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: 21

Title: Source Test Report For Particulate Emissions Impingement Wet Scrubber Number 5 Boiler: United States Sugar Cane Corporation

January 1991

SOURCE TEST REPORT
for
PARTICULATE EMISSIONS

IMPINGEMENT WET SCRUBBER
NUMBER 5 BOILER

UNITED STATES SUGAR CORPORATION
BRYANT, FLORIDA

JANUARY 13, 1991

PREPARED FOR:
U. S. SUGAR CORPORATION
CLEWISTON, FLORIDA

PREPARED BY:
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TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1
2.0	SUMMARY AND DISCUSSION OF RESULTS	2
3.0	PROCESS DESCRIPTION AND OPERATION	4
4.0	SAMPLING POINT LOCATION	5
5.0	FIELD AND ANALYTICAL PROCEDURES	7

APPENDICES

APPENDIX A--COMPLETE EMISSION DATA AND SAMPLE CALCULATIONS

APPENDIX B--FIELD DATA SHEETS

APPENDIX C--LABORATORY ANALYSES

APPENDIX D--QUALITY ASSURANCE AND CHAIN OF CUSTODY

APPENDIX E--PRODUCTION RATE CERTIFICATION

APPENDIX F--PROJECT PARTICIPANTS

LIST OF TABLES

TABLE

1 SUMMARY OF PARTICULATE MATTER EMISSIONS.....3

LIST OF FIGURES

FIGURE

1 SAMPLING POINT LOCATION.....6

2 EPA 5 SAMPLING TRAIN.....8

air consulting and engineering, Inc.

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.

Stephen L. Neck

Stephen L. Neck, P.E.

State of Florida
Registration No. 20020

March 4, 1991

Date

SEAL

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1.0 INTRODUCTION

Personnel from Air Consulting and Engineering, Inc.(ACEI) performed annual source emission compliance testing for the U. S. SUGAR CORPORATION (USSC) on January 13, 1991. Testing was performed at the Bryant Sugar Mill Number 5 Boiler wet scrubber outlet.

Testing was designed to fulfill "specific conditions" of the current Florida Department of Environmental Regulation (FDER) operating permit.

Three United States Environmental Protection Agency (USEPA) Method 5 particulate matter (PM) test runs were conducted while the plant was documented to be operating within 10% of permitted production.

Mr Peter Barquin of USSC served as test coordinator while Mr. Augusto Blanchard of USSC certified production rates.

Mr. Ken Tucker of the Florida Department of Environmental Regulation and Mr. Jeff Koerner of the Palm Beach County Health Department witnessed most of the testing period.

2.0 SUMMARY and DISCUSSION of RESULTS

Results of the emission testing are provided in Table 1. Complete emission data are located in the report appendices.

The source was found to be operating within full compliance of permit conditions. Stack emissions averaged 66.833 pounds per hour (LB/HR) and 0.127 pounds per million btu(LB/MMBTU) heat input against a "process rate" basis allowable emission of 0.150 LB/MMBTU. Permit conditions limit emissions to 0.10 LB/MMBTU from oil and 0.150 LB/MMBTU from bagasse firing. No oil was used during compliance testing.

Production rate summaries are provided in Appendix A. These data were taken from control room recordings of steam flow, temperature, and pressure as well as feedwater temperature and pressure(Appendix E). Steam integrator readings were recorded at the beginning and end of each particulate test run by Mr. Stephen L. Neck of ACEI.

TABLE 1
EMISSION SUMMARY
U. S. SUGAR CORPORATION
NUMBER 5 BOILER
JANUARY 13, 1991

RUN NUMBER	TIME	ACTUAL EMISSIONS		ALLOWABLE EMISSIONS	
		LB/HR	LB/MMBTU	LB/HR	LB/MMBTU
1	0729-0831 62	59.666	0.114	78.27	0.150
2	0933-1035 62	72.445	0.137	79.34	0.150
3	1144-1246 62	68.388	0.129	79.45	0.150
AVERAGES	---------	66.833	0.127	79.02	0.150

3.0 PROCESS DESCRIPTION AND OPERATION

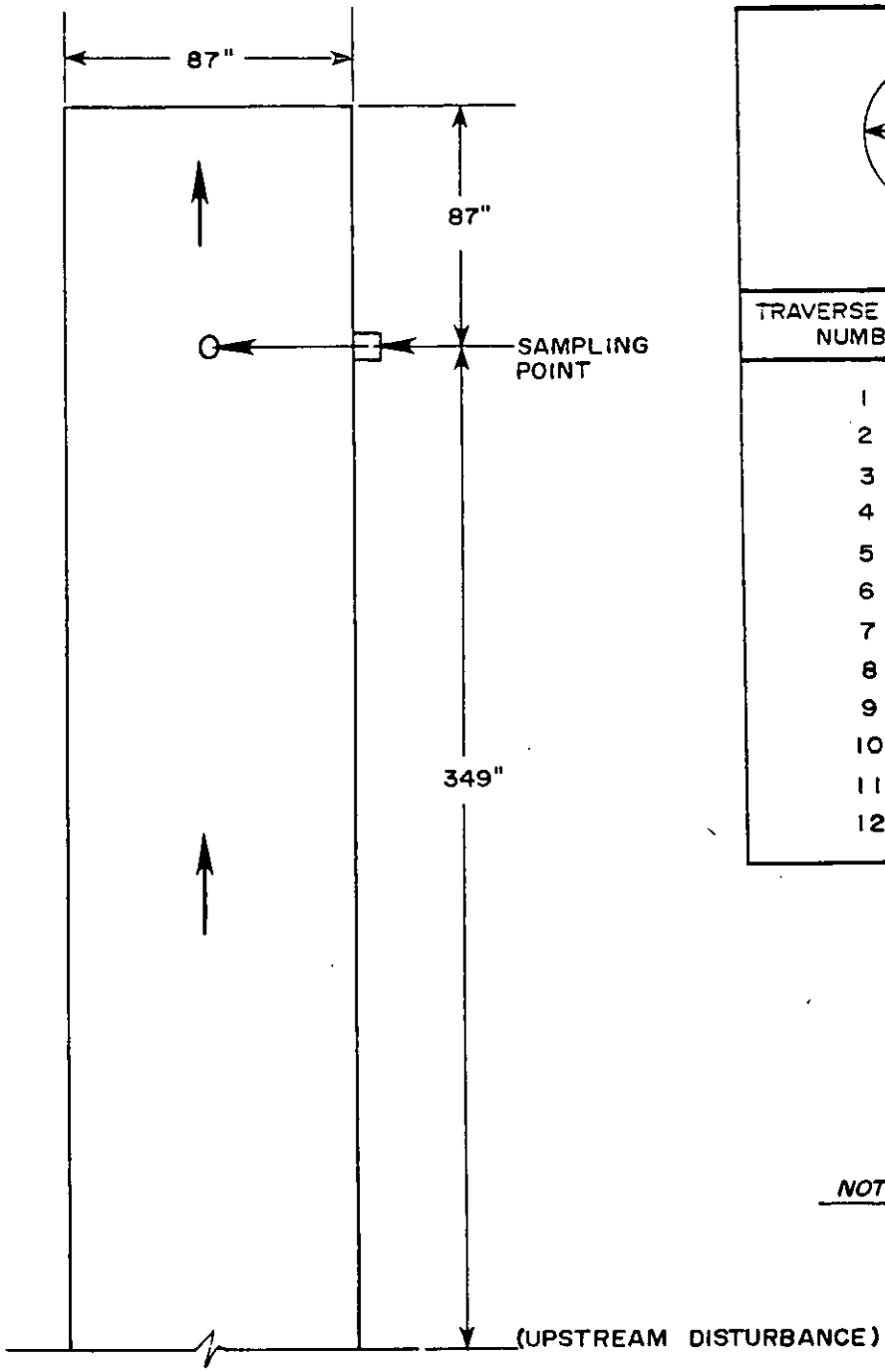
The Number 5 Boiler at the U. S. Sugar Corporation's Bryant plant is a vibrating grate stoker design used primarily for bagasse fuel firing. Supplemental oil firing was not used during the emission test series. The boiler averaged 243095 pounds per hour steam production over the three run test period.

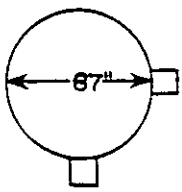
Oil meters, steam integrators, and other production monitoring devices were rigorously calibrated prior to the production season.

4.0 SAMPLING POINT LOCATION

The sampling point location is a single scrubber outlet stack with an 87" diameter. The stack has 2 sampling ports spaced 90 degrees apart. The ports are located 349" from an upstream disturbance and 87" from the outlet.

Twenty-four test points were sampled for each test run. The traverse were located as shown in Figure 1. The stack configuration is such that there is no reason to evaluate the presence of cyclonic flow.





TRAVERSE POINT NUMBER	INCHES INSIDE STACK WALL
1	1.9
2	5.8
3	10.3
4	15.4
5	21.8
6	30.9
7	56.1
8	65.3
9	71.6
10	76.7
11	81.2
12	85.1

NOT TO SCALE

FIGURE 1.
SAMPLING POINT LOCATION
BRYANT-BOILER NO. 5
U.S. SUGAR CORPORATION
PAHOKEE, FLORIDA

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5.0 FIELD and ANALYTICAL PROCEDURES- USEPA METHOD 5

Particulate matter samples were collected by the emission measurement method specified by the United States Environmental Protection Agency. A schematic diagram of the sampling train used is provided 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" glass fiber 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 value.

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 pror to the test program. All openings on the equipment were sealed while in transit to the test site.

3. IMPINGERS - The Greenburg-Smith impingers were cleaned, rinsed, and dried as in 2. The impingers were also sealed during transit.

TEST PROCEDURE

Prior to performing the actual particulate matter sample runs, certain stack and stack gas parameters were measured. These preliminary measurements included the average gas temperature, the stack gas velocity head, the stack gas moisture content, and the dimensions at the point where the tests were to be performed. The stack temperature was determined using a bi-metallic thermocouple and calibrated

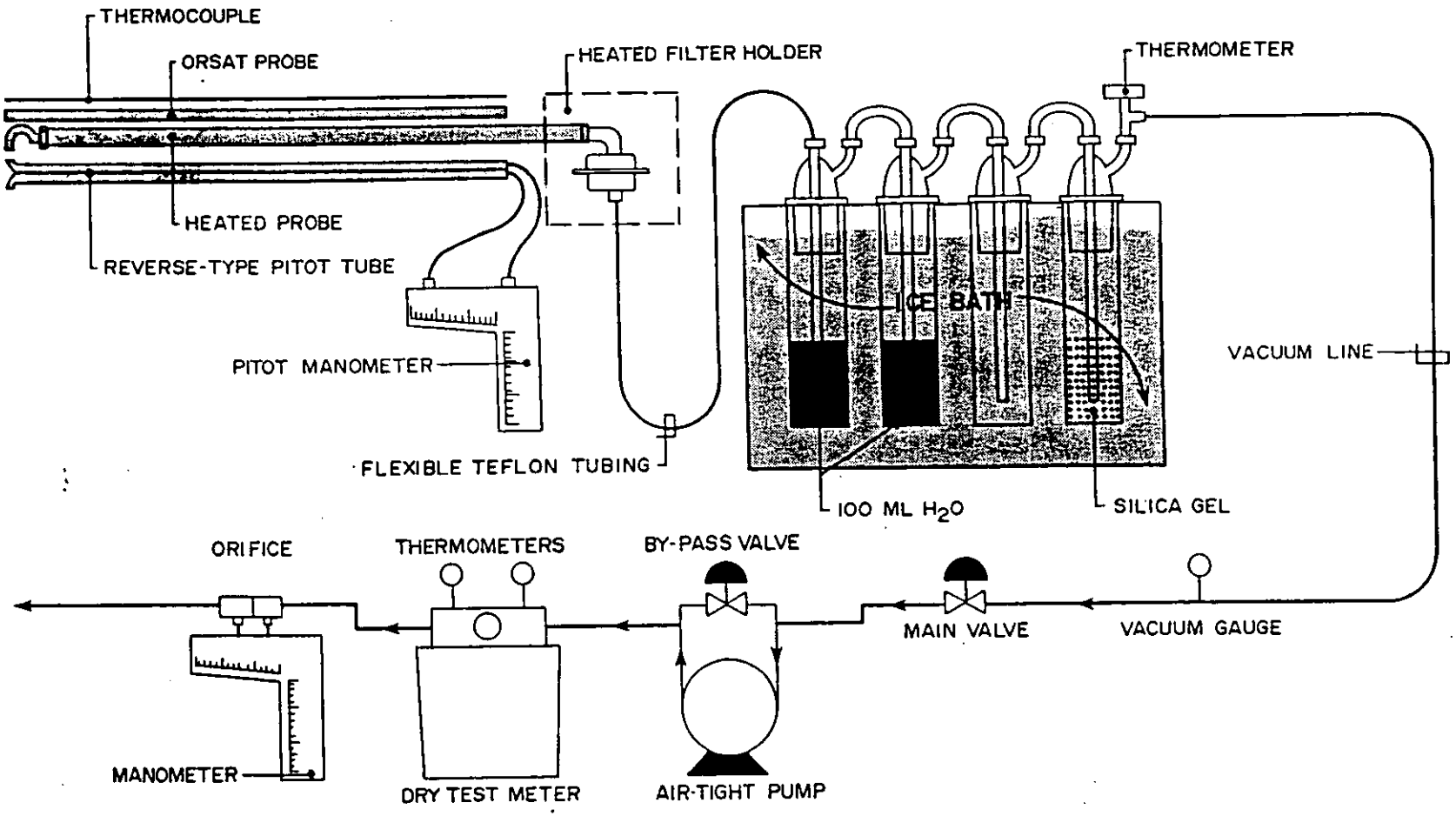

FIGURE 2
EPA METHOD 5 SAMPLING TRAIN

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pyrometer. Velocity head measurements were made with a calibrated type "s" pitot tube and an inclined manometer. Velocity head measurements of 0.05 inches H2O or less were measured using a micromonometer.

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 or downstream from flow disturbances.USEPA Methods 1 and 2 were utilized for this task.

Each particulate matter test run consisted of sampling for a specific amount of time at each 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 conducting the test run. The stack gas temperature was also measured at each traverse point. Together with assumed moisture and orsat knowledge as well as known nozzle area, calculations of "isokinetic" (equal energy or velocity) were quickly made and effected for each traverse point during the test run.

The gases sampled passed through the following components: a stainless steel nozzle and glass probe; a glass fiber filter; two impingers charged with 100 ml of distilled water each; one dry impinger; one impinger with 200 grams of silica gel desiccant; a flexible length of tubing; a leak free pump; a calibrated dry gas meter: and, finally, a calibrated flow orifice.

Sample recovery was accomplished in the following manner:

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. The container was then 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 content of the stack gases, then discarded.

4. The 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 either dried for two hours at 105 degrees C or desiccated for 24 hours at ambient temperature. Following desiccation, the filter was weighed to the nearest 0.1 mg. A minimum of two such weighings six hours apart were made with a variance of less than 0.5 mg.

2. The acetone from Container 2 was transferred to a tared beaker, evaporated to dryness, and weighed in the same manner as above.

3. The used silica gel in its tared container was weighed to the nearest 0.1 gram.

The total sample weight included the weight gains from Sample Containers 1 and 2.

DATA

All relevent field and lab data sheets as well as emission calculations are provided in the report appendices.

APPENDIX A

COMPLETE EMISSION DATA

AND

SAMPLE CALCULATIONS

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Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-13-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	1
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	0727-0834

TIME INTERVAL	67	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	546136	
BEGIN STEAM	546059	
FACTOR	3500	
TEMPERATURE	910	DEGREES F
PRESSURE	850	PSIG
	865	PSIA
FEEDWATER:		
TEMPERATURE	300	DEGREES F
PRESSURE	1255	PSIG
	1270	PSIA
HEAT INPUT:		
STEAM	1458.7	BTU/LB
FEEDWATER	269.6	BTU/LB
NET STEAM	1189.1	BTU/LB
STEAM RATE	241343	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	521.78	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	0.00	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	0.00	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	521.78	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.15	LB/MMBTU
TOTAL ALLOWABLE EMISSION	78.27	LB/HR
TOTAL ACTUAL EMISSION	59.66	LB/HR
TOTAL ALLOWABLE EMISSION	0.150	LB/MMBTU
TOTAL ACTUAL EMISSION	0.114	LB/MMBTU

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 5 BOILER
DATE: 1-13-91

RUN NO.:	1	IMPINGER ml	230
BEGIN TIME:	0729	SILICA GEL gms.	6.2
END TIME:	0831	PERCENT O2	10.5
TOTAL RUN TIME:	60.00 min.	PERCENT CO2	9.8
BAROMETRIC PRESSURE:	30.10 "Hg		0
STACK PRESSURE:	30.15 "Hg.		
NOZZLE DIAMETER:	.175 inches	PARTICULATE	
METER CORR. FACTOR:	.994	---	
FINAL METER:	468.707 cubic ft.	FILTER mg.	105.7
INITIAL METER:	433.055 cubic ft.	WASH mg.	3.6
STACK AREA:	41.283 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	1.100	1.049	.770	151	68
-2	1.100	1.049	.770	159	68
-3	1.140	1.068	.770	160	68
-4	1.350	1.162	.950	160	68
-5	1.450	1.204	1.000	161	69
-6	1.800	1.342	1.250	162	70
-7	3.750	1.936	2.600	162	70
-8	4.400	2.098	3.100	163	71
-9	4.400	2.098	3.100	162	72
-10	4.000	2.000	2.600	163	73
-11	3.800	1.949	2.500	162	74
-12	3.900	1.975	1.900	160	75
2-1	1.500	1.225	1.000	161	76
-2	1.250	1.118	.800	161	77
-3	1.500	1.225	1.000	162	77
-4	1.500	1.225	1.000	162	77
-5	1.750	1.323	1.150	162	78
-6	2.350	1.533	1.500	162	78
-7	2.350	1.533	1.500	162	79
-8	2.250	1.500	1.450	162	80
-9	2.000	1.414	1.300	162	80
-10	1.700	1.304	1.100	162	80
-11	1.700	1.304	1.100	157	81
-12	1.250	1.118	.800	156	81
AVERAGES	2.220	1.448	1.46	161	75

EMISSION RESULTS
RUN 1

NOZZLE AREA (FT2) :0.0001670				
AVG. VELOCITY HEAD :--------	2.10	"H2O	VOL. FLOW ACFM :	224468
AVG. STACK TEMP.: ---------	161	F	VOL. FLOW SCFMD :	145837
AVG. METER TEMP.: ---------	75	F		
AVG. ORIFICE DIFFERENTIAL:---	1.46	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	35.338			
% H2O VAPOR: :--------	24.1		POUNDS PER HOUR:	59.666
GAS MOL. WT. DRY: ---------	29.99		POUNDS PER SCF :	0.0000068
GAS MOL. WT. WET: ---------	27.10		GRAINS/SCF:	0.048
% EXCESS AIR: ---------	99.61		GRAINS/SCF @ 8% O2	0.059
AVG. STACK VEL.(FPS)---------	90.62		GRAINS/SCF @50% EA	0.064
MMBTU INPUT: ---------	521.78		POUNDS PER MMBTU:	0.114
PERCENT ISOKINETIC :---------	99.81			

SAMPLE CALCULATIONS - RUN 1

NOZZLE AREA (FT.2)	(Dn/12)!2x3.1416/4	0.000167
AVG.VELOCITY HEAD:	(AVG.SQ.RT.)!2	90.65
METER STND. FT3:	(Mf-Mi)xMCFx(AVG.ORF.DIFF./ 13.6))/29.92)x(528/(Tm+460))	35.310
PERCENT H2O:	((IMP+SG)x(((IMP+SG)x.0474)+ SCF)x100	
Mw DRY:	((O2%x.32)+CO2%x.44)+(100-(O2%+CO2)x.28	29.99
Mw WET:	(Mw DRYx(1-%H2O/100))+%H20x.18	27.10
% EXCESS AIR:	%O2/(((100-(%O2+%CO2))x.264)-%O2)* 100	99.61
STACK VEL.(FPS):	85.49x.84x(AVG.SQ.RT.VEL.HD.)x((Ts +460)/(PsxMwWET))!.5	90.65
% ISOKINETIC:	((Ts+460)xSCFx2992)/(528xFPSxTIMEx An xPs x 60x(1-%O2/100)	99.61
VOL. FLOW (ACFM):	FPS x 60 x As	224549
STND. FLOW(SCFMD):	ACFMx528/(Ts+460)x(1-%H20/100)x (Ps/29.92)	146026
PARTICULATE LB/HR:	PROBE+FILTER mg./453600 x (SCFMD/ SCF) x 60	59.790
PARTICULATE LB/SCF):	PROBE+FILTER mg./453600 /SCF	0.0000068
GRAINS/SCF:	LB/SCF x 7000	0.0478
GR/SCF @ 8% O2:	(12.9/(20.9-%O2))x GR/SCF	0.0593
GR/SCF @ 50% E.A.:	GR/SCF x ((100+ %E.A.)/150)	0.0636
LB/MMBTU:	(LB/HR)/(LB/MMBTUH)	0.115
LB/MMBTU "F" FACTOR:	LB/SCF x "F" FACTOR x (20.9 /20.9-%O2)	0.000

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-13-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	2
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	0931-1039

TIME INTERVAL	68	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	546280	
BEGIN STEAM	546201	
FACTOR	3500	
TEMPERATURE	916	DEGREES F
PRESSURE	860	PSIG
	875	PSIA
FEEDWATER:		
TEMPERATURE	300	DEGREES F
PRESSURE	1250	PSIG
	1265	PSIA
HEAT INPUT:		
STEAM	1462.0	BTU/LB
FEEDWATER	269.6	BTU/LB
NET STEAM	1192.4	BTU/LB
STEAM RATE	243971	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	528.93	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	0.00	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	0.00	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	528.93	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.15	LB/MMBTU
TOTAL ALLOWABLE EMISSION	79.34	LB/HR
TOTAL ACTUAL EMISSION	72.44	LB/HR
TOTAL ALLOWABLE EMISSION	0.150	LB/MMBTU
TOTAL ACTUAL EMISSION	0.137	LB/MMBTU

AIR CONSULTING and ENGINEERING
COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 5 BOILER
DATE: 1-13-91

RUN NO.:	2	IMPINGER ml	250
BEGIN TIME:	933	SILICA GEL gms.	6.0
END TIME:	1035	PERCENT O2	10.5
TOTAL RUN TIME:	60.00 min.	PERCENT CO2	9.8
BAROMETRIC PRESSURE:	30.10 "Hg		
STACK PRESSURE:	30.15 "Hg.		
NOZZLE DIAMETER:	.175 inches	PARTICULATE	
METER CORR. FACTOR:	.994		
FINAL METER:	505.346 cubic ft.	FILTER mg.	130.4
INITIAL METER:	468.901 cubic ft.	WASH mg.	4.2
STACK AREA:	41.283 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	1.100	1.049	.700	155	75
-2	1.150	1.072	.750	158	75
-3	1.250	1.118	.800	158	75
-4	1.250	1.118	.800	159	75
-5	1.400	1.183	.900	161	75
-6	2.100	1.449	1.350	160	75
-7	3.800	1.949	2.500	159	76
-8	4.400	2.098	2.900	159	77
-9	4.250	2.062	2.800	158	77
-10	3.800	1.949	2.500	159	78
-11	3.600	1.897	2.350	159	79
-12	3.300	1.817	2.150	157	80
2-1	1.350	1.162	.880	158	81
-2	1.350	1.162	.880	159	81
-3	2.000	1.414	1.300	159	81
-4	1.800	1.342	1.200	159	81
-5	2.400	1.549	1.550	159	82
-6	2.750	1.658	1.800	159	82
-7	2.750	1.658	1.800	159	82
-8	2.250	1.500	1.500	158	83
-9	1.750	1.323	1.150	159	83
-10	1.700	1.304	1.100	159	84
-11	1.400	1.183	.900	159	84
-12	1.250	1.118	.800	154	85
AVERAGES	2.256	1.464	1.47	158	79

EMISSION RESULTS
RUN 2

NOZZLE AREA (FT2) :0.0001670				
AVG. VELOCITY HEAD :--------	2.14	"H2O	VOL. FLOW ACFM :	227183
AVG. STACK TEMP.: ---------	158	F	VOL. FLOW SCFMD :	145675
AVG. METER TEMP.: ---------	79	F		
AVG. ORIFICE DIFFERENTIAL:---	1.47	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	35.801		---	
% H2O VAPOR: :--------	25.3		POUNDS PER HOUR:	72.445
GAS MOL. WT. DRY: ---------	29.99		POUNDS PER SCF :	0.0000083
GAS MOL. WT. WET: ---------	26.95		GRAINS/SCF:	0.058
% EXCESS AIR: ---------	99.61		GRAINS/SCF @ 8% O2	0.072
AVG. STACK VEL.(FPS)---------	91.72		GRAINS/SCF @50% EA	0.077
MMBTU INPUT: ---------	528.93		POUNDS PER MMBTU:	0.137
PERCENT ISOKINETIC :---------	101.23			

AIR CONSULTING & ENGINEERING,INC.
Complete Emission Data

PLANT:	U. S. SUGAR CORPORATION	DATE:	1-13-91
LOCATION:	BRYANT, FLORIDA	RUN NUMBER	3
SOURCE:	NUMBER 5 BOILER, SCRUBBER OUTLET	TIME:	1141-1249

TIME INTERVAL	68	MINUTES
OIL:		
FINAL OIL	0	
BEGIN OIL	0	
FACTOR	1	
STEAM:		
FINAL STEAM	546430	
BEGIN STEAM	546351	
FACTOR	3500	
TEMPERATURE	920	DEGREES F
PRESSURE	865	PSIG
	880	PSIA
FEEDWATER:		
TEMPERATURE	300	DEGREES F
PRESSURE	1255	PSIG
	1270	PSIA
HEAT INPUT:		
STEAM	1463.7	BTU/LB
FEEDWATER	269.6	BTU/LB
NET STEAM	1194.1	BTU/LB
STEAM RATE	243971	LB/HR
BOILER EFFICIENCY	55.0	%
TOTAL FUEL HEAT INPUT	529.68	MMBTUH
STEAM CALIBRATION FACTOR	1.00	
OIL	0.00	GPH
OIL	150000	BTU/GAL
TOTAL HEAT INPUT (OIL)	0.00	MMBTUH
TOTAL HEAT INPUT (NON-OIL)	529.68	MMBTUH
ALLOWABLES:		
ALLOWABLE EMISSION (OIL)	.10	LB/MMBTU
ALLOWABLE EMISSION (NON-OIL)	.15	LB/MMBTU
TOTAL ALLOWABLE EMISSION	79.45	LB/HR
TOTAL ACTUAL EMISSION	68.38	LB/HR
TOTAL ALLOWABLE EMISSION	0.150	LB/MMBTU
TOTAL ACTUAL EMISSION	0.129	LB/MMBTU

COMPLETE EMISSION DATA

PLANT: U. S. SUGAR CORPORATION-BRYANT
SOURCE: NUMBER 5 BOILER
DATE: 1-13-91

RUN NO.:	3	IMPINGER ml	240
BEGIN TIME:	1144	SILICA GEL gms.	4.4
END TIME:	1246	PERCENT O2	10.5
TOTAL RUN TIME:	60.00 min.	PERCENT CO2	9.8
BAROMETRIC PRESSURE:	30.10 "Hg		
STACK PRESSURE:	30.15 "Hg.		
NOZZLE DIAMETER:	.175 inches	PARTICULATE	
METER CORR. FACTOR:	.994	---	
FINAL METER:	541.650 cubic ft.	FILTER mg.	116.5
INITIAL METER:	505.517 cubic ft.	WASH mg.	8.7
STACK AREA:	41.283 sq. ft.		

PORT-POINT	VELOCITY HEAD	SQUARE RT. VEL. HEAD	ORIF. DIFF.	STACK TEMP.	METER TEMP.
1-1	1.250	1.118	.800	157	77
-2	1.250	1.118	.800	158	77
-3	1.250	1.118	.800	158	77
-4	1.250	1.118	.800	160	77
-5	1.350	1.162	.880	161	77
-6	2.000	1.414	1.300	161	77
-7	3.800	1.949	2.500	161	78
-8	4.500	2.121	2.900	161	79
-9	4.500	2.121	2.900	161	80
-10	4.000	2.000	2.600	161	80
-11	3.800	1.949	2.500	160	81
-12	3.100	1.761	2.000	159	82
2-1	1.350	1.162	.880	159	83
-2	1.550	1.245	1.000	160	83
-3	1.550	1.245	1.000	161	84
-4	1.800	1.342	1.200	160	84
-5	2.100	1.449	1.350	161	85
-6	2.600	1.612	1.700	162	85
-7	2.350	1.533	1.500	161	85
-8	2.250	1.500	1.450	161	86
-9	1.750	1.323	1.150	160	87
-10	1.700	1.304	1.100	161	87
-11	1.400	1.183	.900	160	87
-12	1.300	1.140	.880	156	88
AVERAGES	2.240	1.458	1.45	160	82

EMISSION RESULTS
RUN 3

NOZZLE AREA (FT2) :0.0001670				
AVG. VELOCITY HEAD :--------	2.13	"H2O	VOL. FLOW ACFM :	226205
AVG. STACK TEMP.: ---------	160	F	VOL. FLOW SCFMD :	145893
AVG. METER TEMP.: ---------	82	F		
AVG. ORIFICE DIFFERENTIAL:---	1.45	"H2O	PARTICULATE DATA :	
METER STANDARD CUBIC FEET:---	35.329		---	
% H2O VAPOR: :--------	24.7		POUNDS PER HOUR:	68.388
GAS MOL. WT. DRY: ---------	29.99		POUNDS PER SCF :	0.0000078
GAS MOL. WT. WET: ---------	27.02		GRAINS/SCF:	0.055
% EXCESS AIR: ---------	99.61		GRAINS/SCF @ 8% O2	0.068
AVG. STACK VEL.(FPS)---------	91.32		GRAINS/SCF @50% EA	0.073
MMBTU INPUT: ---------	529.68		POUNDS PER MMBTU:	0.129
PERCENT ISOKINETIC :---------	99.75			

Avg O_2 = 10.5
Temp = 160
Flow rate = 145,802
mmBtu/hr = 527

APPENDIX B

FIELD DATA SHEETS

R12C7

STACK SAMPLING FIELD DATA SHEET

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

TEST ID 1
PAGE 1 OF 2

PLANT U. S. SUGAR CORP. – BRYANT
SOURCE NUMBER 5 BOILER
PLANT LOCATION BRYANT, FLORIDA
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES PARTICULATE (PM)
DATE 1-31-91 RUN NO. 1
TIME START 0729 TIME END 0831
SAMPLE TIME 24 / 2.5 (min/pt) = 60 Total min
ASSUMED MOISTURE 25 % FDA .75
NOMOGRAPH C_f .7 PITOT CORR. .84
P_b 30.10 "Hg P_s 30.15 "Hg
WEATHER _____ TEMP. _____ °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. .175 .175 .175 = .175
STACK DIMENSIONS 87"
STACK AREA 41.283 ft² EFFECTIVE _____ ft²
STACK HEIGHT _____ ft.
STACK DIAMETER: UPSTRM. _____ DNSTRM. _____
PORT SIZE _____ in. NIPPLE LENGTH _____ in.
U CORD LENGTH 125'
REMARKS:

0827 546059
0834 546136
35.289 SCF
FDA .76
.5085 5369 FPM
59.388 / 59.78
.3990
.1095
.00 0073 lb/SCF
~~63.56~~ 63.69 lb/HR #/HR
63.71
221666 ACFM
144323 SCFMD
USSCSR1 / USSCBSR1 1.3

1.55 = 2.4

MAT'L PROCESSING RATE _____
GAS METER READINGS: FINAL 468.707 ft³
INITIAL 433.055 ft³
NET _____ ft³
FILTER NO. 4034 IMP. VOL. GAIN 230 ml.
SIL GEL NO. 51 WT. GAIN 6.2 ml.
TOTAL CONDENSATE 236.2 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.8
% O_2					10.5
% CO					
% N_2					

F_O = _____ F_O RANGE = _____
ORSAT ANALYZER _____

LEAK CHECKS
PRE 0.00 cfm 11 "Hg POST 0.00 cfm 14 "Hg
METER BOX/PUMP O.K GAS SAMPLE SYST. O.K
ORSAT BAG _____
PITOT TUBE NO. 1602 PRE-TEST O.K
POST-TEST(+) 4.6 / 4.5 H_2O/Sec
POST-TEST(−) 6.8 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK PROBE HOLDER GAUTHREAUX

PORT AND TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE STACK WALL /COMMENTS	CLOCK TIME	GAS METER READING (FT³)	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			434.20	1.1	.77	.77	151	247	50	68	4.0
2		0734	435.36	1.1	.77	.77	159	258	42	68	4.0
3			436.47	1.1	.77	.77	160	261	39	68	4.0
4		0739	437.72	1.35	.95	.95	160	263	38	68	5
5			439.0	1.45	1.0	1.0	161	259	38	69	5
6		0744	440.4	1.8	1.25	1.25	162	256	39	70	6

[redacted] AIR CONSULTING & ENGINEERING, INC.

TEST ID 1

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					
1-7			442.36	3.75	2.6	2.6	162	245	39	70	11.0
8		0749	444.50	4.4	3.1	3.1	163	243	40	71	13.5
9			446.73	4.4	3.1	3.1	162	232	41	72	14.5
10		0754	448.82	4.0	2.6	2.6	163	234	41	73	13
11			450.80	3.8	2.5	2.5	162	238	42	74	12.5
12		0759	452.64	2.9	1.9	1.9	160	237	42	75	11.5
2-1			453.8	1.5	1.0	1.0	161	257	41	76	7
2		0806	454.97	1.25	.8	.8	161	264	41	77	6.5
3			456.22	1.5	1.0	1.0	162	267	40	77	7.5
4		0811	457.50	1.5	1.0	1.0	162	267	41	77	2.5
5			458.85	1.75	1.15	1.15	162	267	41	78	8.5
6		0816	460.36	2.35	1.5	1.5	162	265	40	78	10.0
7			461.87	2.35	1.5	1.5	162	262	41	79	10.0
8		0821	463.40	2.25	1.45	1.45	162	261	41	80	10.0
9			464.85	2.0	1.3	1.3	162	262	41	80	10.0
10		0826	466.15	1.7	1.1	1.1	162	258	41	80	8.5
11			467.45	1.7	1.1	1.1	157	257	41	81	9.0
12		0831	468.707	1.25	.8	.8	156	253	41	81	8

STACK SAMPLING FIELD DATA SHEET

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

TEST ID 2
PAGE 1 OF 2

PLANT U.S. SUGAR CORPORATION
SOURCE NUMBER 5 BOILER
PLANT LOCATION BRYANT, FLORIDA
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES PM
DATE 1-31-91 RUN NO. 2
TIME START 0933 TIME END 1035
SAMPLE TIME 24.25 (min/pt) = 60 Total min
ASSUMED MOISTURE 25 % FDA .75
NOMOGRAPH C_f .65 PITOT CORR. .84
P_b 30.10 "Hg P_s 30.15 "Hg
WEATHER CLOUDY TEMP. °F
METER BOX NO. 1 H 2.05 Y 0.994
NOZZLE CAL. = .175
STACK DIMENSIONS 87
STACK AREA 41.283 ft² EFFECTIVE ft²
STACK HEIGHT ft.
STACK DIAMETER: UPSTRM. DNSTRM.
PORT SIZE in. NIPPLE LENGTH in.
U CORD LENGTH 125
REMARKS:

0931 546201
1039 546280
.143 lb/min B74
.241
528.53 mm
.5315
.3989
132.6
8.0
140.6
75.8 lb/hr
2.06

MAT'L PROCESSING RATE
GAS METER READINGS: FINAL 505.346 ft.³
INITIAL 468.901 ft.³
NET 36.445 ft.³
FILTER NO. 4035 IMP. VOL. GAIN 250 ml.
SIL GEL NO. 28 WT. GAIN 6.0 ml.
TOTAL CONDENSATE 256.0 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.8
% O_2					10.5
% CO					
% N_2					

F_O = F_O RANGE =
ORSAT ANALYZER

LEAK CHECKS
PRE 0.00 cfm 15 "Hg POST 0.00 cfm 13.5 "Hg
METER BOX/PUMP GAS SAMPLE SYST.
ORSAT BAG
PITOT TUBE NO. 1602 PRE-TEST O.K.
POST-TEST(+) 6.0 / 15 H_2O/Sec
POST-TEST(−) 3.9 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR NECK PROBE HOLDER GERARD

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			470.04	1.1	.7	.7	155	258	58	75	4.0
2		0938	471.16	1.15	.75	.75	158	269	54	75	4.5
3			—	1.25	.80	.80	158	270	51	75	5.0
4		0943	473.67	1.25	.80	.80	159	267	51	75	5.0
5			474.92	1.4	.9	.9	161	256	52	75	5.0
6		0948	476.35	2.1	1.35	1.35	160	248	53	75	7

AIR CONSULTING & ENGINEERING, INC.

TEST ID 2

PAGE 2 OF 2

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			478.37	3.8	2.6	2.5	159	227	52	76	11.5
8		0953	480.23	4.4	2.9	2.9	159	222	52	77	13.5
9			482.47	4.25	2.8	2.8	158	239	53	77	14
10		0958	484.53	3.8	2.5	2.5	159	252	54	78	14
11			486.5	3.6	2.35	2.35	159	272	55	79	13.5
12		1003	488.46	3.3	2.15	2.15	157	271	55	80	13
2-1			489.55	1.35	.88	.88	158	272	58	81	7
2		1010	490.76	1.35	.88	.88	159	273	57	81	7
3			492.19	2.0	1.3	1.3	159	273	56	81	10
4		1015	493.57	1.8	1.2	1.2	159	268	55	81	9.5
5			495.07	2.4	1.55	1.55	159	259	55	82	11.5
6		1020	496.70	2.75	1.8	1.8	159	261	55	82	13
7			498.38	2.75	1.8	1.8	159	261	55	82	13.5
8		1025	499.92	2.25	1.5	1.5	158	261	55	83	12.5
9			501.42	1.75	1.15	1.15	159	265	55	83	12
10		1030	502.83	1.7	1.1	1.1	159	269	56	84	11.5
11			504.18	1.4	.9	.9	159	269	56	84	10
12		1035	505.346	1.25	.8	.8	154	269	56	85	9.5

STACK SAMPLING FIELD DATA SHEET

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

TEST ID 3
PAGE 1 OF 2

PLANT U.S. SUGAR CORPORATION
SOURCE NUMBER 5 BOILER
PLANT LOCATION BRYANT, FLORIDA
TYPE OF SAMPLING TRAIN EPA-5
TYPE OF SAMPLES P.M.
DATE 1-31-91 RUN NO. 3
TIME START 1144 TIME END 1246
SAMPLE TIME 24 / 12.5 (min/pt) = 60 Total min
ASSUMED MOISTURE 25 % FDA
NOMOGRAPH C_f .65 PITOT CORR. .84
P_b 30.10 "Hg P_s 30.15 "Hg
WEATHER CLEAR TEMP °F
METER BOX NO. 1 H 2.05 Y .994
NOZZLE CAL. = .175
STACK DIMENSIONS 87
STACK AREA 41.283 ft² EFFECTIVE ft²
STACK HEIGHT ft.
STACK DIAMETER: UPSTRM. DNSTRM.
PORT SIZE in. NIPPLE LENGTH in.
U CORD LENGTH 125
REMARKS:

1141 546351
1249 546430
68.72 lb/hr

.5200
.4024
.1176
8

920 865 300
1258

MAT'L PROCESSING RATE
GAS METER READINGS: FINAL 541.650 ft³
INITIAL 505.577 ft³
NET ft³
FILTER NO. 4036 IMP. VOL. GAIN 240 ml.
SIL GEL NO. 34 WT. GAIN 4.4 ml.
TOTAL CONDENSATE 244.4 ml.

ORSAT

	1	2	3	4	AVG.
% CO_2					9.8
% O_2					10.5
% CO					
% N_2					

F_O = F_O RANGE =
ORSAT ANALYZER

LEAK CHECKS
PRE 0.00 cfm 15 "Hg POST 0.009 cfm 14 "Hg
METER BOX/PUMP GAS SAMPLE SYST.
ORSAT BAG
PITOT TUBE NO. 1602 PRE-TEST O.K.
POST-TEST(+) 3.5 / 15 H_2O/Sec
POST-TEST(−) 4.65 / 15 H_2O/Sec
PYROMETER NO. 1
BOX OPERATOR Neal PROBE HOLDER GERARD

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			506.70	1.25	.8	.8	157	265	62	77	4.5
2		1149	507.89	1.25	.8	.8	158	268	53	77	4.5
3			509.04	1.25	.8	.8	158	265	49	77	4.5
4		1154	510.21	1.25	.8	.8	160	264	49	77	5.0
5			511.44	1.35	.88	.88	161	263	49	77	5.5
6		1159	512.90	2.0	1.3	1.3	161	265	49	77	7.0

AIR CONSULTING & ENGINEERING, INC.

TEST ID 3

PAGE 2 OF 2

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			514.81	3.8	2.5	2.5	161	262	49	78	11.5
8		1204	516.92	4.5	2.9	2.9	161	264	49	79	13.5
9			519.03	4.5	2.9	2.9	161	266	49	80	14
10		1209	521.10	4.0	2.6	2.6	161	267	50	80	14
11			523.10	3.8	2.5	2.5	160	267	50	81	14
12		1214	524.99	3.1	2.0	2.0	159	260	49	82	13
2-1			526.16	1.35	.88	.88	159	261	51	83	7
2		1221	527.43	1.55	1.0	1.0	160	259	51	83	7.5
3			528.68	1.55	1.0	1.0	161	256	51	84	7.0
4		1226	530.08	1.8	1.2	1.2	160	255	52	84	9.0
5			531.50	2.1	1.35	1.35	161	242	51	85	10.0
6		1231	533.1	2.6	1.7	1.7	162	244	51	85	11.5
7			534.72	2.35	1.5	1.5	161	242	51	85	11
8		1236	536.30	2.25	1.45	1.45	161	242	51	86	11
9			537.76	1.75	1.15	1.15	160	239	51	87	10
10		1241	539.14	1.7	1.1	1.1	161	238	51	87	10
11			540.40	1.4	.9	.9	160	238	51	87	9
12		1246	541.650	1.3	.85	.85	156	244	53	88	9

APPENDIX C

LABORATORY ANALYSES

AIR CONSULTING & ENGINEERING, inc. PARTICULATE LAB DATA

SOURCE U.S. SUGAR, CORA — No. 5

PROBE RINSE	RUN 1	RUN 2	RUN 3	BLANK	
CONTAINER NUMBER	S-16	S-20	S-25	S-35	
TOTAL VOLUME (ml)	210	195	185	100	LIQUID LEVEL
1st GROSS WEIGHT (g)	106.3593	103.4157	106.4477	106.1678	DATE & TIME: 2/6/91-1616
2nd GROSS WEIGHT (g)	106.3594	103.4158	106.4478	106.1680	DATE & TIME: 2/9/91-1330
AVERAGE GROSS WEIGHT (g)	106.3594	103.4158	106.4478	106.1679	
TARE WEIGHT (g)	106.3558	103.4116	106.4391	106.1673	
SUB NET WEIGHT (g)	0.0036	0.0042	0.0087	0.0006	
ACETONE BLANK (g)	—	—	—	—	
TOTAL NET WEIGHT (mg)	3.6	4.2	8.7	0.6	

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	4034	4035	4036	4041	
1st GROSS WEIGHT (g)	0.5049	0.5293	0.5190	0.4077	DATE & TIME: 2/6/91-1616
2nd GROSS WEIGHT (g)	0.5045	0.5293	0.5188	.4074	DATE & TIME: 2/9/91-1330
AVERAGE GROSS WEIGHT (g)	0.5047	0.5293	0.5189	.4076	
TARE WEIGHT (g)	0.3990	0.3989	0.4024	0.4080	
SUB NET WEIGHT (g)	0.1057	0.1304	0.1165	0.0004	
TOTAL NET WEIGHT (mg)	105.7	130.4	116.5	0.4	

TARE BALANCE CHECK	1st GROSS WEIGHT BALANCE CHECK	2nd GROSS WEIGHT BALANCE CHECK
SEE LAB BOOK	0 ✓ 10.0g ✓	0 0.0000 100g —
	0.5 g ✓ 100.0g ✓	0.5g 0.5003 100.0g 100.0004
	%RH 38 DATE 2/6/91	%RH 42 DATE 2/9/91
	Signature C. Jt-1-	Signature S. Z. Reb

APPENDIX D

QUALITY ASSURANCE

AND

CHAIN OF CUSTODY

AIR CONSULTING AND ENGINEERING, Inc.

SAMPLE RECOVERY AND CHAIN OF CUSTODY

PLANT NAME U.S. SUGAR CORP. TEST DATE 1/13/91

SOURCE NAME No. 5 BOILER SAMPLE RECOVERED BY SLN

TYPE OF SAMPLE PART. PARTICULATE ANALYSES BY SLN & JCH

SAMPLE RECOVERY

RUN NO.	CONTAINER NO.	LIQUID LEVEL MARKED	COLOR	COMMENTS
1	5-16	✓	MED.	
1	4034	–	BLK	
2	5-20	✓	MED.	
2	4035	–	BLK	
3	5-25	✓	MED.	
3	4036	–	BLK.	
ACETONE / WATER BLANK (CIRCLE)	5-35	✓	CLEAR	
FILTER BLANK	4041	–	WH.	

SILICA GEL

RUN NO.	CONTAINER NO.	FINAL WT. (g)	INIT. WT. (g)	NET WT. (g)	COLOR
1	51	206.2	200.0	6.2	PINK
2	28	206.0	200.0	6.0	"
3	34	204.4	200.0	4.4	"
			200.0		
			200.0		
			200.0		
			200.0		
			200.0		

AIR CONSULTING & ENGINEERING, inc. POST TEST CALIBRATION

DATE 2-11-91 METER BOX NUMBER 1 LEAK CHECK 0.000 CFM at 29 in. Hg.

CLIENT U.S. SUGAR / TALISMAN SOURCE VARIOUS THERMOCOUPLE NUMBER 36 / 160 / PYROMETER NUMBER 1

FLIGHT SERVICE Pb 30.11 in. Hg. ACE BAROMETER Pb 30.1 in. Hg.

ASTM GLASS THERMOMETER 160 / 160 °F / THERMOCOUPLE 160 / 160 °F ASTM GLASS THERMOMETER 64 °F / METER TEMP 64 °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				
-.5	2.1	513.835	508.00	5.835	193.300	199.452	6.152	~~64~~ 59 ~~66~~ 59	64 66	8	21
-.5	2.1	513.835	522.560	8.725	199.817	209.013	9.196	59 59	66 68	12	21
-.5	2.1	522.560	513.835	7.993	209.013	217.471	8.458	59 59	68 70	11	21

CALIBRATED BY: Stephen L. Neal

RUN NUMBER	SCFM	STANDARD M.C.F.	DELTA Ha	M.C.F.
1	0.75	1.005	2.135	0.959
2	0.74	1.005	2.140	0.963
3	0.74	1.005	2.135	0.963
AVERAGES	0.74	1.005	2.137	0.962

air consulting and engineering

STANDARD METER CALIBRATION

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:

$$Y_m \times Y_s = Y$$

Y_m = 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 April 26, 1990, and is checked and/or recalibrated at least annually.

AIR CONSULTING & ENGINEERING — STANDARD METER CALIBRATION

DATE 4-26-90 LEAK CHECK 0.0 CFM at 0.0 In. Hg.

METER BOX NUMBER STD #691751 BAROMETRIC PRESSURE 30.30 In. Hg.

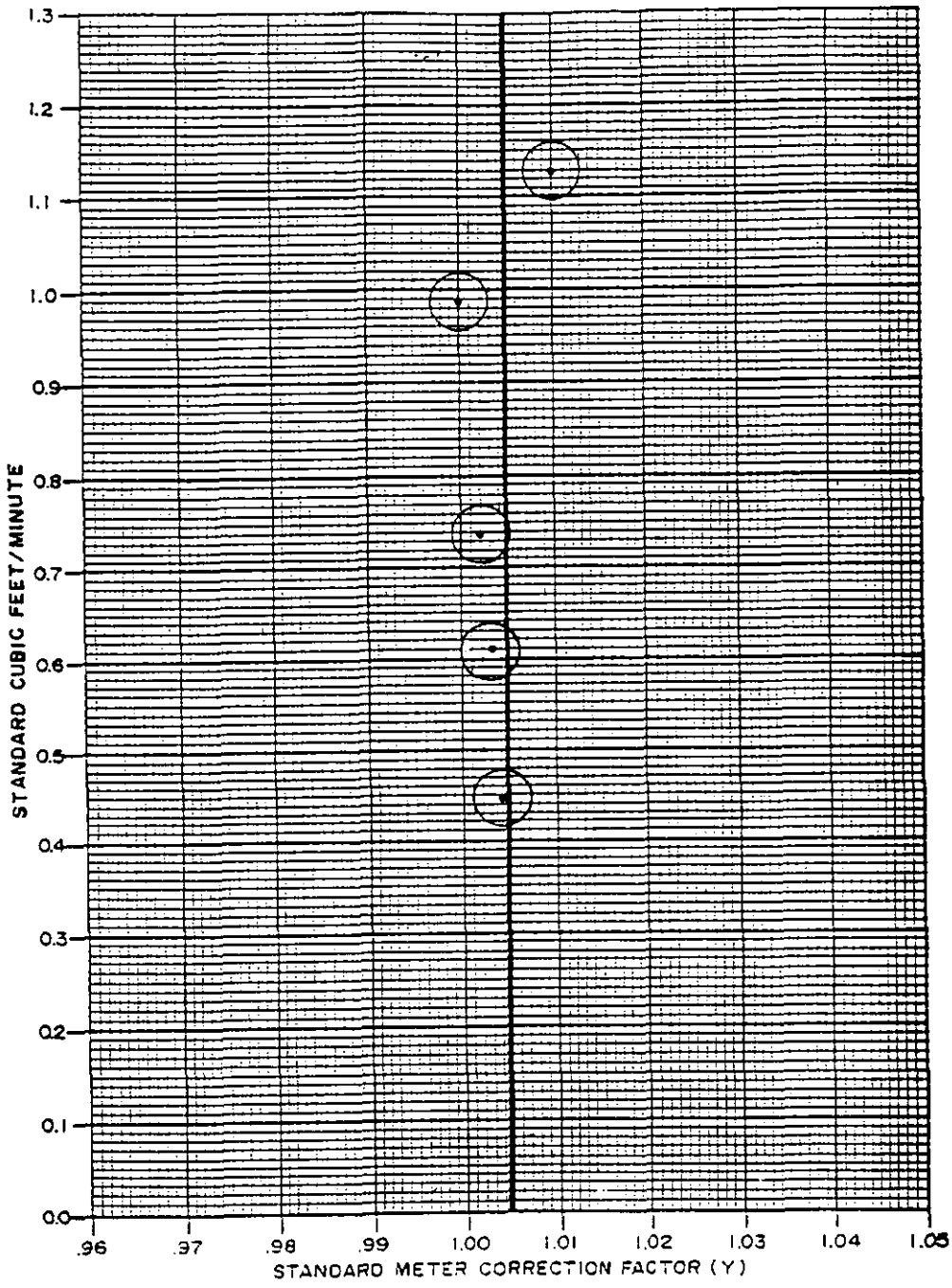
STD GAS METER TEMPERATURE 70 °F/ASTM GLASS THERMOMETER TEMPERATURE 70 °F

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			
-0.2	-1.1	4.020	9.842	5.822	243.643	249.457	5.814	70	70	13
-0.2	-1.1	9.842	15.577	5.735	249.457	255.194	5.737	70.5	71	13
-0.2	-1.1	5.577	11.240	5.663	255.194	260.872	5.678	70.5	71	13
-0.4	-1.8	2.026	7.602	5.576	261.665	267.296	5.631	70.5	72	9
-0.4	-1.8	7.602	13.171	5.569	267.296	272.923	5.627	70.5	72	9
-0.4	-1.8	3.171	8.734	5.563	272.923	278.539	5.616	70.5	72	9
-0.5	-2.2	9.112	14.275	5.163	278.914	284.153	5.239	70.5	72	7
-0.5	-2.2	4.275	9.434	5.159	284.153	289.386	5.233	70.5	72	7
-0.5	-2.2	9.434	14.600	5.166	289.386	294.632	5.246	70.5	72	7
-0.6	-3.1	5.182	10.663	5.481	295.233	300.834	5.601	70.5	72	6
-0.6	-3.1	0.663	6.124	5.461	300.834	306.424	5.590	70.5	72	6
-0.6	-3.1	6.124	11.579	5.455	306.424	311.997	5.573	70.5	72	6
-0.7	-3.7	2.185	7.422	5.237	312.617	317.993	5.376	70.5	71	5
-0.7	-3.7	7.422	12.658	5.236	317.993	323.366	5.373	70.5	71	5
-0.7	-3.7	2.658	7.888	5.230	323.366	328.737	5.371	70.5	71	5

CALIBRATED BY: George F. Gabel

	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM	Y	SCFM
Run 1	1.004	0.452	0.996	0.624	0.993	0.743	0.987	0.920	0.983	1.055
Run 2	1.002	0.444	0.995	0.623	0.993	0.742	0.986	0.917	0.983	1.055
Run 3	1.000	0.439	0.996	0.622	0.992	0.743	0.988	0.916	0.983	1.053
Average	1.002	0.445	0.996	0.623	0.993	0.743	0.987	0.918	0.983	1.054

air consulting and engineering



STANDARD METER CALIBRATION CURVE
METER SERIAL NO. 1040616 (SOUTH)
NOVEMBER 23, 1990

AIR CONSULTING
and
ENGINEERING

AIR CONSULTING & ENGINEERING — ANNUAL METER CALIBRATION

DATE 6-7-90 LEAK CHECK 0.000 CFM at 12 In. Hg.

METER BOX NUMBER 1 BAROMETRIC PRESSURE 30.02 In. Hg.

DRY GAS METER TEMPERATURE 89 °F/ASTM GLASS THERMOMETER TEMPERATURE 90 °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				
-.07	0.5	206.539	214.496	7.957	719.311	727.244	7.933	85	85	21	21
-.15	1.25	215.308	221.239	5.931	728.042	733.952	5.910	85	86	10	
-.22	2.0	221.610	227.578	5.968	734.320	740.265	5.945	85	87	8	
-.32	2.75	228.029	233.291	5.262	740.708	745.940	5.232	86	88	6	
-.40	3.5	233.668	239.592	5.924	746.315	752.205	5.890	87	90	6	
-.50	4.25	240.117	245.527	5.410	752.724	758.112	5.388	87	91	5	

	DELTA H	Ya	SCFM	Ys	Y
	2.004	1.002	0.368	1.004	1.006
	2.041	1.002	0.577	0.998	1.000
	2.061	1.003	0.725	0.993	0.996
	2.054	1.003	0.851	0.989	0.992
	2.063	1.003	0.956	0.985	0.988
	2.082	1.001	1.048	0.983	0.984
MEAN:	2.051	1.002		0.992	0.994

CALIBRATED BY: H. F. Hebel

AIR CONSULTING & ENGINEERING, INC. — PITOT TUBE CALIBRATION

DATE CALIBRATED 9-25-90 PITOT TUBE 1602

IS PITOT TUBE ASSEMBLY LEVEL YES ARE PITOT TUBE OPENINGS DAMAGED no

α_1 = 2.5 °(<10°), α_2 = 1 °(<10°), β_1 = 1.5 °(<5°), β_2 = 1 °(<5°)

γ = 2.5 ° θ = 2 ° A = 1.001 in. = (Pa + Pb)

z = A sin γ = 0.044 in.; <0.32/<1/8 in.

w = A sin θ = 0.035 in.; <0.08/<1/32 in.

P_a 0.5005 in. P_b 0.5005 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	34	34	0	0
AMBIENT	77	77	0	0
HOT OVEN	318	320	2	0.3

FDER - MAXIMUM 5° DIFFERENCE

CALIBRATED BY: C. [illegible]

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

AIR CONSULTING & ENGINEERING, INC. PYROMETER CALIBRATION

DATE 7-10-90

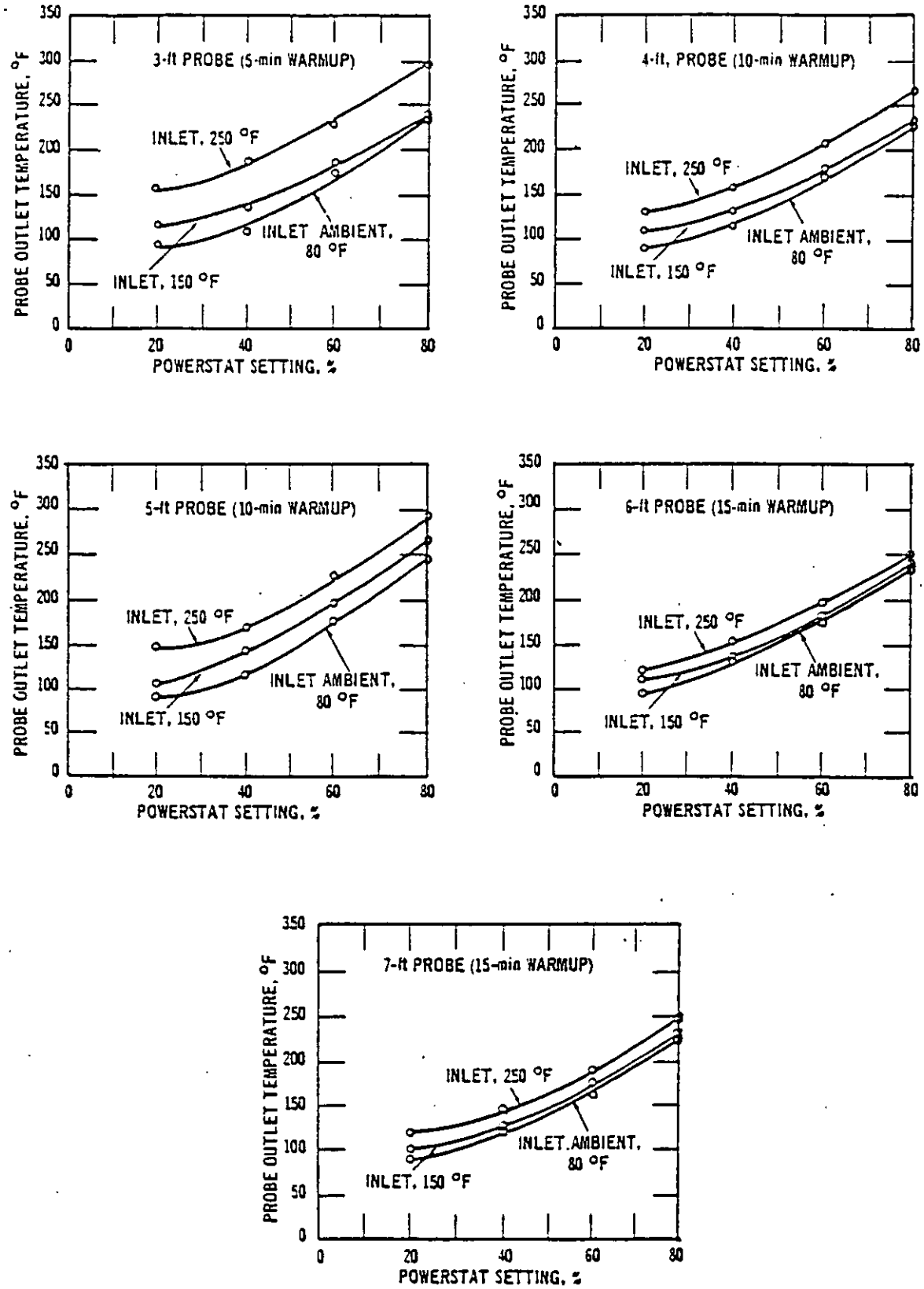
PYROMETER NUMBER METER BOX #1

SOURCE (SPECIFY)	GLASS THERMOMETER WITH NBS MERCURY (°F)	PYROMETER (°F)	DEGREE DIFFERENCE	PERCENT DIFFERENCE
ICE BATH	32°	33°	1	.2%
AMBIENT	94°	96°	2	.4%
HOT OVEN	800°	800°	0	0

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: Larry J. Watts



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

Probe temperatures.

APPENDIX E

PRODUCTION RATE CERTIFICATION

BOILER OPERATION PARAMETERS

PLANT: U.S. SUGAR CORP.- BRYANT

BOILER NUMBER 5

DATE 1-31-91 RUN NUMBER 1

OIL METER FACTOR N/A

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP ____, ____

SCRUBBER(S) GPM 650, ____

OPERATOR SIGNATURE [signature]

SCRUBBER(S)H2O LEVEL ____, ____

Ph(if applicable) ____, ____

INITIAL INTEGRATOR 546059

FINAL INTEGRATOR 546136

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
0727		245,000	900	860	300	1260
0742		245,000	910	840	300	1260
0757		245,000	930	850	300	1260
0812		245,000	915	860	300	1245
0827		245,000	910	860	300	1250
0834		245,000	910	850	300	1230
			910	850	300	1255

BOILER OPERATION PARAMETERS

PLANT U.S. SUGAR CORP. - BRYANT BOILER NUMBER 5

DATE 1-31-91 RUN NUMBER 2 OIL METER FACTOR

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

OPERATOR SIGNATURE Tracy R. Scott SCRUBBER(S) GPM ___, ___

SCRUBBER(S)H2O LEVEL ___, ___

Ph(if applicable) ___, ___

INITIAL INTEGRATOR 546201 FINAL INTEGRATOR 546280

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
0931		251	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]		
1001		[illegible]	[illegible]	[illegible]	300	[illegible]
[illegible]		[illegible]	930	[illegible]	[illegible]	[illegible]
1031		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		244	[illegible]	[illegible]	[illegible]	[illegible]
			915	860	300	1250

265

BOILER OPERATION PARAMETERS

PLANT U.S. SUGAR CORPORATION

BOILER NUMBER 5

DATE 1-31-91 RUN NUMBER 3

OIL METER FACTOR —

STEAM INTEGRATOR FACTOR 3500

SCRUBBER(S) PRESS.DROP____,___
SCRUBBER(S) GPM_____,_____
SCRUBBER(S)H2O LEVEL_____,____
Ph(if applicable)_____,_____

OPERATOR SIGNATURE Tracy R. Scott

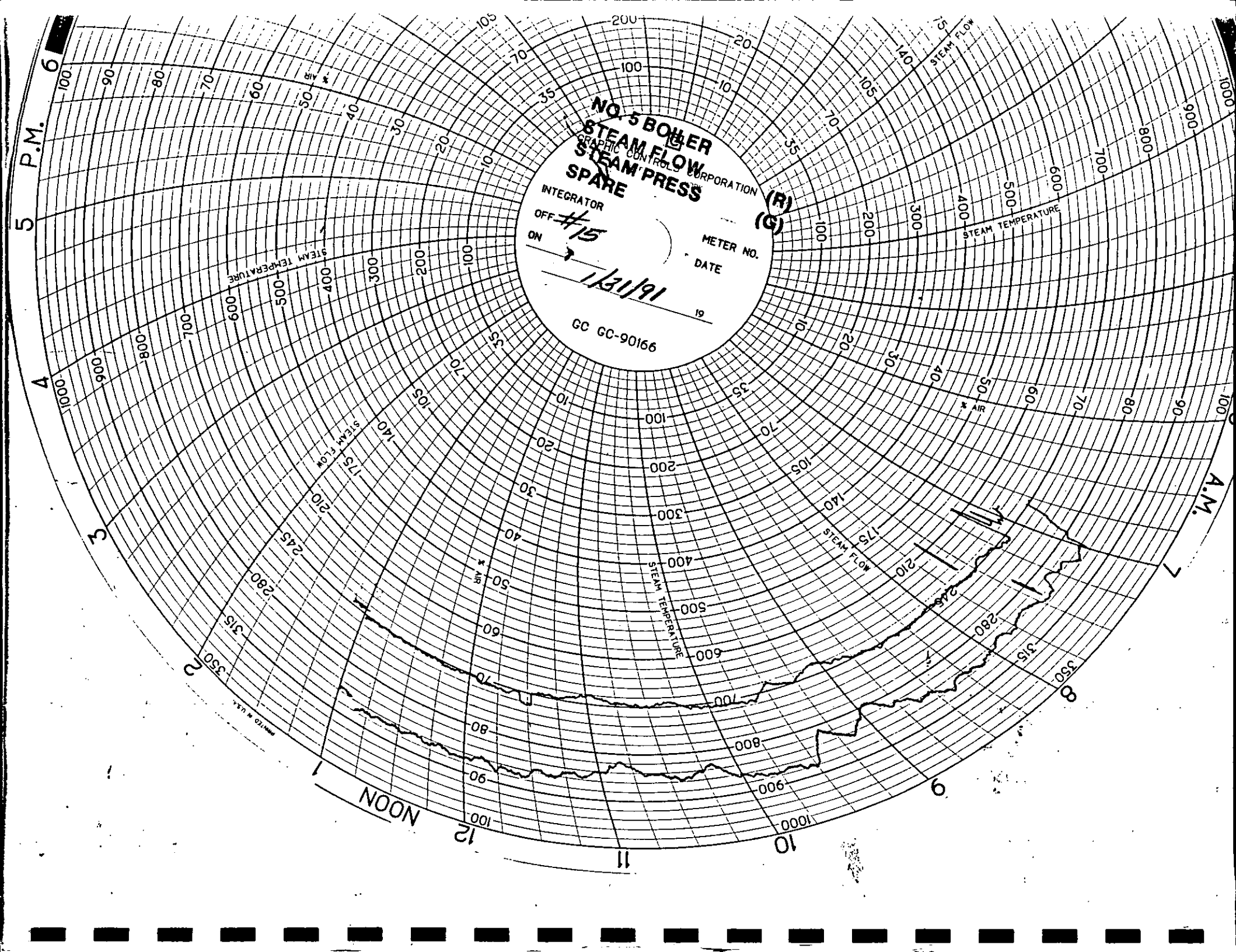
INITIAL INTEGRATOR 546351

FINAL INTEGRATOR 546430

TIME	OIL	STEAM			FEEDWATER	
	METER READING	LBS.FLOW	TEMP.	PRESSURE	TEMP.	PRESSURE
11:41		[illegible]	[illegible]	[illegible]	300	[illegible]
11:56		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12:11		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12:26		[illegible]	[illegible]	[illegible]	300	[illegible]
12:41		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	865	[illegible]	[illegible]
			920	865	300	1255
					522.98	

BRYANT BOILER No 5 DATE: 1-31-91

	TIME	ΔP"	WATER Psi	FLOW GPM	PH
RUN 1	730	8¾-9½	28	650	7.0
	745	9½-10½	29	675	7.1
	757	8¾-9½	28	660	6.9
	8:12	8¾-9½	28	650	7.0
	8:27	9½-10½	29	675	6.9
	8:35	9½-10¾	27	640	7.0
RUN 2	9:31	8¾-9¼	28	660	6.9
	9:46	8¾-9¾	29	655	7.1
	10:01	9-10¼	28	665	7.0
	10:16	8¾-9½	27	665	6.9
	10:31	9¼-10	29	670	7.1
	10:39	8¾-9½	28	675	7.0
RUN 3	11:41	9-9¾	27	665	6.9
	11:56	9½-10	27	670	6.9
	12:11	9½-9¾	28	655	7.0
	12:26	8¾-9¾	28	670	6.9
	12:41	9½-10¼	28	665	7.0
	12:49	9½-10¼	28	670	6.9


NO. 5 BOILER
STEAM FLOW
STEAM PRESS
SPARE
GRAPHIC CONTROLS CORPORATION
INTEGRATOR
OFF
ON
METER NO.
DATE
16/11/91
19
GC GC-90166
(R)
(G)
#15
STEAM FLOW
STEAM TEMPERATURE
% AIR
A.M.
P.M.
NOON
PRINTED IN U.S.A.

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

ACEI:	
STEPHEN L. NECK, P.E.	FIELD TESTING REPORT PREPARTION
GERARD GAUTHREAUX	FIELD TESTING
USSC:	
AUGUSTO BLANCHARD	TEST COORDINATOR
FL. DEPT. OF ENVIRONMENTAL REGULATION	
KEN TUCKER	TEST OBSERVER
PALM BEACH COUNTY HEALTH DEPT.	
JEFF KOERNER	TEST OBSERVER

UNITED STATES SUGAR CORPORATION
Post Office Drawer 1207 Clewiston, Florida 33440
Telephone: (813) 983-8121 Telex: 510-952-7753

March 8, 1991

Mr. David Knowles
Florida Department of Environmental
Regulation
2269 Bay Street
Fort Myers, Fl. 33901-2896

RE: Palm Beach County AP
USSC Bryant Blr. 5
Annual Compliance Test

Dear Mr. Knowles:

We are enclosing copy of annual Compliance Stack Test report on Boiler No. 5 at our Bryant mill.

This test was performed by Air Consulting & Engineering, Inc. on January 13, 1991.

Also enclosed is a certification of calibration of steam recorders by our Mr. Fernando Llorens, Supervisor of our Process Controls and Instrumentation.

By copy of this letter we are also forwarding one copy of this test to Palm Beach County Health Department.

Sincerely,

UNITED STATES SUGAR CORPORATION

Peter Barquin
Administrative Assistant
to Senior Vice President
Sugar Houses

PB:jt
Enclosures

cc: Palm Beach County Health Dept.-ESE
Mr. Murray T. Brinson

RECEIVED
MAR 15 1991
Division of Environmental Engineering
PALM BEACH COUNTY
HEALTH DEPARTMENT

UNITED STATES SUGAR CORPORATION
Post Office Drawer 1207 Clewiston, Florida 33440
Telephone: (813) 983-8121 Telex: 510-952-7753

March 8, 1991

TO WHOM IT MAY CONCERN:

This is to certify that the steam flow recorder of Boiler No. 5 at the Bryant Sugar House was recently calibrated under my supervision and found to be within specifications.

Sincerely,

UNITED STATES SUGAR CORPORATION

Fernando Llorens
Supervisor, Process Controls
and Instrumentation

41.283 MBTU/HR = 526.79 Allowable .150 Stack Area.

INPUT SHEET - REV:09/13/83 - PAGE 2 OF 2

ENTER THE FOLLOWING:

		RUN1	RUN2	RUN3
1. H2O	COLLECTED (ONLY VOL.MEASURED),ML:	230	250	240
2. H2O	COLLECTED (WEIGHED PART ONLY),GM:	6.2	6	4.4
3. M'N	PARTICULATE WEIGHT, GM:	.1093	.1348	.1252
4. V'M	VOLUME METERED, CF:	35.652	36.445	36.133
5. Y	DRY GAS METER CAL FACTOR:	.994	.994	.994
6. RDP	AVG SQR DELTA P (WHEN SAMPLING):	1.448	1.46	1.458
7. DH	AVG DELTA H, IN H2O:	1.46	1.47	1.45
8. T'M	AVG METER TEMP, DEG F:	75	79	82
9. T'S	AVG STACK TEMP, DEG F:	161 ~~[illegible]~~	158	160
10. P'S*	STACK PRESS, *IN ....(.....):	30.15	30.15	30.15
11. P'B	BAROMETRIC PRESS, IN HG:	30.10	30.10	30.10
13. D'N	ACTUAL NOZZLE DIAMETER, IN.:	.175	.175	.175
14. T	ACTUAL SAMPLE TIME, MIN:	60	60	60
15. C'P	PITOT TUBE COEFFICIENT:	.84	.84	.84

OPTION ENTRIES:

17. ORSAT/FYRITE - %CO2:	.....	.....	.....
18. ORSAT/FYRITE - %O2:	.....	.....	.....
28. ORSAT/FYRITE (FOR C'S @ 50%E.A.)-%CO:	.....	.....	.....
19. SPECIFIC M'D ENTRIES:	.....	.....	.....
23. CYCLONIC (10-20 DEG) - AVG COS(YAW):	.....	.....	.....
26. CYC.(>20) - AVG(SQR D.P X COS(YAW)):	.....	.....	.....
21. PROCESS WT SOURCE - T/HR:	.....	.....	.....
22. LB/TON REGULATED - T/HR:	.....	.....	.....
27. LB/* REGULATED (* AS DEFINED) - */HR:	.....	.....	.....
23. LAMBDA(CC(>20)-VAL(SAMPLE PTS/TOT PTS):	.....	.....	.....

DATE ../../.. FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
PARTICULATE STACK TEST VERIFICATION
DER METHOD 5

FACILITY NAME: USSC APIS #

COMPANY CONDUCTING TEST: ACE TEST DATE 1 13 91

SOURCE DESCRIPTION: BOILER 5 PSD

STACK TEST DATA SUMMATION

		RUN1	RUN2	RUN3
1.H2O	(VOL.MEAS.),ML	230	250	240
2.H2O	(MASS MEAS.),GM	6.2	6	4.4
3.M'N	PARTICULATE WEIGHT, GM	.1093	.1348	.1252
4.V'M	VOLUME METERED,CF	35.652	36.445	36.133
5.Y	DRY GAS MTR. CALIB.FCTR.	.994	.994	.994
6.RDP	AVG SQR D.P-SAMPLING	1.448	1.46	1.458
7.DH	AVG DELTA H,IN.H2O	1.46	1.47	1.45
8.T'M	AVG MTR. TEMP,DEG.F	75	79	82
9.T'S	AVG STACK TEMP,DEG.F	161	158	160
10.P'S	STACK PRESS,''HG(ABS)	30.15	30.15	30.15
11.P'B	BAROMETRIC PRESS,''HG	30.1	30.1	30.1
13.D'N	ACTUAL NOZZLE DIAM,IN	.175	.175	.175
14.T	ACTUAL SAMPLE TIME,MIN	60	60	60
15.C'P	PITOT TUBE COEFFICIENT	.84	.84	.84
23.S/T	VALUE:SAMPLE PTS/TOT PTS	1	1	1

RUN	VOLUME SAMPLED DSCF	MOISTURE CONTENT PERCENT	STACK VEL FPS	FLOW RATE DSCF/H	PERCENT ISO-KINETIC	ACTUAL EMISS LB/HR	ACTUAL EMISS LB/MBTU	ALLOW EMISS LB/MBTU
1	35.30	23.95	90.61	8,770,368	99.51	59.87	0.114	0.150
2	35.81	25.18	91.39	8,745,779	101.25	72.56	0.138	0.150
3	35.31	24.57	91.29	8,778,053	99.46	68.61	0.130	0.150
MEAN	35.47	24.57	91.10	8,764,733	100.07	67.01	0.127	0.150

SUMMARY

GENERAL:

REVIEWED BY AS
ACTUAL A 'S = 41.283 SQ FT
LAMINAR FLOW ASSUMED (<10 DEG YAW) (OR <20 DER)
ACTUAL EMISS BASED ON HEAT INPUT = 526.79 MBTU/HR
ALL REQUIRED LEAK TESTS ACCEPTABLE
ASSUMED M 'D=30.0 (COMBUSTION GASES)

COMMENT.....

RUN 1 :

ACTUAL A 'N = .000167 SQ FT

COMMENT.....

RUN 2 :

ACTUAL A 'N = .000167 SQ FT

COMMENT.....

RUN 3 :

ACTUAL A 'N = .000167 SQ FT

COMMENT.....

8-22-91