Home Builders
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 29 13:08:27 EDT 2022
Committee: NFG-AAA

Clean Text Version of PC.....p. 1
Public Comment.....p. 2
Legislative text with comments

Public Comment – Clean Text Version

5.14 Pressure Regulator and Pressure Control Venting.

5.14.1 Protection Against Discharge.

The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard.

5.14.2 Installation of Pressure Control Venting.

Where installed, pressure control venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be in accordance with this section.

5.14.2.1 The vent shall be independent, excluding approved vent designs for devices that are other than appliance regulators whose vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure.

5.14.2.2 The vent pipe shall vent to the outdoors, excluding regulators and vent limiting means combinations listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, listed gas appliance regulators factory equipped with vent limiting devices and listed gas pressure limit controls that are factory equipped with vent limiting devices and in accordance with UL 353, *Limit Controls*, or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2*.

5.14.2.3 The vent pipe shall be sized in accordance with the device manufacturer's instructions.

5.14.2.4 Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.

5.14.2.5 Vent piping from pressure regulators and gas pressure controls shall not be a connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

5.14.3 Vent Materials.

Materials for vent piping shall be in accordance with Section 5.5.

5.14.4 Vent Terminations.

5.14.4.1 The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.

5.14.4.2 Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

5.14.4.3 At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.

5.14 Pressure Regulator and Pressure Control Venting.

5.14.1 Protection Against Discharge.

The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be ~~in accordance with all of the following:~~

~~(1) An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be~~ provided where the location of a device is such that a discharge of fuel gas will cause a hazard.

5.14.2 Installation of Pressure Control Venting.

Where installed, pressure control venting [of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls] shall be in accordance with this section.

5.14.2.1 ~~(2)~~ The vent shall be independent, excluding approved vent designs for ~~For~~ devices that are other than appliance regulators~~, vents shall not be required to be independent where the~~ whose vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure ~~and such design is approved~~.

5.14.2.2 ~~(3)~~ The ~~-~~vent pipe shall vent to the outdoors, excluding ~~A~~ regulators and vent limiting means combinations listed in accordance with ANSI Z21.80/CSA 6.22, Line Pressure Regulators, ~~shall not be required to be vented to the outdoors.~~

~~(4) A~~ listed gas appliance regulators factory equipped with ~~a~~ vent limiting devices and ~~is not required to be vented to the outdoors.~~

~~(5) A~~ listed gas pressure limit controls that ~~is~~ are factory equipped with ~~a~~ vent limiting devices and in accordance with UL 353, Limit Controls, or UL 60730-2-6, Automatic Electrical Controls for Household and Similar Use, Part 2~~, shall not be required to be vented to the outdoors~~.

5.14.2.3 The vent pipe shall be sized in accordance with the device manufacturer's instructions.

5.14.2.4 Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.

5.14.2.5 Vent piping from pressure regulators and gas pressure controls shall not be a connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

5.14.3 Vent Materials.

~~(6)~~ Materials for vent piping shall be in accordance with Section 5.5.

5.14.4 Vent Terminations.

5.14.4.1 ~~(7)~~ The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.

~~(8) Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.~~

5.14.4.2 ~~(9)~~ Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

5.14.4.3 ~~(10)~~ At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.

~~(11) Vent piping from pressure regulators and gas pressure controls shall not be a connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.~~

Public Comment No. 38-NFPA 54-2022 [Section No. 5.14]

5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in line pressure regulators, ~~gas appliance regulators,~~ _ and gas pressure limit controls shall be in accordance with all of the following:

(1) An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard.

(2) ~~For devices other than appliance regulators, vents~~ Independent vents multiple regulators shall not be required ~~to be independent where~~ where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.

(3) A regulator and vent limiting means combination listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators,* shall not be required to be vented to the outdoors.

(4) A listed gas appliance regulator factory equipped with a vent limiting device is not required to be vented to the outdoors.

(5) A listed gas pressure limit control that is factory equipped with a vent limiting device and in accordance with UL 353, *Limit Controls,* or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2,* shall not be required to be vented to the outdoors.

(6) Materials for vent piping shall be in accordance with Section 5.5.

(7) The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.

(8) Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.

(9) Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

(10) At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.

(11) Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

Statement of Problem and Substantiation for Public Comment

Appliance regulators are part of appliances, which are outside the scope of NFPA 54. Reference to appliance regulator venting is deleted from the Code. As venting of appliance regulators is not included in the requirements of 5.14, this is an editorial revision.

Related Item

• PC-12

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None

Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Fri May 20 13:39:57 EDT 2022
Committee:	NFG-AAA

Public Comment No. 43-NFPA 54-2022 [Chapter 6]

Chapter 6 Pipe Sizing

6.1* Pipe Sizing Methods.

Where the pipe size is to be determined using any of the methods in 6.1.2 through 6.1.4, the diameter of each pipe segment shall be obtained from the pipe sizing tables in Section 6.2,Section 6.3, the sizing tables included in a listed piping system manufacturer's installation instructions, or from the sizing equations in Section 6.4.

6.1.1 US to SI Conversions.

For SI units, the following shall apply: 1 ft^3 = 0.028 m^3, 1 ft = 0.305 m, 1 in. w.c. = 0.249 kPa, 1 psi = 6.894 kPa, 1000 Btu/hr = 0.293 kW.

6.1.2* Longest Length Method.

The pipe size of each section of gas piping shall be determined using the longest length of piping from the point of delivery to the most remote outlet and the load of the section.

6.1.3* Branch Length Method.

Pipe shall be sized as follows:

(1) Pipe size of each section of the longest pipe run from the point of delivery to the most remote outlet shall be determined using the longest run of piping and the load of the section.

(2) The pipe size of each section of branch piping not previously sized shall be determined using the length of piping from the point of delivery to the most remote outlet in each branch and the load of the section.

6.1.4 Hybrid Pressure.

The pipe size for each section of higher pressure gas piping shall be determined using the longest length of piping from the point of delivery to the most remote line pressure regulator. The pipe size from the line pressure regulator to each outlet shall be determined using the length of piping from the regulator to the most remote outlet served by the regulator.

6.2 Sizing Natural Gas Piping Systems.

Sizing of piping systems shall be in accordance with 6.2.1 or 6.2.2.

6.2.1

Table 6.2.1(a) through Table 6.2.1(x) shall be used in conjunction with one of the methods described in 6.1.2 through 6.1.4 for piping materials other than non-corrugated stainless steel tubing.

Table 6.2.1(a) Schedule 40 Metallic Pipe

-	-	-	-	-	-	-	-	-	-	-	Gas:
-	-	-	-	-	-	-	-	-	-	-	Inlet Pressure:
-	-	-	-	-	-	-	-	-	-	-	Pressure Drop:
-	-	-	-	-	-	-	-	-	-	-	Specific Gravity:

-	Pipe Size (in.)										
Nominal:	½	¾	1	1¼	1½	2	2½	3	4	5	6	8
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981
Length (ft)	Capacity in Cubic Feet of Gas per Hour											
10	131	273	514	1,060	1,580	3,050	4,860	8,580	17,500	31,700	51,300	105,000
20	90	188	353	726	1,090	2,090	3,340	5,900	12,000	21,800	35,300	72,400
30	72	151	284	583	873	1,680	2,680	4,740	9,660	17,500	28,300	58,200
40	62	129	243	499	747	1,440	2,290	4,050	8,270	15,000	24,200	49,800
50	55	114	215	442	662	1,280	2,030	3,590	7,330	13,300	21,500	44,100
60	50	104	195	400	600	1,160	1,840	3,260	6,640	12,000	19,500	40,000
70	46	95	179	368	552	1,060	1,690	3,000	6,110	11,100	17,900	36,800
80	42	89	167	343	514	989	1,580	2,790	5,680	10,300	16,700	34,200
90	40	83	157	322	482	928	1,480	2,610	5,330	9,650	15,600	32,100
100	38	79	148	304	455	877	1,400	2,470	5,040	9,110	14,800	30,300
125	33	70	131	269	403	777	1,240	2,190	4,460	8,080	13,100	26,900
150	30	63	119	244	366	704	1,120	1,980	4,050	7,320	11,900	24,300
175	28	58	109	224	336	648	1,030	1,820	3,720	6,730	10,900	22,400
200	26	54	102	209	313	602	960	1,700	3,460	6,260	10,100	20,800
250	23	48	90	185	277	534	851	1,500	3,070	5,550	8,990	18,500
300	21	43	82	168	251	484	771	1,360	2,780	5,030	8,150	16,700
350	19	40	75	154	231	445	709	1,250	2,560	4,630	7,490	15,400
400	18	37	70	143	215	414	660	1,170	2,380	4,310	6,970	14,300
450	17	35	66	135	202	389	619	1,090	2,230	4,040	6,540	13,400
500	16	33	62	127	191	367	585	1,030	2,110	3,820	6,180	12,700
550	15	31	59	121	181	349	556	982	2,000	3,620	5,870	12,100
600	14	30	56	115	173	333	530	937	1,910	3,460	5,600	11,500
650	14	29	54	110	165	318	508	897	1,830	3,310	5,360	11,000
700	13	27	52	106	159	306	488	862	1,760	3,180	5,150	10,600
750	13	26	50	102	153	295	470	830	1,690	3,060	4,960	10,200
800	12	26	48	99	148	285	454	802	1,640	2,960	4,790	9,840
850	12	25	46	95	143	275	439	776	1,580	2,860	4,640	9,530
900	11	24	45	93	139	267	426	752	1,530	2,780	4,500	9,240

950	11	23	44	90	135	259	413	731	1,490	2,700	4,370	8,970
1,000	11	23	43	87	131	252	402	711	1,450	2,620	4,250	8,720
1,100	10	21	40	83	124	240	382	675	1,380	2,490	4,030	8,290
1,200	NA	20	39	79	119	229	364	644	1,310	2,380	3,850	7,910
1,300	NA	20	37	76	114	219	349	617	1,260	2,280	3,680	7,570
1,400	NA	19	35	73	109	210	335	592	1,210	2,190	3,540	7,270
1,500	NA	18	34	70	105	203	323	571	1,160	2,110	3,410	7,010
1,600	NA	18	33	68	102	196	312	551	1,120	2,030	3,290	6,770
1,700	NA	17	32	66	98	189	302	533	1,090	1,970	3,190	6,550
1,800	NA	16	31	64	95	184	293	517	1,050	1,910	3,090	6,350
1,900	NA	16	30	62	93	178	284	502	1,020	1,850	3,000	6,170
2,000	NA	16	29	60	90	173	276	488	1,000	1,800	2,920	6,000

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(b) Schedule 40 Metallic Pipe

-	-	-	-	-	-	-	-	-	-	-	**Gas:**
-	-	-	-	-	-	-	-	-	-	-	**Inlet Pressure:**
-	-	-	-	-	-	-	-	-	-	-	**Pressure Drop:**
-	-	-	-	-	-	-	-	-	-	-	**Specific Gravity:**

-	**Pipe Size (in.)**										
Nominal:	½	¾	**1**	**1¼**	**1½**	**2**	**2½**	**3**	**4**	**5**	**6**	**8**
Actual ID:	**0.622**	**0.824**	**1.049**	**1.380**	**1.610**	**2.067**	**2.469**	**3.068**	**4.026**	**5.047**	**6.065**	**7.981**
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**											
10	172	360	678	1,390	2,090	4,020	6,400	11,300	23,100	41,800	67,600	139,000
20	118	247	466	957	1,430	2,760	4,400	7,780	15,900	28,700	46,500	95,500
30	95	199	374	768	1,150	2,220	3,530	6,250	12,700	23,000	37,300	76,700
40	81	170	320	657	985	1,900	3,020	5,350	10,900	19,700	31,900	65,600
50	72	151	284	583	873	1,680	2,680	4,740	9,660	17,500	28,300	58,200
60	65	137	257	528	791	1,520	2,430	4,290	8,760	15,800	25,600	52,700
70	60	126	237	486	728	1,400	2,230	3,950	8,050	14,600	23,600	48,500
80	56	117	220	452	677	1,300	2,080	3,670	7,490	13,600	22,000	45,100
90	52	110	207	424	635	1,220	1,950	3,450	7,030	12,700	20,600	42,300
100	50	104	195	400	600	1,160	1,840	3,260	6,640	12,000	19,500	40,000
125	44	92	173	355	532	1,020	1,630	2,890	5,890	10,600	17,200	35,400
150	40	83	157	322	482	928	1,480	2,610	5,330	9,650	15,600	32,100
175	37	77	144	296	443	854	1,360	2,410	4,910	8,880	14,400	29,500
200	34	71	134	275	412	794	1,270	2,240	4,560	8,260	13,400	27,500
250	30	63	119	244	366	704	1,120	1,980	4,050	7,320	11,900	24,300
300	27	57	108	221	331	638	1,020	1,800	3,670	6,630	10,700	22,100

350	25	53	99	203	305	587	935	1,650	3,370	6,100	9,880	20,300
400	23	49	92	189	283	546	870	1,540	3,140	5,680	9,190	18,900
450	22	46	86	177	266	512	816	1,440	2,940	5,330	8,620	17,700
500	21	43	82	168	251	484	771	1,360	2,780	5,030	8,150	16,700
550	20	41	78	159	239	459	732	1,290	2,640	4,780	7,740	15,900
600	19	39	74	152	228	438	699	1,240	2,520	4,560	7,380	15,200
650	18	38	71	145	218	420	669	1,180	2,410	4,360	7,070	14,500
700	17	36	68	140	209	403	643	1,140	2,320	4,190	6,790	14,000
750	17	35	66	135	202	389	619	1,090	2,230	4,040	6,540	13,400
800	16	34	63	130	195	375	598	1,060	2,160	3,900	6,320	13,000
850	16	33	61	126	189	363	579	1,020	2,090	3,780	6,110	12,600
900	15	32	59	122	183	352	561	992	2,020	3,660	5,930	12,200
950	15	31	58	118	178	342	545	963	1,960	3,550	5,760	11,800
1,000	14	30	56	115	173	333	530	937	1,910	3,460	5,600	11,500
1,100	14	28	53	109	164	316	503	890	1,810	3,280	5,320	10,900
1,200	13	27	51	104	156	301	480	849	1,730	3,130	5,070	10,400
1,300	12	26	49	100	150	289	460	813	1,660	3,000	4,860	9,980
1,400	12	25	47	96	144	277	442	781	1,590	2,880	4,670	9,590
1,500	11	24	45	93	139	267	426	752	1,530	2,780	4,500	9,240
1,600	11	23	44	89	134	258	411	727	1,480	2,680	4,340	8,920
1,700	11	22	42	86	130	250	398	703	1,430	2,590	4,200	8,630
1,800	10	22	41	84	126	242	386	682	1,390	2,520	4,070	8,370
1,900	10	21	40	81	122	235	375	662	1,350	2,440	3,960	8,130
2,000	NA	20	39	79	119	229	364	644	1,310	2,380	3,850	7,910

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(c) Schedule 40 Metallic Pipe

-	-	-	-	-	-	**Gas:**	**Natural**
-	-	-	-	-	-	**Inlet Pressure:**	**Less than 2 psi**
-	-	-	-	-	-	**Pressure Drop:**	**3.0 in. w.c.**
-	-	-	-	-	-	**Specific Gravity:**	**0.60**

INTENDED USE: Initial supply pressure of 8.0 in. w.c. or greater

	Pipe Size (in.)								
Nominal:	½	¾	**1**	**1¼**	**1½**	**2**	**2½**	**3**	**4**
Actual ID:	**0.622**	**0.824**	**1.049**	**1.380**	**1.610**	**2.067**	**2.469**	**3.068**	**4.026**
Length (ft)	**Capacity in Thousands of Btu per Hour**								
10	454	949	1,790	3,670	5,500	10,600	16,900	29,800	60,800
20	312	652	1,230	2,520	3,780	7,280	11,600	20,500	41,800
30	250	524	986	2,030	3,030	5,840	9,310	16,500	33,600
40	214	448	844	1,730	2,600	5,000	7,970	14,100	28,700
50	190	397	748	1,540	2,300	4,430	7,060	12,500	25,500
60	172	360	678	1,390	2,090	4,020	6,400	11,300	23,100

-	-	-	-	-	-	Gas:	Natural		
-	-	-	-	-	-	Inlet Pressure:	Less than 2 psi		
-	-	-	-	-	-	Pressure Drop:	3.0 in. w.c.		
-	-	-	-	-	-	Specific Gravity:	0.60		
INTENDED USE: Initial supply pressure of 8.0 in. w.c. or greater									
-	Pipe Size (in.)								
Nominal:	½	¾	1	1¼	1½	2	2 ½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Thousands of Btu per Hour								
70	158	331	624	1,280	1,920	3,690	5,890	10,400	21,200
80	147	308	580	1,190	1,790	3,440	5,480	9,690	19,800
90	138	289	544	1,120	1,670	3,230	5,140	9,090	18,500
100	131	273	514	1,060	1,580	3,050	4,860	8,580	17,500
125	116	242	456	936	1,400	2,700	4,300	7,610	15,500
150	105	219	413	848	1,270	2,450	3,900	6,890	14,100
175	96	202	380	780	1,170	2,250	3,590	6,340	12,900
200	90	188	353	726	1,090	2,090	3,340	5,900	12,000
250	80	166	313	643	964	1,860	2,960	5,230	10,700
300	72	151	284	583	873	1,680	2,680	4,740	9,660
350	66	139	261	536	803	1,550	2,470	4,360	8,890
400	62	129	243	499	747	1,440	2,290	4,050	8,270
450	58	121	228	468	701	1,350	2,150	3,800	7,760
500	55	114	215	442	662	1,280	2,030	3,590	7,330
550	52	109	204	420	629	1,210	1,930	3,410	6,960
600	50	104	195	400	600	1,160	1,840	3,260	6,640
650	47	99	187	384	575	1,110	1,760	3,120	6,360
700	46	95	179	368	552	1,060	1,690	3,000	6,110
750	44	92	173	355	532	1,020	1,630	2,890	5,890
800	42	89	167	343	514	989	1,580	2,790	5,680
850	41	86	162	332	497	957	1,530	2,700	5,500
900	40	83	157	322	482	928	1,480	2,610	5,330
950	39	81	152	312	468	901	1,440	2,540	5,180
1000	38	79	148	304	455	877	1,400	2,470	5,040
1100	36	75	141	289	432	833	1,330	2,350	4,780
1200	34	71	134	275	412	794	1,270	2,240	4,560
1300	33	68	128	264	395	761	1,210	2,140	4,370
1400	31	65	123	253	379	731	1,160	2,060	4,200
1500	30	63	119	244	366	704	1,120	1,980	4,050
1600	29	61	115	236	353	680	1,080	1,920	3,910
1700	28	59	111	228	342	658	1,050	1,850	3,780
1800	27	57	108	221	331	638	1,020	1,800	3,670
1900	27	56	105	215	322	619	987	1,750	3,560
2000	26	54	102	209	313	602	960	1,700	3,460

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(d) Schedule 40 Metallic Pipe

						Gas:	Natural		
						Inlet Pressure:	Less than 2 psi		
						Pressure Drop:	6.0 in. w.c.		
						Specific Gravity:	0.6		
INTENDED USE: Initial supply pressure of 11.0 in. w.c. or greater									
	Pipe Size (in.)								
Nominal:	**½**	**¾**	**1**	**1¼**	**1½**	**2**	**2½**	**3**	**4**
Actual ID:	**0.622**	**0.824**	**1.049**	**1.38**	**1.61**	**2.067**	**2.469**	**3.068**	**4.026**
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**								
10	660	1,380	2,600	5,340	8,000	15,400	24,600	43,400	88,500
20	454	949	1,790	3,670	5,500	10,600	16,900	29,800	60,800
30	364	762	1,440	2,950	4,410	8,500	13,600	24,000	48,900
40	312	652	1,230	2,520	3,780	7,280	11,600	20,500	41,800
50	276	578	1,090	2,240	3,350	6,450	10,300	18,200	37,100
60	250	524	986	2,030	3,030	5,840	9,310	16,500	33,600
70	230	482	907	1,860	2,790	5,380	8,570	15,100	30,900
80	214	448	844	1,730	2,600	5,000	7,970	14,100	28,700
90	201	420	792	1,630	2,440	4,690	7,480	13,200	27,000
100	190	397	748	1,540	2,300	4,430	7,060	12,500	25,500
125	168	352	663	1,360	2,040	3,930	6,260	11,100	22,600
150	153	319	601	1,230	1,850	3,560	5,670	10,000	20,500
175	140	293	553	1,140	1,700	3,270	5,220	9,230	18,800
200	131	273	514	1,056	1,580	3,050	4,860	8,580	17,500
250	116	242	456	936	1,400	2,700	4,300	7,610	15,500
300	105	219	413	848	1,270	2,450	3,900	6,890	14,100
350	96	202	380	780	1,170	2,250	3,590	6,340	12,900
400	90	188	353	726	1,090	2,090	3,340	5,900	12,000
450	84	176	332	681	1,020	1,960	3,130	5,540	11,300
500	80	166	313	643	964	1,860	2,960	5,230	10,700
550	76	158	297	611	915	1,760	2,810	4,970	10,100
600	72	151	284	583	873	1,680	2,680	4,740	9,660
650	69	144	272	558	836	1,610	2,570	4,540	9,250
700	66	139	261	536	803	1,550	2,470	4,360	8,890
750	64	134	252	516	774	1,490	2,380	4,200	8,560
800	62	129	243	499	747	1,440	2,290	4,050	8,270
850	60	125	235	483	723	1,390	2,220	3,920	8,000
900	58	121	228	468	701	1,350	2,150	3,800	7,760
950	56	118	221	454	681	1,310	2,090	3,690	7,540
1,000	55	114	215	442	662	1,280	2,030	3,590	7,330
1,100	52	109	204	420	629	1,210	1,930	3,410	6,960
1,200	50	104	195	400	600	1,160	1,840	3,260	6,640

1,300	47	99	187	384	575	1,110	1,760	3,120	6,360
1,400	46	95	179	368	552	1,060	1,690	3,000	6,110
1,500	44	92	173	355	532	1,020	1,630	2,890	5,890
1,600	42	89	167	343	514	989	1,580	2,790	5,680
1,700	41	86	162	332	497	957	1,530	2,700	5,500
1,800	40	83	157	322	482	928	1,480	2,610	5,330
1,900	39	81	152	312	468	901	1,440	2,540	5,180
2,000	38	79	148	304	455	877	1,400	2,470	5,040

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(e) Schedule 40 Metallic Pipe

-	-	-	-	-	-	**Gas:**	**Natural**
-	-	-	-	-	-	**Inlet Pressure:**	**2.0 psi**
-	-	-	-	-	-	**Pressure Drop:**	**1.0 psi**
-	-	-	-	-	-	**Specific Gravity:**	**0.60**

-	**Pipe Size (in.)**								
Nominal:	½	¾	**1**	**1¼**	**1½**	**2**	**2½**	**3**	**4**
Actual ID:	**0.622**	**0.824**	**1.049**	**1.380**	**1.610**	**2.067**	**2.469**	**3.068**	**4.026**
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**								
10	1,510	3,040	5,560	11,400	17,100	32,900	52,500	92,800	189,000
20	1,070	2,150	3,930	8,070	12,100	23,300	37,100	65,600	134,000
30	869	1,760	3,210	6,590	9,880	19,000	30,300	53,600	109,000
40	753	1,520	2,780	5,710	8,550	16,500	26,300	46,400	94,700
50	673	1,360	2,490	5,110	7,650	14,700	23,500	41,500	84,700
60	615	1,240	2,270	4,660	6,980	13,500	21,400	37,900	77,300
70	569	1,150	2,100	4,320	6,470	12,500	19,900	35,100	71,600
80	532	1,080	1,970	4,040	6,050	11,700	18,600	32,800	67,000
90	502	1,010	1,850	3,810	5,700	11,000	17,500	30,900	63,100
100	462	934	1,710	3,510	5,260	10,100	16,100	28,500	58,200
125	414	836	1,530	3,140	4,700	9,060	14,400	25,500	52,100
150	372	751	1,370	2,820	4,220	8,130	13,000	22,900	46,700
175	344	695	1,270	2,601	3,910	7,530	12,000	21,200	43,300
200	318	642	1,170	2,410	3,610	6,960	11,100	19,600	40,000
250	279	583	1,040	2,140	3,210	6,180	9,850	17,400	35,500
300	253	528	945	1,940	2,910	5,600	8,920	15,800	32,200
350	232	486	869	1,790	2,670	5,150	8,210	14,500	29,600
400	216	452	809	1,660	2,490	4,790	7,640	13,500	27,500
450	203	424	759	1,560	2,330	4,500	7,170	12,700	25,800
500	192	401	717	1,470	2,210	4,250	6,770	12,000	24,400
550	182	381	681	1,400	2,090	4,030	6,430	11,400	23,200
600	174	363	650	1,330	2,000	3,850	6,130	10,800	22,100
650	166	348	622	1,280	1,910	3,680	5,870	10,400	21,200
700	160	334	598	1,230	1,840	3,540	5,640	9,970	20,300

-	-	-	-	-	-	Gas:	Natural		
-	-	-	-	-	-	Inlet Pressure:	2.0 psi		
-	-	-	-	-	-	Pressure Drop:	1.0 psi		
-	-	-	-	-	-	Specific Gravity:	0.60		
-	Pipe Size (in.)								
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
750	154	322	576	1,180	1,770	3,410	5,440	9,610	19,600
800	149	311	556	1,140	1,710	3,290	5,250	9,280	18,900
850	144	301	538	1,100	1,650	3,190	5,080	8,980	18,300
900	139	292	522	1,070	1,600	3,090	4,930	8,710	17,800
950	135	283	507	1,040	1,560	3,000	4,780	8,460	17,200
1,000	132	275	493	1,010	1,520	2,920	4,650	8,220	16,800
1,100	125	262	468	960	1,440	2,770	4,420	7,810	15,900
1,200	119	250	446	917	1,370	2,640	4,220	7,450	15,200
1,300	114	239	427	878	1,320	2,530	4,040	7,140	14,600
1,400	110	230	411	843	1,260	2,430	3,880	6,860	14,000
1,500	106	221	396	812	1,220	2,340	3,740	6,600	13,500
1,600	102	214	382	784	1,180	2,260	3,610	6,380	13,000
1,700	99	207	370	759	1,140	2,190	3,490	6,170	12,600
1,800	96	200	358	736	1,100	2,120	3,390	5,980	12,200
1,900	93	195	348	715	1,070	2,060	3,290	5,810	11,900
2,000	91	189	339	695	1,040	2,010	3,200	5,650	11,500

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(f) Schedule 40 Metallic Pipe

-	-	-	-	-	-	Gas:	Natural		
-	-	-	-	-	-	Inlet Pressure:	3.0 psi		
-	-	-	-	-	-	Pressure Drop:	2.0 psi		
-	-	-	-	-	-	Specific Gravity:	0.60		
-	Pipe Size (in.)								
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
10	2,350	4,920	9,270	19,000	28,500	54,900	87,500	155,000	316,000
20	1,620	3,380	6,370	13,100	19,600	37,700	60,100	106,000	217,000
30	1,300	2,720	5,110	10,500	15,700	30,300	48,300	85,400	174,000
40	1,110	2,320	4,380	8,990	13,500	25,900	41,300	73,100	149,000
50	985	2,060	3,880	7,970	11,900	23,000	36,600	64,800	132,000
60	892	1,870	3,520	7,220	10,800	20,800	33,200	58,700	120,000
70	821	1,720	3,230	6,640	9,950	19,200	30,500	54,000	110,000
80	764	1,600	3,010	6,180	9,260	17,800	28,400	50,200	102,000

-	-	-	-	-	-		Gas:	Natural	
-	-	-	-	-	-		Inlet Pressure:	3.0 psi	
-	-	-	-	-	-		Pressure Drop:	2.0 psi	
-	-	-	-	-	-		Specific Gravity:	0.60	
-	Pipe Size (in.)								
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
90	717	1,500	2,820	5,800	8,680	16,700	26,700	47,100	96,100
100	677	1,420	2,670	5,470	8,200	15,800	25,200	44,500	90,800
125	600	1,250	2,360	4,850	7,270	14,000	22,300	39,500	80,500
150	544	1,140	2,140	4,400	6,590	12,700	20,200	35,700	72,900
175	500	1,050	1,970	4,040	6,060	11,700	18,600	32,900	67,100
200	465	973	1,830	3,760	5,640	10,900	17,300	30,600	62,400
250	412	862	1,620	3,330	5,000	9,620	15,300	27,100	55,300
300	374	781	1,470	3,020	4,530	8,720	13,900	24,600	50,100
350	344	719	1,350	2,780	4,170	8,020	12,800	22,600	46,100
400	320	669	1,260	2,590	3,870	7,460	11,900	21,000	42,900
450	300	627	1,180	2,430	3,640	7,000	11,200	19,700	40,200
500	283	593	1,120	2,290	3,430	6,610	10,500	18,600	38,000
550	269	563	1,060	2,180	3,260	6,280	10,000	17,700	36,100
600	257	537	1,010	2,080	3,110	5,990	9,550	16,900	34,400
650	246	514	969	1,990	2,980	5,740	9,150	16,200	33,000
700	236	494	931	1,910	2,860	5,510	8,790	15,500	31,700
750	228	476	897	1,840	2,760	5,310	8,470	15,000	30,500
800	220	460	866	1,780	2,660	5,130	8,180	14,500	29,500
850	213	445	838	1,720	2,580	4,960	7,910	14,000	28,500
900	206	431	812	1,670	2,500	4,810	7,670	13,600	27,700
950	200	419	789	1,620	2,430	4,670	7,450	13,200	26,900
1,000	195	407	767	1,580	2,360	4,550	7,240	12,800	26,100
1,100	185	387	729	1,500	2,240	4,320	6,890	12,200	24,800
1,200	177	369	695	1,430	2,140	4,120	6,570	11,600	23,700
1,300	169	353	666	1,370	2,050	3,940	6,290	11,100	22,700
1,400	162	340	640	1,310	1,970	3,790	6,040	10,700	21,800
1,500	156	327	616	1,270	1,900	3,650	5,820	10,300	21,000
1,600	151	316	595	1,220	1,830	3,530	5,620	10,000	20,300
1,700	146	306	576	1,180	1,770	3,410	5,440	9,610	19,600
1,800	142	296	558	1,150	1,720	3,310	5,270	9,320	19,000
1,900	138	288	542	1,110	1,670	3,210	5,120	9,050	18,400
2,000	134	280	527	1,080	1,620	3,120	4,980	8,800	18,000

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(g) Schedule 40 Metallic Pipe

-	-	-	-	-	-	Gas:	Natural

-	-	-	-	-	-	Inlet Pressure:	5.0 psi		
-	-	-	-	-	-	Pressure Drop:	3.5 psi		
-	-	-	-	-	-	Specific Gravity:	0.60		

-	Pipe Size (in.)								
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
10	3,190	6,430	11,800	24,200	36,200	69,700	111,000	196,000	401,000
20	2,250	4,550	8,320	17,100	25,600	49,300	78,600	139,000	283,000
30	1,840	3,720	6,790	14,000	20,900	40,300	64,200	113,000	231,000
40	1,590	3,220	5,880	12,100	18,100	34,900	55,600	98,200	200,000
50	1,430	2,880	5,260	10,800	16,200	31,200	49,700	87,900	179,000
60	1,300	2,630	4,800	9,860	14,800	28,500	45,400	80,200	164,000
70	1,200	2,430	4,450	9,130	13,700	26,400	42,000	74,300	151,000
80	1,150	2,330	4,260	8,540	12,800	24,700	39,300	69,500	142,000
90	1,060	2,150	3,920	8,050	12,100	23,200	37,000	65,500	134,000
100	979	1,980	3,620	7,430	11,100	21,400	34,200	60,400	123,000
125	876	1,770	3,240	6,640	9,950	19,200	30,600	54,000	110,000
150	786	1,590	2,910	5,960	8,940	17,200	27,400	48,500	98,900
175	728	1,470	2,690	5,520	8,270	15,900	25,400	44,900	91,600
200	673	1,360	2,490	5,100	7,650	14,700	23,500	41,500	84,700
250	558	1,170	2,200	4,510	6,760	13,000	20,800	36,700	74,900
300	506	1,060	1,990	4,090	6,130	11,800	18,800	33,300	67,800
350	465	973	1,830	3,760	5,640	10,900	17,300	30,600	62,400
400	433	905	1,710	3,500	5,250	10,100	16,100	28,500	58,100
450	406	849	1,600	3,290	4,920	9,480	15,100	26,700	54,500
500	384	802	1,510	3,100	4,650	8,950	14,300	25,200	51,500
550	364	762	1,440	2,950	4,420	8,500	13,600	24,000	48,900
600	348	727	1,370	2,810	4,210	8,110	12,900	22,900	46,600
650	333	696	1,310	2,690	4,030	7,770	12,400	21,900	44,600
700	320	669	1,260	2,590	3,880	7,460	11,900	21,000	42,900
750	308	644	1,210	2,490	3,730	7,190	11,500	20,300	41,300
800	298	622	1,170	2,410	3,610	6,940	11,100	19,600	39,900
850	288	602	1,130	2,330	3,490	6,720	10,700	18,900	38,600
900	279	584	1,100	2,260	3,380	6,520	10,400	18,400	37,400
950	271	567	1,070	2,190	3,290	6,330	10,100	17,800	36,400
1,000	264	551	1,040	2,130	3,200	6,150	9,810	17,300	35,400
1,100	250	524	987	2,030	3,030	5,840	9,320	16,500	33,600
1,200	239	500	941	1,930	2,900	5,580	8,890	15,700	32,000
1,300	229	478	901	1,850	2,770	5,340	8,510	15,000	30,700
1,400	220	460	866	1,780	2,660	5,130	8,180	14,500	29,500
1,500	212	443	834	1,710	2,570	4,940	7,880	13,900	28,400
1,600	205	428	806	1,650	2,480	4,770	7,610	13,400	27,400

1,700	198	414	780	1,600	2,400	4,620	7,360	13,000	26,500
1,800	192	401	756	1,550	2,330	4,480	7,140	12,600	25,700
1,900	186	390	734	1,510	2,260	4,350	6,930	12,300	25,000
2,000	181	379	714	1,470	2,200	4,230	6,740	11,900	24,300

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(h) Semirigid Copper Tubing

-	-	-	-	-	-	-	-	**Gas:**	**Natural**
-	-	-	-	-	-	-	-	**Inlet Pressure:**	**Less than 2 psi**
-	-	-	-	-	-	-	-	**Pressure Drop:**	**0.3 in. w.c.**
-	-	-	-	-	-	-	-	**Specific Gravity:**	**0.60**

-	-	**Tube Size (in.)**								
Nominal:	**K & L:**	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		**Capacity in Cubic Feet of Gas per Hour**								
10		20	42	85	148	210	448	806	1,270	2,650
20		14	29	58	102	144	308	554	873	1,820
30		11	23	47	82	116	247	445	701	1,460
40		10	20	40	70	99	211	381	600	1,250
50		NA	17	35	62	88	187	337	532	1,110
60		NA	16	32	56	79	170	306	482	1,000
70		NA	14	29	52	73	156	281	443	924
80		NA	13	27	48	68	145	262	413	859
90		NA	13	26	45	64	136	245	387	806
100		NA	12	24	43	60	129	232	366	761
125		NA	11	22	38	53	114	206	324	675
150		NA	10	20	34	48	103	186	294	612
175		NA	NA	18	31	45	95	171	270	563
200		NA	NA	17	29	41	89	159	251	523
250		NA	NA	15	26	37	78	141	223	464
300		NA	NA	13	23	33	71	128	202	420
350		NA	NA	12	22	31	65	118	186	387
400		NA	NA	11	20	28	61	110	173	360
450		NA	NA	11	19	27	57	103	162	338
500		NA	NA	10	18	25	54	97	153	319
550		NA	NA	NA	17	24	51	92	145	303
600		NA	NA	NA	16	23	49	88	139	289
650		NA	NA	NA	15	22	47	84	133	277
700		NA	NA	NA	15	21	45	81	128	266

750	NA	NA	NA	14	20	43	78	123	256
800	NA	NA	NA	14	20	42	75	119	247
850	NA	NA	NA	13	19	40	73	115	239
900	NA	NA	NA	13	18	39	71	111	232
950	NA	NA	NA	13	18	38	69	108	225
1,000	NA	NA	NA	12	17	37	67	105	219
1,100	NA	NA	NA	12	16	35	63	100	208
1,200	NA	NA	NA	11	16	34	60	95	199
1,300	NA	NA	NA	11	15	32	58	91	190
1,400	NA	NA	NA	10	14	31	56	88	183
1,500	NA	NA	NA	NA	14	30	54	84	176
1,600	NA	NA	NA	NA	13	29	52	82	170
1,700	NA	NA	NA	NA	13	28	50	79	164
1,800	NA	NA	NA	NA	13	27	49	77	159
1,900	NA	NA	NA	NA	12	26	47	74	155
2,000	NA	NA	NA	NA	12	25	46	72	151

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(i) Semirigid Copper Tubing

-	-	-	-	-	-	-	**Gas:**	**Natural**		
-	-	-	-	-	-	-	**Inlet Pressure:**	**Less than 2 psi**		
-	-	-	-	-	-	-	**Pressure Drop:**	**0.5 in. w.c.**		
-	-	-	-	-	-	-	**Specific Gravity:**	**0.60**		
-	-	**Tube Size (in.)**								
Nominal:	**K & L:**	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		**Capacity in Cubic Feet of Gas per Hour**								
10		27	55	111	195	276	590	1,060	1,680	3,490
20		18	38	77	134	190	406	730	1,150	2,400
30		15	30	61	107	152	326	586	925	1,930
40		13	26	53	92	131	279	502	791	1,650
50		11	23	47	82	116	247	445	701	1,460
60		10	21	42	74	105	224	403	635	1,320
70		NA	19	39	68	96	206	371	585	1,220
80		NA	18	36	63	90	192	345	544	1,130
90		NA	17	34	59	84	180	324	510	1,060
100		NA	16	32	56	79	170	306	482	1,000
125		NA	14	28	50	70	151	271	427	890

Gas:	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	0.5 in. w.c.
Specific Gravity:	0.60

Nominal:		Tube Size (in.)								
	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
150		NA	13	26	45	64	136	245	387	806
175		NA	12	24	41	59	125	226	356	742
200		NA	11	22	39	55	117	210	331	690
250		NA	NA	20	34	48	103	186	294	612
300		NA	NA	18	31	44	94	169	266	554
350		NA	NA	16	28	40	86	155	245	510
400		NA	NA	15	26	38	80	144	228	474
450		NA	NA	14	25	35	75	135	214	445
500		NA	NA	13	23	33	71	128	202	420
550		NA	NA	13	22	32	68	122	192	399
600		NA	NA	12	21	30	64	116	183	381
650		NA	NA	12	20	29	62	111	175	365
700		NA	NA	11	20	28	59	107	168	350
750		NA	NA	11	19	27	57	103	162	338
800		NA	NA	10	18	26	55	99	156	326
850		NA	NA	10	18	25	53	96	151	315
900		NA	NA	NA	17	24	52	93	147	306
950		NA	NA	NA	17	24	50	90	143	297
1,000		NA	NA	NA	16	23	49	88	139	289
1,100		NA	NA	NA	15	22	46	84	132	274
1,200		NA	NA	NA	15	21	44	80	126	262
1,300		NA	NA	NA	14	20	42	76	120	251
1,400		NA	NA	NA	13	19	41	73	116	241
1,500		NA	NA	NA	13	18	39	71	111	232
1,600		NA	NA	NA	13	18	38	68	108	224
1,700		NA	NA	NA	12	17	37	66	104	217
1,800		NA	NA	NA	12	17	36	64	101	210
1,900		NA	NA	NA	11	16	35	62	98	204
2,000		NA	NA	NA	11	16	34	60	95	199

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(j) Semirigid Copper Tubing

Gas:	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	1.0 in. w.c.
Specific Gravity:	0.60

INTENDED USE: Tube Sizing Between House Line Regulator and the Appliance.

Nominal:	Tube Size (in.)								
K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
10	39	80	162	283	402	859	1,550	2,440	5,080
20	27	55	111	195	276	590	1,060	1,680	3,490
30	21	44	89	156	222	474	853	1,350	2,800
40	18	38	77	134	190	406	730	1,150	2,400
50	16	33	68	119	168	359	647	1,020	2,130
60	15	30	61	107	152	326	586	925	1,930
70	13	28	57	99	140	300	539	851	1,770
80	13	26	53	92	131	279	502	791	1,650
90	12	24	49	86	122	262	471	742	1,550
100	11	23	47	82	116	247	445	701	1,460
125	NA	20	41	72	103	219	394	622	1,290
150	NA	18	37	65	93	198	357	563	1,170
175	NA	17	34	60	85	183	329	518	1,080
200	NA	16	32	56	79	170	306	482	1,000
250	NA	14	28	50	70	151	271	427	890
300	NA	13	26	45	64	136	245	387	806
350	NA	12	24	41	59	125	226	356	742
400	NA	11	22	39	55	117	210	331	690
450	NA	10	21	36	51	110	197	311	647
500	NA	NA	20	34	48	103	186	294	612
550	NA	NA	19	32	46	98	177	279	581
600	NA	NA	18	31	44	94	169	266	554
650	NA	NA	17	30	42	90	162	255	531
700	NA	NA	16	28	40	86	155	245	510
750	NA	NA	16	27	39	83	150	236	491
800	NA	NA	15	26	38	80	144	228	474
850	NA	NA	15	26	36	78	140	220	459
900	NA	NA	14	25	35	75	135	214	445
950	NA	NA	14	24	34	73	132	207	432
1,000	NA	NA	13	23	33	71	128	202	420
1,100	NA	NA	13	22	32	68	122	192	399

1,200	NA	NA	12	21	30	64	116	183	381
1,300	NA	NA	12	20	29	62	111	175	365
1,400	NA	NA	11	20	28	59	107	168	350
1,500	NA	NA	11	19	27	57	103	162	338
1,600	NA	NA	10	18	26	55	99	156	326
1,700	NA	NA	10	18	25	53	96	151	315
1,800	NA	NA	NA	17	24	52	93	147	306
1,900	NA	NA	NA	17	24	50	90	143	297
2,000	NA	NA	NA	16	23	49	88	139	289

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(k) Semirigid Copper Tubing

							Gas:	Natural	
							Inlet Pressure:	Less than 2.0 psi	
							Pressure Drop:	17.0 in. w.c.	
							Specific Gravity:	0.60	
		Tube Size (in.)							
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
10		190	391	796	1,390	1,970	4,220	7,590	12,000	24,900
20		130	269	547	956	1,360	2,900	5,220	8,230	17,100
30		105	216	439	768	1,090	2,330	4,190	6,610	13,800
40		90	185	376	657	932	1,990	3,590	5,650	11,800
50		79	164	333	582	826	1,770	3,180	5,010	10,400
60		72	148	302	528	749	1,600	2,880	4,540	9,460
70		66	137	278	486	689	1,470	2,650	4,180	8,700
80		62	127	258	452	641	1,370	2,460	3,890	8,090
90		58	119	243	424	601	1,280	2,310	3,650	7,590
100		55	113	229	400	568	1,210	2,180	3,440	7,170
125		48	100	203	355	503	1,080	1,940	3,050	6,360
150		44	90	184	321	456	974	1,750	2,770	5,760
175		40	83	169	296	420	896	1,610	2,540	5,300
200		38	77	157	275	390	834	1,500	2,370	4,930
250		33	69	140	244	346	739	1,330	2,100	4,370
300		30	62	126	221	313	670	1,210	1,900	3,960
350		28	57	116	203	288	616	1,110	1,750	3,640
400		26	53	108	189	268	573	1,030	1,630	3,390

								Gas:	Natural	
								Inlet Pressure:	Less than 2.0 psi	
								Pressure Drop:	17.0 in. w.c.	
								Specific Gravity:	0.60	
		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
450		24	50	102	177	252	538	968	1,530	3,180
500		23	47	96	168	238	508	914	1,440	3,000
550		22	45	91	159	226	482	868	1,370	2,850
600		21	43	87	152	215	460	829	1,310	2,720
650		20	41	83	145	206	441	793	1,250	2,610
700		19	39	80	140	198	423	762	1,200	2,500
750		18	38	77	135	191	408	734	1,160	2,410
800		18	37	74	130	184	394	709	1,120	2,330
850		17	35	72	126	178	381	686	1,080	2,250
900		17	34	70	122	173	370	665	1,050	2,180
950		16	33	68	118	168	359	646	1,020	2,120
1,000		16	32	66	115	163	349	628	991	2,060
1,100		15	31	63	109	155	332	597	941	1,960
1,200		14	29	60	104	148	316	569	898	1,870
1,300		14	28	57	100	142	303	545	860	1,790
1,400		13	27	55	96	136	291	524	826	1,720
1,500		13	26	53	93	131	280	505	796	1,660
1,600		12	25	51	89	127	271	487	768	1,600
1,700		12	24	49	86	123	262	472	744	1,550
1,800		11	24	48	84	119	254	457	721	1,500
1,900		11	23	47	81	115	247	444	700	1,460
2,000		11	22	45	79	112	240	432	681	1,420

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(l) Semirigid Copper Tubing

								Gas:	Natural	
								Inlet Pressure:	2.0 psi	
								Pressure Drop:	1.0 psi	
								Specific Gravity:	0.60	
		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2

ACR:	3/8	1/2	5/8	3/4	7/8	1 1/8	1 3/8	—	—
Outside:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity in Cubic Feet of Gas per Hour								
10	245	506	1,030	1,800	2,550	5,450	9,820	15,500	32,200
20	169	348	708	1,240	1,760	3,750	6,750	10,600	22,200
30	135	279	568	993	1,410	3,010	5,420	8,550	17,800
40	116	239	486	850	1,210	2,580	4,640	7,310	15,200
50	103	212	431	754	1,070	2,280	4,110	6,480	13,500
60	93	192	391	683	969	2,070	3,730	5,870	12,200
70	86	177	359	628	891	1,900	3,430	5,400	11,300
80	80	164	334	584	829	1,770	3,190	5,030	10,500
90	75	154	314	548	778	1,660	2,990	4,720	9,820
100	71	146	296	518	735	1,570	2,830	4,450	9,280
125	63	129	263	459	651	1,390	2,500	3,950	8,220
150	57	117	238	416	590	1,260	2,270	3,580	7,450
175	52	108	219	383	543	1,160	2,090	3,290	6,850
200	49	100	204	356	505	1,080	1,940	3,060	6,380
250	43	89	181	315	448	956	1,720	2,710	5,650
300	39	80	164	286	406	866	1,560	2,460	5,120
350	36	74	150	263	373	797	1,430	2,260	4,710
400	33	69	140	245	347	741	1,330	2,100	4,380
450	31	65	131	230	326	696	1,250	1,970	4,110
500	30	61	124	217	308	657	1,180	1,870	3,880
550	28	58	118	206	292	624	1,120	1,770	3,690
600	27	55	112	196	279	595	1,070	1,690	3,520
650	26	53	108	188	267	570	1,030	1,620	3,370
700	25	51	103	181	256	548	986	1,550	3,240
750	24	49	100	174	247	528	950	1,500	3,120
800	23	47	96	168	239	510	917	1,450	3,010
850	22	46	93	163	231	493	888	1,400	2,920
900	22	44	90	158	224	478	861	1,360	2,830
950	21	43	88	153	217	464	836	1,320	2,740
1,000	20	42	85	149	211	452	813	1,280	2,670
1,100	19	40	81	142	201	429	772	1,220	2,540
1,200	18	38	77	135	192	409	737	1,160	2,420
1,300	18	36	74	129	183	392	705	1,110	2,320
1,400	17	35	71	124	176	376	678	1,070	2,230
1,500	16	34	68	120	170	363	653	1,030	2,140
1,600	16	33	66	116	164	350	630	994	2,070
1,700	15	31	64	112	159	339	610	962	2,000
1,800	15	30	62	108	154	329	592	933	1,940
1,900	14	30	60	105	149	319	575	906	1,890
2,000	14	29	59	102	145	310	559	881	1,830

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(m) Semirigid Copper Tubing

Gas:	Natural
Inlet Pressure:	2.0 psi
Pressure Drop:	1.5 psi
Specific Gravity:	0.60

INTENDED USE: Pipe Sizing Between Point of Delivery and the House Line Regulator. Total Load Supplied by a Single House Line Regulator Not Exceeding 150 Cubic Feet per Hour.*

		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:†		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
10		303	625	1,270	2,220	3,150	6,740	12,100	19,100	39,800
20		208	430	874	1,530	2,170	4,630	8,330	13,100	27,400
30		167	345	702	1,230	1,740	3,720	6,690	10,600	22,000
40		143	295	601	1,050	1,490	3,180	5,730	9,030	18,800
50		127	262	532	931	1,320	2,820	5,080	8,000	16,700
60		115	237	482	843	1,200	2,560	4,600	7,250	15,100
70		106	218	444	776	1,100	2,350	4,230	6,670	13,900
80		98	203	413	722	1,020	2,190	3,940	6,210	12,900
90		92	190	387	677	961	2,050	3,690	5,820	12,100
100		87	180	366	640	907	1,940	3,490	5,500	11,500
125		77	159	324	567	804	1,720	3,090	4,880	10,200
150		70	144	294	514	729	1,560	2,800	4,420	9,200
175		64	133	270	472	670	1,430	2,580	4,060	8,460
200		60	124	252	440	624	1,330	2,400	3,780	7,870
250		53	110	223	390	553	1,180	2,130	3,350	6,980
300		48	99	202	353	501	1,070	1,930	3,040	6,320
350		44	91	186	325	461	984	1,770	2,790	5,820
400		41	85	173	302	429	916	1,650	2,600	5,410
450		39	80	162	283	402	859	1,550	2,440	5,080
500		36	75	153	268	380	811	1,460	2,300	4,800
550		35	72	146	254	361	771	1,390	2,190	4,560
600		33	68	139	243	344	735	1,320	2,090	4,350
650		32	65	133	232	330	704	1,270	2,000	4,160
700		30	63	128	223	317	676	1,220	1,920	4,000
750		29	60	123	215	305	652	1,170	1,850	3,850

800	28	58	119	208	295	629	1,130	1,790	3,720
850	27	57	115	201	285	609	1,100	1,730	3,600
900	27	55	111	195	276	590	1,060	1,680	3,490
950	26	53	108	189	268	573	1,030	1,630	3,390
1,000	25	52	105	184	261	558	1,000	1,580	3,300
1,100	24	49	100	175	248	530	954	1,500	3,130
1,200	23	47	95	167	237	505	910	1,430	2,990
1,300	22	45	91	160	227	484	871	1,370	2,860
1,400	21	43	88	153	218	465	837	1,320	2,750
1,500	20	42	85	148	210	448	806	1,270	2,650
1,600	19	40	82	143	202	432	779	1,230	2,560
1,700	19	39	79	138	196	419	753	1,190	2,470
1,800	18	38	77	134	190	406	731	1,150	2,400
1,900	18	37	74	130	184	394	709	1,120	2,330
2,000	17	36	72	126	179	383	690	1,090	2,270

Note: All table entries are rounded to 3 significant digits.

*When this table is used to size the tubing upstream of a line pressure regulator, the pipe or tubing downstream of the line pressure regulator shall be sized using a pressure drop no greater than 1 in. w.c.

†Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(n) Semirigid Copper Tubing

							Gas:	Natural	
							Inlet Pressure:	5.0 psi	
							Pressure Drop:	3.5 psi	
							Specific Gravity:	0.60	
		Tube Size (in.)							
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
10		511	1,050	2,140	3,750	5,320	11,400	20,400	32,200	67,100
20		351	724	1,470	2,580	3,650	7,800	14,000	22,200	46,100
30		282	582	1,180	2,070	2,930	6,270	11,300	17,800	37,000
40		241	498	1,010	1,770	2,510	5,360	9,660	15,200	31,700
50		214	441	898	1,570	2,230	4,750	8,560	13,500	28,100
60		194	400	813	1,420	2,020	4,310	7,750	12,200	25,500
70		178	368	748	1,310	1,860	3,960	7,130	11,200	23,400
80		166	342	696	1,220	1,730	3,690	6,640	10,500	21,800
90		156	321	653	1,140	1,620	3,460	6,230	9,820	20,400
100		147	303	617	1,080	1,530	3,270	5,880	9,270	19,300
125		130	269	547	955	1,360	2,900	5,210	8,220	17,100

								Gas:	Natural	
								Inlet Pressure:	5.0 psi	
								Pressure Drop:	3.5 psi	
								Specific Gravity:	0.60	
		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Cubic Feet of Gas per Hour								
150		118	243	495	866	1,230	2,620	4,720	7,450	15,500
175		109	224	456	796	1,130	2,410	4,350	6,850	14,300
200		101	208	424	741	1,050	2,250	4,040	6,370	13,300
250		90	185	376	657	932	1,990	3,580	5,650	11,800
300		81	167	340	595	844	1,800	3,250	5,120	10,700
350		75	154	313	547	777	1,660	2,990	4,710	9,810
400		69	143	291	509	722	1,540	2,780	4,380	9,120
450		65	134	273	478	678	1,450	2,610	4,110	8,560
500		62	127	258	451	640	1,370	2,460	3,880	8,090
550		58	121	245	429	608	1,300	2,340	3,690	7,680
600		56	115	234	409	580	1,240	2,230	3,520	7,330
650		53	110	224	392	556	1,190	2,140	3,370	7,020
700		51	106	215	376	534	1,140	2,050	3,240	6,740
750		49	102	207	362	514	1,100	1,980	3,120	6,490
800		48	98	200	350	497	1,060	1,910	3,010	6,270
850		46	95	194	339	481	1,030	1,850	2,910	6,070
900		45	92	188	328	466	1,000	1,790	2,820	5,880
950		43	90	182	319	452	967	1,740	2,740	5,710
1,000		42	87	177	310	440	940	1,690	2,670	5,560
1,100		40	83	169	295	418	893	1,610	2,530	5,280
1,200		38	79	161	281	399	852	1,530	2,420	5,040
1,300		37	76	154	269	382	816	1,470	2,320	4,820
1,400		35	73	148	259	367	784	1,410	2,220	4,630
1,500		34	70	143	249	353	755	1,360	2,140	4,460
1,600		33	68	138	241	341	729	1,310	2,070	4,310
1,700		32	65	133	233	330	705	1,270	2,000	4,170
1,800		31	63	129	226	320	684	1,230	1,940	4,040
1,900		30	62	125	219	311	664	1,200	1,890	3,930
2,000		29	60	122	213	302	646	1,160	1,830	3,820

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.2.1(o) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-			Gas:	Natural
-	-	-	-	-	-	-	-	-	-	-			Inlet Pressure:	Less than 2 psi
-	-	-	-	-	-	-	-	-	-	-			Pressure Drop:	0.5 in. w.c.
-	-	-	-	-	-	-	-	-	-	-			Specific Gravity:	0.60
-	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
5	46	63	115	134	225	270	471	546	895	1,037	1,790	2,070	3,660	4,140
10	32	44	82	95	161	192	330	383	639	746	1,260	1,470	2,600	2,930
15	25	35	66	77	132	157	267	310	524	615	1,030	1,200	2,140	2,400
20	22	31	58	67	116	137	231	269	456	536	888	1,050	1,850	2,080
25	19	27	52	60	104	122	206	240	409	482	793	936	1,660	1,860
30	18	25	47	55	96	112	188	218	374	442	723	856	1,520	1,700
40	15	21	41	47	83	97	162	188	325	386	625	742	1,320	1,470
50	13	19	37	42	75	87	144	168	292	347	559	665	1,180	1,320
60	12	17	34	38	68	80	131	153	267	318	509	608	1,080	1,200
70	11	16	31	36	63	74	121	141	248	295	471	563	1,000	1,110
80	10	15	29	33	60	69	113	132	232	277	440	527	940	1,040
90	10	14	28	32	57	65	107	125	219	262	415	498	887	983
100	9	13	26	30	54	62	101	118	208	249	393	472	843	933
150	7	10	20	23	42	48	78	91	171	205	320	387	691	762
200	6	9	18	21	38	44	71	82	148	179	277	336	600	661
250	5	8	16	19	34	39	63	74	133	161	247	301	538	591
300	5	7	15	17	32	36	57	67	95	148	226	275	492	540

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(2) All table entries are rounded to 3 significant digits.

Table 6.2.1(p) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-	Gas:	Natural
-	-	-	-	-	-	-	-	-	-	-	Inlet Pressure:	Less than 2 psi
-	-	-	-	-	-	-	-	-	-	-	Pressure Drop:	3.0 in. w.c.
-	-	-	-	-	-	-	-	-	-	-	Specific Gravity:	0.60

INTENDED USE: Initial Supply Pressure of 8.0 in. w.c. or Greater.

	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
5	120	160	277	327	529	649	1,180	1,370	2,140	2423	4,430	5,010	8,800	10,100
10	83	112	197	231	380	462	828	958	1,530	1740	3,200	3,560	6,270	7,160
15	67	90	161	189	313	379	673	778	1,250	1433	2,540	2,910	5,140	5,850
20	57	78	140	164	273	329	580	672	1,090	1249	2,200	2,530	4,460	5,070
25	51	69	125	147	245	295	518	599	978	1123	1,960	2,270	4,000	4,540
30	46	63	115	134	225	270	471	546	895	1029	1,790	2,070	3,660	4,140
40	39	54	100	116	196	234	407	471	778	897	1,550	1,800	3,180	3,590
50	35	48	89	104	176	210	363	421	698	806	1,380	1,610	2,850	3,210
60	32	44	82	95	161	192	330	383	639	739	1,260	1,470	2,600	2,930
70	29	41	76	88	150	178	306	355	593	686	1,170	1,360	2,420	2,720
80	27	38	71	82	141	167	285	331	555	644	1,090	1,280	2,260	2,540
90	26	36	67	77	133	157	268	311	524	609	1,030	1,200	2,140	2,400
100	24	34	63	73	126	149	254	295	498	579	974	1,140	2,030	2,280
150	19	27	52	60	104	122	206	240	409	477	793	936	1,660	1,860
200	17	23	45	52	91	106	178	207	355	415	686	812	1,440	1,610
250	15	21	40	46	82	95	159	184	319	373	613	728	1,290	1,440
300	13	19	37	42	75	87	144	168	234	342	559	665	1,180	1,320

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(2) All table entries are rounded to 3 significant digits.

Table 6.2.1(q) Corrugated Stainless Steel Tubing (CSST)

Gas:	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	6.0 in. w.c.
Specific Gravity:	0.60

INTENDED USE: Initial Supply Pressure of 11.0 in. w.c. or Greater.

	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
5	173	229	389	461	737	911	1,690	1,950	3,000	3375	6,280	7,050	12,400	14,260

Gas:	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	6.0 in. w.c.
Specific Gravity:	0.60

INTENDED USE: Initial Supply Pressure of 11.0 in. w.c. or Greater.

	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
10	120	160	277	327	529	649	1,180	1,370	2,140	2423	4,430	5,010	8,800	10,100
15	96	130	227	267	436	532	960	1,110	1,760	1996	3,610	4,100	7,210	8,260
20	83	112	197	231	380	462	828	958	1,530	1740	3,120	3,560	6,270	7,160
25	74	99	176	207	342	414	739	855	1,370	1564	2,790	3,190	5,620	6,400
30	67	90	161	189	313	379	673	778	1,250	1433	2,540	2,910	5,140	5,850
40	57	78	140	164	273	329	580	672	1,090	1249	2,200	2,530	4,460	5,070
50	51	69	125	147	245	295	518	599	978	1123	1,960	2,270	4,000	4,540
60	46	63	115	134	225	270	471	546	895	1029	1,790	2,070	3,660	4,140
70	42	58	106	124	209	250	435	505	830	956	1,660	1,920	3,390	3,840
80	39	54	100	116	196	234	407	471	778	897	1,550	1,800	3,180	3,590
90	37	51	94	109	185	221	383	444	735	848	1,460	1,700	3,000	3,390
100	35	48	89	104	176	210	363	421	698	806	1,380	1,610	2,850	3,210
150	28	39	73	85	145	172	294	342	573	664	1,130	1,320	2,340	2,630
200	24	34	63	73	126	149	254	295	498	579	974	1,140	2,030	2,280
250	21	30	57	66	114	134	226	263	447	520	870	1,020	1,820	2,040
300	19	27	52	60	104	122	206	240	409	477	793	936	1,660	1,860

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(2) All table entries are rounded to 3 significant digits.

Table 6.2.1(r) Corrugated Stainless Steel Tubing (CSST)

Gas:	Natural
Inlet Pressure:	2.0 psi
Pressure Drop:	1.0 psi
Specific Gravity:	0.60

	Tube Size (EHD)

Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	62
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
10	270	353	587	700	1,100	1,370	2,590	2,990	4,510	5,037	9,600	10,700	18,600	21,600
25	166	220	374	444	709	876	1,620	1,870	2,890	3,258	6,040	6,780	11,900	13,700
30	151	200	342	405	650	801	1,480	1,700	2,640	2,987	5,510	6,200	10,900	12,500
40	129	172	297	351	567	696	1,270	1,470	2,300	2,605	4,760	5,380	9,440	10,900
50	115	154	266	314	510	624	1,140	1,310	2,060	2,343	4,260	4,820	8,470	9,720
75	93	124	218	257	420	512	922	1,070	1,690	1,932	3,470	3,950	6,940	7,940
80	89	120	211	249	407	496	892	1,030	1,640	1,874	3,360	3,820	6,730	7,690
100	79	107	189	222	366	445	795	920	1,470	1,685	3,000	3,420	6,030	6,880
150	64	87	155	182	302	364	646	748	1,210	1,389	2,440	2,800	4,940	5,620
200	55	75	135	157	263	317	557	645	1,050	1,212	2,110	2,430	4,290	4,870
250	49	67	121	141	236	284	497	576	941	1,090	1,890	2,180	3,850	4,360
300	44	61	110	129	217	260	453	525	862	999	1,720	1,990	3,520	3,980
400	38	52	96	111	189	225	390	453	749	871	1,490	1,730	3,060	3,450
500	34	46	86	100	170	202	348	404	552	783	1,330	1,550	2,740	3,090

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table does not include effect of pressure drop across the line regulator. Where regulator loss exceeds ¾ psi, do not use this table. Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drops across a regulator may vary with flow rate.

(2) CAUTION: Capacities shown in table may exceed maximum capacity for a selected regulator. Consult with regulator or tubing manufacturer for guidance.

(3) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger number of bends and/or fittings shall be increased by an equivalent length of tubing according to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(4) All table entries are rounded to 3 significant digits.

Table 6.2.1(s) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-	Gas:	Natural
-	-	-	-	-	-	-	-	-	-	-	Inlet Pressure:	5.0 psi
-	-	-	-	-	-	-	-	-	-	-	Pressure Drop:	3.5 psi
-	-	-	-	-	-	-	-	-	-	-	Specific Gravity:	0.60

-	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	6
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
10	523	674	1,080	1,300	2,000	2,530	4,920	5,660	8,300	9,140	18,100	19,800	34,400	40,
25	322	420	691	827	1,290	1,620	3,080	3,540	5,310	5,911	11,400	12,600	22,000	25,
30	292	382	632	755	1,180	1,480	2,800	3,230	4,860	5,420	10,400	11,500	20,100	23,

Gas:	Natural
Inlet Pressure:	5.0 psi
Pressure Drop:	3.5 psi
Specific Gravity:	0.60

	Tube Size (EHD)													
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60	6
Length (ft)	Capacity in Cubic Feet of Gas per Hour													
40	251	329	549	654	1,030	1,280	2,420	2,790	4,230	4,727	8,970	10,000	17,400	20,:
50	223	293	492	586	926	1,150	2,160	2,490	3,790	4,251	8,020	8,930	15,600	18,
75	180	238	403	479	763	944	1,750	2,020	3,110	3,506	6,530	7,320	12,800	14,(
80	174	230	391	463	740	915	1,690	1,960	3,020	3,400	6,320	7,090	12,400	14,:
100	154	205	350	415	665	820	1,510	1,740	2,710	3,057	5,650	6,350	11,100	12,(
150	124	166	287	339	548	672	1,230	1,420	2,220	2,521	4,600	5,200	9,130	10,:
200	107	143	249	294	478	584	1,060	1,220	1,930	2,199	3,980	4,510	7,930	9,0
250	95	128	223	263	430	524	945	1,090	1,730	1,977	3,550	4,040	7,110	8,1
300	86	116	204	240	394	479	860	995	1,590	1,813	3,240	3,690	6,500	7,4
400	74	100	177	208	343	416	742	858	1,380	1,581	2,800	3,210	5,650	6,4
500	66	89	159	186	309	373	662	766	1,040	1,422	2,500	2,870	5,060	5,7

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table does not include effect of pressure drop across line regulator. Where regulator loss exceeds 1 psi, do not use this table. Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drop across regulator may vary with the flow rate.

(2) CAUTION: Capacities shown in table may exceed maximum capacity of selected regulator. Consult with tubing manufacturer for guidance.

(3) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(4) All table entries are rounded to 3 significant digits.

Table 6.2.1(t) Polyethylene Plastic Pipe

Gas:	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	0.3 in. w.c.
Specific Gravity:	0.60

	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	4
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682

Length (ft)	Capacity in Cubic Feet of Gas per Hour							
10	153	305	551	955	1,440	2,590	7,170	13,900
20	105	210	379	656	991	1,780	4,920	9,520
30	84	169	304	527	796	1,430	3,950	7,640
40	72	144	260	451	681	1,220	3,380	6,540
50	64	128	231	400	604	1,080	3,000	5,800
60	58	116	209	362	547	983	2,720	5,250
70	53	107	192	333	503	904	2,500	4,830
80	50	99	179	310	468	841	2,330	4,500
90	46	93	168	291	439	789	2,180	4,220
100	44	88	159	275	415	745	2,060	3,990
125	39	78	141	243	368	661	1,830	3,530
150	35	71	127	221	333	598	1,660	3,200
175	32	65	117	203	306	551	1,520	2,940
200	30	60	109	189	285	512	1,420	2,740
250	27	54	97	167	253	454	1,260	2,430
300	24	48	88	152	229	411	1,140	2,200
350	22	45	81	139	211	378	1,050	2,020
400	21	42	75	130	196	352	974	1,880
450	19	39	70	122	184	330	914	1,770
500	18	37	66	115	174	312	863	1,670

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(u) Polyethylene Plastic Pipe

-	-	-	Gas:	Natural				
-	-	-	Inlet Pressure:	Less than 2 psi				
-	-	-	Pressure Drop:	0.5 in. w.c.				
-	-	-	Specific Gravity:	0.60				
-	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	4
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Cubic Feet of Gas per Hour							
10	201	403	726	1,260	1,900	3,410	9,450	18,260
20	138	277	499	865	1,310	2,350	6,490	12,550
30	111	222	401	695	1,050	1,880	5,210	10,080
40	95	190	343	594	898	1,610	4,460	8,630
50	84	169	304	527	796	1,430	3,950	7,640
60	76	153	276	477	721	1,300	3,580	6,930
70	70	140	254	439	663	1,190	3,300	6,370
80	65	131	236	409	617	1,110	3,070	5,930
90	61	123	221	383	579	1,040	2,880	5,560
100	58	116	209	362	547	983	2,720	5,250

-	-	-				Gas:	Natural	
-	-	-				Inlet Pressure:	Less than 2 psi	
-	-	-				Pressure Drop:	0.5 in. w.c.	
-	-	-				Specific Gravity:	0.60	
-	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	4
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Cubic Feet of Gas per Hour							
125	51	103	185	321	485	871	2,410	4,660
150	46	93	168	291	439	789	2,180	4,220
175	43	86	154	268	404	726	2,010	3,880
200	40	80	144	249	376	675	1,870	3,610
250	35	71	127	221	333	598	1,660	3,200
300	32	64	115	200	302	542	1,500	2,900
350	29	59	106	184	278	499	1,380	2,670
400	27	55	99	171	258	464	1,280	2,480
450	26	51	93	160	242	435	1,200	2,330
500	24	48	88	152	229	411	1,140	2,200

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(v) Polyethylene Plastic Pipe

-	-	-				Gas:	Natural	
-	-	-				Inlet Pressure:	2.0 psi	
-	-	-				Pressure Drop:	1.0 psi	
-	-	-				Specific Gravity:	0.60	
-	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	3
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Cubic Feet of Gas per Hour							
10	1,860	3,720	6,710	11,600	17,600	31,600	87,300	169,000
20	1,280	2,560	4,610	7,990	12,100	21,700	60,000	116,000
30	1,030	2,050	3,710	6,420	9,690	17,400	48,200	93,200
40	878	1,760	3,170	5,490	8,300	14,900	41,200	79,700
50	778	1,560	2,810	4,870	7,350	13,200	36,600	70,700
60	705	1,410	2,550	4,410	6,660	12,000	33,100	64,000
70	649	1,300	2,340	4,060	6,130	11,000	30,500	58,900
80	603	1,210	2,180	3,780	5,700	10,200	28,300	54,800
90	566	1,130	2,050	3,540	5,350	9,610	26,600	51,400
100	535	1,070	1,930	3,350	5,050	9,080	25,100	48,600
125	474	949	1,710	2,970	4,480	8,050	22,300	43,000

-	-	-				Gas:	Natural	
-	-	-				Inlet Pressure:	2.0 psi	
-	-	-				Pressure Drop:	1.0 psi	
-	-	-				Specific Gravity:	0.60	
-	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	3
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Cubic Feet of Gas per Hour							
150	429	860	1,550	2,690	4,060	7,290	20,200	39,000
175	395	791	1,430	2,470	3,730	6,710	18,600	35,900
200	368	736	1,330	2,300	3,470	6,240	17,300	33,400
250	326	652	1,180	2,040	3,080	5,530	15,300	29,600
300	295	591	1,070	1,850	2,790	5,010	13,900	26,800
350	272	544	981	1,700	2,570	4,610	12,800	24,700
400	253	506	913	1,580	2,390	4,290	11,900	22,900
450	237	475	856	1,480	2,240	4,020	11,100	21,500
500	224	448	809	1,400	2,120	3,800	10,500	20,300
550	213	426	768	1,330	2,010	3,610	9,990	19,300
600	203	406	733	1,270	1,920	3,440	9,530	18,400
650	194	389	702	1,220	1,840	3,300	9,130	17,600
700	187	374	674	1,170	1,760	3,170	8,770	16,900
750	180	360	649	1,130	1,700	3,050	8,450	16,300
800	174	348	627	1,090	1,640	2,950	8,160	15,800
850	168	336	607	1,050	1,590	2,850	7,890	15,300
900	163	326	588	1,020	1,540	2,770	7,650	14,800
950	158	317	572	990	1,500	2,690	7,430	14,400
1,000	154	308	556	963	1,450	2,610	7,230	14,000
1,100	146	293	528	915	1,380	2,480	6,870	13,300
1,200	139	279	504	873	1,320	2,370	6,550	12,700
1,300	134	267	482	836	1,260	2,270	6,270	12,100
1,400	128	257	463	803	1,210	2,180	6,030	11,600
1,500	124	247	446	773	1,170	2,100	5,810	11,200
1,600	119	239	431	747	1,130	2,030	5,610	10,800
1,700	115	231	417	723	1,090	1,960	5,430	10,500
1,800	112	224	404	701	1,060	1,900	5,260	10,200
1,900	109	218	393	680	1,030	1,850	5,110	9,900
2,000	106	212	382	662	1,000	1,800	4,970	9,600

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(w) Polyethylene Plastic Tubing

-	Gas:	Natural
-	Inlet Pressure:	Less than 2.0 psi

-	Pressure Drop:	0.3 in. w.c.
-	Specific Gravity:	0.60
-	Plastic Tubing Size (CTS) (in.)	
Nominal OD:	½	1
Designation:	SDR 7	SDR 11
Actual ID:	0.445	0.927
Length (ft)	Capacity in Cubic Feet of Gas per Hour	
10	54	372
20	37	256
30	30	205
40	26	176
50	23	156
60	21	141
70	19	130
80	18	121
90	17	113
100	16	107
125	14	95
150	13	86
175	12	79
200	11	74
225	10	69
250	NA	65
275	NA	62
300	NA	59
350	NA	54
400	NA	51
450	NA	47
500	NA	45

CTS: Copper tube size.

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

Table 6.2.1(x) Polyethylene Plastic Tubing

-	Gas:	Natural
-	Inlet Pressure:	Less than 2.0 psi
-	Pressure Drop:	0.5 in. w.c.
-	Specific Gravity:	0.60
-	Plastic Tubing Size (CTS) (in.)	
Nominal OD:	½	1
Designation:	SDR 7	SDR 11
Actual ID:	0.445	0.927

Length (ft)	Capacity in Cubic Feet of Gas per Hour	
10	72	490
20	49	337
30	39	271
40	34	232
50	30	205
60	27	186
70	25	171
80	23	159
90	22	149
100	21	141
125	18	125
150	17	113
175	15	104
200	14	97
225	13	91
250	12	86
275	11	82
300	11	78
350	10	72
400	NA	67
450	NA	63
500	NA	59

CTS: Copper tube size.

NA: A flow of less than 10 cfh.

Note: All table entries are rounded to 3 significant digits.

6.2.2

Section 6.4 shall be used in conjunction with one of the methods described in 6.1.2 through 6.1.4 for non-corrugated stainless steel tubing.

6.3 Sizing Propane Piping Systems.

Sizing of piping systems shall be in accordance with 6.3.1 or 6.3.2.

6.3.1

Table 6.3.1(a) through Table 6.3.1(m) shall be used in conjunction with one of the methods described in 6.1.2 through 6.1.4 for piping materials other than non-corrugated stainless steel tubing.

Table 6.3.1(a) Schedule 40 Metallic Pipe

Gas:	Undiluted Propane
Inlet Pressure:	10.0 psi
Pressure Drop:	1.0 psi
Specific Gravity:	1.50

INTENDED USE: Pipe Sizing Between First-Stage (High-Pressure) Regulator and Second-Stage (Low-Pressure) Regulator.

	Pipe Size (in.)								
Nominal Inside:	½	¾	1	1¼	1½	2	2½	3	4
Actual:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Thousands of Btu per Hour								
10	3,320	6,950	13,100	26,900	40,300	77,600	124,000	219,000	446,000
20	2,280	4,780	9,000	18,500	27,700	53,300	85,000	150,000	306,000
30	1,830	3,840	7,220	14,800	22,200	42,800	68,200	121,000	246,000
40	1,570	3,280	6,180	12,700	19,000	36,600	58,400	103,000	211,000
50	1,390	2,910	5,480	11,300	16,900	32,500	51,700	91,500	187,000
60	1,260	2,640	4,970	10,200	15,300	29,400	46,900	82,900	169,000
70	1,160	2,430	4,570	9,380	14,100	27,100	43,100	76,300	156,000
80	1,080	2,260	4,250	8,730	13,100	25,200	40,100	70,900	145,000
90	1,010	2,120	3,990	8,190	12,300	23,600	37,700	66,600	136,000
100	956	2,000	3,770	7,730	11,600	22,300	35,600	62,900	128,000
125	848	1,770	3,340	6,850	10,300	19,800	31,500	55,700	114,000
150	768	1,610	3,020	6,210	9,300	17,900	28,600	50,500	103,000
175	706	1,480	2,780	5,710	8,560	16,500	26,300	46,500	94,700
200	657	1,370	2,590	5,320	7,960	15,300	24,400	43,200	88,100
250	582	1,220	2,290	4,710	7,060	13,600	21,700	38,300	78,100
300	528	1,100	2,080	4,270	6,400	12,300	19,600	34,700	70,800
350	486	1,020	1,910	3,930	5,880	11,300	18,100	31,900	65,100
400	452	945	1,780	3,650	5,470	10,500	16,800	29,700	60,600
450	424	886	1,670	3,430	5,140	9,890	15,800	27,900	56,800
500	400	837	1,580	3,240	4,850	9,340	14,900	26,300	53,700
550	380	795	1,500	3,070	4,610	8,870	14,100	25,000	51,000
600	363	759	1,430	2,930	4,400	8,460	13,500	23,900	48,600
650	347	726	1,370	2,810	4,210	8,110	12,900	22,800	46,600
700	334	698	1,310	2,700	4,040	7,790	12,400	21,900	44,800
750	321	672	1,270	2,600	3,900	7,500	12,000	21,100	43,100
800	310	649	1,220	2,510	3,760	7,240	11,500	20,400	41,600
850	300	628	1,180	2,430	3,640	7,010	11,200	19,800	40,300
900	291	609	1,150	2,360	3,530	6,800	10,800	19,200	39,100

950	283	592	1,110	2,290	3,430	6,600	10,500	18,600	37,900
1,000	275	575	1,080	2,230	3,330	6,420	10,200	18,100	36,900
1,100	261	546	1,030	2,110	3,170	6,100	9,720	17,200	35,000
1,200	249	521	982	2,020	3,020	5,820	9,270	16,400	33,400
1,300	239	499	940	1,930	2,890	5,570	8,880	15,700	32,000
1,400	229	480	903	1,850	2,780	5,350	8,530	15,100	30,800
1,500	221	462	870	1,790	2,680	5,160	8,220	14,500	29,600
1,600	213	446	840	1,730	2,590	4,980	7,940	14,000	28,600
1,700	206	432	813	1,670	2,500	4,820	7,680	13,600	27,700
1,800	200	419	789	1,620	2,430	4,670	7,450	13,200	26,900
1,900	194	407	766	1,570	2,360	4,540	7,230	12,800	26,100
2,000	189	395	745	1,530	2,290	4,410	7,030	12,400	25,400

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(b) Schedule 40 Metallic Pipe

-	-	-	-	-	-	**Gas:**	**Undiluted Propane**
-	-	-	-	-	-	**Inlet Pressure:**	**10.0 psi**
-	-	-	-	-	-	**Pressure Drop:**	**3.0 psi**
-	-	-	-	-	-	**Specific Gravity:**	**1.50**

INTENDED USE: Pipe Sizing Between First-Stage (High-Pressure) Regulator and Second-Stage (Low-Pressure) Regulator.

-	Pipe Size (in.)								
Nominal Inside:	½	¾	1	1¼	1½	2	2½	3	4
Actual:	**0.622**	**0.824**	**1.049**	**1.380**	**1.610**	**2.067**	**2.469**	**3.068**	**4.026**
Length (ft)	**Capacity in Thousands of Btu per Hour**								
10	5,890	12,300	23,200	47,600	71,300	137,000	219,000	387,000	789,000
20	4,050	8,460	15,900	32,700	49,000	94,400	150,000	266,000	543,000
30	3,250	6,790	12,800	26,300	39,400	75,800	121,000	214,000	436,000
40	2,780	5,810	11,000	22,500	33,700	64,900	103,000	183,000	373,000
50	2,460	5,150	9,710	19,900	29,900	57,500	91,600	162,000	330,000
60	2,230	4,670	8,790	18,100	27,100	52,100	83,000	147,000	299,000
70	2,050	4,300	8,090	16,600	24,900	47,900	76,400	135,000	275,000
80	1,910	4,000	7,530	15,500	23,200	44,600	71,100	126,000	256,000
90	1,790	3,750	7,060	14,500	21,700	41,800	66,700	118,000	240,000
100	1,690	3,540	6,670	13,700	20,500	39,500	63,000	111,000	227,000
125	1,500	3,140	5,910	12,100	18,200	35,000	55,800	98,700	201,000
150	1,360	2,840	5,360	11,000	16,500	31,700	50,600	89,400	182,000
175	1,250	2,620	4,930	10,100	15,200	29,200	46,500	82,300	167,800
200	1,160	2,430	4,580	9,410	14,100	27,200	43,300	76,500	156,100
250	1,030	2,160	4,060	8,340	12,500	24,100	38,400	67,800	138,400
300	935	1,950	3,680	7,560	11,300	21,800	34,800	61,500	125,400
350	860	1,800	3,390	6,950	10,400	20,100	32,000	56,500	115,300

Gas:	Undiluted Propane
Inlet Pressure:	10.0 psi
Pressure Drop:	3.0 psi
Specific Gravity:	1.50

INTENDED USE: Pipe Sizing Between First-Stage (High-Pressure) Regulator and Second-Stage (Low-Pressure) Regulator.

	Pipe Size (in.)								
Nominal Inside:	½	¾	1	1¼	1½	2	2½	3	4
Actual:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Thousands of Btu per Hour								
400	800	1,670	3,150	6,470	9,690	18,700	29,800	52,600	107,300
450	751	1,570	2,960	6,070	9,090	17,500	27,900	49,400	100,700
500	709	1,480	2,790	5,730	8,590	16,500	26,400	46,600	95,100
550	673	1,410	2,650	5,450	8,160	15,700	25,000	44,300	90,300
600	642	1,340	2,530	5,200	7,780	15,000	23,900	42,200	86,200
650	615	1,290	2,420	4,980	7,450	14,400	22,900	40,500	82,500
700	591	1,240	2,330	4,780	7,160	13,800	22,000	38,900	79,300
750	569	1,190	2,240	4,600	6,900	13,300	21,200	37,400	76,400
800	550	1,150	2,170	4,450	6,660	12,800	20,500	36,200	73,700
850	532	1,110	2,100	4,300	6,450	12,400	19,800	35,000	71,400
900	516	1,080	2,030	4,170	6,250	12,000	19,200	33,900	69,200
950	501	1,050	1,970	4,050	6,070	11,700	18,600	32,900	67,200
1,000	487	1,020	1,920	3,940	5,900	11,400	18,100	32,000	65,400
1,100	463	968	1,820	3,740	5,610	10,800	17,200	30,400	62,100
1,200	442	923	1,740	3,570	5,350	10,300	16,400	29,000	59,200
1,300	423	884	1,670	3,420	5,120	9,870	15,700	27,800	56,700
1,400	406	849	1,600	3,280	4,920	9,480	15,100	26,700	54,500
1,500	391	818	1,540	3,160	4,740	9,130	14,600	25,700	52,500
1,600	378	790	1,490	3,060	4,580	8,820	14,100	24,800	50,700
1,700	366	765	1,440	2,960	4,430	8,530	13,600	24,000	49,000
1,800	355	741	1,400	2,870	4,300	8,270	13,200	23,300	47,600
1,900	344	720	1,360	2,780	4,170	8,040	12,800	22,600	46,200
2,000	335	700	1,320	2,710	4,060	7,820	12,500	22,000	44,900

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(c) Schedule 40 Metallic Pipe

Gas:	Undiluted Propane
Inlet Pressure:	2.0 psi
Pressure Drop:	1.0 psi
Specific Gravity:	1.50

INTENDED USE: Pipe Sizing Between 2 psig Service and Line Pressure Regulator.

	Pipe Size (in.)

Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Thousands of Btu per Hour								
10	2,680	5,590	10,500	21,600	32,400	62,400	99,500	176,000	359,000
20	1,840	3,850	7,240	14,900	22,300	42,900	68,400	121,000	247,000
30	1,480	3,090	5,820	11,900	17,900	34,500	54,900	97,100	198,000
40	1,260	2,640	4,980	10,200	15,300	29,500	47,000	83,100	170,000
50	1,120	2,340	4,410	9,060	13,600	26,100	41,700	73,700	150,000
60	1,010	2,120	4,000	8,210	12,300	23,700	37,700	66,700	136,000
70	934	1,950	3,680	7,550	11,300	21,800	34,700	61,400	125,000
80	869	1,820	3,420	7,020	10,500	20,300	32,300	57,100	116,000
90	815	1,700	3,210	6,590	9,880	19,000	30,300	53,600	109,000
100	770	1,610	3,030	6,230	9,330	18,000	28,600	50,600	103,000
125	682	1,430	2,690	5,520	8,270	15,900	25,400	44,900	91,500
150	618	1,290	2,440	5,000	7,490	14,400	23,000	40,700	82,900
175	569	1,190	2,240	4,600	6,890	13,300	21,200	37,400	76,300
200	529	1,110	2,080	4,280	6,410	12,300	19,700	34,800	71,000
250	469	981	1,850	3,790	5,680	10,900	17,400	30,800	62,900
300	425	889	1,670	3,440	5,150	9,920	15,800	27,900	57,000
350	391	817	1,540	3,160	4,740	9,120	14,500	25,700	52,400
400	364	760	1,430	2,940	4,410	8,490	13,500	23,900	48,800
450	341	714	1,340	2,760	4,130	7,960	12,700	22,400	45,800
500	322	674	1,270	2,610	3,910	7,520	12,000	21,200	43,200
550	306	640	1,210	2,480	3,710	7,140	11,400	20,100	41,100
600	292	611	1,150	2,360	3,540	6,820	10,900	19,200	39,200
650	280	585	1,100	2,260	3,390	6,530	10,400	18,400	37,500
700	269	562	1,060	2,170	3,260	6,270	9,990	17,700	36,000
750	259	541	1,020	2,090	3,140	6,040	9,630	17,000	34,700
800	250	523	985	2,020	3,030	5,830	9,300	16,400	33,500
850	242	506	953	1,960	2,930	5,640	9,000	15,900	32,400
900	235	490	924	1,900	2,840	5,470	8,720	15,400	31,500
950	228	476	897	1,840	2,760	5,310	8,470	15,000	30,500
1,000	222	463	873	1,790	2,680	5,170	8,240	14,600	29,700
1,100	210	440	829	1,700	2,550	4,910	7,830	13,800	28,200
1,200	201	420	791	1,620	2,430	4,680	7,470	13,200	26,900
1,300	192	402	757	1,550	2,330	4,490	7,150	12,600	25,800
1,400	185	386	727	1,490	2,240	4,310	6,870	12,100	24,800
1,500	178	372	701	1,440	2,160	4,150	6,620	11,700	23,900
1,600	172	359	677	1,390	2,080	4,010	6,390	11,300	23,000
1,700	166	348	655	1,340	2,010	3,880	6,180	10,900	22,300
1,800	161	337	635	1,300	1,950	3,760	6,000	10,600	21,600
1,900	157	327	617	1,270	1,900	3,650	5,820	10,300	21,000
2,000	152	318	600	1,230	1,840	3,550	5,660	10,000	20,400

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(d) Schedule 40 Metallic Pipe

-	-	-	-	-	-	Gas:	Undiluted Propane
-	-	-	-	-	-	Inlet Pressure:	11.0 in. w.c.
-	-	-	-	-	-	Pressure Drop:	0.5 in. w.c.
-	-	-	-	-	-	Specific Gravity:	1.50

INTENDED USE: Pipe Sizing Between Single- or Second-Stage (Low-Pressure) Regulator and Appliance.

-	Pipe Size (in.)								
Nominal Inside:	½	¾	1	1¼	1½	2	2 ½	3	4
Actual:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Thousands of Btu per Hour								
10	291	608	1,150	2,350	3,520	6,790	10,800	19,100	39,000
20	200	418	787	1,620	2,420	4,660	7,430	13,100	26,800
30	160	336	632	1,300	1,940	3,750	5,970	10,600	21,500
40	137	287	541	1,110	1,660	3,210	5,110	9,030	18,400
50	122	255	480	985	1,480	2,840	4,530	8,000	16,300
60	110	231	434	892	1,340	2,570	4,100	7,250	14,800
70	101	212	400	821	1,230	2,370	3,770	6,670	13,600
80	94	197	372	763	1,140	2,200	3,510	6,210	12,700
90	89	185	349	716	1,070	2,070	3,290	5,820	11,900
100	84	175	330	677	1,010	1,950	3,110	5,500	11,200
125	74	155	292	600	899	1,730	2,760	4,880	9,950
150	67	140	265	543	814	1,570	2,500	4,420	9,010
175	62	129	243	500	749	1,440	2,300	4,060	8,290
200	58	120	227	465	697	1,340	2,140	3,780	7,710
250	51	107	201	412	618	1,190	1,900	3,350	6,840
300	46	97	182	373	560	1,080	1,720	3,040	6,190
350	42	89	167	344	515	991	1,580	2,790	5,700
400	40	83	156	320	479	922	1,470	2,600	5,300
450	37	78	146	300	449	865	1,380	2,440	4,970
500	35	73	138	283	424	817	1,300	2,300	4,700
550	33	70	131	269	403	776	1,240	2,190	4,460
600	32	66	125	257	385	741	1,180	2,090	4,260
650	30	64	120	246	368	709	1,130	2,000	4,080
700	29	61	115	236	354	681	1,090	1,920	3,920
750	28	59	111	227	341	656	1,050	1,850	3,770
800	27	57	107	220	329	634	1,010	1,790	3,640
850	26	55	104	213	319	613	978	1,730	3,530
900	25	53	100	206	309	595	948	1,680	3,420
950	25	52	97	200	300	578	921	1,630	3,320
1,000	24	50	95	195	292	562	895	1,580	3,230
1,100	23	48	90	185	277	534	850	1,500	3,070

1,200	22	46	86	176	264	509	811	1,430	2,930
1,300	21	44	82	169	253	487	777	1,370	2,800
1,400	20	42	79	162	243	468	746	1,320	2,690
1,500	19	40	76	156	234	451	719	1,270	2,590
1,600	19	39	74	151	226	436	694	1,230	2,500
1,700	18	38	71	146	219	422	672	1,190	2,420
1,800	18	37	69	142	212	409	652	1,150	2,350
1,900	17	36	67	138	206	397	633	1120	2280
2,000	17	35	65	134	200	386	615	1090	2220

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(e) Semirigid Copper Tubing

Gas:	Undiluted Propane
Inlet Pressure:	10.0 psi
Pressure Drop:	1.0 psi
Specific Gravity:	1.50

INTENDED USE: Tube Sizing Between First-Stage (High-Pressure) Regulator and Second-Stage (Low-Pressure) Regulator.

		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Thousands of Btu per Hour								
10		513	1,060	2,150	3,760	5,330	11,400	20,500	32,300	67,400
20		352	727	1,480	2,580	3,670	7,830	14,100	22,200	46,300
30		283	584	1,190	2,080	2,940	6,290	11,300	17,900	37,200
40		242	500	1,020	1,780	2,520	5,380	9,690	15,300	31,800
50		215	443	901	1,570	2,230	4,770	8,590	13,500	28,200
60		194	401	816	1,430	2,020	4,320	7,780	12,300	25,600
70		179	369	751	1,310	1,860	3,980	7,160	11,300	23,500
80		166	343	699	1,220	1,730	3,700	6,660	10,500	21,900
90		156	322	655	1,150	1,630	3,470	6,250	9,850	20,500
100		147	304	619	1,080	1,540	3,280	5,900	9,310	19,400
125		131	270	549	959	1,360	2,910	5,230	8,250	17,200
150		118	244	497	869	1,230	2,630	4,740	7,470	15,600
175		109	225	457	799	1,130	2,420	4,360	6,880	14,300
200		101	209	426	744	1,060	2,250	4,060	6,400	13,300
250		90	185	377	659	935	2,000	3,600	5,670	11,800
300		81	168	342	597	847	1,810	3,260	5,140	10,700

350	75	155	314	549	779	1,660	3,000	4,730	9,840
400	70	144	292	511	725	1,550	2,790	4,400	9,160
450	65	135	274	480	680	1,450	2,620	4,130	8,590
500	62	127	259	453	643	1,370	2,470	3,900	8,120
550	59	121	246	430	610	1,300	2,350	3,700	7,710
600	56	115	235	410	582	1,240	2,240	3,530	7,350
650	54	111	225	393	558	1,190	2,140	3,380	7,040
700	51	106	216	378	536	1,140	2,060	3,250	6,770
750	50	102	208	364	516	1,100	1,980	3,130	6,520
800	48	99	201	351	498	1,060	1,920	3,020	6,290
850	46	96	195	340	482	1,030	1,850	2,920	6,090
900	45	93	189	330	468	1,000	1,800	2,840	5,910
950	44	90	183	320	454	970	1,750	2,750	5,730
1,000	42	88	178	311	442	944	1,700	2,680	5,580
1,100	40	83	169	296	420	896	1,610	2,540	5,300
1,200	38	79	161	282	400	855	1,540	2,430	5,050
1,300	37	76	155	270	383	819	1,470	2,320	4,840
1,400	35	73	148	260	368	787	1,420	2,230	4,650
1,500	34	70	143	250	355	758	1,360	2,150	4,480
1,600	33	68	138	241	343	732	1,320	2,080	4,330
1,700	32	66	134	234	331	708	1,270	2,010	4,190
1,800	31	64	130	227	321	687	1,240	1,950	4,060
1,900	30	62	126	220	312	667	1,200	1,890	3,940
2,000	29	60	122	214	304	648	1,170	1,840	3,830

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.3.1(f) Semirigid Copper Tubing

Gas:	Undiluted Propane
Inlet Pressure:	11.0 in. w.c.
Pressure Drop:	0.5 in. w.c.
Specific Gravity:	1.50

INTENDED USE: Tube Sizing Between Single- or Second-Stage (Low-Pressure) Regulator and Appliance.

		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Thousands of Btu per Hour								

10	45	93	188	329	467	997	1,800	2,830	5,890
20	31	64	129	226	321	685	1,230	1,950	4,050
30	25	51	104	182	258	550	991	1,560	3,250
40	21	44	89	155	220	471	848	1,340	2,780
50	19	39	79	138	195	417	752	1,180	2,470
60	17	35	71	125	177	378	681	1,070	2,240
70	16	32	66	115	163	348	626	988	2,060
80	15	30	61	107	152	324	583	919	1,910
90	14	28	57	100	142	304	547	862	1,800
100	13	27	54	95	134	287	517	814	1,700
125	11	24	48	84	119	254	458	722	1,500
150	10	21	44	76	108	230	415	654	1,360
175	NA	20	40	70	99	212	382	602	1,250
200	NA	18	37	65	92	197	355	560	1,170
250	NA	16	33	58	82	175	315	496	1,030
300	NA	15	30	52	74	158	285	449	936
350	NA	14	28	48	68	146	262	414	861
400	NA	13	26	45	63	136	244	385	801
450	NA	12	24	42	60	127	229	361	752
500	NA	11	23	40	56	120	216	341	710
550	NA	11	22	38	53	114	205	324	674
600	NA	10	21	36	51	109	196	309	643
650	NA	NA	20	34	49	104	188	296	616
700	NA	NA	19	33	47	100	180	284	592
750	NA	NA	18	32	45	96	174	274	570
800	NA	NA	18	31	44	93	168	264	551
850	NA	NA	17	30	42	90	162	256	533
900	NA	NA	17	29	41	87	157	248	517
950	NA	NA	16	28	40	85	153	241	502
1,000	NA	NA	16	27	39	83	149	234	488
1,100	NA	NA	15	26	37	78	141	223	464
1,200	NA	NA	14	25	35	75	135	212	442
1,300	NA	NA	14	24	34	72	129	203	423
1,400	NA	NA	13	23	32	69	124	195	407
1,500	NA	NA	13	22	31	66	119	188	392
1,600	NA	NA	12	21	30	64	115	182	378
1,700	NA	NA	12	20	29	62	112	176	366
1,800	NA	NA	11	20	28	60	108	170	355
1,900	NA	NA	11	19	27	58	105	166	345
2,000	NA	NA	11	19	27	57	102	161	335

NA: A flow of less than 10,000 Btu/hr.

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.3.1(g) Semirigid Copper Tubing

Gas:	Undiluted Propane
Inlet Pressure:	2.0 psi
Pressure Drop:	1.0 psi
Specific Gravity:	1.50

INTENDED USE: Tube Sizing Between 2 psig Service and Line Pressure Regulator.

		Tube Size (in.)								
Nominal:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	—	—
Outside:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside:*		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)		Capacity in Thousands of Btu per Hour								
10		413	852	1,730	3,030	4,300	9,170	16,500	26,000	54,200
20		284	585	1,190	2,080	2,950	6,310	11,400	17,900	37,300
30		228	470	956	1,670	2,370	5,060	9,120	14,400	29,900
40		195	402	818	1,430	2,030	4,330	7,800	12,300	25,600
50		173	356	725	1,270	1,800	3,840	6,920	10,900	22,700
60		157	323	657	1,150	1,630	3,480	6,270	9,880	20,600
70		144	297	605	1,060	1,500	3,200	5,760	9,090	18,900
80		134	276	562	983	1,390	2,980	5,360	8,450	17,600
90		126	259	528	922	1,310	2,790	5,030	7,930	16,500
100		119	245	498	871	1,240	2,640	4,750	7,490	15,600
125		105	217	442	772	1,100	2,340	4,210	6,640	13,800
150		95	197	400	700	992	2,120	3,820	6,020	12,500
175		88	181	368	644	913	1,950	3,510	5,540	11,500
200		82	168	343	599	849	1,810	3,270	5,150	10,700
250		72	149	304	531	753	1,610	2,900	4,560	9,510
300		66	135	275	481	682	1,460	2,620	4,140	8,610
350		60	124	253	442	628	1,340	2,410	3,800	7,920
400		56	116	235	411	584	1,250	2,250	3,540	7,370
450		53	109	221	386	548	1,170	2,110	3,320	6,920
500		50	103	209	365	517	1,110	1,990	3,140	6,530
550		47	97	198	346	491	1,050	1,890	2,980	6,210
600		45	93	189	330	469	1,000	1,800	2,840	5,920
650		43	89	181	316	449	959	1,730	2,720	5,670
700		41	86	174	304	431	921	1,660	2,620	5,450
750		40	82	168	293	415	888	1,600	2,520	5,250
800		39	80	162	283	401	857	1,540	2,430	5,070
850		37	77	157	274	388	829	1,490	2,350	4,900
900		36	75	152	265	376	804	1,450	2,280	4,750

950	35	72	147	258	366	781	1,410	2,220	4,620
1,000	34	71	143	251	356	760	1,370	2,160	4,490
1,100	32	67	136	238	338	721	1,300	2,050	4,270
1,200	31	64	130	227	322	688	1,240	1,950	4,070
1,300	30	61	124	217	309	659	1,190	1,870	3,900
1,400	28	59	120	209	296	633	1,140	1,800	3,740
1,500	27	57	115	201	286	610	1,100	1,730	3,610
1,600	26	55	111	194	276	589	1,060	1,670	3,480
1,700	26	53	108	188	267	570	1,030	1,620	3,370
1,800	25	51	104	182	259	553	1,000	1,570	3,270
1,900	24	50	101	177	251	537	966	1,520	3,170
2,000	23	48	99	172	244	522	940	1,480	3,090

Note: All table entries are rounded to 3 significant digits.

*Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

Table 6.3.1(h) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-	**Gas:**	**Undiluted Propane**		
-	-	-	-	-	-	-	-	-	-	-	**Inlet Pressure:**	**11.0 in. w.c.**		
-	-	-	-	-	-	-	-	-	-	-	**Pressure Drop:**	**0.5 in. w.c.**		
-	-	-	-	-	-	-	-	-	-	-	**Specific Gravity:**	**1.50**		

INTENDED USE: CSST Sizing Between Single- or Second-Stage (Low-Pressure) Regulator and Appliance Shutoff Valve.

-	**Tube Size (EHD)**													
Flow Designation:	**13**	**15**	**18**	**19**	**23**	**25**	**30**	**31**	**37**	**39**	**46**	**48**	**60**	**62**
Length (ft)	**Capacity in Thousands of Btu per Hour**													
5	72	99	181	211	355	426	744	863	1,420	1,638	2,830	3,270	5,780	6,550
10	50	69	129	150	254	303	521	605	971	1,179	1,990	2,320	4,110	4,640
15	39	55	104	121	208	248	422	490	775	972	1,620	1,900	3,370	3,790
20	34	49	91	106	183	216	365	425	661	847	1,400	1,650	2,930	3,290
25	30	42	82	94	164	192	325	379	583	762	1,250	1,480	2,630	2,940
30	28	39	74	87	151	177	297	344	528	698	1,140	1,350	2,400	2,680
40	23	33	64	74	131	153	256	297	449	610	988	1,170	2,090	2,330
50	20	30	58	66	118	137	227	265	397	548	884	1,050	1,870	2,080
60	19	26	53	60	107	126	207	241	359	502	805	961	1,710	1,900
70	17	25	49	57	99	117	191	222	330	466	745	890	1,590	1,760
80	15	23	45	52	94	109	178	208	307	438	696	833	1,490	1,650
90	15	22	44	50	90	102	169	197	286	414	656	787	1,400	1,550
100	14	20	41	47	85	98	159	186	270	393	621	746	1,330	1,480
150	11	15	31	36	66	75	123	143	217	324	506	611	1,090	1,210

200	9	14	28	33	60	69	112	129	183	283	438	531	948	1,050
250	8	12	25	30	53	61	99	117	163	254	390	476	850	934
300	8	11	23	26	50	57	90	107	147	234	357	434	777	854

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shall be increased by an equivalent length of tubing to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(2) All table entries are rounded to 3 significant digits.

Table 6.3.1(i) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-	**Gas:**	**Undiluted Propane**
-	-	-	-	-	-	-	-	-	-	-	**Inlet Pressure:**	**2.0 psi**
-	-	-	-	-	-	-	-	-	-	-	**Pressure Drop:**	**1.0 psi**
-	-	-	-	-	-	-	-	-	-	-	**Specific Gravity:**	**1.50**

INTENDED USE: CSST Sizing Between 2 psig Service and Line Pressure Regulator.

-	**Tube Size (EHD)**													
Flow Designation:	**13**	**15**	**18**	**19**	**23**	**25**	**30**	**31**	**37**	**39**	**46**	**48**	**60**	**62**
Length (ft)	**Capacity in Thousands of Btu per Hour**													
10	426	558	927	1,110	1,740	2,170	4,100	4,720	7,130	7,958	15,200	16,800	29,400	34,20
25	262	347	591	701	1,120	1,380	2,560	2,950	4,560	5,147	9,550	10,700	18,800	21,70
30	238	316	540	640	1,030	1,270	2,330	2,690	4,180	4,719	8,710	9,790	17,200	19,80
40	203	271	469	554	896	1,100	2,010	2,320	3,630	4,116	7,530	8,500	14,900	17,20
50	181	243	420	496	806	986	1,790	2,070	3,260	3,702	6,730	7,610	13,400	15,40
75	147	196	344	406	663	809	1,460	1,690	2,680	3,053	5,480	6,230	11,000	12,60
80	140	189	333	393	643	768	1,410	1,630	2,590	2,961	5,300	6,040	10,600	12,20
100	124	169	298	350	578	703	1,260	1,450	2,330	2,662	4,740	5,410	9,530	10,90
150	101	137	245	287	477	575	1,020	1,180	1,910	2,195	3,860	4,430	7,810	8,89(
200	86	118	213	248	415	501	880	1,020	1,660	1,915	3,340	3,840	6,780	7,71(
250	77	105	191	222	373	448	785	910	1,490	1,722	2,980	3,440	6,080	6,90(
300	69	96	173	203	343	411	716	829	1,360	1,578	2,720	3,150	5,560	6,30(
400	60	82	151	175	298	355	616	716	1,160	1,376	2,350	2,730	4,830	5,46(
500	53	72	135	158	268	319	550	638	1,030	1,237	2,100	2,450	4,330	4,88(

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table does not include effect of pressure drop across the line regulator. Where regulator loss exceeds ½ psi (based on 13 in. w.c. outlet pressure), do not use this table. Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drops across a

regulator may vary with flow rate.

(2) CAUTION: Capacities shown in table may exceed maximum capacity for a selected regulator. Consult with regulator or tubing manufacturer for guidance.

(3) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger number of bends and/or fittings shall be increased by an equivalent length of tubing according to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(4) All table entries are rounded to 3 significant digits.

Table 6.3.1(j) Corrugated Stainless Steel Tubing (CSST)

-	-	-	-	-	-	-	-	-	-	-	Gas:	Undil Propa
-	-	-	-	-	-	-	-	-	-	-	Inlet Pressure:	5.0 ps
-	-	-	-	-	-	-	-	-	-	-	Pressure Drop:	3.5 ps
-	-	-	-	-	-	-	-	-	-	-	Specific Gravity:	1.50

-	Tube Size (EHD)												
Flow Designation:	13	15	18	19	23	25	30	31	37	39	46	48	60
Length (ft)	Capacity in Thousands of Btu per Hour												
10	826	1,070	1,710	2,060	3,150	4,000	7,830	8,950	13,100	14,441	28,600	31,200	54,400
25	509	664	1,090	1,310	2,040	2,550	4,860	5,600	8,400	9,339	18,000	19,900	34,700
30	461	603	999	1,190	1,870	2,340	4,430	5,100	7,680	8,564	16,400	18,200	31,700
40	396	520	867	1,030	1,630	2,030	3,820	4,400	6,680	7,469	14,200	15,800	27,600
50	352	463	777	926	1,460	1,820	3,410	3,930	5,990	6,717	12,700	14,100	24,700
75	284	376	637	757	1,210	1,490	2,770	3,190	4,920	5,539	10,300	11,600	20,300
80	275	363	618	731	1,170	1,450	2,680	3,090	4,770	5,372	9,990	11,200	19,600
100	243	324	553	656	1,050	1,300	2,390	2,760	4,280	4,830	8,930	10,000	17,600
150	196	262	453	535	866	1,060	1,940	2,240	3,510	3,983	7,270	8,210	14,400
200	169	226	393	464	755	923	1,680	1,930	3,050	3,474	6,290	7,130	12,500
250	150	202	352	415	679	828	1,490	1,730	2,740	3,124	5,620	6,390	11,200
300	136	183	322	379	622	757	1,360	1,570	2,510	2,865	5,120	5,840	10,300
400	117	158	279	328	542	657	1,170	1,360	2,180	2,498	4,430	5,070	8,920
500	104	140	251	294	488	589	1,050	1,210	1,950	2,247	3,960	4,540	8,000

EHD: Equivalent hydraulic diameter. A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Notes:

(1) Table does not include effect of pressure drop across the line regulator. Where regulator loss exceeds ½ psi (based on 13 in. w.c. outlet pressure), do not use this table. Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drops across a regulator may vary with flow rate.

(2) CAUTION: Capacities shown in table may exceed maximum capacity for a selected regulator. Consult with regulator or tubing manufacturer for guidance.

(3) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger number of bends and/or fittings shall be increased by an equivalent length of tubing according

to the following equation: $L = 1.3n$, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

(4) All table entries are rounded to 3 significant digits.

Table 6.3.1(k) Polyethylene Plastic Pipe

Gas:	Undiluted Propane
Inlet Pressure:	11.0 in. w.c.
Pressure Drop:	0.5 in. w.c.
Specific Gravity:	1.50

INTENDED USE: PE Pipe Sizing Between Integral Second-Stage Regulator at Tank or Second-Stage (Low-Pressure) Regulator and Building.

	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	4
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Thousands of Btu per Hour							
10	340	680	1,230	2,130	3,210	5,770	16,000	30,900
20	233	468	844	1,460	2,210	3,970	11,000	21,200
30	187	375	677	1,170	1,770	3,180	8,810	17,000
40	160	321	580	1,000	1,520	2,730	7,540	14,600
50	142	285	514	890	1,340	2,420	6,680	12,900
60	129	258	466	807	1,220	2,190	6,050	11,700
70	119	237	428	742	1,120	2,010	5,570	10,800
80	110	221	398	690	1,040	1,870	5,180	10,000
90	103	207	374	648	978	1,760	4,860	9,400
100	98	196	353	612	924	1,660	4,590	8,900
125	87	173	313	542	819	1,470	4,070	7,900
150	78	157	284	491	742	1,330	3,690	7,130
175	72	145	261	452	683	1,230	3,390	6,560
200	67	135	243	420	635	1,140	3,160	6,100
250	60	119	215	373	563	1,010	2,800	5,410
300	54	108	195	338	510	916	2,530	4,900
350	50	99	179	311	469	843	2,330	4,510
400	46	92	167	289	436	784	2,170	4,190
450	43	87	157	271	409	736	2,040	3,930
500	41	82	148	256	387	695	1,920	3,720

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(l) Polyethylene Plastic Pipe

Gas:	Undiluted Propane
Inlet Pressure:	2.0 psi
Pressure Drop:	1.0 psi

						Specific Gravity:	1.50	

INTENDED USE: PE Pipe Sizing Between 2 psi Service Regulator and Line Pressure Regulator.

	Pipe Size (in.)							
Nominal OD:	½	¾	1	1¼	1½	2	3	4
Designation:	SDR 9.3	SDR 11	SDR 11	SDR 10	SDR 11	SDR 11	SDR 11	SDR 11
Actual ID:	0.660	0.860	1.077	1.328	1.554	1.943	2.864	3.682
Length (ft)	Capacity in Thousands of Btu per Hour							
10	3,130	6,260	11,300	19,600	29,500	53,100	147,000	284,000
20	2,150	4,300	7,760	13,400	20,300	36,500	101,000	195,000
30	1,730	3,450	6,230	10,800	16,300	29,300	81,100	157,000
40	1,480	2,960	5,330	9,240	14,000	25,100	69,400	134,100
50	1,310	2,620	4,730	8,190	12,400	22,200	61,500	119,000
60	1,190	2,370	4,280	7,420	11,200	20,100	55,700	108,000
70	1,090	2,180	3,940	6,830	10,300	18,500	51,300	99,100
80	1,010	2,030	3,670	6,350	9,590	17,200	47,700	92,200
90	952	1,910	3,440	5,960	9,000	16,200	44,700	86,500
100	899	1,800	3,250	5,630	8,500	15,300	42,300	81,700
125	797	1,600	2,880	4,990	7,530	13,500	37,500	72,400
150	722	1,450	2,610	4,520	6,830	12,300	33,900	65,600
175	664	1,330	2,400	4,160	6,280	11,300	31,200	60,300
200	618	1,240	2,230	3,870	5,840	10,500	29,000	56,100
250	548	1,100	1,980	3,430	5,180	9,300	25,700	49,800
300	496	994	1,790	3,110	4,690	8,430	23,300	45,100
350	457	914	1,650	2,860	4,320	7,760	21,500	41,500
400	425	851	1,530	2,660	4,020	7,220	12,000	38,600
450	399	798	1,440	2,500	3,770	6,770	18,700	36,200
500	377	754	1,360	2,360	3,560	6,390	17,700	34,200
550	358	716	1,290	2,240	3,380	6,070	16,800	32,500
600	341	683	1,230	2,140	3,220	5,790	16,000	31,000
650	327	654	1,180	2,040	3,090	5,550	15,400	29,700
700	314	628	1,130	1,960	2,970	5,330	14,700	28,500
750	302	605	1,090	1,890	2,860	5,140	14,200	27,500
800	292	585	1,050	1,830	2,760	4,960	13,700	26,500
850	283	566	1,020	1,770	2,670	4,800	13,300	25,700
900	274	549	990	1,710	2,590	4,650	12,900	24,900
950	266	533	961	1,670	2,520	4,520	12,500	24,200
1,000	259	518	935	1,620	2,450	4,400	12,200	23,500
1,100	246	492	888	1,540	2,320	4,170	11,500	22,300
1,200	234	470	847	1,470	2,220	3,980	11,000	21,300
1,300	225	450	811	1,410	2,120	3,810	10,600	20,400
1,400	216	432	779	1,350	2,040	3,660	10,100	19,600
1,500	208	416	751	1,300	1,960	3,530	9,760	18,900

1,600	201	402	725	1,260	1,900	3,410	9,430	18,200
1,700	194	389	702	1,220	1,840	3,300	9,130	17,600
1,800	188	377	680	1,180	1,780	3,200	8,850	17,100
1,900	183	366	661	1,140	1,730	3,110	8,590	16,600
2,000	178	356	643	1,110	1,680	3,020	8,360	16,200

Note: All table entries are rounded to 3 significant digits.

Table 6.3.1(m) Polyethylene Plastic Tubing

-	Gas:	Undiluted Propane
-	Inlet Pressure:	11.0 in. w.c.
-	Pressure Drop:	0.5 in. w.c.
-	Specific Gravity:	1.50

INTENDED USE: Sizing Between Integral 2-Stage Regulator at Tank or Second-Stage (Low-Pressure Regulator) and the Building.		
Plastic Tubing Size (CTS) (in.)		
Nominal OD:	½	1
Designation:	SDR 7	SDR 11
Actual ID:	0.445	0.927
Length (ft)	Capacity in Thousands of Btu per Hour	
10	121	828
20	83	569
30	67	457
40	57	391
50	51	347
60	46	314
70	42	289
80	39	269
90	37	252
100	35	238
125	31	211
150	28	191
175	26	176
200	24	164
225	22	154
250	21	145
275	20	138
300	19	132
350	18	121
400	16	113
450	15	106
500	15	100

CTS: Copper tube size.

Note: All table entries are rounded to 3 significant digits.

6.3.2

Section 6.4 shall be used in conjunction with one of the methods described in 6.1.2 through 6.1.4 for non-corrugated stainless steel tubing.

6.4 Sizing Equations.

The inside diameter of smooth wall pipe or tubing shall be determined by the sizing equations in 6.4.1 and 6.4.2 using the equivalent pipe length determined by the methods in 6.1.2 through 6.1.4.

6.4.1* Low-Pressure Gas Formula.

Less than 1.5 psi (10.3 kPa):

$$D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{Cr \times L}\right)^{0.206}} \quad \textbf{[6.4.1]}$$

where:

D = inside diameter of pipe (in.)

Q = input rate appliance(s) (cubic feet per hour at 60°F and 30 in. mercury column)

ΔH = pressure drop [in. w.c. (27.7 in. H_2O = 1 psi)]

L = equivalent length of pipe (ft)

See Table 6.4.2 for values of *Cr*.

6.4.2* High-Pressure Gas Formula.

1.5 psi (10.3 kPa) and above:

$$D = \frac{Q^{0.381}}{18.93\left[\frac{\left(P_1^2 - P_2^2\right) \cdot Y}{Cr \times L}\right]^{0.206}} \quad \textbf{[6.4.2]}$$

where:

D = inside diameter of pipe (in.)

Q = input rate appliance(s) (cubic feet per hour at 60°F and 30 in. mercury column)

P_1 = upstream pressure [psia (P_1 + 14.7)]

P_2 = downstream pressure [psia (P_2 + 14.7)]

L = equivalent length of pipe (ft)

See Table 6.4.2 for values of *Cr* and *Y*.

Table 6.4.2 ***Cr*** and ***Y*** for Natural Gas and Undiluted Propane at Standard Conditions

-	Formula Factors	
Gas	***Cr***	***Y***
Natural gas	0.6094	0.9992
Undiluted propane	1.2462	0.9910

Additional Proposed Changes

File Name	Description	Approved
Public_Comment_No._43-NFPA_54-2022.docx	PC 43 in WORD Format	

Statement of Problem and Substantiation for Public Comment

Sizing tables for PEX-AL-PEX piping have traditionally been found in the manufacturer's instructions. This PC adds the sizing tables to the standard.

Related Item

• Public Input No. 91-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 30 23:47:10 EDT 2022
Committee: NFG-AAA

Public Input No. 91-NFPA 54-2021 [New Section after 7.2]

6.2.1 Table 6.2.1(a) through Table 6.2.1(~~x~~ aa) shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3 for piping materials other than non-corrugated stainless steel tubing.

6.3.1 Table 6.3.1(a) through Table 6.3.1(~~m~~ p) shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3 for piping materials other than non-corrugated stainless steel tubing.

Table 6.2.1(y) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	0.5 in. w.c.
Specific Gravity:	0.60

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	122	259	465	925
10.0	84	178	319	636
15.0	67	143	257	511
20.0	57	122	220	437
25.0	51	108	195	387
30.0	46	98	176	351
35.0	42	90	162	323
40.0	40	84	151	300
45.0	37	79	142	282
50.0	35	74	134	266
55.0	33	71	127	253
60.0	32	67	121	241
65.0	30	65	116	231
70.0	29	62	111	222
75.0	28	60	107	214
80.0	27	58	104	206
85.0	26	56	100	200
90.0	25	54	97	194
95.0	25	53	95	188
100.0	24	51	92	183
105.0	23	50	90	178
110.0	23	49	87	174
115.0	22	47	85	170
120.0	22	46	83	166
125.0	21	45	81	162
130.0	21	44	80	159
135.0	20	44	78	156
140.0	20	43	77	152
145.0	20	42	75	150
150.0	19	41	74	147
155.0	19	40	73	144
160.0	19	40	71	142

Table 6.2.1(z) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Natural
Inlet Pressure:	Less than 2 psi
Pressure Drop:	1.0 in. w.c.
Specific Gravity:	0.60

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	177	377	676	1346
10.0	122	259	465	925
15.0	98	208	373	743
20.0	84	178	319	636
25.0	74	158	283	563
30.0	67	143	257	511
35.0	62	131	236	470
40.0	57	122	220	437
45.0	54	115	206	410
50.0	51	108	195	387
55.0	48	103	185	368
60.0	46	98	176	351
65.0	44	94	169	336
70.0	42	90	162	323
75.0	41	87	156	311
80.0	40	84	151	300
85.0	38	81	146	291
90.0	37	79	142	282
95.0	36	77	138	274
100.0	35	74	134	266
105.0	34	73	130	259
110.0	33	71	127	253
115.0	32	69	124	247
120.0	32	67	121	241
125.0	31	66	119	236
130.0	30	65	116	231
135.0	30	63	114	226
140.0	29	62	111	222
145.0	29	61	109	218
150.0	28	60	107	214
155.0	28	59	106	210
160.0	27	58	104	206

Table 6.2.1(aa) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Natural
Inlet Pressure:	2 psi
Pressure Drop:	1 psi
Specific Gravity:	0.60

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	1124	2390	4292	8541
10.0	772	1643	2950	5870
15.0	620	1319	2369	4714
20.0	531	1129	2027	4034
25.0	471	1001	1797	3576
30.0	426	907	1628	3240
35.0	392	834	1498	2981
40.0	365	776	1393	2773
45.0	342	728	1307	2602
50.0	323	688	1235	2458
55.0	307	653	1173	2334
60.0	293	623	1119	2227
65.0	281	597	1071	2132
70.0	270	573	1029	2049
75.0	260	552	992	1974
80.0	251	533	958	1906
85.0	243	516	927	1844
90.0	235	500	899	1788
95.0	229	486	873	1737
100.0	222	473	849	1689
105.0	216	460	827	1645
110.0	211	449	806	1604
115.0	206	438	787	1566
120.0	201	428	769	1530
125.0	197	419	752	1497
130.0	193	410	736	1466
135.0	189	402	722	1436
140.0	185	394	707	1408
145.0	182	387	694	1381
150.0	178	380	682	1356
155.0	175	373	670	1333
160.0	172	367	658	1310

Table 6.3.1(n) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Propane
Inlet Pressure:	Less than 2 psi
Pressure Drop:	0.5 in. w.c.
Specific Gravity:	1

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	83	176	316	628
10.0	57	121	217	432
15.0	46	97	174	347
20.0	39	83	149	297
25.0	35	74	132	263
30.0	31	67	120	238
35.0	29	61	110	219
40.0	27	57	102	204
45.0	25	54	96	191
50.0	24	51	91	181
55.0	23	48	86	172
60.0	22	46	82	164
65.0	21	44	79	157
70.0	20	42	76	151
75.0	19	41	73	145
80.0	18	39	70	140
85.0	18	38	68	136
90.0	17	37	66	132
95.0	17	36	64	128
100.0	16	35	62	124
105.0	16	34	61	121
110.0	16	33	59	118
115.0	15	32	58	115
120.0	15	31	57	113
125.0	14	31	55	110
130.0	14	30	54	108
135.0	14	30	53	106
140.0	14	29	52	104
145.0	13	28	51	102
150.0	13	28	50	100
155.0	13	27	49	98
160.0	13	27	48	96

Table 6.2.1(o) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Propane
Inlet Pressure:	Less than 2 psi
Pressure Drop:	1.0 in. w.c.
Specific Gravity:	1

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	120	256	459	914
10.0	83	176	316	628
15.0	66	141	253	504
20.0	57	121	217	432
25.0	50	107	192	383
30.0	46	97	174	347
35.0	42	89	160	319
40.0	39	83	149	297
45.0	37	78	140	278
50.0	35	74	132	263
55.0	33	70	126	250
60.0	31	67	120	238
65.0	30	64	115	228
70.0	29	61	110	219
75.0	28	59	106	211
80.0	27	57	102	204
85.0	26	55	99	197
90.0	25	54	96	191
95.0	24	52	93	186
100.0	24	51	91	181
105.0	23	49	88	176
110.0	23	48	86	172
115.0	22	47	84	168
120.0	22	46	82	164
125.0	21	45	80	160
130.0	21	44	79	157
135.0	20	43	77	154
140.0	20	42	76	151
145.0	19	41	74	148
150.0	19	41	73	145
155.0	19	40	72	143
160.0	18	39	70	140

Table 6.2.1(p) Crosslinked PEX-Aluminum-PEX (PEX-AL-PEX) Composite Pipe

Gas	Propane
Inlet Pressure:	2 psi
Pressure Drop:	1 psi
Specific Gravity:	1

Pipe Size (in.)

Nominal:	**3/8**	**1/2**	**3/4**	**1**
Actual ID:	0.472	0.630	0.787	1.024
Length (ft)	**Capacity in Cubic Feet of Gas per Hour**			
5.0	760	1616	2901	5774
10.0	522	1111	1994	3969
15.0	419	892	1601	3187
20.0	359	763	1371	2728
25.0	318	677	1215	2417
30.0	288	613	1101	2190
35.0	265	564	1013	2015
40.0	247	525	942	1875
45.0	231	492	884	1759
50.0	219	465	835	1661
55.0	208	442	793	1578
60.0	198	421	756	1505
65.0	190	403	724	1442
70.0	182	388	696	1385
75.0	176	373	670	1334
80.0	170	361	647	1288
85.0	164	349	627	1247
90.0	159	338	607	1209
95.0	154	329	590	1174
100.0	150	320	574	1142
105.0	146	311	559	1112
110.0	143	304	545	1085
115.0	139	296	532	1059
120.0	136	290	520	1035
125.0	133	283	509	1012
130.0	130	277	498	991
135.0	128	272	488	971
140.0	125	266	478	952
145.0	123	261	469	934
150.0	121	257	461	917
155.0	119	252	453	901
160.0	117	248	445	886

Public Comment No. 8-NFPA 54-2022 [Section No. 6.1.4]

6.1.4 Hybrid Pressure.

~~The pipe size for each section of higher pressure gas piping shall be determined~~
6.1.3 Hybrid Pressure. Sizing of high and low pressure portions of a hybrid pressure system shall be determined:

a. For the high pressure portion using the longest length of piping method in 6.1.1 or the branch length method in 6.1.2 from the point of delivery to the most remote line pressure regulator.

~~The pipe size from the line pressure regulator to each outlet shall be determined using the length of piping from the regulator to the most remote outlet served by the regulator~~

b. For each section of lower pressure piping using the longest length of piping method in 6.1.1 or the branch length method in 6.1.2 from the line pressure regulator to the outlets consistent with the sizing method used .

Statement of Problem and Substantiation for Public Comment

Revised to recognize that the longest length and branch length sizing methods should be used to size the high and low pressure portions of a hybrid system, and make the requirement easier to understand.

Related Item

• PI-5

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: Omega Flex
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 13:26:33 EDT 2022
Committee: NFG-AAA

Public Comment No. 9-NFPA 54-2022 [Section No. 7.1.3.2]

7.1.3.2

Underground piping shall comply with one or more of the following unless approved ~~technical justification is provided to demonstrate that protection is unnecessary~~ for installation without corrosion protection :

(1) The piping shall be made of corrosion-resistant material that is suitable for the environment in which it will be installed.

(2) Pipe shall have a factory-applied, electrically insulating coating. Fittings and joints between sections of coated pipe shall be coated in accordance with the coating manufacturer's instructions.

(3) The piping shall have a cathodic protection system installed, and the system shall be maintained in accordance with 7.1.3.3 or 7.1.3.6.

Statement of Problem and Substantiation for Public Comment

An identical PI was submitted and rejected. In its response to PI-57 the committee stated that removing the words "technical justification" could allow materials with little or no technical justification".

I agree the committee's statement, but the committee ignored that the text duplicates the meaning of "approved" which is defined and has lengthy Annex A text which provides guidance to AHJs.

Related Item

• PI 57

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 13:41:11 EDT 2022
Committee: NFG-AAA

Public Comment No. 44-NFPA 54-2022 [New Section after 7.2.7]

7.2.8 Composite Piping.

Composite piping systems shall be installed in accordance with this code, ISO 17484-1, and the manufacturers installation instructions.

Statement of Problem and Substantiation for Public Comment

Like CSST, this language emphasizes the need to follow the code and the installation instructions to ensure proper installation for the specific application.

Related Item

• Public Input No. 91-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 00:18:27 EDT 2022
Committee: NFG-AAA

Public Comment No. 45-NFPA 54-2022 [Section No. 7.3.2]

7.3.2 Fittings in Concealed Locations.

Fittings installed in concealed locations shall be limited to the following types:

(1) Threaded elbows, tees, couplings, caps, and plugs

(2) Brazed fittings

(3) Welded fittings

(4) Fittings listed to ANSI LC 1/CSA 6.26, *Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)*, or ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*

(5) Crimp fittings listed to ISO 17484, *Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) - Part 1: Specifications for systems* .

Statement of Problem and Substantiation for Public Comment

ISO 17484 contains testing requirements for both the pipe and fitting system together as the fittings are typically designed to be used with the individual piping system only, and fittings cannot be listed to ISO 17484 individually. Crimp fittings are a permanent fitting that has been used successfully in concealed spaces for over 15 years.

Related Item

• Public Input No. 92-NFPA 54-2021

Submitter Information Verification

Submitter Full Name: Andrew Klein
Organization: A S Klein Engineering PLLC
Affiliation: Ferguson Enterprises
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 00:22:28 EDT 2022
Committee: NFG-AAA

Public Comment No. 10-NFPA 54-2022 [Section No. 8.2.3]

8.2.3* Leak Check.

8.2.3.1 Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage.

8.2.3.2 Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

8.2.3.3 Where minor repairs have been made in accordance with 8.1.1.3, no additional leak checks shall be required.

Statement of Problem and Substantiation for Public Comment

The committee rejected this recommendation in PI-64 stating: “Any repairs require a leak check prior to placing the system back into use.” The proposed reference to 8.1.1.3, which includes requirements for leak testing provides this check. The committee’s technical substantiation did not support the rejection of PI-64 and this comment should be accepted.

Related Item

• PI 64

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 13:46:24 EDT 2022
Committee: NFG-AAA

Public Comment No. 47-NFPA 54-2022 [Section No. 8.3.4]

8.3.4 Abandoned Fuel Gas Piping.

Where fuel gas piping is removed from service for an indefinite time period, it shall be purged of fuel gas .

Statement of Problem and Substantiation for Public Comment

This is an editorial change that may seem obvious to most but will remove any ambiguity.

Related Item

• FR No. 43

Submitter Information Verification

Submitter Full Name: Bruce Swiecicki
Organization: National Propane Gas Associati
Affiliation: NPGA
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 15:20:26 EDT 2022
Committee: NFG-AAA

Public Comment No. 18-NFPA 54-2022 [Section No. 9.1.6.1]

9.1.6.1

Where ~~corrosive~~ corrosive fumes or ~~flammable process fumes or~~ gases ~~, such as carbon monoxide, hydrogen sulfide, ammonia, chlorine, and halogenated hydrocarbons, as are present, means for their safe disposal shall be provided.~~ are present in the appliance operating environment in concentrations that can compromise the appliances safe operations the following shall be provided:

a) A means for safe disposal or dilution of the corrosive fumes shall be provided.

b) The appliance shall be listed and labeled for the environmental conditions.

c) Fired appliances shall be located in a mechanical room separate or partitioned off from other areas with provisions for combustion and dilution air from outdoors.

d) The appliance shall be direct vent and installed in accordance with the appliance manufacturers installation instructions.

Statement of Problem and Substantiation for Public Comment

The committee rejected PI 50 identifying conflicts in the way it was written. I have removed the flammable gas issue because if the appliance is actually subjected to a flammable gas environment it would likely be a hazardous condition and also not compliant with a listing requirement. Likely that nothing is listed to be operated in a flammable environment. This revision has been reduced in complexity and made more focused on what I believe the original intent of this item was, (corrosive) environements.

Related Item

• PI 50

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 15 18:55:55 EDT 2022
Committee: NFG-AAA

Public Comment No. 19-NFPA 54-2022 [Section No. 9.1.6.2]

~~9.1.6.2~~ –

~~Where chemicals that generate corrosive or flammable products such as aerosol sprays are routinely used, one of the following shall apply to fired appliances where these chemicals can enter combustion air:~~

(1) ~~Fired appliances shall be located in a mechanical room separate or partitioned off from other areas with provisions for combustion and dilution air from outdoors.~~

(2) ~~The appliances shall be direct vent and installed in accordance with the appliance manufacturer's installation instructions.~~

Statement of Problem and Substantiation for Public Comment

Propose eliminating this and instead addressing these issues in 9.1.6.1 PC

Related Item

• PI 49

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 15 19:15:29 EDT 2022
Committee: NFG-AAA

Public Comment No. 20-NFPA 54-2022 [Section No. 9.1.7]

~~**9.1.7** – Process Air.~~

~~In addition to air needed for combustion in commercial or industrial processes, process air shall be provided as required for cooling of appliances, equipment, or material; for controlling dew point, heating, drying, oxidation, dilution, safety exhaust, odor control, and air for compressors; and for comfort and proper working conditions for personnel.~~

Statement of Problem and Substantiation for Public Comment

This should be annex material. It's not enforceable. It contains things that would be installation requirements by the manufacturer. It contains comfort things that would be ventilation related.

Related Item

• PI 53

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 15 19:30:29 EDT 2022
Committee: NFG-AAA

Public Comment No. 21-NFPA 54-2022 [Section No. 9.1.8.2]

9.1.8.2

~~At the~~ If locations selected for installation of appliances and equipment ~~, the~~ are other than at grade on a slab or within a basement the following shall be provided:

a) The dynamic and static load- carrying capacities of the building structure ~~shall be checked~~ must be validated by a licensed engineer to determine ~~whether they are~~ that they are adequate to carry the additional loads.

b) The appliances and equipment shall be supported and shall be connected to the piping so as not to exert undue stress on the connections.

Statement of Problem and Substantiation for Public Comment

The current language is not enforceable. The determination of static and dynamic loads is a very complex requirement that usually requires sophisticated software models and considerable expertise. This needs to be in the hands of a qualified professional engineer. I also made for no requirement for this if equipment is installed on a slab in a basement or at grade since the load is not then supported by the building structure.

Related Item

• PI 83

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Sat Apr 16 07:28:30 EDT 2022
Committee: NFG-AAA

Public Comment No. 39-NFPA 54-2022 [Section No. 9.1.17]

~~**9.1.17** – Gas Appliance Pressure Regulators.~~

~~Where the gas supply pressure is higher than that at which the appliance is designed to operate or varies beyond the design pressure limits of the appliance, a gas appliance pressure regulator listed in accordance with ANSI Z21.18/CSA 6.3, *Gas Appliance Pressure Regulators* , shall be installed.~~

Statement of Problem and Substantiation for Public Comment

Appliance pressure regulators are part of appliances, and are not covered by this Code, therefore requirements for such regulators are deleted. Alternately, the requirement could be revised to require line pressure regulators.

Related Item

• FR-12

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 20 13:52:17 EDT 2022
Committee: NFG-AAA

Public Comment No. 22-NFPA 54-2022 [Section No. 9.1.21]

9.1.21 Protection of Outdoor Appliances.

Appliances not listed for outdoor installation but installed outdoors shall be provided with protection to the degree that the environment requires. Appliances listed for outdoor installation shall be permitted to be installed without protection in accordance with the manufacturer's installation instructions.

Statement of Problem and Substantiation for Public Comment

In my opinion, this is a horrible section. It tells people that they can knowingly violate listing standards. The statement is made that you can install an indoor appliance outside so long as you accommodate environmental issues. The real issue is that you would have to make the environment equivalent or better to whatever the listing requirements needed them to be. We cannot expect installers to understand all of the nuances of listing requirements or listing standards and then attempt to replicate them completely and reliably in the field. Who would want to take responsibility for these kinds of accommodations and why? The second sentence in the statement is completely worthless since all equipment is already understood to be able to be installed according to the manufacturer's requirements. This item is better removed, too much risk, and not enforceable.

Related Item

• PI 84

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Sat Apr 16 07:41:14 EDT 2022
Committee: NFG-AAA

Public Comment No. 14-NFPA 54-2022 [Section No. 10.11.2]

10.11.2 Clearance for Listed Appliances.

10.11.2.1 Floor-mounted food service appliances, ~~such as ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens,~~ shall be installed at least 6 in. (150 mm) from combustible material except that at least a 2 in. (50 mm) clearance shall ~~be maintained~~ be provided between a draft hood and combustible material.

10.11.2.2 Floor-mounted food service appliances listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.

10.11.2.3 Appliances designed and marked "For use only in noncombustible locations" shall not be installed elsewhere.

A.10.11.2 Examples of floor-mounted food service appliances are ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens.

Statement of Problem and Substantiation for Public Comment

1. The requirements is separated into 3 paragraphs, as they are separate requirements
2. The list of floor-mounted food service appliances is relocated to Annex A as lists are never complete, and belong in Annex A.
3. The requirement for clearance between a draft hood and combustible material is revised that the clearance be provided, rather than maintained. It is not the responsibility of the installer to maintain this distance into the future, rather to ensure that is exists at the time of installation.

Related Item

• PI 70

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 06 14:42:30 EDT 2022
Committee: NFG-AAA

Public Comment No. 11-NFPA 54-2022 [Section No. 10.17.2]

10.17.2 Protection ~~Above Domestic Units.~~

~~Domestic~~

Above Open Top Broilers.

10.17.2.1 open-top broiler ~~units~~ units shall be provided with a metal ventilating hood not less than 0.0122 in. (0.3 mm) thick with a clearance of not less than ¼ in. (6 mm) between the hood and the underside of combustible material or metal cabinets. ~~A clearance of at least 24 in. (610 mm) shall be maintained between the~~

10.17.2.2 The clearance between the cooking top and the combustible material or metal cabinet, and the hood shall be ~~at~~ a minimum of 24 in. (610 mm) at least as wide as the open-top broiler unit and centered over the unit. ~~Domestic~~

10.17.2.3 open-top broiler units installed in residential occupancies incorporating an integral exhaust system and listed for use without a ventilating hood shall not be required to be provided with a ventilating hood if installed in accordance with 10.13.3.1(1).

Statement of Problem and Substantiation for Public Comment

1. The requirement is separated into 3 separate paragraphs as there are 3 different requirements
2. The term "domestic" is deleted as it does not appear to be used in the Z21 appliance standards, and the requirement is revised to be applicable to all open top broiler units.

Related Item

• PI 68

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 14:08:28 EDT 2022
Committee: NFG-AAA

Public Comment No. 2-NFPA 54-2022 [New Section after 10.18]

10.18.1 Ventilation.

When an outdoor cooking appliance is mounted above a cabinet or other space capable of allowing the accumulation of the fuel gas, ventilation shall be required. A minimum of two (2) vents shall be placed on opposite sides of the cabinet or space and within three (3) inches of the bottom of the space. Each vent shall be at a minimum 4 x 4 inches (or 4.5 inches diameter) or equivalent with a minimum of 16 square inches of unrestricted opening.

Statement of Problem and Substantiation for Public Comment

As a fire investigator, I have investigated far to many built-in gas grill explosions. Manufacturers' instructions are often lacking as to how to provide ventilation when, 1) gas is piped in versus the use of an attached propane cylinder, 2) provide proper ventilation when there is an attached propane cylinder, 3) how to provide any ventilation at all. I have even run across manufacturers' instructions which, when it comes to ventilation for their product, have only said "follow NFPA rules for ventilation"! Clearly, some minimum guidance is needed. While providing a minimum ventilation requirement will not prevent all fire/explosion incidents, it can prevent a good number of them.

Related Item

- Public Safety

Submitter Information Verification

Submitter Full Name: Richard Meier
Organization: Meier Fire Investigation LLC
Street Address:
City:
State:
Zip:
Submittal Date: Sat Mar 19 07:25:32 EDT 2022
Committee: NFG-AAA

Public Comment No. 33-NFPA 54-2022 [Section No. 11.6]

11.6* Checking the Draft.

Draft hood–equipped appliances shall be checked to verify that there is no draft hood spillage after 5 minutes of main burner operation under the following conditions:

(1) The building or structure envelope is complete and intact ~~, and all openings to the outdoors are closed~~ such that it represents the future operating conditions of the appliances .

(2) All combustion air systems and openings are in place.

(3) All air-exhausting appliances, power-vented appliances, and exhaust fans are operating.

(4) All air-moving equipment used for heating, cooling, or ventilation is operating.

(5) The draft hood spillage test is conducted only after all previous conditions in this section are established.

Statement of Problem and Substantiation for Public Comment

This is submitted by the TG on combustion air. The revisions provide a more complete set of circumstances that could impact the accuracy and usefulness of a draft test. The new considerations include the impacts of exhaust fan and air handler operations and the state of the building completion and configuration.

Related Item

• PC 33

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 16 10:44:27 EDT 2022
Committee: NFG-AAA

Public Comment No. 12-NFPA 54-2022 [Section No. 12.3.2 [Excluding any Sub-Sections]]

The following appliances shall not be required to be vented:

(1) Listed ranges

(2) Built-~~in domestic~~ in cooking units listed and marked for optional venting

(3) Listed hot plates

(4) Listed Type 1 clothes dryers exhausted in accordance with Section 10.4

(5) A single listed booster-type (automatic instantaneous) water heater, when designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided that the appliance is installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system [Where installed in this manner, the draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.]

(6) Listed refrigerators

(7) Counter appliances

(8) Room heaters listed for unvented use

(9) Direct gas–fired make-up air heaters

(10) Other appliances listed for unvented use and not provided with flue collars

(11) Specialized appliances of limited input such as laboratory burners or gas lights

Statement of Problem and Substantiation for Public Comment

The requirement in (2) is revised by deleting "domestic" and will apply to all built in cooking units. Domestic is deleted because:
1. Domestic is not defined.
2. Domestic was used in the ANSI Z21 standards, but this is being replaced by "household".
3. The requirement is the same with or without "domestic"

Related Item

• PI 72

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 14:24:47 EDT 2022
Committee: NFG-AAA

Public Comment No. 13-NFPA 54-2022 [Section No. A.5.3.2.1]

A.5.3.2.1

Some older appliances do not have a nameplate. In this case Table A.5.3.2.1 or an estimate of the appliance input should be used. The input can be based on the following:

(1) A rating provided by the manufacturer

(2) The rating of similar appliances

(3) Recommendations of the gas supplier

(4) Recommendations of a qualified agency

(5) A gas flow test

(6) Measurement of the orifice size of the appliance

The requirement of 5.3.1 that the piping system provide sufficient gas to each appliance inlet must be complied with.

Table A.5.3.2.1 Approximate Gas Input for ~~Typical~~ Selected Appliances used in residential occupancies

Appliance	Input Btu/hr (Approx.)
Space Heating Units	
Warm air furnace	-
Single family	100,000
Multifamily, per unit	60,000
Hydronic boiler	-
Single family	100,000
Multifamily, per unit	60,000
Space and Water Heating Units	
Hydronic boiler	-
Single family	120,000
Multifamily, per unit	75,000
Water Heating Appliances	-
Water heater, automatic storage 30 gal to 40 gal tank	35,000
Water heater, automatic storage 50 gal tank	50,000
Water heater, automatic instantaneous	-
Capacity at 2 gal/min	142,800
Capacity at 4 gal/min	285,000
Capacity at 6 gal/min	428,400
Water heater, ~~domestic,~~ circulating or side-arm	35,000
Cooking Appliances	-
Range, freestanding~~, domestic~~	65,000
Built-in oven or broiler unit~~, domestic~~	25,000
Built-in top unit~~, domestic~~	40,000
Other Appliances	-
Refrigerator	3,000
Clothes dryer, Type 1 (domestic)	35,000
Gas fireplace direct vent	40,000
Gas log	80,000
Barbecue	40,000
Gas light	2,500

Statement of Problem and Substantiation for Public Comment

The title of the Table A.5.3.2.1 is revised to reflect the contents of the Table. In addition, "domestic" is deleted in 4 table entries.

The term "domestic" is not needed in the table.

Related Item

• PI 73

Submitter Information Verification

Submitter Full Name: Theodore Lemoff
Organization: TLemoff Engineering
Affiliation: None
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 05 14:36:44 EDT 2022
Committee: NFG-AAA

Public Comment No. 34-NFPA 54-2022 [Section No. A.9.3.2.2]

A.9.3.2.2

See Table A.9.3.2.2(a) and Table A.9.3.2.2(b).

Table A.9.3.2.2(a) Known Air Infiltration Rate Method: Minimum Space Volume for Appliances Other than Fan-Assisted for Specified Infiltration Rates ***(ACH)***

Appliance Input (Btu/hr)	Space Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
5,000	420	350	300
10,000	840	700	600
15,000	1,260	1,050	900
20,000	1,680	1,400	1,200
25,000	2,100	1,750	1,500
30,000	2,520	2,100	1,800
35,000	2,940	2,450	2,100
40,000	3,360	2,800	2,400
45,000	3,780	3,150	2,700
50,000	4,200	3,500	3,000
55,000	4,620	3,850	3,300
60,000	5,040	4,200	3,600
65,000	5,460	4,550	3,900
70,000	5,880	4,900	4,200
75,000	6,300	5,250	4,500
80,000	6,720	5,600	4,800
85,000	7,140	5,950	5,100
90,000	7,560	6,300	5,400
95,000	7,980	6,650	5,700
100,000	8,400	7,000	6,000
105,000	8,820	7,350	6,300
110,000	9,240	7,700	6,600
115,000	9,660	8,050	6,900
120,000	10,080	8,400	7,200
125,000	10,500	8,750	7,500
130,000	10,920	9,100	7,800
135,000	11,340	9,450	8,100
140,000	11,760	9,800	8,400
145,000	12,180	10,150	8,700
150,000	12,600	10,500	9,000
160,000	13,440	11,200	9,600
170,000	14,280	11,900	10,200
180,000	15,120	12,600	10,800
190,000	15,960	13,300	11,400
200,000	16,800	14,000	12,000
210,000	17,640	14,700	12,600
220,000	18,480	15,400	13,200

Appliance Input (Btu/hr)	Space Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
230,000	19,320	16,100	13,800
240,000	20,160	16,800	14,400
250,000	21,000	17,500	15,000
260,000	21,840	18,200	15,600
270,000	22,680	18,900	16,200
280,000	23,520	19,600	16,800
290,000	24,360	20,300	17,400
300,000	25,200	21,000	18,000

For SI units, 1 ft^3 = 0.028 m^3, 1000 Btu/hr = 0.293 kW.

ACH: Air change per hour.

Table A.9.3.2.2(b) Known Air Infiltration Rate Method: Minimum Space Volume for Fan-Assisted Appliance, for Specified Infiltration Rates ***(ACH)***

Appliance Input (Btu/hr)	Required Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
5,000	300	250	214
10,000	600	500	429
15,000	900	750	643
20,000	1,200	1,000	857
25,000	1,500	1,250	1,071
30,000	1,800	1,500	1,286
35,000	2,100	1,750	1,500
40,000	2,400	2,000	1,714
45,000	2,700	2,250	1,929
50,000	3,000	2,500	2,143
55,000	3,300	2,750	2,357
60,000	3,600	3,000	2,571
65,000	3,900	3,250	2,786
70,000	4,200	3,500	3,000
75,000	4,500	3,750	3,214
80,000	4,800	4,000	3,429
85,000	5,100	4,250	3,643
90,000	5,400	4,500	3,857
95,000	5,700	4,750	4,071
100,000	6,000	5,000	4,286
105,000	6,300	5,250	4,500
110,000	6,600	5,500	4,714
115,000	6,900	5,750	4,929
120,000	7,200	6,000	5,143
125,000	7,500	6,250	5,357
130,000	7,800	6,500	5,571

Appliance Input (Btu/hr)	Required Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
135,000	8,100	6,750	5,786
140,000	8,400	7,000	6,000
145,000	8,700	7,250	6,214
150,000	9,000	7,500	6,429
160,000	9,600	8,000	6,857
170,000	10,200	8,500	7,286
180,000	10,800	9,000	7,714
190,000	11,400	9,500	8,143
200,000	12,000	10,000	8,571
210,000	12,600	10,500	9,000
220,000	13,200	11,000	9,429
230,000	13,800	11,500	9,857
240,000	14,400	12,000	10,286
250,000	15,000	12,500	10,714
260,000	15,600	13,000	11,143
270,000	16,200	13,500	11,571
280,000	16,800	14,000	12,000
290,000	17,400	14,500	12,429
300,000	18,000	15,000	12,857

For SI units, 1 ft^3 = 0.028 m^3, 1000 Btu/hr = 0.293 kW.

ACH: Air change per hour.

Additional Proposed Changes

File Name	Description	Approved
A.9.3.2_December_27.docx	text to add to this section	

Statement of Problem and Substantiation for Public Comment

The text added to this section is work of the TG on combustion air. The added text provides a method for converting ACH50, (which is commonly used in building tightness evaluations), to ACHNAT which is the parameter used in this code.

This additional text provides a better understanding of combustion air deficiencies and the determination of combustion air volume requirements based on the tightness of the building.

Related Item

• Pr 34

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:

State:	
Zip:	
Submittal Date:	Mon May 16 10:57:43 EDT 2022
Committee:	NFG-AAA

*9.3.2.2.

Meeting the requirements of the “Known Air Infiltration Rate Method” is not a guarantee that the equipment will pass the section 11.6 draft test with current tighter construction, and remodeling, and weatherization methods. There are also factors related to building airflows and combustion air that cannot be quantified or predicted including leakage of supply and return ducts in unconditioned spaces, multiple appliances operating at the same time, operation of exhaust fans, wind and weather conditions, and isolation of appliance areas from sources of combustion air by the closing of doors. This code is not a design manual and should not be considered as such. The formula used to determine the required indoor air volume is meant to provide you with the best guidance available at this time. Even tracer gas methods, for determining air infiltration rates, which require specialized equipment, can only determine rates of flow for the time and conditions when the test is conducted.

ACH (air changes per hour) in this formula is the number of air changes that occur within the building by natural means;($ACH_{NAT.}$). Several methods to measure this although many factors affect this value including wind velocities, wind direction, barometric pressure, and the number and type of appliances installed and operated within the building.
Tracer gas methods have been developed to determine ACH. These produce the most reliable values for ACH. However, these methods can be expensive and cumbersome and out of reach of most contractors and or installers. Other published methods for estimating ACH’s include ASHRAE estimating methods and those developed by the Air Conditioning Contractors of America Manual J, Residential Load Calculations, which includes tightness categories and estimated ACH for each category. The most prevalent technology in use today for evaluating air leakage characteristics associated with structures is through the use of blower door testing. This tool does provide a somewhat consistent and quantifiable means for arriving at the air leakage at a uniform depressurization of the building compared to the atmosphere, normally 50 pascals, and is called ACH_{50}. This method has been successfully correlated to tracer gas measured natural air infiltration rates. ASHRAE 62.2 provides a method for converting ACH_{50} to an ACH value that reflects the actual number of air changes under normal conditions, called ACH_{NAT}.

Many buildings constructed to current building and energy codes can achieve very low $ACH_{NAT.}$ values, which require a relatively large indoor volume for naturally drafted appliances. Designers, builders, installers, and inspectors should know that these kinds of values may require indoor air volumes that are greater than structures have available. In these cases, draft testing, identified in section 11.6 of this Code, may fail. This could require an alternate means of appliance venting, replacing the appliance, or other remedies for achieving the required combustion air other than using indoor air.

Public Comment No. 35-NFPA 54-2022 [Chapter G]

Annex G Recommended Procedure for Safety Inspection of an Existing Appliance Installation

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

For SI units, 1 Btu/hr = 0.293 W.

G.1 General.

The following procedure is intended as a guide to aid in determining that an appliance is properly installed and is in a safe condition for continued use. Where a gas supplier performs an inspection, their written procedures should be followed.

G.1.1 Application.

This procedure is intended for existing residential installations of a furnace, boiler, room heater, water heater, cooking appliance, fireplace appliance, and clothes dryer. This procedure should be performed prior to any attempt to modify the appliance installation or building envelope.

G.1.2 Weatherization Programs.

Before a building envelope is to be modified as part of a weatherization program, the existing appliance installation should be inspected in accordance with these procedures. After all unsafe conditions are repaired, and immediately after the weatherization is complete, the appliance inspections in G.5.2 are to be repeated.

G.1.3 Inspection Procedure.

The safety of the building occupant and inspector are to be determined as the first step as described in Section G.2. Only after the ambient environment is found to be safe should inspections of gas piping and appliances be undertaken. It is recommended that all inspections described in Sections G.3, G.4, and G.6, where the appliance is in the off mode, be completed and any unsafe conditions repaired or corrected before continuing with inspections of an operating appliance described in Sections G.5 and G.6.

G.1.4 Manufacturer Instructions.

Where available, the manufacturer’s installation and operating instructions for the installed appliance should be used as part of these inspection procedures to determine if the appliance is installed correctly and is operating properly.

G.1.5 Instruments.

The inspection procedures include measuring for fuel gas and carbon monoxide (CO) and will require the use of a combustible gas detector (CGD) and a CO detector. It is recommended that both types of detectors be listed. Prior to any inspection, the detectors should be calibrated or tested in accordance with the manufacturer's instructions. In addition, it is recommended that the detectors have the following minimum specifications:

(1) Gas Detector: The CGD should be capable of indicating the presence of the type of fuel gas for which it is to be used (e.g. natural gas or propane). The combustible gas detector should be capable of the following:

   (a) *PPM:* Numeric display with a parts per million (ppm) scale from 1 ppm to 900 ppm in 1 ppm increments

   (b) *LEL:* Numeric display with a percent lower explosive limit (% LEL) scale from 0 percent to 100 percent in 1 percent increments

   (c) *Audio:* An audio sound feature to locate leaks

(2) CO Detector: The CO detector should be capable of the following functions and have a numeric display scale as follows:

   (a) *PPM:* For measuring ambient room and appliance emissions a display scale in parts per million (ppm) from 0 to 1,000 ppm in 1 ppm increments

   (b) *Alarm:* A sound alarm function where hazardous levels of ambient CO is found (*see Section G.2 for alarm levels*)

   (c) *Air Free:* Capable of converting CO measurements to an air-free level in ppm. Where a CO detector is used without an air-free conversion function, the CO air free can be calculated in accordance with Footnote 3 in Table G.6.

G.2 Occupant and Inspector Safety.

Prior to entering a building, the inspector should have both a combustible gas detector (CGD) and CO detector turned on, calibrated, and operating. Immediately upon entering the building, a sample of the ambient atmosphere should be taken. Based on CGD and CO detector readings, the inspector should take the following actions:

(1) Where the CO detector indicates a carbon monoxide level of 70 ppm or greater, the inspector should immediately notify the occupant of the need for themselves and any building occupant to evacuate; the inspector should immediately evacuate and call 911.

(2) Where the CO detector indicates a reading between 30 ppm and 70 ppm, the inspector should advise the occupant that high CO levels have been found and recommend that all possible sources of CO be turned off immediately and windows and doors be opened. Where it appears that the source of CO is a permanently installed appliance, advise the occupant to shut the appliance off and have the appliance serviced by a qualified servicing agent.

(3) Where the CO detector indicates CO below 30 ppm, the inspection can continue. (See U.S. Consumer Product Safety Commission, *Responding to Residential Carbon Monoxide Incidents, Guidelines For Fire and Other Emergency Response Personnel*)

(4) Where the CGD indicates a combustible gas level of 20 percent LEL or greater, the inspector should immediately notify the occupant of the need for themselves and any building occupant to evacuate; the inspector should immediately evacuate and call 911.

(5) Where the CGD indicates a combustible gas level below 20 percent LEL, the inspection can continue.

If during the inspection process it is determined a condition exists that could result in unsafe appliance operation, shut off the appliance and advise the owner of the unsafe condition. Where a gas leak is found that may result in an unsafe condition, advise the owner of the unsafe condition and call the gas supplier to turn off the gas supply. The inspector should not continue a safety inspection on an operating appliance, venting system, and piping system until repairs have been made.

G.3 Gas Piping and Connection Inspections.

G.3.1 Leak Checks.

Conduct a test for gas leakage using either a noncorrosive leak detection solution or a CGD confirmed with a leak detection solution.

The preferred method for leak checking is by use of gas leak detection solution applied to all joints. This method provides a reliable visual indication of significant leaks.

The use of a CGD in its audio sensing mode can quickly locate suspect leaks but can be overly sensitive indicating insignificant and false leaks. All suspect leaks found through the use of a CGD should be confirmed using a leak detection solution.

Where gas leakage is confirmed, the owner should be notified that repairs must be made. The inspection should include the following components:

(1) All gas piping fittings located within the appliance space

(2) Appliance connector fittings

(3) Appliance gas valve/regulator housing and connections

G.3.2 Appliance Connector.

Verify that the appliance connection type is compliant with Section 9.6. Inspect flexible appliance connections to determine if they are free of cracks, corrosion, and signs of damage. Verify that there are no uncoated copper alloy connectors. Where connectors are determined to be unsafe or where an uncoated copper alloy connector is found, the appliance shutoff valve should be placed in the off position and the owner notified that the connector must be replaced.

G.3.3 Piping Support.

Inspect piping to determine that it is adequately supported, that there is no undue stress on the piping, and if there are any improperly capped pipe openings.

G.3.4 Bonding.

Verify that the electrical bonding of gas piping is compliant with Section 7.12.

G.4 Inspections to Be Performed with the Appliance Not Operating.

The following safety inspection procedures are performed on appliances that are not operating. These inspections are applicable to all appliance installations.

G.4.1 Preparing for Inspection.

Shut off all gas and electrical power to the appliances located in the same room being inspected. For gas supply, use the shutoff valve in the supply line or at the manifold serving each appliance. For electrical power, place the circuit breaker in the off position or remove the fuse that serves each appliance. A lock type device or tag should be installed on each gas shutoff valve and at the electrical panel to indicate that the service has been shut off for inspection purposes.

G.4.2 Vent System Size and Installation.

Verify that the existing venting system size and installation are compliant with Chapters 12 and 13. The size and installation of venting systems for other than natural draft and Category I appliances should be in compliance with the manufacturer's installation instructions. Inspect the venting system to determine that it is free of blockage, restriction, leakage, corrosion, and other deficiencies that could cause an unsafe condition. Inspect masonry chimneys to determine if they are lined. Inspect plastic venting system to determine that it is free of sagging and it is sloped in an upward direction to the outdoor vent termination.

G.4.3 Combustion Air Supply.

Inspect provisions for combustion air as follows:

(1) *Non-Direct Vent Appliances.* Determine that non-direct vent appliance installations are compliant with the combustion air requirements in Section 9.3. Inspect any interior and exterior combustion air openings and any connected combustion air ducts to determine that there is no blockage, restriction, corrosion, or damage. Inspect to determine if horizontal combustion air ducts are sloped upward toward the air supply source.

(2) *Direct Vent Appliances.* Verify that the combustion air supply ducts and pipes are securely fastened to direct vent appliance and determine that there are no separations, blockage, restriction, corrosion, or other damage. Determine that the combustion air source is located in the outdoors or to areas that freely communicate to the outdoors.

(3) *Unvented Appliances.* Verify that the total input of all unvented room heaters and gas-fired refrigerators installed in the same room or rooms that freely communicate with each other does not exceed 20 Btu/hr/ft^3.

G.4.4 Flooded Appliances.

Inspect the appliance for signs that the appliance has been damaged by flooding. Signs of flooding include a visible water submerge line on the appliance housing, excessive surface or component rust, deposited debris on internal components, and mildew-like odor. Inform the owner that flood-damaged appliances should be replaced.

G.4.5 Flammable Vapors.

Inspect the room/space where the appliance is installed to determine if the area is free of the storage of gasoline or any flammable products such as oil-based solvents, varnishes or adhesives. Where the appliance is installed where flammable products will be stored or used, such as a garage, verify that the appliances burner is a minimum of 18 in. above the floor unless the appliance is listed as flammable vapor ignition–resistant.

G.4.6 Clearances to Combustibles.

Inspect the immediate location where the appliance is installed to determine if the area is free of rags, paper, or other combustibles. Verify that the appliance and venting system is compliant with clearances to combustible building components in 9.2.2.

G.4.7 Appliance Components.

Inspect internal components by removing access panels or other components for the following:

(1) Inspect burners and crossovers for blockage and corrosion. The presence of soot, debris, and signs of excessive heating could indicate incomplete combustion due to blockage or improper burner adjustments.

(2) Metallic and non-metallic hoses for signs of cracks, splitting, corrosion, and loose connections

(3) Signs of improper or incomplete repairs

(4) Modifications that override controls and safety systems

(5) Electrical wiring for loose connections; cracked, missing, or worn electrical insulation; and indications of excessive heat or electrical shorting. Appliances requiring an external electrical supply should be inspected for proper electrical connection in accordance with *NFPA 70*.

G.4.8 Placing Appliances Back in Operation.

Return all inspected appliances and systems to their pre-existing state by reinstalling any removed access panels and components. Turn on the gas supply and electricity to each appliance found in safe condition. Proceed to the operating inspections in Section G.5 through Section G.6.

G.5 Inspections to Be Performed with the Appliance Operating.

The following safety inspection procedures are to be performed on appliances that are operating where there are no unsafe conditions or where corrective repairs have been completed.

G.5.1 General Appliance Operation.

(1) *Initial Startup.* Adjust the thermostat or other control device to start the appliance. Verify that the appliance starts up normally and is operating properly.

Determine that the pilot(s), where provided, is burning properly and that the main burner ignition is satisfactory by interrupting and re-establishing the electrical supply to the appliance in any convenient manner. If the appliance is equipped with a continuous pilot(s), test all pilot safety devices to determine whether they are operating properly by extinguishing the pilot(s) when the main burner(s) is off and determining, after 3 minutes, that the main burner gas does not flow upon a call for heat. If the appliance is not provided with a pilot(s), test for proper operation of the ignition system in accordance with the appliance manufacturer's lighting and operating instructions.

(2) *Flame Appearance.* Visually inspect the flame appearance for proper color and appearance. Visually determine that the main burner gas is burning properly (i.e., no floating, lifting, or flashback). Adjust the primary air shutter as required. If the appliance is equipped with high and low flame controlling or flame modulation, check for proper main burner operation at low flame.

(3) *Appliance Shutdown.* Adjust the thermostat or other control device to shut down the appliance. Verify that the appliance shuts off properly.

G.5.2 Test for Combustion Air and Vent Drafting for Natural Draft and Category I Appliances.

Combustion air and vent draft procedures are for natural draft and category I appliances equipped with a draft hood and connected to a natural draft venting system.

(1) *Preparing for Inspection.* Close all exterior building doors and windows and all interior doors between the space in which the appliance is located and other spaces of the building that can be closed. Turn on any clothes dryer. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers and any fireplace doors.

(2) *Placing the Appliance in Operation.* Place the appliance being inspected in operation. Adjust the thermostat or control so the appliance will operate continuously.

(3) *Spillage Test.* Verify that all appliances located within the same room are in their standby mode and ready for operation. Follow lighting instructions for each appliance as necessary. Test for spillage at the draft hood relief opening as follows:

  (a) After 5 minutes of main burner operation, check for spillage using smoke.

  (b) Immediately after the first check, turn on all other fuel gas burning appliances within the same room so they will operate at their full inputs and repeat the spillage test.

  (c) Shut down all appliances to their standby mode and wait for 15 minutes.

  (d) Repeat the spillage test steps (a) through (c) on each appliance being inspected.

(4) *Additional Spillage Tests:* Determine if the appliance venting is impacted by other door and air handler settings by performing the following tests:

  (a) Set initial test condition in accordance with G.5.2(1).

  (b) Place the appliance(s) being inspected in operation. Adjust the thermostat or control so the appliance(s) will operate continuously.

  (c) Open the door between the space in which the appliance(s) is located and the rest of the building. After 5 minutes of main burner operation, check for spillage at each appliance using smoke.

  (d) Turn on any other central heating or cooling air handler fan that is located outside of the area where the appliances are being inspected. After 5 minutes of main burner operation, check for spillage at each appliance using smoke. The test should be conducted with the door between the space in which the appliance(s) is located and the rest of the building in the open and in the closed position.

(5) Return doors, windows, exhaust fans, fireplace dampers, and any other fuel gas burning appliance to their previous conditions of use.

(6) If spillage occurs during testing, the owner should be notified, be instructed as to which configuration of the home would lessen its impact, and arrange for corrective action by an HVAC or venting professional. Where it is believed that the venting system performance is inadequate, the owner should be notified that alternative vent sizing, design, or configuration is needed in accordance with Chapters 12 and 13. Where it is believed that sufficient combustion air is not available, the owner should be notified that additional combustion air is needed in accordance with Section 9.3.

G.6 Appliance-Specific Inspections.

The following appliance-specific inspections are to be performed as part of a complete inspection. These inspections are performed either with the appliance in the off or standby mode (indicated by "*OFF*") or on an appliance that is operating (indicated by "*ON*"). The CO measurements are to be taken only after the appliance is determined to be venting properly. The CO detector should be capable of calculating CO emissions in ppm air free. Table G.6 contains CO thresholds for specific appliances.

Table G.6 CO Thresholds

Appliance	Threshold Limit
Central furnace (all categories)	400 ppm[a] air free[b,c]
Floor furnace	400 ppm air free
Gravity furnace	400 ppm air free
Wall furnace	200 ppm air free
Wall furnace (direct vent)	400 ppm air free
Vented room heater	200 ppm air free
Vent-free room heater	200 ppm air free
Boilers (all categories)	400 ppm air free
Water heater	200 ppm air free
Oven/Broiler	225 ppm as measured
Top burner	25 ppm as measured (per burner)
Clothes dryer	400 ppm air free
Refrigerator	25 ppm as measured
Gas log (gas fireplace)	25 ppm as measured in vent
Gas log (installed in wood-burning fireplace)	400 ppm air free in firebox

Notes:

[a]Parts per million

[b]Air-free emission levels are based on a mathematical equation (involving carbon monoxide and oxygen or carbon dioxide readings) to convert an actual diluted flue gas carbon monoxide testing sample to an undiluted air-free flue gas carbon monoxide level utilized in the appliance certification standards. For natural gas or propane, using as-measured CO ppm and O_2 percentage:

$$CO_{AFppm} = \left(\frac{20.9}{20.9 - O_2} \right) \times CO_{ppm} \quad \textbf{[G.6a]}$$

where:

CO_{AFppm} = Carbon monoxide, air-free ppm

CO_{ppm} = As-measured combustion gas carbon monoxide

O_2 = Percentage of oxygen in combustion gas, as a percentage

[c]An alternate method of calculating the CO air-free when access to an oxygen meter is not available:

$$CO_{(air-free)} = \frac{UCO_2}{CO_2}(CO) \quad \textbf{[G.6b]}$$

where:

UCO_2 = Ultimate concentration of carbon dioxide for the fuel being burned in percent for natural gas (12.2 percent) and propane (14.0 percent)

CO_2 = Measured concentration of carbon dioxide in combustion products in percent

CO = Measured concentration of carbon monoxide in combustion products in percent

G.6.1 Forced Air Furnaces.

(1) *OFF.* Verify that an air filter is installed and that it is not excessively blocked with dust.

(2) *OFF.* Inspect visible portions of the furnace combustion chamber for cracks, ruptures, holes, and corrosion. A heat exchanger leakage test should be conducted.

(3) *ON.* Verify that both the limit and fan controls are operating properly. Limit control operation can be checked by blocking the circulating air inlet or temporarily disconnecting the electrical supply to the blower motor and determining that the limit control acts to shut off the main burner gas.

(4) *ON.* Verify that the blower compartment door is installed properly and can be resecured properly if opened. Verify that the blower compartment door safety switch operates properly.

(5) *ON.* Check for flame disturbance before and after blower comes on, which can indicate heat exchanger leaks.

(6) *ON.* Measure the CO in the vent after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.2 Boilers.

(1) *OFF and ON.* Inspect for evidence of water leaks around boiler and connected piping.

(2) *ON.* Verify that the water pumps are in operating condition. Test low water cutoffs, automatic feed controls, pressure and temperature limit controls, and relief valves in accordance with the manufacturer's recommendations to determine that they are in operating condition.

(3) *ON*. Measure the CO in the vent after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.3 Water Heaters.

(1) *OFF.* Verify that the pressure-temperature relief valve is in operating condition. Water in the heater should be at operating temperature.

(2) *OFF.* Verify that inspection covers, glass, and gaskets are intact and in place on a flammable vapor ignition resistant (FVIR)–type water heater.

(3) *ON.* Verify that the thermostat is set in accordance with the manufacturer’s operating instructions and measure the water temperature at the closest tub or sink to verify that it is no greater than 120ºF.

(4) *OFF.* Where required by the local building code in earthquake-prone locations, inspect that the water heater is secured to the wall studs in two locations (high and low) using appropriate metal strapping and bolts.

(5) *ON.* Measure the CO in the vent after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.4 Cooking Appliances.

(1) *OFF.* Inspect oven cavity and range-top exhaust vent for blockage with aluminum foil or other materials.

(2) *OFF.* Inspect cook top to verify that it is free from a build-up of grease.

(3) *ON.* Measure the CO above each burner and at the oven exhaust vents after 5 minutes of burner operation. The CO should not exceed threshold in Table G.6.

G.6.5 Vented Room Heaters.

(1) *OFF.* For built-in room heaters and wall furnaces, inspect that the burner compartment is free of lint and debris.

(2) *OFF.* Inspect that furnishings and combustible building components are not blocking the heater.

(3) *ON.* Measure the CO in the vent after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.6 Vent-Free Heaters.

(1) *OFF.* Verify that the heater input is a maximum of 40,000 Btu/hr input, but not more than 10,000 Btu/hr where installed in a bedroom, and 6,000 Btu/hr where installed in a bathroom.

(2) *OFF.* Inspect the ceramic logs provided with gas log–type vent-free heaters to verify that they are located and aligned properly.

(3) *OFF.* Inspect the heater to verify that it is free of excess lint build-up and debris.

(4) *OFF.* Verify that the oxygen depletion safety shutoff system has not been altered or bypassed.

(5) *ON.* Verify that the main burner shuts down within 3 minutes by extinguishing the pilot light. The test is meant to simulate the operation of the oxygen depletion system (ODS).

(6) *ON.* Measure the CO after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.7 Gas Log Sets and Gas Fireplaces.

(1) *OFF.* For gas logs installed in wood-burning fireplaces equipped with a damper, verify that the fireplace damper is in a fixed open position.

(2) *ON.* Measure the CO in the firebox (log sets installed in wood burning fireplaces or in the vent [gas fireplace]) after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

G.6.8 Gas Clothes Dryer.

(1) *OFF.* Where installed in a closet, verify that a source of make-up air is provided and inspect that any make-up air openings, louvers, and ducts are free of blockage.

(2) *OFF.* Inspect for excess amounts of lint around the dryer and on dryer components. Verify that the lint trap is installed properly and that it does not have holes or tears. Verify that it is in a clean condition.

(3) *OFF.* Inspect visible portions of the exhaust duct and connections for loose fittings and connections, blockage, and signs of corrosion. Verify that the duct termination is not blocked and that it terminates in an outdoor location. Verify that only approved metal vent ducting material is installed (plastic and vinyl materials are not approved for gas dryers).

(4) *ON.* Verify mechanical components, including drum and blower, are operating properly.

(5) *ON.* Operate the clothes dryer and verify that exhaust system is intact and exhaust is exiting the termination.

(6) *ON.* Measure the CO at the exhaust duct or termination after 5 minutes of main burner operation. The CO should not exceed threshold in Table G.6.

Additional Proposed Changes

File Name	Description	Approved
TG_Final_2-22_NFPA_54_Annex_G_1_.docx	Annex G. Rewrite	

Statement of Problem and Substantiation for Public Comment

A complete rewrite of Annex G.5.2 is recommended by the task group on combustion air. The rewrite provides more accurate and comprehensive method for draft testing. The proposed method provides a means to consider more variables such as the impact of door closure, duct leakage, and testing sequence.

Related Item

- fr 36

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 16 11:05:33 EDT 2022
Committee: NFG-AAA

NFPA 54 Annex G. Redraft

G.5.2 Test for Combustion Air and Vent Drafting for Natural Draft and Category I Appliances for single-zone constant volume systems.

Combustion air and vent draft procedures are for natural draft and category I appliances equipped with a draft hood and connected to a natural draft venting system.

(1) Preparation For Testing.

a. Close all exterior building doors and windows and other openings to the outdoors.
b. Close solid-fuel burning appliances and fireplace dampers and combustion air controls.
c. Remove or replace the forced air heating/cooling system air filter.
d. Open heating/cooling supply air registers outside of the combustion appliance zone and close supply air registers within the combustion appliance. The combustion appliance zone in the room or space in which the appliance(s) to be tested Is located.
e. Close all interior doors except those to rooms that contain an exhaust fan or air exhausting appliance.
f. Operate all exhaust fans, air exhausting appliances and appliance mechanical draft exhausters at maximum capacity.
g. Clean filters and exhaust terminals of air exhausting appliances.
h. Do not operate summer exhaust fans.

(2) Measuring Combustion Appliance Zone Pressure.

a. Set up a manometer to measure the combustion appliance zone pressure with reference to the outdoors.
b. Obtain two combustion appliance zone pressure measurements (a total of two data points) with the heating/cooling system air handler(s) not operating.
i. One with the entrance/exit doors to the combustion appliance zone room open
ii. One with the entrance/exit doors to the combustion appliance zone room closed
c. Operate any heating/cooling system air handler at the maximum speed at which it Is expected to operate.
d. Obtain two combustion appliance zone pressure measurements (a total of 2 data points).
i. One with the entrance/exit doors to the combustion appliance zone room open
ii. One with the entrance/exit doors to the combustion appliance zone room closed
e. The most negative pressure in the combustion appliance zone, referenced to the outdoors, shall be considered to be the most negative depressurization case.

(3) Placing the Appliance in Operation.

a. Configure the building in the identified most negative pressure referenced to the outdoors of the 4 data points recorded in steps 2 (b) and (d).
b. Verify that all appliances located within the same room are in their standby mode

and ready for operation.
c. Start with the lowest Btuh input appliance in the space.
d. Place the appliance being tested in operation. Adjust the thermostat or control so that the appliance will operate continuously
e. Spillage Test. Test for spillage at the draft hood relief opening according to the appliance manufacturers' instructions. It is recommended, for personnel safety, to monitor ambient carbon monoxide (CO) levels in the space in which the testing is being conducted. Do not continue testing in an environment with more than 50 ppm (OSHA 8 hour time-weighted average limit) for Carbon monoxide exposure. Carbon Monoxide has cumulative effects, and multiple exposures can be dangerous. CO can cause headaches, dizziness, mental dullness, weakness, sleepiness, nausea, vomiting, unconsciousness, and death [Fire Protection Guide to Hazardous Materials, 14th edition, NFPA]. Persons who exhibit these signs after exposure should seek medical attention immediately.

(4) Draft Testing
If the manufacturer's instructions for draft spillage testing are not available, test as follows:
a. After 5 minutes of main burner operation, check for spillage using smoke or a mirror for fogging.

c. Immediately after the first check, turn on all other fuel gas burning appliances that obtain combustion air from indoors so that they will operate at their full inputs and repeat the spillage test for each appliance to make sure that there is no spillage as all appliances operate together.

(5) After Appliance Testing is Complete:
a. Return doors, windows, exhaust fans, heating/cooling system air handlers, fireplace dampers, and other fuel gas burning appliances to their previous conditions prior to preparation for testing.

(6) Owner Warning, Draft Testing Failures
If spillage occurs during draft testing, the owner must be notified in writing, and the owner must be instructed to arrange for corrective action by an HVAC or venting professional before the systems are again operated.

Public Comment No. 1-NFPA 54-2022 [New Section after G.5.2]

G.5.2 Test for Combustion Air and Vent Drafting for Natural Draft and Category I

Appliances for single-zone constant volume systems.

Combustion air and vent draft procedures are for natural draft and category I appliances equipped with a draft hood and connected to a natural draft venting system.

(1) Preparation For Testing.

a. Close all exterior building doors and windows and other openings to the outdoors.

b. Close solid-fuel burning appliance and fireplace dampers and combustion air controls.

c. Remove or replace the forced air heating/cooling system air filter.

d. Open heating/cooling supply air registers outside of the combustion appliance zone and close supply air registers within the combustion appliance zone. The combustion appliance zone is the room or space in which the appliance(s) to be tested Is located.

e. Close all interior doors except those to rooms that contain an exhaust fan or air exhausting appliance.

f. Clean filters and exhaust terminals of air-exhausting appliances.

g. Operate all exhaust fans, air exhausting appliances, and appliance mechanical draft exhausters at maximum capacity.

h. Do not operate summer exhaust fans.

(2) Measuring Combustion Appliance Zone Pressure.

a. Set up a manometer to measure the combustion appliance zone pressure with reference to the outdoors.

b. Obtain two combustion appliance zone pressure measurements (a total of two data points) with the heating/cooling system air handler(s) not operating.

i. One with the entrance/exit doors to the combustion appliance zone room open

ii. One with the entrance/exit doors to the combustion appliance zone room

closed

c. Operate any heating/cooling system air handler at the maximum speed at which it is expected to operate.

d. Obtain two combustion appliance zone pressure measurements (a total of 2 data points).

i. One with the entrance/exit doors to the combustion appliance zone room open

ii. One with the entrance/exit doors to the combustion appliance zone room closed

e. The most negative pressure in the combustion appliance zone, referenced to the outdoors, shall be considered to be the most negative depressurization case.

(3) Placing the Appliance in Operation.

a. Configure the building in the identified most negative pressure referenced to the outdoors of the 4 data points recorded in steps 2 (b) and (d).

b. Verify that all appliances located within the same room are in their standby mode and ready for operation.

c. Start with the lowest Btuh input appliance in the space.

d. Place the appliance being tested in operation. Adjust the thermostat or control so that the appliance will operate continuously

e. Spillage Test. Test for spillage at the draft hood relief opening according to the appliance manufacturers' instructions. It is recommended, for personnel safety, to monitor ambient carbon monoxide (CO) levels in the space in which the testing is being conducted. Do not continue testing in an environment with more than 50 ppm (OSHA 8 hour time-weighted average limit) for carbon monoxide exposure. Carbon monoxide has cumulative effects, and multiple exposures can be dangerous. Carbon monoxide can cause headaches, dizziness, mental dullness, weakness, sleepiness, nausea, vomiting, unconsciousness, and death [Fire Protection Guide to Hazardous Materials, 14 th edition, NFPA]. Persons who exhibit these signs after exposure should seek medical attention immediately.

(4) Draft Testing

If the manufacturer's instructions for draft spillage testing are not available, test as follows:

a. After 5 minutes of main burner operation, check for spillage using smoke or a mirror for fogging.

b. Immediately after the first check, turn on all other fuel gas burning appliances that obtain combustion air from indoors so that they will operate at their maximum inputs and repeat the spillage test for each appliance to make sure that there is no spillage as all appliances operate together.

(5) After Appliance Testing is Complete:

a. Return doors, windows, exhaust fans, heating/cooling system air handlers, fireplace dampers, and other fuel gas burning appliances to their previous conditions prior to preparation for testing.

(6) Owner Warning, Draft Testing Failures

If spillage occurs during draft testing, the owner must be notified in writing, and the owner must be instructed to arrange for corrective action by an HVAC or venting professional before the systems are again operated.

Statement of Problem and Substantiation for Public Comment

Work product of combustion air task group.

Related Item

• 54 TG combustion air

Submitter Information Verification

Submitter Full Name: John Puskar
Organization: Prescient Technical Services L
Street Address:
City:
State:
Zip:
Submittal Date: Fri Feb 25 09:36:20 EST 2022
Committee: NFG-AAA

Attachment 1

Document #	54
TG Name	Multi-Requirement and Exceptions TG
TG Scope	This task group will look at removing exception language and breaking out multi-requirement sections
TG Chair	Diane Jakobs
TG Members	Bob Torbin, Ted Lemoff, Chris Byers, Eric Smith, Alex

Item #	Section, Figure, or Table Number	Recommended Resolution (Split out, Renumber, Revise, etc.)
1	1.1.1.1 (A)	Split out – 3 shalls
2	3.1	No recommendations TG Reviewed- This is boilerplate and cannot be changed
3	4.2.1	Split out – 2 shalls
4	4.2.1	See Exception recommendation document
5	4.3.1(3)	Split out – 3 shalls
6	4.3.1 (4)	Split out – 2 shalls
7	5.3.2.3	See Exception recommendation document
8	5.5.2.2	Split out – 2 shalls
9	5.5.2.5	Split out – 3 shalls
10	5.5.3.4	Split out – 3 shalls
11	5.5.6.4.3	Split out – 2 shalls
12	5.5.7.1	See Exception recommendation document
13	5.5.7.2	Split out – 4 shalls
14	5.5.7.3	Split out – 2 shalls
15	5.5.7.5	See Exception recommendation document- See 5.5.7.5 Proposed Table Document- Item 15 Attachment
16	5.5.8	Split out – 2 shalls
17	5.5.8 (2)	Split out – 4 shalls
18	5.5.8 (3)	Split out – 7 shalls Capital letters in parentheses needed.
19	5.5.9.3	Split out – 2 shalls
20	5.5.10	Split out – 2 shalls
21	5.5.10.1	No recommendations TG Reviewed
22	5.5.10.5	No recommendations TG Reviewed
23	5.8.1	Split out – 2 shalls
24	5.8.3.1 (4)	See Exception recommendation document

29	5.8.3.2	Split out – 2 shalls (maybe 3)
30	5.8.4 (2)	See Exception recommendation document
31	5.8.8.1	Split out – 2 shalls
32	5.9.2	No recommendations TG Reviewed
33	5.11	Split out – 3 shalls
34	5.12	Split out – 2 shalls
35	5.14	No recommendations TG Reviewed
36	5.14 (10)	Split out - 2 shalls
37	6.1.3	No recommendations TG Reviewed
38	Table 6.2.1(m)	See Exception recommendation document
39	Table 6.2.1(o)	See Exception recommendation document
40	Table 6.2.1(p)	See Exception recommendation document
41	Table 6.2.1(q)	See Exception recommendation document
42	Table 6.2.1(r),(s)	See Exception recommendation document
43	Table 6.2.1(r),(s)	No recommendations TG Reviewed- Other MOS items
44	Table 6.3.1(h),(i), (j)	See Exception recommendation document
45	6.3.2	Beyond scope of TG. TG recommends further work
46	6.4.1 and 6.4.2	Indentation causes Cr and Y to be hidden. Editorial to format
47	7.1.2	Split out – 3 shalls
48	7.1.2.1	See Exception recommendation document
49	7.1.3.2	No recommendations TG Reviewed
50	7.1.3.2 (2)	See Exception recommendation document
51	7.1.3.3	Split out - Paragraph has 2 shalls
52	7.1.3.4	No recommendations TG Reviewed
53	7.1.3.4 (2)	See Exception recommendation document
54	7.1.3.5	Split out – 3 shalls
55	7.1.3.6	No recommendations TG Reviewed
56	7.1.5	No recommendations TG Reviewed
57	7.1.6	No recommendations TG Reviewed
58	7.1.6.1	Split out – 4 shalls
59	7.1.6.2	Split out – 2 shalls
60	7.1.7.1	See Exception recommendation document
61	7.1.7.3.2	Split out – 2 shalls
62	7.2.2	Split out – 2 shalls

63	7.2.6.1	Split out – 4 shalls
64	7.2.6.2	Split out – 2 shalls
65	7.2.6.3	Split out – 2 shalls
66	7.3.2	No recommendations TG Reviewed
67	7.3.4	Split out – 2 shalls.
68	7.3.5.1	Split out – 2 shalls
69	7.4.1	Split out – 3 shalls.
70	7.4.3	Split out – 3 shalls
71	7.5.1	See Exception recommendation document
72	7.5.2	See Exception recommendation document
73	7.5.2 (1)	Split out – 2 shalls
74	7.6.1	Split out – 3 shalls
75	7.6.2	Split out – 2 shalls
76	7.7.1.3	See Exception recommendation document
77	7.7.1.6	Split out – 2 shalls
78	7.7.2.1	See Exception recommendation document
79	7.8.2	Split out – 2 shalls
80	7.8.3.1	Split out – 2 shalls
81	7.8.3.2	Split out – 2 shalls
82	7.8.3.3	Split out – 2 shalls
83	7.11.1	No recommendations TG Reviewed
84	7.11.2	No recommendations TG Reviewed
85	7.11.3	Split out – 2 shalls
86	7.11.4	Split out – 3 shalls
87	7.11.5.1	Split out – 2 shalls
88	7.11.5.4	Split out – 3 shalls
89	7.11.6	See Exception recommendation document
90	7.11.6 (2)	Split out – 2 shalls
91	7.11.6 (3)	Split out – 5 shalls
92	7.11.6 (4)	Split out – 2 shalls
93	7.12.2.3	Split out – 2 shalls
94	7.13	See Exception recommendation document
95	8.1.1.3	No recommendations TG Reviewed
96	8.1.1.11	See Exception recommendation document
97	8.1.1.8	See Exception recommendation document
98	8.1.2	Split out – 2 shalls

99	8.1.3.1	See Exception recommendation document
100	8.1.3.3	Split out – 2 shalls
101	8.1.4.1	Split out – 3 shalls
102	8.1.4.2	Split out – 2 shalls
103	8.1.4.3	Split out – 3 shalls
104	8.1.5.1	Split out – 2 shalls
105	8.2.3	Split out – 2 shalls
106	8.3.1	No recommendations TG Reviewed
107	8.3.1.1	Split out – 2 shalls
108	8.3.1.2	Split out – 2 shalls
109	8.3.1.3	Split out – 2 shalls in the paragraph
110	8.3.1.4	Split out – 2 shalls
111	8.3.2.1	See Exception recommendation document
112	8.3.2.2	Split out – 2 shalls
113	9.1.1.3	Split out – 2 shalls
114	9.1.2	See Exception recommendation document
115	9.1.3	Split out – 3 shalls
116	9.1.5	Split out – 2 shalls
117	9.1.6.2	Resolved at the first draft
118	9.1.8.2	Split out – 2 shalls
119	9.1.9	Split out – 2 shalls
120	9.1.18	See Exception recommendation document
121	9.1.18 (4)	Split out -3 shalls
122	9.1.18 (5)	Split out – 2 shalls
123	9.1.20	Split out – 2 shalls
124	9.1.22	Split out – 2 shalls
125	9.3.1.1	See Exception recommendation document
126	9.3.2	Split out – 3 shalls
127	9.3.2.2	See Exception recommendation document
128	9.3.2.2(3)	See Exception recommendation document
129	9.3.2.3	See Exception recommendation document
130	9.3.2.3 (1)	Split out – 3 shalls
131	9.3.3.1	Split out – 2 shalls
132	9.3.3.1	See Exception recommendation document- Potential duplicate change
133	9.3.3.2	Split out – 4 shalls Revise -

134	9.3.4	Split out – sub subsection (c) has 2 shalls
135	9.3.7.1	Split out – 4 shalls
136	9.3.7.3	Split out – 2 shalls
137	9.3.8	No recommendations TG Reviewed
138	9.3.8.1	See Exception recommendation document
139	9.3.8.4	Split out – 2 shalls
140	9.3.8.7	See Exception recommendation document
141	9.4.2.2	Split out – 3 shalls
142	9.4.2.4	Split out – 2 shalls
143	9.4.3.3	Split out – 7 shalls
144	9.4.3.4	Split out – 2 shalls
145	9.5.1.2	Split out – 2 shalls
146	9.5.3	Split out – 2 shalls
147	9.6.1	See 9.6.1 Proposed Table Document
148	9.6.1.1	Split out – 2 shalls
149	9.6.1.2	See 9.6.1 Proposed Table Document
150	9.6.1.5	See Exception recommendation document
151	9.6.2	See Exception recommendation document
152	9.6.4.4	Split out – 5 shalls
153	9.6.5	Split out – 3 shalls
154	9.6.5.1 through 9.6.5.3	See Exception recommendation document
155	9.6.8	Split out – 3 shalls
156	10.1.1	Split out – 2 shalls
157	10.2.4	No recommendations TG Reviewed
158	Table 10.2.4	Revise – 11 notes with requirements (Style Guide 2.3.6.3) See 10.2.4 Proposed Table Document
159	10.3.1.1	Change title from Application to Listing
160	10.3.2	See Exception recommendation document
161	10.3.2 (1)	Split out – 2 shalls
162	10.3.3.7	Split out – 2 shalls
163	10.3.3.8	Split out – 2 shalls
164	10.3.4	See Exception recommendation document
165	10.3.5	Split out – 2 shalls
166	10.3.6	Split out – 2 shalls
167	10.3.7	Split out – 2 shalls

168	10.3.8.3	Split out – 2 shalls
169	10.3.8.4	Split out – 2 shalls
169A	10.4.1	Change title from Application to Listing
170	10.4.2	See Exception recommendation document
171	10.4.2 (1)	Split out – 3 shalls
172	10.4.2 (2)	Split out – 2 shalls
173	10.4.5.3	Split out – 2 shalls
174	10.4.6.2	Split out – 2 shalls
175	10.6.3	Split out – 2 shalls
176	10.7.2	See Exception recommendation document
177	10.7.3	See Exception recommendation document
178	10.7.3 (1)	Split out – 2 shalls
179	10.8.1	Change title from Application to Listing
180	10.8.5.2	Split out – 2 shalls
181	10.8.6	Split out – 3 shalls
182	10.8.7.2	Split out – 2 shalls
183	10.9.2	See Exception recommendation document
184	10.9.5	Split out – 2 shalls
185	10.9.6	Split out – 2 shalls
186	10.9.7.1	See Exception recommendation document
187	10.9.7.2	See Exception recommendation document
188	10.9.7.3	Split out – 2 shalls
189	10.10.2	See Exception recommendation document
190	10.10.5	See Exception recommendation document
191	10.10.5 (2)	Split out – 4 shalls
192	10.10.8	Split out – 5 shalls
193	10.10.10	Split out – 4 shalls
194	10.10.12	Split out – 2 shalls
195	10.10.13	Split out – 3 shalls
196	10.11.2	Split out – 4 shalls
197	10.11.3.2	Split out – 2 shalls
198	10.11.3.2 (2)	Split out – 2 shalls
199	10.11.3.2 (3)	Split out – 2 shalls
200	10.13.3	Split out – 2 shalls
201	10.13.3.1	Split out – 2 shalls
202	10.14.2.1	No recommendations TG Reviewed

203	10.14.2.2	See Exception recommendation document
204	10.14.2.2 (1)	Split out – 3 shalls
205	10.14.2.2 (3)	Split out – 2 shalls
206	10.14.4	Split out – 5 shalls
207	10.16.2	Split out – 3 shalls
208	10.16.3	See Exception recommendation document
209	10.16.5	Split out – 2 shalls
210	10.17.2	Split out – 4 shalls
211	10.19.3	See Exception recommendation document
212	10.20.2	Split out – 2 shalls Change title from Application to Listing
213	10.21.2	See Exception recommendation document
214	10.24.2	Split out – 2 shalls
215	10.24.3	Split out – 2 shalls
216	10.24.3 (1)	Split out – 2 shalls
217	10.25.2.1	Split out – 2 shalls
218	10.25.2.2	Split out – 6 shalls
219	10.25.3	Split out – 2 shalls
220	10.26.1	Split out – 2 shalls
221	10.26.2	Revised to eliminate multi-requirements
222	10.26.2 (1)	Split out – 2 shalls
223	10.26.3	Split out – 2 shalls
224	10.26.4	Split out – 2 shalls
225	10.26.6	Split out – 3 shalls
226	10.27	Split out – 3 shalls
227	10.28	Split out – 3 shalls
228	10.29	Split out – 2 shalls
229	10.30.1	Split out – 2 shalls
230	10.31	Split out – 2 shalls
231	11.1.1	Split out – 2 shalls
232	11.1.1.2	No recommendations TG Reviewed
233	11.1.2	split out – 2 shalls
234	11.2	Split out – 2 shalls
235	11.3	Split out – 2 shalls
236	11.4	Split out – 2 shalls
237	11.5	Split out – 2 shalls
238	11.6	No recommendations TG Reviewed

239	11.7	Split out – 2 shalls
240	12.3.2	See Exception recommendation document
241	12.4.5.2	No recommendations TG Reviewed
242	12.5.2	Split out – 4 shalls
243	12.5.3	Split out – 3 shalls
244	12.6.1.1	Split out – 2 shalls
245	12.6.1.3	See Exception recommendation document
246	12.6.3.1	See Exception recommendation document
247	12.6.3.1 (5)	No recommendations TG Reviewed
248	12.6.4.1	Split out – 2 shalls
249	12.6.4.3	Split out – 2 shalls
250	12.6.4.4	Split out – 2 shalls
251	12.6.5.2	Split out – 3 shalls
252	12.6.5.3	Split out – 2 shalls
253	12.6.6	Split out – 2 shalls
254	12.6.7	Split out – 2 shalls
255	12.6.8.1	See Exception recommendation document
256	12.6.8.2	See Exception recommendation document
257	12.6.9	Split out – 4 shalls
258	12.7.1	Split out – 2 shalls
259	12.7.2	See Exception recommendation document
260	12.7.2 (3)	Split out – 3 shalls
261	12.7.3	See Exception recommendation document
262	12.7.4.1	See Exception recommendation document
263	12.7.4.2	Split out – 3 shalls
264	12.7.4.3	Split out – 2 shalls
265	12.7.5.1	Split out – 2 shalls
266	12.7.5.3	No recommendations TG Reviewed
267	12.7.7	Split out – 3 shalls
268	12.8.3	No recommendations TG Reviewed
269	12.8.4.2	Split out – 2 shalls
270	12.8.4.4	Split out – 2 shalls
271	Table 12.8.4.4	See Exception recommendation document
272	12.8.4.5	Split out – 3 shalls
273	12.8.4.6	See Exception recommendation document
274	12.8.4.6 (1)	Split out – 2 shalls

275	12.8.5	Split out – 3 shalls
276	12.8.5 (1)(b)	Split out – 2 shalls
277	12.9.1	See Exception recommendation document
278	12.9.3	See Exception recommendation document
279	12.11.2.2	See Exception recommendation document
280	12.11.2.3	See Exception recommendation document
281	12.11.2.3 (2)	See Exception recommendation document
282	12.11.2.4	Split out – 2 shalls
283	12.11.2.5	See Exception recommendation document
284	12.11.3.2	Split out – 4 shalls
285	12.11.4.1	No recommendations TG Reviewed
286	12.11.5	See Exception recommendation document
287	12.11.6	No recommendations TG Reviewed
288	12.11.8	No recommendations TG Reviewed
289	12.11.9.2	Split out – 2 shalls
290	12.13.1	See Exception recommendation document
291	12.13.2.1	See Exception recommendation document
292	12.13.3	Split out – 2 shalls
293	12.13.6	Split out – 3 shalls
294	12.13.7	Split out – 3 shalls
295	12.14.1	Split out – 2 shalls
296	12.16	split out 2 shalls
297	13.1.1	split out 2 shalls
298	13.1.1 (2)	Split out – 2 shalls
299	13.1.2	See Exception recommendation document
300	13.1.2 (5)	Split out – 2 shalls
301	13.1.3	Split out – 4 shalls
302	13.1.5	Split out – 2 shalls
303	13.1.7	Split out – 2 shalls
304	13.1.9	Split out – 3 shalls
305	13.1.11	Split out – 4 shalls
306	13.1.18	See Exception recommendation document
307	13.2.1	Split out – 2 shalls
308	13.2.1 (3) (b)	Split out – 4 shalls
309	13.2.3	No recommendations TG Reviewed
310	13.2.3 (2)	Split out – 4 shalls

311	13.2.4	Split out – 2 shalls
312	13.2.5	Split out – 3 shalls
313	13.2.6	Split out – 2 shalls
314	13.2.7	Split out – 2 shalls
315	13.2.10	Split out – 2 shalls
316	13.2.11	Split out – 2 shalls
317	13.2.16	Split out – 2 shalls
318	13.2.17	split out 2 shalls
319	13.2.19.1	Split out – 2 shalls
320	13.2.20	Split out – 2 shalls
321	13.2.21	Split out – 2 shalls
322	13.2.22	split out 6 shalls
323	13.2.24	split out 3 shalls
324	13.2.25	Split out 2 shalls
325	13.2.30	See Exception recommendation document

Multi-Requirement Split Outs

1.1.1 Applicability.
1.1.1.1
This code is a safety code that shall apply to the installation of fuel gas piping systems, appliances, equipment, and related accessories as shown in 1.1.1.1(A) through 1.1.1.1(F).
(A)*
Coverage of piping systems shall extend from the point of delivery to the appliance connections.
(B)
For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided.
(C)
For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed.
(D)
Where a meter is installed, the point of delivery shall be the outlet of the meter.
(EB)
This code shall apply to natural gas systems operating at a pressure of 125 psi (862 kPa) or less.
(FC)
This code shall apply to LP-Gas systems operating at a pressure of 50 psi (345 kPa) or less.
(GD)
This code shall apply to gas–air mixture systems operating within the flammable range at a pressure of 10 psi (69 kPa) or less.
(HE)
Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, purging, operation, and maintenance.
(IF)
Requirements for appliances, equipment, and related accessories shall include installation, combustion air, ventilation air, and venting.

4.2.1 Notification of Interrupted Service.
4.2.1.1 When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users.
4.2.1.2 Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.

Commented [IA1]: Exception not included (see separate recommendation)

4.3.1 Potential Ignition Sources.
Where work is being performed on piping that contains or has contained gas, the following shall apply:

1. Provisions for electrical continuity shall be made before alterations are made in a metallic piping system.
2. Smoking, open flames, lanterns, welding, or other sources of ignition shall not be permitted.
3. A metallic electrical bond shall be installed around the location of cuts in metallic gas pipes made by other than cutting torches.
4. Where cutting torches, welding, or other sources of ignition are to be used, it shall be determined that all sources of gas or gas–air mixtures have been secured and that all flammable gas or liquids have been cleared from the area.
3.5. Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.

6. Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps. Electric switches shall not be turned on or turned off.

5.5.2.2 Steel, Stainless Steel, and Wrought Iron.

5.5.2.2.1 Steel, stainless steel, and wrought-iron pipe shall be at least Schedule 10

5.5.2.2.2 ~~and~~ Steel, stainless steel, and wrought-iron pipe shall comply with the dimensional standards of ANSI/ASME B36.10M, Welded and Seamless Wrought Steel Pipe, and one of the following:

1. ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
2. ASTM A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
3. ASTM A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

5.5.2.5 Aluminum Alloy.

5.5.2.5.1

Aluminum alloy pipe shall comply with ASTM B241, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

5.5.2.5.2 Alloy 5456 in accordance with ASTM B241, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube shall be prohibited. ~~(except that the use of alloy 5456 is prohibited),~~

5.5.2.5.3 ~~and~~ Aluminum alloy pipe shall be marked at each end of each length indicating compliance.

5.5.2.5.4 Aluminum alloy pipe shall be coated to protect against external corrosion where it is in contact with masonry, plaster, or insulation or is subject to repeated wettings by such liquids as water, detergents, or sewage.

5.5.3.4* Copper and Copper Alloy.

5.5.3.4.1

Copper and copper alloy tubing shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 scf of gas (0.7 mg/100 L).

5.5.3.4.2

Copper tubing shall comply with standard Type K or Type L of ASTM B88, Standard Specification for Seamless Copper Water Tube, or ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

5.5.6.4.3

Thread joint sealing materials shall be non-hardening and ~~shall be~~ resistant to the chemical constituents of the gases to be conducted through the piping.

5.5.7.2 Copper Tubing Joints.

5.5.7.2.1

Copper tubing joints shall be in accordance with any of the following:

1. ~~a~~Assembled with approved gas tubing fittings.~~, shall~~
2. ~~b~~Be brazed with a material having a melting point in excess of 1000°F (538°C).~~, or shall~~
3. ~~b~~Be assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems.

5.5.7.2.2

Brazing alloys shall not contain more than 0.05 percent phosphorus.

5.5.7.3 Stainless Steel Tubing Joints.

5.5.7.3.1

Stainless steel joints shall be in accordance with any of the following

1. ~~w~~Welded,~~a~~
2. Assembled with approved tubing fittings~~, b~~
3. Brazed with a material having a melting point in excess of 1000°F (538°C)~~, or a~~
4. Assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems.

5.5.7.3.2

Brazing alloys and fluxes shall be recommended by the manufacturer for use on stainless steel alloys.

5.5.8 Plastic Piping Joints and Fittings.

5.5.8.1 Plastic pipe, tubing, and fittings shall be joined in accordance with the manufacturers' instructions.

5.5.8.2 The following shall be observed when making such joints:

1. The joint shall be designed and installed so that the longitudinal pullout resistance of the joint will be at least equal to the tensile strength of the plastic piping material.
2. Heat fusion joints shall be made in accordance with qualified procedures that have been established and proven by test to produce gastight joints at least as strong as the pipe or tubing being joined.
3. Heat fusion Joints shall be made with the joining method recommended by the pipe manufacturer.
4. Polyethylene heat fusion fittings shall be marked "ASTM D2513."
5. Polyamide heat fusion fittings shall be marked "ASTM F2945."
6. ~~Where~~The following shall apply when compression-type mechanical joints are used~~:~~
   a. ~~t~~The gasket material in the fitting shall be compatible with the plastic piping and with the gas distributed by the system.
   b. An internal tubular rigid stiffener shall be used in conjunction with the ~~fitting~~compression-type mechanical joints.
   c. The stiffener shall be flush with the end of the pipe or tubing and shall extend at least to the outside end of the compression fitting when installed.
   d. The stiffener shall be free of rough or sharp edges and shall not be a force fit in the plastic.
   ~~3.~~e. Split tubular stiffeners shall not be used.
7. ~~4.~~ Plastic piping joints and fittings for use in LP-Gas piping systems shall be in accordance with NFPA 58.

5.5.9.3 Flange Facings.

5.5.9.3.1

Standard facings shall be permitted for use under this code.

5.5.9.3.2

Where 150 psi (1034 kPa) steel flanges are bolted to Class 125 cast-iron flanges, the raised face on the steel flange shall be removed.

5.5.10 Flange Gaskets.

Commented [IA2]: What does this mean?

Formatted

5.5.10.1
The material for gaskets shall be capable of withstanding the design temperature and pressure of the piping system and the chemical constituents of the gas being conducted without change to its chemical and physical properties.
5.5.10.1.2
The effects of fire exposure to the joint shall be considered in choosing the material.
5.5.10.1.3~~1~~
Acceptable materials shall include the following:

1. Metal (plain or corrugated)
2. Composition
3. Aluminum “O” rings
4. Spiral-wound metal gaskets
5. Rubber-faced phenolic
6. Elastomeric

5.8.1 Where Required.
5.8.1.1 Where the serving gas supplier delivers gas at a pressure greater than 2 psi (14 kPa) for piping systems serving appliances designed to operate at a gas pressure of 14 in. w.c. (3.4 kPa)or less, overpressure protection devices shall be installed.
5.8.1.2 Piping systems serving equipment designed to operate at inlet pressures greater than 14 in. w.c. (3.4 kPa) shall be equipped with overpressure protection devices as required by the appliance manufacturer’s installation instructions.

5.8.3.2
The devices in 5.8.3.1 shall be installed either as an integral part of the service or line pressure regulator or as separate units.

5.8.3.3 Where separate overpressure protection devices are installed, they shall comply with 5.8.4 through 5.8.9.

5.8.8.1
The discharge stacks, vents, or outlet parts of all pressure relieving and pressure limiting devices shall be located so that gas is safely discharged to the outdoors.

5.8.8.2 Discharge stacks or vents shall be designed to prevent the entry of water, insects, or other foreign material that could cause blockage.

5.8.8.3~~2~~
The discharge stack or vent line shall be at least the same size as the outlet of the pressure relieving device.

5.11 Shutoff Valves.
5.11.1 Shutoff valves shall be selected in accordance with Table 5.11.
5.11.2 Shutoff valves of size 1 in. (25 mm) National Pipe Thread and smaller shall be listed and labeled.
5.11.3 Where shutoff valves are used outdoors, such use shall be in accordance with the manufacturer’s recommendation.

5.12 Excess Flow Valve(s).

5.12.1 Where automatic excess flow valves are installed, they shall be listed in accordance with ANSI Z21.93/CSA 6.30, Excess Flow Valves for Natural and LP-Gas with Pressures Up to 5 psig~~, and~~

5.12.2 Excess flow valves shall be sized and installed in accordance with the manufacturers' instructions.

5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be in accordance with all of the following:

1. An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard.
2. For devices other than appliance regulators, vents shall not be required to be independent where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.
3. A regulator and vent limiting means combination listed in accordance with ANSI Z21.80/CSA 6.22, Line Pressure Regulators, shall not be required to be vented to the outdoors.
4. A listed gas appliance regulator factory equipped with a vent limiting device is not required to be vented to the outdoors.
5. A listed gas pressure limit control that is factory equipped with a vent limiting device and in accordance with UL 353, Limit Controls, or UL 60730-2-6, Automatic Electrical Controls for Household and Similar Use, Part 2, shall not be required to be vented to the outdoors.
6. Materials for vent piping shall be in accordance with Section 5.5.
7. The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.
8. Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.
9. Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.
10. At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal ~~shall~~ be located above the height of the expected flood waters or snow.
11. Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

7.1.2 Protection Against Damage.

Commented [IA3]: A new title is needed for this child.

7.1.2.1

Means shall be provided to prevent excessive stressing of the piping where vehicular traffic is heavy or soil conditions are unstable and settling of piping or foundation walls could occur.

7.1.2.1.1

Piping shall be buried or covered in a manner so as to protect the piping from physical damage.

7.1.2.1.2

Piping shall be protected from physical damage where it passes through flower beds, shrub beds, and other such cultivated areas where such damage is reasonably expected.

Renumber remaining sections

7.1.3.3

Cathodic protection systems shall be monitored by testing and the results shall be documented.

7.1.3.4
The test results shall demonstrate one of the following:

1. A pipe-to-soil voltage of −0.85 volts or more negative is produced, with reference to a saturated copper-copper sulfate half cell
2. A pipe-to-soil voltage of −0.78 volts or more negative is produced, with reference to a saturated KCl calomel half cell
3. A pipe-to-soil voltage of −0.80 volts or more negative is produced, with reference to a silver-silver chloride half cell
4. Compliance with a method described in Appendix D of Title 49 of the Code of Federal Regulations, Part 192

7.1.3.5~~4~~
Sacrificial anodes shall be tested in accordance with the following:

1. Upon installation of the cathodic protection system, except where prohibited by climatic conditions, in which case the testing shall be performed not later than 180 days after the installation of the system
2. 12 to 18 months after the initial test
3. Upon successful verification testing in accordance with (1) and (2), periodic follow-up testing shall be performed at intervals not to exceed 36 months

7.1.3.6~~5~~
Systems failing a test shall be repaired not more than 180 days after the date of the failed testing.
7.1.3.7
The testing schedule shall be restarted as required in 7.1.3.4(1) and 7.1.3.4(2)~~, and~~
7.1.3.8
~~t~~The results of the testing in 7.1.3.7 shall comply with 7.1.3.3.

Renumber remaining requirements.

7.1.6.1 Conduit with One End Terminating Outdoors.
7.1.6.1.1
The conduit shall extend into an accessible portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage.
7.1.6.1.2
Where the end sealing is of a type that retains the full pressure of the pipe, the conduit shall be designed for the same pressure as the pipe.
7.1.6.1.3
The conduit shall extend at least 4 in. (100 mm) outside the building, be vented outdoors above finished ground level, and be installed so as to prevent the entrance of water and insects.

7.1.6.2 Conduit with Both Ends Terminating Indoors.
7.1.6.2.1 Where the conduit originates and terminates within the same building, the conduit shall originate and terminate in an accessible portion of the building

7.1.6.2.2 Where the conduit originates and terminates within the same building, the conduit ~~and~~ shall not be sealed.

7.1.7.3.2
Where tracer wire is used either of the following shall apply:~~,~~

1) ~~a~~Access ~~shall~~ be provided from aboveground ~~or~~
~~1)~~2) ~~o~~One end of the tracer wire or tape ~~shall be~~is brought aboveground at a building wall or riser.

7.2.2* Protective Coating.
7.2.2.1
Where piping is in contact with a material or an atmosphere corrosive to the piping system, the piping and fittings shall be coated with a corrosion-resistant material.
7.2.2.2
Any such coating used on piping or components shall not be considered as adding strength to the system.

7.2.6.1
Piping shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers, or building structural components, suitable for the size of piping, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration.
7.2.6.2 Piping shall be anchored to prevent undue strains on connected appliances and equipment and shall not be supported by other piping.
7.2.6.3 Pipe hangers and supports shall conform to the requirements of ANSI/MSS SP-58, Pipe Hangers and Supports — Materials, Design Manufacture, Selection, Application, and Installation.

7.2.6.4~~2~~
Spacings of supports in gas piping installations shall not be greater than shown in Table 7.2.6.2. Spacing of supports of CSST shall be in accordance with the CSST manufacturer's instructions.

7.2.6.5~~3~~
Supports, hangers, and anchors shall be installed so as not to interfere with the free expansion and contraction of the piping between anchors.
7.2.6.6
All parts of the supporting system shall be designed and installed so they are not disengaged by movement of the supported piping.

7.3.4 Tubing in Partitions.
7.3.4.1
Section 7.3.4~~This provision~~ shall not apply to tubing that pierces walls, floors, or partitions.
7.3.4.2
Tubing installed vertically and horizontally inside hollow walls or partitions without protection along its entire concealed length shall meet the following requirements:

1) A steel striker barrier not less than 0.0508 in. (1.3 mm) thick, or equivalent, is installed between the tubing and the finished wall and extends at least 4 in. (100 mm) beyond concealed penetrations of plates, firestops, wall studs, and so on.
2) The tubing is installed in single runs and is not rigidly secured.

7.3.5.1 Industrial Occupancies.

7.3.5.1.1

In industrial occupancies, gas piping in solid floors such as concrete shall be laid in channels in the floor and covered to permit access to the piping with a minimum of damage to the building.

7.3.5.1.2

Where piping in floor channels could be exposed to excessive moisture or corrosive substances, the piping shall be protected in an approved manner.

7.4.1 Pressure Reduction.

7.4.1.1

Where pressure reduction is required in branch connections for compliance with 5.4.1, such reduction shall take place either inside the chase or immediately adjacent to the outside wall of the chase.

7.4.1.2

Regulator venting and downstream overpressure protection shall comply with 5.7.5 and Section 5.8.

7.4.1.3

The regulator shall be accessible for service and repair and vented in accordance with one of the following:

1) Where the fuel gas is lighter than air, either of the following shall apply:
   a. ~~r~~Regulators equipped with a vent limiting means shall be permitted to be vented into the chase.
   ~~1)~~b. Regulators not equipped with a vent limiting means shall be permitted to be vented either directly to the outdoors or to a point within the top 1 ft (0.3 m) of the chase.
2) Where the fuel gas is heavier than air, the regulator vent shall be vented only directly to the outdoors.

Formatted

7.4.3* Ventilation.

7.4.3.1

A chase shall be ventilated to the outdoors and only at the top.

7.4.3.2

The opening(s) shall have a minimum free area [in square inches (square meters)] equal to the product of one-half of the maximum pressure in the piping [in pounds per square inch (kilopascals)] times the largest nominal diameter of that piping [in inches (millimeters)], or the cross-sectional area of the chase, whichever is smaller.

7.4.3.3

Where more than one fuel gas piping system is present, the free area for each system shall be calculated and the largest area used.

7.5.2 Plastic Pipe.

Plastic pipe bends shall comply with the following:

1. The pipe shall not be damaged~~, and~~
~~1.~~2. ~~t~~The internal diameter of the pipe shall not be effectively reduced.
~~2.~~3. Joints shall not be located in pipe bends.
~~3.~~4. The radius of the inner curve of such bends shall not be less than 25 times the inside diameter of the pipe.
~~4.~~5. Where the piping manufacturer specifies the use of special bending tools or procedures, such tools or procedures shall be used.

7.6.1 Provide Drips Where Necessary.

7.6.1.1

For other than dry gas conditions, a drip shall be provided at any point in the line of pipe where condensate could collect.

7.6.1.2

Where required by the authority having jurisdiction or the serving gas supplier, a drip shall also be provided at the outlet of the meter.

7.6.1.3

This drip shall be installed so as to constitute a trap wherein an accumulation of condensate shuts off the flow of gas before it runs back into the meter.

7.6.2 Location of Drips.

7.6.2.1

All drips shall be installed only in such locations that they are readily accessible to permit cleaning or emptying.

7.6.2.2

A drip shall not be located where the condensate is likely to freeze.

7.7.1.6

The provisions of 7.7.1.4 and 7.7.1.5 shall not apply to listed quick-disconnect devices of the flush-mounted type or listed gas convenience outlets.

7.7.1.7 Quick-disconnect devices of the flush-mounted type or listed gas convenience outlets ~~Such devices~~ shall be installed in accordance with the manufacturers' installation instructions.

7.8.2 Valves at Regulators.

7.8.2.1

An accessible gas shutoff valve shall be provided upstream of each gas pressure regulator.

7.8.2.2

Where two gas pressure regulators are installed in series in a single gas line, a manual valve shall not be required at the second regulator.

7.8.3 Valves Controlling Multiple Systems.

7.8.3.1 Shutoff Valves for Multiple House Lines.

7.8.3.1.1

In multiple-tenant buildings supplied through a master meter, through one service regulator where a meter is not provided, or where meters or service regulators are not readily accessible from the appliance or equipment location, an individual shutoff valve for each apartment or tenant line shall be provided at a convenient point of general accessibility.

7.8.3.1.2 In a common system serving a number of individual buildings, shutoff valves shall be installed at each building.

7.8.3.2 Emergency Shutoff Valves.

7.8.3.2.1

An exterior shutoff valve to permit turning off the gas supply to each building in an emergency shall be provided.

7.8.3.2.2

The emergency shutoff valves shall be plainly marked as such and their locations posted as required by the authority having jurisdiction.

7.8.3.3 Shutoff Valve for Laboratories.

7.8.3.3.1

Each laboratory space containing two or more gas outlets installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have a single shutoff valve through which all such gas outlets are supplied.

7.8.3.3.2

The shutoff valve shall be accessible, located within the laboratory or adjacent to the laboratory's egress door, and identified.

7.11.3 Additional Requirements.

7.11.3.1

Gas-mixing machines shall have nonsparking blowers

7.11.3.2 Gas-mixing machines ~~and~~ shall be constructed so that a flashback does not rupture machine casings.

7.11.4* Special Requirements for Mixing Blowers.

7.11.4.1

A mixing blower system shall be limited to applications with minimum practical lengths of mixture piping, limited to a maximum mixture pressure of 10 in. w.c. (2.5 kPa) and limited to gases containing no more than 10 percent hydrogen.

7.11.4.2

The blower shall be equipped with a gas control valve at its air entrance arranged so that gas is admitted to the airstream, entering the blower in proper proportions for correct combustion by the type of burners employed, the said gas control valve being of either the zero governor or mechanical ratio valve type that controls the gas and air adjustment simultaneously.

7.11.4.3

No valves or other obstructions shall be installed between the blower discharge and the burner or burners.

7.11.5.1* Location.

7.11.5.1.1

The gas-mixing machine shall be located in a well-ventilated area or in a detached building or cutoff room provided with room construction and explosion vents in accordance with engineering methods.

7.11.5.1.2

~~Such~~ Cut-off rooms or belowgrade installations shall have adequate positive ventilation.

7.11.5.4* Controls.

7.11.5.4.1

Controls for gas-mixing machines shall include interlocks and a safety shutoff valve of the manual reset type in the gas supply connection to each machine arranged to automatically shut off the gas supply in the event of high or low gas pressure.

7.11.5.4.2

Except for open burner installations only, the controls shall be interlocked so that the blower or compressor stops operating following a gas supply failure.

7.11.5.4.3
Where a system employs pressurized air, means shall be provided to shut off the gas supply in the event of air failure.

7.11.6 Use of Automatic Firechecks, Safety Blowouts, or Backfire Preventers.
7.11.6.1
Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air–gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback,
7.11.6.2
The automatic firechecks and safety blowouts or backfire preventors provided in 7.11.6.1 shall be in accordance with the following:

1. *Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturers' instructions.
2. A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas–air mixture through the firecheck after a flashback has occurred.
3. The valve required in 7.11.6.2(2) shall be located upstream as close as practical to the inlet of the automatic firecheck.
~~2.~~ Caution: these valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset properly.
4. A safety blowout or backfiring preventer shall be provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 21⁄2 in. (64 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck.
5. The manufacturers' instructions shall be followed when installing these safety blowout or backfiring preventers ~~devices~~, particularly after a disc has burst.
6. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel.
7. Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision shall be made to keep the mixture from other machines from reaching any ruptured disc opening.
~~3.~~8. Check valves shall not be used for this purpose.
~~4.~~9. Large-capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at and vented to a safe outdoor location.
~~5.~~10. Provisions shall be provided for automatically shutting off the supply of the gas–air mixture in the event of rupture.

7.12.2.3*
The length of the jumper between the connection to the gas piping system and the grounding electrode system shall not exceed 75 ft (22 m).
7.12.2.4
Any additional grounding electrodes installed to meet 7.12.2.3 ~~this requirement~~ shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system.

8.1.2 Test Medium.

Formatted: Indent: Left: 0.5", No bullets or numbering

Commented [IA4]: What purpose? There are 3 previous purposes in old (3)

8.1.2.1
The test medium shall be air, nitrogen, carbon dioxide, or an inert gas.
8.1.2.2
Oxygen shall not be used as a test medium.

8.1.3.3
Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps.
8.1.3.4
Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

Renumber remaining requirements.

8.1.4 Test Pressure.
8.1.4.1
Test pressure shall be measured with a manometer or with a pressure measuring device designed and calibrated to read, record, or indicate a pressure loss due to leakage during the pressure test period.
8.1.4.2
The source of pressure shall be isolated before the pressure tests are made.
8.1.4.3 Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than 5 times the test pressure.
8.1.4.~~2~~4
The test pressure to be used shall be no less than 1½ times the proposed maximum working pressure, but not less than 3 psi (20 kPa).
8.1.4.5 Where the test pressure exceeds 125 psi (862 kPa), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.
8.1.4.~~3~~6*
Test duration shall be not less than ½ hour for each 500 ft3 (14 m3) of pipe volume or fraction thereof.
8.1.4.7
When testing a system having a volume less than 10 ft3 (0.28 m3) or a system in a single-family dwelling, the test duration shall be a minimum of 10 minutes.
8.1.4.8
The duration of the test shall not be required to exceed 24 hours.

8.1.5.1
The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects.
8.1.5.2
Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

Renumber remaining sections

8.2.3* Leak Check.
8.2.3.1

Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage.
8.2.3.2
Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

8.3.1.2* Placing in Operation.
8.3.1.2.1
Where gas piping containing air and meeting the criteria of Table 8.3.1 is placed in operation, the air in the piping shall first be displaced with an inert gas.
8.3.1.2.2
The inert gas shall then be displaced with fuel gas in accordance with 8.3.1.3.

8.3.1.3 Outdoor Discharge of Purged Gases.
8.3.1.3.1
The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location.
8.3.1.3.2
Purging operations shall comply with all of the following requirements:

1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 ft (3.0 m) from sources of ignition, at least 10 ft (3.0 m) from building openings and at least 25 ft (7.6 m) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with 8.3.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 ft (3.0 m) of the point of discharge.

8.3.1.4* Combustible Gas Indicator.
8.3.1.4.1
Combustible gas indicators shall be listed and calibrated in accordance with the manufacturer's instructions.
8.3.1.4.2
Combustible gas indicators shall numerically display a volume scale from 0 percent to 100 percent in 1 percent or smaller increments.

8.3.2.2 Combustible Gas Detector.
8.3.2.2.1
Combustible gas detectors shall be listed and calibrated or tested in accordance with the manufacturer's instructions.
8.3.2.2.2
Combustible gas detectors shall be capable of indicating the presence of fuel gas

9.1.1.3
The unlisted appliance, equipment, or accessory shall be safe and suitable for the proposed service
9.1.1.4

The unlisted appliance equipment, or accessory ~~and~~ shall be recommended for the service by the manufacturer.

9.1.3 Type of Gas(es).

9.1.3.1

The appliance shall be connected to the fuel gas for which it was designed.

9.1.3.2

No attempt shall be made to convert the appliance from the gas specified on the rating plate for use with a different gas without consulting the installation instructions, the serving gas supplier, or the appliance manufacturer for complete instructions.

9.1.3.3

Listed appliances shall not be converted unless permitted by and in accordance with the manufacturer's installation instructions.

9.1.5 Use of Air or Oxygen Under Pressure.

9.1.5.1

Where air or oxygen under pressure is used in connection with the gas supply, effective means such as a back pressure regulator and relief valve shall be provided to prevent air or oxygen from passing back into the gas piping.

9.1.5.2

Where oxygen is used, installation shall be in accordance with NFPA 51.

9.1.8.2

At the locations selected for installation of appliances and equipment, the dynamic and static load carrying capacities of the building structure shall be checked to determine whether they are adequate to carry the additional loads.

9.1.8.3

The appliances and equipment shall be supported and shall be connected to the piping so as not to exert undue stress on the connections.

9.1.9 Flammable Vapors.

9.1.9.1

Appliances shall not be installed in areas where the open use, handling, or dispensing of flammable liquids occurs, unless the design, operation, or installation reduces the potential of ignition of the flammable vapors.

9.1.9.2

Appliances installed in compliance with 9.1.10 through 9.1.12 shall be considered to comply with the intent of this provision.

9.1.18 Bleed Lines for Diaphragm-Type Valves.

Bleed lines shall comply with the following requirements:

1. Diaphragm-type valves shall be equipped to convey bleed gas to the outdoors or into the combustion chamber adjacent to a continuous pilot.
2. In the case of bleed lines leading outdoors, means shall be employed to prevent water from entering this piping and also to prevent blockage of vents by insects and foreign matter.

3. Bleed lines shall not terminate in the appliance flue or exhaust system.
4. In the case of bleed lines entering the combustion chamber, the bleed line shall be located so the bleed gas is readily ignited by the pilot and the heat liberated thereby does not adversely affect the normal operation of the safety shutoff system.
5. The terminus of the bleed line entering the combustion chamber shall be securely held in a fixed position relative to the pilot.
~~4.~~6. For manufactured gas, the need for a flame arrester in the bleed line piping entering the combustion chamber shall be determined.
~~5.~~7. A bleed line(s) from a diaphragm-type valve and a vent line(s) from an appliance pressure regulator shall not be connected to a common manifold terminating in a combustion chamber. Bleed lines shall not terminate in positive-pressure-type combustion chambers.

9.1.20* Installation Instructions.

9.1.20.1

The installer shall conform to the appliance and equipment manufacturers' recommendations in completing an installation.

9.1.20.2

The installer shall leave the manufacturers' installation, operating, and maintenance instructions on the premises.

9.1.21 Protection of Outdoor Appliances.

Commented [IA5]: This wasn't in the list

9.1.21.1

Appliances not listed for outdoor installation but installed outdoors shall be provided with protection to the degree that the environment requires.

9.1.21.2

Appliances listed for outdoor installation shall be permitted to be installed without protection in accordance with the manufacturer's installation instructions.

9.1.22* Existing Appliances.

9.1.22.1

Existing appliance installations shall be inspected to verify compliance with the provisions of Section 9.3 and Chapter 12 where a component of the building envelope is modified as described by one or more of 9.1.22(1) through 9.1.22(6).

1. The building is modified under a weatherization program.
2. A building permit is issued for a building addition or exterior building modification.
3. Three or more window assemblies are replaced.
4. Three or more storm windows are installed over existing windows.
5. One or more exterior door and frame assemblies are replaced.
6. A building air barrier is installed or replaced.

Commented [IA6]: This is moved from below

9.1.22.2

Where the appliance installation does not comply with Section 9.3 and Chapter 12, the installation shall be altered as necessary to be in compliance with Section 9.3 and Chapter 12.

~~1. The building is modified under a weatherization program.~~
~~2. A building permit is issued for a building addition or exterior building modification.~~
~~3. Three or more window assemblies are replaced.~~

~~4. Three or more storm windows are installed over existing windows.~~
~~5. One or more exterior door and frame assemblies are replaced.~~
~~6.~~7. ~~A building air barrier is installed or replaced.~~

9.3.2 Indoor Combustion Air.

9.3.2.1

The required volume of indoor air shall be determined in accordance with the method in 9.3.2.1 or 9.3.2.2 except that where the air infiltration rate is known to be less than 0.40 ACH (air change per hour), the method in 9.3.2.2 shall be used.

9.3.2.1.1

The total required volume shall be the sum of the required volume calculated for all appliances located within the space.

9.3.2.1.2

Rooms communicating directly with the space in which the appliances are installed through openings not furnished with doors, and through combustion air openings sized and located in accordance with 9.3.2.3, are considered a part of the required volume.

Renumber remaining sections.

9.3.2.3 Indoor Opening Size and Location.

Openings used to connect indoor spaces shall be sized and located in accordance with the following:

1. *Combining spaces on the same story shall be in accordance with the following:~~.~~
   a. Each opening shall have a minimum free area of 1 in.2/1000 Btu/hr (2200 mm2/kW) of the total input rating of all appliances in the space but not less than 100 in.2 (0.06 m2).
   b. One permanent opening shall commence within 12 in. (300 mm) of the top of the enclosure and one permanent opening shall commence within 12 in. (300 mm) of the bottom of the enclosure.
   c. The minimum dimension of air openings shall not be less than 3 in. (80 mm).

~~2.~~

~~3.~~2. Combining spaces in different stories. The volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one or more permanent openings in doors or floors having a total minimum free area of 2 in.2/1000 Btu/hr (4400 mm2/kW) of total input rating of all appliances.

9.3.3.1 Two Permanent Openings Method.

9.3.3.1.1

Two permanent openings, one commencing within 12 in. (300 mm) of the top of the enclosure and one commencing within 12 in. (300 mm) of the bottom of the enclosure, shall be provided.

9.3.3.1.2

The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors, as follows:

1. *Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in.2/4000 Btu/hr (550 mm2/kW) of total input rating of all appliances in the enclosure.

Commented [IA7]: Need Title

Formatted: Normal, No bullets or numbering

Commented [IA8]: This isnt exactly needed.

2. *Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in.2/2000 Btu/hr (1100 mm2/kW) of total input rating of all appliances in the enclosure.

9.3.3.2* One Permanent Opening Method.

9.3.3.2.1

One permanent opening, commencing within 12 in. (300 mm) of the top of the enclosure, shall be provided.

9.3.3.2.2

The appliance shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (150 mm) from the front of the appliance.

9.3.3.2.3

The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors ~~and~~

9.3.3.2.4

The openings in 9.3.3.2.3 shall have a minimum free area of the following:

1. 1 in.2/3000 Btu/hr (700 mm2/kW) of the total input rating of all appliances located in the enclosure
2. Not less than the sum of the areas of all vent connectors in the space

9.3.4 Combination Indoor and Outdoor Combustion Air.

The use of a combination of indoor and outdoor combustion air shall be in accordance with the following:

1. Indoor openings. Where used, openings connecting the interior spaces shall comply with 9.3.2.3.
2. Outdoor opening(s) location. Outdoor opening(s) shall be located in accordance with 9.3.3.
3. Outdoor opening(s) size. The outdoor opening(s) size shall be calculated in accordance with the following:
    a. The ratio of the interior spaces shall be the available volume of all communicating spaces divided by the required volume.
    b. The outdoor size reduction factor shall be 1 minus the ratio of interior spaces.
    c. The minimum size of outdoor opening(s) shall be the full size of outdoor opening(s) calculated in accordance with 9.3.3, multiplied by the reduction factor.
    ~~c.~~d. The minimum dimension of air openings shall not be less than 3 in. (80 mm).

9.3.7.1 Louvers and Grilles.

9.3.7.1.1

The required size of openings for combustion, ventilation, and dilution air shall be based on the net free area of each opening.

9.3.7.1.2

Where the free area through a design of louver, grille, or screen is known, it shall be used in calculating the size opening required to provide the free area specified.

9.3.7.1.3

Where the louver and grille design and free area are not known, it shall be assumed that wood louvers have 25 percent free area, and metal louvers and grilles have 75 percent free area.

9.3.7.1.4

Nonmotorized louvers and grilles shall be fixed in the open position.

9.3.7.3 Motorized Louvers.

9.3.7.3.1

Motorized louvers shall be interlocked with the appliance so they are proven in the full open position prior to main burner ignition and during main burner operation.

9.3.7.3.2

Means shall be provided to prevent the main burner from igniting should the louver fail to open during burner startup and to shut down the main burner if the louvers close during burner operation.

9.3.8.4

Ducts shall not serve both upper and lower combustion air openings where both such openings are used.

9.3.8.5

The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.

Renumber remaining sections

9.4.1 General.

9.4.1.1

Appliances on roofs shall be designed or enclosed so as to withstand climatic conditions in the area in which they are installed.

Commented [IA9]: This was not in the review.

9.4.1.2

Where enclosures are provided, each enclosure shall be in accordance with the following:

1. ~~p~~Permit easy entry and movement,
2. ~~shall~~ be of reasonable height~~, and shall~~
3. ~~h~~Have at least a 30 in. (760 mm) clearance between the entire service access panel(s) of the appliance and the wall of the enclosure.

Formatted: List Paragraph, Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.28" + Indent at: 0.53"

9.4.1.3~~2~~

Roofs on which appliances are to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load.

9.4.1.4~~3~~

All access locks, screws, and bolts shall be of corrosion-resistant material.

9.4.2.2

Appliances shall be installed on a well-drained surface of the roof.

9.4.2.3

At least 6 ft (1.8 m) of clearance shall be available between any part of the appliance and the edge of a roof or similar hazard, or rigidly fixed rails, guards, parapets, or other building structures at least 42 in. (1.1 m) in height shall be provided on the exposed side.

9.4.2.4~~3~~

Appliances requiring an external source of electrical power shall be installed in accordance with NFPA 70.

9.4.2.5~~4~~

Where water stands on the roof at the appliance or in the passageways to the appliance, or where the roof is of a design having a water seal, a suitable platform, walkway, or both shall be provided above the water line.

9.4.2.6

Such platform(s) or walkway(s) shall be located adjacent to the appliance and control panels so that the appliance can be safely serviced where water stands on the roof.

9.4.3.3
The inside means of access shall be a permanent or foldaway inside stairway or ladder, terminating in an enclosure, scuttle, or trapdoor.
9.4.3.4 ~~Such s~~Scuttles or trapdoors shall be at least 22 in. × 24 in. (560 mm × 610 mm) in size, shall open easily and safely under all conditions, especially snow~~, and~~
9.4.3.5 Scuttles or trapdoors shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.
9.4.3.6~~5~~ At least 6 ft (1.8 m) of clearance shall be available between the access opening and the edge of the roof or similar hazard, or rigidly fixed rails or guards a minimum of 42 in. (1.1 m) in height shall be provided on the exposed side.
9.4.3.7~~6~~ Where parapets or other building structures are utilized in lieu of guards or rails, they shall be a minimum of 42 in. (1.1 m) in height.

Renumber remaining sections

9.5.1.2
The passageway shall be unobstructed

9.5.1.3 ~~and~~The passageway shall have solid flooring not less than 24 in. (610 mm) wide from the entrance opening to the appliance.

9.5.3 Lighting and Convenience Outlet.
9.5.3.1
A permanent 120 V receptacle outlet and a luminaire shall be installed near the appliance.
9.5.3.2
The switch controlling the luminaire shall be located at the entrance to the passageway.

9.6.1.1 Protection of Connectors.
9.6.1.1.1
Connectors and tubing addressed in 9.6.1(2), 9.6.1(3), 9.6.1(4), 9.6.1(5), and 9.6.1(6) shall be installed to be protected against physical and thermal damage.
9.6.1.1.2
Aluminum alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as detergents, sewage, or water other than rainwater.

9.6.4.4
Where flexible connections are used, they shall be of the minimum practical length
9.6.4.5 ~~and~~
Flexible connections shall not extend from one room to another or pass through any walls, partitions, ceilings, or floors.
9.6.4.6
Flexible connections shall not be used in any concealed location.
9.6.4.7 ~~They~~
Flexible connections shall be protected against physical or thermal damage

9.6.4.8 ~~and~~
Flexible connections shall be provided with gas shutoff valves in readily accessible locations in rigid piping upstream from the flexible connections.

9.6.5 Appliance Shutoff Valves and Connections.
9.6.5.1
Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member, or a listed gas convenience outlet.
9.6.5.2
Appliance shutoff valves and convenience outlets shall serve a single appliance only and shall be installed in accordance with 9.6.5.1.

Renumber remaining sections

9.6.8 Sediment Trap.
9.6.8.1
Where a sediment trap is not incorporated as a part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical at the time of appliance installation.
9.6.8.2
The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 9.6.8, or another device recognized as an effective sediment trap.
9.6.8.3
Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fireplaces, and outdoor cooking appliances shall not be required to be so equipped.

10.1.1* Application.
10.1.1.1
Appliances shall be installed in accordance with the manufacturers' installation instructions and, as elsewhere specified in this chapter, as applicable to the appliance.
10.1.1.2
Unlisted appliances shall be installed as specified in this chapter as applicable to the appliances.

10.3.2 Location.
Central heating furnace and low-pressure boiler installations in bedrooms or bathrooms shall comply with one of the following:

1. Central heating furnaces and low-pressure boilers shall be installed in a closet in accordance with the following:
   a. The closet is equipped with a weather-stripped door with no openings, and with a self-closing device.
   ~~1.~~b. All combustion air is~~shall be~~ obtained from the outdoors in accordance with 9.3.3.
2. Central heating furnaces and low-pressure boilers shall be of the direct vent type.

10.3.3.7
10.3.3.7.1

Formatted

Supply air ducts connecting to listed central heating furnaces shall have the same minimum clearance to combustibles as required for the furnace supply plenum for a distance of not less than 3 ft (0.9 m) from the supply plenum.

10.3.3.7.2

Clearance shall not be required beyond the 3 ft (0.9 m) distance.

10.3.3.8

10.3.3.8.1

Supply air ducts connecting to unlisted central heating furnaces equipped with temperature limit controls with a maximum setting of 250°F (121°C) shall have a minimum clearance to combustibles of 6 in. (150 mm) for a distance of not less than 6 ft (1.8 m) from the furnace supply plenum.

10.3.3.8.2

Clearance shall not be required beyond the 6 ft (1.8 m) distance.

10.3.5 Temperature or Pressure Limiting Devices.

10.3.5.1

Steam and hot water boilers, respectively, shall be provided with approved automatic limiting devices for shutting down the burner(s) to prevent boiler steam pressure or boiler water temperature from exceeding the maximum allowable working pressure or temperature.

10.3.5.2

Safety limit controls shall not be used as operating controls.

10.3.6 Low-Water Cutoff.

10.3.6.1

All water boilers and steam boilers shall be provided with an automatic means to shut off the fuel supply to the burner(s) if the boiler water level drops below the lowest safe water line.

10.3.6.2

In lieu of the low-water cutoff, water tube or coil-type boilers that require forced circulation to prevent overheating and failure shall have an approved flow sensing device arranged to shut down the boiler when the flow rate is inadequate to protect the boiler against overheating.

10.3.7* Steam Safety and Pressure Relief Valves.

10.3.7.1

Steam and hot water boilers shall be equipped, respectively, with listed or approved steam safety or pressure relief valves of appropriate discharge capacity and conforming with ASME requirements.

10.3.7.2

A shutoff valve shall not be placed between the relief valve and the boiler or on discharge pipes between such valves and the atmosphere.

10.3.8.3*

Where a furnace plenum is not supplied with the furnace, any fabrication and installation instructions provided by the manufacturer shall be followed.

10.3.8.4

The method of connecting supply and return ducts shall facilitate proper circulation of air.

10.3.8.54

Where a furnace is installed so supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

10.3.8.6

Return air shall not be taken from the mechanical room containing the furnace.

10.4.2 Clearance.

10.4.2.1

The installation of Type 1 clothes dryers shall comply with the following requirements:

1. ~~Type 1 clothes dryers~~They shall be installed with a minimum clearance of 6 in. (150 mm) from adjacent combustible material.
2. Type 2 ~~C~~clothes dryers listed for installation at reduced clearances shall be installed in accordance with the manufacturer's installation instructions.

~~1.~~3. Type 1 clothes dryers installed in closets shall be specifically listed for such installation.

10.4.2.2

The installation of Type 2 clothes dryers shall comply with the following requirements:

1. Type 2 clothes dryers shall be installed with clearances of not less than those shown on the marking plate and in the manufacturer's instructions.
2. Type 2 clothes dryers designed and marked “For use only in noncombustible locations” shall not be installed elsewhere.

10.4.5.3

Exhaust ducts shall be constructed of rigid metallic material.

10.4.5.4

Transition ducts used to connect the dryer to the exhaust duct shall be listed and labeled in accordance with UL 2158A, Clothes Dryer Transition Ducts, and installed in accordance with the clothes dryer manufacturer’s installation instructions

10.4.6.2

Exhaust ducts for Type 2 clothes dryers shall be constructed of sheet metal or other noncombustible material.

10.4.6.3

Such ducts for Type 2 clothes dryers shall be equivalent in strength and corrosion resistance to ducts made of galvanized sheet steel not less than 0.0195 in. (0.5 mm) thick.

10.6.3 Installation.

10.6.3.1

A decorative appliance for installation in a vented fireplace shall be installed only in a vented fireplace having a working chimney flue and constructed of noncombustible materials.

10.6.3.2 The~~se~~ appliances in 10.6.3.1 ~~appliances~~ shall not be thermostatically controlled.

Renumber remaining sections

10.7.3 Installation.

The installation of vented gas fireplaces shall comply with the following requirements:

1. Vented gas fireplaces shall be installed in accordance with the manufacturer's installation instructions and
~~1.~~2. where installed in or attached to combustible material the vented gas fireplace shall be specifically listed for such installation.
~~2.~~3. Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building.
~~3.~~4. Direct vent gas fireplaces shall be installed with the vent air intake terminal in the outdoors and in accordance with the manufacturer's instructions.

10.8.5.2
Ventilation air to the recirculating direct gas-fired heating and forced ventilation appliance shall be ducted directly from outdoors.
10.8.5.3
Air in excess of the minimum ventilation air specified on the heater's rating plate shall be taken from the building, ducted directly from outdoors, or a combination of both.

Renumber remaining sections

10.8.6 Atmospheric Vents or Gas Reliefs or Bleeds.
10.8.6.1
Direct gas-fired heating and forced ventilation appliances with valve train components equipped with atmospheric vents, gas reliefs, or bleeds shall have their vent lines, gas reliefs, or bleeds lead to a safe point outdoors.
10.8.6.2
Means shall be employed on these lines to prevent water from entering and to prevent blockage from insects and foreign matter. An atmospheric vent line shall not be required to be provided on a valve train component equipped with a listed vent limiter.

10.8.7.2
Louver or counterbalanced gravity damper relief openings shall be permitted.
10.8.7.3
Where motorized dampers or closable louvers are used, they shall be proved to be in their open position prior to main burner operation.

10.9.5 Location of Draft Hood and Controls.
10.9.5.1
The controls, combustion air inlet, and draft hoods for duct furnaces shall be located outside the ducts.
10.9.5.2
The draft hood shall be located in the same enclosure from which combustion air is taken.

10.9.6 Circulating Air.
10.9.6.1
Where a duct furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.
10.9.6.2
The duct furnace shall be installed on the positive-pressure side of the circulating air blower.

10.9.7.3*
Where a duct furnace is installed downstream of an evaporative cooler or air washer, the heat exchanger shall be constructed of corrosion-resistant materials.
10.9.7.4
Air washers operating with chilled water that deliver air below the dew point of the ambient air at the duct furnace shall be considered as refrigeration systems.

10.10.5 Placement.
The following provisions apply to furnaces that serve one story:

1. ~~Floors.~~ Floor furnaces shall not be installed in the floor of any doorway, stairway landing, aisle, or passageway of any enclosure, public or private, or in an exitway from any such room or space.
2. ~~Walls and Corners.~~ Floor furnaces installed in walls and corners shall be in accordance with the following:
    a. The register of a floor furnace with a horizontal warm air outlet shall not be placed closer than 6 in. (150 mm) from the nearest wall.
    b. A distance of at least 18 in. (460 mm) from two adjoining sides of the floor furnace register to walls shall be provided to eliminate the necessity of occupants walking over the warm air discharge.
    c. The remaining sides shall be a minimum of 6 in. (150 mm) from a wall.
    d. Wall register models shall not be placed closer than 6 in. (150 mm) to a corner.
    ~~2.~~e.
3. ~~Draperies.~~ The furnace shall be placed so that a door, drapery, or similar object cannot be nearer than 12 in. (300 mm) to any portion of the register of the furnace.

Formatted

10.10.8 Clearance.
10.10.8.1
The lowest portion of the floor furnace shall have at least a 6 in. (150 mm) clearance from the general ground level.
10.10.8.1
A reduced clearance to a minimum of 2 in. (50 mm) shall be permitted, provided the lower 6 in. (150 mm) portion of the floor furnace is sealed by the manufacturer to prevent entrance of water.
10.10.8.2
Where these clearances in 10.10.8.1 are not present, the ground below and to the sides shall be excavated to form a “basin-like” pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace.
10.10.8.3
A 12 in. (300 mm) clearance shall be provided on all sides except the control side~~,~~
10.10.8.4
The control side ~~which~~ shall have an 18 in. (460 mm) clearance.

10.10.10 Seepage Pan.
10.10.10.1
Where the excavation exceeds 12 in. (300 mm) in depth or water seepage is likely to collect, a watertight copper pan, concrete pit, or other suitable material shall be used, unless adequate drainage is provided or the appliance is sealed by the manufacturer to meet this condition.

10.10.10.2
A copper pan shall be made of not less than 16 oz/ft2 (4.9 kg/m2) sheet copper.
10.10.10.3 The pan shall be anchored in place ~~so as~~ to prevent floating.~~,~~
10.10.10.4~~and t~~The walls of the pan shall extend at least 4 in. (100 mm) above the ground level with at least a 6 in. (150 mm) clearance on all sides and 18 in. (460 mm) on the control side~~, except on the control side, which shall have at least an 18 in. (460 mm) clearance.~~

10.10.12 Upper Floor Installations.
10.10.12.1
Floor furnaces shall be permitted to be installed in an upper floor, provided the furnace assembly projects below into a utility room, closet, garage, or similar nonhabitable space.
10.10.12.2 In the ~~such~~ installations in 10.10.12.1, the floor furnace shall be enclosed completely (entirely separated from the nonhabitable space) with means for air intake to meet the provisions of Section 9.3, with access for servicing, minimum furnace clearances of 6 in. (150 mm) to all sides and bottom, and with the enclosure constructed of Portland cement plaster or metal lath or other noncombustible material.

10.10.13 First Floor Installation.
10.10.13.1
Floor furnaces installed in the first or ground floors of buildings shall not be required to be enclosed. ~~unless~~
10.10.13.2
~~the~~ Where the basements of ~~these~~ buildings have been converted to apartments or sleeping quarters, ~~in which case~~ the floor furnace shall be enclosed as specified in 10.10.12~~for upper floor installations and~~
10.10.13.3
The enclosure required by 10.10.13.2 shall project into a nonhabitable space.

10.11.2 Clearance for Listed Appliances.
10.11.2.1
Floor-mounted food service appliances, such as ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens, shall be installed at least 6 in. (150 mm) from combustible material except that at least a 2 in. (50 mm) clearance shall be maintained between a draft hood and combustible material.
10.11.2.2
Floor-mounted food service appliances listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.
10.11.2.3
Appliances designed and marked "For use only in noncombustible locations" shall not be installed elsewhere.

10.11.3.2
Floor-mounted food service appliances that are not listed for installation on a combustible floor shall be installed in accordance ~~with 10.11.4 or be installed in accordance~~ with one of the following:

1. It shall be installed in accordance with 10.11.4
~~1.~~2. Where the appliance is set on legs that provide not less than 18 in. (460 mm) open space under the base of the appliance or where it has no burners and no portion of any oven or broiler within 18 in. (460 mm) of the floor, it shall be permitted to be installed on a combustible floor

without special floor protection, provided at least one sheet metal baffle is between the burner and the floor.

3. Where the appliance is set on legs that provide not less than 8 in. (200 mm) open space under the base of the appliance, the following shall apply:
   a. ~~i~~It shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with not less than 3⁄8 in. (9.5 mm) insulating millboard covered with sheet metal not less than 0.0195 in. (0.5 mm) thick.
   ~~2.~~b. The ~~preceding specified~~ floor protection shall extend not less than 6 in. (150 mm) beyond the appliance on all sides.
4. Where the appliance is set on legs that provide not less than 4 in. (100 mm) under the base of the appliance, the following shall apply
   a. ~~i~~It shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with hollow masonry not less than 4 in. (100 mm) in thickness covered with sheet metal not less than 0.0195 in. (0.5 mm) thick.
   ~~3.~~b. Such masonry courses shall be laid with ends unsealed and joints matched in such a way as to provide for free circulation of air through the masonry.
~~4.~~5. Where the appliance does not have legs at least 4 in. (100 mm) high, it shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected by two courses of 4 in. (100 mm) hollow clay tile, or equivalent, with courses laid at right angles and with ends unsealed and joints matched in such a way as to provide for free circulation of air through such masonry courses, and covered with steel plate not less than 3⁄16 in. (4.8 mm) in thickness.

10.13.3 Clearances.

10.13.3.1

Floor-mounted household cooking appliances, where installed on combustible floors, shall be set on their own bases or legs

10.13.3.2

Floor-mounted household cooking appliances, ~~where installed on combustible floors and~~ shall not interfere with combustion air, accessibility for operation, and servicing.

10.13.3.~~3~~1* ~~Vertical Clearance Above Cooking Top.~~

Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 in. (760 mm) to combustible material or metal cabinets.

10.13.3.~~4~~2

A minimum clearance of 24 in. (610 mm) shall be permitted when one of the following is installed:

1. The underside of the combustible material or metal cabinet above the cooking top is protected with not less than 1⁄4 in. (6 mm) insulating millboard covered with sheet metal not less than 0.0122 in. (0.3 mm) thick.
2. A metal ventilating hood of sheet metal not less than 0.0122 in. (0.3 mm) thick is installed above the cooking top with a clearance of not less than 1⁄4 in. (6 mm) between the hood and the underside of the combustible material or metal cabinet, and the hood is at least as wide as the appliance and is centered over the appliance.
3. A cooking appliance or microwave oven is installed over a cooking appliance and conforms to the terms of the upper appliance's manufacturer's installation instructions.

10.14.2.2 Open-Flame Type.

Formatted

Formatted

Commented [IA10]: What does this mean?

Commented [IA11R10]: Deleted "where installed on combustible floors"

Commented [IA12]: Maybe put this as 1

Clearance shall comply with the following:

1. Unlisted open-flame illuminating appliances installed outdoors shall have clearances in accordance with the following:
    a. ~~f~~From combustible material not less than that specified in Table 10.14.2.2.
    b. The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways.
    ~~1.~~c. Lesser clearances shall be permitted to be used where acceptable to the authority having jurisdiction.
2. Unlisted open-flame illuminating appliances installed outdoors shall be equipped with a limiting orifice or other limiting devices that maintain a flame height consistent with the clearance from combustible material, as given in Table 10.14.2.2.
3. Appliances designed for flame heights in excess of 30 in. (760 mm) shall be approved.
~~3.~~4. ~~Such a~~Appliances with a flame heights in excess of 30 in. (760 mm) shall be equipped with a safety shutoff device or automatic ignition.
~~4.~~5. Clearances to combustible material from unlisted open-flame illuminating appliances shall be approved.

10.14.4 Installation on Posts.
10.14.4.1
Illuminating appliances designed for installation on a post shall be securely and rigidly attached to a post.
10.14.4.2
Posts shall be rigidly installed.
10.14.4.3
The strength and rigidity of posts greater than 3 ft (0.9 m) in height shall be at least equivalent to that of a 21⁄2 in. (64 mm) diameter post constructed of 0.064 in. (1.6 mm) thick steel or a 1 in. Schedule 40 steel pipe.
10.14.4.5
Posts 3 ft (0.9 m) or less in height shall not be smaller than a 3⁄4 in. Schedule 40 steel pipe.
10.14.4.6
Drain openings shall be provided near the base of posts where water collecting inside the posts is possible.

10.16.2 Support.
10.16.2.1

Suspended-type infrared heaters shall be fixed in position independent of gas and electric supply lines.
10.16.2.2
Hangers and brackets shall be of noncombustible material.
10.16.2.3
Heaters subject to vibration shall be provided with vibration-isolating hangers.

10.16.5 Installation in Commercial Garages and Aircraft Hangars.
10.16.5.1
Overhead heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be listed
10.16.5.2

Formatted

Commented [IA13]: This isn't a clearance requirement

Overhead heaters installed in garages for more than three motor vehicles or in aircraft hangars ~~and~~ shall be installed in accordance with 9.1.11 and 9.1.12.

10.17.2 Protection Above Domestic Units.

10.17.2.1

Domestic open-top broiler units shall be provided with a metal ventilating hood not less than 0.0122 in. (0.3 mm) thick with a clearance of not less than 1⁄4 in. (6 mm) between the hood and the underside of combustible material or metal cabinets.

10.17.2.2

A clearance of at least 24 in. (610 mm) shall be maintained between the cooking top and the combustible material or metal cabinet, and the hood shall be at least as wide as the open-top broiler unit and centered over the unit.

10.17.2.3

Domestic open-top broiler units incorporating an integral exhaust system and listed for use without a ventilating hood shall not be required to be provided with a ventilating hood if installed in accordance with 10.13.3.1(1).

10.20.2 Clearance.

10.20.2.1

Refrigerators shall be installed~~provided~~ with clearances for ventilation at the top and back in accordance with the manufacturers' instructions.

10.20.2.2

Where such instructions are not available, clearance shall be at least 2 in. (50 mm) shall be provided between the back of the refrigerator and the wall and at least 12 in. (300 mm) above the top.

10.24.2 Support.

10.24.2.1

Suspended-type unit heaters shall be safely and adequately supported, with due consideration given to their weight and vibration characteristics.

10.24.2.2

Hangers and brackets shall be of noncombustible material.

10.24.3 Clearance for Suspended-Type Unit Heaters.

Suspended-type unit heaters shall meet the following requirements:

1. Unit heaters shall be installed with clearances from combustible material of not less than 18 in. (460 mm) at the sides, 12 in. (300 mm) at the bottom, and 6 in. (150 mm) above the top where the unit heater has an internal draft hood, or 1 in. (25 mm) above the top of the sloping side of a vertical draft hood.
~~1.~~2. A unit heater listed for reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
~~2.~~3. Clearances for servicing shall be in accordance with the manufacturers' installation instructions.

10.25.2 Installation.

10.25.2.1

Wall furnaces shall be installed in accordance with the manufacturer's installation instructions.

10.25.2.2

Wall furnaces installed in or attached to combustible material shall be listed for such installation.

10.25.2.2
Vented wall furnaces connected to a Type B-W gas vent system listed only for a single story shall be installed only in single-story buildings or the top story of multistory buildings.
10.25.2.3
Vented wall furnaces connected to a Type B-W gas vent system listed for installation in multistory buildings shall be permitted to be installed in single-story or multistory buildings.
10.25.2.4
Type B-W gas vents shall be attached directly to a solid header plate that serves as a firestop at that point and that shall be permitted to be an integral part of the vented wall furnace, as illustrated in Figure 10.25.2.4~~2~~.
10.25.2.5
The stud space in which the vented wall furnace is installed shall be ventilated at the first ceiling level by installation of the ceiling plate spacers furnished with the gas vent.
10.25.2.6
Firestop spacers shall be installed at each subsequent ceiling or floor level penetrated by the vent.

10.25.2.7~~3~~
Direct vent wall furnaces shall be installed with the combustion air intake terminal outdoors.

10.25.2.8~~4~~
Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building. (For additional information on the venting of wall furnaces, see Chapter 12.)

10.25.3 Location.
10.25.3.1
Wall furnaces shall be located so as not to cause a hazard to walls, floors, curtains, furniture, or doors.
10.25.3.2
Wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.

10.26.1 Application.
10.26.1.1
Water heaters shall be listed in accordance with ANSI Z21.10.1/CSA 4.1, Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less, or ANSI Z21.10.3/CSA 4.3, Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating or Instantaneous~~, and~~
10.26.1.2
Water heaters shall be installed in accordance with the manufacturer's installation instructions.

10.26.2 Location.
Water heater installations in bedrooms and bathrooms shall comply with one of the following:

1. Water heater shall be installed in a closet in accordance with the following:
   a. The closet is equipped with a weather-stripped door with no openings and with a self-closing device.
   ~~1.~~b. All combustion air shall be obtained from the outdoors in accordance with 9.3.3.
2. Water heater shall be of the direct vent type.

Formatted

10.26.3 Clearance.

10.26.3.1

The clearances shall not be such as to interfere with combustion air, draft hood clearance and relief, and accessibility for servicing.

10.26.3.2

Listed water heaters shall be installed in accordance with the manufacturer's installation instructions.

10.26.4 Pressure Relief Devices.

10.26.4.1

A water heater installation shall be provided with overpressure protection by means of a device listed in accordance with ANSI Z21.22/CSA 4.4, Relief Valves for Hot Water Supply Systems, and installed in accordance with the manufacturer’s installation instructions.

10.26.4.2

The pressure setting of the device shall exceed the water service pressure and shall not exceed the maximum pressure rating of the water heater.

10.26.6 Temperature, Pressure, and Vacuum Relief Devices.

10.26.6.1

Temperature, pressure, and vacuum relief devices, or combinations thereof, and automatic gas shutoff devices shall be in-stalled in accordance with the manufacturer's installation instructions.

10.26.6.2

A shutoff valve shall not be placed between the relief valve and the water heater or on discharge pipes between such valves and the atmosphere.

10.26.6.3

The hourly Btu discharge capacity or the rated steam relief capacity of the device shall not be less than the input rating of the water heater.

10.27 Compressed Natural Gas (CNG) Vehicular Fuel Systems.

10.27.1

The installation of compressed natural gas (CNG) fueling (dispensing) systems shall be in accordance with NFPA 52.

10.27.2

Residential CNG fueling appliances shall be listed in accordance with ANSI/CSA NGV 5.1, Residential Fueling Appliances, and installed in accordance to the appliance manufacturer’s installation instructions.

10.27.3

Non-residential CNG fueling appliances shall be listed in accordance with ANSI/CSA NGV 5.2, Vehicle Fueling Appliances (VFA), and installed in accordance with the appliance manufacturer’s installation instructions.

10.28 Appliances for Installation in Manufactured Housing.

10.28.1

Appliances installed in manufactured housing after the initial sale shall be listed for installation in manufactured housing, or approved.

10.28.2~~, and~~

Appliances shall be installed in accordance with the requirements of this code and the manufacturers’ installation instructions.

10.28.3

Appliances installed in the living space of manufactured housing shall be in accordance with the requirements of Section 9.3.

10.29 Fuel Cell Power Plants.

10.29.1

Fuel cell power plants with a power output of less than 50 kW shall be listed in accordance with ANSI/CSA FC 1, Fuel Cell Technologies — Part 3-100: Stationary Fuel Cell Power Systems — Safety, and installed in accordance with the manufacturer's instructions.

10.29.2

Fuel cell power plants with a power output of greater than 50 kW shall be installed in accordance with NFPA 853.

10.30.1 Application.

10.30.1.1

Outdoor open flame decorative appliances shall be listed in accordance with ANSI Z21.97/CSA 2.41, Outdoor Decorative Gas Appliances., ~~and~~

10.30.1.2 Outdoor open flame decorative appliances shall be installed in accordance with the manufacturer's installation instructions.

10.31 Outdoor Infrared Heaters.

10.31.1

Outdoor infrared heaters for residential and commercial applications shall be listed in accordance with ANSI Z83.26/CSA 2.27, Gas-Fired Outdoor Infrared Patio Heaters~~, and~~

10.31.2

Outdoor infrared heaters for residential and commercial applications shall be installed in accordance with the manufacturer's installation instructions.

11.1.1* Adjusting Input.

11.1.1.1

The input rate of the burner shall be adjusted to the proper value in accordance with the appliance manufacturer's instructions.

11.1.1.2

Firing at a rate in excess of the nameplate rating shall be prohibited.

Renumber Remaining sections

11.1.2 High Altitude.

11.1.2.1

Gas input ratings of appliances shall be used for elevations up to 2000 ft (600 m).

11.1.2.2

The input ratings of appliances operating at elevations above 2000 ft (600 m) shall be reduced in accordance with one of the following methods:

1. At the rate of 4 percent for each 1000 ft (300 m) above sea level before selecting appropriately sized appliance
2. As permitted by the authority having jurisdiction
3. In accordance with the manufacturer's installation instructions

11.2* Primary Air Adjustment.

11.2.1

The primary air for injection (Bunsen)-type burners shall be adjusted for proper flame characteristics in accordance with the appliance manufacturer's instructions.

11.2.2

After setting the primary air, the adjustment means shall be secured in position.

11.3 Safety Shutoff Devices.

11.3.1

Where a safety shutoff device is provided, it shall be checked for proper operation and adjustment in accordance with the appliance manufacturer's instructions.

11.3.2

Where the device does not turn off the gas supply in the event of pilot outage or other ignition malfunction, the device shall be serviced or replaced with a new device.

11.4 Automatic Ignition.

11.4.1

Appliances supplied with means for automatic ignition shall be checked for operation within the parameters provided by the manufacturer.

11.4.2

Any adjustments made shall be in accordance with the manufacturer's installation instructions.

11.5 Protective Devices.

11.5.1

Where required by the manufacturer's installation instructions, all protective devices furnished with the appliance, such as a limit control, fan control to blower, temperature and pressure relief valve, low-water cutoff device, or manual operating features, shall be checked for operation within the parameters provided by the manufacturer.

11.5.2

Any adjustments made shall be in accordance with the manufacturer's installation instructions.

11.7 Operating Instructions.

11.7.1

Operating instructions shall be furnished

11.7.2

Operating instructions ~~and~~ shall be left in a prominent position near the appliance for use by the consumer.

12.5.2 Plastic Piping.

12.5.2.1

Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material.

12.5.2.2

The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed and labeled in accordance with UL 1738, Venting Systems for Gas-Burning Appliances, Categories II, III, and IV.

12.5.3 Plastic Vent Joints.

12.5.3.1

Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions.

12.5.3.2

Plastic pipe venting materials listed and labeled in accordance with UL 1738, Venting Systems for Gas-Burning Appliances, Categories II, III, and IV, shall be installed in accordance with the vent manufacturer's installation instructions.

12.5.3.3

Where primer is required, it shall be of a contrasting color.

12.6.1.1

Factory-built chimneys shall be listed in accordance with UL 103, Factory-Built Chimneys for Residential Type and Building Heating Appliances; UL 959, Medium Heat Appliance Factory-Built Chimneys; or UL 2561, 1400 Degree Fahrenheit Factory-Built Chimneys.

12.6.1.2

Factory-built chimneys used to vent appliances that operate at positive vent pressure shall be listed for such application.

Renumber remaining sections

12.6.4 Inspection of Chimneys.

12.6.4.1

Before replacing an existing appliance or connecting a vent connector to a chimney, the chimney passageway shall be examined to ascertain that it is clear and free of obstructions

12.6.4.2 ~~and~~

The chimney passageway shall be cleaned if previously used for venting solid or liquid fuel–burning appliances or fireplaces.

12.6.4.3~~2~~

Chimneys shall be lined in accordance with NFPA 211.

12.6.4.4~~3~~

Cleanouts shall be examined

12.6.4.5 ~~and w~~Where cleanouts~~they~~ do not remain tightly closed when not in use, they shall be repaired or replaced.

12.6.4.5~~4~~

When inspection reveals that an existing chimney is not safe for the intended application, it shall be repaired, rebuilt, lined, relined, or replaced with a vent or chimney to conform to NFPA 211

12.6.4.6~~5~~ ~~and~~

Vents and chimneys shall be suitable for the appliances to be attached.

12.6.5.2

Where one chimney serves gas appliances and liquid fuel–burning appliances, the appliances shall be connected through separate openings or connected through a single opening where joined by a suitable fitting located as close as practical to the chimney.

12.6.5.3

Where two or more openings are provided into one chimney flue, they shall be at different levels.

12.6.5.4

Where the gas appliance is automatically controlled, it shall be equipped with a safety shutoff device.

12.6.5.53*
A listed combination gas- and solid fuel–burning appliance connected to a single chimney flue shall be equipped with a manual reset device to shut off gas to the main burner in the event of sustained backdraft or flue gas spillage.
12.6.5.6
The chimney flue shall be sized to properly vent the appliance.

12.6.6 Support of Chimneys.
12.6.6.1
All portions of chimneys shall be supported for the design and weight of the materials employed.
12.6.6.2
Listed factory-built chimneys shall be supported and spaced in accordance with the manufacturer's installation instructions.

12.6.7 Cleanouts.
12.6.7.1
Where a chimney that formerly carried flue products from liquid or solid fuel–burning appliances is used with an appliance using fuel gas, an accessible cleanout shall be provided.
12.6.7.2
The cleanout shall have a tight-fitting cover and be installed so its upper edge is at least 6 in. (150 mm) below the lower edge of the lowest chimney inlet opening.

12.6.9 Insulation Shield.
12.6.9.1
Where a factory-built chimney passes through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 in. (0.4712 mm) (nominal 26 gage) shall be installed to provide clearance between the chimney and the insulation material.
12.6.9.2
The clearance shall not be less than the clearance to combustibles specified by the chimney manufacturer's installation instructions.
12.6.9.3
Where chimneys pass through attic space, the shield shall terminate not less than 2 in. (51 mm) above the insulation materials and shall be secured in place to prevent displacement.

12.7 Gas Vents.
12.7.1 Materials.
12.7.1.1
Type B and Type BW gas vents shall be listed in accordance with UL 441, Gas Vents.
12.7.1.2
Vents for listed combination gas- and oil-burning appliances shall be listed in accordance with UL 641, Type L Low-Temperature Venting Systems.

12.7.2 Installation.
The installation of gas vents shall meet the following requirements:

1. Gas vents shall be installed in accordance with the manufacturer's installation instructions.
2. A Type B-W gas vent shall have a listed capacity not less than that of the listed vented wall furnace to which it is connected.

Commented [IA14]: Renumber annex

3. Gas vents installed within masonry chimneys shall be installed in accordance with the manufacturer's installation instructions.
4. Gas vents installed within masonry chimneys shall be identified with a permanent label installed at the point where the vent enters the chimney.
~~3.~~5. The label shall contain the following language: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel–burning appliances or incinerators."
~~4.~~6. Screws, rivets, and other fasteners shall not penetrate the inner wall of double-wall gas vents, except at the transition from the appliance draft hood outlet, flue collar, or single-wall metal connector to a double-wall vent.

12.7.4.2 Vent Offsets.

12.7.4.2.1

Type B and Type L vents sized in accordance with 12.7.4.1(3) or 12.7.4.1(4) shall extend in a generally vertical direction with offsets not exceeding 45 degrees, except that a vent system having not more than one 60 degree offset shall be permitted.

12.7.4.2.2

Any angle greater than 45 degrees from the vertical is considered horizontal.

12.7.4.2.3

The total horizontal distance of a vent plus the horizontal vent connector serving draft hood–equipped appliances shall not be greater than 75 percent of the vertical height of the vent.

12.7.4.3 Category II, Category III, and Category IV Appliances.

12.7.4.3.1

The sizing of gas vents for Category II, Category III, and Category IV appliances shall be in accordance with the appliance manufacturers' instructions.

12.7.4.3.2

The sizing of plastic pipe specified by the appliance manufacturer as a venting material for Category II, III, and IV appliances shall be in accordance with the appliance manufacturers' instructions.

12.7.5.1

Where a common vent is installed in a multistory installation to vent Category I appliances located on more than one floor level, the venting system shall be designed and in-stalled in accordance with engineering methods.

12.7.5.2

Crawl spaces, basements, and attics shall be considered as floor levels.

Renumber remaining requirements

12.7.7 Marking.

12.7.7.1

In those localities where solid and liquid fuels are used extensively, gas vents shall be permanently identified by a label attached to the wall or ceiling at a point where the vent connector enters the gas vent.

12.7.7.2

The label shall read: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel–burning appliances or incinerators."

12.7.7.3

The authority having jurisdiction shall determine whether its area constitutes such a locality.

12.8.4.2
Single-wall metal pipe shall be used only for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air.

12.8.4.3
A pipe passing through a roof shall extend without interruption through the roof flashing, roof jacket, or roof thimble.

12.8.4.~~3~~4
Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space, or floor.

12.8.4.~~4~~5
Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 12.8.4.4.

12.8.4.6
Reduced clearances from single-wall metal pipe to combustible material shall be as specified for vent connectors in Table 10.2.4.

12.8.4.5
Where a single-wall metal pipe passes through a roof constructed of combustible material, a noncombustible, nonventilating thimble shall be used at the point of passage.

12.8.4.6
The thimble shall extend at least 18 in. (460 mm) above and 6 in. (150 mm) below the roof with the annular space open at the bottom and closed only at the top.

12.8.4.7
The thimble shall be sized in accordance with 12.8.4.~~8~~6.

12.8.4.~~8~~6
Single-wall metal pipe shall not pass through a combustible exterior wall unless guarded at the point of passage by a ventilated metal thimble not smaller than the following:

1. For listed appliances with draft hoods and appliances listed for use with Type B gas vents, the thimble shall be a minimum of 4 in. (100 mm) larger in diameter than the metal pipe.
~~1.~~2. For listed appliances with draft hoods and appliances listed for use with Type B gas vents and ~~W~~where there is a run of not less than 6 ft (1.8 m) of metal pipe in the opening between the draft hood outlet and the thimble, the thimble shall be a minimum of 2 in. (50 mm) larger in diameter than the metal pipe.
~~2.~~3. For unlisted appliances having draft hoods, the thimble shall be a minimum of 6 in. (150 mm) larger in diameter than the metal pipe.
~~3.~~4. For residential and low-heat appliances, the thimble shall be a minimum of 12 in. (300 mm) larger in diameter than the metal pipe.
~~4.~~5. ~~Exception:~~

12.8.4.9
~~In lieu of~~ Where a thimble ~~protection~~ is not installed the following shall be required ~~permitted~~:~~,~~
1. ~~a~~All combustible material in the wall shall be removed a sufficient distance from the metal pipe to provide the specified clearance from such metal pipe to combustible material.
~~1.~~2. Any material used to seal ~~close up such~~ an opening shall be noncombustible.

12.8.5 Size of Single-Wall Metal Pipe.
Single-wall metal piping shall comply with the following requirements:

Commented [IA15]: Exception was removed here

1. *A venting system of a single-wall metal pipe shall be sized in accordance with one of the following methods and the appliance manufacturer's instructions:
   a. For a draft hood–equipped appliance, in accordance with Chapter 13.
   b. For a venting system for a single appliance with a draft hood, the following:
      i. ~~t~~The areas of the connector and the pipe each shall not be less than the area of the appliance flue collar or draft hood outlet, whichever is smaller.
      ~~b.~~ii. The vent area shall not be greater than seven times the draft hood outlet area.
   c. Engineering methods.
2. Where a single-wall metal pipe is used and has a shape other than round, it shall have an equivalent effective area equal to the effective area of the round pipe for which it is substituted and the minimum internal dimension of the pipe shall be 2 in. (50 mm).
3. The vent cap or a roof assembly shall have a venting capacity not less than that of the pipe to which it is attached.

12.11.2.4
A vent connector for a nonresidential low-heat appliance shall be a factory-built chimney section or steel pipe having resistance to heat and corrosion equivalent to that for the appropriate galvanized pipe as specified in Table 12.11.2.4.

12.11.2.5
Factory-built chimney sections shall be joined together in accordance with the chimney manufacturer's instructions.

12.11.2.~~6~~5
Vent connectors for medium-heat appliances shall be constructed of factory-built, medium-heat chimney sections or steel of a thickness not less than that specified in Table 12.11.2.~~6~~5. ~~and~~

12.11.2.7
Vent connectors for medium heat appliances shall comply with the following:

1. A steel vent connector for an appliance with a vent gas temperature in excess of 1000°F (538°C) measured at the entrance to the connector shall be lined with medium-duty fire brick or the equivalent.
2. The lining shall be at least 21⁄2 in. (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 in. (460 mm) or less.
3. The lining shall be at least 41⁄2 in. (110 mm) thick laid on the 41⁄2 in. (110 mm) bed for a vent connector having a diameter or greatest cross-sectional dimension greater than 18 in. (460 mm).
4. Where factory-built chimney sections are installed, they shall be joined together in accordance with the chimney manufacturer's instructions.

12.11.3.2
Where a single appliance having more than one draft hood outlet or flue collar is installed, the manifold shall be constructed according to the instructions of the appliance manufacturer.

12.11.3.3
Where there are no instructions, the manifold shall be designed and constructed in accordance with engineering methods.

12.11.3.4
As an alternative method, the effective area of the manifold shall be in accordance with the following
1. ~~e~~Equal the combined area of the flue collars or draft hood outlets~~, and~~

Formatted

2. ~~t~~The vent connectors shall have a minimum 1 ft (0.3 m) rise.

Renumber remaining sections

12.11.9.2
The maximum horizontal length of a Type B double-wall connector shall be 100 percent of the height of the chimney or vent, except for engineered systems.
12.11.9..3
The maximum length of an individual connector for a chimney or vent system serving multiple appliances, from the appliance outlet to the junction with the common vent or another connector, shall be 100 percent of the height of the chimney or vent.

12.13.3 Draft Control Devices.
12.13.3.1
Where a draft control device is part of the appliance or is supplied by the appliance manufacturer, it shall be installed in accordance with the manufacturer's instructions.
12.13.3.2
In the absence of manufacturer's instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical.
12.13.4* Additional Devices.
Appliances requiring controlled chimney draft shall be permitted to be equipped with listed double-acting barometric draft regulators installed and adjusted in accordance with the manufacturer's instructions.
12.13.5 Location.
Draft hoods and barometric draft regulators shall be installed in the same room or enclosure as the appliance in such a manner as to prevent any difference in pressure between the hood or regulator and the combustion air supply.
12.13.6 Positioning.
12.13.6.1
Draft hoods and draft regulators shall be installed in the position for which they were designed with reference to the horizontal and vertical planes. ~~and~~
12.13.6.2
Draft hoods and draft regulators shall be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction.
12.13.6.3
The appliance and its draft hood shall be located so that the relief opening is accessible for checking vent operation.
12.13.7 Clearance.
12.13.7.1
A draft hood shall be located so that its relief opening is not less than 6 in. (150 mm) from any surface except that of the appliance it serves and the venting system to which the draft hood is connected.
12.13.7.2
Where a greater or lesser clearance is indicated on the appliance label, the clearance shall not be less than that specified on the label.
12.13.7.3 ~~Such c~~The clearances in 12.13.7 shall not be reduced.

12.14.1
A manually operated damper shall not be placed in any appliance vent connector.

12.14.2
Fixed baffles and balancing baffles shall not be classified as manually operated dampers.

12.16 Obstructions.
12.16.1
Devices that retard the flow of vent gases shall not be installed in a vent connector, chimney, or vent.
12.16.2
The following shall not be considered as obstructions:

1. Draft regulators and safety controls specifically listed for installation in venting systems and installed in accordance with the manufacturer's installation instructions
2. Approved draft regulators and safety controls designed and installed in accordance with engineering methods
3. Listed heat reclaimers and automatically operated vent dampers installed in accordance with the manufacturers' installation instructions
4. Vent dampers serving listed appliances installed in accordance with 13.1.1 or 13.2.1 or engineering methods
5. Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided the appliance manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with Section 12.1 and 12.4.1 is obtained

13.1.1 Obstructions and Vent Dampers.
13.1.1.1
Venting Table 13.1(a) through Table 13.1(f) shall not be used where obstructions are installed in the venting system.
13.1.1.2
The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions or in accordance with the following:

1. The maximum capacity of the vent system shall be determined using the "NAT Max" column.
2. The minimum capacity shall be determined as though the appliance were a fan-assisted appliance, using the "FAN Min" column to determine the minimum capacity of the vent system. Where the corresponding "Fan Min" is "NA," the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

13.1.2 Vent Downsizing.
13.1.2.1
Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted, provided that the installation complies with all of the following requirements:

1. The total vent height (H) is at least 10 ft (3 m).
2. Vents for appliance draft hood outlets or flue collars 12 in. (300 mm) in diameter or smaller are not reduced more than one table size.
3. Vents for appliance draft hood outlets or flue collars larger than 12 in. (300 mm) in diameter are not reduced more than two table sizes.

4. The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10 percent (0.90 × maximum table capacity).
5. The draft hood outlet is greater than 4 in. (100 mm) in diameter.

13.1.2.2
A 3 in. (80 mm) diameter vent shall not be connected to a 4 in. (100 mm) diameter draft hood outlet.
13.1.2.3
~~This provision~~ 13.1.2.1(5) shall not apply to fan-assisted appliances.

13.1.3 Elbows.
13.1.3.1
Single-appliance venting configurations with zero (0) lateral lengths in Table 13.1(a), Table 13.1(c), and Table 13.1(f) shall not have elbows in the venting system.
13.1.3.2
Single-appliance venting with lateral lengths include two 90 degree elbows.

Commented [IA16]: This isnt a requirement

13.1.3.3
For each additional elbow up to and including 45 degrees, the maximum capacity listed in the venting tables shall be reduced by 5 percent.
13.1.3.4
For each additional elbow greater than 45 degrees up to and including 90 degrees, the maximum capacity listed in the venting tables shall be reduced by 10 percent.
13.1.3.5
Where multiple offsets occur in a vent, the total lateral length of all offsets combined shall not exceed that specified in Table 13.1(a) through Table 13.1(e).
13.1.4 Zero Lateral.
Zero (0) lateral (L) shall apply only to a straight vertical vent attached to a top outlet draft hood or flue collar.
13.1.5 High-Altitude Installations.
13.1.5.1
Sea level input ratings shall be used when determining maximum capacity for high-altitude installation.
13.1.5.2
Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation.

13.1.7* Corrugated Chimney Liners.
13.1.7.1
Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.1(a) or Table 13.1(c) for Type B vents, with the maximum capacity reduced by 20 percent (0.80 × maximum capacity) and the minimum capacity as shown in Table 13.1(a) or Table 13.1(c).
13.1.7.2
Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.1.3.
13.1.7.3
The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one long radius 90-degree turn at the bottom of the liner.

13.1.8 Connection to Chimney Liners.
Connections between chimney liners and listed double-wall connectors shall be made with listed adapters designed for such purpose.

13.1.9 Vertical Vent Upsizing/7 × Rule.

13.1.9.1

Where the vertical vent has a larger diameter than the vent connector, the vertical vent diameter shall be used to determine the minimum vent capacity, and the connector diameter shall be used to determine the maximum vent capacity.

13.1.9.2

The flow area of the vertical vent shall not exceed seven times the flow area of the listed appliance categorized vent area, flue collar area, or draft hood outlet area unless designed in accordance with engineering methods.

13.1.11 Chimneys and Vent Locations.

13.1.11.1

Table 13.1(a) through Table 13.1(f) shall be used only for chimneys and vents not exposed to the outdoors below the roof line.

13.1.11.2

A Type B vent or listed chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors.

13.1.11.3

Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), the outdoor portion of the vent shall be enclosed as required by this paragraph for vents not considered to be exposed to the outdoors, or such venting system shall be engineered.

13.1.11.4

A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors.

13.1.11.5

Table 13.1(d) in combination with Table 13.1(g) shall be used for clay tile–lined exterior masonry chimneys, provided all of the following requirements are met:

1. The vent connector is Type B double wall.
2. The vent connector length is limited to 18 in./in. (18 mm/mm) of vent connector diameter.
3. The appliance is draft hood equipped.
4. The input rating is less than the maximum capacity given in Table 13.1(d).
5. For a water heater, the outdoor design temperature shall not be less than 5°F (−15°C).
6. For a space-heating appliance, the input rating is greater than the minimum capacity given by Table 13.1(g).

13.2.1 Obstructions and Vent Dampers.

13.2.1.1

Venting Table 13.2(a) through Table 13.2(j) shall not be used where obstructions are installed in the venting system.

13.2.1.2

The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions, or in accordance with the following:

1. The maximum capacity of the vent connector shall be determined using the NAT Max column.

2. The maximum capacity of the vertical vent or chimney shall be determined using the FAN+NAT column when the second appliance is a fan-assisted appliance, or the NAT+NAT column when the second appliance is equipped with a draft hood.
3. The minimum capacity shall be determined as if the appliance were a fan-assisted appliance, as follows:
    a. The minimum capacity of the vent connector shall be determined using the FAN Min column.
    b. The FAN+FAN column shall be used when the second appliance is a fan-assisted appliance~~, and~~
    c. ~~t~~The FAN+NAT column shall be used when the second appliance is equipped with a draft hood, to determine whether the vertical vent or chimney configuration is not permitted (NA).
    ~~b.~~d. Where the vent configuration is NA, the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

13.2.3 Vent Connector Exceeding Maximum Length.

13.2.3.1

The vent connector shall be routed to the vent utilizing the shortest possible route.

13.2.3.2

Connectors with longer horizontal lengths than those listed in Table 13.2.2 are permitted under the following conditions:

1. The maximum capacity (FAN Max or NAT Max) of the vent connector shall be reduced 10 percent for each additional multiple of the length listed in Table 13.2.2. For example, the maximum length listed for a 4 in. (100 mm) connector is 6 ft (1.8 m). With a connector length greater than 6 ft (1.8 m) but not exceeding 12 ft (3.7 m), the maximum capacity must be reduced by 10 percent (0.90 × maximum vent connector capacity). With a connector length greater than 12 ft (3.7 m) but not exceeding 18 ft (5.5 m), the maximum capacity must be reduced by 20 percent (0.80 × maximum vent capacity).
2. For a connector serving a fan-assisted appliance, the minimum capacity (FAN Min) of the connector shall be determined by referring to the corresponding single appliance table.
3. For Type B double-wall connectors, Table 13.1(a) shall be used.
4. For single-wall connectors, Table 13.1(c) shall be used.
~~2.~~5. The height (H) and lateral (L) shall be measured according to the procedures for a single appliance vent, as if the other appliances were not present.

Commented [IA17]: This is annex material?

13.2.4 Vent Connector Manifolds.

13.2.4.1

Where the vent connectors are combined prior to entering the vertical portion of the common vent to form a common vent manifold, the size of the common vent manifold and the common vent shall be determined by applying a 10 percent reduction (0.90 × maximum common vent capacity) to the common vent capacity part of the common vent tables.

13.2.4.2

The length of the common vent manifold (LM) shall not exceed 18 in./in. (18 mm/mm) of common vent diameter (D).

13.2.5 Vent Offsets.

13.2.5.1

Where the common vertical vent is offset, the maximum capacity of the common vent shall be reduced in accordance with 13.2.6 and the horizontal length of the common vent offset shall not exceed 18 in./in. (18 mm/mm) of common vent diameter (D).

13.2.5.2

Where multiple offsets occur in a common vent, the total horizontal length of all offsets combined shall not exceed 18 in./in. (18 mm/mm) of the common vent diameter.

13.2.6 Elbows in Vents.

13.2.6.1

For each elbow up to and including 45 degrees in the common vent, the maximum common vent capacity listed in the venting tables shall be reduced by 5 percent.

13.2.6.2

For each elbow greater than 45 degrees up to and including 90 degrees, the maximum common vent capacity listed in the venting tables shall be reduced by 10 percent.

13.2.7 Elbows in Connectors.

13.2.7.1

The vent connector capacities listed in the common vent sizing tables include allowance for two 90 degree elbows.

Commented [IA18]: This isnt a requirement

13.2.7.2

For each additional elbow up to and including 45 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 5 percent.

13.2.7.3

For each elbow greater than 45 degrees up to and including 90 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 10 percent.

13.2.10 Tee and Wye Sizing.

13.2.10.1

At the point where tee or wye fittings connect to a common gas vent, the opening size of the fitting shall be equal to the size of the common vent.

13.2.10.2

Such fittings shall not be prohibited from having reduced size openings at the point of connection of appliance gas vent connectors.

13.2.11 High-Altitude Installations.

13.2.11.1

Sea level input ratings shall be used when determining maximum capacity for high-altitude installation.

13.2.11.2

Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation.

13.2.16 Multistory B Vents Required.

Where used in multistory systems, vertical common vents shall be in accordance with the following:

1. ~~b~~Be Type B double wall. ~~and~~
~~1.~~2. ~~shall b~~Be installed with a listed vent cap.

Formatted: List Paragraph, Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Indent at: 0.5"

13.2.17 Multistory Vent Offsets and Capacity.

13.2.17.1

Offsets in multistory common vent systems shall be limited to a single offset in each system.~~, and~~

13.2.17.2

~~s~~Systems with an offset shall comply with all of the following:

1. The offset angle shall not exceed 45 degrees from vertical.
2. The horizontal length of the offset shall not exceed 18 in./in. (18 mm/mm) of common vent diameter of the segment in which the offset is located.
3. For the segment of the common vertical vent containing the offset, the common vent capacity listed in the common venting tables shall be reduced by 20 percent (0.80 × maximum common vent capacity).
4. A multistory common vent shall not be reduced in size above the offset.

13.2.19.1

The minimum vent connector capacity (FAN Min) of appliances with more than one input rate shall be determined from the tables~~ and~~

13.2.19.2 The minimum vent connector capacity (FAN Min) of appliances shall be less than the lowest appliance input rating.

Renumber the remaining requirements.

13.2.20* Corrugated Chimney Liners.

13.2.20.1

Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.2(a) or Table 13.2(c) for Type B vents, with the maximum capacity reduced by 20 percent (0.80 × maximum capacity) and the minimum capacity as shown in Table 13.2(a) or Table 13.2(c).

13.2.20.2

Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.2.5 and 13.2.6.

13.2.20.3

The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one long radius 90-degree turn at the bottom of the liner.

Commented [IA19]: This isnt a requirement

13.2.21 Connections to Chimney Liners.

13.2.21.1

Where double-wall connectors are required, tee and wye fittings used to connect to the common vent chimney liner shall be listed double-wall fittings.

13.2.21.2

Connections between chimney liners and listed double-wall fittings shall be made with listed adapter fittings designed for such purpose.

13.2.22 Chimneys and Vent Locations.

13.2.22.1

Table 13.2(a) through Table 13.2(f) shall be used only for chimneys and vents not exposed to the outdoors below the roof line.

13.2.22.2

A Type B vent or listed chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors.

13.2.22.3

A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors.

13.2.22.4

Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), the outdoor portion of the vent shall be enclosed as required by this paragraph for vents not considered to be exposed to the outdoors, or such venting system shall be engineered.

13.2.22.5

Table 13.2(g), Table 13.2(h), Table 13.2(i), and Table 13.2(j) shall be used for clay tile lined exterior masonry chimneys, provided all the following conditions are met:

1. The vent connector is Type B double wall.
2. At least one appliance is draft hood equipped.
3. The combined appliance input rating is less than the maximum capacity given by Table 13.2(g) (for NAT+NAT) or Table 13.2(i) (for FAN+NAT).
4. The input rating of each space-heating appliance is greater than the minimum input rating given by Table 13.2(h) (for NAT+NAT) or Table 13.2(j) (for FAN+NAT).
5. The vent connector sizing is in accordance with Table 13.2(d).

13.2.24 Vent Connector Sizing.

13.2.24.1

Vent connectors shall not be increased more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.

13.2.24.2

Vent connectors for draft hood–equipped appliances shall not be smaller than the draft hood outlet diameter.

13.2.24.3

Where a vent connector size(s) determined from the tables for a fan-assisted appliance(s) is smaller than the flue collar diameter, the use of the smaller size(s) shall be permitted, provided that the installation complies with all of the following conditions:

1. Vent connectors for fan-assisted appliance flue collars 12 in. (300 mm) in diameter or smaller are not reduced by more than one table size [e.g., 12 in. to 10 in. (300 mm to 250 mm) is a one-size reduction], and those larger than 12 in. (300 mm) in diameter are not reduced more than two table sizes [e.g., 24 in. to 20 in. (610 mm to 510 mm) is a two-size reduction].
2. The fan-assisted appliance(s) is common vented with a draft hood–equipped appliance(s).
3. The vent connector has a smooth interior wall.

13.2.25 Multiple Vent and Connector Sizes.

13.2.25.1

All combinations of pipe sizes, single-wall metal pipe, and double-wall metal pipe shall be allowed within any connector run(s) or within the common vent, provided ALL of the appropriate tables permit ALL of the desired sizes and types of pipe, as if they were used for the entire length of the subject connector or vent.

13.2.25.2

Where single-wall and Type B double-wall metal pipes are used for vent connectors within the same venting system, the common vent shall be sized using Table 13.2(c) or Table 13.2(e) as appropriate.

Exception Recommendation Document

Exception Recommendation Document

Item 4
4.2.1 Notification of Interrupted Service.
4.2.1.1
When the gas supply is to be turned off in other than an emergency, it the qualifying agency shall be the duty of the qualified agency to notify all affected users.
4.2.1.2
Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.
Exception: In cases of emergency, affected users shall be notified as soon as possible of the actions

~~taken by the qualified agency.~~

Item 7
5.3.2.3
The basis for pipe sizing shall be the total hourly load, assuming all appliances are operating at full capacity simultaneously or the total hourly load adjusted with established load diversity factors.
~~The total connected hourly load shall be used as the basis for piping sizing, assuming all appliances are operating at full capacity simultaneously.~~
~~Exception: Sizing shall be permitted to be based upon established load diversity factors.~~

Item 12
5.5.7.1* Pipe Joints.
Pipe shall be joined in accordance with the following:
(A)
Schedule 40 and heavier pipe joints shall be threaded, flanged, brazed, welded, or assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems.
(B~~A~~)
Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing, or welding.
(C~~B~~)
Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1000°F (538°C).
(D~~C~~)
Brazing alloys shall not contain more than 0.05 percent phosphorus.

Item 15
5.5.7.5 Metallic Pipe Fittings.
Metallic fittings shall comply with the following:

1. Threaded fittings in sizes larger than 4 in. (100 mm) shall not be used.
2. Fittings used with steel, stainless steel, or wrought-iron pipe shall be steel, stainless steel, copper alloy, malleable iron, or cast iron.
3. Fittings used with copper or copper alloy pipe shall be copper or copper alloy.
4. Fittings used with aluminum alloy pipe shall be aluminum alloy.
5. Cast-Iron Fittings. Cast-iron fittings shall comply with the following:

Exception Recommendation Document

a. Flanges shall be permitted.
b. Bushings shall not be used.
c. Fittings shall not be used in systems containing flammable gas–air mixtures.
d. Fittings in sizes 4 in. (100 mm) and larger shall not be used indoors unless approved.
e. Fittings in sizes 6 in. (150 mm) and larger shall not be used unless approved.

6. Aluminum Alloy Fittings. Threads shall not form the joint seal.
7. Zinc–Aluminum Alloy Fittings. Fittings shall not be used in systems containing flammable gas–air mixtures.
8. Special Fittings. Fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless, or compression-type tubing fittings shall be ~~as follows~~:
   a. Used within the fitting manufacturer's pressure–temperature recommendations
   b. Used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction
   c. ~~Acceptable to the authority having jurisdiction~~Approved
9. When pipe fittings are drilled and tapped in the field, the operation shall be ~~in accordance with the following~~:
   a. ~~The operation shall be p~~Performed on systems having operating pressures of 5 psi (34 kPa) or less.
   b. ~~The operation shall be p~~Performed by the gas supplier or their designated representative.
   c. ~~The drilling and tapping operation shall be p~~Performed in accordance with written procedures prepared by the gas supplier.
   ~~d. The fittings shall be located outdoors.~~ [Moved to Chapter 7
   ~~e.~~d. ~~The tapped fitting assembly shall be i~~Inspected and proven to be free of leaks.

7.3.7 Drilled and Tapped Fittings.
Drilled and tapped fittings shall be located outdoors.

Item 24
5.8.3.1
Overpressure protection devices shall be one of the following:

1. Pressure relief valve.
2. Monitor regulator.
3. Series regulator installed upstream from the line regulator and set to continuously limit the pressure on the inlet of the line regulator to the maximum values specified by 5.8.2.1 or less.
4. Automatic shutoff device installed in series with the line pressure regulator and set to shut off when the pressure on the downstream piping system reaches the maximum values specified by 5.8.2.1 or less~~. This device shall be designed so that it will~~ and remains closed until manually reset.

Item 30
5.8.4 Construction and Installation.

Exception Recommendation Document

All overpressure protection devices shall meet the following requirements:

1. Be constructed of materials so that the operation of the device is not impaired by corrosion of external parts by the atmosphere or of internal parts by the gas.
2. Be designed and installed so they can be operated to determine whether the valve is free.
~~2.~~3. The devices shall also be designed and installed so they can be tested to determine the pressure at which they operate and be examined for leakage when in the closed position.

Item 38
Revise 6.2 and 6.3 to the following.

6.2 Sizing Natural Gas Piping Systems

6.2.1 Where natural gas piping systems are sized using tables, either tables 6.2.1 (a) through Table 6.2.1 (x) or the sizing tables supplied by a manufacturer of a listed gas piping system shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3.

6.2.2 Where natural gas piping systems are sized using equations, Section 6.4 shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3 for non-corrugated stainless steel tubing.

6.3 Sizing Propane Piping Systems.

6.3.1 Where undiluted propane piping systems are sized using tables, either Tables 6.3.1 (a) through Table 6.1.3 (m) or the sizing tables supplied by a manufacturer of a listed gas piping system shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3.

6.3.2 Where undiluted propane piping systems are sized using equations, Section 6.4 shall be used in conjunction with one of the methods described in 6.1.1 through 6.1.3 for non-corrugated stainless steel tubing.

Item 39 – 41
Revise note (1) in tables o, p, q, s to remove the requirement and revise as follows:

(1) Table includes losses for four 90 degree bends and two end fittings. For ~~T~~tubing runs with larger numbers of bends and/or fittings ~~, shall be~~ increase~~d~~ by an equivalent length of tubing to the following equation: L = 1.3n, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

Item 42
Revise note (3) in tables r through s to remove the requirement and revise as follows

(3) Table includes losses for four 90 degree bends and two end fittings. For ~~T~~tubing runs with larger numbers of bends and/or fittings ~~, shall be~~ increase~~d~~ by an equivalent length of tubing to the following equation: L = 1.3n, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

Exception Recommendation Document

Item 44
Revise note (1) in tables h and (3) in i and j to remove the requirement and revise as follows

Table includes losses for four 90 degree bends and two end fittings. For ~~T~~tubing runs with larger numbers of bends and/or fittings ~~,shall be~~ increase~~d~~ by an equivalent length of tubing to the following equation: L = 1.3n, where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.

Item 48
7.1.2.1 Cover Requirements.
Underground piping systems shall be installed in accordance with any of the following:
(A)~~with~~ a minimum of 12 in. (300 mm) of cover.
(B~~A~~)
~~The minimum cover shall be increased to~~ 18 in. (460 mm) if external damage to the pipe or tubing from external forces is likely to result.
(C~~B~~)*
Where a minimum of 12 in. (300 mm) of cover cannot be provided, the piping ~~shall be~~is installed in conduit.

Item 50
7.1.3.2
Underground piping shall comply with one or more of the following unless approved technical justification is provided to demonstrate that protection is unnecessary:

1. The piping is~~shall be~~ made of corrosion-resistant material that is suitable for the environment in which it will be installed. [Move to 4]
2. Pipe has~~shall have~~ a factory-applied, electrically insulating coating.
~~2.~~3. Fittings and joints between sections of coated pipe are~~shall be~~ coated in accordance with the coating manufacturer's instructions.
~~3.~~4. The piping has~~shall have~~ a cathodic protection system in-stalled, and the system is~~shall be~~ maintained in accordance with 7.1.3.3 or 7.1.3.6.

Item 53
7.1.3.4
Sacrificial anodes shall be tested in accordance with the following schedule:

1. Upon installation of the cathodic protection system, except where prohibited by climatic conditions, in which case the testing ~~shall be~~is performed not later than 180 days after the installation of the system
2. 12 to 18 months after the initial test
3. Upon successful verification testing in accordance with (1) and (2), periodic follow-up testing is~~shall be~~ performed at intervals not to exceed 36 months

Item 60

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

7.1.7.1 Connection of Plastic Piping.
Plastic pipe shall be installed outdoors underground only unless one of the following apply:
(1) Terminated above ground using an anodeless riser.
(2) Terminated with a wall head adapter aboveground in buildings, including basements, where the plastic piping is inserted in a piping material permitted for use in buildings.
~~Plastic piping shall be installed outdoors, underground only.~~

~~Exception No. 1: Plastic piping shall be permitted to terminate aboveground where an anodeless riser is used.~~
~~Exception No. 2: Plastic piping shall be permitted to terminate with a wall head adapter aboveground in buildings, including basements, where the plastic piping is inserted in a piping material permitted for use in buildings.~~

Item 71
7.5.1 Metallic Pipe.
Metallic pipe bends shall comply with the following:

1. Bends are~~shall be~~ made only with bending tools and procedures intended for that purpose.
2. All bends are~~shall~~ be smooth and free from buckling, cracks, or other evidence of mechanical damage.
3. The longitudinal weld of the pipe is~~shall be~~ near the neutral axis of the bend.
4. Pipe is~~shall~~ not be bent through an arc of more than 90 degrees.
5. The inside radius of a bend is~~shall be~~ not less than 6 times the outside diameter of the pipe.

Item 72
7.5.2 Plastic Pipe.
Plastic pipe bends shall comply with the following:

1. The pipe is~~shall~~ not be damaged, and the internal diameter of the pipe shall not be effectively reduced.
2. Joints are~~shall~~ not be located in pipe bends.
3. The radius of the inner curve of such bends is~~shall~~ not be less than 25 times the inside diameter of the pipe.
4. ~~Where~~Tools specified by the piping manufacturer specifies the use of special bending tools or procedures, such tools or procedures are~~shall be~~ used.

Item 76
7.7.1.3
Outlets shall be located not less than 1 in. (25 mm) ~~far enough~~ from floors, walls, patios, slabs, and ceilings to permit the use of wrenches without straining, bending, or damaging the piping.
~~7.7.1.4~~
~~The unthreaded portion of gas piping outlets shall extend not less than 1 in. (25 mm) through finished ceilings or indoor or outdoor walls.~~

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

Item 78
7.7.2 Cap All Outlets.
7.7.2.1
Each outlet excluding laboratory appliances installed in accordance with 9.6.2(1) and outlets with a quick listed disconnect device with integral shutoff or listed gas convenience outlet~~,~~ including outlets with valves ~~a valve~~, shall be closed gastight with a threaded plug or cap immediately after installation and shall be left closed until the appliance or equipment is connected thereto.
7.7.2.2
When an appliance or equipment is disconnected from an outlet and the outlet is not to be used again immediately, it shall be capped or plugged gastight.
~~Exception No. 1: Laboratory appliances installed in accordance with 9.6.2(1) shall be permitted.~~
~~Exception No. 2: The use of a listed quick-disconnect device with integral shutoff or listed gas convenience outlet shall be permitted.~~
Renumber current 7.7.2.2 to 7.7.2.3

Item 89
7.11.6 Use of Automatic Firechecks, Safety Blowouts, or Backfire Preventers.
Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air–gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback, in accordance with the following:

1. *Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturers' instructions.
2. A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas–air mixture through the firecheck after a flashback has occurred. The valve shall be located upstream as close as practical to the inlet of the automatic firecheck. Caution: these valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset properly.
3. A safety blowout or backfiring preventer shall be installed in accordance with the manufacturers' instruction ~~provided~~ in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 21⁄2 in. (64 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck. ~~The manufacturers' instructions shall be followed when installing these devices, particularly after a disc has burst.~~
4. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel.
5. ~~3.~~ Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision, other than check valves shall be made to keep the mixture from other machines from reaching any ruptured disc opening. ~~Check valves shall not be used for this purpose.~~
6. ~~4.~~ Large-capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at and vented to a safe outdoor location.

Exception Recommendation Document

Provisions shall be provided for automatically shutting off the supply of the gas–air mixture in the event of rupture.

A.7.11.6
This is particularly applicable after a disc has burst.

Item 94
7.13 Electrical Circuits.
7.13.1
Electrical circuits at less than 50 V shall not utilize gas piping or components as conductors.
~~Exception: Low-voltage (50 V or less)~~
7.13.2 ~~c~~Control circuits, ignition circuits, and electronic flame detection device circuits operating at 50 V or less shall be permitted to ~~make~~ use ~~of~~ piping or components as a part of an electric circuit.

Item 96
8.1.1.11*
Prior to pressure testing, the interior of the pipe shall be cleared of all foreign material.

Item 97
8.1.1.8
~~Under no circumstances shall a v~~Valves in a line shall not be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless a double block and bleed valve system is installed.

Item 99
8.1.3.1
Pipe joints other than covered or concealed pipe end joints that have been previously tested in accordance with this code, including welds, shall be left exposed for examination during the test.
~~Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code.~~

Item 111
8.3.2.1* Purging Procedure.
The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber that is~~. Such burner shall be~~ provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.

Exception Recommendation Document

4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with 8.3.2.2 until~~. Purging shall be stopped when~~ fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures.

Item 114
9.1.2 Added or Converted Appliances.
When additional or replacement appliances or equipment is installed or an appliance is converted to gas from another fuel, the location in which the appliances or equipment is to be operated shall be checked to verify the following:

1. Air for combustion and ventilation is provided where required, in accordance with the provisions of Section 9.3~~.~~ and ~~W~~ where existing facilities are not adequate, they shall be upgraded to meet Section 9.3 specifications.
2. The installation components and appliances meet the clearances to combustible material provisions of 9.2.2 by determining~~. It shall be determined~~ that the installation and operation of the additional or replacement appliances do not render the remaining appliances unsafe for continued operation.
3. The venting system is constructed and sized in accordance with the provisions of Chapter 12 or~~.~~ ~~W~~where the existing venting system, ~~is not adequate,~~does not comply with Chapter 12 it shall be upgraded to comply with Chapter 12.

Item 120
9.1.18 Bleed Lines for Diaphragm-Type Valves.
Bleed lines shall comply with the following requirements:

1. Diaphragm-type valves shall be equipped to convey bleed gas to the outdoors or into the combustion chamber adjacent to a continuous pilot.
2. In the case of bleed lines leading outdoors, means shall be employed to prevent water from entering this piping and also to prevent blockage of vents by insects and foreign matter.
3. Bleed lines shall not terminate in the appliance flue or exhaust system.
4. ~~In the case of~~ Where bleed lines ~~entering~~ enter the combustion chamber, the bleed line shall be located so the bleed gas is readily ignited by the pilot and the heat liberated thereby does not adversely affect the normal operation of the safety shutoff system.
    a. The terminus of the bleed line shall be secured~~ly held~~ in a fixed position relative to the pilot.
    ~~a.~~b. Where~~For~~ manufactured gas is used, the need for a flame arrester in the bleed line piping shall be determined.
~~4.~~5. A bleed line(s) from a diaphragm-type valve and a vent line(s) from an appliance pressure regulator shall not be connected to a common manifold terminating in a combustion chamber and~~. Bleed lines~~ shall not terminate in positive-pressure-type combustion chambers.

Item 125
9.3.1.1

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

Air for combustion, ventilation, and dilution of flue gases for appliances installed in buildings shall be obtained by application of one of the methods covered in 9.3.2 through 9.3.6.

9.3.1.1.1

Where the requirements of 9.3.2 are not met, and the appliance is not a direct vent appliance or a Type 1 clothes dryer that is provided with make-up air in accordance with 10.4.4, outdoor air shall be introduced in accordance with methods covered in 9.3.3 through 9.3.6.

~~Exception No. 1: This provision shall not apply to direct vent appliances.~~

~~Exception No. 2: Type 1 clothes dryers that are provided with make-up air in accordance with 10.4.4.~~

Item 127

9.3.2.2

Where the air infiltration rate of a structure is known and is 0.6 ACH or lower, the minimum required volume shall be determined as follows:

1. For appliances other than fan assisted, calculate using the following equation:
   [9.3.2.2a]
2. For fan-assisted appliances, calculate using the following equation:
   [9.3.2.2b]
   where:
   Iother = all appliances other than fan-assisted input (Btu/hr)
   Ifan = fan-assisted appliance input (Btu/hr)
   ACH = air change per hour (percent of volume of space exchanged per hour, expressed as a decimal)
3. ~~For purposes of these calculations, an infiltration rate greater than 0.60 ACH shall not be used in Equations 9.3.2.2a and 9.3.2.2b.~~

Item 129

9.3.2.3 Indoor Opening Size and Location.

Openings used to connect indoor spaces shall be sized and located in accordance with the following:

1. *Openings ~~C~~combining spaces on the same story~~. Each opening~~ shall have a minimum free area of 1 in.2/1000 Btu/hr (2200 mm2/kW) of the total input rating of all appliances in the space but not less than 100 in.2 (0.06 m2)~~.~~ with ~~O~~one permanent opening commencing~~shall commence~~ within 12 in. (300 mm) of the top of the enclosure and one permanent opening shall commence within 12 in. (300 mm) of the bottom of the enclosure and a~~. The~~ minimum dimension of air openings shall not be less than 3 in. (80 mm).
2. ~~C~~Openings combining spaces in different stories~~. The~~the spaces ~~volumes of spaces in different stories shall be considered as communicating spaces where such spaces are~~ shall be connected by one or more permanent openings in doors or floors having a total minimum free area of 2 in.2/1000 Btu/hr (4400 mm2/kW) of total input rating of all appliances.

Item 132

9.3.3.1 Two Permanent Openings Method.

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

Two permanent openings, one commencing within 12 in. (300 mm) of the top of the enclosure and one commencing within 12 in. (300 mm) of the bottom of the enclosure, shall be provided~~.~~ that ~~The openings shall~~ communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors, as follows:

1. *Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in.2/4000 Btu/hr (550 mm2/kW) of total input rating of all appliances in the enclosure.
2. *Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in.2/2000 Btu/hr (1100 mm2/kW) of total input rating of all appliances in the enclosure.

Item 138
9.3.8.1
Ducts shall be constructed of galvanized steel or a material having equivalent corrosion resistance, strength, and rigidity~~.~~
~~Exception:~~ or ~~W~~within dwellings units, unobstructed stud and joist spaces ~~shall not be prohibited from conveying combustion air, provided that~~ where not more than one fireblock is removed.

Item 140
9.3.8.7
The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry, metal, or factory built chimney shall not be used to supply combustion air.
~~Exception:~~
9.3.8.8
~~.~~Direct vent appliances designed for installation in a solid fuel–burning fireplace shall be permitted to be installed in the remaining space surrounding a chimney liner where installed in accordance with the manufacturer's installation instructions.

Item 147
9.6.1 Connecting Appliances and Equipment.
Appliances and equipment shall be connected to the building piping in compliance with 9.6.5 through 9.6.7 by one of the following:

1. Rigid metallic pipe and fittings.
2. Semirigid metallic tubing and metallic fittings other then ~~. A~~aluminum alloy tubing ~~shall not be used~~ in exterior locations.
3. ~~A~~ One connector for gas appliances listed in accordance with ANSI Z21.24/CSA 6.10, Connectors for Gas Appliances where ~~. The connector shall be~~ used in accordance with the manufacturer's installation instructions and located~~shall be~~ in the same room as the appliance. ~~Only one connector shall be used per appliance.~~
4. ~~A~~One connector for outdoor gas appliances and manufactured homes listed in accordance with ANSI Z21.75/CSA 6.27, Connectors for Outdoor Gas Appliances and Manufactured Homes. ~~Only one connector shall be used per appliance.~~

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

5. One length of CSST where installed to connect appliances fixed in place in accordance with the manufacturer's installation instructions and. ~~CSST shall~~ not ~~be~~ directly routed into a metallic appliance enclosure where the appliance is connected to a metallic vent that terminates above a roofline. ~~CSST shall connect only to appliances that are fixed in place.~~
6. Listed nonmetallic gas hose connectors in accordance with 9.6.2.
7. Unlisted gas hose connectors for use in laboratories and educational facilities in accordance with 9.6.3.

Item 150
9.6.1.5* Suspended Low-Intensity Infrared Tube Heaters.
Suspended low-intensity infrared tube heaters shall be connected to the building piping system in accordance with the following:
(A) ~~with~~
~~a~~A connector shall be listed for the application in accordance with ANSI Z21.24/CSA 6.10, Connectors for Gas Appliances.
(B~~A~~)
The connector shall be installed in accordance with the tube heater installation instructions.
(C) ~~and~~
The connector shall be installed in the same room as the appliance.
(D~~B~~)
Only one connector shall be used per appliance.

Item 151
9.6.2 Use of Nonmetallic Gas Hose Connectors.
Listed gas hose connectors shall be used in accordance with the manufacturer's installation instructions and as follows:

1. ~~Indoor.~~ Indoor gas hose connectors shall be used only to connect laboratory, shop, and ironing appliances requiring mobility during operation and installed in accordance with the following:
    a. An appliance shutoff valve shall be installed where the connector is attached to the building piping.
    b. The connector shall be of minimum length and shall not exceed 6 ft (1.8 m).
    c. The connector shall not be concealed and shall not extend from one room to another or pass through wall partitions, ceilings, or floors.
2. ~~Outdoor.~~ Where outdoor gas hose connectors are used to connect portable outdoor appliances, the connector shall be listed in accordance with ANSI Z21.54/CSA 8.4, Gas Hose Connectors for Portable Outdoor Gas-Fired Appliances, and installed in accordance with the following:
    a. An appliance shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet shall be installed where the connector is attached to the supply piping and in such a manner so as to prevent the accumulation of water or foreign matter.
    b. This connection shall be made only in the outdoor area where the appliance is to be used.

Item 154

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

9.6.5.1
The shutoff valve shall be located within 6 ft (1.8 m) of the appliance it serves except as permitted in 9.6.5.2 or 9.6.5.3.
~~(A)~~ 9.6.5.1.1
Where a connector is used, the valve shall be installed upstream of the connector.
9.6.5.1.2
A union or flanged connection shall be provided downstream from the valve to permit removal of appliance controls.
~~(B)~~ 9.6.5.1.3
Shutoff valves serving decorative appliances in a fireplace shall not be located within the fireplace firebox except where the valve is listed for such use.
9.6.5.2
Shutoff valves serving appliances installed in vented fireplaces and ventless firebox enclosures shall not be required to be located within 6 ft (1.8 m) of the appliance where such valves are readily accessible and permanently identified.
9.6.5.3
The piping from the shutoff valve to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.
9.6.5.4~~3~~
Where installed at a manifold, the appliance shutoff valve shall be located within 50 ft (15 m) of the appliance served and shall be readily accessible and permanently identified.
9.6.5.5
The piping from the manifold to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.

Item 160
10.3.2 Location.
Central heating furnace and low-pressure boiler installations in bedrooms or bathrooms shall comply with one of the following:

1. Central heating furnaces and low-pressure boilers shall be installed in a closet equipped with a weather-stripped door with no openings, ~~and~~ with a self-closing device. ~~All~~ all combustion air shall be obtained from the outdoors in accordance with 9.3.3.
2. Central heating furnaces and low-pressure boilers shall be of the direct vent type.

Item 164
10.3.4 Assembly and Installation.
A central heating boiler or furnace shall be installed in accordance with the manufacturer's instructions in one of the following manners:

1. On a floor of noncombustible construction with noncombustible flooring and surface finish and with no combustible material against the underside thereof
2. On fire-resistive slabs or arches having no combustible material against the underside thereof
~~2.~~3. Appliances listed for installation on a combustible floor.

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

~~3.~~4. Installation on a floor protected in an approved manner.

~~Exception No. 1: Appliances listed for installation on a combustible floor.~~
~~Exception No. 2: Installation on a floor protected in an approved manner.~~

Item 170

10.4.2 Clearance for Type 1 Clothes Dryers.
~~The installation of clothes dryers shall comply with the following requirements:~~

10.4.2.1
Type 1 clothes dryers shall be installed with a minimum clearance of 6 in. (150 mm) from adjacent combustible material.
10.4.2.2
Clothes dryers listed for installation at reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
10.4.2.3
Type 1 clothes dryers installed in closets shall be specifically listed for such installation.

10.4.3. Clearance for Type 2 clothes dryers
10.4.3.1
Type 2 clothes dryers shall be installed with clearances of not less than those shown on the marking plate and in the manufacturer's instructions.
10.4.3.2
Type 2 clothes dryers designed and marked “For use only in noncombustible locations” shall not be installed elsewhere.

Item 176
10.7.2* Prohibited Installations.
Vented gas fireplaces, other than direct vent gas fireplaces, shall not be installed in bathrooms or bedrooms unless the bedroom or bathroom has the required volume in accordance with 9.3.2.
~~Exception: Direct vent gas fireplaces.~~

Item 177
10.7.3 Installation.
~~The installation of vented gas fireplaces shall comply with the following requirements:~~

10.7.3.1
~~1.~~ Vented gas fireplaces shall be installed in accordance with the manufacturer's installation instructions and where installed in or attached to combustible material ~~shall be specifically~~ listed for such installation.

Formatted: Indent: Left: 0.5", No bullets or numbering

10.7.3.2
~~2.~~ Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building.

Formatted: Indent: Left: 0.5", No bullets or numbering

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

10.7.3.3
Direct vent gas fireplaces shall be installed with the vent air intake terminal in the outdoors and in accordance with the manufacturer's instructions.

Formatted: Indent: Left: 0.5"

Item 183
10.9.2 Clearances.
Duct furnaces shall be installed with clearances of at least 6 in. (150 mm) between adjacent walls, ceilings, and floors of combustible material, and the furnace draft hood. ~~and shall comply with the following:~~
10.9.2.1
Duct furnaces listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.
10.9.2.2
The clearance shall not interfere with combustion air and accessibility.

Item 186
10.9.7.1
Where a duct furnace is installed in conjunction with a refrigeration coil, the blower shall have sufficient capacity to overcome the external static resistance imposed by the duct system, the furnace, the cooling coil, and the air throughput necessary for heating or cooling, whichever is greater.
~~A duct furnace shall not be installed in conjunction with a refrigeration coil where circulation of cooled air is provided by the blower.~~
~~Exception: Where the blower has sufficient capacity to overcome the external static resistance imposed by the duct system, the furnace, and the cooling coil and the air throughput necessary for heating or cooling, whichever is greater.~~

Item 187
10.9.7.2
Duct furnaces used in conjunction with cooling appliances shall be installed in parallel with or on the upstream side of cooling coils to avoid condensation within heating elements.
10.9.7.3
~~With a~~Where parallel flow arrangement is used, either the dampers or other means used to control the flow of air shall be sufficiently tight to prevent any circulation of cooled air through the unit.
~~Exception:~~
10.9.7.4
~~Where the duct~~Duct furnace listed for downstream installations shall be permitted. ~~has been specifically listed for downstream installation.~~

Item 189
10.10.2 Installation.
~~The installation of floor furnaces shall comply with the following requirements:~~

10.10.2.1
Floor furnaces shall be installed in accordance with the manufacturers' installation instructions.

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

~~1.~~ 10.10.2.2

Thermostats controlling floor furnaces shall not be located in a room or space that can be separated from the room or space in which the register of the floor furnace is located.

Formatted: Normal, Indent: Left: 0.25", No bullets or numbering

Item 190

10.10.5 Placement

~~The following provisions apply to furnaces that serve one story:~~

~~Floors.~~

10.10.5.1

Floor furnaces shall not be installed in the floor of any doorway, stairway landing, aisle, or passageway of any enclosure, public or private, or in an exitway from any such room or space.

~~Walls and Corners.~~

10.10.5.2

The register of a floor furnace with a horizontal warm air outlet shall not be placed closer than 6 in. (150 mm) from the nearest wall.

10.10.5.2.1

A distance of at least 18 in. (460 mm) from two adjoining sides of the floor furnace register to walls shall be provided to eliminate the necessity of occupants walking over the warm air discharge.

10.10.5.2.2

The remaining sides shall be a minimum of 6 in. (150 mm) from a wall.

10.10.5.2.3

Wall register models shall not be placed closer than 6 in. (150 mm) to a corner.

~~Draperies.~~

10.10.5.3

The furnace shall be placed so that a door, drapery, or similar object cannot be nearer than 12 in. (300 mm) to any portion of the register of the furnace.

Item 203

10.14.2.2 Open-Flame Type.

Clearance shall comply with the following:

1. Unlisted open-flame illuminating appliances installed outdoors shall have clearances from combustible material not less than that specified in Table 10.14.2.2.
~~1.~~2. The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways or lower where approved. ~~Lesser clearances shall be permitted to be used where acceptable to the authority having jurisdiction.~~
~~2.~~3. Unlisted open-flame illuminating appliances installed outdoors shall be equipped with a limiting orifice or other limiting devices that maintain a flame height consistent with the clearance from combustible material, as given in Table 10.14.2.2.
~~3.~~4. Appliances designed for flame heights in excess of 30 in. (760 mm) shall be approved. ~~Such appliances shall be~~ equipped with a safety shutoff device or automatic ignition.

Exception Recommendation Document

~~4.~~5. The clearance to combustible materials from unlisted open flame illuminating appliances installed indoors shall be approved. ~~Clearances to combustible material from unlisted open-flame illuminating appliances shall be approved.~~

Item 208
10.16.3 Clearance.
The installation of infrared heaters shall meet the following clearance requirements:

~~1. Listed heaters shall be installed with clearances from combustible material in accordance the manufacturer's installation instructions.~~
~~2. Unlisted heaters shall be installed in accordance with clearances from combustible material acceptable to the authority having jurisdiction.~~

10.16.3.1
Clearance from combustible materials to unlisted heaters shall be approved.

Formatted: Normal, No bullets or numbering

10.16.3.2
~~In l~~Locations used for the storage of combustible materials~~, signs~~ shall have signs ~~be~~ posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.

Item 211
10.19.3 Clearance.
~~The installation of pool heaters shall meet the following requirements:~~

~~1.~~ ~~The c~~Clearances shall not interfere with combustion air, draft hood or vent terminal clearance and relief, and accessibility for servicing.

Formatted: Normal, No bullets or numbering

~~A pool heater shall be installed in accordance with the manufacturer's installation instructions.~~

Item 213
10.21.2* Installation in Bathrooms and Bedrooms~~Prohibited Installations.~~
Unvented room heaters ~~shall not be~~ installed in bathrooms or bedrooms shall comply with 10.21.2.1 and 10.21.2.2.
~~Exception No. 1:~~
10.21.2.1
Where approved, one listed wall-mounted, unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bathroom, provided that the input rating does not exceed 6000 Btu/hr (1760 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.
~~Exception No. 2:~~
10.21.2.2
Where approved, one listed wall-mounted unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bedroom, provided that the input rating does not exceed 10,000 Btu/hr (2930 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

Item 240
12.3.2 Appliances Not Required to Be Vented.
The following appliances shall not be required to be vented:

1. Listed ranges
2. Built-in domestic cooking units listed and marked for optional venting
3. Listed hot plates
4. Listed Type 1 clothes dryers exhausted in accordance with Section 10.4
5. A single listed booster-type (automatic instantaneous) water heater, when designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided the following criteria are met:
    a. That the appliance is installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system
    ~~5.~~b. ~~[Where installed in this manner, t~~The draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.~~]~~
6. Listed refrigerators
7. Counter appliances
8. Room heaters listed for unvented use
9. Direct gas–fired make-up air heaters
10. Other appliances listed for unvented use and not provided with flue collars
11. Specialized appliances of limited input such as laboratory burners or gas lights

Formatted

Item 245
12.6.1.3*
Masonry chimneys shall be built and installed in accordance with NFPA 211 and lined with one of the following:

1. Approved clay flue lining
2. A chimney lining system listed and labeled in accordance with UL 1777, Chimney Liners
3. Other approved material that resists corrosion, erosion, softening, or cracking from vent gases at temperatures up to 1800°F (982°C)

~~Exception:~~
12.6.1.4
Masonry chimney flues lined with a chimney lining system specifically listed for use with listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be permitted.
~~The liner shall be installed in accordance with the liner manufacturer's installation instructions.~~
12.6.1.4.1
A permanent identifying label shall be attached at the point where the connection is to be made to the liner.
12.6.1.4.2

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

The label shall read “This chimney liner is for appliances that burn gas only. Do not connect to solid or liquid fuel–burning appliances or incinerators.”

Item 246
12.6.3.1
The effective area of a chimney venting system serving listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be in accordance with one of the following methods:

1. Those listed in Chapter 13.
2. The effective areas of the vent connector and chimney flue of a venting system serving a single appliance with a draft hood shall be not less than the area of the appliance flue collar or draft hood outlet or greater than seven times the draft hood outlet area.
3. The effective area of the chimney flue of a venting system serving two appliances with draft hoods shall be not less than the area of the larger draft hood outlet plus 50 percent of the area of the smaller draft hood outlet or greater than seven times the smaller draft hood outlet area.
4. Chimney venting systems using mechanical draft shall be sized in accordance with engineering methods.
5. ~~Other e~~Engineering methods.

Item 255 and 256
12.6.8.1
The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry chimney shall not be used to vent another appliance.
~~Exception:~~
12.6.8.2
The insertion of another liner or vent shall be permitted within the chimney as provided in this code and the liner or vent manufacturer’s instructions.
12.6.8.3~~2~~
The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry, metal, or factory-built chimney flue shall not be used to supply combustion air.
~~Exception:~~
12.6.8.4 Direct vent appliances designed for installation in a solid fuel–burning fireplace shall be permitted where installed in accordance with the manufacturer’s installation instructions.

Item 259
12.7.2 Installation.
~~The installation of gas vents shall meet the following requirements:~~

~~1. Gas vents shall be installed in accordance with the manufacturer's installation instructions.~~
12.7.2.1
A Type B-W gas vent shall have a listed capacity not less than that of the listed vented wall furnace to which it is connected.

Formatted: No bullets or numbering

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

12.7.2.2

~~2.~~

Gas vents installed within masonry chimneys shall be installed in accordance with the manufacturer's installation instructions.

12.7.2.2.1

Gas vents installed within masonry chimneys shall be identified with a permanent label installed at the point where the vent enters the chimney.

12.7.2.2.2

The label shall contain the following language: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel–burning appliances or incinerators."

~~3.~~ 12.7.2.3

Screws, rivets, and other fasteners shall not penetrate the inner wall of double-wall gas vents, except at the transition from the appliance draft hood outlet, flue collar, or single-wall metal connector to a double-wall vent.

Item 261

12.7.3 Gas Vent Termination.

~~The termination of gas vents shall comply with the following requirements:~~

12.7.3.1

~~1.~~ A gas vent shall terminate in accordance with one of the following:

1. Gas vents that are 12 in. (300 mm) or less in size and located not less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 12.7.3 and Table 12.7.3.
2. Gas vents that are over 12 in. (300 mm) in size or are located less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate not less than 2 ft (0.6 m) above the highest point where they pass through the roof and not less than 2 ft (0.6 m) above any portion of a building within 10 ft (3.0 m) horizontally.
3. Industrial appliances as provided in 12.3.4.
4. Direct vent systems as provided in 12.3.5.
5. Appliances with integral vents as provided in 12.3.6.
6. Mechanical draft systems as provided in 12.4.3.
7. Ventilating hoods and exhaust systems as provided in 12.4.4.

12.7.3.2

A Type B or a Type L gas vent shall terminate at least 5 ft (1.5 m) in vertical height above the highest connected appliance draft hood or flue collar.

12.7.3.3

~~2.~~

A Type B-W gas vent shall terminate at least 12 ft (3.7 m) in vertical height above the bottom of the wall furnace.

12.7.3.4

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in 12.3.5 and 12.4.3.

12.7.3.5

~~3.~~

Formatted: Normal, Indent: Left: 0.25", No bullets or numbering

Formatted: No bullets or numbering

Formatted: No bullets or numbering

Formatted: Indent: Left: 0.5", No bullets or numbering

Formatted: Normal, No bullets or numbering

Formatted: Normal, No bullets or numbering

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

Decorative shrouds shall not be installed at the termination of gas vents except where such shrouds are listed for use with the specific gas venting system and are installed in accordance with the manufacturer's installation instructions.

12.7.3.6

~~4.~~

All gas vents shall extend through the roof flashing, roof jack, or roof thimble and terminate with a listed cap or listed roof assembly.

12.7.3.7

~~5.~~

A gas vent shall terminate at least 3 ft (0.9 m) above a forced air inlet located within 10 ft (3.0 m).

Item 262

12.7.4 Size of Gas Vents.

Venting systems shall be sized and constructed in accordance with 12.7.4.1 through 12.7.4.3. ~~and the appliance manufacturer's instructions.~~

Item 271

12.8.4.4

Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 12.8.4.4 unless the installation instructions of a listed appliance or connector specify different clearances, in which case the listed clearances apply.

12.8.4.5

Reduced clearances from single-wall metal pipe to combustible material shall be as specified for vent connectors in Table 10.2.4.

Item 273

12.8.4.6

Single-wall metal pipe passing ~~shall not pass~~ through a combustible exterior wall shall be in accordance with either of the following:

~~unless guarded~~

1. With a thimble at the point of passage by a ventilated metal thimble not smaller than the following:
   a. For listed appliances with draft hoods and appliances listed for use with Type B gas vents, the thimble shall be a minimum of 4 in. (100 mm) larger in diameter than the metal pipe. Where there is a run of not less than 6 ft (1.8 m) of metal pipe in the opening between the draft hood outlet and the thimble, the thimble shall be a minimum of 2 in. (50 mm) larger in diameter than the metal pipe.
   b. For unlisted appliances having draft hoods, the thimble shall be a minimum of 6 in. (150 mm) larger in diameter than the metal pipe.
   c. For residential and low-heat appliances, the thimble shall be a minimum of 12 in. (300 mm) larger in diameter than the metal pipe.
2. ~~Exception: In lieu of~~ ~~6.~~2. Without a thimble ~~protection~~, all combustible material in the wall shall be removed a sufficient distance from the metal pipe to provide the specified clearance from such metal pipe to

Formatted: Normal, No bullets or numbering

Formatted: Normal, No bullets or numbering

Commented [IA1]: Renumber remaining exceptions. Remove note from table 12.8.4.4

Formatted: List Paragraph, Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Indent at: 0.5"

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

combustible material where. Aany material used to close up such opening isshall be noncombustible.

Item 277
12.9.1
The clearance for through-the-wall direct vent and non-direct vent terminals other than the combustion air intake of a direct vent appliance shall be in accordance with Table 12.9.1 and Figure 12.9.1.
Exception: The clearances in Table 12.9.1 shall not apply to the combustion air intake of a direct vent appliance.

Item 278
12.9.3
Vent systems for Category IV appliances that terminate through an outside wall of a building and discharge flue gases perpendicular to the adjacent wall shall be located not less than 10 ft (3 m) horizontally from an operable opening in an adjacent building. Except for
Exception: This shall not apply to vent terminals that are 2 ft (0.6 m) or more above or 25 ft (7.6 m) or more below operable openings.

Item 279
12.11.2.2
Where the vent connector used for an appliance having a draft hood or a Category I appliance is located in or passes through an unconditioned area, attic, or crawl space, that portion of the vent connector shall be listed Type B, Type L, or listed vent material having equivalent insulation qualities.
Exception:
12.11.2.3
Single-wall metal pipe located within the exterior walls of the building and located in an unconditioned area other than an attic or a crawl space having a local 99 percent winter design temperature of 5°F (−15°C) or higher.

Commented [IA2]: Renumber remaining sections

Item 280
12.11.2.3
Vent connectors for residential-type appliances shall comply with the following:

1. Vent connectors for listed appliances having draft hoods, appliances having draft hoods and equipped with listed conversion burners, and Category I appliances that are not installed in attics, crawl spaces, or other unconditioned areas shall be one of the following:
   a) Type B or Type L vent material
   b) Galvanized sheet steel not less than 0.018 in. (0.46 mm) thick
   c) Aluminum (1100 or 3003 alloy or equivalent) sheet not less than 0.027 in. (0.69 mm) thick
   d) Stainless steel sheet not less than 0.012 in. (0.31 mm) thick
   e) Smooth interior wall metal pipe having resistance to heat and corrosion equal to or greater than that of 12.11.2.3(1)(b), 12.11.2.3(1)(c), or 12.11.2.3(1)(d)
   f) A listed vent connector

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

2. Vent connectors shall not be covered with insulation.
12.11.2.4 ~~Exception: Listed insulated vent connectors shall be installed in accordance with the manufacturer's installation instructions.~~ Vent connectors, other than listed insulate vent connectors, shall not be covered with insulation

Item 283
12.11.2.5
Vent connectors for medium-heat appliances shall be constructed of factory-built, medium-heat chimney sections or steel of a thickness not less than that specified in Table 12.11.2.5 and ~~shall~~ comply with the following:

1. A steel vent connector for an appliance with a vent gas temperature in excess of 1000°F (538°C) measured at the entrance to the connector is~~shall be~~ lined with medium-duty fire brick or the equivalent.
2. The lining is~~shall be~~ at least 21⁄2 in. (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 in. (460 mm) or less.
3. The lining is~~shall be~~ at least 41⁄2 in. (110 mm) thick laid on the 41⁄2 in. (110 mm) bed for a vent connector having a diameter or greatest cross-sectional dimension greater than 18 in. (460 mm).
4. ~~Where~~ ~~f~~Factory-built chimney sections are ~~installed, they shall be~~ joined together in accordance with the chimney manufacturer's instructions.

Item 286
12.11.5 Clearance.
Minimum clearances from vent connectors to combustible material shall be in accordance with Table 12.8.4.4 or reduced where~~.~~
~~Exception: The clearance between a vent connector and~~ the combustible material shall be permitted to be reduced where the combustible material is protected as specified for vent connectors in Table 10.2.4.

Item 288
12.11.8 Slope.
12.11.8.1~~A v~~Vent connector attached to natural draft appliances shall be installed without any dips or sags and shall slope upward toward the vent or chimney at least 1⁄4 in./ft (20 mm/m).
~~Exception:~~ 12.11.8.2 Vent connector~~s~~ attached to a mechanical draft system shall be in~~-~~stalled in accordance with both the appliance and the draft system manufacturers' instructions.

Item 290
12.13.1 Appliances Requiring Draft Hoods.
Vented appliances other than the following shall be installed with draft hoods.
~~Exception:~~
1. Dual oven-type combination ranges~~;~~
2. ~~d~~Direct vent appliances~~;~~
3. ~~f~~Fan-assisted combustion system appliances~~;~~
4. ~~a~~Appliances requiring chimney draft for operation;

Exception Recommendation Document

5. ~~s~~Single-firebox boilers equipped with conversion burners with inputs greater than 400,000 Btu/hr (117 kW)~~;~~
6. ~~a~~Appliances equipped with blast, power, or pressure burners that are not listed for use with draft hoods;
~~1.~~7. ~~and a~~Appliances designed for mechanical~~forced~~ venting.

Item 291
12.13.2.1
If a draft hood is not supplied by the appliance manufacturer where one is required, a draft hood shall be installed as follows:~~,~~

1. be of a listed or approved type~~, and, in the absence of other instructions, be of~~
2. the same size as the appliance flue collar in the absence of other instructions.

12.13.2.2
Where a draft hood is required with a conversion burner, it shall be of a listed or approved type.

Formatted: List Paragraph, Numbered + Level: 1 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0.25" + Indent at: 0.5"

Item 299
13.1.2 Vent Downsizing.
Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted, provided that the installation complies with all of the following requirements:

1. The total vent height (H) is at least 10 ft (3 m).
2. Vents for appliance draft hood outlets or flue collars 12 in. (300 mm) in diameter or smaller are not reduced more than one table size.
3. Vents for appliance draft hood outlets or flue collars larger than 12 in. (300 mm) in diameter are not reduced more than two table sizes.
4. The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10 percent (0.90 × maximum table capacity).
5. The draft hood outlet is greater than 4 in. (100 mm) in diameter. A 3 in. (80 mm) diameter vent shall not be connected to a non-fan-assisted 4 in. (100 mm) diameter draft hood outlet. ~~This provision shall not apply to fan-assisted appliances.~~

Item 306
13.1.18 Height Entries.
Where the actual height of a vent falls between entries in the height column of the applicable table in Table 13.1(a) through Table 13.1(g) either of the following shall be used:

1. Interpolation
2. The lower appliance input rating shown in the table entries for FAN Max and NAT Max column values ~~;~~ and the higher appliance input rating for the FAN Min column values

Item 13.2.30
13.2.30 Height Entries.
Where the actual height of a vent falls between entries in the height column of the applicable table in Table 13.2(a) through Table 13.2(j), either of the following shall be used:

Exception Recommendation Document

Important Notice: This document has been provided for NFPA technical committee member use only. This document is the copyright property of the National Fire Protection Association (NFPA), Copyright © 2021 NFPA, and may not be used for any other purpose or distributed to any other persons or parties outside of the technical committee.

1. Interpolation
2. The lower appliance input rating shown in the table entries, for FAN Max and NAT Max column values~~,~~ and the higher appliance input rating for the FAN Min column values

Item 15 Attachment

~~**5.5.7.5 Metallic Pipe Fittings.** Metallic fittings shall comply with the following:~~

5.5.7.5 Metallic Pipe Fittings. Metallic pipe fittings shall be in accordance with Tables 5.5.7.5 (A) and (B).

Table 5.5.7.5 (A), Allowable pipe fittings for piping materials.

Pipe material	Fittings material	Prohibited fittings
Steel, stainless steel or wrought-iron	Steel, stainless steel, cast iron or wrought-iron	Cast iron fittings identified in Table 5.5.7.5 (B) Fittings ≥ 4 in.
Copper and copper alloy	copper or copper alloy	All ≥ 4 in.
Aluminum	Aluminum	All , where threads form the joint seal Fittings ≥ 4 in.

Table 5.5.7.5 (B). Fittings with prohibited uses.

Fitting Material	Prohibited use
Cast Iron	Bushings
	Fittings in flammable gas-air mixture service
	Fittings ≥ 4 in indoors,
	All fittings ≥ 6 in,
	Flanges in flammable gas-air mixtures
Zinc-Aluminum Alloys	Fittings used outside the fitting manufacturer's pressure–temperature recommendations
	Fittings used outside the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction
Special Fittings	Special fittings not approved

*Special fittings include couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless, or compression-type tubing fittings
NOTE: See 7.5.4 For field drilled and tapped fittings

7.5.4 Field drilled and tapped fittings. When pipe fittings are drilled and tapped in the field, the operation shall be in accordance with the following:
(1) ~~(a) The operation shall be performed~~ on systems having operating pressures of 5 psi (34 kPa) or less.
(2) ~~(b) The operation shall be performed~~ by the gas supplier or their designated representative.
(3) ~~(c) The drilling and tapping operation shall be performed in accordance with~~ written procedures prepared by the gas supplier.
~~(d) The fittings shall be located outdoors.~~
(4) ~~(e)~~ The tapped fitting assembly shall be inspected and pressure tested to be free of leaks

Item 15 Attachment

NOTE: Relocated requirements for field drilled and tapped fitting to Chapter 7 as it is an installation requirement.

Item 147 and 149 Attachment

9.6 Appliance and Equipment Connections to Building Piping.
9.6.1 Connecting Appliances and Equipment. Appliances and equipment shall be connected to the building piping in compliance with 9.6.5 through 9.6.7 with a connector in Table 9.6.1:

Delete 9.6.1 and 9.6.2 and substitute Table 9.6.1.

Table 9.6.1 Connectors and Hoses use to Connect Appliances

Replace

Connector or Hose Type	Standard	Additional Requirements
1. Rigid metallic pipe and fittings	See 5.5	None
2. Semirigid metallic tubing and metallic fittings	See 5.5	No aluminum alloy tubing in exterior locations.
3. Gas appliance connectors	ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances*.	1. Install in accordance with the manufacturer's installation instructions 2. Install in the same room as the appliance. 3. Only one connector per appliance.
4. Outdoor gas appliances and manufactured homes connector	Z21.75/CSA 6.27, *Connectors for Outdoor Gas Appliances and Manufactured Homes*.	Only one connector shall be used per appliance.
5. CSST	ANSI LC 1/CSA 6.26, *Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing.*	1. Installed in accordance with the manufacturer's installation instructions 2. Not be directly routed into a metallic appliance enclosure where the appliance is connected to a metallic vent that terminates above a roofline. 3. Use only to connect appliances that are fixed in place.
6. Unlisted gas hose connectors	None	Use to connect Injection (Bunsen) burners in laboratories and educational facilities only
7. Food Service Appliance Connectors	ANSI Z21.69/CSA 6.16, *Connectors for Movable Gas Appliances*.	1. Use with food service appliances that are moved for cleaning and sanitation purposes 2. Install in accordance with the connector manufacturer's installation instructions.
8. Indoor nonmetallic gas hose connectors indoors	None	1. Use only to connect laboratory, shop, and ironing appliances requiring mobility during operation 2. Install in accordance with the manufacturer's installation instructions. 3. Install an appliance shutoff valve where the connector is attached to the building piping. 4. The connector is a minimum length and is no longer than 6 ft (1.8 m). 5. The connector is not concealed and does not extend from one room to

Item 147 and 149 Attachment

		another or pass through wall partitions, ceilings, or floors.
9. Outdoor gas hose connectors used	ANSI Z21.54/CSA 8.4, *Gas Hose Connectors for Portable Outdoor Gas-Fired Appliances*,	1. Use only to connect portable outdoor appliances 2. Install in accordance with the manufacturer's installation instructions. 3. Install an appliance shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet s where the connector is attached to the supply piping 4. Install the shutoff valve or device required in (3) to prevent the accumulation of water or foreign matter. 5 Locate the connection in the outdoor area where the appliance is to be used.

9.6.1.1 Protection of Connectors. Connectors and tubing addressed in Table 9.6.1, rows 2, 3, 4, 5, 9.6.1(2), 9.6.1(3), 9.6.1(4), 9.6.1(5), and 9.6.1(6) shall be installed to be protected against physical and thermal damage. Aluminum alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as detergents, sewage, or water other than rainwater.

9.6.1.2 Materials addressed in Table 9.6.1 Rows 2, 3, 4, 5, and 8 ~~9.6.1(2), 9.6.1(3), 9.6.1(4), 9.6.1(5), and 9.6.1(6)~~ shall not be installed through an opening in an appliance housing, cabinet, or casing, unless the tubing or connector is protected against damage.

9.6.1.4 Restraint. Movement of appliances with casters shall be limited by a restraining device installed in accordance with the connector and appliance manufacturer's installation instructions.

9.6.1.5 * Suspended Low-Intensity Infrared Tube Heaters. Suspended low-intensity infrared tube heaters shall be connected to the building piping system with a connector listed for the application in accordance with ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances*.

(A) The connector shall be installed in accordance with the tube heater installation instructions and shall be in the same room as the appliance.

(B) Only one connector shall be used per appliance.

Delete 9.6.3 and 9.6.4

Item 158 Attachment

10.2.4 Clearances for Indoor Installation.
10.2.4.1 Air-conditioning appliances shall be installed with clearances in accordance with the manufacturer's instructions ,and not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing.
10.2.4.2 Air-conditioning appliances shall be permitted to be installed with reduced clearances to combustible material, In accordance with 10.2.5.
10.2.4.3 Where a furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 in. (50 mm) or less.
10.2.4.4 Air-conditioning appliances shall have the clearance from supply ducts within 3 ft (0.9 m) of the furnace plenum be not less than that specified from the furnace plenum. No clearance is necessary beyond this distance.
10.2.5.5 ~~(11)~~ Listed single-wall connectors shall be installed in accordance with the manufacturers' installation instructions. Relocated Note 11

Revise Table 10.2.4 third row: **Minimum Clearances with Specified Protection (in.)**
Revise Table 10.2.4 by replacing "-" with N/A, and add a Note: N/A = Not applicable.
Substantiation: This will make the table clearer. At present there is no indication of what a dash means.
Revise the notes to Table 10.2.4 by deleting (1) and (3) thru (11)
Substantiation: Notes (1) and (3) thru (10) have been relocated to a new 10.2.5. Note

Add a new 10.2.5:

10.2.5 Clearance reduction
10.2.5.1 Air-conditioning appliances shall be permitted to be installed with reduced clearances to combustible material, provided that the combustible material or appliance is protected as described in Table 10.2.4 and such reduction is allowed by the manufacturer's installation instructions. Relocated from 10.2.4 (2)
10.2.5.2 Reduction of clearances from combustible materials shall not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing. Relocated from Note (1)
10.2.5.3 All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the appliance, disregarding any intervening protection applied to the combustible material. Relocated from Note (2)
10.2.5.3 Spacers and ties shall be of noncombustible material. No spacer or tie shall be used directly opposite the appliance or connector. Relocated from Note (3)
10.2.5.4 Where all clearance reduction systems use a ventilated air space, adequate provision for air circulation shall be provided as described. Relocated from Note (4)
10.2.5.5 At least 1 in. (25 mm) shall be between clearance reduction systems and combustible walls and ceilings for reduction systems using a ventilated air space. Relocated from Note (5)
10.2.5.6 Where a wall protector is installed on a single flat wall away from corners, it shall have a minimum 1 in. (25 mm) air gap. the bottom and top edges, or only the side and top edges, or all edges shall be left open To provide adequate air circulation. Relocated from Note (6)
10.2.5.7 Mineral wool batts (blanket or board) shall have a minimum density of 8 lb/ft^3 (128 kg/m^3) and a minimum melting point of 1500°F (816°C). Relocated from Note (7)
10.2.5.8 Insulation material used as part of a clearance reduction system shall have a thermal conductivity of 1.0 Btu in./ft^2/hr-°F (0.144 W/m-K) or less. Relocated from Note (8)
10.2.5.9 At least 1 in. (25 mm) shall be between the appliance and the protector.
10.2.5.10 The clearance between the appliance and the combustible surface shall not be reduced below that allowed in Table 10.2.4. Relocated from Note (9)
10.2.5.11 All clearances and thicknesses are minimum; larger clearances and thicknesses are acceptable. Relocated from Note (9)

Item 158 Attachment

Notes:

(2) All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the appliance, disregarding any intervening protection applied to the combustible material.
(5) At least 1 in. (25 mm) shall be between clearance reduction systems and combustible walls and ceilings for reduction systems using a ventilated air space.
(7) Mineral wool batts (blanket or board) shall have a minimum density of 8 lb/ft^3 (128 kg/m^3) and a minimum melting point of 1500°F (816°C).

Committee Inputs

Committee Input No. 45-NFPA 54-2021 [Global Input]

The committee is looking at breaking out multi-sentence requirements into separate line items and changing exceptions into requirement line items.

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Tue Sep 21 16:54:44 EDT 2021

Committee Statement

Committee Statement: The committee is looking at breaking out multi-sentence requirements into separate line items and changing exceptions into requirement line items.

Response Message: CI-45-NFPA 54-2021

Committee Input No. 46-NFPA 54-2021 [Global Input]

The the committee is looking into combustion air requirements and linking it to commonly used blower door testing procedures and ASHRAE published air change factors. A task group has been formed that will also look into potential test methods and who will be conducting these tests. See attachments for proposed tables for converting ACH50 to ACHnat

Supplemental Information

File Name	Description	Approved
ACH50_to_ACHnat_-_variables_reduced.docx		
ACH50_to_ACHnat_conversion_-_Michigan_-_1_story.docx		

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Wed Sep 22 14:00:16 EDT 2021

Committee Statement

Committee Statement: The the committee is looking into combustion air requirements and linking it to commonly used blower door testing procedures and ASHRAE published air change factors. A task group has been formed that will also look into potential test methods and who will be conducting these tests. See related Public Input 86 as well.

Response Message: CI-46-NFPA 54-2021

Converting ACH50 to estimated ACHnat using Equation 4-3 from ASHRAE 62.2 2019, Section 4.1.2.1 – "Effective Annual Average Infiltration Rate (Q*inf*) Using a Single-Point Envelope Leakage Test"

Equation 4-3: $Q_{inf} = .052 \times Q_{50} \times wsf \times (H/Hr)^z$ $ACH_{nat} = .052 \times Q_{50} \times wsf \times (H/Hr)^z \times 60/volume$					
Single story – 1200 sq.ft/9600 cu.ft. volume – Height 9.5'					
ACH50	CFM50	WSF (Low/High)	ACHnat	WSF (Avg/-4 high/-4 low)	ACHnat
3	480	.5	.08	.583	.096
		.67	.11	.572	.095
				.593	.098
4	640	.5	.11	.583	.13
		.67	.15	.572	.12
				.593	.13
5	800	.5	.14	.583	.16
		.67	.18	.572	.16
				.593	.16
6	960	.5	.165	.583	.19
		.67	.22	.572	.19
				.593	.20
7	1120	.5	.19	.583	.225
		.67	.26	.572	.22
				.593	.23
8	1280	.5	.22	.583	.26
		.67	.295	.572	.25
				.593	.26
9	1440	.5	.25	.583	.29
		.67	.33	.572	.28
				.593	.29
10	1600	.5	.275	.583	.32
		.67	.37	.572	.315
				.593	.33
11	1760	.5	.30	.583	.35
		.67	.40	.572	.35
				.593	.36
12	1920	.5	.33	.583	.385
		.67	.44	.572	.38
				.593	.37
13	2080	.5	.36	.583	.42
		.67	.48	.572	.41
				.593	.42
14	2240	.5	.385	.583	.45
		.67	.52	.572	.44
				.593	.46

Summary next page for Single-Story in Michigan

Potential ACH numbers to be used for KAIR combustion air calculations for Section 9.3 of the NFPA 54

ACH50	ACHnat	ACH50	ACHnat	ACH50	ACHnat	ACH50	ACHnat	ACH50	ACHnat
3,4	**.10**	5,6	**.15**	7,8	**.20**	9,10	**.25**	11	**.30**
ACH50	ACHnat	ACH50	ACHnat						
12,13	.**35**	14	**.4**						

$ACH_{nat} = .052 \times Q_{50} \times wsf \times (H/Hr)^Z \times 60 / volume$
$ACH_{nat} = .052 \times 800 \times wsf \times 1.08 \times 60 / 16{,}000$
(the ACH50 and wsf are now the only variables)

Single story		
ACH_{50}	wsf	ACH_{nat}
3	.30	.05
	.35	.06
	.40	.07
	.45	.08
	.50	.08
	.55	.09
	.60	.10
	.65	.10
	.70	.10
	.75	.10
	.80	.10
	.85	.15
	.90	.15
	.95	.15
	1.00	.15
	1.05	.175
	1.10	.20
	1.15	.20
ACH_{50}		
4	.30	
And so on…	.35	
	.40	

Height correction factor $(H/Hr)^Z$
Single story with varying heights of conditioned space above grade

Height in feet	$(H/Hr)^Z$	ACH_{nat} wsf - .5 and .9
8	.99	.077 / .139
8.5	1.01	.079 / .142
9	1.04	.08 / .146
9.5	1.06	.083 / .149
10	1.08	.084 / .152
10.5	1.10	.086 / .154
11	1.12	.087 / .157
11.5	1.14	.089 / .160
12	1.16	.09 / .161

Looking at variations in Height Correction Factor by inserting average ACHnat calculations (8 and 10 foot) into the KAIR formula using 100k input units

Draft hood	Draft induced
ACHnat – Volume	ACHnat - Volume
.077 – 27,273 cu.ft	.077 – 19,480 cu.ft
.084 – 25,000	.084 – 17,857
.139 – 15,108 cu.ft.	.139 – 10,791 cu.ft
.152 – 13,815	.152 – 9,868

The differences are all within 10%

Variations in square footage or volume of buildings is not needed because the ACH50 uses volume in its calculation. To determine the CFM50 (Q50) needed in performing the calculation for estimated natural ACH, the ACH50 is multiplied by the volume and divided by 60. As the volume of the building changes, so does the CFM50. The calculation done using a specific wsf can use any size building because at a specific ACH50, the CFM50 will change proportionally to a change in volume. A 2,000 square foot building with 8-foot ceiling height was used in the calculations above. At an ACH50 of 3, this works out to 800 CFM50.

An estimated average height of conditioned space above grade was used in the formula also. I used 10 foot which calculates to a height correction factor of 1.08. I do not believe there is a significant enough concern in using this for determination of estimated ACHnat. Comparing extremes from 8 to 10 shows KAIR calculations within 10% for combustion air purposes.

This allows 3 tables to be built (granted, they would be long ones) – single story, two story and three story. There would be 14 ACH50 categories for the single story, 10 for two story and 9 for 3 story. In looking at previous calculations I had done, these are where the infiltration rate of the building climbs above .4 at which you could now use the Standard Method. You can use the KAIR method up to an ACH of .6 per the 54 so there is a wild card there. The tables could also be shortened in the wsf columns by lumping like ACH numbers into a single row. For example, in the above table, you could say from ".60 to .80 – ACHnat is .1.

Lastly, if this is built, it might show that we just don't want any appliances using interior air for combustion if the building is a particular ACH50 or below. You can see from the above table that for an ACH50 of 3, the best ACHnat you are going to see is a .20 in Alaska. There just should not be any combustion air taken from the inside in these buildings. So, that could reduce the number of ACH50 listings in the tables.

Committee Input No. 47-NFPA 54-2021 [Global Input]

The Technical Committee is looking into issues with the current code in regards to installations Industrial or large commercial. There are issues such as the line pressure regulator installations and venting of ovens where there are clear incompatibilities between the code and common industrial practices.

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Wed Sep 22 14:09:03 EDT 2021

Committee Statement

Committee Statement: The Technical Committee is looking into issues with the current code in regards to installations Industrial or large commercial. There are issues such as the line pressure regulator installations and venting of ovens where there are clear incompatibilities between the code and common industrial practices.

Response Message: CI-47-NFPA 54-2021

Committee Input No. 41-NFPA 54-2021 [New Section after 3.3.84.1]

3.3.84.2 Draft Control Damper System

A listed electronically controlled damper device attached to a chimney, vent connector, breeching, or flue gas manifold to control the vent, vent connector or chimney pressure.

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Tue Sep 21 15:43:00 EDT 2021

Committee Statement

Committee Statement: Draft control dampers systems are usually placed inside the chimney, vent or vent connector to automatically maintain the required appliance outlet pressure. These devices are common and should be addressed by NFPA 54. The committee is looking at adding further requirements in chapter 12 around their use.

Response Message: CI-41-NFPA 54-2021

Public Input No. 127-NFPA 54-2021 [New Section after 3.3.84.1]

Public Input No. 126-NFPA 54-2021 [Section No. 3.3.84.1 [Excluding any Sub-Sections]]

Committee Input No. 48-NFPA 54-2021 [New Section after 4.5]

4.X Gas Detection.

Where fuel gas detection and warning equipment is required in residential occupancies with gas service, the installation shall be in accordance with NFPA 715, Standard for the Installation of Fuel Gases Detection and Warning Equipment. (See Committee Input Substantiation for further detail and See FR 32)

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Wed Sep 22 14:26:05 EDT 2021

Committee Statement

Committee Statement: The Technical Committee believes that requiring fuel gas detectors in residential or other occupancies with gas service would be better addressed in building and fire codes, such as NFPA 101, Life Safety Code® or NFPA 5000, Building Code. These codes address the installation of similar warning equipment, such as carbon monoxide alarms, and the Technical Committee believes that the enforcing authorities who enforce the Life Safety Code or the Building Code would be better equipped to enforce fuel gas detector requirements in residential and other occupancies.

Response Message: CI-48-NFPA 54-2021

Committee Input No. 30-NFPA 54-2021 [Section No. 12.1]

12.1* Minimum Safe Performance.

12.1.1

Venting systems shall be designed and constructed to convey all flue and vent gases to the outdoors.

12.1.2

The chimney or vent system shall be sized for the total btu input.

Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Mon Sep 20 16:43:15 EDT 2021

Committee Statement

Committee Statement: The committee is aware of certain instances in which venting systems and chimneys are being sized for operating appliance input and not total appliance input and is looking to add requirements to require total appliance input when sizing venting systems and chimneys.

Response Message: CI-30-NFPA 54-2021

Public Input No. 128-NFPA 54-2021 [New Section after 12.7.4.3]