Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section Number: 1.8

Reference Number: 38

Title: Source Test Report for Particulate Emissions Impingement Wet Scrubber Boiler Number 4

November 1991

SOURCE TEST REPORT
for
PARTICULATE EMISSIONS

IMPINGEMENT WET SCRUBBER
BOILER NUMBER 4

05W1-306C10

NOVEMBER 26, 1991

Prepared for:

SUGAR CANE GROWERS
COOPERATIVE OF FLORIDA
AIRPORT ROAD
BELLE GLADE, FLORIDA 33430-0666

Prepared by:

AIR CONSULTING AND ENGINEERING, INC.
2106 N.W. 67TH PLACE, SUITE 4
GAINESVILLE, FLORIDA 32606
(904) 335-1889

236-91-04

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ACE
AIR CONSULTING
& ENGINEERING, INC.

2106 N.W. 67th Place • Suite 4 • Gainesville, Florida • 32606
(904) 335-1889 FAX (904) 335-1891

REPORT CERTIFICATION

To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

Dagmar Neck

Dagmar Neck

12/31/91

Date

1.0 INTRODUCTION

On November 26, 1991, Air Consulting and Engineering, Inc. (ACE), conducted particulate emission testing on the Wet Scrubber Outlet of Boiler 4 at Sugar Cane Growers Cooperative of Florida (Sugar Cane Growers) located in Belle Glade, Florida.

Testing was performed to demonstrate compliance with the current Florida Department of Environmental Regulation (FDER) operating permit.

United States Environmental Protection Agency (EPA) Method 5 was utilized for the emission testing.

Mr. Ken Tucker of the FDER observed a portion of the testing.

Mr. Blas Marin of Sugar Cane Growers coordinated testing and provided production data.

2.0 SUMMARY AND DISCUSSION OF RESULTS

Boiler Number 4 demonstrated compliance with the permit conditions.

Table 1 is a summary of the emission results and flue gas parameters.

Particulate emissions averaged 55.45 pounds per hour (lbs/Hr) and 0.134 pounds per million BTU (lbs/MMBTU) which is within the allowable emissions of 82.07 lbs/Hr and 0.199 lbs/MMBTU.

Complete emission summaries, field data sheets and laboratory data are presented in Appendices A, B, and C, respectively.

Production rate summaries are provided in Appendix D. This data was obtained from control room recordings of steam flow, temperature, and pressure as well as feed water temperature and pressure. Residue integrator and oil meter readings were recorded at the beginning and end of each particulate run.

Table 1 Emission Summary
Boiler Number 4
Sugar Cane Growers Cooperative of Florida
Belle Glade, Florida
November 26, 1991

Run Number	Flow Rate SCFMD	Stack Temp. °F	Stack Moisture %	Particulate Emissions lbs/Hr	Particulate Emissions lbs/MMBTU	Allowable Emissions lbs/Hr	Allowable Emissions lbs/MMBTU
1	117591	141	19.2	58.94	0.142	82.40	0.199
2	115388	141	19.9	53.98	0.131	82.05	0.199
3	116611	141	19.9	53.42	0.130	81.76	0.199
AVERAGE	116530	141	19.7	55.45	0.134	82.07	0.199

3.0 PROCESS DESCRIPTION AND OPERATION

The Number 4 Boiler at Sugar Cane Growers is a spreader stoker design used primarily for residue fuel firing. Supplemental oil firing was also utilized for the emission test. The boiler averaged 243,718 lbs/Hr steam production over the three run test period.

Oil meters, steam integrators, and other production monitoring devices were rigorously calibrated prior to the production season.

APPENDIX C

LABORATORY ANALYSIS

AIR CONSULTING & ENGINEERING, inc. PARTICULATE LAB DATA

SOURCE SGC Unit #4

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK	
CONTAINER NUMBER	5-41A	5-42A	5-10	5-43A	
TOTAL VOLUME (ml)	195	220	220	130	LIQUID LEVEL ✓
1st GROSS WEIGHT (g)	113.7469	110.0235	103.4149	114.4950	DATE & TIME: 11-30-91 8:00
2nd GROSS WEIGHT (g)	113.7471	110.0238	103.4151	114.4951	DATE & TIME: 12-2-91 10:51
AVERAGE GROSS WEIGHT (g)	113.7470	110.0236	103.4150	114.4950	
TARE WEIGHT (g)	113.7339	110.0110	103.3951	114.4950	
SUB NET WEIGHT (g)	0.0131	0.0126	0.0199	0.0000	
ACETONE BLANK (g)	–	12.6	–	–	
TOTAL NET WEIGHT (mg)	13.1	12.6	19.9	0	

NOTE: In no case should a blank residue >0.01 mg/g or 0.001% of the weight of acetone used be subtracted from the sample weight.

FILTER	RUN 1	RUN 2	RUN 3	BLANK	
FILTER NUMBER	3520	3521	3522	3473	
1st GROSS WEIGHT (g)	0.5905	0.5730	0.5672	0.4222	DATE & TIME: 11-30-91 9:00
2nd GROSS WEIGHT (g)	0.5902	0.5729	0.5671	0.4221	DATE & TIME: 12-1-91 11:32
AVERAGE GROSS WEIGHT (g)	0.5904	0.5730	0.5672	0.4222	
TARE WEIGHT (g)	0.4213	0.4168	0.4213	0.4223	
SUB NET WEIGHT (g)	0.1727	0.1562	0.1459	-.0001	
TOTAL NET WEIGHT (mg)	172.7	156.2	145.9	-.1	

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

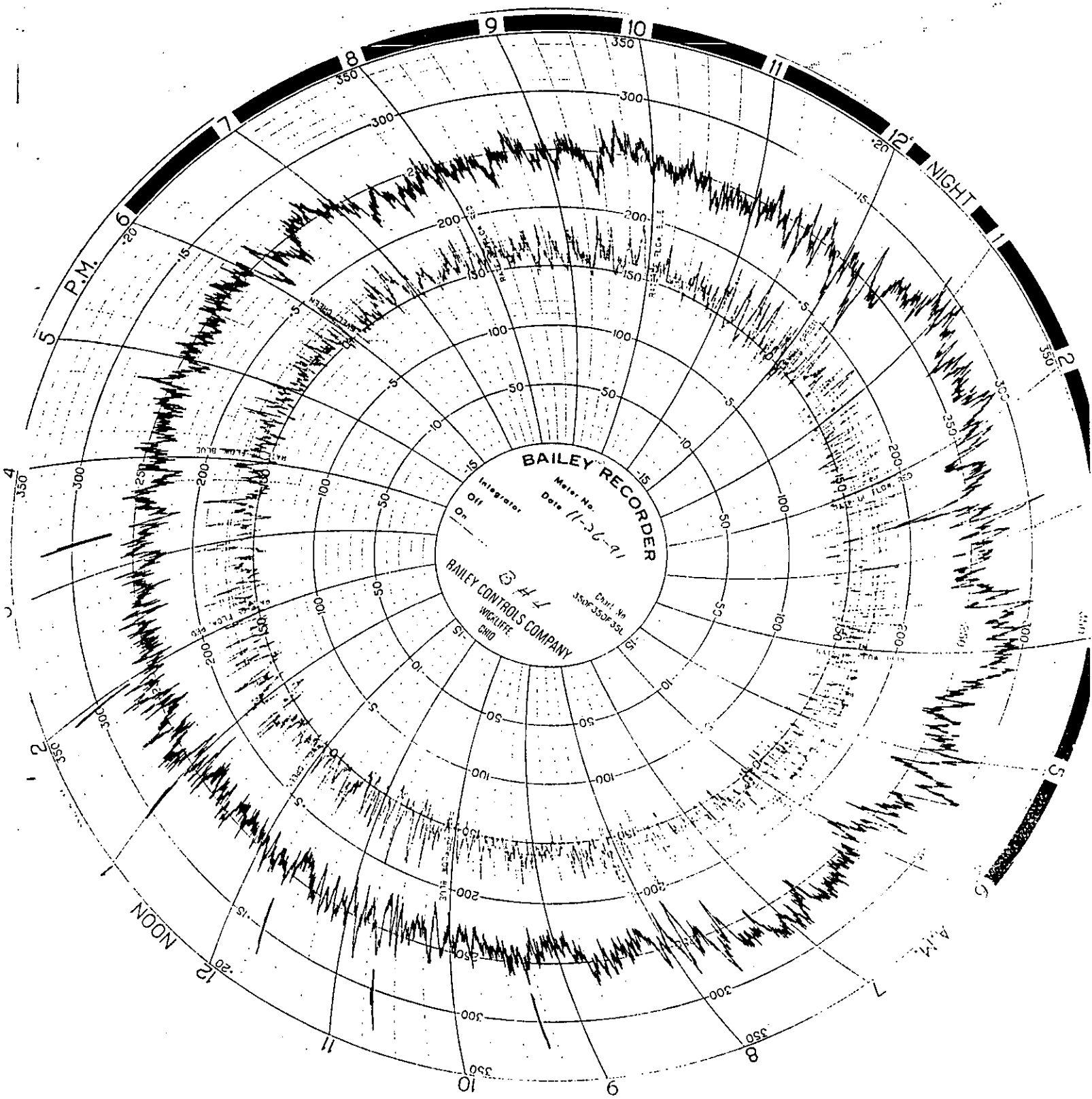
0 ✓ 10.0g ✓
0.5 g ✓ 100.0g ✓
%RH 67 DATE 11-30-91
Signature Christy L. Neck

2nd GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓
0.5g ✓ 100.0g ✓
%RH 69 DATE 12-2-91
Signature Christy L. Neck

APPENDIX D

PRODUCTION RATE CERTIFICATION


BAILEY RECORDER
Integrator
Off
On
Meter No.
Date 11-26-91
Chart No.
350F-350F-35L
BAILEY CONTROLS COMPANY
WICKLIFFE
OHIO
NIGHT
P.M.
NOON
A.M.

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	0920-1039

TIME INTERVAL----------	79 MINUTES
OIL:	
FINAL OIL----------	646
BEGIN OIL	616
FACTOR----------	1
STEAM:	
FINAL STEAM----------	232623
BEGIN STEAM	232531
FACTOR----------	3500
TEMPERATURE	570 DEGREES F
PRESSURE----------	420 PSIG
	435 PSIA
FEEDWATER:	
TEMPERATURE----------	260 DEGREES F
PRESSURE	600 PSIG
	615 PSIA
HEAT INPUT:	
STEAM----------	1286.0 BTU/LB
FEEDWATER	228.6 BTU/LB
NET STEAM----------	1057.4 BTU/LB
STEAM RATE	244557 LB/HR
BOILER EFFICIENCY----------	62.5 %
TOTAL FUEL HEAT INPUT	413.75 MMBTUH
STEAM CALIBRATION FACTOR----------	1.00
OIL----------	23.16 GPH
OIL	150000 BTU/GAL
TOTAL HEAT INPUT (OIL)----------	3.47 MMBTUH
TOTAL HEAT INPUT (NON-OIL)	410.28 MMBTUH
ALLOWABLES:	
ALLOWABLE EMISSION (OIL)----------	.10 LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20 LB/MMBTU
TOTAL ALLOWABLE EMISSION----------	82.40 LB/HR
TOTAL ACTUAL EMISSION	58.94 LB/HR
TOTAL ALLOWABLE EMISSION----------	0.199 LB/MMBTU
TOTAL ACTUAL EMISSION	0.142 LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Florida

BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 1

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____, ____
SCRUBBER(S) GPM _____, _____
SCRUBBER(S)H2O LEVEL _____, _____
Ph(if applicable) _____, _____

OPERATOR SIGNATURE _____

INITIAL INTEGRATOR 232531

FINAL INTEGRATOR 232623

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
9:20	6160	240 000	570	420 ~~000~~	260	600
9:40		240 000	570	420 ~~000~~	260	600
10:00		240 000	570	420 ~~000~~	260	600
10:20		245000	570	420	260	600
10:39	6465					

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	1141-1302

TIME INTERVAL	81 MINUTES
OIL:	
FINAL OIL	707
BEGIN OIL	673
FACTOR	1
STEAM:	
FINAL STEAM	232788
BEGIN STEAM	232694
FACTOR	3500
TEMPERATURE	570 DEGREES F
PRESSURE	425 PSIG
	440 PSIA
FEEDWATER:	
TEMPERATURE	260 DEGREES F
PRESSURE	600 PSIG
	615 PSIA
HEAT INPUT:	
STEAM	1285.6 BTU/LB
FEEDWATER	228.6 BTU/LB
NET STEAM	1057.0 BTU/LB
STEAM RATE	243704 LB/HR
BOILER EFFICIENCY	62.5 %
TOTAL FUEL HEAT INPUT	412.15 MMBTUH
STEAM CALIBRATION FACTOR	1.00
OIL	25.19 GPH
OIL	150000 BTU/GAL
TOTAL HEAT INPUT (OIL)	3.78 MMBTUH
TOTAL HEAT INPUT (NON-OIL)	408.37 MMBTUH
ALLOWABLES:	
ALLOWABLE EMISSION (OIL)	.10 LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20 LB/MMBTU
TOTAL ALLOWABLE EMISSION	82.05 LB/HR
TOTAL ACTUAL EMISSION	53.98 LB/HR
TOTAL ALLOWABLE EMISSION	0.199 LB/MMBTU
TOTAL ACTUAL EMISSION	0.131 LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Florida BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 2 OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500 SCRUBBER(S) PRESS.DROP ___, ___

SCRUBBER(S) GPM ___, ___

OPERATOR SIGNATURE [signature] SCRUBBER(S)H2O LEVEL ___, ___

Ph(if applicable) ___, ___

INITIAL INTEGRATOR 232694 FINAL INTEGRATOR 232788

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
11:41	673.0	240000	570	425	260	600
12:01		245000	570	430	260	600
12:21		245000	570	430	260	600
12:41		240000	570	420	260	600
1:01		245000	570	420	260	600
1:02	707.0					

AIR CONSULTING & ENGINEERING.INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	1355-1518

TIME INTERVAL	83	MINUTES
OIL:		
FINAL OIL	766	
BEGIN OIL	729	
FACTOR	1	
STEAM:		
FINAL STEAM	232947	
BEGIN STEAM	232851	
FACTOR	3500	
TEMPERATURE	570	DEGREES F
PRESSURE	424	PSIG
	439	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1285.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1057.1	BTU/LB
STEAM RATE	242892	LB/HR
BOILER EFFICIENCY	62.8	%
TOTAL FUEL HEAT INPUT	410.82	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	26.82	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	4.02	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	406.79	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20	LB/MMBTU
TOTAL ALLOWABLE EMISSION	81.76	LB/HR
TOTAL ACTUAL EMISSION	53.42	LB/HR
TOTAL ALLOWABLE EMISSION	0.199	LB/MMBTU
TOTAL ACTUAL EMISSION	0.130	LB/MMBTU

Avg
25.06
3.76
408.48
412.24

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop of Florida

BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 3

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____, ____
SCRUBBER(S) GPM _____, _____
SCRUBBER(S)H2O LEVEL _____, ____
Ph(if applicable) _____, _____

OPERATOR SIGNATURE [illegible]

INITIAL INTEGRATOR 232851

FINAL INTEGRATOR 232947

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1:55	729.4	240 000	570	430	260	600
2:15		240 000	570	420	260	600
2:35		250 000	570	430	260	600
2:55		240 000	570	420	260	600
3:15		240 000	570	420	260	600
3:18	766.5					

APPENDIX E

QUALITY ASSURANCE AND CHAIN OF CUSTODY

STANDARD METER CALIBRATION
Meter Number 1040616

Air Consulting and Engineering. Inc. (ACE) uses a dry gas meter for the calibration standard. This meter has been calibrated against a wet test meter in triplicate. This data was used to generate a standard meter calibration curve (see next page). Field meter calibrations are corrected to this curve using the following formula:

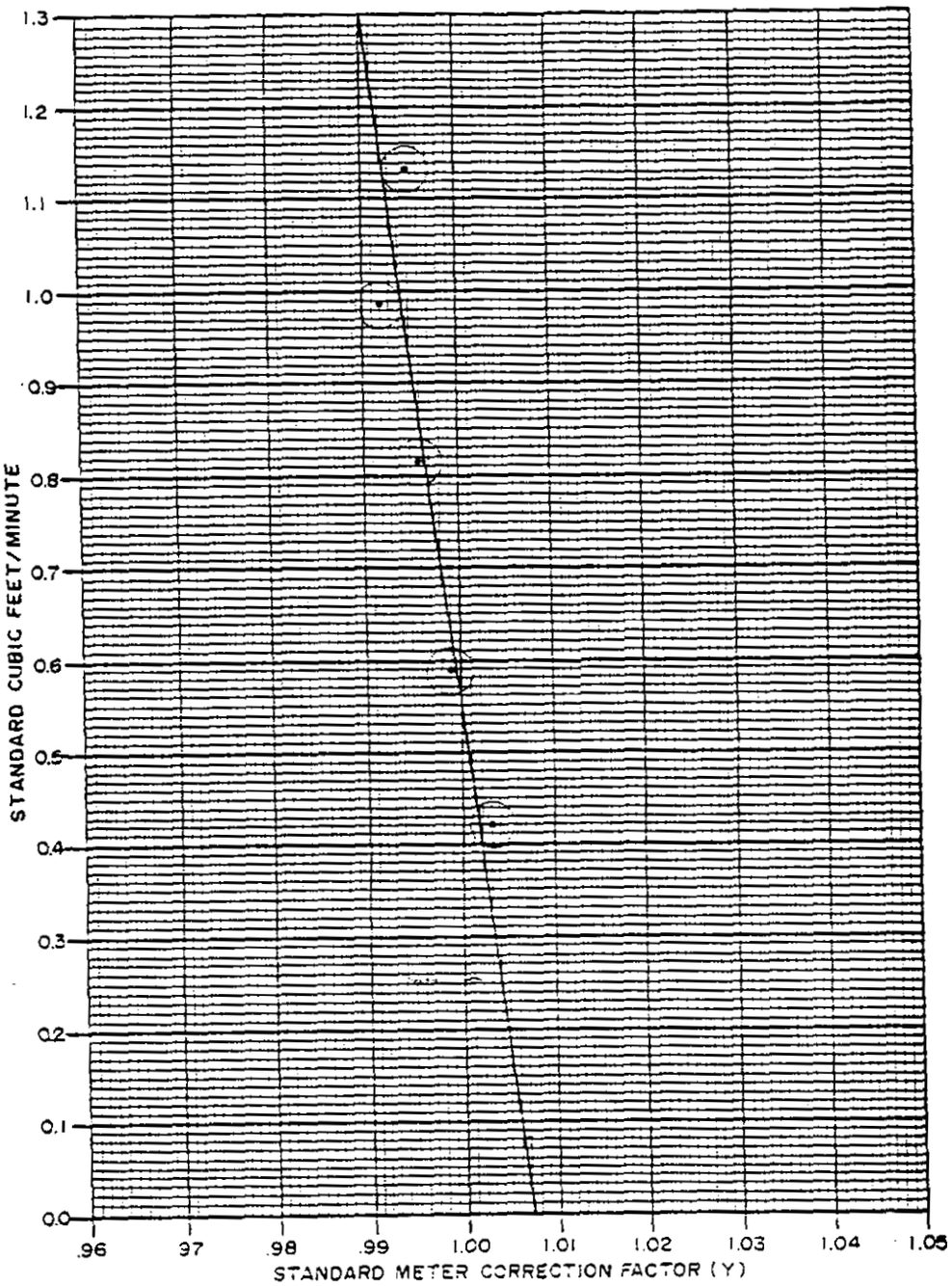
$$Y_a \times Y_s = Y$$

Y_a = actual ratio of field meter to standard meter

Y_s = ratio of standard meter to wet test meter at a given flow rate (from Calibration Curve)

Y = corrected ratio of field meter

The dry standard meter was calibrated on June 11. 1991. and is checked and/or recalibrated at least annually.



STANDARD METER CALIBRATION CURVE

JUNE 11, 1991

AIR CONSULTING and ENGINEERING

AIR CONSULTING & ENGINEERING — STANDARD METER CALIBRATION

DATE 6-13-91

LEAK CHECK 0.000 CFM at 10 In. Hg.

METER SERIAL NUMBER 104 0616

BAROMETRIC PRESSURE 30.12 In. Hg.

STD GAS METER TEMPERATURE 74 °F/ ASTM GLASS THERMOMETER TEMPERATURE 74 °F

WET ΔH	STD ΔH	GAS VOLUME, WET TEST METER			GAS VOLUME, STD GAS METER			TEMP WET TEST METER (°F)	TEMP OF STD METER (°F)	TIME (Minutes)
		INITIAL	FINAL	ACTUAL ft³	INITIAL	FINAL	ACTUAL ft³			
.3	-.60	6.042	11.553	5.511	0.003	5.500	5.497	77	77	13
.3	-.60	1.553	7.032	5.479	5.500	10.979	5.479	75	75	13
.3	-.60	7.032	12.509	5.477	10.979	16.450	5.471	75	75	13
.3	-.6	2.843	8.143	5.290	16.804	22.127	5.323	75	76	9
.3	-.6	8.143	13.430	5.287	22.127	27.442	5.315	75	76	9
.35	-.6	3.430	8.703	5.273	27.442	32.753	5.311	75	77	9
-.4	-1.6	9.252	14.995	5.743	33.311	39.123	5.812	76	78	7
-.4	-1.6	4.995	10.713	5.718	39.123	44.909	5.786	76	78	7
-.4	-1.6	0.113	6.445	5.732	44.909	50.707	5.798	76	78	7
-.55	-2.1	6.941	12.917	5.976	51.214	57.292	6.078	76	78	6
-.55	-2.1	2.917	8.898	5.981	57.292	63.375	6.083	76	78	6
-.55	-2.1	8.898	14.873	5.975	63.375	69.452	6.077	76	78	6
-.7	-2.7	5.278	10.988	5.710	69.866	75.663	5.797	76	78	5
-.7	-2.7	0.988	6.708	5.720	75.663	81.474	5.811	76	78	5
-.7	-2.7	6.708	12.386	5.678	81.474	87.247	5.773	76	78	5

CALIBRATED BY: G. F. Habel

	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM
Run 1	1.004	0.422	0.998	0.584	0.996	0.814	0.992	0.988	0.995	1.132
Run 2	1.001	0.419	0.999	0.584	0.996	0.810	0.992	0.989	0.995	1.134
Run 3	1.003	0.419	0.999	0.582	0.996	0.812	0.992	0.988	0.994	1.126
Average	1.003	0.420	0.999	0.583	0.996	0.812	0.992	0.988	0.995	1.131

air consulting and engineering

AIR CONSULTING & ENGINEERING — ANNUAL METER CALIBRATION

DATE 6-14-91

LEAK CHECK 0.000 CFM at 14 in. Hg.

METER BOX NUMBER #1

BAROMETRIC PRESSURE 30.10 in. Hg.

DRY GAS METER TEMPERATURE 87 °F/ASTM GLASS THERMOMETER TEMPERATURE 88 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP STD METER	TEMP OF DRY METER	TIME (Minutes)	TIMER
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
-.06	.5	977.651	983.301	5.650	884.756	890.239	5.483	87	88	15	15
-.12	1.0	971.708	977.548	5.840	878.739	884.547	5.808	86	87	11	11
-.16	1.5	985.835	993.630	7.795	892.764	900.523	7.759	88	89	12	12
-.23	2.0	993.630	1000.397	6.767	900.523	907.262	6.739	88	89	9	9
-.33	3.0	1000.397	1006.790	6.393	907.262	913.626	6.364	89	90	7	7
-.47	4.0	1007.008	1012.339	5.331	913.950	919.144	5.194	89	91	5	5

	DELTA H	Ya	SCFM	Ys	Y
	2.026	1.031	0.366	1.000	1.031
	2.036	1.005	0.516	0.998	1.003
	2.048	1.003	0.630	0.996	0.999
	2.038	1.001	0.729	0.994	0.995
	2.076	0.999	0.884	0.991	0.990
	2.027	1.020	1.032	0.988	1.008
MEAN:	2.042	1.010		0.995	1.004

CALIBRATED BY: Greg R. Brown

AIR CONSULTING & ENGINEERING, inc. — POST TEST CALIBRATION

DATE 11-28-91 METER BOX NUMBER 1 LEAK CHECK 0.000 CFM at 20 in. Hg.

CLIENT Sugar Cane Growers Co-op SOURCE All THERMOCOUPLE NUMBER ATK 2 PYROMETER NUMBER 88

FLIGHT SERVICE Pb 30.18 in. Hg. ACE BAROMETER Pb 30.30 in. Hg.

ASTM GLASS THERMOMETER 150 °F / THERMOCOUPLE 150 °F ASTM GLASS THERMOMETER 75 °F / METER TEMP 76 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP. STANDARD METER	TEMP. OF DRY METER	TIME (Minutes)	MAX. VACUUM In. Hg.
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
.82	1.2	396.050	410.553	14.503	589.332	604.342	15.010	75 76 75.5	75 79 77	27	23
1.1	1.8	411.948	447.738	35.79	605.777	642.838	37.061	77 79 78	79 91 85	56	15
1.2	2.0	448.113	484.770	36.657	643.230	681.586	38.356	79 79 79	91 93 92	52	18.5

CALIBRATED BY: S L Dick

RUN NUMBER	SCFM	STANDARD M.C.F.	DELTA Ha	M.C.F.
1	0.53	1.005	2.338	0.971
2	0.63	1.005	2.464	0.979
3	0.69	1.005	2.230	0.979
AVERAGES	0.62	1.005	2.344	0.976

air consulting and engineering

AIR CONSULTING & ENGINEERING, INC. PYROMETER CALIBRATION

DATE 10-1-90 PYROMETER NUMBER Atkins #2

SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	42	41	1	0.2
AMBIENT	88	88	0	0.0
HOT OVEN	345	344	1	0.2

FDER - MAXIMUM 5° DIFFERENCE

EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$

CALIBRATED BY: S. L. Carter

AIR CONSULTING & ENGINEERING, INC.

PITOT TUBE CALIBRATION

DATE CALIBRATED 10-4-91

PITOT TUBE 88

IS PITOT TUBE ASSEMBLY LEVEL YES

ARE PITOT TUBE OPENINGS DAMAGED no

α_1 = 2 °(<10°), α_2 = 0 °(<10°), β_1 = 0 °(<5°), β_2 = 1 °(<5°)

γ = 2 ° θ = 1 ° A = 1.025 in. = (Pa + Pb)

z = A sin γ = 0.036 in.; <0.32/<1/8 in.

w = A sin θ = 0.018 in.; <0.08/<1/32 in.

P_a 0.512 in. P_b 0.512 in. D_t .375

WAS CALIBRATION REQUIRED no

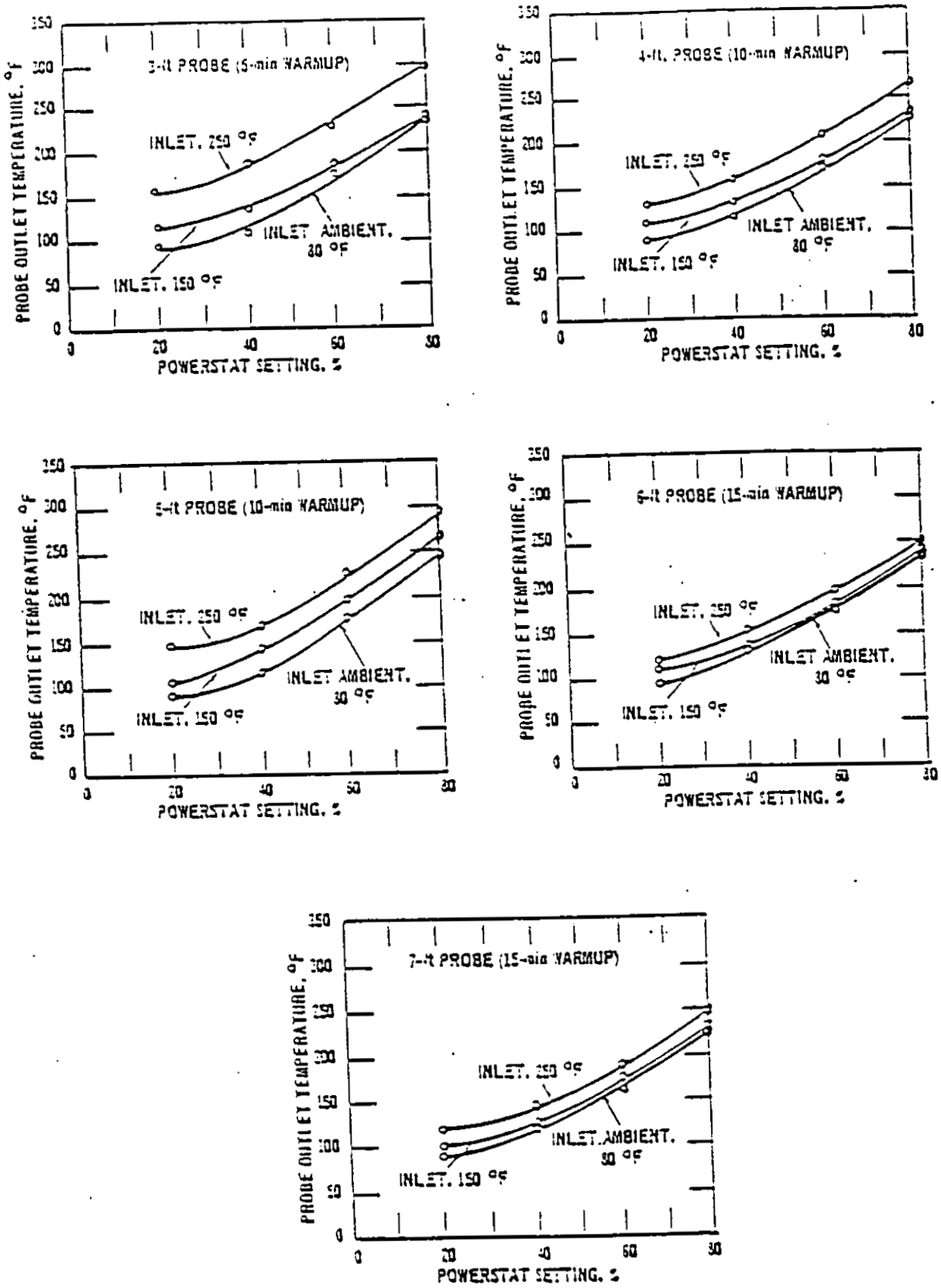
THERMOCOUPLE CALIBRATION

SOURCE (SPECIFY)	ASTM GLASS THERMOMETER WITH MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	44	45	1	0.19
AMBIENT	77	78	1	0.19
HOT OVEN	345	346	1	0.19

FDER - MAXIMUM 5° DIFFERENCE

CALIBRATED BY: _____

EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$



NOTE: Flow rate held constant at 0.75; 50% change in flow rate has little effect on probe temperature.

Probe temperatures.

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME Sugar Grove [illegible] TEST DATE 11-26-91
SOURCE NAME [illegible] #4 SAMPLE RECOVERED BY GG
TYPE OF SAMPLE Pm PARTICULATE ANALYSES BY CN

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	3520	–	DK. Gray	
1	S-U1A	✓	clear	
2	3521	–	DK. Gray	
2	S-U2A	✓	clear	
3	3522	–	Md. Gray	
3	[illegible]	✓	clear	
ACETONE / WATER BLANK (CIRCLE)	S-U3A	✓	clear	
FILTER BLANK	3473	–	white	

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	129	208.1	200.0	8.1	Pink
2	105	209.5	200.0	9.5	Pink
3	120	209.8	200.0	9.8	Pink
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

AIR CONSULTING AND ENGINEERING, INC.

Stephen L. Neck, P.E.
Project Manager

Gerard Gauthreaux
Field Testing

Early McFarland
Field Testing

Christy Neck
Laboratory Analysis

Dagmar Neck
Report Preparation

Candace V. Taylor
Document Production

SUGAR CANE GROWERS

Jose Alvarez
Test Coordinator

Blas Marin
Test Coordinator

FDER

Ken Tucker
Test Observer

Sterling Jordan
Test Observer

PALM BEACH COUNTY

Jeffrey K. Koerner
Test Observer

David Brown
Test Observer

APPENDIX C

LABORATORY ANALYSIS

AIR CONSULTING & ENGINEERING, inc.

PARTICULATE LAB DATA

SOURCE SGC Unit #4

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK	
CONTAINER NUMBER	S-41A	S-42A	S-10	S-43A	
TOTAL VOLUME (ml)	195	220	220	130	LIQUID LEVEL ✓
1st GROSS WEIGHT (g)	113.7469	110.0235	103.4149	114.4950	DATE & TIME: 11-30-91 8.00
2nd GROSS WEIGHT (g)	113.7471	110.0238	103.4151	114.4951	DATE & TIME: 12-2-91 10.51
AVERAGE GROSS WEIGHT (g)	113.7470	110.0236	103.4150	114.4950	
TARE WEIGHT (g)	113.7339	110.0110	103.3951	114.4950	
SUB NET WEIGHT (g)	0.0131	0.0126	0.0199	.0000	
ACETONE BLANK (g)	–	~~12.6~~	–	–	
TOTAL NET WEIGHT (mg)	13.1	12.6	19.9	.0	

NOTE: In no case should a blank residue >0.01 mg/g or 0.001% of the weight of acetone used be subtracted from the sample weight.

FILTER	RUN 1	RUN 2	RUN 3	BLANK	
FILTER NUMBER	3520	3521	3522	3473	
1st GROSS WEIGHT (g)	0.5905	0.5730	0.5672	0.4222	DATE & TIME: 11-30-91 9.00
2nd GROSS WEIGHT (g)	0.5902	0.5729	0.5671	0.4221	DATE & TIME: 12-1-91 11.32
AVERAGE GROSS WEIGHT (g)	0.5904	0.5730	0.5672	0.4222	
TARE WEIGHT (g)	0.4213	0.4168	0.4213	0.4223	
SUB NET WEIGHT (g)	0.1727	0.1562	0.1459	-.0001	
TOTAL NET WEIGHT (mg)	172.7	156.2	145.9	-.1	

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓

0.5 g ✓ 100.0g ✓

%RH 67 DATE 11-30-91

Signature Christy L. Neck

2nd GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓

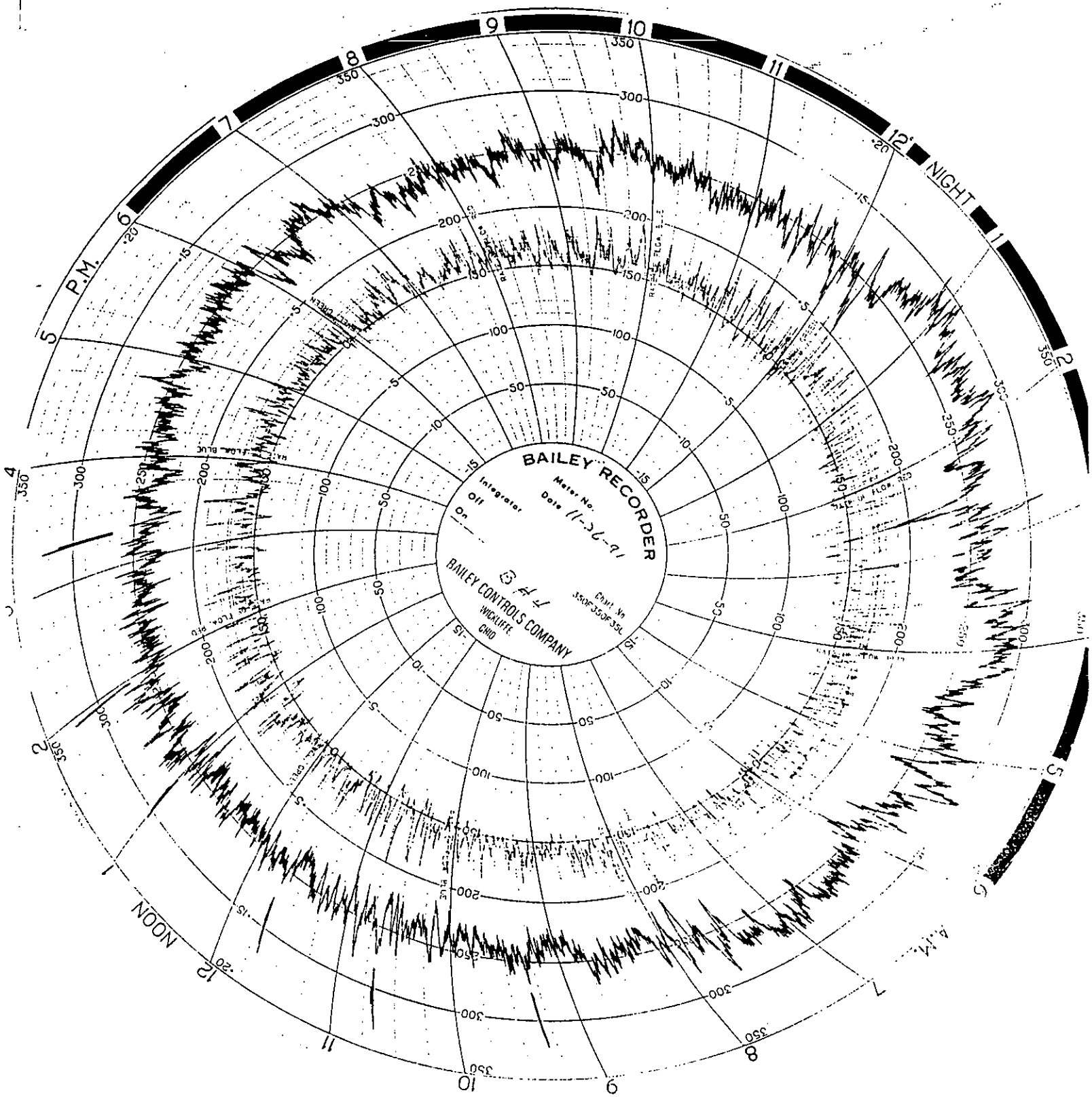
0.5g ✓ 100.0g ✓

%RH 69 DATE 12-2-91

Signature Christy L. Neck

APPENDIX D

PRODUCTION RATE CERTIFICATION


BAILEY RECORDER
Meter No.
Date 11-26-71
Integrator
Off
On
Chart No.
350F-350F-35L
BAILEY CONTROLS COMPANY
WICKLIFFE
OHIO
NIGHT
A.M.
NOON
P.M.

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	0920-1039

TIME INTERVAL	79 MINUTES
OIL:	
FINAL OIL	646
BEGIN OIL	616
FACTOR	1
STEAM:	
FINAL STEAM	232623
BEGIN STEAM	232531
FACTOR	3500
TEMPERATURE	570 DEGREES F
PRESSURE	420 PSIG
	435 PSIA
FEEDWATER:	
TEMPERATURE	260 DEGREES F
PRESSURE	600 PSIG
	615 PSIA
HEAT INPUT:	
STEAM	1286.0 BTU/LB
FEEDWATER	228.6 BTU/LB
NET STEAM	1057.4 BTU/LB
STEAM RATE	244557 LB/HR
BOILER EFFICIENCY	82.5 %
TOTAL FUEL HEAT INPUT	413.75 MMBTUH
STEAM CALIBRATION FACTOR	1.00
OIL	23.16 GPH
OIL	150000 BTU/GAL
TOTAL HEAT INPUT (OIL)	3.47 MMBTUH
TOTAL HEAT INPUT (NON-OIL)	410.28 MMBTUH
ALLOWABLES:	
ALLOWABLE EMISSION (OIL)	.10 LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20 LB/MMBTU
TOTAL ALLOWABLE EMISSION	82.40 LB/HR
TOTAL ACTUAL EMISSION	58.94 LB/HR
TOTAL ALLOWABLE EMISSION	0.199 LB/MMBTU
TOTAL ACTUAL EMISSION	0.142 LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Florida

BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 1

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____, ____
SCRUBBER(S) GPM _____, _____
SCRUBBER(S)H2O LEVEL _____, ____
Ph(if applicable) _____, _____

OPERATOR SIGNATURE _____

INITIAL INTEGRATOR 232531

FINAL INTEGRATOR 232623

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
9:20	616.0	240000	570	420	260	600
9:40		240000	570	420	260	600
10:00		240000	570	420	260	600
10:20		245000	570	420	260	600
10:39	646.5					

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	1141-1302

TIME INTERVAL	81 MINUTES
OIL:	
FINAL OIL	707
BEGIN OIL	673
FACTOR	1
STEAM:	
FINAL STEAM	232788
BEGIN STEAM	232694
FACTOR	3500
TEMPERATURE	570 DEGREES F
PRESSURE	425 PSIG
	440 PSIA
FEEDWATER:	
TEMPERATURE	250 DEGREES F
PRESSURE	600 PSIG
	615 PSIA
HEAT INPUT:	
STEAM	1285.6 BTU/LB
FEEDWATER	228.6 BTU/LB
NET STEAM	1057.0 BTU/LB
STEAM RATE	243704 LB/HR
BOILER EFFICIENCY	62.5 %
TOTAL FUEL HEAT INPUT	412.15 MMBTUH
STEAM CALIBRATION FACTOR	1.00
OIL	25.19 GPH
OIL	150000 BTU/GAL
TOTAL HEAT INPUT (OIL)	3.78 MMBTUH
TOTAL HEAT INPUT (NON-OIL)	408.37 MMBTUH
ALLOWABLES:	
ALLOWABLE EMISSION (OIL)	.10 LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20 LB/MMBTU
TOTAL ALLOWABLE EMISSION	82.05 LB/HR
TOTAL ACTUAL EMISSION	53.98 LB/HR
TOTAL ALLOWABLE EMISSION	0.199 LB/MMBTU
TOTAL ACTUAL EMISSION	0.131 LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Florida BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 2 OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500 SCRUBBER(S) PRESS.DROP ___, ___

SCRUBBER(S) GPM ___, ___

OPERATOR SIGNATURE [signature] SCRUBBER(S)H20 LEVEL ___, ___

Ph(if applicable) ___, ___

INITIAL INTEGRATOR 232694 FINAL INTEGRATOR 232788

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
11:41	673.0	240000	570	425	260	600
12:01		245000	570	430	260	600
12:21		245000	570	430	260	600
12:41		240000	570	420	260	600
1:01		245000	570	420	260	600
1:02	707.0					

AIR CONSULTING & ENGINEERING.INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-26-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 4 BOILER, SCRUBBER OUTLET	TIME:	1355-1518

TIME INTERVAL	83	MINUTES
OIL:		
FINAL OIL	766	
BEGIN OIL	729	
FACTOR	1	
STEAM:		
FINAL STEAM	232947	
BEGIN STEAM	232851	
FACTOR	3500	
TEMPERATURE	570	DEGREES F
PRESSURE	424	PSIG
	439	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1285.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1057.1	BTU/LB
STEAM RATE	242892	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	410.82	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	26.82	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	4.02	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	406.79	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.20	LB/MMBTU
TOTAL ALLOWABLE EMISSION	81.76	LB/HR
TOTAL ACTUAL EMISSION	53.42	LB/HR
TOTAL ALLOWABLE EMISSION	0.199	LB/MMBTU
TOTAL ACTUAL EMISSION	0.130	LB/MMBTU

Avg
25.06
3.76
408.48
412.24

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop of Florida

BOILER NUMBER 4

DATE 11-26-91 RUN NUMBER 3

OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____,____
SCRUBBER(S) GPM _____,_____
SCRUBBER(S)H2O LEVEL _____,____
Ph(if applicable)_____,_____

OPERATOR SIGNATURE [illegible]

INITIAL INTEGRATOR 232851

FINAL INTEGRATOR 232947

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
1:55	729.4	240 000	570	430	260	600
2:15		240 000	570	420	260	600
2:35		250 000	570	430	260	600
2:55		240 000	570	420	260	600
3:15		240 000	570	420	260	600
3:18	766.5					

APPENDIX E

QUALITY ASSURANCE AND CHAIN OF CUSTODY

STANDARD METER CALIBRATION
Meter Number 1040616

Air Consulting and Engineering, Inc. (ACE) uses a dry gas meter for the calibration standard. This meter has been calibrated against a wet test meter in triplicate. This data was used to generate a standard meter calibration curve (see next page). Field meter calibrations are corrected to this curve using the following formula:

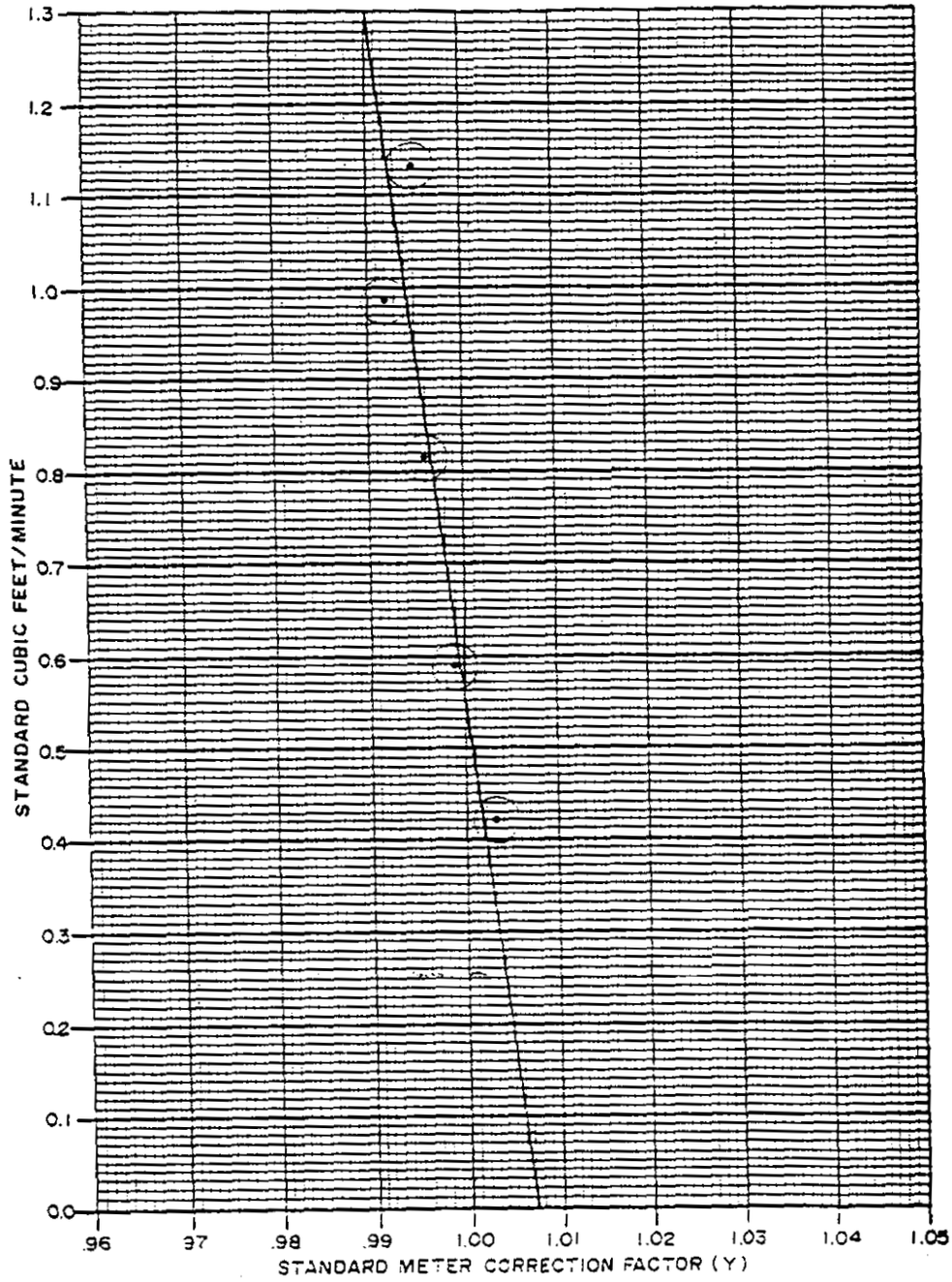
$$Y_a \times Y_s = Y$$

Y_a = actual ratio of field meter to standard meter

Y_s = ratio of standard meter to wet test meter at a given flow rate (from Calibration Curve)

Y = corrected ratio of field meter

The dry standard meter was calibrated on June 11, 1991, and is checked and/or recalibrated at least annually.



STANDARD METER CALIBRATION CURVE

JUNE 11, 1991

AIR CONSULTING and ENGINEERING

AIR CONSULTING & ENGINEERING — STANDARD METER CALIBRATION

DATE 6-13-91 LEAK CHECK 0.000 CFM at 10 in. Hg.

METER SERIAL NUMBER 104D616 BAROMETRIC PRESSURE 30.12 in. Hg.

STD GAS METER TEMPERATURE 74 °F/ASTM GLASS THERMOMETER TEMPERATURE 74 °F

WET ΔH	STD ΔH	GAS VOLUME, WET TEST METER			GAS VOLUME, STD GAS METER			TEMP WET TEST METER (°F)	TEMP OF STD METER (°F)	TIME (Minutes)
		INITIAL	FINAL	ACTUAL ft³	INITIAL	FINAL	ACTUAL ft³			
.3	-.60	6.042	11.553	5.511	0.003	5.500	5.497	77	77	13
.2	-.60	1.553	7.032	5.479	5.500	10.979	5.479	75	75	13
.3	-.60	7.032	12.509	5.477	10.973	16.450	5.477	75	75	13
.35	-.96	2.873	8.143	5.290	16.804	22.127	5.323	75	76	9
.35	-.96	8.143	13.430	5.287	22.127	27.442	5.315	75	76	9
.35	-.96	3.430	8.703	5.273	27.442	32.753	5.311	75	77	9
.4	-1.6	9.252	14.995	5.743	33.311	39.123	5.812	76	78	7
.4	-1.6	4.995	10.713	5.718	39.123	44.909	5.786	76	78	7
.4	-1.6	0.113	6.845	5.732	44.909	50.707	5.798	76	78	7
.55	-2.1	6.941	12.917	5.976	51.214	57.292	6.078	76	78	6
.55	-2.1	2.917	8.898	5.981	57.292	63.375	6.083	76	78	6
.55	-2.1	8.898	14.873	5.975	63.375	69.452	6.077	76	78	6
.7	-2.7	5.278	10.988	5.710	69.866	75.663	5.797	76	78	5
.7	-2.7	0.988	6.708	5.720	75.663	81.474	5.811	76	78	5
.7	-2.7	6.708	12.386	5.678	81.474	87.247	5.773	76	78	5

CALIBRATED BY: G. F. Habel

	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM
Run 1	1.004	0.422	0.998	0.584	0.996	0.814	0.992	0.988	0.995	1.132
Run 2	1.001	0.419	0.999	0.584	0.996	0.810	0.992	0.989	0.995	1.134
Run 3	1.003	0.419	0.999	0.582	0.996	0.812	0.992	0.988	0.994	1.126
Average	1.003	0.420	0.999	0.583	0.996	0.812	0.992	0.988	0.995	1.131

air consulting and engineering

AIR CONSULTING & ENGINEERING — ANNUAL METER CALIBRATION

DATE 6-14-91

LEAK CHECK 0.000 CFM at 14 In. Hg.

METER BOX NUMBER #1

BAROMETRIC PRESSURE 30.10 In. Hg.

DRY GAS METER TEMPERATURE 87 °F/ASTM GLASS THERMOMETER TEMPERATURE 88 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP. STD. METER	TEMP. OF DRY METER	TIME (Minutes)	TIMER
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
-.06	.5	977.651	983.301	5.650	884.756	890.239	5.483	87	88	15	15
-.12	1.0	971.708	977.548	5.840	878.739	884.547	5.808	86	87	11	11
-.16	1.5	985.835	993.630	7.795	892.764	900.523	7.759	88	89	12	12
-.23	2.0	993.630	1000.397	6.767	900.523	907.262	6.739	88	89	9	9
-.33	3.0	1000.397	1006.790	6.393	907.262	913.626	6.364	89	90	7	7
-.47	4.0	1007.008	1012.339	5.331	913.950	919.144	5.194	89	91	5	5

	DELTA H	Ya	SCFM	Ys	Y
	2.026	1.031	0.366	1.000	1.031
	2.036	1.005	0.516	0.998	1.003
	2.048	1.003	0.630	0.996	0.999
	2.038	1.001	0.729	0.994	0.995
	2.076	0.999	0.884	0.991	0.990
	2.027	1.020	1.032	0.988	1.008
MEAN:	2.042	1.010		0.995	1.004

CALIBRATED BY: Greg R. Brown

AIR CONSULTING & ENGINEERING, inc. POST TEST CALIBRATION

DATE 11-28-91 METER BOX NUMBER 1 LEAK CHECK 0.000 CFM at 20 in. Hg.

CLIENT Sugar Cane Growers Co-op SOURCE All THERMOCOUPLE NUMBER ATK 2 PYROMETER NUMBER 88

FLIGHT SERVICE Pb 30.18 in. Hg. ACE BAROMETER Pb 30.30 in. Hg.

ASTM GLASS THERMOMETER 150 °F / THERMOCOUPLE 150 °F ASTM GLASS THERMOMETER 75 °F / METER TEMP 76 °F

ΔHS	AVERAGE ΔHD	GAS VOLUME, STANDARD METER			GAS VOLUME, DRY GAS METER			TEMP STANDARD METER	TEMP OF DRY METER	TIME (Minutes)	MAX. VACUUM In. Hg.
		INITIAL	FINAL	ACTUAL ft^3	INITIAL	FINAL	ACTUAL ft^3				
.82	1.2	396.050	410.553	14.503	589.332	604.342	15.010	75 76 75.5	75 79 77	27	23
1.1	1.8	411.948	447.738	35.79	605.777	642.838	37.061	77 79 78	79 91 85	56	15
1.2	2.0	448.113	484.770	36.657	643.230	681.586	38.356	79 79 79	91 93 92	52	18.5

CALIBRATED BY: S L [illegible]

RUN NUMBER	SCFM	STANDARD M.C.F.	DELTA Ha	M.C.F.
1	0.53	1.005	2.338	0.971
2	0.63	1.005	2.464	0.979
3	0.69	1.005	2.230	0.979
AVERAGES	0.62	1.005	2.344	0.976

air consulting and engineering

AIR CONSULTING & ENGINEERING, INC. PYROMETER CALIBRATION

DATE 10-1-90 PYROMETER NUMBER Atkins #2

SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	42	41	1	0.2
AMBIENT	88	88	0	0.0
HOT OVEN	345	344	1	0.2

FDER - MAXIMUM 5° DIFFERENCE

EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$

CALIBRATED BY: S. L. Carter

AIR CONSULTING & ENGINEERING, INC.

PITOT TUBE CALIBRATION

DATE CALIBRATED 10-4-91

PITOT TUBE 88

IS PITOT TUBE ASSEMBLY LEVEL YES

ARE PITOT TUBE OPENINGS DAMAGED no

α_1 = 2 °(<10°), α_2 = 0 °(<10°), β_1 = 0 °(<5°), β_2 = 1 °(<5°)

γ = 2 ° θ = 1 ° A = 1.025 in. = (Pa + Pb)

z = A sin γ = 0.036 in.; <0.32/<1/8 in.

w = A sin θ = 0.018 in.; <0.08/<1/32 in.

P_a 0.512 in. P_b 0.512 in. D_t .375

WAS CALIBRATION REQUIRED no

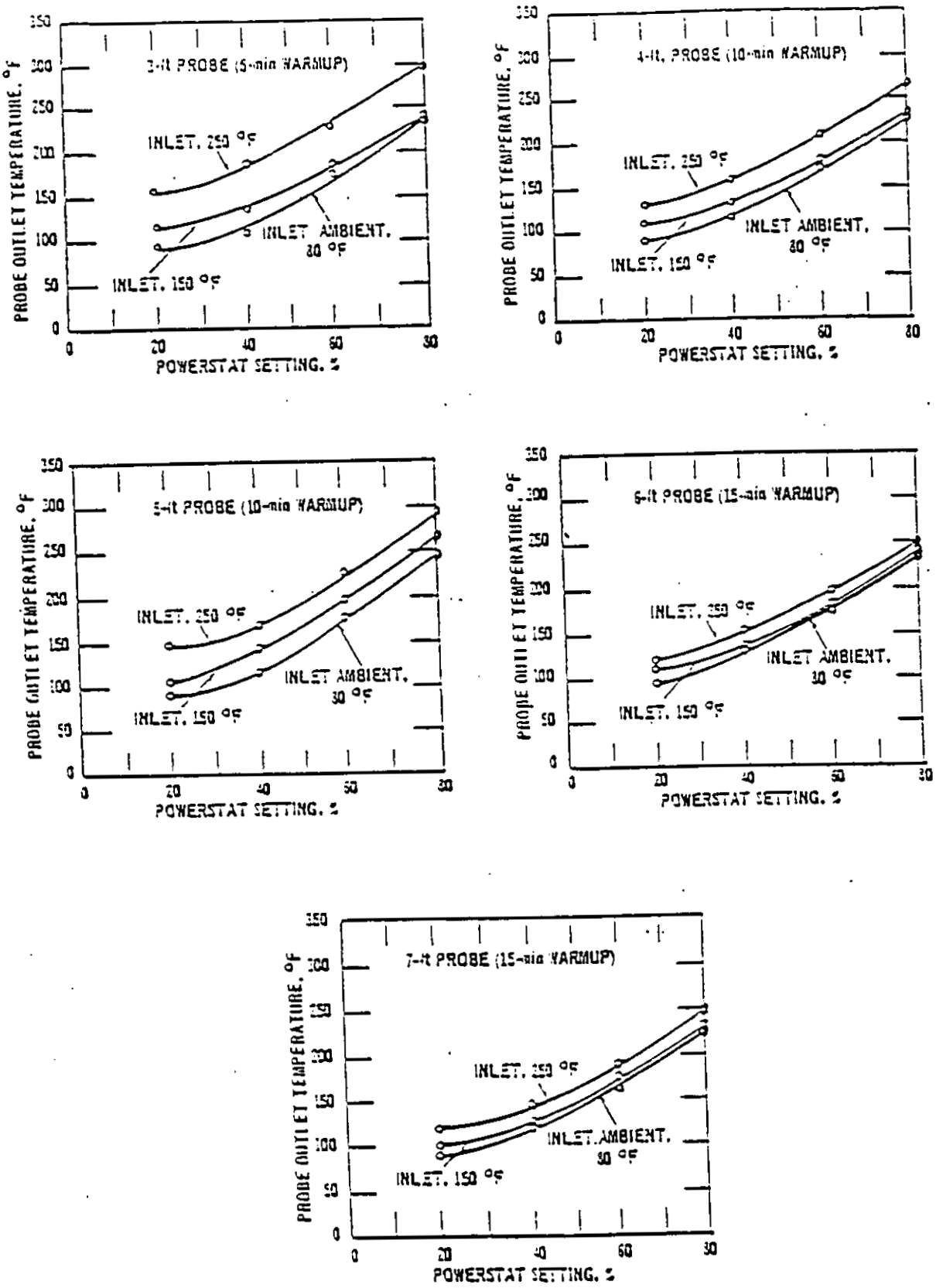
THERMOCOUPLE CALIBRATION

SOURCE (SPECIFY)	ASTM GLASS THERMOMETER WITH MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	44	45	1	0.19
AMBIENT	77	78	1	0.19
HOT OVEN	345	346	1	0.19

FDER - MAXIMUM 5° DIFFERENCE

CALIBRATED BY: _____

EPA $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] 100 \leq 1.5\%$



NOTE: Flow rate held constant at 0.25; 50% change in flow rate has little effect on probe temperature.

Probe temperatures.

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME Sugar Growers [illegible] TEST DATE 11-26-91
SOURCE NAME [illegible] #4 SAMPLE RECOVERED BY GG
TYPE OF SAMPLE Pm PARTICULATE ANALYSES BY CN

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	3520	~	DK. Gray	
1	S-U12	✓	clear	
2	3521	~	DK. Gray	
2	S-U24	✓	clear	
3	3522	~	Md. Gray	
3	[illegible]	✓	clear	
ACETONE / WATER BLANK (CIRCLE)	S-U34	✓	clear	
FILTER BLANK	3473	~	white	

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	129	208.1	200.0	8.1	Pink
2	105	209.5	200.0	9.5	Pink
3	120	209.8	200.0	9.8	Pink
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

APPENDIX F

PROJECT PARTICIPANTS

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AIR CONSULTING AND ENGINEERING, INC.

Stephen L. Neck, P.E.
Project Manager

Gerard Gauthreaux
Field Testing

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Laboratory Analysis

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Report Preparation

Candace V. Taylor
Document Production

SUGAR CANE GROWERS

Jose Alvarez
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Blas Marin
Test Coordinator

FDER

Ken Tucker
Test Observer

Sterling Jordan
Test Observer

PALM BEACH COUNTY

Jeffrey K. Koerner
Test Observer

David Brown
Test Observer