

bryant

day
night

Payne

installation instructions

PROCEDURES FOR VENTING CATEGORY I APPLIANCES (GAMA VENTING TABLES)

Cancels: New

II 373L-35-3
8/15/90

NOTE: Before beginning the installation, read these instructions along with those provided in the product literature packet carefully and completely.

I. INTRODUCTION

This information replaces the information found in the Venting Section of the Installation, Startup, and Operating Instructions provided with this furnace. The information relating to "Removal of Existing Furnaces From Common Vent Systems" is still valid and must be used.

NOTE: Do not use these instructions to size a vent system for Category I appliances to be vented into a masonry vent system.

For installation information and procedures for venting Category I fan-assisted or induced-draft appliances into masonry chimneys, refer to the separate installation instruction included in this literature packet.

Definitions of terms, along with venting tables for the correct venting of Category I appliances using Type-B or single wall metal vent connectors attached to Type-B vents, are included in these instructions. Tables are also included for the proper sizing of a common vent serving two or more appliances. Examples are shown demonstrating how to use the vent tables for a variety of applications.

When reference is made (in this publication) to the National Fuel Gas Code NFPA No. 54-1988/ANSI Z223.1-1988, note that this applies to installations inside the United States. All Canadian installations must be made in accordance with the CAN/CGA-B149 Installation Codes and all authorities having jurisdiction.

II. DEFINITION OF TERMS

Definitions of terms describing gas appliances and venting systems are provided in Section II of this Instruction.

III. GENERAL VENTING REQUIREMENTS

This section includes information relative to the general venting requirements which must be followed to properly vent Category I appliances.

The following items 19, 20, and WARNING must be considered in addition to the requirements defined in Section III on pages 5, 6, and 7.

19. If a common vent becomes blocked, the furnace will be shut off by the draft safeguard switch located on the inducer assembly.

⚠ WARNING: Do not bypass the draft safeguard switch, as an unsafe condition exists which must be corrected. Failure to follow this warning could result in a build up of carbon monoxide and lead to personal injury or death.

20. When removing an existing furnace from a common vent system, the vent system is likely to be oversized for the remaining appliances. Refer to Section E, Venting Instructions, included in the Installation, Startup, and Operating Instructions in this literature packet.

IV. VENT TABLES

This section contains the venting tables for Category I furnaces. Examples are provided to illustrate the use of the tables. The new venting tables were developed by Battelle under contract to the Gas Research Institute (GRI). The VENT-II computer program was used for generating these tables.

GAMA VENTING TABLES
FOR
CATEGORY I CENTRAL FURNACES

This booklet contains new venting tables designed specifically for use with Category I central furnaces. These tables are unique, in that, industry wide venting tables now exist for fan-assisted combustion system central furnaces. Venting tables for these types of appliances are not contained in the National Fuel Gas Code (NFPA 54/ANSI Z223.1-1988).

All requirements contained in this booklet apply to both Category I draft-hood equipped central furnaces as well as fan-assisted combustion system central furnaces. At no time should a venting system for a listed Category II, III, or IV central furnace be sized with these tables. The National Fuel Gas Code (NFPA 54/ANSI Z223.1-1988) may also be used to size venting systems for draft-hood equipped central furnaces. However, at this time, the National Fuel Gas Code does not include alternate sizing methods for fan-assisted combustion systems. Therefore, until engineering data is developed to allow alternate sizing methods for Category I fan-assisted central furnaces, the enclosed venting tables must be used for fan-assisted combustion system central furnaces. These tables apply to venting single appliances and common venting multiple appliances, in chimneys other than masonry chimneys.

The new venting tables were developed by Battelle under contract (GRI-5088-245-1728) to the Gas Research Institute (GRI). The computer program (VENT-II) developed by Battelle Columbus generated the venting tables in this booklet and this procedure has been accepted by the American Gas Association Laboratories as an appropriate engineering methodology for determining venting requirements of Category I central furnaces.

For your information, the general venting requirements listed in this booklet are not intended to be used as complete installation instructions and represent only a partial list of venting considerations.

For venting applications that fall outside the parameters of the new venting tables, refer to the furnace manufacturer's complete installation instructions, the specific vent manufacturer's complete installation instructions and state and local codes.

GRI DISCLAIMER

LEGAL NOTICE: This information is, in part, a result of work performed by Battelle under the sponsorship of the Gas Research Institute (GRI). Neither GRI, members of GRI, nor any person acting on behalf of either:

- a. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of this information, or that the use of any apparatus, method, or process disclosed may not infringe privately owned rights; or
- b. Assumes any liability with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed.

VENTING TABLES

CATEGORY I CENTRAL FURNACES



COPYRIGHT © 1990
GAS APPLIANCE MANUFACTURERS ASSOCIATION

VENTING REQUIREMENTS FOR CATEGORY I CENTRAL FURNACES

I. INTRODUCTION

This booklet contains the current definitions, instructions, and tables necessary to vent today's modern Category I Gas Fired Appliance. A variety of definitions of new terms describing today's gas appliances are included to supplement the actual venting tables which have been generated to correctly vent various combinations of Category I Appliances using Type B or single-wall metal vent connectors attached to Type B vents. Tables are also included covering similar venting material combinations when applied to common venting arrangements of two appliances.

Finally, a series of examples are presented demonstrating how the vent tables are used to size the vent connector and the vertical vent for a variety of typical applications.

II. DEFINITION OF TERMS

"Fan Assisted
Combustion
System"

An appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber and/or heat exchanger.

"FAN Min"

refers to the minimum appliance input rating of a Category I appliance with a fan-assisted combustion system that could be attached to the vent.

"FAN Max"

refers to the maximum appliance input rating of a Category I appliance with a fan-assisted combustion system that could be attached to the vent.

"NAT Max"

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

"FAN+FAN"

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

"FAN+NAT"

refers to the maximum combined input rating of one fan-assisted appliance and one draft-hood-equipped appliance attached to the common vent.

"NAT+NAT"

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

"NR"

means not recommended due to potential for condensate formation and/or pressurization of the venting system.

"NA"

means not applicable due to physical or geometric constraints.

Draft Hood

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

A passageway used to convey flue gases from gas utilization equipment, or their vent connectors, to the outside atmosphere.

Vent Connector

The pipe or duct which connects a fuel-gas burning appliance to a vent or chimney.

Flue Collar

That portion of an appliance designed for the attachment of a draft hood, vent connector, or venting system.

III. GENERAL VENTING REQUIREMENTS

All requirements contained in this document apply to both Category I draft hood equipped and 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. The alternate sizing methods described in the National Fuel Gas Code (NFPA54/ANSI Z223.1-1988) may also be used to size the venting system for a draft hood equipped appliance. At this time, alternate sizing methods have not been developed for fan-assisted appliances. Therefore, until engineering data is developed to allow alternate sizing methods for Category I fan-assisted appliances, the vent tables must be used.

1. If the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the smaller size may be used provided:
 - a) The total vent height "H" is at least 10 feet.
 - b) Vents for appliance draft hood outlets or flue collars 12 inches in diameter or smaller are not reduced more than one size (e.g. 12 inches to 10 inches is a one size reduction).
 - c) Vents for appliance draft hood or flue collars above 12 inches in diameter are not reduced more than two sizes (e.g. 24 inches to 20 inches is a two size reduction).
 - d) The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10% ($0.90 \times$ maximum capacity).
 - e) The draft hood outlet is greater than 4 inches in diameter. Do not connect a 3 inch diameter vent to a 4 inch diameter draft hood outlet. This provision does not apply to fan-assisted appliances.
- 2) Single appliance venting configurations with zero lateral lengths, Tables 1 & 2, are assumed to have no elbows in the vent system. For all other vent configurations with indicated lateral lengths, the vent system is assumed to have two 90° elbows. For each additional 90° elbow, or equivalent* beyond two, the maximum capacity listed in the venting table should be reduced by 10 percent ($0.90 \times$ maximum listed capacity).
- 3) The common venting Tables 3 & 4 were generated using a maximum vent connector length of 1 1/2 feet (18 inches) for each inch of connector diameter as follows:

* Two 45° Elbows are equivalent to one 90° Elbow.

CONNECTOR DIAMETER (INCHES)	MAXIMUM CONNECTOR LENGTH (FEET)
3	4 1/2
4	6
5	7 1/2
6	9
7	10 1/2
8	12
9	13 1/2
10	15
12	18
14	21
16	24
18	27
20	30
22	33
24	36

The vent connector should be routed to the vent utilizing the shortest possible route. Longer connectors than these listed are possible but require an increase in size, rise, or total vent height to compensate for the additional length. Consult the appliance manufacturer for specific recommendations concerning long vent connectors.

- 4) If vent connectors are combined prior to entering the common vent, the maximum common vent capacity listed in the common venting tables must be reduced by 10% ($0.90 \times$ maximum common vent capacity). See Figure 7. The length of the common vent connector offset (L) should not exceed 1-1/2 feet (18 inches) for each inch of common vent connector diameter.
- 5) If the common vertical vent is offset as shown in Figure 8, the maximum common vent capacity listed in the common venting tables should be reduced by 20% ($0.80 \times$ maximum common vent capacity).
- 6) The flow area in the common vent should be greater than or equal to 80 percent of the sum of the flow areas of the individual vent connectors. However, the common vent diameter must always be at least as large as the largest vent connector diameter. All interconnection fittings must also be the same size as the common vent.
- 7) Type B gas vents shall terminate above the roof surface with a listed cap or a listed roof assembly in accordance with the terms of their respective listings and the manufacturer's instructions. See Figures 1 and 2.

WIND-TESTED CAPS - (12" and Smaller)

Listed gas venting systems using listed vent caps 12" and smaller in size may terminate in accordance with the VENT TERMINATION TABLE.

GAS VENT TERMINATION TABLE

ROOF PITCH	MINIMUM HEIGHT
FLAT TO 7/12	1.0 FEET *
OVER 7/12 TO 8/12	1.5 FEET
OVER 8/12 TO 9/12	2.0 FEET
OVER 9/12 TO 10/12	2.5 FEET
OVER 10/12 TO 11/12	3.25 FEET
OVER 11/12 TO 12/12	4.0 FEET
OVER 12/12 TO 14/12	5.0 FEET
OVER 14/12 TO 16/12	6.0 FEET
OVER 16/12 TO 18/12	7.0 FEET
OVER 18/12 TO 20/12	7.5 FEET
OVER 20/12 TO 21/12	8.0 FEET

* THIS REQUIREMENT COVERS MOST INSTALLATIONS

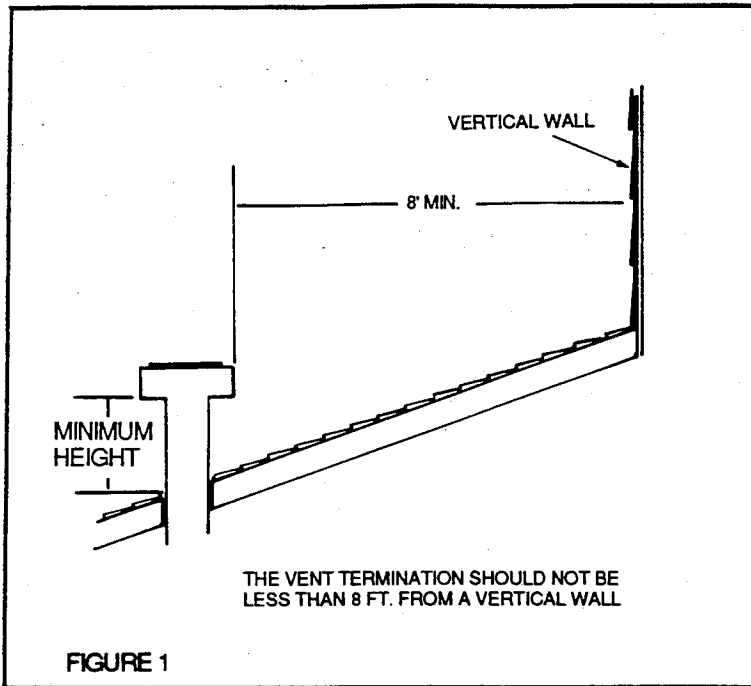


FIGURE 1

VENT CAPS LARGER THAN 12"

Listed vent caps larger than 12" must be located at least 2 feet above the highest point and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet.

- 8) No portion of the venting system can extend into, or pass through any circulating air duct or plenum.
- 9) All vent pipe passing through floors, walls, and ceilings must be installed with the listed clearance to combustible materials and be fire stopped according to local codes. In the absence of local codes, refer to NFPA.
- 10) Vent connectors serving Category I appliances shall not be connected to any portion of mechanical draft systems operating under positive pressure such as Category III or IV Venting Systems.
- 11) A Category I appliance must never be connected to a chimney that is servicing a solid fuel appliance. If a fireplace chimney, lined with a metal liner, is used to vent this appliance, the fireplace opening must be permanently sealed.
- 12) These tables are not applicable to outside chimneys or vents unless enclosed in a chase. A Type B vent passing through an unused masonry chimney is considered to be an enclosed vent system and these tables may be used.

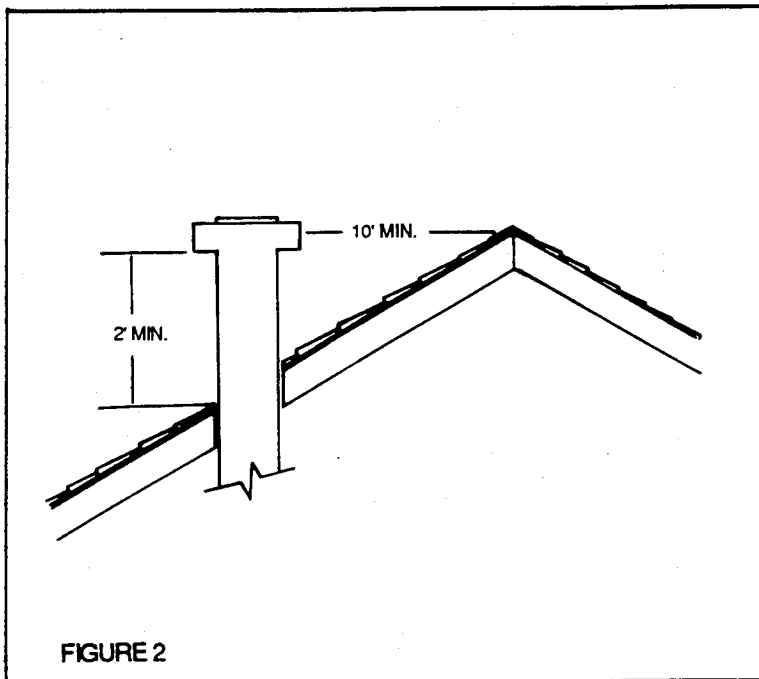


FIGURE 2

- 13) A vent connector shall be supported without any dips or sags and shall slope a minimum of 1/4 inch per lineal foot of connector, back towards the appliance.
- 14) When two or more vent connectors enter a common gas vent, chimney flue, or single-wall metal pipe, the smaller connector shall enter at the highest level consistent with the available headroom or clearance to combustible material.
- 15) Vent connectors shall be firmly attached to draft hood outlets or flue collars by sheet-metal screws or other approved means, except vent connectors of listed Type B vent material which shall be assembled in accordance with the manufacturer's instructions. Joints between sections of single wall connector piping shall be fastened by sheet-metal screws or other approved means.
- 16) When the vent connector used for Category I appliances must be located in or pass through a crawl space or other area which may be cold, that portion of the vent connector shall be of listed double-wall Type B vent material or material having equivalent insulation qualities.
- 17) The entire length of a vent connector shall be readily accessible for inspection, cleaning, and replacement.
- 18) When more than two appliances are connected to a common vent, and at least one of the common vented appliances is a fan assisted type, the common vent must be sized to accommodate:
 - 1) The capacity of all the common vented appliances.
 - 2) Have a minimum capacity lower than that of the smallest fan assisted appliance. Minimum capacity should be determined using Tables 1 and 2.

TYPICAL VENTING APPLICATIONS

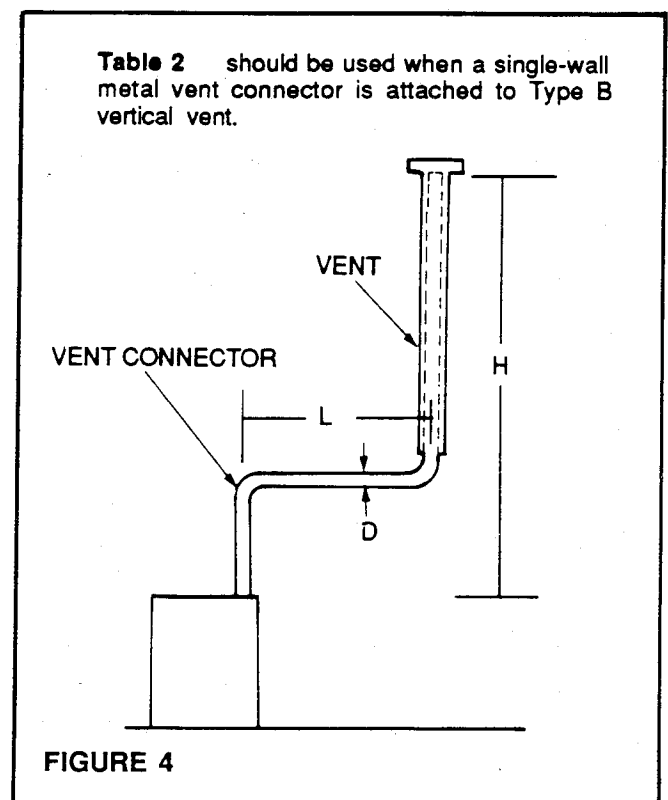
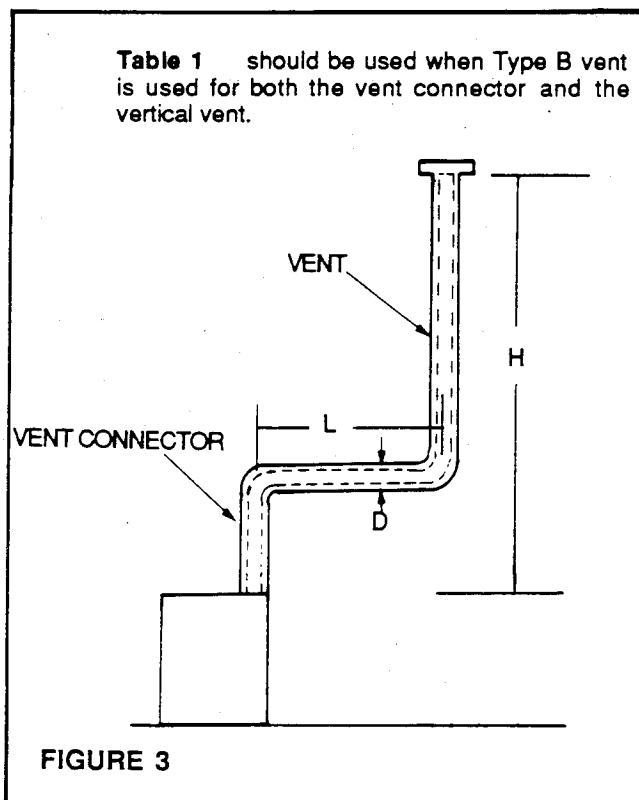


Table 3 should be used when Type B vent connectors are attached to a Type B common vent.

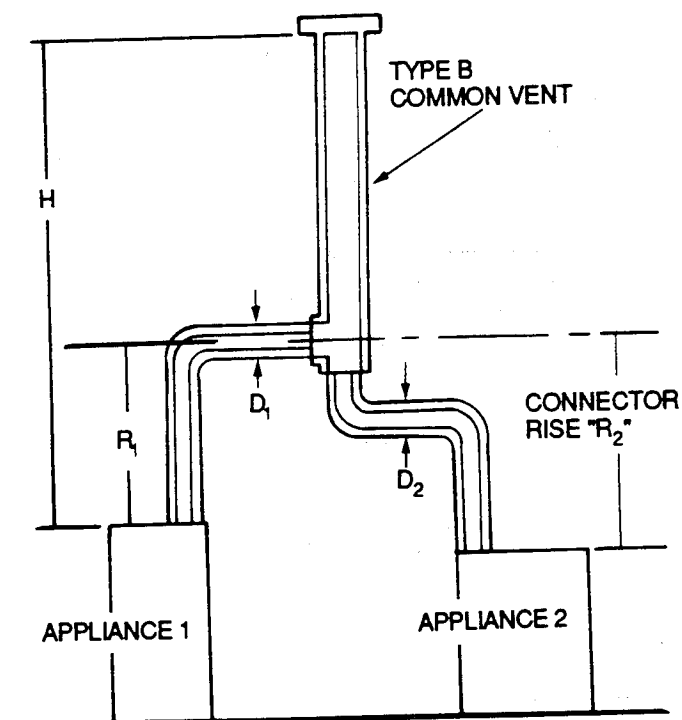


FIGURE 5

Table 4 should be used when single-wall metal vents are attached to a Type B common vent.

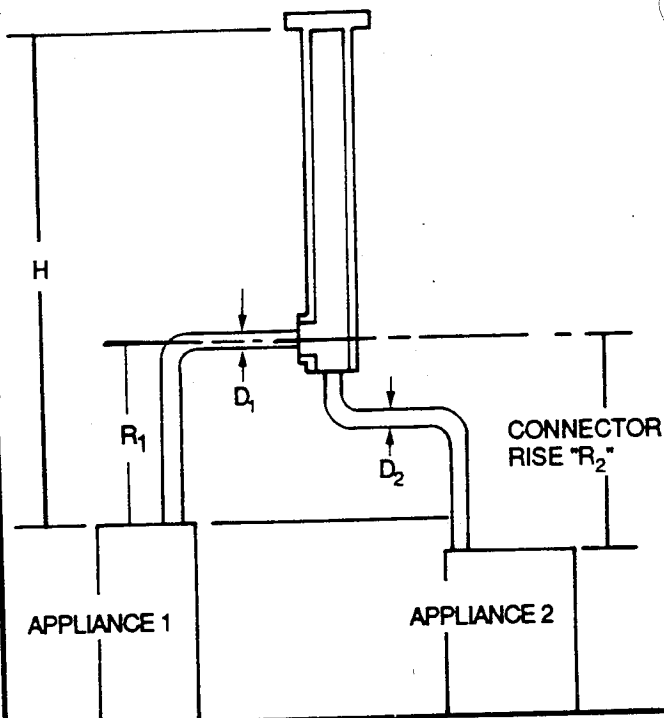


FIGURE 6

Schematic Diagram showing offset in the common vent section "L", of the vent connector.

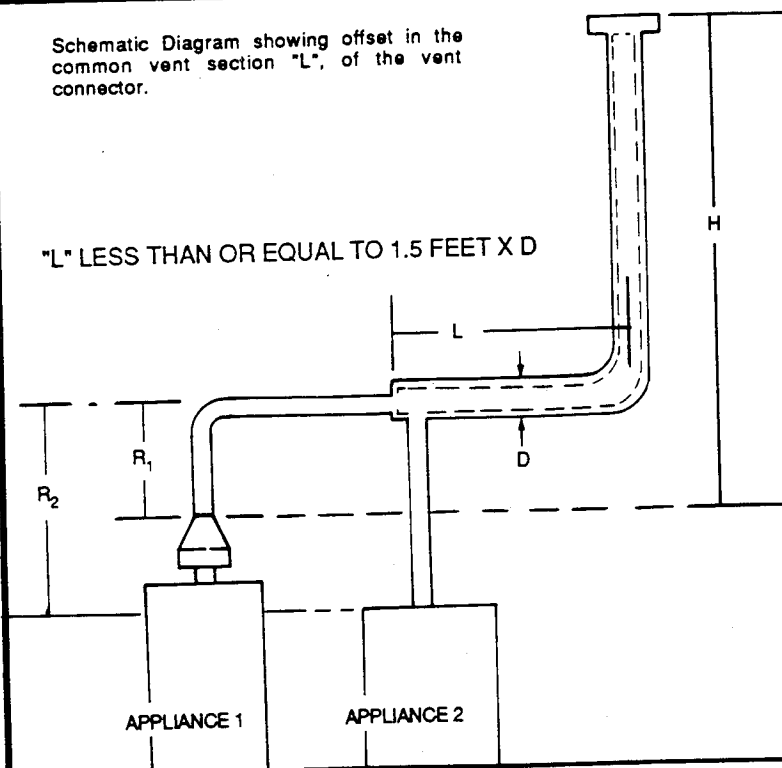


FIGURE 7

Schematic Diagram showing offset in the common vent section of the vertical vent.

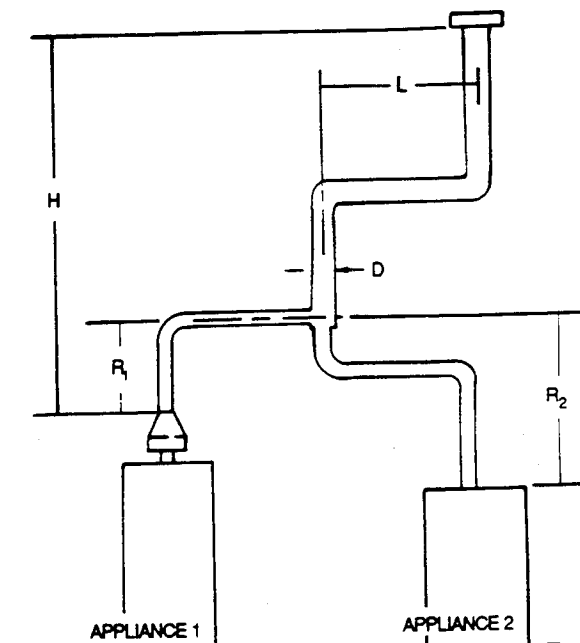


FIGURE 8

Table 1
Capacity of Type B Double-Wall Vents with Type B Double-Wall Connectors
Serving a Single Category I Appliance

Height Lateral H L (ft) (ft)		Vent and Connector Diameter - D																	
		3"		4"		5"		6"		7"		8"		9"					
		Appliance Input Rating 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	Min Max		Max		
6	0	0	78	46	0	152	86	0	251	141	0	375	205	0	524	285	0	698	470
	2	13	51	36	18	97	67	27	157	105	32	232	157	44	321	217	53	425	285
	4	21	49	34	30	94	64	39	153	103	50	227	153	66	316	211	79	419	279
	6	25	46	32	36	91	61	47	149	100	59	223	149	78	310	205	93	413	273
8	0	0	84	50	0	165	94	0	276	155	0	415	235	0	583	320	0	780	415
	2	12	57	40	16	109	75	25	178	120	28	263	180	42	365	247	50	483	322
	5	23	53	38	32	103	71	42	171	115	53	255	173	70	356	237	83	473	313
	8	28	49	35	39	98	66	51	164	109	64	247	165	84	347	227	99	463	303
10	0	0	88	53	0	175	100	0	295	166	0	447	255	0	631	345	0	847	450
	2	12	61	42	17	118	81	23	194	129	26	289	195	40	402	273	48	533	355
	5	23	57	40	32	113	77	41	187	124	52	280	188	68	392	263	81	522	346
	10	30	51	36	41	104	70	54	176	115	67	267	175	88	376	245	104	504	330
15	0	0	94	58	0	191	112	0	327	187	0	502	285	0	716	390	0	970	525
	2	11	69	48	15	136	93	20	226	150	22	339	225	38	475	316	45	633	414
	5	22	65	45	30	130	87	39	219	142	49	330	217	64	463	300	76	620	403
	10	29	59	41	40	121	82	51	206	135	64	315	208	84	445	288	99	600	386
20	0	0	97	61	0	202	119	0	349	202	0	540	307	0	776	430	0	1057	575
	2	10	75	51	14	149	100	18	250	166	20	377	249	33	531	346	41	711	470
	5	21	71	48	29	143	96	38	242	160	47	367	241	62	519	337	73	697	460
	10	28	64	44	38	133	89	50	229	150	62	351	228	81	499	321	95	675	443
30	0	0	100	64	0	213	128	0	374	220	0	587	336	0	853	475	0	1173	650
	2	9	81	56	13	166	112	14	283	185	18	432	280	27	613	394	33	826	535
	5	21	77	54	28	160	108	36	275	176	45	421	273	58	600	385	69	811	524
	10	27	70	50	37	150	102	48	262	171	59	405	261	77	580	371	91	788	507
50	0	0	101	67	0	216	134	0	397	232	0	633	363	0	932	518	0	1297	708
	2	8	86	61	11	183	122	14	320	206	15	497	314	22	715	445	26	975	615
	5	20	82	NR	27	177	119	35	312	200	43	487	308	55	702	438	65	960	605
	10	26	76	NR	35	168	114	45	299	190	56	471	298	73	681	426	86	935	589
100	0	NR	NR	NR	42	158	NR	54	287	180	66	455	288	85	662	413	100	911	572
	20	NR	NR	NR	50	149	NR	63	275	169	76	440	278	97	642	401	113	888	556
	30	NR	NR	NR	69	131	NR	84	250	NR	99	410	259	123	605	376	141	844	522
	50	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
200	0	NR	NR	NR	0	218	NR	0	407	NR	0	665	400	0	997	560	0	1411	770
	2	NR	NR	NR	10	194	NR	12	354	NR	13	566	375	18	831	510	21	1155	700
	5	NR	NR	NR	26	189	NR	33	347	NR	40	557	369	52	820	504	60	1141	692
	10	NR	NR	NR	33	182	NR	43	335	NR	53	542	361	68	801	493	80	1118	679
300	0	NR	NR	NR	40	174	NR	50	321	NR	62	528	353	80	782	482	93	1095	666
	15	NR	NR	NR	47	166	NR	59	311	NR	71	513	344	90	763	471	105	1073	653
	20	NR	NR	NR	NR	NR	NR	78	290	NR	92	483	NR	115	726	449	131	1029	627
	30	NR	NR	NR	NR	NR	NR	NR	NR	NR	147	428	NR	180	651	405	197	944	575
400	0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	50	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	100	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	200	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 2
Capacity of Type B Double-Wall Vents with Single-Wall Metal Connectors
Serving a Single Category I Appliance

Height Lateral H (ft) L (ft)		Vent and Connector Diameter - D																										
		3"			4"			5"			6"			7"			8"			9"			10"			12"		
		Appliance Input Rating in Thousands of Btu Per Hour																										
		FAN		NAT	FAN		NAT	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	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	267	894	469	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	251	541	368	347	673	453	498	979	648
	4	NR	NR	33	74	92	63	102	152	102	146	225	152	187	313	208	237	416	277	295	533	360	409	664	443	584	971	638
	6	NR	NR	31	83	89	60	114	147	99	163	220	148	207	307	203	263	409	271	327	526	352	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	258	1002	536	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	246	617	417	339	768	513	486	1120	743
	5	NR	NR	37	77	102	69	107	168	114	151	252	171	193	352	235	245	470	311	305	604	404	418	754	500	598	1104	730
	8	NR	NR	33	90	95	64	122	161	107	175	243	163	223	342	225	280	458	300	344	591	392	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	253	1093	584	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	242	681	456	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	299	667	443	409	834	544	584	1224	825
	10	NR	NR	34	97	100	68	132	171	112	188	261	171	237	369	241	296	497	325	363	643	423	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	244	1259	681	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	232	812	543	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	287	795	526	392	997	657	562	1469	963
	10	NR	NR	39	95	116	79	128	201	131	182	308	203	228	438	284	284	592	381	349	768	501	470	966	628	664	1433	928
20	15	NR	NR	NR	NR	NR	72	158	186	124	220	290	192	272	418	269	334	568	367	404	742	484	540	937	601	750	1399	894
	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1053	573	238	1379	750	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	227	914	611	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	279	896	596	381	1126	734	547	1665	1074
30	10	NR	NR	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1092	702	646	1626	1037
	15	NR	NR	NR	NR	NR	80	155	208	136	216	325	210	264	469	301	325	640	419	393	838	549	526	1060	677	730	1587	1005
	20	NR	NR	NR	NR	NR	NR	186	192	126	254	306	196	309	448	285	374	616	400	448	810	526	592	1028	651	808	1550	973
	30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
50	0	34	99	63	53	211	127	76	372	219	110	584	334	144	849	472	184	1168	647	229	1542	852	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	219	1069	698	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	269	1049	684	366	1324	846	524	1971	1283
	10	NR	NR	NR	91	144	98	122	255	168	171	397	257	213	570	367	265	777	501	327	1017	662	440	1287	821	620	1927	1243
100	15	NR	NR	NR	115	131	NR	151	239	157	208	377	242	255	547	349	312	750	481	379	985	638	507	1251	794	702	1884	1205
	20	NR	NR	NR	NR	NR	NR	181	223	NR	246	357	228	298	524	333	360	723	461	433	955	615	570	1216	768	780	1841	1166
	30	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	389	477	305	461	670	426	541	895	574	704	1147	720	937	1759	1101
	0	33	99	66	51	213	133	73	394	230	105	629	361	138	928	515	176	1292	704	220	1724	948	295	2223	1189	428	3432	1818
50	2	36	84	61	53	181	121	73	318	205	104	495	312	133	712	443	168	971	613	209	1273	811	280	1615	1007	401	2426	1509
	5	48	80	NR	70	174	117	94	308	198	131	482	305	164	696	435	204	953	602	257	1252	795	347	1591	991	496	2396	1490
	10	NR	NR	NR	89	160	NR	118	292	186	162	461	292	203	671	420	253	923	583	313	1217	765	418	1551	963	589	2347	1455
	15	NR	NR	NR	112	148	NR	145	275	174	199	441	280	244	646	405	299	894	562	363	1183	736	481	1512	934	668	2299	1421
100	20	NR	NR	NR	NR	NR	NR	176	257	NR	236	420	267	285	622	389	345	866	543	415	1150	708	544	1473	906	741	2251	1387
	30	NR	NR	NR	NR	NR	NR	NR	NR	NR	315	376	NR	373	573	NR	442	809	502	521	1086	649	674	1399	848	892	2159	1318
	0	NR	NR	NR	49	214	NR	69	403	NR	100	659	395	131	991	555	166	1404	765	207	1900	1033	273	2479	1300	395	3912	2042
	2	NR	NR	NR	51	192	NR	70	351	NR	98	563	373	125	828	508	158	1152	698	196	1532	933	259	1970	1168	371	3021	1817
50	5	NR	NR	NR	67	186	NR	90	342	NR	125	551	366	156	813	501	194	1134	688	240	1511	921	322	1945	1153	460	2990	1796
	10	NR	NR	NR	85	175	NR	113	324	NR	153	532	354	191	789	486	238	1104	672	293	1477	902	389	1905	1133	547	2938	1763
	15	NR	NR	NR	132	162	NR	138	310	NR	188	511	343	230	764	473	281	1075	656	342	1443	884	447	1865	1110	618	2888	1730
	20	NR	NR	NR	NR	NR	NR	168	295	NR	224	487	NR	270	739	458	325	1046	639	391	1410	864	507	1825	1087	690	2838	1696
100	30	NR	NR	NR	NR	NR	NR	231	264	NR	301	448	NR	355	685	NR	418	988	NR	491	1343	824	631	1747	1041	834	2739	1627
	50	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	540	584	NR	617	866	NR	711	1205	NR	895	1591	NR	1138	2547	1489

Table 3
Capacity of Type B Double-Wall Vents with Type B Double-Wall
Connectors Serving Two or More Category I Appliances

Vent Connector Capacity

Vent Height H (ft)		Connector Rise R (ft)		Vent Connector Diameter - D																															
				3"			4"			5"			6"			7"			8"			9"			10"										
				Appliance Input Rating Limits in Thousands of Btu Per Hour																															
				FAN			NAT			FAN			NAT			FAN			NAT			FAN			NAT			FAN			NAT			FAN	
Min		Max	Max	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	1	22	37	26	35	66	46	46	106	72	58	164	104	77	225	142	92	296	185	109	376	237	128	466	289										
	2	23	41	31	37	75	55	48	121	86	60	183	124	79	253	168	95	333	220	112	424	282	131	526	345										
	3	24	44	35	38	81	62	49	132	96	62	199	139	82	275	189	97	363	248	114	463	317	134	575	386										
8	1	22	40	27	35	72	48	49	114	76	64	176	109	84	243	148	100	320	194	118	408	248	138	507	303										
	2	23	44	32	36	80	57	51	128	90	66	195	129	86	269	175	103	356	230	121	454	294	141	564	358										
	3	24	47	36	37	87	64	53	139	101	67	210	145	88	290	198	105	384	258	123	492	330	143	612	402										
10	1	22	43	28	34	78	50	49	123	78	65	189	113	89	257	154	106	341	200	125	436	257	146	542	314										
	2	23	47	33	36	86	59	51	136	93	67	206	134	91	282	182	109	374	238	128	479	305	149	596	372										
	3	24	50	37	37	92	67	52	146	104	69	220	150	94	303	205	111	402	268	131	515	342	152	642	417										
15	1	21	50	30	33	89	53	47	142	83	64	220	120	88	298	163	110	389	214	134	493	273	162	609	333										
	2	22	53	35	35	96	63	49	153	99	66	235	142	91	320	193	112	419	253	137	532	323	165	658	394										
	3	24	55	40	36	102	71	51	163	111	68	248	160	93	339	218	115	445	286	140	565	365	167	700	444										
20	1	21	54	31	33	99	56	46	157	87	62	246	125	86	334	171	107	436	224	131	552	285	158	681	347										
	2	22	57	37	34	105	66	48	167	104	64	259	149	89	354	202	110	463	265	134	587	339	161	725	414										
	3	23	60	42	35	110	74	50	176	116	66	271	168	91	371	228	113	486	300	137	618	518	164	764	466										
30	1	20	62	33	31	113	59	45	181	93	60	288	134	83	391	182	103	512	238	125	649	305	151	802	372										
	2	21	64	39	33	118	70	47	190	110	62	299	158	85	408	215	105	535	282	129	679	360	155	840	439										
	3	22	66	44	34	123	79	48	198	124	64	309	178	88	423	242	108	555	317	132	706	405	158	874	494										
50	1	19	71	36	30	133	64	43	216	101	57	349	145	78	477	197	97	627	257	120	797	330	144	984	403										
	2	21	73	43	32	137	76	45	223	119	59	358	172	81	490	234	100	645	306	123	820	392	148	1014	478										
	3	22	75	48	33	141	86	46	229	134	61	366	194	83	502	263	103	661	343	126	842	441	151	1043	538										
100	1	18	82	37	28	158	66	40	262	104	53	442	150	73	611	204	91	810	266	112	1038	341	135	1285	417										
	2	19	83	44	30	161	79	42	267	123	55	447	178	75	619	242	94	822	316	115	1054	405	139	1306	494										
	3	20	84	50	31	163	89	44	272	138	57	452	200	78	627	272	97	834	355	118	1069	455	142	1327	555										

Common Vent Capacity

Vent Height H (ft)	Common Vent Diameter - D																							
	4"			5"			6"			7"			8"			9"			10"					
	Combined Appliance Input Rating in Thousands of Btu Per Hour																							
	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT			
6	92	81	65	140	116	103	204	161	147	309	248	200	404	314	260	547	434	335	672	520	410			
8	101	90	73	155	129	114	224	178	163	339	275	223	444	348	290	602	480	378	740	577	465			
10	110	97	79	169	141	124	243	194	178	367	299	242	477	377	315	649	522	405	800	627	495			
15	125	112	91	195	164	144	283	228	206	427	352	280	556	444	365	753	612	465	924	733	565			
20	136	123	102	215	183	160	314	255	229	475	394	310	621	499	405	842	688	523	1035	826	640			
30	152	138	118	244	210	185	361	297	266	547	459	360	720	585	470	979	808	605	1209	975	740			
50	167	153	134	279	244	214	421	353	310	641	547	423	854	706	550	1164	977	705	1451	1188	860			
100	175	163	NR	311	277	NR	489	421	NR	751	658	479	1025	873	625	1408	1215	800	1784	1502	975			

Table 4

**Capacity of Type B Double-Wall Vent with Single-Wall
Connectors Serving Two or More Category I Appliances**

Vent Connector Capacity

Vent Height H (ft)		Connector Rise R (ft)		Vent Connector Diameter - D																									
				3"			4"			5"			6"			7"			8"			9"			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	FAN		NAT	FAN	
Min	Max	Max	Min	Max	Max	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	1	NR	NR	26	NR	NR	46	NR	NR	71	NR	NR	102	207	223	140	262	293	183	325	373	234	447	463	286				
	2	NR	NR	31	NR	NR	55	NR	NR	85	168	182	123	215	251	167	271	331	219	334	422	281	458	524	344				
	3	NR	NR	34	NR	NR	62	121	131	95	174	198	138	222	273	188	279	361	247	344	462	316	468	574	385				
15	1	NR	NR	29	79	87	52	116	138	81	177	214	116	238	291	158	312	380	208	397	482	266	556	596	324				
	2	NR	NR	34	83	94	62	121	150	97	185	230	138	246	314	189	321	411	248	407	522	317	568	646	387				
	3	NR	NR	39	87	100	70	127	160	109	193	243	157	255	333	215	331	438	281	418	557	360	579	690	437				
30	1	47	60	31	77	110	57	113	175	89	169	278	129	226	380	175	296	497	230	378	630	294	528	779	358				
	2	50	62	37	81	115	67	117	185	106	177	290	152	236	397	208	307	521	274	389	662	349	541	819	425				
	3	54	64	42	85	119	76	122	193	120	185	300	172	244	412	235	316	542	309	400	690	394	555	855	482				
50	1	46	69	33	75	128	60	109	207	96	162	336	137	217	460	188	284	604	245	364	768	314	507	951	384				
	2	49	71	40	79	132	72	114	215	113	170	345	164	226	473	223	294	623	293	376	793	375	520	983	458				
	3	53	72	45	83	136	82	119	221	128	178	353	186	235	486	252	304	640	331	387	816	424	535	1013	518				

Common Vent Capacity

Common Vent Capacity																						
Vent Height H (ft)	Common Vent Diameter - D																					
	4"			5"			6"			7"			8"			9"			10"			
	Combined Appliance Input Rating in Thousands of Btu Per Hour																					
	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	
6	89	78	64	136	113	100	200	158	144	304	244	196	398	310	257	541	429	332	665	515	407	
8	98	87	71	151	126	112	218	173	159	331	269	218	436	342	285	592	473	373	730	569	460	
10	106	94	76	163	137	120	237	189	174	357	292	236	467	369	309	638	512	398	787	617	487	
15	121	108	88	189	159	140	275	221	200	416	343	274	544	434	357	738	599	456	905	718	553	
20	131	118	98	208	177	155	305	247	223	463	383	302	606	487	395	824	673	512	1013	808	626	
30	145	132	113	236	202	179	350	286	257	533	446	349	703	570	459	958	790	593	1183	952	723	
50	159	145	128	268	233	204	406	337	296	622	529	410	833	686	535	1139	954	689	1418	1157	838	

© 1990 by Gas Research Institute

EXAMPLES USING SINGLE APPLIANCE VENTING TABLES

Example 1: Single Draft-Hood-Equipped Appliance

Suppose that an installer has a 120,000 Btu/hr input appliance with a 5 inch diameter draft hood outlet that needs to be vented into a 10 foot high Type B vent system. What size vent should be used assuming (a) a 5-Ft lateral single-wall metal vent connector is used with two 90° elbows, (b) a 5-Ft lateral single-wall metal vent connector is used with three 90° elbows in the vent system?

Solution

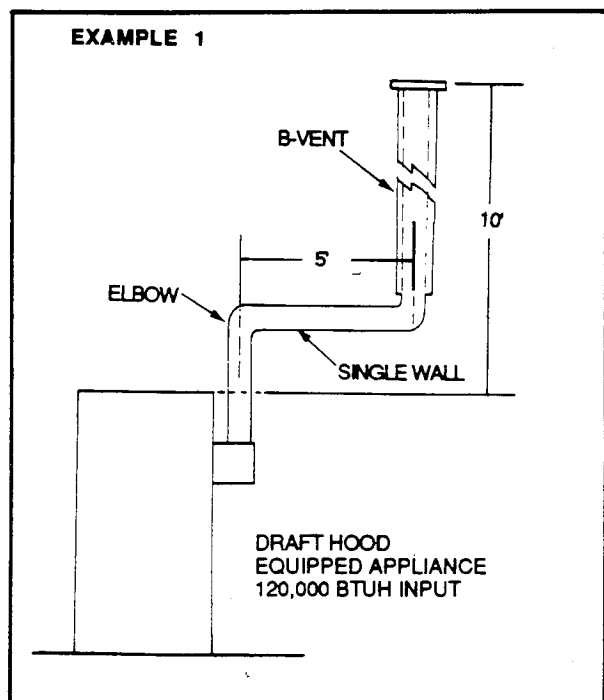
Table 2 should be used to solve this problem because single-wall metal vent connectors are being used with a Type B vent. Refer to Figure 4 of Typical Applications.

- (a) Read down the first column in Table 2 until the row associated with a 10-Ft height and 5-Ft lateral is found. Read across this row until a vent capacity greater than 120,000 Btu/hr is located in the shaded columns labeled "NAT Max" for draft-hood-equipped appliances. In this case, a 5 inch diameter vent has a capacity of 122,000 Btu/hr and may be used for this application.
- (b) If three 90° elbows are used in the vent system, then the maximum vent capacity listed in the tables must be reduced by 10 percent (see Note 6). This implies that the 5 inch diameter vent has an adjusted capacity of only 110,000 Btu/hr. In this case, the vent system must be increased to 6 inches in diameter. See calculations below:

$$122,000 \times .90 = 110,000 \text{ for 5" Vent}$$

From Table 2 - Select 6" Vent

$$186,000 \times .90 = 167,000; \text{ This is greater than the required 120,000, therefore use a 6" Vent}$$



Example 2: Single Fan-Assisted Appliance

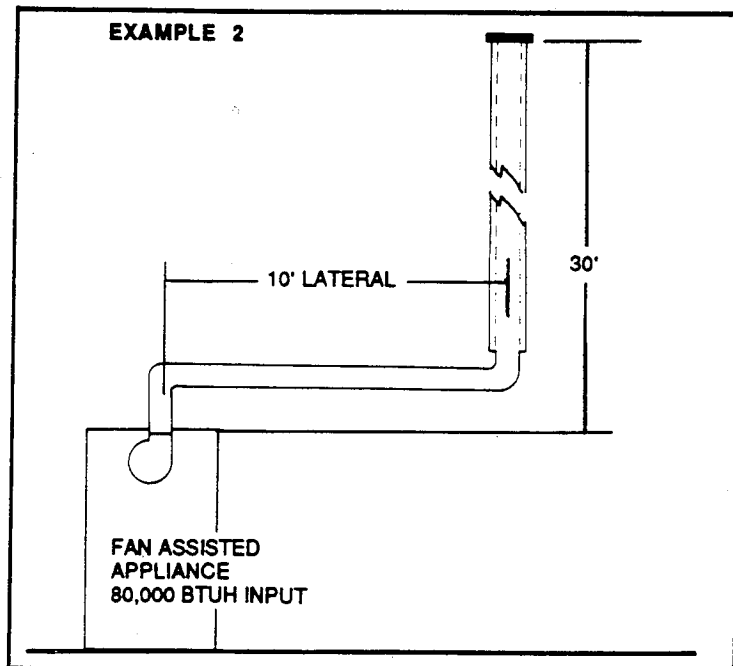
Suppose an installer has an 80,000 Btu/hr input fan-assisted appliance that must be installed using 10 feet of lateral connector attached to a 30-Ft high Type B vent. Two 90° elbows are needed for the installation. Can a single-wall metal vent connector be used for this application?

Solution

Table 2 refers to the use of single-wall metal vent connectors with Type B vent. In the first column find the row associated with a 30-Ft height and a 10-Ft lateral. Read across this row, looking at the "FAN Min" and "FAN Max" columns, to find that a 3 inch diameter single-wall metal connector vent is not recommended. Moving to the next larger size single wall connector (4") we find that a 4 inch diameter single-wall metal connector has a recommended minimum vent capacity of 91,000 Btu/hr and a recommended maximum vent capacity of 144,000 Btu/hr. The 80,000 Btu/hr fan-assisted appliance is outside this range, so we conclude that a single-wall metal vent connector cannot be used to vent this appliance using 10 feet of lateral for the connector.

However, we see that if the 80,000 Btu/hr input appliance could be moved to within 5 feet of the vertical vent, then a 4 inch single-wall metal connector could be used to vent the appliance. Table 2 shows the acceptable range of vent capacities for a 4 inch vent with 5 feet of lateral to be between 72,000 Btu/hr and 157,000 Btu/hr.

If the appliance cannot be moved closer to the vertical vent, then Type B vent could be used as the connector material. In this case, Table 1 shows that for a 30-Ft high vent with 10 feet of lateral, the acceptable range of vent capacities for a 4 inch diameter vent attached to a fan-assisted appliance are between 37,000 Btu/hr and 150,000 Btu/hr.



EXAMPLES USING COMMON VENTING TABLES

Example 3; Common Venting Two Draft-Hood Appliances

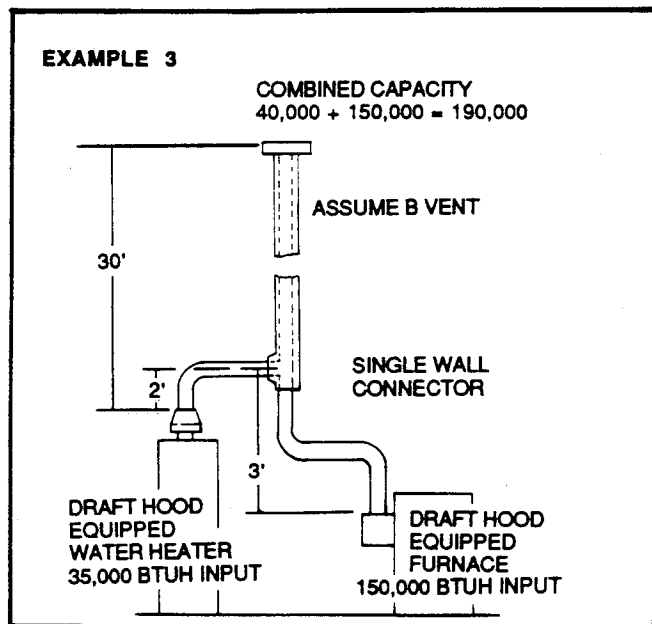
Suppose a 35,000 Btu/hr water heater is to be common vented with a 150,000 Btu/hr furnace using a common vent with a total height of 30 feet. The connector rise is 2 feet for the water heater and 3 feet for the furnace. Assume single-wall metal connectors will be used with Type B vent. What size connectors and combined vent should be used in this installation?

Solution - (Table 4 applies in this example)

Table 4 should be used to size single-wall metal vent connectors attached to Type B vertical vent. In the vent connector capacity Table 4, find the row associated with a 30-Ft vent height. For a 2-Ft rise on the vent connector for the water heater, read the shaded columns for draft-hood-equipped appliances to find that a 3 inch diameter vent connector has a capacity of 37,000 Btu/hr.

Therefore, a 3 inch single-wall metal vent connector may be used with the water heater. For a draft-hood-equipped furnace with a 3-Ft rise, read across the appropriate row to find that a 5 inch diameter vent connector has a maximum capacity of 120,000 Btu/hr (which is too small for the furnace) and a 6 inch diameter vent connector has a maximum vent capacity of 172,000 Btu/hr. Therefore, a 6 inch diameter vent connector should be used with the 150,000 Btu/hr furnace.

For the capacity of the combined vent, the lower portion of Table 4 should be used. The combined vent capacity required is 185,000 Btu/hr. Table 4 shows that the combined vent capacity of a 6 inch diameter vent with a 30-Ft vent height is 257,000 Btu/hr. This is more than adequate to handle the 35,000 Btu/hr input water heater and the 150,000 Btu/hr input furnace.

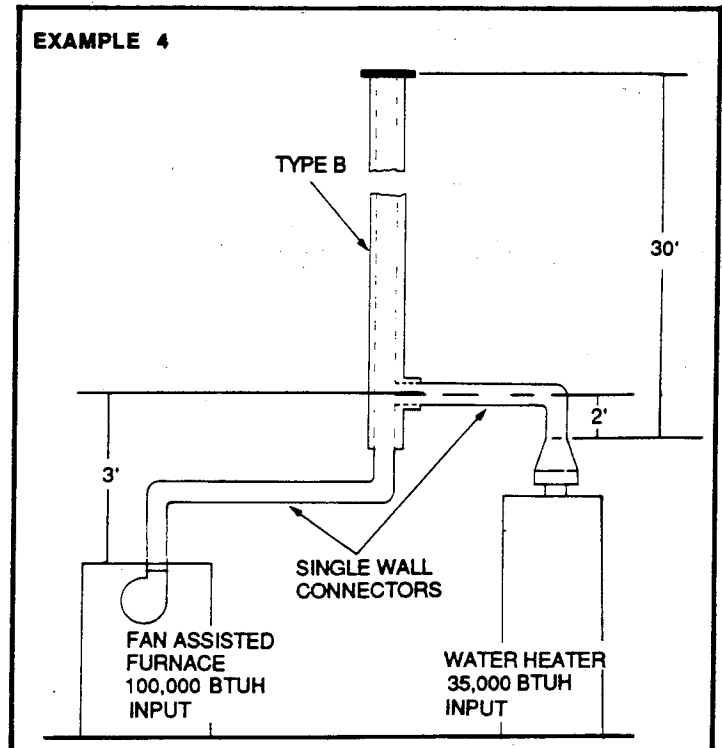


Example 4: Common Venting a Draft Hood Water Heater with a Fan-Assisted Furnace

In this case, a 35,000 Btu/hr input draft-hood-equipped water heater with a 2 foot connector rise is to be common vented with a 100,000 Btu/hr fan-assisted furnace with a 3-Ft connector rise. The common vent consists of a 30-Ft rise of Type B vent. What are the recommended vent diameters for each connector and the common vent?

Solution - (Table 4)

Water Heater Vent Connector Diameter. Let us assume the installer would like to use a single-wall metal vent connector. Using Table 4, Vent Connector Capacity, read down the Total Vent Height "H" column to 30 feet and read across the 2-Ft Connector Rise "R" row to the first Btu/hr rating in the "NAT Max" column that is equal to or greater than the water heater input rating. The table shows that a 3 inch vent connector has a maximum input rating of 37,000 Btu/hr. Since this is greater than the water heater input rating, a 3 inch vent connector is adequate. Furthermore, since the water heater is equipped with a draft hood, there are no minimum input rating restrictions.



Furnace Vent Connector Diameter. Again, let us assume the installer would like to use a single-wall metal vent connector. Using Table 4, Vent Connector Capacity, read down the Total Vent Height "H" column to 30 feet and across the 3-ft Connector Rise "R" row. Since the furnace has a fan-assisted combustion system, find the first "FAN Max" column with a Btu/hr rating greater than the furnace input rating. The 4 inch vent connector has a maximum input rating of 119,000 Btu/hr and a minimum input rating of 85,000 Btu/hr. The 100,000 Btu/hr furnace in this example falls within this range, so a 4 inch connector is adequate. If the furnace would have had an input rating of 80,000 Btu/hr, then a Type B vent connector (see Table 4) would have to be used in order to meet the minimum capacity limit.

Common Vent Diameter. The total input to the common vent is 135,000 Btu/hr. Using Table 4, Common Vent Capacity, read down the Total Vent Height "H" column to 30 feet and across this row to find the smallest vent diameter in the "FAN+NAT" column that has a Btu/hr rating equal to or greater than 135,000 Btu/hr. The 4 inch common vent has a capacity of 132,000 Btu/hr and the 5 inch common vent has a capacity of 202,000 Btu/hr. Therefore, the 5 inch common vent should be used in this example.

Summary. In this example, the installer may use a 3 inch diameter, single-wall metal vent connector for the water heater and a 4 inch diameter, single-wall metal vent connector for the furnace. The common vent should be a 5 inch diameter Type B vent.

