

$$2000 \text{ lbs} \times 57 = \frac{114}{23} = 115 \text{ FG}$$

$$\frac{162 \text{ FG}}{16 \text{ H}_2} = \frac{57}{23} = 2.5 \text{ 160 FG/16 H}_2$$

$$\frac{30}{23} = 1.3 \text{ 160 FG/16 OFFGAS}$$

$$\text{Btu/lb} = 18003 + 30339/56$$

TABLE 1

Combustion Constants

No.	Substance	Formula	Molecular Weight	Lb per Cu Ft	Cu Ft per Lb	Sp Gr Air = 1.000	Heat of Combustion		For 100% Total Air						For 100% Total Air								
							Btu per Gross (High)	Cu Ft Net (Low)	Btu per Gross (High)	Lb Net (Low)	Cu Ft per Cu Ft of Combustible	O ₂	N ₂	Air	CO ₂	H ₂ O	N ₂	O ₂	N ₂	Air	CO ₂	H ₂ O	N ₂
1	Carbon*	C	12.01	.....	.....	.....	.....	.....	14,093	14,093	1.0	3.76	4.76	1.0	.....	3.76	2.66	8.86	11.53	3.66	.....	8.86	26.41
2	Hydrogen	H ₂	2.016	0.0053	187.723	0.0696	325	275	61,190	51,623	0.5	1.88	2.38	.....	1.0	1.88	7.94	26.41	34.34	.....	8.94	26.41	26.41
3	Oxygen	O ₂	32.000	0.0846	11.819	1.1053	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	Nitrogen (atm.)	N ₂	28.016	0.0744	13.443	0.9718	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	Carbon monoxide	CO	28.01	0.0740	13.506	0.9672	322	322	4,347	4,347	0.5	1.88	2.38	1.0	.....	1.88	0.57	1.90	2.47	1.57	.....	1.90	1.90
6	Carbon dioxide	CO ₂	44.01	0.1170	8.548	1.5282	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Paraffin series																							
7	Methane	CH ₄	16.041	0.0424	23.565	0.5543	1013	913	23,879	21,520	2.0	7.53	9.53	1.0	2.0	7.53	3.99	13.28	17.27	2.74	2.25	13.28	13.28
8	Ethane	C ₂ H ₆	30.067	0.0803	12.455	1.0488	1792	1641	22,320	20,432	3.5	13.18	16.68	2.0	3.0	13.18	3.73	12.39	16.12	2.93	1.80	12.39	12.39
9	Propane	C ₃ H ₈	44.092	0.1196	8.365	1.5617	2590	2385	21,661	19,944	5.0	18.82	23.82	3.0	4.0	18.82	3.63	12.07	15.70	2.99	1.63	12.07	12.07
10	n-Butane	C ₄ H ₁₀	58.118	0.1582	6.321	2.0665	3370	3113	21,308	19,680	6.5	24.47	30.97	4.0	5.0	24.47	3.58	11.91	15.49	3.03	1.55	11.91	11.91
11	Isobutane	C ₄ H ₁₀	58.118	0.1582	6.321	2.0665	3363	3105	21,257	19,629	6.5	24.47	30.97	4.0	5.0	24.47	3.58	11.91	15.49	3.03	1.55	11.91	11.91
12	n-Pentane	C ₅ H ₁₂	72.144	0.1904	5.252	2.4872	4016	3709	21,091	19,517	8.0	30.11	38.11	5.0	6.0	30.11	3.55	11.81	15.35	3.05	1.50	11.81	11.81
13	Isopentane	C ₅ H ₁₂	72.144	0.1904	5.252	2.4872	4008	3716	21,052	19,478	8.0	30.11	38.11	5.0	6.0	30.11	3.55	11.81	15.35	3.05	1.50	11.81	11.81
14	Neopentane	C ₅ H ₁₂	72.144	0.1904	5.252	2.4872	3993	3693	20,970	19,396	8.0	30.11	38.11	5.0	6.0	30.11	3.55	11.81	15.35	3.05	1.50	11.81	11.81
15	n-Hexane	C ₆ H ₁₄	86.169	0.2274	4.398	2.9704	4762	4412	20,940	19,403	9.5	35.76	45.26	6.0	7.0	35.76	3.53	11.74	15.27	3.06	1.46	11.74	11.74
Olefin series																							
16	Ethylene	C ₂ H ₄	28.051	0.0746	13.412	0.9740	1614	1513	21,644	20,295	3.0	11.29	14.29	2.0	2.0	11.29	3.42	11.39	14.81	3.14	1.29	11.39	11.39
17	Propylene	C ₃ H ₆	42.077	0.1110	9.007	1.4504	2336	2186	21,041	19,691	4.5	16.94	21.44	3.0	3.0	16.94	3.42	11.39	14.81	3.14	1.29	11.39	11.39
18	n-Butene	C ₄ H ₈	56.102	0.1480	6.756	1.9336	3084	2885	20,840	19,496	6.0	22.59	28.59	4.0	4.0	22.59	3.42	11.39	14.81	3.14	1.29	11.39	11.39
19	Isobutene	C ₄ H ₈	56.102	0.1480	6.756	1.9336	3068	2869	20,730	19,382	6.0	22.59	28.59	4.0	4.0	22.59	3.42	11.39	14.81	3.14	1.29	11.39	11.39
20	n-Pentene	C ₅ H ₁₀	70.128	0.1852	5.400	2.4190	3836	3586	20,712	19,363	7.5	28.23	35.73	5.0	5.0	28.23	3.42	11.39	14.81	3.14	1.29	11.39	11.39
Aromatic series																							
21	Benzene	C ₆ H ₆	78.107	0.2060	4.852	2.6920	3751	3601	18,210	17,480	7.5	28.23	35.73	6.0	3.0	28.23	3.07	10.22	13.30	3.38	0.69	10.22	10.22
22	Toluene	C ₇ H ₈	92.132	0.2431	4.113	3.1760	4484	4284	18,440	17,620	9.0	33.88	42.88	7.0	4.0	33.88	3.13	10.40	13.53	3.34	0.78	10.40	10.40
23	Xylene	C ₈ H ₁₀	106.158	0.2803	3.567	3.6618	5230	4980	18,650	17,760	10.5	39.52	50.02	8.0	5.0	39.52	3.17	10.53	13.70	3.32	0.85	10.53	10.53
Miscellaneous gases																							
24	Acetylene	C ₂ H ₂	26.036	0.0697	14.344	0.9107	1499	1448	21,500	20,776	2.5	9.41	11.91	2.0	1.0	9.41	3.07	10.22	13.30	3.38	0.69	10.22	10.22
25	Naphthalene	C ₁₀ H ₈	128.162	0.3384	2.955	4.4208	5854	5654	17,298	16,708	12.0	45.17	57.17	10.8	4.0	45.17	3.00	9.97	12.96	3.43	0.56	9.97	9.97
26	Methyl alcohol	CH ₃ OH	32.041	0.0846	11.820	1.1052	868	768	10,259	9,078	1.5	5.65	7.15	1.0	2.0	5.65	1.50	4.98	6.48	1.37	1.13	4.98	4.98
27	Ethyl alcohol	C ₂ H ₅ OH	46.067	0.1216	8.221	1.5890	1600	1451	13,161	11,929	3.0	11.29	14.29	2.0	3.0	11.29	2.08	6.93	9.02	1.92	1.17	6.93	6.93
28	Ammonia	NH ₃	17.031	0.0456	21.914	0.5961	441	365	9,668	8,001	0.75	2.82	3.57	.....	1.5	3.32	1.41	4.69	6.10	.....	1.59	5.31	5.31
29	Sulfur*	S	32.06	.....	.....	.....	.....	.....	3,983	3,983	1.0	3.76	4.76	1.0	.....	3.76	1.00	3.29	4.29	2.00	.....	3.29	3.29
30	Hydrogen sulfide	H ₂ S	34.076	0.0911	10.979	1.1898	647	596	7,100	6,545	1.5	5.65	7.15	1.0	1.0	5.65	1.41	4.69	6.10	1.88	0.53	4.69	4.69
31	Sulfur dioxide	SO ₂	64.06	0.1733	5.770	2.264	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
32	Water vapor	H ₂ O	18.016	0.0476	21.017	0.6215	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
33	Air	.....	28.9	0.0766	13.063	1.0000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Carbon and sulfur are considered as gases for molal calculations only.

Note: This table is arranged from B&W work data.

All gas volumes corrected to 60 F and 30 in. Hg dry.