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: 39

Title: Source Test Report for Particulate Emissions Twin Impingement Wet Scrubbers Boiler Number 5

November 1991

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ACE
AIR CONSULTING
& ENGINEERING, INC.

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(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

12/30/91

Date

1.0 INTRODUCTION

On November 20, 1991, Air Consulting and Engineering, Inc. (ACE), conducted particulate emission testing on the Dual Wet Scrubber Outlet of Boiler 5 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. Sterling Jordan 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 5 demonstrated compliance with the permit conditions.

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

Particulate emissions averaged 51.36 pounds per hour (lbs/Hr) and 0.170 pounds per million BTU (lbs/MMBTU) which is within the allowable emissions of 70.58 lbs/Hr and 0.233 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 5
Sugar Cane Growers Cooperative of Florida
Belle Glade, Florida
November 20, 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	80545	158	23.5	52.59	0.174	70.36	0.233
2	77327	163	23.7	51.53	0.172	69.83	0.233
3	75904	161	24.0	49.97	0.163	71.55	0.233
AVERAGE	77925	161	23.7	51.36	0.170	70.58	0.233

3.0 PROCESS DESCRIPTION AND OPERATION

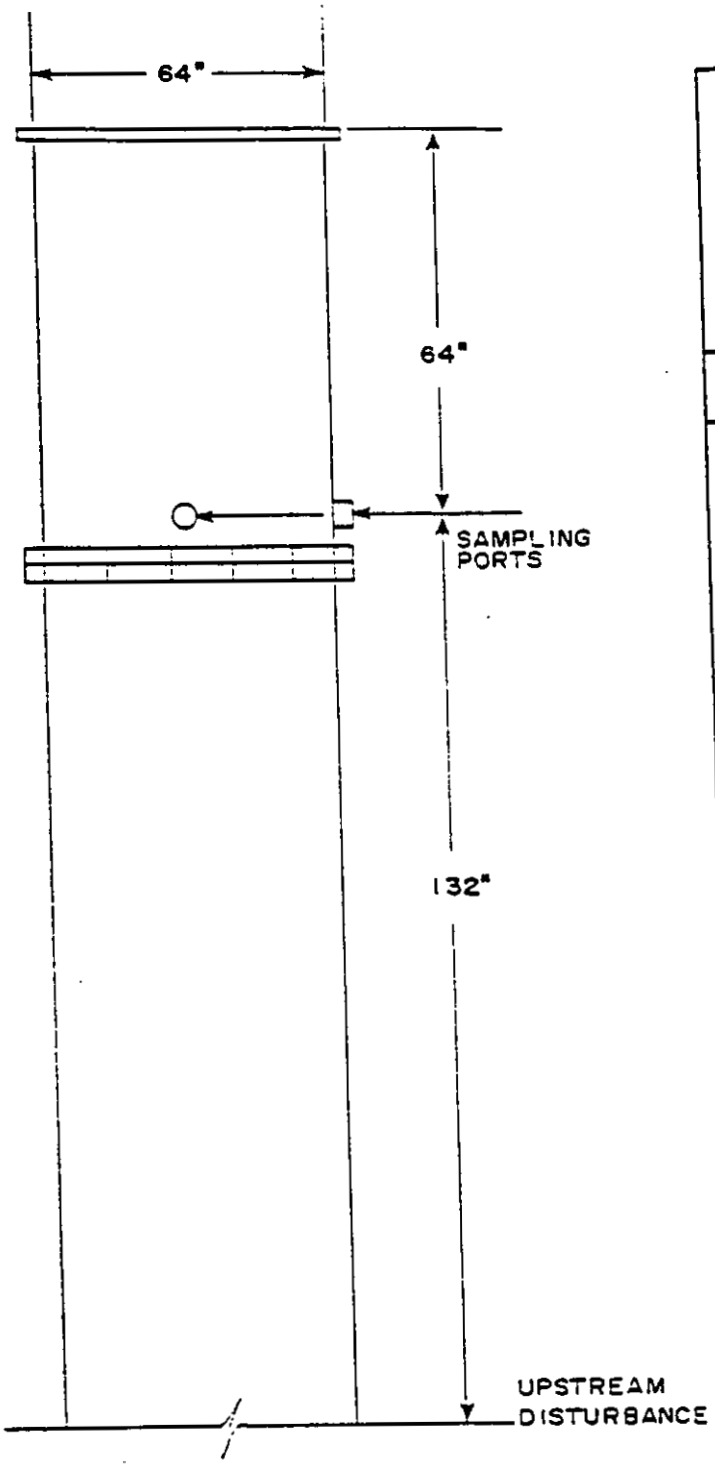
The Number 5 Boiler at Sugar Cane Growers is a spreader stoker design used primarily for residue fuel firing. Supplemental oil firing was also utilized for the emission test. The boiler averaged 178,257 lbs/Hr steam production over the three run test period.

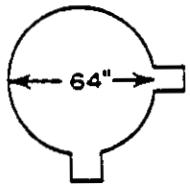
Oil meters, steam integrators, and other production monitoring devices were rigorously calibrated prior to the production season.

4.0 SAMPLING POINT LOCATION

The sampling point location (Figure 1) consists of dual scrubber outlet stacks, each 64" in diameter. Each stack has two sample ports 90 degrees apart. The ports on the south stack are located 132 from an upstream disturbance and 64" from the outlet.

Twenty-four test points were sampled on each stack for each test run. The traverse were located as shown below. The stack configuration is such that there was no reason to evaluate the presence of cyclonic flow.





TRAVERSE POINT NUMBER	INCHES INSIDE STACK WALL
1	1.4
2	4.3
3	7.6
4	11.3
5	16.0
6	22.8
7	41.2
8	48.0
9	52.7
10	56.4
11	59.7
12	62.6

NOTE: NOT TO SCALE
BOTH STACKS ARE IDENTICAL.

FIGURE 1.
SAMPLING POINT LOCATION
BOILER NO. 5
SUGARCANE GROWERS COOP. OF FLORIDA

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5.0 FIELD AND ANALYTICAL PROCEDURES

5.1 Particulate Matter Sampling and Analysis--EPA Method 5 (Glass Probe)

Particulate matter samples were collected by the particulate matter emission measurement method specified by the United States Environmental Protection Agency. A schematic diagram of the sampling train used is shown in Figure 2. All particulate matter captured from the nozzle to, and including, the filter was included in the calculation of the emission rate of particulate matter.

PREPARATION OF EQUIPMENT

1. FILTERS - Gelman type "A" filters were placed in a drying oven for two hours at 105 degrees C, removed and placed in a standard desiccator containing indicating silica gel, allowed to cool for two hours, and weighed to the nearest 0.1 mg. The filters were then re-desiccated for a minimum of six hours and weighed to a constant weight (less than 0.5 mg change from previous weighing). The average of the two constant weights was used as the tare weight.

2. NOZZLE, FILTER HOLDER, AND SAMPLING PROBE - The nozzle, filter holder, and sampling probe were washed vigorously with soapy water and brushes, rinsed with distilled water and acetone, and dried prior to the test program. All openings on the sampling equipment were sealed while in transit to the test site.

3. IMPINGERS - The Greenburg-Smith impingers were cleaned with a warm soapy water solution and brushes, rinsed with distilled water and acetone, and dried. The impingers were sealed tightly during transit.

TEST PROCEDURE

Prior to performing the actual particulate matter sample runs, certain stack and stack gas parameters were measured. These preliminary measurements

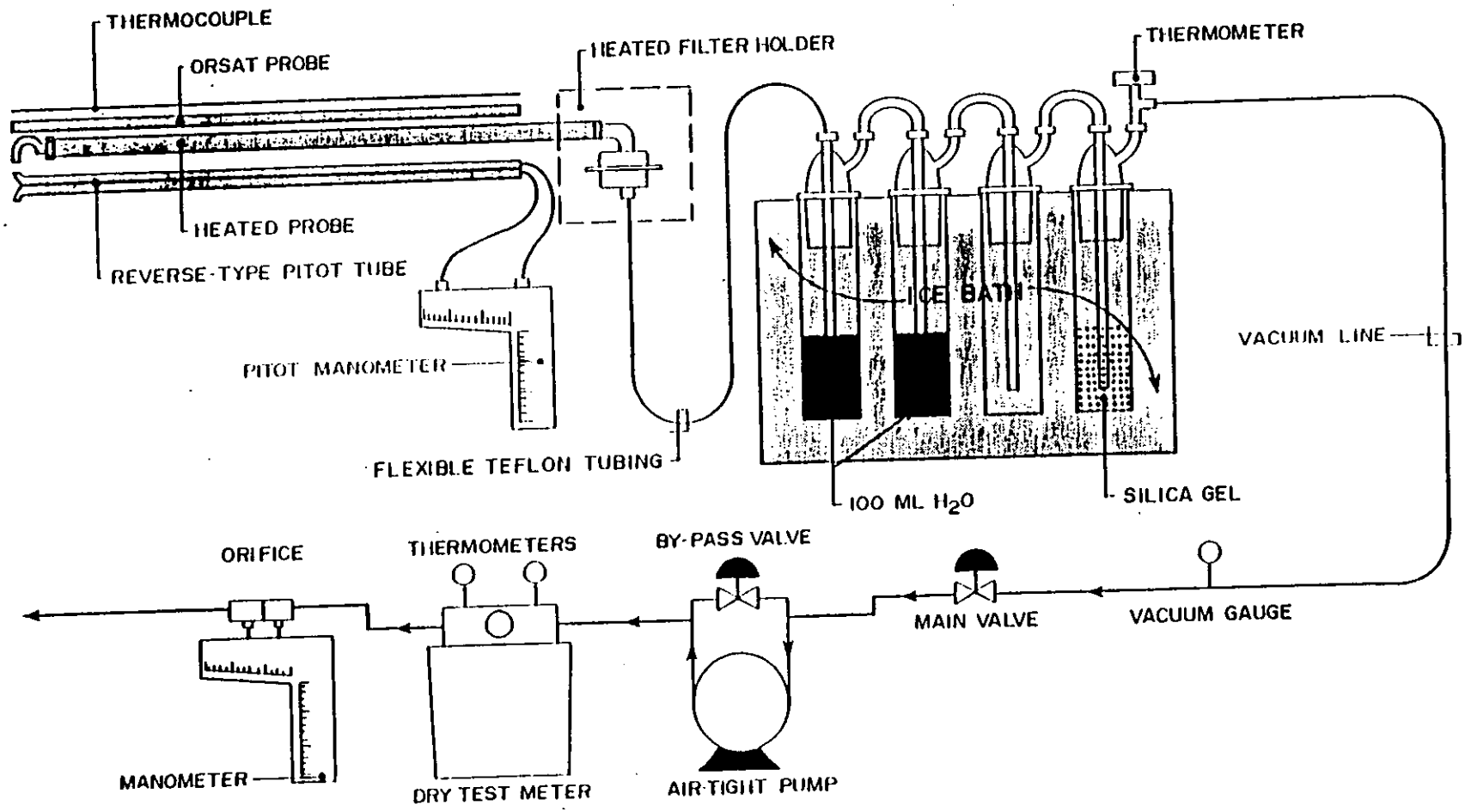

FIGURE 1.
EPA METHOD 5 SAMPLING TRAIN

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included the average gas temperature, the stack gas velocity head, the stack gas moisture content, and the stack dimensions at the point where the tests were being performed. The stack gas temperature was determined by using a bi-metallic thermocouple and calibrated pyrometer. Velocity head measurements were made with calibrated type "S" pitot tube and an inclined manometer. Velocity head measurements of 0.05 inches H_2O or less were measured utilizing a micromanometer.

The sampling traverse points were selected so that a representative sample could be extracted from the gas stream. The traverse points were located in the center of equal areas, the number of which were dependent upon the distance upstream and downstream from flow disturbances.

Each particulate matter test run consisted of sampling for a specific amount of time at each traverse point. The type "S" pitot tube was connected to the sampling probe so that an instantaneous velocity head measurement could be made at each traverse point while making the test run. The stack gas temperature was also measured at each traverse point. Nomographs were used to calculate the isokinetic sampling rate at each traverse point during each test run.

The gases sampled passed through the following components: a stainless steel nozzle and glass probe; a glass fiber filter; two impingers each with 100 ml

of distilled deionized water; one impinger dry; one impinger with 200 grams of silica gel; a flexible sample line; an air-tight pump; a dry test meter; and a calibrated orifice. The second impinger had a standard tip, while the first, third, and fourth impingers had modified tips with a 0.5 inch I.D. opening.

Sample recovery was accomplished by the following procedures:

1. The pre-tared filter was removed from its holder and placed in Container 1 and sealed. (This is usually performed in the lab.)
2. All sample-exposed surfaces prior to the filter were washed with acetone and placed in Container 2, sealed and the liquid level marked.
3. The volume of water from the first three impingers was measured for the purpose of calculating the moisture in the stack gas and then discarded.
4. The used silica gel from the fourth impinger was transferred to the original tared container and sealed.

LABORATORY ANALYSIS

The three sample containers from each sample run were analyzed according to the following procedures:

1. The filter was dried at 105 degrees C for three hours, desiccated for a minimum of one hour, and weighed to the nearest 0.1 mg. A minimum of two such weighings six hours apart was made to determine constant weight.
2. The acetone from Container 2 was transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours, and weighed to the nearest 0.1 mg. A minimum of two such weighings six hours apart were made to determine constant weight.
3. The used silica gel in its tared container was weighed to the nearest 0.1 gram.

The total sample weight included the weight of material collected on the filter plus the weight of material collected in the nozzle, sampling probe, and front half of the filter holder.

DATA

The field data sheets, calculation sheets, and nomenclature definitions are included in the appendices of this report.

APPENDIX A
COMPLETE EMISSION DATA

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COMPLETE EMISSION DATA

PLANT: SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
SOURCE: NUMBER 5 BOILER
DATE: 11-20-91

RUN NO.:	1	IMPINGER ml	350
BEGIN TIME	832	SILICA GEL gms.	11.6
END TIME:	1017	PERCENT O2	9.50
TOTAL RUN TIME:	96.00 min.	PERCENT CO2	10.50
BAROMETRIC PRESSURE:	30.33 "Hg	"F" FACTOR	0
STACK PRESSURE:	30.33 "Hg.		
NOZZLE DIAMETER:	.250 inches	PARTICULATE	
METER CORR. FACTOR:	1.004		
FINAL METER:	659.967 cubic ft.	FILTER mg.	247.3
INITIAL METER:	603.955 cubic ft.	WASH mg.	29.2
STACK AREA:	44.680 sq. ft.		276.5

STACK 1 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	.570	0.755	1.540	153	76
1-2	.570	0.755	1.540	153	76
1-3	.570	0.755	1.540	153	76
1-4	.700	0.837	1.890	156	76
1-5	.670	0.819	1.810	154	76
1-6	.570	0.755	1.540	156	76
1-7	.450	0.671	1.220	157	76
1-8	.550	0.742	1.490	156	76
1-9	.500	0.707	1.350	156	76
1-10	.450	0.671	1.220	156	76
1-11	.380	0.616	1.030	156	76
1-12	.310	0.557	.840	156	77
2-1	.400	0.632	1.080	150	77
2-2	.380	0.616	1.030	153	77
2-3	.490	0.700	1.320	155	76
2-4	.570	0.755	1.540	156	78
2-5	.570	0.755	1.540	156	78
2-6	.450	0.671	1.220	157	78
2-7	.620	0.787	1.670	157	78
2-8	.670	0.819	1.810	157	78
2-9	.510	0.714	1.380	157	79
2-10	.450	0.671	1.220	157	79
2-11	.370	0.608	1.000	155	79
2-12	.330	0.574	.890	155	79
AVERAGES	0.504	0.706	1.363	155	77

EMISSION RESULTS

NOZZLE AREA(FT2)	:0.0003414			
AVG. VELOCITY HEAD	:--------	0.53 "H2O	VOL. FLOW ACFM :	121455
AVG. STACK TEMP.:	---------	158 F	VOL. FLOW SCFMD :	80545
AVG. METER TEMP.:	---------	79 F		
AVG. ORIFICE DIFFERENTIAL:	---	1.38 "H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:	---	56.017		
% H2O VAPOR:	:--------	23.5	POUNDS PER HOUR:	52.589
GAS MOL. WT. DRY:	---------	30.06	POUNDS PER SCF :	0.0000109
GAS MOL. WT. WET:	---------	27.23	GRAINS/SCF:	0.076
% EXCESS AIR:	---------	81.76	GRAINS/SCF @ 8% O2	0.086
AVG. STACK VEL.(FPS)	---------	45.31	GRAINS/SCF @50% EA	0.092
MMBTU INPUT:	---------	302.51	POUNDS PER MMBTU:	0.174
PERCENT ISOKINETIC :	---------	94.82		

STACK 2 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIFICE DIFF.	STACK TEMP.	METER TEMP.
1-1	.450	0.671	1.220	153	80
1-2	.450	0.671	1.220	157	80
1-3	.510	0.714	1.380	159	80
1-4	.610	0.781	1.650	159	80
1-5	.620	0.787	1.670	161	80
1-6	.550	1.490	1.490	162	80
1-7	.720	0.848	1.940	163	81
1-8	.620	0.787	1.670	161	81
1-9	.370	0.608	1.000	161	81
1-10	.290	0.539	.780	160	81
1-11	.220	0.469	.590	160	81
1-12	.170	0.412	.460	158	81
2-1	.560	0.748	1.510	158	81
2-2	.550	0.742	1.490	159	81
2-3	.620	1.095	1.670	160	81
2-4	.770	0.877	2.080	160	82
2-5	.700	0.837	1.890	161	82
2-6	.590	0.768	1.590	162	82
2-7	.590	0.768	1.590	162	82
2-8	.630	0.794	1.700	163	82
2-9	.630	0.794	1.700	163	82
2-10	.500	0.707	1.350	163	82
2-11	.380	0.616	1.030	162	82
2-12	.300	0.548	.810	161	82
AVERAGES	0.517	0.753	1.395	160	81

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
SOURCE: NUMBER 5 BOILER
DATE: 11-20-91

RUN NO.:	2	IMPINGER ml	342
BEGIN TIME	1127	SILICA GEL gms.	12.2
END TIME:	1321	PERCENT O2	9.50
TOTAL RUN TIME:	96.00 min.	PERCENT CO2	11.00
BAROMETRIC PRESSURE:	30.33 "Hg	"F" FACTOR	0
STACK PRESSURE:	30.33 "Hg.		
NOZZLE DIAMETER:	.250 inches	PARTICULATE	
METER CORR. FACTOR:	1.004		
FINAL METER:	714.589 cubic ft.	FILTER mg.	237.5
INITIAL METER:	660.335 cubic ft.	WASH mg.	34.7
STACK AREA:	44.680 sq. ft.		

272.2

STACK 1 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	.330	0.574	.890	156	77
1-2	.340	0.583	.920	157	77
1-3	.410	0.640	1.110	158	77
1-4	.500	0.707	1.350	158	77
1-5	.580	0.762	1.570	156	77
1-6	.580	0.762	1.570	158	77
1-7	.380	0.616	1.030	160	77
1-8	.420	0.648	1.130	157	77
1-9	.420	0.648	1.130	157	77
1-10	.380	0.616	1.030	157	77
1-11	.330	0.574	.890	158	78
1-12	.280	0.529	.760	155	78
2-1	.350	0.592	.950	152	78
2-2	.330	0.574	.890	154	78
2-3	.400	0.632	1.080	155	78
2-4	.480	0.693	1.300	156	80
2-5	.470	0.686	1.270	156	80
2-6	.330	0.574	.890	158	80
2-7	.550	0.742	1.490	158	81
2-8	.620	0.787	1.670	158	81
2-9	.440	0.663	1.190	158	81
2-10	.350	0.592	.950	158	81
2-11	.310	0.557	.840	158	81
2-12	.270	0.520	.730	157	81
AVERAGES	0.410	0.636	1.110	157	79

EMISSION RESULTS

NOZZLE AREA(FT2)	:0.0003414			
AVG. VELOCITY HEAD	:--------	0.50 "H2O	VOL. FLOW ACFM :	117915
AVG. STACK TEMP.:	---------	163 F	VOL. FLOW SCFMD :	77327
AVG. METER TEMP.:	---------	81 F		
AVG. ORIFICE DIFFERENTIAL:	---	1.31 "H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:	---	54.035		
% H2O VAPOR:	:--------	23.7	POUNDS PER HOUR:	51.526
GAS MOL. WT. DRY:	---------	30.14	POUNDS PER SCF :	0.0000111
GAS MOL. WT. WET:	---------	27.26	GRAINS/SCF:	0.078
% EXCESS AIR:	---------	82.69	GRAINS/SCF @ 8% O2	0.088
AVG. STACK VEL.(FPS)	---------	43.99	GRAINS/SCF @50% EA	0.095
MMBTU INPUT:	---------	300.05	POUNDS PER MMBTU:	0.172
PERCENT ISOKINETIC :	---------	95.27		

STACK 2 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIFICE DIFF.	STACK TEMP.	METER TEMP.
1-1	.540	0.735	1.460	169	82
1-2	.540	0.735	1.460	169	82
1-3	.650	0.806	1.760	169	82
1-4	.750	0.866	2.030	170	82
1-5	.830	0.911	2.240	170	82
1-6	.700	1.490	1.890	170	82
1-7	.630	0.794	1.700	170	82
1-8	.650	0.806	1.760	170	84
1-9	.440	0.663	1.190	170	84
1-10	.280	0.529	.760	170	84
1-11	.220	0.469	.590	169	84
1-12	.180	0.424	.490	167	84
2-1	.600	0.775	1.620	169	85
2-2	.620	0.787	1.670	170	85
2-3	.730	1.095	1.970	170	85
2-4	.860	0.927	2.000	170	85
2-5	.830	0.911	2.000	171	85
2-6	.760	0.872	2.000	170	85
2-7	.540	0.735	1.460	168	85
2-8	.630	0.794	1.700	170	85
2-9	.560	0.748	1.510	170	85
2-10	.430	0.656	1.160	162	86
2-11	.350	0.592	.950	162	86
2-12	.240	0.490	.840	150	84
AVERAGES	0.565	0.775	1.509	168	84

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: SUGAR CANE GROWERS COOPERATIVE OF FLORIDA
SOURCE: NUMBER 5 BOILER
DATE: 11-20-91

RUN NO.:	3	IMPINGER ml	340
BEGIN TIME	1446	SILICA GEL gms.	12.0
END TIME:	1630	PERCENT O2	8.50
TOTAL RUN TIME:	96.00 min.	PERCENT CO2	12.00
BAROMETRIC PRESSURE:	30.33 "Hg	"F" FACTOR	0
STACK PRESSURE:	30.33 "Hg.		
NOZZLE DIAMETER:	.250 inches	PARTICULATE	
METER CORR. FACTOR:	1.004		
FINAL METER:	768.653 cubic ft.	FILTER mg.	244.6
INITIAL METER:	714.995 cubic ft.	WASH mg.	19.1
STACK AREA:	44.680 sq. ft.		

Avg 9.2

263.7

STACK 1 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	.300	0.548	.810	158	83
1-2	.300	0.548	.810	158	83
1-3	.360	0.600	.970	158	83
1-4	.480	0.693	1.300	158	83
1-5	.530	0.728	1.430	158	83
1-6	.480	0.693	1.300	158	93
1-7	.380	0.616	1.030	158	83
1-8	.450	0.671	1.220	158	83
1-9	.440	0.663	1.190	158	83
1-10	.350	0.592	.950	158	83
1-11	.300	0.548	.810	157	83
1-12	.250	0.500	.680	157	83
2-1	.380	0.616	1.030	153	84
2-2	.400	0.632	1.080	156	84
2-3	.450	0.671	1.220	157	84
2-4	.450	0.671	1.220	158	85
2-5	.430	0.656	1.160	158	85
2-6	.570	0.755	1.540	158	85
2-7	.640	0.800	1.730	159	85
2-8	.500	0.707	1.350	159	86
2-9	.350	0.592	.950	157	86
2-10	.320	0.566	.860	158	86
2-11	.280	0.529	.760	158	86
2-12	.280	0.529	.760	156	86
AVERAGES	0.403	0.630	1.090	158	84

EMISSION RESULTS

Avg = 161

NOZZLE AREA(FT2)	:0.0003414		
AVG. VELOCITY HEAD	:--------	0.48 "H20	VOL. FLOW ACFM : 115924
AVG. STACK TEMP.:	---------	161 F	VOL. FLOW SCFMD : 75904
AVG. METER TEMP.:	---------	86 F	
AVG. ORIFICE DIFFERENTIAL:	---	1.26 "H20	PARTICULATE DATA :
METER STANDARD CUBIC FEET:	---	52.980	
% H20 VAPOR:	:--------	24.0	POUNDS PER HOUR: 49.974
GAS MOL. WT. DRY:	---------	30.26	POUNDS PER SCF : 0.0000110
GAS MOL. WT. WET:	---------	27.32	GRAINS/SCF: 0.077
% EXCESS AIR:	---------	68.07	GRAINS/SCF @ 8% O2 0.080
AVG. STACK VEL.(FPS)	---------	43.24	GRAINS/SCF @50% EA 0.086
MMBTU INPUT:	---------	307.43	POUNDS PER MMBTU: 0.163
PERCENT ISOKINETIC :	---------	95.16	

Avg = 77,925

STACK 2 DATA INPUTS

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIFICE DIFF.	STACK TEMP.	METER TEMP.
1-1	.520	0.721	1.400	159	87
1-2	.530	0.728	1.430	160	87
1-3	.650	0.806	1.760	166	87
1-4	.780	0.883	2.110	168	87
1-5	.750	0.866	2.030	168	87
1-6	.580	1.490	1.570	167	87
1-7	.670	0.819	1.810	169	87
1-8	.610	0.781	1.650	167	88
1-9	.380	0.616	1.030	165	88
1-10	.250	0.500	.680	164	89
1-11	.200	0.447	.540	163	88
1-12	.160	0.400	.430	162	88
2-1	.550	0.742	1.490	164	88
2-2	.570	0.755	1.540	165	88
2-3	.650	1.095	1.760	165	88
2-4	.700	0.837	1.890	165	88
2-5	.750	0.866	1.850	165	88
2-6	.600	0.775	1.620	165	88
2-7	.550	0.742	1.490	166	88
2-8	.640	0.800	1.730	169	88
2-9	.550	0.742	1.490	168	88
2-10	.470	0.686	1.270	166	88
2-11	.350	0.592	.950	168	88
2-12	.320	0.566	.860	165	88
AVERAGES	0.533	0.761	1.433	165	88

APPENDIX B

FIELD DATA SHEETS

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA · 32606

TEST ID SC5C1AS
PAGE 1 OF 3

PLANT Sugar Cane Growers Coop.
SOURCE Boiler #5
PLANT LOCATION Belle Glade, Florida
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 11-20-91 RUN NO. 1
TIME START 0832 TIME END 1017
SAMPLE TIME 2 / 48 (min/pt) = 96 Total min
ASSUMED MOISTURE 25 % FDA .75
NOMOGRAPH C_f 2.7 PITOT CORR. .84
P_b 30.33 "Hg P_g 30.33 "Hg
WEATHER MSTLY CLDY TEMP. 80 °F
METER BOX NO. 1 H 2.15 Y 1.004
NOZZLE CAL. .251 .250 .249 = .250
STACK DIMENSIONS 64" X 2 stacks
STACK AREA 44.68 ft² EFFECTIVE _____ ft²
STACK HEIGHT _____ ft
STACK DIAMETER: UPSTRM. 3 DNSTRM. 1
PORT SIZE 4" in. NIPPLE LENGTH 8 in.
U CORD LENGTH 200'
REMARKS:

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 659.967 ft³
INITIAL 603.955 ft³
NET 56.012 ft³
FILTER NO. 3470 IMP. VOL. GAIN 350.0 ml.
SIL GEL NO. 9 WT. GAIN 11.6 ml.
TOTAL CONDENSATE 361.6 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2	10.5	10.5			
% O_2	10.0	9.0			
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 20 "Hg POST 0.00 cfm 18.5 "Hg
METER BOX/PUMP _____ GAS SAMPLE SYST. _____
ORSAT BAG _____
PITOT TUBE NO. _____ PRE-TEST OK
POST-TEST(+) 0.00 / 15 H_2O/Sec
POST-TEST(−) 0.00 / 15 H_2O/Sec
PYROMETER NO. 2
BOX OPERATOR Southreaux PROBE HOLDER McFarlane

PORT AND TRAVERSE POINT NUMBER North	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP (°F)	SAMPLE BOX TEMP (°F)	LAST IMPINGER TEMP F	DRY GAS METER TEMP (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		0834	605.41	.57	1.54	1.54	153	255	58	76	7.0
2		0836	606.51	.57	1.54	1.54	153	255	58	76	7.0
3		0838	607.52	.57	1.54	1.54	153	242	55	76	8.0
4		0840	608.90	.70	1.89	1.89	156	233	54	76	10.0
5		0842	610.42	.67	1.81	1.81	154	229	55	76	10.0
6		0844	611.51	.57	1.54	1.54	156	229	55	76	8.5

AIR CONSULTING & ENGINEERING, INC.

TEST ID SC.SC1AS

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	METER ORIFICE PRESS. DIFF. ("H_2O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
North											
1-7		0846	612.61	.45	1.22	1.22	157	251	58	76	7.0
8		0848	613.80	.55	1.49	1.49	156	257	58	76	9.0
9		0850	615.12	.50	1.35	1.35	156	260	58	76	8.0
10		0852	616.15	.45	1.22	1.22	156	262	58	76	8.0
11		0854	617.06	.38	1.03	1.03	156	264	58	76	7.0
12		0856	618.00	.31	.84	.84	156	265	58	77	6.5
2-1		0901	619.01	.40	1.08	1.08	150	267	62	77	7.5
2		0903	620.11	.38	1.03	1.03	153	270	60	77	7.5
3		0905	621.40	.49	1.32	1.32	155	275	60	78	9.0
4		0907	622.51	.57	1.54	1.54	156	274	58	78	10.0
5		0909	624.00	.57	1.54	1.54	156	273	58	78	10.0
6		0911	624.74	.45	1.22	1.22	157	258	59	78	9.0
7		0913	626.10	.62	1.67	1.67	157	256	59	78	11.0
8		0915	627.41	.67	1.81	1.81	157	260	59	78	12.0
9		0917	628.70	.51	1.38	1.38	157	258	59	79	10.5
10		0919	629.81	.45	1.22	1.22	157	252	59	79	10.0
11		0921	630.81	.37	1.00	1.00	155	251	59	79	9.0
12		09.23	631.73	.33	.89	.89	155	250	59	79	8.0
South											
1-1		0926	632.85	.45	1.22	1.22	153	250	59	80	10.0
2		0928	633.90	.45	1.22	1.22	158	250	58	80	10.0
3		0930	635.10	.51	1.38	1.38	159	248	59	80	11.0
4		0932	636.31	.61	1.65	1.65	159	248	59	80	12.0
5		0934	637.66	.62	1.67	1.67	161	246	59	80	13.0
6		0936	638.81	.55	1.49	1.49	162	246	59	80	13.0
7		0938	640.40	.72	1.94	1.94	163	246	59	81	15.0

AIR CONSULTING & ENGINEERING, INC.

TEST ID SC5C/AS

PAGE 3 OF 3

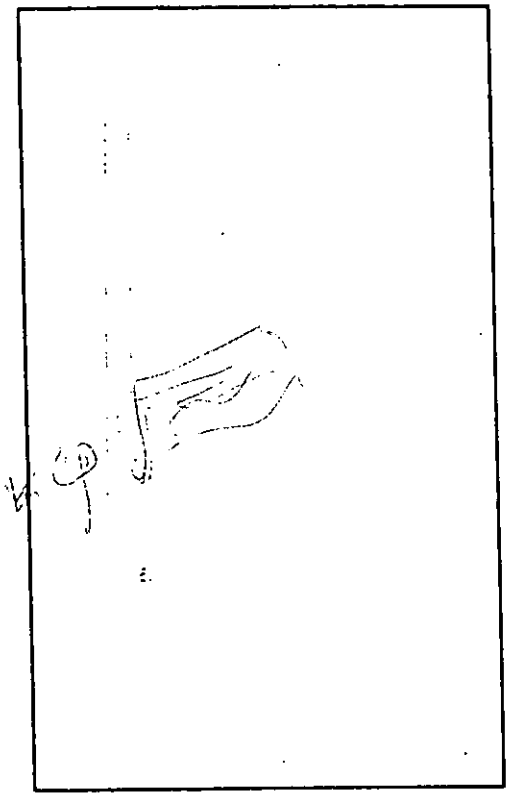
PORT AND TRAVERSE POINT NUMBER South	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-8		0940	641.86	.62	1.67	1.67	161	254	59	81	14.5
9		0942	642.78	.37	1.00	1.00	161	254	59	81	10.0
10		0944	643.61	.29	.78	.78	160	254	59	81	8.5
11		0946	644.61	.22	.59	.59	160	253	59	81	7.5
12		0948	645.28	.17	.46	.46	158	253	59	81	7.0
2-1		0955	646.12	.56	1.51	1.51	158	251	59	81	13.0
2		0957	647.40	.55	1.49	1.49	159	250	58	81	13.0
3		0959	648.60	.62	1.67	1.67	160	248	58	81	15.0
4		1001	650.10	~~2.08~~ 2.75	2.08	2.08	160	248	58	82	17.0
5		1003	651.45	.70	1.89	1.89	161	253	62	82	17.0
6		1005	653.34	.59	1.59	1.59	162	255	62	82	17.0
7		1007	654.51	.59	1.59	1.59	162	255	62	82	16.5
8		1009	655.43	.63	1.70	1.70	163	255	62	82	13.0
9		1011	656.71	.63	1.70	1.70	163	255	62	82	13.0
10		1013	657.91	.50	1.35	1.35	163	255	62	82	15.0
11		1015	659.01	.38	1.03	1.03	162	268	63	82	13.0
12		1017	659.96	.30	.81	.81	161	264	63	82	11.0

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA · 32606

TEST ID SCSC2A
PAGE 1 OF 3

PLANT Sugar Cane Growers Coop. of Fla.
SOURCE Boiler #5
PLANT LOCATION Belle Glade, Florida
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M
DATE 11-20-91 RUN NO. 2
TIME START 1127 TIME END 1321
SAMPLE TIME 2 / 48 (min/pt) = 96 Total min
ASSUMED MOISTURE 24 % FDA .76
NOMOGRAPH C_f 2.7 PITOT CORR. .84
P_b 30.33 "Hg P_s 30.33 "Hg
WEATHER CLDY TEMP. 80 °F
METER BOX NO. 1 H 2.15 Y 1.004
NOZZLE CAL. .251 .250 .249 .250
STACK DIMENSIONS 64" x 2 stacks
STACK AREA 44.68 ft² EFFECTIVE ____ ft²
STACK HEIGHT ____ ft
STACK DIAMETER: UPSTRM. 3 DNSTRM. 1
PORT SIZE 4 in. NIPPLE LENGTH 8 in.
U CORD LENGTH 200'
REMARKS:



MAT'L PROCESSING RATE ____
GAS METER READINGS: FINAL 714.589 ft³
INITIAL 660.335 ft³
NET 54.254 ft³
FILTER NO. 3510 IMP. VOL. GAIN 342.0 ml.
SIL GEL NO. 32 WT. GAIN 12.2 ml.
TOTAL CONDENSATE 354.2 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2	10.5	11.75			11.0
% O_2	10.0	9.0			9.5
% CO					
% N_2					

F_O = ____ F_O RANGE = ____
ORSAT ANALYZER ____

LEAK CHECKS
PRE 0.015 cfm 22 "Hg POST 0.001 cfm 21 "Hg
METER BOX/PUMP ____ GAS SAMPLE SYST. ____
ORSAT BAG ____
PITOT TUBE NO. ____ PRE-TEST OK
POST-TEST(+) 0.00 / 15 H_2O/Sec
POST-TEST(−) 0.00 / 15 H_2O/Sec
PYROMETER NO. 2
BOX OPERATOR Gouthreaux PROBE HOLDER McFarlane

PORT AND TRAVERSE POINT NUMBER North	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. F	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		1129	661.25	.33	.89	.89	156	238	66	77	5.0
2		1131	662.20	.34	.92	.92	157	241	64	77	5.0
3		1133	663.25	.41	1.11	1.11	158	245	61	77	7.0
4		1135	664.44	.50	1.35	1.35	158	249	59	77	7.5
5		1137	665.63	.58	1.57	1.57	156	245	59	77	8.5
6		1139	666.82	.58	1.57	1.57	158	243	59	77	8.5

ACE AIR CONSULTING & ENGINEERING, INC.

TEST ID SC5C2A

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O)		STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
					CALC.	ACTUAL					
North											
1-7		1141	667.90	.38	1.03	1.03	160	243	62	77	7.0
8		1143	669.32	.42	1.13	1.13	160	244	63	77	7.5
9		1145	670.00	.42	1.13	1.13	157	248	63	77	7.5
10		1147	671.02	.38	1.03	1.03	157	248	63	77	7.5
11		1149	672.01	.33	.89	.89	158	250	64	78	7.0
12		1151	672.94	.28	.76	.76	155	250	65	78	7.0
2-1		1155	673.92	.35	.95	.95	152	250	66	78	7.0
2		1157	674.82	.33	.89	.89	154	256	64	78	7.0
3		1159	675.93	.40	1.08	1.08	155	260	64	78	8.5
4		1201	677.05	.48	1.30	1.30	156	261	64	80	10.0
5		1203	678.21	.47	1.27	1.27	156	260	64	80	10.0
6		1205	679.15	.33	.89	.89	158	260	64	80	10.0
7		1207	680.26	.55	1.49	1.49	158	254	64	81	10.5
8		1209	681.61	.62	1.67	1.67	158	254	64	81	12.0
9		1211	682.81	.44	1.19	1.19	158	253	64	81	11.0
10		1213	683.81	.35	.95	.95	158	253	64	81	9.0
11		1215	684.71	.31	.84	.84	158	250	66	81	8.0
12		1217	685.66	.27	.73	.73	157	250	66	81	8.0
South											
1-1		1222	686.67	.54	1.46	1.46	169	249	66	82	12.0
2		1224	687.85	.54	1.46	1.46	169	247	59	82	12.0
3		1226	689.51	.65	1.76	1.76	169	245	57	82	14.0
4		1228	691.00	.75	2.03	2.03	170	242	57	82	16.0
5		1230	691.91	.83	2.24	2.24	170	242	56	82	16.0
6		1232	693.54	.70	1.89	1.89	170	242	56	82	15.0
7		1234	694.72	.63	1.70	1.70	170	242	56	82	15.0

AIR CONSULTING & ENGINEERING, INC.

TEST ID SCSC2AS

PORT AND TRAVERSE POINT NUMBER South	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-8		1236	695.91	.65	1.76	1.76	170	254	55	84 ~~047~~	15.0
9		1238	697.21	.44	1.19	1.19	170	248	55	84 ~~2~~	14.0
10		1240	698.11	.28	.76	.76	170	248	55	84	10.0
11		1242	698.91	.22	.59	.59	169	249	53	84	8.5
12		1244	699.66	.18	.49	.49	167	249	53	84	8.0
2-1		1254	700.83	.60	1.62	1.62	169	263	55	85	15.0
2		1256	702.21	.62	1.67	1.67	170	260	53	85	16.0
3		1258	703.32	.73	1.97	1.97	170	252	53	85	19.0
4		1300	704.75	.86	2.32	2.00	170	248	54	85	21.0
5		1302	706.15	.83	2.24	2.00	171	252	56	85	21.0
6		1303	707.62	.76	2.05	1.90	170	263	57	85	21.0
7		1305	708.76	.54	1.46	1.46	168	266	58	85	16.0
8		1307	710.05	.63	1.70	1.70	170	267	58	85	20.0
9		1309	711.50	.56	1.51	1.51	170	267	58	85	19.0
10		1311	712.51	.43	1.16	1.16	162	261	58	85	18.0
11		1313	713.55	.38	1.03	1.03	162	255	61	86	14.0
12		1315	714.59	.35	.95	.95	166	257	58	86	13.5

STACK SAMPLING FIELD DATA SHEET

ACE AIR CONSULTING & ENGINEERING, INC.
2106 N. W. 67th PLACE · Suites 9 & 10
GAINESVILLE, FLORIDA · 32606

TEST ID SCSC3A
PAGE 1 OF 3

PLANT Sugar Cane Growers Coop. of Fla.
SOURCE Boiler #5
PLANT LOCATION Belle Glade, Florida
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 11-20-91 RUN NO. 3
TIME START 1446 TIME END 1630
SAMPLE TIME 2 / 48 (min/pt) = 96 Total min
ASSUMED MOISTURE 24 % FDA .76
NOMOGRAPH C_f 2.7 PITOT CORR. .84
P_b 30.33 "Hg P_s 30.33 "Hg
WEATHER CLDY TEMP. 80 °F
METER BOX NO. 1 H 2.15 Y 1.004
NOZZLE CAL. .251 .250 .249 = .250
STACK DIMENSIONS 64" x 2 stacks
STACK AREA 44.68 ft² EFFECTIVE ____ ft²
STACK HEIGHT ____ ft.
STACK DIAMETER: UPSTRM. ____ DNSTRM. ____
PORT SIZE 4 in. NIPPLE LENGTH 8 in.
U CORD LENGTH 200'
REMARKS:

MAT'L PROCESSING RATE ____
GAS METER READINGS: FINAL 768.653 ft³
INITIAL 714.995 ft³
NET 53.658 ft³
FILTER NO. 3511 IMP. VOL. GAIN 340.0 ml.
SIL GEL NO. 45 WT. GAIN 12.0 ml.
TOTAL CONDENSATE 352.0 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2	12.0	12.0			12.0
% O_2	8.5	8.0			8.5
% CO					
% N_2					

F_O = ____ F_O RANGE = ____
ORSAT ANALYZER ____

LEAK CHECKS
PRE 0.015 cfm 20 "Hg POST 0.015 cfm 22 "Hg
METER BOX/PUMP ____ GAS SAMPLE SYST. ____
ORSAT BAG ____
PITOT TUBE NO. ____ PRE-TEST OK
POST-TEST(+) 0.00 / 15 H_2O/Sec
POST-TEST(−) 0.00 / 15 H_2O/Sec
PYROMETER NO. 2
BOX OPERATOR Gauthreaux PROBE HOLDER McFarland

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT.³)	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. F	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-1		1448	715.71	.30	.81	.81	158	243	~~2~~57	83	5.0
2		1450	716.72	.30	.81	.81	158	243	~~2~~57	83	5.0
3		1452	717.79	.36	.97	.97	158	244	57	83	6.0
4		1454	718.77	.48	1.30	1.30	158	239	57	83	7.0
5		1456	719.91	.53	1.43	1.43	158	239	56	83	8.0
6		1458	721.10	.48	1.30	1.30	160	239	57	83	8.0

AGS AIR CONSULTING & ENGINEERING, INC.

TEST ID SCSC3A9

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	METER ORIFICE PRESS. DIFF. ("H_2O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-7		1500	722.35	.38	1.03	1.03	158	240	58	83	7.0
8		1502	723.22	.45	1.22	1.22	158	240	58	83	7.0
9		1504	724.47	.44	1.19	1.19	158	244	57	83	7.0
10		1506	725.31	.35	.95	.95	158	245	57	83	7.0
11		1508	726.46	.30	.81	.81	157	250	59	83	6.5
12		1510	727.15	.25	.68	.68	157	250	59	83	6.0
2-1		1514	728.25	.38	1.03	1.03	153	260	61	84	7.0
2		1516	729.40	.40	1.08	1.08	156	261	60	84	8.0
3		1518	730.36	.45	1.22	1.22	157	261	60	84	9.0
4		1520	731.46	.45	1.22	1.22	158	263	59	85	9.0
5		1522	732.61	.43	1.16	1.16	158	261	59	85	9.0
6		1524	733.75	.57	1.54	1.54	158	260	59	85	10.5
7		1526	735.40	.64	1.73	1.73	159	258	59	85	12.0
8		1528	736.40	.50	1.35	1.35	159	254	59	86	11.0
9		1530	737.51	.35	.95	.95	157	251	59	86	8.0
10		1532	738.40	.32	.86	.86	158	250	59	86	7.5
11		1534	739.43	.28	.76	.76	158	250	59	86	6.0
12		1536	740.33	.28	.76	.76	156	250	59	86	6.0
1-1		1540	741.06	.52	1.40	1.40	159	249	63	87	10.0
2		1542	742.17	.53	1.43	1.43	160	249	60	87	11.0
3		1544	743.52	.65	1.76	1.76	166	257	59	87	14.0
4		1546	744.81	.78	2.11	2.11	168	264	59	87	17.0
5		1548	746.30	.75	2.03	2.03	168	261	60	87	17.0
6		1550	747.80	.58	1.57	1.57	167	256	61	87	16.5
7		1552	749.10	.67	1.81	1.81	169	253	61	87	16.5

AVISE AIR CONSULTING & ENGINEERING, INC.

TEST ID SC5C3A

PAGE 3 OF 3

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (ft.^{3})	STACK VELOCITY HEAD	METER ORIFICE PRESS. DIFF. ("H_2O) CALC.	METER ORIFICE PRESS. DIFF. ("H_2O) ACTUAL	STACK GAS TEMP. (°F)	SAMPLE BOX TEMP. (°F)	LAST IMPINGER TEMP. (°F)	DRY GAS METER TEMP. (°F)	VACUUM ON SAMPLE TRAIN ("Hg)
1-8		1554	750.39	.61	1.65	1.65	167	253	61	88	15.0
9		1556	751.50	.38	1.03	1.03	165	258	61	88	12.0
10		1558	752.57	.25	.68	.68	164	254	60	89	9.5
11		1600	753.20	.20	.54	.54	163	256	61	88	9.5
12		1602	754.00	.16	.43	.43	162	257	61	88	9.5
2-1		1607	754.91	.55	1.49	1.49	164	255	63	88	14.5
2		1609	756.11	.57	1.54	1.54	165	252	61	88	15.0
3		1611	757.32	.65	1.76	1.76	165	249	59	88	18.0
4		1613	758.62	.70	1.89	1.89	165	247	60	88	20.0
5		1615	760.12	.75	2.03	1.85	165	247	60	88	21.0
6		1617	761.32	.60	1.62	1.62	165	247	60	88	18.5
7		1619	762.52	.55	1.49	1.49	166	255	62	88	18.0
8		1621	764.01	.64	1.73	1.73	169	264	62	88	21.0
9		1623	765.22	.55	1.49	1.49	168	269	62	88	20.0
10		1625	766.30	.47	1.27	1.27	166	270	62	88	17.0
11		1627	767.40	.35	.95	.95	168	271	62	88	14.5
12		1629	768.65	.32	.86	.86	165	273	62	88	14.5

APPENDIX C

LABORATORY ANALYSIS

AIR CONSULTING & ENGINEERING, inc.

PARTICULATE LAB DATA

SOURCE SUGAR GROWER'S CO-OP UNIT #5

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK	
CONTAINER NUMBER	5-4	5-11	5-14	5-44A	
TOTAL VOLUME (ml)	250	177	174	100	LIQUID LEVEL ✓
1st GROSS WEIGHT (g)	106.5151	105.29311	103.5933	110.6280	DATE & TIME: 11-22-91 16:40
2nd GROSS WEIGHT (g)	106.5151	105.2929	103.5930	110.6282	DATE & TIME: 11-24-91 10:50
AVERAGE GROSS WEIGHT (g)	106.5151	105.2930	103.5932	110.6281	
TARE WEIGHT (g)	106.4859	105.25831	103.5741	110.6280	
SUB NET WEIGHT (g)	.0292	.0347	.0191	.0001	
ACETONE BLANK (g)	—	—	—	—	
TOTAL NET WEIGHT (mg)	29.2	34.7	19.1	.1	

244.6
19.1
253.7

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.

34.7 mg (3.6)

FILTER	RUN 1	RUN 2	RUN 3	BLANK	
FILTER NUMBER	3470	3510	3511	3472	
1st GROSS WEIGHT (g)	0.6712	0.6631	0.6449	0.4202	DATE & TIME: 11-21-91 0950
2nd GROSS WEIGHT (g)	0.6710	0.6632	0.6446	0.4201	DATE & TIME: 11-23-91 1200
AVERAGE GROSS WEIGHT (g)	0.6711	0.6632	0.6448	0.4202	
TARE WEIGHT (g)	0.4238	0.4257	0.4202	0.4203	
SUB NET WEIGHT (g)	0.2473	0.2375	0.2446	-.0001	
TOTAL NET WEIGHT (mg)	247.3	237.5	244.6	-.1	

237.5
34.6
272.1

TARE BALANCE CHECK

SEE LAB BOOK

1st GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓
0.5 g ✓ 100.0g ✓
%RH 66 DATE 11-22-91
Signature Christy L. Nick

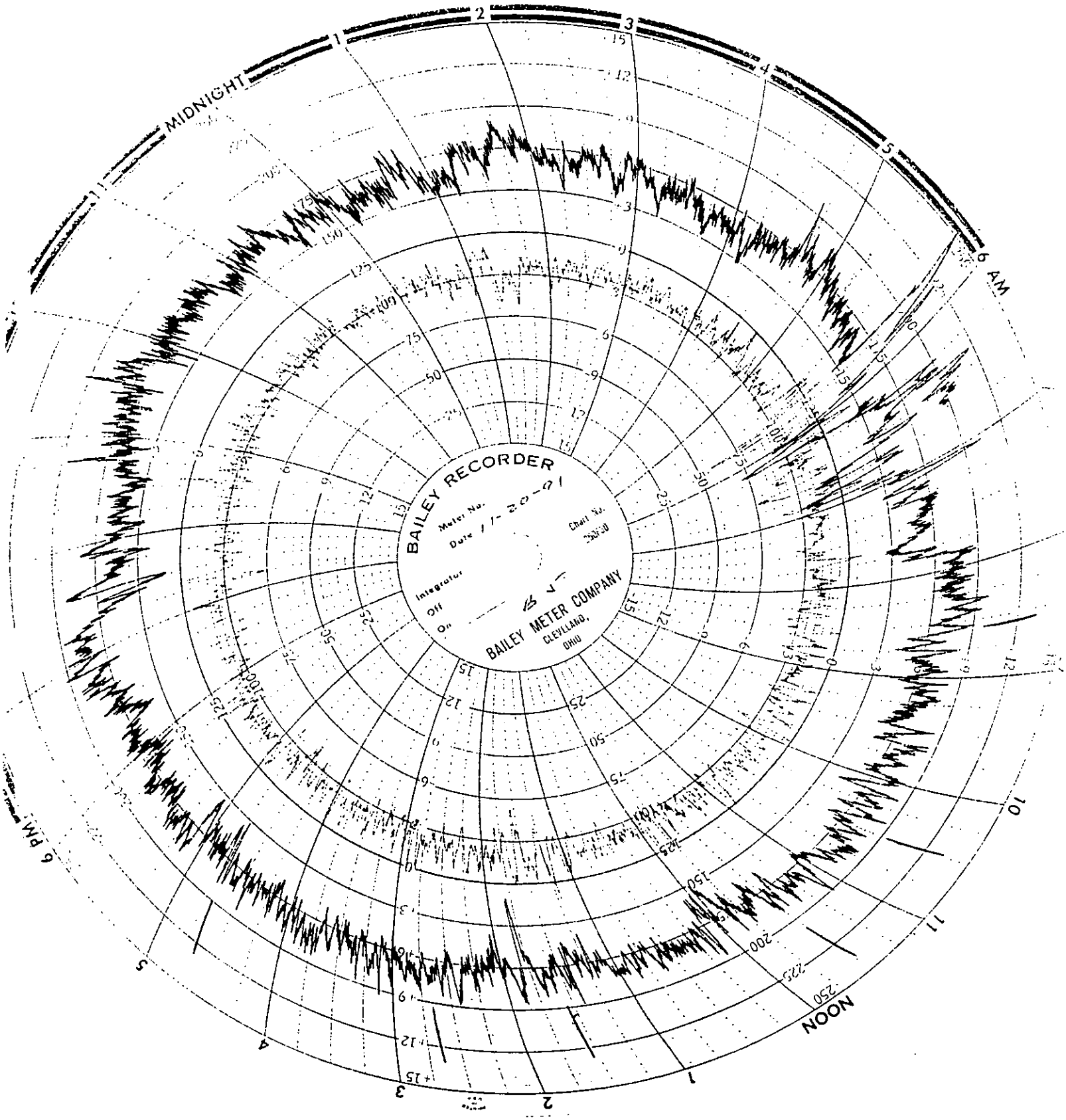
272.1

2nd GROSS WEIGHT BALANCE CHECK

0 ✓ 10.0g ✓
0.5g ✓ 100.0g ✓
%RH 66 DATE 11-24-91
Signature Christy L. Nick

APPENDIX D

PRODUCTION RATE CERTIFICATION


MIDNIGHT
6 AM
NOON
6 PM
BAILEY RECORDER
Meter No.
Date
Chart No.
Integrator
Off
On
BAILEY METER COMPANY
CLEVELAND, OHIO

AIR CONSULTING & ENGINEERING.INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-20-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	0828-1022

TIME INTERVAL	114	MINUTES
OIL:		
FINAL OIL	2955	
BEGIN OIL	2510	
FACTOR	1	
STEAM:		
FINAL STEAM	123896	
BEGIN STEAM	123761	
FACTOR	2500	
TEMPERATURE	580	DEGREES F
PRESSURE	409	PSIG
	424	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1293.0	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1064.4	BTU/LB
STEAM RATE	177632	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	302.51	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	234.21	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	35.13	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	267.38	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.25	LB/MMBTU
TOTAL ALLOWABLE EMISSION	70.36	LB/HR
TOTAL ACTUAL EMISSION	52.59	LB/HR
TOTAL ALLOWABLE EMISSION	0.233	LB/MMBTU
TOTAL ACTUAL EMISSION	0.174	LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Fla. BOILER NUMBER 5

DATE 11-20-91 RUN NUMBER 1 OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 2500 SCRUBBER(S) PRESS.DROP ____, ___

SCRUBBER(S) GPM _____, _____

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

Ph(if applicable) _____, _____

INITIAL INTEGRATOR 123761 FINAL INTEGRATOR 123896

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
8:28	2510	170000	580	410	260	600
8:48		170000	580	410	260	600
9:08		175000	580	410	260	600
9:28		180,000	580	410	260	600
9:48		180,000	580	400	260	600
10:08		175000	580	400	260	600
10:22	2955					

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-20-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	1122-1327

TIME INTERVAL	125	MINUTES
OIL:		
FINAL OIL	3670	
BEGIN OIL	3190	
FACTOR	1	
STEAM:		
FINAL STEAM	124115	
BEGIN STEAM	123968	
FACTOR	2500	
TEMPERATURE	580	DEGREES F
PRESSURE	425	PSIG
	440	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1291.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1063.1	BTU/LB
STEAM RATE	176400	LB/HR
BOILER EFFICIENCY	62.5	%
TOTAL FUEL HEAT INPUT	300.05	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	230.40	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	34.56	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	265.49	MMBTUH
Bagasse only		
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.25	LB/MMBTU
TOTAL ALLOWABLE EMISSION	69.83	LB/HR
TOTAL ACTUAL EMISSION	51.53	LB/HR
TOTAL ALLOWABLE EMISSION	0.233	LB/MMBTU
TOTAL ACTUAL EMISSION	0.172	LB/MMBTU

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Fla BOILER NUMBER 5

DATE 11-20-91 RUN NUMBER 2 OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 2500 SCRUBBER(S) PRESS.DROP ___,___

SCRUBBER(S) GPM ___,___

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

Ph(if applicable) ___,___

INITIAL INTEGRATOR 123968 FINAL INTEGRATOR ~~123~~ 124115

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
11:22	3190	180000	580	420	260	600
1142		170000	580	410	260	600
1202		180000	580	425	260	600
1222		185000	580	430	260	600
1242		180000	580	425	260	600
1:02		170000	580	420	260	600
1:22		185000	580	430	260	600
1:27	3670					

AIR CONSULTING & ENGINEERING, INC.
Complete Emission Data

PLANT:	SUGAR CANE GROWERS COOPERATIVE	DATE:	11-20-91
LOCATION:	BELLE GLADE, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	1431-1633

TIME INTERVAL	122	MINUTES
OIL:		
FINAL OIL	4395	
BEGIN OIL	3915	
FACTOR	1	
STEAM:		
FINAL STEAM	124337	
BEGIN STEAM	124190	
FACTOR	2500	
TEMPERATURE	580	DEGREES F
PRESSURE	425	PSIG
	440	PSIA
FEEDWATER:		
TEMPERATURE	260	DEGREES F
PRESSURE	600	PSIG
	615	PSIA
HEAT INPUT:		
STEAM	1291.7	BTU/LB
FEEDWATER	228.6	BTU/LB
NET STEAM	1063.1	BTU/LB
STEAM RATE	180738	LB/HR
BOILER EFFICIENCY	62.3	%
TOTAL FUEL HEAT INPUT	307.43	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	236.07	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	35.41	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	272.02	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.25	LB/MMBTU
TOTAL ALLOWABLE EMISSION	71.55	LB/HR
TOTAL ACTUAL EMISSION	49.97	LB/HR
TOTAL ALLOWABLE EMISSION	0.233	LB/MMBTU
TOTAL ACTUAL EMISSION	0.163	LB/MMBTU

Avg
233.56

35.03
268.30
303.33

BOILER OPERATION PARAMETERS

PLANT Sugar Cane Growers Coop. of Fla. BOILER NUMBER 5

DATE 11-20-91 RUN NUMBER 3 OIL METER FACTOR 1

STEAM INTEGRATOR FACTOR 2500 SCRUBBER(S) PRESS.DROP ___, ___

SCRUBBER(S) GPM ___, ___

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

Ph(if applicable) ___, ___

INITIAL INTEGRATOR 124190 FINAL INTEGRATOR 124337

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
	~~3194~~					
14:31	3915	185000	580	430	260	600
2:51		180000	580	425	260	600
3:11		180000	580	425	260	600
3:31		180000	580	420	260	600
3:51		175000	580	425	260	600
4:01		180000	580	420	260	600
4:21		185000	580	430	260	600
4:33	4395					

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:

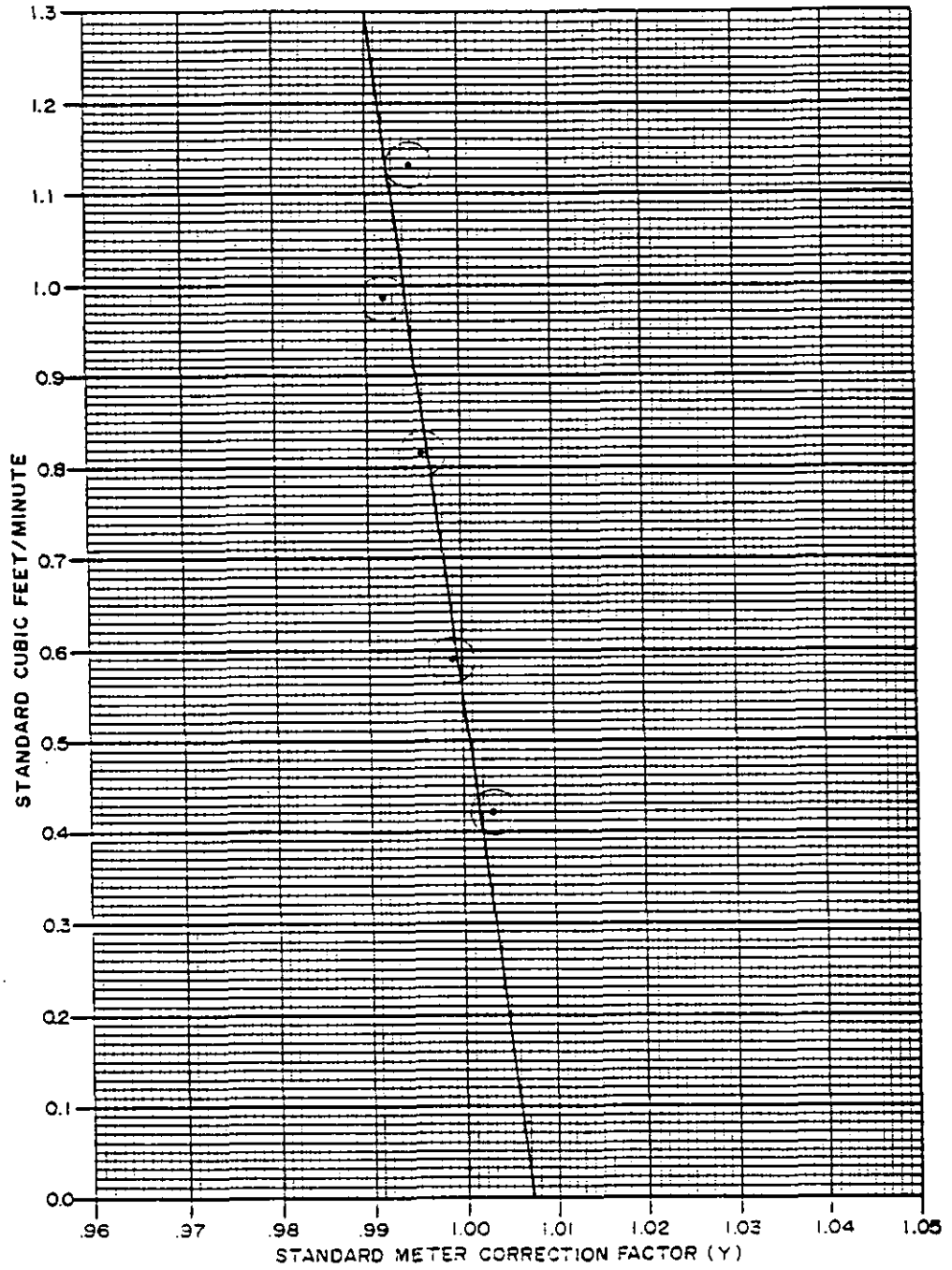
$$Y_a \times Y_s = Y$$

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 104616

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 ft^3	INITIAL	FINAL	ACTUAL ft^3			
-.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
-.35	-.96	2.853	8.143	5.290	16.801	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	0.713	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: J. 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: Gary 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 Grower's 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 $\left[\frac{(\text{REF. TEMP. °F} + 460°) - (\text{PYROMETER TEMP. °F} + 460°)}{\text{REF. TEMP. °F} + 460°}\right] \cdot 100 \leq 1.5\%$

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

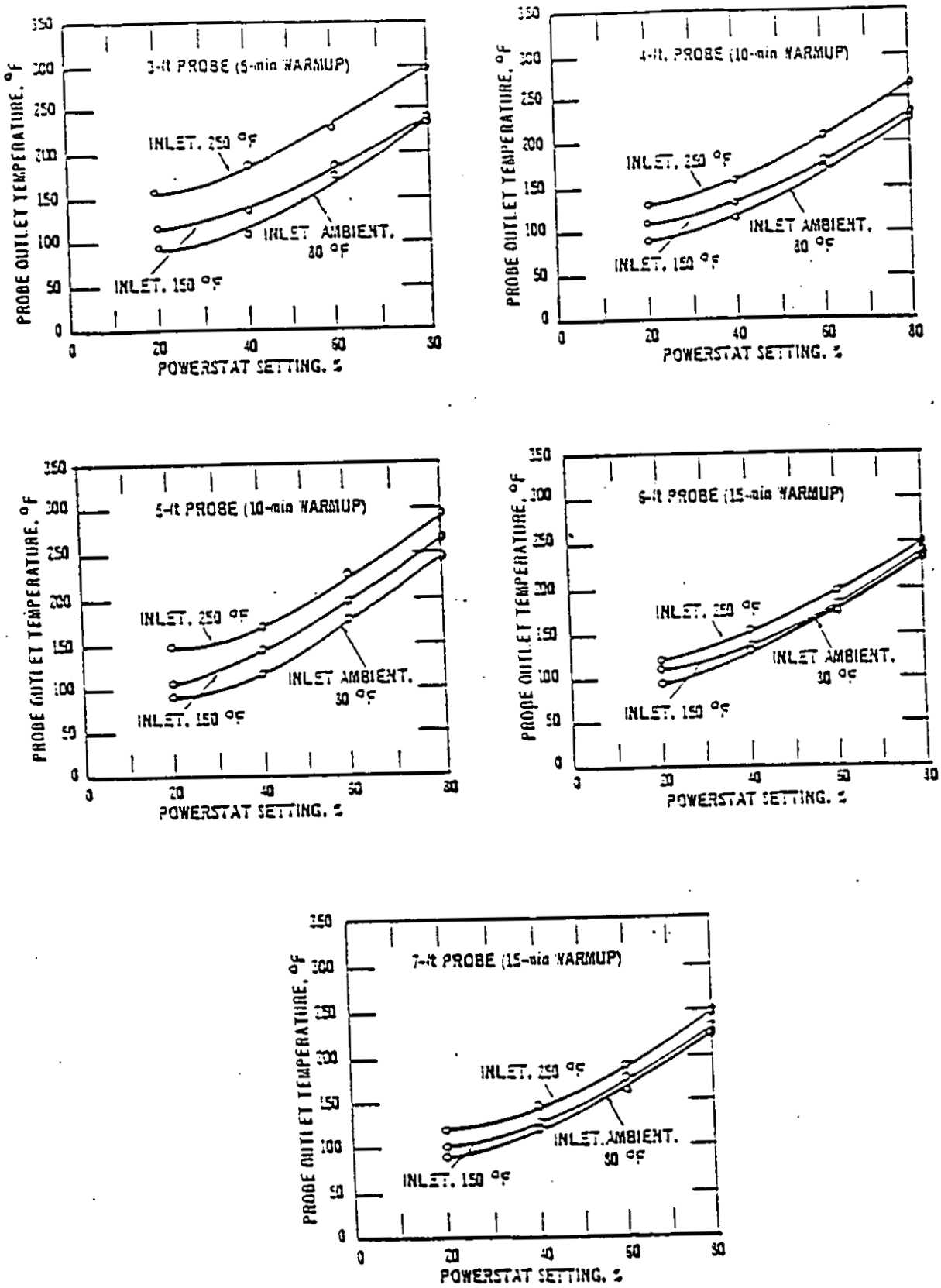
THERMOCOUPLE CALIBRATION

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 6° 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 Cane Growers TEST DATE 11-20-91
SOURCE NAME Boiler # 5 SAMPLE RECOVERED BY Gerard
TYPE OF SAMPLE PM PARTICULATE ANALYSES BY Christy

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	3470	—	Med. Gray	
1	S-4	✓	clear	
2	3510	—	DK. Gray	
2	S-11	✓	clear	
3	3511	—	DK. Gray	
3	S-14	✓	clear	
ACETONE / WATER BLANK (CIRCLE)	S-44A	✓	clear	
FILTER BLANK	3472	—	White	

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	9	211.6	200.0	11.6	OK
2	32	211.9	200.0	11.9	OK
3	45	211.4	200.0	11.4	OK
			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

Sterling Jordan
Test Observer

PALM BEACH COUNTY

Jeffrey K. Koerner
Test Observer

David Brown
Test Observer