APPENDIX M

FORCED-WARM-AIR HEATING SYSTEM DESIGN

Table M-1.① Determination of Free Area and Total Pressure Loss of Register for 22° Deflection of Air[a]

CFM	Distance from register to opposite wall (feet)				
	10-12	13-15	16-18	19-21	22-24
Up to 59	44	34	--------	--------	--------
	0.01	0.01	--------	--------	--------
60-69	50	40	--------	--------	--------
	0.01	0.01	--------	--------	--------
70-99	58	46	32	--------	--------
	0.01	0.02	0.03	--------	--------
100-119	66	52	37	--------	--------
	0.01	0.02	0.03	--------	--------
120-129	77	58	42	--------	--------
	0.01	0.02	0.03	--------	--------
130-169	86	64	47	32	27
	0.01	0.02	0.03	0.04	0.05
170-189	95	70	52	40	32
	0.01	0.02	0.03	0.03	0.05
190-209	105	80	61	49	38
	0.01	0.02	0.03	0.03	0.05

CFM	Distance from register to opposite wall											
	Up to 18	19-21	22-24	25-27	28-30	31-34	36-39	40-49	50-59	60-69	70-79	80-89
190-209	68	49	38	29	24	19	--------	--------	--------	--------	--------	--------
	0.02	0.03	0.05	0.08	0.11	0.16	--------	--------	--------	--------	--------	--------
210-229	82	60	45	35	28	23	--------	--------	--------	--------	--------	--------
	0.02	0.03	0.04	0.06	0.10	0.13	--------	--------	--------	--------	--------	--------
230-249	--------	71	54	42	34	28	22	--------	--------	--------	--------	--------
		0.02	0.04	0.06	0.08	0.11	0.17	--------	--------	--------	--------	--------
250-269	--------	84	63	49	40	32	25	--------	--------	--------	--------	--------
		0.02	0.03	0.05	0.07	0.10	0.16	--------	--------	--------	--------	--------
270-299	--------	100	76	60	48	38	30	--------	--------	--------	--------	--------
		0.02	0.03	0.04	0.06	0.09	0.13	--------	--------	--------	--------	--------
300-339	--------	--------	96	73	60	48	37	--------	--------	--------	--------	--------
			0.02	0.04	0.05	0.07	0.11	--------	--------	--------	--------	--------
340-379	--------	--------	122	95	78	61	47	33	--------	--------	--------	--------
			0.02	0.03	0.04	0.06	0.09	0.18	--------	--------	--------	--------
380-419	--------	--------	--------	117	94	75	58	39	--------	--------	--------	--------
				0.02	0.03	0.05	0.08	0.15	--------	--------	--------	--------
420-459	--------	--------	--------	142	113	91	70	47	--------	--------	--------	--------
				0.02	0.03	0.04	0.06	0.13	--------	--------	--------	--------
460-499	--------	--------	--------	168	135	108	83	56	--------	--------	--------	--------
				0.02	0.03	0.04	0.06	0.11	--------	--------	--------	--------

See footnotes at end of table.

Table M-1.② Determination of Free Area and Total Pressure Loss of Register for 29° Deflection of Air [a]—Continued

CFM	Distance from register to opposite wall											
	Up to 18	19-21	22-24	25-27	28-30	31-34	36-39	A 40-49	50-59	60-69	70-79	80-89
500-539	-------	-------	-------	-------	159 0.02	126 0.03	97 0.05	66 0.10	-------	-------	-------	-------
540-579	-------	-------	-------	-------	185 0.02	147 0.03	113 0.04	77 0.08	-------	-------	-------	-------
580-619	-------	-------	-------	-------	212 0.02	169 0.03	130 0.04	88 0.08	51 0.18	-------	-------	-------
620-659	-------	-------	-------	-------	-------	192 0.02	147 0.03	100 0.07	59 0.15	-------	-------	-------
660-699	-------	-------	-------	-------	-------	217 0.02	166 0.03	113 0.06	75 0.13	-------	-------	-------
700-739	-------	-------	-------	-------	-------	243 0.02	186 0.03	127 0.06	85 0.11	-------	-------	-------
740-779	-------	-------	-------	-------	-------	271 0.02	208 0.03	141 0.05	94 0.10	-------	-------	-------
780-819	-------	-------	-------	-------	-------	-------	230 0.02	157 0.05	105 0.09	-------	-------	-------
820-859	-------	-------	-------	-------	-------	-------	254 0.02	173 0.04	115 0.08	-------	-------	-------
860-899	-------	-------	-------	-------	-------	-------	278 0.02	190 0.04	126 0.08	-------	-------	-------
900-930	-------	-------	-------	-------	-------	-------	304 0.02	207 0.04	138 0.07	-------	-------	-------
940-979	-------	-------	-------	-------	-------	-------	332 0.02	226 0.03	151 0.07	108 0.12	-------	-------
980-1019	-------	-------	-------	-------	-------	-------	360 0.02	245 0.03	163 0.06	118 0.11	-------	-------
1020-1059	-------	-------	-------	-------	-------	-------	390 0.02	265 0.03	177 0.06	127 0.11	-------	-------
1060-1099	-------	-------	-------	-------	-------	-------	-------	285 0.03	190 0.06	137 0.10	-------	-------
1100-1139	-------	-------	-------	-------	-------	-------	-------	307 0.03	204 0.05	147 0.09	-------	-------
1140-1179	-------	-------	-------	-------	-------	-------	-------	330 0.02	220 0.05	158 0.09	-------	-------
1180-1219	-------	-------	-------	-------	-------	-------	-------	353 0.02	235 0.04	169 0.08	-------	-------
1220-1259	-------	-------	-------	-------	-------	-------	-------	376 0.02	251 0.04	180 0.08	-------	-------
1260-1299	-------	-------	-------	-------	-------	-------	-------	401 0.02	267 0.04	192 0.07	136 0.13	-------
1300-1339	-------	-------	-------	-------	-------	-------	-------	426 0.02	284 0.04	204 0.07	144 0.13	-------
1340-1379	-------	-------	-------	-------	-------	-------	-------	452 0.02	301 0.04	217 0.06	154 0.12	109 0.22
1380-1419	-------	-------	-------	-------	-------	-------	-------	479 0.02	319 0.04	230 0.06	163 0.12	116 0.21
1420-1459	-------	-------	-------	-------	-------	-------	-------	508 0.02	338 0.03	244 0.06	172 0.11	122 0.20
1460-1500	-------	-------	-------	-------	-------	-------	-------	536 0.02	356 0.03	256 0.06	182 0.10	129 0.19

[a] Register free area is in square inches (upper value in each group). Pressure loss is in inches of water (lower value in each group). If register selected based on distance from register to opposite wall is unsatisfactory on account of size or pressure loss, it is permissible to shift one or more spaces left or right in the tables to obtain a more suitable register. If requirements fall in blank space, select two registers in place of one and divide CFM capacity between the two registers. Total pressure (static plus velocity) loss is based on flat face adjustable bar type and does not include stackhead. Values on the right of line A should not be used in applications such as churches, and auditoriums, and concert halls.

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Table M-2.① Determination of Free Area and Total Pressure Loss of Register for no Deflection of Air [a]

CFM	Distance from register to opposite wall (feet)				
	10-12	13-15	16-18	19-21	22-24
Up to 59	48	36	--------	--------	--------
	. 01	. 01	--------	--------	--------
60-69	54	42	--------	--------	--------
	. 01	. 01	--------	--------	--------
70-99	60	51	36	--------	--------
	. 01	. 01	0. 03	--------	--------
100-119	--------	60	44	--------	--------
		0. 01	0. 03	--------	--------
120-129	--------	69	52	--------	--------
		0. 01	0. 03	--------	--------
130-169	--------	78	59	41	33
		0. 01	0. 03	0. 04	0. 05
170-189	--------	86	65	50	39
		0. 01	0. 02	0. 03	0. 04

CFM	Distance from register to opposite wall											
	19-21	22-24	25-27	28-30	A 31-34	35-39	40-49	50-59	60-69	70-79	80-89
190-209	62	47	37	30	24	18	--------	--------	--------	--------	--------
	0. 02	0. 03	0. 04	0. 06	0. 09	0. 15	--------	--------	--------	--------	--------
210-229	76	58	45	36	29	22	--------	--------	--------	--------	--------
	0. 02	0. 02	0. 04	0. 05	0. 08	0. 12	--------	--------	--------	--------	--------
230-249	--------	69	53	43	34	26	--------	--------	--------	--------	--------
		0. 02	0. 03	0. 04	0. 07	0. 11	--------	--------	--------	--------	--------
250-269	--------	81	63	50	40	31	21	--------	--------	--------	--------
		0. 02	0. 03	0. 04	0. 06	0. 09	0. 18	--------	--------	--------	--------
270-299	--------	93	73	59	47	36	24	--------	--------	--------	--------
		0. 02	0. 02	0. 03	0. 05	0. 08	0. 16	--------	--------	--------	--------
300-339	--------	--------	95	77	61	46	32	--------	--------	--------	--------
			0. 02	0. 03	0. 04	0. 06	0. 12	--------	--------	--------	--------
340-379	--------	--------	120	97	77	59	40	--------	--------	--------	--------
			0. 02	0. 02	0. 03	0. 05	0. 10	--------	--------	--------	--------
380-419	--------	--------	--------	119	95	73	50	--------	--------	--------	--------
				0. 02	0. 03	0. 04	0. 08	--------	--------	--------	--------
420-459	--------	--------	--------	149	114	88	60	--------	--------	--------	--------
				0. 02	0. 03	0. 04	0. 07	--------	--------	--------	--------
460-499	--------	--------	--------	171	136	105	71	--------	--------	--------	--------
				0. 02	0. 02	0. 03	0. 06	--------	--------	--------	--------

Table M-2.① Determination of Free Area and Total Pressure Loss of Register for no Deflection of Air [a]—Continued

CFM	Distance from register to opposite wall										
	19-21	22-24	25-27	28-30	31-34	35-39	A 40-49	50-59	60-69	70-79	80-89
500-539	--------	--------	--------	--------	160 0.02	123 0.03	84 0.05	--------	--------	--------	--------
540-579	--------	--------	--------	--------	186 0.02	143 0.02	97 0.05	65 0.09	47 0.17	--------	--------
580-619	--------	--------	--------	--------	213 0.02	164 0.02	111 0.04	74 0.08	54 0.15	--------	--------
620-659	--------	--------	--------	--------	--------	180 0.02	127 0.04	85 0.07	61 0.14	--------	--------
660-699	--------	--------	--------	--------	--------	210 0.02	143 0.03	95 0.07	69 0.12	49 0.22	--------
700-739	--------	--------	--------	--------	--------	236 0.02	160 0.03	107 0.06	77 0.11	54 0.21	--------
740-779	--------	--------	--------	--------	--------	262 0.02	179 0.03	119 0.06	86 0.10	61 0.18	--------
780-819	--------	--------	--------	--------	--------	291 0.02	198 0.03	132 0.05	95 0.09	67 0.17	--------
820-859	--------	--------	--------	--------	--------	320 0.02	218 0.03	145 0.05	105 0.08	74 0.15	--------
860-899	--------	--------	--------	--------	--------	352 0.02	240 0.02	160 0.04	115 0.08	81 0.14	--------
900-939	--------	--------	--------	--------	--------	385 0.01	262 0.02	175 0.04	126 0.07	89 0.13	--------
940-979	--------	--------	--------	--------	--------	419 0.01	285 0.02	190 0.04	137 0.07	97 0.12	--------
980-1019	--------	--------	--------	--------	--------	455 0.01	309 0.02	206 0.04	148 0.06	105 0.11	--------
1020-1059	--------	--------	--------	--------	--------	493 0.01	335 0.02	223 0.03	161 0.06	113 0.11	--------
1060-1099	--------	--------	--------	--------	--------	530 0.01	361 0.02	241 0.03	173 0.06	123 0.10	--------
1100-1139	--------	--------	--------	--------	--------	571 0.01	388 0.02	258 0.03	186 0.05	132 0.09	93 0.17
1140-1179	--------	--------	--------	--------	--------	--------	416 0.02	277 0.03	199 0.05	141 0.08	100 0.16
1180-1219	--------	--------	--------	--------	--------	--------	446 0.02	297 0.03	214 0.04	151 0.08	107 0.15
1220-1259	--------	--------	--------	--------	--------	--------	476 0.02	317 0.03	228 0.04	161 0.07	116 0.14
1260-1299	--------	--------	--------	--------	--------	--------	507 0.01	338 0.02	243 0.04	172 0.07	122 0.13
1300-1339	--------	--------	--------	--------	--------	--------	539 0.01	359 0.02	258 0.04	183 0.07	130 0.12
1340-1379	--------	--------	--------	--------	--------	--------	--------	382 0.02	274 0.04	195 0.07	138 0.12
1380-1419	--------	--------	--------	--------	--------	--------	--------	403 0.02	290 0.03	206 0.06	146 0.12
1420-1459	--------	--------	--------	--------	--------	--------	--------	--------	308 0.03	218 0.06	155 0.10
1460-1500	--------	--------	--------	--------	--------	--------	--------	--------	324 0.03	230 0.06	163 0.10

[a] Register free air is in square inches (upper value in each group). Pressure loss is in inches of water column (lower value in each group). If register selected based on distance from register to opposite wall is not satisfactory on account of size or pressure loss, it is permissible to shift one or more spaces left or right in the tables to obtain a more suitable register. If requirements fall in blank space, select two registers in place of one and divide CFM capacity between the two registers. Total pressure (static plus velocity) loss is based on flat face adjustable bar type and does not include stackhead. Values on the right of line A should not be used in applications such as churches, auditoriums, and concert halls.

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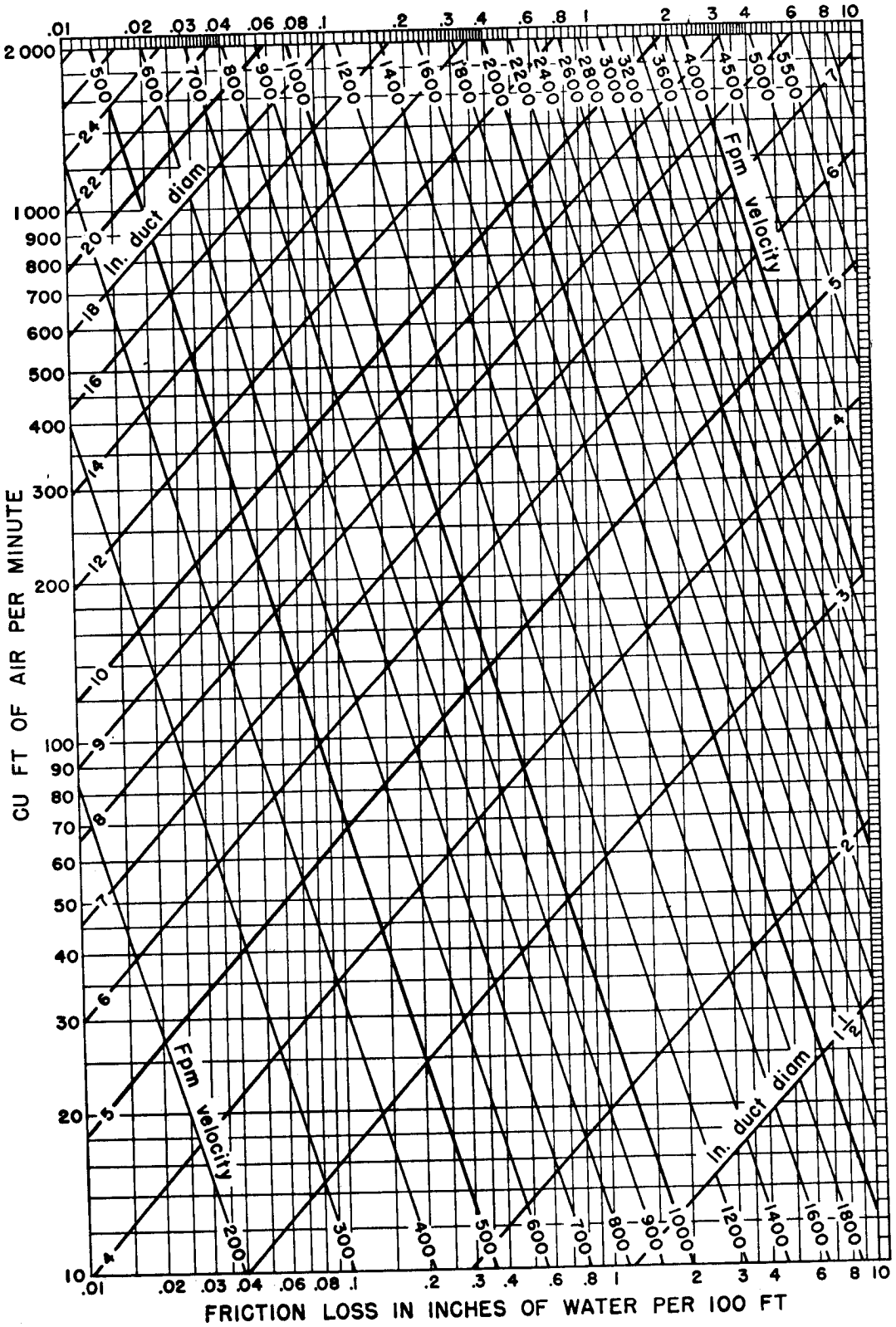
Table M–3. Selection of Bonnet Temperature, Register Temperature and Register Delivery (CFM) [a]

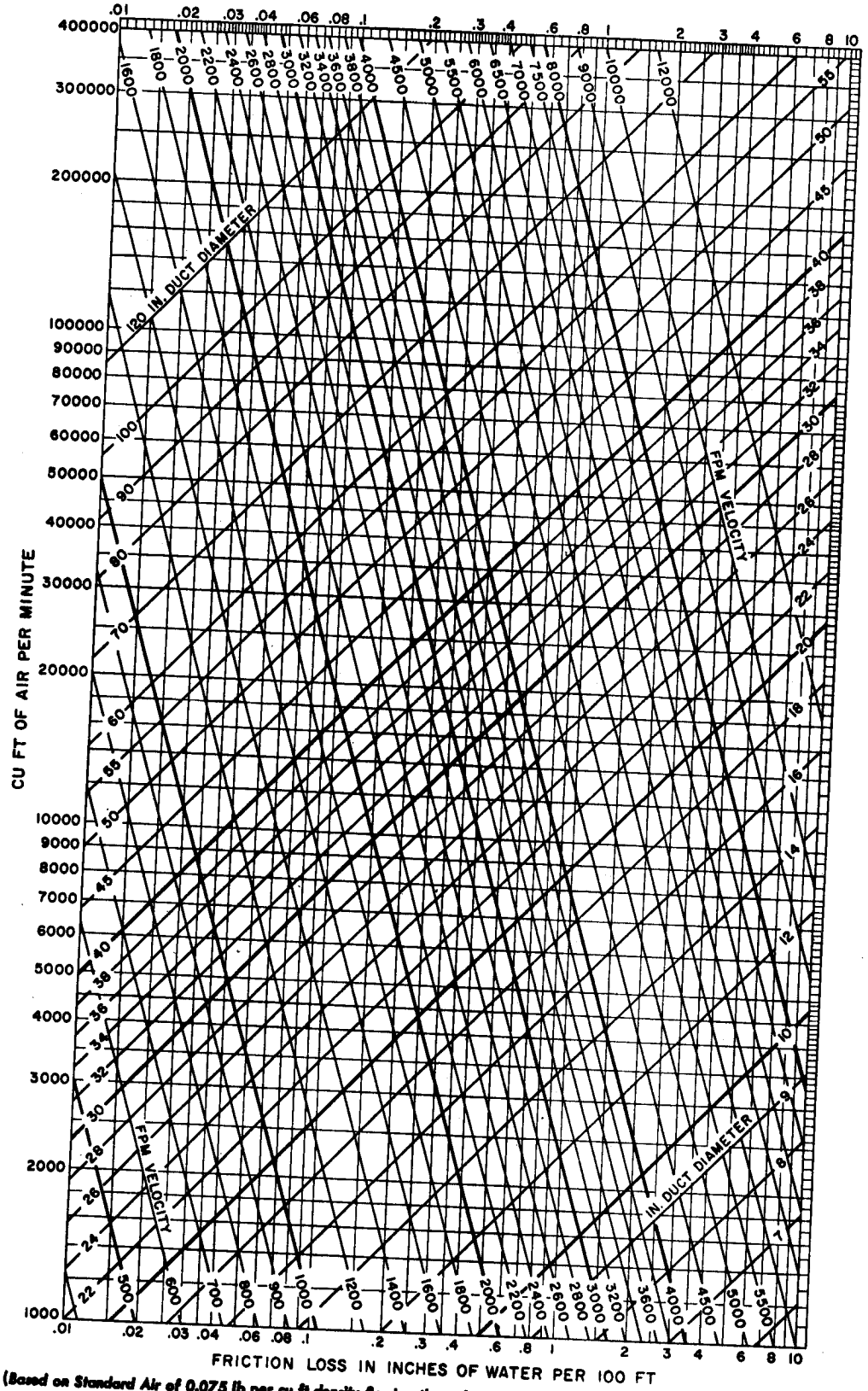
Bonnet temp. °F.	Linear distance from bonnet to register, in feet																							
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240
110	108	107	106	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	90	89	89	88	88	87
22. 1	23. 1	23. 6	24. 2	25. 4	26. 0	26. 6	27. 3	28. 0	28. 8	29. 6	30. 5	31. 5	32. 3	33. 3	34. 6	35. 9	37. 3	38. 6	38. 6	39. 9	39. 9	41. 3	41. 3	42. 7
120	118	116	114	112	111	109	108	106	105	103	102	101	100	99	98	97	96	95	94	93	92	91	90	90
18. 4	19. 0	19. 6	20. 3	21. 1	21. 6	22. 5	23. 1	24. 2	24. 8	26. 0	26. 6	27. 3	28. 0	28. 8	29. 6	30. 5	31. 5	32. 3	33. 3	34. 6	35. 9	37. 3	38. 6	38. 6
130	128	126	123	121	119	117	115	113	111	110	108	107	105	104	103	102	101	99	98	97	96	95	94	93
15. 9	16. 4	16. 9	17. 6	18. 1	18. 7	19. 3	20. 0	20. 7	21. 6	22. 1	23. 1	23. 6	24. 8	25. 4	26. 0	26. 6	27. 3	28. 8	29. 6	30. 5	31. 5	32. 3	33. 3	34. 6
140	137	134	131	129	126	124	122	120	118	116	114	112	110	109	107	106	105	103	102	101	100	99	98	97
14. 0	14. 6	15. 1	15. 7	16. 2	16. 9	17. 3	17. 9	18. 4	19. 0	19. 6	20. 3	21. 1	22. 1	22. 5	23. 6	24. 2	24. 8	26. 0	26. 6	27. 3	28. 0	28. 8	29. 6	30. 5
150	147	143	140	137	134	131	129	127	124	122	120	118	116	114	112	110	109	107	106	105	103	102	101	100
12. 2	12. 9	13. 5	14. 0	14. 6	15. 1	15. 7	16. 2	16. 6	17. 3	17. 9	18. 5	18. 4	19. 6	20. 3	21. 1	22. 1	22. 5	23. 6	24. 2	24. 8	26. 0	26. 6	27. 3	28. 0
160	156	152	149	145	142	139	136	133	130	128	126	123	121	119	117	115	113	112	110	108	107	106	104	103
11. 4	11. 8	12. 3	12. 7	13. 2	13. 7	14. 2	14. 8	15. 3	15. 9	16. 4	16. 9	17. 6	18. 1	18. 7	19. 3	20. 0	20. 7	21. 1	22. 1	23. 1	23. 6	24. 2	25. 4	26. 0
170	166	161	157	153	150	146	143	140	137	134	131	128	126	124	122	120	118	116	114	112	110	109	107	106
10. 5	10. 8	11. 3	11. 7	12. 2	12. 6	13. 1	13. 5	14. 0	14. 6	15. 1	15. 7	16. 4	16. 9	17. 3	17. 9	18. 4	19. 0	19. 6	20. 3	21. 1	22. 1	22. 5	23. 6	24. 2
180	175	170	166	161	157	153	150	146	143	140	137	135	131	128	126	124	122	120	118	116	115	113	111	110
9. 7	10. 0	10. 5	10. 8	11. 3	11. 7	12. 2	12. 6	13. 1	13. 5	14. 0	14. 6	14. 9	15. 7	16. 4	16. 9	17. 3	17. 9	18. 4	19. 0	19. 6	20. 0	20. 7	21. 6	22. 1
190	184	179	174	169	165	160	156	153	149	145	142	139	136	133	130	128	126	124	121	119	117	115	113	112
9. 1	9. 4	9. 8	10. 1	10. 6	10. 9	11. 4	11. 8	12. 2	12. 7	13. 2	13. 7	14. 2	14. 7	15. 3	15. 9	16. 4	16. 9	17. 3	18. 1	18. 7	19. 3	20. 0	20. 7	21. 1
200	193	187	182	176	171	167	163	158	154	151	147	144	140	138	135	132	129	127	125	122	120	118	116	114
8. 6	8. 9	9. 2	9. 6	9. 9	10. 4	10. 7	11. 1	11. 6	12. 1	12. 4	12. 9	13. 4	14. 0	14. 4	14. 9	15. 5	16. 2	16. 2	17. 2	17. 9	18. 4	19. 0	19. 6	20. 3

[a] For buildings having a heat loss between 120,000 and 350,000 Btu/hr., register delivery volume in CFM per 1,000 Btu per hr. Register temperature, Fahrenheit (Use upper value in each group). Register delivery volume in cubic feet per minute per 1,000 Btu (Use lower value in each group). Register delivery volumes in column 1 for zero length of duct.



(Based on Standard Air of 0.075 lb per cu ft density flowing through average, clean, round, galvanized metal ducts having approximately 40 joints per 100 ft.) Caution: Do not extrapolate below chart.

Figure M-2. Friction losses in straight ducts (for volumes up to 2,000 CFM).



(Based on Standard Air of 0.075 lb per cu ft density flowing through average, clean, round, galvanized metal ducts having approximately 40 joints per 100 ft.)

Figure M-3. Friction losses in straight ducts (for volumes of 1,000 to 100,000 CFM).

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Table M-4.① Rectangular Equivalents of Round Ducts

Depth, inches	Side rectangular duct					
	3.0	3.5	4.0	4.5	5.0	5.5
4.0	3.8	4,1	4.4	4.6	4.9	5.1
4.5	4.0	4,3	4.6	4.9	5.2	5.4
5.0	4.2	4,6	4.9	5.2	5.5	5.7
5.5	4.4	4,8	5.1	5.4	5.7	6.0
6.0	4.6	5,0	5.3	5.6	6.0	6.3
6.5	4.8	5,2	5.5	5.9	6.2	6.5
7.0	4.9	5,3	5.7	6.1	6.4	6.8
7.5	5.1	5,5	5.9	6.3	6.7	7.0
8.0	5.2	5,7	6.1	6.5	6.9	7.2
8.5	5.4	5,8	6.3	6.7	7.1	7.4
9.0	5.5	6,0	6.4	6.9	7.3	7.6
9.5	5.6	6,1	6.6	7.0	7.4	7.8
10.0	5.7	6,3	6.8	7.2	7.6	8.0
10.5	5.9	6,4	6.9	7.4	7.8	8.2
11.0	6.0	6,5	7.1	7.5	8.0	8.4
11.5	6.1	6,7	7.2	7.7	8.1	8.6
12.0	6.2	6,8	7.3	7.8	8.3	8.7
13.0	6.4	7,0	7.6	8.1	8.6	9.0
13.5	6.5	7,1	7.7	8.2	8.7	9.2
14.0	6.6	7,2	7.8	8.4	8.9	9.4
14.5	6.7	7,3	7.9	8.5	9.0	9.5
15.0	6.8	7,4	8.1	8.6	9.1	9.6
15.5	6.9	7,5	8.2	8.7	9.3	9.8
16.0	7.0	7,6	8.3	8.9	9.4	9.8

Side rectangular duct	6	7	8	9	10	11	12	13	14	15	16	17	18	19
6	6.6	------	------	------	------	------	------	------	------	------	------	------	------	------
7	7.1	7.7	------	------	------	------	------	------	------	------	------	------	------	------
8	7.5	8.2	8.8	------	------	------	------	------	------	------	------	------	------	------
9	8.0	8.6	9.3	9.9	------	------	------	------	------	------	------	------	------	------
10	8.4	9.1	9.8	10.4	10.9	------	------	------	------	------	------	------	------	------
11	8.8	9.5	10.2	10.8	11.4	12.0	------	------	------	------	------	------	------	------
12	9.1	9.9	10.7	11.3	11.9	12.5	13.1	------	------	------	------	------	------	------
13	9.5	10.3	11.1	11.8	12.4	13.0	13.6	14.2	------	------	------	------	------	------
14	9.8	10.7	11.5	12.2	12.9	13.5	14.2	14.7	15.3	------	------	------	------	------
15	10.1	11.0	11.8	12.6	13.3	14.0	14.6	15.3	15.8	16.4	------	------	------	------
16	10,4	11.4	12.2	13.0	13.7	14.4	15.1	15.7	16.3	16.9	17.5	------	------	------
17	10.7	11.7	12.5	13.4	14.1	14.9	15.5	16.1	16.8	17.4	18.0	18.6	------	------
18	11.0	11.9	12.9	13.7	14.5	15.3	16.0	16.6	17.3	17.9	18.5	19.1	19.7	------
19	11.2	12.2	13.2	14.1	14.9	15.6	16.4	17.1	17.8	18.4	91.0	19.6	20.2	20.8
20	11.5	12.5	13.5	14.4	15.2	15.9	16.8	17.5	18.2	18.8	19.5	20.1	20.7	21.3
22	12.0	13.1	14.1	15.0	15.9	16.7	17.6	18.3	19.1	19.7	20.4	21.0	21.7	22.3
24	12.4	13.6	14.6	15.6	16.6	17.5	18.3	19.1	19.8	20.6	21.3	21.9	22.6	23.2
26	12.8	14.1	15.2	16.2	17.2	18.1	19.0	19.8	20.6	21.4	22.1	22.8	23.5	24.1
28	13.2	14.5	15.6	16.7	17.7	18.7	19.6	20.5	21.3	22.1	22.9	23.6	24.4	25.0
30	13.6	14.9	16.1	17.2	18.3	19.3	20.2	21.1	22.0	22.9	23.7	24.4	25.2	25.9
32	14.0	15.3	16.5	17.7	18.8	19.8	20.8	21.8	22.7	23.6	24.4	25.2	26.0	26.7
34	14.4	15.7	17.0	18.2	19.3	20.4	21.4	22.4	23.3	24.2	25.1	25.9	26.7	27.5
36	14.7	16.1	17.4	18.6	19.8	20.9	21.9	23.0	23.9	24.8	25.8	26.6	27.4	28.3
38	15.0	16.4	17.8	19.0	20.3	21.4	22.5	23.5	24.5	25.4	26.4	27.3	28.1	29.0
40	15.3	16.8	18.2	19.4	20.7	21.9	23.0	24.0	25.1	26.0	27.0	27.9	28.8	29.7
42	15.6	17.1	18.5	19.8	21.1	22.3	23.4	24.5	25.6	26.6	27.6	28.5	29.4	30.4
44	15.9	17.5	18.9	20.2	21.5	22.7	23.9	25.0	26.1	27.2	28.2	29.1	30.0	31.0
46	16.2	17.8	19.2	20.6	21.9	23.2	24.3	25.5	26.7	27.7	28.7	29.7	30.6	31.6

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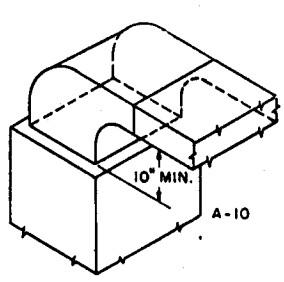
Table M-4.③ Rectangular Equivalents of Round Ducts—Continued

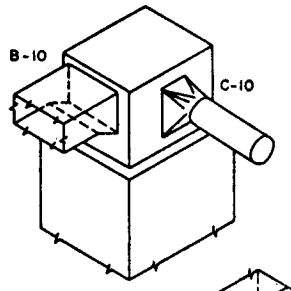
Side rectangular duct	20	22	24	26	28	30	32	34	36	38	40	42	44	46
20	21.9	------	------	------	------	------	------	------	------	------	------	------	------	------
22	22.9	24.1	------	------	------	------	------	------	------	------	------	------	------	------
24	23.9	25.1	26.2	------	------	------	------	------	------	------	------	------	------	------
26	24.8	26.1	27.2	28.4	------	------	------	------	------	------	------	------	------	------
28	25.7	27.1	28.2	29.5	30.6	------	------	------	------	------	------	------	------	------
30	26.7	28.0	29.3	30.5	31.6	32.8	------	------	------	------	------	------	------	------
32	27.5	28.9	30.1	31.4	32.6	33.8	35.0	------	------	------	------	------	------	------
34	28.3	29.7	31.0	32.3	33.6	34.8	36.0	37.2	------	------	------	------	------	------
36	29.0	30.5	32.0	33.0	34.6	35.8	37.0	38.2	39.4	------	------	------	------	------
38	29.8	31.4	32.8	34.2	35.5	36.7	38.0	39.2	40.4	41.6	------	------	------	------
40	30.5	32.1	33.6	35.1	36.4	37.6	39.0	40.2	41.4	42.6	43.8	------	------	------
42	31.2	32.8	34.4	35.9	37.3	38.6	39.9	41.1	42.4	43.6	44.8	45.9	------	------
44	31.9	33.5	35.2	36.7	38.1	39.5	40.8	42.0	43.4	44.6	45.8	46.9	48.1	------
46	32.5	34.2	35.9	37.4	38.9	40.3	41.7	43.0	44.3	45.6	46.8	47.9	49.1	50.3

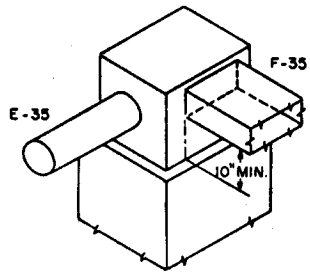
Side rectangular duct	6	7	8	9	10	11	12	13	14	15	16	17	18	19
48	16.5	18.1	19.6	20.9	22.3	23.6	24.8	26.0	27.2	28.2	29,2	30.2	31.2	32.2
50	16.8	18.4	19.9	21.3	22.7	24.0	25.2	26.4	27.6	28.7	29.8	30.8	31.8	32.8
52	17.0	18.7	20.2	21.6	23.1	24.4	25.6	26.8	28.1	29.2	30.3	31.4	32.4	33.4
54	17.3	19.0	20.5	22.0	23.4	24.8	26.1	27.3	28.5	29.7	30.8	31.9	32.9	33.9
56	17.6	19.3	20.9	22.4	23.8	25.2	26.5	27.7	28.9	30.1	31.2	32.4	33.4	34.5
58	17.8	19.5	21.1	22.7	24.2	25.5	26.9	28.2	29.3	30.5	31.7	32.9	33.9	35.0
60	18.1	19.8	21.4	23.0	24.5	25.8	27.3	28.7	29.8	31.0	32,2	33.4	34.5	35.5
62	18.3	20.1	21.7	23.3	24.8	26.2	27.6	29.0	30.2	31.4	32.6	33.8	35.0	36.0
64	18.6	20.3	22.0	23.6	25.2	26.5	27.9	29.3	30.6	31.8	33.1	34.2	35.5	36.5
66	18.8	20.6	22.3	23.9	25.5	26.9	28.3	29.7	31.0	32.2	33.5	34.7	35.9	37.0
68	19.0	20.8	22.5	24.2	25.8	27.3	28.7	30.1	31.4	32.6	33.9	35.1	36.3	37.5
70	19.2	21.0	22.8	24.5	26.1	27.6	29.1	30.4	31.8	33.1	34.3	35.6	36.8	37.9

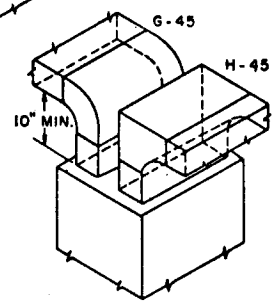
Table M-4.③ Rectangular Equivalents of Round Ducts—Continued

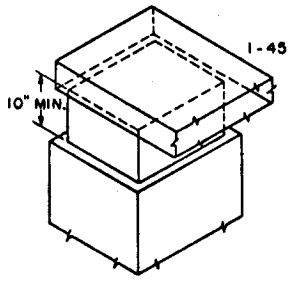
Side rectangular duct	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	56	60	64	68
48	33.1	34.9	36.6	38.2	39.7	41.2	42.6	43.9	45.2	46.5	47.8	48.9	50.2	51.3	52.6	-----	-----	-----	-----	-----	-----
50	33.7	35.5	37.3	38.9	40.4	42.0	43.5	44.8	46.1	47.4	48.8	49.8	51.2	52.3	53.6	54.7	-----	-----	-----	-----	-----
52	34.3	36.2	38.0	39.6	41.2	42.8	44.3	45.7	47.1	48.3	49.7	50.8	52.2	53.3	54.6	55.8	56.9	-----	-----	-----	-----
54	34.9	36.8	38.7	40.3	42.0	43.6	45.0	46.5	48.0	49.2	50.6	51.8	53.2	54.3	55.6	56.8	57.9	-----	-----	-----	-----
56	35.5	37.4	39.3	41.0	42.7	44.3	45.8	47.3	48.8	50.1	51.5	52.7	54.1	55.3	56.5	57.8	58.9	61.3	-----	-----	-----
58	36.0	38.0	39.8	41.7	43.4	45.0	46.6	48.1	49.6	51.0	52.4	53.7	55.0	56.2	57.5	58.8	60.0	62.3	-----	-----	-----
60	36.5	38.6	40.4	42.3	44.0	45.8	47.3	48.9	50.4	51.8	53.3	54.6	55.9	57.1	58.5	59.8	61.0	63.3	65.7	-----	-----
62	37.1	39.2	41.0	42.9	44.7	46.5	48.0	49.7	51.2	52.6	54.2	55.5	56.8	58.0	59.4	60.7	62.0	64.3	66.7	-----	-----
64	37.6	39.7	41.6	43.5	45.4	47.2	48.7	50.4	52.0	53.4	55.0	56.4	57.7	59.0	60.3	61.6	62.9	65.3	67.7	70.0	-----
66	38.1	40.2	42.2	44.1	46.0	47.8	49.5	51.1	52.8	54.2	55.8	57.2	58.6	59.9	61.2	62.5	63.9	66.3	68.7	71.1	-----
68	38.6	40.7	42.8	44.7	46.6	48.4	50.2	51.8	53.5	55.0	56.6	58.0	59.5	60.8	62.1	63.4	64.8	67.3	69.7	72.1	74.4
70	39.1	41.3	43.3	45.3	47.2	49.0	50.9	52.5	54.2	55.8	57.3	58.8	60.3	61.7	63.0	64.3	65.7	68.3	70.7	73.1	75.4
72	39.6	41.8	43.8	45.9	47.8	49.7	51.5	53.2	54.9	56.5	58.0	59.6	61.1	62.6	63.9	65.2	66.6	69.2	71.7	74.1	76.4



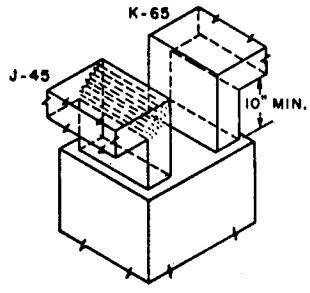


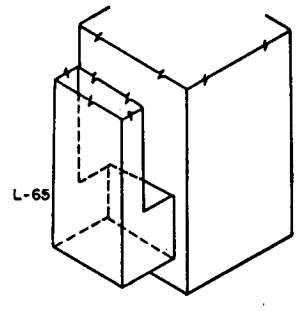


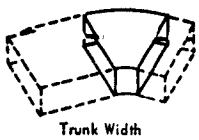




RETURN AIR ONLY

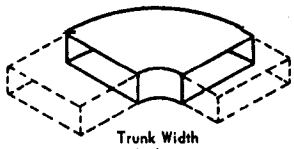






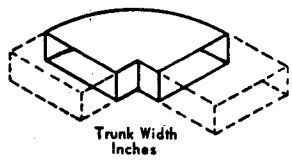
Trunk Width
Inches

A – 4 to 15	5
A – 16 to 27	10
A – 28 to 41	15
A – 42 to 52	20
A – 53 to 64	25



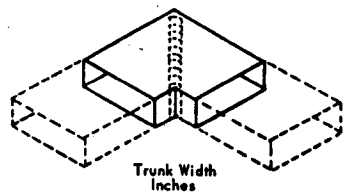
Trunk Width
Inches

B – 4 to 11	10
B – 12 to 21	15
B – 22 to 27	20
B – 28 to 33	25
B – 34 to 42	30
B – 43 to 51	40
B – 52 to 64	50



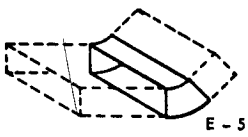
Trunk Width
Inches

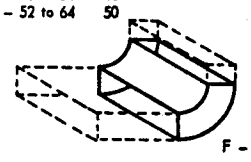
C – 4 to 6	20
C – 7 to 11	40
C – 12 to 15	55
C – 16 to 21	75
C – 22 to 27	100
C – 28 to 33	125
C – 34 to 42	150

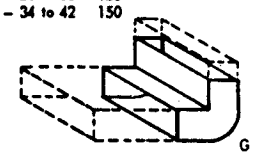


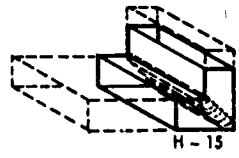
Trunk Width
Inches

D – 4 to 11	15
D – 12 to 21	20
D – 22 to 27	25
D – 28 to 42	40

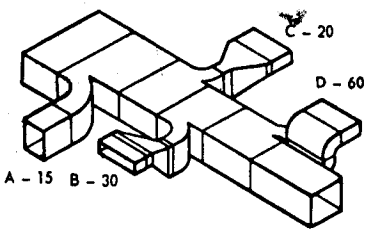


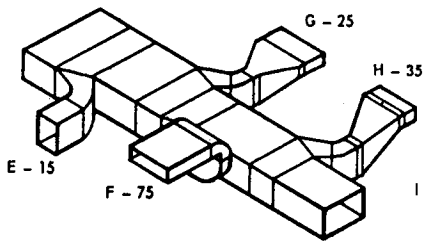


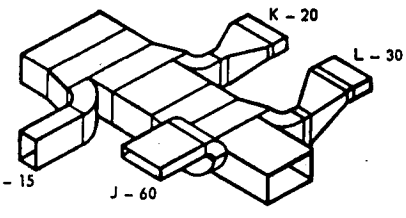


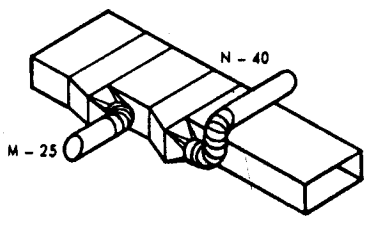


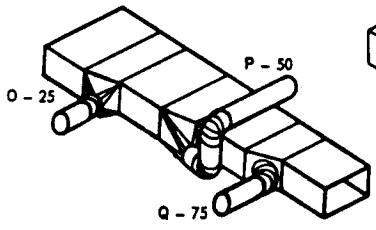
* *Inside radius = ½ width of duct.*











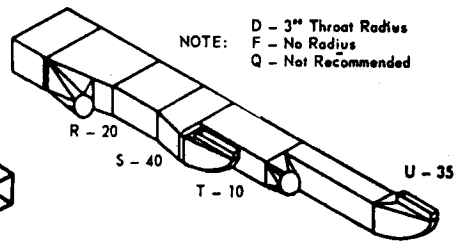


Figure M–1.① Equivalent lengths of forced-air duct fittings.

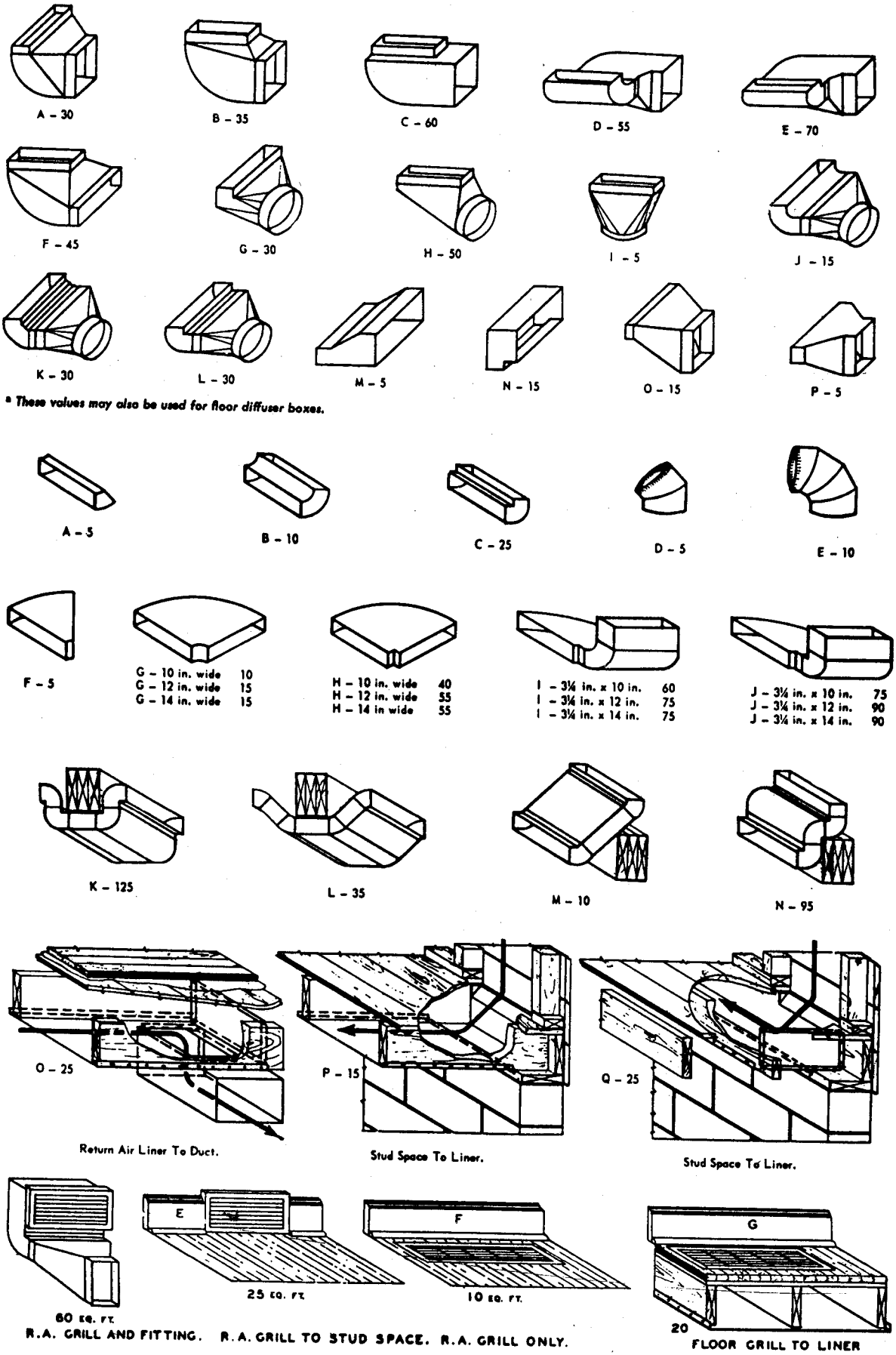


Figure M-1③—Continued.