



Sizing Guide

Type B Gas Vent
for Category 1 Appliances

All Fuel Chimney
for Oil-Fired Appliances &
Open-Face Fireplaces

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Type B Gas Vent Systems

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(includes flexible stainless liner sizing)

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Foreword

This guide is a compilation of the system design and application procedures for all Hart & Cooley Gas Venting and Chimney products. The first section is specifically devoted to the design of Double-Wall Type B Gas Vent Systems for use with equipment certified by the American Gas Association or Canadian Gas Association.

This guide has been prepared for the convenience and assistance of contractors, building inspectors, engineering firms and architects, as well as for training purposes.

The basis for this guide is the standard engineering application of the scientific laws for the behavior of fluid flow and heat transfer. In addition, these methods have been proved valid through many decades of field and laboratory experience by engineers, utilities and code authorities.

Additional references for the development of the material in this guide:

National Fuel Gas Code, NFPA Standard 54 ANSI Z223.1

Standard for the Installation of Oil-Burning Equipment 2006 Edition, NFPA 31

American Society of Heating, Refrigerating and Air Conditioning Handbook, Equipment

International Mechanical Code

The capacities given in the Tables for Type B Gas Venting are consistent with those found in publications by the appliance manufacturers and NFPA 54 National Fuel Gas Code.

The capacities given in Section 2 tables for all-fuel chimney are consistent with those found in NFPA 31, Standard for Oil-Burning Equipment.

For information on products for use with the systems in this guide, refer to specific product literature.

NOTE

THIS GUIDE SHOULD BE USED IN ADDITION TO, NOT AS REPLACEMENT FOR, HART & COOLEY INSTALLATION INSTRUCTIONS.

CAUTION

ALWAYS READ AND COMPLY WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS SUPPLIED WITH THE APPLIANCE.

Type B Gas Vent Systems

Single-Appliance Vents

Multiple-Appliance Vents

Multiple-Story Venting

General Rules

Systems

The Tables given in Section 1 apply to system design using Hart & Cooley Type B Gas Vents and to Model TLC Chimneys when used for the venting of listed Category I gas-fired, draft-hood-equipped or fan-assisted combustion appliances. At no time should a venting system for a listed Category II, III, or IV appliance be sized with these tables; instead, follow the appliance manufacturer's instructions.

Type B Gas Vent is designed for negative pressure applications and flue gas temperatures that do not exceed 400 Degrees Fahrenheit above ambient for Category I appliances.

Clearance

Installations must provide the proper clearances to combustible materials as specified in the appropriate Underwriters Laboratories Inc. conditions for Listing, as stated in the product catalogs and embossed on the vent pipe. Hart & Cooley systems to be designed using Section 1 of this Guide are shown below with their proper clearances.

| | |
|------------------|---|
| Type B | Hart & Cooley pipe sizes 3 through 24 inches in diameter require 1 inch of airspace clearance throughout the entire length. Pipe sizes 26" - 30" in diameter require 2" of airspace clearance throughout the entire length. |
| Model TLC | Hart & Cooley chimney sizes 5 through 14 inches in diameter require 2 inches of airspace clearance to combustible construction. |

Air Supply

For satisfactory performance of appliances in confined spaces and for the venting system, an adequate supply of fresh air must be provided. When proper air supply has been provided for other appliances, such as clothes dryers, range hoods, fireplaces, etc., then the following method as provided by NFPA Standard 54, ANSI Z223.1 will provide the additional air needed for the appliances. The two grilles specified in A, B, C and D of Figure 1 must be installed so that one is at or below the combustion air inlet of the appliance (within 12" from the floor), and the other above the relief opening of the draft hood (within 12" from the ceiling). The minimum dimension of air opening shall be 3". Any ducting used should have at least the same free area as the grilles determined.

One permanent opening, commencing within 12 inches of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 inch from the sides and back and 6 inches from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors (see Figure 1, E) and shall have a minimum free area of:

- 1 inch²/3000 Btu/hour of the total input rating of all equipment located in the enclosure, and
- Not less than the sum of the areas of all vent connectors in the confined space.

A combination of air supplied from both the indoors and outdoors is also permitted. See NFPA 54 for these provisions. For appliance rooms in multi-story buildings, all air must come from outdoors.

Local Building Code

Should the local building code differ from recommendations given in this Guide, consult with your building inspector or other local administrative authority. As stated in the Foreword, the information given is based on the latest scientific data, which has been further verified by a long and satisfactory use history. These data and practices given herein will invariably provide better results than practices required by an obsolete code.

Correction for Altitude

The vent system should always be designed for the sea level nameplate rating (greatest input when unit has modulated input) of the appliance, regardless of the actual derated operating input required by the local altitude.

Outside Vents

The gas vent sizing tables are not applicable to outside (exposed) chimneys or vents below the roofline per NFPA 54. A Type B vent lining an exposed masonry chimney is considered to be an enclosed vent system, and these tables may be used.

Connectors

Single-wall pipe (stovepipe) is not recommended for use in TYPE B venting systems. Because of the higher heat loss from the flue products, the draft is reduced and condensation can occur. The resulting moisture may corrode the pipe and will likely leak out on the building and contents, causing damage.

Where single-wall connector pipe usage is accepted local practice, the following considerations must be followed:

- Minimum clearance to combustibles is 6 inches instead of the 1 inch required for Hart & Cooley vent.
- The heat loss is roughly double that for B-Vent, so **DO NOT USE IN ANY COLD OR CONCEALED SPACES, AS CONDENSATION WILL RESULT AND LEAD TO VENTING FAILURE AND POSSIBLE OTHER DAMAGE.**

Connector Rise

The immediate vertical height from the flue collar to the first turn (connector rise) will have an important effect on the proper functioning of a venting system. In order for a venting system to prime (for flow up the vent to start), the vent **MUST** be heated by the flue gases. If it is easier (less resistance) for the flue products to spill out the draft hood relief opening than to flow into the vent, priming can be delayed or prevented altogether. By using all of the vertical height (head room) available (NEVER less than 1 foot), a venting system will usually prime within 8 to 10 seconds. Small increases in connector rise generally have a greater impact on vent capacity than an increase in common vent height.

Vent Cap or Termination

Use only Hart & Cooley companion listed caps or roof assemblies. The capacity and wind resistance depends on the correct termination. Terminations on any factory-built chimney housing or other custom enclosure or chase **MUST** comply with the instructions for a roof surface.

Appliance Type Restrictions

The following are examples of appliances that are **NOT** to be connected to Type B gas vent. Other appliances not listed may be restricted.

- Wood, oil, pellet, coal, kerosene, and any other liquid- or solid-fuel appliance.
- Category 2, 3, and 4 gas-fired appliances including, but are not limited to, high-efficiency furnaces and water heaters, most tankless water heaters, and some unit heaters.
- Gas-fired clothes dryers, which can create positive pressure and produce lint that can block the vent.
- Gas incinerators.

Table Limitations

The Tables in Section 1 of this Guide include the following considerations:

- Low resistance Hart & Cooley termination caps
- Listed Category I appliances
- Two 90° turns except for "0" lateral

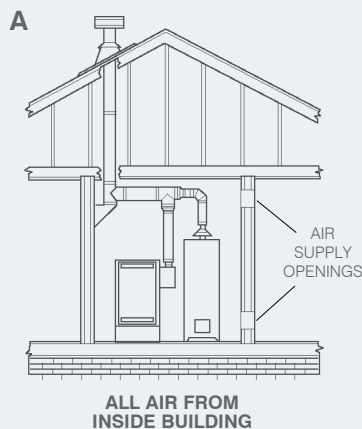
For each additional elbow up to and including 45 deg the maximum capacity listed in the Sizing Tables must be reduced by 5%. For each additional elbow greater than 45 deg up to and including 90 deg, the maximum capacity in the Sizing Tables must be reduced by 10%.

| | | | | | | | | | | | |
|-------------------|-----|------|------|------|------|------|------|-------|-----|-------|-------|
| Pipe Diameter | 3" | 4" | 5" | 6" | 7" | 8" | 10" | 12" | 14" | 16" | 18" |
| Pipe Area sq. in. | 7.1 | 12.5 | 19.6 | 28.3 | 38.5 | 50.3 | 78.5 | 113.1 | 154 | 201.1 | 254.5 |

The vent connector should be routed to the vent, utilizing the shortest possible route.

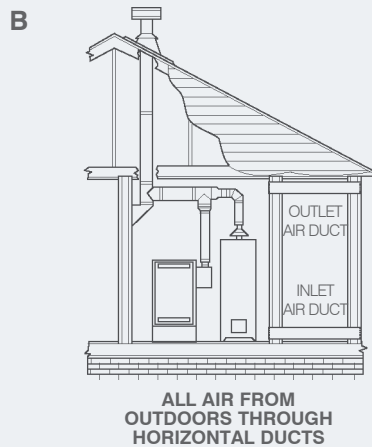
- Chimneys and vents on an outside wall must be enclosed below the roofline.
- *See page 8 for definitions of gas appliance categories.

Figure 1

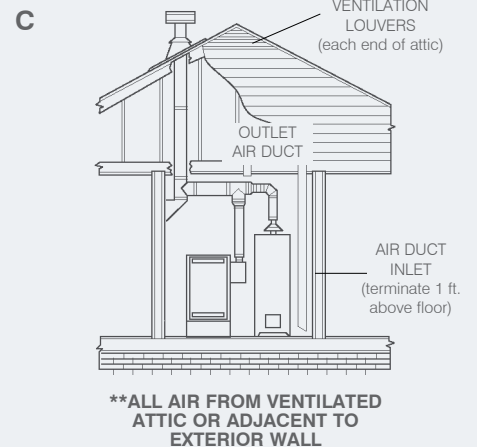


$$\text{Free Area of Each Grille} = \frac{\text{Total Input}^*}{1000}$$

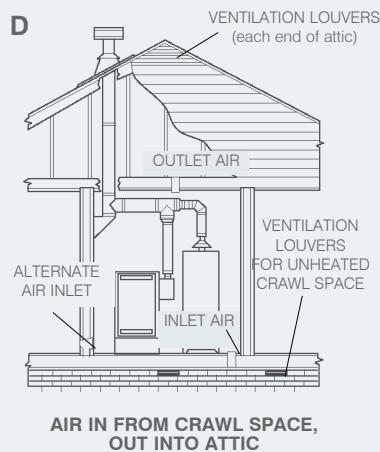
(Use 2 grilles facing into large interior room. Minimum free area of each grille is 100 sq. in.)



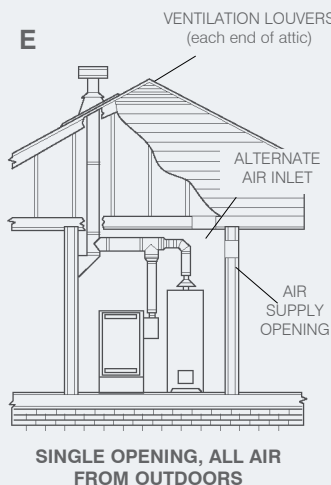
$$\text{Free Area of Each Duct} = \frac{\text{Total Input}^*}{2000}$$



$$\text{Free Area of Each Duct or Grille} = \frac{\text{Total Input}^*}{4000}$$



$$\text{Free Area of Each Grille} = \frac{\text{Total Input}^*}{4000}$$



*Total Input = Total of combined appliance input ratings in BTU; (Free Area in square inches).

**If the equipment room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 Btu per hour of the total input rating of all equipment in the enclosure.

†See NFPA 54 for additional provisions and restrictions for the air supply.

Condensation

The condensing of water vapor from the products of combustion of gas fuels can be minimized with the use of these sizing tables. When the vent system is designed properly, dilution air, which may enter a draft hood (if available), reduces the temperature at which water vapor will condense (dew point). Exceptions that will cause condensation are as follows:

- A. Temporarily (for a few seconds) after burner ignition, condensation will form on the cold inner liner of the vent. Before it develops to drop size, the liner will have been heated above the dew point, and this condensate will reevaporate. If the vent is located outdoors and the temperature is very low, condensation may continue. This is a good reason for avoiding this type of installation. It is also important NOT to extend the vent above the roof more than the rules require.
- B. Extremely long vents or long laterals in unheated spaces can allow the flue products to cool to the dew point. **DO NOT WRAP INSULATION AROUND B-VENT TRYING TO PREVENT CONDENSATION.** This method is not reliable and may contribute to other problems.
- C. AIR SUPPLY, as covered earlier, is of great importance to the proper operation of a vent. Again if sufficient make-up air is not available to replace that required by the burner and the draft hood, the system is starved. The first result is that less air enters the draft hood, and the dew point temperature rises. In other words, condensation can occur at a higher temperature. At some point in the dilution percent, condensation will start in the vent. Further starving for air can result in water running out of the vent, and damage will result to the structure and contents.

Remember—When in doubt for any reason, such as dimensions being questionable, a borderline chart selection, or overhead clearance for maximum connector rise in doubt, ALWAYS USE THE NEXT LARGER SIZE and prevent problems that might occur. This does not apply to table minimums.

Vent Caps

Listed vent caps for double-wall Type B vents are designed to serve two purposes, (1) prevent rain and debris from entering the vent, and (2) help prevent a downdraft condition in the vent due to adverse wind conditions. These Tables apply to vents, vent caps or roof housing of the same make and style as the vent. For safe, efficient operation, DO NOT use combination roof jacks or caps or termination designs fabricated by other than the vent manufacturer. ALWAYS install an approved vent cap immediately after installation of the vent to exclude debris and prevent damage.

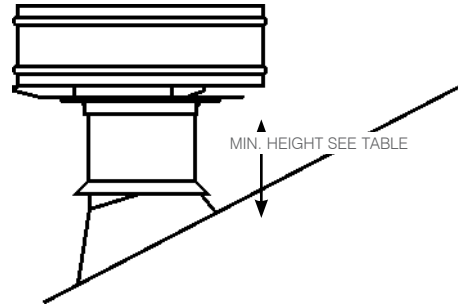
Wall Furnace Vents

Wall furnaces (vented recessed heaters) require a 12-foot minimum vent height measured from the floor to the top of the vent, or, in the case of combined vents, to the top of the vent connector. Many vented wall furnaces require connection to oval vents.

**Flashing and Top Assembly Using a Cap
Model RHW/RM Metal Cap Termination**

Model RHW/RM cap sizes 3" through 12" round are listed by U.L. for installation on gas vents terminating a sufficient distance from the roof so that no discharge opening is less than 2 feet horizontally from the roof surface. The lowest discharge opening shall be no closer than the minimum height shown in the Table in Figure 2. These minimum heights may be used provided that the vent is NOT less than 8 feet from any vertical wall. **This also means that no installation shall terminate by piercing a wall with a short pipe and cap.** These requirements satisfy all national codes.

Termination Dimensions for Type RHW/RM Caps



| Roof Pitch | Minimum Height from Roof to Lowest Discharge Opening (ft) |
|---------------------|---|
| Flat to 6/12 | 1.0 |
| Over 6/12 to 7/12 | 1.25 |
| Over 7/12 to 8/12 | 1.5 |
| Over 8/12 to 9/12 | 2.0 |
| Over 9/12 to 10/12 | 2.5 |
| Over 10/12 to 11/12 | 3.25 |
| Over 11/12 to 12/12 | 4.0 |
| Over 12/12 to 14/12 | 5.0 |
| Over 14/12 to 16/12 | 6.0 |
| Over 16/12 to 18/12 | 7.0 |
| Over 18/12 to 20/12 | 7.5 |
| Over 20/12 to 21/12 | 8.0 |

Model RHW/RM caps are listed under the "Draft Loss and Wind Effect" requirements of UL Standard 441.

Figure 2

Metal Cap Terminations

Cap sizes 14" through 30" diameters are for gas vents that extend at least 2 feet above the highest point where they pass through a building and at least 2 feet higher than any portion of the building within 10 feet. If any adjacent structures are within 10 feet of the vent and are higher, then the vent **MUST** terminate at least 2 feet above these structures. This recommendation should be followed unless local code requirements state otherwise.

Large offsets in the attic space are discouraged. However, small offsets (laterals) may be used to minimize the amount of vent pipe that must be exposed above the roof in order to comply with the above. NO gas vent should be terminated less than 5 feet in vertical height above the highest connected appliance draft hood outlet.

General Termination Considerations

A cap or chimney housing offers protection against the entrance of rain, snow and debris, as well as birds, and will minimize the effect of wind on the vent. It will protect the vent from downdrafts due to a wind that impinges directly upon the vent. However, no vent cap, cowl or top can overcome the adverse effect of a region of high static pressure around the vent terminal nor the effect of an interior region of low pressure. Regions of high static pressure around the vent terminal can be avoided by following the general rule for the vent termination given above. Low or negative interior pressures in the building may be caused by (1) failure to provide for combustion air, (2) excessive use of exhaust fans, and (3) tight construction resulting in the lack of infiltration air. Vented clothes dryers and fireplaces will also remove large amounts of air from the interior, tending to produce a low interior pressure.

This also means that no B Vent installation shall terminate by piercing a wall with a short vertical or horizontal pipe and a cap.

Definitions

A *SINGLE-APPLIANCE VENT* is an independent vent for one appliance (Figure 3).

TOTAL HEIGHT (H) is the vertical distance measured between the appliance collar connection and the vent termination (Figure 3).

TOTAL LATERAL LENGTH (L) is the actual horizontal distance or length of offset between the appliance collar and the main vertical portion of vent (Figure 3).

MULTIPLE-APPLIANCE VENT is a venting system combining the connectors of two or more appliances at one floor level to a common vertical vent. Connector in a combined vent system connects an individual appliance flue collar to the common vent or manifold (Figure 4).

MINIMUM TOTAL VENT HEIGHT is the vertical distance measured from the tallest appliance flue collar outlet in the system to the termination of the vent (see Figures 3 and 4). This minimum height is a fixed dimension for any one vent system regardless of the number or placement of appliances in the system.

CONNECTOR RISE for any appliance in a vent system is the vertical distance from the flue collar outlet to the point where the next connector joins the system (see Figure 4).

COMMON VENT is that portion of the venting system above the lowest interconnection. When the common vent is entirely vertical, the system is called a *VERTICAL* or *V* type. All others are called *LATERAL* or *L* type (see Figure 4).

FAN-ASSISTED COMBUSTION SYSTEM is an appliance equipped with a fan to either draw or force products of combustion through the combustion chamber and/or heat exchanger.

FAN MIN refers to the minimum input rating of a Category 1 fan-assisted appliance attached to the vent.

FAN MAX refers to the maximum input rating of a Category I fan-assisted appliance attached to the vent.

NAT MAX refers to the maximum input rating of a Category I draft-hood-equipped appliance attached to the vent. There are no minimum appliance input ratings for draft-hood-equipped appliances.

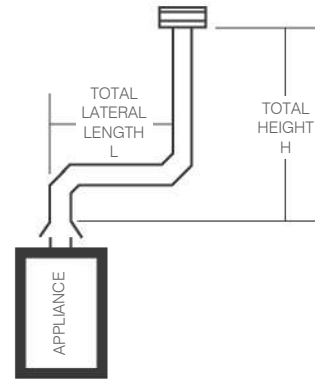


Figure 3

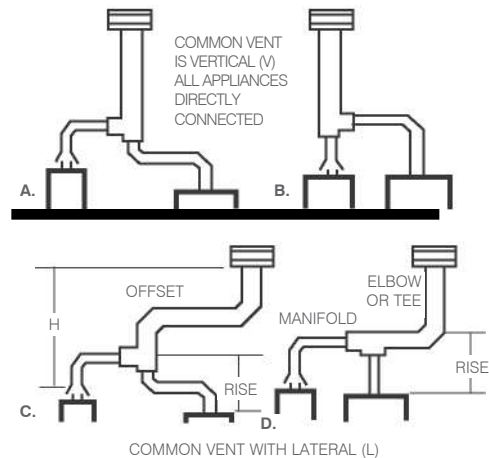


Figure 4

FAN+FAN refers to the maximum combined input rating of two or more fan-assisted appliances attached to the common vent.

FAN+NAT refers to the maximum combined input rating of one or more fan-assisted appliances and one or more draft-hood-equipped appliances attached to the common vent.

NAT+NAT refers to the maximum combined input rating of two or more draft-hood-equipped appliances attached to the common vent.

NA means not allowed due to physical or geometric constraints.

DRAFT HOOD is a device built into an appliance, or made a part of the vent connector from an appliance, which is designed to (1) provide for the ready escape of the flue gases from the appliance in the event of no draft, backdraft, or stoppage beyond the draft hood; (2) prevent a backdraft from entering the appliance; and (3) neutralize the effect of stack action of the chimney or gas vent upon the operation of the appliance.

VENT is a passageway used to convey flue gases from gas utilization equipment, or its vent connector, to the outside atmosphere.

VENT CONNECTOR is the pipe or duct that connects a fuel gas-burning appliance to a vent or chimney.

FLUE COLLAR is that portion of an appliance designed for the attachment of a draft hood, appliance adapter, vent connector or venting system.

FORCED DRAFT indicates that the combustion air fan or blower is located ahead of the burner compartment.

INDUCED DRAFT indicates that the combustion air fan or blower is located at or after the exit of flue products from the heat exchanger.

CONDENSING APPLIANCE is one which by reason of having sufficient heat removed from its products of combustion, water vapors will condense in its heat exchanger and continue to condense in the venting system.

Definition of ANSI Categories of Appliances*

Gas Appliances Categories. Vented gas appliances are classified for venting purposes into four categories as follows:

- | | |
|---------------------|--|
| Category I | An appliance that operates with a negative vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent. |
| Category II | An appliance that operates with a negative vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent. |
| Category III | An appliance that operates with a positive vent static pressure and with a vent gas temperature that usually avoids excessive condensate production in the vent. |
| Category IV | An appliance that operates with a positive vent static pressure and with a vent gas temperature that causes excessive condensate production in the vent. |

* Remember that these definitions apply to the appliance and do not necessarily reflect the performance of the connected vent system.

Single-Appliance Vent Systems

General Rules for Venting Single Appliances.

Normally, a vent equal to the size of the draft hood outlet can be considered satisfactory for venting a single appliance. It is important to note that this rule may NOT apply to cases where an extra high vent is required, and it may be desirable to calculate the system to determine whether it is possible to reduce the size of the vent.

How to Use Single-Appliance Vent Tables

To determine the proper vent size for a single-appliance vent, use Table 1 or 2 (pages 12-14).

- Determine Total Height (H) and Total Lateral Length (L) based on location of appliance and vent and the height to vent termination.
- Read down the Total Height (H) column at the left to a height equal to the Total Height.
- Select the horizontal row for the appropriate Length of Lateral (L) (zero for straight vertical vents).
- Read across to the column that represents the appliance type and shows a capacity equal to or greater than the appliance nameplate input for draft-hood-equipped appliances or that falls between the FAN Min and Max for FAN-assisted appliances.
- If the vent size shown at the top of the column containing the correct capacity is equal to or larger than the appliance draft hood, use the vent size shown by the Table.
- If the vent shown is smaller than the draft hood size, see **Draft Hood to Vent Reduction** to the right.

Example

A typical example of use of the Tables for Single-Appliance Venting is shown in Figure 5. The furnace has an input rating of 80,000 BTU per hour and is fan-assisted. Total Height (H) of the vent is 30 feet with a 10-foot Total Lateral Length (L). The entire system is Type B gas vent.

Procedure

Go down Vent Height (H) column of Table 1 to 30-foot height with a 10-foot lateral under the FAN Min and FAN Max column giving 37,000 and 150,000 BTUH for a 4-inch vent. Generally, the smallest diameter that will do the job is preferred. Note that if this system were to have a single-wall connector, Table 2 would have to be used. However, there is no solution!

Draft Hood to Vent Reduction

If the vent size determined from the Tables is less than the size of a draft hood outlet or flue collar, the smaller vent may be used, provided:

- The vent is at least 10 feet high. When a vent is less than 10 feet high, the vent should be at least as large as the flue collar outlet.
- Vents for draft hoods or flue collars 12 inches in diameter or less should NOT be reduced more than one pipe size. A 6- to 5-inch or a 12- to 10-inch reduction is a one- pipe size reduction. For larger gas-burning equipment, such as boilers having draft hood sizes from 14 to 24 inches in diameter, reductions of more than two pipe sizes are NOT recommended (24- to 20-inch is a two-size reduction).
- The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10 percent.
- Regardless of the size vent shown by the Tables for such appliances, DO NOT connect any 4-inch draft hoods to 3-inch vents. This provision does not apply to fan-assisted appliances.

Additional Guidelines for Single-Appliance Vent Systems

The flow area of the vertical vent shall not exceed seven times the flow area of the appliance flue collar area or the draft hood outlet area. For instance, if:

| | | | | | | |
|--|----|-----|-----|-----|-----|-----|
| The flue collar diameter is: | 3" | 4" | 5" | 6" | 7" | 8" |
| The maximum common vent diameter allowed is: | 8" | 10" | 12" | 14" | 18" | 20" |

Single-appliance vent configurations with zero (0) lateral lengths in Tables 1 and 2 have no elbows in the system. For all other vent configurations with indicated lateral lengths, the vent table capacities include two 90° elbows. For each additional 90° fitting or equivalent, the maximum capacity listed shall be reduced by 10%. Two 45° elbows are equivalent to one 90° elbow. Two 90° elbows connected together are equivalent to three in the system.

Interpolation is permitted between table entries. Extrapolation beyond table entries is not permitted.

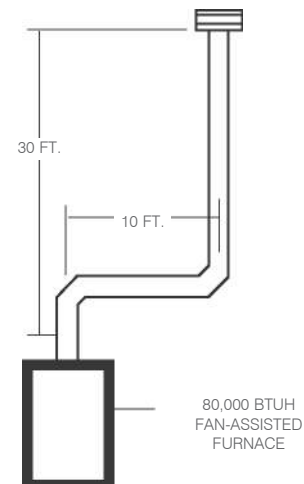


Figure 5

Type B Double-Wall Gas Vent Capacities with Type B Double-Wall Connector

Single Category I Appliance

Table 1

| Vent Height H (ft) | Lateral L (ft) | Vent and Connector Diameter - D | | | | | | | | | | | | | | | | | | | | |
|--------------------|----------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|------|------|------|
| | | 3" | | 4" | | 5" | | 6" | | 7" | | 8" | | 10" | | | | | | | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | | | |
| | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | |
| 6 | 0 | 0 | 78 | 46 | 0 | 152 | 86 | 0 | 251 | 141 | 0 | 375 | 205 | 0 | 524 | 285 | 0 | 698 | 370 | 0 | 1121 | 570 |
| | 2 | 13 | 51 | 38 | 18 | 97 | 67 | 27 | 157 | 105 | 32 | 232 | 157 | 44 | 321 | 217 | 53 | 425 | 285 | 75 | 675 | 455 |
| | 4 | 21 | 49 | 34 | 30 | 94 | 64 | 39 | 153 | 103 | 50 | 227 | 153 | 66 | 316 | 211 | 79 | 419 | 279 | 110 | 668 | 445 |
| | 6 | 25 | 46 | 32 | 36 | 91 | 61 | 47 | 149 | 100 | 59 | 223 | 149 | 78 | 310 | 205 | 93 | 413 | 273 | 128 | 661 | 435 |
| 8 | 0 | 0 | 84 | 50 | 0 | 165 | 94 | 0 | 276 | 155 | 0 | 415 | 235 | 0 | 583 | 320 | 0 | 780 | 415 | 0 | 1261 | 660 |
| | 2 | 12 | 57 | 40 | 16 | 109 | 75 | 25 | 178 | 120 | 28 | 263 | 180 | 42 | 365 | 247 | 50 | 483 | 322 | 71 | 770 | 515 |
| | 5 | 23 | 53 | 38 | 32 | 103 | 71 | 42 | 171 | 115 | 53 | 255 | 173 | 70 | 356 | 237 | 83 | 473 | 313 | 115 | 758 | 503 |
| | 8 | 28 | 49 | 35 | 39 | 98 | 66 | 51 | 164 | 109 | 64 | 247 | 165 | 84 | 347 | 227 | 99 | 463 | 303 | 137 | 746 | 490 |
| 10 | 0 | 0 | 88 | 53 | 0 | 175 | 100 | 0 | 295 | 166 | 0 | 447 | 255 | 0 | 631 | 345 | 0 | 847 | 450 | 0 | 1377 | 720 |
| | 2 | 12 | 61 | 42 | 17 | 118 | 81 | 23 | 194 | 129 | 26 | 289 | 195 | 40 | 402 | 273 | 48 | 533 | 355 | 68 | 852 | 560 |
| | 5 | 23 | 57 | 40 | 32 | 113 | 77 | 41 | 187 | 124 | 52 | 280 | 188 | 68 | 392 | 263 | 81 | 522 | 346 | 112 | 839 | 547 |
| | 10 | 30 | 51 | 36 | 41 | 104 | 70 | 54 | 176 | 115 | 67 | 267 | 175 | 88 | 376 | 245 | 104 | 504 | 330 | 142 | 817 | 525 |
| 15 | 0 | 0 | 94 | 58 | 0 | 191 | 112 | 0 | 327 | 187 | 0 | 502 | 285 | 0 | 716 | 390 | 0 | 970 | 525 | 0 | 1596 | 840 |
| | 2 | 11 | 69 | 48 | 15 | 136 | 93 | 20 | 226 | 150 | 22 | 339 | 225 | 38 | 475 | 316 | 45 | 633 | 414 | 63 | 1019 | 675 |
| | 5 | 22 | 65 | 45 | 30 | 130 | 87 | 39 | 219 | 142 | 49 | 330 | 217 | 64 | 463 | 300 | 76 | 620 | 403 | 105 | 1003 | 660 |
| | 10 | 29 | 59 | 41 | 40 | 121 | 82 | 51 | 206 | 135 | 64 | 315 | 208 | 84 | 445 | 288 | 99 | 600 | 386 | 135 | 977 | 635 |
| | 15 | 35 | 53 | 37 | 48 | 112 | 76 | 61 | 195 | 128 | 76 | 301 | 198 | 98 | 429 | 275 | 115 | 580 | 373 | 155 | 953 | 610 |
| 20 | 0 | 0 | 97 | 61 | 0 | 202 | 119 | 0 | 349 | 202 | 0 | 540 | 307 | 0 | 776 | 430 | 0 | 1057 | 575 | 0 | 1756 | 930 |
| | 2 | 10 | 75 | 51 | 14 | 149 | 100 | 18 | 250 | 166 | 20 | 377 | 249 | 33 | 531 | 346 | 41 | 711 | 470 | 59 | 1150 | 755 |
| | 5 | 21 | 71 | 48 | 29 | 143 | 96 | 38 | 242 | 160 | 47 | 367 | 241 | 62 | 519 | 337 | 73 | 697 | 460 | 101 | 1133 | 738 |
| | 10 | 28 | 64 | 44 | 38 | 133 | 89 | 50 | 229 | 150 | 62 | 351 | 228 | 81 | 499 | 321 | 95 | 675 | 443 | 130 | 1105 | 710 |
| | 15 | 34 | 58 | 40 | 46 | 124 | 84 | 59 | 217 | 142 | 73 | 337 | 217 | 94 | 481 | 308 | 111 | 654 | 427 | 150 | 1078 | 688 |
| | 20 | 48 | 52 | 35 | 55 | 116 | 78 | 69 | 206 | 134 | 84 | 322 | 206 | 107 | 464 | 295 | 125 | 634 | 410 | 167 | 1052 | 665 |
| 30 | 0 | 0 | 100 | 64 | 0 | 213 | 128 | 0 | 374 | 220 | 0 | 587 | 336 | 0 | 853 | 475 | 0 | 1173 | 650 | 0 | 1977 | 1060 |
| | 2 | 9 | 81 | 56 | 13 | 166 | 112 | 14 | 283 | 185 | 18 | 432 | 280 | 27 | 613 | 394 | 33 | 826 | 535 | 54 | 1351 | 865 |
| | 5 | 21 | 77 | 54 | 28 | 160 | 108 | 36 | 275 | 176 | 45 | 421 | 273 | 58 | 600 | 385 | 69 | 811 | 524 | 96 | 1332 | 851 |
| | 10 | 27 | 70 | 50 | 37 | 150 | 102 | 48 | 262 | 171 | 59 | 405 | 261 | 77 | 580 | 371 | 91 | 788 | 507 | 125 | 1301 | 829 |
| | 15 | 33 | 64 | NA | 44 | 141 | 96 | 57 | 249 | 163 | 70 | 389 | 249 | 90 | 560 | 357 | 105 | 765 | 490 | 143 | 1272 | 807 |
| | 20 | 56 | 58 | NA | 53 | 132 | 90 | 66 | 237 | 154 | 80 | 374 | 237 | 102 | 542 | 343 | 119 | 743 | 473 | 160 | 1243 | 784 |
| | 30 | NA | NA | NA | 73 | 113 | NA | 88 | 214 | NA | 104 | 346 | 219 | 131 | 507 | 321 | 149 | 702 | 444 | 195 | 1189 | 745 |
| 50 | 0 | 0 | 101 | 67 | 0 | 216 | 134 | 0 | 397 | 232 | 0 | 633 | 363 | 0 | 932 | 518 | 0 | 1297 | 708 | 0 | 2231 | 1195 |
| | 2 | 8 | 86 | 61 | 11 | 183 | 122 | 14 | 320 | 206 | 15 | 497 | 314 | 22 | 715 | 445 | 26 | 975 | 615 | 41 | 1620 | 1010 |
| | 5 | 20 | 82 | NA | 27 | 177 | 119 | 35 | 312 | 200 | 43 | 487 | 308 | 55 | 702 | 438 | 65 | 960 | 605 | 90 | 1600 | 996 |
| | 10 | 26 | 76 | NA | 35 | 168 | 114 | 45 | 299 | 190 | 56 | 471 | 298 | 73 | 681 | 426 | 86 | 935 | 589 | 118 | 1567 | 972 |
| | 15 | 59 | 70 | NA | 42 | 158 | NA | 54 | 287 | 180 | 66 | 455 | 288 | 85 | 662 | 413 | 100 | 911 | 572 | 136 | 1536 | 948 |
| | 20 | NA | NA | NA | 50 | 149 | NA | 63 | 275 | 169 | 76 | 440 | 278 | 97 | 642 | 401 | 113 | 888 | 556 | 151 | 1505 | 924 |
| | 30 | NA | NA | NA | 69 | 131 | NA | 84 | 250 | NA | 99 | 410 | 259 | 123 | 605 | 376 | 141 | 844 | 522 | 183 | 1446 | 876 |
| 100 | 0 | NA | NA | NA | 0 | 218 | NA | 0 | 407 | NA | 0 | 665 | 400 | 0 | 997 | 560 | 0 | 1411 | 770 | 0 | 2491 | 1310 |
| | 2 | NA | NA | NA | 10 | 194 | NA | 12 | 354 | NA | 13 | 566 | 375 | 18 | 831 | 510 | 21 | 1155 | 700 | 30 | 1975 | 1170 |
| | 5 | NA | NA | NA | 26 | 189 | NA | 33 | 347 | NA | 40 | 557 | 369 | 52 | 820 | 504 | 60 | 1141 | 692 | 82 | 1955 | 1159 |
| | 10 | NA | NA | NA | 33 | 182 | NA | 43 | 335 | NA | 53 | 542 | 361 | 68 | 801 | 493 | 80 | 1118 | 679 | 108 | 1923 | 1142 |
| | 15 | NA | NA | NA | 40 | 174 | NA | 50 | 321 | NA | 62 | 528 | 353 | 80 | 782 | 482 | 93 | 1095 | 666 | 126 | 1892 | 1124 |
| | 20 | NA | NA | NA | 47 | 166 | NA | 59 | 311 | NA | 71 | 513 | 344 | 90 | 763 | 471 | 105 | 1073 | 653 | 141 | 1861 | 1107 |
| | 30 | NA | NA | NA | NA | NA | NA | 78 | 290 | NA | 92 | 483 | NA | 115 | 726 | 449 | 131 | 1029 | 627 | 170 | 1802 | 1071 |
| 50 | NA | NA | NA | NA | NA | NA | NA | NA | NA | 147 | 428 | NA | 180 | 651 | 405 | 197 | 944 | 575 | 241 | 1688 | 1000 | |

Table 1 Continued

| Vent Height H (ft) | Lateral L (ft) | Vent and Connector Diameter - D | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----------------|--|------|------|-----|------|------|-----|------|------|-----|-------|------|-----|-------|------|-----|-------|------|-----|-------|-------|-----|
| | | 12" | | 14" | | 16" | | | 18" | | | 20" | | | 22" | | | 24" | | | | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | FAN | | NAT | FAN | | | NAT | FAN | | | NAT | FAN | | | NAT | FAN | | NAT | |
| Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max |
| 6 | 0 | 0 | 1645 | 850 | 0 | 2267 | 1170 | 0 | 2983 | 1530 | 0 | 3802 | 1960 | 0 | 4721 | 2430 | 0 | 5737 | 2950 | 0 | 6853 | 3520 | |
| | 2 | 103 | 982 | 650 | 138 | 1346 | 890 | 178 | 1769 | 1170 | 225 | 2250 | 1480 | 296 | 2782 | 1850 | 360 | 3377 | 2220 | 426 | 4030 | 2670 | |
| | 4 | 147 | 975 | 640 | 191 | 1338 | 880 | 242 | 1761 | 1160 | 300 | 2242 | 1475 | 390 | 2774 | 1835 | 469 | 3370 | 2215 | 555 | 4023 | 2660 | |
| | 6 | 171 | 967 | 630 | 219 | 1330 | 870 | 276 | 1753 | 1150 | 341 | 2235 | 1470 | 437 | 2767 | 1820 | 523 | 3363 | 2210 | 618 | 4017 | 2650 | |
| 8 | 0 | 0 | 1858 | 970 | 0 | 2571 | 1320 | 0 | 3399 | 1740 | 0 | 4333 | 2220 | 0 | 5387 | 2750 | 0 | 6555 | 3360 | 0 | 7838 | 4010 | |
| | 2 | 98 | 1124 | 745 | 130 | 1543 | 1020 | 168 | 2030 | 1340 | 212 | 2584 | 1700 | 278 | 3196 | 2110 | 336 | 3882 | 2560 | 401 | 4634 | 3050 | |
| | 5 | 154 | 1110 | 733 | 199 | 1528 | 1010 | 251 | 2013 | 1330 | 311 | 2563 | 1685 | 398 | 3180 | 2090 | 476 | 3863 | 2545 | 562 | 4612 | 3040 | |
| | 8 | 180 | 1097 | 720 | 231 | 1514 | 1000 | 289 | 2000 | 1320 | 354 | 2552 | 1670 | 450 | 3163 | 2070 | 537 | 3850 | 2530 | 630 | 4602 | 3030 | |
| 10 | 0 | 0 | 2036 | 1060 | 0 | 2825 | 1450 | 0 | 3742 | 1925 | 0 | 4782 | 2450 | 0 | 5955 | 3050 | 0 | 7254 | 3710 | 0 | 8682 | 4450 | |
| | 2 | 93 | 1244 | 850 | 124 | 1713 | 1130 | 161 | 2256 | 1480 | 202 | 2868 | 1890 | 264 | 3556 | 2340 | 319 | 4322 | 2840 | 378 | 5153 | 3390 | |
| | 5 | 149 | 1229 | 829 | 192 | 1696 | 1105 | 243 | 2238 | 1461 | 300 | 2849 | 1871 | 382 | 3536 | 2318 | 458 | 4301 | 2818 | 540 | 5132 | 3371 | |
| | 10 | 187 | 1204 | 795 | 238 | 1669 | 1080 | 298 | 2209 | 1430 | 364 | 2818 | 1840 | 459 | 3504 | 2280 | 546 | 4268 | 2780 | 641 | 5099 | 3340 | |
| 15 | 0 | 0 | 2380 | 1240 | 0 | 3323 | 1720 | 0 | 4423 | 2270 | 0 | 5678 | 2900 | 0 | 7099 | 3620 | 0 | 8665 | 4410 | 0 | 10393 | 5300 | |
| | 2 | 86 | 1495 | 985 | 114 | 2062 | 1350 | 147 | 2719 | 1770 | 186 | 3467 | 2260 | 239 | 4304 | 2800 | 290 | 5232 | 3410 | 346 | 6251 | 4080 | |
| | 5 | 140 | 1476 | 967 | 182 | 2041 | 1327 | 229 | 2696 | 1748 | 283 | 3442 | 2235 | 355 | 4278 | 2777 | 426 | 5204 | 3385 | 501 | 6222 | 4057 | |
| | 10 | 177 | 1446 | 936 | 227 | 2009 | 1289 | 283 | 2659 | 1712 | 346 | 3402 | 2193 | 432 | 4234 | 2739 | 510 | 5159 | 3343 | 599 | 6175 | 4019 | |
| | 15 | 202 | 1418 | 905 | 257 | 1976 | 1250 | 318 | 2623 | 1675 | 385 | 3363 | 2150 | 479 | 4192 | 2700 | 564 | 5115 | 3300 | 665 | 6129 | 3980 | |
| 20 | 0 | 0 | 2637 | 1350 | 0 | 3701 | 1900 | 0 | 4948 | 2520 | 0 | 6376 | 3250 | 0 | 7988 | 4060 | 0 | 9785 | 4980 | 0 | 11753 | 6000 | |
| | 2 | 81 | 1694 | 1100 | 107 | 2343 | 1520 | 139 | 3097 | 2000 | 175 | 3955 | 2570 | 220 | 4916 | 3200 | 269 | 5983 | 3910 | 321 | 7154 | 4700 | |
| | 5 | 135 | 1674 | 1079 | 174 | 2320 | 1498 | 219 | 3071 | 1978 | 270 | 3926 | 2544 | 337 | 4885 | 3174 | 403 | 5950 | 3880 | 475 | 7119 | 4662 | |
| | 10 | 172 | 1641 | 1045 | 220 | 2282 | 1460 | 273 | 3029 | 1940 | 334 | 3880 | 2500 | 413 | 4835 | 3130 | 489 | 5896 | 3830 | 573 | 7063 | 4600 | |
| | 15 | 195 | 1609 | 1018 | 248 | 2245 | 1425 | 306 | 2988 | 1910 | 372 | 3835 | 2465 | 459 | 4786 | 3090 | 541 | 5844 | 3795 | 631 | 7007 | 4575 | |
| | 20 | 217 | 1578 | 990 | 273 | 2210 | 1390 | 335 | 2948 | 1880 | 404 | 3791 | 2430 | 495 | 4737 | 3050 | 585 | 5792 | 3760 | 689 | 6953 | 4550 | |
| 30 | 0 | 0 | 3004 | 1550 | 0 | 4252 | 2170 | 0 | 5725 | 2920 | 0 | 7420 | 3770 | 0 | 9341 | 4750 | 0 | 11483 | 5850 | 0 | 13848 | 7060 | |
| | 2 | 74 | 2004 | 1310 | 98 | 2786 | 1800 | 127 | 3696 | 2380 | 159 | 4734 | 3050 | 199 | 5900 | 3810 | 241 | 7194 | 4650 | 285 | 8617 | 5600 | |
| | 5 | 127 | 1981 | 1289 | 164 | 2759 | 1775 | 206 | 3666 | 2350 | 252 | 4701 | 3020 | 312 | 5863 | 3783 | 373 | 7155 | 4622 | 439 | 8574 | 5552 | |
| | 10 | 164 | 1944 | 1254 | 209 | 2716 | 1733 | 259 | 3617 | 2300 | 316 | 4647 | 2970 | 386 | 5803 | 3739 | 456 | 7090 | 4574 | 535 | 8505 | 5471 | |
| | 15 | 187 | 1908 | 1220 | 237 | 2674 | 1692 | 292 | 3570 | 2250 | 354 | 4594 | 2920 | 431 | 5744 | 3695 | 507 | 7026 | 4527 | 590 | 8437 | 5391 | |
| | 20 | 207 | 1873 | 1185 | 260 | 2633 | 1650 | 319 | 3523 | 2200 | 384 | 4542 | 2870 | 467 | 5686 | 3650 | 548 | 6964 | 4480 | 639 | 8370 | 5310 | |
| | 30 | 246 | 1807 | 1130 | 305 | 2555 | 1585 | 369 | 3433 | 2130 | 440 | 4442 | 2785 | 540 | 5574 | 3565 | 635 | 6842 | 4375 | 739 | 8239 | 5225 | |
| 50 | 0 | 0 | 3441 | 1825 | 0 | 4934 | 2550 | 0 | 6711 | 3440 | 0 | 8774 | 4460 | 0 | 11129 | 5635 | 0 | 13767 | 6940 | 0 | 16694 | 8430 | |
| | 2 | 66 | 2431 | 1513 | 86 | 3409 | 2125 | 113 | 4554 | 2840 | 141 | 5864 | 3670 | 171 | 7339 | 4630 | 209 | 8980 | 5695 | 251 | 10788 | 6860 | |
| | 5 | 118 | 2406 | 1495 | 151 | 3380 | 2102 | 191 | 4520 | 2813 | 234 | 5826 | 3639 | 283 | 7295 | 4597 | 336 | 8933 | 5654 | 394 | 10737 | 6818 | |
| | 10 | 154 | 2366 | 1466 | 196 | 3332 | 2064 | 243 | 4464 | 2767 | 295 | 5763 | 3585 | 355 | 7224 | 4542 | 419 | 8855 | 5585 | 491 | 10652 | 6749 | |
| | 15 | 177 | 2327 | 1437 | 222 | 3285 | 2026 | 274 | 4409 | 2721 | 330 | 5701 | 3534 | 396 | 7155 | 4511 | 465 | 8779 | 5546 | 542 | 10570 | 6710 | |
| | 20 | 195 | 2288 | 1408 | 244 | 3239 | 1987 | 300 | 4356 | 2675 | 361 | 5641 | 3481 | 433 | 7086 | 4479 | 506 | 8704 | 5506 | 586 | 10488 | 6670 | |
| | 30 | 232 | 2214 | 1349 | 287 | 3150 | 1910 | 347 | 4253 | 2631 | 412 | 5523 | 3431 | 494 | 6953 | 4421 | 577 | 8557 | 5444 | 672 | 10328 | 6603 | |
| 100 | 0 | 0 | 3925 | 2050 | 0 | 5729 | 2950 | 0 | 7914 | 4050 | 0 | 10485 | 5300 | 0 | 13454 | 6700 | 0 | 16817 | 8600 | 0 | 20578 | 10300 | |
| | 2 | 44 | 3027 | 1820 | 72 | 4313 | 2550 | 95 | 5834 | 3500 | 120 | 7591 | 4600 | 138 | 9577 | 5800 | 169 | 11803 | 7200 | 204 | 14264 | 8800 | |
| | 5 | 107 | 3002 | 1803 | 136 | 4282 | 2531 | 172 | 5797 | 3475 | 208 | 7548 | 4566 | 245 | 9528 | 5769 | 293 | 11748 | 7162 | 341 | 14204 | 8756 | |
| | 10 | 142 | 2961 | 1775 | 180 | 4231 | 2500 | 223 | 5737 | 3434 | 268 | 7478 | 4509 | 318 | 9447 | 5717 | 374 | 11658 | 7100 | 436 | 14105 | 8683 | |
| | 15 | 163 | 2920 | 1747 | 206 | 4182 | 2469 | 252 | 5678 | 3392 | 304 | 7409 | 4451 | 358 | 9367 | 5665 | 418 | 11569 | 7037 | 487 | 14007 | 8610 | |
| | 20 | 181 | 2880 | 1719 | 226 | 4133 | 2438 | 277 | 5619 | 3351 | 330 | 7341 | 4394 | 387 | 9289 | 5613 | 452 | 11482 | 6975 | 523 | 13910 | 8537 | |
| | 30 | 215 | 2803 | 1663 | 265 | 4037 | 2375 | 319 | 5505 | 3267 | 378 | 7209 | 4279 | 446 | 9136 | 5509 | 514 | 11310 | 6850 | 592 | 13720 | 8391 | |
| | 50 | 292 | 2657 | 1550 | 350 | 3856 | 2250 | 415 | 5289 | 3100 | 486 | 6956 | 4050 | 572 | 8841 | 5300 | 659 | 10979 | 6600 | 752 | 13354 | 8100 | |

Type B Double-Wall Gas Vent Capacities with Single-Wall Connector

Single Category I Appliance

Table 2

| Vent Height H (ft) | Lateral L (ft) | Vent and Connector Diameter - D | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|------|------|------|------|------|
| | | 3" | | 4" | | 5" | | 6" | | 7" | | 8" | | 10" | | 12" | | | | | | | | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | |
| Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | | |
| 6 | 0 | 38 | 77 | 45 | 59 | 151 | 85 | 85 | 249 | 140 | 126 | 373 | 204 | 165 | 522 | 284 | 211 | 695 | 369 | 371 | 1118 | 569 | 537 | 1639 | 849 |
| | 2 | 39 | 51 | 36 | 60 | 96 | 66 | 85 | 156 | 104 | 123 | 231 | 156 | 159 | 320 | 213 | 201 | 423 | 284 | 347 | 673 | 453 | 498 | 979 | 648 |
| | 4 | NA | NA | 33 | 74 | 92 | 63 | 102 | 152 | 102 | 146 | 225 | 152 | 187 | 313 | 208 | 237 | 416 | 277 | 409 | 664 | 443 | 584 | 971 | 638 |
| | 6 | NA | NA | 31 | 83 | 89 | 60 | 114 | 147 | 99 | 163 | 220 | 148 | 207 | 307 | 203 | 263 | 409 | 271 | 449 | 656 | 433 | 638 | 962 | 627 |
| 8 | 0 | 37 | 83 | 50 | 58 | 164 | 93 | 83 | 273 | 154 | 123 | 412 | 234 | 161 | 580 | 319 | 206 | 777 | 414 | 360 | 1257 | 658 | 521 | 1852 | 967 |
| | 2 | 39 | 56 | 39 | 59 | 108 | 75 | 83 | 176 | 119 | 121 | 261 | 179 | 155 | 363 | 246 | 197 | 482 | 321 | 339 | 768 | 513 | 486 | 1220 | 743 |
| | 5 | NA | NA | 37 | 77 | 102 | 69 | 107 | 168 | 114 | 151 | 252 | 171 | 193 | 352 | 235 | 245 | 470 | 311 | 418 | 754 | 500 | 598 | 1104 | 730 |
| | 8 | NA | NA | 33 | 90 | 95 | 64 | 122 | 161 | 107 | 175 | 243 | 163 | 223 | 342 | 225 | 280 | 458 | 300 | 470 | 740 | 486 | 665 | 1089 | 715 |
| 10 | 0 | 37 | 87 | 53 | 57 | 174 | 99 | 82 | 293 | 165 | 120 | 444 | 254 | 158 | 628 | 344 | 202 | 844 | 449 | 351 | 1373 | 718 | 507 | 2031 | 1057 |
| | 2 | 39 | 61 | 41 | 59 | 117 | 80 | 82 | 193 | 128 | 119 | 287 | 194 | 153 | 400 | 272 | 193 | 531 | 354 | 332 | 849 | 559 | 475 | 1242 | 848 |
| | 5 | 52 | 56 | 39 | 76 | 111 | 76 | 105 | 185 | 122 | 148 | 277 | 186 | 190 | 388 | 261 | 241 | 518 | 344 | 409 | 834 | 544 | 584 | 1224 | 825 |
| | 10 | NA | NA | 34 | 97 | 100 | 68 | 132 | 171 | 112 | 188 | 261 | 171 | 237 | 369 | 241 | 296 | 497 | 325 | 492 | 808 | 520 | 688 | 1194 | 788 |
| 15 | 0 | 36 | 93 | 57 | 56 | 190 | 111 | 80 | 325 | 186 | 116 | 499 | 283 | 153 | 713 | 388 | 195 | 966 | 523 | 336 | 1591 | 838 | 488 | 2374 | 1237 |
| | 2 | 38 | 69 | 47 | 57 | 136 | 93 | 80 | 225 | 149 | 115 | 337 | 224 | 148 | 473 | 314 | 187 | 631 | 413 | 319 | 1015 | 673 | 457 | 1491 | 983 |
| | 5 | 51 | 63 | 44 | 75 | 128 | 86 | 102 | 216 | 140 | 144 | 326 | 217 | 182 | 459 | 298 | 231 | 616 | 400 | 392 | 997 | 657 | 562 | 1469 | 963 |
| | 10 | NA | NA | 39 | 95 | 116 | 79 | 128 | 201 | 131 | 182 | 308 | 203 | 228 | 438 | 284 | 284 | 582 | 381 | 470 | 966 | 628 | 664 | 1433 | 928 |
| 20 | 0 | 35 | 96 | 60 | 54 | 200 | 118 | 76 | 346 | 201 | 114 | 537 | 306 | 149 | 772 | 428 | 190 | 1053 | 573 | 326 | 1751 | 927 | 473 | 2631 | 1346 |
| | 2 | 37 | 74 | 50 | 56 | 148 | 99 | 78 | 248 | 165 | 113 | 375 | 248 | 144 | 528 | 344 | 182 | 708 | 468 | 309 | 1146 | 754 | 443 | 1689 | 1098 |
| | 5 | 50 | 68 | 47 | 73 | 140 | 94 | 100 | 239 | 158 | 141 | 363 | 239 | 178 | 514 | 334 | 224 | 692 | 457 | 381 | 1126 | 734 | 547 | 1665 | 1074 |
| | 10 | NA | NA | 41 | 93 | 129 | 86 | 125 | 223 | 146 | 177 | 344 | 224 | 222 | 491 | 316 | 277 | 666 | 437 | 457 | 1092 | 702 | 646 | 1626 | 1037 |
| 30 | 0 | 34 | 99 | 63 | 53 | 211 | 127 | 76 | 372 | 219 | 110 | 584 | 334 | 144 | 849 | 472 | 184 | 1168 | 647 | 312 | 1971 | 1056 | 454 | 2996 | 1545 |
| | 2 | 37 | 80 | 56 | 55 | 164 | 111 | 76 | 281 | 183 | 109 | 429 | 279 | 139 | 610 | 392 | 175 | 823 | 533 | 296 | 1346 | 863 | 424 | 1999 | 1308 |
| | 5 | 49 | 74 | 52 | 72 | 157 | 106 | 98 | 271 | 173 | 136 | 417 | 271 | 171 | 595 | 382 | 215 | 806 | 521 | 366 | 1324 | 846 | 524 | 1971 | 1283 |
| | 10 | NA | NA | NA | 91 | 144 | 98 | 122 | 255 | 168 | 171 | 397 | 257 | 213 | 570 | 367 | 265 | 777 | 501 | 440 | 1287 | 821 | 620 | 1927 | 1243 |
| 50 | 0 | 33 | 99 | 66 | 51 | 213 | 133 | 73 | 394 | 230 | 105 | 629 | 361 | 138 | 928 | 515 | 176 | 1292 | 704 | 295 | 2223 | 1189 | 428 | 3432 | 1818 |
| | 2 | 36 | 84 | 61 | 53 | 181 | 121 | 73 | 318 | 205 | 104 | 495 | 312 | 133 | 712 | 443 | 168 | 971 | 613 | 280 | 1615 | 1007 | 401 | 2426 | 1509 |
| | 5 | 48 | 80 | NA | 70 | 174 | 117 | 94 | 308 | 198 | 131 | 482 | 305 | 164 | 696 | 435 | 204 | 953 | 602 | 347 | 1591 | 991 | 496 | 2396 | 1490 |
| | 10 | NA | NA | NA | 89 | 160 | NA | 118 | 292 | 186 | 162 | 461 | 292 | 203 | 671 | 420 | 253 | 923 | 583 | 418 | 1551 | 963 | 589 | 2347 | 1455 |
| 100 | 0 | NA | NA | NA | 49 | 214 | NA | 69 | 403 | NA | 100 | 659 | 395 | 131 | 991 | 555 | 166 | 1404 | 765 | 273 | 2479 | 1300 | 395 | 3912 | 2042 |
| | 2 | NA | NA | NA | 51 | 192 | NA | 70 | 351 | NA | 98 | 583 | 373 | 125 | 828 | 508 | 158 | 1152 | 698 | 259 | 1970 | 1168 | 371 | 3021 | 1817 |
| | 5 | NA | NA | NA | 67 | 186 | NA | 90 | 342 | NA | 125 | 551 | 366 | 156 | 813 | 501 | 194 | 1134 | 688 | 322 | 1945 | 1153 | 460 | 2990 | 1796 |
| | 10 | NA | NA | NA | 85 | 175 | NA | 113 | 324 | NA | 153 | 532 | 354 | 191 | 789 | 486 | 238 | 1104 | 672 | 386 | 1905 | 1133 | 547 | 2938 | 1763 |
| 100 | 0 | NA | NA | NA | NA | NA | NA | 168 | 295 | NA | 224 | 487 | NA | 270 | 739 | 458 | 325 | 1046 | 639 | 507 | 1825 | 1087 | 690 | 2838 | 1696 |
| | 2 | NA | NA | NA | NA | NA | NA | 231 | 264 | NA | 301 | 448 | NA | 355 | 685 | NA | 418 | 988 | NA | 631 | 1747 | 1041 | 834 | 2739 | 1627 |
| | 5 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 540 | 584 | NA | 617 | 866 | NA | 895 | 1591 | NA | 1138 | 2547 | 1489 |

Multiple-Appliance Vent Systems

How to Determine Each Vent Connector Size

(Table 4A or 5A, pages 14-16)

- Determine the MINIMUM TOTAL VENT HEIGHT for the system from a sketch of the proposed system.
- Determine the CONNECTOR RISE for each appliance.
- Enter the VENT CONNECTOR Table 4A or 5A at the line showing VENT HEIGHT equal to or less than that determined above. Continue horizontally on that line for the first appliance CONNECTOR RISE using the appliance nameplate BTUH rating (sea level). Always use a Table entry that equals or exceeds a draft-hood appliance input or that brackets a fan-assisted appliance input. Read the connector vent size for that appliance at the top of the column.
- Using the same VENT HEIGHT, repeat the procedure for each appliance, using its CONNECTOR RISE AND BTUH rating.

CAUTION. NEVER use a connector size smaller than the draft-hood outlet size. (Exception: Does not apply to fan-assisted appliances.)

How to Determine Common Vent Size

(Table 4B or 5B, pages 14-16)

- Total all appliance BTUH input ratings that are to be connected to this common vent.
- Enter the COMMON VENT TABLE 4B or 5B at the same VENT HEIGHT used to determine the vent connector sizes above.
- Move horizontally across from this VENT HEIGHT figure using either the L line if the common vent has an offset, or has a horizontal manifold (Figure 4D), or the V line if the common vent is vertical with no offsets.
- Select the first value in the correct appliance combination column that is equal to or greater than the total of BTUH ratings.
- The size of the required COMMON VENT is found at the top of this column.

CAUTION. Regardless of the COMMON VENT size determined by the above procedure, the vent MUST be at least as large as the largest connector. If more than one connector is this same size, then use a COMMON VENT one size larger.

Example

Connect a 45,000 BTU water heater with a draft hood and 1-foot connector rise with a 100,000 BTU fan-equipped furnace with a 2-foot connector rise to a Common Vent with a Minimum Total Vent Height of 18 feet (Figure 6). All portions of the system are Type B GAS VENT.

Water Heater Vent Connector Size

Use Vent Connector Table 4A under NAT. Read down Minimum Total Vent Height column to 15 feet and read across 1 foot connector rise line to BTU rating equal to or higher than water heater input rating. This figure shows 53,000 BTU and is in the column for 4-inch connector. Since this is in excess of the water heater input, it is not necessary to find the maximum input for an 18-foot minimum total vent height. Use a 4-inch connector (Figure 6A).

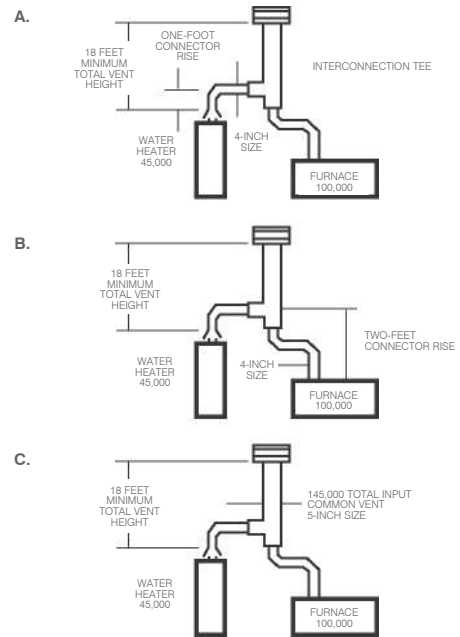


Figure 6

Furnace Vent Connector

Use Vent Connector Table 4A. Read down Total Vent Height column to 15 feet and read across 2-foot Connector Rise line to fan column. Note 4-inch vent size shows 96,000 BTU per hour or less than furnace input. However, with 20-foot Total Height, read across 2-foot connector rise line. Note 4-inch vent size shows 105,000 BTU per hour. Since 18-foot height is $\frac{3}{5}$ of this: $\frac{3}{5}(105,000 - 96,000) = 5400$. $96,000 + 5400 = 101,400$, which is the maximum input for 18-foot Minimum Total Vent Height. Therefore a 4-inch connector would be the correct size for furnace, providing the furnace had a 4-inch or smaller draft hood outlet (Figure 6B).

Common Vent Size

Total input to Common Vent is 145,000 BTU. Vent goes straight through roof so use V line of Table 4B under FAN + NAT column. Note that for 15-foot Minimum Total Vent Height maximum BTU for 5-inch vent is 164,000, which is greater than total input to the common vent. Therefore the common vent can be 5-inch diameter (Figure 6C).

Type B Vent Connector Capacities

For Multiple Category I Appliances Connected to a Common Vent

Table 4A

| Vent Height H (ft) | Connector Rise R (ft) | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | | | | |
|--------------------|-----------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
| | | 3" | | | 4" | | | 5" | | | 6" | | | 7" | | | 8" | | | 10" | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT |
| Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | | |
| 6 | 1 | 22 | 37 | 26 | 35 | 66 | 46 | 106 | 72 | 58 | 164 | 104 | 77 | 225 | 142 | 82 | 296 | 185 | 128 | 466 | 289 | |
| | 2 | 23 | 41 | 31 | 37 | 75 | 55 | 48 | 121 | 86 | 60 | 183 | 124 | 79 | 253 | 168 | 95 | 333 | 220 | 131 | 526 | 345 |
| | 3 | 24 | 44 | 35 | 38 | 81 | 62 | 49 | 132 | 96 | 62 | 199 | 139 | 82 | 275 | 189 | 97 | 363 | 248 | 134 | 575 | 386 |
| 8 | 1 | 22 | 40 | 27 | 35 | 72 | 48 | 49 | 114 | 76 | 64 | 176 | 109 | 84 | 243 | 148 | 100 | 320 | 194 | 138 | 507 | 303 |
| | 2 | 23 | 44 | 32 | 36 | 80 | 57 | 51 | 128 | 90 | 66 | 195 | 129 | 86 | 269 | 175 | 103 | 356 | 230 | 141 | 564 | 358 |
| | 3 | 24 | 47 | 36 | 37 | 87 | 64 | 53 | 139 | 101 | 67 | 210 | 145 | 88 | 290 | 198 | 105 | 384 | 258 | 143 | 612 | 402 |
| 10 | 1 | 22 | 43 | 28 | 34 | 78 | 50 | 49 | 123 | 78 | 65 | 189 | 113 | 89 | 257 | 154 | 106 | 341 | 200 | 146 | 542 | 314 |
| | 2 | 23 | 47 | 33 | 36 | 86 | 59 | 51 | 136 | 93 | 67 | 206 | 134 | 91 | 282 | 182 | 109 | 374 | 238 | 149 | 596 | 372 |
| | 3 | 24 | 50 | 37 | 37 | 92 | 67 | 52 | 146 | 104 | 69 | 220 | 150 | 94 | 303 | 205 | 111 | 402 | 268 | 152 | 642 | 417 |
| 15 | 1 | 21 | 50 | 30 | 33 | 89 | 53 | 47 | 142 | 83 | 64 | 220 | 120 | 88 | 298 | 163 | 110 | 389 | 214 | 162 | 609 | 333 |
| | 2 | 22 | 53 | 35 | 35 | 96 | 63 | 49 | 153 | 99 | 66 | 235 | 142 | 91 | 320 | 193 | 112 | 419 | 253 | 165 | 658 | 394 |
| | 3 | 24 | 55 | 40 | 36 | 102 | 71 | 51 | 163 | 111 | 68 | 248 | 160 | 93 | 339 | 218 | 115 | 445 | 286 | 167 | 700 | 444 |
| 20 | 1 | 21 | 54 | 31 | 33 | 99 | 56 | 46 | 157 | 87 | 62 | 246 | 125 | 86 | 334 | 171 | 107 | 436 | 224 | 158 | 681 | 347 |
| | 2 | 22 | 57 | 37 | 34 | 105 | 66 | 48 | 167 | 104 | 64 | 259 | 149 | 89 | 354 | 202 | 110 | 463 | 265 | 161 | 725 | 414 |
| | 3 | 23 | 60 | 42 | 35 | 110 | 74 | 50 | 176 | 116 | 66 | 271 | 168 | 91 | 371 | 228 | 113 | 486 | 300 | 164 | 764 | 466 |
| 30 | 1 | 20 | 62 | 33 | 31 | 113 | 59 | 45 | 181 | 93 | 60 | 288 | 134 | 83 | 391 | 182 | 103 | 512 | 238 | 151 | 802 | 372 |
| | 2 | 21 | 64 | 39 | 33 | 118 | 70 | 47 | 190 | 110 | 62 | 299 | 158 | 85 | 408 | 215 | 105 | 535 | 282 | 155 | 840 | 439 |
| | 3 | 22 | 66 | 44 | 34 | 123 | 79 | 48 | 198 | 124 | 64 | 309 | 178 | 88 | 423 | 242 | 108 | 555 | 317 | 158 | 874 | 494 |
| 50 | 1 | 19 | 71 | 36 | 30 | 133 | 64 | 43 | 216 | 101 | 57 | 349 | 145 | 78 | 477 | 197 | 97 | 627 | 257 | 144 | 984 | 403 |
| | 2 | 21 | 73 | 43 | 32 | 137 | 76 | 45 | 223 | 119 | 59 | 358 | 172 | 81 | 490 | 234 | 100 | 645 | 306 | 148 | 1014 | 478 |
| | 3 | 22 | 75 | 48 | 33 | 141 | 86 | 46 | 229 | 134 | 61 | 366 | 194 | 83 | 502 | 263 | 103 | 661 | 343 | 151 | 1043 | 538 |
| 100 | 1 | 18 | 82 | 37 | 28 | 158 | 66 | 40 | 262 | 104 | 53 | 442 | 150 | 73 | 611 | 204 | 91 | 810 | 266 | 135 | 1285 | 417 |
| | 2 | 19 | 83 | 44 | 30 | 161 | 79 | 42 | 267 | 123 | 55 | 447 | 178 | 75 | 619 | 242 | 94 | 822 | 316 | 139 | 1306 | 494 |
| | 3 | 20 | 84 | 50 | 31 | 163 | 89 | 44 | 272 | 138 | 57 | 452 | 200 | 78 | 627 | 272 | 97 | 834 | 355 | 142 | 1327 | 555 |

Type B Common Vent Capacities

When Using Type B Connectors

Table 4B

| Vent Height H (ft) | Vent Type | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | |
|--------------------|-----------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| | | 4" | | | 5" | | | 6" | | | 7" | | | 8" | | | 10" | | |
| | | Combined Appliance Input Rating in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | |
| | | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT |
| +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | | |
| 6 | L | 74 | 65 | 52 | 112 | 93 | 82 | 163 | 129 | 117 | 247 | 198 | 160 | 323 | 251 | 210 | 538 | 416 | 328 |
| | V | 92 | 81 | 65 | 140 | 116 | 103 | 204 | 161 | 147 | 309 | 248 | 200 | 404 | 314 | 260 | 672 | 520 | 410 |
| 8 | L | 81 | 72 | 58 | 124 | 103 | 91 | 179 | 142 | 130 | 271 | 220 | 178 | 355 | 278 | 230 | 592 | 462 | 372 |
| | V | 101 | 90 | 73 | 155 | 129 | 114 | 224 | 178 | 163 | 339 | 275 | 223 | 444 | 348 | 290 | 740 | 577 | 465 |
| 10 | L | 88 | 78 | 63 | 135 | 113 | 98 | 194 | 155 | 142 | 294 | 239 | 193 | 382 | 302 | 250 | 640 | 502 | 396 |
| | V | 110 | 97 | 79 | 169 | 141 | 124 | 243 | 194 | 178 | 367 | 299 | 242 | 477 | 377 | 315 | 800 | 627 | 495 |
| 15 | L | 100 | 90 | 73 | 156 | 131 | 114 | 226 | 182 | 164 | 342 | 282 | 224 | 445 | 355 | 290 | 739 | 586 | 452 |
| | V | 125 | 112 | 91 | 195 | 164 | 144 | 283 | 228 | 206 | 427 | 352 | 280 | 556 | 444 | 365 | 924 | 733 | 565 |
| 20 | L | 109 | 98 | 81 | 172 | 146 | 127 | 251 | 204 | 182 | 380 | 315 | 250 | 497 | 399 | 325 | 828 | 661 | 512 |
| | V | 136 | 123 | 102 | 215 | 183 | 160 | 314 | 255 | 229 | 475 | 394 | 310 | 621 | 499 | 405 | 1035 | 826 | 640 |
| 30 | L | 122 | 110 | 94 | 195 | 168 | 147 | 289 | 238 | 211 | 438 | 367 | 290 | 576 | 468 | 375 | 967 | 780 | 592 |
| | V | 152 | 138 | 118 | 244 | 210 | 185 | 361 | 297 | 266 | 547 | 459 | 360 | 720 | 585 | 470 | 1209 | 975 | 740 |
| 50 | L | 134 | 122 | 107 | 223 | 195 | 171 | 337 | 282 | 248 | 513 | 438 | 338 | 683 | 565 | 440 | 1161 | 950 | 688 |
| | V | 167 | 153 | 134 | 279 | 244 | 214 | 421 | 353 | 310 | 641 | 547 | 423 | 854 | 706 | 550 | 1451 | 1188 | 860 |
| 100 | L | 140 | 130 | NA | 249 | 222 | NA | 391 | 337 | NA | 601 | 526 | 383 | 820 | 698 | 500 | 1427 | 1202 | 780 |
| | V | 175 | 163 | NA | 311 | 277 | NA | 489 | 421 | NA | 751 | 658 | 479 | 1025 | 873 | 625 | 1784 | 1502 | 975 |

Table 4A (continued)

| Vent Height H (ft) | Connector Rise R (ft) | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | | | | |
|--------------------|-----------------------|--|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|-----|------|------|
| | | 12" | | 14" | | 16" | | 18" | | 20" | | 22" | | 24" | | | | | | | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | FAN | | NAT | | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | | |
| 6 | 2 | 174 | 764 | 496 | 223 | 1046 | 653 | 281 | 1371 | 853 | 346 | 1772 | 1080 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 180 | 897 | 616 | 230 | 1231 | 827 | 287 | 1617 | 1081 | 352 | 2069 | 1370 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 6 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | |
| 8 | 2 | 186 | 822 | 516 | 238 | 1126 | 696 | 298 | 1478 | 910 | 365 | 1920 | 1150 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 192 | 952 | 644 | 244 | 1307 | 884 | 305 | 1719 | 1150 | 372 | 2211 | 1460 | 471 | 2737 | 1800 | 560 | 3319 | 2180 | 662 | 3957 | 2590 |
| | 6 | 198 | 1050 | 772 | 252 | 1445 | 1072 | 313 | 1902 | 1390 | 380 | 2434 | 1770 | 478 | 3018 | 2180 | 568 | 3665 | 2640 | 669 | 4373 | 3130 |
| 10 | 2 | 196 | 870 | 536 | 249 | 1195 | 730 | 311 | 1570 | 955 | 379 | 2049 | 1205 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 201 | 997 | 664 | 256 | 1371 | 924 | 318 | 1804 | 1205 | 387 | 2332 | 1535 | 486 | 2887 | 1890 | 581 | 3502 | 2280 | 686 | 4175 | 2710 |
| | 6 | 207 | 1095 | 792 | 263 | 1509 | 1118 | 325 | 1989 | 1455 | 395 | 2556 | 1865 | 494 | 3169 | 2290 | 589 | 3849 | 2760 | 694 | 4593 | 3270 |
| 15 | 2 | 214 | 967 | 568 | 272 | 1334 | 790 | 336 | 1760 | 1030 | 408 | 2317 | 1305 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 221 | 1085 | 712 | 279 | 1499 | 1006 | 344 | 1978 | 1320 | 416 | 2579 | 1665 | 523 | 3197 | 2060 | 624 | 3881 | 2490 | 734 | 4631 | 2960 |
| | 6 | 228 | 1181 | 856 | 286 | 1632 | 1222 | 351 | 2157 | 1610 | 424 | 2796 | 2025 | 533 | 3470 | 2510 | 634 | 4216 | 3030 | 743 | 5035 | 3600 |
| 20 | 2 | 223 | 1051 | 596 | 291 | 1443 | 840 | 357 | 1911 | 1095 | 430 | 2533 | 1385 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 230 | 1162 | 748 | 298 | 1597 | 1064 | 365 | 2116 | 1395 | 438 | 2778 | 1765 | 554 | 3447 | 2180 | 661 | 4190 | 2630 | 772 | 5005 | 3130 |
| | 6 | 237 | 1253 | 900 | 307 | 1726 | 1288 | 373 | 2287 | 1695 | 450 | 2984 | 2145 | 567 | 3708 | 2650 | 671 | 4511 | 3190 | 785 | 5392 | 3790 |
| 30 | 2 | 216 | 1217 | 632 | 286 | 1664 | 910 | 367 | 2183 | 1190 | 461 | 2891 | 1540 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 223 | 1316 | 792 | 294 | 1802 | 1160 | 376 | 2366 | 1510 | 474 | 3110 | 1920 | 619 | 3840 | 2365 | 728 | 4681 | 2860 | 847 | 5606 | 3410 |
| | 6 | 231 | 1400 | 952 | 303 | 1920 | 1410 | 384 | 2524 | 1830 | 485 | 3299 | 2340 | 632 | 4080 | 2875 | 741 | 4976 | 3480 | 860 | 5961 | 4150 |
| 50 | 2 | 206 | 1479 | 689 | 273 | 2023 | 1007 | 350 | 2659 | 1315 | 435 | 3548 | 1665 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 213 | 1561 | 860 | 281 | 2139 | 1291 | 359 | 2814 | 1685 | 447 | 3730 | 2135 | 580 | 4601 | 2633 | 709 | 5569 | 3185 | 851 | 6633 | 3790 |
| | 6 | 221 | 1631 | 1031 | 290 | 2242 | 1575 | 369 | 2951 | 2055 | 461 | 3893 | 2605 | 594 | 4808 | 3208 | 724 | 5826 | 3885 | 867 | 6943 | 4620 |
| 100 | 2 | 192 | 1923 | 712 | 254 | 2644 | 1050 | 326 | 3490 | 1370 | 402 | 4707 | 1740 | NA | NA | NA | NA | NA | NA | NA | NA | |
| | 4 | 200 | 1984 | 888 | 263 | 2731 | 1346 | 336 | 3606 | 1760 | 414 | 4842 | 2220 | 523 | 5982 | 2750 | 639 | 7254 | 3330 | 769 | 8650 | 3950 |
| | 6 | 208 | 2035 | 1064 | 272 | 2811 | 1642 | 346 | 3714 | 2150 | 426 | 4968 | 2700 | 539 | 6143 | 3350 | 654 | 7453 | 4070 | 786 | 8892 | 4810 |

Table 4B (continued)

| Vent Height H (ft) | Vent Type | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | | | | |
|--------------------|-----------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|------|-------|-------|------|
| | | 12" | | 14" | | 16" | | 18" | | 20" | | 22" | | 24" | | | | | | | | |
| | | Combined Appliance Input Rating in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | |
| | | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT |
| | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | |
| 6 | L | 720 | 557 | 470 | 1027 | 792 | 652 | 1388 | 1069 | 825 | 1802 | 1386 | 1076 | 2270 | 1744 | 1328 | 2790 | 2142 | 1576 | 3365 | 2581 | 1912 |
| | V | 900 | 696 | 588 | 1284 | 990 | 815 | 1735 | 1336 | 1065 | 2253 | 1732 | 1345 | 2838 | 2180 | 1660 | 3488 | 2677 | 1970 | 4206 | 3226 | 2390 |
| 8 | L | 795 | 618 | 522 | 1138 | 882 | 730 | 1542 | 1193 | 952 | 2006 | 1549 | 1208 | 2530 | 1951 | 1488 | 3112 | 2398 | 1760 | 3756 | 2893 | 2144 |
| | V | 994 | 773 | 652 | 1423 | 1103 | 912 | 1927 | 1491 | 1190 | 2507 | 1936 | 1510 | 3162 | 2439 | 1860 | 3890 | 2998 | 2200 | 4695 | 3616 | 2680 |
| 10 | L | 861 | 673 | 570 | 1234 | 960 | 796 | 1674 | 1300 | 1040 | 2182 | 1690 | 1316 | 2755 | 2132 | 1624 | 3393 | 2622 | 1920 | 4098 | 3166 | 2336 |
| | V | 1076 | 841 | 712 | 1542 | 1200 | 995 | 2093 | 1625 | 1300 | 2727 | 2113 | 1645 | 3444 | 2665 | 2030 | 4241 | 3278 | 2400 | 5123 | 3957 | 2920 |
| 15 | L | 998 | 789 | 660 | 1435 | 1128 | 926 | 1952 | 1528 | 1208 | 2547 | 1987 | 1525 | 3221 | 2506 | 1888 | 3977 | 3090 | 2232 | 4813 | 3736 | 2720 |
| | V | 1247 | 986 | 825 | 1794 | 1410 | 1158 | 2440 | 1910 | 1510 | 3184 | 2484 | 1910 | 4026 | 3133 | 2360 | 4971 | 3862 | 2790 | 6016 | 4670 | 3400 |
| 20 | L | 1124 | 893 | 733 | 1605 | 1270 | 1032 | 2178 | 1718 | 1352 | 2849 | 2238 | 1712 | 3638 | 2842 | 2112 | 4458 | 3482 | 2496 | 5399 | 4209 | 3040 |
| | V | 1405 | 1116 | 916 | 2006 | 1588 | 1290 | 2722 | 2147 | 1690 | 3561 | 2798 | 2140 | 4548 | 3552 | 2640 | 5573 | 4352 | 3120 | 6749 | 5261 | 3800 |
| 30 | L | 1326 | 1062 | 820 | 1898 | 1514 | 1220 | 2576 | 2046 | 1592 | 3358 | 2661 | 2016 | 4242 | 3354 | 2488 | 5231 | 4126 | 2944 | 6352 | 4998 | 3584 |
| | V | 1658 | 1327 | 1025 | 2373 | 1892 | 1525 | 3220 | 2558 | 1990 | 4197 | 3326 | 2520 | 5303 | 4193 | 3110 | 6539 | 5157 | 3680 | 7940 | 6247 | 4480 |
| 50 | L | 1619 | 1312 | 1024 | 2329 | 1878 | 1490 | 3171 | 2546 | 1944 | 4147 | 3319 | 2460 | 5254 | 4192 | 3040 | 6493 | 5166 | 3600 | 7870 | 6250 | 4380 |
| | V | 2024 | 1640 | 1280 | 2911 | 2347 | 1836 | 3964 | 3183 | 2430 | 5184 | 4149 | 3075 | 6567 | 5240 | 3800 | 8116 | 6458 | 4500 | 9837 | 7813 | 5475 |
| 100 | L | 2055 | 1705 | 1336 | 2986 | 2461 | 1960 | 4100 | 3362 | 2560 | 5399 | 4407 | 3240 | 6878 | 5589 | 4000 | 8545 | 6918 | 4736 | 10403 | 8399 | 5760 |
| | V | 2569 | 2131 | 1670 | 3732 | 3076 | 2450 | 5125 | 4202 | 3200 | 6749 | 5509 | 4050 | 8597 | 6986 | 5000 | 10681 | 8648 | 5920 | 13004 | 10499 | 7200 |

Single-Wall Vent Connector Capacities

For Multiple Category I Appliances Connected to a Common Vent

Table 5A Vent Connector Capacity

| Vent Height H (ft) | Connector Rise R (ft) | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | | | | |
|--------------------|-----------------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
| | | 3" | | | 4" | | | 5" | | | 6" | | | 7" | | | 8" | | | 10" | | |
| | | Appliance Input Rating Limits in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | | | | |
| | | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT | FAN | | NAT |
| | | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max | Min | Max | Max |
| 6 | 1 | NA | NA | 26 | NA | NA | 46 | NA | NA | 71 | NA | NA | 102 | 207 | 223 | 140 | 262 | 293 | 183 | 447 | 463 | 286 |
| | 2 | NA | NA | 31 | NA | NA | 55 | NA | NA | 85 | 168 | 182 | 123 | 215 | 251 | 167 | 271 | 331 | 219 | 458 | 524 | 344 |
| | 3 | NA | NA | 34 | NA | NA | 62 | 121 | 131 | 95 | 175 | 198 | 138 | 222 | 273 | 188 | 279 | 361 | 247 | 468 | 574 | 385 |
| 8 | 1 | NA | NA | 27 | NA | NA | 48 | NA | NA | 75 | NA | NA | 106 | 226 | 240 | 145 | 285 | 316 | 191 | 481 | 502 | 299 |
| | 2 | NA | NA | 32 | NA | NA | 57 | 125 | 126 | 89 | 184 | 193 | 127 | 234 | 266 | 173 | 293 | 353 | 228 | 492 | 560 | 355 |
| | 3 | NA | NA | 35 | NA | NA | 64 | 130 | 138 | 100 | 191 | 208 | 144 | 241 | 287 | 197 | 302 | 381 | 256 | 501 | 609 | 400 |
| 10 | 1 | NA | NA | 28 | NA | NA | 50 | 119 | 121 | 77 | 182 | 186 | 110 | 240 | 253 | 150 | 302 | 335 | 196 | 506 | 534 | 308 |
| | 2 | NA | NA | 33 | 84 | 85 | 59 | 124 | 134 | 91 | 189 | 203 | 132 | 248 | 278 | 183 | 311 | 369 | 235 | 517 | 589 | 368 |
| | 3 | NA | NA | 36 | 89 | 91 | 67 | 129 | 144 | 102 | 197 | 217 | 148 | 257 | 299 | 203 | 320 | 398 | 265 | 528 | 637 | 413 |
| 15 | 1 | NA | NA | 29 | 79 | 87 | 52 | 116 | 138 | 81 | 177 | 214 | 116 | 238 | 291 | 158 | 312 | 380 | 208 | 556 | 596 | 324 |
| | 2 | NA | NA | 34 | 83 | 94 | 62 | 121 | 150 | 97 | 185 | 230 | 138 | 246 | 314 | 189 | 321 | 411 | 248 | 568 | 646 | 387 |
| | 3 | NA | NA | 39 | 87 | 100 | 70 | 127 | 160 | 109 | 193 | 243 | 157 | 255 | 333 | 215 | 331 | 438 | 281 | 579 | 690 | 437 |
| 20 | 1 | 49 | 52 | 30 | 78 | 97 | 54 | 115 | 152 | 84 | 175 | 238 | 120 | 233 | 325 | 165 | 306 | 425 | 217 | 546 | 664 | 336 |
| | 2 | 52 | 55 | 36 | 82 | 103 | 64 | 120 | 163 | 101 | 182 | 252 | 144 | 243 | 346 | 197 | 317 | 453 | 259 | 558 | 709 | 403 |
| | 3 | 55 | 58 | 40 | 87 | 107 | 72 | 125 | 172 | 113 | 190 | 264 | 174 | 252 | 363 | 223 | 326 | 476 | 294 | 570 | 750 | 457 |
| 30 | 1 | 47 | 60 | 31 | 77 | 110 | 57 | 112 | 175 | 89 | 169 | 278 | 129 | 226 | 380 | 175 | 296 | 497 | 230 | 528 | 779 | 358 |
| | 2 | 51 | 62 | 37 | 81 | 115 | 67 | 117 | 185 | 106 | 177 | 290 | 152 | 236 | 397 | 208 | 307 | 521 | 274 | 541 | 819 | 425 |
| | 3 | 54 | 64 | 42 | 85 | 119 | 76 | 122 | 193 | 120 | 185 | 300 | 172 | 244 | 412 | 235 | 316 | 542 | 309 | 555 | 855 | 482 |
| 50 | 1 | 46 | 69 | 34 | 75 | 128 | 60 | 109 | 207 | 96 | 162 | 336 | 137 | 217 | 460 | 188 | 284 | 604 | 245 | 507 | 951 | 384 |
| | 2 | 49 | 71 | 40 | 79 | 132 | 72 | 114 | 215 | 113 | 170 | 345 | 164 | 226 | 473 | 223 | 294 | 623 | 293 | 520 | 983 | 458 |
| | 3 | 52 | 72 | 45 | 83 | 136 | 82 | 119 | 221 | 123 | 178 | 353 | 186 | 235 | 486 | 252 | 304 | 640 | 331 | 535 | 1013 | 518 |
| 100 | 1 | 45 | 79 | 34 | 71 | 150 | 61 | 104 | 249 | 98 | 153 | 424 | 140 | 205 | 585 | 192 | 269 | 774 | 249 | 476 | 1236 | 393 |
| | 2 | 48 | 80 | 41 | 75 | 153 | 73 | 110 | 255 | 115 | 160 | 428 | 167 | 212 | 593 | 228 | 279 | 788 | 299 | 490 | 1259 | 469 |
| | 3 | 51 | 81 | 46 | 79 | 157 | 85 | 114 | 260 | 129 | 168 | 433 | 190 | 222 | 603 | 256 | 289 | 801 | 339 | 506 | 1280 | 527 |

Type B Common Vent Capacities

When Using Single-Wall Connectors

Table 5B Common Vent Capacity

| Vent Height H (ft) | Vent Type | Vent Connector Diameter - D | | | | | | | | | | | | | | | | | |
|--------------------|-----------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | 4" | | | 5" | | | 6" | | | 7" | | | 8" | | | 10" | | |
| | | Combined Appliance Input Rating in Thousands of BTU Per Hour | | | | | | | | | | | | | | | | | |
| | | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT | FAN | FAN | NAT |
| | | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT | +FAN | +NAT | +NAT |
| 6 | L | NA | 62 | 51 | NA | 90 | 80 | 160 | 126 | 115 | 243 | 195 | 157 | 318 | 248 | 206 | 523 | 412 | 326 |
| | V | NA | 78 | 64 | NA | 113 | 100 | 200 | 158 | 144 | 304 | 244 | 196 | 398 | 310 | 257 | 665 | 515 | 407 |
| 8 | L | NA | 70 | 57 | NA | 101 | 90 | 174 | 138 | 127 | 265 | 215 | 174 | 349 | 274 | 228 | 584 | 455 | 368 |
| | V | NA | 87 | 71 | NA | 126 | 112 | 218 | 173 | 159 | 331 | 269 | 218 | 436 | 342 | 285 | 730 | 569 | 460 |
| 10 | L | NA | 75 | 61 | 130 | 110 | 96 | 190 | 151 | 139 | 286 | 234 | 189 | 374 | 295 | 247 | 630 | 494 | 390 |
| | V | NA | 94 | 76 | 163 | 137 | 120 | 237 | 189 | 174 | 357 | 292 | 236 | 467 | 369 | 309 | 787 | 617 | 487 |
| 15 | L | 97 | 86 | 70 | 151 | 127 | 112 | 220 | 177 | 160 | 333 | 274 | 219 | 435 | 347 | 286 | 724 | 574 | 442 |
| | V | 121 | 108 | 88 | 189 | 159 | 140 | 275 | 221 | 200 | 416 | 343 | 274 | 544 | 434 | 357 | 905 | 718 | 553 |
| 20 | L | 105 | 94 | 78 | 166 | 142 | 124 | 244 | 198 | 178 | 370 | 306 | 242 | 485 | 390 | 316 | 810 | 646 | 501 |
| | V | 131 | 118 | 98 | 208 | 177 | 155 | 305 | 247 | 223 | 436 | 383 | 302 | 606 | 487 | 395 | 1013 | 808 | 626 |
| 30 | L | 116 | 106 | 90 | 189 | 162 | 143 | 280 | 229 | 206 | 426 | 357 | 279 | 562 | 456 | 367 | 946 | 762 | 578 |
| | V | 145 | 132 | 113 | 236 | 202 | 179 | 350 | 286 | 257 | 533 | 446 | 349 | 703 | 570 | 459 | 1183 | 952 | 723 |
| 50 | L | 127 | 116 | 102 | 214 | 186 | 163 | 325 | 270 | 237 | 498 | 423 | 328 | 666 | 549 | 428 | 1134 | 926 | 670 |
| | V | 159 | 145 | 128 | 268 | 233 | 204 | 406 | 337 | 296 | 622 | 529 | 410 | 833 | 686 | 535 | 1418 | 1157 | 838 |
| 100 | L | 133 | 122 | NA | 238 | 210 | NA | 375 | 318 | NA | 581 | 506 | 371 | 799 | 677 | 485 | 1393 | 1167 | 758 |
| | V | 166 | 153 | NA | 297 | 263 | NA | 469 | 398 | NA | 726 | 633 | 464 | 999 | 856 | 606 | 1741 | 1459 | 948 |

Additional Guidelines

When common-venting, connector Tables 4A and 5A allow for connector lateral lengths of 1½ feet (18 inches) for each inch of connector diameter as follows:

Connector Lateral Length Allowance

| Diameter | | 3" | 4" | 5" | 6" | 7" | 8" | 10" | 12" | 16" | 24" |
|-------------|--|----|----|----|----|-----|----|-----|-----|-----|-----|
| Length, Ft. | | 4½ | 6 | 7½ | 9 | 10½ | 12 | 15 | 18 | 24 | 36 |

Table 3

It is permissible to double the length shown by reducing the maximum connector capacity by 10%. Next, determine FAN MIN by using the corresponding single-appliance table treating each appliance and connector along with the common vent as a single-appliance vent system. If the input is still above FAN MIN, go ahead and double the connector length.

If the vent connectors are combined prior to entering the common vent (Figure 4D, page 7), the maximum common vent capacity shall be reduced by 10%. The horizontal length allowance shall not exceed 1½ feet (18 inches) for each inch of common vent manifold diameter. This length limitation also includes the common vent offset in the attic added together.

When manifolding a fan-assisted appliance with a draft-hood-equipped appliance, the fan-assisted appliance should be positioned closer to the common vertical vent.

If the common vent has a horizontal offset (Figure 4C, page 7), the maximum common vent capacity shall be reduced. The horizontal length of the common vent offset shall not exceed 1½ feet for each inch of common vent diameter. Each elbow 45 deg or less requires a capacity reduction in common vent of 5%. A 10% reduction in common vent capacity must be taken for each additional fitting larger than 45 deg up to and including 90 deg. The L line in Tables 4B and 5B already take into account an offset greater than 45 deg up to and including 90 deg. If the offset is 45 deg or less the maximum capacity listed in the V line of Tables 4B and 5B must be reduced by 10% (5% for each elbow).

The common vent diameter shall be at least as large as the largest vent connector diameter.

Interpolation is permitted between table entries. Extrapolation beyond table entries is not permitted.

The "7 times rule" (page 9) also limits the size of the common vent to no more than 7 times the cross-sectional area of the smallest connected appliance vent connector or flue collar area; do not use the connector pipe area.

Use available headroom for maximum connector rise

Always use available headroom for maximum connector rise after allowing for the listed clearance to combustibles. Obtain maximum connector rise by such methods as extending the connectors between the floor joists. Increased venting power and efficiency of the system permits reduction of vent and connector sizes.

Alternate ways for increasing vent height and connector rise

If a combined vent cannot be used because of limitations in connector rise or total vent height, alternatives such as those illustrated (Figure 7) may be used to secure greater connector rise or greater total vent height. Type B GAS VENT CONNECTOR must be used for Figure 7B.

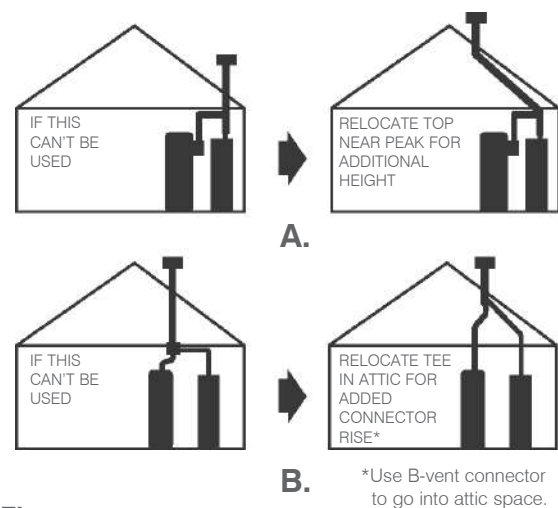


Figure 7

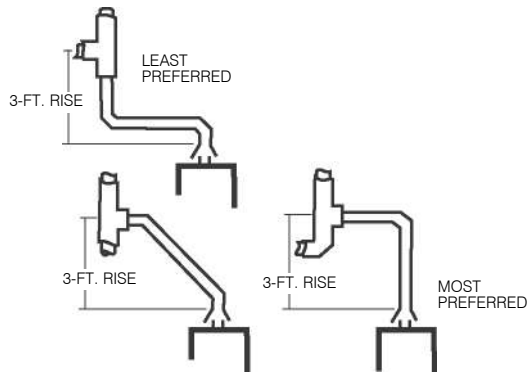


Figure 8

The configurations of the vent connector are not as important as the connector rise and length requirements being met. All of the illustrated methods in Figure 8 permit correct vent operation.

For economy, consider all alternatives

It is important in a combined vent system that the cost of individual versus combined vents be considered, especially if the system is short or many fittings are needed.

Frequently, individual vents will prove more economical than a combined system in instances of this type (Figure 9).

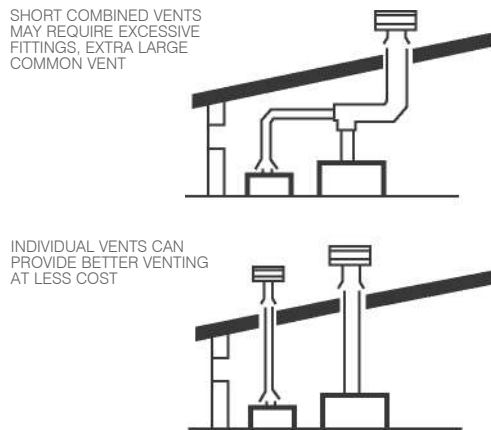


Figure 9

Self-venting connectors sized from single-appliance vent tables

When a vent connector as a part of a combined vent system has a rise of 5 feet or more, it can be installed as though it were an individual vent by using the appropriate Single-Appliance Vent Tables. It is important when sizing self-venting connectors that allowances be made for lateral length and the number of turns.

When in doubt use one size larger vent

It is neither possible nor practical in some cases to anticipate all installation or operational contingencies in designing a vent system. A safe rule is, when in doubt use one size larger connectors and common vents than required by the Vent Tables.

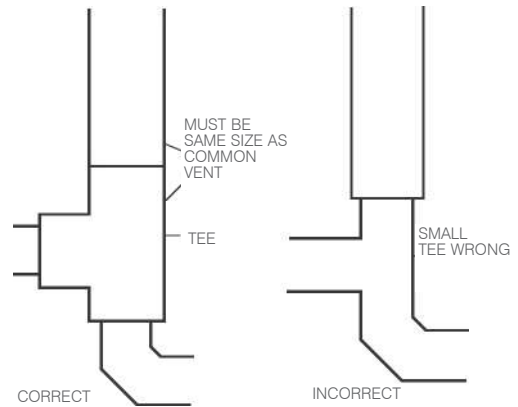


Figure 10

Size of interconnecting tees

Interconnecting tees must be the same size as the common vent, as shown in Figure 10.

Use of Manifolds

Use of Line V Capacities for Manifold Sizing

A manifold is merely a vent system that is a horizontal extension of the lower end of a common vent. The connection of a manifold to a common vent may be made by either a 90° elbow or tee. A manifold should be sized as a common vent, using the combined total capacity and applicable total height of the vent system. The V lines in the common vent table must be reduced by 10% to determine the capacity of the manifold and common vent. There is also the horizontal length limitation of 1.5 feet per inch of common vent that must be followed.

Horizontal Versus Sloped Manifolds

Some codes require pitched or sloped manifolds. The requirements for sloped manifolds or connectors is a necessity for vent systems having low insulating values where condensation may occur. Adequate connector rise is necessary for proper venting of all appliances; therefore, lateral manifolds should NOT be excessively sloped. Too much manifold slope may cause insufficient connector rise at the appliance farthest from the common vent, increasing the chance of draft-hood spillage.

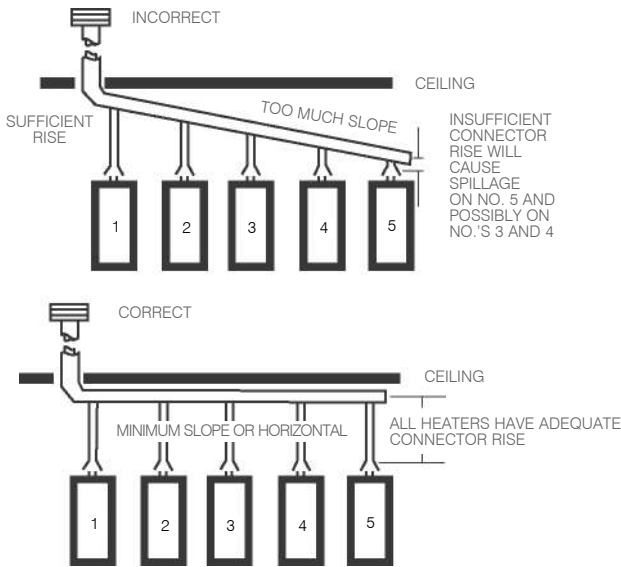


Figure 11

Manifold Connectors

Vent connectors from a group of appliances on one level may enter from below or from the side of the manifold. In either case, the connector rise should be measured as the vertical distance from the draft-hood outlet to the lowest level at which the connector enters the manifold. Care must be exercised in designing these systems, especially with connector turns and lengths, because heat loss is apt to be greater for such systems causing accompanying capacity reduction.

Sizing of Manifolds

As shown in Figure 12, manifolds may be designed either as (1) tapered or (2) constant size. Choice is dictated on the basis of convenience and cost.

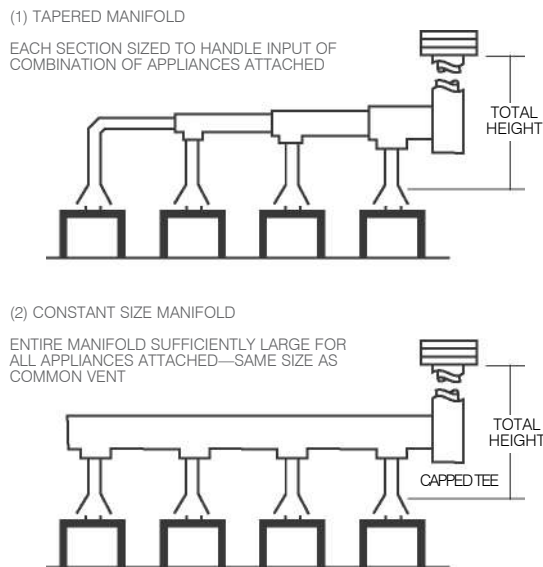


Figure 12

Tapered

Use total heat input to each portion of manifold under construction, using V capacities with a 10% reduction from Common Vent Table at total vent height.

Constant Size

Determine the required size of the common vent, based on total input and total vent height, using V capacities with a 10% reduction from Common Vent Table and then use this size for the entire manifold.

Table Limitations

When three or more appliances are connected to the same manifold, the largest CANNOT exceed 7 times the area of the smallest one. No more than seven appliances of identical input may be connected to the same manifold, unless the Tabled Capacity is reduced by 10% or using a connector rise of at least 3 feet. Manifold lengths shall not exceed 1½ feet for each inch of manifold diameter. This length limitation also incorporates any offsets in the vertical common vent.

Multiple-Story Venting

A multiple-story vent system serves gas appliances at two or more different levels of a building. In designing multiple-story vent systems, use the Vent Connector and Multiple-Appliance Vent Tables. When properly designed, such multiple-story vent systems will function satisfactorily when combinations of one appliance to all appliances on the system are operating.

Figures 13 and 14 illustrate the major principles of multiple-story installation, which are as follows:

- The overall system should be divided into smaller simple combined vent systems for each level, using a minimum total vent height for each level as illustrated.
- Each vent connector from the appliance to the common vent should be designed from the Vent Connector Table as in multiple-appliance vent systems.
- For sizing of the common vent section, the Common Vent Table is used. The common vent for each system must be sized large enough to accommodate the accumulated total input of all appliances discharging into it, but should NEVER be smaller in area than the largest section below it.
- The vent connector from the first floor or the lowest appliance to the common vent is designed as if terminating at the first tee or interconnection. The next lowest appliance is considered to have a combined vent that terminates at the second interconnection. The same principle continues on to the highest connecting appliance, with the top-floor appliance having a total vent height measured to the outlet of the common vent. The multiple-story system has no limit in height, as long as the common vent is sized to accommodate the total input.

CAUTION: It is important to keep the following points in mind.

- Common vent height must always be computed as the distance from the outlet of the connected appliance to the lowest part of the opening from the next interconnection above.
- If the connector rise is inadequate, increase connector size, always making sure of maximum available connector rise.
- Be sure that the air supply to each appliance is adequate for proper operation. A separation of appliance rooms from occupied areas and provision for outside air supply is necessary.
- If an air shaft is used for installation of the common vent, be sure that sufficient space is provided for fittings, clearance to combustibles, and access for proper assembly.
- These calculations apply ONLY when the entire system is constructed of listed double-wall Type B Vent materials.

Ratio of Connector Size to Common Vent Size

Whenever the area of the common vent becomes more than 7 times the area of the vent connector entering it, the connector rise must be increased one foot above the allowable vent connector rise shown in the Tables. For example, where appliance input is 90,000 BTU per hour using a 5-inch (area 20 square inches) vent connector in a system having a minimum vent height of 10 feet, the vent connector rise must be 2 feet on the lower floors where the common vent size is 12 inches (area 113 square inches) or less. However, as soon as a larger common vent size is required, such as 14 inches (area 154 square inches), the vent connector rise must be increased to 3 feet to avoid draft hood spillage.

This requirement does NOT apply when the connector rise is originally over 5 feet and consequently self-venting.

Offsets in Multistory Vents

A multistory common vertical vent may have a single offset, provided:

- The offset does not exceed 45°, and
- The section of common vent that contains the offset shall be reduced by 20%, and
- The horizontal length of the offset does not exceed 1½ feet for each inch of common vent diameter.

Economy of Parallel Systems

It may frequently prove more economical to group appliances to upper and lower common vent systems so that smaller vent sizes can be used. Even though many appliances may be connected to a single multiple-story common vent, the increase in size caused by this may prove uneconomical because of the space for access required and the need for numerous fittings. An alternate procedure is to use parallel common vents with staggered connections at alternate floors, thereby greatly increasing the minimum total vent height available to each connected appliance.

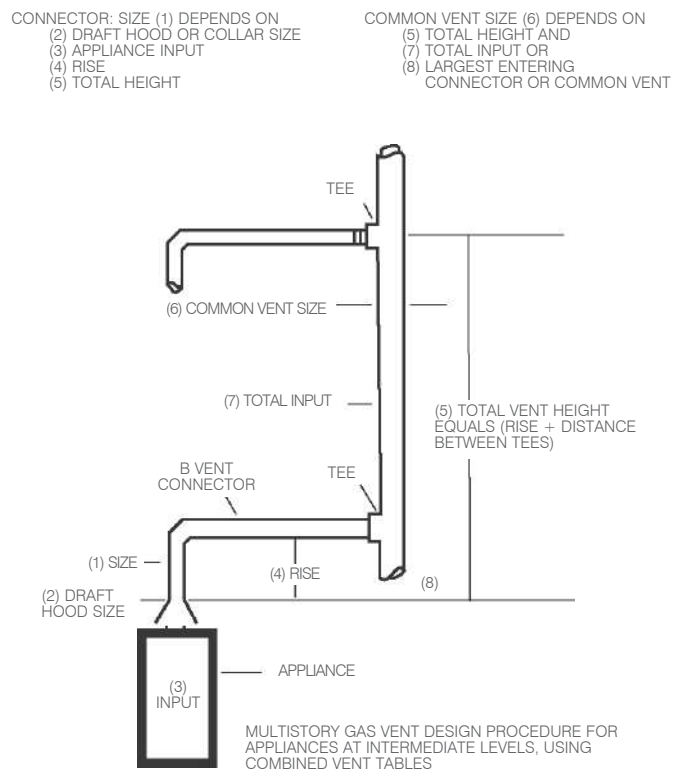


Figure 13

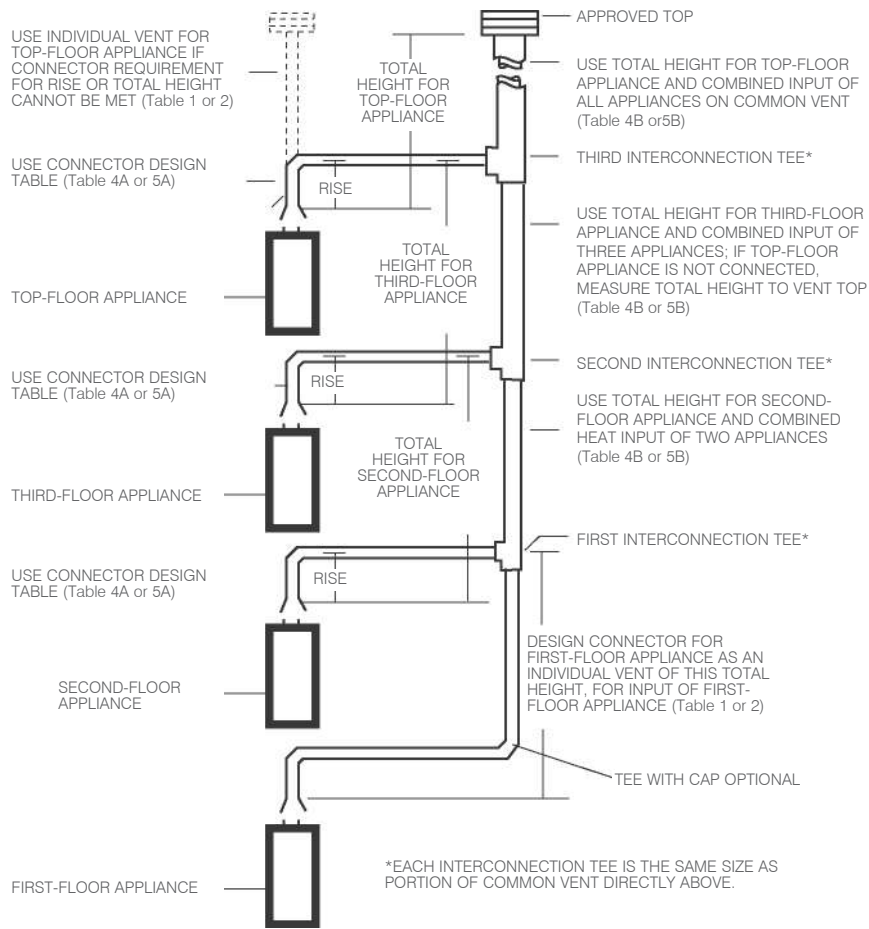


Figure 14

PRINCIPLES OF DESIGN OF MULTISTORY VENTS USING VENT CONNECTOR AND COMMON VENT DESIGN TABLES

Table 6

| Appliance | Input Total BTUH To Common Vent | Available Connector Rise | Min. Total Vent Height | Connector Size | Common Vent Size |
|-----------|---------------------------------|--------------------------|------------------------|---------------------------|------------------------|
| 1 | 90,000 | 10' | 10' | 5" with up to 10' lateral | self-venting connector |
| 2 | 180,000 | 1' | 10' | 6" | 7" |
| 3 | 270,000 | 1' | 10' | 6" | 8" |
| 4 | 360,000 | 1' | 6' | 6" | 10" |

Example of Multiple-Story Systems

To give an example of the method of using the tables for multiple-story venting, consider Figure 14 as a four-story apartment with each natural draft heater arrangement as follows: 90,000 BTU/L input, 5" draft hood, 1-foot connector rise, 10-foot vent height for lower three floors, 6-foot vent height for top floor, B-vent being used for complete system. The Common Vent is vertical, so use V lines of Table 4B under NAT+NAT column for figuring common

vent size. Table 6 shows the calculations for venting all four floors into the common vent. However, if the heater on the top floor is vented separately, Table 7 shows the result of increasing the Minimum Total Vent Height of the third-floor appliance to 16 feet and decreasing total input to the common vent to 270,000 BTU per hour. Table 7 indicates the economics of venting the top floor separately, which eliminates the larger sizes of vent pipe and the use of costly increasing fittings.

Table 7

| Appliance | Input Total BTUH To Common Vent | Available Connector Rise | Min. Total Vent Height | Connector Size | Common Vent Size |
|-----------|---------------------------------|--------------------------|------------------------|----------------|------------------------|
| 1 | 90,000 | 10' | 10' | 5" | self-venting connector |
| 2 | 180,000 | 1' | 10' | 6" | 7" |
| 3 | 270,000 | 1' | 16' | 6" | 7" |
| 4 | 90,000 | 6' | 6' | 5" | self-venting connector |

Special Considerations and Additional Precautions

A. COMBUSTION AIR requirements MUST be supplied from outside the living areas from sources such as hallways, service areas or outdoor balconies in accordance with the information in NFPA Standard 54 ANSI Z223.1. It is preferred that this air be taken into the appliance room directly from outdoors. This is important because any restriction in the common vent or termination will cause flue products of all appliances below this obstruction to spill out the draft hoods of other appliances just below this obstruction.

B. Other Cautions

1. Provide proper clearance to combustibles around the common vent in its chase or shaft.
2. Use the highest connector rise possible. If capacity is borderline, use the next size connector.
3. The only draft effect to be considered available is due to the vertical height from the draft-hood relief opening of the highest appliance on that floor to the point where the connector for the floor above enters the common vent. NEVER USE THE HEIGHT TO THE TERMINATION except for the top floor.
4. The appliance on the first floor is considered to be self-venting (vertical height 5 feet or more), and therefore sizing is calculated using Table 1 or 2 Single-Appliance Venting.

Factory-Built All-Fuel Chimney Systems Sizing Guide

Model TLC All-Fuel Chimney System

Description

The Hart & Cooley MODEL TLC all-fuel chimney system consists of straight sections and other necessary fittings, which are constructed of stainless steel outer jacket and stainless steel inner liner spaced one inch smaller to provide an enclosure for solid pack insulation. This chimney system may be fully enclosed by the structure when the minimum clearance airspace of 2 inches is maintained to all materials of the structure or contents—THIS MEANS NO INSULATION IS TO BE WRAPPED OR PACKED AROUND THIS CHIMNEY SYSTEM CLOSER THAN 2 INCHES, UNLESS USING INSULATION PROVIDED BY HART & COOLEY FOR SPECIFIC USES. Follow installation instructions.

Appliances That May Be Connected

This system is to be used with all neutral or negative draft gas, liquid, or solid fuel-fired residential appliances and other building heating appliances that produce flue products up to 1000°F during normal operation and up to 1400°F for up to one hour of unusual firing, and to 2100°F for up to 10 minutes at a time.

This system is listed by Underwriters Laboratories as complying with Standard UL 103-HT. FOR PROPER INSTALLATION, READ AND FOLLOW THE INSTALLATION INSTRUCTIONS PACKED WITH PRODUCT.

Preliminary Planning

Check the local building code for additional installation requirements for the area. The National Fire Protection Association Standards 31 and 211 require that the chimney extend at least 3 feet above the highest side of the roof opening through which the chimney passes AND at least 2 feet higher than any portion of the building within a 10-foot horizontal distance. See Figure 16.

- Make a sketch of the proposed chimney system.

Locate the chimney near the appliance, taking care that all structural and other obstructions are considered. Measure and note horizontal and vertical sections to be needed plus all elbows and other fittings.

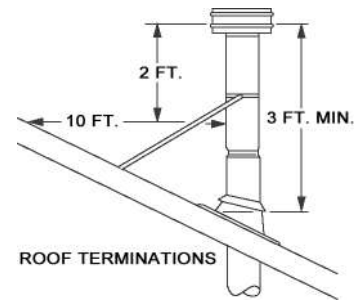


Figure 16

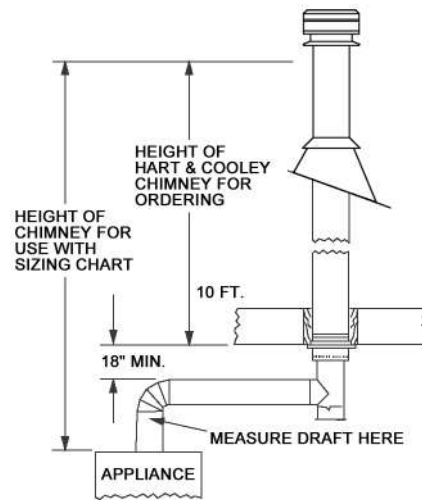


Figure 17

Oil-Fired Appliance Chimney Sizing

(includes flexible stainless liner sizing - reduce table capacities by 15%)

Tables based on steady state efficiency. Content from NFPA 31, 2006 Edition.

Chimney Sizing for 88% Steady State Appliances (10-14% CO2, 300°F gross)

| System Height, Ft. | Lateral, Ft. w/ (2) 90° turns | GPH for 6" dia | GPH for 5" dia | GPH for 4" dia |
|--------------------|-------------------------------|----------------|----------------|----------------|
| 10 | 4 | 0.5-1.0 | 0.4-0.65 | 0.25 |
| | 10 | 0.4-0.75 | NR | NR |
| 15 | 4 | 0.65-1.25 | 0.4-0.75 | 0.4 |
| | 10 | 0.5-1.0 | 0.4-0.75 | 0.4 |
| 20 | 4 | 0.65-1.5 | 0.5-0.85 | 0.4 |
| | 10 | 0.65-1.25 | 0.65-0.85 | 0.4-0.5 |
| 25 | 4 | 0.75-1.5 | 0.65-1.0 | 0.5 |
| | 10 | 0.85-1.25 | 0.65-0.85 | 0.5 |
| 35 | 4 | 1.0-1.75 | 0.75-1.0 | 0.5 |
| | 10 | 1.0-1.5 | 0.75-1.0 | 0.5 |
| 40 | 4 | 1.25-1.75 | 0.85-1.0 | 0.65 |
| | 10 | 1.25-1.75 | 0.85-1.0 | 0.65 |

Chimney Sizing for 86% Steady State Appliances (10-14% CO2, 370°F gross)

| System Height, Ft. | Lateral, Ft. w/ (2) 90° turns | GPH for 6" dia | GPH for 5" dia | GPH for 4" dia |
|--------------------|-------------------------------|----------------|----------------|----------------|
| 10 | 4 | 0.4-1.25 | 0.4-0.85 | 0.25-0.5 |
| | 10 | 0.4-1.25 | 0.4-0.75 | 0.25 |
| 15 | 4 | 0.5-1.5 | 0.4-1.0 | 0.4-0.5 |
| | 10 | 0.5-1.25 | 0.4-0.85 | 0.4-0.5 |
| 20 | 4 | 0.65-1.75 | 0.5-1.0 | 0.4-0.5 |
| | 10 | 0.65-1.5 | 0.5-1.0 | 0.4-0.5 |
| 25 | 4 | 0.75-1.75 | 0.5-1.0 | 0.4-0.5 |
| | 10 | 0.75-1.75 | 0.65-1.0 | 0.4-0.5 |
| 35 | 4 | 0.85-2.0 | 0.65-1.25 | 0.5-0.65 |
| | 10 | 0.85-2.0 | 0.65-1.25 | 0.5-0.65 |
| 40 | 4 | 1.0-2.25 | 0.75-1.25 | 0.65-0.75 |
| | 10 | 1.0-2.0 | 0.85-1.25 | 0.65-0.75 |

Chimney Sizing for 84% Steady State Appliances (10-14% CO2, 440°F gross)

| System Height, Ft. | Lateral, Ft. w/ (2) 90° turns | GPH for 6" dia | GPH for 5" dia | GPH for 4" dia |
|--------------------|-------------------------------|----------------|----------------|----------------|
| 10 | 4 | 0.4-1.5 | 0.25-0.85 | 0.25-0.5 |
| | 10 | 0.4-1.25 | 0.25-0.85 | 0.25-0.4 |
| 15 | 4 | 0.5-1.75 | 0.4-1.0 | 0.25-0.65 |
| | 10 | 0.65-1.5 | 0.4-1.0 | 0.4-0.5 |
| 20 | 4 | 0.65-1.75 | 0.5-1.25 | 0.4-0.65 |
| | 10 | 0.65-1.75 | 0.5-1.0 | 0.4-0.5 |
| 25 | 4 | 0.65-2.0 | 0.5-1.25 | 0.4-0.75 |
| | 10 | 0.65-2.0 | 0.5-1.25 | 0.4-0.65 |
| 35 | 4 | 0.85-2.25 | 0.65-1.5 | 0.5-0.75 |
| | 10 | 0.85-2.25 | 0.65-1.25 | 0.5-0.75 |
| 40 | 4 | 1.0-2.25 | 0.75-1.5 | 0.65-0.75 |
| | 10 | 1.0-2.25 | 0.75-1.5 | 0.65-0.75 |

Chimney Sizing for 82% Steady State Appliances (10-14% CO2, 505°F gross)

| System Height, Ft. | Lateral, Ft. w/ (2) 90° turns | GPH for 6" dia | GPH for 5" dia | GPH for 4" dia |
|--------------------|-------------------------------|----------------|----------------|----------------|
| 10 | 4 | 0.4-1.5 | 0.25-1.0 | 0.25-0.5 |
| | 10 | 0.4-1.5 | 0.25-0.85 | 0.25-0.5 |
| 15 | 4 | 0.4-1.75 | 0.4-1.25 | 0.25-0.65 |
| | 10 | 0.4-1.75 | 0.4-1.0 | 0.25-0.65 |
| 20 | 4 | 0.5-2.0 | 0.4-1.25 | 0.4-0.75 |
| | 10 | 0.5-2.0 | 0.4-1.25 | 0.4-0.75 |
| 25 | 4 | 0.5-2.25 | 0.5-1.5 | 0.4-0.75 |
| | 10 | 0.65-2.0 | 0.5-1.25 | 0.4-0.75 |
| 35 | 4 | 0.65-2.25 | 0.65-1.5 | 0.5-0.85 |
| | 10 | 0.75-2.25 | 0.65-1.5 | 0.5-0.85 |
| 40 | 4 | 0.75-2.25 | 0.75-1.5 | 0.5-0.85 |
| | 10 | 0.85-2.25 | 0.75-1.5 | 0.5-0.85 |

Chimney Sizing for 80% Steady State Appliances (10-14% CO2, 575°F gross)

| System Height, Ft. | Lateral, Ft. w/ (2) 90° turns | GPH for 6" dia | GPH for 5" dia | GPH for 4" dia |
|--------------------|-------------------------------|----------------|----------------|----------------|
| 10 | 4 | 0.25-1.75 | 0.25-1.0 | 0.25-0.65 |
| | 10 | 0.4-1.5 | 0.25-1.0 | 0.25-0.65 |
| 15 | 4 | 0.4-2.0 | 0.4-1.25 | 0.25-0.75 |
| | 10 | 0.5-2.0 | 0.4-1.25 | 0.25-0.75 |
| 20 | 4 | 0.4-2.25 | 0.4-1.5 | 0.4-0.85 |
| | 10 | 0.4-2.0 | 0.4-1.25 | 0.4-0.75 |
| 25 | 4 | 0.4-2.25 | 0.4-1.5 | 0.4-0.85 |
| | 10 | 0.65-2.25 | 0.5-1.5 | 0.4-0.85 |
| 35 | 4 | 0.5-2.25 | 0.5-1.75 | 0.4-0.85 |
| | 10 | 0.65-2.25 | 0.65-1.5 | 0.4-0.85 |
| 40 | 4 | 0.65-2.25 | 0.65-1.75 | 0.5-1.5 |
| | 10 | 0.65-2.25 | 0.65-1.75 | 0.5-0.85 |

GPH (gallons per hour firing rate) * 140,000 = BTU/hr input

NR: Not recommended

Flexible liners: reduce max GPH by 15% due to higher flow losses

Calculations based from draft set at -0.03" of water at appliance outlet

Determining steady state efficiency by AFUE:

- Add 1% to AFUE for hydronic boiler.
- Add 2% to AFUE for warm-air furnace.

| Chimney Sizing for Lower Efficiency Oil-Fired Appliances (600°F temperature rise at 9% CO ₂) | | | | | | | | | |
|---|---------------------|---------------------------|--------------------------------------|------|------|------|------|------|------|
| Input BTUH X 1000 | Chimney Diameter | 90° Turns Equiv. Ft. * | Chimney Draft Specified, inches w.c. | | | | | | |
| | | | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 |
| | | | Minimum Chimney Height, Ft. | | | | | | |
| 100 | 6 | 1 | 6 | 7½ | 9 | 10½ | 12 | 13½ | 15 |
| | 7 | 1 | 5½ | 7 | 8½ | 10 | 11½ | 12½ | 14 |
| | 8 | 1 | 5½ | 7 | 8 | 9½ | 11 | 12 | 13½ |
| 200 | 6 | 2 | 6½ | 8½ | 10 | 11½ | 13½ | 15 | 16½ |
| | 7 | 1½ | 6½ | 8 | 9½ | 11 | 12½ | 14 | 16 |
| | 8 | 1 | 6 | 7½ | 9 | 10½ | 12 | 13½ | 15 |
| 300 | 10 | 1 | 6 | 7 | 8½ | 10 | 11½ | 13 | 14½ |
| | 6 | 4½ | 7½ | 9½ | 11 | 12½ | 15 | 16½ | 18½ |
| | 7 | 3 | 7 | 8½ | 10 | 12 | 13½ | 15 | 17 |
| 400 | 8 | 1½ | 6½ | 8 | 9½ | 11 | 13 | 14½ | 16 |
| | 10 | 1 | 6 | 7½ | 9 | 10½ | 12 | 13½ | 15 |
| | 7 | 4½ | 7½ | 9½ | 11 | 12½ | 15 | 16½ | 18½ |
| 500 | 8 | 3 | 7 | 8½ | 10 | 12 | 13½ | 15 | 17 |
| | 10 | 1½ | 6½ | 8 | 9½ | 11 | 13 | 14½ | 16 |
| | 12 | 1 | 6 | 7½ | 9 | 10½ | 12 | 13½ | 15 |
| 600 | 8 | 4 | 7½ | 9 | 11 | 12½ | 14½ | 16½ | 18 |
| | 10 | 2 | 6½ | 8 | 9½ | 11½ | 13 | 14½ | 16 |
| | 12 | 1 | 6 | 7½ | 9 | 10½ | 12 | 13½ | 15 |
| 700 | 14 | 1 | 6 | 7½ | 8½ | 10 | 11½ | 13 | 14½ |
| | 10 | 2½ | 7 | 8½ | 10 | 12 | 13½ | 16 | 17 |
| | 12 | 1½ | 6½ | 8 | 9½ | 11 | 12½ | 14 | 15½ |
| 800 | 14 | 1 | 6 | 7½ | 9 | 10½ | 12½ | 14 | 15½ |
| | 10 | 3½ | 7 | 9 | 10½ | 12½ | 14 | 16 | 17½ |
| | 12 | 1½ | 6½ | 8 | 9½ | 11 | 13 | 14½ | 16 |
| 900 | 14 | 1 | 6 | 7½ | 9 | 10½ | 12½ | 14 | 15½ |
| | 10 | 4½ | 7½ | 9½ | 11 | 13 | 14½ | 16½ | 18 |
| | 12 | 2½ | 7 | 8½ | 10 | 11½ | 13½ | 15 | 16½ |
| 1000 | 14 | 1 | 6½ | 8 | 9½ | 11 | 12½ | 14 | 15½ |
| | 12 | 3 | 7 | 8½ | 10 | 12 | 14 | 15½ | 17 |
| | 14 | 2 | 6½ | 8 | 9½ | 11½ | 13 | 14½ | 16 |
| 1100 | 12 | 3½ | 7 | 9 | 10½ | 12½ | 14 | 16 | 17½ |
| | 14 | 2 | 6½ | 8½ | 9½ | 11½ | 13 | 14½ | 16 |
| | 12 | 4 | 7½ | 9 | 10½ | 12½ | 14½ | 16 | 18 |
| 1200 | 14 | 2 | 6½ | 8½ | 10 | 11½ | 13½ | 15 | 16½ |
| | 12 | 4½ | 7½ | 9½ | 11 | 13 | 15 | 16½ | 18½ |
| | 14 | 2½ | 7 | 8½ | 10 | 12 | 13½ | 15½ | 17 |
| 1300 | 14 | 3 | 7 | 9 | 10½ | 12 | 14 | 15½ | 17½ |
| 1400 | 14 | 3½ | 7 | 9 | 10½ | 12½ | 14 | 16 | 17½ |
| 1500 | 14 | 4 | 7½ | 9 | 11 | 12½ | 14½ | 16½ | 18 |

*For EACH 90° turn (tee, elbow), ADD this value to Tabled Height figure to get ACTUAL vertical height required.
 GPH x 140,000 = BTUH

Chimney Sizing for Appliances Using Table 9 Example

GIVEN:

- Input is 700,000 BTUH.
- Draft required is 0.04 inches w.c.
- System contains one 90° elbow and one tee.
- Collar size of appliance is 10 inches.

SOLUTION: Find Input 700 (thousand) BTUH in the left column and 0.04 inches w.c. draft at the top of the table. Adjacent to the Input column is a column giving multiple choices of chimney sizes. For a trial, use the flue collar size of 10 inches. Adjacent to the 10-inch size is a figure 3½, which is explained as the feet that must be added for EACH 90° turn. Proceed to right from 700 figure, then the 10-inch size horizontally to the right until it intersects the 0.04 vertical column. The height shown is 7 feet. There are two 90° turns required (the 90° elbow and tee given); therefore, 7 feet must be added (2 times 3½) to the 7 feet given in the table. The required chimney height is then 14 feet (7+7). A larger size chimney will result in a lower total height if such is required.

Chimney Sizing for Open Face Fireplaces

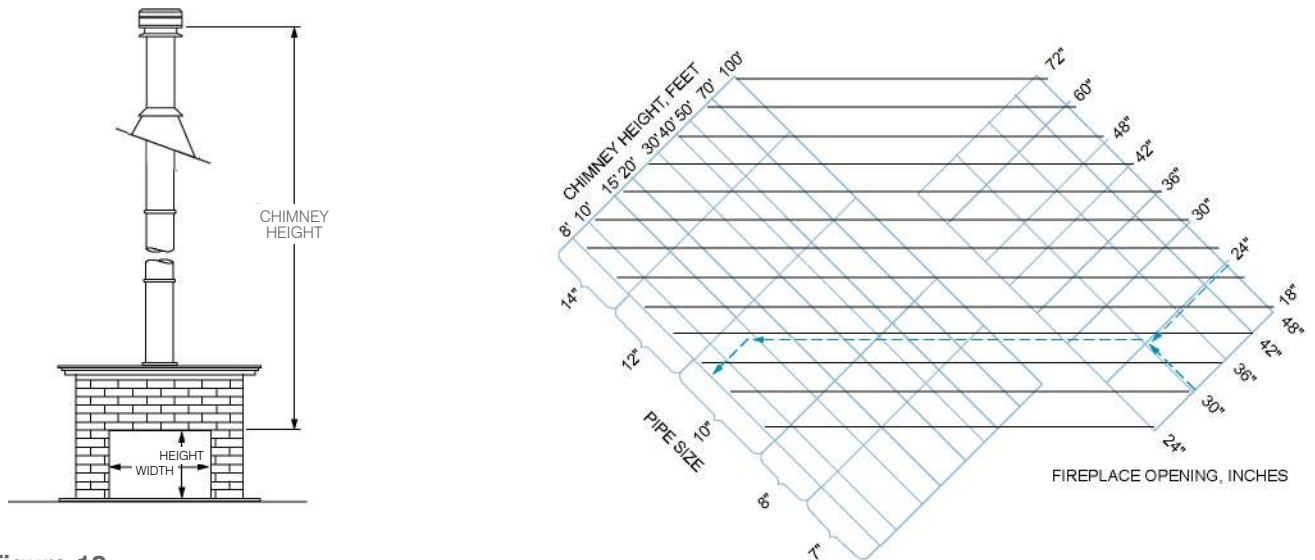


Figure 18

Example—Note Purple Line

GIVEN:

- Fireplace opening size 30 inches x 24 inches.
- Desired height from top of opening to top of chimney 15 feet.

SOLUTION: At right-hand section of chart, find intersection of 30-inch and 24-inch lines. Proceed horizontally to left until 15-foot height line is intersected. This intersection occurs within the limits of a 10-inch chimney size.

Note: Offsets in the USA are limited to 30 deg from vertical and require no additional consideration.

Relining Masonry Chimneys

Options for Relining

When an existing masonry chimney is inspected and found to require modification in order to make it suitable for use with gas burning appliances, a variety of options are available. Where Type B gas vent can be installed within a flue which is otherwise unused, it may provide the most cost effective solution to the situation, and is advantageous since it provides extra insulating value as compared to single wall liners, thereby reducing condensation. In other situations, a flexible chimney liner may be easier to install and provide acceptable service.

Sizing Guidelines

When Type B gas vent is installed within a masonry chimney, the tables and guidelines covered in previous sections of this handbook apply. When a corrugated metallic chimney lining system is to be installed, current sizing guidelines suggest that the Type B Gas Vent tables (as appropriate) may be employed if a reduction of 20% is applied to all maximum capacity values. Minimum capacities remain unchanged. Bends or offsets in the corrugated lining system may require additional capacity reductions as noted in the previous sections.

Reference

New Vent Sizing Tables, American Gas Association, Catalog No. T20002, October 1990

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ASHRAE Handbook, Equipment Volume, Chapter on Chimneys, 1972 Edition or later, American Society of Heating, Refrigerating, and Air Conditioning Engineers

An Interactive Personal Computer Program for Design and Analysis of Venting Systems for One or Two Gas Appliances, Users Manual for Vent 11 (Version 4.1) with Diskettes, Topical Report (Sept. 1 1989-July 1990), Gas Research Institute

R.L. Stone: A Practical General Chimney Design Method, ASHRAE Transactions 1971, Paper No. 2175.

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