

The factors in Table 4, as corrected if necessary, are satisfactory for regions having 3500 to 6500 degree-days per heating season. In regions with less than 3500 degree-days the unit gas consumption is higher than given; where over 6500, the unit is less than given. Ten per cent addition or deduction in these cases is recommended by AGA publications.

For gas heating values other than those given in Table 4, simply interpolate or extrapolate. It will also be noted that Table 4 applies only to small installations. In general the larger the installation the smaller the unit gas consumption becomes and the values in the table should be used with care, if at all, in large gas-burning installations.

Example 7. Make an estimate of the gas required to heat a building located in Chicago, Ill., assuming that the calculated heating surface requirements are 1000 sq ft of hot water radiation based on design temperature of 0 F and 70 F. Chicago has 800 Btu mixed gas, and 6027 degree-days.

Solution. Using Equation 3 and Table 4, the fuel consumption for a design temperature of 0 F with 800 Btu gas is found to be 0.085 cu ft of gas per degree-day per square foot of hot water radiation.

$$0.085 \times 1000 \times 6027 = 512,295 \text{ cu ft.}$$

Estimating Oil Consumption

Unit fuel consumption factors for oil, similar to those for gas in Table 4 are given in Table 6. The factors in Table 6 apply only to an inside design

TABLE 4. FACTORS FOR ESTIMATING GAS CONSUMPTION^a

Btu Value of Gas per Cu Ft	HOT WATER			STEAM			WARM AIR	
	Cu Ft Gas per Degree-Day per Sq Ft Radiator			Cu Ft Gas per Degree-Day per Sq Ft Radiator			Cu Ft Gas per Degree-Day per 1000 Btu Hourly Design Heat Loss	
	Up to 500 Sq Ft	500 to 1200 Sq Ft	Over 1200 Sq Ft	Up to 500 Sq Ft	300 to 700 Sq Ft	Over 700 Sq Ft	Gravity	Fan Systems
500	0.142	0.135	0.128	0.242	0.231	0.220	0.855	0.820
535	0.132	0.126	0.120	0.226	0.215	0.206	0.800	0.766
800	0.089	0.085	0.081	0.151	0.144	0.137	0.534	0.513
1000	0.071	0.068	0.065	0.121	0.115	0.110	0.428	0.410
1 Therm = 100,000 Btu	Gas Consumption in Therms per Degree-Day							
	0.000708	0.000675	0.000642	0.00121	0.00115	0.00110	0.00428	0.00409

^aAbstracted from Comfort Heating, American Gas Association, 1938.

TABLE 5. CORRECTION FACTORS FOR OUTSIDE DESIGN TEMPERATURES

OUTSIDE DESIGN TEMP. DEG F	INSIDE DESIGN TEMP. DEG F	MULTIPLY VALUES IN TABLES 4, 6 AND 7 BY
-20	70	0.778
-10	70	0.875
0	70	0.900
+10	70	1.167
+20	70	1.400

temperature of 70 F and an outside design temperature of 0 F. For other outside design temperatures, the constants in Table 6 must be multiplied by the values in Table 5 as explained under Estimating Gas Consumption.

Table 6 assumes the use of oil with a heating value of 140,000 Btu per gallon. For other heating values, multiply the values in Table 6 by the ratio of 140,000 divided by the heating value per gallon of fuel being used.

Example 8. What would be the estimated seasonal oil consumption of a boiler-burner unit in Minneapolis of a building having a calculated heat loss of 192,000 Btu per hour, burning 144,000 Btu per gallon oil and operating at a seasonal efficiency of 60 per cent, if the outside design temperature for Minneapolis is -20 F, and the inside design temperature is 70 F?

Solution. From Table 6, under 60 per cent efficiency and opposite the bottom column, find the uncorrected U to be 0.00476 gal per 1000 Btu hourly heat loss.

From Table 5, the correction multiplier for -20 F outside design temperature is 0.778. Solving, $0.778 \times 0.00476 = 0.00370$. Making a further correction for the heating value:

$$0.0037 \times \frac{140,000}{144,000} = 0.0036 \text{ gal per 1000 Btu per hour calculated heat loss per degree-day.}$$

From Table 3, the average degree-days for Minneapolis number 7883, and from the problem $N = 192$. Substituting in Equation 3:

$$F = 0.0036 \times 7883 \times 192 = 5449 \text{ gal.}$$

TABLE 6. UNIT FUEL CONSUMPTION^a CONSTANTS FOR OIL^b

UNIT	EFFICIENCY IN PER CENT				
	40	50	60	70	80
Gal Oil per Sq Ft Steam Radiator..	0.00172	0.00137	0.00114	0.00098	0.00086
Gal Oil per Sq Ft Hot Water Radiator.....	0.00108	0.00086	0.00072	0.00062	0.00054
Gal Oil per 1000 Btu per Hour Heat Loss.....	0.00715	0.00571	0.00476	0.00409	0.00358

^aBased on a heating value of 140,000 Btu per gallon.

^bAbstracted by permission from *Degree-Day Handbook* (Second Edition, 1937), by C. Strock and C. H. B. Hotchkiss.

TABLE 7. UNIT FUEL CONSUMPTION^a CONSTANTS FOR COAL^b

UNIT	EFFICIENCY IN PER CENT				
	40	50	60	70	80
Lb Coal per Sq Ft Steam Radiator..	0.0200	0.0160	0.0133	0.0114	0.0100
Lb Coal per Sq Ft Hot Water Radiator.....	0.0125	0.0100	0.0084	0.0072	0.0063
Lb Coal per 1000 Btu per Hour Heat Loss.....	0.0825	0.0666	0.0550	0.0471	0.0412

^aBased on a heating value of 12,000 Btu per pound.

^bAbstracted by permission from *Degree-Day Handbook*, (Second Edition, 1937), by C. Strock and C. H. B. Hotchkiss.