



Code Check Plumbing & Mechanical 2021

An Illustrated Reference for Plumbing & Mechanical Codes



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Based on the 2021 editions of the model codes
including annotated changes from the previous code editions

Conventions used in this book: The material in this book is organized by major headings, subheadings, and "checkbox" lines that summarize a particular code rule. Figures and tables accompany the text, and changes from the prior code editions are highlighted and explained. To condense such a large amount of information into a relatively small book, we have used many abbreviations, which are always accessible through the buttons at the top of every page.

How to navigate this book: You must be using Adobe Acrobat® or Acrobat Reader to use the navigation features of this book. Reader is a free [download](#).

This file contains all of the material that is in the print version of *Code Check Plumbing & Mechanical 6th edition* and the plumbing & mechanical material from the print version of *Code Check Complete 3rd edition*. The easiest way to find a particular topic is to start at the table of contents, which is always available from the button at the top of every page.

- Every line in each table of contents is a link to the section it describes.
- Figures and tables are referenced in the text by the letters **F** and **T** followed by the figure or table number.
- Every figure reference, page reference, and table reference is a link.
- When the text references a figure or table that is not on the same page as the text, clicking on the reference number takes you to that reference, and clicking on the red "Return to Previous Page" button at the top of the screen takes you back to the text.

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EACH LINE IN THE TABLE OF CONTENTS IS A LINK. FOR EXAMPLE, FROM WHEREVER YOU ARE IN THE BOOK, IF YOU DECIDE TO LOOK AT TANKLESS WATER HEATERS, SIMPLY CLICK THE "CONTENTS" BUTTON AT THE TOP OF EACH PAGE, THEN CLICK THE LINE FOR "TANKLESS" UNDER "WATER HEATERS"

GAS APPLIANCE COMBUSTION AIR (C/A)

As buildings have become tighter, the necessary air for combustion, ventilation, and dilution of flue gases must be supplied directly to the appliance space rather than relying upon the air from habitable spaces. Direct-vent appliances obtain their combustion air from the exterior and do not use the appliance space as their source of combustion air. Local energy codes may have more restrictive requirements limiting the use of interior air for combustion.

General

- | | | |
|---|----------------------|---------------------|
| <input type="checkbox"/> Provide C/A all spaces containing Cat. I appliances _____ | 21 IRC 2407.1 | 21 UMC 701.1 |
| <input type="checkbox"/> Other appliances (not Cat. I) provide C/A AMI _____ | 2407.1 | 701.1.1 |
| <input type="checkbox"/> Draft hood must be in same space as appliance _____ | 2407.3 | 701.2 |
| <input type="checkbox"/> Provide makeup air to offset effect of exhaust fans, such as kitchen & bath fans, dryers, etc. _____ | 2407.4 | 701.3 |
| <input type="checkbox"/> Provide makeup air if kitchen exhaust >400 cfm _____ | 1503.6 | local |
| <input type="checkbox"/> Engineered installations using approved methods allowed _____ | 2407.8 | 701.8 |

Mechanically Supplied Combustion Air

- | | | |
|---|----------|---------|
| <input type="checkbox"/> Mechanical C/A supply min 0.35 cu.ft./minute/kBtu _____ | 2407.9 | 701.9 |
| <input type="checkbox"/> Appliance interlocked to mechanically supplied C/A _____ | 2407.9.2 | 701.9.2 |

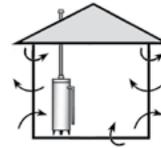
Indoor Air Source

- | | | |
|--|------------|-----------|
| <input type="checkbox"/> Indoor air source alone only OK if infiltration ≥ 0.40 ACH _____ | 2407.5 | 701.4 |
| <input type="checkbox"/> Min volume of space 50 cu. ft./1kBtu/hr. F83 _____ | 2407.5.1 | 701.4.1 |
| <input type="checkbox"/> Volume includes rooms directly communicating w/ appliance space through openings w/o doors or openings per T44,F83 _____ | 2407.5 | 701.4.1 |
| <input type="checkbox"/> Openings connecting indoor spaces must be located in upper & lower 12 in. of appliance space F83 _____ | 2407.5.3.1 | 701.4.1.1 |
| <input type="checkbox"/> Openings connecting indoor spaces on same story min 100 sq. in. each & min 1 sq. in./kBtu of appliances T44 _____ | 2407.5.3.1 | 701.4.1.1 |
| <input type="checkbox"/> If on different levels, min 2 sq. in./kBtu of appliances _____ | 2407.5.3.2 | 701.4.1.2 |
| <input type="checkbox"/> If ACH <0.40, min volumes for known air infiltration method: | | |
| • Non fan-assisted appliance (21 cu. ft./ACH) per kBtu _____ | 2407.5.2 | 701.4.2 |
| • Fan-assisted appliance (15 cu. ft./ACH) per kBtu _____ | 2407.5.2 | 701.4.2 |
| <input type="checkbox"/> Combined indoor + outdoor air calculated by ratio of communicating spaces divided by required volume. Reduction factor of 1 minus that ratio is applied to the values in T44 _____ | 2407.7 | 701.7 |

FIG. 83

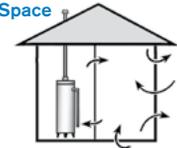
Combustion Air from Infiltration

Air from Indoors



Space w/ > 0.40 ACH sufficient if volume ≥ 50 cu.ft./kBtu.

Openings into Enclosed Indoor Space



Indoor air cannot be the sole source of combustion air in tightly constructed homes. The air-infiltration rate must be > 0.40 ACH.

Openings from enclosed space in upper 12 in. & in lower 12 in.

TABLE 44

MIN. COMBUSTION AIR OPENING SIZES

Btu	Indoor Air ^A		Outdoor Air Openings		
	Opening size ^B	cu.ft. (sq. ft.) ^C	1 in./2kBtu/hr. ^D	1 in./3kBtu/hr. ^E	1 in./4kBtu/hr. ^F
30k	100 sq.in.	1,500 (188)	15 sq.in.	10 sq.in.	7.5 sq.in.
40k	100 sq.in.	2,000 (250)	20 sq.in.	13.3 sq.in.	10 sq.in.
50k	100 sq.in.	2,500 (313)	25 sq.in.	16.7 sq.in.	12.5 sq.in.
60k	100 sq.in.	3,000 (375)	30 sq.in.	20 sq.in.	15 sq.in.
70k	100 sq.in.	3,500 (438)	35 sq.in.	23.3 sq.in.	17.5 sq.in.
80k	100 sq.in.	4,000 (500)	40 sq.in.	26.7 sq.in.	20 sq.in.
90k	100 sq.in.	4,500 (563)	45 sq.in.	30 sq.in.	22.5 sq.in.
100k	100 sq.in.	5,000 (625)	50 sq.in.	33.3 sq.in.	25 sq.in.

The eBook contains 126 illustrations and 55 tables. The text lines contain links to these illustrations and tables. When the link takes you to a different page, you can quickly return with the "RETURN TO PREVIOUS PAGE" button at the top.

- D. Applies to horizontal ducts **F85**.
 E. Applies to single opening method **F84**.
 F. Applies to direct exterior openings (2 opening method) or to vertical ducts **F84,85,86**.

The basic infiltration rate of 0.40 ACH is not directly comparable to the required ACH from energy codes, and most homes have a lower rate than 0.40 ACH under passive conditions. Outdoor openings are typically needed for combustion air.

FREESTANDING FIREPLACE STOVES

The IRC (section 1414.1) requires fireplace stoves to be listed, labeled & tested in accord with UL 737, which in turn references the current edition of NFPA 211. UMC section 902.10 refers to NFPA 211 for solid fuel-burning appliances. The rules for clearance, protection, and clearance reductions are virtually identical among the IRC, UMC, and NFPA 211.

Fireplace Stoves & Solid Fuel Room Heaters

NFPA 211

- Equipment must be listed & installed per L&L or be approved by AHJ _____ 13.1
- Unlisted equipment must be approved & installed AMI _____ 13.1.1
- No unlisted equipment in mobile homes _____ 13.1.9

- Not
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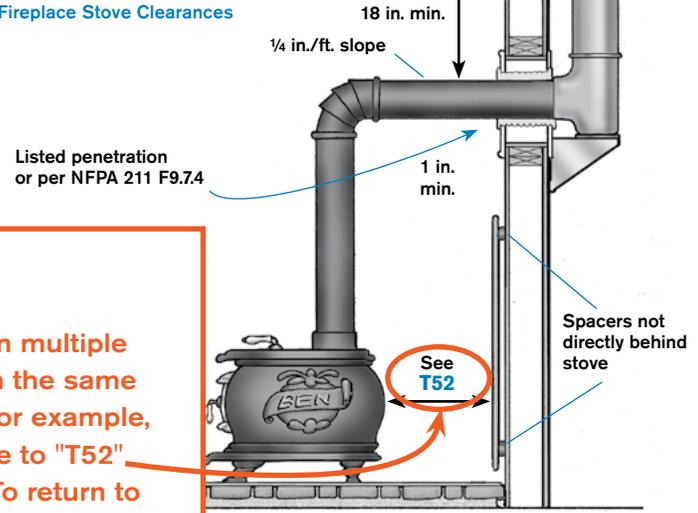
Many of the illustrations and tables are referenced in multiple places in the book. As a result, they might not be on the same page. All the figure and table references are links. For example, inside the illustration to the right there is a reference to "T52" (Table 52). Clicking on it will take you to that table. To return to the text, simply click "RETURN TO PREVIOUS PAGE" button.

Conne

- Must be accessible for inspection, cleaning & replacement _____ 9.7.10
- Single-wall min 18 in. clearance to combustibles EXC [F122](#) _____ T9.5.1.1
 - Lesser clearance w/ approved clearance-reduction system [T52](#) _____ 9.5.1.2.1
- Not to pass through wall EXC _____ 9.7.4
 - Listed pass-through system _____ 9.7.4
 - Pass-through system constructed per NFPA 211 figure 9.7.4 _____ 9.7.4
- Maintain min ¼ in./ft. rise from appliance collar to chimney _____ 9.7.6

FIG. 120

Fireplace Stove Clearances



Combustibles are critical to the safe long term operation of fireplace stoves. Improper clearances can allow heat transfer to adjacent combustibles. Over time, heat degrades wood and lowers its ignition temperature. This process—pyrolysis—can eventually result in a fire.

Connectors to Masonry Fireplaces

NFPA 211

- Connector must extend to flue liner—not just to firebox _____ 13.4.5.1
- If connector enters direct through chimney wall above smoke chamber, noncombustible seal required below entry _____ 13.4.5.1
- No dilution of combustion products in flue w/ habitable space air _____ 13.4.5.1
- Flue not less than size of appliance collar _____ 13.4.5.1
- Flue diameter max 2× appliance collar if chimney walls exposed to exterior below roof, 3× if no part exposed below roof _____ 13.4.5.1
- Installation must allow for chimney inspection & cleaning _____ 13.4.5.1

Vent Table Example 1:

The first step is to select the correct table based on the type of vent or chimney, the connector type, and the number of appliances.

In **F90**, an 80kBtu fan-assisted furnace is directly connected to a double-wall B vent with 2 90° elbows. The lateral distance **L** of the offset is 5 ft., and the overall height **H** of the vent is 10 ft.

Question: What size B vent is needed?

Solution: IRC Section 2428.2.3 & UMC section 803.1.2 allow 2 90° elbows without requiring a further reduction in table values. The tables has columns for natural and fan-assisted appliances. Use IRC table 2428.2.3 for Type B double-wall Gas Vent, Single Appliance, Single-wall Vent Connector. Go down the "height" column at the left of the table to the row for 10 ft. lateral length of 5 ft. Go across that row to the first entry in the "FAN" "Max" column. That is under the column

Vent Table Example 2:

In **F91** a 100kBtu draft-hood-equipped furnace w/ a 5 in. draft hood outlet connects to a B vent with an overall height **H** of 10 ft. above the appliance draft hood, and a single-wall connector with a lateral length **L** of 5 ft.

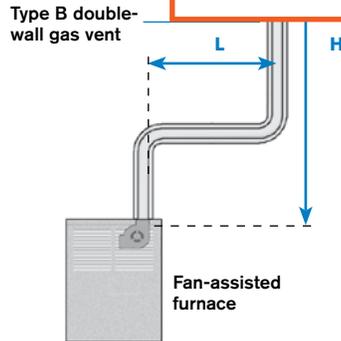
Question: What size B vent and single-wall connector are needed?

Solution: Refer to IRC table 2428.2(2) or UMC table 803.1.2(1) for Type B Double-wall Gas Vent, Single Appliance, Single-wall Vent Connector. As with the first example, go down the height column to the row for 5 ft. lateral, and go across to the first entry in the "NAT" column that is greater than 100. That is in the 5 in. column. The connector must be 5-in., since it cannot be smaller than the flue

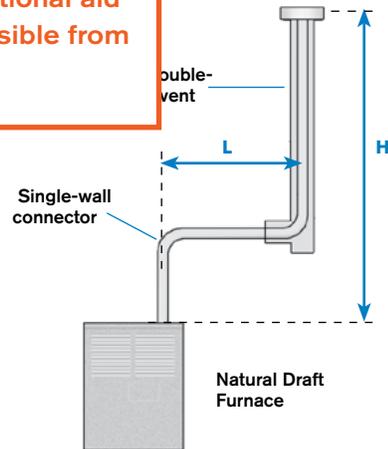
The book can be used as an instructional aid. These pages provide examples on the use of the code tables for sizing gas appliance vents. Another instructional aid is the expanded glossary, accessible from the button at the top right.

FIG. 90

Example for B Vent Directly Connect



Example for B Vent with Single-Wall Connector



Example of Vent Tables for Common Venting

F92 depicts an 80kBTU fan-assisted furnace vented in common with a 35kBTU water heater. The combined inputs are 115kBTus. Each appliance has a 4 in. flue collar, and the connectors join at a type B common vent. The overall height of the common vent (measured from the taller appliance outlet to the top of the common vent) is 20 ft. The horizontal length of the water heater vent connector is 3 ft., the vertical rise of the water heater connector is 2 ft., and the rise of the furnace connector is 3 ft. The common vent is offset in the attic space with 2 60° elbows, and the horizontal offset distance is 3 ft.

Question: What diameter connectors and Type B common vent should be used?

Solution: IRC table 2428.3(2) of

Start with the water heater. Go to the row for connector height of 2 ft. in the "NAT" column that is greater than 3 in connector would be smaller

Next compute the size for the water heater. Go to the height column to the row for 20 ft. that row to the first column with a rating greater than 115 in. column. However, the "FAN" column connector is needed, or we could use a 4 in. where the "Min" rating for a 4 in listed type B flexible connector, a 4 in connector is acceptable.

Next compute the size for the common vent. The second part of the table is common vent capacity. In the 20 ft. row, go across to the first number in the "FAN+NAT" column that exceeds 115. That is 118 in the 4 inch column. However, due to the offset in the common vent, section 2428.3.6 tells us to subtract 10% for each offset greater than 45°. Therefore, we must subtract 20%, and a 4 in. common vent is too small. In the 5 in. column, the "FAN+NAT" entry is 177. Subtracting 20% from 177 gives us 141, which is greater than our combined input rating. Therefore, a min 5 in. common vent is required. That also complies with 2428.3.5, which limits the horizontal distance of the offset to 1½ ft. for each in. of diameter.

The eBook contains additional illustrations and tables that would not fit into the 50-page printed book.

FIG. 92

Common Venting Example

