

**Combustion
Efficiency
Tables**

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Wood 10% Moisture

Specifications:

Higher Heating Value	8,800 Btu/lb
Moisture	10.0%
Carbon	50.0%
Hydrogen	6.5%
Ultimate CO ₂	20.0%

Appendix A

WOOD 10% MOISTURE 150°F to 300°F

EXIT GAS HEAT LOSSES

X EXCESS OXYGEN AIR	X CO ₂	X CO	NET STACK TEMPERATURE DEG F															
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE															
			150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
0.0	0.0	20.0	10.8	10.9	11.1	11.3	11.5	11.6	11.8	12.0	12.2	12.4	12.5	12.7	12.9	13.1	13.2	13.4
2.4	0.5	19.5	10.8	11.0	11.2	11.4	11.5	11.7	11.9	12.1	12.3	12.4	12.6	12.8	13.0	13.2	13.4	13.5
4.9	1.0	19.0	10.9	11.1	11.2	11.4	11.6	11.8	12.0	12.2	12.4	12.5	12.7	12.9	13.1	13.3	13.5	13.7
7.5	1.5	18.6	10.9	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5	12.7	12.8	13.0	13.2	13.4	13.6	13.8
10.3	2.0	18.1	11.0	11.2	11.4	11.6	11.8	12.0	12.2	12.4	12.6	12.8	13.0	13.2	13.3	13.5	13.7	13.9
13.2	2.5	17.6	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5	12.6	12.8	13.0	13.2	13.3	13.5	13.7	13.9
16.3	3.0	17.1	11.2	11.4	11.6	11.8	12.0	12.2	12.4	12.6	12.8	13.0	13.2	13.4	13.6	13.8	14.0	14.2
19.5	3.5	16.7	11.2	11.5	11.7	11.9	12.1	12.3	12.5	12.7	12.9	13.1	13.3	13.6	13.8	14.0	14.2	14.4
23.0	4.0	16.2	11.3	11.5	11.8	12.0	12.2	12.4	12.6	12.8	13.1	13.3	13.5	13.7	13.9	14.1	14.4	14.6
26.6	4.5	15.7	11.4	11.6	11.9	12.1	12.3	12.5	12.8	13.0	13.2	13.4	13.6	13.9	14.1	14.3	14.5	14.8
30.5	5.0	15.2	11.5	11.8	12.0	12.2	12.4	12.7	12.9	13.1	13.4	13.6	13.8	14.0	14.3	14.5	14.7	14.9
34.6	5.5	14.8	11.6	11.9	12.1	12.3	12.6	12.8	13.0	13.3	13.5	13.7	14.0	14.2	14.5	14.7	14.9	15.2
39.0	6.0	14.3	11.7	12.0	12.2	12.5	12.7	13.0	13.2	13.4	13.7	13.9	14.2	14.4	14.7	14.9	15.1	15.4
43.7	6.5	13.8	11.8	12.1	12.4	12.6	12.9	13.1	13.4	13.6	13.9	14.1	14.4	14.6	14.9	15.1	15.4	15.6
48.7	7.0	13.3	12.0	12.2	12.5	12.8	13.0	13.3	13.5	13.8	14.1	14.3	14.6	14.8	15.1	15.4	15.6	15.9
54.1	7.5	12.9	12.1	12.4	12.7	12.9	13.2	13.5	13.7	14.0	14.3	14.5	14.8	15.1	15.3	15.6	15.9	16.1
59.9	8.0	12.4	12.3	12.5	12.8	13.1	13.4	13.7	13.9	14.2	14.5	14.8	15.0	15.3	15.6	15.9	16.2	16.4
66.2	8.5	11.9	12.4	12.7	13.0	13.3	13.6	13.9	14.2	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.5	16.8
72.9	9.0	11.4	12.6	12.9	13.2	13.5	13.8	14.1	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.5	16.8	17.1
80.3	9.5	11.0	12.8	13.1	13.4	13.7	14.0	14.3	14.7	15.0	15.3	15.6	15.9	16.2	16.5	16.8	17.2	17.5
88.3	10.0	10.5	13.0	13.3	13.6	14.0	14.3	14.6	14.9	15.3	15.6	15.9	16.3	16.6	16.9	17.2	17.6	17.9
97.0	10.5	10.0	13.2	13.6	13.9	14.2	14.6	14.9	15.3	15.6	15.9	16.3	16.6	17.0	17.3	17.6	18.0	18.3
106.6	11.0	9.5	13.5	13.8	14.2	14.5	14.9	15.2	15.6	16.0	16.3	16.7	17.0	17.4	17.7	18.1	18.5	18.8
117.2	11.5	9.0	13.7	14.1	14.5	14.9	15.2	15.6	16.0	16.4	16.8	17.1	17.5	17.9	18.2	18.6	19.0	19.4
129.0	12.0	8.6	14.0	14.4	14.8	15.2	15.6	16.0	16.4	16.8	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0
142.1	12.5	8.1	14.4	14.8	15.2	15.6	16.0	16.5	16.9	17.3	17.7	18.1	18.6	19.0	19.4	19.8	20.2	20.6
156.8	13.0	7.6	14.7	15.2	15.6	16.1	16.5	17.0	17.4	17.9	18.3	18.7	19.2	19.6	20.1	20.5	21.0	21.4
173.4	13.5	7.1	15.2	15.7	16.1	16.6	17.1	17.5	18.0	18.5	19.0	19.4	19.9	20.4	20.8	21.3	21.8	22.3
192.4	14.0	6.7	15.7	16.2	16.7	17.2	17.7	18.2	18.7	19.2	19.7	20.2	20.7	21.2	21.7	22.2	22.7	23.2
214.2	14.5	6.2	16.2	16.8	17.3	17.9	18.4	19.0	19.5	20.0	20.6	21.1	21.7	22.2	22.8	23.3	23.8	24.4
239.4	15.0	5.7	16.9	17.5	18.1	18.7	19.2	19.8	20.4	21.0	21.6	22.2	22.8	23.4	23.9	24.5	25.1	25.7
269.2	15.5	5.2	17.7	18.3	19.0	19.6	20.2	20.9	21.5	22.2	22.8	23.4	24.1	24.7	25.4	26.0	26.6	27.3
304.7	16.0	4.8	18.6	19.3	20.0	20.7	21.4	22.1	22.8	23.5	24.2	24.9	25.6	26.3	27.0	27.7	28.4	29.1

Appendix A

WOOD 10% MOISTURE 300°F to 450°F

EXIT GAS HEAT LOSSES

EXCESS OXYGEN AIR	%	%	NET STACK TEMPERATURE DEG F															
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE															
			300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450
0.0	0.0	20.0	13.4	13.6	13.8	13.9	14.1	14.3	14.5	14.7	14.8	15.0	15.2	15.4	15.5	15.7	15.9	16.1
2.4	0.5	19.5	13.5	13.7	13.9	14.1	14.3	14.4	14.6	14.8	15.0	15.2	15.3	15.5	15.7	15.9	16.1	16.3
4.9	1.0	19.0	13.7	13.8	14.0	14.2	14.4	14.6	14.8	15.0	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.4
7.3	1.5	18.6	13.8	14.0	14.2	14.4	14.6	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.6
10.3	2.0	18.1	13.9	14.1	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.8
13.2	2.5	17.6	14.1	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1
16.3	3.0	17.1	14.2	14.4	14.6	14.8	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3
19.5	3.5	16.7	14.4	14.6	14.8	15.0	15.2	15.4	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.5
23.0	4.0	16.2	14.6	14.8	15.0	15.2	15.4	15.6	15.9	16.1	16.3	16.5	16.7	16.9	17.2	17.4	17.6	17.8
26.6	4.5	15.7	14.8	15.0	15.2	15.4	15.6	15.9	16.1	16.3	16.5	16.8	17.0	17.2	17.4	17.6	17.9	18.1
30.3	5.0	15.2	14.9	15.2	15.4	15.6	15.9	16.1	16.3	16.5	16.8	17.0	17.2	17.5	17.7	17.9	18.1	18.4
34.6	5.5	14.8	15.2	15.4	15.6	15.9	16.1	16.3	16.6	16.8	17.0	17.3	17.5	17.7	18.0	18.2	18.5	18.7
39.0	6.0	14.3	15.4	15.6	15.9	16.1	16.4	16.6	16.8	17.1	17.3	17.6	17.8	18.1	18.3	18.5	18.8	19.0
43.7	6.5	13.8	15.6	15.9	16.1	16.4	16.6	16.9	17.1	17.4	17.6	17.9	18.1	18.4	18.6	18.9	19.1	19.4
48.7	7.0	13.3	15.9	16.1	16.4	16.6	16.9	17.2	17.4	17.7	17.9	18.2	18.5	18.7	19.0	19.2	19.5	19.8
54.1	7.5	12.9	16.1	16.4	16.7	16.9	17.2	17.5	17.8	18.0	18.3	18.6	18.8	19.1	19.4	19.6	19.9	20.2
59.9	8.0	12.4	16.4	16.7	17.0	17.3	17.6	17.8	18.1	18.4	18.7	18.9	19.2	19.5	19.8	20.1	20.3	20.6
66.2	8.5	11.9	16.8	17.0	17.3	17.6	17.9	18.2	18.5	18.8	19.1	19.4	19.6	19.9	20.2	20.5	20.8	21.1
72.9	9.0	11.4	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6
80.3	9.5	11.0	17.5	17.8	18.1	18.4	18.7	19.0	19.4	19.7	20.0	20.3	20.6	20.9	21.2	21.5	21.9	22.2
88.3	10.0	10.5	17.9	18.2	18.5	18.9	19.2	19.5	19.8	20.2	20.5	20.8	21.1	21.5	21.8	22.1	22.5	22.8
97.4	10.5	10.0	18.3	18.7	19.0	19.4	19.7	20.0	20.4	20.7	21.1	21.4	21.7	22.1	22.4	22.8	23.1	23.4
106.6	11.0	9.5	18.8	19.2	19.5	19.9	20.3	20.6	21.0	21.3	21.7	22.0	22.4	22.8	23.1	23.5	23.8	24.2
117.2	11.5	9.0	19.4	19.7	20.1	20.5	20.9	21.2	21.6	22.0	22.4	22.7	23.1	23.5	23.9	24.2	24.6	25.0
129.0	12.0	8.6	20.0	20.4	20.8	21.2	21.6	21.9	22.3	22.7	23.1	23.5	23.9	24.3	24.7	25.1	25.5	25.9
142.1	12.5	8.1	20.6	21.1	21.5	21.9	22.3	22.7	23.2	23.6	24.0	24.4	24.8	25.2	25.7	26.1	26.5	26.9
156.8	13.0	7.6	21.4	21.8	22.3	22.7	23.2	23.6	24.1	24.5	25.0	25.4	25.8	26.3	26.7	27.2	27.6	28.1
173.4	13.5	7.1	22.3	22.7	23.2	23.7	24.2	24.6	25.1	25.6	26.0	26.5	27.0	27.5	27.9	28.4	28.9	29.3
192.4	14.0	6.7	23.2	23.8	24.3	24.8	25.3	25.8	26.3	26.8	27.3	27.8	28.3	28.8	29.3	29.8	30.3	30.8
214.2	14.5	6.2	24.4	24.9	25.5	26.0	26.6	27.1	27.6	28.2	28.7	29.3	29.8	30.4	30.9	31.4	32.0	32.5
239.4	15.0	5.7	25.7	26.3	26.9	27.5	28.1	28.6	29.2	29.8	30.4	31.0	31.6	32.2	32.7	33.3	33.9	34.5
269.2	15.5	5.2	27.3	27.9	28.5	29.2	29.8	30.5	31.1	31.7	32.4	33.0	33.7	34.3	34.9	35.6	36.2	36.9
304.7	16.0	4.8	29.1	29.8	30.5	31.2	32.0	32.7	33.4	34.1	34.8	35.5	36.2	36.9	37.6	38.3	39.0	39.7

Appendix A

WOOD 20% MOISTURE 300°F to 450°F

EXIT GAS HEAT LOSSES

EXCESS OXYGEN AIR	%	%	NET STACK TEMPERATURE DEG F																
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE																
			300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450	
0.0	0.0	20.0	14.4	14.8	15.0	15.1	15.3	15.5	15.7	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.1	17.3	
2.4	0.5	19.5	14.7	14.9	15.1	15.3	15.4	15.6	15.8	16.0	16.2	16.3	16.5	16.7	16.9	17.1	17.3	17.4	
4.9	1.0	19.0	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.4	17.6	
7.5	1.5	18.6	15.0	15.2	15.4	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.4	17.6	17.8	
10.3	2.0	18.1	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.4	17.6	17.8	18.0	
13.2	2.5	17.6	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.5	17.7	17.9	18.1	18.3	
16.3	3.0	17.1	15.4	15.6	15.8	16.0	16.2	16.4	16.6	16.8	17.1	17.3	17.5	17.7	17.9	18.1	18.3	18.5	
19.5	3.5	16.7	15.6	15.8	16.0	16.2	16.4	16.6	16.8	17.0	17.3	17.5	17.7	17.9	18.1	18.3	18.5	18.7	
23.0	4.0	16.2	15.8	16.0	16.2	16.4	16.6	16.8	17.0	17.3	17.5	17.7	17.9	18.1	18.3	18.6	18.8	19.0	
26.6	4.5	15.7	15.9	16.2	16.4	16.6	16.8	17.0	17.3	17.5	17.7	17.9	18.2	18.4	18.6	18.8	19.0	19.3	
30.5	5.0	15.2	16.1	16.4	16.6	16.8	17.0	17.3	17.5	17.7	18.0	18.2	18.4	18.6	18.9	19.1	19.3	19.6	
34.6	5.5	14.8	16.3	16.6	16.8	17.0	17.3	17.5	17.8	18.0	18.2	18.5	18.7	18.9	19.2	19.4	19.6	19.9	
39.0	6.0	14.3	16.6	16.8	17.0	17.3	17.5	17.8	18.0	18.3	18.5	18.7	19.0	19.2	19.5	19.7	20.0	20.2	
43.7	6.5	13.8	16.8	17.0	17.3	17.6	17.8	18.1	18.3	18.6	18.8	19.1	19.3	19.6	19.8	20.1	20.3	20.6	
48.7	7.0	13.3	17.1	17.3	17.6	17.8	18.1	18.3	18.6	18.9	19.1	19.4	19.6	19.9	20.2	20.4	20.7	20.9	
54.1	7.5	12.9	17.3	17.6	17.9	18.1	18.4	18.7	18.9	19.2	19.5	19.7	20.0	20.3	20.5	20.8	21.1	21.4	
59.9	8.0	12.4	17.6	17.9	18.2	18.5	18.7	19.0	19.3	19.6	19.8	20.1	20.4	20.7	21.0	21.2	21.5	21.8	
66.2	8.5	11.9	17.9	18.2	18.5	18.8	19.1	19.4	19.7	20.0	20.2	20.5	20.8	21.1	21.4	21.7	22.0	22.3	
72.9	9.0	11.4	18.3	18.6	18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.8	
80.3	9.5	11.0	18.7	19.0	19.3	19.6	19.9	20.2	20.5	20.8	21.2	21.5	21.8	22.1	22.4	22.7	23.0	23.3	
88.3	10.0	10.5	19.1	19.4	19.7	20.0	20.4	20.7	21.0	21.3	21.7	22.0	22.3	22.7	23.0	23.3	23.6	24.0	
97.0	10.5	10.0	19.5	19.9	20.2	20.5	20.9	21.2	21.6	21.9	22.2	22.6	22.9	23.3	23.6	23.9	24.3	24.6	
106.6	11.0	9.5	20.0	20.4	20.7	21.1	21.4	21.8	22.1	22.5	22.9	23.2	23.6	23.9	24.3	24.7	25.0	25.4	
117.2	11.5	9.0	20.5	20.9	21.3	21.7	22.0	22.4	22.8	23.2	23.6	23.9	24.3	24.7	25.1	25.4	25.8	26.2	
129.0	12.0	8.6	21.2	21.5	21.9	22.3	22.7	23.1	23.5	23.9	24.3	24.7	25.1	25.5	25.9	26.3	26.7	27.1	
142.1	12.5	8.1	21.8	22.2	22.7	23.1	23.5	23.9	24.3	24.8	25.2	25.6	26.0	26.4	26.8	27.3	27.7	28.1	
156.8	13.0	7.6	22.6	23.0	23.5	23.9	24.4	24.8	25.2	25.7	26.1	26.6	27.0	27.5	27.9	28.3	28.8	29.2	
173.4	13.5	7.1	23.4	23.9	24.4	24.9	25.3	25.8	26.3	26.7	27.2	27.7	28.2	28.6	29.1	29.6	30.1	30.5	
192.4	14.0	6.7	24.4	24.9	25.4	25.9	26.4	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0	31.5	32.0	
214.3	14.5	6.2	25.6	26.1	26.6	27.2	27.7	28.3	28.8	29.4	29.9	30.4	31.0	31.5	32.1	32.6	33.2	33.7	
239.4	15.0	5.7	26.9	27.5	28.1	28.6	29.2	29.8	30.4	31.0	31.6	32.2	32.8	33.3	33.9	34.5	35.1	35.7	
269.2	15.5	5.2	28.4	29.1	29.7	30.4	31.0	31.6	32.3	32.9	33.6	34.2	34.8	35.5	36.1	36.8	37.4	38.0	
304.7	16.0	4.8	30.3	31.0	31.7	32.4	33.1	33.8	34.5	35.2	35.9	36.6	37.3	38.0	38.7	39.4	40.1	40.9	

Appendix A

WOOD 30% MOISTURE 150°F to 300°F

EXIT GAS HEAT LOSSES

NET STACK TEMPERATURE DEG F

X	X	X	EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE																
			150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	
0.0	0.0	20.0	13.1	13.3	13.5	13.7	13.8	14.0	14.2	14.4	14.5	14.7	14.9	15.1	15.2	15.4	15.6	15.8	
2.4	0.5	19.5	13.2	13.4	13.5	13.7	13.9	14.1	14.3	14.4	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.9	
4.9	1.0	19.0	13.2	13.4	13.6	13.8	14.0	14.2	14.4	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.8	16.0	
7.5	1.5	18.6	13.3	13.5	13.7	13.9	14.1	14.3	14.4	14.6	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.2	
10.3	2.0	18.1	13.4	13.6	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	
13.2	2.5	17.6	13.5	13.8	13.8	14.0	14.2	14.4	14.6	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	
16.3	3.0	17.1	13.5	13.7	13.9	14.1	14.3	14.6	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.6	
19.5	3.5	16.7	13.6	13.8	14.0	14.2	14.4	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.4	16.8	
23.0	4.0	16.2	13.7	13.9	14.1	14.3	14.6	14.8	15.0	15.2	15.4	15.6	15.9	16.1	16.3	16.5	16.7	16.9	
26.6	4.5	15.7	13.8	14.0	14.2	14.5	14.7	14.9	15.1	15.3	15.6	15.8	16.0	16.2	16.5	16.7	16.9	17.1	
30.5	5.0	15.2	13.9	14.1	14.3	14.6	14.8	15.0	15.3	15.5	15.7	15.9	16.2	16.4	16.6	16.9	17.1	17.3	
34.6	5.5	14.8	14.0	14.2	14.5	14.7	14.9	15.2	15.4	15.6	15.9	16.1	16.3	16.6	16.8	17.1	17.3	17.5	
39.0	6.0	14.3	14.1	14.3	14.6	14.8	15.1	15.3	15.6	15.8	16.0	16.3	16.5	16.8	17.0	17.3	17.5	17.7	
43.7	6.5	13.8	14.2	14.5	14.7	15.0	15.2	15.5	15.7	16.0	16.2	16.5	16.7	17.0	17.2	17.5	17.7	18.0	
48.7	7.0	13.0	14.3	14.6	14.9	15.1	15.4	15.6	15.9	16.2	16.4	16.7	16.9	17.2	17.5	17.7	18.0	18.2	
54.1	7.5	12.9	14.5	14.8	15.0	15.3	15.6	15.8	16.1	16.4	16.6	16.9	17.2	17.4	17.7	18.0	18.2	18.5	
59.9	8.0	12.4	14.6	14.9	15.2	15.5	15.7	16.0	16.3	16.6	16.9	17.1	17.4	17.7	18.0	18.2	18.5	18.8	
66.2	8.5	11.9	14.8	15.1	15.4	15.7	15.9	16.2	16.5	16.8	17.1	17.4	17.7	18.0	18.3	18.5	18.8	19.1	
72.9	9.0	11.4	15.0	15.3	15.6	15.9	16.2	16.5	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.2	19.5	
80.3	9.5	11.0	15.1	15.5	15.8	16.1	16.4	16.7	17.0	17.3	17.6	18.0	18.3	18.6	18.9	19.2	19.5	19.8	
88.5	10.0	10.5	15.4	15.7	16.0	16.3	16.7	17.0	17.3	17.6	18.0	18.3	18.6	18.9	19.2	19.5	19.8	20.2	
97.0	10.5	10.0	15.6	15.9	16.3	16.6	16.9	17.3	17.6	18.0	18.3	18.6	19.0	19.3	19.7	20.0	20.4	20.7	
106.6	11.0	9.5	15.8	16.2	16.5	16.9	17.3	17.6	18.0	18.3	18.7	19.0	19.4	19.8	20.1	20.5	20.8	21.2	
117.2	11.5	9.0	16.1	16.5	16.8	17.2	17.6	18.0	18.3	18.7	19.1	19.5	19.8	20.2	20.6	21.0	21.4	21.7	
129.0	12.0	8.6	16.4	16.8	17.2	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.4	20.7	21.1	21.5	21.9	22.3	
142.1	12.5	8.1	16.7	17.2	17.6	18.0	18.4	18.8	19.2	19.7	20.1	20.5	20.9	21.3	21.8	22.2	22.6	23.0	
156.8	13.0	7.6	17.1	17.6	18.0	18.4	18.9	19.3	19.8	20.2	20.7	21.1	21.5	22.0	22.4	22.9	23.3	23.8	
173.4	13.5	7.1	17.5	18.0	18.5	19.0	19.4	19.9	20.4	20.8	21.3	21.8	22.3	22.7	23.2	23.7	24.2	24.6	
192.4	14.0	6.7	18.0	18.5	19.0	19.5	20.1	20.6	21.1	21.6	22.1	22.6	23.1	23.6	24.1	24.6	25.1	25.6	
214.2	14.5	6.2	18.6	19.1	19.7	20.2	20.8	21.3	21.9	22.4	22.9	23.5	24.0	24.6	25.1	25.7	26.2	26.7	
239.4	15.0	5.7	19.3	19.9	20.4	21.0	21.6	22.2	22.8	23.4	24.0	24.5	25.1	25.7	26.3	26.9	27.5	28.1	
269.2	15.5	5.2	20.0	20.7	21.3	22.0	22.6	23.2	23.9	24.5	25.2	25.8	26.4	27.1	27.7	28.4	29.0	29.6	
304.7	16.0	4.8	21.0	21.7	22.4	23.1	23.8	24.5	25.2	25.9	26.6	27.3	28.0	28.7	29.4	30.1	30.8	31.5	

Appendix A

WOOD 30% MOISTURE 300°F to 450°F

EXIT GAS HEAT LOSSES

EXCESS AIR	% OXYGEN	% CO2	NET STACK TEMPERATURE DEG F															
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE															
			300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450
0.0	0.0	20.0	15.8	16.0	16.1	16.3	16.5	16.7	16.8	17.0	17.2	17.4	17.6	17.7	17.9	18.1	18.3	18.4
2.4	0.5	19.5	15.9	16.1	16.3	16.4	16.6	16.8	17.0	17.2	17.3	17.5	17.7	17.9	18.1	18.3	18.4	18.6
4.9	1.0	19.0	16.0	16.2	16.4	16.6	16.8	17.0	17.1	17.3	17.5	17.7	17.9	18.1	18.2	18.4	18.6	18.8
7.5	1.5	18.6	16.2	16.3	16.3	16.7	16.9	17.1	17.3	17.5	17.7	17.9	18.1	18.2	18.4	18.6	18.8	19.0
10.3	2.0	18.1	16.3	16.5	16.7	16.9	17.1	17.3	17.5	17.7	17.9	18.0	18.2	18.4	18.6	18.8	19.0	19.2
13.2	2.5	17.6	16.4	16.6	16.8	17.0	17.2	17.4	17.6	17.8	18.0	18.2	18.4	18.6	18.8	19.0	19.2	19.4
16.3	3.0	17.1	16.6	16.8	17.0	17.2	17.4	17.6	17.8	18.0	18.2	18.4	18.6	18.8	19.0	19.1	19.3	19.5
19.5	3.5	16.7	16.8	17.0	17.2	17.4	17.6	17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.5	19.7	19.9
23.0	4.0	16.2	16.9	17.1	17.4	17.6	17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.5	19.7	20.0	20.2
26.6	4.5	15.7	17.1	17.3	17.6	17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.2	20.4
30.5	5.0	15.2	17.3	17.5	17.8	18.0	18.2	18.5	18.7	18.9	19.1	19.4	19.6	19.8	20.1	20.3	20.5	20.7
34.6	5.5	14.8	17.5	17.8	18.0	18.2	18.5	18.7	18.9	19.2	19.4	19.6	19.9	20.1	20.3	20.6	20.8	21.1
39.0	6.0	14.3	17.7	18.0	18.2	18.5	18.7	19.0	19.2	19.4	19.7	19.9	20.2	20.4	20.7	20.9	21.1	21.4
43.7	6.5	13.8	18.0	18.2	18.5	18.7	19.0	19.2	19.5	19.7	20.0	20.2	20.5	20.7	21.0	21.2	21.5	21.7
48.7	7.0	13.3	18.2	18.5	18.8	19.0	19.3	19.5	19.8	20.0	20.3	20.6	20.8	21.1	21.3	21.6	21.9	22.1
54.1	7.5	12.9	18.5	18.8	19.0	19.3	19.6	19.8	20.1	20.4	20.7	20.9	21.2	21.5	21.7	22.0	22.3	22.5
59.9	8.0	12.4	18.8	19.1	19.4	19.6	19.9	20.2	20.5	20.7	21.0	21.3	21.6	21.9	22.1	22.4	22.7	23.0
66.2	8.5	11.9	19.1	19.4	19.7	20.0	20.3	20.6	20.9	21.1	21.4	21.7	22.0	22.3	22.6	22.9	23.2	23.5
72.9	9.0	11.4	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.6	21.9	22.2	22.5	22.8	23.1	23.4	23.7	24.0
80.3	9.5	11.0	19.8	20.2	20.5	20.8	21.1	21.4	21.7	22.0	22.3	22.7	23.0	23.3	23.6	23.9	24.2	24.5
88.3	10.0	10.5	20.2	20.6	20.9	21.2	21.6	21.9	22.3	22.5	22.9	23.2	23.5	23.8	24.2	24.5	24.8	25.1
97.0	10.5	10.0	20.7	21.0	21.4	21.7	22.1	22.4	22.7	23.1	23.4	23.8	24.1	24.4	24.8	25.1	25.5	25.8
106.6	11.0	9.5	21.2	21.5	21.9	22.3	22.6	23.0	23.3	23.7	24.0	24.4	24.8	25.1	25.5	25.8	26.2	26.5
117.2	11.5	9.0	21.7	22.1	22.5	22.9	23.2	23.6	24.0	24.4	24.7	25.1	25.5	25.9	26.2	26.6	27.0	27.4
129.0	12.0	8.6	22.3	22.7	23.1	23.5	23.9	24.3	24.7	25.1	25.5	25.9	26.3	26.7	27.1	27.5	27.9	28.3
142.1	12.5	8.1	23.0	23.4	23.8	24.3	24.7	25.1	25.5	25.9	26.4	26.8	27.2	27.6	28.0	28.4	28.9	29.3
156.8	13.0	7.6	23.8	24.2	24.7	25.1	25.5	26.0	26.4	26.9	27.3	27.8	28.2	28.6	29.1	29.5	30.0	30.4
173.4	13.5	7.1	24.6	25.1	25.6	26.0	26.5	27.0	27.5	27.9	28.4	28.9	29.3	29.8	30.3	30.8	31.2	31.7
192.4	14.0	6.7	25.6	26.1	26.6	27.1	27.6	28.1	28.6	29.1	29.6	30.2	30.7	31.2	31.7	32.2	32.7	33.2
214.2	14.5	6.2	26.7	27.3	27.8	28.4	28.9	29.5	30.0	30.5	31.1	31.6	32.2	32.7	33.3	33.8	34.3	34.9
239.4	15.0	5.7	28.1	28.7	29.2	29.8	30.4	31.0	31.6	32.2	32.8	33.3	33.9	34.5	35.1	35.7	36.3	36.9
269.2	15.5	5.2	29.6	30.3	30.9	31.5	32.2	32.8	33.5	34.1	34.7	35.4	36.0	36.7	37.3	37.9	38.6	39.2
304.7	16.0	4.8	31.5	32.2	32.9	33.6	34.3	35.0	35.7	36.4	37.1	37.8	38.5	39.2	39.9	40.6	41.3	42.0

Appendix A

WOOD 40% MOISTURE

150°F to 300°F

WOOD 40% MOISTURE

EXIT GAS HEAT LOSSES

%	%	%	NET STACK TEMPERATURE DEG F															
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE															
			150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
0.0	0.0	20.0	14.3	14.5	14.7	14.8	15.0	15.2	15.4	15.5	15.7	15.9	16.1	16.3	16.4	16.6	16.8	17.0
2.4	0.5	19.5	14.4	14.5	14.7	14.9	15.1	15.3	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.1
4.9	1.0	19.0	14.4	14.6	14.8	15.0	15.2	15.4	15.5	15.7	15.9	16.1	16.3	16.5	16.6	16.8	17.0	17.2
7.5	1.5	18.4	14.5	14.7	14.9	15.1	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.8	17.0	17.1	17.3
10.3	2.0	18.1	14.6	14.8	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.5
13.2	2.5	17.6	14.6	14.8	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.6	16.8	17.0	17.2	17.4	17.6
16.3	3.0	17.1	14.7	14.9	15.1	15.3	15.5	15.7	15.9	16.1	16.3	16.5	16.6	16.8	17.0	17.2	17.4	17.6
19.5	3.5	16.7	14.8	15.0	15.2	15.4	15.6	15.8	16.1	16.3	16.5	16.7	16.9	17.1	17.3	17.5	17.7	17.9
23.0	4.0	16.2	14.9	15.1	15.3	15.5	15.7	16.0	16.2	16.4	16.6	16.8	17.0	17.2	17.4	17.6	17.8	18.1
26.6	4.5	15.7	15.0	15.2	15.4	15.6	15.9	16.1	16.3	16.5	16.7	17.0	17.2	17.4	17.6	17.9	18.1	18.3
30.5	5.0	15.2	15.1	15.3	15.5	15.8	16.0	16.2	16.4	16.7	16.9	17.1	17.4	17.6	17.8	18.0	18.3	18.5
34.6	5.5	14.8	15.2	15.4	15.6	15.9	16.1	16.3	16.6	16.8	17.1	17.3	17.5	17.8	18.0	18.2	18.5	18.7
39.0	6.0	14.3	15.3	15.5	15.8	16.0	16.3	16.5	16.7	17.0	17.2	17.5	17.7	18.0	18.2	18.4	18.7	18.9
43.7	6.5	13.8	15.4	15.7	15.9	16.2	16.4	16.7	16.9	17.2	17.4	17.7	17.9	18.2	18.4	18.7	18.9	19.2
48.7	7.0	13.3	15.5	15.8	16.0	16.3	16.6	16.8	17.1	17.3	17.6	17.9	18.1	18.4	18.6	18.9	19.2	19.4
54.1	7.5	12.9	15.7	15.9	16.2	16.5	16.7	17.0	17.3	17.5	17.8	18.1	18.3	18.6	18.9	19.2	19.4	19.7
59.9	8.0	12.4	15.8	16.1	16.4	16.6	16.9	17.2	17.5	17.8	18.0	18.3	18.6	18.9	19.1	19.4	19.7	20.0
66.2	8.5	11.9	16.0	16.3	16.5	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.1	19.4	19.7	20.0	20.3
72.9	9.0	11.4	16.1	16.4	16.7	17.0	17.3	17.6	17.9	18.2	18.5	18.8	19.1	19.4	19.7	20.0	20.3	20.6
80.3	9.5	11.0	16.3	16.6	17.0	17.3	17.6	17.9	18.2	18.5	18.8	19.1	19.5	19.8	20.1	20.4	20.7	21.0
88.3	10.0	10.5	16.5	16.9	17.2	17.5	17.8	18.2	18.5	18.8	19.1	19.5	19.8	20.1	20.4	20.8	21.1	21.4
97.0	10.5	10.0	16.8	17.1	17.4	17.8	18.1	18.5	18.8	19.1	19.5	19.8	20.2	20.5	20.9	21.2	21.5	21.9
106.6	11.0	9.5	17.0	17.4	17.7	18.1	18.4	18.8	19.1	19.5	19.9	20.2	20.6	20.9	21.3	21.7	22.0	22.4
117.2	11.5	9.0	17.3	17.7	18.0	18.4	18.8	19.2	19.5	19.9	20.3	20.7	21.0	21.4	21.8	22.2	22.5	22.9
129.0	12.0	8.6	17.6	18.0	18.4	18.8	19.2	19.6	20.0	20.3	20.7	21.1	21.5	21.9	22.3	22.7	23.1	23.5
142.1	12.5	8.1	17.9	18.3	18.8	19.2	19.6	20.0	20.4	20.8	21.3	21.7	22.1	22.5	22.9	23.4	23.8	24.2
156.8	13.0	7.6	18.3	18.7	19.2	19.6	20.1	20.5	21.0	21.4	21.8	22.3	22.7	23.2	23.6	24.1	24.5	24.9
173.4	13.5	7.1	18.7	19.2	19.7	20.1	20.6	21.1	21.6	22.0	22.5	23.0	23.4	23.9	24.4	24.9	25.3	25.8
192.4	14.0	6.7	19.2	19.7	20.2	20.7	21.2	21.7	22.2	22.6	23.1	23.6	24.1	24.6	25.1	25.6	26.1	26.6
214.2	14.5	6.2	19.8	20.3	20.9	21.4	22.0	22.5	23.0	23.6	24.1	24.7	25.2	25.8	26.3	26.9	27.5	28.1
239.4	15.0	5.7	20.4	21.0	21.6	22.2	22.8	23.4	24.0	24.6	25.1	25.7	26.3	26.9	27.5	28.1	28.7	29.2
269.2	15.5	5.2	21.2	21.9	22.5	23.1	23.8	24.4	25.1	25.7	26.3	27.0	27.6	28.3	28.9	29.5	30.2	30.8
304.7	16.0	4.8	22.2	22.9	23.6	24.3	25.0	25.7	26.4	27.1	27.8	28.5	29.2	29.9	30.6	31.3	32.0	32.7

Appendix A

WOOD 40% MOISTURE 300°F to 450°F

WOOD 40% MOISTURE

EXIT GAS HEAT LOSSES

%	%	%	NET STACK TEMPERATURE DEG F															
			EXIT FLUE GAS TEMPERATURE - COMBUSTION AIR TEMPERATURE															
			300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450
0.0	0.0	20.0	17.0	17.1	17.3	17.5	17.7	17.8	18.0	18.2	18.4	18.6	18.7	18.9	19.1	19.3	19.4	19.6
2.4	0.5	19.5	17.1	17.3	17.4	17.6	17.8	18.0	18.2	18.3	18.5	18.7	18.9	19.1	19.3	19.4	19.6	19.8
4.9	1.0	19.0	17.2	17.4	17.6	17.8	17.9	18.1	18.3	18.5	18.7	18.9	19.1	19.2	19.4	19.6	19.8	20.0
7.5	1.5	18.6	17.3	17.5	17.7	17.9	18.1	18.3	18.5	18.7	18.9	19.0	19.2	19.4	19.6	19.8	20.0	20.2
10.3	2.0	18.1	17.5	17.7	17.9	18.1	18.3	18.4	18.6	18.8	19.0	19.2	19.4	19.6	19.8	20.0	20.2	20.4
13.2	2.5	17.6	17.6	17.8	18.0	18.2	18.4	18.6	18.8	19.0	19.2	19.4	19.6	19.8	20.0	20.2	20.4	20.6
16.3	3.0	17.1	17.8	18.0	18.2	18.4	18.6	18.8	19.0	19.2	19.4	19.6	19.8	20.0	20.2	20.4	20.6	20.8
19.5	3.5	16.7	17.9	18.2	18.4	18.6	18.8	19.0	19.2	19.4	19.6	19.8	20.0	20.3	20.5	20.7	20.9	21.1
23.0	4.0	16.2	18.1	18.3	18.5	18.8	19.0	19.2	19.4	19.6	19.8	20.1	20.3	20.5	20.7	20.9	21.1	21.4
26.6	4.5	15.7	18.3	18.5	18.7	19.0	19.2	19.4	19.6	19.9	20.1	20.3	20.5	20.7	21.0	21.2	21.4	21.6
30.5	5.0	15.2	18.5	18.7	19.0	19.2	19.4	19.6	19.9	20.1	20.3	20.6	20.8	21.0	21.2	21.5	21.7	21.9
34.6	5.5	14.8	18.7	18.9	19.2	19.4	19.6	19.9	20.1	20.4	20.6	20.8	21.1	21.3	21.5	21.8	22.0	22.2
39.0	6.0	14.3	18.9	19.2	19.4	19.7	19.9	20.1	20.4	20.6	20.9	21.1	21.4	21.6	21.8	22.1	22.3	22.6
43.7	6.5	13.8	19.2	19.4	19.7	19.9	20.2	20.4	20.7	20.9	21.2	21.4	21.7	21.9	22.2	22.4	22.7	22.9
48.7	7.0	13.3	19.4	19.7	19.9	20.2	20.5	20.7	21.0	21.2	21.5	21.7	22.0	22.3	22.5	22.8	23.0	23.3
54.1	7.5	12.9	19.7	20.0	20.2	20.5	20.8	21.0	21.3	21.6	21.8	22.1	22.4	22.6	22.9	23.2	23.4	23.7
59.9	8.0	12.4	20.0	20.3	20.5	20.8	21.1	21.4	21.7	21.9	22.2	22.5	22.8	23.0	23.3	23.6	23.9	24.2
66.2	8.5	11.9	20.3	20.6	20.9	21.2	21.5	21.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.3	24.6
72.9	9.0	11.4	20.6	20.9	21.2	21.5	21.8	22.1	22.4	22.7	23.0	23.3	23.6	23.9	24.2	24.5	24.8	25.1
80.3	9.5	11.0	21.0	21.3	21.6	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.5	24.8	25.1	25.4	25.7
88.3	10.0	10.5	21.4	21.8	22.1	22.4	22.7	23.1	23.4	23.7	24.0	24.4	24.7	25.0	25.3	25.7	26.0	26.3
97.0	10.5	10.0	21.9	22.3	22.6	22.9	23.2	23.6	23.9	24.3	24.6	24.9	25.3	25.6	26.0	26.3	26.7	27.0
106.6	11.0	9.5	22.4	22.7	23.1	23.4	23.8	24.2	24.5	24.9	25.2	25.6	25.9	26.3	26.7	27.0	27.4	27.7
117.2	11.5	9.0	22.9	23.3	23.7	24.0	24.4	24.8	25.2	25.5	25.9	26.3	26.7	27.0	27.4	27.8	28.2	28.5
129.0	12.0	8.6	23.5	23.9	24.3	24.7	25.1	25.5	25.9	26.3	26.7	27.1	27.5	27.9	28.3	28.7	29.1	29.5
142.1	12.5	8.1	24.2	24.6	25.0	25.4	25.9	26.3	26.7	27.1	27.5	28.0	28.4	28.8	29.2	29.6	30.0	30.5
156.8	13.0	7.6	24.9	25.4	25.8	26.3	26.7	27.2	27.6	28.1	28.5	28.9	29.4	29.8	30.3	30.7	31.2	31.6
173.4	13.5	7.1	25.8	26.3	26.8	27.2	27.7	28.2	28.6	29.1	29.6	30.1	30.5	31.0	31.5	31.9	32.4	32.9
192.4	14.0	6.7	26.8	27.3	27.8	28.3	28.8	29.3	29.8	30.3	30.8	31.3	31.8	32.3	32.9	33.4	33.9	34.4
214.2	14.5	6.2	27.9	28.5	29.0	29.6	30.1	30.6	31.2	31.7	32.3	32.8	33.4	33.9	34.4	35.0	35.5	36.1
239.4	15.0	5.7	29.2	29.8	30.4	31.0	31.6	32.2	32.8	33.4	33.9	34.5	35.1	35.7	36.3	36.9	37.5	38.1
269.2	15.5	5.2	30.8	31.5	32.1	32.7	33.4	34.0	34.6	35.3	35.9	36.6	37.2	37.8	38.5	39.1	39.8	40.4
304.7	16.0	4.8	32.7	33.4	34.1	34.8	35.5	36.2	36.9	37.6	38.3	39.0	39.7	40.4	41.1	41.8	42.5	43.2