AGENDA

NFPA Technical Committee on National Fuel Gas Code (NFG-AAA)
NFPA 54/ANSI Z223.1 First Draft Meeting (A2026)

September 17th -19th, 2024
8:00 a.m. – 5:00 p.m. (Eastern)

Charlotte, NC
To join the meeting, please contact Sarah Caldwell (scaldwell@nfpa.org)

1. **Call to order.** Franklin Switzer.
2. **Introductions.** See committee roster attached.
3. **Chair report.** Franklin Switzer.
4. **Staff liaison report.**
   a. **NFPA 54.** Alex Ing.
   b. **ANSI Z223.** Luis Escobar.
5. **Previous meeting minutes.** March 2024 Web/Teleconference. See attached.
6. **NFPA 54/ANSI Z223.1 First Draft.**
   a. **Public Inputs.** See attached.
   b. **Task group reports.**
      i. **Multi-Requirements and Exceptions**.
      ii. **Alternative Fuel**. Andy Thielen.
      iii. **Repair, Renewal, or Rehabilitation of Piping**. Ted Lemoff.
      iv. **Piping Underground Under Structures**. Mike Gorham.
      v. **Flammable Air Gas Mixtures**. Mike Gorham.
      vi. **Industrial Coverage**. John Puskar.
      vii. **Chapter 8 Purging**. Matt Wilber.
      viii. **Table Consolidation**.
      ix. **Nonapplication**.
7. **Other Business.**
   a. **Equivalency Revision** Ted Lemoff
8. **Future meetings.**
9. **Adjournment.**

Address List No Phone

07/29/2024
Alex Ing

National Fuel Gas Code

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Alex Ing 2/9/2019
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MINUTES

NFPA Technical Committee on National Fuel Gas Code (NFG-AAA)
NFPA 54 Pre-First Draft Meeting (A2025)

March 12th and 15th, 2024
1:00 p.m. – 4:00 p.m. (Eastern)

Web/Teleconference

1. **Call to order.** Franklin Switzer, chair, called the meeting to order at 1:00 p.m. on March 12th .
2. **Introductions.** Attendees introduced themselves and identified their affiliation and NFPA staff took attendance.
3. **Chair report.** Franklin Switzer welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Alex Ing provided an overview of the standards development process and the revision cycle schedule.
   a. The following members declared that they had been retained to represent the interest of an entity that would be classified in an interest category different from their own with respect to a specific issue or issues that were addressed by the committee. These members refrained from voting on the Public Input, Public Comment or other matters, as noted.
      i. Jim Kendzel noted that the American Supply Association (ASA) is contracted to represent Heating, Air Conditioning Refrigeration Distributers International (HARDI)
5. **Previous meeting minutes.** The minutes from October 2022 Pittsburgh Minute were approved without revision.
6. **NFPA 54 Pre-First Draft.**
   a. **Presentation(s).** The committee heard presentations and had discussion on the following items.
      i. **NFPA 54 Manual of Style.** See new task group multi-requirements and exceptions for further information.
      ii. **Hydrogen blending.** See new task group on alternative fuel for further information.
      iii. **Renewable fuel impact on pipe sizing and equipment operation.** See new task group on repair, renewal, or rehabilitation of piping for further information.
      iv. **New piping system materials.** See new task groups for further information.

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v. **Fuel gas detection.** Discussion on fuel gas detection was had and updates on NFPA 715 were given.

vi. **Underground piping and understructure requirements of piping systems.** See new task groups for further information.

vii. **Regulator venting.** Discussion was had on regulator venting placement and discussion was had on a Gas Technology Institute research project related to the matter.

b. **New task groups.** The following task groups were appointed to work subsequent to the meeting:

i. **Multi-requirements and exceptions** . TG Chair: Bob Torbin. Members: Ted Lemoff, Andy Thielen, Chris Byers, Eric Smith, Gregg Gress, Enrique Gonzalez. This task group will look at removing exception language and breaking out multi-requirement sections.

ii. **Alternative fuel**. TG Chair: Andy Thielen. Members: Chris Byers, Bob Torbin, Franklin Switzer, Ted Lemoff, Ted Williams. Jeremy Conjura, Jason Stanek, Jonathan Brania, John Puskar. This task group will look at alternative fuel use in fuel gas systems.

iii. **Repair, renewal, or rehabilitation of piping**. TG Chair: Ted Lemoff. Members: Chris Byers, George Ragula, John Puskar, Brian Williams, Bob Torbin, Phil Ribbs. The TG will look at repair, renewal, or rehabilitation of existing piping systems..

iv. **Piping underground under structures**. TG Chair: Mike Gorham. Members: Bob Torbin, Ted Williams, Andy Thielen, Phil Ribbs, Enrique Gonzales, Gregg Gress, Paul Gugliotta, Tung Nguyen. The TG will look at correlating piping underground under structures with the other model codes..

v. **Flammable Air Gas Mixture**. TG Chair: Mike Gorham. Members: Ted Lemoff, Bill Murray, Franklin Switzer. The task group will look at the requirements concerning flammable air gas mixtures.

vi. **Industrial Coverage**. TG Chair: John Puskar. Members: Mike Gorham, Gregg Gress, Ted Lemoff, Andy Thielen, Steen Hagensen, Franklin Switzer. The TG will look into revising requirements based on common industrial applications.

7. **Other Business.**

8. **Future meetings.** The next committee meeting is proposed to be September 16-18th, 2024. A meeting notification will be posted at www.nfpa.org/54next when the meeting is scheduled.

9. **Adjournment.** The meeting was adjourned at 4:15 p.m. on March 12th. The March 15th meeting was not needed and was cancelled.

Attendees

Committee Members:

✓	**Switzer, Franklin**	Chair	S-afe, Inc.
✓	**Escobar, Luis**	Recording Secretary	American Gas Association
✓	**Andrews, Thomas**	Principal	TR Energy Consulting
	Bethany, Michael	Principal	Gas Piping Safety Services (GPSS)
✓	**Brania, Jonathan**	Principal	UL Solutions
✓	**Brewer, James**	Principal	National Chimney Sweep Guild
	Brown, Charles	Principal	Advanced Engineering Investigations
✓	**Bukowski, Ted**	Principal	Gas Technology Institute (GTI)
	Bunsey, James	Principal	Propane Education and Research Council
✓	**Byers, Chris**	Principal	Duke Energy/Piedmont Natural Gas
✓	**Conjura, Jeremy**	Principal	Corning Incorporated
✓	**Davis, Gerald**	Principal	Williams Meter Company
✓	**Evans, Marvin**	Principal	CSA Group
✓	**Feehan, Pennie**	Principal	Copper Development Association Inc.
✓	**Fossa, Alberto**	Principal	NFPA Latin American Section
	George, Sean	Principal	United Assn. of Journeymen & Apprentices
✓	**Gonzalez, Enrique**	Principal	International Association of Plumbing &
✓	**Gorham, Mike**	Principal	National Propane Gas Association
✓	**Gress, Gregg**	Principal	International Code Council
✓	**Griffith, Roger**	Principal	Griffith Engineering
✓	**Gugliotta, Paul**	Principal	National Grid
	Hagensen, Steen	Principal	ENERVEX
✓	**Holmes, Peter**	Principal	Maine Fuel Board
	Hussain, Nasir	Principal	Combustion Science & Engineering, Inc.
	Ibrahim, Zuhair	Principal	Ibrahim & Associates LLC
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	Kleiss, Jeff	Principal	Air-Conditioning, Heating, & Refrigeration
✓	**Kulik, Marek**	Principal	Technical Standards and Safety Authority
✓	**Kurtz, Brian**	Principal	Carrier/UTC
✓	**Lemoff, Theodore**	Principal	TLemoff Engineering
	McNulty, Timothy	Principal	RM Manifold Group Inc., dba US Draft

	Murray, William	Principal	Self
✓	**Nguyen, Tung**	Principal	Emerson Automation Solution
✓	**Papageorge, Andrea**	Principal	American Gas Association
✓	**Ragula, George**	Principal	RagulaTech
✓	**Readout, Brett**	Principal	American Property Casualty Insurance
✓	**Ribbs, Phillip**	Principal	California State Pipe Trades Council
✓	**Richardson, April**	Principal	Railroad Commission of Texas
✓	**Russell, Jon**	Principal	American Public Gas Association
	Ryglewicz, Brian	Principal	Chimney Design Solutions Inc.
	Sipe, Joel	Principal	Exponent, Inc.
✓	**Stanek, Jason**	Principal	American Gas Association
✓	**Thielen, Andy**	Principal	Engineering Systems Incorporated (ESI)
✓	**Timmons, Calvin**	Principal	Willbanks & Associates, Inc.
	Wagner, Christopher	Principal	AmeriGas Propane
✓	**Williams, Brian**	Principal	Ferguson Enterprises
✓	**Williams, Ted**	Principal	Natural Gas Direct, LLC.
✓	**McDowell, Jean**	Voting Alternate	Texas Propane Gas Association
	Aguilar, Hugo	Alternate	International Association of Plumbing &
	Askey, Joshua	Alternate	Corning CET
	Carraway, LaToya	Alternate	International Code Council
✓	**Daniel, Kody**	Alternate	American Property Casualty Insurance
✓	**Deary, Thomas**	Alternate	Air-Conditioning, Heating, & Refrigeration
✓	**Euchner, Ralph**	Alternate	American Gas Association
✓	**Han, Young**	Alternate	Enervex, Inc.
	Hardin, Travis	Alternate	UL Solutions
	Jason, Zachary	Alternate	Advanced Engineering Investigations
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✓	**Puskar, John**	Alternate	Prescient Technical Services LLC
	Swiecicki, Bruce	Alternate	National Propane Gas Association
✓	**Thompson, Kent**	Alternate	Railroad Commission Of Texas
	Wilber, Matthew	Alternate	ESi
✓	**Ing, Alex**	Staff Liaison	National Fire Protection Association

Guests:

Bob Torbin	Omega Flex
Jonathan Sargeant	Omega Flex
Eric Adair	Hearth, Patio, & Barbeque Association
Stanley Smith	Eldridge Utility District- AGA
Adam Smith	Viega
Eric Benstock	Texas Propane Gas Association
Daniel Buuck	National Home Builders Association

Total number in attendance: 49

DRAFT Minutes – ANSI Z223 Committee
Pre-First Draft Meeting
2027 National Fuel Gas Code

Tuesday, March 12, 2024
Microsoft Teams

1. Call To Order.
Franklin Switzer called the meeting to order at 1:00 pm on March 12, 2024.

2. Introductions.
Everyone in attendance introduced themselves.
Quorum: 23 out of 31 principals from ANSI Z223 Committee were on the call (74%). There is a quorum.

3. Chair Report.
We will make a concerted effort during this revision cycle to better align the ANSI Z223.1 and NFPA 54 documents. Also want to align the membership of both committees (understanding the different allowances for multiple representatives; i.e., Z223 allows multiple reps while NFPA does not).

4. Staff Liaison Report.

Alex Ing

- NFG-AAA is the designator for NFPA 54
- See Alex's presentation slides for his report

Luis Escobar

- PINS was published on January 19, 2024 with public comment due date of February 18, 2024. No public comments were received.
- Membership changes in 2023:
  - Richard Gilbert retired from the Texas LP Gas Association. Jean McDowell moved up to principal voting member and Eric Benstock was appointed their alternate.
  - Tom Dreary (AHRI staff) appointed new representative for AHRI.
- Membership ballot to include:
  - Bob Carpenter change of employment from Viega to Wavin
  - Duane Arnold Wolf (Wolf Engineering) as new applicant
  - Adam Smith (Viega) as new applicant)
  - NFPA 54 members who confirmed they want to join ANSI Z223 (by membership ballot):
    - Charles Brown (AEI Corp) – alt. Zachary Jason
    - Jeremy Conjura (Corning) – alt. Joshua Askey
    - Gerald Davis (Williams Meter Co)
    - Nasir Hussain (Combustion Scient & Engineering)
    - Zuhair Ibrahim (Ibrahim & Associates)
    - James Kendzel (American Supply Association)
    - William Muray (Self)
    - Calvin Timmons (Willbanks & Associates)
    - Brian Williams (Ferguson Enterprises)
    - Ted Williams (Natural Gas Direct)
    - Young Han as alt to Steen Hagensen (ballot not required for appointment of alternate)
  - NFPA 54 members who declined to join ANSI Z223:
    - Ted Bukowski (GTI) **– NOT INTERESTED**
    - Alberto Fossa (NEWEN Creative Engineering) **– NOT INTERESTED**
    - Roger Griffith (Griffith Engineering) **– NOT INTERESTED**

        - Marek Kulik (Technical Standards and Safety Authority) **– NOT INTERESTED**
        - Brian Kurtz (Carrier Corp) **– NOT INTERESTED**
        - George Ragula (RagulaTech) **– NOT INTERESTED**
        - Phillip Ribbs (PHR Consultants) **– NOT INTERESTED**
    - NFPA 54 members who did not respond to inquiry:
        - James Bunsey (Propane Education and Research Council)
        - John Foley (Van-Packer) – who is he with?
        - Sean George (Steamfitters LU 449-Pittsburgh)
        - Tim McNulty (RM Manifold Group dba US Draft Company)
        - Tung Nguyen (Emerson Automation Solutions)
        - Brian Ryglewicz (Chimney Design Solutions)
        - Joel Sipe (Exponent Inc)

5. Previous Meeting Minutes.
Motion to approve the October 2022 meeting minutes was approved unanimously.

6. <u>2027 National Fuel Gas Code</u> (NFPA 54 <u>/ ANSI Z223.1).</u>

a. Discussion Items.

i. NFPA 54 Manual of Style.
The TIA from last cycle was approved which reversed the reorganizational changes (multi-requirements and exceptions). The topic, however, is not done. Those changes must still go on to keep the NFPA 54 in line with the requirements of the Manual of Style.

The First Draft Meeting will include the TIA from the last cycle.

This group will break up sections that have multiple requirements and create sections for exceptions to the requirements.

Task Force created by unanimous approval: Chris Byers, Enrique Gonzelez, Gregg Gress, Ted Lemoff, Eric Smith, Andy Thielen, Bob Torbin (lead).

ii. Alternate Fuels and Blends (Hydrogen Blending, DME, Pure Hydrogen).
Franklin Switzer updated the committee on NFPA 2 (Hydrogen Technologies Code). This includes hydrogen *up to* 100%. They've taken the NFPA 86 on combustion furnaces/burners and incorporate it in NFPA 2 chapter 14. They are meeting in April 2024 in Indianapolis.

This committee should consider reviewing that NFPA 2 committee's work product when it becomes available. The CSA also has a similar task group.

On the propane side there's a push to include DME (dimethyl ether) as an alternative to LP gas. It's a renewable combustible gas.
Topic of interest: What percentage of hydrogen blends are appropriate? IAPMO, CSA, and ICC are all working on this larger topic in some fashion. This group will look at alternative fuel use into fuel gas systems.

Task Force created by unanimous approval: Jonathan Brania, Chris Byers, Jeremy Conjura, Ted Lemoff, John Puskar, Jason Stanek, Franklin Switzer, Andy Thielen (lead), Bob Torbin, Ted Williams.

iii. Renewable Fuel Impact on Pipe Sizing and Equipment Operation.

Bob Torbin notified us of potential future proposals for the effects of admixtures on pipe sizing and pressure drops.

Ted Williams noted that CSA group and their standards are looking at a definition of natural gas that would allow up to 5% hydrogen.

iv. **Common Venting of Other Than Category 1 Appliances.**
Both members who requested this topic were not present.
Calvin Timmons and Young Han (both members of NFPA 54) to develop a public input on this topic.

v. **New Piping System Materials.**
PEX-AL-PEX and other new materials. Interest in putting together a new Task Force to look into new piping materials? Let the manufacturers follow the normal procedure to seek approval for their materials.

George Ragula: There's a lot of new technology coming up for in-situ pipe repair, renewal, rehabilitation of systems. Could this be a new appendix? NFGC is about new installations so not appropriate to retrofit/rehabbing pipe.

Task Force created by unanimous approval: Chris Byers, Ted Lemoff (lead), John Puskar, George Ragula, Phil Ribbs, Bob Torbin, Brian Williams.

vi. **Pressure Limits Inside Buildings.**
No discussion.

vii. **Fuel Gas Detection.**
There's a lot of work going on in the NFPA 715 technical group. NTSB sent a letter to NFPA saying we need to add fuel gas detectors to the NFGC. We added it in the annex (not mandatory) during the last cycle.

There have been proposals submitted to the IFC and IBC (and probably IRC) mandating fuel gas detector installations per NFPA 715. Issue: NFPA 715 requires one detector per gas appliance in the house. Bob Torbin is leading the effort in 715 to change that requirement to just one detector per floor where there are gas appliances (depending on the detector type).

NPGA is currently working to oppose the IFC and IBC proposals. We should reiterate our stance that gas detectors don't belong in NFGC in case we get any proposals on the topic.

State of Maine has mandated these detectors for multi-family. NYC also requires a fuel gas detector in all apartments in the city (retroactively). Enforcement TBD. Seven other states are considering adding fuel gas detectors to their residential codes.

Add to agenda for First Draft Meeting: report on efforts to include fuel gas detectors in the code.

viii. **Leak Testing.**
No discussion.

ix. **Underground Piping and Understructure Requirements of Piping Systems.**
IAPMO gets asked about the conduit for underground piping and when is it required. Slab vs. Footing. The code could benefit from some guidance for these situations.

Bob Torbin put in a proposal into UPC on this topic. There is disjointed coverage on underground pipes in all three model codes (UPC, IFGC, NFGC). We don't prohibit penetration of foundation

walls with gas piping, we just require it to be safe. IFGC does not allow this. UPC more consistent with us. Are we able to identify the disparate requirements and address the discrepancies?

Gregg notes that the prohibition in the IFGC only applies to house piping (like to pool heater or gas range) and specifically excludes utility piping.

Task Force created by unanimous approval: Enrique Gonzalez, Mike Gorham (lead), Gregg Gress, Paul Gugliotta, Tung Nguyen, Phil Ribbs, Andy Thielen, Bob Torbin, Ted Williams.

Potentially develop a technical note on the topic, which also compares our requirements with the requirements of the other two codes.

x. **Regulator Venting.**
Paul Gugliotta: one of the most debated topics in codes and standards. Very little concrete requirements in 192 (the 3 foot rule).

NFGC only covers line pressure regulators. AGA's CFSM (Customer Field Service & Measurement) Committee and BECS (Building Energy Codes and Standards) Committee are working on this. BECS is working on more concrete guidance and a gas dispersion test; they will bring us a proposal once they have something.

7. Other Business.
Do we want to keep the following Task Forces going from last cycle?

- Industrial Coverage [Mike Gorham, Gregg Gress, Steen Hagensen, Ted Lemoff, John Puskar, Franklin Switzer, Andy Thielen] – YES
- Flammable Air Gas Mixture [Mike Gorham (lead), Ted Lemoff, Bill Murray, Franklin Switzer] – YES

8. Future Meetings.
Attendees selected Nashville the week September 16-20 for the First Draft Meeting. Plan for 2-1/2 days.

9. Adjournment.

Advisory Panel – these have been removed from the NFPA process and should be removed from the ANSI Z223 Committee Procedures

(The establishment of an Advisory Panel and the assignment of its responsibilities shall require a majority vote of the Committee. An Advisory Panel shall be a standing technical group which drafts recommendations for standards or standards revisions for consideration by the Committee and otherwise acts in an advisory capacity to the Committee.

Members of an Advisory Panel shall be appointed by the Chairman of the Committee and confirmed by the Committee. Members may include, in addition to members of the Committee, individuals who have knowledge and interest in the advisory panel's area of responsibility. There shall be no alternates for advisory panel members.)

- Appliance Installation
- Piping
- Venting

Ad Hoc Task Force – see highlights above

(The Committee, by a majority vote, may appoint an ad hoc task force to initiate the development of a standard not within the area of responsibility of an existing Advisory Panel or to investigate or study an individual standards matter of direct concern to the Committee. A task force shall report directly to the Committee and, upon completing its assignment, be discharged.

Membership of ad hoc task forces of the Committee shall be appointed by the Chairman of the Committee and may include, in addition to members of the Committee, individuals who have knowledge and interest in the subject of the task force's assignment.)

- Mutli-Requirements and Exceptions
- Alternative Fuels and Blens

Attendance

Cat.	Status	First Name	Last Name	Attd	Representing
M	PV	Eric	Adair	X	Hearth, Patio & Barbecue Association
SE	PV	Thomas	Andrews	X	Self
SE	PV	Michael	Bethany	NO	Gas Piping Safety Service
AR-TL	PV	Jonathan	Brania	X	Underwriters Laboratories:
I-M	PV	James P.	Brewer	X	National Chimney Sweep Guild
I-M	PV	Daniel	Buuck	X	National Assoc. of Home Builders
ES	PV	Christopher	Byers	X	American Gas Association
M	PV	Bob	Carpenter	NO	Viega
ES	PV	Ralph	Euchner	X	American Gas Association
AR-TL	PV	Marvin	Evans	X	CSA Group
M	PV	Pennie	Feehan	X	Copper Development Association
EA	PV	Enrique	Gonzalez	X	International Assoc. of Plumbing & Mech. Officials
ES	PV	Michael R.	Gorham	NO	The National Propane Gas Association
EA	PV	Gregg	Gress	X	International Code Council
M	PV	Steen	Hagensen	NO	ENERVEX, Inc.
EA	PV	Peter	Holmes	X	Maine Fuel Board
M	PV	Jeff	Kleiss	NO	Air Conditioning, Heating, and Refrigeration Institute
SE	PV	Theodore	Lemoff	X	TLemoff Engineering
ES	PV	Jean	McDowell	X	Texas Propane Gas Association
ES	PV	Andrea	Papageorge	X	American Gas Association
M	PV	John	Park	NO	Association of Home Appliance Manufacturers
I	PV	Brett	Readout	X	EMC Insurance Companies
EA	PV	April Dawn	Richardson	X	Railroad Commission of Texas
ES	PV	Jon	Russell	X	American Public Gas Association
EA	PV	Eric C.	Smith	NO	International Fire Marshals Association
ES	PV	Jason	Stanek	X	American Gas Association
M	PV	Tom	Deary	X	Air Conditioning, Heating, and Refrigeration Institute
SE	PV	Franklin	Switzer	X	S-afe, Inc.
SE	PV	Andy	Thielen	X	ESi
M	PV	Robert	Torbin	X	Air Conditioning, Heating, and Refrigeration Institute
I-M	PV	Christopher	Wagner	NO	AmeriGas Propane L.P.
EA	A	Hugo	Aguilar	NO	International Assoc. of Plumbing & Mech. Officials
EA	A	LaToya	Carraway	NO	International Code Council
I	A	Kody	Daniel	X	EMC Insurance Companies
ES	A	Paul	Gugliotta	NO	American Gas Association
AR-TL	A	Travis	Hardin	NO	Underwriters Laboratories:
M	A	Andy	Kireta	NO	Copper Development Association
I-M	A	Vladimir	Kochkin	NO	National Assoc. of Home Builders
ES	A	Eric	Benstock	X	Texas Propane Gas Association
AR-TL	A	Colin	Moorhouse	NO	CSA Group
SE	A	John	Puskar	X	Technical Services LLC
ES	A	Stan	Smith	X	American Gas Association
ES	A	Bruce	Swiecicki	NO	The National Propane Gas Association
EA	A	Kent	Thompson	X	Railroad Commission of Texas
SE	A	Matt	Wilber	NO	ESi

Others:
Alex Ing, NFPA
NFPA 54 Committee members (see their minutes)

Public Input No. 124-NFPA 54-2024 [Global Input]

See attached issued TIA for changes to various paragraphs throughout.

Additional Proposed Changes

File Name	Description	Approved
TIA_54_24_1_1726.pdf	54_24_1_1726	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 24-1 (Log 1726) issued by the Standards Council on August 25, 2023 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Substantiation: The NFPA 54 Committee approved SR-31 which reorganized many sections throughout NFPA 54 (the SR-31 was 81 pages long). The reorganization broke up any existing section that had multiple requirements so that each requirement had its own subsection. Sometimes this required editorial changes to make it flow correctly. If upheld, the changes made in SR-31 will result in an NFPA 54 version of the National Fuel Gas Code (NFGC) that is substantially different from the ANSI Z223.1 version of the NFGC which is developed by AGA. This second issue is problematic because many external documents and organizations are currently able to reference almost any part of the NFGC without specifying NFPA or ANSI because the sections match. With the extensive renumbering of the NFPA 54 sections many of those references would be incorrect, which could hamper enforcement. The TIA simply reverts the organization back to what it was in the first draft of the NFPA 54, 2024 edition.

Emergency Nature: The standard contains an error or an omission that was overlooked during the regular revision process. The proposed TIA intends to correct a circumstance in which the revised NFPA Standard has resulted in an adverse impact on a product or method that was inadvertently overlooked in the total revision process or was without adequate technical (safety) justification for the action.

SR-31 was discussed at the October meeting of the Z223 and NFPA 54 committees. During that discussion some concerns were raised that the sweeping changes may have led to errors and omissions. During the ballot, many members found technical issues with some of the reorganized sections (including two of the members who voted Affirmative w/ Comment). There was even a clarification ballot to fix an error contained in this SR. Members noted that they didn't have time to review such a long SR and would like to have a second, more detailed review to fix other issues.

Submitter Information Verification

Submitter Full Name: NFPA TIA
Organization: Technical Committee on National Fuel Gas Code
Street Address:
City:
State:
Zip:

Submittal Date: Thu Jun 06 18:47:31 EDT 2024

Committee:	NFG-AAA

Tentative Interim Amendment

NFPA® 54

National Fuel Gas Code

2024 Edition

Reference: Various paragraphs throughout
TIA 24-1
(SC 23-8-51 / TIA Log #1726)

Note: Text of the TIA was issued and approved for incorporation into the document prior to printing.

See attached for text changes.

Issue Date: August 25, 2023

Effective Date: September 14, 2023

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)~~1.1.1.1.1*~~
Coverage of piping systems shall extend from the point of delivery to the appliance connections.

~~1.1.1.1.2~~
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.

~~1.1.1.1.3~~
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.

~~1.1.1.1.4~~
Where a meter is installed, the point of delivery shall be the outlet of the meter.

(B)~~1.1.1.1.5~~
This code shall apply to natural gas systems operating at a pressure of 125 psi (862 kPa) or less.

(C)~~1.1.1.1.6~~
This code shall apply to LP-Gas systems operating at a pressure of 50 psi (345 kPa) or less.

(D)~~1.1.1.1.7~~
This code shall apply to gas–air mixture systems operating within the flammable range at a pressure of 10 psi (69 kPa) or less.

(E)~~1.1.1.1.8~~
Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, purging, operation, and maintenance.

(F)~~1.1.1.1.9~~
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.

~~*Exception: In cases of emergency, affected users shall be notified as soon as possible of the actions taken by the qualified agency.*~~

~~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.

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.
~~5.~~ Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.
~~6~~4.Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps.
~~7.~~ Electric switches shall not be turned on or turned off.

Commented [BM1]: Prod: These go with list item (3)

Commented [BM2]: Prod: This goes with list item (4)

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~~
~~Steel, stainless steel,~~ and ~~wrought-iron pipe~~ shall comply with ~~both~~ the dimensional standards of ANSI/ASME B36.10M, *Welded and Seamless Wrought Steel Pipe,* and one of the following:

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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*~~.~~ (except that the use of alloy 5456 is prohibited), and

~~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.~~

~~5.5.2.5.3~~
~~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 ~~both~~ nonhardening 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.~~ ~~Assembled~~ assembled with approved gas tubing fittings, shall be
~~2. Be~~ brazed with a material having a melting point in excess of 1000°F (538°C), or shall be
~~3. 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.

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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.~~ ~~Welded~~welded,
~~2.~~ ~~Assembled~~ assembled with approved tubing fittings,
~~3.~~ ~~Brazed~~ brazed with a material having a melting point in excess of 1000°F (538°C), or
~~4.~~ ~~Assembled~~ 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 ~~as stated in 5.5.8.1~~:

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.~~3. Where ~~The following shall apply when~~ compression-type mechanical joints are used~~.~~:
~~a.~~ ~~The~~ 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 ~~both~~ flush with the end of the pipe or tubing and shall extend~~ed~~ at least to the outside end of the compression fitting when installed.
~~d.~~ The stiffener shall be free of rough or sharp edges~~.~~
~~e.~~ ~~The stiffener~~ and shall not be a force fit in the plastic.
~~f.~~ 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.

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Commented [BM4]: Prod: These go with list item (3)

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.

~~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.

~~5.5.10.1.1~~
The effects of fire exposure to the joint shall be considered in choosing the material.

5.5.10.1.~~2~~
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. ~~Where separate overpressure protection devices are installed, they shall comply with 5.8.4 through 5.8.9.~~

~~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 ~~pressure~~ relieving and pressure ~~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.

5.8.8.2~~3~~
The discharge stack or vent line shall be at least the same size as the outlet of the pressure ~~pressure~~ relieving device.

5.11 Shutoff Valves.

~~5.11.1~~
Shutoff valves shall be selected in accordance with Table 5.11~~.1~~.

~~Table 5.11.1 Manual Gas Valve Standards~~

~~Shutoff Valve Application~~	~~Valve Meeting the Following Standards~~
~~Appliance shutoff valve up to 1/2 psi~~	~~ANSI Z21.15/CSA 9.1~~ ~~ANSI/ASME B16.44~~ ~~ANSI/ASME B16.33 marked 125 G~~ ~~ANSI LC 4/CSA 6.32~~
~~Valve up to 1/2 psi~~	~~ANSI/ASME B16.44~~ ~~ANSI/ASME B16.33 marked 125 G~~ ~~ANSI LC 4/CSA 6.32~~
~~Valve up to 2 psi~~	~~ANSI/ASME B16.44 labeled 2G~~ ~~ANSI/ASME B16.33 marked 125 G~~ ~~ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 labeled 2G or labeled 5G~~ ~~ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G~~

Shutoff Valve Application	Valve Meeting the Following Standards
Valve up to 5 psi	ANSI/ASME B16.44 labeled 5G
	ANSI/ASME B16.33
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 marked 5G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 125 psi	ANSI/ASME B16.33 marked 125 G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G

For SI units, 1 psi gauge = 6.895 kPa.

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.

Table 5.11. Manual Gas Valve Standards

Shutoff Valve Application	Valve Meeting the Following Standards
Appliance shutoff valve up to 1/2 psi	ANSI Z21.15/CSA 9.1
	ANSI/ASME B16.44
	ANSI/ASME B16.33 marked 125 G
	ANSI LC 4/CSA 6.32
Valve up to 1/2 psi	ANSI/ASME B16.44
	ANSI/ASME B16.33 marked 125 G
	ANSI LC 4/CSA 6.32
Valve up to 2 psi	ANSI/ASME B16.44 labeled 2G
	ANSI/ASME B16.33 marked 125 G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 labeled 2G or labeled 5G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 5 psi	ANSI/ASME B16.44 labeled 5G
	ANSI/ASME B16.33
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 marked 5G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 125 psi	ANSI/ASME B16.33 marked 125 G
	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G

For SI units, 1 psi gauge = 6.895 kPa.

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*.

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5.12.2
Excess flow valves and shall be sized and installed in accordance with the manufacturers' instructions.

5.14 Pressure Regulator and Pressure Control Venting.

Commented [IA5]: SR 29 is also on this section

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. Independent vents for multiple regulators 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 ~~vent~~ limiting device shall not be required to be vented to the outdoors.
5. A listed gas pressure limit control that is factory equipped with a vent ~~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, one of the following shall apply:
    a. An antiflood-type breather vent fitting shall be installed.
    b. 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.

~~7.1.2.1 Piping Protection.~~

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.

7.1.3.3

Cathodic protection systems shall be monitored by testing~~.~~

~~7.1.4.4~~

~~Testing results for cathodic protection systems~~ and the results shall be documented.

~~7.1.3.5~~
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.~~4~~6
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.~~7~~ 5
Systems failing a test shall be repaired not more than 180 days after the date of the failed testing.

~~7.1.3.8~~
The testing schedule shall be restarted as required in 7.1.3.~~6~~4(1) and 7.1.3.~~6~~4(2~~). ~~)~~, and

~~7.1.3.9~~
~~The~~ the results ~~of the testing in 7.1.3.8~~ shall comply with 7.1.3.3~~5~~.

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7.1.6.1 Conduit with One End Terminating Outdoors.

~~7.1.6.1.1~~
~~Where the conduit has one end that terminates indoors, the~~ The conduit shall extend into an accessible portion of the building~~.~~, and

~~7.1.6.1.2~~
~~A~~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.

~~7.1.6.1.3~~
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.

~~7.1.6.1.4~~
The conduit shall ~~comply with all of the following~~:

~~(1) Extend~~ extend at least 4 in. (100 mm) outside the building.
~~(2) B~~be vented outdoors above finished ground level, and
~~(3) B~~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, access shall~~, either of the following shall apply:~~
~~1) Access shall~~ be provided from aboveground~~.~~
~~2) One~~ or one end of the tracer wire or tape shall be ~~shall be~~ 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 ~~corrosion-resistant~~ 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~~.~~

~~7.2.6.3~~
~~Piping~~ and shall not be supported by other piping.

~~7.2.6.4~~
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*.

7.2.6.2~~5~~
Spacings of supports in gas piping installations shall not be greater than shown in Table 7.2.6.2.

~~7.2.6.6~~
Spacing of supports of CSST shall be in accordance with the CSST manufacturer's instructions.

7.2.6.3~~7~~
Supports, hangers, and anchors shall be installed so as not to interfere with the free expansion and contraction of the piping between anchors.

~~7.2.6.8~~
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 ~~shall be~~ installed between the tubing and the finished wall and extend at least 4 in. (100 mm) beyond concealed penetrations of plates, firestops, wall studs, and so on.
2) The tubing is ~~shall be~~ installed in single runs.
~~3) The tubing shall~~ and is not ~~be~~ rigidly secured.

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7.3.5 Piping in Floors ~~in Industrial Occupancies~~.

7.3.5.1 Industrial Occupancies.
In industrial occupancies, gas piping in solid floors such as concrete shall be ~~both~~ laid in channels in the floor and covered to permit access to the piping with a minimum of damage to the building.

~~7.3.5.2~~
Where piping in floor channels could be exposed to excessive moisture or corrosive substances, the piping shall be protected in an approved manner.

7.3.5.2~~6~~ ~~Piping in Floors in~~ Other ~~Than Industrial~~ Occupancies.
Gas piping in nonindustrial occupancies shall not be embedded in concrete floor slabs unless in accordance with 7.3.6.1 through 7.3.6.5.

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.~~ ~~Regulators~~ regulators equipped with a vent limiting means shall be permitted to be vented into the chase.
   ~~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.

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2) Where the fuel gas is heavier than air, the regulator vent shall be vented only directly to the outdoors.

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 ~~ventilation~~ 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 the
~~2) The~~ internal diameter of the pipe shall not be effectively reduced.
~~3)~~ 2) Joints shall not be located in pipe bends.
~~4)~~ 3) The radius of the inner curve of such bends shall not be less than 25 times the inside diameter of the pipe.
~~5)~~ 4) Where the piping manufacturer specifies the use of special bending tools or procedures, such tools or procedures shall be used.

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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~~
~~A~~ 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.
All drips shall be installed only in such locations that they are readily accessible to permit cleaning or emptying.

~~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, ~~with~~ 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~~
~~Cut-off~~ Such rooms or below grade 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. Caution: ~~These~~ 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)~~3) 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 2½ 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.
~~8)~~ Check valves shall not be used for this purpose ~~as a safety blowout or backfire preventer~~.
~~9)~~ 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.
~~10)~~ Provisions shall be provided for automatically shutting off the supply of the gas–air mixture in the event of rupture.

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Commented [BM11]: Prod: Goes with list item (4)

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 this requirement ~~7.12.2.3~~ shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system.

8.1.2 Test Medium.

~~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.

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.

8.1.4.24
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 ft^3 (14 m^3) of pipe volume or fraction thereof.

~~8.1.4.7~~
When testing a system having a volume less than 10 ft^3 (0.28 m^3) 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.

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~~.~~

~~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 ~~both~~ 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.
~~6.~~ For manufactured gas, the need for a flame arrester in the bleed line piping ~~entering the combustion chamber~~ shall be determined.
~~7~~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. Bleed lines shall not terminate in positive-pressure-type combustion chambers.

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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.

9.1.22* 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). ~~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.~~
~~the following~~:

~~1. The building is modified under a weatherization program.~~
~~2.~~1. ~~A building permit is issued for a building addition or exterior building modification.~~
~~3.~~1. ~~Three or more window assemblies are replaced.~~
~~4.~~1. ~~Three or more storm windows are installed over existing windows.~~

~~5.1. One or more exterior door and frame assemblies are replaced.~~
~~6.1.A building air barrier is installed or replaced.~~

~~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. A building air barrier is installed or replaced.

9.3.2 Indoor Combustion Air.

~~9.3.2.1 Required Indoor Air Volume.~~
The required volume of indoor air shall be determined in accordance with the method in 9.3.2.1 or 9.3.2.2 ~~*(see 9.3.2.1.1)*~~.

~~9.3.2.1.1~~
~~W~~ 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~~2
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~~3
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 ~~shall be~~ considered a part of the required volume.

9.3.2.~~4~~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 mm^2/kW) of the total input rating of all appliances in the space but not less than 100 in.^{2} (0.06 m^2).
   ~~b.~~ One permanent opening shall commence within 12 in. (300 mm) of the top of the enclosure~~.~~
   ~~c. O~~and one permanent opening shall commence within 12 in. (300 mm) of the bottom of the enclosure.
   ~~d.~~ The minimum dimension of air openings shall not be less than 3 in. (80 mm).
2. ~~Where c~~*Combining spaces in different stories*. ~~t~~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 mm^2/kW) of total input rating of all appliances.

9.3.3.1 Two Permanent Openings Method.

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~~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 mm^2/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 mm^2/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 ~~either~~ directly communicate with the outdoors or communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors~~.~~

~~9.3.3.2.4~~
~~The openings in 9.3.3.2.3~~ and shall have a minimum free area of the following:

1. 1 $in.^2$/3000 Btu/hr (700 mm^2/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.
    ~~d.~~ The minimum dimension of air openings shall not be less than 3 in. (80 mm).

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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.

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.

~~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. Be~~ shall be of reasonable height.

~~3. Have~~ and shall 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.

9.4.1.2~~3~~
Roofs on which appliances are to be installed shall be ~~either~~ capable of supporting the additional load or shall be reinforced to support the additional load.

9.4.1.34
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. ~~*(see 9.4.2.4)*~~.

~~9.4.2.4~~
~~If least 6 ft (1.8 m) of clearance is not possible 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.

9.4.2.3~~5~~
Appliances requiring an external source of electrical power shall be installed in accordance with *NFPA 70*.

9.4.2.4~~6~~
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.

~~9.4.2.7~~
Such platform(s) or walkway(s) ~~as stated in 9.4.2.6~~ 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~~
Scuttles or trapdoors shall be at least 22 in. × 24 in. (560 mm × 610 mm) in size~~.~~.

~~9.4.3.5~~
~~Scuttles~~ ~~such scuttles or trapdoors~~ shall open easily and safely under all conditions, especially snow.~~.~~

~~9.4.3.6~~
~~Scuttles or trapdoors~~ and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.

~~9.4.3.7~~
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 ~~*(see 9.4.3.8)*~~.

~~9.4.3.8~~
~~If at least 6 ft (1.8 m) of clearance is not possible 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.

~~9.4.3.9~~
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.

9.5.1.2
The passageway shall be unobstructed~~.~~

~~9.5.1.3~~
~~The passageway~~ and shall have solid flooring not less than 24 in. (610 mm) wide from the entrance opening to the appliance~~.~~

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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~~
~~Flexible connections~~ and 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~~
~~Flexible connections~~ They shall be protected against physical or thermal damage~~.~~

~~9.6.4.8~~
~~Flexible connections~~ and 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.

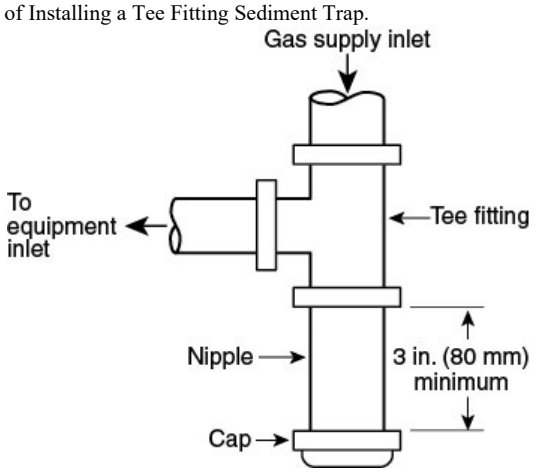
~~9.6.5.2~~
Appliance shutoff valves and convenience outlets shall serve a single appliance only~~.~~

~~9.6.5.3~~
~~Appliance shutoff valves and convenience outlets~~ and shall be installed in accordance with 9.6.5.1.

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~~.2~~, or another device recognized as an effective sediment trap.

Figure 9.6.8~~.2~~ Method of Installing a Tee Fitting 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 ~~with a sediment trap~~.

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.
   ~~b.~~ All combustion air shall be~~is~~ obtained from the outdoors in accordance with 9.3.3.
2. Central heating furnaces and low-pressure boilers shall be of the direct ~~direct~~ vent type.

Commented [BM15]: Prod: Goes with list item (1)

10.3.3.7

~~10.3.3.7.1~~
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 ~~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.

10.3.8.4~~5~~
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. ~~C~~Type 1 clothes dryers shall be installed with a minimum clearance of 6 in. (150 mm) from adjacent combustible material.
~~2.~~ Clothes dryers listed for installation at reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
~~3.~~ ~~C~~Type 1 clothes dryers installed in closets shall be specifically listed for such installation.

Commented [BM16]: Prod: Goes with list item (1)

~~10.4.2.2~~
~~The installation of Type 2 clothes dryers shall comply with the following requirements:~~
~~1.~~2. ~~C~~ 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.~~ ~~C~~ Type 2 Clothes dryers designed and marked “For use only in noncombustible locations” shall not be installed elsewhere.

Commented [BM17]: Prod: Goes with list item (2)

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~~
These appliances ~~in 10.6.3.1~~ shall not be thermostatically controlled.

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 where
~~2. Where~~ installed in or attached to combustible material~~, the vented gas fireplace~~ shall be specifically listed for such installation.
~~3.~~2. Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building.
~~4. Direct~~ 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.

Commented [BM18]: Prod: Goes with list item (1)

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.

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.

~~10.8.6.3~~
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 near 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.

Commented [BM19]: Prod: Goes with list item (2)

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.

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.

~~10.10.8.2~~
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.

~~10.10.8.3~~
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.

~~10.10.8.4~~
A 12 in. (300 mm) clearance shall be provided on all sides except the control side~~.~~.

~~10.10.8.5~~
~~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 adaquate 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/ft^2 (4.9 kg/m^2) sheet copper.

~~10.10.10.3~~
The pan shall be anchored in place ~~so as~~ to prevent floating~~.~~.

~~10.10.10.4~~
~~The~~ and 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 (~~i.e.,~~ 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~~.~~

~~10.10.13.2~~
~~Where the~~ unless 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.~~

~~10.10.13.3~~
~~The enclosure required by 10.10.13.2~~ for upper floor installations and shall project into a nonhabitable space.

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.~~
~~2.~~ 1. 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.~~ 2. 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. It~~ it shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with not less than ⅜ in. (9.5 mm) insulating millboard covered with sheet metal not less than 0.0195 in. (0.5 mm) thick.
   ~~b.~~ The preceding specified floor protection shall extend not less than 6 in. (150 mm) beyond the appliance on all sides.
~~4.~~ 3.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.
   ~~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.
~~5.~~4. 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.

Commented [BM20]: Prod: Goes with list item (2)

Commented [BM21]: Prod: Goes with list item (3)

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.~~ and shall not interfere with combustion air, accessibility for operation, and servicing.

10.13.3.1~~3~~* 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~~
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 ¼ 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 ¼ 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.
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.
   ~~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.
~~4. Appliances with a flame heights in excess of 30 in. (760 mm)~~ Such appliances shall be equipped with a safety shutoff device or automatic ignition.
~~5.~~ 4. Clearances to combustible material from unlisted open-flame illuminating appliances shall be approved.

Commented [BM22]: Prod: Goes with list item (1)

Commented [BM23]: Prod: Goes with list item (3)

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 2½ in. (64 mm) diameter post constructed of 0.064 in. (1.6 mm) thick steel or a 1 in. Schedule 40 steel pipe.

~~10.14.4.4~~
Posts 3 ft (0.9 m) or less in height shall not be smaller than a ¾ in. Schedule 40 steel pipe.

~~10.14.4.5~~
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~~
~~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.

10.20.2 Clearance.

~~10.20.2.1~~
Refrigerators shall be provided ~~installed~~ with clearances for ventilation at the top and back in accordance with the manufacturers' instructions.

~~10.20.2.2~~
Where such ~~manufacturers'~~ instructions are not available, ~~clearance shall be provided of~~ 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.
~~2.~~ A unit heater listed for reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
~~3.~~ 2. Clearances for servicing shall be in accordance with the manufacturers' installation instructions.

Commented [BM24]: Prod: Goes with list item (1)

10.25.2 Installation.

10.25.2.1
Wall furnaces shall be installed in accordance with the manufacturer's installation instructions.

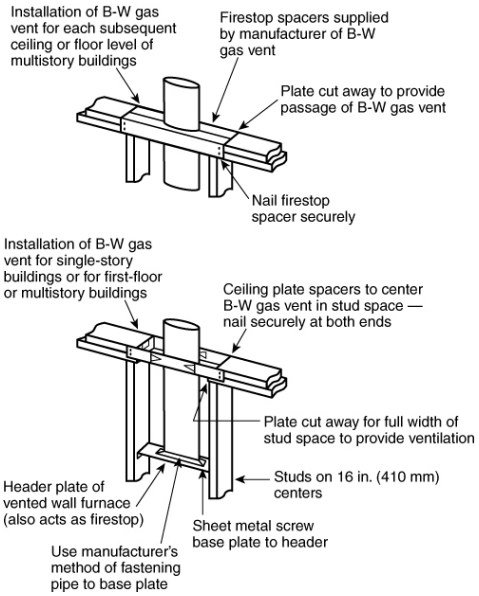
~~10.25.2.2~~
Wall furnaces installed in~~,~~ or attached to~~,~~ combustible material shall be listed for such installation.

10.25.2.2~~3~~
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.

~~10.25.2.4~~
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.

~~10.25.2.5~~
Type B-W gas vents shall be ~~both~~ 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 10.25.2.2~~5~~.

Figure 10.25.2.2~~5~~ Installation of Type B-W Gas Vents for Vented Wall Furnaces.



~~10.25.2.6~~
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.

~~10.25.2.7~~
Firestop spacers shall be installed at each subsequent ceiling or floor level penetrated by the vent.

10.25.2.3~~8~~
~~Direct~~ Direct vent wall furnaces shall be installed with the combustion air intake terminal outdoors.

10.25.2.4~~9~~
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*.

~~10.26.1.2~~
~~Water heaters~~ and 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 shall be~~ equipped with a weather-stripped door with no openings and with a self-closing device.
   ~~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.

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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 ~~*(see 10.26.4.3).*~~

~~10.26.4.3~~
~~The pressure setting of the device~~ 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 installed 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 (i.e., dispensing) systems shall be in accordance with NFPA 52.

~~10.27.2~~
Residential CNG fueling appliances shall be both 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~~
Nonresidential CNG fueling appliances shall be both 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 ~~either~~ listed for installation in manufactured housing, or approved~~.~~.

~~10.28.2~~
~~Appliances~~ and 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 ~~both~~ 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*.~~.~~

~~10.31.2~~
~~Outdoor infrared heaters for residential and commercial applications~~ and 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.

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, ~~both of the following shall apply:~~

~~1.~~ ~~T~~the appliance shall be listed for use with such venting materials~~.~~
~~2.~~ ~~T~~ 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 ~~either~~ 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.

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~~
~~The chimney passageway~~ and shall be cleaned if previously used for venting solid~~-~~ or liquid~~-~~ fuel~~--~~ burning appliances or fireplaces.

12.6.4.2~~3~~
Chimneys shall be lined in accordance with NFPA 211.

12.6.4.3~~4~~
Cleanouts shall be examined~~.~~

~~12.6.4.5~~
and where they ~~Where cleanouts~~ do not remain tightly closed when not in use, they shall be repaired or replaced.

12.6.4.~~6~~ ~~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~~.~~

~~12.6.4.7~~
~~Vents and chimneys~~ and shall be suitable for the appliances to be attached.

12.6.5.2
Where one chimney serves gas appliances and ~~liquid~~ liquid fuel~~--~~burning appliances, the appliances shall be ~~either~~ 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.

12.6.5.3~~5~~*
A listed combination gas- and ~~solid~~ ~~soldi~~ 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, ~~both of the following shall apply:~~

~~1.~~ ~~T~~the shield shall terminate not less than 2 in. (51 mm) above the insulation materials~~.~~
~~2. The shield~~ 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*.

12.7.4.2 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~~ 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 installed in accordance with engineering methods.

~~12.7.5.2~~
Crawl spaces, basements, and attics shall be considered as floor levels.

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 ~~stated in 12.7.7.1~~ shall read: "This gas vent is for appliances that burn gas. Do not connect to solid~~-~~ or ~~liquid-~~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.

12.8.4.34
Single-wall metal pipe shall not ~~neither~~ originate in any unoccupied attic or concealed space and shall not ~~nor~~ pass through any attic, inside wall, concealed space, or floor.

12.8.4.45
Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 12.8.4.45.

~~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.

12.8.4.57
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 ~~stated in 12.8.4.5~~ 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 ~~stated in 12.8.4.5~~ shall be sized in accordance with 12.8.4.69.

12.8.4.69
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.
~~2. For listed appliances with draft hoods and appliances listed for use with Type B gas vents and where~~ 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.
~~3.~~2. For unlisted appliances having draft hoods, the thimble shall be a minimum of 6 in. (150 mm) larger in diameter than the metal pipe.
~~4.~~3. For residential and low-heat appliances, the thimble shall be a minimum of 12 in. (300 mm) larger in diameter than the metal pipe.

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Exception: In lieu of 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 combustible material. Any material used to close up such opening shall be noncombustible.

~~12.8.4.710~~
~~Where a thimble is not installed, the following shall be required:~~
1. ~~All combustible material in the wall shall be removed from the metal pipe to provide the specified clearance from such metal pipe to combustible material.~~
2. ~~Any material used to seal an opening shall be noncombustible.~~

12.8.5 Size of Single-Wall Metal Pipe.
Single-wall metal piping shall comply with the following requirements:

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. ~~The~~ 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.
      ii. ~~The~~ 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~~.~~

12.11.2.5~~6~~
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~~6~~

~~12.11.2.7~~
~~Vent connectors for medium-heat appliances~~ 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 shall be lined with medium-duty fire brick or the equivalent.
2. The lining shall be at least 2½ in. (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 in. (460 mm) or less.

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3. The lining shall be at least 4½ in. (110 mm) thick laid on the 4½ 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. The effective area shall be~~ equal the combined area of the flue collars or draft hood outlets~~.~~
~~2.~~ ~~T~~ and the vent connectors shall have a minimum 1 ft (0.3 m) rise.

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~~.~~

~~12.13.6.2~~
~~Draft hoods and draft regulators~~ and 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~~
~~The clearances in 12.13.7~~ Such clearances 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 ~~either~~ 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.
3. Where the corresponding "Fan Min" is "NA," ~~both of the following shall apply:~~
   ~~a.~~ ~~T~~ the vent configuration shall not be permitted~~.~~
   ~~b.~~ ~~A~~ 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~~
~~The~~ This ~~provision in 13.1.2.1(5~~) shall not apply to fan-assisted appliances.

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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.

~~A.13.1.3.1~~
Single-appliance venting with lateral lengths include two ~~90~~ 90 degree elbows.

~~13.1.3.2~~
For each additional elbow up to and including 45 degrees, the maximum capacity listed in the venting tables shall be reduced by 5 percent.

~~13.1.3.3~~
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.

~~13.1.3.4~~
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~~, both of the following shall apply:~~

~~1.~~ ~~T~~the vertical vent diameter shall be used to determine the minimum vent capacity~~.~~, and
~~2.~~ ~~T~~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), ~~one of the following shall apply:~~

~~1.~~ ~~The~~ the outdoor portion of the vent shall be enclosed as required by this paragraph ~~13.1.11~~ for vents not considered to be exposed to the outdoors.~~,~~
~~2. The~~ 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 ~~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 ~~is~~ 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 ~~either~~ 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 ~~applicable~~ (NA).

~~d.~~ Where the vent configuration is NA, ~~both of the following shall apply:~~

~~i.~~ ~~T~~the vent configuration shall not be permitted~~.~~

~~ii.~~ Aand an alternative venting configuration shall be utilized.

Commented [BM29]: Prod: Goes with list item (b)

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.

~~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 [BM30]: Prod: Goes with list item (2)

~~A.13.2.3.2(1)~~ **[Move to between 13.2.3 (1) and 13.2.3.(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).~~

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, ~~both of the following shall apply:~~

~~1)~~ ~~T~~the maximum capacity of the common vent shall be reduced in accordance with 13.2.6~~.~~
~~2)~~ ~~T~~ 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.

~~A.13.2.7~~
The vent connector capacities listed in the common vent sizing tables include allowance for two 90~~-~~ degree elbows.

~~13.2.7.1~~
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.

~~13.2.7.2~~
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 ~~as stated in 13.2.10.1~~ shall not be prohibited from having reduced ~~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.~~ Type B double wall
~~2.~~ ~~I~~ and shall be installed with a listed vent cap.

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.~~.~~

~~13.2.17.2~~
~~S~~and 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~~.~~

~~13.2.19.2~~
~~The minimum vent connector capacity (FAN Min) of appliances~~ and shall be less than the lowest appliance input rating.

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.

> ~~A.13.2.20.1~~
> The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one ~~long~~ long radius 90-degree turn at the bottom of the liner.

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), ~~one of the following shall apply:~~

> ~~1.~~ ~~T~~the outdoor portion of the vent shall be enclosed as required by this paragraph ~~13.2.22~~ for vents not considered to be exposed to the outdoors~~.~~
> ~~2. The~~ 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 ~~all~~ of the appropriate ~~applicable~~ tables permit ALL~~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 ~~applicable~~.

Public Input No. 25-NFPA 54-2024 [Global Input]

Substitute “gas supplier” for “serving gas supplier”

Statement of Problem and Substantiation for Public Input

It is proposed to use the term “gas supplier” instead of “serving gas supplier” as both mean the same thing, and it is clear to users that the term means the natural gas or propane company suppling fuel gas to a consumer.
The term is used 7 times in the Code

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Public Input No. 27-NFPA 54-2024 [Global Input]

Revise Tables 6.2.1 (a), 6.2.1 (b) and 6.2.1 (h) by adding an Intended Use line below the gas material box and above the line "Pipe Size (in.) to read:

Intended Use: Inlet gas pressure is 7in. w.c. or lower.

Statement of Problem and Substantiation for Public Input

There are 24 sizing tables for natural gas in the Code. It is not unusual for the wrong table to be used because the descriptions are similar. The proposed Intended Use line will make it more evident that the tables with a 0.3 psi drop are intended for systems with the minimum inlet pressure and will help to prevent under-sizing of pipe. With the present Code, and installer can see that both Tables 6.2.1 (1) and (b) appear to be applicable, and might note that Table 6.2.1 (b) provided greater capacity, allowing the use of smaller pipe.

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Public Input No. 28-NFPA 54-2024 [Global Input]

Delete Table 6.2.1 (f).

Statement of Problem and Substantiation for Public Input

The table is deleted as the use of 3 psl inlet pressure systems is not common. The the knowledge of the submitted, gas utilities do not normally offer 3 psi pressure for building use. The deletion of the table does not intend to prohibit 3 psi piping systems, but will require the engineer or designer to identify the proper sizing table. The table will always be available in previous editions of the Code. Reducing the number of tables by deleting those that will rarely be used reduces the possibliity of the wrong table being used, resulting in undersized pipe.

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Public Input No. 31-NFPA 54-2024 [Global Input]

Delete Table 6.2.1 (k).

Statement of Problem and Substantiation for Public Input

The table is no longer needed. The combination of a less than 2 psi (<55 in. w.c.) system inlet pressure and 17 in. with a pressure drop of 17 in w.c. is unlikely today.

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Public Input No. 32-NFPA 54-2024 [Global Input]

Delete Table 6.2.1 (m).

Statement of Problem and Substantiation for Public Input

The table is of little utility. It is limited to a total load of 150 Cu. Ft. per hour, yet the table has entries up to 2,270 Cu. Ft per hour. Only the length rows up to 60 ft. provide capacities under 150 Cu. Ft. per hour. This table covers the inlet to a line pressure regulator. The information is being provided by manufacturers of line pressure regulators, therefore this table is not needed.

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Public Input No. 35-NFPA 54-2024 [Global Input]

1. Revise the Intended Use in Table 6.2.1 (q) to read:

INTENDED USE: Supply pressuer between 11 in. w.c. and 14 in. w.c. with or without a line pressure regulator

2. Revise the notes to Table 6.2.1 (q) to read:

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

(2) No not use unless the gas supplier can supply 11 in. w.c. or greater.

(3) This table is intended for use with engineered methods.

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

Statement of Problem and Substantiation for Public Input

1. The Intended Use is revise to be consistent with allowable practice.

2. Note (1) is revised to use "should" instead of "shall" as requirements cannot be in table notes. A new Note (2) is added to remind the user that a minimum supply pressure of 11" w.c. is needed to use this table. This reiterates the Intended Use line, as the table has been misused. A new Note 3 is added as the table is intended for use where higher pressures or a line pressure regulator is used. Either of these conditions will require and engineered method.

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Public Input No. 40-NFPA 54-2024 [Global Input]

Revise Table 6.21 j) to read:

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

Statement of Problem and Substantiation for Public Input

The term "line pressure regulator" is substituted for "house pressure regulator". Line pressure regulator is a defined term, and its use is preferred.

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Public Input No. 41-NFPA 54-2024 [Global Input]

Revise Table 6.2.1 (p) as follows:

1. Revise the Intended Use to read:

Intended Use: Supply pressure between 8 in. w.c.and 14 in. w.c. with or without a line pressure regulator.

2. Revise the Table Notes to read:

Notes:

(1) Table includes losses for four 90 degree bends and two end fittings. Tubing runs with larger numbers of bends and/or fittings shoiuld 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)This Table is intended for use with engineered methods

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

Statement of Problem and Substantiation for Public Input

The Intended Use is revised to be consistent with allowable practice.
Note (1) is revised to substitute "should" for "shall" as mandatory requirements cannot be used in Table Notes.
A new note (2) is added to remind users that in inlet pressure between 11 in. w.c. and 14 in. w.c. is needed to use the Table.

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Public Input No. 42-NFPA 54-2024 [Global Input]

Delete Tables 6.3.1 (a) and 6.3.1 (b).

Statement of Problem and Substantiation for Public Input

These tables cover propane lines with inlet pressure of 10 psig. The Code covers pressure from the outlet of the final stage pressure regulator (1.1.1.1 (A)), therefore these cover piping outside the scope of the Code.
Similar tables are included in NFPA 58.

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Public Input No. 83-NFPA 54-2024 [Global Input]

Revise the title of paragraphs 10.2.1, 10.3.1, 10.4.1, 10.6.1, 10.7.1, 10.8.1, 10.12.1, 10.13.1, 10.16.1, 10.17.1, 10.19.1, 10.20.1, 10.21.1, 10.24.1, 10.25.1 and 10.26.1 to read:

~~**Application**~~ **Listing.**

Statement of Problem and Substantiation for Public Input

These paragraphs establish listing requirements, not the application of the appliance.

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Public Input No. 14-NFPA 54-2024 [Section No. 1.1.1.1(A)]

(A)*

Coverage of piping systems shall extend from the point of delivery to the appliance ~~connections~~ isolation valve . 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. 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. Where a meter is installed, the point of delivery shall be the outlet of the meter.

Statement of Problem and Substantiation for Public Input

Appliance connection is not consistent with equipment codes like NFPA 85 or 86. In these documents coverage is known to begin with the "equipment isolation valve". Harmonizing these terms would avoid confusion for users.

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Public Input No. 15-NFPA 54-2024 [Section No. 1.1.1.1(D)]

(D)

~~This code~~ Chapter 7, sections 7.10 and 7.11 of this code shall apply to gas–air mixture systems operating within the flammable range at a pressure of 10 psi (69 kPa) or less.

Statement of Problem and Substantiation for Public Input

It is not correct to imply that the entire document applies to gas-air mixtures. Many sections of many chapters clearly do not. For example, the pipe sizing tables do not apply to gas-air mixtures. The document user deserves to be forewarned that only a narrow portion of the document applies to this special condition.

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Public Input No. 17-NFPA 54-2024 [Section No. 1.1.1.1(F)]

(F)

Requirements for appliances, equipment, and related accessories shall include installation, combustion air, ventilation air, draft testing, and venting.

Statement of Problem and Substantiation for Public Input

Draft testing is a significant requirement covered in detail within this document. It should be mentioned in the overall scope statement here.

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Public Input No. 19-NFPA 54-2024 [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) systems

(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 Input

If the power plant operates with natural gas at 125 psig or less there is no technical reason why this standard should not apply. Electrical generating plants have gas piping, regulators, and valves that can pose a hazard if they are not selected and or installed or tested as per this code, just like for any other gas-fired pieces of equipment.

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Public Input No. 33-NFPA 54-2024 [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) systems

(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 Input

The document currently says, "Installation of" and then lists appliances that might be used in farming. This is confusing. NFPA 54 is not an equipment code. Hence, nothing past the fuel train equipment isolation valve is covered anyway. I would argue that the gas piping to this equipment is covered since that does not involve installation of this equipment. The issues then are then mostly combustion air, flues and draft. It does not make sense to not make this equipment safe for use for farmers. Farmers lives should be valued as much as anyone else's life. It's also true that manual of style issues do not

want lists of things. I would also argue that is this list comprehensive or not? I do not believe this exception has a technical reason for being here.

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Public Input No. 34-NFPA 54-2024 [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)

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

(8) 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

(9) LP-Gas installations at utility gas plants

(10) Liquefied natural gas (LNG) systems

(11) Fuel gas piping in electric utility power plants

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

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

(14) 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

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

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

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

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

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

(20) Fuel gas systems using hydrogen as a fuel

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

This statement is redundant and again is a list. Unless we list every gas known to mankind users are supposed to think by default that the gas they are considering must be part of the code. I contend that we already say in item B that the document is about natural gas alone. That is sufficient.

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Submittal Date: Mon May 20 13:30:31 EDT 2024
Committee: NFG-AAA

Public Input No. 36-NFPA 54-2024 [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) systems

(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~~

(21)

Statement of Problem and Substantiation for Public Input

It's already clear that NFPA 54 is not an equipment code. The document already clearly states that its scope only covers to the appliance connection. Keeping this in the document, "construction of appliances" is confusing.

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Committee: NFG-AAA

Public Input No. 37-NFPA 54-2024 [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) systems

(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)

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

(14) 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

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

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

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

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

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

(20) Fuel gas systems using hydrogen as a fuel

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

First of all, this again is not an equipment code so we should never be suggesting that it is. Secondly, this is completely not enforceable. Isn't everything proprietary? The terms used here are so general and broad they could mean anything. Again, this is a list and unless our lists contain everything they make no sense.

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Committee: NFG-AAA

Public Input No. 38-NFPA 54-2024 [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) systems

(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)

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

(20) Fuel gas systems using hydrogen as a fuel

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

We cover everything that there is for the use of natural gas within building systems. To say that there is an exemption for "building construction" makes no sense and is confusing and useless. It only can tend to steer people away from the document and provide potential claims for why something was not done according to the document. It does not support the overall cause of gas and gas piping safety.

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Committee: NFG-AAA

Public Input No. 39-NFPA 54-2024 [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) systems

(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)

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

The document already in B explains that its just for natural gas. It makes no sense to be telling people that it also does not apply to hydrogen. If we need to explain on a singular basis all of the gases that are not considered to be part of the document we would need another couple of pages. If the alternate fuels TG wants to insert something here regarding hydrogen thats fine but for now, this exclusion does not belong.

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Submittal Date: Mon May 20 13:57:24 EDT 2024
Committee: NFG-AAA

Public Input No. 43-NFPA 54-2024 [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)

(9) LP-Gas installations at utility gas plants

(10) Liquefied natural gas (LNG) systems

(11) Fuel gas piping in electric utility power plants

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

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

(14) 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

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

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

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

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

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

(20) Fuel gas systems using hydrogen as a fuel

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

It is usual and customary to expect that large chemical plants are designed according to other piping codes and standards which may be as rigorous as NFPA 54. If that's the case then safety of the systems and topics covered within NFPA 54 can be covered. However, the way this is currently worded is not enforceable. What are the criteria for a large, medium and small chemical plant? What does integrated mean in the context of a chemical plant? Do we need to tell people that this does not include fuel gases made from different derivations of things within the plant, this is the same as telling

them again that this only covers natural gas which again is pointed out in B. There is no technical basis to have this statement, it is not enforceable, and part of it is already stated within item B.

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Public Input No. 44-NFPA 54-2024 [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)

(8) 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

(9) LP-Gas installations at utility gas plants

(10) Liquefied natural gas (LNG) systems

(11) Fuel gas piping in electric utility power plants

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

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

(14) 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

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

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

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

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

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

(20) Fuel gas systems using hydrogen as a fuel

(21) Construction of appliances

Statement of Problem and Substantiation for Public Input

There is no technical basis for excluding these facilities. These facilities do not constitute some type of obviously inherently safe entity that needs no protection from NFPA 54. The entities named might as well be car washes, circus tents, and bowling balls. Petroleum refineries often have natural gas feeds to auxiliary boilers that are less than 125 psig. This would be a parallel configuration to others used in industry, a gas compressor station may have natural gas engine driven compressors, I am not aware of much gas use in pumping stations, or loading terminals? What exactly is a compounding plant

anyway? Why in the world would tank farms be here? There are sometimes direct fired asphalt tank heaters but other than that I do not see why this is even mentioned? Natural gas processing plants should be covered to the extent they use natural gas as specified in this document. Not derivatives of naturals gas, but the finished product when it is within the parameters that apply to this document. Again, NO technical basis for these exclusions.

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Submittal Date: Mon May 20 17:48:00 EDT 2024
Committee: NFG-AAA

Public Input No. 45-NFPA 54-2024 [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) systems from the liquefication system isolation valve through the liquefication process and storage system but not including vaporization equipment and produced vaporized gas.

(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 Input

Gas piping to the liquefication part of the facility is no different than any other gas piping that NFPA 54 covers. Likewise, the vaporization facilities, if they are fired are typically hydronic boilers just like a commercial building, or some type of submerged combustion burner, or another type of process heater heating a glycol bath. The gas feeds to these burners are nothing different than systems that NFPA 54 covers in other applications. Likewise, when LNG gas is vaporized and inserted into a distribution

system it is then the same gas under the same conditions that NFPA 54 covers anyway. Why would we create such a broad blanket exemption for such conventional uses of gas that are similar to other NFPA 54 uses of gas.

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Submittal Date: Mon May 20 17:57:55 EDT 2024
Committee: NFG-AAA

Public Input No. 86-NFPA 54-2024 [Section No. 1.2]

1.2 Purpose.- ~~(Reserved)~~ The purpose of this code shall be to provide for safe installations of fuel gas piping systems, appliances, equipment, and related accessories.

Statement of Problem and Substantiation for Public Input

A purpose statement is added to reflect the purpose of the Code. Currently, no purpose is included and it is believed that one will assist users in understanding the intent of the Code.

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Submittal Date: Thu May 30 22:52:09 EDT 2024
Committee: NFG-AAA

Public Input No. 87-NFPA 54-2024 [Section No. 2.3.5]

2.3.5 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. ~~www.ul.com~~

UL 103, *Factory-Built Chimneys for Residential Type and Building Heating Appliances*, 2010, revised 2021.

UL 353, *Limit Controls*, 1994, revised 2011 .

UL 378, *Draft Equipment*, 2006, revised 2013.

UL 441, *Gas Vents*, ~~2019~~ 2024 .

UL 467, *Grounding and Bonding Equipment*, 2022.

UL 641, *Type L Low-Temperature Venting Systems*, 2010, revised 2018.

UL 651, *Schedule 40 and 80 Type EB and A Rigid PVC Conduit and Fittings,* 2011, revised 2022.

UL 959, *Medium Heat Appliance Factory-Built Chimneys*, 2010, revised ~~2019~~ 2024 .

UL 1738, *Venting Systems for Gas Burning Appliances, Categories II, III and IV*, ~~2010, revised 2021~~ 2023 .

UL 1777, *Chimney Liners*, 2015, revised ~~2019~~ 2024 .

UL 2158A, *Clothes Dryer Transition Ducts*, 2013, revised ~~2021~~ 2023 .

UL 2561, *1400 Degree Fahrenheit Factory-Built Chimneys*, 2016, revised ~~2018~~ 2022 .

UL 2989, *Outline of Investigation for Tracer Wire*, ~~2017~~ 2022 .

UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*, 2016, revised 2021.

Statement of Problem and Substantiation for Public Input

Update references to most current editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 88-NFPA 54-2024 [Section No. K.1.2.8]	

Submitter Information Verification

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Submittal Date: Sat Jun 01 12:18:15 EDT 2024

Committee:	NFG-AAA

Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]

~~**3.3.4.4.2** – Gas Deep Fat Fryer.~~

~~An appliance, including a cooking vessel in which oils or fats are placed to such a depth that the cooking food is essentially supported by displacement of the cooking fluid or a perforated container immersed in the cooking fluid rather than by the bottom of the vessel, designed primarily for use in hotels, restaurants, clubs, and similar institutions.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Gas Deep Fat Fryer. The term is not used in the Code. It is used in Annex A. See PI 2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	

Submitter Information Verification

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Submittal Date: Wed Feb 28 10:46:24 EST 2024
Committee: NFG-AAA

Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]

~~**3.3.4.4.3** – Kettle.~~

~~An appliance with a cooking chamber that is heated either by a steam jacket in which steam is generated by gas heat or by direct gas heat applied to the cooking chamber.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Kettle. The term is not used in the Code. It is used in Annex A:
A.10.11.2.1 Examples of floor-mounted food service appliances include ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens.

Inclusion in a list of examples of the type of appliance is not sufficient to require a definition of the term. It is noted that the term is defined in most dictionaries.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	
Public Input No. 9-NFPA 54-2024 [Section No. 3.3.4.4.4]	

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Submittal Date: Wed Feb 28 09:44:37 EST 2024
Committee: NFG-AAA

Public Input No. 9-NFPA 54-2024 [Section No. 3.3.4.4.4]

~~**3.3.4.4.4** – Steam Cooker.~~

~~An appliance that cooks, defrosts, or reconstitutes food by direct contact with steam.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Steam Cooker. The term is not used in the code. It is used in It is used in A.10.11.2.1.
See substantiation for PI 2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	

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Submittal Date: Thu Feb 29 11:27:57 EST 2024
Committee: NFG-AAA

Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]

~~**3.3.4.4.5** – Steam Generator.~~

~~A separate appliance primarily intended to supply steam for use with food service appliances.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Steam Kettle. The term is not used in the code. It is used in Annex A. See PI 2.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	

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Submittal Date: Wed Feb 28 10:16:29 EST 2024
Committee: NFG-AAA

Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]

~~**3.3.13** – Breeching.~~

~~See 3.3.101 , Vent Connector.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Breeching. The term is not used in the Code.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	

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Submittal Date: Wed Feb 28 10:22:15 EST 2024
Committee: NFG-AAA

Public Input No. 11-NFPA 54-2024 [Section No. 3.3.16.5.1]

~~**3.3.16.5.1** – Fan-Assisted Power Burner.~~

~~A burner that uses either induced or forced draft.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Fan-Assisted Power Burner. Delete. The term is not used in the code. The term “Power Burner” is defined, and is sufficient to allow readers to understand what a Fan-Assisted Power Burner is.

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Submittal Date: Thu Feb 29 11:37:05 EST 2024
Committee: NFG-AAA

Public Input No. 117-NFPA 54-2024 [Section No. 3.3.49 [Excluding any Sub-Sections]]

Include natural gas, manufactured gas, liquefied petroleum (LP) gas in the vapor phase only, liquefied petroleum gas–air mixtures, and mixtures of these gases, plus gas–air mixtures within the flammable range, with the fuel gas or the flammable component of a mixture being a commercially distributed product and natural gas containing up to and including 5 percent hydrogen gas by volume .

Statement of Problem and Substantiation for Public Input

Consensus among technical experts and standards developers (principally CSA Group, the most prominent ANSI-recognized consensus standards development organization – SDO – for natural gas appliances and equipment) has determined that natural gases with up and including 5% hydrogen by volume is technically equivalent in terms of resulting combustion behavior (the most sensitive fuel quality characteristic that is composition dependent) to the natural gas into which is its admixed (i.e., “blended”) as a “baseline gas.” CSA standards development going forward and retroactively recognize this equivalency and will not impose any difference in requirements or standards recognition of admixtures up to and including 5% by volume. This conclusion is backed up with all published available appliance testing, historical treatment of natural gas compositions in test gases administered in standards approval testing, and gas properties analysis using standard natural gas interchangeability calculations applied to multiple baseline gases and admixtures of hydrogen with those gases. As a consequence, hydrogen concentrations up to and including 5% in natural gas is recognized by CSA Group and other technical experts as “natural gas,” regardless of the source of hydrogen (i.e., admixing by design of natural gas supply or otherwise included part of natural gas supply composition).

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Submittal Date: Tue Jun 04 16:12:16 EDT 2024
Committee: NFG-AAA

Public Input No. 118-NFPA 54-2024 [New Section after 3.3.59]

TITLE OF NEW CONTENT

3.3.59 Hydrogen Admixture. A natural gas supply into which hydrogen is blended or mixed at concentrations greater than 5 percent by volume by the fuel supplier or at the point of delivery.

Statement of Problem and Substantiation for Public Input

Given the proposed change in the definition of “fuel gas” to include natural gas containing up to and including 5% by volume, formal recognition of “hydrogen admixtures” is reserved to admixtures greater than 5%. Hydrogen admixtures are proposed by gas suppliers as a means of reducing airborne carbon emissions by displacing methane in natural gas with hydrogen, for which combustion produces no carbon dioxide and thus represents an opportunity for gas suppliers to reduce carbon emissions by adjusting chemical composition of natural gas baseline fuel gas. Specific technical requirements may be called for in addressing hydrogen admixtures of increasing hydrogen percent concentrations, but this definition does not call for such specifications since they represent requirements best considered outside of the definition.

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Submittal Date: Tue Jun 04 16:15:36 EDT 2024
Committee: NFG-AAA

Public Input No. 76-NFPA 54-2024 [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 equipment; that is ~~experienced in~~ qualified 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 Input

Being qualified to do something provides a much stronger basis for competence than simply saying someone is experienced. Saying that someone is experienced, does not mean successful experience, and it does not mean more than once.

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Submittal Date: Wed May 29 20:46:15 EDT 2024
Committee: NFG-AAA

Public Input No. 77-NFPA 54-2024 [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 equipment; that is experienced in such work; that is ~~familiar with~~ trained with all precautions required; and that has complied with all the requirements of the authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

Merriam Webster says that familiar means acquainted, trained means proficient and qualified. It does not serve the purpose of public safety to have entities such as qualified agencies work with hazardous natural gas when they are only required to be acquainted and not proficient and qualified.

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Submittal Date: Wed May 29 20:59:29 EDT 2024
Committee: NFG-AAA

Public Input No. 78-NFPA 54-2024 [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~~ A trained competent person representing themselves or a business entity that 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 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 Input

The previous definition never identified the need for this person to be competent. An OSHA "competent person" is defined as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them" [29 CFR 1926.32(f)].

The previous definition allowed for a representative that had no qualifications to be engaged in the work for a firm, corporation, or company.

Firm, corporation, or company are the same thing.

The previous definition never required anyone to be trained.

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Submittal Date: Thu May 30 06:43:59 EDT 2024
Committee: NFG-AAA

Public Input No. 92-NFPA 54-2024 [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, removal or replacement of gas piping or (2) the connection, installation, testing, repair, or servicing of appliances and 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 Input

In Youngstown, Ohio on or about May 31 a demolition crew cut into gas piping in the basement of a commercial building while removing piping. The resulting explosion took the life of a 27 year old man and injured 7 others. Requiring this "removal or demolition" work to be done by a qualified agency reduces the risks of this kind of event in the future.

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Submittal Date: Sun Jun 02 07:18:22 EDT 2024
Committee: NFG-AAA

Public Input No. 10-NFPA 54-2024 [Section No. 3.3.93]

~~**3.3.93** – Steam Cooker.~~

~~See 3.3.4.4.4 , Steam Cooker.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Steam Cooker. It references another definition of Steam Cooker. Two entries for the same term is excessive.

Submitter Information Verification

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Submittal Date: Thu Feb 29 11:34:26 EST 2024
Committee: NFG-AAA

Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]

~~**3.3.99.2** – Automatic Valve.~~

~~An automatic or semiautomatic device consisting essentially of a valve and operator that control the gas supply to the burner(s) during operation of an appliance.~~

Statement of Problem and Substantiation for Public Input

Delete definition of Automatic Valve. The term is not used in the Code or in Annexes A thru H.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	

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Submittal Date: Wed Feb 28 10:50:14 EST 2024
Committee: NFG-AAA

Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]

~~**3.3.99.4** – Manual Reset Valve.~~

~~An automatic shutoff valve installed in the gas supply piping and set to shut off when unsafe conditions occur. The device remains closed until manually reopened.~~

Statement of Problem and Substantiation for Public Input

Delete definition of Manual Reset Valve. The term is not used in the Code or in Annexes A thru H.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]	

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Submittal Date: Wed Feb 28 11:29:36 EST 2024
Committee: NFG-AAA

Public Input No. 8-NFPA 54-2024 [Section No. 3.3.99.6]

~~**3.3.99.6** – Service Shutoff Valve.~~

~~A valve, installed by the serving gas supplier between the source of supply and the customer piping system, to shut off the fuel gas to the entire piping system.~~

Statement of Problem and Substantiation for Public Input

Delete the definition of Service Shutoff Valve. The term is used only in the Code's scope in 1.1.1.1 (A). If the committee believes that the term is not self defining, revise 1.1.1.1(A) to incorporate the definition to make is easier for users to understand the intent of the requirement.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 2-NFPA 54-2024 [Section No. 3.3.4.4.3]	
Public Input No. 3-NFPA 54-2024 [Section No. 3.3.4.4.5]	
Public Input No. 4-NFPA 54-2024 [Section No. 3.3.13]	
Public Input No. 5-NFPA 54-2024 [Section No. 3.3.4.4.2]	
Public Input No. 6-NFPA 54-2024 [Section No. 3.3.99.2]	
Public Input No. 7-NFPA 54-2024 [Section No. 3.3.99.4]	

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Submittal Date: Wed Feb 28 11:33:23 EST 2024
Committee: NFG-AAA

Public Input No. 119-NFPA 54-2024 [Chapter 4]

Chapter 4 General

4.1 Qualified Agency.

The following shall be performed only by a qualified agency:

(1) The design, installation, testing, purging, and replacement of gas piping, appliances, equipment, and accessories

(2) The repair and servicing of appliances and equipment

4.2 Interruption of Service.

4.2.1 Notification of Interrupted Service.

When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users. 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.

4.2.2 Work Interruptions.

When interruptions in work occur while repairs or alterations are being made to an existing piping system, the system shall be left in a safe condition.

4.3 Prevention of Accidental Ignition.

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. 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. Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.

(4) Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps. Electric switches shall not be turned on or turned off.

4.3.2 Handling of Flammable Liquids.

4.3.2.1* Drip Liquids.

Liquid that is removed from a drip in existing gas piping shall be handled to avoid spillage or ignition.

4.3.2.2 Other Flammable Liquids.

Flammable liquids used by the installer shall be handled with precaution and shall not be left within the premises from the end of one working day to the beginning of the next.

4.4* Noncombustible Material.

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*

4.5 Engineering Methods.

Where an engineering method is used to calculate flow of air or gas, or to determine the size of gas pipe or a gas vent, the authority having jurisdiction shall be permitted to require submittal of any or all of the following:

(1) Calculations including documentation that the method used is published and recognized as being valid for the calculations provided

(2) The name of any software used, input and output developed, and documentation that the software is recognized as being valid for the calculations provided

(3) * The name of the person that performed the calculation or design, along with their qualifications to perform the calculation or design.

4.6 Hydrogen Admixtures. For the scope, purpose, and requirements of this code, hydrogen admixtures in natural gas supplies shall not exceed 20 percent by volume.

Statement of Problem and Substantiation for Public Input

The current state of knowledge around hydrogen admixtures of natural gas has concluded that 20% hydrogen by volume represents a prudent upper bound for gas suppliers used in existing and new natural gas appliances and equipment from a standpoint of appliance and gas system safety. This knowledge is based upon appliance testing, combustion properties associated with interchangeability to the baseline natural gas used for admixing, uncertainties associated with non-combustion characteristics of admixtures upon natural gas piping systems and components, and known current gas supplier plans for hydrogen admixtures that do not exceed 20% for near term projects, higher heating value (HHV) limits of natural gas suppliers and the decrements of HHV associated with hydrogen fractions (hydrogen representing roughly one-third the HHV of methane). At a minimum, a 20% admixture limit serves as a reasonable limit for hydrogen admixtures for the current code cycle and as research and analysis continues to test this threshold as an upper bound. This limit may change if technically justified on past, current, and future designs of appliance, equipment, and building gas systems, but exceeding 20% is not justified at this time.

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Committee: NFG-AAA

Public Input No. 120-NFPA 54-2024 [Chapter 4]

Chapter 4 General

4.1 Qualified Agency.

The following shall be performed only by a qualified agency:

(1) The design, installation, testing, purging, and replacement of gas piping, appliances, equipment, and accessories

(2) The repair and servicing of appliances and equipment

4.2 Interruption of Service.

4.2.1 Notification of Interrupted Service.

When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users. 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.

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4.3 Prevention of Accidental Ignition.

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. 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. Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.

(4) Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps. Electric switches shall not be turned on or turned off.

4.3.2 Handling of Flammable Liquids.

4.3.2.1* Drip Liquids.

Liquid that is removed from a drip in existing gas piping shall be handled to avoid spillage or ignition.

4.3.2.2 Other Flammable Liquids.

Flammable liquids used by the installer shall be handled with precaution and shall not be left within the premises from the end of one working day to the beginning of the next.

4.4* Noncombustible Material.

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*

4.5 Engineering Methods.

Where an engineering method is used to calculate flow of air or gas, or to determine the size of gas pipe or a gas vent, the authority having jurisdiction shall be permitted to require submittal of any or all of the following:

(1) Calculations including documentation that the method used is published and recognized as being valid for the calculations provided

(2) The name of any software used, input and output developed, and documentation that the software is recognized as being valid for the calculations provided

(3) * The name of the person that performed the calculation or design, along with their qualifications to perform the calculation or design.

A4.6 Safe distribution of hydrogen admixtures in natural gas and use in building systems do not appear to present issues of safety or operability when prudent limits on hydrogen percentages (by volume) are used. Pipe sizing criteria used in the National Fuel Gas Code specific to natural gas (as well as propane) do not appear to warrant specific adjustments for hydrogen admixtures provided the admixtures do not significantly lead to deviate natural gas fuel gas properties from the currently-assumed density of 0.60 relative to dry air and higher heating value (HHV) of 1,024 Btus per standard cubic foot (Btu/scf). Generally, however, the higher the admixture hydrogen percentage, the less reliable continued safety and operability can be presumed. A more immediate impact of hydrogen admixture percentages and percentage increases is demonstrated and predicted impacts upon end use appliance and equipment (hereafter referred to as “appliance”) function, most directly represented by combustion behavior effects. The principal and most immediate safety concern of increasing admixture percentages is on burner “flashback” where flame fronts in burners retreat into the burner itself, leading to burner failure and consequent destruction of the burner system and potential destruction of release of unburned gas in the building environment. Regression of flame fronts into burners occurs when hydrogen fractions increase gas mixture flame speed in excess of flow velocity, hydrogen burning at a burning velocity approximately six times faster than that of methane. A 20% maximum threshold for hydrogn admixtures with natural gas represents a prudent limit to minimize the potential of flashback behavior and associated safety risks of burner failure.

Statement of Problem and Substantiation for Public Input

The annex material would provide useful information to National Fuel Gas Code users on the need to adhere to hydrogen admixture maximum threshold limits in order to mitigate health and safety risks associated with flashback and subsequent burner failure and that is substantiated by appliance testing, gas properties analysis, gas interchangeability analysis, and various non-technical limits on gas composition that would otherwise compromise the appropriateness of hydrogen admixtures in natural gases.

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Committee: NFG-AAA

Public Input No. 90-NFPA 54-2024 [Section No. 4.1]

4.1 Qualified Agency.

4.1.1 Work Scope

The following shall be performed only by a qualified agency:

(1) The design, installation, testing, purging, removal, and replacement of gas piping, appliances, equipment, and accessories

(2) The repair and servicing of appliances and equipment

Statement of Problem and Substantiation for Public Input

In some cases gas piping is removed and not replaced. This would refer to the demolition industry. On or about May 31, 2024 workers were removing gas pipes from the basement of a building in downtown Youngstown, Ohio. They cut a pipe that contained pressurized natural gas. A horrendous explosion occurred taking the life of a 27 year old man and injuring 7 others while also devastating a community trying to rebuild its inner city infrastructure. A requirement to make sure people doing gas piping demolition are part of a qualified agency and are trained reduces the risk of this ever happening again.

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Submittal Date: Sun Jun 02 07:08:26 EDT 2024
Committee: NFG-AAA

Public Input No. 91-NFPA 54-2024 [Section No. 4.1]

4.1 Qualified Agency.

~~The following shall be performed only by a qualified agency:~~

(1) ~~The design, installation, testing, purging, and replacement of gas piping, appliances, equipment, and accessories~~

(2) ~~The repair and servicing of appliances and equipment~~

4.1.2 Qualification of Personnel

Persons whose duties fall within the scope of this code shall be provided with training consistent with the scope of their job activities that includes the following:

a) Proper gas piping materials selection, pipe joining methods, leak checking, purging, and emergency response procedures.

b) Training shall be provided in a language and at a literacy level that employees understand, and that the training provides an opportunity for interactive questions and answers with the instructor/trainer.

c) A training plan shall be created for both initial and ongoing needs including refresher training.

d) Training shall be commensurate with all employee exposure hazards. The employer shall provide a training hazards matrix as part of the training plan.

e) Training resources shall be provided to those trained to include reference materials for self-study future review.

f) The training program shall include validation of both knowledge and skills transfer.

g) Validation of skills transfer shall include witness sign-offs by competent persons.

h) Validation of knowledge transfer shall include written tests administered in a controlled environment with results provided to the trainees along with documented discussions of each test item.

Statement of Problem and Substantiation for Public Input

This document is one of the few documents within all published by NFPA that requires no training. Even the parallel sister document for LPG, (NFPA 58) requires training. Human error is known as the number one cause of accidents. Training reduces human error risks. Requiring training for those working with gas piping systems will serve the public and the gas industry in general by reducing accidents overall.

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Submittal Date: Sun Jun 02 07:13:43 EDT 2024
Committee: NFG-AAA

Public Input No. 46-NFPA 54-2024 [New Section after 4.2]

4.2.1 Qualified Agency Training

Persons whose duties fall within the scope of this code shall be provided with training that is consistent with the scope of their job activities.

4.2.1.1 Training Requirements.

Training shall meet the following requirements

a) Shall be Documented with a written curriculum

b) Shall include validation of knowledge transfer.

c) Shall include validation of skills transfer.

d) Shall be provided in a language and at a literacy level that employees understand,

e) Shall provide an opportunity for interactive questions and answers with the instructor/trainer.

4.2.1.2 Refresher training

Refresher training shall be provided at least every 3 years.

Statement of Problem and Substantiation for Public Input

Human error has been recognized for decades as the #1 cause of accidents. Almost every other significant document that deals with fuels or fired equipment including NFPA 58, 85, and 86 contain a section on training. It makes no sense that the keystone document within NFPA that covers natural gas has no mention of anyone needing to be trained for doing any of the critical work that is the subject of NFPA 54 where lives are literally at stake with almost everything in the document. This requirement can significantly advance the cause of safety in the natural gas industry and provide enhanced safety to the public.

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Submittal Date: Mon May 20 18:09:59 EDT 2024
Committee: NFG-AAA

Public Input No. 79-NFPA 54-2024 [Section No. 4.2.1]

4.2.1 Notification of Interrupted Service.

When the gas supply is to be turned off ~~, it shall be~~ the ~~duty of the qualified agency to~~ qualified agency shall notify all affected users. 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.

Statement of Problem and Substantiation for Public Input

What is important is that notification occur. As the qualified agency is interrupting the service, they are the only one who are aware of every turnoff. The deleted phrase is not needed to ensure that notification occurs. It is noted that this is the only paragraph in the code that uses the phrase, “it shall be the duty”.

Submitter Information Verification

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Submittal Date: Thu May 30 22:09:45 EDT 2024
Committee: NFG-AAA

Public Input No. 54-NFPA 54-2024 [Section No. 4.3.1]

4.3.1 Potential Ignition Sources.

Where work is being performed on piping that ~~contains or~~ has contained gas and does not require purging as per Section 8.3 , 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.
~~Piping shall be purged as required in Section~~ 8.3 ~~before welding or cutting with a torch is attempted.~~

(5)

(6) Smoking, open flames, lanterns, welding, or other sources of ignition shall not be permitted.

(7) Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps.
~~Electric switches shall not be turned on or turned off.~~

(8)

(9) The work area shall be well-ventilated.

(10) The work area shall be verified to be at less than 10% LEL with a flammable gas detector at all times.

Statement of Problem and Substantiation for Public Input

Several changes were proposed, substantiation for each follows:
1. Organized topics in the list according to their relation to each other.
2. Broke up shall statement requirements into separate items as per manual of style requirements.
3. Restated the opening statement since there. is no hazard to fuel piping systems that are in service and contain gas and have no leaks.
4. The opening statement previously suggested that gas piping can be opened and worked on without purging.
5. There are hazards related to working on piping that meet the deminimus requirements of table 8.3.1. Requirements for ventilation and monitoring of the space were added.

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Submittal Date:	Sun May 26 18:16:10 EDT 2024
Committee:	NFG-AAA

Public Input No. 55-NFPA 54-2024 [Section No. 4.3.2]

~~**4.3.2** – Handling of Flammable Liquids.~~

~~**4.3.2.1** * – Drip Liquids.~~

~~Liquid that is removed from a drip in existing gas piping shall be handled to avoid spillage or ignition.~~

~~**4.3.2.2** – Other Flammable Liquids.~~

~~Flammable liquids used by the installer shall be handled with precaution and shall not be left within the premises from the end of one working day to the beginning of the next.~~

Statement of Problem and Substantiation for Public Input

NFPA 30 flammable liquids code is the correct document to be providing advice on flammable liquids. This section is not within the scope of this document.

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Submittal Date: Sun May 26 18:29:38 EDT 2024
Committee: NFG-AAA

Public Input No. 56-NFPA 54-2024 [Section No. 4.3.2.1]

~~**4.3.2.1** *~~ – ~~Drip Liquids.~~

~~Liquid that is removed from a drip in existing gas piping shall be handled to avoid spillage or ignition.~~

Statement of Problem and Substantiation for Public Input

This item is a legacy item from the days when manufactured gas routinely had liquids. There is no longer an expectation that liquids are collected or exist in commercial natural gas distribution systems that are the subject of this document.

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Public Input No. 57-NFPA 54-2024 [Section No. 4.3.2.2]

~~**4.3.2.2** – Other Flammable Liquids.~~

~~Flammable liquids used by the installer shall be handled with precaution and shall not be left within the premises from the end of one working day to the beginning of the next.~~

Statement of Problem and Substantiation for Public Input

This item has two shall statement requirements. The first one is not enforceable. Its not clear what precautions would be taken? It's also not understandable how leaving a gallon of something on site would be a problem depending on how this was done. Again, this is not enforceable, is handled by NFPA 30 and is most likely a legacy item from manufactured gas days.

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Submittal Date: Sun May 26 18:35:32 EDT 2024
Committee: NFG-AAA

Public Input No. 58-NFPA 54-2024 [Section No. 4.4]

MOVE THIS TO DEFINITIONS 3.3.65.2

4.4* Noncombustible Material.

A material that complies with any of the following shall be considered a noncombustible material:

(1) A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

(2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*

Statement of Problem and Substantiation for Public Input

There is already a spot for this item in definitions right next to combustible materials. There is no reason for this to be in chapter 4.

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Submittal Date: Sun May 26 18:39:55 EDT 2024
Committee: NFG-AAA

Public Input No. 48-NFPA 54-2024 [Section No. 4.5]

~~**4.5** – Engineering Methods.~~

~~Where an engineering method is used to calculate flow of air or gas, or to determine the size of gas pipe or a gas vent, the authority having jurisdiction shall be permitted to require submittal of any or all of the following:~~

(1) ~~Calculations including documentation that the method used is published and recognized as being valid for the calculations provided~~

(2) ~~The name of any software used, input and output developed, and documentation that the software is recognized as being valid for the calculations provided~~

(3)~~*~~ ~~The name of the person that performed the calculation or design, along with their qualifications to perform the calculation or design~~

Statement of Problem and Substantiation for Public Input

This section belongs in pipe sizing, chapter 6, section 6.2

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Submittal Date: Mon May 20 18:38:03 EDT 2024
Committee: NFG-AAA

Public Input No. 52-NFPA 54-2024 [Section No. 5.2.1]

5.2.1 Interconnections Supplying Separate Users.

Where two or more meters, or two or more service regulators where meters are not provided, are located on the same premises and supply separate users, the gas piping systems shall not be interconnected on the outlet side of the meters or service regulators.

Exception: Unless in an industrial application and the interconnection is approved by the AHJ.

Statement of Problem and Substantiation for Public Input

Many industrial applications have interconnected piping systems supplied by different service regulators or meters. The interconnections are provided for reliability and redundancy.

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Submittal Date: Sat May 25 20:55:11 EDT 2024
Committee: NFG-AAA

Public Input No. 53-NFPA 54-2024 [Section No. 5.2.2.2]

5.2.2.2

~~A three~~ Acceptable equipment for preventing backflow shall be one of the following:

a) A Three -way valve~~- installed~~ , that has no intermediate position flow path, installed to admit the standby supply and at the same ~~time shut~~ time shut off the regular supply~~- shall be permitted to be used for this purpose.~~ .

b) Two isolation valves in series.

c) A single isolation valve with a blind.

Statement of Problem and Substantiation for Public Input

The way this is written provides inadequate means for enforcement. There are many 3 way valves manufactured that are not rated for positive shut off in some intermediate position. If not completely at a stop position they can leak through when appearing to be at their complete travel. The way this is written it sounds like one isolation valve would also be acceptable when in practice this would be dangerous given the potential for having one isolation valve leak through when closed. The proposed language also makes it clear that other devices like a check valve are not acceptable. The proposed language identifies robust positive shut off technologies and makes the choices clear.

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Submittal Date: Sat May 25 21:01:37 EDT 2024
Committee: NFG-AAA

Public Input No. 98-NFPA 54-2024 [Section No. 5.3.2.3]

5.3.2.3

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 or interlocked processes or appliances that restrict simultaneous operation .

Statement of Problem and Substantiation for Public Input

Many industrial processes and appliances have installed redundant spares. Sizing piping for both systems to be operated simultaneously would be burdensome to these processes and appliances where interlocks to prevent simultaneous operation exist.

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Submittal Date: Sun Jun 02 19:53:29 EDT 2024
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Public Input No. 12-NFPA 54-2024 [New Section after 5.5.4.1]

5.5.4.1.1.1

Polyamide mechanical fittings for use on polyethylene pipe and tubing shall comply with ASTM F1924, *Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing* .

Statement of Problem and Substantiation for Public Input

The current standard (ASTM D2513), referenced in section 5.5.4.1.1, allows for the use of mechanical fittings, but it only covers fittings made of polyethylene. ASTM F1924, "Standard Specification for Plastic Mechanical Fittings for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing" is written as a supplement to D2513. It defines requirements for plastic mechanical fittings specifically for use on ASTM D2513 systems and allows for the use of fittings constructed of all plastic materials, provided they are compatible with ASTM D2513 piping systems. ASTM F1924 is an established standard with over 25 years of history. Including ASTM F1924 will increase the fittings available for use on gas systems while maintaining the safety and reliability of those systems.

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Submittal Date: Wed Mar 13 11:41:50 EDT 2024
Committee: NFG-AAA

Public Input No. 65-NFPA 54-2024 [Section No. 5.5.4.1.1]

5.5.4.1.1

Polyethylene plastic pipe, tubing, and fittings used to supply fuel gas shall conform to ASTM D2513, *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings.* Pipe to be used shall be marked "gas" and "ASTM D2513." Polyethylene plastic pipe, tubing, and fittings shall not be installed indoors or aboveground.

Statement of Problem and Substantiation for Public Input

Section 7.1.7 states that polyethylene plastic piping is not permitted indoors or aboveground. Mirroring this requirement to section 5.5, which discusses the applicability of piping materials, will assist in the ease of use of the standard.

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Submittal Date: Tue May 28 14:45:46 EDT 2024
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Public Input No. 115-NFPA 54-2024 [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 Input

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.

1. 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.

2. 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.

3. 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.

Submitter Information Verification

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Submittal Date: Tue Jun 04 10:09:14 EDT 2024
Committee: NFG-AAA

Public Input No. 116-NFPA 54-2024 [Section No. 5.5.5]

5.5.5 Workmanship and Defects.

Gas pipe, tubing, and fittings at the time of installation shall meet the following requirements:

(1) Gas pipe, tubing, and fittings shall be clear and free from cutting burrs and visible defects in structure or threading.

(2) Gas pipe, tubing, and fittings shall be ~~thoroughly~~ cleaned to remove chip, scale, and debris.

(3) ~~Visible defects in pipe, tubing, and fittings shall not be repaired.~~

(4)

(5) Pipe, tubing, and fittings with visible defects shall be replaced.

Statement of Problem and Substantiation for Public Input

Revised to:
1. Delete Thoroughly. The requirement for cleaning is sufficient. The modifier “thoroughly” is not enforceable as degree of cleaning is subjective.
2. Delete a redundant requirement. Saying that visible defects shall not be repaired is not needed when they are required to be replaced in the next sub-paragraph.

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Submittal Date: Tue Jun 04 13:36:20 EDT 2024
Committee: NFG-AAA

Public Input No. 51-NFPA 54-2024 [Sections 5.5.7.1, 5.5.7.2, 5.5.7.3, 5.5.7.4, 5.5.7.5]

Sections 5.5.7.1, 5.5.7.2, 5.5.7.3, 5.5.7.4, 5.5.7.5

~~**5.5.7.1** * – Pipe Joints.~~

~~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* .~~

~~**(A)** –~~

~~Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing, or welding.~~

~~**(B)** –~~

~~Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1000°F (538°C).~~

~~**(C)** –~~

~~Brazing alloys shall not contain more than 0.05 percent phosphorus.~~

~~**5.5.7.2** – Copper Tubing Joints.~~

~~Copper tubing joints shall be assembled with approved gas tubing fittings, shall be brazed with a material having a melting point in excess of 1000°F (538°C), or shall 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* . Brazing alloys shall not contain more than 0.05 percent phosphorus.~~

~~**5.5.7.3** – Stainless Steel Tubing Joints.~~

~~Stainless steel joints shall be welded, assembled with approved tubing fittings, brazed with a material having a melting point in excess of 1000°F (538°C), 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* . Brazing alloys and fluxes shall be recommended by the manufacturer for use on stainless steel alloys.~~

~~**5.5.7.4** – Flared Joints.~~

~~Flared joints shall be used only in systems constructed from nonferrous pipe and tubing where experience or tests have demonstrated that the joint is suitable for the conditions and where provisions are made in the design to prevent separation of the joints.~~

~~**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:~~

(6) ~~Flanges shall be permitted.~~

(7) ~~Bushings shall not be used.~~

(8) ~~Fittings shall not be used in systems containing flammable gas–air mixtures.~~

(9) ~~Fittings in sizes 4 in. (100 mm) and larger shall not be used indoors unless approved.~~

(10) ~~Fittings in sizes 6 in. (150 mm) and larger shall not be used unless approved.~~

(11) ~~*Aluminum Alloy Fittings.* Threads shall not form the joint seal.~~

(12) ~~*Zinc–Aluminum Alloy Fittings.* Fittings shall not be used in systems containing flammable gas–air mixtures.~~

(13) ~~*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:~~

(14) ~~Used within the fitting manufacturer's pressure–temperature recommendations~~

(15) ~~Used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction~~

(16) ~~Acceptable to the authority having jurisdiction~~

(17) ~~When pipe fittings are drilled and tapped in the field, the operation shall be in accordance with the following:~~

(18) ~~The operation shall be performed on systems having operating pressures of 5 psi (34 kPa) or less.~~

(19) ~~The operation shall be performed by the gas supplier or their designated representative.~~

(20) ~~The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier.~~

(21) ~~The fittings shall be located outdoors.~~

(22) ~~The tapped fitting assembly shall be inspected and proven to be free of leaks.~~

Delete and replace with the following:

Additional Proposed Changes

File Name	Description	Approved
Proposed_fittings_materials_table_May_23_PI_Only.docx		

Statement of Problem and Substantiation for Public Input

The requirements for fittings are converted into a table for ease of use and understanding. During the development of the table, it became evident at least one requirement is archaic, the inclusion of wrought iron pipe and fittings and it is deleted. While wrought iron is an acceptable material, wrought iron pipe and fittings are longer commercially available.

The requirements for field frilling and tapped fittings are relocated to Chapter 7, as these are installation requirements, and not a materials requirement. The requirements for outdoor location and inspection are moved to separate requirements as they do not belong in this list of how to drill and tap.

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Submittal Date: Thu May 23 15:10:18 EDT 2024
Committee: NFG-AAA

5.5.7 Metallic Piping, Joints, and Fittings. Unchanged.

1. Delete 5.5.7.1 thru 5.5.7.5 and replace with the following:

5.5.7.1 Allowable Metallic Pipe Fittings. Metallic pipe fittings shall be in accordance with Tables 5.5.7.5 (A) and (B).

Table 5.5.7 (A), Allowable pipe fittings for piping materials.

Pipe material	Fittings material	Fitting Type	Prohibited fittings
Steel, stainless steel or wrought-iron ≥ Schedule 40	Steel, stainless steel, cast iron or wrought-iron	Thread, Flange[5], Braze, Weld or Press-Connect Fitting per ANSI LC 4/CSA 6.32	Cast iron fittings identified in Table 5.5.7.5 (B) Threaded fittings > 4 in.
Steel, stainless steel or wrought-iron < Schedule 40	Steel, stainless steel, cast iron or wrought-iron	Flange[5], Braze, Weld, or Press-Connect Fitting per ANSI LC 4/CSA 6.32	Cast iron fittings identified in Table 5.5.7.5 (B) Threaded fittings > 4 in.
Stainless steel tubing	Stainless steel	Approved tubing fittings, Weld, Braze[1, 2, 3], or Press-Connect Fitting per ANSI LC 4/CSA 6.32	
Copper and copper alloy[1]	Copper or copper alloy	Approved gas tubing fittings, Braze or Press-Connect Fitting per ANSI LC 4/ CSA 6.32, Flare fittings[4]	All ≥ 4 in.
Aluminum	Aluminum		All where threads form the joint seal Fittings ≥ 4 in.

Notes:
1. Melting point of materials for non-ferrous pipe brazes > 1000° F (see 5.5.7.2)
2. Brazing alloys not > 0.05% phosphorus (see 5.5.7.2)
3. Brazing alloys and fluxes recommended by the manufacturer for use with stainless steel alloys
4. Only where experience or tests have demonstrated that the joint is suitable for the conditions and where provisions are made in the design to prevent separation of the joints.
5. See 5.5.9 for flange requirements.

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. unless approved,
Zinc-Aluminum Alloys	Flanges in flammable gas-air mixtures, unless approved.
	Threaded fittings > 4”
Aluminum and Aluminum Alloys	Threads shall not form the joint seal
Special Fittings*	Fittings used outside the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction
	Special fittings not approved
	Threaded special fittings > 4”

2. Add new Annex A text to read:

A.5.5.7.1 Special fittings include couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless, or compression-type tubing fittings

7.5.4 ~~5.5.7.5 (8)~~ Field drilled and tapped fittings.
7.5.4.1 When pipe fittings are drilled and tapped in the field, the operation shall be performed:
(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~~ Using written procedures prepared by the gas supplier.
~~(d) The fittings shall be located outdoors.~~
7.5.4.2 ~~(e)~~ The tapped fitting assembly shall be inspected and proven to be free of leaks.
7.5.4.3 Field drilled and tapped fittings shall be located outdoors only.

Public Input No. 24-NFPA 54-2024 [Section No. 5.5.8]

~~5~~ Relocate to paragraph 7 .5. ~~8 Plastic Piping Joints and Fittings.~~

~~Plastic pipe, tubing, and fittings shall be joined in accordance with the manufacturers' instructions. The following shall be observed when making such joints~~

2 and renumber as (5) through (9) :

(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. Joints shall be made with the joining method recommended by the pipe manufacturer. Polyethylene heat fusion fittings shall be marked "ASTM D2513." Polyamide heat fusion fittings shall be marked "ASTM F2945."

(3) Where compression-type mechanical joints are used, the gasket material in the fitting shall be compatible with the plastic piping and with the gas distributed by the system. An internal tubular rigid stiffener shall be used in conjunction with the fitting. 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. The stiffener shall be free of rough or sharp edges and shall not be a force fit in the plastic. Split tubular stiffeners shall not be used.

(4) Plastic piping joints and fittings for use in LP-Gas piping systems shall be in accordance with NFPA 58.

Statement of Problem and Substantiation for Public Input

Installation requirements are relocated to Chapter 7, Gas Piping Installatoion where they belong.

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Submittal Date: Wed May 15 11:40:36 EDT 2024
Committee: NFG-AAA

Public Input No. 80-NFPA 54-2024 [Section No. 5.5.10 [Excluding any Sub-Sections]]

The material for gaskets shall be capable of withstanding:

1. the design temperature and pressure of the piping ~~system and~~ system

2. the chemical constituents of the gas being conducted without change to its chemical and physical properties.

3. The effects of fire exposure to the ~~joint shall be considered in choosing the material.~~ joint

Statement of Problem and Substantiation for Public Input

As written the requirement is vague in respect to the ability of the gasket to withstand the effects of fire on the joint. It requires “consideration” which does not provide criteria for the material, only that someone thinks about it. As revised a requirement is added. In addition, the 3 requirements in the paragraph are separated in accordance with the Manual of Style.

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Submittal Date: Thu May 30 22:12:20 EDT 2024
Committee: NFG-AAA

Public Input No. 67-NFPA 54-2024 [New Section after 5.7]

5.7.8 Test Ports

5.7.8.1 Test ports shall be provided upstream and downstream of the line pressure regulator to facilitate testing of the regulator after installation.

5.7.8.2 A tee fitting with one opening capped or plugged shall be installed between the regulator and its upstream shutoff valve to allow connection of a pressure-measuring instrument.

5.7.8.3 Means shall be provided downstream of, and in the same room as, the regulator for the connection of a pressure measuring instrument using any of the following:

1) dedicated test port on the regulator,

2) test port on the appliance gas control,

3) test port on the manifold,

4) a plugged tee fitting in the piping,

5) a plugged manifold port.

Statement of Problem and Substantiation for Public Input

A new requirement for test ports is added. Test ports are needed where the line pressure regulator is installed to allow the regulator to be tested to verify that it is operating properly. Improper operation can result in lower pressure than the appliance requires to operate safely and efficiently or higher pressure which can cause overfiring of the appliance.

Submitter Information Verification

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Submittal Date: Tue May 28 15:56:39 EDT 2024
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Public Input No. 13-NFPA 54-2024 [Section No. 5.7.2]

5.7.2 Listing.

~~Line~~ Except for appliances rated for pressures higher than 1/2 PSI and covered under NFPA 86, NFPA 87, NFPA 37, and NFPA 85, line pressure regulators shall 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.

Statement of Problem and Substantiation for Public Input

The current language is inherently design limiting for higher flow appliances that are covered under the standards listed in the proposal. Higher flow means 5,000 cubic feet of natural gas or more. There is no regulator on the market that can comply with ANSI Z21.80 listed regulators and flow 12,500 (or more) cubic feet of natural gas at pressures less than 1/2 PSI. ANSI Z21.80 fits very well for residential and light commercial appliances that are listed under the Z21/83 series standards (and most of these are all less than 5,000 CFH) , but once the appliance is a larger commercial, industrial(light or heavy), or a gas engine (e.g. larger CAT engine), the requirement for an ANSI Z21.80 listed regulator either does not work or just complicates the installation. Additionally, what need or value does a ANSI Z21.80 listed regulator provide on such appliances that have high and low gas pressure switches and have not used ANSI Z21.80 listed regulators since time immemorial. In the previous editions, I offered an alternative to remove this design restriction by requiring either of the following: a ANSI Z21.80 regulator or have the appliance be fitted with a high and low gas pressure switches. That was rejected. So, please do something to fix this for these industries. The current requirement works great for residential and light commercial appliances that are listed under the Z21/83 series standards. In most all cases, no one that makes unlisted appliances covered by NFPA 37 (except for small, 1/2 PSI rated, packaged gen sets), 86, 87 and 85 is able to comply with this requirement.

Submitter Information Verification

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Submittal Date: Wed Apr 03 11:10:41 EDT 2024
Committee: NFG-AAA

Public Input No. 93-NFPA 54-2024 [Section No. 5.8.4]

5.8.4 Construction and Installation.

All overpressure protection devices shall be designed, constructed, and installed to meet the following requirements:

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

(2) Be ~~designed and installed so they can be operated~~ capable of being operated to determine whether the valve is free.~~ The devices shall also be designed and installed so they can be tested~~

(3) Be capable of being tested to determine the pressure at which they operate~~ and be~~ .

(4) Be capable of being examined for leakage, (through the device), when in the closed position.

Statement of Problem and Substantiation for Public Input

The previous language did not meet the manual of style requirements. It also spoke about not being impacted by the atmosphere. The term ambient environment is more descriptive and useful. The final requirement was modified to speak about leakage in the closed position through the device. This is the leakage path that is of concern in that requirement but it was not clear.

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Submittal Date: Sun Jun 02 18:47:49 EDT 2024
Committee: NFG-AAA

Public Input No. 94-NFPA 54-2024 [Section No. 5.8.7]

5.8.7– _ Unauthorized Operation - of Critical Isolation Valves

Where

~~unauthorized~~
operation of

~~any shutoff valve~~
an isolation valve could render a pressure relieving valve

~~or~~
, pressure limiting device inoperative, or a sensing line obstructed one of the following shall be

~~accomplished: The valve~~
implemented, 5.8.7.1 or 5.8.7.2.

5.8.7.1 Locking open of valves

(1) Critical isolation valves that can be closed and make for an obstruction 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.~~

~~Duplicate relief valves shall~~

(2)

(3) Personnel shall be trained to leave critical isolation valves open.

(4) Tags shall be placed on these valves to indicate their need to be open.

(5) Procedures shall be developed for verifying operation of tagged critical valves such that if they are closed for any reason while the system is out of service it will be returned to an open position before restarting equipment.

5.8.7.2 Duplicate overpressure control equipment

(1) Duplicate overpressure control equipment shall be installed, each having adequate capacity to protect the system~~, and arrange the~~ .

(2) Arrange isolating valves or a three-way valve so that only one relief valve can be rendered inoperative at a time.

Statement of Problem and Substantiation for Public Input

The previous language did not meet the manual of style having multiple shall statements bundled together. The requirements also called for instruction which is training and should be called out that way. It also called for instructions which are procedures and should be called out that way. The proposed language meets the manual of style requirements and provides a more clear precise set of requirements that allows the document to be used in manner that will enhance safety.

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Committee: NFG-AAA

Public Input No. 95-NFPA 54-2024 [Section No. 5.8.8]

~~**5.8.8** – Vents.~~

~~**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. Discharge stacks or vents shall be designed to prevent the entry of water, insects, or other foreign material that could cause blockage.~~

~~**5.8.8.2** –~~

~~The discharge stack or vent line shall be at least the same size as the outlet of the pressure-relieving device.~~

Statement of Problem and Substantiation for Public Input

Much of the same information is already contained in section 5.14. There is only one such item that needs to be moved to this section to have all of this section's requirements also included below, rendering this section duplicative.

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Public Input No. 63-NFPA 54-2024 [Section No. 5.13]

5.13 ~~Expansion and Flexibility~~ Design for e xpansion and flexibility .

5.13.1 ~~Design.~~ Thermal expansion or contraction

Piping systems shall be designed to prevent failure from thermal expansion or contraction.

~~**5.13.2** Special Local Conditions.~~

~~Where local conditions include earthquake, tornado, unstable ground, or flood hazards, special consideration shall be given to increased strength and flexibility of piping supports and connections.~~

Statement of Problem and Substantiation for Public Input

The title of this section should be about design. The section regarding consideration for special local considerations is not enforceable. It can never be clear what this consideration actually consists of. This is also a list, but it is not a complete list and the manual of style prefers lists not be given. For example, why is not icing on exterior gas piping also not on the list, or mudslides? What is flooding? Does this mean any flood zone? for a 100 year, 500 year, 1000 year storm?

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Committee: NFG-AAA

Public Input No. 96-NFPA 54-2024 [Section No. 5.14]

5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in line-pressure 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) Independent vents for multiple regulators shall not be required 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 shall not be 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, one of the following shall apply:

(a) An antiflood-type breather vent fitting shall be installed.

(b) 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.

(12) <u>The discharge stack or vent line shall be at least the same size as the outlet of the pressure relieving device.</u>

Statement of Problem and Substantiation for Public Input

The addition of this one item (12) allows section 5.8.8 to be removed from the document.

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Committee: NFG-AAA

Public Input No. 97-NFPA 54-2024 [Section No. 5.14]

5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in line-pressure 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~~ or its potential release of gas is such that a discharge ~~of fuel gas~~ will cause a hazard.

(2) Independent vents for multiple regulators shall not be required 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 shall not be 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 from diaphragm type regulators shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

(10) Vent terminations from from gas pressure relief valves or combination regulator relief valves shall have an engineering analysis completed to identify distances required from possible sources of ignition.

(11) At locations where a vent termination could be submerged during floods or snow accumulations, one of the following shall apply:

(a) An antiflood-type breather vent fitting shall be installed.

(b) The vent terminal shall be located above the height of the expected flood waters or snow.

(12) 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 Input

Relief valve discharges are likely to release considerably more gas than diaphragm regulators. They cannot safely be discharged to within 3' of an ignition source. This is dangerous and a disservice to the public. It is common practice in the chemical industry to have gas pressure relief valve termination locations modeled to identify safe distances from ignition sources. This document already calls for engineering methods as a means to size pipe. This is likewise the best approach for relief valve vent terminations.

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Public Input No. 59-NFPA 54-2024 [Chapter 6 [Title Only]]

Pipe Sizing Tables

Statement of Problem and Substantiation for Public Input

This chapter 90% supports sizing using the sizing tables and not sizing in general. The title is misleading and hurts the usability of the document.

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Public Input No. 60-NFPA 54-2024 [Section No. 6.1]

MOVE TO CHAPTER 5, 5.3.3, FOR PIPE SIZING METHODS

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.

Statement of Problem and Substantiation for Public Input

Chapter 5 is all about pipe sizing methods, its misleading and confusing to speak about pipe sizing in 2 different chapters. Chapter 6 primarily supports sizing using the tables method and not sizing in general.

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Public Input No. 47-NFPA 54-2024 [Section No. 6.2 [Excluding any Sub-Sections]]

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

6.2.1 Application of Engineering Methods

Where an engineering method is used to calculate flow of air or gas, or to determine the size of gas pipe or a gas vent, the authority having jurisdiction shall be permitted to require submittal of any or all of the following:

- (1)
  Calculations including documentation that the method used is published and recognized as being valid for the calculations provided
- (2)
  The name of any software used, input and output developed, and documentation that the software is recognized as being valid for the calculations provided
- (3)*
  The name of the person that performed the calculation or design, along with their qualifications to perform the calculation or design

Statement of Problem and Substantiation for Public Input

The term engineering method is provided in chapter 4 as a method for sizing gas piping systems. It belongs here in chapter 6 which is all about pipe sizing. There is no reason for it to be in a general chapter, 4, and not here.

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Submittal Date: Mon May 20 18:34:17 EDT 2024
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Public Input No. 61-NFPA 54-2024 [Section No. 7.2.4]

~~**7.2.4** – Gas Piping to Be Sloped.~~

~~Piping for other than dry gas conditions shall be sloped not less than **1**⁄**4** in. in 15 ft (7 mm in 4.6 m) to prevent traps.~~

Statement of Problem and Substantiation for Public Input

This requirement is a legacy requirement from when commercially available gas contained condensates. This requirement is misleading. There is no commercial standard that definitively identifies what non-dry gas is and when this should be applied or enforced. It also does not say in what direction the piping is supposed to be sloped.

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Public Input No. 62-NFPA 54-2024 [Section No. 7.2.5]

7.2.5* Prohibited Locations.

Gas piping inside any building shall not be installed in or through a clothes chute, chimney or gas vent, dumbwaiter, elevator shaft, or air duct~~, other than combustion air ducts~~ .

Statement of Problem and Substantiation for Public Input

It is not safe to allow for gas piping to be installed within combustion air ducts for the same reasons that all of the other locations are prohibited. Leaks of gas into combustion air ducts could immediately communicate flammable mixtures to ignition sources. This could burn back through the duct and make for a catastrophic explosion and fire.

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Public Input No. 68-NFPA 54-2024 [Section No. 7.4.1]

7.4.1 Pressure Reduction.

The following are requirements for pressure reduction piping installation and regulators installed within chases:

a) 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.

b) Regulator venting and downstream overpressure protection shall comply with 5.7.5 and Section 5.8 .

7.4.1.1 Regulator Venting

The regulator shall be accessible for service and repair and vented in accordance with one of the following:

a) Where the fuel gas is lighter than air, regulators equipped with a vent limiting means shall be permitted to be vented into the chase.

~~Regulators~~

b) Where the fuel gas is lighter than air, 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.

c) Where the fuel gas is heavier than air, the regulator vent shall be vented only directly to the outdoors in a manner that provides for a discharge location at least 12" below the top of the chase .

Statement of Problem and Substantiation for Public Input

The previous language had bundled many requirements into a limited number of paragraphs contrary to manual of style requirements. The heavier than air venting requirement called for a discharge point only directly to the outdoors which could have made for a point simply above the vertical chase allowing for heavier than air discharges to fall back down into the chase. This could make for an accumulation of flammable gases and make for an explosion hazard.

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Submittal Date: Tue May 28 18:02:11 EDT 2024
Committee: NFG-AAA

Public Input No. 69-NFPA 54-2024 [Section No. 7.7.1.2]

7.7.1.2

Outlets shall not be located ~~behind doors~~ in concealed areas with limited access for making connections or accessing valves .

Statement of Problem and Substantiation for Public Input

Everything is located behind a door. The intent of this is for installations to not be made in concealed areas with limited access.

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Submittal Date: Tue May 28 18:29:09 EDT 2024
Committee: NFG-AAA

Public Input No. 70-NFPA 54-2024 [Section No. 7.7.1.3]

~~7.7.1.3~~ –

~~Outlets shall be located far enough from floors, walls, patios, slabs, and ceilings to permit the use of wrenches without straining, bending, or damaging the piping.~~

Statement of Problem and Substantiation for Public Input

7.7.1.3 is not consistent with 7.7.1.4 or 7.7.1.5. It's either enough to prevent straining of the pipe or its 7.7.1.4 or 7.7.1.5, If I leave enough of the connection sticking up, 1" or 2" then it appears that the requirement for "no straining" is met.

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Submittal Date: Tue May 28 18:31:27 EDT 2024
Committee: NFG-AAA

Public Input No. 71-NFPA 54-2024 [Section No. 7.7.2.1]

7.7.2.1

Each outlet, including a valve, shall be closed gastight with a threaded plug or cap immediately after installation ~~and~~ .

7.7.2.2

Each outlet shall be left closed until the appliance or equipment is connected thereto.

7.7.2.3

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.

Statement of Problem and Substantiation for Public Input

The existing languages had multiple requirements within the same paragraphs contrary to the manual of style.

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Committee: NFG-AAA

Public Input No. 72-NFPA 54-2024 [Section No. 7.7.2.1]

7.7.2.1

Each outlet ~~, including~~ shall contain a valve ~~, shall be closed~~ and be closed gastight with a threaded plug or cap~~- immediately after installation and shall~~ , including on the valve outlet, immediately after installation.

7.7.2.2

Outlet valves shall be left closed until the appliance or equipment is connected thereto.

7.7.2.3

Outlets are not to be opened for connecting or disconnecting appliances once the system is energized with gas unless the piping is purged out of service in accordance with the provisions of section 8.3.

7.7.2.4

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.

Statement of Problem and Substantiation for Public Input

The previous language had multiple shall statements contrary to the manual of style. Also, the previous language did not make it clear that once systems are energized they cannot be opened and gas released unless these systems meet the purging requirements of chapter 8. The current language also does not require valves. The implications are that you can take an energized system apart and let the gas come into the building. This section is clearly aimed at residential installations but has serious hazardous implications for the commercial and industrial gas piping worlds.

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Submittal Date: Tue May 28 18:38:47 EDT 2024
Committee: NFG-AAA

Public Input No. 81-NFPA 54-2024 [Section No. 7.11]

7.11 Systems Containing Flammable Gas–Air Mixtures.

7.11.1

~~– Required Components.~~

~~A central premix system with a flammable mixture in the blower or compressor shall consist of the following components:~~

(1) ~~Gas-mixing machine in the form of an automatic gas–air proportioning device combined with a downstream blower or compressor~~

(2) ~~Flammable mixture piping, minimum Schedule 40~~

(3) ~~Automatic firecheck(s)~~

(4) ~~Safety blowout(s) or backfire preventers for systems utilizing flammable mixture lines above 2 1/2 in. (64 mm) nominal pipe size or the equivalent~~

~~**7.11.2** – Optional Components.~~

~~The following components shall also be permitted to be utilized in any type of central premix system:~~

(1) ~~Flowmeter(s)~~

(2) ~~Flame arrester(s)~~

~~**7.11.3** – Additional Requirements.~~

~~Gas-mixing machines shall have nonsparking blowers and shall be constructed so that a flashback does not rupture machine casings.~~

~~**7.11.4** * – Special Requirements for Mixing Blowers.~~

~~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. 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. No valves or other obstructions shall be installed between the blower discharge and the burner or burners.~~

~~**7.11.5** – Installation of Gas-Mixing Machines.~~

~~**7.11.5.1** * – Location.~~

~~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. Such rooms or belowgrade installations shall have adequate positive ventilation.~~

~~**7.11.5.2** – Electrical Requirements.~~

~~**7.11.5.2.1** –~~

~~Where gas-mixing machines are installed in well-ventilated areas, the type of electrical equipment shall be in accordance with *NFPA 70* for unclassified areas unless other hazards require classification of the area.~~

~~**7.11.5.2.2** –~~

~~Where gas-mixing machines are installed in small detached buildings or cutoff rooms, the small detached building or cutoff room shall be classified Class I, Division 2.~~

~~**7.11.5.3** – Air Intakes.~~

~~Air intakes for gas-mixing machines using compressors or blowers shall be taken from outdoors whenever practical.~~

~~**7.11.5.4** * – Controls.~~

~~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. Except for open burner installations only, the controls shall be interlocked so that the blower or compressor stops operating following a gas supply failure. Where a system employs pressurized air, means shall be provided to shut off the gas supply in the event of air failure.~~

~~**7.11.5.5** – Installation in Parallel.~~

~~Centrifugal gas-mixing machines in parallel shall be reviewed by the user and equipment manufacturer before installation, and means or plans for minimizing the effects of downstream pulsation and equipment overload shall be prepared and utilized as needed.~~

~~**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 provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 2 1/2 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. 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. 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. Check valves shall not be used for this purpose.~~

(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. Provisions shall be provided for automatically shutting off the supply of the gas–air mixture in the event of rupture.~~

Systems containing flammable gas-air mixtures shall be designed in accordance with engineering methods.

7.11.2 Equipment used in flammable gas-air mixtures shall be selected in accordance with engineering methods.

Statement of Problem and Substantiation for Public Input

Section 7.11 is proposed to be deleted and replaced with a performance requirement that requires engineering methods.
To my knowledge, the committee has no members who routinely design gas piping system containing flammable gas-air mixtures or who have knowledge of such systems. I am advised by staff that no questions on this section have been asked in a long time (possibly decades). Such systems are used, but appear to be of a propriety nature designed using experience and engineering methods.
I am also not aware of fires in flammable gas-air mixture systems being a problem

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Submittal Date: Thu May 30 22:18:08 EDT 2024
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Public Input No. 18-NFPA 54-2024 [Section No. 8.1.1.11]

8.1.1.11*

Prior to testing, the interior of the pipe shall be ~~cleared~~ purged of all foreign material.

Statement of Problem and Substantiation for Public Input

"Purged" has a more specific and technical connotation in the context of piping systems compared to "cleared." It implies a thorough process to remove contaminants, whereas "cleared" could be interpreted more generally and less rigorously.
In the gas piping industry, the term "purged" is standard practice. When gas pipes are fitted, they are typically purged to remove air, moisture, and any potential contaminants to ensure the pipe is safe and ready for use.
"Purging" specifies the use of a controlled and deliberate method to ensure the pipe is free of contaminants, which is essential in maintaining the integrity and safety of the gas piping system.

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Submittal Date: Tue May 14 10:13:49 EDT 2024
Committee: NFG-AAA

Public Input No. 22-NFPA 54-2024 [Section No. 8.1.3.1]

8.1.3.1

Pipe joints ~~, 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.

A.8.1.3.1 Welded pipe joints must be left exposed for examination as well as threaded joints.

Statement of Problem and Substantiation for Public Input

A weld is a pipe joint and including it in the requirement is redundant. Moving to Annex A provides this explanation.

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Submittal Date: Wed May 15 08:37:01 EDT 2024
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Public Input No. 49-NFPA 54-2024 [Section No. 8.2.3]

8.2.3* Leak Check.

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 in-service portion of the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

Statement of Problem and Substantiation for Public Input

8.2.3 as written does not lead to a leak test of the “Piping System” only the "in service" portion of the system. This creates a non-compliance issue if a portion of the system is isolated within the premises with an open, uncapped, unplugged line or valve with no appliance connected. Additionally, the "Piping System" as defined in 3.3.95.6 cannot be confirmed to have been leak tested, again, only the "in service" portion will have been tested.

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Submittal Date: Thu May 23 14:41:16 EDT 2024
Committee: NFG-AAA

Public Input No. 64-NFPA 54-2024 [Section No. 8.3.1 [Excluding any Sub-Sections]]

The purging of piping systems shall be in accordance with 8.3.1.1 through 8.3.1.4 where the piping system meets either of the following:
The

~~design operating gas pressure is greater than 2 psig (14 kPag).The~~
piping being purged contains one or more sections of pipe or tubing meeting the size and length criteria of Table 8.3.1 .

Table 8.3.1 Size and Length of Piping*

Nominal Piping Size (in.)	Length of Piping (ft)
≥2½ <3	> 50
≥3 <4	> 30
≥4 <6	> 15
≥6 <8	> 10
≥8	Any length

For SI units, 1 in. = 25.4 mm; 1 ft = 0.305 m.

* CSST EHD size of 62 is equivalent to 2 in. nominal size pipe or tubing.

Statement of Problem and Substantiation for Public Input

There is no technical basis to allow any piping system of any size that operates at 2 psig to be purged to the indoors of a building. This is totally contrary to the intent of what the US Chemical Safety Board and others have requested of NFPA. Identifying instead the use of tables at least provides some element of protection since it limits the volume of flammable materials released. Defining purging requirements by anything having to do with operating pressures makes no technical sense since purging is defined as the act of removing residuals in the pipe with inert materials. Piping systems of every pressure are depressurized to the same residual atmospheric state when purging occurs. Operating pressure is has nothing to do with the safety or relative hazard at all.

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Public Input No. 74-NFPA 54-2024 [Section No. 8.3.1 [Excluding any Sub-Sections]]

The purging of piping systems shall be in accordance with 8.3.1.1 through 8.3.1.4 where the piping system meets either of the following:

(1) The design operating gas pressure is greater than 2 psig (14 kPag).

(2) ~~The piping being purged contains one or more sections of pipe or tubing meeting the size and length criteria of Table 8.3.1 .~~

~~Table 8.3.1 Size and Length of Piping*~~

~~Nominal Piping Size~~

~~(in.) Length of Piping~~

~~(ft) ≥2 1/2 <3 > 50 ≥3 <4 > 30 ≥4 <6 > 15 ≥6 <8 > 10 ≥8 Any length~~

~~For SI units, 1 in. = 25.4 mm; 1 ft = 0.305 m.~~

~~* CSST EHD size of 62 is equivalent to 2 in. nominal size pipe or tubing.~~

(1)

Statement of Problem and Substantiation for Public Input

The table provided implies that no worker would be hurt by the amount of gas released that would make for a flash fire in that person's presence. In fact, each size/configuration in the table provided calls for the release of about 3 cubic feet of gas. Since the LEL of natural gas is generally accepted to be about 4.3%, then 3 cubic feet of gas can make about 70 cubic feet of a flammable mixture. This means that the table accepts the worker being in a flammable envelope about 4'X4'X4'. Flash fires lasting only seconds can cause extensive damage. The deminimus TG found no historical scientific basis for the figures given. Hence there is no rational technical justification for this table and it should no longer exist in this document as it makes for a public safety hazard.

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Public Input No. 100-NFPA 54-2024 [Section No. 8.3.1.3]

8.3.1.3 Outdoor Discharge of Purged Gases.

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. 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.~~

(6)

Statement of Problem and Substantiation for Public Input

There is no technical basis for providing the distance that is given. The document is for natural gas up to 125 psig. Purging methods can include pressure purging. Providing distances like this with no testing to validate them is going to get people hurt and killed. This information is misleading and should not be in this document.

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Committee: NFG-AAA

Public Input No. 101-NFPA 54-2024 [Section No. 8.3.1.3]

8.3.1.3 Outdoor Discharge of Purged Gases.

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. 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)~~ Engineering methods shall be used to identify safe distances for the point of discharge from sources of ignition,~~ at least 10 ft (3.0 m) from building openings and at least 25 ft (7.6 m) from~~ building openings, mechanical air intake openings, and for determining safe evacuation distances for personnel not involved in the purging operation .

(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.~~

Statement of Problem and Substantiation for Public Input

There is no technical basis for providing the distances that are given. The document is for natural gas up to 125 psig. Purging methods can include pressure purging. Providing distances like this with no testing to validate them is going to get people hurt and killed. These are misleading and should not be in this document. Engineering methods are described as a process or technique to be used in this document to size gas piping. Likewise, engineering methods can be applied here to identify safe distances.

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Public Input No. 104-NFPA 54-2024 [Section No. 8.3.1.3]

8.3.1.3 Outdoor Discharge of Purged Gases.

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. 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) out of service operations should be concluded when a combustible gas detector indicates no further presence of fuel gas .

(6) Persons not involved in the purging operations shall be evacuated from all areas within 10 ft (3.0 m) of the point of discharge.

Statement of Problem and Substantiation for Public Input

This section discusses purging out of service. The 90% concentration and combustible gas indicator is not relevant for this part of the work. A combustible gas indicator could be used for identifying a target purge point but a combustible gas detector can serve the same purpose.

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Public Input No. 99-NFPA 54-2024 [Section No. 8.3.1.3]

8.3.1.3 Outdoor Discharge of Purged Gases.

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. 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.

Statement of Problem and Substantiation for Public Input

There is no technical basis for providing the distances that are given. The document is for natural gas up to 125 psig. Purging methods can include pressure purging. Providing distances like this with no testing to validate them is going to get people hurt and killed. These are misleading and should not be in this document.

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Public Input No. 103-NFPA 54-2024 [Section No. 8.3.2]

~~**8.3.2.1** * – Purging Procedure.~~

~~The piping system shall be purged in accordance with one or more of the following:~~

- ~~The piping shall be purged with fuel gas and shall discharge to the outdoors.~~
- ~~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. Such burner shall be provided with a continuous source of ignition.~~

~~The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner~~

8.3.2* ~~Piping Systems Allowed to Be Purged Indoors or Outdoors.~~

~~The purging of piping systems shall be in accordance with the provisions of 8.3.2.1 where the piping system meets both of the following:~~

(1) ~~The design operating pressure is 2 psig (14 kPag) or less.~~

(2) ~~The piping being purged is constructed entirely from pipe or tubing not meeting the size and length criteria of Table 8.3.1 .~~

Purging into service

Gas piping systems shall be purged into service with fuel gas using one of the following methods.

8.3.2.1 Discharge of mixed gases during purging into service

The discharge of mixed indeterminate gases during purging into service shall be discharged in one of the following methods.

(1) Residual gas can be consumed through a burner or flare that has a continuous source of ignition ~~and~~ , that is designed for such purpose and has the surrounding environment monitored to verify that carbon monoxide levels do not exceed 50 ppm at locations where personnel can be exposed .

(2) 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~~ indicator in accordance with 8.3. ~~2~~ 1 . ~~2.~~ 4 Purging shall be stopped when fuel gas is ~~detected~~ at a 90% concentration or greater at the equipment isolation valve .

(3) The piping shall be purged by the gas supplier in accordance with written procedures.

8.3.2.2 Combustible Gas Detector.

Combustible gas detectors shall be listed and calibrated or tested in accordance with the manufacturer's instructions. Combustible gas detectors shall be capable of indicating the presence of fuel gas.

Statement of Problem and Substantiation for Public Input

This section is all about purging into service. The use of appliance with continuous ignition can be very dangerous with indeterminate mixtures coming into the system. The use of only devices or burners meant for this purpose provides for a greater level of safety. Also, this is the section where 90% concentration should be discussed. It is also the section where an indicator and not a detector is required.

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Committee: NFG-AAA

Public Input No. 102-NFPA 54-2024 [Section No. 8.3.2 [Excluding any Sub-Sections]]

The purging of piping systems shall be in accordance with the provisions of 8.3.2.1 where the piping system meets ~~both of~~ the following:

(1) The
~~design operating pressure is 2 psig (14 kPag) or less.~~

(2) ~~The~~ piping being purged is constructed entirely from pipe or tubing not meeting the size and length criteria of Table 8.3.1.

Statement of Problem and Substantiation for Public Input

There is no technical basis to allow any piping system of any size that operates at 2 psig to be purged to the indoors of a building. This is totally contrary to the intent of what the US Chemical Safety Board and others have requested of NFPA. Identifying instead the use of tables at least provides some element of protection since it limits the volume of flammable materials released. Defining purging requirements by anything having to do with operating pressures makes no technical sense since purging is defined as the act of removing residuals in the pipe with inert materials. Piping systems of every pressure are depressurized to the same residual atmospheric state when purging occurs. Operating pressure is has nothing to do with the safety or relative hazard at all.

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Public Input No. 106-NFPA 54-2024 [Section No. 9.1.1.3]

9.1.1.3–

~~The unlisted appliance, equipment, or accessory shall be safe and suitable for the proposed service and shall be recommended for the service by the manufacturer~~

Risk Assessment of Unlisted Appliances

Unlisted appliances shall be assessed for risks before they are put into service in accordance with the following:

a) A PHA (process hazard analysis), shall be conducted on unlisted equipment to assess the equipment risks.

c) Documentation of the PHA shall be maintained onsite and made available to the AHJ upon request .

Statement of Problem and Substantiation for Public Input

The previous language was not enforceable and vague. It did not support enforcement or public safety. More than half of NFPA documents call for risk assessments and PHA's. This is not a new concept or term. The intent of the previous text before submission of this PI was to give some method to provide assurance that something unlisted was safe. PHA's provide an objective means to do this using well known process safety processes. The proposed language also puts something objective in the hands of enforcement officials, (AHJ's) that allows them to understand the equipments risks.

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Submittal Date: Mon Jun 03 20:07:03 EDT 2024
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Public Input No. 107-NFPA 54-2024 [Section No. 9.1.4]

~~**9.1.4** – Safety Shutoff Devices for Unlisted LP-Gas Appliances Used Indoors.~~

~~Unlisted appliances for use with undiluted LP-Gases and installed indoors, except attended laboratory equipment, shall be equipped with safety shutoff devices of the complete shutoff type.~~

Statement of Problem and Substantiation for Public Input

The proposed language is not within the scope of this document. It speaks to the design of the fuel train of equipment. This document addresses only up to equipment isolation valves. Other problems are, what is the dilution rate of the LP gas that is the subject of this, what is a complete shut off safety shut off device? what is a device, did this mean valves? Again, why would we be discussing valves here related to an equipment fuel train. This should be in NFPA 58.

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Submittal Date: Mon Jun 03 20:34:50 EDT 2024
Committee: NFG-AAA

Public Input No. 108-NFPA 54-2024 [Section No. 9.1.5]

9.1.5 Use of Air or Oxygen Under Pressure.

Where air or oxygen under pressure is ~~used in connection with~~ connected to the gas supply ~~;~~ ~~effective means such as a back pressure regulator and relief valve shall be provided to prevent~~ engineering methods approved by the AHJ shall be implemented to prevent air or oxygen from passing back into the gas piping. ~~Where oxygen is used, installation shall be in accordance with NFPA 51~~

Exception: This does not apply to listed burners providing air under pressure to be mixed with gas .

Statement of Problem and Substantiation for Public Input

The proposed language was not enforceable. It was also not technically sound. Instead of calling for check valves to prevent reverse flow it called for backpressure valves and or relief valves. It also called for NFPA 51 use when oxygen was in use. NFPA 51 is for oxy fuel systems for cutting and welding and allied processes. What is I was building or connecting a glass melting furnace where oxy fuel burners are typical. Are you telling me here to not use NFPA 86 standard for ovens and furnaces and instead use 51? This makes no sense. This document calls for engineering methods to be used for pipe sizing and other things, there can also be applied here. It also makes sense for special circumstances like this to have the AHJ be involved and informed.

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Submittal Date: Mon Jun 03 20:46:55 EDT 2024
Committee: NFG-AAA

Public Input No. 109-NFPA 54-2024 [Section No. 9.1.6.1]

9.1.6.1

Where corrosive or flammable process fumes ~~or~~ , gases, ~~such as carbon~~ or aerosol sprays, including but not limited to carbon monoxide, hydrogen sulfide, ammonia, chlorine, and halogenated hydrocarbons, ~~as~~ are present ~~, means for their~~ in combustion air in concentrations that can degrade the safety of the fired equipment, one of the following accommodations shall be made.

a. Means for their removal or safe disposal shall be provided.

b. The fired equipment shall be located or relocated to an area of the facility that is provided with combustion air in accordance with this documents requirements that is not contaminated.

c. The appliance shall be of a design that takes outside air directly from the outdoors, (direct vent).

Statement of Problem and Substantiation for Public Input

Lists are not welcomed in the manual of style. It is proposed that this list be identified as not inclusive of everything that can be a problem. It makes no sense that simply the presence of these is a problem, the concentration has to be such that it is problematic and it has to be in the combustion air. The remedy also has to include cleaning or removing this air.

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Public Input No. 110-NFPA 54-2024 [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 Input

This is redundant with 9.1.6.1 the previous section. PI 109 addresses a means to combine these into one statement that is more clear and comprehensive.

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Submittal Date: Mon Jun 03 21:07:19 EDT 2024
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Public Input No. 111-NFPA 54-2024 [Section No. 9.1.9]

~~**9.1.9** – Flammable Vapors.~~

~~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. Appliances installed in compliance with 9.1.10 through 9.1.12 shall be considered to comply with the intent of this provision.~~

Statement of Problem and Substantiation for Public Input

Addressing flammable liquids and vapors is outside the scope of this document. These are addressed in NFPA 30. This section would prohibit the use of many heat processes used in industry. In automotive paint shops for example, flammable liquids are used in the solvents for paints and then applied next to paint drying ovens. The final sentence clearly implies that this is all about residential issues. This section does not need to be here and does not provide value.

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Public Input No. 112-NFPA 54-2024 [Section No. 9.3.1.1]

9.3.1.1

Air for combustion, ventilation, process, 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. Where the requirements of 9.3.2 are not met, 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.

Statement of Problem and Substantiation for Public Input

section 9.1.7 defines process air to be a critical consideration and even identifies in the context of combustion air, yet when we talk about combustion air we don't mention it at all. It's vital that process air be also considered when identifying combustion air needs and the document should say that.

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Submittal Date: Mon Jun 03 21:29:12 EDT 2024
Committee: NFG-AAA

Public Input No. 29-NFPA 54-2024 [Section No. 9.3.2.2]

9.3.2.2* Known Air Infiltration Rate Method.

Where the air infiltration rate of a structure is known, the minimum required volume shall be determined as follows:

(1) ~~For appliances other than fan assisted, calculate~~ Calculate using the following equation:

$$\text{Required Volume}_{other} \geq \frac{21\ \text{ft}^3}{ACH}\left(\frac{I_{other}}{1000\ \text{Btu/hr}}\right) \qquad \text{[9.3.2.2a]}$$

(2) ~~For fan-assisted appliances, calculate using the following equation:~~

$$\text{Required Volume}_{fan} \geq \frac{15\ \text{ft}^3}{ACH}\left(\frac{I_{fan}}{1000\ \text{Btu/hr}}\right) \qquad \text{[9.3.2.2b]}$$

~~all appliances other than fan-assisted input (Btu/hr~~

where:

~~I other =~~

~~(remove the words "other" from the formula)~~

~~I~~

~~fan = fan-assisted appliance input (Btu/hr)~~

~~= Btuh input of the appliances in the space~~

~~*ACH* = air change per hour (percent of volume of space exchanged per hour, expressed as a decimal)~~

~~[9.3.2.2b]~~

(3) For purposes of ~~these calculations~~ this calculation , an infiltration rate greater than 0.60 *ACH* shall not be used in ~~Equations 9~~ Equation 9 .3.2.2a- ~~and 9 .3.2.2b.~~

Statement of Problem and Substantiation for Public Input

Section 9.3 covers Air for Combustion and Ventilation. The ventilation aspect of the deleted formula was not considered when reducing the volume requirement for fan-assisted appliances. The ventilation aspect is not just cooling of the appliance; it is also for ventilating a space in the event the flue products do not go up the vent. The upper ventilation opening (withing 12" of the ceiling) allows trapped flue products to exit outdoors or to the living space if that's the source of the combustion air. If flue products enter the living space, this code (9.3.2) requires the volume be large enough and the space be leaky enough to dilute the flue products to a less harmful level. This is the rationale behind Sections 10.6 (Decorative Appliances), 10.7 (Gas Fireplaces, Vented), and 10.21 (Room Heaters - vented and unvented) referencing Section 9.3 for Combustion and Ventilation Air. Other Sections in Chapter 10 reference Section 9.3 also. If you have an unvented heater, the space needs to adhere to Section 9.3 volume requirements. Logically, two appliances of the same input should have the same volume requirement for ventilation. There should not be a distinction between draft-hood or fan-assisted appliances.

Text from the 2002 handbook (when these formulas were first introduced) states: "The importance of combustion, dilution and ventilation air...cannot be overemphasized. Typical gas-fired natural draft (draft hood) furnaces require approximately 21 ft3 of air (i.e., combustion, vent dilution and ventilation) for every cubic foot of gas burned. Although modern fan-assisted combustion system furnaces do not need dilution air, they still require approximately 15 ft3/hr for each cubic foot of gas burned." It appears that the 21 and 15 numbers came from the fact that fan-assisted appliances do not require dilution air thus the volume requirement was lower. This does not consider the ventilation aspect if the appliance vent malfunctioned, and flue products entered the living space.
Additionally, this position seems to be supported with the following text from the same handbook: "The increased use of gas for heating and the popularity of "closet furnaces" following WWII resulted in AGA Research Bulleting #53, "The Effects of Confined Space Installation on Central Gas Space Heating Equipment Performance" published in 1947. The study resulted in a requirement, included in the 1950 edition of the standards...for two air openings into the confined space...and communicating with an area having "adequate infiltration".

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Submittal Date: Mon May 20 10:44:14 EDT 2024
Committee: NFG-AAA

Public Input No. 113-NFPA 54-2024 [Section No. 9.3.7.1]

9.3.7.1 Louvers and Grilles.

Louvers and grilles used to provide combustion air needs shall be designed and installed as follows:

a) The required size of openings for combustion, ventilation, and dilution air shall be based on the net free area of each opening.

b) 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.

c) 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.

d) Nonmotorized louvers and grilles shall be fixed in the open position.

Statement of Problem and Substantiation for Public Input

The previous language had multiple shall statements and did not meet the manual of style requirements.

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Public Input No. 114-NFPA 54-2024 [Section No. 9.3.7.3]

9.3.7.3 Motorized Louvers.

Motorized louvers for combustion air shall be designed and installed as follows:

a) Motorized louvers shall be interlocked with the appliance so they are all proven in the full open position prior to main burner ignition and during main burner operation.

b) 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 any of the louvers close during burner operation.

Statement of Problem and Substantiation for Public Input

The previous language did not meet manual of style requirements having multiple shall statements. It also did not call for ALL if the louvers to have to be proven open or if in a failed condition.

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Public Input No. 89-NFPA 54-2024 [Section No. 9.6.8]

9.6.8 Sediment Trap.

9.6.8.1 Where an appliance is served by piping 2 in. and larger a sediment trap

~~is not incorporated as a part of the appliance, a sediment trap~~

consisting of 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 shall be installed

9.6.8.2 Appliances served by piping smaller than 2 in. shall not be required to have a sediment trap.

9.6.8.3 The 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.

~~The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure~~

9.6.8

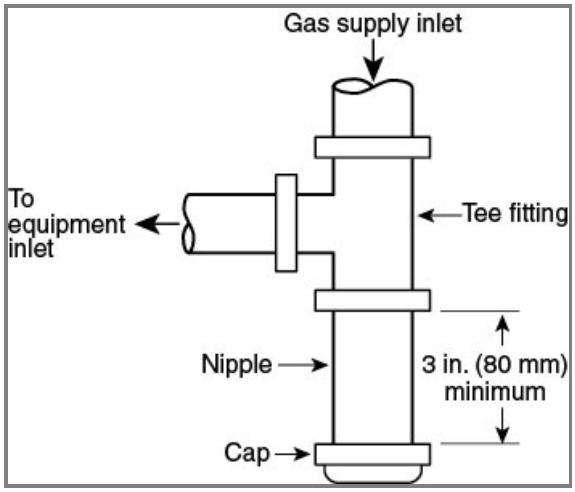
~~, or another device recognized as an effective sediment trap. Illuminating~~

.4 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~~

have a sediment trap .

Figure 9.6.8 Method of Installing a Tee Fitting Sediment Trap.



Statement of Problem and Substantiation for Public Input

Sediment traps have been required in the Code since the 1980 edition, which was the second edition of the National Fuel Gas Code. The first edition of the Gas Code was issued in 1974, combining five standards:

1. NFPA 54-1969 (ANSI Z21.30), Installation of Gas Appliances Gas Piping
2. NFPA 54A-1969 (ANSI Z83.1), Industrial Gas Piping and Equipment
3. ASME B31.2 Fuel Gas Piping

This is described in the Origin and Development in the introduction pages of the Code.

There has been discussion about sediment traps in previous committee meetings. A proposal was introduced, and after discussion it was not accepter. I have had numerous questions during seminars and from installers asking why sediment traps were needed, stating that they have inspected many sediment traps in their work, but never found anything inside in them.

I am advised that sediment traps evolved from drip legs, which are identical. Prior to natural gas replacing manufactured gas drip legs were needed to remove the water that was introduced into manufactured gas during the distribution process. I have also been advised that occasionally liquids are inadvertently added to natural gas due to faulty pipeline compressors. Sediment traps can serve to remove debris in new piping systems, but beyond an initial period they may no longer provides a useful function.

The sediment trap must have a vertical leg of 3 in. or more. It is noted that another gas piping code requires a sediment trap but has no minimum length of the vertical leg, which could be a closely coupled pipe cap. I am not aware of the technical substantiation for this smaller distance. If many sediment traps with just a pipe cap have been installed and allow normal appliance function, it may be that the sediment trap is not needed. I have no engineering substantiation to modify this requirement, but anecdotes reported over the years from plumbers and other piping system installers indicate that many with experience in the field do not believe that they serve a useful purpose.

As the experience reported experience relates to residential and commercial piping systems, the requirement for a sediment trap is retained for the larger pipe sizes used in industrial installations.

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Submittal Date: Sat Jun 01 21:51:15 EDT 2024
Committee: NFG-AAA

Public Input No. 122-NFPA 54-2024 [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.

Additional Proposed Changes

File Name	Description	Approved
54_PC_2_Held.pdf	54_PC2	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 2 of the (A2023) Second Draft Report for NFPA and per the Regs. At 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

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.

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Submittal Date: Thu Jun 06 18:42:12 EDT 2024
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

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Submittal Date: Sat Mar 19 07:25:32 EDT 2022
Committee: NFG-AAA

Committee Statement

Committee Action: Rejected but held
Resolution: This subject is new material for this cycle and will be considered for the next cycle.

Public Input No. 84-NFPA 54-2024 [Section No. 10.24.2]

10.24.2 Support.

~~Suspended~~ Hangers and brackets used to support suspended -type unit ~~heaters shall be safely and adequately supported, with due consideration given to their weight and vibration characteristics. Hangers and brackets shall be~~ heaters shall be of noncombustible material.

Statement of Problem and Substantiation for Public Input

The sentence proposed to be deleted does not contain a specific requirement, and is unenforceable.
As an alternate to deletion, it could be revised to read:
Suspended-type unit heaters shall be installed in accordance with the manufacturer's installation instructions or engineering methods.

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Submittal Date: Thu May 30 22:29:26 EDT 2024
Committee: NFG-AAA

Public Input No. 82-NFPA 54-2024 [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 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~~ input of 5,000 btu/hr. or less such as laboratory burners or gas lights

Statement of Problem and Substantiation for Public Input

The current requirement is vague. An limit of 5,000 btu/hr. is suggested with no technical basis. It is understood that many gas lights have an input of less than 5,000 btu/hr. A specific limit is needed to make this requirement enforceable.

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Submittal Date: Thu May 30 22:22:51 EDT 2024
Committee: NFG-AAA

Public Input No. 105-NFPA 54-2024 [Sections 12.5.2, 12.5.3, 12.5.4]

Sections 12.5.2, 12.5.3, 12.5.4

12.5.2 Plastic Piping.

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. 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.~~

~~Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions. Plastic pipe venting materials~~

P lastic Venting Test Port.

Where the appliance manufacturer does not provide provisions for combustion gas analysis through a test port, a test tee fitting from the vent manufacturer shall be installed. The test tee fitting shall be listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV* ~~,~~ and shall be installed ~~in accordance with~~ on the ~~vent manufacturer's installation instructions. Where primer is required, it shall be of a contrasting color.~~ exhaust vent directly above and within 2 ft of the appliance.

12.5.4 Special Gas Vents.

Special gas vents shall be listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV,* and installed in accordance with the special gas vent manufacturer's installation instructions.

Statement of Problem and Substantiation for Public Input

IPEX is a manufacturer of thermoplastic systems for the mechanical (including plumbing), electrical and municipal sectors. In the mechanical sector we manufacture DWV products as well as products specifically designed for flue gas venting. Its our belief that a system as critical as flue gas venting should be designed for that purpose and meet industry standards written for the application. This proposal would mandate that the appliance manufacturer specify the vent material type and that only plastic venting listed and labelled to UL 1738 would be permitted for venting the appliance. We are also proposing provisions for a test tee when the appliance does not include these provisions.

Generic plastic plumbing products including PVC and ABS are being installed for the most part as mandated by the appliance standards so long as they comply with specific ASTM and CSA standards. The ASTM and CSA standards referenced by the appliance manufacturers are for plumbing applications and do not include provisions for venting of combustion gases. The scope of these standards includes DWV and water applications only and in most cases, there are notes warning that the products defined in the standards do not include provisions for flue gas venting. In one case ASTM D1785 references UL 1738 as the appropriate standard for flue gas venting. This makes sense when you consider that at ASTM the voting members for these standards have no expertise in flue gas venting. The appliance standards contain some testing for venting, but the testing is minimal when compared to UL 1738. Several PVC manufacturers have gone on record for not supporting the use of their PVC product for FGV applications.

Flue Gas Venting (FGV) systems are used to remove lethal combustion gases, namely carbon monoxide, generated by heating appliances from homes and businesses. Because venting systems

provide this essential safety feature, they must be built, installed, and maintained to the appropriate standard for this specialized function. Standard UL 1738 consists of stringent requirements for venting systems intended for venting category II, III, and IV gas-burning appliances.

Various US States have recognized the safety advantages of UL 1738 listed venting products. These include Idaho, New York, Connecticut, Massachusetts, Rhode Island, Minnesota, and Wisconsin who are all considering or have mandated certain requirements related to UL 1738.

The proposal for test tees reinforces the need for safe installation and testing practices. Too many contractors are drilling holes in the exhaust vent and then sealing the hole by inappropriate means such as duct tape. Not only does this practice of drilling a hole in the vent pipe compromise the integrity of the vent system, it also creates an opportunity for CO leakage which jeopardizes public safety. A properly installed test port designed for the application will provide safe access to the flue gases when testing appliance combustion.

The US Environmental Agency website states: “Carbon monoxide (CO) can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.” Failed venting of gasses from burning fossil fuels can result in raised levels of CO. A recent CPSC hearing to consider mandating carbon monoxide detectors heard presentations on incidents which have injured or killed building occupants. Venting failures were not noted specifically as data for the cause of these failures is not readily gathered or available. Here are links to the hearing which includes testimony from the appliance industry and affected building occupants and family members.

CPSC Commission Hearing | Residential Gas Furnaces and Boilers NPR; Oral Presentations (youtube.com)

https://www.regulations.gov/document/CPSC-2019-0020-0051

According to the incident data included in the CPSC’s NPR, residential gas furnaces and boilers are associated with a risk of carbon monoxide poisoning. Between 2017-2019, there were annually an estimated 21 CO-related deaths associated with gas furnaces and boilers. From 2000-2019, these products were associated with a total of 539 deaths from CO poisoning. CPSC staff estimates that the aggregate number of nonfatal CO-related injuries from 2014 to 2018 was 30,587, with 22,817 of these treated in an outpatient setting, 7,358 resulting in emergency department treatment, and 412 resulting in hospital admissions. When it comes to the safety of families and workers, it makes sense to use plastic vent materials that meet the UL 1738 safety standard.

In Canada, the CSA B149 gas code adopted the ULC S636 standard for non-metallic FGV systems, and IPEX responded with System 636®, an FGV system that meets the performance standards, installation, and safety requirements. Note that ABS and cell core products will not pass ULC S636 or UL 1738 testing. The ULC S636 requirement was prompted by Canadian safety authorities due to identified failures in several existing plastic gas vents—predominately ABS plastic pipe and fittings—such as environmental stress, cracking, and adverse heat effects. This code change has made a positive impact on the safety of flue gas venting in Canadian homes and businesses. Since 2007, inspectors can now confidently verify, in non-metallic systems, that the critical standards of safety and installation have been met.

Finally, both UL 1738 and ULC S636 mandate that the pipe, fittings, and cement be from one manufacturer. This is another level of security to ensure proper fitted joints. The ASTM and CSA plumbing DWV standards contain minimum and maximum dimensional tolerances for the OD and ID for pipe and fittings. Products at the ends of each scale from different manufacturers may not provide the required fit for a proper solvent weld joint. Having a system of pipe, fittings, and cements from one manufacturer removes the risk of improper fitted joints and potential carbon monoxide (CO) leakage.

Submitter Information Verification

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Committee: NFG-AAA

Public Input No. 16-NFPA 54-2024 [Section No. A.1.1.1.1(A)]

A.1.1.1.1(A)

The final pressure regulator in an undiluted liquefied petroleum gas (LP-Gas) system can include any one of the following:

(1) The second stage regulator or integral two-stage regulator

(2) A 2 psi (14 kPa) service regulator or integral 2 psi (14 kPa) service regulator

(3) A single-stage regulator, where single-stage systems are permitted by NFPA 58.

An equipment isolation valve is intended to be a manual 1/4 turn isolation valve as is required by this document.

Statement of Problem and Substantiation for Public Input

This addition tries to explain what is intended by the term "equipment isolation valve".

Submitter Information Verification

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Submittal Date: Sun May 12 18:12:06 EDT 2024
Committee: NFG-AAA

Public Input No. 20-NFPA 54-2024 [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
230,000	19,320	16,100	13,800

Appliance Input (Btu/hr)	Space Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
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

Appliance Input (Btu/hr)	Required Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
125,000	7,500	6,250	5,357
130,000	7,800	6,500	5,571
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.

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, 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 the time of publication of this edition of NFPA 54. 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.

Air changes per hour (ACH) in this formula is the number of air changes that occur within the building by natural means (ACH_{NAT}). There are several methods to measure ACH, although many factors can affect this value, such as 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. Such methods produce the most reliable values for ACH. However, these methods can be expensive and cumbersome, making them out of reach of most contractors or installers. Other published methods for estimating ACHs 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, called ACH_{50}, provides a somewhat consistent and quantifiable means for arriving at the air leakage for a uniform depressurization of a building compared to atmosphere—normally 50 pascals. ~~This method has been successfully correlated to tracer-gas-measured natural air infiltration rates. ASHRAE~~ ASHRAE 62.2 provides a method for converting ACH_{50} to an ACH value ~~that reflects~~ that estimates 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 need a relatively large indoor volume for naturally drafted appliances. Designers, builders, installers, and inspectors should know that these kinds of values might need indoor air volumes that are greater than structures have available. In such cases, draft testing per Section 11.6 might fail. This could necessitate an alternate means of appliance venting, replacing the appliance, or other remedies for achieving the necessary combustion air other than using indoor air.

The following is intended to provide guidance on developing the ACH factor for use in the "known air infiltration rate" *(see 9.3.2.1)* method of providing combustion air. It supports converting commonly used ACH_{50} blower door air change measurements to estimated natural air infiltration rates.

ASHRAE 62.2, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, provides an infiltration credit formula used with single-point blower door testing for estimating natural infiltration rates. A.9.3.2.2(c) represents one set of simplified ASHRAE method calculations for a single-story building for an ACH_{50} of 3. The formula should be used to calculate ACH_{NAT} for buildings with larger ACH_{50} leakage rates. A design professional should be consulted to validate calculations before they are used as the basis for providing combustion air.

$$Q_{50} = CFM_{50} \text{ blower door reading or } ACH_{50} \times \text{volume}/60 \quad \textbf{[A.9.3.2.3a]}$$

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume} \quad \textbf{[A.9.3.2.3b]}$$

where:

wsf = Weather and shielding factor (from ASHRAE 62.2)

H = Conditioned height above grade

Hr = Reference height, 8.2 ft

Z = .4

Table A.9.3.2.2(c) ACH_{50} to ACH_{NAT} Sample Calculations

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume}$$ *

Single story			
ACH_{50}	Wsf†	ACH_{nat}	
3	0.30	0.05	
	-	0.35	0.06
	-	0.40	0.07
	-	0.45	0.08 -
	0.50	0.08	
	-	0.55	0.09
	-	0.60	0.10 -
	0.65	0.10	
	-	0.70	0.10 -

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / volume$$ *

Single story			
ACH50	Wsf†	ACHnat	
	0.75	0.10	
-		0.80	0.10
-		0.85	0.15 -
	0.90	0.15	
-		0.95	0.15
-		1.00	0.15
-		1.05	0.175
-		1.10	0.20 -
	1.15	0.20	

*H/Hr was derived from an average of 10 ft. This made for a representative factor for facilities with 8 ft to 12 ft conditioned heights.

†Created with selected weather shielding factors.

Statement of Problem and Substantiation for Public Input

This statement is not universal enough to be included. In some instances, this is the case, but this certainly does not apply to all buildings. The statement would not be true for a building with most of the leakage low and not high in the building. The same building with the same amount and type of holes with the same blower door number would have different natural infiltration rates if the holes were evenly distributed around the building versus most of them being low. Buildings are too different to make such a blanket statement.

Determination of actual natural air leakage rates in buildings is not an exact science. Estimate is more accurate.

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Submittal Date: Tue May 14 13:04:24 EDT 2024
Committee: NFG-AAA

Public Input No. 21-NFPA 54-2024 [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
230,000	19,320	16,100	13,800

Appliance Input (Btu/hr)	Space Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
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

Appliance Input (Btu/hr)	Required Volume (ft^3)		
	0.25 *ACH*	0.30 *ACH*	0.35 *ACH*
125,000	7,500	6,250	5,357
130,000	7,800	6,500	5,571
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.

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, 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 the time of publication of this edition of NFPA 54. 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.

Air changes per hour (ACH) in this formula is the number of air changes that occur within the building by natural means (ACH_{NAT}). There are several methods to measure ACH, although many factors can affect this value, such as 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. Such methods produce the most reliable values for ACH. However, these methods can be expensive and cumbersome, making them out of reach of most contractors or installers. Other published methods for estimating ACHs 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, called ACH_{50}, provides a somewhat consistent and quantifiable means for arriving at the air leakage for a uniform depressurization of a building compared to atmosphere—normally 50 pascals. 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 need a relatively large indoor volume for naturally drafted appliances. Designers, builders, installers, and inspectors should know that these kinds of values might need indoor air volumes that are greater than structures have available. In such cases, draft testing per Section 11.6 might fail. This could necessitate an alternate means of appliance venting, replacing the appliance, or other remedies for achieving the necessary combustion air other than using indoor air.

The following is intended to provide guidance on developing the ACH factor for use in the "known air infiltration rate" *(see 9.3.2.1)* method of providing combustion air. It supports converting commonly used ACH_{50} blower door air change measurements to estimated natural air infiltration rates.

ASHRAE 62.2, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, provides an infiltration credit formula used with single-point blower door testing for estimating natural infiltration rates. A.9.3.2.2(c) represents one set of simplified ASHRAE method calculations for a single-story building for an ACH_{50} of 3. The formula should be used to calculate ACH_{NAT} for buildings with ~~larger ACH~~ other ACH $_{50}$ leakage rates. A design professional should be consulted to validate calculations before they are used as the basis for providing combustion air.

$$Q_{50} = CFM_{50} \text{ blower door reading or } ACH_{50} \times \text{volume}/60 \quad \textbf{[A.9.3.2.3a]}$$

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume} \quad \textbf{[A.9.3.2.3b]}$$

where:

Q50 = CFM50 blower door reading OR (ACH50 x volume / 60)

wsf = Weather and shielding factor (from ASHRAE 62.2)

H = Conditioned height above grade

Hr = Reference height, 8.2 ft

Z = .4

Table A.9.3.2.2(c) ACH_{50} to ACH_{NAT} Sample Calculations

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume}$$ *

Single story			
ACH_{50}	**Wsf†**	**ACH_{nat}**	
3	0.30	0.05	
-		0.35	0.06
-		0.40	0.07
-		0.45	0.08 -
	0.50	0.08	
-		0.55	0.09
-		0.60	0.10 -
	0.65	0.10	

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / volume$$ *

Single story			
ACH50	Wsf†	ACHnat	
-		0.70	0.10 -
	0.75	0.10	
-		0.80	0.10
-		0.85	0.15 -
	0.90	0.15	
-		0.95	0.15
-		1.00	0.15
-		1.05	0.175
-		1.10	0.20 -
	1.15	0.20	

*H/Hr was derived from an average of 10 ft. This made for a representative factor for facilities with 8 ft to 12 ft conditioned heights.

†Created with selected weather shielding factors.

Statement of Problem and Substantiation for Public Input

"Larger" is not accurate enough. It is context with the previous sentence regarding the chart based on an ACH50 of 3. But, you can also have ACH50 numbers less than three. The 3 number in the chart was used because that is the IECC ACH50 maximum for new construction. The formula is used for ACH50 numbers both larger and smaller than 3.

Move the Q50 formula to A.9.3.2.3b where it belongs. Does not belong before A.9.3.2.3a. It is part of the key for the formula in A.9.3.2.3a.

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Submittal Date: Tue May 14 14:31:27 EDT 2024
Committee: NFG-AAA

Public Input No. 30-NFPA 54-2024 [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 All Appliances ~~Other than Fan-Assisted~~ for Specified Infiltration Rates ***(ACH)***

Refer to A.9.3.2.3a for buildings tighter than .25

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,~~

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

~~*ACH* : Air change per hour.~~

~~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, 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 the time of publication of this edition of NFPA 54. 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.~~

~~Air changes per hour (ACH) in this formula is the number of air changes that occur within the building by natural means (ACH_{NAT}). There are several methods to measure ACH, although many factors can affect this value, such as 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. Such methods produce the most reliable values for ACH. However, these methods can be expensive and cumbersome, making them out of reach of most contractors or installers. Other published methods for estimating ACHs 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, called ACH_{50} , provides a somewhat consistent and quantifiable means for arriving at the air leakage for a uniform depressurization of a building compared to atmosphere—normally 50 pascals. 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 need a relatively large indoor volume for naturally drafted appliances. Designers, builders, installers, and inspectors should know that these kinds of values might need indoor air volumes that are greater than structures have available. In such cases, draft testing per Section 11.6 might fail. This could necessitate an alternate means of appliance venting, replacing the appliance, or other remedies for achieving the necessary combustion air other than using indoor air.

The following is intended to provide guidance on developing the ACH factor for use in the "known air infiltration rate" *(see 9.3.2.1)* method of providing combustion air. It supports converting commonly used ACH_{50} blower door air change measurements to estimated natural air infiltration rates.

ASHRAE 62.2, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings* , provides an infiltration credit formula used with single-point blower door testing for estimating natural infiltration rates. A.9.3.2.2(c) represents one set of simplified ASHRAE method calculations for a single-story building for an ACH_{50} of 3. The formula should be used to calculate ACH_{NAT} for buildings with larger ACH_{50} leakage rates. A design professional should be consulted to validate calculations before they are used as the basis for providing combustion air.

$$Q_{50} = CFM_{50} \text{ blower door reading or } ACH_{50} \times \text{volume}/60 \quad \text{[A.9.3.2.3a]}$$

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume} \quad \text{[A.9.3.2.3b]}$$

where:

wsf = Weather and shielding factor (from ASHRAE 62.2)

H = Conditioned height above grade

Hr = Reference height, 8.2 ft

Z = .4

Table A.9.3.2.2(c) ACH_{50} to ACH_{NAT} Sample Calculations

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / \text{volume} \ *$$

Single story			
ACH_{50}	Wsf†	ACH_{nat}	
3	0.30	0.05	
	-	0.35	0.06
	-	0.40	0.07
	-	0.45	0.08 -
	0.50	0.08	
	-	0.55	0.09
	-	0.60	0.10 -
	0.65	0.10	
	-	0.70	0.10 -
	0.75	0.10	
	-	0.80	0.10
	-	0.85	0.15 -

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^{Z} \times 60 / volume$$ *

Single story			
~~ACH_{50}~~	~~Wsf†~~	~~ACH_{nat}~~	
	~~0.90~~	~~0.15~~	
~~-~~		~~0.95~~	~~0.15~~
~~-~~		~~1.00~~	~~0.15~~
~~-~~		~~1.05~~	~~0.175~~
~~-~~		~~1.10~~	~~0.20~~ -
	~~1.15~~	~~0.20~~	

~~*H/Hr was derived from an average of 10 ft. This made for a representative factor for facilities with 8 ft to 12 ft conditioned heights.~~

† ~~Created with selected weather shielding factors.~~

Statement of Problem and Substantiation for Public Input

Per the formula deletion in PI 29, A.9.3.2.2b is not needed. Table title for 9.3.2.2a then needed to be revised to accommodate all appliances. A guide was added to A.9.3.2 3a for buildings tighter than .25 which is the lowest ACH in the table.

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Public Input No. 1-NFPA 54-2024 [Section No. G.3.3]

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 have been poorly capped or are not capped at all .

Statement of Problem and Substantiation for Public Input

The prior language is ambiguous, because "improperly capped openings" could imply either of the following: (1) pipe openings that are capped poorly or not at all, (2) pipe openings that are mistakenly capped (and shouldn't be capped at all).
An uncapped or poorly capped pipe opening is very dangerous, whereas a pipe opening that is mistakenly capped could always be corrected if doing so was necessary to permit the downstream appliance to operate.

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Public Input No. 88-NFPA 54-2024 [Section No. K.1.2.8]

K.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. ~~www.ul.com~~

UL 651, *Schedule 40 and 80, Type EB and A Rigid PVC Conduit and Fittings*, 2011, revised 2022.

UL 795, *Commercial-Industrial Gas Heating Equipment*, ~~2016, revised 2022~~ 2024 .

Statement of Problem and Substantiation for Public Input

Update references to most current editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 87-NFPA 54-2024 [Section No. 2.3.5]	

Submitter Information Verification

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Submittal Date: Sat Jun 01 12:22:46 EDT 2024
Committee: NFG-AAA

[Section No. 1.4]

1.4 Equivalency.

1.4.1 The provisions of this code are not intended to prevent the use of any material, appliance, equipment, method of construction, or installation procedure, provided that any such alternative ~~is acceptable to the authority having jurisdiction. The authority having jurisdiction shall require that sufficient evidence be submitted to substantiate any claims made regarding the safety of such alternatives~~ meets the following.

(1) is equivalent or superior to that prescribed in this code in terms of quality, strength, effectiveness, fire resistance, durability, and safety as applicable,

2) meets the intent of this code, and

(3) is approved for the intended purpose by the AHJ.

1.4.2 Technical documentation satisfactory to the AHJ shall be submitted to demonstrate equivalency .

Statement of Problem and Substantiation

The definition of Equivalency is revised using the NFPA 2, Hydrogen Technologies Code definition as a model. The revised text clarifies that the AHJ must approve the alternate method. As currently written, the paragraph requires only that the evidence to substantiate the claim of equivalency be submitted.

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