

engineer and must be well built to sustain such a heavy load and the height is such as to produce considerable draft to offset unfavorable weather conditions, etc. Chimneys in this class produce about 0.00945 in. of theoretical draft per foot of height in zero weather with 600 deg. in the stack.

Chimneys recommended for larger boilers 15 to 250 hp. may be proportioned in accordance with the report made by a joint Committee of the

TABLE 3. CHIMNEY SIZES FOR LOW PRESSURE HEATING BOILERS AND WARM AIR FURNACES

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.	Actual Area Sq. In.	Height in Ft. from Grate
790	590	973	8½x13	7x11½	81	70	10	79	As height necessary is dependent upon the draft requirements of the varying designs these factors should be known before height can be accurately determined.
1000	690	1140	13x13	11¼x11¼	127	99	12	113	
	900	1490	8½x18	6¾x16¾	110	100	15	177	
	1100	1820	13x18	11¼x16¾	183	156	18	254	
	1700	2800	18x18	15¾x15¾	248	195	20	314	
	1940	3200	20x20	17¼x17¼	298	234	22	380	
	2130	3520					24	452	
	2480	4090					27	573	
	3150	5200					30	707	
	4300	7100	20x24	17x21	357	278	33	855	
	4600	7590	24x24	21x21	441	380	36	1018	
	5000	8250		24x24*	576	380			
	5570	9190							
	5580	9200							
	6980	11500							
	7270	12000		24x28*	672	468			
	8700	14400		28x28*	784	531			
	9380	15500							
	10150	16750		30x30*	900	616			
	10470	17250		28x32*	896	635			
	11800	19500							
	14700	24300							
	17900	29500							

*Dimensions below are for unlined rectangular flues.

American Boiler Manufacturers Association and Stoker Manufacturers Association and approved by these organizations. The sizes are given in Table 4.

Chimneys for Oil Fuel.—The requirements for stacks for oil fuels are entirely different from those connected to coal-fired boilers, as there are certain losses through the boiler proper that are eliminated. Gas temperatures entering the stacks are lower for a given capacity, and the volume of gas is less than with coal. The cross-sectional area of the stack may therefore be less. In most instances this may safely be taken as

From Marks' Mechanical Engineers Handbook.

60 per cent of the area that would be furnished for coal-fired boilers. In determining the height, care must be taken to design a stack that will give a sufficient draft for the maximum requirements of the boiler, but not more. In this way the efficiency is safeguarded, and the danger of a draft such as to pull through too large an excess of air is eliminated.

TABLE 4. HEIGHT OF STACK FOR AVERAGE INSTALLATIONS (Sea Level)
Average Draft Losses with 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

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.

Chimneys for still greater horsepowers are given by Tables 5 and 6. Table 7, adapted from one calculated by C. R. Weymouth (*Trans. A. S. M. E.*, Vol. 34, 1912) and based on actual test data, will be found to give satisfactory results under the assumed conditions as given for stacks with oil-burning boilers.