

reliable, because as a rule the chimney is designed by an engineer and must be well built to sustain such a heavy load and the height is such as to produce considerable head or force to offset unfavorable weather conditions, etc. Chimneys in this class produce about 0.009 in. draft per ft. of height in zero weather with 600 deg. in the stack according to the formula:

$$P = H \left(\frac{7.6}{T_o} - \frac{7.9}{T_s} \right)$$

where

P = draft pressure in inches of water.
 H = height of chimney in feet.
 T_o = absolute temperature of outside air.
 T_s = absolute temperature of stack gases.

For low-pressure heating boilers, water heaters and warm air furnaces conservative modern practice in the matter of chimney sizes is in accordance with the accompanying schedule, Table 61:

TABLE 61. CHIMNEY SIZES

WARM AIR FURNACE CAPACITY IN LEADER PIPE SQ. IN.	STEAM BOILER CAPACITY SQ. FT. OF RADIATION	HOT WATER HEATER CAPACITY SQ. FT. OF RADIATION	NOMINAL DIMENSIONS OF FIRE CLAY LINING IN.	RECTANGULAR FLUE			ROUND FLUE		
				Actual Inside Dimensions of Fire Clay Lining In.	Actual Area Sq. In.	Effective Area Sq. In.	Inside Diameter of Lining In.	Effective Area Sq. In.	Height in Ft. from Grate
790	590	973	8½x13	7x11½	81	70			35
1000	690	1140					10	79	
	900	1490	13x13	11¼x11¼	127	99			
	900	1490	8½x18	6¾x16¼	110	100			
	1100	1820					12	113	40
	1700	2800	13x18	11¼x16¼	183	156			
	1940	3200					15	177	
	2130	3520	18x18	15¾x15¾	248	195			
	2480	4090	20x20	17¼x17¼	298	234			45
	3150	5200					18	254	50
	4300	7100					20	314	
	5000	8250	24x24	21x21	441				
	4600	7590		20x24*	480	326			55
	5570	9190		24x24	576	380			60
	5580	9200					22	380	
	6980	11500					24	452	65
	7270	12000		24x28	672	468			
	8700	14400		28x28	784	531			
	9380	15500					27	573	
	10150	16750		30x30	900	616			
	10470	17250		28x32	896	635			
	11800	19500					30	707	70
	14700	24300					33	855	
	17900	29500					36	1018	

*Dimensions below are for unlined rectangular flues.

Chimneys recommended for larger boilers 15 to 250 hp. are proportioned in accordance with the report made by a joint Committee of the *American Boiler Manufacturers Association* and *Stoker Manufacturers Association* and approved by these organizations. The sizes are given in Table 62.

TABLE 62. HEIGHT OF STACK FOR AVERAGE INSTALLATIONS (Sea Level)

Forced Draft Stokers

Per Cent Rating.....	100	150	200	250	300
Draft Furnace.....	0.15	0.15	0.15	0.15	0.15
Friction Loss (Boiler).....	0.18	0.4	0.65	0.9	1.20
Friction Loss (Breeching).....	0.10	0.10	0.10	0.10	0.10
Total Draft Required.....	0.43	0.65	0.90	1.15	1.45
Height of Stack (Ft.).....	80	112	145	178	220

DIAMETER OF CHIMNEY IN INCHES FOR HORIZONTAL RETURN TUBULAR BOILERS				HEIGHT OF STACK IN FEET—FOR SEA LEVEL AND 60 DEG. FAHR. OUTSIDE TEMP. ASSUMED FRICTION LOSS IN STACK 0.1 IN. PER 100 FT.			
Nominal H. P.	100% Rating	150% Rating	200% Rating	Draft at Base of Stack	100% Rating	150% Rating	200% Rating
15	13	14	17	0.12	21	22	25
20	14	16	18	0.15	26	28	30
25	16	18	20	0.20	35	37	41
30	17	19	21	0.25	43	46	51
35	18	20	22	0.30	52	56	61
40	19	21	23	0.35	60	65	71
50	20	23	25	0.40	69	74	81
60	21	24	27	0.45	78	84	91
75	23	26	29	0.50	86	93	101
90	25	28	31	0.55	95	102	111
100	26	29	33	0.60	104	112	122
115	27	31	34	0.65	112	121	132
125	28	32	35	.....	.....	.....	.....
150	30	34	38	.....	.....	.....	.....
175	32	36	40	.....	.....	.....	.....
200	33	38	43	.....	.....	.....	.....
210	34	38	44	.....	.....	.....	.....
225	35	40	45	.....	.....	.....	.....
250	36	41	47	.....	.....	.....	.....

DATA ON WHICH TABLES ARE BASED

Rating.....	100%	150%	200%	Stack Temp,			
Efficiency.....	65%	65%	63%	deg. fahr.....	450	500	550
CO ₂	8%	9%	10%	Lbs. of Gas.....	85	77	73

AVERAGE FRICTION LOSS THROUGH BOILERS

Per Cent Rating.....	100	150	200	250	300
Loss Ins., Water.....	0.1 to 0.3	0.2 to 0.6	0.3 to 0.9	0.5 to 1.4	0.7 to 1.9

Friction loss through boiler varies according to construction.
 For Furnace Draft.—Allow 0.15 for forced draft. For Natural Draft 0.35 in. or higher should be used depending upon rate of combustion and fuel used.
 For Breeching Friction Loss.—Allow 0.05 in. for each right angle bend and 0.1 in. per 100 ft. of length. Cross sectional area should be 20 per cent larger than that of stack.