

ABMA

American
Boiler Manufacturers
Association

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Arlington VA 22209

DoE

United States
Department
of Energy

Division of Power Systems
Energy Technology Branch
Washington DC 20545

EPA

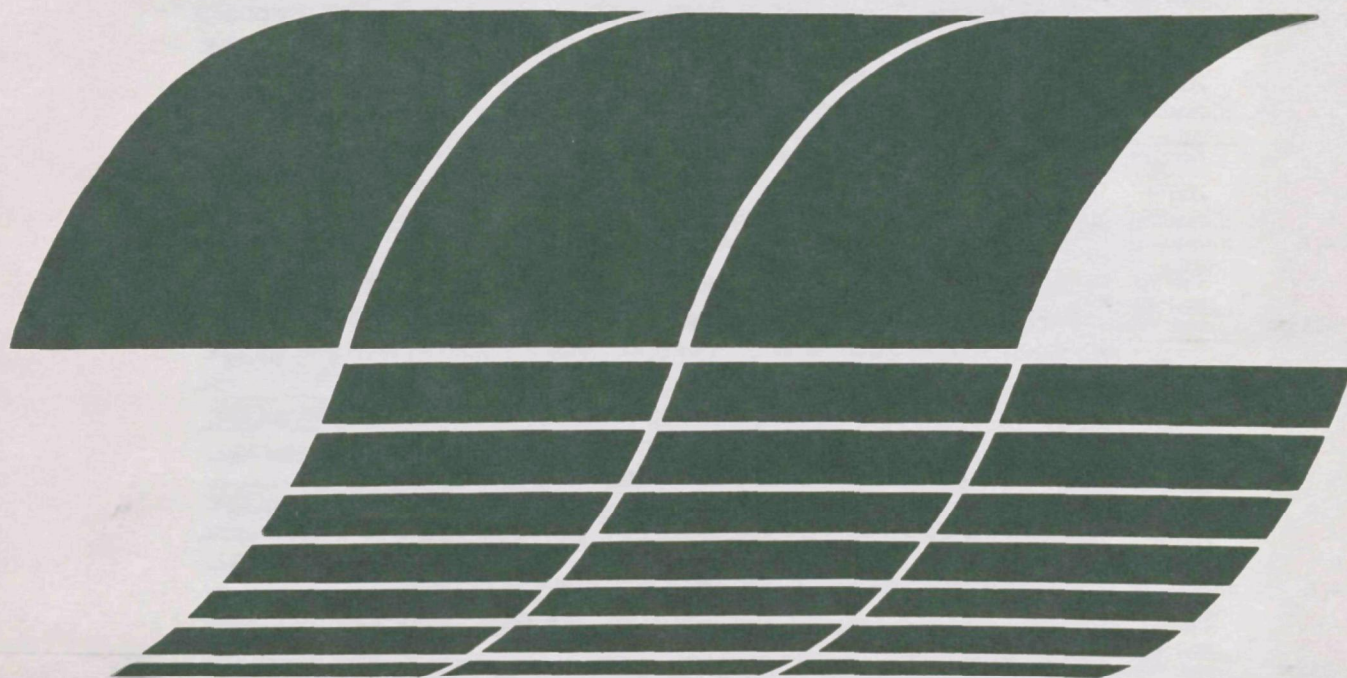
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April 1980

Field Tests of Industrial Stoker Coal-fired Boilers for Emissions Control and Efficiency Improvement — Site F (Data Supplement)

Interagency
Energy/Environment
R&D Program Report



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April 1980

Field Tests of Industrial Stoker Coal-fired Boilers for Emissions Control and Efficiency Improvement — Site F (Data Supplement)

by

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and

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ABSTRACT

The Data Supplement is a compilation of test data presented in greater detail than was practical in the Final Technical Report. It is intended to provide the necessary details to other researchers who are interested in performing their own analysis. Readers are referred to the contract final report for information as to objectives, description of facility tested and coals fired, test equipment and procedures, interpretations and conclusions. The Final Technical Report also contains data summaries not found in this volume. The Supplement contains panel board data for each test, detailed particulate, O₂, CO₂, NO, SO₂ and SO₃ data, particle size distribution data, chemical analysis of the coal and coal size consistency data.

KVB 15900-535

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FOREWORD

The purpose of this Data Supplement Volume is to document data in greater detail than was practical in the Final Technical Report.¹ It is intended to provide the necessary details to other researchers who are interested in performing their own analysis. Readers are referred to the contract final report for information as to objectives, description of facility tested and coals fired, test equipment and procedures, interpretations and conclusions. The Final Technical Report also contains data summaries not found in this volume.

The data in this volume are arranged by type (i.e., Panel Board Data, Particulate Data, etc.) and within each type by test number. Data summaries where they exist are at the front of each section. The boiler tested is referred to as Boiler F; as it is the sixth boiler tested under the program entitled, "A Testing Program to Update Equipment Specifications and Design Criteria for Stoker Fired Boilers."

¹Gabrielson, J. E., et al., "Field Tests of Industrial Stoker Coal-Fired Boilers for Emissions Control and Efficiency Improvement - Site F."

CONVERSION FACTORS

ENGLISH AND METRIC UNITS TO SI UNITS

<u>To Convert From</u>	<u>To</u>	<u>Multiply By</u>
in	cm	2.540
in ²	cm ²	6.452
ft	m	0.3048
ft ²	m ²	0.09290
ft ³	m ³	0.02832
lb	Kg	0.4536
lb/hr	Mg/s	0.1260
lb/10 ⁶ BTU	ng/J	430
g/Mcal	ng/J	239
BTU	J	1054
BTU/lb	J/kg	2324
BTU/hr	W	0.2929
J/sec	W	1.000
J/hr	W	3600
BTU/ft/hr	W/m	0.9609
BTU/ft/hr	J/hr/m	3459
BTU/ft ² /hr	W/m ²	3.152
BTU/ft ² /hr	J/hr/m ²	11349
BTU/ft ³ /hr	W/m ³	10.34
BTU/ft ³ /hr	J/hr/m ³	37234
psia	Pa	6895
"H ₂ O	Pa	249.1
Rankine	Celsius	C = 5/9R-273
Fahrenheit	Celsius	C = 5/9(F-32)
Celsius	Kelvin	K = C+273
Rankine	Kelvin	K = 5/9R

FOR TYPICAL COAL FUEL

ppm @ 3% O ₂ (SO ₂)	ng/J (lb/10 ⁶ Btu)	0.851 (1.98x10 ⁻³)
ppm @ 3% O ₂ (SO ₃)	ng/J (lb/10 ⁶ Btu)	1.063 (2.47x10 ⁻³)
ppm @ 3% O ₂ (NO)*	ng/J (lb/10 ⁶ Btu)	0.399 (9.28x10 ⁻⁴)
ppm @ 3% O ₂ (NO ₂)	ng/J (lb/10 ⁶ Btu)	0.611 (1.42x10 ⁻³)
ppm @ 3% O ₂ (CO)	ng/J (lb/10 ⁶ Btu)	0.372 (8.65x10 ⁻⁴)
ppm @ 3% O ₂ (CH ₄)	ng/J (lb/10 ⁶ Btu)	0.213 (4.95x10 ⁻⁴)

*Federal environmental regulations express NO_x in terms of NO₂;
thus NO units should be converted using the NO₂ conversion factor.

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CONVERSION FACTORS

SI UNITS TO ENGLISH AND METRIC UNITS

<u>To Convert From</u>	<u>To</u>	<u>Multiply By</u>
cm	in	0.3937
cm ²	in ²	0.1550
m	ft	3.281
m ²	ft ²	10.764
m ³	ft ³	35.315
Kg	lb	2.205
Mg/s	lb/hr	7.937
ng/J	lb/10 ⁶ BTU	0.00233
ng/J	g/Mcal	0.00418
J	BTU	0.000948
J/kg	BTU/lb	0.000430
J/hr/m	BTU/ft/hr	0.000289
J/hr/m ²	BTU/ft ² /hr	0.0000881
J/hr/m ³	BTU/ft ³ /hr	0.0000269
W	BTU/hr	3.414
W	J/hr	0.000278
W/m	BTU/ft/hr	1.041
W/m ²	BTU/ft ² /hr	0.317
W/m ³	BTU/ft ³ /hr	0.0967
Pa	psia	0.000145
Pa	"H ₂ O	0.004014
Kelvin	Fahrenheit	F = 1.8K-460
Celsius	Fahrenheit	F = 1.8C+32
Fahrenheit	Rankine	R = F+460
Kelvin	Rankine	R = 1.8K

FOR TYPICAL COAL FUEL

ng/J	ppm @ 3% O ₂ (SO ₂)	1.18
ng/J	ppm @ 3% O ₂ (SO ₃)	0.941
ng/J	ppm @ 3% O ₂ (NO)	2.51
ng/J	ppm @ 3% O ₂ (NO ₂)	1.64
ng/J	ppm @ 3% O ₂ (CO)	2.69
ng/J	ppm @ 3% O ₂ (CH ₄)	4.69

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SI PREFIXES

<u>Multiplication Factor</u>	<u>Prefix</u>	<u>SI Symbol</u>
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^9	giga	G
10^6	mega	M
10^3	kilo	k
10^2	hecto*	h
10^1	deka*	da
10^{-1}	deci*	d
10^{-2}	centi*	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

*Not recommended but occasionally used

EMISSION UNITS CONVERSION FACTORS
FOR TYPICAL COAL FUEL (HV = 13,320 BTU/LB)

Multiply To Obtain	By	% Weight in Fuel		lbs/10 ⁶ Btu		grams/10 ⁶ Cal		PPM (Dry @ 3% O ₂)		Grains/SCF. (Dry @ 12% CO ₂)	
		S	N	SO ₂	NO ₂	SO ₂	NO ₂	SO _x	NO _x	SO ₂	NO ₂
% Weight In Fuel	S	1		0.666	/	0.370	/	13.2x10 ⁻⁴	/	1.48	/
	N			/	0.405	/	0.225	/	5.76x10 ⁻⁴	/	.903
lbs/10 ⁶ Btu	SO ₂	1.50	/	1		(.556)	/	19.8x10 ⁻⁴	/	(2.23)	/
	NO ₂	/	2.47			/	(.556)	/	14.2x10 ⁻⁴	/	(2.23)
grams/10 ⁶ Cal	SO ₂	2.70	/			1		35.6x10 ⁻⁴	/	(4.01)	/
	NO ₂	/	4.44					/	25.6x10 ⁻⁴	/	(4.01)
PPM (Dry @ 3% O ₂)	SO _x	758	/	505	/	281	/	1		1127	/
	NO _x	/	1736	/	704	/	391			/	1566
Grains/SCF (Dry @ 12% CO ₂)	SO ₂	.676	/	(.448)	/	(.249)	/	8.87x10 ⁻⁴	/	1	
	NO ₂	/	1.11	/	(.448)	/	(.249)	/	6.39x10 ⁻⁴		

NOTE: 1. Values in parenthesis can be used for all flue gas constituents such as oxides of carbon, oxides of nitrogen, oxides of sulfur, hydrocarbons, particulates, etc.
2. Standard reference temperature of 530°R was used.

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SECTION 1.0

PANEL BOARD DATA

1.1 CONTROL ROOM DATA SHEETS

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 PANEL BOARD DATA SHEET
 ABMA TEST SITE F
Coal Flow, lb/hr 5540Steam Flow, lb/hr 60229FW Flow, lb/hr 62250
(avg from 4 hot + readings)% Design Capacity 75.0Evaporation 11.24 ^{lb steam}/_{lb coal}

DESIGN CAP. = 80,000 lb/h
 steam @ 150 psig O₂ variation $\bar{\omega}$ = 604 lb/Hr

TEST NUMBER	1	2	3	4	
DATE	12-18-78	12-18-78	12-18-78	12-18-78	
DESCRIPTION	Baseline	Hi O ₂	Hi O ₂	Lo O ₂	
Coal Designation	Pennsylv. medium volatile				
INTEGRATORS	Bituminous coal				
Coal Scale x 200 lbs	85243	85318	85356	85429	
Time of Reading	10:02	12:49	14:14	17:00	
Steam Flow x 100 lbs	3235422	2237128	2237975	2239604	
Feedwater Flow x 100 lbs	747195	747195	0.0.5.	0.0.5.	
Time of Reading	10:03	12:50	14:15	17:01	
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.4	+3.4	+3.9	+1.6	
Windbox Pressure, "H ₂ O	+1.2	+1.3	+1.5	+0.8	
Furnace Pressure, "H ₂ O	-1.2	-1.2	-0.2	-0.15	
Boiler Outlet Pressure, "H ₂ O	-1.9	-1.1	-1.4	-0.8	
Economizer Outlet Pressure, "H ₂ O	-3.8	-3.2	-3.7	-2.2	
Dust Collector Outlet Pressure, "H ₂ O	-6.1	-7.4	-8.3	-4.7	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	145	145	142	
Steam Header Pressure, psig	147	145	143	140	
Feedwater Header Pressure, psig	199	195	192	185	

KV3

TEST NUMBER	1	2	3	4
CHART RECORDINGS				
Steam Flow x 1000 lb/hr	63.0	61.5	61.0	61.5
Air Flow, %	61.0	70.0	81.0	50.0
Excess Oxygen, %	7.5	8.8	9.5	6.9
Economizer Gas Temp Inlet, °F	548	550	552	527
Economizer FW Temp Outlet, °F	312	318	330	300
Economizer Gas Temp Outlet, °F	377	376	387	360
Feedwater Flow x 1000 lb/hr	64.0	63.0	55.0	67.0
Steam Pressure, psig	145	145	142	139
Feedwater Temp, °F	222	222	219	218
Feedwater Header Press, psig	197	190	188	182
Opacity, % 0 ÷ 100	8	8	8	8
CONTROLS				
Boiler Master/Stoker	60	57	57	43
Fuel Air Ratio	52	51	52	52
Forced Draft	62	71	78	54
Furnace Draft	60	66	72	50
Furnace Draft Bias	-1.2	-1.2	-0.2	-0.2
Economizer By-Pass	0	0	0	0
Feedwater Flow	64	63	66	69
Condensate Flow	50	50	50	50
Feedwater Pressure	0	0	0	0

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TEST NUMBER	1	2	3	4	
STOKER					
Front Upper OFA Press, "H ₂ O	^{.46} 12.7	^{.46} 12.7	^{.47} 13.0	^{.48} 14.3	
Front Lower OFA Press, "H ₂ O	10.2	^{.31} 8.6	^{.31} 8.6	^{.31} 8.6	
Rear Upper OFA Press, "H ₂ O	1.4	^{.06} 1.7	^{.06} 1.7	^{.06} 1.7	
Rear Lower OFA Press, "H ₂ O	6.9	^{.17} 4.7	^{.23} 6.4	^{.23} 6.4	
Boiler Hopper Reinjection Pressure, "H ₂ O	6.1	^{.23} 6.4	^{.23} 6.4	^{.23} 6.4	
Econ Hopper Reinjection Pressure, "H ₂ O	8.6	^{.31} 8.6	^{.31} 8.6	^{.32} 8.9	
Overfire Air Fan Static Pressure, "H ₂ O	34.6	^{.128} 35.4	^{.120} 33.2	^{.121} 33.5	
Boiler Hopper Reinjection, YES/NO	yes	yes	yes	yes	
Economizer Hopper Reinjection, YES/NO	yes	yes	yes	yes	
FURNACE					
Ash Bed Thickness, inches	~ 3	~ 3	~ 3	~ 2	
Clinker Formation, YES/NO	No	No	No	NO	
Visible Smoke?	No	No	No	No	

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NOTES

TEST NO: 4

Control Room @: at ~ 2% unit opacity
meter read ~ 50%

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr
 Steam Flow, lb/hr 45000
 (from chart)
 FW Flow, lb/hr 45000
 (from chart)
 % Design Capacity 53.8
 Evaporation

TEST NUMBER	5	5			
DATE	12-19-78	12-19-78			
DESCRIPTION	Baseline Partic. Test	→			
	Pennsylv. Coal	Pennsylv. Coal			
INTEGRATORS					
Coal Scale x 200 lbs	85838	not			
Time of Reading	1010	could			
Steam Flow x 100 lbs	2249027				
Feedwater Flow x 100 lbs	0.0.5.				
Time of Reading	1009	17:30			
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	1.25				
Windbox Pressure, "H ₂ O	.8				
Furnace Pressure, "H ₂ O	-.175				
Boiler Outlet Pressure, "H ₂ O	-.7				
Economizer Outlet Pressure, "H ₂ O	-2.0				
Dust Collector Outlet Pressure, "H ₂ O	-4.1				
PRESSURE GAUGES					
Boiler Steam Pressure, psig	136				
Steam Header Pressure, psig	136				
Feedwater Header Pressure, psig	192				

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TEST NUMBER	5				
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	46.0				
Air Flow, %	43.5				
Excess Oxygen, %	8.6				
Economizer Gas Temp Inlet, °F	494				
Economizer FW Temp Outlet, °F	345				
Economizer Gas Temp Outlet, °F	308				
Feedwater Flow x 1000 lb/hr	43.0				
Steam Pressure, psig	136				
Feedwater Temp, °F	222				
Feedwater Header Press, psig	190				
Opacity, %	8				
CONTROLS					
Boiler Master/Stoker	40				
Fuel Air Ratio	52				
Forced Draft	52				
Furnace Draft	47				
Furnace Draft Bias	-1.25				
Economizer By-Pass	0				
Feedwater Flow	52				
Condensate Flow	53				
Feedwater Pressure	0				

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TEST NUMBER	5				
STOKER					
Front Upper OFA Press, "H ₂ O	.48 psi 13.3				
Front Lower OFA Press, "H ₂ O	.36 10.0				
Rear Upper OFA Press, "H ₂ O	.05 1.7				
Rear Lower OFA Press, "H ₂ O	.20 6.1				
Boiler Hopper Reinjection Pressure, "H ₂ O	.24 6.6				
Econ Hopper Reinjection Pressure, "H ₂ O	.31 8.6				
Overfire Air Fan Static Pressure, "H ₂ O	.13 36.0				
Boiler Hopper Reinjection, YES/NO	yes				
Economizer Hopper Reinjection, YES/NO	yes				
FURNACE					
Ash Bed Thickness, inches	2.5 - 3				
Clinker Formation, YES/NO	No				
Visible Smoke?	No				

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PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 3611
 Steam Flow, lb/hr 42300
 FW Flow, lb/hr 39000
 (avg. from chart)
 % Design Capacity 52.9
 Evaporation 11.71 $\frac{\text{lb steam}}{\text{lb coal}}$

TEST NUMBER	6	6	7	8	9
DATE	12-20-78	12-20-78	12-20-78	12-20-78	12-20-78
DESCRIPTION	BASLINE	BASLINE	ADJUST	LD O ₂	H ₂ O
INTEGRATORS					
Coal Scale x 200 lbs	86385	86404	86436	86469	86487
Time of Reading	10:25	11:29	13:16	15:06	16:04
Steam Flow x 100 lbs	2261568	2262023	2262787	2263540	2264165
Feedwater Flow x 100 lbs	0.0.5	0.0.5	0.0.5	0.0.5	0.0.5
Time of Reading	10:26	11:31	13:18	15:07	16:06
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+0.6	+0.6	+1.2	+0.3	+2.2
Windbox Pressure, "H ₂ O	+0.4	+0.4	+0.6	+0.2	+1.1
Furnace Pressure, "H ₂ O	-0.15	-0.15	-0.18	-0.15	-0.16
Boiler Outlet Pressure, "H ₂ O	-0.55	-0.55	-0.65	-0.48	-0.88
Economizer Outlet Pressure, "H ₂ O	-1.50	-1.50	-1.97	-1.23	-2.50
Dust Collector Outlet Pressure, "H ₂ O	-3.2	-3.1	-4.1	-2.5	-5.2
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	145	140	145	144
Steam Header Pressure, psig	145	145	140	145	144
Feedwater Header Pressure, psig	210	202	205	212	211

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TEST NUMBER	6	6	7	8	1
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	43.0	42.0	42.0	43.0	42.0
Air Flow, %	35.0	34.8	42.0	29.0	59.0
Excess Oxygen, %	8.3	8.1	9.8	6.8	11.2
Economizer Gas Temp Inlet, °F	480	480	486	469	480
Economizer FW Temp Outlet, °F	305	303	312	300	320
Economizer Gas Temp Outlet, °F	340	338	339	330	340
Feedwater Flow x 1000 lb/hr	45	36	34	43	36
Steam Pressure, psig	141	140	135	140	140
Feedwater Temp, °F	219	220	219	225	225
Feedwater Header Press, psig	220	198	190	225	204
Opacity, %	2.2	2.2	2.3	2.2	2.2
CONTROLS					
Boiler Master/Stoker	35	35	35	38	38
Fuel Air Ratio	42	42	50	53	67
Forced Draft	44	47	50	25	62
Furnace Draft	35	40	45	2	58
Furnace Draft Bias	-0.18	-0.18	-0.20	-0.20	-0.15
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	54	54	57	52	50
Condensate Flow	43	43	43	44	43
Feedwater Pressure	0	0	0	51	44

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TEST NUMBER	6	6	7	8	7
STOKER					
Front Upper OFA Press, "H ₂ O	0.48 psi 13.3	0.48 13.3	0.48 13.3	.49 13.6	.49 13.7
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.33 9.1	0.31 8.6	.31 8.6	.31 8.6
Rear Upper OFA Press, "H ₂ O	.06 1.7	.06 1.7	.06 1.7	.06 1.7	.06 1.7
Rear Lower OFA Press, "H ₂ O	0.23 6.4	0.21 5.8	.20 5.5	.23 6.4	.19 5.3
Boiler Hopper Reinjection Pressure, "H ₂ O	0.24 6.6	0.25 6.9	.24 6.6	.23 6.4	.24 6.6
Econ Hopper Reinjection Pressure, "H ₂ O	0.32 8.9	0.35 9.7	.32 8.9	.31 8.6	.35 9.7
Overfire Air Fan Static Pressure, "H ₂ O	1.24 34.3	1.24 35.4	1.26 34.9	1.24 34.3	1.24 34.3
Boiler Hopper Reinjection, YES/NO	Yes	Yes	Yes	Yes	Yes
Economizer Hopper Reinjection, YES/NO	Yes	Yes	Yes	Yes	Yes
FURNACE					
Ash Bed Thickness, inches	2 1/2"	2 1/2"	2"	2 1/2"	3"
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

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PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7298.5
 Steam Flow, lb/hr 78133.8
 FW Flow, lb/hr —
 % Design Capacity 97.7
 Evaporation 10.7 ^{lb steam} / lb coal

TEST NUMBER	10	10	10		
DATE	1-4-79	1-4-79	1-4-79		
DESCRIPTION	BASELINE	BASELINE	BASELINE		
INTEGRATORS					
Coal Scale x 200 lbs	094409	094548	094572		
Time of Reading	11:06	14:54	15:34		
Steam Flow x 100 lbs	2441351	2444316	2444854		
Feedwater Flow x 100 lbs	0.0.5.	0.0.5.	0.0.5.		
Time of Reading	11:08	14:55	15:37		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+4.4	+4.4	+4.3		
Windbox Pressure, "H ₂ O	+1.7	+1.7	+1.6		
Furnace Pressure, "H ₂ O	-0.25*	-0.23	-0.23		
Boiler Outlet Pressure, "H ₂ O	-1.45	-1.40	-1.35		
Economizer Outlet Pressure, "H ₂ O	-4.2	-4.2	-4.1		
Dust Collector Outlet Pressure, "H ₂ O	-9.5	-9.3	-9.2		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	150	149	150		
Steam Header Pressure, psig	145	145	148		
Feedwater Header Pressure, psig	200	197	231		

* should read ~0.20

KVB

TEST NUMBER	10	10	10		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	79.0	79.0		
Air Flow, %	84.0	84.0	84.0		
Excess Oxygen, %	7.0	7.1	7.4		
Economizer Gas Temp Inlet, °F	588	583	585		
Economizer FW Temp Outlet, °F	320	320	320		
Economizer Gas Temp Outlet, °F	402	400	400		
Feedwater Flow x 1000 lb/hr	71	81	63		
Steam Pressure, psig	141	142	145		
Feedwater Temp, °F	220	220	226		
Feedwater Header Press, psig	190	192	205		
Opacity, %	2.5	2.5	2.5		
CONTROLS					
Boiler Master/Stoker	69	70	70		
Fuel Air Ratio	58	58	58		
Forced Draft	81	80	80		
Furnace Draft	89	87	88		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	76	74	75		
Condensate Flow	34	34	34		
Feedwater Pressure	42	41	0		

KVB

TEST NUMBER	10	10	10		
STOKER	psi				
Front Upper OFA Press, "H ₂ O	1.53 14.7	.50 13.8	.50 13.8		
Front Lower OFA Press, "H ₂ O	.35 9.7	.36 10.0	.34 9.4		
Rear Upper OFA Press, "H ₂ O	.05 1.4	.05 1.4	.05 1.4		
Rear Lower OFA Press, "H ₂ O	.24 6.6	.22 6.1	.23 6.4		
Boiler Hopper Reinjection Pressure, "H ₂ O	.24 6.6	.24 6.6	.24 6.6		
Econ Hopper Reinjection Pressure, "H ₂ O	1.32 8.9	.32 8.9	.32 8.9		
Overfire Air Fan Static Pressure, "H ₂ O	1.26 34.9	1.30 36.0	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
FURNACE					
Ash Bed Thickness, inches	3	3	3½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 10

Test had to be stopped when boiler load could not be held
due to warming ambient air.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7403.0
 Steam Flow, lb/hr 79290
 FW Flow, lb/hr —
 % Design Capacity 99.1
 Evaporation 10.7

TEST NUMBER	11	12	13	14	
DATE	1-5-79	1-5-79	1-5-79	1-5-79	
DESCRIPTION	O ₂ VARIATIONS BASELINE	H ₂ O ₂	LO O ₂	Med O ₂	
INTEGRATORS					
Coal Scale x 200 lbs	095102	095154	095184	095226	
Time of Reading	10:57	12:21	13:10	14:18	
Steam Flow x 100 lbs	2456296	2457391	2458039	2458939	
Feedwater Flow x 100 lbs	0.0.5.	0.0.5.	0.0.5.	0.0.5	
Time of Reading	10:59	12:23	13:11	14:19	
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+4.4	+5.0	+2.8	+3.4	
Windbox Pressure, "H ₂ O	+1.7	+2.0	+1.2	+1.4	
Furnace Pressure, "H ₂ O	-0.25	-0.18	-0.19	-0.20	
Boiler Outlet Pressure, "H ₂ O	-1.45	-1.35	-1.00	-1.10	
Economizer Outlet Pressure, "H ₂ O	-4.2	-4.2	-3.0	-3.3	
Dust Collector Outlet Pressure, "H ₂ O	-9.5	-9.5	-6.7	-7.3	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	148	145	153	143	
Steam Header Pressure, psig	144	140	149	140	
Feedwater Header Pressure, psig	193	207	211	200	

KVB

TEST NUMBER	11	12	13	14	
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.5	80.0	80.5	81.0	
Air Flow, %	84.5	92.5	68.0	74.0	
Excess Oxygen, %	7.3	7.5	5.2	6.2	
Economizer Gas Temp Inlet, °F	590	585	570	572	
Economizer FW Temp Outlet, °F	320	320	310	300	
Economizer Gas Temp Outlet, °F	402	402	390	393	
Feedwater Flow x 1000 lb/hr	80	78	82	67	
Steam Pressure, psig	139	135	145	134	
Feedwater Temp, °F	220	220	220	220	
Feedwater Header Press, psig	185	197	206	190	
Opacity, %	2.5	2.5	2.5	2.5	
F.D. FAN INLET AIR TEMP, °F	77	78	78	78	
CONTROLS					
Boiler Master/Stoker	72	72	71	68	
Fuel Air Ratio	53	53	53	53	
Forced Draft	81	95	60	66	
Furnace Draft	89	100	70	74	
Furnace Draft Bias	-0.20	-0.10	-0.17	-0.15	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	84	74	76	76	
Condensate Flow	34	34	34	34	
Feedwater Pressure	44	59	100	49	

KVB

TEST NUMBER	11	12	13	14	
STOKER					
Front Upper OFA Press, "H ₂ O	.51 14.1	.51 14.1	.49 13.6	.50	
Front Lower OFA Press, "H ₂ O	.36 10.0	.34 9.4	.37 10.2	.37 10.2	
Rear Upper OFA Press, "H ₂ O	.07 1.9	.04 1.7	.06 1.7	.05	
Rear Lower OFA Press, "H ₂ O	.19 5.3	.22 6.1	.22 6.1	.23 6.4	
Boiler Hopper Reinjection Pressure, "H ₂ O	.23 6.4	.22 6.1	.24 6.6	.24 6.6	
Econ Hopper Reinjection Pressure, "H ₂ O	.31 8.6	.31 8.6	.32 8.9	.32 8.9	
Overfire Air Fan Static Pressure, "H ₂ O	1.28 35.4	1.30 36.0	1.26 34.9	1.25	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	
FURNACE					
Ash Bed Thickness, inches	3	3	3	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	

KVB

NOTES

TEST NO: 13

AT LD O₂ HAVE SOME UNBURNED CARBON IN BOTTOM ASH.
NO CLINKERS ON GRATE, BUT CLINKER IN ASH PIT,

TEST NO: 14

SLIGHT AMOUNT OF UNBURNED CARBON IN BOTTOM ASH - NOT AS
MUCH (APPARENTLY) AS IN TEST #13

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7263.2
 Steam Flow, lb/hr 78973
 PW Flow, lb/hr —
 % Design Capacity 98.7
 Evaporation 10.9

TEST NUMBER	15	15	15		
DATE	1-8-79	1-8-79	1-8-79		
DESCRIPTION	HIGH O ₂ PARTICULATES	HIGH O ₂ PARTICULATES	HIGH O ₂ PARTICULATES		
INTEGRATORS					
Coal Scale x 200 lbs	096712	096755	096781		
Time of Reading	13:35	14:47	15:29		
Steam Flow x 100 lbs	2492366	2493250	2493827		
Feedwater Flow x 100 lbs	0.0.5.	0.0.5	0.0.5.		
Time of Reading	13:41	14:49	15:32		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+5.0	+4.8	+4.9		
Windbox Pressure, "H ₂ O	+2.0	+1.9	+1.9		
Furnace Pressure, "H ₂ O	-0.17	-0.18	-0.17		
Boiler Outlet Pressure, "H ₂ O	-1.30	-1.25	-1.27		
Economizer Outlet Pressure, "H ₂ O	-4.1	-4.1	-4.1		
Dust Collector Outlet Pressure, "H ₂ O	-9.4	-9.3	-9.3		
:					
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	140	141		
Steam Header Pressure, psig	140	135	136		
Feedwater Header Pressure, psig	200	195	188		

KVB

TEST NUMBER	15	15	15		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	80.0	84.0		
Air Flow, %	93.5	93.0	94.0		
Excess Oxygen, %	7.3	6.8	7.0		
Economizer Gas Temp Inlet, °F	583	585	589		
Economizer FW Temp Outlet, °F	320	320	330		
Economizer Gas Temp Outlet, °F	400	400	400		
Feedwater Flow x 1000 lb/hr	67	81	80		
Steam Pressure, psig	135	129	129		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	191	188	180		
Opacity, % *	2.5	3.5	2.8		
CONTROLS					
Boiler Master/Stoker	84	84	82		
Fuel Air Ratio	58	56	55		
Forced Draft	100	100	94		
Furnace Draft	100	100	100		
Furnace Draft Bias	-0.08	-0.05	-0.05		
Economizer By-Pass	0	0	0		
Feedwater Flow	76	80	90		
Condensate Flow	34	34	34		
Feedwater Pressure	100	100	86		

* A) stock, ...

KVB

TEST NUMBER	15	15	15		
STOKER					
Front Upper OFA Press, "H ₂ O	.49 13.6	.50 13.8	.48 13.3		
Front Lower OFA Press, "H ₂ O	.33 9.1	.37 10.2	.35 9.7		
Rear Upper OFA Press, "H ₂ O	.06 1.7	.18 2.2	.06 1.7		
Rear Lower OFA Press, "H ₂ O	.19 5.3	.19 5.3	.18 5.0		
Boiler Hopper Reinjection Pressure, "H ₂ O	.21 5.8	.23 6.4	.22 6.1		
Econ Hopper Reinjection Pressure, "H ₂ O	.31 8.6	.31 8.6	.31 8.6		
Overfire Air Fan Static Pressure, "H ₂ O	1.25 34.6	1.26 34.9	1.21 33.5		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D.FAN INLET AIR TEMP, °F	82	79	79		
PURNACE					
Ash Bed Thickness, inches	3	3	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

1/10/79

7059

Coal Flow, lb/hr

1/9/79

7200

73826

- Steam Flow, lb/hr

77673

PANEL BOARD DATA SHEET

FW Flow, lb/hr

ABMA TEST SITE F

92.3

% Design Capacity

99.6

10.5

Evaporation

11.1

TEST NUMBER	16a	16a	16b	16c	16c
DATE	1-9-79	1-9-79	1-9-79	1-10-79	1-10-79
DESCRIPTION	OFA VARIATIONS BASELINE	—————→	MAX OFA	LOW OFA	LOW OFA
	100% LOAD	—————→	—————→	—————→	—————→
INTEGRATORS					
Coal Scale x 200 lbs	097506	097544	097572	098126	098146
Time of Reading	14:35	15:38	16:25	10:12	10:46
Steam Flow x 100 lbs	2510011	2510886	2511392	2523435	2523718
Feedwater Flow x 100 lbs	0.0.5.	0.0.5.	0.0.5.	0.0.5.	0.0.5.
Time of Reading	14:37	15:42	16:21	10:13	10:36
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+4.4	+4.2	+4.1	+3.8	+4.8
Windbox Pressure, "H ₂ O	+1.7	+1.7	+1.6	+1.6	+1.8
Furnace Pressure, "H ₂ O	-0.20	-0.20	-0.20	-0.20	-0.23
Boiler Outlet Pressure, "H ₂ O	-1.30	-1.25	-1.25	-1.15	-1.15
Economizer Outlet Pressure, "H ₂ O	-3.9	-3.9	-3.8	-3.5	-4.2
Dust Collector Outlet Pressure, "H ₂ O	-8.9	-8.6	-8.6	-7.8	-9.4
PRESSURE GAUGES					
Boiler Steam Pressure, psig	139	146	146	145	145
Steam Header Pressure, psig	135	142	144	141	140
Feedwater Header Pressure, psig	195	197	197	210	186

KVB

TEST NUMBER	16a	16a	16b	16c	16c
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.0	80.0	81.0	78.0	77.0
Air Flow, %	92.5	90.0	86.0	81.0	91.5
Excess Oxygen, %	6.6	6.8	6.8	6.5	7.0
Economizer Gas Temp Inlet, °F	580	582	588	580	590
Economizer FW Temp Outlet, °F	317	319	319	320	320
Economizer Gas Temp Outlet, °F	397	396	396	392	400
Feedwater Flow x 1000 lb/hr	79	78	76	72	72
Steam Pressure, psig	130	138	139	136	136
Feedwater Temp, °F	220	220	220	243	218
Feedwater Header Press, psig	185	198	190	180	174
Opacity, % * (in stack, downstack of precipitator)	2.5	2.5	2.5	3.6	6.0
CONTROLS					
Boiler Master/Stoker	72	71	71	81	82
Fuel Air Ratio	53	52	52	56	58
Forced Draft	80	77	74	89	83
Furnace Draft	85	85	84	91	70
Furnace Draft Bias	-0.15	-0.15	-0.17	-0.14	-0.15
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	73	76	78	78	84
Condensate Flow	34	34	34	34	34
Feedwater Pressure	76	76	76	41	41

KVB

TEST NUMBER	16a	16a	16b	16c	16c
STOKER	Baseline	Baseline	Max	Low	Low
Front Upper OFA Press, "H ₂ O	.49 13.6	.46 12.7	.40 11.1	.19 5.3	.18 5.0
Front Lower OFA Press, "H ₂ O	.36 10.0	.35 9.7	.36 10.0	.24 6.6	.24 6.6
Rear Upper OFA Press, "H ₂ O	.17 1.4	.14 1.1	.16 4.4	.10 2.8	.09 2.5
Rear Lower OFA Press, "H ₂ O	.19 5.3	.19 5.3	.30 8.3	.10 2.8	.10 2.8
Boiler Hopper Reinjection Pressure, "H ₂ O	.20 5.5	.20 5.5	.12 3.3	.19 5.3	.18 5.0
Econ Hopper Reinjection Pressure, "H ₂ O	.30 8.3	.30 8.3	.21 5.8	.19 5.3	.19 5.3
Overfire Air Fan Static Pressure, "H ₂ O	1.28 35.4	1.25 34.6	1.24 34.3	1.33 36.8	1.30 36.0
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	80	78	78	77	78
FURNACE					
Ash Bed Thickness, inches	3	3	3	3 1/2	3 1/2
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE FCoal Flow, lb/hr 7045.2Steam Flow, lb/hr 79333FW Flow, lb/hr —% Design Capacity 99.2Evaporation 11.3

TEST NUMBER	17	17	17		
DATE	1-10-79	1-10-79	1-10-79		
DESCRIPTION	LOW O ₂ PARTICULATES				
	100% LOAD				
INTEGRATORS					
Coal Scale x 200 lbs	098249	098301	098340		
Time of Reading	13:37	15:07	16:12		
Steam Flow x 100 lbs	2526131	2527400	2528273		
Feedwater Flow x 100 lbs	0.0.5.	0.0.5	0.0.5.		
Time of Reading	13:41	15:19	16:23		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+3.4	+3.6	+3.7		
Windbox Pressure, "H ₂ O	+1.4	+1.5	+1.5		
Furnace Pressure, "H ₂ O	-0.24	-0.23	-0.24		
Boiler Outlet Pressure, "H ₂ O	-1.20	-1.20	-1.20		
Economizer Outlet Pressure, "H ₂ O	-3.4	-3.6	-3.7		
Dust Collector Outlet Pressure, "H ₂ O	-7.8	-8.0	-8.3		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	149	145	145		
Steam Header Pressure, psig	145	141	140		
Feedwater Header Pressure, psig	190	186	177		

KVB

TEST NUMBER	17	17	17		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	79.0	79.0	83.0		
Air Flow, %	75.0	76.0	78.5		
Excess Oxygen, %	5.0	5.2	5.8		
Economizer Gas Temp Inlet, °F	579	583	590		
Economizer FW Temp Outlet, °F	309	310	320		
Economizer Gas Temp Outlet, °F	391	395	400		
Feedwater Flow x 1000 lb/hr	67	80	76		
Steam Pressure, psig	138	137	134		
Feedwater Temp, °F	219	220	221		
Feedwater Header Press, psig	180	179	174		
Opacity, %	4.0	3.7	4.1		
CONTROLS					
Boiler Master/Stoker	84	83	80		
Fuel Air Ratio	47	47	47		
Forced Draft	70	71	73		
Furnace Draft	79	80	82		
Furnace Draft Bias	-0.18	-0.17	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	81	67	67		
Condensate Flow	34	34	34		
Feedwater Pressure	40	41	42		

KVB

TEST NUMBER	17	17	17		
STOKER					
Front Upper OFA Press, "H ₂ O	.49 13.6	.48 13.3	.50 13.8		
Front Lower OFA Press, "H ₂ O	.36 10.0	.39 10.8	.36 10.0		
Rear Upper OFA Press, "H ₂ O	.03 1.0	.03 1.0	.03 1.0		
Rear Lower OFA Press, "H ₂ O	.18 5.0	.20 5.5	.20 5.5		
Boiler Hopper Reinjection Pressure, "H ₂ O	.18 5.0	.17 4.7	.19 5.3		
Econ Hopper Reinjection Pressure, "H ₂ O	.30 8.3	.30 8.3	.30 8.3		
Overfire Air Fan Static Pressure, "H ₂ O	1.24 34.3	1.25 34.6	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D FAN INLET AIR TEMP, °F	80	80	80		
FURNACE					
Ash Bed Thickness, inches	3½	4	3½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7239.1
 Steam Flow, lb/hr 79323
 FW Flow, lb/hr -
 % Design Capacity 99.15
 Evaporation 11.0

TEST NUMBER	18	11	18		
DATE	1-15-79	1-15-79	1-15-79		
DESCRIPTION	Optimum O ₂ HIGH OFA				
	MAX. LIMITS				
INTEGRATORS					
Coal Scale x 200 lbs	101351	101410	101462		
Time of Reading	13:29	15:08	16:33		
Steam Flow x 100 lbs	2593863	2595164	2596322		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	13:31	15:11	16:37		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.9	+2.5	+2.7		
Windbox Pressure, "H ₂ O	11.2	11.2	11.1		
Furnace Pressure, "H ₂ O	-0.20	-0.17	-0.20		
Boiler Outlet Pressure, "H ₂ O	-1.10	-1.00	-1.00		
Economizer Outlet Pressure, "H ₂ O	-3.2	-2.9	-3.0		
Dust Collector Outlet Pressure, "H ₂ O	-7.1	-6.5	-6.8		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	151	150	154		
Steam Header Pressure, psig	147	146	150		
Feedwater Header Pressure, psig	218	197	198		

KVB

TEST NUMBER	18	18	18		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	82.0	80.0		
Air Flow, %	68.0	64.5	80.0		
Excess Oxygen, %	5.8	4.8	5.6		
Economizer Gas Temp Inlet, °F	565	570	570		
Economizer FW Temp Outlet, °F	300	300	310		
Economizer Gas Temp Outlet, °F	380	387	390		
Feedwater Flow x 1000 lb/hr	77	73	74		
Steam Pressure, psig	142	142	145		
Feedwater Temp, °F	218	219	220		
Feedwater Header Press, psig	206	190	190		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	69	70	67		
Fuel Air Ratio	51	50	50		
Forced Draft	65	62	62		
Furnace Draft	74	70	71		
Furnace Draft Bias	-0.18	-0.13	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	70	76	84		
Condensate Flow	34	34	34		
Feedwater Pressure	55	56	56		

KVB

TEST NUMBER	18	18	18		
STOKER					
Front Upper OFA Press, "H ₂ O	.38 10.5	.40 11.1	.39 10.8		
Front Lower OFA Press, "H ₂ O	.38 10.5	.37 10.2	.36 10.0		
Rear Upper OFA Press, "H ₂ O	.18 5.0	.17 4.7	.17 4.7		
Rear Lower OFA Press, "H ₂ O	.30 8.3	.29 8.0	.30 8.3		
Boiler Hopper Reinjection Pressure, "H ₂ O	.20 5.5	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	.20 5.5	.18 5.0	.18 5.0		
Overfire Air Fan Static Pressure, "H ₂ O	1.23 34.1	1.25 34.6	1.23 34.1		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	80	78	80		
FURNACE					
Ash Bed Thickness, inches	2 1/2	2 1/2	2 1/2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7525.4
 - Steam Flow, lb/hr 79282
 FW Flow, lb/hr —
 % Design Capacity 99.1
 Evaporation 10.5

TEST NUMBER	19	19	19		
DATE	1-16-79	1-16-79	1-16-79		
DESCRIPTION	OPTIMUM Q_2 LOW OFA				
	PARTICULATES				
INTEGRATORS					
Coal Scale x 200 lbs	102321	102380	102395		
Time of Reading	21:12	22:46	23:10		
Steam Flow x 100 lbs	2614879	2616116	2616425		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	21:14	22:48	23:11		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+3.4	+3.3	+3.5		
Windbox Pressure, "H ₂ O	+1.4	+1.4	+1.5		
Furnace Pressure, "H ₂ O	-0.17	-0.17	-0.17		
Boiler Outlet Pressure, "H ₂ O	-1.00	-1.00	-1.02		
Economizer Outlet Pressure, "H ₂ O	-3.1	-3.1	-3.3		
Dust Collector Outlet Pressure, "H ₂ O	-7.0	-7.0	-7.3		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	148	145	144		
Steam Header Pressure, psig	143	140	140		
Feedwater Header Pressure, psig	198	200	203		

KVB

TEST NUMBER	19	19	19		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.0	79.4	81.0		
Air Flow, %	74.5	73.0	75.0		
Excess Oxygen, %	5.2	5.0	5.6		
Economizer Gas Temp Inlet, °F	580	575	580		
Economizer FW Temp Outlet, °F	305	300	305		
Economizer Gas Temp Outlet, °F	397	392	392		
Feedwater Flow x 1000 lb/hr	81	83	92		
Steam Pressure, psig	136	139	133		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	189	200	195		
Opacity, %	4.5	4.0	4.0		
CONTROLS					
Boiler Master/Stoker	70	70	70		
Fuel Air Ratio	45	45	45		
Forced Draft	70	64	69		
Furnace Draft	75	72	75		
Furnace Draft Bias	-0.15	-0.15	-0.15		
Economizer By-Pass	0	0	0		
Feedwater Flow	67	65	79		
Condensate Flow	34	34	34		
Feedwater Pressure	53	53	62		

KVB

TEST NUMBER	19	19	19		
STOKER					
Front Upper OFA Press, "H ₂ O	.17 4.7	.18 5.0	.18 5.0		
Front Lower OFA Press, "H ₂ O	.25 6.9	.24 6.6	.26 7.2		
Rear Upper OFA Press, "H ₂ O	.09 2.5	.08 2.2	.09 2.5		
Rear Lower OFA Press, "H ₂ O	.09 2.5	.09 2.5	.12 3.3		
Boiler Hopper Reinjection Pressure, "H ₂ O	.18 5.0	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	.22 6.1	.21 5.8	.21 5.8		
Overfire Air Fan Static Pressure, "H ₂ O	1.28 35.4	1.30 36.0	1.28 35.4		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, OF	81	81	81		
FURNACE					
Ash Bed Thickness, inches	3	3 1/2	3 1/2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 19

temporarily

Test interrupted A by change in load.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5256.2
 Steam Flow, lb/hr 59754
 FW Flow, lb/hr —
 % Design Capacity 74.7
 Evaporation 11.4

TEST NUMBER	20	20	20		
DATE	1-17-79	1-17-79	1-17-79		
DESCRIPTION	PARTICULATES NORM O ₂	PARTICULATES			
	NORM O ₂ A				
INTEGRATORS					
Coal Scale x 200 lbs	102930	102963	102983		
Time of Reading	16:17	17:31	18:18		
Steam Flow x 100 lbs	2628065	2628874	2629280		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	16:19	17:40	18:21		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.0	+2.0	+2.0		
Windbox Pressure, "H ₂ O	+1.0	+1.0	+0.9		
Furnace Pressure, "H ₂ O	-0.18	-0.18	-0.18		
Boiler Outlet Pressure, "H ₂ O	-0.85	-0.80	-0.80		
Economizer Outlet Pressure, "H ₂ O	-2.6	-2.5	-2.5		
Dust Collector Outlet Pressure, "H ₂ O	-5.8	-5.5	-5.5		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	144	144		
Steam Header Pressure, psig	142	142	141		
Feedwater Header Pressure, psig	210	210	208		

KVB

TEST NUMBER	20	20	20		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	61.0	60.5	61.0		
Air Flow, %	57.5	57.5	57.5		
Excess Oxygen, %	8.0	8.2	7.8		
Economizer Gas Temp Inlet, °F	530	530	530		
Economizer FW Temp Outlet, °F	310	310	310		
Economizer Gas Temp Outlet, °F	360	365	366		
Feedwater Flow x 1000 lb/hr	60	55	58		
Steam Pressure, psig	135	138	138		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	198	200	202		
Opacity, %	3.2	3.2	3.3		
CONTROLS					
Boiler Master/Stoker	45	45	44		
Fuel Air Ratio	48	47	47		
Forced Draft	56	55	55		
Furnace Draft	63	65	64		
Furnace Draft Bias	-0.18	-0.18	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	64	63	59		
Condensate Flow	34	34	34		
Feedwater Pressure	76	75	75		

KVB

TEST NUMBER	20	20	20		
STOKER					
Front Upper OFA Press, "H ₂ O	.49 13.6	.49 13.6	.49 13.6		
Front Lower OFA Press, "H ₂ O	.36 10.0	.36 10.0	.36 10.0		
Rear Upper OFA Press, "H ₂ O	.06 1.7	.05 1.4	.06 1.7		
Rear Lower OFA Press, "H ₂ O	.17 4.7	.18 5.0	.18 5.0		
Boiler Hopper Reinjection Pressure, "H ₂ O	.18 5.0	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	.30 8.3	.30 8.3	.30 8.3		
Overfire Air Fan Static Pressure, "H ₂ O	1.25 34.6	1.25 34.6	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
FAN					
F.D. INLET AIR TEMP, °F	76	76	74		
FURNACE					
Ash Bed Thickness, inches	2	2	2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 20

IMPINGING TRAIL AT D.C. OUTLET FAIL. TEST MUST HAVE TO BE
HALTED BEFORE COMPLETION. EION. OUTLET TEST OK.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE FCoal Flow, lb/hr 5625.0Steam Flow, lb/hr 61116FW Flow, lb/hr —% Design Capacity 76.4Evaporation 10.9

TEST NUMBER	21	21	21		
DATE	1-24-79	1-24-79	1-24-79		
DESCRIPTION	75% LOAD NORM O ₂ NORM OFA PARTICULATES	—————→	—————→		
INTEGRATORS					
Coal Scale x 200 lbs	106879	106911	106939		
Time of Reading	10:18	11:26	12:26		
Steam Flow x 100 lbs	2718413	2719107	2719727		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	10:19	11:28	12:28		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+1.85	+2.0	+2.0		
Windbox Pressure, "H ₂ O	+0.90	+1.0	+1.0		
Furnace Pressure, "H ₂ O	-0.25	-0.23	-0.23		
Boiler Outlet Pressure, "H ₂ O	-0.95	-0.95	-0.95		
Economizer Outlet Pressure, "H ₂ O	-2.5	-2.6	-2.6		
Dust Collector Outlet Pressure, "H ₂ O	-5.6	-5.7	-5.6		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	150	150	148		
Steam Header Pressure, psig	150	150	147		
Feedwater Header Pressure, psig	215	222	220		

KVB

TEST NUMBER	21	21	21		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	59.0	62.0	62.0		
Air Flow, %	56.5	58.0	58.0		
Excess Oxygen, %	7.0	7.3	7.5		
Economizer Gas Temp Inlet, °F	530	537	535		
Economizer FW Temp Outlet, °F	312	310	309		
Economizer Gas Temp Outlet, °F	367	370	370		
Feedwater Flow x 1000 lb/hr	60	59	58		
Steam Pressure, psig	145	145	141		
Feedwater Temp, °F	219	219	219		
Feedwater Header Press, psig	203	215	205		
Opacity, %	0.05	0.05	0.05		
CONTROLS					
Boiler Master/Stoker	56	55	54		
Fuel Air Ratio	50	47	47		
Forced Draft	54	55	57		
Furnace Draft	66	66	66		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	64	61	65		
Condensate Flow	30	30	30		
Feedwater Pressure	55	55	55		

KVB

TEST NUMBER	21	21	21		
STOKER					
Front Upper OFA Press, "H ₂ O	0.48 13.3	0.48 13.3	0.48 13.3		
Front Lower OFA Press, "H ₂ O	0.36 10.0	0.35 9.7	0.36 10.0		
Rear Upper OFA Press, "H ₂ O	0.06 1.7	0.06 1.7	0.06 1.7		
Rear Lower OFA Press, "H ₂ O	0.19 5.3	0.17 4.7	0.19 5.3		
Boiler Hopper Reinjection Pressure, "H ₂ O	0.17 4.7	0.17 4.7	0.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	0.30 8.3	0.29 8.0	0.29 8.0		
Overfire Air Fan Static Pressure, "H ₂ O	1.25 34.6	1.30 36.0	1.24 34.3		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	78	82	82		
FURNACE					
Ash Bed Thickness, inches	3½	3½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 6927.3
 Steam Flow, lb/hr 79473
 FW Flow, lb/hr —
 % Design Capacity 99.3
 Evaporation 11.5

TEST NUMBER	22	22	22		
DATE	1-31-79	1-31-79	1-31-79		
DESCRIPTION	OPTIMUM OF 4 OPTIMUM O ₂				
	SASS SO ₃				
INTEGRATORS					
Coal Scale x 200 lbs	110645	110832	110899		
Time of Reading	10:52	16:15	18:12		
Steam Flow x 100 lbs	2801994	2806291	2807928		
Feedwater Flow x 100 lbs	0.05	0.05	0.05		
Time of Reading	10:54	16:18	18:22		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.6	+2.5	+2.5		
Windbox Pressure, "H ₂ O	+1.2	+1.2	+1.1		
Furnace Pressure, "H ₂ O	-0.22	-0.22	-0.22		
Boiler Outlet Pressure, "H ₂ O	-1.00	-1.00	-1.00		
Economizer Outlet Pressure, "H ₂ O	-3.0	-3.0	-3.0		
Dust Collector Outlet Pressure, "H ₂ O	-6.5	-6.7	-6.8		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	120	145	145		
Steam Header Pressure, psig	116	141	140		
Feedwater Header Pressure, psig	162	200	204		

KVB

TEST NUMBER	22	22	22		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.5	81.0	79.5		
Air Flow, %	68.0	65.0	79.5		
Excess Oxygen, %	5.4	5.2	5.2		
Economizer Gas Temp Inlet, °F	560	580	575		
Economizer FW Temp Outlet, °F	300	310	300		
Economizer Gas Temp Outlet, °F	390	390	390		
Feedwater Flow x 1000 lb/hr	80	74	65		
Steam Pressure, psig	105	136	135		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	151	190	195		
Opacity, %	0.0.5.	0.0.5.	0.0.5.		
CONTROLS					
Boiler Master/Stoker	72	71	71		
Fuel Air Ratio	50	50	50		
Forced Draft	59	62	61		
Furnace Draft	71	72	73		
Furnace Draft Bias	-0.18	-0.19	-0.19		
Economizer By-Pass	0	0	0		
Feedwater Flow	91	75	72		
Condensate Flow	32.5	32	32		
Feedwater Pressure	51	49	49		

KVB

TEST NUMBER	22	22	22		
STOKER					
Front Upper OFA Press, "H ₂ O	0.38 10.5	0.37 10.2	0.37 10.2		
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.35 9.7	0.34 9.4		
Rear Upper OFA Press, "H ₂ O	0.21 5.8	0.19 5.3	0.19 5.3		
Rear Lower OFA Press, "H ₂ O	0.29 8.0	0.29 8.0	0.29 8.0		
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.19 5.3	0.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.20 5.5	0.18 5.0		
Overfire Air Fan Static Pressure, "H ₂ O	1.25 34.6	1.24 34.3	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.I.D. FAN INLET AIR TEMP, °F	74	75	76		
FURNACE					
Ash Bed Thickness, inches	4	3½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE FCoal Flow, lb/hr 7441.3Steam Flow, lb/hr 79989FW Flow, lb/hr -% Design Capacity 100.0Evaporation 11.4

NO ELON. HOPPER REINJECTION

TEST NUMBER	23	23	23	23	
DATE	2-1-79	2-1-79	2-1-79	2-1-79	
DESCRIPTION	OPTIMUM O ₂ OPTIMUM OFA BRINK TEST				
			PARTICULATES		
INTEGRATORS					
Coal Scale x 200 lbs	111348	111397	111451	111561	
Time of Reading	10:46	12:11	13:45	16:49	
Steam Flow x 100 lbs	2817904	2819019	2820261	2822810	
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	
Time of Reading	10:48	12:13	13:47	16:56	
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+3.2	+2.9	+2.9	+3.0	
Windbox Pressure, "H ₂ O	+1.4	+1.3	+1.3	+1.3	
Furnace Pressure, "H ₂ O	-0.22	-0.22	-0.22	-0.20	
Boiler Outlet Pressure, "H ₂ O	-1.10	-1.00	-1.00	-1.00	
Economizer Outlet Pressure, "H ₂ O	-3.3	-3.1	-3.1	-3.2	
Dust Collector Outlet Pressure, "H ₂ O	-7.4	-6.8	-7.0	-7.4	
.					
PRESSURE GAUGES					
Boiler Steam Pressure, psig	142	143	140	145	
Steam Header Pressure, psig	138	139	135	140	
Feedwater Header Pressure, psig	191	191	190	196	

KVB

TEST NUMBER	23	23	23	23	
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	80.0	80.3	82.0	
Air Flow, %	70.0	68.0	68.0	69.0	
Excess Oxygen, %	5.6	5.5	5.2	5.4	
Economizer Gas Temp Inlet, °F	579	570	575	580	
Economizer FW Temp Outlet, °F	305	306	302	305	
Economizer Gas Temp Outlet, °F	395	390	390	390	
Feedwater Flow x 1000 lb/hr	73	74	75	78	
Steam Pressure, psig	133	132	130	135	
Feedwater Temp, °F	220	220	220	221	
Feedwater Header Press, psig	186	182	188	189	
Opacity, %	0.05.	0.05.	0.05.	0.05.	
CONTROLS					
Boiler Master/Stoker	80	80	80	75	
Fuel Air Ratio	50	50	50	50	
Forced Draft	65	62	62	66	
Furnace Draft	76	74	74	76	
Furnace Draft Bias	-0.18	-0.18	-0.18	-0.15	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	75	81	72	79	
Condensate Flow	33	33	33	32	
Feedwater Pressure	47	47	53	47	

KVB

TEST NUMBER	23	23	23	23	
STOKER					
Front Upper OFA Press, "H ₂ O	0.39 10.8	0.39 10.8	0.39 10.8	0.37 10.2	
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7	
Rear Upper OFA Press, "H ₂ O	0.18 5.0	0.18 5.0	0.18 5.0	0.18 5.0	
Rear Lower OFA Press, "H ₂ O	0.29 8.0	0.29 8.0	0.29 8.0	0.30 8.3	
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.18 5.0	0.18 5.0	0.18 5.0	
Econ Hopper Reinjection Pressure, "H ₂ O	0.05 1.4	0.01 0.3	0.01 0.3	0.01 0.3	
Overfire Air Fan Static Pressure, "H ₂ O	1.26 34.9	1.28 35.4	1.24 34.3	1.21 33.5	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	NO	NO	NO	NO	
F.D. FAN INLET AIR TEMP, °F	81	83	84	82	
FURNACE					
Ash Bed Thickness, inches	3½	3½	4	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	
REINJECTION AIR TO ECONOMIZER HOPPERS OFF AT 10:28 HRS BY CLOSING					
AIR DAMPER AND HOPPER GATES					
3 FRESH BARRELS PLACED UNDER ECON. HOPPERS AFTER UNPLUGGED					
AT 15:55 HRS: LH - BBL #1, TARE WT. = 36.5#					
E - BBL #2, TARE WT. = 50.0#					
RH - BBL #3, TARE WT. = 41.0#					

THESE BARRELS WERE REMOVED FROM HOPPERS AT 18:05 HRS.

KVB

NOTES

TEST NO: 23

DISCOVERED DURING TEST THAT THE CENTER + RH SIDE ECON. HOPPERS WERE ALMOST COMPLETELY PLUGGED. THE LH SIDE HOPPER WAS O.K. THIS WAS DISCOVERED AFTER BRINK TEST & DURING PARTICULATE TESTS.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7495.4
 Steam Flow, lb/hr 81957
 FW Flow, lb/hr -
 % Design Capacity 102.4
 Evaporation 10.9

TEST NUMBER	24	24	24	24	24
DATE	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79
DESCRIPTION	OPT. O ₂ , OPT. OFF BRINK TEST		PARTICULATES		
INTEGRATORS					
Coal Scale x 200 lbs	114932	114989	115042	115077	115135
Time of Reading	12:01	13:30	14:52	15:47	17:26
Steam Flow x 100 lbs	2896027	2897235	2898449	2899146	2900480
Feedwater Flow x 100 lbs	0.0.5.	0.0.5.	0.0.5.	0.0.5.	0.0.5.
Time of Reading	12:03	13:32	15:00	15:51	17:29
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.7	+2.6	+2.2	+2.3	+2.1
Windbox Pressure, "H ₂ O	+1.2	+1.2	+1.0	+1.0	+1.0
Furnace Pressure, "H ₂ O	-0.18	-0.18	-0.22	-0.22	-0.20
Boiler Outlet Pressure, "H ₂ O	-0.95	-0.94	-1.00	-1.05	-1.00
Economizer Outlet Pressure, "H ₂ O	-3.0	-3.0	-3.0	-3.0	-2.9
Dust Collector Outlet Pressure, "H ₂ O	-6.7	-6.6	-6.5	-6.5	-6.2
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	148	148	144	147
Steam Header Pressure, psig	144	144	144	140	143
Feedwater Header Pressure, psig	210	210	199	214	210

KVB

TEST NUMBER	24	24	24	24	24
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	83.0	83.0	82.5	85.5	81.0
Air Flow, %	66.0	65.5	61.5	61.0	67.5
Excess Oxygen, %	5.4	5.5	5.2	5.2	5.6
Economizer Gas Temp Inlet, °F	570	570	568	566	565
Economizer FW Temp Outlet, °F	300	300	300	300	300
Economizer Gas Temp Outlet, °F	390	390	390	385	385
Feedwater Flow x 1000 lb/hr	66	77	80	73	70
Steam Pressure, psig	140	138	140	136	139
Feedwater Temp, °F	221	220	221	220	220
Feedwater Header Press, psig	225	205	205	210	202
Opacity, %	0.05.	0.05.	0.05.	0.05.	0.05.
CONTROLS					
Boiler Master/Stoker	73	72	71	71	70
Fuel Air Ratio	50	50	50	50	50
Forced Draft	62	62	56	59	59
Furnace Draft	71	70	70	70	68
Furnace Draft Bias	-0.15	-0.15	-0.20	-0.20	-0.20
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	64	70	84	67	68
Condensate Flow	32	32	31	31	31
Feedwater Pressure	68	59	64	59	54

KVB

TEST NUMBER	24	24	24	24	24
STOKER					
Front Upper OFA Press, "H ₂ O	0.39 10.8	0.36 10.0	0.40 11.1	0.40 11.1	0.38 10.5
Front Lower OFA Press, "H ₂ O	0.36 10.0	0.36 10.0	0.36 10.0	0.35 9.7	0.36 10.0
Rear Upper OFA Press, "H ₂ O	0.20 5.5	0.22 6.1	0.20 5.5	0.20 5.5	0.21 5.8
Rear Lower OFA Press, "H ₂ O	0.30 8.3	0.29 8.0	0.28 7.8	0.29 8.0	0.29 8.0
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.17 4.7	0.17 4.7	0.17 4.7	0.17 4.7
Econ Hopper Reinjection Pressure, "H ₂ O	0.19 5.0	0.18 5.0	0.17 4.7	0.17 4.7	0.17 4.7
Overfire Air Fan Static Pressure, "H ₂ O	1.28 35.4	1.27 35.2	1.28 35.4	1.27 35.2	1.27 35.2
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	68	70	70	70	68
FURNACE					
Ash Bed Thickness, inches	3	3	3	3	2½
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7238.1
 Steam Flow, lb/hr 79472
 FW Flow, lb/hr -
 % Design Capacity 99.3
 Evaporation 11.0

TEST NUMBER	23A	23A			
DATE	2-8-79	2-8-79			
DESCRIPTION	BRINK TEST OPT. O ₂ & O ₂ A NO ECON HOPPER REINT.	→			
INTEGRATORS					
Coal Scale x 200 lbs	116488	116526			
Time of Reading	12:14	13:17			
Steam Flow x 100 lbs	2929865	2930567			
Feedwater Flow x 100 lbs	0.05	0.05			
Time of Reading	12:19	13:12			
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.0	+2.1			
Windbox Pressure, "H ₂ O	2.9	+1.0			
Furnace Pressure, "H ₂ O	-0.25	-0.25			
Boiler Outlet Pressure, "H ₂ O	-1.00	-1.00			
Economizer Outlet Pressure, "H ₂ O	-2.8	-3.0			
Dust Collector Outlet Pressure, "H ₂ O	-6.1	-6.3			
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	146			
Steam Header Pressure, psig	140	142			
Feedwater Header Pressure, psig	218	218			

KVB

TEST NUMBER	23A	23A			
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	79.5			
Air Flow, %	58.0	58.0			
Excess Oxygen, %	5.2	5.2			
Economizer Gas Temp Inlet, °F	560	570			
Economizer FW Temp Outlet, °F	300	300			
Economizer Gas Temp Outlet, °F	384	387			
Feedwater Flow x 1000 lb/hr	70	78			
Steam Pressure, psig	135	137			
Feedwater Temp, °F	221	221			
Feedwater Header Press, psig	210	210			
Opacity, %	0.05	0.05			
CONTROLS					
Boiler Master/Stoker	70	73			
Fuel Air Ratio	50	50			
Forced Draft	55	59			
Furnace Draft	69	70			
Furnace Draft Bias	-0.23	-0.23			
Economizer By-Pass	0	0			
Feedwater Flow	65	71			
Condensate Flow	31	31			
Feedwater Pressure	54	62			

KVB

TEST NUMBER	23A	23A			
STOKER					
Front Upper OFA Press, "H ₂ O	0.40 11.1	0.39 10.9			
Front Lower OFA Press, "H ₂ O	0.36 9.96	0.36 9.96			
Rear Upper OFA Press, "H ₂ O	0.47 4.70	0.30 5.53			
Rear Lower OFA Press, "H ₂ O	0.29 7.02	0.29 7.02			
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 4.98	0.18 4.98			
Econ Hopper Reinjection Pressure, "H ₂ O	0.0 0.0	0.0 0.0			
Overfire Air Fan Static Pressure, "H ₂ O	1.21	1.21			
Boiler Hopper Reinjection, YES/NO	YES	YES			
Economizer Hopper Reinjection, YES/NO	NO	NO			
F.D. FAN INLET AIR TEMP, °F	83	82			
FURNACE					
Ash Bed Thickness, inches	3	3			
Clinker Formation, YES/NO	NO	NO			
Visible Smoke?	NO	NO			

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE FCoal Flow, lb/hr 6975.6Steam Flow, lb/hr 79488FW Flow, lb/hr —% Design Capacity 99.4Evaporation 11.4O₂ VARIATIONS

TEST NUMBER	25	26	27	28	
DATE	2-12-79	2-12-79	2-12-79	2-12-79	
DESCRIPTION	416A O ₂ COAL B	BASELINE	Med-Low O ₂	Low O ₂	
INTEGRATORS					
Coal Scale x 200 lbs	119384	119429	119476	119527	
Time of Reading	10:17	11:32	12:53	14:23	
Steam Flow x 100 lbs	2993980	2994985	2996068	2997239	
Feedwater Flow x 100 lbs	0.05	0.05	0.05	0.05	
Time of Reading	10:18	11:34	12:54	14:24	
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+4.9	+3.9	+2.4	+1.9	
Windbox Pressure, "H ₂ O	+1.9	+1.5	+1.1	+0.9	
Furnace Pressure, "H ₂ O	-0.17	-0.25	-0.25	-0.22	
Boiler Outlet Pressure, "H ₂ O	-1.20	-1.25	-1.00	-0.85	
Economizer Outlet Pressure, "H ₂ O	-4.0	-3.8	-3.0	-2.6	
Dust Collector Outlet Pressure, "H ₂ O	-9.1	-8.6	-6.5	-5.7	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	147	143	150	
Steam Header Pressure, psig	141	143	140	145	
Feedwater Header Pressure, psig	190	190	183	202	

KVB

TEST NUMBER	25	26	27	28	
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	78.0	81.0	79.0	79.0	
Air Flow, %	92.5	83.5	65.0	56.5	
Excess Oxygen, %	8.0	7.0	6.2	4.5	
Economizer Gas Temp Inlet, °F	585	589	560	560	
Economizer FW Temp Outlet, °F	320	313	304	300	
Economizer Gas Temp Outlet, °F	400	400	389	386	
Feedwater Flow x 1000 lb/hr	74	80	72	77	
Steam Pressure, psig	137	139	134	140	
Feedwater Temp, °F	220	220	220	220	
Feedwater Header Press, psig	183	183	175	195	
Opacity, %	0.05	0.05	0.05	0.05	
CONTROLS					
Boiler Master/Stoker	81	79	68	71	
Fuel Air Ratio	50	50	50	50	
Forced Draft	96	73	59	55	
Furnace Draft	100+	85	70	66	
Furnace Draft Bias	-0.08	-0.20	-0.20	-0.20	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	80	91	83	76	
Condensate Flow	30	30	30	30	
Feedwater Pressure	55	55	55	55	

KVB

TEST NUMBER	25	26	27	28	
STOKER					
Front Upper OFA Press, "H ₂ O	0.49 13.6	0.49 13.6	0.49 13.6	0.48 13.3	
Front Lower OFA Press, "H ₂ O	0.32 8.9	0.33 9.1	0.33 9.1	0.34 9.4	
Rear Upper OFA Press, "H ₂ O	0.07 1.9	0.06 1.7	0.07 1.9	0.06 1.7	
Rear Lower OFA Press, "H ₂ O	0.19 5.3	0.18 5.0	0.18 5.0	0.18 5.0	
Boiler Hopper Reinjection Pressure, "H ₂ O	0.19 5.3	0.18 5.0	0.18 5.0	0.19 5.3	
Econ Hopper Reinjection Pressure, "H ₂ O	0.30 8.3	0.28 7.8	0.28 7.8	0.29 8.0	
Overfire Air Fan Static Pressure, "H ₂ O	1.23 34.1	1.23 34.1	1.23 34.1	1.23 34.1	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	
F.D. FAN INLET AIR TEMP, °F	82	82	81	80	
FURNACE					
Ash Bed Thickness, inches	3	3	2 1/2	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 6552.1
 Steam Flow, lb/hr 80,400
 FW Flow, lb/hr —
 % Design Capacity 100.5
 Evaporation 12.3

COAL B

TEST NUMBER	29	29	29		
DATE	2-12-79	2-12-79	2-12-79		
DESCRIPTION	OPT. O ₂ & OFA PARTICULATES	BRINK & PARTICULATES	BRINK		
INTEGRATORS					
Coal Scale x 200 lbs	119682	119716	119771		
Time of Reading	18:50	19:56	21:33		
Steam Flow x 100 lbs	3000757	3001850	3002968		
Feedwater Flow x 100 lbs	0.0.5.	0.0.5.	0.0.5.		
Time of Reading	18:53	20:15	21:38		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.2	+2.2	+2.2		
Windbox Pressure, "H ₂ O	+1.0	+1.0	+1.0		
Furnace Pressure, "H ₂ O	-0.25	-0.25	-0.25		
Boiler Outlet Pressure, "H ₂ O	-1.00	-1.00	-1.00		
Economizer Outlet Pressure, "H ₂ O	-2.9	-3.0	-3.0		
Dust Collector Outlet Pressure, "H ₂ O	-6.3	-6.5	-6.4		
.					
PRESSURE GAUGES					
Boiler Steam Pressure, psig	142	147	145		
Steam Header Pressure, psig	137	142	140		
Feedwater Header Pressure, psig	194	209	205		

KVB

TEST NUMBER	29	29	29		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	82.0	80.0	80.5		
Air Flow, %	66.0	60.0	60.0		
Excess Oxygen, %	5.0	5.0	5.5		
Economizer Gas Temp Inlet, °F	570	570	569		
Economizer FW Temp Outlet, °F	300	300	305		
Economizer Gas Temp Outlet, °F	390	388	385		
Feedwater Flow x 1000 lb/hr	100	80	84		
Steam Pressure, psig	132	138	135		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	192	202	205		
Opacity, %	0.0.5.	0.0.5.	0.0.5.		
CONTROLS					
Boiler Master/Stoker	75	71	71		
Fuel Air Ratio	50	50	50		
Forced Draft	58	60	60		
Furnace Draft	70	70	70		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	92	74	74		
Condensate Flow	30	30	30		
Feedwater Pressure	75	65	56		

KVB

TEST NUMBER	29	29	29		
STOKER					
Front Upper OFA Press, "H ₂ O	0.17 10.5	0.17 10.2	0.18 10.5		
Front Lower OFA Press, "H ₂ O	0.36 10.0	0.35 9.7	0.35 9.7		
Rear Upper OFA Press, "H ₂ O	0.18 5.0	0.18 5.0	0.19 5.3		
Rear Lower OFA Press, "H ₂ O	0.29 8.0	0.29 8.0	0.29 8.0		
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.18 5.0	0.18 5.0		
Econ Hopper Reinjection Pressure, "H ₂ O	0.17 4.7	0.17 4.7	0.18 5.0		
Overfire Air Fan Static Pressure, "H ₂ O	1.23 34.1	1.23 34.1	1.23 34.1		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
E.D. FAN INLET AIR TEMP, °F	80	80	79		
FURNACE					
Ash Bed Thickness, inches	3	2 1/2	2 1/2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 29

SNOW CAUSED MOIST COAL

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

 PANEL BOARD DATA SHEET
 ABMA TEST SITE F

Coal Flow, lb/hr _____

Steam Flow, lb/hr _____

FW Flow, lb/hr _____

% Design Capacity _____

Evaporation _____

TEST NUMBER	30	30	30	30	30
DATE	2-13-79	2-13-79	2-13-79	2-13-79	2-13-79
DESCRIPTION	LOW HIGHT OFA				
	CONSOYR- ROSS		SASS	SASS	SASS
INTEGRATORS					
Coal Scale x 200 lbs	120197	120251	120355	120390	120448
Time of Reading	11:01	12:31	15:29	16:29	18:08
Steam Flow x 100 lbs	3012938	3013797	3016300	3017081	3018412
Feedwater Flow x 100 lbs	0.05	0.05	0.05	0.05	0.05
Time of Reading	11:26	12:29	15:33	16:31	18:09
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+3.0		+2.9	+2.9	+2.6
Windbox Pressure, "H ₂ O	+1.2		+1.2	+1.3	+1.2
Furnace Pressure, "H ₂ O	-0.25		-0.20	-0.20	-0.23
Boiler Outlet Pressure, "H ₂ O	-1.1		-1.0	-1.0	-0.9
Economizer Outlet Pressure, "H ₂ O	-3.3		-3.1	-3.1	-3.0
Dust Collector Outlet Pressure, "H ₂ O	-7.3		-6.8	-6.8	-6.5
:					
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145		146	145	141
Steam Header Pressure, psig	140		141	140	137
Feedwater Header Pressure, psig	200		192	205	208

KVB

TEST NUMBER	30		30	30	30
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	82.0		82.0	82.0	80.5
Air Flow, %	67.5		67.0	67.0	67.0
Excess Oxygen, %	5.3		5.6	5.2	5.4
Economizer Gas Temp Inlet, °F	570		570	577	570
Economizer FW Temp Outlet, °F	310		307	303	300
Economizer Gas Temp Outlet, °F	390		390	391	390
Feedwater Flow x 1000 lb/hr	79		86	85	81
Steam Pressure, psig	135		135	135	135
Feedwater Temp, °F	220		221	221	220
Feedwater Header Press, psig	194		190	195	200
Opacity, %	0.0.5.		0.0.5.	0.0.5.	0.0.5.
CONTROLS					
Boiler Master/Stoker	76		76	76	75
Fuel Air Ratio	50		50	50	50
Forced Draft	65		64	63	60
Furnace Draft	75		73	72	70
Furnace Draft Bias	-0.20		-0.17	-0.17	-0.18
Economizer By-Pass	0		0	0	0
Feedwater Flow	75		84	77	65
Condensate Flow	30		30	30	30
Feedwater Pressure	51		47	47	45

KVB

TEST NUMBER	30	30	30	30
STOKER				
Front Upper OFA Press, "H ₂ O	0.38 10.5	0.38 10.5	0.38 10.5	0.38 10.5
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.33 9.1	0.34 9.4	0.33 9.7
Rear Upper OFA Press, "H ₂ O	0.19 5.3	0.19 5.3	0.20 5.5	0.20 5.5
Rear Lower OFA Press, "H ₂ O	0.29 8.0	0.29 8.0	0.29 8.0	0.29 8.0
Boiler Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.18 5.0	0.19 5.3	0.18 5.0
Econ Hopper Reinjection Pressure, "H ₂ O	0.18 5.0	0.18 5.0	0.18 5.0	0.18 5.0
Overfire Air Fan Static Pressure, "H ₂ O	1.23 34.1	1.23 34.1	1.22 33.8	1.22 33.8
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES
E.D. FAN INLET AIR TEMP, °F	78	83	83	82
FURNACE				
Ash Bed Thickness, inches	3	3	3	3½
Clinker Formation, YES/NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO

KVB

NOTES

TEST NO: 30

SOME LARGE (5" DIAM) CHUNKS OF COAL BLANKING NEAR SPREADER
PROBABLY DUE TO MOIST COAL.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5333.3
 Steam Flow, lb/hr 5997.0
 FW Flow, lb/hr
 % Design Capacity 75.0
 Evaporation 11.2

COAL B

TEST NUMBER	31	31	32	33	34
DATE	2-14-79	2-14-79	2-14-79	2-14-79	2-14-79
DESCRIPTION	NORM OFA O ₂ VARIATIONS				
	BASELINE	→	HIGH O ₂	MED. LO O ₂	LO O ₂
INTEGRATORS					
Coal Scale x 200 lbs	120982	121008	121025	121048	121074
Time of Reading	10:43	11:43	12:22	13:13	14:10
Steam Flow x 100 lbs	3030527	3031122	3031508	3032024	3032556
Feedwater Flow x 100 lbs	0.05	0.05	0.05	0.05	0.05
Time of Reading	10:44	11:44	12:23	13:15	14:07
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.4	+2.4	+3.9	+1.9	+1.1
Windbox Pressure, "H ₂ O	+1.1	+1.1	+1.5	+1.0	+0.6
Furnace Pressure, "H ₂ O	-0.18	-0.20	-0.20	-0.16	-0.14
Boiler Outlet Pressure, "H ₂ O	-0.9	-0.9	-1.1	-0.75	-0.60
Economizer Outlet Pressure, "H ₂ O	-2.8	-2.7	-3.6	-2.4	-1.8
Dust Collector Outlet Pressure, "H ₂ O	-6.2	-6.1	-8.3	-5.2	-4.0
.					
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	145	145	148	150
Steam Header Pressure, psig	142	145	145	146	148
Feedwater Header Pressure, psig	217	230	240	243	223

KVB

TEST NUMBER	31	31	32	33	34
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	60.0	60.0	60.0	60.5	62.0
Air Flow, %	61.0	61.0	80.0	53.0	42.0
Excess Oxygen, %	8.9	8.6	9.9	7.8	5.7
Economizer Gas Temp Inlet, °F	530	535	550	530	519
Economizer FW Temp Outlet, °F	310	310	322	300	296
Economizer Gas Temp Outlet, °F	370	370	380	370	360
Feedwater Flow x 1000 lb/hr	52	56	56	53	60
Steam Pressure, psig	138	140	140	143	145
Feedwater Temp, °F	220	220	220	220	220
Feedwater Header Press, psig	210	225	255	250	210
Opacity, %	0.0.5.	0.0.5.	0.0.5.	0.0.5.	0.0.5.
CONTROLS					
Boiler Master/Stoker	55	55	55	55	54
Fuel Air Ratio	50	50	50	50	31
Forced Draft	60	61	75	59	49
Furnace Draft	70	70	84	65	58
Furnace Draft Bias	-0.18	-0.20	-0.20	-0.20	-0.20
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	61	58	55	55	62
Condensate Flow	30	30	30	30	30
Feedwater Pressure	54	59	59	52	51

KVB

TEST NUMBER	31	31	32	33	34
STOKER					
Front Upper OFA Press, "H ₂ O	0.50 13.8	0.50 13.8	0.50 13.8	0.50 13.8	0.49 13.6
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7
Rear Upper OFA Press, "H ₂ O	0.05 1.4	0.05 1.4	0.05 1.4	0.05 1.4	0.05 1.4
Rear Lower OFA Press, "H ₂ O	0.20 5.5	0.13 6.4	0.19 5.3	0.21 5.8	0.21 5.8
Boiler Hopper Reinjection Pressure, "H ₂ O	0.14 6.1	0.12 6.1	0.21 5.8	0.22 6.1	0.21 5.8
Econ Hopper Reinjection Pressure, "H ₂ O	0.31 8.6	0.32 8.9	0.32 8.3	0.31 8.6	0.31 8.6
Overfire Air Fan Static Pressure, "H ₂ O	1.30 36.0	1.31 36.3	1.30 36.0	1.30 36.0	1.30 36.0
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
FD FAN INLET AIR TEMP, °F	68	69	68	68	66
FURNACE					
Ash Bed Thickness, inches	2	2½	2	2½	2
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO
	Some clumps of coal (2-3 in) in furnace bed.	Burning OK			

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5342.5Steam Flow, lb/hr 60616FW Flow, lb/hr % Design Capacity 75.9Evaporation 11.3

TEST NUMBER	35	35	35		
DATE	2-14-79	2-14-79	2-14-79		
DESCRIPTION	NORM O ₂				
	NORM O ₂ A				
	PARTIC.				
INTEGRATORS					
Coal Scale x 200 lbs	121124	121162	121189		
Time of Reading	16:02	17:26	18:28		
Steam Flow x 100 lbs	3033736	3034578	3035211		
Feedwater Flow x 100 lbs	0.05.	0.05.	0.05.		
Time of Reading	16:03	17:28	18:29		
DRAFT GAUGES					
FD Fan Pressure, "H ₂ O	+2.3	+2.5	+2.5		
Windbox Pressure, "H ₂ O	+1.0	+1.1	+1.2		
Furnace Pressure, "H ₂ O	-0.18	-0.18	-0.15		
Boiler Outlet Pressure, "H ₂ O	-0.85	-0.85	-0.85		
Economizer Outlet Pressure, "H ₂ O	-2.7	-2.7	-2.7		
Dust Collector Outlet Pressure, "H ₂ O	-6.0	-6.1	-6.1		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	145	145		
Steam Header Pressure, psig	145	144	144		
Feedwater Header Pressure, psig	212	210	205		

KVB

TEST NUMBER	35	35	35		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	60.0	60.5	61.0		
Air Flow, %	62.5	61.5	61.5		
Excess Oxygen, %	8.9	8.6	8.8		
Economizer Gas Temp Inlet, °F	540	540	540		
Economizer FW Temp Outlet, °F	311	302	310		
Economizer Gas Temp Outlet, °F	373	372	370		
Feedwater Flow x 1000 lb/hr	57	55	55		
Steam Pressure, psig	140	139	134		
Feedwater Temp, °F	220	221	220		
Feedwater Header Press, psig	205	200	195		
Opacity, %	0.05	0.05	0.05		
CONTROLS					
Boiler Master/Stoker	54	55	55		
Fuel Air Ratio	50	50	50		
Forced Draft	59	61	63		
Furnace Draft	68	70	70		
Furnace Draft Bias	-0.15	-0.18	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	60	60	62		
Condensate Flow	30	30	30		
Feedwater Pressure	46	46	46		

KVB

TEST NUMBER	35	35	35		
STOKER					
Front Upper OFA Press, "H ₂ O	0.49 13.6	0.49 13.6	0.49 13.6		
Front Lower OFA Press, "H ₂ O	0.35 9.7	0.34 9.4	0.34 9.4		
Rear Upper OFA Press, "H ₂ O	0.05 1.4	0.05 1.4	0.05 1.4		
Rear Lower OFA Press, "H ₂ O	0.23 6.4	0.21 5.8	0.21 5.8		
Boiler Hopper Reinjection Pressure, "H ₂ O	0.22 6.1	0.21 5.8	0.22 5.8		
Econ Hopper Reinjection Pressure, "H ₂ O	0.30 8.3	0.31 8.6	0.31 8.6		
Overfire Air Fan Static Pressure, "H ₂ O	1.30 36.0	1.30 36.0	1.30 36.0		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, OF	70	70	70		
FURNACE					
Ash Bed Thickness, inches	2 1/2	2 1/2	2 1/2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

SECTION 2.0
PARTICULATE DATA

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BLR - 25.11 ft²
STACK - 12.84 ft²

PARTICULATE DATA SUMMARY
PART I

LOCATION: ABWA TEST SITE F

TEST NO.	Total Mass mgm.	Dry Gas Volume ft ³	Liquid Coll. ml.	Baro. Press. "Hg	Static Press. "H ₂ O	Pitot ΔP "H ₂ O	Orifice ΔH "H ₂ O	Stack Gas Temp. °R	Excess O ₂ %	Sampling Time min.	Nozzle Dia. in.	Pitot Factor n.d.	Fuel Factor SCF/10 ⁶ BTU	Flue Gas MW g/g mole
05 BLR	5443.2	4163	38.0	30.0	-2.0	0.091	0.71	770	94	72	.375	.837	9750 9871	29.49
15 BLR	4770.8	28.31	32.9	29.47	-4.4	0.309	0.472	848	7.8	60	.25	.837	9871	29.47
15 MECH	1514.4	45.28	54.6	29.47	0	0.735	1.27	808	8.8	60	.25	.837	9871	29.40
17 BLR	4342.9	24.77	31.4	29.87	-4.4	0.243	0.409	849	6.7	60	.25	.837	9688	29.57
17 MECH	1246.0	37.24	73.7	29.87	0.27	0.641	0.863	850	7.7	60	.25	.837	9688	29.22
18 BLR	4534.0	22.34	31.7	29.97	-3.6	0.193	0.303	825	5.5	60	.25	.837	10.36	29.59
18 MECH	779.2	33.10	42.1	29.97	0.20	0.500	0.705	860	6.7	60	.25	.837	10.36	29.66
19 BLR	5891.5	21.09	35.1	29.92	-3.6	0.179	0.277	839	5.9	62	.25	.837	10.252	29.36
19 MECH	1225.5	33.54	33.9	29.92	0.10	0.500	0.705	853	7.2	60	.25	.837	10.252	29.70
20 BLR	2451.8	21.21	26.2	29.49	-2.6	0.159	0.241	818	8.4	66	.25	.837	9289	29.38
21 BLR	3832.8	24.68	32.8	28.62	-3.2	0.167	0.445	817	8.0	72	.25	.837	9624	29.33
21 MECH	1221.7	37.28	43.5	28.62	0.10	0.407	0.612	842	8.9	60	.25	.837	9624	29.42
23 BLR	477.8	27.12	32.1	29.21	-3.6	0.203	0.3125	831	6.3	72	.25	.837	9334	29.69
23 MECH	1274.5	42.815	46.9	29.21	0.15	0.564	0.815	861	7.8	60	.25	.837	9334	29.74
24 BLR	6132.2	24.12	35.4	29.84	-3.6	0.176	0.269	830	5.0	72	.25	.837	9735	29.85
24 MECH	1252.8	37.84	43.4	29.84	0.27	0.51	0.74	853	6.5	60	.25	.837	9735	29.87
29 BLR	5214.7	24.82	48.0	29.90	-3.6	0.182	0.283	833	5.0	72	.25	.837	9768	29.60
29 MECH	1723.5	38.02	46.0	29.90	0.14	0.48	0.692	771	6.3	60	.25	.837	9768	29.66
35 BLR	3323.6	28.63	29.1	29.76	-3.0	0.165	0.296	816	8.7	72	.25	.837	9495	29.47
35 MECH	937.7	38.050	46.0	29.76	0.15	0.506	0.83	767	10.0	60	.25	.837	9495	29.47

PARTICULATE DATA SUMMARY
PART II

Location ABMA TEST SITE F

575

TEST NO.	LOAD %	O ₂ %	CONDITIONS	1b/10 ⁶ Btu Corrected	EMISSIONS			Moisture %	Stack Gas Velocity Ft/sec	Stack Gas Flow SCF/sec	Isokin. %
					1b/10 ⁶ BTU	GR/SCF	LB/HR				
5 BLR	53.8	9.4		5.076	5.113	2.009	360	4.13	20.18	348	95
15 BLR	98.8	7.8		5.926	5.895	2.638	820	5.29	39.52	604	100
15 MECH	98.8	7.8		1.329	1.322	0.547	138	5.71	59.23	491	97
17 BLR	99.1	6.7		5.510	5.585	2.708	750	5.47	34.77	538	100
17 MECH	99.1	6.7		1.130	1.145	0.516	120	8.57	56.51	452	94
18 BLR	99.1	5.5		6.136	5.945	3.125	794	6.29	30.87	494	99
18 MECH	99.1	5.5		0.771	0.747	0.362	73	5.67	49.15	355	93
19 BLR	99.1	5.9		8.785	8.414	4.309	1035	7.31	29.71	467	97
19 MECH	99.1	5.9		1.256	1.203	0.563	115	4.56	49.56	595	93
20 BLR	74.8	8.4		4.008	4.237	1.809	412	5.60	27.82	443	93
21 BLR	99.4	8.0		5.567	5.681	2.503	576	6.17	28.96	448	96
21 MECH	99.4	8.0		1.262	1.288	0.528	96	5.46	45.64	353	112
23 BLR	100.0	6.3		5.240	5.513	2.748	694	5.43	31.70	491	97
23 MECH	100.0	6.3		0.998	1.050	0.470	100	5.04	53.48	413	112
24 BLR	102.5	5.0		7.183	7.245	39.32	933	6.52	29.10	461	95
24 MECH	102.5	5.0		1.031	1.040	0.511	105	5.16	49.97	398	105
29 BLR	100.5	5.0		5.944	5.915	3.243	785	7.59	21.74	471	97
29 MECH	100.5	5.0		1.392	1.402	0.699	147	5.42	46.21	408	103
35 BLR	75.8	8.7		4.726	4.643	1.935	451	4.95	28.14	453	105
35 MECH	75.8	8.7		1.026	1.008	0.376	81	5.36	47.63	420	101

DATA

ISOXINETICS = 92.5

TEST NUMBER 5

DATE 12-19-78

OPERATOR H. Buening

FUEL Penn A

SITE F

PROBE LOCATION *Econ. Out*

Sampling Time Per Point, Min	6
---------------------------------	---

	$\frac{\text{Vac}}{\text{in. Hg}}$	$\frac{\text{ft}^3/\text{min}}{\text{min}}$
Before	15	0
After	15	0

[illegible]

METER VOL.	END	142.44
	START	100.86
SAMPLE VOL.		

ft³

C _{pitot}	Stack Press. In. Hg-Gauge	barometric Pressure
.837	-2.0	30.0

Percent O_2 = 9.4

Ambient Temp. 85 F

5.27 lbs / 10^6 BTU

Nomograph Setup

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz(Ideal)}$
 $\% \text{ H}_2\text{O} = 4.1 \text{ Noz(Actual)}$

$$H_2O = 4.1$$
$$V_s = 20.17 \frac{m}{sec} \quad \text{at } 5$$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	<u>107</u>	<u>100</u>	<u>7</u>
#2	<u>121</u>	<u>100</u>	<u>21</u>
#3	<u>0</u>	<u>0</u>	<u>0</u>
		Total	<u>28</u>

#4	$\sigma(\text{End})$	$\sigma(\text{Start})$	Δgrams
Silica (#)	210	200	10

Total Vol. H₂O 38 ml

PARTICULATE

DATA

Leak Check Rate

ISO KINETICS = 98

TEST NUMBER

15

Vac
in. Hg ft³/min

DATE

1-8-79

OPERATOR

FUEL

Pen A

SITE

F

PROBE LOCATION

Mech. Unit

Sampling Time Per Point, Min
5

Before
After

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ %	Vac.
		ΔP _s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers		Meter			
								In	Out				
1	5 min	.44	.65	3733.29	364	120	376	173	71				
2		.62	.92	3736.68			376	214	63				
3		.81	1.20	3740.19			376	214	61				
4		.53	.79	3743.10			364	214	61				
5		.82	1.22	3747.21			364	214	63				
6		1.1	1.63	3751.06			364	213	62				
7		.60	.89	3754.37			363	214	61				
8		.83	1.23	3758.89			375	214	60				
9		1.2	1.78	3763.325			381	214	60				
10		.45	.67	3766.10			378	213	61				
11		.56	.83	3769.09			370	213	61				
12	✓	.86	1.28	3773.35	✓	✓	371	213	62				

Memorandum Setup:

METER VOL. END 3773.35
START 3733.07
SAMPLE VOL. 40.28 ft³

C _f tot	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	0.0	29.47

Percent O₂ =

P_{meter} = C =
P_{stack} = T_{stack} =
T_{meter} = ΔP =
ΔH_g = Noz(Ideal) =
H₂O = 5.7 Noz(Actual) =

V_g = 59.82 ft³

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	127	100	27
#2	116	100	16
#3	2	0	2
			Total 45

	g (End)	g (Start)	grams
Solids	15.13	141.7	9.6
			Total Vol. H ₂ O 54.6

DATA

ISOKINETICS • 97 •

TEST NUMBER 15

Vac
in. Hg ft³/min

DATE 1-8-79

Sampling Time
Per Point, Min

Before
After

OPERATOR

FUEL Fish A

SITE

SITE F

PROBE LOCATION 1st Cond.

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ ,%	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter			
								In	Out				
1	1:10	.37	.56	146.25	360	330	270	160	65	85		6.0	
2	1:19	.29	.45	148.55	340	330	260	180	60	85		3.0	
3	1:28	.22	.32	150.50	360	340	300	160	65	85		2.5	
4	1:41	.15	.23	152.15	340	340	300	160	70	90		2.0	
5	2:11	.36	.55	154.71	400	270	290	150	70	85		3.0	
6	2:19	.40	.61	157.45	380	320	250	160	60	90		4.0	
7	2:28	.33	.50	159.90	420	330	280	170	65	90		3.0	
8	2:42	.25	.38	162.00	350	330	280	150	70	90		2.0	
9	3:05	.41	.64	164.80	440	280	280	150	70	90		4.0	
10	3:13	.39	.60	167.45	420	360	300	210	60	90		3.0	
11	3:21	.32	.49	169.75	450	400	320	210	65	90		3.0	
12	2:34	.22	.34	171.71	400	330	300	160	70	90		2.0	

METER VOL.	END	171.71	
	START	143.40	
SAMPLE VOL.		28.31	ft ³

C _{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
1.837	29.15	29.47

Percent O_2 =

Memorandum Set up

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta F =$
 $\Delta H_g = \text{Noz (Ideal)} =$
 $\text{H}_2\text{O} = 5.1 \quad \text{Noz (Actual)} =$

$$V_2 = 39.56$$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	122	100	22
#2	105	100	5
#3	0	0	0
Total			27

#4	g(Lnd)	g(Start)	grams
S.1:ca (a)	152.7	1416.8	5.9
Total Vol. H ₂ O			32.4

DATA

150KINETICS - 46

TEST NUMBER 17

DATE 1-12-79

OPERATOR

FUEL Penn A

SITE F

PROBE LOCATION *Encl. 047*

Sampling Time Per Point, Min	5
---------------------------------	---

	Vac in. Hg	ft ³ /min
Before	15.1	.01
After	15.1	0

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O ₂ , %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Indingers		Meter		
								In	Out			
1	1:49	.32	.48	175.27	380	260	220	130	70	90		3.0
2	1:58	.23	.35	177.29	340	350	270	160	70	90		2.0
3	2:08	.17	.25	178.90	380	300	280	150	75	90		1.0
4	2:18	.10	.15	180.08	310	290	280	170	70	92		1.0
5	2:23	.25	.38	182.10	420	280	260	160	65	93		2.0
6	2:42	.30	.46	184.42	390	350	290	175	68	95		3.0
7	2:50	.23	.35	186.41	420	360	290	180	70	95		3.0
8	2:59	.20	.31	188.27	340	360	300	180	65	97		2.7
9	3:23	.33	.51	190.74	430	280	280	160	70	95		3.0
10	3:31	.30	.46	193.04	430	350	290	170	70	95		3.0
11	3:40	.29	.45	195.33	440	350	300	160	70	93		4.0
12	3:48	.20	.31	197.29	390	360	300	200	70	97		3.0
Average		.247	.404		844°R					553°K		

Nomograph Setup

METER VOL.	END	192.29	
	START	172.52	
SAMPLE VOL.		24.77	ft ³

C _F istol	Stack Press. In. H ₂ O-Gauge	barometric Pressure
837	- 4.4" H ₂ O	

Percent O₂ =

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz (Ideal)} =$
 $\text{H}_2\text{O} = 5.7 \quad \text{Noz (Actual)} =$

$$V_2 = 34.5754 \text{ m}^3$$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	122	100	22
#2	104	100	4
#3	0	0	0
		Total	26
#4	<u>g(End)</u>	<u>g(Start)</u>	<u>Δgrams</u>
5.13cc (#1)	157.3	151.9	5.4
		Total Vol. H ₂ O	31.4

DATA

ISOKINETICS - 45,6.

TEST NUMBER 17

DATE 1-10-79

OPERATOR

FUEL Penn A

SITE

PROBE LOCATION *175H 048*

Sampling Time Per Point, Min	5
---------------------------------	---

	Vac in. Hg	ft ³ /min
Before	15	0
After	15	0

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter			
								OUT	IN				
1	5 min	.27	.39	3775.75	390	280	265	65	135	70			
2		.45	.64	3778.42	395	285	285	65	155	68			
3		.67	.46	3781.71	400	300	295	60	165	70			
4		.45	.64	3784.28	390	310	305	63	170	70			
5		.68	.47	3787.83	390	310	300	63	180	70			
6		.88	1.26	3791.51	390	300	310	62	185	70			
7		.48	.69	3794.33	390	305	320	62	190	74			
8		.71	1.02	3797.85	390	305	320	62	195	74			
9		.97	1.39	3802.35	390	305	330	62	210	74			
10		.40	.57	3804.84	390	305	310	62	210	74			
11		.52	.74	3806.96	390	305	310	62	210	76			
12	✓	.76	1.09	3810.95	390	305	310	62	210	76			

Honouraph. Setup.

METER VOL.	END	38.1445
	START	3773.71
SAMPLE VOL.		37.24 ft ³

C _p tot	Stack Press. In. H ₂ O Gauge	Barometric Pressure
537	4.27 H ₂ O	29.87

Percent O₂ = _____

W: 22/10/20 - .25

$P_{meter} = C =$
 $F_{stack} = T_{stack} =$
 $T_{meter} = \Delta F =$
 $\Delta H_g = Noz(Ideal) =$
 $\% H_2O = 8.6 \quad Noz(Actual) =$

$$V_s = 56.34$$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	120	100	20
#2	145	100	45
#3	0	0	0
		Total	65
#4	c(End)	c(Start)	Grams
Silica Gel	164.2	155.5	8.7
		Total Vol. H ₂ O	73.7 ml

PARTICULATE

DATA

Leak Check Rate

ISO KINETICS = 95.4

TEST NUMBER 18
DATE 1-15-79
OPERATOR Penn A
FUEL F
SITE F
PROBE LOCATION Equidist

Sampling Time
Per Point, Min
5

Vac
in. Hg ft³/min
Before
After

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
								In	Out			
1	15:41	.30	.16	200.30	340	300	220	150	70	80		2.0
2	15:44	.21	.33	202.21	300	330	260	180	60	85		
3	15:56	.13	.20	203.52	360	340	280	170	65	87		1.0
4	14:05	.11	.17	204.73	300	350	300	170	70	90		1.0
5	14:21	.26	.40	206.94	350	280	280	160	70	88		
6	14:31	.24	.38	209.01	370	330	300	180	70	90		2.0
7	14:41	.18	.29	210.85	420	350	310	195	70	90		2.0
8	14:50	.15	.23	212.70	320	350	320	190	70	92		1.0
9	15:11	.22	.34	214.67	410	260	290	160	70	90		2.0
10	15:14	.26	.40	216.88	400	310	300	200	65	90		3.0
11	15:28	.14	.30	218.73	420	350	310	180	70	90		2.0
12	15:37	.13	.20	220.10	390	350	320	200	70	92		1.0

METER VOL. END 220.16
START 197.82
SAMPLE VOL. 22.34 ft³

C _p tot	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-3.61420	29.97

Percent O₂ =

Nomograph Setup

P_{meter} = C =
P_{stack} = T_{stack} =
T_{meter} = ΔP =
ΔHg = Noz(Ideal) =
% H₂O = 6.3 Noz(Actual) =
V_g = 30.97

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	122	100	22
#2	102	100	2
#3	2	0	2
Total			
#4	g(End)	g(Start)	Δgrams
Silica Gel	1616	155.7	5.7
Total Vol. H ₂ O 31.7 ml			

DATA

Leak Check Rate

ISOKINETICS -

TEST NUMBER

15

DATE _____

1-15-79

OPERATOR

FUEL

Penn A

SITE

F

PROBE LOCATION *Mach-out*

Sampling Time Per Point, Min	5
---------------------------------	---

Before
After

Vac
in. Hg ft³/min

[illegible]

METER VOL.	END	385.202
	START	3818.92
SAMPLE VOL.		33.10

ft³

C _p itor	Stack Press. In. Hg-Gauge	barometric Pressure
837		29.97

Percent O_2 =

Nomograph Setup

$P_{meter} = C =$
 $P_{stack} = T_{stack} =$
 $T_{meter} = \Delta P =$
 $\Delta H_g = Noz(Ideal) =$
 $\% H_2O = 5.7 \quad Noz(Actual) =$

$$y_i =$$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	112	100	12
#2	117	100	17
#3	4	0	4
		Total	33

#4	<u>q(End)</u>	<u>q(Start)</u>	<u>Δgrams</u>
Silica	<u>160.2</u>	<u>151.5</u>	<u>8.1</u>
Gel			
	<u>Total Vol. H₂O</u>		<u>42.1</u> ml

DATA

ISOKINETICS =

TEST NUMBER 14

DATE 1-16-79

OPERATOR

FUEL	<u>Penn A</u>
------	---------------

SITE F

PROBE LOCATION *Even Out*

Sampling Time Per Point, Min	5
---------------------------------	---

	Vac in. Hg	ft ³ /min
Before	15	0.2
After	10	0.2

[illegible]

METER VOL.	END	255.65
	START	234.56
SAMPLE VOL.		

C _{pitot}	Stack Press. Am. Hg Gauge	Barometric Pressure
837	36" H ₂ O	29.92

Percent O_2 = _____

Nomograph Setup

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz(Ideal)} =$
 $\% \text{ H}_2\text{O} = 7.3 \quad \text{Noz(Actual)} =$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	<u>112</u>	<u>100</u>	<u>12</u>
#2	<u>105</u>	<u>100</u>	<u>5</u>
#3	<u>2</u>	<u>0</u>	<u>2</u>
		Total	<u>19</u>
#4	<u>g(End)</u>	<u>g(Start)</u>	<u>Δgrams</u>
Silica	<u>173.4</u>	<u>157.3</u>	<u>16.1</u>
Gel			
		Total Vol. H ₂ O	<u>35.1 ml</u>

DATA

Leak Check Rate

ISOKINETICS - _____

TEST NUMBER 19

DATE 1-16-79

OPERATOR

FUEL Penn A

SITE F

PROBE LOCATION Mech. Out

[illegible]

Before

After

Vac
in. Hg ft³/min

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter			
								In	Out				
1	5 min	.26	.37	3857.28	385	260	305	60	170	61			
2		.35	.50	3859.73	390	260	300	60	190	62			
3		.44	.64	3862.43	390	285	300	60	190	64			
4		.37	.52	3864.34	390	260	305	62	200	60			
5		.61	.86	3867.58	390	270	305	60	210	65			
6		.86	1.21	3871.24	390	290	305	60	215	65			
7		.38	.54	3873.53	395	295	310	62	215	70			
8		.57	.81	3876.52	395	295	312	62	225	70			
9		.82	1.16	3880.35	395	300	300	62	235	72			
10		.27	.38	3882.22	395	280	300	62	220	75			
11		.40	.54	3885.15	395	280	305	62	220	75			
12	✓	.62	.88	3888.59	400	305	310	62	225	74			

METER VOL.	END	3855.54	
	START	3863.05	
SAMPLE VOL.		33.54	ft ³

C _{pitot}	Stack Press. In. Hg-Gauge	barometric Pressure
0.837	+ 0.10	24.92

Percent O_2 =

Ambient Air Temp. 30°F

Nomograph Setup

$P_{\text{meter}} = C =$

$$P_{stack} = T_{stack} =$$
$$T_{\text{meter}} = \Delta P =$$
$$\Delta H_g = N_{O_2}(\text{Ideal}) =$$
$$H_2O = \text{Noz(Actual)} =$$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
-------------	-------------------	---------------------	-------------------

45 - 100 - 7 -

$$\frac{141}{100} = 1.41$$

12 $\frac{100}{100} = \frac{100}{100} = \frac{100}{100}$

#3 0 - 0 - 0

Total 25

#4	<u>g(End)</u>	<u>g(Start)</u>	<u>Δgrams</u>
----	---------------	-----------------	---------------

Silica	164.4	155.5	8.9
--------	-------	-------	-----

Total Vol. H₂O 33.9 ml

DATA

ISOKINETICS •

DATE 1-17-79

OPERATOR

FUEL

SITE

PROBE LOCATION ECU OUT

Sampling Time Per Point, Min	6
---------------------------------	---

Before

After

Vac	ft ³ /min
in. Hg	
21	1.1

[illegible]

METER VOL.	END	277.82	
	START	256.61	
SAMPLE VOL.		21.21	ft ³

C _F tot	stack Press. In the house	barometric Pressure
837	-2.6" H ₂ O	29.49

Percent O₂ =

Memorandum Setup

P_{meter}	=	C	=
P_{stack}	=	T_{stack}	=
T_{meter}	=	Δt	=
ΔH_g	=	$Noz(Ideal)$	=
$\% H_2O$	=	5%	$Noz(Actual)$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	118	100	18
#2	103	100	3
#3	0	0	0
Total			21

#4	c(End)	c(Start)	grams
Silica	151.4	156.2	5.2
Fe:			

Total Vol. H₂O 26.2 ml

DATA

ISOINETICS - 43

TEST NUMBER

Vac
in. Hg ft³/min

Before .16 0.02
After

DATE _____

OPERATOR

FUEL

SITE

PROBE LOCATION *Entrance*

Sampling Time Per Point, Min	6
---------------------------------	---

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Imingers		Meter			
								In	Out				
1	10:26	.20	.34	281.78	330	320	260	170	70	80		2.0	
2	10:38	.15	.25	283.67	300	320	280	180	70	83		1.0	
3	10:48	.12	.20	285.42	340	340	288	160	70	85		1.0	
4	10:57	.08	.13	286.55	300	340	280	180	70	87		.5	
5	11:14	.22	.37	288.97	400	260	260	170	68	90		2.0	
6	11:29	.22	.37	291.55	360	300	260	170	70	90		2.0	
7	11:38	.16	.27	293.54	400	330	250	170	68	90		1.0	
8	11:48	.13	.22	295.46	300	340	300	180	70	92		1.0	
9	12:13	.23	.38	298.01	400	280	300	170	75	90		2.0	
10	12:22	.20	.33	300.36	390	310	310	200	70	90		2.0	
11	12:31	.18	.30	302.52	400	340	310	210	70	93		1.0	
12	12:41	.11	.18	304.17	380	300	300	180	72	95		.5	

METER VOL.	END	304.17	
	START	274.49	
SAMPLE VOL.		24.68	ft ³

C _F tot	Stack Press. Low-Hg Gauge	Barometric Pressure
.1837	-3.2" H ₂ O	28.62

Percent O_2 = _____

Honour and Setur

P_{meter}	=	C	=
P_{stack}	=	T_{stack}	=
T_{meter}	=	ΔP	=
ΔH_G	=	$\text{Noz}(\text{Ideal})$	

$$H_2O = 6.2 \text{ NO}_2 (\text{Actual}) =$$
$$V_s = 28.93$$
$$V = 1.12$$

<u>Imp.</u>	<u>Vol. (Lnd)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	127	100	27
#2	48	100	-2
#3	0	0	0
Total			25

Total 25

#4	c(End)	c(Start)	Acgrams
5:10:08	160.8	153.0	7.8
6:2			

Total Vol. H₂O 32.8 ml

DATA

ISOKINETICS - 112.

TEST NUMBER 21

DATE 2-1-79

OPERATOR

FUEL Penn A

SITE F

PROBE LOCATION *Asch. 200*

Sampling Time Per Point, Min	5
---------------------------------	---

Before

After

[illegible]

METER VOL.	END	394.27
	START	3909.11
SAMPLE VOL.		37.25 ft ³

C _F Factor	Stack Press. In. Hg Gauge	Barometric Pressure
.837	+0.10	28.62

Percent O₂ =

Nomograph Setup

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz (Ideal)} =$
 $\text{H}_2\text{O} = 5.5 \quad \text{Noz (Actual)} =$

$$V_s = 415.65 \text{ ft/s} = 0$$

Imp.	Vol. (End)	Vol. (Start)	$\Delta \text{Vol. (ml)}$
#1	120	100	20
#2	112	100	12
#3	0	0	0

Total

#4	$c(\text{End})$	$c(\text{Start})$	Acres
Silica (d)	161.0	149.5	11.5

Total Vol. H₂O 43.5 ml.

DATA

ISOKINETICS -

TEST NUMBER 23

DATE 2-1-79

OPERATOR J E C

FUEL Penn A

SITE F

PROBE LOCATION Elon On

Sampling Time Per Point, Min.	6
----------------------------------	---

Before
After

Vac
in. Hg ft³/min

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O ₂ , %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Indingers		Meter		
								In	Out			
1	2:27	.25	.38	310.31	350	220	200	140	70	80		2.0
2	2:37	.19	.29	312.33	340	380	280	160	65	82		1.0
3	2:47	.14	.21	314.14	330	320	290	170	70	87		1.0
4	2:51	.10	.16	315.57	310	340	300	180	70	90		1.0
5	3:14	.23	.35	317.89	400	260	220	160	70	90		2.0
6	3:30	.23	.35	320.45	380	360	280	160	70	90		2.0
7	3:41	.22	.34	322.68	410	350	300	140	65	92		2.0
8	3:52	.20	.31	325.05	340	350	290	200	60	90		2.0
9	4:12	.22	.34	327.40	400	270	380	170	70	90		2.5
10	4:27	.27	.42	330.08	380	330	290	190	70	90		3.0
11	4:37	.21	.32	332.43	420	350	290	180	68	90		2.0
12	4:47	.18	.28	334.44	390	350	300	170	68	90		1.0
Average		0.203	0.3125		371°F					88°F		

METER VOL.	END	32.44	
	START	307.32	
SAMPLE VOL.		27.12	ft ³

Stack	Stack Press. 3.6 H₂O	barometric Pressure
1831	-3.6 H ₂ O	29.21

Percent O₂ =

Nomograph Setup

$P_{\text{meter}} = C =$
 $F_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta h_g = \text{Noz}(\text{Ideal}) =$
 $\% \text{H}_2\text{O} = 5.4 \text{ Noz}(\text{Actual}) =$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	<u>122</u>	- <u>100</u>	- <u>22</u>
#2	<u>104</u>	- <u>100</u>	- <u>4</u>
#3	<u>0</u>	- <u>0</u>	- <u>0</u>
		Total	

#4 $\frac{c(\text{End})}{c(\text{Start})}$ $\frac{a(\text{Start})}{a(\text{End})}$ $\frac{\Delta \text{grams}}{\Delta \text{grams}}$

Sol: ca 157.2 151.1 32.1

Ca: 157.2 151.1 32.1

Total Vol. H₂O 32.1 ml

DATA

ISOKINETICS -

TEST NUMBER

23

DATE _____

2-1-74

OPERATOR

FUEL

SITE

PROBE LOCATION *1464 1/2*

Sampling Time
Per Point, Min.

.5

Before

After

VAC

$$2r, Hg \quad f r^3 / m_2 n$$

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter			
1	5 min	.24	.38	3951.63	405	250	270	70	100	60		1.0	
2		.48	.70	3954.78	405	250	270	70	115	60		5.5	
3		.58	.85	3958.61	405	260	270	70	120	65		6.0	
4		.42	.61	3961.84	405	270	280	65	130	65		5.0	
5		.66	.95	3965.32	405	270	280	65	135	65		7.2	
6		.87	1.2	3969.21	405	270	280	65	150	65		11.0	
7		.45	.64	3972.21	405	270	280	65	170	70		5.5	
8		.72	1.03	3976.30	405	270	280	69	185	70		8.0	
9		.86	1.23	3980.71	390	275	300	69	180	70		10.2	
10		.33	.46	3983.42	395	275	305	65	175	72		4.0	
11		.43	.63	3986.39	390	280	310	70	180	72		5.2	
12	"	.70	1.1	3990.285	400	280	320	70	190	72		9.0	
								</					

METER VOL.	END	3990.25
	START	3447.47
SAMPLE VOL.		42.515

C _{PTOT} :	Stack Press. 75-Hg-Gauge	Barometric Pressure
.837	7.15" H ₂ O	24.21

Percent O₂ =

Ambient Air Temp. 20°F

F_{meter}	=	C	=
F_{stack}	=	T_{stack}	=
T_{meter}	=	ΔP	=
ΔH_g	=	$Noz(Ideal)$	=
V_{H_2O}	= 5.0	$Noz(Actual)$	=

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	117	100	17
#2	110	100	10
#3	3	3	3
		Total	36
#4	e(End)	e(Start)	grams
Salica	160.6	149.7	10.9
Cal			
		Total Vol. H ₂ O	46.9 ml

DATA

ISOKINETICS - 11.2.

TEST NUMBER 24
DATE 2-6-79
OPERATOR _____
FUEL Lean A
SITE E
PROBE LOCATION Lean O

Sampling Time Per Point, Min.	6
----------------------------------	---

	Vac in. Hg	ft ³ /min
Before	15.	0.00
After		

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Indingers		Meter			
								In	Out				
1	2:46	.28	.43	337.59	350	340	250	170	70	83		2.5	
2	2:55	.14	.29	339.62	340	340	350	140	68	85		2.0	
3	3:04	.12	.17	341.18	340	350	330	140	70	88		1.0	
4	3:13	.09	.14	342.46	300	370	310	140	70	90		1.0	
5	3:22	.21	.32	344.70	340	—	—	160	70	90		2.0	
6	3:43	.24	.37	347.14	380	310	280	160	70	90		2.0	
7	3:52	.17	.26	349.13	430	340	290	180	68	92		1.5	
8	4:03	.16	.25	351.02	320	350	300	180	70	93		1.5	
9	4:30	.17	.26	353.07	400			170	70	90		1.5	
10	4:39	.15	.23	354.44	400	360	280	140	70	90		1.0	
11	4:48	.18	.28	357.01	410	350	300	140	68	92		2.0	
12	4:58	.15	.23	358.90	380	350	300	170	70	95		1.0	

METER VOL.	END	358.94	
	START	334.78	
SAMPLE VOL		24.12	ft ³

C _p tot	Stack Press. In. H ₂ O Gauge	Barometric Pressure
1.837	-3.6" H ₂ O	29.84

Percent O_2 = _____

Ambient Temp. 12°F

Nonparagraph Setup

F_{meter}	C	$=$
F_{stack}	T_{stack}	$=$
T_{meter}	ΔP	$=$
ΔH_g	$\text{Noz}(\text{Ideal})$	$=$
$\text{H}_2\text{O} = 5.7$	$\text{Noz}(\text{Actual})$	$=$

$$v_1 = 29.32$$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	125	100	25
#2	105	100	5
#3	0	0	0
Total			30
#4	c(End)	c(Start)	grams
E.1:ca Gel	1354	150.0	54
Total Vol. H ₂ O			35.4 gr.

DATA

Leak Check Rate

ISOMINETICS = 294.

TEST NUMBER 2-1

Vac
in. Hg ft³/min

Sampling Time Per Point, Min	5
---------------------------------	---

Before
After

DATE 2-6-74

OPERATOR

FUEL 12000.0

SITE 7

PROBE LOCATION: Mach 0.1
0.1500000000

METER VOL.	END	4030.06
	START	3942.22
SAMPLE VOL.		3784 ft ³

Percent O₂ = _____

4m c'n + Temp. 12'f'

Nomouraph Setur.

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz (Ideal)} =$
 $\text{H}_2\text{O} = 5, 1 \text{ Noz (Actual)} =$
 $\therefore 50.36$

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	107	100	7
#2	120	100	20
#3	6	0	6
Total			33

#4	<u>c(End)</u>	<u>c(Start)</u>	<u>hegrams</u>
00:30a	10.4	15.0	10.4

Total Vol. H₂O 43.4 ml

DATA

ISOKINETICS - 43

TEST NUMBER 29

DATE 2-12-79

OPERATOR

FUEL Penn. 13

SITE F

PROBE LOCATION Entr. cut

Sampling Time Per Point, Min	6
---------------------------------	---

Before
After

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						$O_2\%$	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
								In	Out			
1	5:55	.27	.41	362.32	350	300	280	140	70	76		2.0
2	6:04	.16	.25	364.37	320	320	300	160	60	80		1.5
3	6:15	.12	.19	365.86	350	340	300	160	70	82		1.0
4	6:22	.095	.15	367.20	310	340	300	170	70	85		<1
5	6:38	.21	.32	369.46	420	340	300	170	70	87		2.0
6	6:46	.21	.32	372.66	400	340	300	190	67	89		2.0
7	6:55	.17	.27	373.63	420	340	310	190	70	90		2.0
8	7:05	.16	.25	375.61	350	340	310	190	70	90		1.5
9	7:14	.19	.30	377.76	400	340	310	190	70	90		2.0
10	7:27	.21	.32	380.09	405	340	300	180	70	90		2.5
11	7:35	.22	.35	382.42	400	340	300	180	65	90		3.0
12	7:44	.17	.27	384.45	370	340	300	180	70	90		2.0
Average		0.182	0.283		373°F					87°F		

METER VOL.	END	384.45	
	START	359.63	
SAMPLE VOL.		24.82	ft ³

Critol	Stack Press. In. H ₂ O-Gauge	Barometric Pressure
837	3.6 "H ₂ O	29.90

Percent O₂ = _____
$$\begin{aligned} P_{\text{meter}} &= C = \\ P_{\text{stack}} &= T_{\text{stack}} = \\ T_{\text{meter}} &= \Delta P = \\ \Delta H_0 &= \text{Noz(Ideal)} = \end{aligned}$$

* $H_2O = 6.0$ Noz (Actual) *

$$v_s = 29.66 \text{ ft/sec}$$
 $\gamma = 1.19$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	<u>124</u>	- <u>100</u> -	<u>24</u>
#2	<u>108</u>	- <u>100</u> -	<u>8</u>
#3	<u>5</u>	- <u>0</u> -	<u>5</u>
		Total	<u>37</u>

#4	$\frac{q(\text{End})}{\text{Silica Gel}}$	$\frac{q(\text{Start})}{\text{Total Vol. H}_2\text{O}}$	Grams
	160.0	154.0	6
			43

PARTICULATE

DATA

Leak Check Rate

ISO KINETICS = 103

TEST NUMBER 29

Vac
in. Hg ft³/min

DATE 2-12-79

Sampling Time
Per Point, Min
5

Before
After

OPERATOR

FUEL Propan 13

SITE F

PROBE LOCATION: March 0.5 ft
collected for 2.0 hr

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O ₂ %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
								OUT	IN			
1	5 min	.20	.24	4032.45	340	275	270	55	165	50		10
2		.38	.56	4035.27	340	300	300	55	180	55		20
3		.54	.74	4038.98	300	300	305	55	215	55		50
4		.33	.47	4041.30	300	300	305	55	210	55		30
5		.54	.78	4045.56	310	300	320	55	210	58		50
6		.25	.40	4049.86	305	290	315	55	200	58		65
7		.35	.50	4052.62	300	275	315	55	190	60		30
8		.60	.86	4056.31	305	275	315	55	200	60		60
9		.76	1.1	4057.67	305	275	315	55	210	62		60
10		.30	.43	4061.52	310	280	320	55	190	62		20
11		.38	.55	4064.50	310	280	320	55	190	62		25
12		.62	.90	4068.10	300	280	320	55	190	62		60

METER VOL. END 4068.10
START 4030.25
SAMPLE VOL. 37.85 ft³

C _{stack}	Stack Press. In. Hg Gauge	Barometric Pressure
.837	.141 H ₂ O	29.616

Percent O₂ =

Barograph Setup

P_{meter} = C
T_{stack} = T_{stack}
T_{meter} = ΔP
ΔH = Noz(Ideal) =
H₂O = 5.21 Noz(Actual) =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	115	100	15
#2	114	100	14
#3		0	1
Total			

#4 Vol. (End) 100.83 Vol. (Start) 152.8
Bulbs (ml) 100.83 - 152.8 = 8.05
Total Vol. H₂O 416.35

PARTICULATE

DATA

Leak Check Rate

ISOCHINETICS = 120.5

TEST NUMBER 35

DATE 2-14-75

OPERATOR

FUEL Penn B

SITE F

PROBE LOCATION E. Am. Out

Sampling Time Per Point, Min.
6

Before
After

Vac
in. Hg ft³/min

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O ₂ , %	Vac.
		Δ P _s	Δ H	Meter Reading	Stack	Probe	Oven	Imdingers		Meter			
								In	Out				
Port #1 1	15:52	.21		386.57	343	320	270	180	-	89	90		
2		.17		388.62	309	320	290	180	-	89	92		
3		.11		390.10	330	330	310	180	-	90	77		1.0
4		.09		391.28	300	330	305	185	-	92	98		1.0
Port #2 1		.20	.34	393.50	355	270	270	190	62	92	95		2.0
2		.22	.37	395.45	350	280	285	190	62	92	97		2.0
3		.17	.34	398.88	410	310	300	190	63	93	97		2.0
4		.16	.30	401.88	310	310	310	192	67	93	98		2.0
Port #3 1		.15	.28	404.15	395	315	280	192	68	92	98		2.0
2		.145	.36	406.68	390	300	305	190	65	92	98		2.4
3		.17	.32	409.18	420	300	310	190	63	92	98		2-3
4		.135	.25	411.439	365	305	310	190	67	93	98		2.0

METER VOL. END 411.439
START 384.51
SAMPLE VOL. 26.928 ft³

C _{factor}	Stack Press. In. Hg-Gauge	Barometric Pressure
.937	-3.0" H ₂ O	24.76

Percent O₂ =

Barograph Setup

F_{meter} = C
T_{stack} = T_{stack}
T_{meter} = ΔP
ΔHg = Noz (Ideal) =
H₂O = 41.7 Noz (Actual) =

Ino.	Vol. (End)	Vol. (Start)	ΔVol. (ft ³)
#1	122	100	22
#2	102	100	2
#3	0	0	0
Total			24
#4	5 (End)	0 (Start)	5
Total Vol. H ₂ O			29.1

DATA

ISOKINETICS = 10'30

TEST NUMBER 35

DATE 2-12-75
OPERATOR M. G. Gaudin
FUEL Heater B
SITE E
PROBE LOCATION Area 4 D-11
Collect

Sampling Time Per Point, Min	5
---------------------------------	---

	$\frac{\text{Vac}}{\text{in. Hg}}$	ft^3/min
Before		
After		

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O ₂ , %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
								In	Out			
1	5 min	.27	.37	4089.70	310	305	300	55	155	62		1.0
2		.50	.82	4093.06	295	310	300	55	165	62		3.5
3		.53	.95	4096.53	280	305	305	62	160	62		4.2
4		.40	.65	4097.57	310	320	320	64	200	70		3.0
5		.65	1.07	4103.33	305	307	320	66	225	72		5.4
6		.78	1.28	4107.32	305	310	325	68	230	72		7.0
7		.36	.59	4109.92	310	310	325	65	235	75		1.5
8		.58	.96	4113.46	307	305	305	65	240	75		4.5
9		.73	1.18	4117.20	310	305	310	65	220	73		6.4
10		.25	.41	4119.57	320	310	320	65	220	73		1.0
11		.38	.62	4122.50	316	300	320	60	220	73		2.0
12	v	.64	1.05	4126.28	316	300	325	60	220	72		5.0
Average		0.506	0.83		307 K					70 °F		

METER VOL.	END	412.78
	START	415.765
SAMPLE VOL.		38.65

C _{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	.15" Hg	29.76

Percent O₂ =

$P_{\text{meter}} = C =$
 $P_{\text{stack}} = T_{\text{stack}} =$
 $T_{\text{meter}} = \Delta P =$
 $\Delta H_g = \text{Noz(Ideal)} =$
 $\% \text{ H}_2\text{O} = 5.3 \text{ Noz(Actual)} =$

$$v_s = 47.64 \text{ ft/sec}$$

<u>Imp.</u>	<u>Vol. (End)</u>	<u>Vol. (Start)</u>	<u>ΔVol. (ml)</u>
#1	<u>109</u>	- <u>100</u>	= <u>9</u>
#2	<u>122</u>	- <u>100</u>	= <u>22</u>
#3	<u>5</u>	- <u>0</u>	= <u>5</u>
Total			<u>36</u>

Total 36

#4	$\frac{q(\text{End})}{\text{Silica Gel}}$	$\frac{q(\text{Start})}{\text{Silica Gel}}$	grams
	100.02	150.	10
	Total Vol. H ₂ O		46 ml

PARTICULATE LAB WORKSHEET

TEST NO. 5 (Inlet, Outlet) ^{B/L} LOCATION ARMA site F
 Date 12-19-78 Box No. _____ Eng. LS.
 Test Description Baseline Pacific @ 45 K/lbs/Hr.

Dry Gas Meter Vol (ft³)

Final 142.49
 Initial 100.86
 Δ DgV 41.63

Impinger Water Vol (ml)

Final
 Initial
 Δ Vlc

1	2	3	Total
See accompanying data sheet			

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	Acetone Blank No.
BOTTLE NO.		1	1	1	2	200 ml
BEAKER NO.		1				6
DATE WT.		12-18-78	12-19-78	12-18-78	12-18-78	12-18-78
TARE WT.	1	100.0747	60.5214	.8404	.8455	100.4806
	2	100.0743	60.5213	.8400	.8458	100.4809
	3	100.0747	60.5210	.8399	.8458	100.4811
	4					
AVG.		100.0746	60.5212	.8401	.8457	100.4809

^{100 ml}
180 ml POST TEST WTS.

1		100.1139	65.1562	1.0119	.8454	100.4858
2		100.1192	65.1559	1.0117	.8456	100.4855
3		100.1193	65.1561	1.0116	.8455	100.4853
4						
AVG.		100.1191	65.1561	1.0117	.8455	100.4855
Δ WT.		0.0445	5.2349	0.1716	- .0002	+ 0.0046

Δ Vlc = 38 ml
 Δ DgV = 41.63 ft³
 Δ Mn 5.4432 g/m

LOAD 45 klb/hr
 O₂ 9.4 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 15 (~~Inlet~~, ~~Outlet~~)

LOCATION 4EMA Site F

Date 1/2/77

Box No. _____

Eng. _____

Test Description _____

Dry Gas Meter Vol (ft³)

Final _____

Initial _____

Δ DgV _____

Impinger Water Vol (ml)

1	2	3	Total
Final			
Initial			
Δ Vlc			

Final

Initial

Δ Vlc

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				<u>3</u>		
BEAKER NO.		<u>5</u>	<u>4</u>			
DATE WT.		<u>12-18-76</u>	<u>12-19-78</u>	<u>12-18-78</u>		
TARE WT.	1	<u>99.9246</u>	<u>100.7865</u>	<u>.8550</u>		
	2	<u>99.9250</u>	<u>100.7861</u>	<u>.8551</u>		
	3	<u>99.9251</u>	<u>100.7863</u>	<u>.8551</u>		
	4					
AVG.		<u>99.9249</u>	<u>100.7863</u>	<u>.8551</u>		

POST TEST WTS.

1		<u>100.0065</u>	<u>105.2715</u>	<u>01.0364</u>		
2		<u>100.0063</u>	<u>105.2946</u>	<u>01.0363</u>		
3		<u>100.0061</u>	<u>105.2715</u>	<u>01.0361</u>		
4						
AVG.		<u>100.0063</u>	<u>105.2945</u>	<u>01.0363</u>		
Δ WT.		<u>0.0814</u>	<u>4.5082</u>	<u>0.1812</u>		

Δ Vlc = 32.9 ml

LOAD 871 klb/hr

Δ DgV = 28.31 ft³

O₂ 7.8 %

Δ Mn 4770.3 mgm

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 15 Mech. Out (Inlet, Outlet) LOCATION F
 Date 1/8/79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.		<u>2</u>	<u>2</u>	<u>4</u>		
BEAKER NO.						
DATE WT.		<u>1-4-79</u>	<u>1-4-79</u>	<u>12-18-78</u>		
TARE WT.	1	<u>100.6053</u>	<u>78.8320</u>	<u>.8303</u>		
	2	<u>100.6054</u>	<u>78.8315</u>	<u>.8303</u>		
	3	<u>100.6051</u>	<u>78.8316</u>	<u>.8301</u>		
	4					
AVG.		<u>100.6052</u>	<u>78.8318</u>	<u>.8302</u>		

POST TEST WTS.

	1	<u>100.9373</u>	<u>79.5974</u>	<u>01.2473</u>		
	2	<u>100.9372</u>	<u>79.5971</u>	<u>01.2471</u>		
	3	<u>100.9372</u>	<u>79.5970</u>	<u>01.2470</u>		
	4					
AVG.		<u>100.9372</u>	<u>79.5972</u>	<u>01.2471</u>		
Δ WT.		<u>0.3321</u>	<u>0.7654</u>	<u>0.4169</u>		

Δ Vlc = 54.6 ml
 Δ DgV = 43.28 ft³
 Δ Mn 1514.4 mgm

LOAD 50 klb/hr
 O₂ 8.8 %
 REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 17 (~~Inlet, Outlet~~)

LOCATION 1, 4

Date 1/10/79

Box No. _____

Eng. _____

Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.		<u>12</u>		<u>6</u>		
BEAKER NO.			<u>6</u>			
DATE WT.			<u>1/6/78</u>	<u>1/5/78</u>		
TARE WT.	1	<u>98.7403</u>	<u>100.4217</u>	<u>.5024</u>		
	2	<u>98.7423</u>	<u>100.4217</u>	<u>.51</u>		
	3	<u>98.7425</u>	<u>100.4219</u>	<u>.51</u>		
	4					
AVG.		<u>98.7404</u>	<u>100.4218</u>	<u>.8422</u>		

POST TEST WTS.

1		<u>98.8415</u>	<u>104.5236</u>	<u>1.0420</u>		
2		<u>98.8414</u>	<u>104.5239</u>	<u>1.0421</u>		
3		<u>98.8413</u>	<u>104.5240</u>	<u>1.0422</u>		
4						
AVG.		<u>98.8414</u>	<u>104.5238</u>	<u>1.0421</u>		
Δ WT.		<u>0.101</u>	<u>4.042</u>	<u>0.1999</u>		

Δ Vlc = 31.4 ml

LOAD 80 klb/hr

Δ DgV = 24.77 ft³

O₂ 6.7 %

Δ Mn 4342.9 mgm

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 17 ²⁰⁷ ~~(Inlet, Outlet)~~ LOCATION ABAMA
 Date 1/11/79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Final _____
 Initial _____
 Δ Vlc _____

Impinger Water Vol (ml)

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.		<u>15</u>		<u>7</u>		
BEAKER NO.			<u>8</u>			
DATE WT.			<u>1/6/78</u>	<u>1/6/78</u>		
TARE WT.	1	<u>101.4234</u>	<u>99.3337</u>	<u>.8240</u>		
	2	<u>101.4236</u>	<u>99.3339</u>	<u>.8238</u>		
	3	<u>101.4238</u>	<u>99.3340</u>	<u>.8239</u>		
	4					
AVG.		<u>101.4236</u>	<u>99.3339</u>	<u>.8239</u>		

POST TEST WTS.

1		<u>101.8965</u>	<u>99.7519</u>	<u>1.1788</u>		
2		<u>101.8966</u>	<u>99.7516</u>	<u>1.1791</u>		
3		<u>101.8969</u>	<u>99.7514</u>	<u>1.1793</u>		
4						
AVG.		<u>101.8967</u>	<u>99.7516</u>	<u>1.1791</u>		
Δ WT.		<u>0.4731</u>	<u>0.4177</u>	<u>0.3552</u>		

Δ Vlc = 73.7 ml
 Δ DgV = 37.24 ft³
 Δ Mn 1246 mgm

LOAD 80 klb/hr
 O₂ 7.7 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 18 (Inlet, Outlet)

LOCATION Exhaust Outlet

Date 1-15-79

Box No. _____

Eng. Tidona

Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
Initial _____
Δ DgV _____

Impinger Water Vol (ml)

Final _____
Initial _____
Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				8		
BEAKER NO.		# 30	# 5			
DATE WT.		1-13-79	1-13-79	1-13-79		
TARE WT.	1	103.1102	99.9245	.8290		
	2	103.1000	99.9245	.8290		
	3	103.1028	99.9243	.8290		
	4					
AVG.		103.1100	99.9245	.8290		

POST TEST WTS.

1		103.4726	103.9073	.0173		
2		103.4723	103.9073	.0173		
3		103.4724	103.9073	.0173		
4						
AVG.		103.4724	103.9073	.0173		
Δ WT.		.3624	3.9833	.1873		

Δ Vlc = 31.7 ml

LOAD 80 klb/hr

Δ DgV = 22.34 ft³

O₂ 5.5 %

Δ Mn 4531.0 mgm

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 18 (Inlet, Outlet)

LOCATION Mech. Inst. Collect. Outlet

Date 1-15-79

Box No. _____

Eng. _____

Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
Initial _____
 Δ DgV _____

Final _____
Initial _____
 Δ Vlc _____

Impinger Water Vol (ml)

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				9		
BEAKER NO.		#10	#1			
DATE WT.		1-13-79	1-13-79	1-13-79		
TARE WT.	1	100.9350	100.0743	.8467		
	2	100.9346	100.0746	.8468		
	3	100.9344	100.0745	.8466		
	4					
AVG.		100.9347	100.0746	.8467		

POST TEST WTS.

1	101.0635	100.4027	1.1690		
2	101.0630	100.4025	1.1690		
3	101.0631	100.4025	1.1691		
4					
AVG.	101.0632	100.4024	1.1696		
Δ WT.	.1285	.3278	.3229		

Δ Vlc = 42.1 ml
 Δ DgV = 33.10 ft³
 Δ Mn = 779.2 mgm

LOAD 80 klb/hr
O₂ 6.7 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 19 Conduct
 (Inlet, Outlet) LOCATION 6' / 11'
 Date 1/15/79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				2		
BEAKER NO.		16				
DATE WT.		1-17-79	1-17-79	12-20-78		
TARE WT.	1	98.7370	100.6050	.8455		
	2	98.7361	100.6050	.8458		
	3	98.7367	100.6050	.8458		
	4					
AVG.		98.7368	100.6050	0.8457		

POST TEST WTS.

	1	98.8990	106.1080	1.0788		
	2	98.8967	106.1041	1.0784		
	3	98.8965	106.1038	1.0786		
	4	98.8966	106.1036			
AVG.		98.8966	106.1038	1.0786		
Δ WT.		0.1598	5.4988	0.2329		

Δ Vlc = 35.1 ml
 Δ DgV = 21.09 ft³
 Δ Mn = 5891.5 mgm

LOAD 80 klb/hr
 O₂ 5.9 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 19 (Inlet, ~~Inlet~~ Outlet) LOCATION ABMA test site F
 Date 1-16-79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				11		
BEAKER NO.		8	31			
DATE WT.		1-17-79	1-16-79			
TARE WT.	1	99.3339	103.9755	.8248		
	2	99.3337	103.9753	.8250		
	3	99.3340	103.9757	.8251		
	4					
AVG.		99.3339	103.9754	.8250		

POST TEST WTS.

	1	99.6173	104.4801	1.2672		
	2	99.6153	104.4778	1.2672		
	3	99.6151	104.4774	1.2667		
	4	99.6155	104.4773			
AVG.		99.6153	104.4775	1.2670		
Δ WT.		0.2814	0.5021	0.4420		

Δ Vlc = 33.9 ml
 Δ DgV = 33.54 ft³
 Δ Mn 1225.5 mgm

LOAD 80 klb/hr
 O₂ 7.2 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 22 (Inlet, ~~Outlet~~) LOCATION 3rd floor
 Date 1-19-79 Box No. _____ Eng. Jim Brown
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO. <u>4</u>	BLANK NO.	
BOTTLE NO.						
BEAKER NO.		# 30	# 17			
DATE WT.		1-19-79	1-17-79			
TARE WT.	1	103.1115	102.3127	.8537		
	2	103.1098	102.3127	.8536		
	3	103.1095	102.3127	.8537		
	4	103.1094				
AVG.		103.1096	102.3127	0.8537		

POST TEST WTS.

1	103.1662	104.5997	0.9620		
2	103.1662	104.5995	0.9622		
3	103.1662	104.5993	0.9622		
4					
AVG.	103.1662	104.5995	0.9621		
Δ WT.	0.0566	2.2868	0.1084		

Δ Vlc = 26.2 ml Assume Spillage occurred during 30 min. off LOAD 60 klb/hr
 Δ DgV = 21.21 ft³ O₂ 8.4 %
 Δ Mn 2451.8 mgm REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 21 ^{FCOR} (~~Inlet~~, Outlet) LOCATION ABMA F
 Date 1-24-79 Box No. _____ Eng. T. Lina
 Test Description 75% LOAD, NORM 3, 11/19 OFA

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				6		
BEAKER NO.		#53	16			
DATE WT.		1-22-79	1-22-79	1-19-79		
TARE WT.	1	102.3094	98.7358	0.8198		
	2	102.3517	98.7356	0.8198		
	3	102.3096	98.7358	0.8198		
	4					
AVG.		102.3095	98.7357	0.8198		

POST TEST WTS.

1		102.4032	102.2218	1.0728		
2		102.4028	102.2217	1.0734		
3		102.4026	102.2219	1.0737		
4						
AVG.		102.4027	102.2218	1.0733		
Δ WT.		0.0932	3.4861	0.2535		

Δ Vlc = 32.8 ml
 Δ DgV = 24.68 ft³
 Δ Mn = 3832.8 mgm

LOAD 60 klb/hr
 O₂ 8.0 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 21 (Inlet, Outlet) ^{PC_{out}} LOCATION ABMA F
 Date 1-24-79 Box No. _____ Eng. T. Jones
 Test Description 75% LOAD, NORM O₂, NORM ACP

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				7		
BEAKER NO.		#2	#31			
DATE WT.		1/22/79	1/22/79	1-19-79		
TARE WT.	1	100.6052	103.9747	0.8503		
	2	100.6057	103.9747	0.8506		
	3	100.6057	103.9747	0.8506		
	4					
AVG.		100.6055	103.9747	0.8505		

POST TEST WTS.

1		101.0500	104.4972	1.1049		
2		101.0500	104.4974	1.1056		
3		101.0499	104.4967	1.1054		
4						
AVG.		101.0500	104.4971	1.1053		
Δ WT.		0.4445	0.5224	0.2548		

Δ Vlc = 43.5 ml LOAD 60 klb/hr
 Δ DgV = 37.28 ft³ O₂ 8.9 %
 Δ Mn 1221.7 mgm REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 23 ~~From~~ ^{From} ~~Outlet~~ LOCATION ABMA F
 Date 2/1/79 Box No. _____ Eng. _____
 Test Description OPT O₂, OPT. OFA, NO ELON. REINT.

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				833		
BEAKER NO.		10	5			
DATE WT.		1-24-79	1-24-79	1-22-79		
TARE WT.	1	100.9373	99.9281	0.8244		
	2	100.9369	99.9277	0.8244		
	3	100.9368	99.9276	0.8241		
	4					
AVG.		100.9370	99.9278	0.8243		

POST TEST WTS.

1		101.0236	104.3631	1.0204		
2		101.0234	104.3629	1.0206		
3		101.0233	104.3629	1.0204		
4						
AVG.		101.0234	104.3630	1.0205		
Δ WT.		0.0864	4.4352	0.1962		

Δ Vlc = 32.1 ml
 Δ DgV = 2742 ft³
 Δ Mn 4717.8 mgm

LOAD 80 klb/hr
 O₂ 6.3 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 23 ^{Mech. d.c.} (~~Inlet~~, Outlet) LOCATION AB19A F
 Date 2-1-79 Box No. _____ Eng. _____
 Test Description OPT O₂, OPT OFA, NO ECON. REINT.

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				829		
BEAKER NO.		8	1			
DATE WT.		1-24-79	1-24-79	1-22-79		
TARE WT.	1	99.3356	100.0780	0.8451		
	2	99.3360	100.0782	0.8449		
	3	99.3361	100.0785	0.8447		
	4					
AVG.		99.3359	100.0782	0.8449		

POST TEST WTS.

1		99.5802	100.6948	1.2591		
2		99.5797	100.6945	1.2590		
3		99.5771	100.6945	1.2590		
4						
AVG.		99.5799	100.6946	1.2590		
Δ WT.		0.2410	0.6164	0.4141		

Δ Vlc = 46.9 ml
 Δ DgV = 42.215 ft³
 Δ Mn = 1274.5 mgm

LOAD 80 klb/hr
 O₂ 7.8 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 24 ^{Econ.} (~~Inlet~~, Outlet) LOCATION ABMA F
 Date 2-6-79 Box No. _____ Eng. _____
 Test Description OPT. O₂, OPT. OFA - BRINK F PARTICULATES - 10070LMD

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				6		
BEAKER NO.		4	11			
DATE WT.		2-5-79	2-5-79	2-5-79		
TARE WT.	1	100.7872	99.8083	1.5291		
	2	100.7867	99.8085	1.5293		
	3	100.7867	99.8085	1.5293		
	4					
AVG.		100.7869	99.8084	1.5292		

POST TEST WTS.

1		100.9132	105.5624	1.7804		
2		100.9124	105.5620	1.7807		
3		100.9124	105.5622	1.7809		
4						
AVG.		100.9133	105.5628	1.7806		
Δ WT.		0.1264	5.7544	0.2514		

Δ Vlc = 35.4 ml
 Δ DgV = 24.12 ft³
 Δ Mn = 6132.2 mgm

LOAD 80 klb/hr
 O₂ _____ %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 24 (Inlet, Outlet) ^{March D.C.} LOCATION ABMA F
 Date 2-6-79 Box No. _____ Eng. _____
 Test Description OPT. O₂, OPT. OFA - BRINK & PARTICULATES - 100% LOAD

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

1	2	3	Total
Final			
Initial			
Δ Vlc			

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				7		
BEAKER NO.		# 19	X			
DATE WT.		2-5-79	2-5-79	2-5-79		
TARE WT.	1	98.5873	99.4354	0.7630		
	2	98.5875	99.4355	0.7632		
	3	98.5876	99.4354	0.7632		
	4					
AVG.		98.5874	99.4354	0.7631		

POST TEST WTS.

1	99.1617	99.7848	1.0919		
2	99.1622	99.7846	1.0921		
3	99.1624	99.7842	1.0920		
4					
AVG.	99.1621	99.7846	1.0920		
Δ WT.	0.5747	0.3492	0.3289		

Δ Vlc = 43.4 ml
 Δ DgV = 37.84 ft³
 Δ Mn 1252.8 mgm

LOAD 80 klb/hr
 O₂ _____ %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 22 ^{From} (~~Inlet~~, Outlet) LOCATION ABMA F
 Date 2-12-79 Box No. _____ Eng. T. Jones
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				833		
BEAKER NO.		#5	18			
DATE WT.		2/11/79	2/11/79	2/11/79		
TARE WT.	1	99.9275	101.6424	.7651		
	2	99.9276	101.6428	.7651		
	3	99.9272	101.6428	.7651		
	4					
AVG.		99.9274	101.6428	0.7651		

POST TEST WTS.

1		99.9999	106.5399	1.0101		
2		99.9999	106.5399	1.0101		
3		99.9999	106.5399	1.0103		
4						
AVG.		99.9999	106.5399	1.0102		
Δ WT.		0.0725	4.8971	0.2451		

Δ Vlc = 70 ml
 Δ DgV = 24.82 ft³
 Δ Mn 5214.7 mgm

LOAD 80 klb/hr
 O₂ 5.0 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 21 *Mech. DC.* (Inlet, Outlet) LOCATION ABMA F
 Date 2-12-79 Box No. _____ Eng. T. d. nia
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

Final _____
 Initial _____
 Δ Vlc _____

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.				829		
BEAKER NO.		8	15			
DATE WT.		2/11/79	2/11/79	2/11/79		
TARE WT.	1		101.4160	.7634		
	2	98.9311	101.4160	.7631		
	3	98.9311	101.4160	.7632		
	4					
AVG.		98.9310	101.4160	0.7632		

POST TEST WTS.

1		99.5799	102.0381	1.2156		
2		99.5799	102.0381	1.2157		
3		99.5799	102.0381	1.2158		
4						
AVG.		99.5799	102.0381	1.2157		
Δ WT.		0.6489	0.6221	0.4525		

Δ Vlc = 46 ml
 Δ DgV = 38.02 ft³
 Δ Mn 1723.5 mgm

LOAD 80 klb/hr
 O₂ 6.3 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 35 ~~Inlet~~ ^{Exon.} (Inlet, Outlet) LOCATION ABMA 5th F
 Date 2/15/79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.		<u>12</u>	<u>81</u>	<u>6</u>		
BEAKER NO.						
DATE WT.		<u>2/11/79</u>	<u>2/11/79</u>	<u>2/11/79</u>		
TARE WT.	1	<u>100.9694</u>	<u>98.9311</u>	<u>0.7617</u>		
	2	<u>100.9692</u>	<u>98.9311</u>	<u>0.7617</u>		
	3	<u>100.9692</u>	<u>98.9309</u>	<u>0.7617</u>		
	4					
AVG.		<u>100.9693</u>	<u>98.9310</u>	<u>0.7617</u>		

POST TEST WTS.

	1	<u>101.0466</u>	<u>102.0167</u>	<u>0.9225</u>		
	2	<u>101.0466</u>	<u>102.0167</u>	<u>0.9225</u>		
	3	<u>101.0462</u>	<u>102.0166</u>	<u>0.9224</u>		
	4					
AVG.		<u>101.0464</u>	<u>102.0167</u>	<u>0.9225</u>		
Δ WT.		<u>0.0771</u>	<u>3.0857</u>	<u>0.1608</u>		

Δ Vlc = 29.1 ml
 Δ DgV = 26.63 ft³
 Δ Mn 3323.6 mgm

LOAD 60 klb/hr
 O₂ 8.7 %

REMARKS: _____

PARTICULATE LAB WORKSHEET

TEST NO. 35 ^{DC} ~~Inlet~~, Outlet) LOCATION ARMA 1000 F
 Date 2/15/79 Box No. _____ Eng. _____
 Test Description _____

Dry Gas Meter Vol (ft³)

Final _____
 Initial _____
 Δ DgV _____

Final _____
 Initial _____
 Δ Vlc _____

Impinger Water Vol (ml)

1	2	3	Total

CONTENT	H ₂ O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.		31	10	7		
BEAKER NO.						
DATE WT.		2/11/79	2/11/79	2/11/79		
TARE WT.	1	103.9760	100.9356	.7651		
	2	103.9760	100.9356	.7651		
	3	103.9760	100.9356	.7651		
	4					
AVG.		103.9760	100.9356	0.7652		

POST TEST WTS.

1	104.1362	101.5127	.9655		
2	104.1362	101.5127	.9655		
3	104.1362	101.5127	.9655		
4	104.1362				
AVG.	104.1362	101.5127	0.9656		
Δ WT.	0.1602	0.5771	0.2004		

Δ Vlc = 46 ml
 Δ DgV = 38.650 ft³
 Δ Mn = 937.7 mgm

LOAD 60 klb/hr
 O₂ 10.0 %

REMARKS: _____

SECTION 3.0
GASEOUS DATA

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GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN A

TEST NO.	DATE	LOAD %	CONDITIONS	BOILER OUTLET										SO ₂ ppm Dry	SO ₃ ppm Dry	NOTES
				O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry	NO ₂ ppm Wet	HC ppm Wet	O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry			
01	12-18-78	75.0	Max load, vary O ₂	8.9	10.0	146	343	1	0					944		
02	12-18-78	75.0	↓	9.5	9.6	173	345	5	19					826		
03	12-18-78	75.0	↓	10.7	8.2	233	426	7	18					738		
04	12-18-78	75.0	↓	7.8	11.6	137	322	3	28					937		
05	12-19-78	53.8	low load, baseline	9.4	10.0	115	297	3	0					908		PARTICULATE
06	12-20-78	52.9	low load, vary O ₂	8.8	10.6	112	294	3	0					1062		
07	12-20-78	52.9	↓	11.3	9.0	252	389	11	0					1151		
08	12-20-78	52.9	↓	7.2	12.5	77	237	6	0					1111		
09	12-20-78	52.9	↓	12.7	7.3	420	442	8	0					1130		
10	1-4-79	97.6	Max load, baseline	8.2	11.1	252	348	0	0					1044		
11	1-5-79	99.1	Max load, vary O ₂	8.1	10.8	231	413	7	0					1164		
12	1-5-79	99.1	↓	8.5	11.0	222	377	3	0					1109		
13	1-5-79	99.1	↓	5.4	12.8	612	269	2	12					1108		
14	1-5-79	99.1	↓	6.4	12.8	251	369	0	12					1164		
15	1-8-79	98.8	Max load, high O ₂	7.8	11.1	250	384	1	1					966		PARTICULATE

NOTE: All parts per million (ppm) figures are corrected to a 3% O₂ constant dilution factor

117

#15900

0211

GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN A & B

TEST NO.	DATE	LOAD %	CONDITIONS	Boiler Outlet										SO ₂ ppm Dry	SO ₃ ppm Dry	NOTES
				O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry	NO ₂ ppm Wet	HC ppm Wet	O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry			
16A	1-9-79	99.6	OFA Flowrate	7.6	12.0	228	-	-	13					933		PENN A
16B	1-9-79	99.6	↓	7.2	12.8	163	-	-	13					991		
16C	1-9-79	99.6	↓	8.3	11.8	378	-	-	0					991		
17	1-10-79	99.1	Max load, low O ₂	6.7	12.5	382	-	-	9					953		PARTICULATES
18	1-15-79	99.1	Max load, Opt O ₂ , ^{high} OFA	5.5	13.4	429	263	5	5					1110		
19	1-16-79	99.1	Max load, Opt O ₂ , ^{low} OFA	5.9	12.6	607	309	5	16					1186		
20	1-17-79	74.8	Med load, norm O ₂ & OFA	8.4	10.7	100	342	3	15					1088		
21	1-24-79	76.4	Med load, norm O ₂ & OFA	8.0	11.0	107	314	2	27					1252		✓
22	1-31-79	99.4	Max load, Opt O ₂ and OFA	6.0	13.2	352	281	1	16					1126	0	SAGS & SEI
23	2-1-79	100.0	NO REINJECTION Max load, Opt O ₂ & OFA	6.3	13.2	221	298	2	12					1058		Brnk + PARTICULATES
24	2-6-79	102.5	REINJECTION Max load, Opt O ₂ & OFA	5.0	14.5	549	289	0	-					1131		↓
23A	2-8-79	99.4	NO REINJECTION Max load, Opt O ₂ & OFA	5.9	12.5	186	282	3	-					1387		✓ Brnk
25	2-12-79	99.4	Max Load, vary O ₂	8.3	10.3	172	395	26	-					708		PENN B
26	2-12-79	99.4	↓	7.0	11.6	253	323	3	-					687		
27	2-12-79	99.4	↓	6.4	11.8	198	297	2	-					708		
28	2-12-79	99.4	↓	4.6	12.8	437	264	8	-					688		↓

NOTE: All parts per million (ppm) figures are corrected to a 3% O₂ constant dilution factor

GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN B

TEST NO.	DATE	LOAD %	CONDITIONS	BOILER OUTLET										SO ₂ ppm Dry	SO ₃ ppm Dry	NOTES
				O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry	NO ₂ ppm Wet	HC ppm Wet	O ₂ % Dry	CO ₂ % Dry	CO ppm Dry	NO ppm Dry			
29	2-12-79	100.5	Max load, opt O ₂ & sFA	5.0	13.3	361	266	1	-					693		Brnk & PARTICULATES
30	2-13-79	97.1	Max load, low O ₂ , ^{high} sFA	6.8	11.7	284	249	0	5					695	22	SASS & S.D.X
31	2-14-79	75.0	Med load vary O ₂	9.9	9.2	139	328	5	14					610		
32	2-14-79	75.0		11.5	8.4	207	452	4	8					763		
33	2-14-79	75.0		8.2	11.4	78	290	0	14					637		
34	2-14-79	75.0	✓	6.2	12.4	96	228	1	10					639		
35	2-14-79	75.8	Med load baseline	8.7	10.7	107	380	-	-					-		PARTICULATES

NOTE: All parts per million (ppm) figures are corrected to a 3% O₂ constant dilution factor

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

FUEL Pennsylvania (res)

TEST NOS. 1-4

LOAD ~63 Klb/h

DATE DEC 10 1978

CONDITIONS BASELINE

DATA TAKEN BY Tidona / Brenning

O₂ variations

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2(wet) Remarks unc/cor
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1000	8.45	11.1	93	133	.		216	310	214	307	2	3	0	0	680/976
1 (Econ Out)	1050	9.0	10.0	100	150	225	338									O2
2 (Econ Out)	1055	8.9	10.0	90	139	233	347									NORMAL test 1
4 (D.C. Out)	1100	10.3	9.2	80	135	206	347									
5 (D.C. Out)	1103	9.8	9.0	90	145	210	337									
H (Econ Out)	1110	8.8	10.0	110	162			214	316	213	315	1	1	0	0	640/944
H (Econ Out)	1250	9.4	9.4	115	175			238	369	235	365	3	5	9	14	532/826
Ports 1 & 2 (Econ Out)	1300	9.65	9.8	110	174	248	393									HIGH O2 test 2
Ports 4 & 5 (D.C. Out)	1306	10.5	9.0	98	165	231	396									
H (Econ Out)	1525	10.75	8.0	145	255	223	392	232	407	228	400	4	7	10	18	420/738
Port 1 & 2	1413	10.6	8.3	140	241	244	420									High O2 test 3
Port 4 & 5	1515	11.3	7.8	110	204	233	432									
H (Econ Out)	1721	8.3	10.8	80	114	220	312	220	312	218	310	2	3	20	28	660/937
Port 1 & 2	1700	7.2	12.4	90	117	236	308									low O2 test 4
Port 4 & 5	1713	11.0	8.3	100	180	186	335									
						Dry NO RDGS from Port H (Hot Line) seem low										
		Averages do not include Ports 4 & 5														
Test 1	AVG.	8.9	10.0	114	146	243	343	316	315	1	1	0				SO2 (cor.) 944
Test 2	AVG.	9.5	9.6	173	173	315	315	369	365	5	14					826
Test 3	AVG.	10.7	8.2	233	233	426	426	407	400	7	18					738
Test 4	AVG.	7.8	11.0	137	137	322	322	312	312	3	28					937

2 Averages do not include Port H NO (dry) numbers

NOTE: Parts per million (ppm) figures are corrected to 3% O₂
Hot line wet samples not corrected to dry basis

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NO. 5
 DATE DEC 1 1978

FUEL Pa. Med.-Volatile Bit. Coal
 LOAD ~46 Klb/h
 CONDITIONS LO LOAD, BASELINE, PARTICULATES
 DATA TAKEN BY Tidona

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks unc/cor
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	10:15	9.5	10.1	110	172	181	283	188	294	146	291	2	3	0	0	580/908
Ports 1&2	10:25	9.3	9.9	95	146	193	297									Test 5
Ports 4&5	11:33	11.4	8.1	110	206	158	296									
Unit changed load at 17:30; could not get second set of gaseous emissions data																

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NOS. 6-9
 DATE DEC 20 1978

FUEL Pa. Bituminous Coal
 LOAD ~43 Kib/hr.
 CONDITIONS LO LOAD, O₂ VARIATIONS
 DATA TAKEN BY Tidona / Jix

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks unc/cor
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1035	8.8	10.6	70	103	195	288	190	280	188	277	2	3	0	0	720 / 1062
Port 1 & 2	1045	9.0	10.2	70	105	200	300									Baseline Test # 6
Port 4 & 5	1050	10.6	8.8	65	113	170	294									
H	1125	8.8	11.0	80	118	188	277	184	271	182	269	2	2	0	0	780 / 1151
Port 1 & 2	1133	8.8	10.6	70	103	198	292									Baseline Test # 6
Port 4 & 5	1137	10.5	8.8	75	129	173	297									
" H	1315	11.0	8.6	145	261	203	365	204	367	198	356	6	11	0	0	640 / 1152
Port 1 & 2	1400	11.6	9.4	140	268	193	370									Med. high O2 Test # 7
Port 4 & 5	1330	12.25	7.8	110	226	181	372									
H	1512	6.9	12.8	60	77	185	236	174	222	169	216	5	6	0	0	870 / 1111
Port 1 & 2	1505	7.4	12.2	60	79	184	244									Low O2 Test # 8
Port 4 & 5	1510	9.05	10.9	50	75	153	232									
H	1600	12.4	7.55	210	440	199	417	208	435	204	427	4	8	0	0	540 / 1130
Port 1 & 2	1608	13.0	7.1	180	405	198	446									High O2 Test # 9
Port 4 & 5	1611	13.6	6.6	170	414	180	432									

NOTE: Parts per million (ppm) figures are corrected to 3% O₂
 Hot line samples not corrected to dry basis.

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABIMA F
 TEST NO. 10
 DATE JAN 4 1979

FUEL Gr. Bituminous Coal
 LOAD 2000 lb/hr (10) % CAP.
 CONDITIONS BASLINE
 DATA TAKEN BY _____

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks unc/cor
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	11:13	8.2	10.8	195	274	235	330			230	323			^	0	740/1040
H	11:45	8.5	10.6	200	288	2	2			232	334			0	0	700/1008.10
Port 4+5	11:54	9.0	10.2	180	270	255	309									Test Baseline
H	14:50	8.1	10.8	180	251	246	342	245	342	45	342	0	0	0	0	720/1004
Port 4+5	15:04	9.0	10.6	180	240	2	348									Test 10 Baseline
H	15:30	8.2	11.6	180	225	255	359	254	357	254	357	0	0	0	0	800/1124
Port 4+5	15:40	9.0	10.6	175	218	240	360									Test 10 Baseline
Test stopped : couldn't hold load on boiler. Outside temp. too warm.																
Test 10	AVG.	8.2	11.1	252	348	339	339					0			0	1044
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ARMA F
 TEST NOS 11-14
 DATE JAN. 05, 1979

FUEL Pa. Bituminous Coal
 LOAD 100%
 CONDITIONS Very Dry
 DATA TAKEN BY Tidona Stix

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks UNColl. / Corr.
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1055	8.1	10.8	160	223	250	349	265	370	260	363	5	7	0	0	834 / 1164
P-4+5	1108	8.9	10.1	145	239	250	413									Test # 11 O2 Variations Baseline
H	1205	8.5	11.0	160	230			272	392	270	384	2	3	0	0	770 / 1109
P-4+5	1220	9.2	9.5	140	214	260	397									Test 12 H2O2
H	1300	5.4	12.8	500	577	230	265	220	254	218	252	2	2	10	12	960 / 1108
P-4+5	1320	6.5	11.6	520	646	220	273									Test 13 Low O2
H	1405	6.4	12.8	180	222	242	298	235	290	235	290	0	0	10	12	944 / 1164
P-4+5	1418	7.5	11.4	210	280	240	320									test 14 - Mod
Test 11	AVG.	8.1	10.8	160	231	250	413	265	370	260	363	5	7	0	0	1164
Test 12	AVG.	8.5	11.0	160	222		397	272	392	270	384	2	3	0	0	1109
Test 13	AVG.	5.4	12.8	500	612	230	269	220	254	218	252	2	2	10	12	1108
Test 14	AVG.	6.4	12.8	180	251	242	309	235	290	235	290	0	0	10	12	1164

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

GASEOUS EMISSIONS DATA

Particulates

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

GASEOUS EMISSIONS DATA

FUEL Pa. Bituminous Coal
LOAD 100%
CONDITIONS OFA variations, vel. traverses
DATA TAKEN BY Tidona / Jiv

[illegible]

15900

GASEOUS EMISSIONS DATA

DATA TAKEN BY Chick

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA side F
TEST NO. 18
DATE 1-15-79

FUEL Pa. Bituminous Coal

LOAD 100% (80 kib/hr)

CONDITIONS Opt. O₂, HIGH OFA, PARTICULATES

DATA TAKEN BY Tidona / Shil

[illegible]

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 19
DATE 1-16-79

FUEL Pa. Bituminous Coal
LOAD 100%

CONDITIONS OPTIMUM O₂, LOW OFA, PARTICULATES
DATA TAKEN BY Tidona / Spix

[illegible]

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

GASEOUS EMISSIONS DATA

FUEL Pa. Bituminous Coal

LOAD 75 %

CONDITIONS Normal J², normal JFA, Particulate:

DATA TAKEN BY Stix

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

GASEOUS EMISSIONS DATA

DATA TAKEN BY Shx

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NO. 22 / SASS & SO₂
 DATE JAN 31 1979

FUEL PA BITUMINOUS COAL
 LOAD 100%
 CONDITIONS Optimum OFA ; Optimum O₂
 DATA TAKEN BY Stx

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks UNCORR/corr
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1100	6.0	12.9	140	168	236	283	218	262	218	262	0	0	10	12	980 / 1176
P 3 & 4	1120	7.8	11.6	130	177	218	297									
H	1245	5.95	13.8	120	144	243	291	225	269	225	269	0	0	10	12	960 / 1148
P 3 & 4	1305	7.0	12.2	120	154	218	280									
H	1445	5.7	13.1	350	412	223	262	210	247	208	245	2	2	10	12	1040 / 1224
P 3 & 4	1455	6.3	12.3	540	661	214	262									
H	1605	5.95	12.8	520	622	233	279	216	258	214	256	2	2	20	24	880 / 1052
P 3 & 4	1610	6.7	12.1	500	629	223	281									
H	1820	6.3	13.3	240	294	235	288	216	264	216	264	0	0	15	18	840 / 1029
P 3 & 4	1830	6.95	12.3	200	256	225	288									

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NO. 23 BRINK & PARTICULATE
 DATE FEB 1 1979

FUEL PA. Bituminous Coal
 LOAD 100%
 CONDITIONS Optimum OFA Optimum 72 NO ELON HOPPER REINJECTION
 DATA TAKEN BY Shi

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks UNCORR / CORR
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1025	6.1	13.4	130	157	252	304	238	288	235	284	3	4	10	12	770 / 930
P 3-4	1055	7.6	11.3	120	161	225	302									HOTLINE PORT #3 BRINK
P 5-6	1055	7.7	11.7	110	149	228	309									
P 3-4-5-6	1050	8.05	11.3	90	125	220	306									
H	1210	5.95	14.0	120	144	258	309	232	277	230	275	2	2	10	12	790 / 945
P 3-4-5-6	1220	7.4	12.0	100	132	226	299									HOTLINE PORT #3 BRINK
H	1345	6.05	13.6	160	193	240	289	221	266	220	265	1	1	10	12	840 / 1011
P 3-4-5-6	1350	7.6	12.0	140	188	214	287									HOTLINE PORT #2 PARTICULATE
H	1545	6.1	13.1	280	338	231	279	211	255	209	252	2	3	10	12	960 / 1160
P 3-4	1535	7.8	11.6	380	518	204	278									HOTLINE PORT #1 PARTICULATE
H	1625	7.4	12.0	220	291	229	303	211	279	209	277	2	2	10	12	940 / 1244
P 3-4-5-6	1700	8.25	10.9	180	254	218	308									HOTLINE PORT #1 PARTICULATE
						</										

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NO. 24 / Brink & Particulates
 DATE 2-6-79

FUEL Pa. Bituminous (con) (Clearfield Co.)

LOAD 80,000 lb/h (100%)

CONDITIONS OPT. O₂, OPT. OFA

DATA TAKEN BY Stix

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								SO2 Remarks uncorr / corr
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1215	4.65	14.8	620	683	245	292	245	270	245	270	0	0	N/A	960 / 1057 H = Port # 2 = BRINK	
Ports 3 & 4	1230	6.3	12.8	340	416	240	294									
Ports 5 & 6	1235	6.4	12.8	360	444	243	300									
H	1310	4.6	14.9	440	483	262	294	245	269	245	269	0	0	N/A	1020 / 1120 H = Port # 2 = BRINK	
Ports 3 & 4	1315	6.4	13.6	420	518	240	296									
Ports 5 & 6	1315	6.25	13.6	440	537	242	295									
Ports 3-4-5-6	1320	6.3	13.6	440	539	240	294									
H	1425	5.2	13.6	320	365	260	296	240	273	240	273	0	0	N/A	940 / 1071 H = Port # 4 = Particulates	
Ports 3 & 4	1435	7.0	12.0	220	283	238	306									
Ports 5 & 6	1440	6.5	11.9	480	596	242	300									
Ports 3-4-5-6	1440	6.5	11.9	800	993	240	292									
H	1555	5.6	14.4	620	725	235	275	220	257	220	257	0	0	N/A	990 / 1157 H = Port # 2 = Particulates	
Ports 3 & 4	1615	8.1 (?)	12.5 (?)	170	227	222	310									
H	1700	4.7	14.7	400	442	238	263	220	243	220	243	0	0	N/A	1130 / 1248 H = Port # 2 Particulates	
P 3 & 4	1715	7.2	12.3	540	704	215	280									
P 5 & 6	1710	6.05	12.8	460	554	225	271									
P 3-4-5-6	1705	6.5	12.8	400	497	215	267									
		Part H														
		(Ports 3, 4, 5, 6)														
Test 24	AVG.	5.0	14.5	549	549	289	289	262	262	262	262	0	0	-	SO2 corr 1131	
	AVG.	(6.5)	(12.7)													
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NO. 23A / BRINK TEST
 DATE 2-8-79

FUEL P. B. Y. Coal
 LOAD 100%
 CONDITIONS OPTIMUM O₂ OFA, NO ELON. HOPPER REIN?
 DATA TAKEN BY M. G. Gabriel

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								Remarks
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1210	6.14	12.4	120	145	274	271	202	245	200	242	2	3	N/A	N/A	50° 1110 / 1355
Port 1	1223	5.15	13.0	220	250	240	273									

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
 TEST NOS. 25-28
 DATE FEB 12 1979

FUEL Pa. Bit Coal (Coal B)
 LOAD 100%
 CONDITIONS O₂ Variations, Norm OFA
 DATA TAKEN BY M. G. Gabriel

Probe Position	Time	O ₂ % (dry)	CO ₂ % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								50 ² Remarks
				ppm(dry)		ppm(dry)		NOx		NO		NO ₂		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1008	8.61	10.2	120	174	275	399	281	408	263	382	18	26	I.O.O.S.	498 / 708	
1 & 2	1025	7.89	10.2	124	170	288	396									
3, 4, 5, 6	1050	8.35	10.6	120	171	275	391								Test 25 / 100 O ₂	
H	1107	6.95	12.8	180	231	285	365	260	333	258	331	2	2.56	—	50 ² 536 / 687	
1 & 2	1135	6.5	11.3	200	248	234	253									
3, 4, 5, 6	1148	7.46	10.6	210	279	264	351								Test 26 base O ₂	
H	1250	6.25	12.4	170	207	250	305	228	278	226	276	2	2.44	—	50 ² 580 / 708	
1 & 2	1307	5.96	12.1	140	168	245	293									
3, 4, 5, 6	1310	7.0	11.0	170	219	228	293								Test 27 " " " "	
H	1420	4.25	13.6	430	462	245	263	222	239	215	231	7	8	—	50 ² 640 / 688	
1 & 2	1430	4.24	13.3	525	564	245	263									
3, 4, 5, 6	1436	5.25	11.4	250	286	234	267								Test 28 base O ₂	
		2.00	11.2													
		3.45	8.55													
Ave		8.3	10.2	170	174	275	391					26		0.05	708	
AVG.		6.7	12.1	240	274	249	351					3			687	
AVG.		6.1	12.3	168	149	249	243					2			708	
AVG.		4.2	13.5	513	286	263	267					8		✓	688	

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 29 / Particulates & Brink
DATE 2-12-79

FUEL P. Bituminous Coal (Coal B)

LOAD 100%

CONDITIONS Optimum O_2 & UFA (Low O_2 , High UFA)

DATA TAKEN BY Tidona

[illegible]

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA site F
 TEST NO. 30/Goksoyr-Ross + SASS
 DATE 2-13-79

FUEL Pero. 1st.
 LOAD 100%
 CONDITIONS 6-2, 4th C.F.A.
 DATA TAKEN BY M.G. Gabriel, J. C. C.

Probe Position	Time	O2 % (dry)	CO2 % (dry)	CO		NO		HOT LINE SAMPLES, PPM(WET)								Remarks
				ppm(dry)		ppm(dry)		NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1120	6.25	11.0	260	317	230	231	210	236	209	231	1	1.5	5	6.1	502 588/713
3,4,5,6	1155	7.2	10.6	205	267	220	257									1100-1200 Goksoyr-Ross H.L.
H	3:37	5.5	12.8	250	296	240	284	211	262	219	259	2	2.4	3	3.6	580/687
3,4,5,6	3:54	6.5	12.0	270	335	222	276									
H	4:40	5.8	13.2	300	355	245	297	222	263	225	266	-3	-3.6	8	9.5	600/710
3,4,5,6	4:50	6.5	12.4	320	397	223	277									
H	5:25	6.5	12.4	340	422	230	256	212	262	212	253	0	0	0	0	570/708
3,4,5,6	5:37	6.7	12.0	250	315	227	256									
H	6:15	6.7	12.8	160	201	230	256	221	278	221	278	0	0	5	6.3	544/685
3,4,5,6	6:30	7.6	11.3	160	215	260	349									Boiler not firing properly
H	7:05	5.7	12.4	115	135	270	218	241	254	240	282	1	2	5	5.9	561/659
3,4,5,6	7:25	6.4	11.7	140	173	260	321									
H	7:40	5.6	12.0	120	140	272	218	245	280	242	253	3	3.5	8	9.3	560/654
3,4,5,6	AVG.	6.82	11.7	284	299	268	267	0.3	5.2							1695
H	AVG.	6.05	13.8	267	298											
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

GASEOUS EMISSIONS DATA

TEST SITE ADWA Site F
 TEST NO. 31-34
 DATE 2/14/79

FUEL Light Oil
 LOAD 100%
 CONDITIONS 1
 DATA TAKEN BY JLC

Probe Position	Time	O ₂ % (dry)	CO ₂ % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								Remarks	
				unc		unc		NOx		NO		NO ₂		HC			
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor		
1,2	10:00	10.5	8.6	95	162	190	326										
H	10:40	11.0	8.0	80	144	175	315	171	308	168	302	3	5.4		14	300/540/12	
1,2	11:00	9.1	10.2	97	147	10	318									Test #31	
3,4,5,6	11:10	10.75	9.0	80	132	200	335										
H	11:20	9.9	9.2	80	130	205	332	194	314	192	11	2	3.2	8	13	420/681	
1,2	11:25	8.9	9.8	65	97	222	330									Test #31	
	Test #	30		High	O ₂												
H	12:05	11.75	7.7	120	233	212	412	212	412	210	409	2	4	4	8	392/763	
	12:20	11.0	8.7	110	198	240	444									Test #32	
3,4,5,6	12:30	11.8	9.2	108	211	232	456										
	Test #	33		Low	O ₂												
1,2	13:00	7.7	11.7	60	81	217	214										
H	13:15	8.0	11.3	70	97	206	285	190	263	190	263	0	0	10	14	460/637	
3,4,5,6	13:35	8.5	11.2	50	72	200	288									Test #33	
	Test #	34		Low	O ₂												
1,2	14:03	5.1	13.9	98	111	190	215										
H	14:20	5.8	13.2	97	115	190	225	170	201	169	200	1	1	8	9.5	540/639	
3,4,5,6	14:30	6.8	11.7	70	89	185	235									Test #34	
31	AVG.	9.7	9.3	82	326	22	130							43		14	500/611
32	AVG.	11.4	8.2	82	428	216	216							40		8	600/763
33	AVG.	7.9	11.5	70	210	92	92							8		14	637
34	AVG.	5.5	13.6	72	220	113	113							1		9.5	639

NOTE: Parts per million (ppm) figures are corrected to 3% O₂

KVB

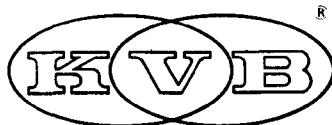
GASEOUS EMISSIONS DATA

TEST SITE ADMA CIL F
TEST NO. 35
DATE 2/14/79

FUEL Penn B.t
LOAD 75%
CONDITIONS Normal Op, Normal Sea
DATA TAKEN BY JRC

[illegible]

NOTE: Parts per million (ppm) figures are corrected to 3% O₂



SO_x DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 22 Date Jan 31 1979 Location TEST SITE F
 Unit No. _____ Fuel PENN A
 Capacity 99.4% Unit Type 80000 LB/HR Spreader stoker
 Engr. Bob Tidona Conditions Max Load opt O₂ and OFA

Meter Finish 328.531

Meter Start 327.045

Sample Volume Collected = 1.486 ADCF $\times \frac{P_m}{P_{STD}} \times \frac{T_{STD}}{T_m} = \underline{1.416}$ DSCF

Start Time	Stop Time	Elapsed Time (minutes)
<u>14:31</u>	<u>14:51</u>	<u>20</u>

Total Sampling Time = 20 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
<u>14:31</u>	<u>10.4</u>	<u>98</u>	<u>120</u>	<u>103</u>	<u>143</u>	<u>430</u>	<u>0.074</u>
<u>14:36</u>	<u>10.4</u>	<u>98</u>	<u>121</u>	<u>104</u>	<u>143</u>	<u>430</u>	<u>0.074</u>
<u>14:41</u>	<u>10.4</u>	<u>98</u>	<u>121</u>	<u>105</u>	<u>143</u>	<u>429</u>	<u>0.074</u>
<u>14:47</u>	<u>10.4</u>	<u>98</u>	<u>121</u>	<u>106</u>	<u>143</u>	<u>429</u>	<u>0.074</u>
<u>14:51</u>	<u>10.4</u>	<u>99</u>	<u>120</u>	<u>106</u>	<u>143</u>	<u>429</u>	<u>0.074</u>

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM
or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Date 11/31/77

K V B. INC.

Test No. 22

SOX DATA SHEET

TEST NO. 22 UNIT NO. _____ FUEL COAL LOAD _____ klb/hr _____ Location Boiler - F

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N ₂ Purge Time					

Calculation: SO_3 or SO_2 , ppm = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$ Excess O₂ 6.0 %

^{NaOH soln}
 A = Ml of ~~lead perchlorate~~ used for sample =
^{No. 0.4 soln}
 B = Ml of ~~lead perchlorate~~ used for blank =
 N = Normality of lead perchlorate titrant =
 F = Dilution factor =
 T = Average temp. in gas meter =
 V = Volume of gas sample ft³ =
 P = Barometric pressure =
 p = Pressure in gas meter, in. Hg =

SO ₂	SO ₃	SO _x
no SO ₂	0	
sample	0	
taken	0.25	
	1.0	
	99%	
	1.416	
	30.02	
	19.62	
	0	
	0	
	0	
	0	
	0	

Concentration, C, ppm =

, gm/dscm =

Emission, E, g/Mcal =

lb/MBtu =

ng/J =

$$E = CF \left[\frac{2090}{20.9 - x_{O_2}} \right]$$

where

C = pollutant concentration, g/dscm
 F, volume factor = _____ dscm/10⁴ cal

_____ dscf/10⁴ Btu

SO_x DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 30 Date Feb 13 1979 Location TEST SITE F
Unit No. _____ Fuel PENN A
Capacity 911 % Unit Type 80,000 ^{LB}/HR spreader stoker
Engr. Bob Tidona Conditions MAX LOAD, low O₂ high OFA

Meter Finish 345.965Meter Start 344.380Sample Volume Collected = 1585 ADCF $\times \frac{P_m}{P_{std}} \times \frac{T_{std}}{T_m} = 1544$ DSCF

Start Time	Stop Time	Elapsed Time (minutes)
<u>11:22</u>	<u>11:43</u>	<u>21</u>

Total Sampling Time = 21 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
<u>11:22</u>	<u>5</u>	<u>86</u>	<u>94</u>	<u>119</u>	<u>144</u>	<u>387</u>	<u>0.0755</u>
<u>11:28</u>	<u>5</u>	<u>83</u>	<u>95</u>	<u>113</u>	<u>144</u>	<u>338</u>	<u>0.0755</u>
<u>11:34</u>	<u>4.5</u>	<u>83</u>	<u>96</u>	<u>113</u>	<u>144</u>	<u>335</u>	<u>0.0755</u>
<u>11:40</u>	<u>4.5</u>	<u>83</u>	<u>97</u>	<u>111</u>	<u>144</u>	<u>338</u>	<u>0.0755</u>

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM
or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~20 minutes sampling time).

143

Date 2/13/79

K V B, INC.

Test No. 30

SOx DATA SHEET

TEST NO. 30 UNIT NO. _____ FUEL COAL LOAD _____ klb/hr Location ABMA-F

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N ₂ Purge Time					

$$\text{Calculation: } \text{SO}_3 \text{ or } \text{SO}_2, \text{ ppm} = \frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$$

Excess O_2 6.8 %

A = Ml of ^{NaOH soln.} ~~lead perchlorate~~ used for sample =

B = Ml of ^{NaOH soln.} ~~lead perchlorate~~ used for blank =

N = Normality of lead perchlorate titrant =

F = Dilution factor =

T = Average temp. in gas meter, °F =

V = Volume of gas sample ft³ =

P = Barometric pressure

p = Pressure in gas meter, in Hg =

Concentration, C, ppm =

$$, \text{gm/dscm} =$$

Emission - ,E, g/Mcal =

$$E = CF \left[\frac{2090}{20.9 - x_{O_2}} \right] \quad \begin{array}{l} \text{lb/MBtu} = \\ \text{ng/J} = \end{array}$$

C = pollutant concentration, g/dscm
F, volume factor = $\text{dscm}/10^4 \text{ cal}$

$$\text{dscf}/10^4 \text{ Btu}$$

from Fed. Reg. 9/11/74 p 32856

SO ₂	SO ₃	SO _x
no SO ₂	2.2	
sample	0.0	
taken	0.7236	
	1.0	
	84	
	1.544	
	25.17	
	17.4	
	corr to 3% O ₂	
	22	

SECTION 4.0
PARTICULATE SIZE DISTRIBUTION

	<u>PAGE</u>
4.1 BRINK	146
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KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 23 LOAD 80,000 lb/hr
 TEST SITE ABMA Site F % O₂ 7.5
 TEST DATE 2/1/79 FUEL Pennsylvania Bit.
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Low O₂, High OFA

Op - Density of particles 2.5 g/cm³ Vm - Dry gas volume 2.016 SCF
 μ - Viscosity of flue gas 2.45 × 10⁻⁴ poise Mn - Total particulate mass 180.8 mgm
 Mws - Molecular wt. flue gas 29.4 g/g mole Cn - Total concentration 1.385 grains/SCF
 ΔP_I - Pressure drop across impactor 6.1 in H₂O I - Percent isokinetics 142 %
 Ps - Absolute stack pressure 28.99 in. Hg Vs - Gas velocity 31.48 ft/sec.
 Ts - Absolute stack temperature 860 °R Dn - Nozzle diameter 0.079 in.
 Qs - Actual flow rate at stack conditions 0.0643 ft³/min

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
Ds, $\overline{50}$ Stokes diameter, μm		3.02	1.75	1.17	0.58	0.34	
D _{A, 50} Aerodynamic diameter, μm		4.88	2.87	1.95	1.02	0.64	
D _{AI, 50} Aerodynamic impaction diameter, μm		5.05	3.04	2.12	1.18	0.80	
Mn - Particulate mass, mgm	176.5	0.3	1.2	1.2	0.7	0.7	0.2
% - Percent of Total	97.6	0.2	0.7	0.7	0.4	0.4	0.1
Cumulative percent	2.5	2.3	1.6	0.9	0.5	0.1	
Cn - Concentration, grains/SCF	1.352	0.002	0.009	0.009	0.005	0.005	0.002
Cumulative concentration, grains/SCF	1.352	1.354	1.363	1.372	1.377	1.382	1.384

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 23 LOAD 80,000 lb/hr
 TEST SITE ABMA Site F % O₂ 7.5
 TEST DATE 2/1/79 FUEL Pennsylvania Bit.
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Low O₂, High OFA

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.20 BAROMETRIC PRESS in. Hg, P_{bar} 29.21
 GAS TEMP. °R, T_s 860 GAS STATIC PRESS in. H₂O -3.6
 PITOT CORRECTION FACTOR, C_p 0.837 GAS STATIC PRESS in. Hg abs, P_s 28.99
 MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48 C_p \left(\frac{T_s \Delta P}{P_s M W_s} \right)^{1/2} = \underline{31.48} \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, D_n 0.079
 NOZZLE AREA ft², A_n 3.404×10^{-5} $A_n = \pi (D_n/24)^2$
 $Q_n = V_s A_n 60 = \underline{0.0643} \text{ ft}^3/\text{min}$ at nozzle
 $Q_c = Q_s \left(\frac{P_s M W_s}{1.3 T_s} \right)^{1/2} = \underline{0.0517} \text{ ft}^3/\text{min}$ corrected to calibration conditions
 PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 6.1 in. H₂O
 OPERATING VACUUM (corrected for static pressure of duct) 9.6 in. H₂O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (V_m)	METER TEMP (T_m)
INITIAL	10:42	328.838	86
FINAL	11:19	330.854	88
Δ	37	2.016	87

$$\% H_2O = \underline{5} \%$$

$$I = \frac{1.667 T_s V_m P_{bar}}{\theta T_m V_s P_s A_n (1 - \frac{\% H_2O}{100})} = \underline{142} \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 23

LOCATION ABMA F

TEST DATE _____

ENGINEER T. DONA

TEST DESCRIPTION OPTIMUM O₂, OPTIMUM OFA, NO ECON. REINJECTION

PRE TEST WEIGHTS (GRAMS)

PLATE NO.	CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		1-23-79	1-23-79	1-23-79	1-23-79	1-23-79	1-23-79
TARE WT.	1	0.4171	3.6636	3.3543	3.7363	3.2855	3.7592
	2	0.4190	3.6634	3.3538	3.7364	3.2850	3.7589
	3	0.4186	3.6635	3.3538	3.7365	3.2850	3.7589
	4	0.4189					
AVERAGE		0.4188	3.6635	3.3540	3.7364	3.2852	3.7590

POST TEST WEIGHTS (GRAMS)

DATE WT.							
GROSS WT.	1	0.5951	3.6638	3.3550	3.7375	3.2859	3.7596
	2	0.5952	3.6637	3.3553	3.7377	3.2851	3.7591
	3	0.5953	3.6638	3.3554	3.7377	3.2850	3.7597
	4						
AVERAGE		0.5953	3.6638	3.3552	3.7376	3.2859	3.7597

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.1765	0.0003	0.0012	0.0012	0.0007	0.0007	0.0002
PERCENT	97.62	0.17	0.66	0.66	0.39	0.39	0.11

TOTAL NET WEIGHT 0.1808 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 23 A LOAD 100 70
 TEST SITE F % O₂ 5.9
 TEST DATE 2/8/79 FUEL Pennsylvania Bituminous
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Optimum

ρ_p - Density of particles 2.5 g/cm³
 μ - Viscosity of flue gas 2.4 $\times 10^{-4}$ poise
 MWS - Molecular wt. flue gas 29.4 g/g mole
 ΔP_I - Pressure drop across impactor 5.7 in H₂O
 P_s - Absolute stack pressure 29.35 in. Hg
 T_s - Absolute stack temperature 830 °R
 Q_s - Actual flow rate at stack conditions 0.0608 ft³/min
 V_m - Dry gas volume 3.06 SCF
 M_n - Total particulate mass 233.9 mgm
 C_n - Total concentration 1.180 grains/SCF
 I - Percent isokinetics 133 %
 V_s - Gas velocity 29.77 ft/sec.
 D_n - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
D_j - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
F_j - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
$D_{s,50}$ Stokes diameter, μ m		3.09	1.80	1.21	0.61	0.36	
$D_{A,50}$ Aerodynamic diameter, μ m		4.98	2.93	2.00	1.05	0.66	
$D_{AI,50}$ Aerodynamic impaction diameter, μ m		5.14	3.10	2.16	1.20	0.82	
M_n - Particulate mass, mgm	197.2	7.6	9.3	8.9	7.5	3.4	0.0
% - Percent of Total	84.3	3.2	4.0	3.8	3.2	1.5	0.0
Cumulative percent	15.7	12.5	8.5	4.7	1.5	0.0	
C_n - Concentration, grains/SCF	0.995	0.038	0.047	0.045	0.038	0.017	0.000
Cumulative concentration, grains/SCF	0.995	1.033	1.080	1.125	1.163	1.180	1.180

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 23 A LOAD 100 %
 TEST SITE F % O₂ 5.9
 TEST DATE 2/8/79 FUEL Pennsylvania Bituminous
 SAMPLE LOCATION _____ SPECIAL CONDITIONS Optimum

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.18 BAROMETRIC PRESS in. Hg, P_{bar} 29.57
 GAS TEMP. °R, T_s 830 GAS STATIC PRESS in. H₂O -3.0
 PITOT CORRECTION FACTOR, C_p 0.837 GAS STATIC PRESS in. Hg abs, P_s 29.35
 MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48 C_p \left(\frac{T_s \Delta P}{P_s M W_s} \right)^{1/2} = \underline{29.77} \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, D_n 0.079
 NOZZLE AREA ft², A_n 3.404×10^{-5} $A_n = \pi (D_n/24)^2$
 $Q_n = V_s A_n 60 = \underline{6.08 \times 10^{-2}} \text{ ft}^3/\text{min}$ at nozzle
 $Q_c = Q_s \left(\frac{P_s M W_s}{1.2 T_s} \right)^{1/2} = \underline{0.049} \text{ ft}^3/\text{min}$ corrected to calibration conditions
 PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 5.7 in. H₂O
 OPERATING VACUUM (corrected for static pressure of duct) 8.5 in. H₂O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (V _m)	METER TEMP (T _m)
INITIAL	12:10	337.830	83
FINAL	13:11	340.890	88
Δ	61	3.06	86

$$\% H_2O = \underline{5} \%$$

$$I = \frac{1.667 T_s V_m P_{bar}}{\theta T_m V_s P_s A_n (1 - \frac{\% H_2O}{100})} = \underline{133} \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 23A

LOCATION ABMA F / Econ. Outlet

TEST DATE 2-8-79

ENGINEER TIDONA

TEST DESCRIPTION REPEAT BRINK TEST FOR TEST #23

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CRACKER CYCLONE #13	1	2	3	4	5	FINAL FILTER
DATE WT.		2/8/79	2/8/79	2/8/79	2/8/79	2/8/79	2/8/79	2-7-79
TARE WT.	1	102.3635	3.6579	3.2479	3.7220	3.2792	3.7520	0.0391
	2	102.3635	3.6573	3.2476	3.7121	3.2791	3.7527	0.0391
	3	102.3635	3.6573	3.2476	3.7121	3.2791	3.7529	0.0388
	4							
AVERAGE		102.3635	3.6575	3.2477	3.7220	3.2792	3.7528	0.0390

POST TEST WEIGHTS (GRAMS)

DATE WT.		2/9/79	2/9/79	2/9/79	2/9/79	2/9/79	2/9/79	2/9/79
GROSS WT.	1	102.5605	3.6651	3.3570	3.7407	3.2867	3.7564	.0382
	2	102.5607	3.6651	3.3570	3.7409	3.2867	3.7562	.0391
	3	102.5608	3.6653	3.3569	3.7409	3.2866	3.7560	.0391
	4							
AVERAGE		102.5607	3.6651	3.3570	3.7409	3.2867	3.7562	.0390

NET TEST RESULTS (MILLIGRAMS)

NET WT.	.1972	.0076	.0093	.0089	.0075	.0034	0
PERCENT	84.3	3.25	3.98	3.80	3.20	1.45	0

TOTAL NET WEIGHT 233.9 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 24 LOAD 100 %
 TEST SITE Site F % O₂ 6.3
 TEST DATE 2/6/79 FUEL Pennsylvania Bit.
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Low O₂ High OFA

Op - Density of particles 2.5 g/cm³
 μ - Viscosity of flue gas 2.4 × 10⁻⁴ poise
 MWs - Molecular wt. flue gas 29.4 g/g mole
 ΔP_I - Pressure drop across impactor 6.0 in H₂O
 Ps - Absolute stack pressure 29.59 in. Hg
 Ts - Absolute stack temperature 830 °R
 Qs - Actual flow rate at stack conditions 0.0639 ft³/min
 Vm - Dry gas volume 3.409 SCF
 Mn - Total particulate mass 282.2 mgm
 Cn - Total concentration 1.278 grains/SCF
 I - Percent isokinetics 126 %
 Vs - Gas velocity 31.30 ft/sec.
 Dn - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
Ds, $\overline{50}$ Stokes diameter, μm		3.01	1.75	1.18	0.59	0.35	
D _{A, 50} Aerodynamic diameter, μm		4.86	2.86	1.95	1.02	0.64	
AI, $\overline{50}$ Aerodynamic impaction diameter, μm		5.02	3.02	2.11	1.17	0.80	
Mn - Particulate mass, mgm	265.4	2.8	10.5	1.3	1.2	1.0	0.0
% - Percent of Total	94.0	1.0	3.7	0.5	0.4	0.4	0.0
Cumulative percent	6.0	5.0	1.3	0.8	0.4	0.0	
Cn - Concentration, grains/SCF	1.202	0.013	0.048	0.006	0.005	0.005	0.000
Cumulative concentration, grains/SCF	1.202	1.215	1.263	1.269	1.274	1.279	1.279

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 24 LOAD 100%
 TEST SITE Site F % O₂ 6.3
 TEST DATE 2/6/79 FUEL Pennsylvania Bit.
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Low O₂ High OFA

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.20 BAROMETRIC PRESS in. Hg, P_{bar} 29.80
 GAS TEMP. °R, T_s 830 GAS STATIC PRESS in. H₂O -2.8
 PITOT CORRECTION FACTOR, C_p 0.837 GAS STATIC PRESS in. Hg abs, P_s 29.59
 MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48 C_p \left(\frac{T_s \Delta P}{P_s MW_s} \right)^{1/2} = \underline{31.30} \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, D_n 0.079
 NOZZLE AREA ft², A_n 3.404×10^{-5} $A_n = \pi (D_n/24)^2$
 $Q_n = V_s A_n 60 = \underline{6.393 \times 10^{-2}}$ ft³/min at nozzle
 $Q_c = Q_s \left(\frac{P_s MW_s}{1.3 T_s} \right)^{1/2} = \underline{0.05174}$ ft³/min corrected to calibration conditions
 PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 6.0 in. H₂O
 OPERATING VACUUM (corrected for static pressure of duct) 8.8 in. H₂O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (V _m)	METER TEMP (T _m)
INITIAL	12:22	331.308	88 °F
FINAL	13:30	334.717	92 °F
Δ	68	3.409	90 °F

$$\% H_2O = \underline{5} \%$$

$$I = \frac{1.667 T_s V_m P_{bar}}{\theta T_m V_s P_s A_n \left(1 - \frac{\% H_2O}{100} \right)} = \underline{126} \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 24 LOCATION ABMA F / ECONOMIZER OUTLET
 TEST DATE 2-6-79 ENGINEER TIDORJA
 TEST DESCRIPTION BRINK PARTICULATES AT 100% LOAD, OPT. D₂ + OPT. OF A

PRE TEST WEIGHTS (GRAMS)

PLATE NO.	CYCLONE BEAKER "A"	1	2	3	4	5	FINAL FILTER
DATE WT.	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79
TARE WT.	1	100.8353	3.6606	3.3507	3.7349	3.2820	3.7550
	2	100.8362	3.6604	3.3507	3.7347	3.2822	3.7553
	3	100.8365	3.6602	3.3504	3.7346	3.2819	3.7553
	4	100.8360					
AVERAGE		100.8362	3.6604	3.3506	3.7347	3.2820	3.7552

POST TEST WEIGHTS (GRAMS)

DATE WT.	2-8-79	2-7-79	2-7-79	2-7-79	2-7-79	2-7-79	2-7-79
GROSS WT.	1	101.1016	3.6641	3.3613	3.7367	3.2833	3.7564
	2	101.1014	3.6635	3.3610	3.7359	3.2831	3.7561
	3	101.1018	3.6631	3.3610	3.7358	3.2832	3.7561
	4		3.6631		3.7363		
AVERAGE		101.1016	3.6632	3.3611	3.7360	3.2832	3.7562

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.2654	0.0028	0.0105	0.0013	0.0012	0.0010	0.0000
PERCENT	94.05	0.99	3.72	0.46	0.43	0.35	0

TOTAL NET WEIGHT 282.2 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 29 LOAD 100 %
 TEST SITE Site F % O₂ 6.4
 TEST DATE 2/12/79 FUEL Coal B
 SAMPLE LOCATION Econ. Out SPECIAL CONDITIONS Optimum O₂ 40FA

Op - Density of particles 2.5 g/cm³ Vm - Dry gas volume 3.075 SCF
 μ - Viscosity of flue gas 2.0 x 10⁻⁴ poise Mn - Total particulate mass 396.5 mgm
 Mws - Molecular wt. flue gas 29.4 g/g mole Cn - Total concentration 1.991 grains/SCF
 ΔP_I - Pressure drop across impactor 5.6 in H₂O I - Percent isokinetics 128 %
 Ps - Absolute stack pressure 29.64 in. Hg Vs - Gas velocity 29.80 ft/sec.
 Ts - Absolute stack temperature 840 °R Dn - Nozzle diameter 0.079 in.
 Qs - Actual flow rate at stack conditions 6.09 x 10⁻⁴ ft³/min

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
Ds, $\overline{50}$ Stokes diameter, μm		2.83	1.65	1.11	0.57	0.34	
D _{A, 50} Aerodynamic diameter, μm		4.56	2.69	1.84	0.97	0.61	
D _{AI, 50} Aerodynamic impaction diameter, μm		4.69	2.82	1.97	1.10	0.75	
Mn - Particulate mass, mgm	366.5	5.8	11.6	5.4	4.1	2.0	1.1
% - Percent of Total	92.4	1.5	2.9	1.4	1.0	0.5	0.3
Cumulative percent	7.6	6.1	3.2	1.8	0.8	0.3	
Cn - Concentration, grains/SCF	1.840	0.029	0.058	0.027	0.021	0.010	0.006
Cumulative concentration, grains/SCF	1.840	1.869	1.927	1.954	1.975	1.985	1.991

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 29 LOAD 100%
 TEST SITE ABMA SITE F % O₂ _____
 TEST DATE 2/12/77 FUEL Coal B
 SAMPLE LOCATION JOIT SPECIAL CONDITIONS _____

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.18 BAROMETRIC PRESS in. Hg, P_{bar} 29.90
 GAS TEMP. °R, T_s 840 GAS STATIC PRESS in. H₂O -3.6
 PITOT CORRECTION FACTOR, C_p 0.97 GAS STATIC PRESS in. Hg abs, P_s 29.64
 MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48 C_p \left(\frac{T_s \Delta P}{P_s M W_s} \right)^{1/2} = \underline{29.80} \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, D_n 0.079
 NOZZLE AREA ft², A_n 3.404×10^{-5} $A_n = \pi (D_n/24)^2$
 $Q_s = V_s A_n 60 = \underline{6.087 \times 10^{-2}} \text{ ft}^3/\text{min}$ at nozzle
 $Q_c = Q_s \left(\frac{P_s M W_s}{1.3 T_s} \right)^{1/2} = \underline{4.901 \times 10^{-2}} \text{ ft}^3/\text{min}$ corrected to calibration conditions
 PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 5.6 in. H₂O
 OPERATING VACUUM (corrected for static pressure of duct) 8.4 in. H₂O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	<u>20</u>	<u>240.000</u>	<u>80°F</u>
FINAL	<u>9:25</u>	<u>344.005</u>	<u>83°F</u>
Δ	<u>65</u>	<u>3.075</u>	<u>82</u>

$$\% H_2O = \underline{5} \%$$

$$I = \frac{1.667 T_s V_m P_{bar}}{\theta T_m V_s P_s A_n (1 - \frac{\% H_2O}{100})} = \underline{128} \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 29 LOCATION ANNA 1.4. =
 TEST DATE 2/12/79 ENGINEER T. J. ...
 TEST DESCRIPTION OPT O₂ + OPA - Coal B

PRE TEST WEIGHTS (GRAMS)

T. J. #
16

PLATE NO.	CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		2/11/79	2/11/79	2/11/79	2/11/79	2/11/79	2/9/79
TARE WT.	1	98.7384	3.3517	3.3511	3.7346	3.2824	3.7557
	2	98.7384	3.6672	3.3511	3.7347	3.2826	3.7553
	3	98.7384	3.6672	3.3511	3.7345	3.2825	3.7552
	4		—	—	—	—	—
AVERAGE		98.7382	3.6671	3.3511	3.7346	3.2825	3.7554

POST TEST WEIGHTS (GRAMS)

DATE WT.		2/15/79	2/15/79	2/15/79	2/15/79	2/15/79	2/15/79
GROSS WT.	1	99.1048	3.6672	3.3628	3.7400	3.2866	3.7574
	2	99.1048	3.6672	3.3628	3.7401	3.2866	3.7574
	3	99.1044	3.6674	3.3628	3.7399	3.2866	3.7574
	4						
AVERAGE		99.1047	3.6675	3.3627	3.7400	3.2866	3.7574

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.3665	0.0058	0.0116	0.0054	0.0041	0.0020	0.0011
PERCENT	92.43	1.46	2.93	1.36	1.03	0.50	0.28

TOTAL NET WEIGHT 0.3965 mgm

SITE F

SASS GRAVIMETRICS

Test 22	10μ	89.4199	9.81% Passing
	3μ	6.3749	3.38% Passing
	1μ	0.9482	2.42% Passing
	Filter	<u>2.4037</u>	
	TOTAL	99.1467	

Test 30	10μ	74.9933	12.86% Passing
	3μ	7.1511	4.55% Passing
	1μ	1.2138	3.14% Passing
	Filter	<u>2.7016</u>	
	TOTAL	86.0598	

KVB
6990-01
July 12, 1979

Sample No.	<u>K-23138</u>	<u>K-23139</u>	<u>K-23140</u>
Sample Description	Fly Ash F-5 12/19/78	Fly Ash F-21 1/24/79	Fly Ash F-23 2/1/79

Bahco Particle
Size Determination

% Through #100 (149 Microns)	33.8	18.2	17.3
---------------------------------	------	------	------

Results:	<u>Terminal Velocity</u>	<u>Diameter (Microns)</u>	<u>%Smaller</u>	<u>Diameter (Microns)</u>	<u>%Smaller</u>	<u>Diameter (Microns)</u>	<u>%Smaller</u>
	112.	26.	19.7	24.	5.6	24.	5.5
	79.	22.	17.4	21.	4.7	20.	4.8
	31.	14.	12.7	13.	3.2	13.	3.4
	12.3	8.8	7.4	8.1	2.0	8.0	2.4
	4.15	5.1	3.6	4.7	1.3	4.7	1.7
	0.96	2.4	1.3	2.3	0.8	2.2	1.0
	0.35	1.5	0.3	1.4	0.4	1.4	0.5

Density, gms/cc (On #100 mesh Material Only)	2.23	2.61	2.64
--	------	------	------

Screen Sizing

% Through #10	100.0	100.0	100.0
16	98.5	97.8	95.8
30	79.6	67.7	60.4
50	54.3	37.6	34.3
100	33.8	18.2	17.3
200	16.3	5.1	5.3
325	8.3	2.4	2.6

KVB
6990-01
July 12, 1979

Sample No.	<u>K-23141</u>	<u>K-23142</u>
Description	Fly Ash F-24 2/6/79	Fly Ash F-29 2/12/79

Bahco Particle
Size Determination

% Through #100 (149 Microns)	16.1	16.0
---------------------------------	------	------

Results:	<u>Terminal Velocity</u>	<u>Diameter (Microns)</u>	<u>%Smaller</u>	<u>Diameter (Microns)</u>	<u>%Smaller</u>
	112.	25.	6.1	26.	6.8
	79.	21.	5.3	22.	6.0
	31.	13.	3.4	14.	4.5
	12.3	8.4	2.6	8.8	3.1
	4.15	4.9	1.7	5.1	2.1
	0.96	2.3	1.0	2.4	1.1
	0.35	1.4	0.6	1.5	0.5

Density, gms/cc (On #100 Mesh Material Only)	2.44	2.23
---	------	------

Screen Sizing

% Through #10	100.0	100.0
16	97.8	98.2
30	64.1	68.8
50	33.1	35.4
100	16.1	16.0
200	5.0	4.7
325	2.4	2.8

SECTION 5.0
FUEL AND ASH ANALYSIS

	<u>PAGE</u>
5.1 COMMERCIAL TESTING ANALYSES	162
5.2 COMBUSTIBLES ANALYSES	196
5.3 COAL SIEVE ANALYSES	198

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
16130 VAN DRUNEN RD., SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

► KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.Kind of sample Coal
reported to usABMA Test Site "F"
Test #5

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 12/19/78

Date received 2/22/79

Analysis report no. 71- 28163

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	4.80	xxxxx
% Ash	10.80	11.34
% Volatile	14.03	14.74
% Fixed Carbon	70.37	73.92
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13145	13808
% Sulfur	1.34	1.41

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>	
Initial Deformation	xxx °F	xxx °F	
Softening (H = W)	xxx °F	xxx °F	
Softening (H = 1/2 W)	xxx °F	xxx °F	H = Cone Height
Fluid	xxx °F	xxx °F	W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSEH, Manager, Midwest Division



Charter Member

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Coal	ABMA Test Site "F"
		Test #15
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	1/8/79	
Date received	2/22/79	

Analysis report no. 71- 28165

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	5.69	xxxxx
% Ash	10.96	11.62
% Volatile	22.86	24.24
% Fixed Carbon	60.49	64.14
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	12975	13758
% Sulfur	1.20	1.27

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>		<u>Oxidizing</u>	
Initial Deformation	xxx °F		xxx °F	
Softening (H = W)	xxx °F		xxx °F	
Softening (H = 1/2 W)	xxx °F		xxx °F	
Fluid	xxx °F		xxx °F	

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample Coal
reported to us

ABMA Test Site "F"
Test #17

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 1/10/79

Date received 2/22/79

Analysis report no. 71- 28167

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	5.26	xxxxx
% Ash	9.69	10.23
% Volatile	23.86	25.18
% Fixed Carbon	61.19	64.59
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13223	13957
% Sulfur	1.24	1.31

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = 1/2 W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Coal

ABMA Test Site "F"
Test #18

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 1/15/79

Date received 2/22/79

Analysis report no. 71- 28169

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	5.58	xxxxx
% Ash	12.50	13.24
% Volatile	22.66	24.00
% Fixed Carbon	59.26	62.76
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	12649	13396
% Sulfur	1.43	1.51

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>	
Initial Deformation	xxx °F	xxx °F	
Softening (H = W)	xxx °F	xxx °F	
Softening (H = 1.5W)	xxx °F	xxx °F	
Flow	xxx °F	xxx °F	

H -- Cone Height
W -- Cone Width

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample Coal
reported to us

ABMA Test Site "F"
Test #19

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 1/16/79

Date received 2/22/79

Analysis report no. 71- 28171

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	7.76	xxxxx
% Ash	11.08	12.01
% Volatile	22.45	24.34
% Fixed Carbon	58.71	63.65
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	12501	13553
% Sulfur	1.35	1.46

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>	
Initial Deformation	xxx °F	xxx °F	
Softening (H = W)	xxx °F	xxx °F	
Softening (H = 1/2 W)	xxx °F	xxx °F	H Cone Height
Fluid	xxx °F	xxx °F	W Cone Width

Respectfully submitted,
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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Coal	ABMA Test Site "F"
		Test #20
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	1/17/79	
Date received	2/22/79	

Analysis report no. 71- 28173

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	2.26	xxxxx
% Ash	8.43	8.62
% Volatile	25.22	25.80
% Fixed Carbon	64.09	65.58
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13813	14132
% Sulfur	1.61	1.65

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>		<u>Oxidizing</u>	
Initial Deformation	xxx °F		xxx °F	
Softening (H = W)	xxx °F		xxx °F	
Softening (H = 1/2 W)	xxx °F		xxx °F	
Fluid	xxx °F		xxx °F	

H = Cone Height
W = Cone Width

Respectfully submitted,
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OFFICE TEL. (312) 264-1173

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Coal

ABMA Test Site "F"
Test #21

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 1/24/79

Date received 2/22/79

Analysis report no. 71- 28175

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	1.99	xxxxx
% Ash	11.15	11.38
% Volatile	62.87	64.15
% Fixed Carbon	23.99	24.47
	100.00	100.00
Btu/lb.	13347	13618
% Sulfur	1.85	1.89

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = 1/2 W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H -- Cone Height
W -- Cone Width

Respectfully submitted,
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OFFICE TEL. (312) 264-1173*field*

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

ABMA Test Site "F"
Test #22

Coal

KVB, Inc.

1/31/79

2/22/79

Analysis report no. 71- 28186

% Weight

	As received	Dry basis	As received	Dry basis
Moisture	3.13	xxxxx	3.13	xxxxx
Ash	9.44	9.74	Carbon	76.57 79.04
Hydrogen	23.58	24.34	Hydrogen	4.69 4.84
Nitrogen	63.85	65.92	Nitrogen	1.26 1.30
Chlorine	100.00	100.00	Chlorine	0.15 0.15
Sulfur	13627	14067	Sulfur	1.51 1.56
Ash	1.51	1.56	Ash	9.44 9.74
Oxygen (diff)	xxxxx	0.14	Oxygen (diff)	3.25 3.37
			100.00	100.00

MINERAL ANALYSIS OF ASH

% Weight

Silica, SiO ₂	41.47
Alumina, Al ₂ O ₃	32.72
Titania, TiO ₂	1.23
Ferric oxide, Fe ₂ O ₃	16.23
Lime, CaO	2.52
Magnesia, MgO	0.64
Potassium oxide, K ₂ O	1.59
Sodium oxide, Na ₂ O	0.35
Sulfur trioxide, SO ₃	2.00
Phos. pentoxide, P ₂ O ₅	0.82
Undetermined	0.28*
	100.00
SILICA VALUE =	68.14
BASE: ACID RATIO	0.28
T ₉₀₀ Temperature =	2575 °F

	Reducing	Oxidizing
2420 °F	xxxx	°F
2600 °F	xxxx	°F
2650 °F	xxxx	°F
2700+ °F	xxxx	°F
96		
9		

*These ignited basis results were used
to calculate undetermined value above
%Strontium oxide, SrO 0.04
%Barium oxide, BaO 0.09
%Manganese oxide, Mn₃O₄ 0.02

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.Kind of sample Coal
reported to usABMA Test Site "F"
Test #23

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 2/1/79

Date received 2/22/79

Analysis report no. 71- 28177

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	2.28	xxxxx
% Ash	9.45	9.67
% Volatile	24.20	24.76
% Fixed Carbon	64.07	65.57
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13750	14071
% Sulfur	1.66	1.70

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>	
Initial Deformation	xxx °F	xxx °F	
Softening (H = W)	xxx °F	xxx °F	
Softening (H = 1/2 W)	xxx °F	xxx °F	H = Cone Height
Fluid	xxx °F	xxx °F	W = Cone Width

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Coal	ABMA Test Site "F"
		Test #23A
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/8/79	
Date received	2/22/79	

Analysis report no. 71- 28181

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	2.51	xxxxxx
% Ash	11.01	11.29
% Volatile	23.92	24.54
% Fixed Carbon	62.56	64.17
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13467	13814
% Sulfur	1.67	1.71

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>	<u>Oxidizing</u>
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = 1/2 W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSE, Manager, Midwest Division



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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Kind of sample
reported to us **Coal**

Sample identification
by **KVB, Inc.**

Sample taken at -----

ABMA Test Site "F"
Test #24

Sample taken by **KVB, Inc.**

Date sampled **2/7/79**

Date received **2/22/79**

Analysis report no. 71- 28189			% Weight		
PROXIMATE ANALYSIS	As received	Dry basis	ULTIMATE ANALYSIS	As received	Dry basis
% Moisture	3.42	xxxxx	Moisture	3.42	xxxxx
% Ash	11.59	12.00	Carbon	73.70	76.31
% Volatile	23.32	24.15	Hydrogen	4.53	4.69
% Fixed Carbon	61.67	63.85	Nitrogen	1.20	1.24
	100.00	100.00	Chlorine	0.14	0.15
Btu/lb.	13164	13630	Sulfur	1.32	1.37
% Sulfur	1.32	1.37	Ash	11.59	12.00
% Alk. as Na ₂ O	xxxxx	0.20	Oxygen (diff)	4.10	4.24
				100.00	100.00
SULFUR FORMS			MINERAL ANALYSIS OF ASH	% Weight Ignited Basis	
% Pyritic Sulfur	0.52	0.54	Silica, SiO ₂		48.65
% Sulfate Sulfur	0.08	0.08	Alumina, Al ₂ O ₃		32.14
% Organic Sulfur	0.72	0.75	Titania, TiO ₂		1.47
			Ferric oxide, Fe ₂ O ₃		10.23
WATER SOLUBLE ALKALIES			Lime, CaO		1.93
% Na ₂ O =	xxxxx	xxxx	Magnesia, MgO		0.70
% K ₂ O =	xxxxx	xxxx	Potassium oxide, K ₂ O		2.21
			Sodium oxide, Na ₂ O		0.23
TEMPERATURE OF ASH	Reducing	Oxidizing			
Initial Deformation	2700+ °F	xxxx °F	Sulfur trioxide, SO ₃		1.71
Softening (H ₂ W)	2700+ °F	xxxx °F	Phos. pentoxide, P ₂ O ₅		0.41
Softening (H ₂ W)	2700+ °F	xxxx °F	Undetermined		0.17*
Fluid	2700+ °F	xxxx °F			
PERCENT MOISTURE =	xxxx		SILICA VALUE =	100.00	
ACIDITY INDEX =	89		BASE ACID RATIO	79.09	
ALKALINITY INDEX =	9		T ₉₀₀ Temperature =	0.19	
				2735 °F	

*These ignited basis results were used
to calculate undetermined value above
%Strontium oxide, SrO 0.04
%Barium oxide, BaO 0.10
%Manganese oxide, Mn₃O₄ 0.01

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. Houser
R. A. HOUSER, Manager, Midwest Division



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COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES, 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO:
16130 VAN DRUNEN RD., SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identified
by KVB, Inc.

Coal

ABMA Test Site "F"
Test #29

KVB, Inc.

2/12/79

2/22/79

		Analysis report no. 71- 28192		ULTIMATE ANALYSIS OF AS RECEIVED	
		As received	Dry basis		
Moisture	3.54	xxxxxx		Moisture	3.54
Carbon	8.79	9.11		Carbon	76.62
Hydrogen	26.10	27.06		Hydrogen	4.70
Nitrogen	61.57	63.83		Nitrogen	1.15
Chlorine	100.00	100.00		Chlorine	0.17
Sulfur	13623	14123		Sulfur	1.00
Ash	1.00	1.04		Ash	8.79
Oxygen (diff)	----	0.14		Oxygen (diff)	4.03
					100.00
				MINERAL ANALYSIS OF ASH	
				Weight %	
				Silica, SiO ₂	47.74
				Alumina, Al ₂ O ₃	34.17
				Titania, TiO ₂	1.38
				Ferric oxide, Fe ₂ O ₃	9.21
				Lime, CaO	1.32
				Magnesia, MgO	0.57
				Potassium oxide, K ₂ O	1.74
				Sodium oxide, Na ₂ O	0.37
				Sulfur trioxide, SO ₃	1.43
				Phos. pentoxide, P ₂ O ₅	0.30
				Undetermined	1.55*
					100.00
				SILICA VALUE	81.14
				BASE ACID RATIO	0.16
				Ignition temperature	2805 °F

*These ignited basis results were used
to calculate undetermined value above

%Strontium oxide, SrO 0.10
 %Barium oxide, BaO 0.12
 %Manganese oxide, Mn₃O₄ 0.00

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Coal

ABMA Test Site "F"
Test #30

KVB, Inc.

2/13/79

2/22/79

Analysis report no. 71- 28194			% Weight		
PROXIMATE ANALYSIS	As received	Dry basis	ULTIMATE ANALYSIS	As received	Dry basis
% Moisture	3.84	xxxxx	Moisture	3.84	xxxxx
% Ash	9.12	9.48	Carbon	76.09	79.13
% Volatile	25.39	26.40	Hydrogen	4.68	4.87
% Fixed Carbon	61.65	64.12	Nitrogen	1.09	1.13
	100.00	100.00	Oxygen	0.17	0.18
Calorific value	13568	14110	Sulfur	0.99	1.03
% Sulfur	0.99	1.03	Ash	9.12	9.48
% Chlorine	xxxxx	0.18	Gravimetric	4.02	4.18
				100.00	100.00
ELEMENTS			MINERAL ANALYSIS (by weight)		
Chlorine	0.44	0.46	Silica		47.95
Aluminum	0.00	0.00	Alumina		32.66
Iron	0.55	0.57	Total		1.46
			Ferric oxide		10.68
	xxxxx	xxxx	Calcium		1.45
	xxxxx	xxxx	Magnesium		0.74
			Potassium		2.15
			Sodium		0.44
			Substrates		1.38
			Phosphorus		0.45
			Barium		0.36*
	xxxx				100.00
	84				78.84
	9				0.19
					2730 °F

*These ignited basis results were used
to calculate undetermined value above
%Strontium oxide, SrO 0.10
%Barium oxide, BaO 0.17
%Manganese oxide, Mn₃O₄ 0.01

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample Coal
reported to us

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 2/14/79

Date received 2/22/79

ABMA Test Site "F"
Test #35

Analysis report no. 71- 28184

PROXIMATE ANALYSIS

	<u>As Received</u>	<u>Dry Basis</u>
% Moisture	4.17	xxxxx
% Ash	10.25	10.70
% Volatile	25.54	26.65
% Fixed Carbon	60.04	62.65
	<u>100.00</u>	<u>100.00</u>
Btu/lb.	13315	13894
% Sulfur	1.01	1.05

FUSION TEMPERATURE OF ASH

	<u>Reducing</u>		<u>Oxidizing</u>	
Initial Deformation	xxx °F		xxx °F	
Softening (H = W)	xxx °F		xxx °F	
Softening (H = ½ W)	xxx °F		xxx °F	
Fluid	xxx °F		xxx °F	

H -- Cone Height
W -- Cone WidthRespectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F"
		Test #5
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	12/19/78	
Date received	2/22/79	

Analysis report no. 71- 28164

DRY BASIS

%Ash.....	89.38
%Combustible.....	10.62

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample Identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

ABMA Test Site "F"
Test #15

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 1/8/79

Date received 2/22/79

Analysis report no. 71- 28166

DRY BASIS

%Ash.....	72.77
%Combustible.....	27.23

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. House
R. A. HOUSE, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample Identification
by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F"
		Test #17
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/10/79	
Date received	2/22/79	

Analysis report no. 71- 28168

	<u>DRY BASIS</u>
%Ash.....	82.66
%Combustible.....	17.34

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. House
R. A. HOUSE, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F"
		Test #18
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/15/79	
Date received	2/22/79	

Analysis report no. 71- 28170

DRY BASIS

%Ash.....	91.79
%Combustible.....	8.21

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 1/16/79

Date received 2/22/79

ABMA Test Site "F"
Test #19

Analysis report no. 71- 28172

DRY BASIS

%Ash.....	86.21
%Combustible.....	13.79

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample Identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 1/17/79

Date received 2/22/79

ABMA Test Site "F"
Test #20

Analysis report no. 71- 28174

DRY BASIS

%Ash.....	93.95
%Combustible.....	6.05

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division

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A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample Identification
by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F"
		Test #21
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/24/79	
Date received	2/22/79	

Analysis report no. 71- 28176

	<u>DRY BASIS</u>
%Ash.....	90.10
%Combustible.....	9.90

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Fly Ash (Cyclone Hopper)	ABMA Test Site F Test #22
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	1/31/79	
Date received	2/22/79	

Analysis report no. 71- 28188

	<u>Dry Basis</u>
%Ash.....	34.10
%Combustible.....	65.90
%Sulfur.....	0.71

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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► KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification
by KVB, Inc.

Kind of sample
reported to us Bottom Ash

ABMA Test Site F
Test #22

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 1/31/79

Date received 2/22/79

Analysis report no. 71- 28187

	<u>Dry Basis</u>
%Ash.....	91.38
%Combustible.....	8.62
%Sulfur.....	0.09

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division



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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

ABMA Test Site "F"
Test #23

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 2/1/79

Date received 2/22/79

Analysis report no 71- 28178

DRY BASIS

%Ash.....	90.40
%Combustible.....	9.60

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 284-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Flyash Sample (Cyclone Hopper)	ABMA Test Site "F" Test #23
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/1/79	
Date received	2/22/79	

Analysis report no. 71- 28179

DRY BASIS

%Ash.....	43.37
%Combustible.....	56.63

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R. A. HOUSER, President, Division



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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by
KVB, Inc.

Kind of sample reported to us	Ash Sample (Econ. Hopper)	ABMA Test Site "F"
		Test #23
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/1/79	
Date received	2/22/79	

Analysis report no. 71- 28180

	<u>DRY BASIS</u>
%Ash.....	29.65
%Combustible.....	70.35

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COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division



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COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 AREA CODE 312 726-8434



PLEASE ADDRESS ALL CORRESPONDENCE TO:
16130 VAN DRUNEN RD., SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

► KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 2/8/79

Date received 2/22/79

ABMA Test Site "F"
Test #23A

Analysis report no. 71- 28182

DRY BASIS

%Ash.....	88.58
%Combustible.....	11.42

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division



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OFFICE TEL. (312) 264-1173*field*

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Flyash Sample (Cyclone Hopper)	ABMA Test Site "F" Test #23A
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/8/79	
Date received	2/22/79	

Analysis report no. 71- 28183

DRY BASIS

%Ash.....	36.73
%Combustible.....	63.27

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R. A. HOUSER, Manager, Midwest Division


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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

ABMA Test Site "F"
Test #24

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 2/6/79

Date received 2/22/79

Analysis report no. 71- 28190

DRY BASIS

%Ash.....	86.19
%Combustible.....	13.81

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R. A. Houser
R. A. HOUSER, Manager, Midwest Division



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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us	Fly Ash Sample (Cyclone Hopper)	ABMA Test Site "F" Test #24
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/6/79	
Date received	2/22/79	

Analysis report no. 71- 28191

DRY BASIS

%Ash.....	36.55
%Combustible.....	63.45

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R. A. HOUSER, Manager, Midwest Division



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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

Kind of sample reported to us Bottom Ash Sample

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 2/12/79

Date received 2/22/79

ABMA Test Site "F"
Test #29

Analysis report no. 71- 28193

DRY BASIS

%Ash.....	86.93
%Combustible.....	13.07

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample from location
by KVB, Inc.

Kind of sample reported to us	Bottom Ash	ABMA Test Site F Test #30
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/13/79	
Date received	2/22/79	

Analysis report no. 71- 28195

	<u>Dry Basis</u>
%Ash.....	89.81
%Combustible.....	10.19
%Sulfur.....	0.09

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser
R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

► KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample Identification
by KVB, Inc.

Kind of sample reported to us	Fly Ash (Cyclone Hopper)	ABMA Test Site F Test #30
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/13/79	
Date received	2/22/79	

Analysis report no. 71- 28196

	<u>Dry Basis</u>
%Ash.....	35.49
%Combustible.....	64.51
%Sulfur.....	0.43

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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 OFFICE TEL. (312) 264-1173

KVB, INC.
 A Research-Cottrell Company
 6176 Olson Memorial Highway
 Minneapolis, Minnesota 55422

March 7, 1979

Sample identification
 by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F"
		Test #35
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/14/79	
Date received	2/22/79	

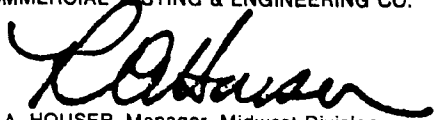
Analysis report no. 71- 28185

	<u>DRY BASIS</u>
%Ash.....	86.18
%Combustible.....	13.82

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 R. A. HOUSER, Manager, Midwest Division


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COMBUSTIBLES DATA SHEET

SITE

F

Crucible Number	Sample Origin	Crucible Weight grams	Crucible & Sample Weight Post 110°C gms	Sample Weight grams	Post 750°C grams	Δ Weight grams	% Combustibles
20	Site F TEST #15 ECON. OUT 1-8-79 AVG.	8.8421	10.3171	1.4756	9.2877	0.9409	63.1
		8.8416	10.3176		9.2873		
		—	—		—		
		8.8410	10.3174		9.2873		
21	Site F TEST #15 MECH. OUT 1-8-79 AVG.	9.4804	10.2184	0.7380	9.8340	0.3845	52.1
		9.4804	10.2185		9.8337		
		—	—		—		
		9.4804	10.2184		9.8337		
22	Site F TEST #17 ECON. OUT 1-11-79 AVG.	9.7274	11.4632	1.7362	10.2464	1.2171	70.1
		9.7273	11.4639		10.2463		
		—	—		—		
		9.7273	11.4635		10.2464		
23	Site F TEST #17 MECH. OUT 1-11-79 AVG.	10.1031	10.4971	0.3946	10.3198	0.1777	45.0
		10.1025	10.4976		10.3195		
		—	—		—		
		10.1028	10.4974		10.3197		
24	Site F TEST #18 ECON. OUT 1-15-79 AVG.	10.1189	11.4739	1.3551	10.5065	0.9679	71.4
		10.1187	11.4746		10.5065		
		—	—		—		
		10.1188	11.4743		10.5065		
25	Site F TEST #18 MECH. OUT 1-15-79 AVG.	9.6896	9.9923	0.3028	9.8677	0.1250	41.3
		9.6897	9.9927		9.8673		
		—	—		—		
		9.6897	9.9925		9.8675		
26	Site F TEST #19 ECON. OUT 1-16-79 AVG.	10.2375	11.9342	1.6971	10.7148	1.2198	71.9
		10.2374	11.9350		10.7147		
		—	—		—		
		10.2375	11.9346		10.7148		
27	Site F TEST #19 MECH. OUT 1-16-79 AVG.	9.4130	9.8848	0.4721	9.6673	0.2178	46.1
		9.4128	9.8853		9.6673		
		—	—		—		
		9.4129	9.8851		9.6673		
28	Site F TEST #20 ECON. OUT 1-17-79 AVG.	10.0589	11.0430	0.9844	10.3849	0.6587	66.9
		10.0591	11.0437		10.3845		
		—	—		—		
		10.0590	11.0434		10.3847		
29	Site F TEST #21 MECH. OUT 1-24-79 AVG.	10.2787	10.7456	0.4674	10.5333	0.2128	45.5
		10.2784	10.7463		10.5331		
		—	—		—		
		10.2786	10.7460		10.5332		
30	Site F TEST #24 MECH. OUT 2-6-79 AVG.	9.6552	9.9551	0.3000	9.8177	0.1375	45.8
		9.6551	9.9553		9.8177		
		—	—		—		
		9.6552	9.9552		9.8177		

COMBUSTIBLES DATA SHEET

SITE

F

TEST #23 - MECH - ~~23~~ BROKEN.
CONTAINER

Crucible Number	Sample Origin	Crucible Weight grams	Crucible & Sample Weight Post 110°C gms	Sample Weight grams	Post 750°C grams	Δ Weight grams	% Combustibles
31	TEST #29 MECH OUT	9.6245	10.1190	0.4947	9.8864	0.2326	47.0
		9.6243	10.1191		9.8865		
		—	—		—		
		AVG. 9.6244	10.1191		9.8865		
32	TEST #35 MECH OUT 2-15-79	8.5066	8.9766	0.4701	8.7441	0.2326	49.5
		8.5064	8.9766		8.7438		
		—	—		—		
		AVG. 8.5065	8.9766		8.7440		
33	TEST #35 ECON. OUT 2-15-79	10.2335	11.1803	0.9469	10.4928	0.6877	72.6
		10.2332	11.1803		10.4924		
		—	—		—		
		AVG. 10.2334	11.1803		10.4926		
21	TEST #24 BULK OUT SITE F	9.6093	10.2647	0.6558	9.8254	0.4396	67.0
		9.6091	10.2653		9.8254		
		—	—		—		
		AVG. 9.6092	10.2650		9.8254		
22	TEST #35 BULK OUT SITE F	9.3589	9.9802	0.6215	9.6727	0.3018	49.5
		9.3591	9.9807		9.6727		
		—	—		—		
		AVG. 9.3590	9.9805		9.6727		
	AVG.						
	AVG.						
	AVG.						
	AVG.						
	AVG.						
	AVG.						

KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 15

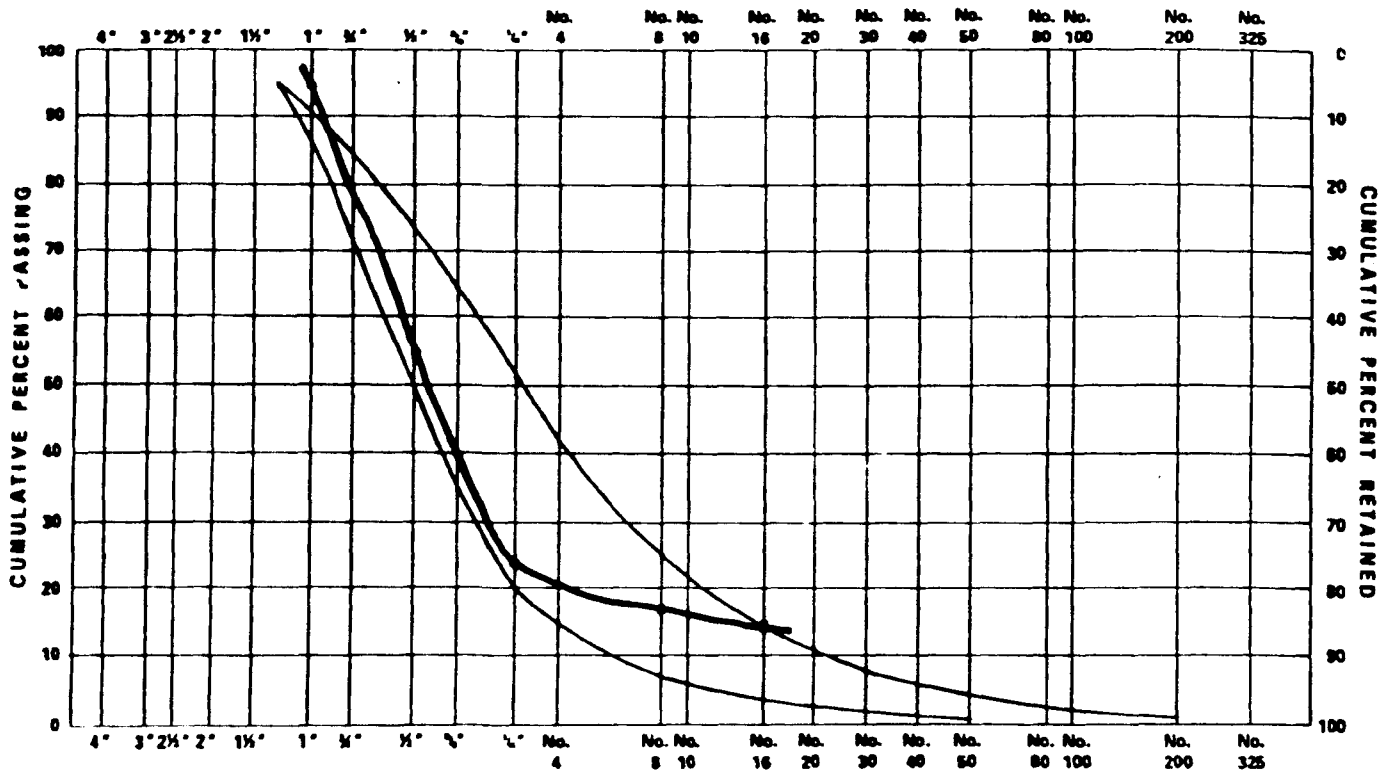
DATE SAMPLE TAKEN 1/8/79

TEST SITE F

TEST PERFORMED BY Tidina

SAMPLE IDENTIFICATION PA. BITUMINOUS COAL

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			175.0	5.18	3377.4	100	15
1"			1349.2	39.95	3202.4	94.82	minutes total
1/2"			1023.6	30.31	1853.2	54.87	shaking time
1/4"			245.6	7.27	829.6	24.56	for all screens
No. 8			86.8	2.57	584.0	17.29	
No. 16			497.2	14.72	497.2	14.72	



SIEVE OPENING

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SIEVE ANALYSIS TEST REPORT

TEST NO. 17

DATE SAMPLE TAKEN 11/10/79

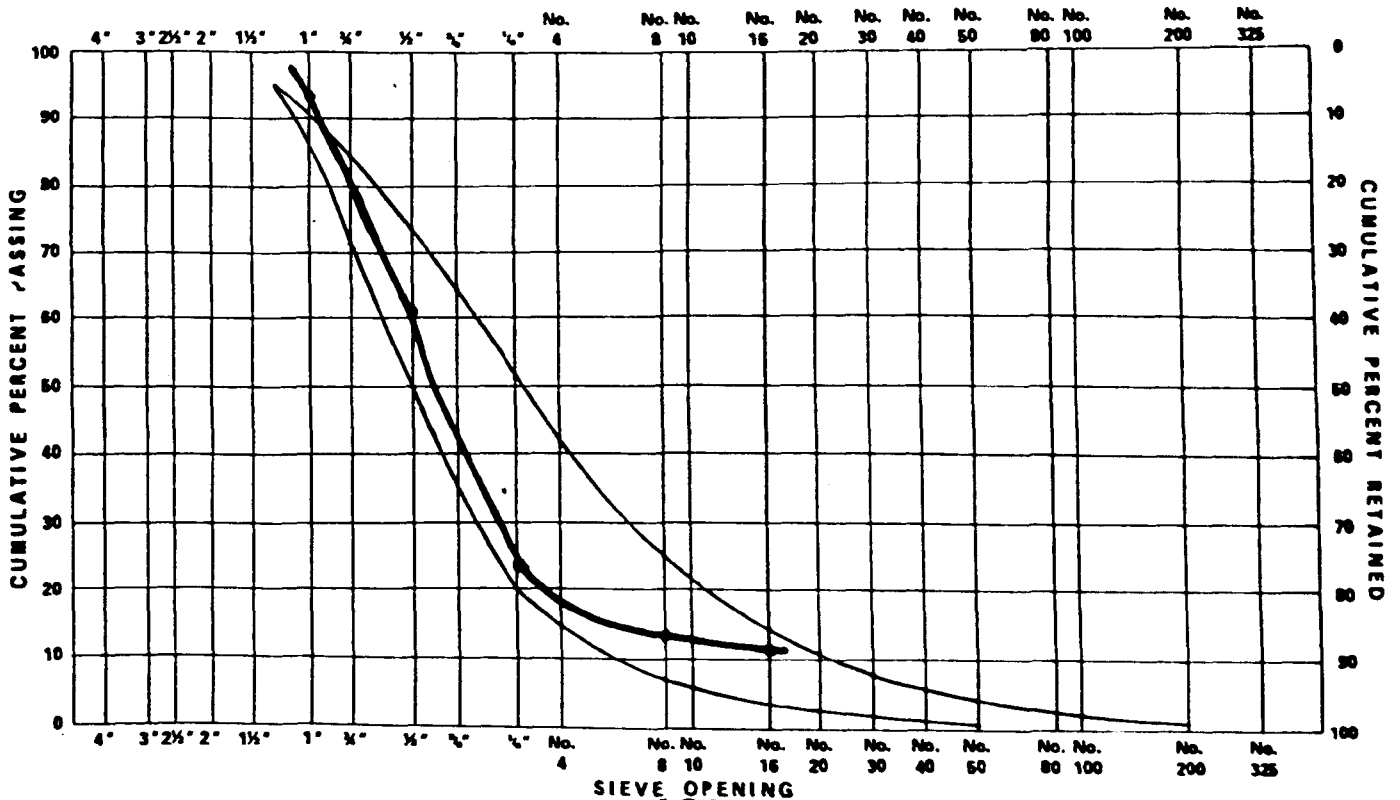
TEST SITE F

TEST PERFORMED BY T. Lina

SAMPLE IDENTIFICATION Pa. Bit. Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			203.0	7.0	2905.1	100.0	
1"			935.2	32.2	2702.1	93.0	1
1/2"			1043.2	37.3	1766.9	60.8	2
1/4"			284.8	9.8	683.7	23.5	4
No. 8			82.9	2.9	398.7	13.7	8
No. 16			316.0	10.9	316.0	10.9	16

Totals = 2905.1 100.1



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SIEVE ANALYSIS TEST REPORT

TEST NO. 18

DATE SAMPLE TAKEN 1/16/79

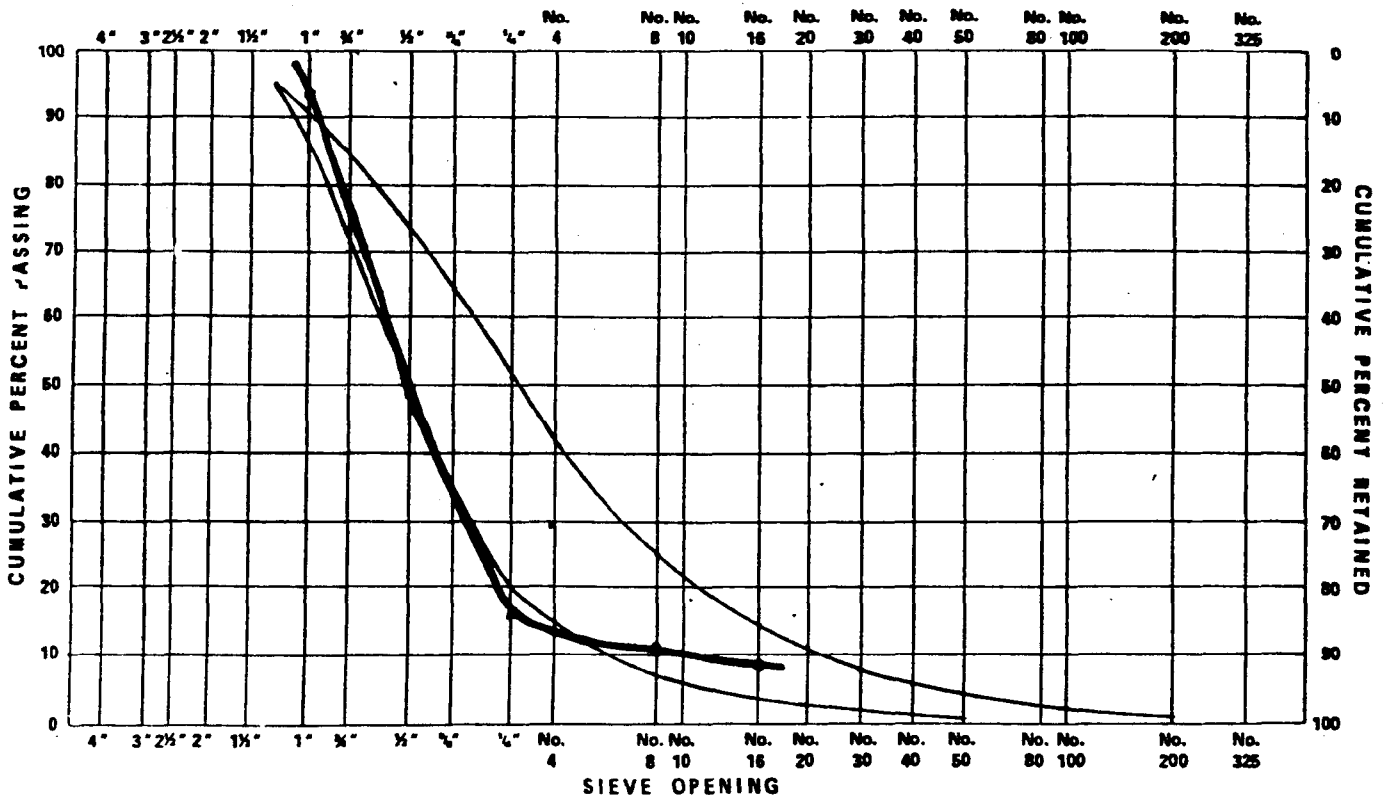
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pc. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			192.3	6.6	2906.2	100.0	
1"			1304.8	44.9	2713.9	93.4	1
1/2"			939.1	32.3	1409.1	48.5	2
1/4"			159.8	5.5	470.0	16.2	4
No. 8			48.2	1.7	310.2	10.7	8
No. 16			262.0	9.0	262.0	9.0	16

Totals = 2906.2 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 19

DATE SAMPLE TAKEN JAN. 16, 1979

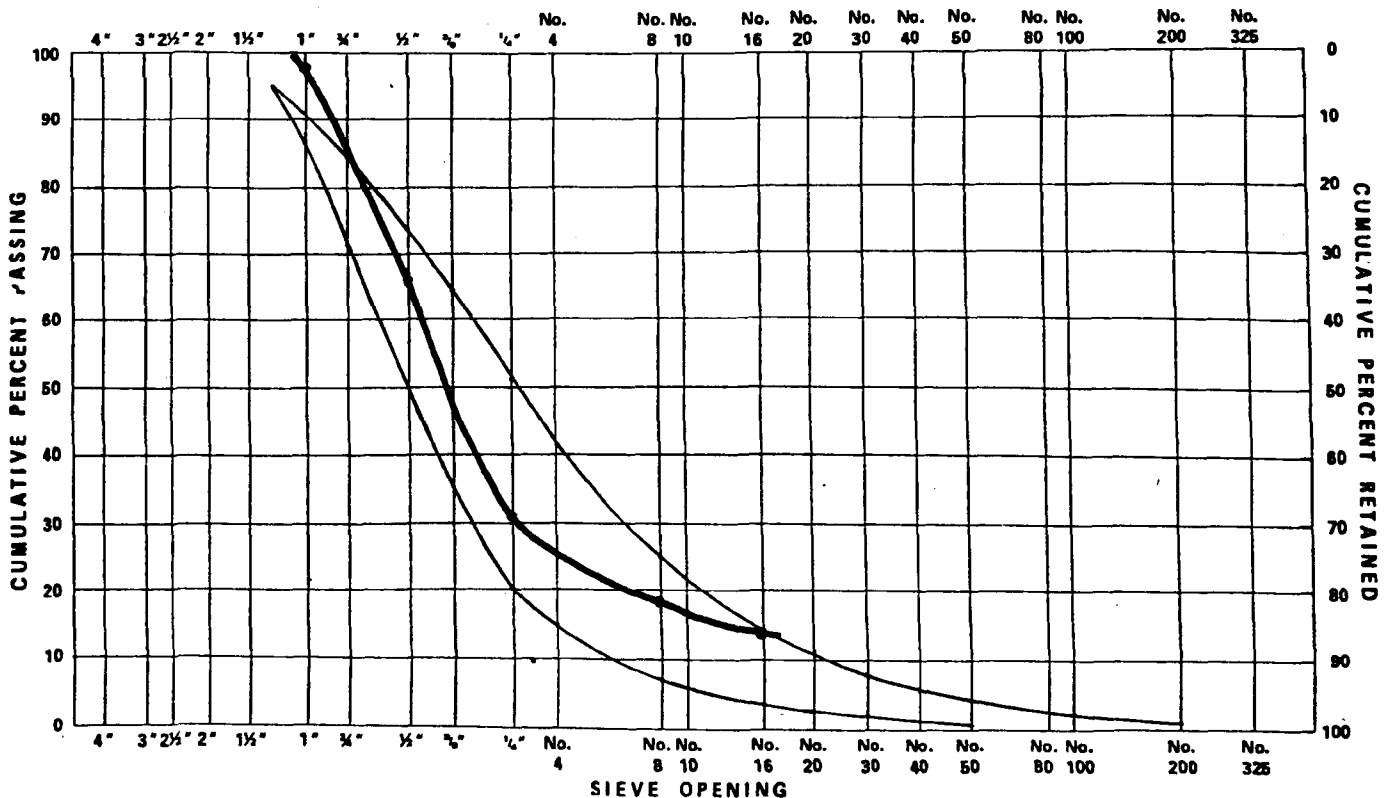
TEST SITE F

TEST PERFORMED BY T. J. Dena

SAMPLE IDENTIFICATION Pa. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			97.5	2.4	3991.5	100.0	0
1"			1242.6	31.1	3894.0	97.6	1
1/2"			1435.1	36.0	2651.4	66.4	2
1/4"			467.9	11.7	1216.3	30.5	4
No. 8			180.8	4.5	748.4	18.7	8
No. 16			567.6	14.2	517.6	14.2	16

Totals = 3991.5 99.9



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 20

DATE SAMPLE TAKEN 11/17/79

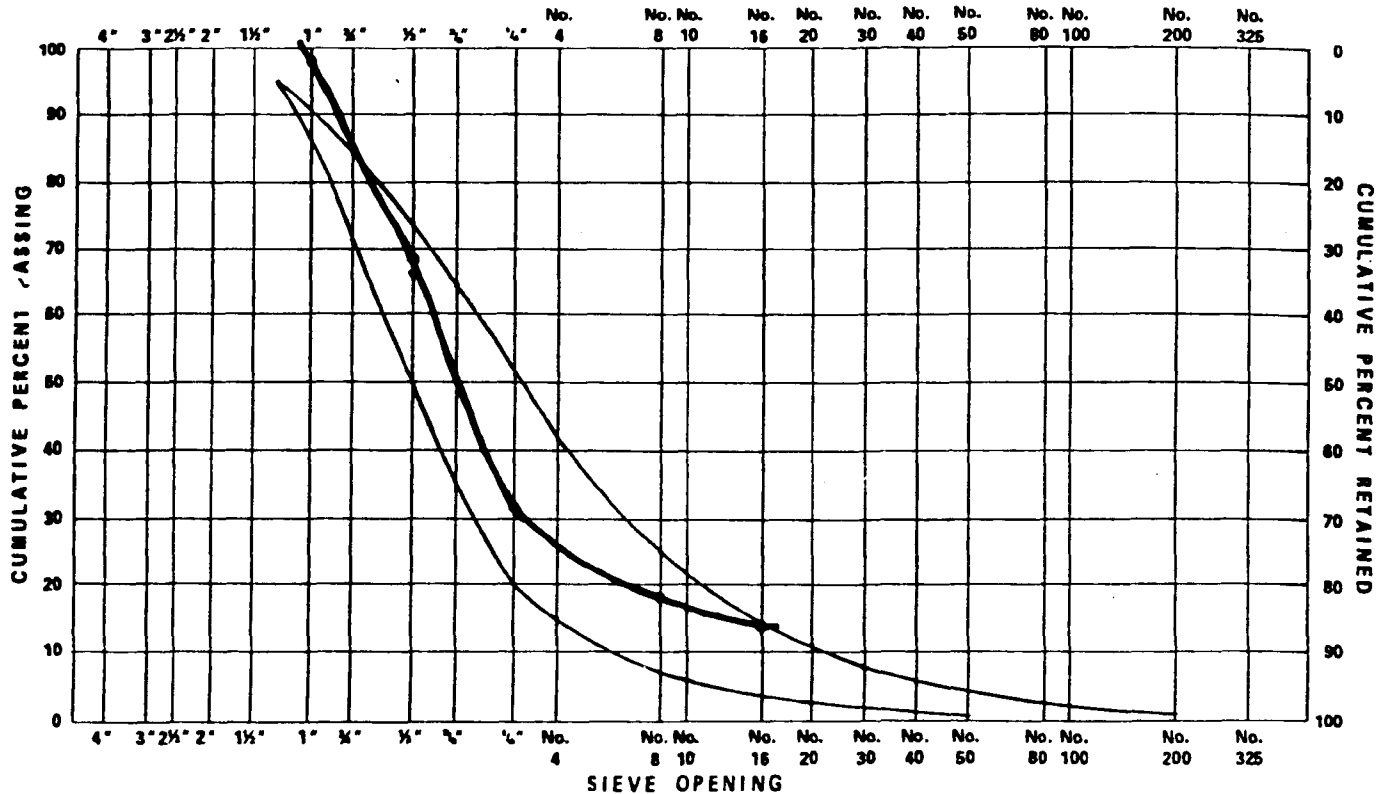
TEST SITE F

TEST PERFORMED BY T. Idara

SAMPLE IDENTIFICATION Pc. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			102.4	2.5	4138.8	100.0	0
1"			1190.4	28.8	4036.4	97.5	1
1/2"			1533.8	37.1	2846.0	68.8	2
1/4"			542.0	13.1	1312.2	31.7	4
No. 8			193.1	4.7	770.2	18.6	8
No. 16			577.1	13.9	577.1	13.9	16

Total = 4138.8 100.1



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SIEVE ANALYSIS TEST REPORT

TEST NO. 21

DATE SAMPLE TAKEN 1/24/79

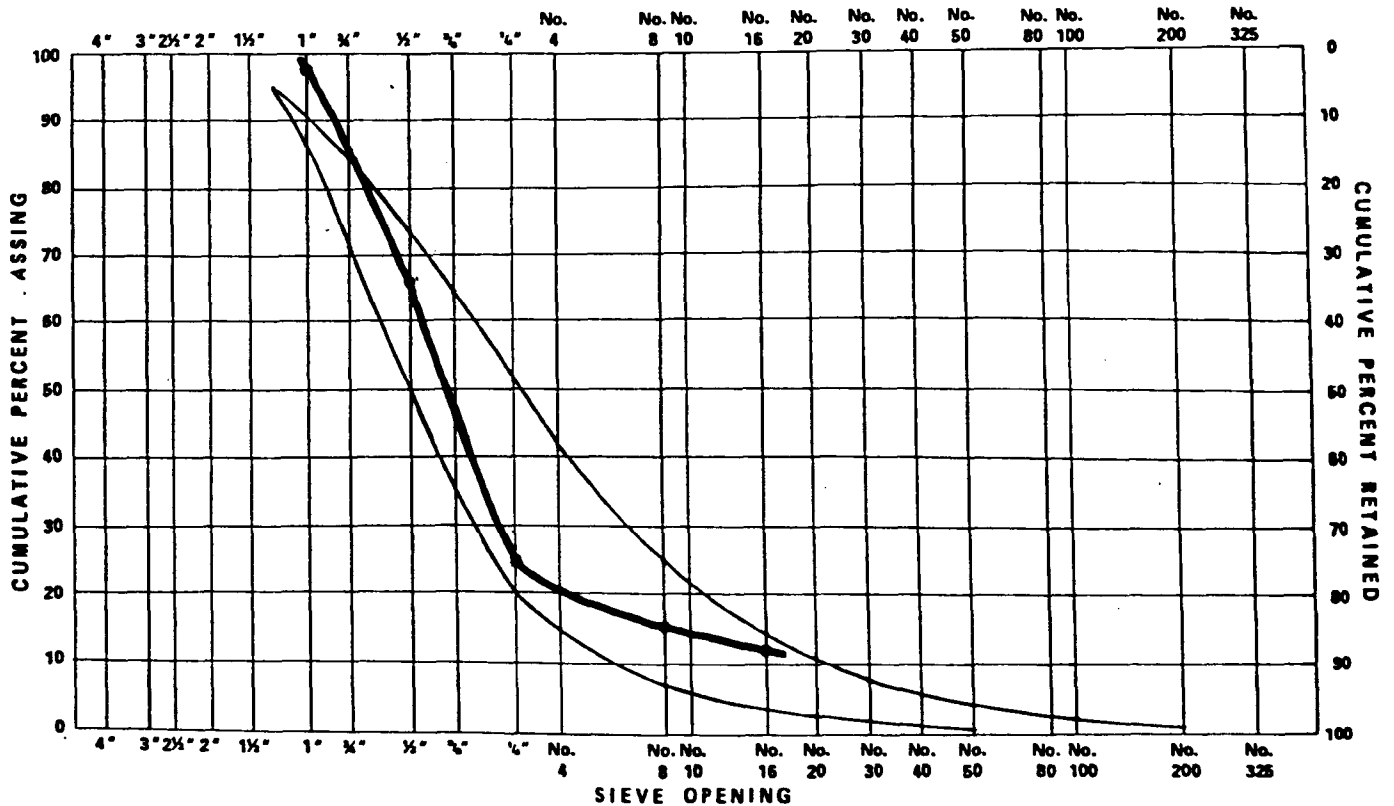
TEST SITE F

TEST PERFORMED BY T. Jona

SAMPLE IDENTIFICATION P. B. 4 Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			142.9	2.9	4993.1	100.0	0
1"			1549.4	31.0	4850.2	97.1	1
3/4"			1574.5 483.4 2057.9	41.2	3300.8	66.1	2
1/2"			475.3	9.5	1242.9	24.9	4
No. 8			164.0	3.3	767.6	15.4	8
No. 16			603.6	12.1	603.6	12.1	16

Total = 4993.1 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 22

DATE SAMPLE TAKEN 1-31-79

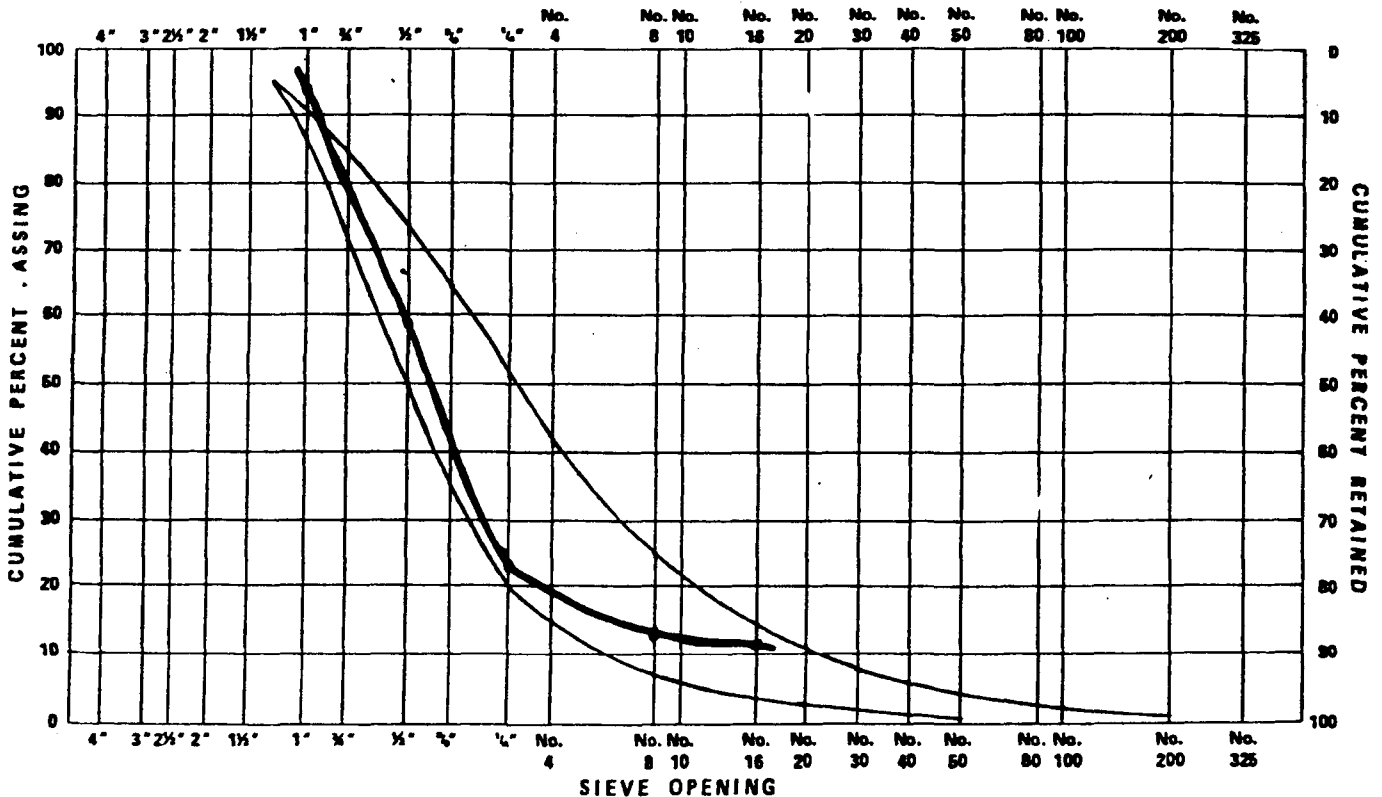
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bit. Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			385.4	5.8	6690.5	100.0	0
1"			1297.0 1067.2 2364.2	35.3	6305.1	94.2	1
1/2"			1265.3 1187.2 2416.9	36.1	3940.9	58.9	2
1/4"			608.3	9.1	1524.1	22.8	4
No. 8			188.5	2.8	915.8	13.7	8
No. 16			727.3	10.9	727.3	10.9	16

Totals = 6690.5 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 23

DATE SAMPLE TAKEN 2/1/79

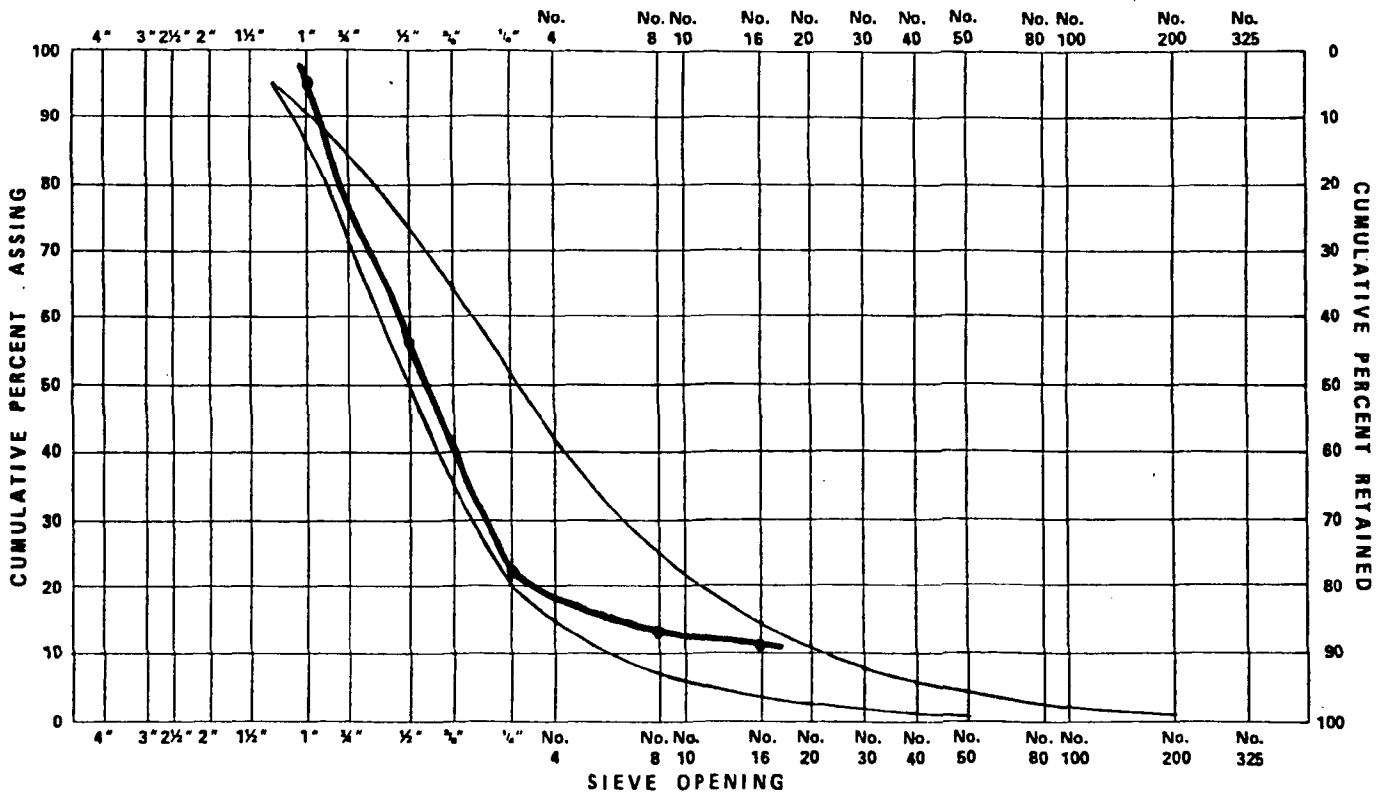
TEST SITE F

TEST PERFORMED BY T. Loma

SAMPLE IDENTIFICATION Po Bt. Co. 1 (clear field)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			255.2	4.9	5241.7	100.0	0
1"			2034.1	38.8	4986.5	95.1	1
1/2"			1809.7	34.5	2952.4	56.3	2
1/4"			454.0	8.7	1142.7	21.8	4
No. 8			140.5	2.7	688.7	13.1	8
No. 16			548.2	10.5	548.2	10.5	16

Totals = 5241.7 100.1



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 23A

DATE SAMPLE TAKEN 2-8-79

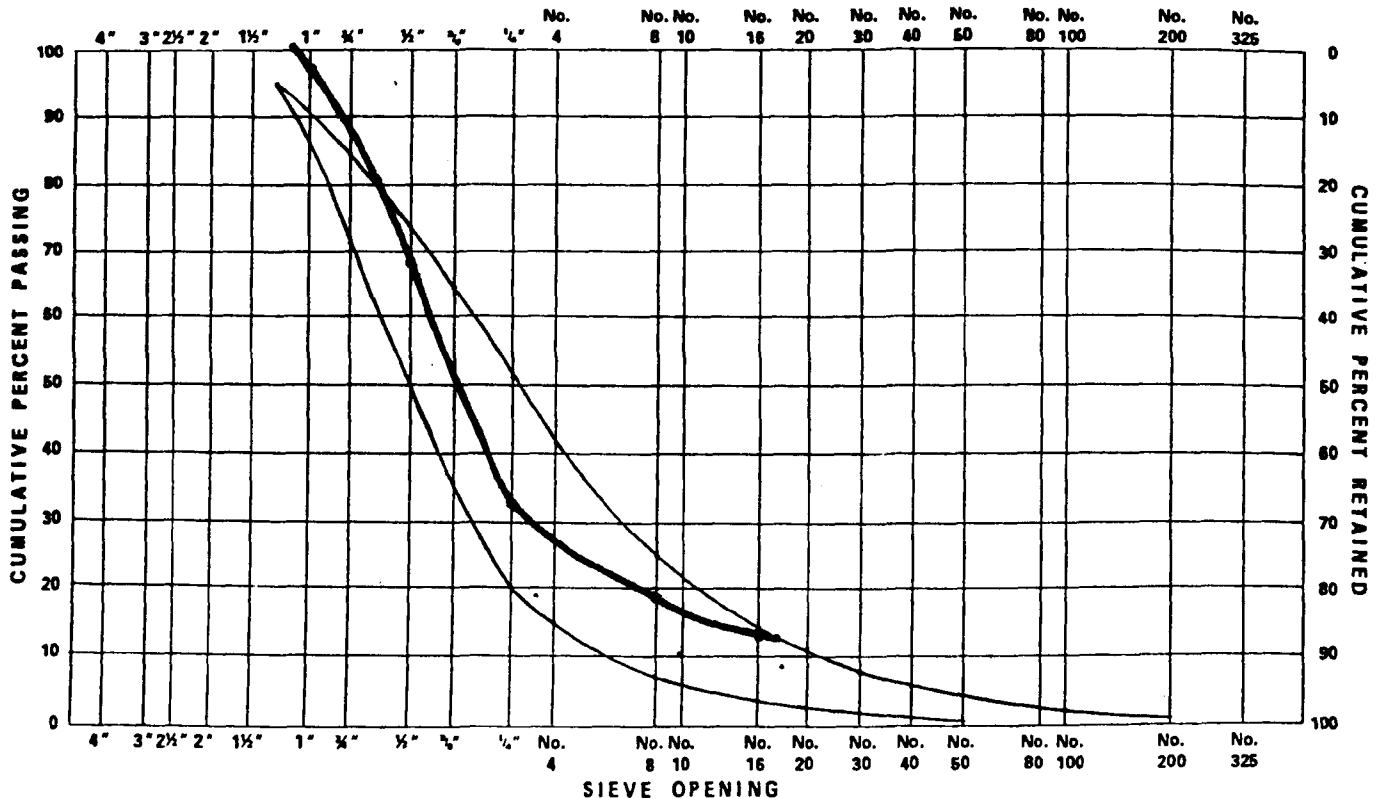
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION la Bt Coal (Clearfield Co)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
TOP			190.0	3.2	5945.4	100.0	0
1"			1708.1	28.7	5755.4	96.8	1
1/2"			1685.3 2150.8	35.8	4047.3	68.1	2
3/4"			810.4	13.6	1916.5	32.2	4
No. 8			282.5	4.8	1106.1	18.6	8
No. 16			823.6	13.9	823.6	13.9	16

totals - 5945.4 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 24

DATE SAMPLE TAKEN 2-6-79

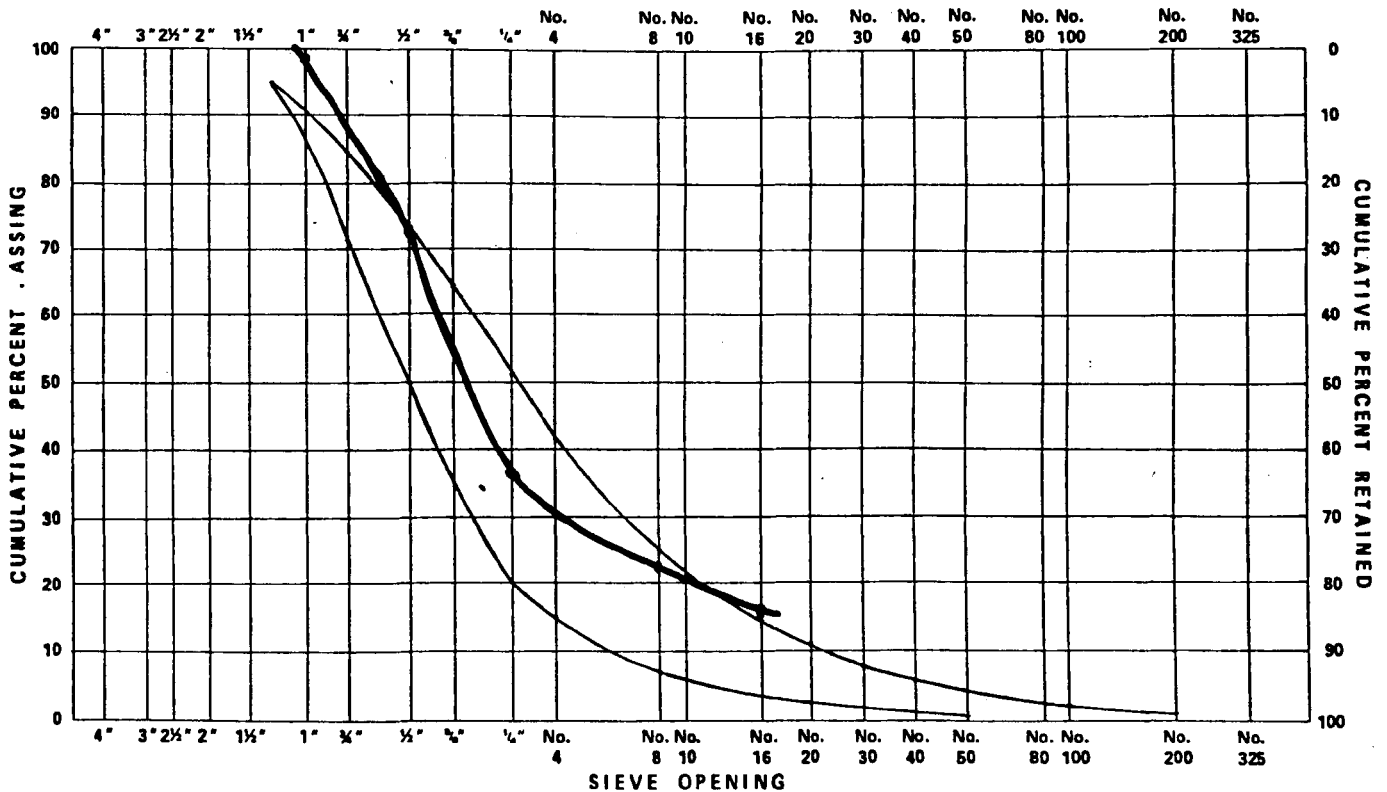
TEST SITE r

TEST PERFORMED BY Tidna

SAMPLE IDENTIFICATION Pa. Bit. Coal (Clear Creek Co.)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			71.2	1.5	4654.7	100.0	0
1"			1196.7	25.7	4583.5	98.5	1
1/2"			$\frac{1061.3}{617.7}$ 1679.0	36.1	3386.8	72.8	2
1/4"			713.3	15.3	1707.8	36.7	4
No. 8			265.2	5.7	994.5	21.4	8
No. 16			729.3	15.7	729.3	15.7	16

Total = 4654.7 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 29

DATE SAMPLE TAKEN 2-12-79

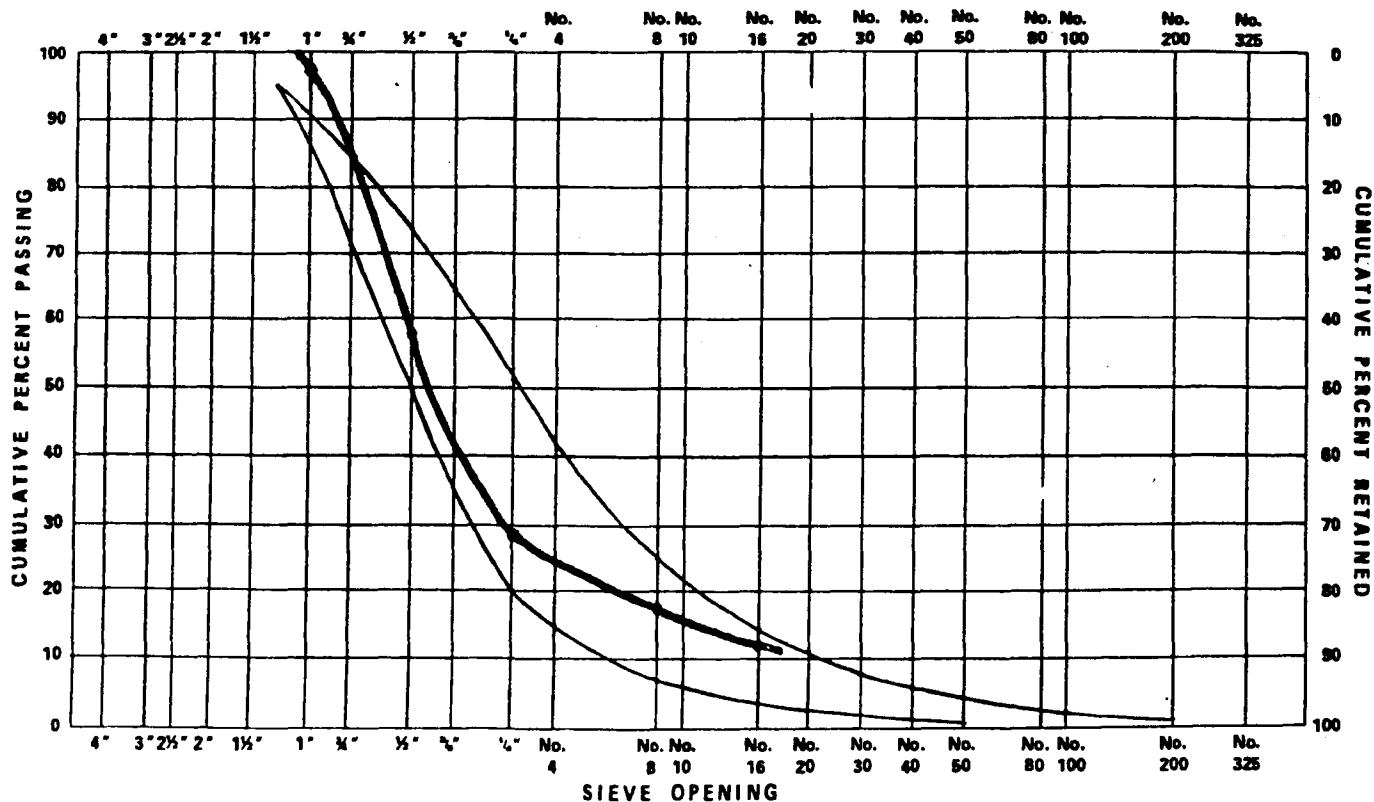
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Ra Bit Coal B

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
TOP			196.8	3.0	6480.6	100.0	0
1"			1466.7 1132.1	40.1	6283.8	97.0	1
1/2"			1844.8	28.5	3685.0	56.9	2
3/4"			749.2	11.6	1840.2	28.4	4
No 8			316.8	4.9	1091.0	16.8	8
No 16			774.2	11.9	774.2	11.9	16

totals = 6480.6 100.0



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 30

DATE SAMPLE TAKEN 2-13-79

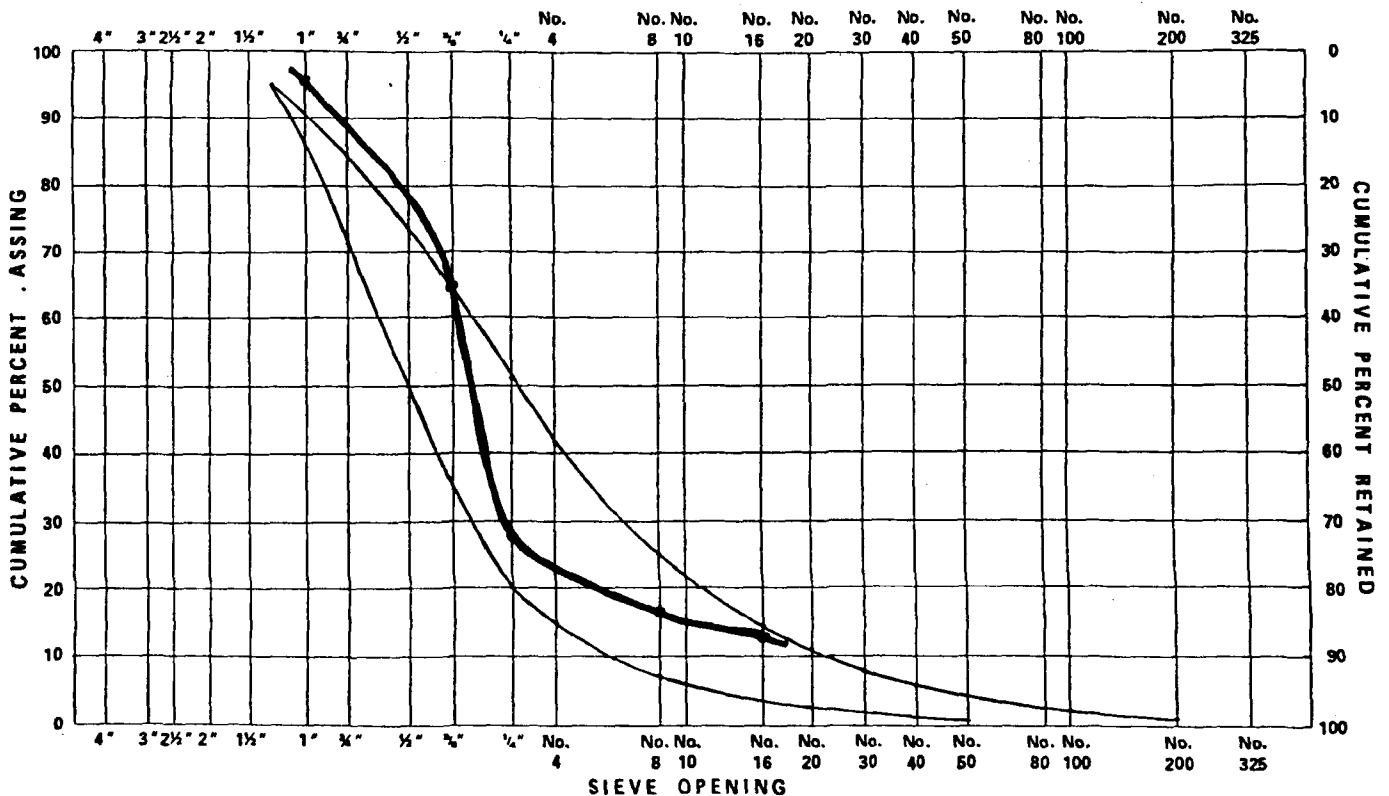
TEST SITE F

TEST PERFORMED BY T. Lora

SAMPLE IDENTIFICATION Pa. Bitum. Coal B

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			226.1	4.0	5627.3	100.0	0
1"			1768.0	31.4	5401.2	96.0	1
1/2"			2032.7	36.1	3633.2	64.6	2
1/4"			655.2	11.6	1600.5	28.4	4
No. 8			255.1	4.5	945.3	16.8	8
No. 16			690.2	12.3	690.2	12.3	16

Totals = 5627.3 99.9



KVB

SIEVE ANALYSIS TEST REPORT

TEST NO. 35

DATE SAMPLE TAKEN 2-14-79

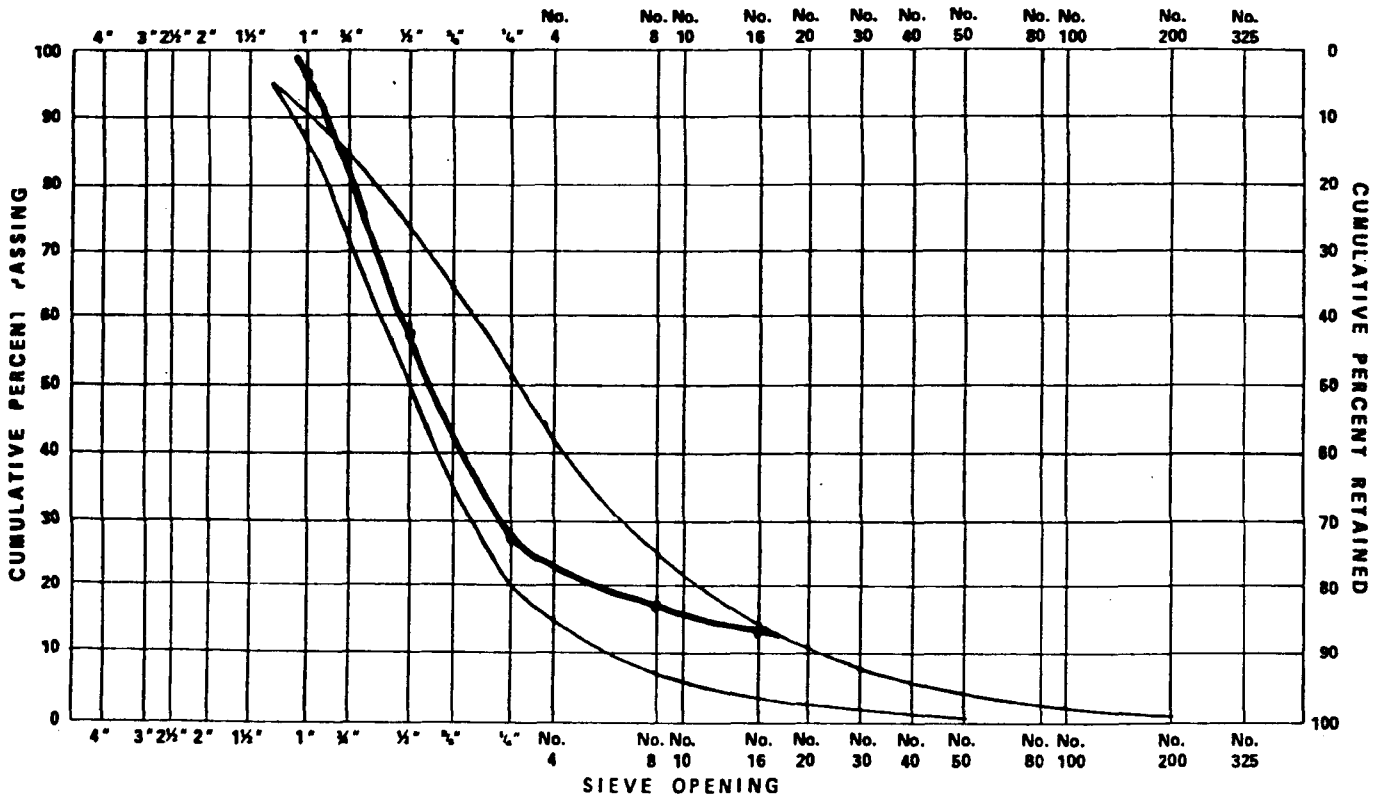
TEST SITE F

TEST PERFORMED BY T. Loma

SAMPLE IDENTIFICATION Pa. Bit. Coal B

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			151.2	2.9	5133.1	100.0	0
1"			2064.7	40.2	4981.9	97.1	1
1/2"			1485.7	28.9	2917.2	56.8	2
1/4"			529.0	10.3	1431.5	27.9	4
No. 8			236.8	4.6	902.5	17.6	8
No. 16			665.7	13.0	665.7	13.0	16

Totals = 5133.1 99.9



TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)			
1. REPORT NO. EPA-600/7-80-065b		3. RECIPIENT'S ACCESSION NO.	
4. TITLE AND SUBTITLE Field Tests of Industrial Stoker Coal-fired Boilers for Emissions Control and Efficiency Improvement--Site F (Data Supplement)		5. REPORT DATE April 1980	
7. AUTHOR(S) R. J. Tidona, H. L. Stix, J. E. Cook, and M. G. Gabriel		6. PERFORMING ORGANIZATION CODE	
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		14. SPONSORING AGENCY CODE EPA/600/13	
15. SUPPLEMENTARY NOTES (*)Cosponsors are DOE and the American Boiler Manufacturers Assoc. Project officers are R. Hall (EPA) and W. Harvey Jr. (DOE). The final technical report is EPA-600/7-80-065a.			
16. ABSTRACT The Data Supplement is a compilation of test data presented in greater detail than was practical in the final technical report. It is intended to provide the necessary details to other researchers who are interested in performing their own analysis. Readers are referred to the contract final report for information as to objectives, description of facility tested and coals fired, test equipment and procedures, interpretations, and conclusions. The final technical report also contains data summaries not found in this Supplement. The Supplement contains panel board data for each test, detailed particulate, O ₂ , CO ₂ , NO, SO ₂ , and SO ₃ data, particle size distribution data, chemical analysis of the coal, and coal size consistency data.			
17. KEY WORDS AND DOCUMENT ANALYSIS			
a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution	Improvement	Air Pollution Control	13B
Boilers	Efficiency	Stationary Sources	13A
Combustion	Flue Gases	Combustion Modification	21B
Coal	Fly Ash	Spreader Stokers	21D
Field Tests	Particle Size	Particulate	14B
Dust	Nitrogen Oxides	Overfire Air	11G
Stokers	Sulfur Oxides	Flyash Reinjection	07B
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