

bryant

day
night

Payne

installation, operation

PROCEDURES FOR VENTING CATEGORY I INDUCED-COMBUSTION APPLIANCES INTO A MASONRY CHIMNEY

Cancels: New

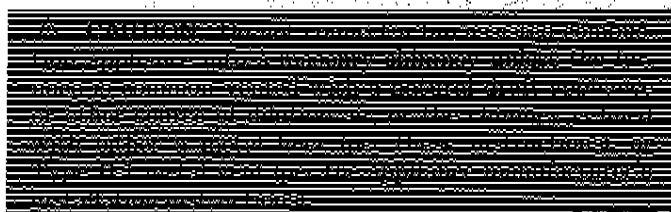
II 673L-35-2

5/15/90

I. INTRODUCTION

The following instructions show the proper method of sizing the vent system when connecting an induced-combustion (hereafter called fan-assisted combustion) appliance to a masonry chimney.

NOTE: Refer to the appliance manufacturer's installation instructions for procedures for sizing a metal vent system for a fan-assisted combustion appliance. Also, refer to the current edition of the National Fuel Gas Code NFPA No. 54-1988/ANSI Z223.1-1988 for additional requirements. Canadian installations must be installed in accordance with CAN/CGA.B149 Installation Codes and all authorities having jurisdiction.



II. DEFINITION OF TERMS

A. Fan-Assisted Combustion Appliance—An appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber and heat exchanger.

B. 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.

C. 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.

D. 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.

E. 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.

F. NR—Means Not Recommended due to potential for condensate formation and/or pressurization of the venting system.

G. NA—Means Not Applicable due to physical or geometric constraints.

H. 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.

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

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

K. Flue Collar—The 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 Category I fan-assisted combustion appliances only. Venting systems for listed Category II, III, and IV appliances must not be sized by these tables. Refer to the National Fuel Gas Code or Canadian CAN/CGA.B149 for venting requirements of draft hood-equipped appliances.

NOTE: When selecting appropriate vent connector size, select smallest size possible for vent connector and only one size larger is permissible or potential condensate formation may occur.

1. The appliance must not be connected to a chimney flue servicing a separate appliance designed to burn solid fuel.
2. Never connect this appliance to a chimney serving a fireplace, unless the fireplace opening is permanently sealed off.
3. 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 are 12 inches in diameter or smaller, are not reduced more than one size (e.g., 12 inches to 10 inches is one reduction).
 - c. The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10% ($0.90 \times$ maximum capacity).
 - d. When 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.
4. All other vent configurations, with indicated lateral lengths, are assumed to have two elbows. For each additional elbow beyond two, the maximum capacity listed in the venting table should be reduced by 10% (i.e. $90\% \times$ maximum listed capacity for three elbows; $80\% \times$ maximum for four elbows etc.).

5. The common venting tables were generated using a maximum vent connector diameter as follows:

CONNECTOR DIA (In Inches)	MAX CONNECTOR LENGTH (In 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

The vent connector should be routed to the vent utilizing the shortest possible route. Longer connectors than these listed above 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.

6. The flow area in the common vent should be greater than or equal to 80% 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. All vents or chimneys should be terminated as specified in the National Fuel Gas Code or Canadian CAN/CGA.B149 Installation Codes and all authorities having jurisdiction.
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 the requirements specified in the National Fuel Gas Code and Canadian CAN/CGA.B149.
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. Tables I and II are not applicable to outside chimneys or vents. A Type B-1 vent, lining a masonry chimney is considered to be an enclosed vent system and tables found in the appliance manufacturer's installation instructions should be used. Table V is applicable to the venting of a single Category I appliance into a flexible metal liner installed in a masonry chimney.
12. A vent connector shall be supported without any dips or sags and shall slope downward a minimum of 1/4 inch per linear foot of connector, toward the appliance.
13. When two or more vent connectors enter a common gas vent, chimney, or single-wall metal pipe, the smaller connector shall enter at the highest level consistent with the available headroom or clearance to combustible material.
14. Vent connectors shall be firmly attached to drafthood outlets or flue collars by sheet metal screws or other approved means, except vent connectors of listed Type B-1 vent which shall be assembled in accordance with the manufacturer's instructions.
15. When the vent connector used for Category I appliances must be located in or pass through an unheated crawl space or other area which can be cold, that portion of the vent connector shall be of listed Type B-1 vent or material having equivalent insulation qualities.
16. When entering a masonry chimney with a vent connector, means shall be employed to prevent the connector

from entering so far as to restrict the space between its end and the opposite wall of the chimney.

17. The entire length of a vent connector shall be readily accessible for inspection, cleaning, and replacement.

IV. EXAMPLES

A. Example 1: Common Venting a Drafthood-Equipped Water Heater With a Fan-Assisted Combustion Furnace

In this example, an installer wants to vent a 40,000 Btuh input drafthood-equipped water heater, and a 110,000 Btuh input fan-assisted combustion furnace into an 8 x 12-inch tile-lined masonry chimney. See Figure 1. The vent connector from the water heater has a 1-foot rise, and the vent connector from the furnace has a 3-foot rise. The chimney height is 30 feet. Both appliances are located within 4 feet of the chimney in the basement of the structure. Both appliances are also vented separately into the chimney. What are the recommended diameters for each vent connector, and should Type B-1 or single-wall vent pipe be used?

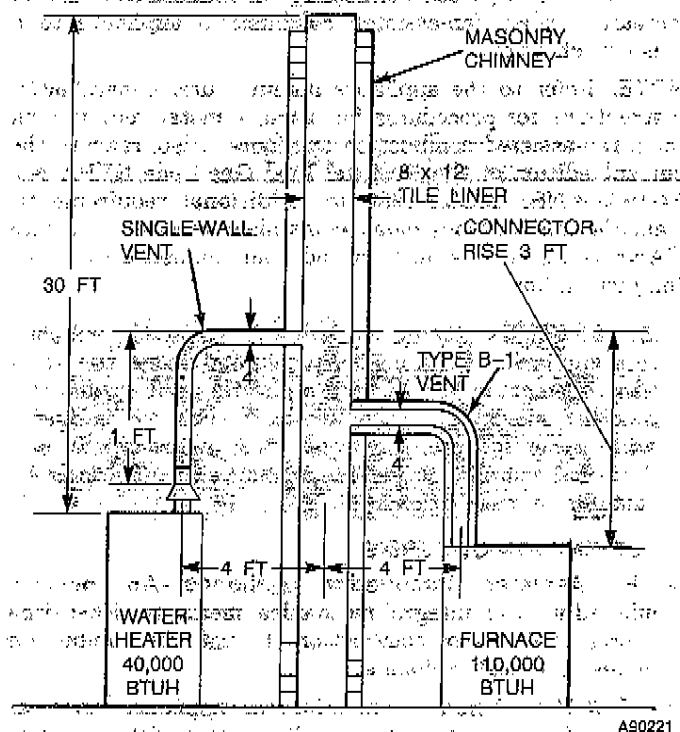


Figure 1—Typical Installation

SOLUTION: Refer to Tables I through IV and Figures 2 and 3.

1. **Water heater vent connector:** Let us assume the installer would like to use single-wall metal vent connector. Using Table III, read down the Vent Height H column to 30 feet and read across the 1-foot Connector Rise R row to the first Btuh rating in the NAT MAX column that is equal to or greater than the water heater input rating. The table shows that a 4-inch single-wall metal vent connector has a maximum input rating of 65,000 Btuh. Since the water heater input is 40,000 Btuh, a 4-inch single-wall metal vent connector is acceptable.

2. **Furnace vent connector:** Let us again assume the installer would like to use single-wall metal vent connector. Using Table III, read down the Vent Height H column to 30 feet and read across the 3-foot Connector Rise R row to the first Btuh rating in the FAN Min column that is equal to or less than the furnace input rating. In addition, the Btuh rating in the adjacent FAN Max column must be equal to or greater than the furnace input rating.

Table III shows that a 4-inch single-wall metal vent connector is NR (Not Recommended). It also shows that the minimum capacity for a 5-inch single-wall connector (115,000 Btuh) is greater than the fan-assisted combustion furnace input rating (110,000 Btuh). Therefore, a single-wall connector *cannot* be used for this particular application.

The installer has two options. First, reduce the furnace vent connector rise to 1 foot would allow the use of a 5-inch single-wall connector (107,000 Btuh minimum and 159,000 Btuh per Table III), and eliminate the risk of chimney condensate.

Second, the installer could use Type B-1 double-wall connector per Table I. From this table, the installer could use anywhere from 4-inch through 8-inch Type B-1 vent connector. The smallest diameter, 4 inches in this case, is recommended because it will provide for minimum vent gas heat loss between the furnace and the chimney.

3. *Chimney liner size:* Now that the water heater and furnace vent connectors are sized properly, the capacity of the 8 x 12-inch tile-lined chimney must be verified. Let us assume the installer chose to use the 4-inch diameter Type B-1 vent connector for the furnace. Referring to Table II, read down the Vent Height H column to 30 feet and read across to the Fan + Nat column for 8 x 12-inch tile liners. The table shows a maximum capacity of 612,000 Btuh. Since the water heater and furnace input ratings total 150,000 Btuh, the 8 x 12-inch tile liner is acceptable.

B. Example 2: Same As Example 1, Except the Masonry Chimney Has No Tile Lining

In this case, the masonry chimney must be lined per the National Fuel Gas Code NFPA No. 54-1988/ANSI Z223.1-1988 or CAN/CGA.B149 Installation Code regardless of whether the appliance has a draft hood or is fan-assisted

combustion. There are two methods that can be used to line the masonry chimney. The first would be to run a Type B-1 common vent up the chimney. The Type B-1 common vent would be sized per the appliance manufacturer's installation instructions.

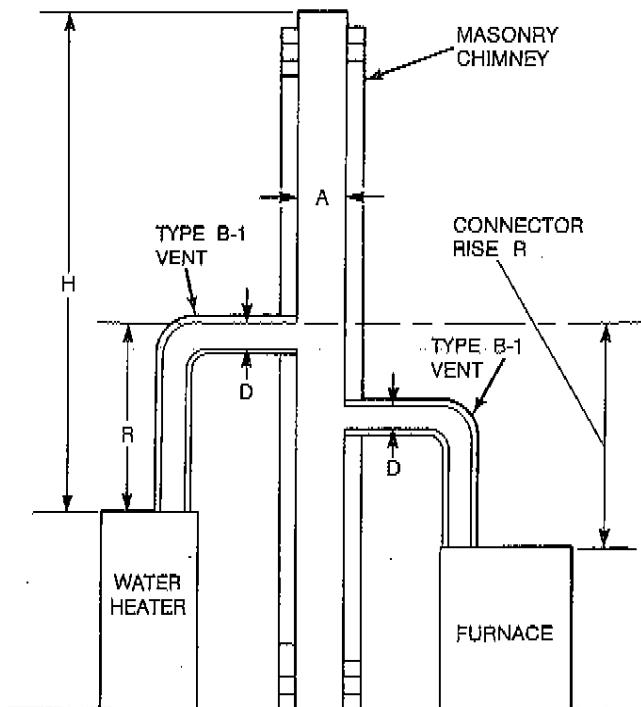
The second method would be to line the chimney with a flexible aluminum liner. Table V provides guidelines for sizing a flexible liner for a single appliance. It does not, however, address the sizing of a flexible common vent. Tables for sizing flexible common vents are not available as of this writing.

C. Example 3: Same As Example 1, Except the Furnace and Water Heater Are Installed in An Unheated Garage

In this instance, the vent connectors for both the draft hood-equipped water heater and fan-assisted combustion furnace must be either Type B-1 double-wall vent or of a material having equivalent insulation qualities. See Section III, step 15 of these instructions. Therefore, a 4-inch diameter Type B-1 double-wall vent connector is acceptable in this example for both the water heater and furnace.

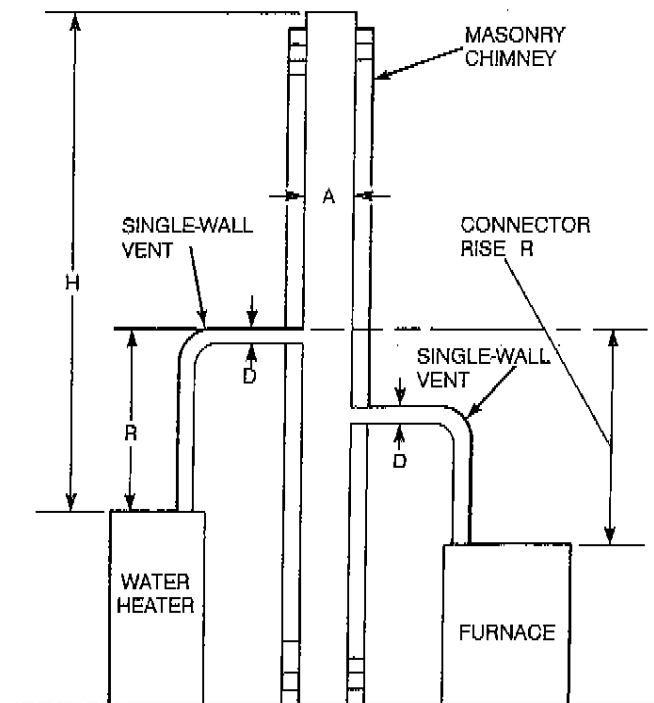
D. Example 4: Same As Example 1, Except the Water Heater Is Located 7 Feet From the Chimney

The 4-inch single-wall connector determined in Example 1 has a maximum lateral length of 6 foot (1-1/2 times diameter per Section III, step 5 of these instructions). In order to use a 7-foot lateral, the diameter of the vent connector must be increased. A 5-inch single-wall vent connector has a maximum lateral of 7-1/2 feet. It is also an allowable vent connector for the 40,000 Btuh water heater per Table III (30-foot height and 1-foot rise). Therefore, the water heater vent connector diameter must be increased to 5 inches for a 7-foot lateral.



A80222

Figure 2—Type B-1 Vent Connectors Common Vented Into a Masonry Chimney



A90223

Figure 3—Single-Wall Vent Connectors Common Vented Into a Masonry Chimney

TABLE I—CAPACITY OF TYPE B-1 DOUBLE-WALL VENT CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES WHEN CONNECTED TO A TILE LINED MASONRY CHIMNEY

Vent Height H (Feet)	Connector Rise R (Feet)	Vent Connector Diameter-D (In Inches)																	
		3			4			5			6			7			8		
		Appliance Input Rating Limits in Thousands of Btuh																	
		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		
6	1	NR	NR	24	32	64	42	41	103	67	50	157	101	66	218	138	77	286	181
	2	NR	NR	28	NR	NR	50	42	119	79	52	178	117	67	248	161	79	327	211
	3	NR	NR	31	NR	NR	56	43	133	89	53	199	132	68	276	181	80	365	238
15	1	NR	NR	31	30	85	55	42	133	85	56	203	130	78	281	178	93	368	233
	2	NR	NR	34	31	93	61	44	146	96	57	221	144	79	306	198	97	401	259
	3	NR	NR	37	NR	NR	66	45	157	104	59	236	156	81	327	214	99	429	281
30	1	NR	NR	37	29	104	66	41	163	103	53	251	159	73	356	223	89	467	293
	2	NR	NR	40	30	110	71	42	174	112	54	266	172	75	376	240	92	494	315
	3	NR	NR	42	31	116	76	43	183	120	56	279	182	76	394	254	93	519	334
50	1	NR	NR	42	28	117	74	40	184	117	51	287	182	69	415	261	85	547	343
	2	NR	NR	44	29	122	79	41	193	125	52	300	193	71	433	275	87	571	362
	3	NR	NR	47	30	127	83	42	201	132	54	312	203	72	448	288	89	593	379

TABLE II—CAPACITY OF MASONRY CHIMNEY WITH TYPE B-1 DOUBLE-WALL COMMON VENT CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES

Vent Height H (Feet)	Chimney Liner Nominal Dimensions (In Inches)			
	4 x 8	8 x 8	8 x 12	12 x 12
	Combined Appliance Input Rating in Thousands of Btuh			
	Fan + Nat	Fan + Nat	Fan + Nat	Fan + Nat
6	76	192	357	550
8	81	210	392	604
10	86	228	420	651
15	91	264	486	747
20	94	292	537	827
30	96	332	612	945
50	93	379	701	1087

TABLE III—CAPACITY OF SINGLE-WALL VENT CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES WHEN CONNECTED TO A TILE LINED MASONRY CHIMNEY

Vent Height H (Feet)	Connector Rise R (Feet)	Vent Connector Diameter-D (In Inches)																	
		3			4			5			6			7			8		
		Appliance Input Rating Limits in Thousands of Btuh																	
		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		
6	1	NR	NR	23	NR	NR	42	NR	NR	66	145	155	100	185	216	137	234	284	180
	2	NR	NR	27	NR	NR	49	NR	NR	78	152	177	116	192	246	160	242	325	210
	3	NR	NR	31	NR	NR	56	NR	NR	89	159	196	131	198	275	181	249	364	238
15	1	NR	NR	30	NR	NR	54	109	130	84	164	198	127	217	276	175	285	361	229
	2	NR	NR	34	NR	NR	60	113	144	94	171	217	141	225	301	195	294	395	255
	3	NR	NR	38	NR	NR	65	117	155	103	177	232	153	233	322	212	304	424	277
30	1	NR	NR	36	NR	NR	65	107	159	101	158	246	156	211	348	219	276	457	287
	2	NR	NR	39	NR	NR	70	111	170	110	185	280	168	218	369	236	284	485	309
	3	NR	NR	42	NR	NR	75	115	180	118	172	274	179	226	387	250	291	510	329
50	1	NR	NR	41	NR	NR	73	104	179	114	154	281	178	204	407	255	268	537	336
	2	NR	NR	44	NR	NR	77	109	189	122	161	294	189	211	424	270	275	560	355
	3	NR	NR	46	NR	NR	82	113	197	129	168	305	199	219	440	283	281	582	373

TABLE IV—CAPACITY OF MASONRY CHIMNEY WITH SINGLE-WALL COMMON VENT CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES

Vent Height H (Feet)	Chimney Liner Nominal Dimensions (In Inches)			
	4 x 8	8 x 8	8 x 12	12 x 12
	Combined Appliance Input Rating in Thousands of Btuh			
	Fan + Nat	Fan + Nat	Fan + Nat	Fan + Nat
6	74	188	353	545
8	79	205	386	598
10	83	223	412	643
15	89	258	476	734
20	91	286	527	813
30	93	325	600	928
50	91	372	688	1069

**TABLE V—CAPACITY OF FLEXIBLE ALUMINUM LINERS IN MASONRY CHIMNEYS
WITH TYPE B-1 DOUBLE-WALL CONNECTORS SERVING A SINGLE
CATEGORY I APPLIANCE**

Height H (Feet)	Lateral L (Feet)	Vent and Connector Diameter-D (In Inches)														
		3			4			5			6			7		
		Appliance Input Rating in Thousands of Btu/h														
		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	2	19	41	34	25	79	65	32	129	104	40	191	152	49	266	210
	4	26	39	33	36	77	63	47	127	102	59	188	150	72	262	208
	6	32	38	32	42	75	62	55	125	101	69	185	149	85	259	206
8	2	29	45	38	24	88	72	31	145	117	38	215	172	47	300	238
	5	38	42	36	37	85	71	48	140	114	60	210	170	73	294	235
	8	NR	NR	35	46	81	68	59	136	112	74	205	167	90	288	232
10	2	31	48	41	23	95	79	30	157	128	37	235	190	45	329	283
	5	41	45	39	36	91	76	47	153	125	58	230	186	71	322	259
	10	NR	NR	38	49	85	73	63	145	121	78	221	181	95	311	254
15	2	17	53	46	22	107	91	28	180	150	35	272	223	42	384	312
	5	45	50	44	34	103	88	44	175	147	55	266	220	67	377	307
	10	NR	NR	41	47	96	84	60	167	141	74	257	214	90	366	301
20	15	NR	NR	37	65	90	79	71	159	136	87	247	208	104	365	294
	2	16	55	50	21	115	99	26	196	165	33	299	249	40	424	349
	5	52	52	48	33	111	96	43	191	162	53	293	245	64	417	344
30	10	NR	NR	44	45	104	92	58	183	157	72	283	238	86	405	337
	15	NR	NR	40	68	97	87	68	175	151	84	273	232	100	394	330
	20	NR	NR	NR	NR	NR	81	81	166	146	98	264	225	116	382	322
50	2	15	58	53	18	124	110	22	216	187	28	335	285	34	481	404
	5	NR	NR	51	32	119	108	41	211	184	50	329	281	61	473	399
	10	NR	NR	47	43	113	102	55	203	178	68	319	274	82	461	391
100	15	NR	NR	NR	85	106	96	65	193	172	80	309	267	95	450	383
	20	NR	NR	NR	NR	NR	NR	78	185	166	93	299	260	110	438	375
	30	NR	NR	NR	NR	NR	NR	126	168	NR	123	277	246	141	414	359
50	2	NR	NR	55	16	130	121	19	236	212	23	374	329	27	546	472
	5	NR	NR	53	31	127	116	39	231	209	47	368	325	57	539	468
	10	NR	NR	NR	109	120	111	52	221	202	64	358	318	77	529	459
100	15	NR	NR	NR	NR	NR	NR	62	213	196	75	348	311	89	515	451
	20	NR	NR	NR	NR	NR	NR	74	205	186	89	335	303	103	503	443
	30	NR	NR	NR	NR	NR	NR	173	189	NR	116	315	286	132	478	425
100	2	NR	NR	NR	14	130	125	16	246	228	19	401	376	22	609	553
	5	NR	NR	NR	NR	NR	122	36	242	225	44	396	371	53	602	549
	10	NR	NR	NR	NR	NR	NR	49	234	219	60	387	363	72	583	540
50	15	NR	NR	NR	NR	NR	NR	58	223	212	71	378	348	84	572	531
	20	NR	NR	NR	NR	NR	NR	NR	NR	NR	86	368	340	97	561	522
	30	NR	NR	NR	NR	NR	NR	NR	NR	NR	108	343	NR	123	538	491
50	50	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	197	486	NR

