~~3 controlled~~
3 runs on a baghouse controlling emissions from coal-fired kilns.
PM-filt; ~~PM~~ cond.

EXHIBIT 3

TEST CONDUCTED AT

PLANT NO. 3

May 24, 25, and 26, 1977

REPORT ON THE PARTICULATE EMISSIONS FROM A LIME KILN BAGHOUSE

The attached report presents the results of three stack test runs on the third stack of the No. 5 Baghouse at the Plant Number 3. The tests were conducted to evaluate Baghouse performance after the installation of a completely new set of bags.

The results of these tests are compared below with the results of all previous tests on the Plant No. 3 baghouse.

TEST DATE	EMISSION RATES			ALLOWABLE EMISSION RATES	
	#/hr	gr/SCFD	#/ton feed	PROPOSED 0.3#/ton feed	CURRENT STANDARD
June 1974 (Federal EPA)	17.52	0.0148 ↑diluted	0.459	11.46	43.38
April 1976 (MHL)	51.86	0.0507	1.173	13.26	44.87
May 1977 (MHL)	17.71	0.0302 ↓ closed slots lower air volume	0.413	12.86	44.37
May 1977 (MHL)	24.88	0.0432	0.515	14.63	45.44
(#3 Stack only Total Emission Rate Based on the avg. of 3 runs X 6 stacks)	4.14 as opposed to 5.09 ∴ 17.71 - 5.09 + 4.14 = 16.76 #/hr.				

All of the above tests were conducted using USEPA Method 5 stack testing procedures. It is generally accepted that results obtained using Method 5 are accurate to within ± 10%.

It can be concluded that the results outlined above provide a reasonably accurate assessment of the #5 Baghouse emission rates.

It should also be noted that during the last two sets of tests conducted (May 1977) there was no visible opacity from any stack while it was being tested.

TEST CONDUCTED AT

PLANT NO. 3

May, 1977

Report on the Particulate Emissions From A Lime Kiln Baghouse

CONTENTS

I. INTRODUCTION

This report presents the results of a particulate emission test conducted on the No. 5 kiln baghouse at Plant Number Three.

Three runs of 2 hours and 12 minutes each were made on the third No. 5 baghouse exit stack. Particulate results for each run have been divided into evaluations of the probe and filter catch alone and the total catch (The probe and filter plus impingers). The total emission rate for the baghouse has been calculated by multiplying the average emission rate for the three runs times 6 stacks.

The test were performed in accordance with EPA Method 5 Procedures.

Plant #3 PARTICULATE

STACK TEST

	Run Number / Date	1 5-24-77	2 5-25-77	3 5-26-77	AVG	AVERAGE X 6 STACKS
	tons/hr feed	46	54	47		
olume Gas Sampled, SCFD		54.655	49.233	54.339	52.742	
Moisture, Volume		14.0	15.4	13.9	14.4	
verage Stack Temp. °F		410.5	428.0	426.5	421.7	
CFM D		11,564	10,074	11,327	10,988	65,930
CFM		21,853	19,807	21,893	21,184	127,106
Isokinetic		101.9	105.4	103.5	103.6	
eed Rate T/hr (Limestone only)		46.23	53.52	46.58	48.78	
oal Feed T/hr		6.04	6.06	6.04	6.05	
otal PWR		52.27	59.58	52.62	54.82	
articulates - Probe & Filter Catch						
g		137.6	132.0	174.3	148.0	887.8
r/DSCF		0.0388	0.0413	0.0495	0.0432	
/hr		3.88	3.67	4.89	4.15	24.88
/ton feed		0.0839	0.0686	0.1050	0.0858	0.515
	lb/ton prod	1.01	0.82	1.26		1.03
articulates - Total Catch						
g		144.2	145.5	203.4	164.4	986.2
r/DSCF		0.0407	0.0456	0.0577	0.0480	
/hr		4.08	4.05	5.70	4.61	27.66
/ton feed		0.0883	0.0757	0.1224	0.0955	0.5728
Impinger Catch		4.90	9.38	14.21	9.50	
	lb/ton prod	0.052	0.084	0.21	0.115	

PROCESS WEIGHT RATE CALCULATION

DATE: 5-24-77 Run 1

TEST PERIOD: 10:30 AM - 4:37 PM

STONE FEED

	TIME	POIDOMETER READING
START	10:00 AM	5454735
FINISH	5:00 PM	5487099
TOTAL POIDOMETER UNITS		32364
TOTAL TONS (@ 20#/POID. UNIT)		323.64
TONS/HOUR		46.23

COAL FEED

	TIME	POIDOMETER READING
START	10:00 AM	290659
FINISH	5:00 PM	294890
TOTAL POIDOMETER UNITS		4231
TOTAL TONS (@ 20#/POID. UNIT)		42.31
TONS/HOUR		6.04

TOTAL PWR = 52.27

PROCESS WEIGHT RATE CALCULATION

DATE: 5-25-77 Run 2

TEST PERIOD: 9:50 AM - 12:42 PM

STONE FEED

	TIME	POIDOMETER READING
START	10:00 AM	5563575
FINISH	1:00 PM	5579632
TOTAL POIDOMETER UNITS		16057
TOTAL TONS (@ 20#/POID. UNIT)		160.57
TONS/HOUR		53.52

COAL FEED

	TIME	POIDOMETER READING
START	10:00 AM	305102
FINISH	1:00 PM	306919
TOTAL POIDOMETER UNITS		1817
TOTAL TONS (@ 20#/POID. UNIT)		18.17
TONS/HOUR		6.06

TOTAL PWR = 59.58

PROCESS WEIGHT RATE CALCULATION

DATE: 5-26-77 Run 3

TEST PERIOD: 9:50 AM - 12:42 PM

STONE FEED

	TIME	POIDOMETER READING
START	10:00 AM	5677229
FINISH	1:00 PM	5691202
TOTAL POIDOMETER UNITS		13973
TOTAL TONS (@ 20#/POID. UNIT)		139.73
TONS/HOUR		46.58

COAL FEED

	TIME	POIDOMETER READING
START	10:00 AM	319447
FINISH	1:00 PM	321260
TOTAL POIDOMETER UNITS		1813
TOTAL TONS (@ 20#/POID. UNIT)		18.13
TONS/HOUR		6.04

TOTAL PWR = 52.62

REVISIONS

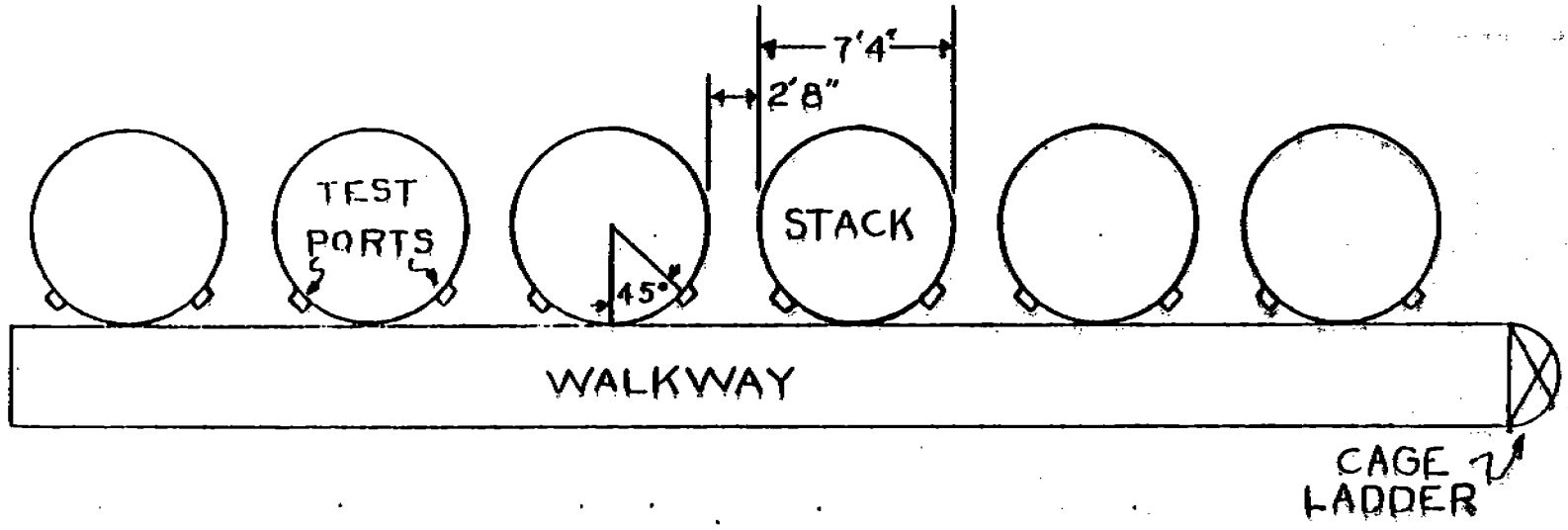
DESTROY ALL PREVIOUS PRINTS

5	
4	
3	
2	
1	

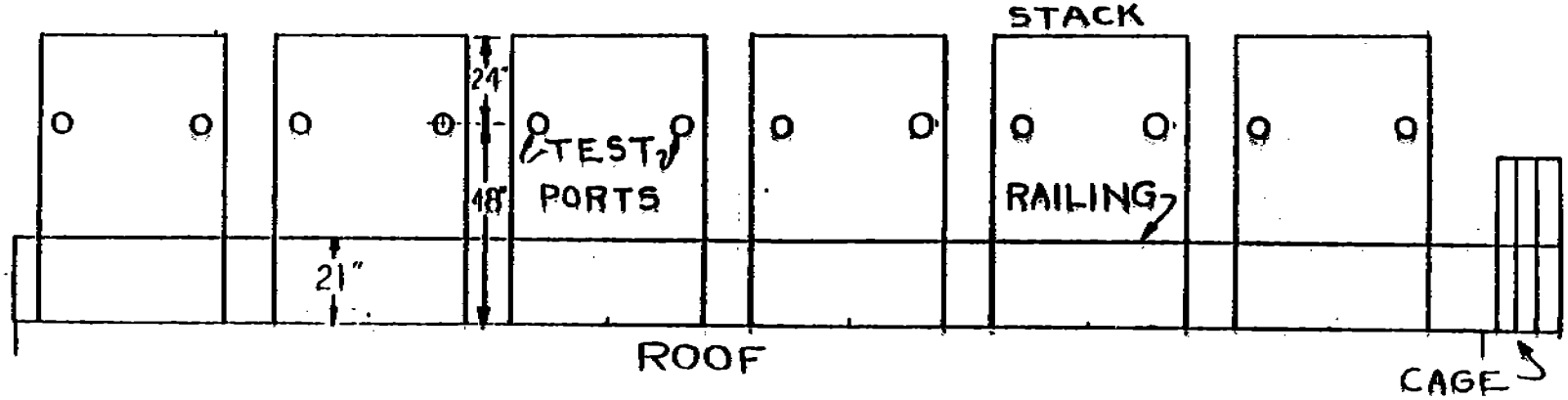
DRAWN BY [illegible] DATE 5-12-77

CHECKED BY

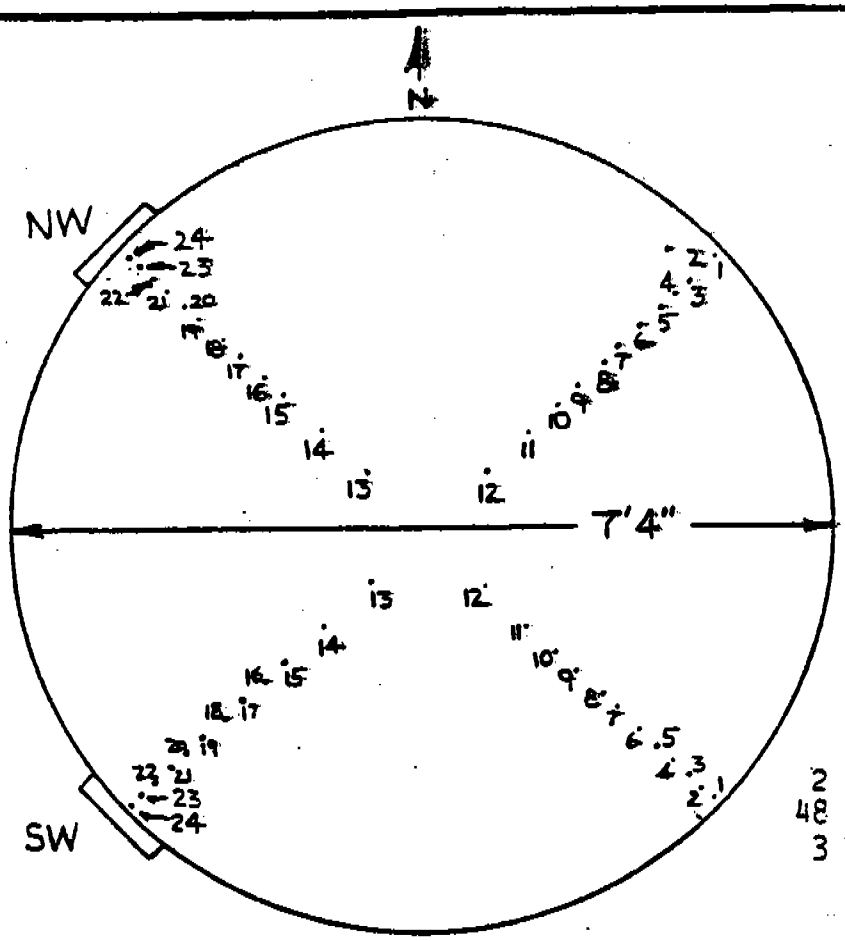
APPROVED



TOP VIEW



SIDE VIEW



2 Traverses
48 Sampling Points
3 Minutes Per Sampling Point

TRAVERSE POINT	DISTANCE FROM INSIDE WALL, INCHES	TRAVERSE POINT	DISTANCE FROM INSIDE WALL, INCHES
1	87.05	13	35.02
2	85.14	14	28.45
3	83.16	15	23.91
4	81.03	16	20.24
5	78.76	17	17.06
6	76.41	18	14.21
7	73.77	19	11.62
8	70.94	20	9.22
9	67.76	21	6.97
10	64.09	22	4.85
11	59.55	23	2.87
12	53.98	24	.92

REVISIONS DESTROY ALL PREVIOUS PRINTS	
1	
2	
3	
4	
5	

DRAWN BY W. K. SCALE DATE 5-12-77
CHECKED BY APPROVED

TEST PROCEDURE

desiccant dried glass fiber filter (MSA 1106 BH), preweighed silica gel and distilled water are used to prepare the particulate sampling train for the stack sampling. The equipment is taken to the test site, set up, and checked out for an acceptable leakage rate. The test is now ready to be performed. The stack gas velocity head measurements are made with a reverse-type or Type "S" pitot tube and an inclined-vertical manometer. Stack gas temperatures are sensed by a Type "K" thermocouple and indicated on a readout at the control unit. Traverse points are based on the division of stack cross sectional area into equal area zones.

The metering rate to establish isokinetic sampling of stack gas is determined by measuring gas conditions in the stack at the sampling point and gas conditions at the meter while sampling. Other necessary data to determine isokinetic metering rate is determined by preliminary test.

The probe with the pitot and thermocouple attachments, is inserted into the stack and continuous gas samples are withdrawn isokinetically at specific traverse points for specific intervals of time. The probe and filter holder are electrically heated to prevent condensation. The gas then passes through a series of four impingers containing distilled water and silica gel set in an ice bath to condense water vapor. The gas, then, passes through the pump, totalizing gas meter, orifice meter and finally to the atmosphere. Needle valves are used to control the flow rates in the sampling train.

At the end of the run, the probe is held in a vertical position, nozzle up, and tapped on the nozzle to cause any dust sticking to the inside of the nozzle to enter the filter.

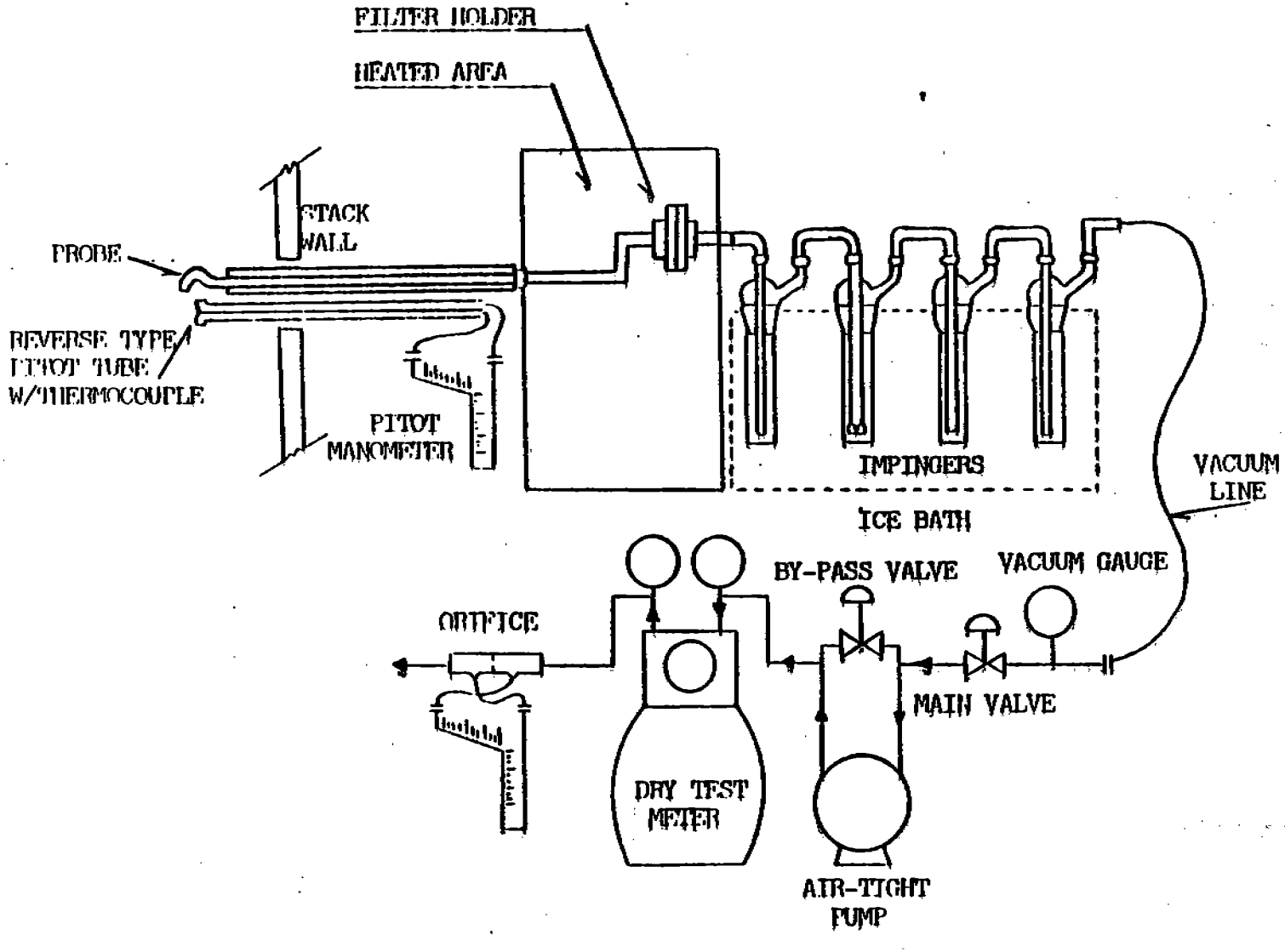
REVISIONS

1	DESTROY ALL PREVIOUS PRINTS	
2		
3		
4		
5		

DRAWN BY D.C. SCALE DATE 9-12-75

CHECKED BY APPROVED

EPA METHOD 5 SAMPLING TRAIN



PARTICULATE SAMPLING TRAIN

e basic equipment is manufactured by SCIENTIFIC GLASS & INSTRUMENTS, INC. The Model -5000 Modular Stac-C-Lator consists of the following equipment:

(1) 0.50" I.D. Button hook-type sampling probe tip, 316 SS

(2) 10 Ft. effective length pitobe with heated 316 SS inner liner with

(a) 1/2" I.D., 5/8" O.D. inner liner, heated
(b) 3/8" O.D. 316 SS pitot tube
(c) Type "K" thermocouple in 1/4" O.D. jacket

(3) Four impingers in ice bath

(a) Absorber with 100 ml distilled water with 1/2" I.D. absorbent tube.
(b) Greenburgh-Smith impinger with 100 ml distilled water
(c) Absorber with 1/2" I.D. absorber tube, dry
(d) Absorber with 200 gms dry silica gel

(4) 50 LF umbilical cord to control case

(5) Vacuum gauge

(6) Needle control valves

(7) Thomas diaphragm pump, 4 SCFM at 0" Hg, 23" Hg. max.

(8) Dry gas meter rated at 0.1 ft.^{3}/rev.

(9) Calibrated orifice plate

EQUIPMENT TRAIN CHECKOUT

Prior to performing a run, the test equipment is thoroughly checked out:

(a) Teflon tape on all metal-to-metal joints.

(b) Silicone grease on all glass or metal ball joints.

(c) Plug vacuum line at the umbilical cord after impingers, turn on pump, open coarse valve and adjust vacuum to max. vacuum with fine valve. Gas meter should register no flow.

(d) Assemble entire train including probe, plug probe tip and adjust valves to 15" Hg. Leakage, if any, should not exceed 0.02 CFM at 15" Hg. or correction must be made.

(e) Check operation of all sensors, meters, and equipment orientatio

APPENDIX A

Gravimetric Analysis

PLANT #3

DATE: 5-26-77

RUN: 3

	WEIGHT of PARTICULATE COLLECTED grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
FILTER CATCH	0.7665	0.7284	0.0381
ACETONE WASHINGS	138.6838	138.5476	0.1362
IMPINGER CATCH	143.5428	143.5137	0.0291
TOTAL PARTICULATE COLLECTED			0.2034

PLANT #3

DATE: 5-25-77

RUN: 2

	WEIGHT of PARTICULATE COLLECTED grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
FILTER CATCH	0.7566	0.7226	0.0340
ACETONE WASHINGS	142.9575	142.8595	0.0980
IMPINGER CATCH	138.1428	138.1293	0.0135
TOTAL PARTICULATE COLLECTED			0.1455

PLANT #3

DATE: 6-24-77

RUN: 1

	WEIGHT of PARTICULATE COLLECTED grams		
	FINAL WEIGHT	TARE WEIGHT	WEIGHT GAIN
FILTER CATCH	0.7768	0.7316	0.0452
ACETONE WASHINGS	135.7041	135.6117	0.0924
IMPINGER CATCH	136.7746	136.7680	0.0066
TOTAL PARTICULATE COLLECTED			0.1442

APPENDIX B

Field Data and Calculation Sheets

STACK GAS COMPOSITION

Stack: PLANT #3

Date: 5-3-77 Time: 10:00 AM

Method of Collection:

( ) Grab Sample ( ) Integrated Other _____

( ) Bomb (X) Bag ( ) Bottle Number _____

Analytical Method:

_____ for _____

_____ for _____

_____ for _____

Test No.	CO_2 Reading	%	O_2 Reading	%	CO Reading	%	Reading	
1								
2								
3								
4								
Avg.	16.6	16.6	27.1	10.5	27.1	0.0		

(AVERAGE OF 3 TRIALS)

Test No.	Reading		Reading		Reading		Reading	
1								
2								
3								
4								
Avg.								

Run 1
5-24-77

CALCULATION WORK SHEET

1. VOLUME OF GAS SAMPLE (DRY, STP) $V_{m_{std}}$:

$$V_{m_{std}} = V_{mc}$$
$$= V_{mc_1}$$
$$= 54.655 \text{ SCFDG}$$

2. WATER CALCULATION:

A. Water Vapor Through Meter (SCF):

$$V_{c_{std}} = \left(\frac{B_{wc}}{1-B_{wc}}\right) V_{m_{std}}$$
$$= \left(\frac{0.003}{1-0.003}\right) (54.655)$$
$$= 0.164 \text{ SCF}$$

B. Collected Water (Impingers + Silica Gel)

V_{l_c}

183.5 ml

C. Water Fraction Gas Stream, B_{wo} =

$$B_{wo} = \frac{(V_{c_{std}} + 0.0474\ V_{l_c})}{(V_{c_{std}} + 0.0474\ V_{l_c}) + V_{m_{std}}}$$
$$= \frac{(0.164) + 0.0474\ (183.5)}{(0.164) + 0.0474\ (183.5)} + (54.655)$$
$$= 0.1395$$

D. Dry Gas Fraction, B_d :

$$B_d = 1 - B_{wo}$$
$$= .8605$$

3. MOLECULAR WEIGHT CALCULATION:

$$M_d = \frac{1}{100} (\%\ CO_2)(M_{CO_2}) + (\%\ O_2)(M_{O_2}) + (\%\ CO)(M_{CO}) + (\%\ N_2)(M_{N_2})$$

3. MOLECULAR WEIGHT CALCULATIONS: (cont'd)

$$= \frac{1}{100}\left[(16.6)\ (44) + (10.5)\ (32) + (\ 0\ )\ (28) + (72.9)\ (28)\right]$$

$$= (7.30) + (3.36) + (0) + (20.41)$$

$$= \underline{31.07}$$

$$M_s = (M_d)\ (B_d) + 18\ B_{wo}$$

$$= (31.07)\ (0.8605) + 18\ (0.1395)$$

$$= \underline{29.25}$$

4. VELOCITY CALCULATIONS:

$$V_s = 85.48\ (C_{p\ test})\ (\sqrt{\Delta P_{avg}})\ \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_s = (85.48)\ (0.812)\ (0.125)\ \sqrt{\frac{870.5}{(30.22)(29.25)}}$$

$$V_s = \underline{8.623}\ \text{fps}$$

5. VOLUMETRIC FLOW IN STACK (STP), Q_s :

$$Q_s = 3600\ (V_s)\ (A)\ (B_d)\left(\frac{T_{std}}{T_{s\ avg}}\right)\left(\frac{P_{s\ avg}}{P_{std}}\right)$$

$$Q_s = 3600\ (8.623)\ (42.237)\ (0.8605)\ \left(\frac{530}{870.5}\right)\left(\frac{30.22}{29.92}\right)$$

$$Q_s = \underline{693,817}\ \text{SCFHDG}$$

6. POLLUTANT MASS RATE, pmr

a. Area Ratio Method, pmr_a

$$pmr_a = 60\ \frac{(pm)\ (A)}{(B)\ (An)} = 60\ \frac{(0.000303)\ (42.237)}{(1444)\ (0.00136)}$$

$$= \underline{3.921}\ \#/\text{hr}$$

Total Catch pm: 0.000318

$\therefore pmr_a = 4.115$

b. Concentration Method, pmr_c

$$pmr_c = \frac{(pm)\ (Q_s)}{V_{m\ std}} = \frac{(0.000303)\ (693,817)}{(64655)}$$

$$= \underline{3.846}\ \#/\text{hr}$$

$pmr_c = 4.036$

CALCULATION WORK SHEET - 3

c. Average $pmr = \frac{pmr_a + pmr_c}{2}$

$= \frac{(3.921) + (3.846)}{2} = 3.884$ #/hr

TOTAL CATCH = $\frac{(4.115) + (4.036)}{2} = 4.076$ #/hr

7. ISOKINETIC RATIO, I_r:

$I_r = \frac{pmr_a}{pmr_c} = \frac{(3.921)}{3.846}$

$= 1.0195$

8. ISOKINETIC VARIATION CHECK, I%:

$I\% = \frac{100\ (V_{m_{std}})\ (T_s)\ (P_{std})}{60\ (\theta)\ (A_n)\ (B_d)\ (V_s)\ (T_{std})\ (P_s)}$

$= \frac{100\ (54.655)\ (870.5)\ (29.92)}{60\ (.1444)\ (0.00136)\ (0.8605)\ (8.623)\ (530)\ (30.2}$

$= 101.9$ %

9. PARTICULATE LOADING, c'_s:

$c'_s = (0.01542)\ \frac{(\text{Total Particulate Catch, mg})}{V_{m_{std}}}$

$= (0.01542)\ \left(\frac{137.6}{54.655}\right)$

$= 0.0388$ gr/SCFDG

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_c	V_{ps}	P_c	$P_c - V_{ps}$	V_c	V_{md}	T_m	P_m	V_{mc}
1	.02	.141	1.320						1.316	538.5	30.32	1.312
2	.02	.141	1.305						1.301	538.0	30.32	1.299
3	.03	.173	1.575						1.570	538.0	30.34	1.568
4	.03	.173	1.585						1.580	538.5	30.34	1.577
5	.03	.173	1.580						1.575	538.0	30.34	1.573
6	.03	.173	1.580						1.575	538.0	30.34	1.573
7	.03	.173	1.575						1.570	538.0	30.34	1.568
8	.04	.200	1.770						1.765	538.0	30.36	1.764
9	.04	.200	1.820						1.814	537.0	30.36	1.816
10	.04	.200	1.845						1.839	537.0	30.36	1.841
11	.02	.141	1.275						1.271	536.5	30.32	1.272
12	.01	.100	.910						.907	536.5	30.30	.907
13	.01	.100	.900						.897	535.5	30.30	.899
14	.01	.100	.920						.917	535.5	30.30	.919
15	.01	.100	.900						.897	535.0	30.30	.900
16	.01	.100	.905						.902	534.5	30.30	.906
17	.01	.100	.920						.917	535.0	30.30	.920
18	.01	.100	.915						.912	535.0	30.30	.915
19	.01	.100	.915						.912	534.5	30.30	.916
20	.01	.100	.920						.917	534.0	30.30	.921
21	.01	.100	.905						.902	533.5	30.30	.907
22	.01	.100	.910						.907	533.5	30.30	.912
23	.01	.100	.920						.917	533.5	30.30	.922
24	.01	.100	.910						.907	533.0	30.30	.913
Tot.	.46	3.188	28.170						28.987	12864.5	727.64	29.020
Avg.	.02	.133							1.208	536.0	30.32	1.209

Name: PLANT #3
Source: #5 BAGHOUSE
Date: 5-24-77

Run No. 1 NW. TRAV. #3 STACK

P_{bar} = 30.28 "Hg

V_i = _____ ml

V_f = _____ ml

$(t_s)_{avg}$ = _____ °F

$(P_s)_{avg}$ = _____ "Hg

A = _____ ft^2

θ = _____ min

D_n = _____ in

$V = \left(\frac{V_{ps}}{P_c}\right) V_m$

$V_{md} = V_m - V_g$

$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V_{md}$

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_o	V_{ps}	P_c	$P_c - V_{ps}$	V_c	V_{md}	T_m	P_m	V_{mc}
1	.02	.141	1.775						1.770	538.5	30.26	1.761
2	.02	.141	1.205						1.201	539.5	30.26	1.193
3	.02	.141	1.305						1.301	539.5	30.26	1.292
4	.02	.141	1.300						1.296	540.0	30.26	1.286
5	.02	.141	1.310						1.306	540.5	30.26	1.295
6	.02	.141	1.300						1.296	540.5	30.26	1.285
7	.02	.141	1.295						1.291	542.5	30.26	1.275
8	.01	.100	.955						.952	545.0	30.24	.935
9	.01	.100	.900						.897	547.0	30.24	.878
10	.01	.100	.895						.892	547.5	30.24	.872
11	.01	.100	.895						.892	548.5	30.24	.871
12	.01	.100	.905						.902	549.0	30.24	.880
13	.02	.141	1.250						1.246	550.0	30.26	1.214
14	.02	.141	1.280						1.276	548.5	30.26	1.247
15	.02	.141	1.295						1.291	548.5	30.26	1.261
16	.01	.100	.940						.937	550.0	30.24	.912
17	.01	.100	.920						.917	550.0	30.24	.893
18	.01	.100	.920						.917	550.0	30.24	.893
19	.01	.100	.920						.917	550.0	30.24	.893
20	.01	.100	.925						.922	551.0	30.24	.896
21	.01	.100	.925						.922	551.5	30.24	.895
22	.01	.100	.920						.917	552.5	30.24	.889
23	.01	.100	.945						.942	553.0	30.24	.912
24	.01	.100	.940						.937	553.5	30.24	.907
Tot.	.34	2.810	28.220						26.137	13126.5	725.96	25.635
Avg.	.01	.117	1.093						1.089	546.9	30.25	1.068
RND TOT.	.80	5.998								25991.0	1453.6	54.655
AVE.	.02	.125								[illegible]	[illegible]	[illegible]

Name; PLANT #3
Source; #5 BAGHOUSE
Date; 5-24-77

Run No. #1 SW TRUS
#3 STACK

P_{bar} = 30.22 "Hg

V_i = _____ ml

V_f = _____ ml

$(t_s)_{avg}$ = _____ °F

$(P_s)_{avg}$ = _____ "Hg

A = _____ ft^2

θ = _____ min

D_n = _____ in

$$V = \left(\frac{V_{ps}}{P_c}\right) V_m$$

$$V_{md} = V_m - V_c$$

$$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V_m$$

PLANT No. 3 LOCATION STACK 3
DATE 5-24-77 RUN NO. 1

MOISTURE CONTENT

Impinger No. 1	Gross	810.5
	Tare	661.0
	Net	149.5
Impinger No. 2	Gross	653.8
	Tare	634.7
	Net	19.1
Impinger No. 3	Gross	445.6
	Tare	443.6
	Net	2.0
Impinger No. 4	Gross	677.0
	Tare	664.1
	Net	12.9

No. 1	Net	149.5
No. 2	Net	19.1
No. 3	Net	2.0
No. 4	Net	12.9
	Total	183.5

PARTICULATE FIELD DATA

PLANT PLANT #3

RUN NO. 1 N-W TRAVERSE

LOCATION #3 STACK/ASBESTOSHOUSE

DATE 5-24-77

OPERATOR D.C. - R.M.

SAMPLE BOX NO.

METER BOX NO.

AMBIENT TEMP. °F 80

BAR. PRESS. IN. Hg 30.22

ASSUMED MOISTURE % 15

HEATER BOX SETTING °F

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10' REF

PROBE HEATER SETTING

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³ 28.950	Δp test PITOT IN. H_2O	ΔH ORIFICE IN. H_2O REQUIRED	ΔH ORIFICE IN. H_2O ACTUAL	t_m DRY GAS TEMP. °F INLET	t_m DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_g STACK PRESS IN. H_2O	t_g STACK TEMP °F
	3:25											
1	1	30.270	.02	.54		72	84	10.3	251	99	.08	441
2	2	31.575	.02	.54		72	84	7.6	281	97	.04	444
3	3	33.150	.03	.81		72	84	11.7	282	97	.04	446
4	4	34.735	.03	.81		72	85	10.1	303	98	.04	447
5	5	36.315	.03	.81		73	84	9.8	324	96	.06	449
6	6	37.895	.03	.81		72	84	9.5	320	98	.06	448
7	7	39.470	.03	.81		72	84	9.5	315	98	.05	446
8	8	41.240	.04	1.08		72	84	11.9	314	98	.05	451
9	9	43.060	.04	1.08		71	83	11.4	312	100	.05	453
10	10	44.905	.04	1.08		71	83	11.0	312	101	.04	453
11	11	46.180	.02	.54		71	82	5.0	312	102	.03	453
12	12	47.090	.01	.27		71	82	3.1	310	111	.02	452
13	13	47.990	.01	.27		70	81	3.1	310	113	.02	451
14	14	48.910	.01	.27		70	81	3.3	307	125	.02	446
15	15	49.810	.01	.27		70	80	3.4	307	126	.02	444
16	16	50.715	.01	.27		69	80	3.4	303	118	.02	440
17	17	51.635	.01	.27		70	80	3.3	302	117	.02	436
18	18	52.550	.01	.27		70	80	3.3	301	116	.02	433
19	19	53.465	.01	.27		70	79	3.2	300	115	.02	428
20	20	54.385	.01	.27		69	79	3.3	300	114	.02	428
21	21	55.290	.01	.27		69	78	3.3	299	117	.02	422
22	22	56.200	.01	.27		69	78	3.3	297	114	.02	424
23	23	57.120	.01	.27		69	78	3.2	295	114	.02	411
24	24	58.030	.01	.27		69	77	3.2	294	114	.02	411
TOTAL				12.42		Avg 71	Avg 81			2605	.75	10,516
				5		Avg 76				109	.03	438

PARTICULATE FIELD DATA

PLANT No. 3

RUN NO. 1 SO TRAVERSE

LOCATION #3 STACK / #5 BAGHOUSE

DATE 5-24-77

OPERATOR D.C. - R.M.

SAMPLE BOX NO. _____

METER BOX NO. _____

AMBIENT TEMP. °F 80

BAR. PRESS. IN. Hg 30.22

ASSUMED MOISTURE % 15

HEATER BOX SETTING °F _____

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10 FEET

PROBE HEATER SETTING _____

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³	Δp test PITOT IN. H_2O	ΔH ORIFICE IN. H_2O REQUIRED	ΔH ORIFICE IN. H_2O ACTUAL	t_m DRY GAS TEMP. °F INLET	t_m DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_s STACK PRESS IN. H_2O	t_s STACK TEMP °F
	10:30	802.315										
1	1	804.090	.02	.54		79	78	10.0	315	75	.04	309
2	2	805.295	.02	.54		80	79	10.0	250	75	.04	308
3	3	6.600	.02	.54		80	79	10.1	260	75	.04	309
4	4	7.900	.02	.54		81	79	10.1	280	74	.04	311
5	5	9.210	.02	.54		82	79	10.1	284	74	.04	311
6	6	10.510	.02	.54		82	79	10.1	292	73	.03	314
7	7	11.805	.02	.54		85	80	10.2	295	72	.03	356
8	8	13.760	.01	.27		89	81	5.0	305	71	.03	379
9	9	13.660	.01	.27		92	82	5.0	304	73	.02	387
10	10	14.555	.01	.27		93	82	5.0	305	74	.02	393
11	11	15.450	.01	.27		94	83	5.1	310	75	.02	406
12	12	16.355	.01	.27		95	83	5.2	311	78	.02	411
13	13	17.605	.02	.54		96	84	11.7	313	79	.03	425
14	14	18.815	.02	.54		93	84	12.0	314	83	.03	427
15	15	20.180	.02	.54		93	84	11.5	304	89	.03	423
16	16	21.120	.01	.27		95	85	5.1	302	85	.02	428
17	17	22.040	.01	.27		95	85	5.1	290	84	.02	393
18	18	22.960	.01	.27		94	86	5.1	287	85	.02	423
19	19	23.880	.01	.27		94	86	5.2	281	84	.02	420
20	20	24.805	.01	.27		96	86	5.2	280	84	.02	418
21	21	25.730	.01	.27		96	87	5.2	278	83	.02	418
22	22	26.650	.01	.27		98	87	5.2	275	81	.02	391
23	23	27.595	.01	.27		99	87	5.2	273	79	.02	420
24	24	28.535	.01	.27		99	88	5.2	270	78	.02	414
TOTAL				9.18		Avg. 91	Avg. 83			1879	.64	9194
				.38		Avg. 87				78	.03	383

RUN 2
5-25-77

CALCULATION WORK SHEET

1. VOLUME OF GAS SAMPLE (DRY, STP) $V_{m_{std}}$:

$$V_{m_{std}} = V_{mc}$$
$$= V_{m_{-1}}$$
$$= 49.233 \text{ SCFDG}$$

2. WATER CALCULATION:

A. Water Vapor Through Meter (SCF):

$$V_{c_{std}} = \left(\frac{B_{wc}}{1-B_{wc}}\right) V_{m_{std}}$$
$$= \left(\frac{0.003}{1-0.003}\right) (49.233)$$
$$= 0.148 \text{ SCF}$$

B. Collected Water (Impingers + Silica Gel)

V_{l_c}

186.6 ml

C. Water Fraction Gas Stream, B_{wo} =

$$B_{wo} = \frac{(V_{c_{std}} + 0.0474\ V_{l_c})}{(V_{c_{std}} + 0.0474\ V_{l_c}) + V_{m_{std}}}$$
$$= \frac{(0.148) + 0.0474\ (186.6)}{(0.148) + 0.0474\ (186.6)} + (49.233)$$
$$= 0.1544$$

D. Dry Gas Fraction, B_d :

$$B_d = 1 - B_{wo}$$
$$= 0.8456$$

3. MOLECULAR WEIGHT CALCULATION:

$$M_d = \frac{1}{100} (\%\ CO_2)(M_{CO_2}) + (\%\ O_2)(M_{O_2}) + (\%\ CO)(M_{CO}) + (\%\ N_2)(M_{N_2})$$

CALCULATION WORK SHEET - 2

3. MOLECULAR WEIGHT CALCULATIONS: (cont'd)

$$= \frac{I}{100}\left[(16.6)\ (44) + (12.5)\ (32) + (\ 0\ )\ (28) + (72.9)\ (28)\right]$$

$$= (7.30) + (3.36) + (0.) + (20.4)$$

$$= 31.07$$

$$M_s = (M_d)\ (B_d) + 18\ B_{wo}$$

$$= (31.07)\ (0.8456) + 18\ (0.1544)$$

$$= 29.05$$

4. VELOCITY CALCULATIONS:

$$V_s = 85.48\ (C_{p\ test})\ (\sqrt{\Delta P_{avg}})\ \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_s = (85.48)\ (0.812)\ (0.112)\ \sqrt{\frac{888}{(30.15)(29.05)}}$$

$$V_s = 7.816 \text{ fps}$$

5. VOLUMETRIC FLOW IN STACK (STP), Q_s :

$$Q_s = 3600\ (V_s)\ (A)\ (B_d)\left(\frac{T_{std}}{T_{s\ avg}}\right)\left(\frac{P_{s\ avg}}{P_{std}}\right)$$

$$Q_s = 3600\ (7816)\ (42.237)\ (0.8456)\ \left(\frac{530}{888}\right)\ \left(\frac{30.15}{29.92}\right)$$

$$Q_s = 604,413 \text{ SCFHDG}$$

6. POLLUTANT MASS RATE, pmr

a. Area Ratio Method, pmr_a

$$pmr_a = 60\ \frac{(pm)\ (A)}{(e)\ (An)} = 60\ \frac{(0.000291)\ (42.237)}{(144)\ (0.00136)}$$

$$= 3.766 \text{ \#/hr}$$

TOTAL CATCH = 0.000321

$\therefore pmr_a = 4.154$

b. Concentration Method, pmr_c

$$pmr_c = \frac{(pm)\ (Q_s)}{V_{m\ std}} = \frac{(0.000291)\ (604,413)}{(49.233)}$$

$$= 3.572 \text{ \#/hr}$$

$pmr_c = 3.940$

CALCULATION WORK SHEET - 3

c. Average pmr = $\frac{pmr_a + pmr_c}{2}$

= $\frac{(3.766) + (3.572)}{2}$ = 3.669 #/hr

TOTAL CATCH = $\frac{4.154 + 3.940}{2}$ = 4.047 #/hr.

7. ISOKINETIC RATIO, I_r:

$I_r = \frac{pmr_a}{pmr_c} = \frac{(3.766)}{3.572}$

= 1.054

8. ISOKINETIC VARIATION CHECK, I%:

$I\% = \frac{100\ (V_{m_{std}})\ (T_s)\ (P_{std})}{60\ (\theta)\ (A_n)\ (B_d)\ (V_s)\ (T_{std})\ (P_s)}$

$= \frac{100\ (49.233)\ (\ 888\ )\ (29.92)}{60\ (\ 144\ )\ (0.00136)\ (0.8456)\ (7.816)\ (\ 530\ )\ (30.15}$

= 105.41 %

9. PARTICULATE LOADING, c'_s:

$c'_s = (0.01542)\ \frac{(\text{Total Particulate Catch, mg})}{V_{m_{std}}}$

= (0.01542) $\left(\frac{132.0}{49.233}\right)$

= 0.0413 gr/SCFDG

TOTAL CATCH = 0.0456 gr/SCFDG

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_o	V_{ps}	P_c	$P_c - V_{ps}$	V_c	V_{md}	T_m	P_m	V_{mc}
1	.01	.100	.950						.947	531.5	30.17	.952
2	.01	.100	.895						.892	529.5	30.17	.900
3	.01	.100	.900						.897	529.5	30.17	.905
4	.01	.100	.900						.897	529.5	30.17	.905
5	.01	.100	.905						.902	529.5	30.17	.910
6	.01	.100	.905						.902	529.5	30.17	.910
7	.01	.100	.905						.902	529.5	30.17	.910
8	.01	.100	.910						.907	529.5	30.17	.915
9	.01	.100	.910						.907	529.5	30.17	.915
10	.01	.100	.910						.907	529.5	30.17	.915
11	.01	.100	.900						.897	529.0	30.17	.906
12	.02	.141	1.270						1.266	529.0	30.19	1.280
13	.02	.141	1.285						1.281	529.0	30.19	1.295
14	.01	.100	1.035						1.032	529.0	30.17	1.042
15	.01	.100	.815						.813	529.0	30.17	.821
16	.01	.100	.925						.922	529.0	30.17	.931
17	.01	.100	.910						.907	529.0	30.17	.916
18	.01	.100	.925						.922	529.0	30.17	.931
19	.01	.100	.910						.907	529.0	30.17	.916
20	.01	.100	.920						.917	529.0	30.17	.926
21	.01	.100	.925						.922	530.0	30.17	.929
22	.01	.100	.910						.907	529.0	30.17	.916
23	.01	.100	.930						.927	529.0	30.17	.936
24	.01	.100	.925						.922	529.0	30.17	.931
Tot.	.26	2.482	22.675						22.602	12704.0	724.12	22.813
Avg.	.01	.103	.945						.941	529.3	30.17	.951

Name: PLANT NO.3
Source: #5 BAGHOUSE
Date: 5-25-77

Run No. 2 NW TRVS
#3 STACK

P_{bar} = 30.15 "H

V_1 = _____ m

V_f = _____ n

$(t_s)_{avg}$ = _____ p

$(P_s)_{avg}$ = _____ "H

A = _____ ft

θ = _____ min

D_n = _____ in

$$V = \left(\frac{V_{ps}}{P_c}\right) V_m$$

$$V_{md} = V_m - V_c$$

$$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V_1$$

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_s	V_{ps}	P_s	$P_s - V_{ps}$	V_s	V_{md}	T_m	P_m	V_{mc}
1	.01	.100	.920						.917	527.5	30.17	.929
2	.01	.100	.905						.902	529.0	30.17	.911
3	.02	.141	1.260						1.256	529.0	30.19	1.269
4	.02	.141	1.280						1.276	529.0	30.19	1.290
5	.02	.141	1.280						1.276	529.0	30.19	1.290
6	.02	.141	1.275						1.271	529.5	30.19	1.283
7	.02	.141	1.275						1.271	528.5	30.19	1.286
8	.02	.141	1.280						1.276	528.5	30.19	1.291
9	.02	.141	1.280						1.276	529.5	30.19	1.288
10	.02	.141	1.270						1.266	530.0	30.19	1.277
11	.02	.141	1.290						1.286	531.0	30.19	1.295
12	.02	.141	1.290						1.286	530.0	30.19	1.297
13	.02	.141	1.280						1.276	530.5	30.19	1.286
14	.02	.141	1.280						1.276	530.5	30.19	1.286
15	.01	.100	.930						.927	530.5	30.17	.934
16	.01	.100	.905						.902	530.5	30.17	.908
17	.01	.100	.910						.907	530.5	30.17	.914
18	.01	.100	.920						.917	532.0	30.17	.921
19	.01	.100	.910						.907	532.5	30.17	.910
20	.01	.100	.905						.902	532.0	30.17	.906
21	.01	.100	.915						.912	531.5	30.17	.917
22	.01	.100	.910						.907	531.0	30.17	.913
23	.01	.100	.905						.902	531.5	30.17	.907
24	.01	.100	.910						.907	531.5	30.17	.912
Tot.	.36	2.892	26.285						26.201	12725.0	724.32	26.420
Avg.	.02	.121	1.095						1.092	530.2	30.18	1.101
RAND TOT.	.62	5.374	48.960						48.803	25429.0	1448.44	49.233
	.01	.117	1.020						1.017	529.8	30.18	1.026

Name: PLANT NO. 3
Source: BAGHOUSE
Date: 5-23-77

Run No. 2 SW TRVS
#3 STACK

P_{bar} = 30.15 "Hg

V_t = _____ ml

V_f = _____ ml

$(t_s)_{avg}$ = _____ °F

$(P_s)_{avg}$ = _____ "Hg

A = _____ ft^2

θ = _____ min

D_n = _____ in

$$V = \left(\frac{V_{ps}}{P_s}\right) V_m$$

$$V_{md} = V_m - V_s$$

$$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V_d$$

PLANT NO. 3
DATE 5-25-77

LOCATION BAGHOUSE STACK
RUN NO. 2

MOISTURE CONTENT

Impinger No. 1	Gross	851.4
	Tare	664.8
	Net	186.6
Impinger No. 2	Gross	624.4
	Tare	640.4
	Net	-16.0
Impinger No. 3	Gross	445.8
	Tare	443.7
	Net	2.1
Impinger No. 4	Gross	679.4
	Tare	665.5
	Net	13.9

No. 1	Net	186.6
No. 2	Net	-16.0
No. 3	Net	2.1
No. 4	Net	13.9
	Total	186.6

PARTICULATE FIELD DATA

PLANT NO. 3

RUN NO. 2 NW Traverse

LOCATION STACK 3

DATE 5-25-77

OPERATOR D.C-R.M

SAMPLE BOX NO. _____

METER BOX NO. _____

AMBIENT TEMP. °F 78

BAR. PRESS. IN. Hg 30.15

ASSUMED MOISTURE % _____

HEATER BOX SETTING °F _____

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10 FEET

PROBE HEATER SETTING _____

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³	Δp test PITOT IN. H_2O	ΔH ORIFICE IN. H_2O REQUIRED	ΔH ORIFICE IN. H_2O ACTUAL	t_m DRY GAS TEMP. °F INLET	t_m DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_s STACK PRESS IN H_2O	t_s STACK TEMP °F
	9:50	58.410										
1	1	59.380	.01	0.27		70	73	2.1	265	67	.02	431
2	2	60.255	.01	.27		68	71	2.1	260	68	.02	430
3	3	61.155	.01	.27		68	71	2.1	260	68	.02	436
4	4	62.055	.01	.27		68	71	2.1	287	68	.02	431
5	5	62.960	.01	.27		68	71	2.1	278	68	.02	436
6	6	63.865	.01	.27		68	71	2.2	264	67	.02	440
7	7	64.770	.01	.27		68	71	2.2	261	67	.02	443
8	8	65.680	.01	.27		68	71	2.2	263	67	.02	443
9	9	66.590	.01	.27		68	71	2.2	263	67	.02	443
10	10	67.500	.01	.27		68	71	2.2	263	66	.02	443
11	11	68.400	.01	.27		67	71	2.3	262	68	.02	443
12	12	69.670	.02	.54		67	71	3.9	265	68	.03	442
13	13	70.955	.02	.54		67	71	3.9	264	68	.03	439
14	14	71.990	.01	.27		67	71	2.5	264	68	.02	432
15	15	72.805	.01	.27		67	71	2.5	267	68	.02	428
16	16	73.730	.01	.27		67	71	2.5	271	68	.02	424
17	17	74.640	.01	.27		67	71	2.6	270	68	.02	419
18	18	75.565	.01	.27		67	71	2.6	266	68	.02	414
19	19	76.475	.01	.27		67	71	2.6	265	67	.02	407
20	20	77.395	.01	.27		67	71	2.6	268	67	.02	404
21	21	78.320	.01	.27		66	72	2.6	268	68	.02	396
22	22	79.230	.01	.27		67	71	2.6	268	67	.02	392
23	23	80.160	.01	.27		67	71	2.6	273	67	.02	348
24	24	81.065	.01	.27		67	71	2.6	273	66	.02	273
TOTAL				7.02		Avg. 68	Avg. 71			1619	.50	0.027
										67	.02	MIR

PARTICULATE FIELD DATA

PLANT NO. 3

RUN NO. 2 SW TRAVERSE

LOCATION STACK 3

DATE 5-25-77

OPERATOR D.C.-R.M.

SAMPLE BOX NO.

METER BOX NO.

AMBIENT TEMP. °F 78

BAR. PRESS. IN. Hg 30.15

ASSUMED MOISTURE %

HEATER BOX SETTING °F

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10' EA

PROBE HEATER SETTING

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³	Δp test PITOT IN. H_2O	ΔH ORIFICE IN. H_2O REQUIRED	ΔH ORIFICE IN. H_2O ACTUAL	t_m DRY GAS TEMP. °F INLET	t_m DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_s STACK PRESS IN H_2O	t_s STACK TEMP °F
	1130	81.085										
1		82.005	.01	.27		65	70	2.5	251	60	.03	415
2		82.910	.01	.27		67	71	2.5	267	59	.02	439
3		84.170	.02	.54		67	71	3.7	257	59	.03	439
4		85.450	.02	.54		67	71	3.8	257	58	.04	441
5		86.730	.02	.54		67	71	3.8	255	57	.08	446
6		88.005	.02	.54		67	72	3.8	252	57	.03	443
7		89.230	.02	.54		66	71	3.8	248	56	.02	449
8		90.560	.02	.54		66	71	3.8	254	56	.03	448
9		91.840	.02	.54		67	72	3.8	264	56	.03	449
10		93.110	.02	.54		68	72	3.8	269	56	.03	449
11		94.400	.02	.54		69	73	3.8	268	56	.03	450
12		95.690	.02	.54		68	72	3.9	275	56	.03	450
13		96.970	.02	.54		68	73	3.9	278	56	.03	448
14		98.250	.02	.54		66	73	3.9	280	57	.03	444
15		99.100	.01	.27		68	73	2.6	284	57	.02	434
16		100.085	.01	.27		68	73	2.6	277	57	.02	439
17		100.992	.01	.27		68	73	2.6	283	57	.02	437
18		101.915	.01	.27		70	74	2.7	285	57	.02	436
19		102.825	.01	.27		71	74	2.7	287	56	.02	435
20		103.730	.01	.27		70	74	2.7	288	56	.02	433
21		104.645	.01	.27		70	73	2.7	287	57	.02	429
22		105.555	.01	.27		69	73	2.7	281	57	.02	426
23		106.460	.01	.27		69	74	2.7	275	58	.02	417
24		107.370	.01	.27		69	74	2.7	279	57	.02	402
TOTAL				9.72		Avg. 68	Avg. 72			1368	.96	10,509
Average				.41		Avg. 70				57	.03	438

Run 3
5-26-77

CALCULATION WORK SHEET

1. VOLUME OF GAS SAMPLE (DRY, STP) $V_{m_{std}}$:

$$V_{m_{std}} = V_{mc}$$
$$= V_{mc_1}$$
$$= 54.339 \text{ SCFDG}$$

2. WATER CALCULATION:

A. Water Vapor Through Meter (SCF):

$$V_{c_{std}} = \left(\frac{B_{wc}}{1-B_{wc}}\right) V_{m_{std}}$$
$$= \left(\frac{0.003}{1-0.003}\right) (54.339)$$
$$= 0.163 \text{ SCF}$$

B. Collected Water (Impingers + Silica Gel)

V_{l_c}

$$181.9 \text{ ml}$$

C. Water Fraction Gas Stream, B_{wo} =

$$B_{wo} = \frac{(V_{c_{std}} + 0.0474\ V_{l_c})}{(V_{c_{std}} + 0.0474\ V_{l_c}) + V_{m_{std}}}$$
$$= \frac{(0.163) + 0.0474\ (181.9)}{0.163) + 0.0474\ (181.9)} + (54.339)$$
$$= 0.1392$$

D. Dry Gas Fraction, B_d :

$$B_d = 1 - B_{wo}$$
$$= 0.8608$$

3. MOLECULAR WEIGHT CALCULATION:

$$M_d = \frac{1}{100} (\%\ CO_2)\ (M_{CO_2}) + (\%\ O_2)\ (M_{O_2}) + (\%\ CO)\ (M_{CO}$$
$$+ (\%\ N_2)\ (M_{N_2})$$

3. MOLECULAR WEIGHT CALCULATIONS: (cont'd)

$$= \frac{1}{100}\left[(16.6)\ (44) + (10.5)\ (32) + (0)\ (28) + (72.9)\ (28)\right]$$

$$= (7.30) + (3.36) + (0) + (20.41)$$

$$= 31.07$$

$$M_s = (M_d)\ (B_d) + 18\ B_{wo}$$

$$= (31.07)\ (0.8608) + 18\ (0.1392)$$

$$= 29.25$$

4. VELOCITY CALCULATIONS:

$$V_s = 85.48\ (C_{p\ test})\ (\sqrt{\Delta P_{avg}})\ \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_s = (85.48)\ (0.812)\ (0.124)\ \sqrt{\frac{886.5}{(30.08)(29.25)}}$$

$$V_s = 8.639 \text{ fps}$$

5. VOLUMETRIC FLOW IN STACK (STP), Q_s :

$$Q_s = 3600\ (V_s)\ (A)\ (B_d)\left(\frac{T_{std}}{T_{s\ avg}}\right)\left(\frac{P_{s\ avg}}{P_{std}}\right)$$

$$Q_s = 3600\ (8.639)\ (42.237)\ (0.8608)\ \left(\frac{530}{886.5}\right)\ \left(\frac{30.08}{29.92}\right)$$

$$Q_s = 679,633 \text{ SCFHDG}$$

6. POLLUTANT MASS RATE, pmr

a. Area Ratio Method, pmr_a

$$pmr_a = 60\ \frac{(pm)\ (A)}{(B)\ (An)} = 60\ \frac{(0.000384)\ (42.237)}{(144)\ (0.00136)}$$

$$= 4.969 \text{ \#/hr}$$

TOTAL CATCH pm = 0.0004448

$pmr_a = 5.797$ #/hr.

b. Concentration Method, pmr_c

$$pmr_c = \frac{(pm)\ (Q_s)}{V_{m\ std}} = \frac{(0.000384)\ (679,633)}{(54.339)}$$

$$= 4.803 \text{ \#/hr}$$

$pmr_c = 5.604$ #/hr.

CALCULATION WORK SHEET - 3

c. Average pmr = $\frac{pmr_a + pmr_c}{2}$

= $\frac{(4.969) + (4.803)}{2}$ = 4.886 #/hr

Total Catch = $\frac{5.797 + 5.604}{2}$ = 5.701 #/hr

7. ISOKINETIC RATIO, I_r:

$I_r = \frac{pmr_a}{pmr_c} = \frac{(4.969)}{4.803}$

= 1.0346

8. ISOKINETIC VARIATION CHECK, I%:

$I\% = \frac{100\ (V_{m_{std}})\ (T_s)\ (P_{std})}{60\ (\theta)\ (A_n)\ (B_d)\ (V_s)\ (T_{std})\ (P_s)}$

= $\frac{100\ (54.339)\ (886.5)\ (29.92)}{60\ (.144)\ (0.00136)\ (.8608)\ (8.639)\ (530)\ (30.0$

= 103.5 %

9. PARTICULATE LOADING, c'_s:

$c'_s = (0.01542)\ \frac{(\text{Total Particulate Catch, mg})}{V_{m_{std}}}$

= $(0.01542)\ \left(\frac{174.3}{54.339}\right)$

= 0.0495 gr/SCFDG

Total Catch = 0.01542 (203.9 mg) = 0.0[illegible] gr/SCFM

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_c	V_{ps}	P_c	$P_c - V_{ps}$	V_c	V_{md}	T_m	P_m	V_{mc}
1	.02	.141	1.315						1.311	536.5	30.12	1.303
2	.02	.141	1.275						1.271	536.5	30.12	1.264
3	.03	.173	1.570						1.565	536.5	30.14	1.557
4	.03	.173	1.555						1.550	536.5	30.14	1.542
5	.03	.173	1.570						1.565	537.0	30.14	1.556
6	.03	.173	1.555						1.550	536.5	30.14	1.542
7	.03	.173	1.570						1.565	536.0	30.14	1.559
8	.03	.173	1.555						1.550	536.0	30.14	1.544
9	.02	.141	1.325						1.321	536.0	30.12	1.315
10	.02	.141	1.290						1.286	535.0	30.12	1.282
11	.02	.141	1.300						1.296	536.0	30.12	1.290
12	.02	.141	1.290						1.286	535.0	30.12	1.282
13	.02	.141	1.305						1.301	536.0	30.12	1.295
14	.02	.141	1.295						1.291	536.0	30.12	1.285
15	.01	.100	.950						.947	536.0	30.10	.942
16	.01	.100	.905						.902	538.5	30.10	.893
17	.01	.100	.930						.927	537.5	30.10	.919
18	.01	.100	.910						.907	536.0	30.10	.902
19	.01	.100	.925						.922	536.0	30.10	.917
20	.01	.100	.920						.917	537.5	30.10	.909
21	.01	.100	.915						.912	537.5	30.10	.904
22	.01	.100	.925						.922	538.0	30.10	.914
23	.01	.100	.920						.917	538.0	30.10	.909
24	.01	.100	.930						.927	538.0	30.10	.919
Tot.	.44	3.166	29.000						28.908	12878.5	722.80	28.744
Avg.	.02	.132	1.208						1.204	536.6	30.12	1.198

Name: PLANT #3
Source: BAGHOUSE
Date: 5-26-77

Run No. 3 NW TRVS
#3 STACK

P_{bar} = 30.08 "Hg

V_t = _____ m

V_f = _____ m

$(t_s)_{avg}$ = _____ °

$(P_s)_{avg}$ = _____ "H

A = _____ ft

θ = _____ min

P_n = _____ in

$$V = \left(\frac{V_{ps}}{P_c}\right) V_m$$

$$V_{md} = V_m - V_c$$

$$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V$$

NO.	Δp	$\sqrt{\Delta p}$	V_m	t_s	V_{ps}	P_s	$P_s - V_{ps}$	V_s	V_{md}	T_m	P_m	V_{mc}
1	.01	.100	.950						.947	531.5	30.10	.950
2	.01	.100	.925						.922	533.5	30.10	.921
3	.01	.100	.905						.902	533.5	30.10	.901
4	.01	.100	.915						.912	535.5	30.10	.908
5	.01	.100	.915						.912	534.0	30.10	.910
6	.01	.100	.920						.917	534.0	30.10	.915
7	.01	.100	.920						.917	535.0	30.10	.914
8	.01	.100	.910						.907	534.0	30.10	.905
9	.01	.100	.915						.912	535.0	30.10	.909
10	.01	.100	.920						.917	534.0	30.10	.915
11	.01	.100	.930						.927	534.0	30.10	.925
12	.02	.141	1.275						1.271	534.0	30.12	1.270
13	.02	.141	1.375						1.371	534.0	30.12	1.370
14	.02	.141	1.225						1.221	535.0	30.12	1.216
15	.02	.141	1.310						1.306	535.0	30.12	1.302
16	.03	.173	1.545						1.540	535.5	30.14	1.535
17	.03	.173	1.570						1.565	535.5	30.14	1.560
18	.02	.141	1.305						1.301	536.5	30.12	1.294
19	.02	.141	1.300						1.296	536.0	30.12	1.290
20	.01	.100	.955						.952	536.0	30.10	.947
21	.01	.100	.945						.942	537.0	30.10	.935
22	.01	.100	.935						.932	536.5	30.10	.926
23	.01	.100	.940						.937	536.0	30.10	.932
24	.01	.100	.955						.952	537.0	30.10	.945
Tot.	.34	2.792	25.760						25.678	12838.0	722.6	25.595
Avg.	.01	.116	1.073						1.070	534.9	30.11	1.066
AND TOT.	.78	5.958	54.780						54.586	25716.5	1445.4	54.339

Name: PLANT #3
Source: BAGHOUSE
Date: 5-26-77

Run No. 3 SW, TOS, #3 STACK

P_{bar} = 30.08 "H

V_t = _____ m

V_f = _____ n

$(t_s)_{avg}$ = _____ e

$(P_s)_{avg}$ = _____ "H

A = _____ ft

θ = _____ mi

D_n = _____ in

$$V = \left(\frac{V_{ps}}{P_s}\right) V_m$$

$$V_{md} = V_m - V_s$$

$$V_{mc} = 17.71 \left(\frac{P_m}{T_m}\right) V$$

PLANT PLANT NO. 3 LOCATION STACK 3
DATE 5-26-77 RUN NO. 3

MOISTURE CONTENT

Impinger No. 1	Gross	808.3
	Tare	667.5
	Net	140.8
Impinger No. 2	Gross	660.3
	Tare	636.6
	Net	23.7
Impinger No. 3	Gross	445.9
	Tare	443.7
	Net	2.2
Impinger No. 4	Gross	677.7
	Tare	662.5
	Net	15.2

No. 1	Net	140.8
No. 2	Net	23.7
No. 3	Net	2.2
No. 4	Net	15.2
	Total	181.9

PARTICULATE FIELD DATA

PLANT NO. 3

RUN NO. 3 NW TRAVERSE

LOCATION BAGHOUSE - STACK

DATE 5-26-77

OPERATOR D.C.-R.M.

SAMPLE BOX NO. _____

METER BOX NO. _____

AMBIENT TEMP. °F 80

BAR. PRESS. IN. Hg 30.09

ASSUMED MOISTURE % _____

HEATER BOX SETTING °F _____

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10 FEET

PROBE HEATER SETTING _____

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³	Δp test PITOT IN. H_2O	ΔH ORIFICE IN. H_2O REQUIRED	ΔH ORIFICE IN. H_2O ACTUAL	t_m DRY GAS TEMP. °F INLET	t_m DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_g STACK PRESS IN H_2O	t_s STACK TEMP T_1, °F
	11:30	33.260										
1		34.575	.02	.54		74	79	4.2	251	71	.05	421
2		35.850	.02	.54		74	79	4.2	277	74	.04	420
3		37.420	.03	.81		74	79	5.3	281	75	.05	417
4		38.975	.03	.81		74	79	5.3	274	75	.06	420
5		40.546	.03	.81		74	80	5.3	277	74	.06	424
6		42.100	.03	.81		74	79	5.3	276	73	.06	449
7		43.670	.03	.81		73	79	5.3	277	72	.06	454
8		45.225	.03	.81		73	79	5.3	279	71	.06	434
9		46.550	.02	.54		73	79	4.0	277	69	.05	432
10		47.840	.02	.54		72	78	4.0	274	68	.04	431
11		49.140	.02	.54		73	79	4.0	263	66	.04	432
12		50.430	.02	.54		72	78	4.0	261	65	.04	433
13		51.735	.02	.54		73	79	4.0	263	63	.04	432
14		53.030	.02	.54		73	79	4.0	259	61	.04	428
15		53.980	.01	.27		73	79	2.7	262	60	.04	424
16		54.885	.01	.27		76	81	2.6	261	60	.04	425
17		55.815	.01	.27		74	81	2.6	265	59	.03	423
18		56.725	.01	.27		73	79	2.6	266	56	.03	421
19		57.650	.01	.27		73	79	2.6	270	58	.03	420
20		58.570	.01	.27		74	81	2.6	271	57	.02	420
21		59.485	.01	.27		74	81	2.6	272	58	.03	415
22		60.410	.01	.27		76	81	2.6	265	57	.02	413
23		61.330	.01	.27		75	81	2.6	268	58	.02	389
24		62.260	.01	.27		75	81	2.6	263	56	.02	390
TOTAL				11.88		Avg. 74	Avg. 80			1576	.98	10132
				.50		Avg. 77				80	.04	423

PARTICULATE FIELD DATA

PLANT No. 3

RUN NO. 3 SW TRAVERSE

LOCATION BAGHOUSE - STACK

DATE 5-26-77

OPERATOR D.C. - R.M.

SAMPLE BOX NO. _____

METER BOX NO. _____

AMBIENT TEMP. °F 80

BAR. PRESS. IN. Hg 30.08

ASSUMED MOISTURE % _____

HEATER BOX SETTING °F _____

PROBE TIP DIA., IN. 0.50

PROBE LENGTH 10' 6"

PROBE HEATER SETTING _____

POINT	θ CLOCK TIME	V_m DRY GAS METER, Ft³	Δp test PITOT IN. H₂O	ΔH ORIFICE IN. H₂O		t_m DRY GAS TEMP. °F		PUMP VACUUM IN Hg GAUGE	BOX TEMP °F	t_c IMPINGER TEMP °F	P_g STACK PRESS IN H_2O	T_s STACK TEMP °F
				REQUIRED	ACTUAL	INLET	OUTLET					
	9:50	7.500										
1		8.460	.01	.27		70	73	2.5	251	68	.03	424
2		9.375	.01	.27		73	74	2.4	292	72	.03	421
3		10.280	.01	.27		73	74	2.4	293	74	.03	424
4		11.195	.01	.27		75	76	2.4	286	72	.03	430
5		12.110	.01	.27		73	75	2.5	294	76	.03	433
6		13.030	.01	.27		74	74	2.5	296	77	.03	437
7		13.950	.01	.27		75	75	2.5	300	79	.03	439
8		14.860	.01	.27		73	75	2.5	300	79	.03	439
9		15.775	.01	.27		74	76	2.6	295	81	.03	441
10		16.695	.01	.27		73	76	2.7	301	81	.02	445
11		17.625	.01	.27		73	75	2.7	303	81	.03	447
12		18.900	.02	.54		73	75	4.0	299	75	.04	446
13		20.275	.02	.54		73	75	4.1	299	77	.04	443
14		21.500	.02	.54		74	76	4.1	295	73	.04	437
15		22.810	.02	.54		74	76	4.1	293	72	.04	440
16		24.355	.03	.81		74	77	5.5	287	68	.05	432
17		25.925	.03	.81		74	77	5.6	290	67	.03	437
18		27.230	.02	.54		75	78	4.2	286	66	.03	436
19		28.530	.02	.54		75	77	4.2	283	65	.02	431
20		29.485	.01	.27		75	77	2.7	282	64	.03	427
21		30.430	.01	.27		76	78	2.8	282	63	.02	423
22		31.365	.01	.27		75	78	2.8	282	62	.02	416
23		32.305	.01	.27		74	78	2.8	280	64	.02	385
24		33.260	.01	.27		75	79	2.8	280	63	.04	380
TOTAL				9.18		Avg 71	Avg 76			1719	.04	10,316
										72		430

E-22