Appendix J

Air Heater Heat Loss to Stack Calculations

													····	Cond	ditions -	- Assigned or	Observe	d				
		Comb	usiti	on Ca	alcula	itions	Mc	olal B	asis						and	l Miscellaneou	ıs					
												Date		04/18/94		en Unit 2 with		trom Air	Heate	r		
												Fuel B	ituminous	Coal	_		7			 .		
1							F	lue Gas	(F.G.) (Compositi	on	Source	9									;
1	Fuel, C	02, and A	Air per U	Jnit of F	uel			Moles	per Fuel	Unit (AF)												l N
				Moles			1		1	<u> </u>	1	Fuel U	nit 100 lbs	3								E
L		Per	Mol.	Fuel	02	02		}			ļ											-
1 .	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2		1		ļ	Fuel A	nal.as Fire	ed (AF), % by Wt or V	ol							а
N	Constituent	Unit,	Dive-	stit-	ti-	Theo	+	02	N2	H2O	СО	С	72.4	Moles C/100 lb fuel							*	+ -
E		lb	sor	uent	plier	Reqd	SO2		l		[H2	4.9	C in fuel	6.04							
1	C to CO2	72.20	12	6.02	1	6.02	6.02					S	1.6	C in refuse	0.02							ь
2	C to CO	0.00	12	0.00	0.5	0.00				 	0.00	02	6.0	C in CO2+CO	6.02							1 1
3	CO to CO2		28		0.5	1						N2	1 4	C in CO2	6.02							
4	C unburned											H2O	7.0	C in CO	0.00							
	line k	0.24	12	0.02		l					1	Ash	6.7									
5	H2	4.88	2	2.44	0.5	1.22			ļ	2.44	İ		100.0									
6	s	1.62	32	0.05	1	0.05	0.05		l		İ				12.5	O2	7	CO	0	N2	80.5	С
7	O2 (deduct)	5.97	32	0.19	1	-0.19		}						Total air (T.A.) assig						149.1	%	d
8	N2	1.44	28	0.05		0.00		l	0.05					Lines f, g, h For Ga								е
9	CO2		44			0.00		l	1		l	:		Wt fuel unit = sum(m		ch x mol. wt)	lb					f
10	H2O	7.00	18	0.39		0.00				0.39				Mol. wt of fuel = line								g
11	Ash	6.65				0.00					ĺ			Density of fuel @ 80	F & 30i	in. = line g/39						h
12	Sum	100.00		9.16		7.10						l		Fuel Heat Value			12,959	Btu/lb		/cu ft		11
									1					Combustible in refus						3.43	%	النا
	00 4 4: 1		T-4-1 4		440.4	0/			1		1			Carbon unburned, lb								
i i	O2 and Air, I		Total	Air =	149.1	%		į	1			1		= % ash in fuel x %		00-%"C")				0.2	<u>%</u>	k
13	(see Line d at O2 (theo) req	0 ,	12			7.10			1			1		Exit temp of fuel gas						264	F	$\perp \perp$
	O2 (theo) req			0 - 02	lina 12			3.49	1		1			Dry-bulb (ambient) to	emp, t'1					80	F	m
	O2 (total) sup	•			iiie 12	10.59	1	3.49				1		Wet-bulb temp Rel humid. (psychror		h4\					F	n
	N2 supplied =	•				39.86			39.86		1			B*, barometric press						60 30.00	%	0
17	Air (dry) supp			10		50.45			33.00					Sat. press. H2O at a						1.032		P
1	H2O in air = n			//B - A)*		1.06		-	1	1.06	1			A*, press. H2O in air						0.619		q r
	Air (wet) supp					51.51			1	1.00		1		Total	1 11163 (Wet Flue Ga		Dry	Flue (+
	Flue gas cons				total	01.01	6.07	3.49	39.91	3.89	0.00			Moles	Ì	53.36	15		49.47	Jas		s
	, lao gao come	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		, 10 10,	.0.0.		0.01	0.10	100.01	0.00	0.00	l		I WIOICS	1	33.30		<u> </u>	+5.41			1.5
21	*Note for air	rat 80 F	and 60	% relativ	e humi	ditv. A/(B - A) =	0.0212	is often	used as	standard	1										
						,,(,															
	Determinatio	n of Flu	e Gas a	nd Con	nbustib	le Loss	ses in B	tu per	Fuel Un	it (AF)												
22	Flue gas cons							•	- 1	CO2 +	SO2	02	N2	H2O	co	Total					· · · · · · · · · · · · · · · · · · ·	
23	Mcp, mean, t2									9.42	10.02	7.12	6.96	8.10	6.98							
24	In dry flue gas	= moles	each,	line 20 x	Мсрх	(t2 - t'1))			10,430	93	4,571	51,131]	0	66,226						
25	In H2O in air :	= moles l	120, lin	e 18 x N	Иср x (t	2 - t'1)					1			1,584		1,584						
26	In sens heat,	H2O in fi	ie! = mo	oles, line	es (5 +	10) x Mo	cp x (t2	- t'1)			·		1	4,217		4,217						
27	In latent heat,	H2O in 1	uel = m	oles, lin	es (5 +	10) x 10	040 x 18	3					1	52,985		52,985						ŀ
28	Total in wet flu	ue gas										-	-	•		125,012						
29	Due to carbon	in refus	e = line	k x 14,1	00											3,330						1
30	Due to unburn	ned CO ii	n flue ga	as = mo	les C to	CO x 1	2 x 9,75	55								0						
	Total flue gas							9 + 30								128,342						i
32	Heat value of	fuel unit	= 100 x	line i fo	r solid a	and liqui	d fuels									1,295,900						İ
33	Stack and cor	nbustible	loss, %	of hea	t input =	= 100 x	line 31/l	ine 32								9.90	%					

Fuel Fuel														-	Con	ditions	Assigned o	r Observe	ed				
Date			Com	busit	ion C	alcula	ations	Mc	olal B	asis			-			and	Miscellanen						
Fuel O2, and Air per Unit of Fuel													Data		04/10/04								
Fuel Oz. and Air per Unit Fuel Oz. and Air per Unit Fuel Oz. and Air per Unit								T		···				ituminous		Millike	n Unit 2 Wit	in Ljungs	trom Air	Heate	<u>r</u>		т.
Fue Out								F	lue Gas	(F.G.)	Compositi	on	1		Cuai								-
Fuel Note Fuel Vision Fuel O2 O2 O2 O3 O3 O4 O5 O5 O5 O5 O5 O5 O5		Fuel.	O2. and	Air per l	Unit of F	uel		'		. ,	•		Source	-									1.5
Fue Fue Fue Wilson Fue W	-	T		F		T	1	 	T	T de	T CITE (A)	Τ	اريمارا	nit 100 lh									N
Fuel Fuel Fuel Fuel Wil Con- Mul Moles Co2 No No Constituent Theorem No No No Pier Regal SO2 No No Pier Regal SO2 No No No Pier No No No Pier No No No No Pier No No No Pier No No No Pier Pier No	L		Per	Mol	1	02	02						Fuelo	THE TOO IDS	•								E
N Constituent Unit, Dive- stit. Ib. Theo + 02 N2 N2 N2 N2 N2 N2 N2 N2 N2 N2 N2 N2 N2	ī	Fuel		1			1	002					Eugl A	nal ac Eire	od (AE) 0/ by M/4 a= 1/								┿
E	N				1	1	f .	1	02	N2	Han	00			· · · · · · · · · · · · · · · · · · ·								а
1 Clo CO2		i i	l '		1	1		1	02	1112	1120	00											
2 Clo Co					+				 	 		 			-1								
3 Co Co Co Co 2 28		1	ľ	i .	1	1		0.01				0.00											b
4 Cunburned line k			0.00	1	0.00		0.00					0.00			-4								1
Inc k				-		0.0		İ							-								
S		1	0.34	12	0.03	1]						10 111 00	0.00							
6 S 1,71 32 0.05 1 0.05 0	5			l	1	0.5	1 22		1		2 4 4		ASII		-								
7 02 (deduct) 5.56 32 0.19 1 0.19 0.00				1	1	1		0.05			2.44		-	100.0	600	2 40 4							<u> </u>
8 N2		1	ı	l	1		1	0.00										1.1	CO	U			C
Second S				1	1	· '	1	1		0.05											150.2	%	d
10				ı	0.00		1			0.03								16					e
11			7.00		0.39					1	0.30	1	1				n x moi. wt)	ID					l f
12 Sum 100 00 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 7.09 9.16 9					0,00				ĺ	1	0.00	İ					- 1: (0.0	4 11 / 61					g
O2 and Air, Moles for Total Air = 150.2 % (see Line d at right) O2 (theo) reqd = O2, line 12 7.09		1 -			9 16	1		1								F & 30II	i. = line g/39		D. (1)				h_
Carbon unburned, lb/100 lb fue Sash in fue x %"C"/(100.%"C") O.3 % (see Line d at right) (se	_			•	1 0		1 7.00		1	1						0 0/ "С"		12.978	Btu/ID	<u>-</u>			 !
O2 and Air, Moles for Total Air = 150.2 % See Line d at right) See Line d at right) C2 (excess) = (T.A 100)/100 x O2, line 12 7.09 3.56 3.56 3.56 0.10 40.10																					4.85	%	┼┴
(see Line d at right) (see Line dat right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right) (see Line d at right)		O2 and Air.	Moles for	r Total A	Air =	150.2	%			l											- 0.0	0/	
13 O2 (theo) reqd = O2, line 12 7.09 3.56 3.56 3.56 02 (excess) = (T.A 100)/100 x O2, line 12 7.09 3.56 7.09 3.50 3.56 7.09 3.56 7.09 3.56 7.09 3.56 7.09 3.50 7.09 3.56 7.09 3.50 7.09 3.56 7.09 3.50 7.09 3.56 7.09 3.50 7.09 3.56 7.09 3.50 7.09 3.56 7.09 3.50 7.09 3.50 3.56 7.09 3.50 3.56 7.09 3.50 3.56 7.09 3.50 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.50 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.50 3.56 3							,,	}		1			İ				0-70 C)					%	k
14 O2 (excess) = (T.A 100)/100 x O2, line 12 3.56	13	O2 (theo) reg	d = O2. I	ine 12			7.09					İ				·						<u>-</u>	
15 O2 (total) supplied = lines 13 + 14 10.65 40.10 40.10 40.10 40.10 8th positive decision of Flue Gas and Combustible Losses in Btu per Fuel Unit (AF) 10.65 40.10 10.50 10.65 40.10 10.65 40.10 40.1	14	O2 (excess)	= (T.A	100)/10	0 x O2.	line 12	3.56		3.56				ł			sinp, t i					- 60	<u>-</u>	m
16 N2 supplied = 3.76 x O2, line 15 40.10 40.10 40.10 Air (dry) supplied = O2 + N2 50.75 1.07 Air (wet) supplied = lines 17 + 18 51.82 6.06 3.56 40.15 3.90 0.00 0.00 Moles 53.67 Moles Moles 53.67 Moles	15						10.65	1					l			metric ch	art)				60	<u> </u>	n
Air (dry) supplied = O2 + N2	16	N2 supplied =	3.76 x C	2, line	15		40.10			40.10												70	0
18	17	Air (dry) supp	lied = O2	2 + N2			50.75					1			Sat press H2O at a	mh temn	in Ha		· · · · · · · · · · · · · · · · · · ·				P
Air (wet) supplied = lines 17 + 18	18				/(B - A)*		1.07				1.07				A*, press, H2O in air	lines (o	x a) in Ha						l d
20 Flue gas constituents = lines 1 to 18, total 6.06 3.56 40.15 3.90 0.00 Moles 53.67 49.77 21 *Note for air at 80 F and 60% relative humidity, A/(B - A) = 0.0212 is often used as standard. Determination of Flue Gas and Combustible Losses in Btu per Fuel Unit (AF) Flue gas constituents Mcp, mean, t2 to t'1 In dry flue gas = moles each, line 20 x Mcp x (t2 - t'1) In H2O in air = moles H2O, line 18 x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) The first standard. CO2 + SO2 O2 N2 H2O CO Total 9.43 10.02 7.12 6.96 8.10 6.98 10,530 100 4,715 52,001 11,611 1,611 12,611 13,611 14,263 14,263	19	Air (wet) supp	lied = lin	es 17 +	18		51.82	1			1								Dry F				 ' -
21 *Note for air at 80 F and 60% relative humidity, A/(B - A) = 0.0212 is often used as standard. Determination of Flue Gas and Combustible Losses in Btu per Fuel Unit (AF) 22 Flue gas constituents Mcp. mean, t2 to t*1 In dry flue gas = moles each, line 20 x Mcp x (t2 - t*1) In H2O in air = moles H2O, line 18 x Mcp x (t2 - t*1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 23 In H2O in air = moles H2O, line 18 x Mcp x (t2 - t*1) 24 In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 25 In H2O in air = moles H2O, line 18 x Mcp x (t2 - t*1) 26 In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 27 In the the the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 28 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 29 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 20 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 20 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 21 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 22 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 23 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 24 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 25 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1) 26 In the third H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t*1)	20	Flue gas cons	stituents	= lines :	1 to 18,	total	•	6.06	3.56	40.15	3.90	0.00				1		30	1 '		°°		5
Determination of Flue Gas and Combustible Losses in Btu per Fuel Unit (AF) Flue gas constituents Mcp. mean, t2 to t'1 In dry flue gas = moles each, line 20 x Mcp x (t2 - t'1) In H2O in air = moles H2O, line 18 x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1)		1									· · · · · · · · · · · · · · · · · · ·				1		00.01			3.11			1 5
CO2 + SO2 O2 N2 H2O CO Total	21	*Note for ai	r at 80 F	and 609	% relativ	e humi	dity, A/(E	3 - A) =	0.0212	is often	used as s	tandard	l.										
CO2 + SO2 O2 N2 H2O CO Total							. ,	•															
23 Mcp, mean, t2 to t'1 9.43 10.02 7.12 6.96 8.10 10.530 100 4,715 52,001 10.611 1,611 10.611 4,263 10.698 10.69		Determinatio	n of Flu	e Gas a	nd Con	nbustib	le Loss	es in Bi	tu per F	uel Uni	t (AF)												
23 Mcp, mean, t2 to t'1 24 In dry flue gas = moles each, line 20 x Mcp x (t2 - t'1) 25 In H2O in air = moles H2O, line 18 x Mcp x (t2 - t'1) 26 In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) 27 In the transfer of		Flue gas cons	tituents									SO2	02	N2	H2O	CO	Total						
24 In dry flue gas = moles each, line 20 x Mcp x (t2 - t'1) 10 H2O in air = moles H2O, line 18 x Mcp x (t2 - t'1) 11 h2O in gar = moles H2O, line 18 x Mcp x (t2 - t'1) 11 h2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t'1) 12 h2 h2 h2 h2 h2 h2 h2 h2 h2 h2 h2 h2 h2	23										9.43	10.02	7.12	6.96	8.10								
25 In H2O in air = moles H2O, line 18 x Mcp x (t2 - t'1) 1,611 1,611 1,611 4,263 4,263											10,530	100	4,715	52,001		1 1	67,345						
26 In sens heat, H2O in fuel = moles, lines (5 + 10) x Mcp x (t2 - t1) 4,263 4,263															1,611								
27 In Island head 1120 in final - mater France (5 + 40) 4040 40		In sens heat,	H2O in fu	ıel = mo	oles, line	es (5 + 1	10) x Mc	p x (t2 -	t'1)						1								
1 J2,300 J2,300 J2,300	27			uel = m	oles, lin	es (5 +	10) x 10	40 x 18					1		52,985		52,985						
28 Total in wet flue gas															•								
29 Due to carbon in refuse = line k x 14,100 4,752																1							
30 Due to unburned CO in flue gas = moles C to CO x 12 x 9,755																1	J						
31 Total flue gas losses + unburned combustible = lines 28 + 29 + 30									+ 30								130,957						
32 Heat value of fuel unit = 100 x line i for solid and liquid fuels 1,297,800																ĺ	1,297,800						I
33 Stack and combustible loss, % of heat input = 100 x line 31/line 32	33	Stack and cor	nbustible	loss, %	of hea	t input =	100 x li	ne 31/lir	ne 32							<u></u>		%					-

												T		Condit	ions A	ssigned or O	bserved				
		Comi	hueiti	ion C	alcul:	ations	: Ma	olal F	lacie			ł			and Mi	scellaneous					
1		Com	busit	ion c	aicui	ations) 1011	Jiai L	Jusis			Date		04/20/94		Unit 2 with	Liupactr	om Air Haai			- 1
<u> </u>															Milliken	Unit 2 With	Ljungstr	om Air nea	lei		┰, ┨
1							_		(F.O.)				minous Co	oai							1 - 1
1							-			Compositio	n	Source									1 . 1
	Fuel, (02, and a	Air per l		uel	T	<u> </u>	Moles	per Fue	Unit (AF)	г	-									N
				Moles					1			Fuel Unit	100 lbs								E
L		Per	Mol.	Fuel	02	02															+
	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2							(AF), % by Wt or Vol							a
N	Constituent	Unit,	Dive-	stit-	ti-	Theo	+	O2	N2	H2O	СО	С	72.4	Moles C/100 lb fuel							
E	ļ	lb .	sor	uent	plier	Reqd	SO2	 	-			H2	4.9	C in fuel	6.03						1.1
1	C to CO2	72.13	12	6.01	1	6.01	6.01					S	1.7	C in refuse	0.02						b
2	C to CO	0.00	12	0.00	0.5	0.00					0.00	02	6.0	C in CO2+CO	6.01						1 1
3	CO to CO2		28		0.5							N2	1.3	C in CO2	6.01						1 1
4	C unburned						i					H2O	7.0	C in CO	0.00						1 1
	line k	0.27	12	0.02								Ash	6.7	4							1 1
5	H2	4.87	2	2.44	0.5	1.22				2.44			100.0	000	40.4		7.4		NO	00.5	+
6	S	1.70	32	0.05	1	0.05	0.05	l							12.4	02	7.1	CO 0	N2 150.2	80.5	c d
7	O2 (deduct)	5.99	32	0.19	1	-0.19	ŀ	ŀ	0.05					Total air (T.A.) assign					150.2	. %	e e
8	N2	1.33	28	0.05		0.00			0.05					Lines f, g, h For Ga							f
9	CO2	7.00	44	0.00		0.00		1		0.39				Wt fuel unit = sum(mo Mol. wt of fuel = line f		x moi. wt) ii)				g
10	H2O	7.00	18	0.39		0.00		•		0.39				Density of fuel @ 80	F 8 30in	- line a/204	lb/ou ft				h
11	Ash	6.71		9.15		7.10	{							Fuel Heat Value	r & SUITI.	- inte y/394	12.973	Dtu/lb	/cu ft		+ '' - 1
112	Sum	100.00	ı	9.15	ı	1 7.10								Combustible in refuse	9/4 "C"		12.010	Btarib	3 84	10/2	+: $+$
1														Carbon unburned, lb/					7 5	170	+
	O2 and Air.	Moles fo	r Total	Air =	150.2	%			1					= % ash in fuel x %			· · · · · ·		0.3	%	k
	(see Line d a		TOTAL	A11 -	150.2	70								Exit temp of fuel gas,		,, ,,			258		111
13	O2 (theo) red	0 ,	line 12			7.10		l						Dry-bulb (ambient) te						F	m
	O2 (excess)			0 x O2	line 12			3.56	l					Wet-bulb temp		*****				F	n
	O2 (total) sur					10.65	1	"""	1		l			Rel humid. (psychron	netric cha	irt)			60	%	0
	N2 supplied					40.11		İ	40.11			İ		B*, barometric pressu					30.00		P
17	Air (dry) supp					50.76	1					İ		Sat. press. H2O at ar					1.032	2	q
	H2O in air =			V(B - A)	•	1.07		l		1.07				A*, press. H2O in air,					0.619		r
	Air (wet) supp		,			51.83	1							Total		Wet Flue Ga	s	Dry Flu	ie Gas		
	Flue gas con				total	•	6.06	3.56	40.15	3.90	0.00			Moles		53.67		49.	78		s
21	*Note for a					•					standar	d.									
122	Determination		e Gas	and Cor	เเมนริไป	DIE LOSS	es in B	iu per	ruel UN	CO2 +	502	02	N2	H2O	СО	Total					
	Flue gas con Mcp, mean, t									9.41	10.01		6.96	8.09	6.98	i Utai					
	In dry flue ga		c aach	line 20	v Mcc v	v /+2 _ +'1	1			10.067	95	4.510	49.749	0.03	0.30	64,420					l
	In H2O in air						,			.0,007	55	1 3,515	, ,,,,,,,	1,541		1,541					
	In sens heat,						cn x (t2	- t'1)						4,070		4,070					
27	In latent heat													52,891		52,891					
	Total in wet f			,		,				1	•	•	•	'		122,923					
	Due to carbo		se = line	k x 14.	100											3,775					
	Due to unbur					o CO x ²	12 x 9.7	55								0					
	Total flue gas															126,698					
32	Heat value of															1,297,300					
33	Stack and co	mbustibl	e loss,	% of hea	at input	= 100 x	line 31/	line 32								9.77	%				

Г	*****	· - · · · · · · · · · · · · · · · · · ·									<u>-</u>	T		Con	ditions	Assigned o	r Observe	ed			
l		Comi	ousiti	on Ca	alcula	ations	M	olal B	asis						and	Miscellaneo					
												Date		10/17/95							
Н						•	T						ituminous		MIIIIKE	n Unit 2 wi	tn Heat P	ripe			
							F	lua Gas	(F.G.)	Compositi	on	Source		Coar							L
l	Fuel	O2, and a	Air ner I	Init of F	امير		'			Unit (AF)		Source	3								1
\vdash	1 001,		Til per c	Moles	I	Τ	 	Ivioles	T	T OIIII (AF	<u>'</u>	 	-14.400.11								N
L	1	Per	Mol.	Fuel	02	02		i				Fuel O	nit 100 lb:	S							E
Ī	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2	1	ĺ	1	1	F		-1 (A.E.) O(1) M(1)							
N	Constituent	Unit.	Dive-	stit-	ti-	Theo	+	02	N2	H2O	СО	C		ed (AF), % by Wt or V							a
E	Constituent	lb lb	sor	uent	plier	Reqd	502	02	IN2	H2U			73 5	Moles C/100 lb fuel							
1	C to CO2	73.31	12	6.11	1	6.11	6.11	 	 	 	 	H2 S	4.8	C in fuel	6.12						
2	C to CO	0.00	12	0.00	0.5	0.00	0.11		1	l	0.00	02	5.0	C in refuse	0.02						b
3	CO to CO2	0.00	28	0.00	0.5	0.00					0.00	N2	1.5	C in CO2+CO	6.11						İ
4	Cunburned		20		0.5]	H20	7.0	C in CO2	6.11						
1	line k	0.18	12	0.02				1	l		l	Ash	6.6	C in CO	0.00						
5	H2	4.78	2	2.39	0.5	1.20				2.39		Asn	100.0	-							
6	S	1.72	32	0.05	1	0.05	0.05			2.39	1	<u> </u>	100.0		400						
7	O2 (deduct)	4.99	32	0.03		-0.16	0.00					1			2 13.3	02	5.75	co	0	N2 81	
8	N2	1.46	28	0.05	'	0.00			0.05			Ì		Total air (T.A.) assig	ned or b	ORSAT				136.8 %	d
9	CO2	1.40	44	0.03		0.00	İ		0.03	i	į	1		Lines f, g, h For G							е
10	H2O	7.00	18	0.39		0.00	i	j		0.39	1			Wt fuel unit = sum(m		ch x mol. wt) lb				f
11	Ash	6.56		0.55		0.00				0.39	i			Mol. wt of fuel = line		1. (0.					9
12	Sum	100.00		9.16		7.20		l			1	l		Density of fuel @ 80	F & 30n	n. = line g/3!					h
	-	100.00		0.10	ı	1 7.20		1		l				Fuel Heat Value	0/ 1101		13,029	Btu/lb		/cu ft	<u> </u> _ <u> </u>
	Ì]					Combustible in refus						2 72 %	
	O2 and Air.	Moles for	Total A	Air =	136.8	%								Carbon unburned, lb							
	(see Line d a				100.0	,0			ĺ			İ		= % ash in fuel x 4 Exit temp of fuel gas		00-% "C")				0.2 %	k
13	O2 (theo) req		ine 12			7.20		İ	l					Dry-bulb (ambient) to						289 F	
	O2 (excess)			0 x O2	line 12			2.65						Wet-bulb temp	emp, cr					80 F	m
	O2 (total) sup					9.85		2.00		l				Rel humid. (psychro	motrio al	20.54)				P 00 01	n
	N2 supplied =					37.08			37.08	1				B*, barometric press						60 %	0
	Air (dry) supp					46.93			01.00					Sat. press. H2O at a						30.00	P
18	H2O in air = r			/(B - A)*		0.99				0.99	1			A*, press. H2O in air	lino tenip	o, iii. mg				1.032	9
19	Air (wet) supp					47.92				0.00		1		Total		Wet Flue G		T -		0.619	r
20	Flue gas cons				total		6.16	2 65	37.13	3.77	0.00			Moles		49.71	as		Flue G 45.94	as	1
				•		,					0.00			Wioles		43.71		·	45.94		S
21	*Note for ai	r at 80 F	and 60°	% relativ	e humi	dity, A/(B - A) =	0.0212	is often	used as	standar	d.									
	Determinatio		e Gas a	nd Con	nbustib	le Loss	es in B	tu per	Fuel Un	it (AF)											
	Flue gas cons	tituents								CO2 +	SO2	02	N2	H2O	TcoT	Total	Γ				
	Mcp, mean, ta								1	9.48	10.07	7.14	6.97	8.11	6.99						
	In dry flue gas)			12,097	113	3,952	54,097		0	70,259					
25	In H2O in air	= moles l	120, lin	e 18 x N	Лсрх (t	2 - t'1)						·		1,677		1,677					
26	In sens heat,	H2O in fu	iel = mo	oles, line	es (5 + 1	10) x Mc	p x (t2	- t'1)						4,713		4,713					
27	In latent heat,	H2O in f	uel = m	oles, lin	es (5 +	10) x 10	040 x 18	3	1					52,021		52,021					
28	Total in wet flu	ie gas									-		•			128,670					
29	Due to carbor	in refus	e = line	k x 14,1	00											2,585					
30	Due to unburn	ed CO ir	flue ga	as = mol	les C to	CO x 1	2 x 9,75	55							1	2,505					
31	Total flue gas	losses +	unburn	ed com	bustible	= lines	28 + 29	+ 30								131,255					
32	Heat value of	fuel unit	= 100 x	line i fo	r solid a	and liquid	d fuels									1,302,900					
	Stack and cor							ne 32								10.07	%				
																	-				

														Condi	itions Assigned or	Observe	d				
1		Coml	busiti	on Ca	alcula	ations	Mc	olal B	asis						and Miscellaneou	s					
1												Date		10/18/95	Milliken Unit 2 with	Heat Pi	ine				
						···							tuminous				ъ				\neg
1							F	lue Gas	(F.G.) (Compositi	on	Source									
1	Fuel (02, and	Air ner l	Unit of F	uel				` ,	Unit (AF)											N
	1 001,	2, 4114	T	Moles	1	T		I I	I	T	<u></u>	Fuel III	nit 100 lb:	•							
L		Per	Mol.	Fuel	02	02						li dei oi	1100 103	3							Е
17	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2					Fuel A	and an Eire	ed (AF), % by Wt or Vo	\I						
Ι'n	Constituent	Unit.	Dive-	stit-	ti-	Theo	+	02	N2	H2O	co	C	73.7	Moles C/100 lb fuel	JI						а
E	Constituent	lb	sor	uent	plier	Regd	SO2	02	1112	H2U	00	H2	4.8	C in fuel	6.14						1
1	C to CO2	73.49	12	6.12	1	6.12	6.12	 			 	S	1.8	C in refuse	0.02						١. ١
2	C to CO	0.00	12	0.12	0.5	0.00	0.12				0.00	02	5.3	C in CO2+CO	6.12						ь
3	CO to CO2	0.00	28	0.00	0.5	0.00					0.00	N2	1.5	10 in CO2+CO	6.12 6.12						ı
4	C unburned		20	Ì	0.5			1				H20	6.3	C in CO							i
4	line k	0.20	4.2	0.02	ĺ						1			Ac in co	0.00						i
5	H2	l	12 2	2.42	0.5	1 21				2.42		Ash	6.6 100.0	-							1
6	S S	4.84 1.76	32	0.06	0.5	0.06	0.06			2.42		⊢ — •	100.0	CO2	13.2 02	E 0		- 0	NO	0.4	
7	1 -	1	32	0.06	1	-0.17	0.06									5.8	СО	0		81	С
8	O2 (deduct) N2	5.31 1.49	28	0.17	1	0.00			0.05					Total air (T.A.) assign					137.2 %		d
9	CO2	1.49	44	0.05		0.00		l	0.05					Lines f, g, h For Ga							е
10	H2O	6.30	18	0.35	ļ	0.00		l		0.35				Wt fuel unit = sum(mo		ID					f
1			10	0.35						0.35	1			Mol. wt of fuel = line f							g
11	Ash	6.62	1	0.40	l	0.00		l			1			Density of fuel @ 80 I	F & 30in. = line g/394						h
12	Sum	100.00	l	9.18	ŀ	7.22					1			Fuel Heat Value	0/ 11011	13,137	Btu/lb		cu ft		
														Combustible in refuse					2.89 %		μ
1	02 4 4:-	NA-1 6-	- T-4-1	A:	1272	0/					1			Carbon unburned, lb/							—
	O2 and Air,		riotari	AIr =	137.2	%								= % ash in fuel x %				-	0.2 %		k
1	(see Line d a	0 ,	i: 40			1 7 00						İ		Exit temp of fuel gas,					294 F		1
	O2 (theo) req				E 40	7.22		2.69			1	l		Dry-bulb (ambient) te	mp, t'i				80 F		m
14	O2 (excess)				line 12			2.69		1	1			Wet-bulb temp					F		n
15	O2 (total) sup					9.91			37.30		1			Rel humid. (psychrom					60 %	,	0
16	N2 supplied =			15		37.30			37.30		1			B*, barometric pressu					30.00		P
17	Air (dry) supp			//D A)		47.21				4.00	1			Sat. press. H2O at an					1.032		Р
18	H2O in air = 1					1.00				1.00				A*, press. H2O in air,					0.619		г
	Air (wet) supp				4-4-1	48.21	0.40	200	27.00	2.70	0.00			Total	Wet Flue Ga	s		Flue G	as		ı l
20	Flue gas con:	stituents	= lines	1 to 18,	тотат		6.18	2.69	37.36	3.76	0.00	L		Moles	49.98		<u> </u>	46.22			s
21	*Note for ai					, ,	,				standar	d.									
22	Flue gas cons		'							CO2 +	SO2	02	N2	H2O	CO Total						-
1	Mcp, mean, t									9.49	10.07	7.14	6.97	8.12	6.99						
	In dry flue ga		s each	line 20	к Мср х	(t2 - t'1)			12.432	119	4.108	55,741		0 72,399						
	In H2O in air						,			,		.,	,. , ,	1,729	1,729						
	In sens heat,						cp x (t2	- t'1)						4.808	4,808						
27	In latent heat,				•									51,808	51,808						
28	Total in wet fl		0. "		(,		-		'	ı	•	ı	' ',,,,,,	130,743						
29	Due to carbor	-	e = line	k x 14	100										2,776						
	Due to unbur					CO x 1	2 x 9 7	55							2,770						i
31	Total flue gas		-											ł	133,519						
32	Heat value of														1,313,700						
	Stack and co							line 32							1,313,700	2/6					
تت	aa ana oo		000, .	1106	puc	, 00 X		02						<u>-</u>	10.10	, v					

1				_										Con	ditions	Assigned o	r Observe	ed				-
		Comb	ousiti	on Ca	alcula	ations	: Мо	olal B	asis						and	Miscellaneo	us					
												Date		05/14/96	Millike	n Unit 2 wi	h Heat P	ine				
1												Fuel B	ituminous					.,,,,				Ti
ı							F	lue Gas	(F.G.) (Compositi	ion	Source	9									1:
į	Fuel, C	02, and <i>i</i>	Air per l	Jnit of F	uel					Unit (AF												l N
T				Moles		<u> </u>				T	Ή	Fuel U	nit 100 lb:	c c								
L		Per	Mol.	Fuel	02	02			İ			1. 00. 0	100 10.									E
	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2					Fuel A	nal as Fire	ed (AF), % by Wt or V	ol.							
N	Constituent	Unit.	Dive-	stit-	ti-	Theo	+	02	N2	H2O	CO	C	73.6	Moles C/100 lb fuel	UI							а
Е	o o moting o m	lb	sor	uent	plier	Regd	SO2	02	1112	1120	1 00	H ₂	4.9	C in fuel	0.40							
	C to CO2	73.38	12	6.12	1	6.12	6.12		 		╁	S	1.9	C in ruei	6.13 0.02							
	C to CO	0.00	12	0.00	0.5	0.00	0.12				0.00	02			_							Ь
	CO to CO2	0.00	28	0.00	0.5	0.00					0.00		4.3	C in CO2+CO	6.12							
	C unburned		20		0.5							N2	1.5	C in CO2	6.12							1
. "	line k	0.22	12	0.02	ŀ			i				H2O	6.4	C in CO	0.00							
5	H2 ""'e k	4.86			۸.	4 22		l		0.40	1	Ash	7.4	4								İ
	1		2	2.43	0.5	1.22	0.00			2.43		<u></u>	100.0									
	S O2 (daduat)	1.87	32	0.06	1	0.06	0.06								14.5	O2	4.35	СО	0	N2	81.2	С
	O2 (deduct)	4.32	32	0.14	1	-0.14								Total air (T.A.) assig						125.5	%	d
	N2	1.53	28	0.05		0.00			0.05			1		Lines f, g, h For G	aseous F	uels						е
- 1	CO2		44			0.00					Ì	l		Wt fuel unit = sum(n	oles ead	ch x mol. wt)	lb					f
- 1	H2O	6.43	18	0.36		0.00				0.36	1	1		Mol. wt of fuel = line	f/100							g
- 1	Ash	7.39				0.00								Density of fuel @ 80	F & 30ir	n. = line g/39	94 lb/cu ft					h
12	Sum	100.00		9.17		7.25						1		Fuel Heat Value			13,094	Btu/lb		/cu ft		i
														Combustible in refus	e, % "C'					2.89	%	1
														Carbon unburned, It	/100 lb f	uel						1-
	O2 and Air, I	Moles for	· Total A	Air =	125.5	%						ļ		= % ash in fuel x	%"C"/(10	0-%"C")				0.2	%	l k
1	(see Line d at	right)									1			Exit temp of fuel gas						288		Ti
13 (O2 (theo) req	d = O2, I	ine 12			7.25					1			Dry-bulb (ambient) t	emp. t'1					80		m
14 (O2 (excess) =	: (T.A	100)/10	0 x O2,	line 12	1.85		1.85						Wet-bulb temp							F	n
15 (O2 (total) sup	plied = li	nes 13	+ 14		9.10					1			Rel humid. (psychro	metric ct	nart)				60	%	1 0
16 1	N2 supplied =	3.76 x C	2, line	15		34.25			34.25		1	1		B*, barometric press						30.00	70	P
17 /	Air (dry) supp	lied = O2	+ N2			43.35								Sat. press. H2O at a						1.032		q
18 H	H2O in air = m	noles dry	air x A	/(B - A)*		0.91				0.91	1			A*, press. H2O in air						0.619		l r
19	Air (wet) supp	lied = lin	es 17 +	18		44.27								Total		Wet Flue G		Dry	Flue C		-	+-
20 F	Flue gas cons	tituents	= lines '	1 to 18.	total	' İ	6.17	1.85	34.31	3.70	0.00			Moles		46.03	3		42.33	oas		١.
	J					,				<u> </u>	1 0.00	1		I Woles	<u> </u>	40.03			42.33			s
21 1.	Note for air	at 80 F	and 60°	% relativ	e humi	dity A/(I	R - A1 =	0.0212	is often	used as	standar	4										
1		'					,		.5 0.1011		o.andan	- .										
l r	Determinatio	n of Flu	Gasa	nd Con	nhustih	عوم ا ماد	es in R	tu ner	Fuel He	it (AE)												
	Flue gas cons			0011		033		-a hei	ا ا	CO2 +	SO2	02	N2	H2O	1 00 1	Tot-!						
- 1	Mcp, mean, t2									9.47	10.06	7.14	6.97	8.11	6.99	Total						
	n dry flue gas		each	line 20 v	Mony	(t2 = t'1)				12,049	122	2.742	49,745	0.11	4 1	64.056						
	n H2O in air =				•	,			l	12,049	'22	2,142	49,745	1.540	0	64,658						
	n sens heat, I					,	n v (12	#14.V						1,542		1,542						
- 1	n latent heat, r										1			4,704		4,704						
1			uei – m	oies, im	es (5 +	10) X 10	74U X 18	•	1		I	1	l	52,177	ļL.	52,177						
- 1	Total in wet flu	-	a = 1:	1, , 4 4 4	.00											123,081						
	Due to carbon			,		00										3,101						
	Due to unburn		-													0						
	Total flue gas							+ 30								126,182						
	Heat value of														ŀ	1,309,400						
33 IS	Stack and con	nbustible	loss, %	of hea	t input =	= 100 x I	ine 31/li	ne 32							I	9.64	%					

		_										T		Conditions	s Assigned or Obs	erved		
l		Com	busiti	ion Ca	alcula	ations	: M	olal B	asis					а	nd Miscellaneous			
1												Date			iken Unit 2 with He	at Dine		
												Fuel B	ituminous		men onit 2 with the	attipe		- 11
l							F	lue Gas	(F.G.)	Compositi	ion	Source		364.				-
ļ	Fuel.	O2, and	Air per l	Unit of F	uel		1			Unit (AF		1000.00	•					.'.
	T		1	Moles	1	T	<u> </u>	1	1	I	Ή	1=	nit 100 lb					N
L		Per	Mol.	Fuel	02	02				1		l nei o	1111 100 10	•				E
Ιī	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2				1	Fuel A	nal an Eir	ed (AF), % by Wt or Vol				
N	Constituent	Unit.	Dive-	stit-	ti-	Theo	+	02	N2	H2O	co	C	72.3	Moles C/100 lb fuel				а
E	Constituent	lb lb	sor	uent	plier	Read	502	02	142	1120		H2	4.7	1	•			
1	C to CO2	72.16	12	6.01	1	6.01	6.01	 	 	 	-	S	1.9	C in fuel 6.0 C in refuse 0.0				
2	C to CO	0.00	12	0.00	0.5	0.00	0.01	İ	ŀ		0.00	02	4.0	4				b
3	CO to CO2	0.00	28	0.00	0.5	0.00	1		l	İ	0.00			C in CO2+CO 6.0				
4	C unburned		20		0.5	İ		1				N2	1.5	C in CO2 6.0				
"	line k	0.15	12	0.01				ļ			l	H2O	7.9	C in CO 0.0	0			
5	H2	4.70	12 2	2.35	0.5	1 10			1	2.25	1	Ash	7.7	4				- 1
	S	1.88	32	1		1.18	0.00		1	2.35		<u> </u>	100.0					
6 7	1		32	0.06	1	0.06	0.06					1		CO2 14.		6 CO 0	N2 81.	
1	O2 (deduct)	3.99	ı	0.12	1	-0.12								Total air (T.A.) assigned of			127.3 %	d
8	N2	1.49	28	0.05	Į	0.00			0.05			1		Lines f, g, h For Gaseou				е
9	CO2	7.04	44			0.00			İ					Wt fuel unit = sum(moles				f
10	H2O	7.94	18	0.44		0.00				0.44	ł			Mol. wt of fuel = line f/100				g
11	Ash	7.69			1	0.00	Į		1					Density of fuel @ 80 F & 3				h
12	Sum	100.00	l	9.05	l	7.12	i	l	ľ					Fuel Heat Value		BO9 Btu/lb	/cu ft	i
								İ	ļ	İ				Combustible in refuse, %			1.89 %	j
							İ							Carbon unburned, lb/100				
	O2 and Air,		r Total /	Air =	127.3	%	1							= % ash in fuel x %"C"/	(100-%"C")		0.1 %	k
	(see Line d at					F =								Exit temp of fuel gas, t2			290 F	- 1
	O2 (theo) req					7.12		l				İ		Dry-bulb (ambient) temp,	<u>t'1</u>		80 F	m
14	O2 (excess)				line 12			1.95						Wet-bulb temp			F	n
	O2 (total) sup	•				9.07		1	1					Rel humid. (psychrometric	chart)		60 %	0
	N2 supplied =			15		34.14			34.14					B*, barometric pressure, in			30.00	р
17	Air (dry) supp					43.21		1						Sat. press. H2O at amb te	emp, in. Hg		1.032	q
18	H2O in air = r				•	0.91				0.91	1	l		A*, press. H2O in air, lines	s (o x q), in. Hg		0.619	г
19	Air (wet) supp					44.12					1			Total	Wet Flue Gas	Dry Flue	Gas	
20	Flue gas cons	stituents	= lines	1 to 18,	total		6.07	1.95	34.19	3.70	0.00			Moles	45.92	42.2	1	s
	*Note for ai	n of Flu				• •	,			it (AF)								
	Flue gas cons									CO2+		02	N2	H2O CO				
	Mcp, mean, ta									9.48	10.07	7.14	6.97	8.12 6.99)			
	In dry flue gas					,)			11,968	124	2,920	50,061	0	65,073			
	In H2O in air													1,552	1,552			
	In sens heat,													4,757	4,757			
	In latent heat,		fuel = m	ioles, lin	ies (5 +	10) x 10	040 x 18	3						52,250	52,250			
	Total in wet flu	U													123,631			
	Due to carbor													1	2,089			
	Due to unburr														0			
	Total flue gas							+ 30							125,720			
32	Heat value of														1,280,900			
33	Stack and cor	nbustible	loss, %	6 of hea	t input :	= 100 x l	ine 31/l	ine 32						1	9.81 %			

													· · · · · · · · · · · · · · · · · · ·	Cone	ditions	Assigned or	Observe	ed			
1		Com	busit	ion C	alcula	ations	Mc	olal B	asis						and	Miscellaneo	us				
												Date		11/07/96		n Unit 2 wit		ine			
							I					+	ituminous			Olik Z Wit	ii ii dat i	170			Ti
1							F	lue Gas	(F.G.)	Compositi	on	Source									15
	Fuel,	O2, and	Air per	Unit of F	uel					Unit (AF)											N
	T			Moles	Ī	T			1	1	1	Fuelli	nit 100 lbs								E
L		Per	Mol.	Fuel	02	02			1			1 4010	100 101	,							-
Ī	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2		i	1		Fuel A	nal as Fire	ed (AF), % by Wt or V	ol.						а
N	Constituent	Unit.	Dive-	stit-	ti-	Theo	+	02	N2	H2O	co	C	70.5	Moles C/100 lb fuel	01					-	a
E		lb	sor	uent	plier	Regd	SO2		''-		"	H2	4.8	C in fuel	5.88						
1	C to CO2	70.39	12	5.87	1	5.87	5.87	 	†		†	S	2.9	C in refuse	0.01						
2	C to CO	0.00	12	0.00	0.5	0.00		İ	1	l	0.00	02	4.2	C in CO2+CO	5.87						10
3	CO to CO2		28		0.5	1			1		0.00	N2	1.4	C in CO2	5.87						
4	Cunburned			1]				H20	5.9	C in CO	0.00						ı
	line k	0.14	12	0.01				l	1			Ash	10.3	10 111 00	0.00						
5	H2	4.84	2	2.42	0.5	1.21	1	1		2.42		7,311	100.0	1							
6	s	2.90	32	0.09	1	0.09	0.09	1		1 2.72	1		100.0	CO	14.3	02	4.6	CO 0	N2	81.1	<u>_</u>
7	O2 (deduct)	4.19	32	0.13	i	-0.13	1	l		l				Total air (T.A.) assig			4.0		127.3		14 c
8	N2	1.38	28	0.05	· .	0.00	1		0.05					Lines f, g, h For G					127.	90	
9	CO2	,,,,,,	44		l	0.00			0.00	İ				Wt fuel unit = sum(m			lb.				e f
10	H2O	5.90	18	0.33		0.00	Ì	İ		0.33				Mol. wt of fuel = line		JI X IIIOI. WIJ	10				
11	Ash	10.26				0.00			Ì	0.00				Density of fuel @ 80		- line a/20	4 lb/ou ft				g h
12	Sum	100.00		8.90	1	7.04			l					Fuel Heat Value	1 0 3011	i iiie g/39	12,629	Btu/lb	/cu ft		
-		,	'	1 0.00	,	1						1		Combustible in refus	o % "C"		12,029	D LU/ID	1.3	7 10/	+
l	l											1		Carbon unburned, lb					1.3	1%	
	O2 and Air.	Moles fo	r Total	Air =	127.3	%								= % ash in fuel x					<u> </u>	1%	k
1	(see Line d a					,,		l		l				Exit temp of fuel gas		0-76 0)			292		+ `
13	O2 (theo) req	0 ,	ine 12			7.04		ŀ			İ			Dry-bulb (ambient) to						F	
	O2 (excess)			0 x O2	line 12			1.92				İ		Wet-bulb temp	silip, Ci				- 81	F	m
15	O2 (total) sup	•				8.96		1.02				I		Rel humid. (psychro	metric ch) art)				%	- "
16	N2 supplied =	•				33.72		1	33.72]				B*, barometric press				·	30.00		
1	Air (dry) supp					42.68			002					Sat. press. H2O at a					1.032		P a
	H2O in air = r			/(B - A)	•	0.90				0.90		1		A*, press. H2O in air					0.619		- q
	Air (wet) supp			,		43.58		İ		0.00				Total	T 100	Wet Flue Ga		Dry Flu		'\	
t	Flue gas con				total	1 .0.00	5.96	1 92	33.77	3.65	0.00	1		Moles		45.30	35	41.			1.
	as gas so			,	to tar	1	0.00	1.02	100.71	0.00	1 0.00			I Moles	<u> </u>	45.50	-	41.	.03		S
21	*Note for ai	rat80 F	and 60	% relativ	ze humi	dity A//F	3 - A) =	0.0212	is often	used as s	tandard										
				, , , , , , , , , , , , , , , , , , , ,		,,,(-	,				, and are	•									
	Determination	n of Flu	e Gas a	and Cor	nbustib	le Loss	es in B	tu per F	Fuel Un	it (AF)											
	Flue gas cons						•		•	CO2 +	SQ2	02	N2	H2O	ТсоТ	Total					
	Mcp, mean, t									9.48	10.07	7.14	6.97	8.12	6.99	, 0.01					
	In dry flue gas		s each.	line 20 >	(Мср х	(t2 - t'1)				11,791	193	2,913	49,921	0.12	0.33	64.818					
	In H2O in air									,,		-,5.0	1 ,0,02	1,548		1,548					
	In sens heat,					,	p x (t2 -	- t'1)						4,728		4,728					
	In latent heat,				•	,		,						51,438	1 1	51,438					
28	Total in wet fl				(-	,				1	ı	1	i	, 01,400		122,532					
	Due to carbor	•	e = line	k x 14 1	100										1	2,009					
30	Due to unbur					CO x 1	2 x 9 75	5								2,009					
31	Total flue gas														 	124,542					
32	Heat value of							. 00								1,262,900					
33	Stack and cor							ne 32							1	9.86	0/				
ے ت				5 5. 1100		, 00 A I	5 1711	02								9.00	/0				

														Conditi	ons Ass	signed or Observed	ŀ		
											1				and Mis	cellaneous			
		Coml	ousiti	on Ca	ilcula	tions	Mo	iai Ba	ISIS		1	D - 1-		11/08/96 M		nit 2 with Heat Pi	De		
												Date Fuel Bitur	minous C						Įι
-						İ						-uei Bilui Source	minous C	Juan					
										ompositio	n i	Source							1
	Fuel, (02, and	Air per l	Jnit of F	uel			Moles p	er Fuel I	Unit (AF)		Fuel Unit	100 lbs						1
				Moles					1		l l'	ruei Oiiii	100 103						
		Per	Mol.	Fuel	02	02				1	<u> </u>	Fuel Ana	Las Fired	d (AF), % by Wt or Vol					
	Fuel	Fuel	Wt	Con-	Mul-	Moles	CO2	00	N2	H2O	cot	C	69.3	Moles C/100 lb fuel					
1	Constituent	Unit,	Dive-	stit-	ti-	Theo	+	O2	IN Z	HZO :	1 ⁰⁰ 1	H2			5.78				- 1
Ξ		lb	sor	uent	plier	Reqd	SO2				-	S		C in refuse	0.03				
	C to CO2	68.99	12	5.75	1	5.75	5.75				0.00	02			5.75				
2	C to CO	0.00	12	0.00	0.5	0.00					1 0.00	N2		C in CO2	5.75				
,	CO to CO2		28	1	0.5	1					1 1	H2O		C in CO	0.00				
ļ	C unburned		1		İ	1					1 1	Ash	10.3						
	line k	0.34	12	0.03	1	1				2.35	1		100.0					NO 04	.09
5	H2	4.69	2	2.35	0.5	1.17	0.09			2.00				CO2		O2 4.935	CO 0	N2 81	.09
3	S	2.81	32	0.09	1	0.09	0.09							Total air (T.A.) assign	ed or by (ORSAT		130 %	
7	O2 (deduct)		32	0.12	1	0.00	İ	İ	0.05					Lines f, g, h For Gas	seous Fu	els			-
В	N2	1.34	28	0.05		0.00			0.00					Wt fuel unit = sum(mo	oles each	x mol. wt) lb			\rightarrow
9	CO2		44	0.40		0.00		1		0.42				Mol. wt of fuel = line fa	/100				+
0	1	7.58	18	0.42		0.00								Density of fuel @ 80 l	F & 30in.	= line g/394 lb/cu ft	D4(Ib	/cu ft	-+
1	1	10.33	4	0.00	-	6.89	1	1	1					Fuel Heat Value		12,306	Btu/ID	3.19 %	-+
2	Sum	100.00)	8.80	ı	0.09			1					Combustible in refuse	e, % "C"			3.19 //	-
							1				1			Carbon unburned, lb/				0.3 %	-
			T - 4 - 1	A i.e	130	%		ĺ						= % ash in fuel x %		-%"C")		280.5 F	
	O2 and Air		oriolai	All -	100	,,	1							Exit temp of fuel gas,				80 F	-
	(see Line d		line 12			6.89		1						Dry-bulb (ambient) te	mp, t1			F	
	O2 (theo) re O2 (excess)	eqo = 02	1001/1	v O2	line 12			2.06	1					Wet-bulb temp				60 %	
14) = (1.A. upplied =	lines 1:	3 + 14	, ,,,,,,	8.95	1	1	İ	į	1			Rel humid. (psychron	netric cha	110		30.00	$\neg \uparrow$
15		Jpplieu -	∩2 lin	e 15		33.69			33.69	1				B*, barometric pressi	ure, in. ng	in Ha		1.032	
16 17		n = 3.707	12 + N2	,		42.64	⊣ .							Sat. press. H2O at at A*, press. H2O in air	lines (o.)	va) in Ha		0.619	
17 18		moles (Irv air x	A/(B - A	.)*	0.90	1			0.90	Ì	1		Total		Vet Flue Gas	Dry Flue	Gas	
19		nnlied =	lines 17	+ 18	,	43.54	1		1					Moles	1	45.30	41.64	I .	
20		nstituen	s = line	s 1 to 18	3, total	,	5.84	2.06	33.74	3.66	0.00	1		I Willes		10.00			
	*Note for	air at 80	F and 6	30% rela	itive hur						standar	d.			· · · · · · · · · · · · · · · · · · ·				
	Determina	tion of F	iue Gas	s and C	บเทเมนรา	IIDIE FOS	,363 111	po.		CO2	+ SO2	02	N2	H2O	co	Total			
	Flue gas co		ts							9.46	10.05	7.13	6.97	8.11	6.99	04.464			
23	•	, 12 to 11	lan	h line 2	n y Man	x (t2 - t'	1)			10,901	177	2,951	47,135		0	61,164			
24		gas = mo	nes eac	lina 19	v Mcn v	(t2 - t'1)	.,]	1,461		1,461			
25	1	ur = mole	s nzu,	moles I	ines (5	+ 10) x N	Acp x (t	2 - t'1)		1			1	4,497	1	4,497			
26		at, H2U I	in luel =	moles	lines (5	+ 10) x	1040 x	18					1	51,782	<u> </u>	51,782			
2				moles,	03 (0	, ,										118,904			
21	8 Total in we	t flue gas		ne k v 1	4 100											4,799			
2	1	oon in re	iuse – II O in flee	110 K A 1	noles C	to CO x	12 x 9.	755								123,703			
31		ourned C	o in nue	yas - I	ombusti	ble = line	es 28 +	29 + 30											
3		as losse	5 + unb	O v line	i for soli	d and lin	uid fuel	s								1,230,600			
3	2 Heat value 3 Stack and	or idei t	int - 10	% of h	eat inni	ıt = 100	x line 3	1/line 32	!							10.00 70			