

Venting of Gas Fired Equipment

RV 6.17.16

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Quiz 1

1. Hot flue gases have greater buoyancy than the cooler air around them. This is why they rise.
 - True
 - False
2. As water temperature increases, density decreases. This is why warm water rises and cold water sinks.
 - True
 - False
3. Cold air is less dense than warm air.
 - True
 - False
4. As the hot-line gas flows through the vent system, heat from the flue gas travels through the vent walls and cools down. The flue gas becomes less buoyant, resulting in lower lift or draft.
 - True
 - False
5. Double-wall metal vents or B vents are NOT preferred because of the insulating quality of the air space between the walls of the vent.
 - True
 - False
6. Increasing the vent height increases the draft. As the height of the stack is increased there is also an increase in the resistance, which reduces the flow of gas.
 - True
 - False

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7. Doubling the Btu/h input of an appliance effectively doubles the amount of flue gas produced.
 - True
 - False
8. If the limit of the vent system has been exceeded, some of the flue gases will not be carried up the vent, but will spill out at the flue collar.
 - True
 - False
9. Increasing the number of 90-degree bends in the vent will NOT impede the flow of flue gases.
 - True
 - False
10. There are a number of things that restrict the flow of flue gas. Which of the following is NOT one of them?
 - Flue gas temperature loss through the vent pipe
 - Gas pressure from gas valve too low
 - Flue gas vent undersized for system
 - Restrictions to flow due to numerous bends and 90s
11. Water vapor is created when natural gas is burned.
 - True
 - False
12. Water in the flue gas is generally not a problem as long as it remains in vapor form.
 - True
 - False
13. A 40 M Btu/h water heater will produce 1/2 gallon of water per hour in the flue gas.
 - True
 - False
14. Natural draft appliances operate with high flue gas temperatures which results in the water remaining a vapor.
 - True
 - False
15. The dew point is the temperature at which a vapor condenses into a liquid.
 - True
 - False
16. Condensation may cause damage to flue material.
 - True
 - False
17. Most gas water heaters fall under _____.
 - Category I
 - Category II
 - Category III
 - Category IV
18. A category II appliance vents flue gases at a temperature _____ the dew point.
 - higher than
 - lower than
 - equal to
19. The type of vent material recommended for Type II is _____.
 - masonry
 - stainless steel
 - single Wall
20. A Category III appliance has _____ pressure in the vent.
 - positive
 - negative
 - neutral
21. A Category III appliance is very similar to a _____ appliance.
 - Category I
 - Category II
 - Category IV
22. A Category IV appliance vent has a _____ vent pressure.
 - positive
 - negative
 - neutral
23. _____ is the material that is used for a Category IV vent.
 - Masonry
 - Stainless steel
 - Plastic

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24. The major characteristics of Category IV gas appliances are _____.
- negative pressure, non-condensing, natural draft
 - positive pressure, non-condensing, induced or forced draft
 - positive pressure, condensing, induced or forced draft
 - negative pressure, condensing, natural draft
25. The best way to determine the category of the appliance is to _____.
- look at the appliance you are replacing
 - look at the appliance's nameplate
 - ask a friend
 - guess

Quiz 2

1. Category I vented appliances shall be provided with combustion, ventilation, and dilution air in accordance with the equipment manufacturers instructions.
- True
 - False
2. Venting combustion gases through a chimney without a proper liner can result in the collapse of the chimney, since acidic condensate can dissolve the mortar between bricks.
- True
 - False
3. If a tile liner is observed protruding from the top of a chimney, it is always correct to assume that the liner extends along the entire length of the chimney.
- True
 - False
4. When providing combustion air from the interior of a building, the total required volume of the space in the building shall be the sum of the required volume calculated for ALL appliances located within the space.
- True
 - False
5. When providing combustion air from the interior of a building, rooms considered a part of the required volume are those communicating directly with the space through openings furnished with doors and through combustion air openings.
- True
 - False
6. The minimum required volume shall be 100 cubic feet per 1000 Btu/h.
- True
 - False
7. When combining spaces on the same story, each opening shall have a minimum free area of 1 sq. in. per 1000 Btu/h of the total input rating of all gas utilization equipment in the space, but not less than 100 sq. inches.
- True
 - False
8. When combining spaces in different stories, the volumes of spaces shall be considered as communicating spaces when they are connected by one or more openings in doors or floors having a total minimum free area of 2 square inches per 1000 Btu/h.
- True
 - False
9. Using the two permanent openings method, one opening shall commence within 12 in. of the top of the enclosure.
- True
 - False
10. When using the two permanent openings method, one opening must commence within 12 in. of the bottom of the enclosure.
- True
 - False
11. When using the two permanent openings method, where communication with the outdoors is through horizontal ducts, each opening shall have a minimum free area of 1 square in. per 4000 Btu/h of total input rating of all equipment in the enclosure.
- True
 - False

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12. When using the one permanent opening method, the equipment shall have clearances of at least 1 inch from the side of the appliance.
 - True
 - False
13. Using the one permanent opening method, the permanent opening should commence within 12 inches of the top of the enclosure.
 - True
 - False
14. Using the one permanent opening method, the equipment shall have clearances of at least 6 inches from the front of the appliance.
 - True
 - False
15. Using the one permanent opening method, the opening shall directly communicate with the outdoors through a vertical or horizontal duct.
 - True
 - False
16. To quickly find the area in square inches of a vent pipe, first determine the O.D. of the pipe, and then use the appropriate conversion table.
 - True
 - False
17. The required size of grille openings for combustion, ventilation, and dilution air is based on the net free area of each opening.
 - True
 - False
18. Combustion air ducts shall terminate in an unobstructed space allowing free movement of combustion air to the appliances.
 - True
 - False
19. A combustion air duct shall NOT service BOTH the upper and the lower combustion air openings where both such openings are used.
 - True
 - False

20. The horizontal upper combustion air duct shall slope downward toward the source of combustion air.
 - True
 - False
21. The space around a chimney liner installed within a masonry chimney flue can be used to supply combustion air.
 - True
 - False

Quiz 3

1. Listed direct-vent gas utilization equipment shall be considered properly vented where installed in accordance with the terms of its listing, the installer's instructions, and Section 510.8(3) of this code.
 - True
 - False
2. A venting system shall be designed and constructed to develop a flow adequate to remove vent gases to the outside atmosphere.
 - True
 - False
3. A chimney for residential equipment shall extend at least 3 ft. above the highest point where it passes through a roof of a building and at least 2 ft. higher than any portion of a building within a horizontal distance of 10 feet.
 - True
 - False
4. A chimney for medium-heat equipment shall extend at least 10 ft. higher than any portion of any building within 25 feet.
 - True
 - False
5. A chimney shall extend at least 20 ft. above the highest connected equipment draft hood outlet or flue collar.
 - True
 - False

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6. When sizing an individual chimney venting system for a single appliance with a draft hood, the effective areas of the vent connector and chimney flue shall NOT be greater than the area of the appliance flue collar or draft hood outlet.
 - True
 - False
7. When sizing a chimney venting system connected to two appliances with draft hoods, the effective area of the chimney flue shall be not less than the area of the larger draft hood outlet, plus 50 percent of the area of the smaller draft hood outlet.
 - True
 - False
8. Gas utilization equipment is allowed to connect to a chimney serving a separate solid fuel appliance.
 - Yes
 - No
9. A gas vent passing through a roof shall extend through the entire roof flashing, and can be terminated with a NON-LISTED termination cap.
 - True
 - False
10. A Type B vent installed at an angle greater than 45 degrees from the vertical is considered horizontal.
 - True
 - False
11. The total horizontal distance of a vent, including the horizontal vent connector serving appliances equipped with a draft hood, shall not be greater than 75% of the vertical height of the vent.
 - True
 - False
12. Gas vents installed within masonry chimneys are required to be identified with a permanent label installed at the point where the vent enters the chimney.
 - True
 - False
13. Gas vent termination locations for listed caps 12 inches in diameter or smaller shall be at least 5 ft. from an outside vertical wall.
 - True
 - False
14. Gas vents shall terminate not less than 2 feet above the highest point where they pass through the roof, and at least 2 feet higher than any portion of a building within 10 feet.
 - True
 - False
15. A Type B or a Type L gas vent shall terminate at least 20 ft. in vertical height above the highest connected equipment draft hood or flue collar.
 - True
 - False
16. A Type B gas vent shall terminate at least 12 feet vertically above the bottom of a wall furnace.
 - True
 - False
17. A gas vent extending through an exterior wall is NOT permitted to terminate below eaves or parapets.
 - True
 - False
18. A single vent serving a single appliance installed on a single story of a building, shall be not less than the area of the appliance draft hood outlet.
 - True
 - False
19. A flue vent can be any size as long as it is not smaller than the appliance draft hood outlet.
 - True
 - False
20. For sizing a gas vent connected to two appliances with draft hoods, the effective area of the vent shall be not less than the area of the larger draft hood outlet, plus 50 percent of the area of the smaller draft hood outlet.
 - True
 - False

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Quiz 4

1. It is permitted to vent Category I gas utilization equipment on a multistory installation using a single or common gas vent.
 - Yes
 - No
2. On a multistory installation using a common gas vent, it is permitted to obtain dilution, combustion and ventilation air from the habitable space.
 - Yes
 - No
3. The total available height for each segment of a multistory venting system is the vertical distance between the level of the highest draft hood outlet on that floor and the centerline of the next highest interconnection tee.
 - True
 - False
4. The size of the connector for a segment is determined from: 1) equipment heat input and 2) available connector rise. It shall not be smaller than the draft hood outlet or flue collar size.
 - True
 - False
5. The size of the common vent is determined from the Btu/h rating of the largest rated equipment.
 - True
 - False
6. Gas vents must be supported and spaced in accordance with their listings and the manufacturer's instructions.
 - True
 - False
7. Single-wall metal pipe shall be constructed of cold rolled sheet steel at LEAST 0.0304 inches thick.
 - True
 - False
8. Single-wall metal pipe may be used outdoors in cold climates for venting gas utilization equipment.
 - True
 - False
9. Single-wall metal pipe shall terminate at least 5 feet in vertical height above the highest connected equipment draft hood outlet or flue collar.
 - True
 - False
10. Single-wall metal pipe shall extend at least 4 ft. above the highest point where it passes through the roof of a building.
 - True
 - False
11. Single-wall metal pipe shall extend at least 2 ft. higher than any portion of a building within a horizontal distance of 20 feet.
 - True
 - False
12. Single-wall metal pipe shall be used only for runs directly from the space in which the gas utilization equipment is located, extending through the roof or exterior wall to the outer air.
 - True
 - False
13. Single wall pipe shall NOT originate in any unoccupied attic.
 - True
 - False
14. Single-wall metal pipe is permitted to pass through any attic and inside a wall.
 - True
 - False
15. In a venting system for a single appliance with a draft hood, the areas of the connector and the pipe shall each be equal to or larger than either the appliance flue collar or draft hood outlet, whichever is smaller.
 - True
 - False
16. In a venting system for a single appliance with a draft hood, the areas of the connector and the pipe shall each NOT be greater than SEVEN times the draft hood outlet area.
 - True
 - False

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17. Category II and Category IV gas utilization equipment and non-categorized condensing appliances require a provision to collect and dispose of condensate from venting systems serving them.
 - True
 - False
 18. A vent connector shall be made of NON-combustible material capable of withstanding the vent gas temperatures.
 - True
 - False
 19. When the vent connector used on a Category I appliance is located in an unconditioned area, that portion of the vent connector may be single-wall pipe.
 - True
 - False
 20. When the vent connector used for a Category I appliance is located in a crawl space, that portion of the vent connector shall be Type B.
 - True
 - False
 21. Where two or more gas appliances are vented through a common vent manifold, the manifold shall be located at the highest level consistent with available headroom and clearance to combustible material.
 - True
 - False
 22. Where two or more vent connectors enter a common chimney, the smaller connector shall enter at the lowest level consistent with the available headroom or clearance to combustible material.
 - True
 - False
 23. Vent connectors serving Category I appliances are permitted to be connected to any portion of a mechanical draft system which operates under positive static pressure.
 - True
 - False
 24. A vent connector shall be installed so as to avoid turns that create excessive resistance to the flow of vent gases.
 - True
 - False
 25. Joints between sections of connector piping and connections to flue collars or draft hood outlets shall be fastened using only LISTED duct tape.
 - True
 - False
 26. A vent connector shall be installed without any dips or sags, and shall slope upward toward the vent or chimney at least 1/4 inch per foot.
 - True
 - False
 27. A vent connector shall be as short as practical, and the gas utilization equipment shall be located as close as practical to the chimney or vent.
 - True
 - False
 28. For a vent serving multiple appliances, the maximum length of an individual connector from the appliance outlet to the junction with the common vent can be up to 150 percent of the height of the common vent.
 - True
 - False
 29. A vent connector shall not be connected to a chimney flue serving a fireplace unless the fireplace flue opening is permanently sealed.
 - True
 - False
- Quiz 5**
1. For listed appliances equipped with draft hoods and appliances listed for use with Type B gas vents, the thimble shall be a minimum of _____ larger in diameter than the vent connector.
 - 4 inches
 - 6 inches
 - 12 inches
 - no thimble or gap required

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2. Single Wall: For unlisted appliances having draft hoods, the thimble shall be a minimum of _____ larger in diameter than the vent connector.
 - 4 inches
 - 6 inches
 - 12 inches
 - no thimble or gap required
 3. Single Wall: For residential and low-heat appliances, the thimble shall be a minimum of _____ larger in diameter than the vent connector.
 - 4 inches
 - 6 inches
 - 12 inches
 - no thimble or gap required
 4. Which factor does NOT affect the required vent size?
 - ambient air temperature
 - vent connector type
 - appliance input Btu/h rating
 - number of elbows
 - all of the answers provided affect the required vent size
 5. Corrugated vent connectors shall not be smaller than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.
 - True
 - False
 6. Where the vertical vent has a larger diameter than the vent connector, the vertical vent diameter shall be used to determine the maximum vent capacity, and the connector diameter shall be used to determine the minimum vent capacity.
 - True
 - False
 7. Vent connectors shall not be upsized more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.
 - True
 - False
 8. The most common types of venting problems faced by plumbers and by mechanical and HVAC contractors are with the Category I type gas appliances.
 - True
 - False
 9. The most common factors that a contractor can adjust in his vent design are the selection of the vent and connector types and their sizes.
 - True
 - False
 10. Single-wall metal vent connectors are generally lower in initial cost than Type B connectors.
 - True
 - False
 11. Single-wall metal vent connectors operate at much higher surface temperatures than do Type B connectors.
 - True
 - False
 12. Single-wall metal connectors cannot be used in attics due to the fire hazard, and they must have greater clearances on all structural components than Type B connectors.
 - True
 - False
- Quiz 6**
Refer to table 5-9 located at the end of the quiz to help answer questions 1 – 8.
1. What is the minimum sized B vent for the following NAT draft appliances with no laterals?
Height – 20 feet, 40 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches

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2. What is the minimum sized B vent for the following NAT draft appliances with no laterals?
Height – 15 feet, 75 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
3. What is the minimum sized B vent for the following NAT draft appliances with no laterals?
Height – 30 feet, 200 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
4. What is the minimum sized B vent for the following NAT draft appliances with no laterals?
Height – 10 feet, 200 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
5. What is the minimum sized B vent for the following NAT draft appliances?
Height – 20 feet, Lateral – 20 feet, 100 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
6. What is the minimum sized B vent for the following NAT draft appliances?
Height – 15 feet, Lateral – 10 feet, 75 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
7. What is the minimum sized B vent for the following NAT draft appliances?
Height – 30 feet, Lateral – 5 feet, 200 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches
8. What is the minimum sized B vent for the following NAT draft appliances?
Height - 10 feet, Lateral 10 feet, 150 M Btu/h input.
 - 3 inches
 - 4 inches
 - 5 inches
 - 6 inches
 - 7 inches

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Using the picture on the right to size the following equipment for installation for questions 9, 10, and 11. Refer to table 5-14 located at the end of the quiz.

9. Water heater connector min. size _____.

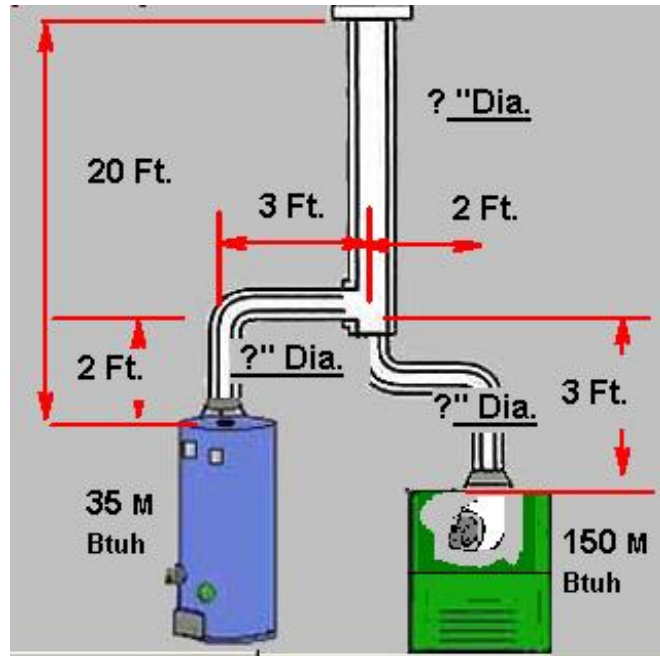
- 3 inches
- 4 inches
- 5 inches
- 6 inches
- 7 inches

10. FAN-assisted furnace connector size _____.

- 3 inches
- 4 inches
- 5 inches
- 6 inches
- 7 inches

11. Common vent size _____.

- 4 inches
- 5 inches
- 6 inches
- 7 inches



Using the picture on the right to size the following equipment for installation for questions 12, 13, and 14. Refer to table 5-14 located at the end of the quiz.

12. Water heater connector min. size _____.

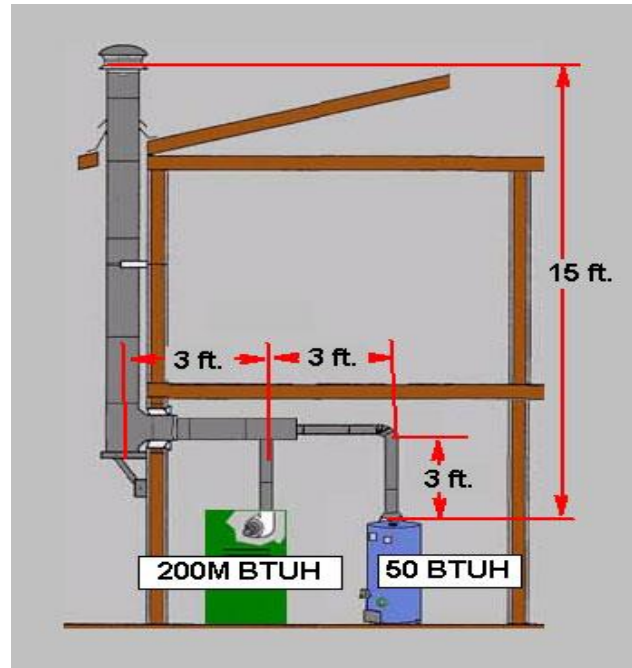
- 3 inches
- 4 inches
- 5 inches
- 6 inches
- 7 inches

13. FAN-assisted furnace connector size _____.

- 3 inches
- 4 inches
- 5 inches
- 6 inches
- 7 inches

14. Common vent size _____.

- 4 inches
- 5 inches
- 6 inches
- 7 inches



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Table 5-9. Type B Double-Wall Vent

		Number of Appliances: Single															
		Appliance Type: Category I															
		Appliance Vent Connection: Single-Wall Metal Connector															
		Vent Diameter – D (in.)															
		3			4			5			6			7			
		Appliance Input Rating in Thousands of Btu per Hour															
Height (ft.)	Lateral (ft.)	FAN			NAT	FAN			NAT	FAN			NAT	FAN			NAT
		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	
	2	39	51	36	60	96	66	85	156	104	123	231	256	159	320	213	
	4	NA	NA	33	74	92	63	102	152	102	146	225	152	187	313	208	
	6	NA	NA	31	83	89	60	114	147	99	163	220	148	207	307	203	
8	0	37	83	50	58	164	93	83	273	154	123	412	234	161	580	319	
	2	39	56	39	59	108	75	83	176	119	121	261	179	155	363	246	
	5	NA	NA	37	77	102	69	107	168	114	151	252	171	193	353	235	
	8	NA	NA	33	90	95	64	122	161	107	175	243	163	223	342	225	
10	0	37	87	53	57	174	99	82	293	165	120	444	254	158	628	344	
	2	39	61	41	59	117	80	82	193	128	119	287	194	153	400	272	
	5	52	56	39	76	11	76	105	185	122	148	277	186	190	388	261	
	10	NA	NA	34	97	100	68	132	171	112	188	261	171	237	369	241	
15	0	36	93	57	56	190	111	80	325	186	116	499	283	153	713	388	
	2	38	69	47	57	136	93	80	225	149	115	337	224	148	473	314	
	5	51	63	44	75	128	86	102	216	140	144	326	217	182	459	298	
	10	NA	NA	39	95	116	79	128	201	131	182	308	203	228	438	284	
	15	NA	NA	NA	NA	NA	72	158	186	124	220	290	192	272	418	269	
20	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	
	5	50	68	47	73	140	94	100	239	1158	141	363	239	178	514	334	
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	
	15	NA	NA	NA	NA	NA	80	155	208	136	216	325	210	264	469	301	
	20	NA	NA	NA	NA	NA	NA	186	192	126	254	306	196	309	448	285	
30	0	34	99	63	53	211	127	76	372	210	110	584	334	144	849	472	
	2	37	80	56	55	164	111	76	281	183	109	429	279	139	610	392	
	5	49	74	52	72	157	106	98	271	173	136	417	271	171	595	382	
	10	NA	NA	NA	91	144	98	122	255	168	171	397	257	213	570	367	
	15	NA	NA	NA	115	131	NA	151	239	157	208	377	242	255	547	349	
	20	NA	NA	NA	NA	NA	NA	181	223	NA	246	357	228	298	524	333	
	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	389	477	305	

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Table 5-14. Type B Double-Wall Vent

Number of Appliances:	Two or More
Appliance Type:	Category I
Appliance Vent Connection:	Type B Double-Wall Connector

Vent Connector Capacity

Vent Height H (ft.)		Connector Rise R (ft.)		Type B Double-Wall Vent and Connector Diameter – D (in.)														
				3			4			5			6			7		
				Appliance Input Rating Limits in Thousands of Btu per Hour														
				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		
6	1	22	37	26	35	66	46	46	106	72	58	164	104	77	225	142		
	2	23	41	31	37	75	55	48	121	86	60	183	124	79	253	168		
	3	24	44	35	38	81	62	49	132	96	62	199	139	82	275	189		
8	1	22	40	27	35	72	48	49	114	76	64	176	109	84	243	148		
	2	23	44	32	36	80	57	51	128	90	66	195	129	86	269	175		
	3	24	47	36	37	87	64	53	139	101	67	210	145	88	290	198		
10	1	22	43	28	34	78	50	49	123	78	65	189	113	89	257	154		
	2	23	47	33	36	86	59	51	136	93	67	206	134	91	282	182		
	3	24	50	37	37	92	67	52	146	104	69	220	150	94	303	205		
15	1	21	50	30	33	89	53	47	142	83	64	220	120	88	298	163		
	2	22	53	35	35	96	63	49	153	99	66	235	142	91	320	193		
	3	24	55	40	36	102	71	51	163	111	68	248	160	93	339	218		
20	1	21	54	31	33	99	56	46	157	87	62	246	125	86	334	171		
	2	22	57	37	34	105	66	48	167	104	64	259	149	89	354	202		
	3	23	60	42	35	110	74	50	176	116	66	271	168	91	371	228		
30	1	20	62	33	31	113	59	45	181	93	60	288	134	83	391	182		
	2	21	64	39	33	118	70	47	190	110	62	299	158	85	408	215		
	3	22	66	44	34	123	79	48	198	124	64	309	178	88	423	242		

Common Vent Capacity

Vent Height H (ft.)	Type B Double-Wall Vent and Connector Diameter – D (in.)											
	4			5			6			7		
	FAN	FAN	NAT	FAN	FAN	NAT	FAN	FAN	NAT	FAN	FAN	NAT
	+FAN	+NAT	+NAT	+FAN	+NAT	+NAT	+FAN	+NAT	+NAT	+FAN	+NAT	+NAT
6	92	81	65	140	116	103	204	161	147	309	248	200
8	101	90	73	155	129	114	224	178	163	339	275	223
10	110	97	79	169	141	124	243	194	178	367	299	242
15	125	112	91	195	164	144	283	228	206	427	352	280
20	136	123	102	215	183	160	314	255	229	475	394	310
30	152	138	118	244	210	185	361	297	266	547	459	360