hour per square foot for each degree Fahrenheit temperature difference between the gases and surrounding air.

DOMESTIC CHIMNEYS

Experience has shown that the chimney sizes given in Table 1 are in general adequate for heating boilers and furnaces with the capacities indicated, when such devices are hand fired and that chimneys of these sizes are likely to be architecturally congruous with houses or buildings which require heating devices of such capacities.

Sometimes it is desirable to use a smaller or shorter chimney than that indicated in Table 1. In such cases it is necessary to estimate whether

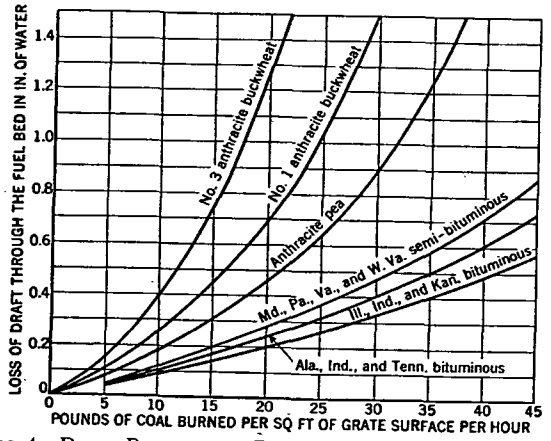


FIG. 4. DRAFT REQUIRED AT DIFFERENT RATES OF COMBUSTION FOR VARIOUS KINDS OF COAL

a chimney of limited height can be made to produce sufficient draft in the particular case or whether mechanical draft must be employed.

It should be remembered that mechanically fired devices, oil burners and stokers, are equipped with blowers so that, with these devices, the chimney is not required to overcome the resistance of a fuel bed. Nevertheless, a draft in the fire box, of about 0.03 in. of water is considered desirable so that any small openings in the fire box or flue passages will result in leakage of air in, and not leakage of combustion products out, of such parts. This is not to be taken to condone leaks in fire boxes. Such leaks adversely affect plant efficiency.

OBSERVED TEST PERFORMANCE

The observed performances of some brick chimneys are given in Tables 2 and 3[3].

The tests on which these data are based were made at various outside

[3]Observed Performance of Some Experimental Chimneys, by R. S. Dill, P. R. Achenbach and J. T. Duck (A.S.H.V.E. TRANSACTIONS, Vol. 48, 1942, p. 351).

temperatures as shown and, to make them comparable among themselves, the observed drafts were corrected to 32 F, 1 atmosphere pressure, by the formula:

$$O_2 = O_1 + S_2 - S_1 \qquad (12)$$

where

S_1 = computed static (theoretical) draft, experimental conditions.
S_2 = computed static (theoretical) draft, standard conditions.
O_1 = observed draft, experimental conditions.
O_2 = observed draft corrected to standard conditions.

TABLE 1. RECOMMENDED MINIMUM CHIMNEY SIZES FOR HEATING BOILERS AND FURNACES[a]

Warm Air Furnace Capacity in Sq In. of Leader Pipe	Steam Boiler Capacity Sq Ft of Radiation	Hot Water Heater Capacity Sq Ft of Radiation	Nominal Dimensions of Fire Clay Lining in Inches	Rectangular Flue		Round Flue		Height in Ft Above Grate
				Actual Inside Dimensions of Fire Clay Lining in Inches	Actual Area Sq In.	Inside Diameter of Lining in Inches	Actual Area Sq In.	
790	590	973	8½x13	7x11½	81	10	79	35
1000	690	1,140						
	900	1,490	13x13	11¼x11¼	127			
	900	1,490	8½x18	6¾x16¼	110	12	113	40
	1,100	1,820						
	1,700	2,800	13x18	11¼x16¼	183	15	177	
	1,940	3,200						
	2,130	3,520	18x18	15¾x15¾	248			45
	2,480	4,090	20x20	17¼x17¼	298	18	254	50
	3,150	5,200				20	314	
	4,300	7,100						
	4,600	7,590	20x24	17x21	357			55
	5,000	8,250	24x24	21x21	441			60
	5,570	9,190		24x24[b]	576			
	5,580	9,200				22	380	
	6,980	11,500				24	452	65
	7,270	12,000		24x28[b]	672			
	8,700	14,400		28x28[b]	784			
	9,380	15,500				27	573	
	10,150	16,750		30x30[b]	900			
	10,470	17,250		28x32[b]	896			

[a]This table is taken from the A.S.H.V.E. Code of Minimum Requirements for the Heating and Ventilation of Buildings (Edition of 1929).
[b]Dimensions are for unlined rectangular flues.

It will be noted that the observed draft exceeded the computed static draft during some observations on the shorter chimneys. This is mainly attributed to the draft producing effect of the hot gases immediately above the chimney. By means of a manometer it was found that a measurable draft existed in this gas column for some distance above the chimney top. However, the temperatures in the chimney were measured with unshielded thermocouples and the actual gas temperatures may have been higher for this reason than the observed temperatures on which the computations of draft were based. The tests were made in calm weather.